

The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park

Submissions and Preferred Infrastructure Report Volume 1: Main Report

Roads and Maritime Services | December, 2017



BLANK PAGE

The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park Submissions and Preferred Infrastructure Report

December 2017

Prepared for

Roads and Maritime Services

By Jacobs Australia

Publication Number: RMS 17.629

BLANK PAGE

Executive summary

The Project

Roads and Maritime Services (Roads and Maritime) propose to upgrade 16 km of The Northern Road between Mersey Road, Bringelly and Glenmore Parkway, Glenmore Park (the project). Key features of the project are summarised below:

- A six-lane divided road between Mersey Road, Bringelly and Bradley Street, Glenmore Park (two general traffic lanes and a kerbside bus lane in each direction). A wide central median would allow for an additional travel lane in each direction in the future, if required
- An eight-lane divided road between Bradley Street, Glenmore Park and just south of Glenmore Parkway, Glenmore Park (three general traffic lanes and a kerbside bus lane in each direction separated by a central median)
- About eight kilometres of new road between Mersey Road, Bringelly and just south of the existing Elizabeth Drive, Luddenham to realign the section of The Northern Road that currently runs through the Western Sydney Airport site
- About eight kilometres of upgraded and widened road between the existing Elizabeth Drive, Luddenham and just south of Glenmore Parkway, Glenmore Park
- Access to the Luddenham town centre from north of the realigned The Northern Road and the existing The Northern Road
- Twin bridges over Adams Road, Luddenham
- Four new traffic light intersections and new traffic lights at existing intersections
- Local road changes and upgrades to current access arrangements for businesses and private properties
- A new shared path for pedestrians and cyclists on the western side of The Northern Road and footpaths on the eastern side of The Northern Road where required.

To meet the requirements of both the Commonwealth and State planning approval processes for the proposed upgrade, Roads and Maritime prepared a single document acting as both the NSW Environmental Impact Statement (EIS) and the Commonwealth Draft EIS for the project.

Roads and Maritime, as the proponent of the project, has prepared this submissions and preferred infrastructure report to meet requirements of Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and to respond to issues raised in submissions received during the exhibition of the EIS, as well as describe and assess proposed changes and design refinements to the project.

Environmental impact statement exhibition

With approval from the Commonwealth Department of the Environment and Energy (Commonwealth DoEE), the EIS was exhibited by the NSW Department of Planning and Environment (NSW DPE) from Wednesday 21 June 2017 until Wednesday 2 August 2017. The EIS was displayed at a number of locations during the exhibition period and also made available electronically.

Additionally, Roads and Maritime hosted three community information sessions during the exhibition period. A project information line was also available throughout the exhibition period to answer questions from the community relating to the project.

Further information about the EIS exhibition is provided in section 1.3 of this report.

Response to submissions

Roads and Maritime received a total of 39 submissions during exhibition of the EIS. Of these submissions 24 were received from community members including:

- Four from community special interest groups
- Nineteen from community members
- One from a private developer.

In addition to the 24 community submissions, a total of 15 government agency, local council and utility provider submissions were received in response to exhibition of the EIS.

The key issues raised included:

- Traffic and transport issues relating to:
 - maintaining access to utility corridors
 - construction impacts to local roads and the need to consult with residents
 - provision of bus shelters and shared path facilities
 - the model used for traffic forecasting and intersection capacity.
- Noise and vibration issues primarily related to:
 - construction noise and vibration impacts including the requirements for consultation with the community and utility providers
 - post construction noise verification requirements
 - the assessment of work carried out outside standard construction hours.
- Biodiversity issues, primarily related to:
 - the removal of existing, large remnant trees and the related fauna impacts
 - the removal Cumberland Plain Woodland
 - impacts to terrestrial and aquatic fauna including impacts from street lighting and impacts to fauna inhabiting farm dams
 - impacts to wildlife corridors and habitat connectivity. Connectivity measures including underpasses and fencing have been included in the design
 - the use of local native flora species for roadside plantings
 - ecosystem offset quantum and effectiveness.
- Socio-economic and land use issues related to:
 - property value and compensation concerns
 - property acquisition
 - construction related impacts including the proximity of construction compounds
 - operational impacts including economic impacts on non-registered businesses and agricultural land
 - Signage and gateway treatments for the Local Government Areas.
- Non-Aboriginal heritage issues related to:
 - the existing Non-Aboriginal heritage of the project area including errors identified in the technical paper in relation to historical background information
 - potential construction impacts on local heritage items such as Miss Lawson's Guesthouse and Lawson's Inn site
 - further historical research and archaeological assessment for some items.
- Urban design and landscaping issues related to the impact of the project on the landscape character of the area and loss of rural aspect
- Effectiveness of mitigation measures to address the cumulative impacts of the project and other large infrastructure projects.

Roads and Maritime responded to issues raised within this report by:

- Justifying the scope and location of elements of the proposal as well as confirming access arrangements, predicted traffic volumes and consultation requirements during construction and operation
- Including additional information on indicative worst case noise impacts, justification for out of hours work (OOHW) activities, background noise monitoring methodology and updated management measures
- Holding meetings with OEH and community members to discuss biodiversity issues including technical issues, offsets and connectivity measures. Sections of the biodiversity assessment report (BAR) for the Proposal were also updated to respond to submissions including clarification of the assessment methodology and updated management measures
- Clarifying that the acquisition and valuation for the Proposal would be in accordance with the provisions of the *NSW Land Acquisition (Just Terms Compensation) Act 1991* as well as that negotiations would be ongoing through the detailed design for the project and that dedicated case manager has been allocated for property acquisition
- Carrying out further non-Aboriginal heritage assessment which included:
 - further historical research, land title searches and correction of errors
 - updated histories and significance assessments for known and potential heritage items.
 - additional archaeological assessment
 - research designs and excavation methodologies
- Clarifying consultation commitments with Councils for the urban design and landscape plan and with other proponents regarding other infrastructure projects in the area.

This report identifies the issues raised by the community (Chapter 2) and government agencies, local councils and utilities (Chapter 3) during exhibition of the EIS and provides responses to those issues.

Project changes and design refinements

Roads and Maritime has refined aspects of the project as presented in the EIS in order to minimise impacts, where possible. The design refinements are a direct response to:

- Consultation with the community during the EIS exhibition period
- Submissions received during the EIS exhibition period
- Landowner discussions during property acquisition and adjustment
- Further review of the project concept design to address constructability and safety issues and to minimise the environmental impact of the project.

The design refinements include:

- Refinements to cuttings, embankments and the width of the median at various locations along the main alignment
- Changes to utilities and services
- Refinements to the horizontal and vertical alignment of The Northern Road
- Refinements to local road upgrades
- Refinements to various intersections including changes to turning movements, signal phasing and median lengths

- Removal of northbound heavy vehicle inspection bays and variable message signage (VMS)
- Refinements to drainage and water quality infrastructure
- Property adjustments including provision of new accesses at various locations
- Refinements to culvert designs at Surveyors and Badgerys Creek to provide dry fauna passage
- Changes to the delivery timing of the Littlefields Road to Glenmore Parkway stage of the project, the incident management facility and the mid-block sections of bus lanes. Other minor elements of the project may be staged due to funding availability and service requirements.

In accordance with section 115Z(6) of the EP&A Act, a preferred infrastructure report has been prepared for the project to address the design refinements described above.

Overall, changes to the project have been assessed as being generally consistent with the outcomes of the EIS. The mitigation measures identified in the EIS would continue to apply, with a number of revised or new environmental management measures developed in response to the changes as summarised in Chapter 6 of this report

Additional environmental assessment

Roads and Maritime has carried out additional desktop and field assessment as well as commissioned a number of supporting technical reports to respond to submissions received and to assess the impacts of design refinements outlined above. Additional assessments since exhibition of the EIS are outlined below.

Biodiversity

Further assessment of potential biodiversity impacts was carried out partly in response to submissions received from community members, Penrith City Council, OEH and DPI. Additionally, design refinements have been made to the proposed construction footprint for the project which has resulted in revised impacts and associated biodiversity offset requirements.

A revised assessment of the impacts under the Framework for Biodiversity Assessment (FBA) has been carried out including recalculation of landscape values, impacts to native vegetation (including threatened ecological communities), impacts to threatened species, and impacts to MNES, including impacts to the environment of Commonwealth land. An additional targeted survey for *Pultenaea parviflora* and *Marsdenia viridiflora* subsp. *viridiflora* was also carried out around the Vineyard Road extension on 7 August 2017.

Overall, impacts to biodiversity have decreased as a result of the refined design. Additional mitigation measures have also been developed in response to some of the submissions, and in response to design refinements. These measures have been incorporated into the revised environmental management measures for the project (refer to Chapter 6 of this report).

Water quality

Further assessment of potential water quality impacts was carried out partly in response to submissions received from Penrith and Liverpool City Councils. Additionally, through the design process, design refinements were made to the proposed road and pavement drainage design.

Water quality modelling using the MUSIC model was re-run for the revised drainage design which included vegetated swales and two detention basins. The results of the MUSIC model were compared against the result previously achieved for the road and pavement drainage proposed in the EIS. The results of the MUSIC modelling, which are measured in annual pollutant load reductions, indicate that the refined road and pavement drainage would generally result in an

improvement in water quality compared to that which was previously achieved (and assessed within the EIS).

Non-Aboriginal heritage

Further non-Aboriginal heritage assessment has been carried out in response to submissions received from the community and agencies, as well as updated impacts and mitigation measures to account for design refinements (refer to Appendix D). The assessment included further historical research which informed updated histories and significance assessments for some of the known and potential heritage items identified in the EIS, including comparative analysis for Item 9: Miss Lawson's Guesthouse site and Item 10: Lawson's Inn site.

Although there were updates to the assessments and statements of heritage significance for some items, there was no change in relation to whether or not an item satisfied the criteria for local or State listing, with no State significant items identified within the project area.

The updated assessment in Appendix D also includes updated statements of heritage impact for the four potentially impacted heritage items assessed in the EIS. The additional historical research on Item 10: Lawson's Inn located the original site of the Inn outside of the project footprint, noting that design refinements associated with changes to batters at the tie in point to Eaton Road has resulted in avoiding areas of high archaeological potential, therefore decreasing the expected likelihood of impact to this item. Otherwise, there was minimal change to impacts and mitigation measures to reflect the refined design. Research designs and excavation methodologies have also been prepared for the impacted items as required, and are incorporated into the updated assessment. These are included in Appendix D.

Revised environmental management measures

The EIS identified a range of environmental outcomes and management measures proposed to avoid or reduce environmental impacts. After consideration of the issues raised in the public submissions and from project design refinements, Roads and Maritime has provided minor amendments to the environmental management measures for the project where appropriate.

The main amendments to the management measures provided in the EIS include:

- Preparation of a supplementary measures package as part of the Biodiversity Offsets Strategy for the Project
- Additional commitments for the preparation of revegetation plans and specifications that clearly identify the locations of areas to be revegetated
- Additional detail regarding exclusion zones for threatened flora species
- The inclusion of a Vegetation Management Plan (VMP) to including specific management measures to mitigate impacts to riparian areas
- Additional revegetation measures including the transplanting native species
- Additional noise and vibration management measures for construction compounds
- Further consultation commitments with utility providers and additional protection requirements for their assets
- Further consultation commitments with local Councils regarding street signage, revitalisation plans for Luddenham and the provision of heritage reports and photo archival results.

These environmental management measures, detailed in Chapter 6 of this report, will guide subsequent development and delivery phases of the project.

Next steps

This submissions and preferred infrastructure report will be made available to the public in accordance with section 115Z of the *Environmental Planning and Assessment Act 1979*.

This report and all accompanying documents have been made available electronically at the DPE's website - www.majorprojects.planning.nsw.gov.au. All online documents have been made web accessible and can be accessed free of charge.

Roads and Maritime has also prepared a Final EIS to satisfy requirements under Part 8 of the Commonwealth EPBC Act. The Final EIS would be available via the Commonwealth DoEE website – <http://epbcnotices.environment.gov.au/publicnoticesreferrals/> and displayed on Roads and Maritime's project website <http://www.rms.nsw.gov.au/projects/sydney-west/the-northern-road/stage-4/index.html>

The NSW DPE and the Commonwealth DoEE will consider the responses to submissions, and additional assessment of design refinements as presented in this Submissions and Preferred Infrastructure Report and Final EIS respectively during its assessment of the project. The NSW Minister for Planning and the Commonwealth Minister for Environment and Energy will then decide whether or not to approve the project and identify any conditions of approval that would apply. If approved, Roads and Maritime will continue to consult with community members, government agencies and other stakeholders during the construction and operation phases of the project.

Contents

Executive summary	i
The Project.....	i
Environmental impact statement exhibition.....	i
Response to submissions	ii
Project changes and design refinements	iii
Additional environmental assessment.....	iv
Revised environmental management measures	v
Next steps	vi
Glossary of terms and abbreviations.....	3
1 Introduction and background	12
1.1 The project.....	12
1.2 Statutory context.....	16
1.3 Community and stakeholder consultation.....	19
1.4 Purpose and structure of this report	22
2 Response to community issues	23
2.1 Respondents	23
2.2 Overview of the issues raised by the community	24
2.3 General objections.....	26
2.4 Consultation.....	26
2.5 Traffic and transport	28
2.6 Noise and vibration.....	30
2.7 Biodiversity	35
2.8 Socio-economic and land use	46
2.9 Hydrology and flooding.....	54
2.10 Soils, water and contamination.....	54
2.11 Non-Aboriginal heritage.....	55
2.12 Urban design and visual impact	57
2.13 Air quality.....	59
2.14 Cumulative impacts	59
3 Response to government agency, local councils and utility provider issues and advice.....	61
3.1 Respondents	61
3.2 Overview of the issues raised and advice provided	61
3.3 NSW Rural Fire Service	63
3.4 Civil Aviation Safety Authority.....	63

3.5	Federal Member for Macarthur, Dr Mike Freeland MP	64
3.6	WaterNSW.....	64
3.7	NSW Department of Planning and Environment, Division of Resources and Geoscience (GSNSW).....	70
3.8	Liverpool City Council	70
3.9	TransGrid.....	82
3.10	Penrith City Council	86
3.11	NSW Office of Environment and Heritage (Heritage)	102
3.12	NSW Department of Industry (Land and Forestry)	110
3.13	Campbelltown City Council.....	110
3.14	NSW Office of Environment and Heritage (Biodiversity)	110
3.15	NSW Environment Protection Authority.....	118
3.16	NSW Department of Primary Industries	122
3.17	Sydney Water	130
4	Project changes and design refinements	134
4.1	Overview.....	134
4.2	Project changes.....	135
5	Additional assessment	167
5.1	Key issues	168
5.2	Other issues	190
6	Revised environmental management measures	209
6.1	Construction safeguards and management measures.....	209
6.2	Operational environmental management	267
7	References.....	274

Appendices

Appendix A – Noise and Vibration: additional information in response to submissions

Appendix B – Technical Memorandum: Noise and vibration

Appendix C – Technical Memorandum: Biodiversity

Appendix D – Technical Memorandum: Non-Aboriginal Heritage

Glossary of terms and abbreviations

Term	Meaning
ABS	Australian Bureau of Statistics
Abutment	The end support of a bridge or similar structure
Access	The driveway by which vehicles and/or pedestrians enter and/or leave property adjacent to a road
AEP	Annual Exceedance Probability
AHD	Australian Height Datum: The standard reference level used to express the relative height of various features. A height given in metres AHD is essentially the height above sea level. Mean sea level is set as zero elevation
AHIMS	Aboriginal Heritage Information Management System: register of NSW Aboriginal heritage information maintained by OEH
AHIP	Aboriginal Heritage Impact Permit: An Aboriginal Heritage Impact Permit is the statutory instrument that OEH issues under section 90 of the <i>National Parks and Wildlife Act 1974</i> to manage harm or potential harm to Aboriginal objects and places
Alignment	The general route or layout (e.g. of a roadway) in plan (horizontal) and elevation (vertical)
ARI	Average reoccurrence interval: Used to describe the frequency or probability of floods occurring (e.g. a 100 year ARI flood is a flood that occurs or is exceeded on average once every 100 years)
Arterial	The main or trunk road of the State road network
B-double	A B-double is a class 2 heavy vehicle that consists of a prime mover towing two semitrailers, with the first semitrailer being attached directly to the prime mover by a fifth wheel coupling and the second semitrailer being mounted on the rear of the first semitrailer by a fifth wheel coupling on the first semitrailer
Backfill	Fill replaced in an excavation
BAR	Biodiversity assessment report
Base case / „do nothing / do minimum	Used in evaluating projects to compare the cost and benefit of the do minimum (the base case) with another or a number of other projects or options
Batter	The side slope of embankments and cuttings which is usually expressed as a ratio of horizontal distance to vertical height value of one

Term	Meaning
Blue Book	<i>Soils and Construction, 2008 Volume 2D Main Road</i> . This document provides guidelines, principles and recommended design standards for managing erosion and sediment control during service installation
BOPMP	Biodiversity Offsets Policy for Major Projects
BOS	Biodiversity Offset Strategy
Bridge deck	The surface of the bridge including road and pedestrian/cyclist path
BSA	Bureau of Statistics and Analytics, Transport for NSW
Carriageway	The portion of roadway used by vehicles including shoulders and ancillary lanes
CASA	Civil Aviation Safety Authority
Catchment	The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location
CCS	Community Communications Strategy
CEEC	Critically endangered ecological community
CEMP	Construction Environmental Management Plan
CIP	Community Involvement Plan
Chainage	Measurement at a particular point along a line as measured from a fixed starting point (in metres)
CHAR	Cultural heritage assessment report
CHL	Commonwealth Heritage List
CHMP	Cultural Heritage Management Plan
CMA	Catchment Management Area
CNVG	Roads and Maritime Construction Noise and Vibration Guideline
CNVMP	Construction Noise and Vibration Management Plan
CTMP	Construction Traffic Management Plan
Collector road	A local road that moves traffic to arterial roads
Commonwealth EIS Guidelines	Refers to the <i>Guidelines for the content of a draft environment impact statement: The Northern Road Upgrade: Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park</i> (Reference: EPBC 2016/7696), issued by the Commonwealth Department of Environment and Energy on 24 August 2016

Term	Meaning
Concrete	A mixture of fine and coarse aggregate, water, cement and admixtures
CPSWSGTF	Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Cumberland Plain Woodlands)
CPTED	Crime prevention through environmental design
Cross-section	A vertical section, generally at right angles to the centreline showing the ground. On drawings it commonly shows the road to be constructed, or as constructed
Cut	The depth from the natural surface of the ground to the subgrade level
Cutting	The formation resulting from the construction of the road below existing ground level. The material is cut out or excavated
CWEMP	Construction Waste and Energy Management Sub-Plan
dB(A)	Decibels using the A-weighted scale measured according to the frequency to the human ear
DEHP	Defence Environment and Heritage Panel
DEOH	Defence Establishment Orchard Hills
Design standard	The particular standards used in the design, such as a standard lane width
DIRD	Commonwealth Department of Infrastructure and Regional Development
Discharge	The rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second (m ³ /s). Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving (e.g. metres per second [m/s])
DoD	Department of Defence
DOEE	Commonwealth Department of Energy and Environment
DPE	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries, including DPI Fisheries and DPI Water
DUXOP	Commonwealth Department of Defence UXO Panel
Earthworks	All operations involved in loosening, excavating, placing, shaping and compacting soil or rock
EEC	Endangered ecological community: An ecological community identified as having endangered status under the NSW <i>Threatened Species Conservation Act 1995</i>

Term	Meaning
EIS	Environmental impact statement: An environmental impact assessment document prepared for the purposes of Part 5.1 of the <i>Environmental Planning and Assessment Act 1979</i> (NSW), and written generally to comply with the requirements issued by the Secretary of the NSW Department of Planning and Environment. The EIS was also prepared to meet the Commonwealth EIS Guidelines issued under the EPBC Act 1999.
Embankment	An earthen structure where the road subgrade level is above the natural surface
EMP	Environmental Management Plan
EMS	Environmental management system: A quality system that enables an organisation to identify, monitor and control its environmental aspects. An EMS is part of an overall management system that includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, reviewing and maintaining its environmental policy and performance
EPA	NSW Environment Protection Authority
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPL	Environmental protection license: The <i>Protection of the Environment Operations Act 1997</i> (POEO Act) establishes the NSW environmental regulatory framework and includes a licensing requirement for certain activities. Environment protection licences are a central means to control the localised, cumulative and acute impacts of pollution in NSW
ESD	Ecologically sustainable development: As defined by the <i>Protection of the Environment Administration Act 1991</i>
FBA	Framework for Biodiversity Assessment: The Framework for Biodiversity Assessment prepared by the NSW Office of Heritage and Environment underpins the Biodiversity Offset Policy for Major Projects. It contains the assessment methodology that is adopted by the policy to quantify and describe the impact assessment requirements and offset guidance that apply to Major Projects
FFMP	Flora and Fauna Management Plan
Fill	The material placed in an embankment
Flood affected area	Land susceptible to flooding by a PMF event
FM Act	<i>Fisheries Management Act 1994</i>
GDA	Geocentric Datum of Australia
GIS	Geographic Information System

Term	Meaning
GHG	Greenhouse gases: Greenhouse gases are those gases that reduce the loss of heat in the earth's atmosphere by absorbing infrared radiation. These gases include carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, hydrofluocarbons and perfluorocarbons
GPT	Gross Pollutant Trap
GSNSW	NSW Department of Planning and Environment, Division of Resources and Geoscience, Geological Survey of New South Wales
Ha	Hectare
Hydraulic	The term given to the study of water flow in waterways, in particular the evaluation of flow parameters such as water level and velocity
Hydrology/Hydrologic	The term given to the study of the rainfall and runoff process; in particular, the evaluation of peak flows, flow volumes and the derivation of hydrographs for a range of floods
ICNG	NSW EPA Interim Construction Noise Guideline
Kerb	An edge stone or concrete shape used for bordering a road and defining the footway
KNC	Kelleher Nightingale Consulting
Landscape character	The aggregate of built, natural and cultural aspects that make up an area and provide a sense of place. Includes all aspects of a tract of land – built, planted and natural topographical and ecological features
LCT	Local Traffic Committee
LCZ	Landscape Character Zones
LCVIA	Landscape Character and Visual Impact Assessment
LEP	Local environmental plan
LGA	Local government area
LoS	The „Level of Service: The standard measure used to assess the operational performance of these intersections. Level of service is ranked from LoS A to LoS F, with LoS A representing the best performance and LoS F the worst. The LoS is based on the average delay experienced by vehicles driving through the intersection (in seconds)
MCP	Management Control Plans
MDP	Metropolitan Development Plan
MNES	Matters of national environmental significance: Matters listed under the EPBC Act

Term	Meaning
Median	The central reservation which separates carriageways from traffic travelling in the opposite direction
MP	Members of Parliament
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
NCA	Noise catchment areas
NMG	Noise Management Guidelines
NML	Noise management levels
NSW RFS	New South Wales Rural Fire Service
Obstacle limitation surface (OLS)	The Obstacle Limitation Surfaces define the volume of airspace that should ideally be kept free from obstacles in order to minimise the danger to aircraft during an entirely visual approach
OEH	NSW Office of Environment and Heritage, includes OEH Heritage and OEH Biodiversity
OEMP	Operational Environmental Management Plan
OOHW	Out of Hours Works
Pavement	The portion of carriageway placed above the subgrade for the support of, and to form a running surface for, vehicular traffic
PCT	Plant community types
Peak discharge	The maximum discharge occurring during a flood event
Peak flow rate	The maximum flow rate occurring during a flood event
pH	A figure expressing the acidity or alkalinity of an aqueous solution on a logarithmic scale. 7 is neutral, lower values are more acid and higher values are more alkaline
PM2.5	Particulate matter less than 2.5 microns in diameter
PMF	Probable maximum flood: The largest flood that could conceivably occur at a particular location, usually estimated from the probably maximum precipitation. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain
POEO	<i>Protection of the Environment Operations Act 1997</i>
Project footprint	The extent of impact that the project makes on the land
RAP	Remediation Action Plan

Term	Meaning
RBL	Rating background level: As defined by the NSW Industrial Noise Policy is it the overall single figure background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-h period used for the assessment background level)
RBS	Rapid Biodiversity Survey
Receiver	An environmental modelling term used to describe a map reference point where the impact is predicted. A sensitive receiver is a home, work place, school or other place where people spend some time
Retaining wall	A wall constructed to resist lateral pressure from the adjoining ground or to maintain in position a mass of earth
Riparian	Relating to the banks of a natural waterway
RMS	Roads and Maritime Services NSW (formerly Roads and Traffic Authority)
RNP	NSW Road Noise Policy
Roundabout	An intersection where all traffic travels in one direction around a central island
RTA	(former) Roads and Traffic Authority (now RMS)
Safety barrier	A physical barrier separating roadside hazards or opposing traffic and the travelled way, designed to resist penetration by an out-of-control vehicle and, as far as practicable, to stop or redirect colliding vehicles
SCA	Sydney Catchment Authority
Scour	The erosion of material by the action of flowing water
SEARs	Secretary's environmental assessment requirements
Shared path	A path used by both cyclists and pedestrians, usually located on the side of the road
Shoulder	The portion of the carriageway beyond the traffic lanes adjacent to and flush with the surface of the pavement
SHR	NSW State Heritage Register
Site compound	Area enclosing construction machinery, stockpiles, site offices and other ancillary facilities
Span	The distance between centres of adjacent supports of a bridge
Spoil	Surplus excavated material
SME	Small to medium enterprise

Term	Meaning
SSI	State Significant Infrastructure
STAM	RMS Strategic Traffic Assignment Model
Stockpile	Temporarily stored materials such as soil, sand, gravel and spoil/waste
Sub-arterial	A road that supports and links State roads
Subgrade	The trimmed or prepared portion of the formation on which the pavement is constructed
Substructure	In a bridge, the piers and abutments (including wing walls) which support the superstructure
Superstructure	That part of a bridge structure which is supported by the piers and abutments
SWMP	Soil and Water Management Plan
SWPGA	South West Priority Growth Area
TAMS	Total Asset Management System
TCP	Traffic Control Plan
TECs	Threatened Ecological Communities
TfNSW	Transport for New South Wales
TNR	The Northern Road
TSC Act	<i>NSW Threatened Species Conservation Act, 1995</i>
Total Suspended Solids (TSS)	Total suspended solids (TSS) are particles that are larger than 2 microns found in the water column
Underpass	A tunnel constructed for the use of pedestrians and cyclists under a carriageway
Urban design	The process and product of designing human settlements and their supporting infrastructure, in urban and rural environments
UDLP	Urban Design Landscaping Plan
UXO	Unexploded ordinance
Vertical alignment	The longitudinal profile along the design line of a road
View point	A point in the landscape chosen to measure impacts to visual amenity
VIS	Vegetation information system
VMP	Vegetation Management Plan
VMS	Variable Message Signs

Term	Meaning
Water quality basin	An area where stormwater is ponded to be treated before entering a waterway
WSA	Western Sydney Airport
WSIP	Western Sydney Infrastructure Plan
WSPGA	Western Sydney Priority Growth Area

1 Introduction and background

1.1 The project

The Australian and NSW governments are planning to upgrade The Northern Road as part of the \$3.6 billion Western Sydney Infrastructure Plan (WSIP) to improve safety, increase road capacity and reduce travel times and congestion in the future.

Roads and Maritime Services (Roads and Maritime) propose to upgrade 16 km of The Northern Road between Mersey Road, Bringelly and Glenmore Parkway, Glenmore Park (the project).

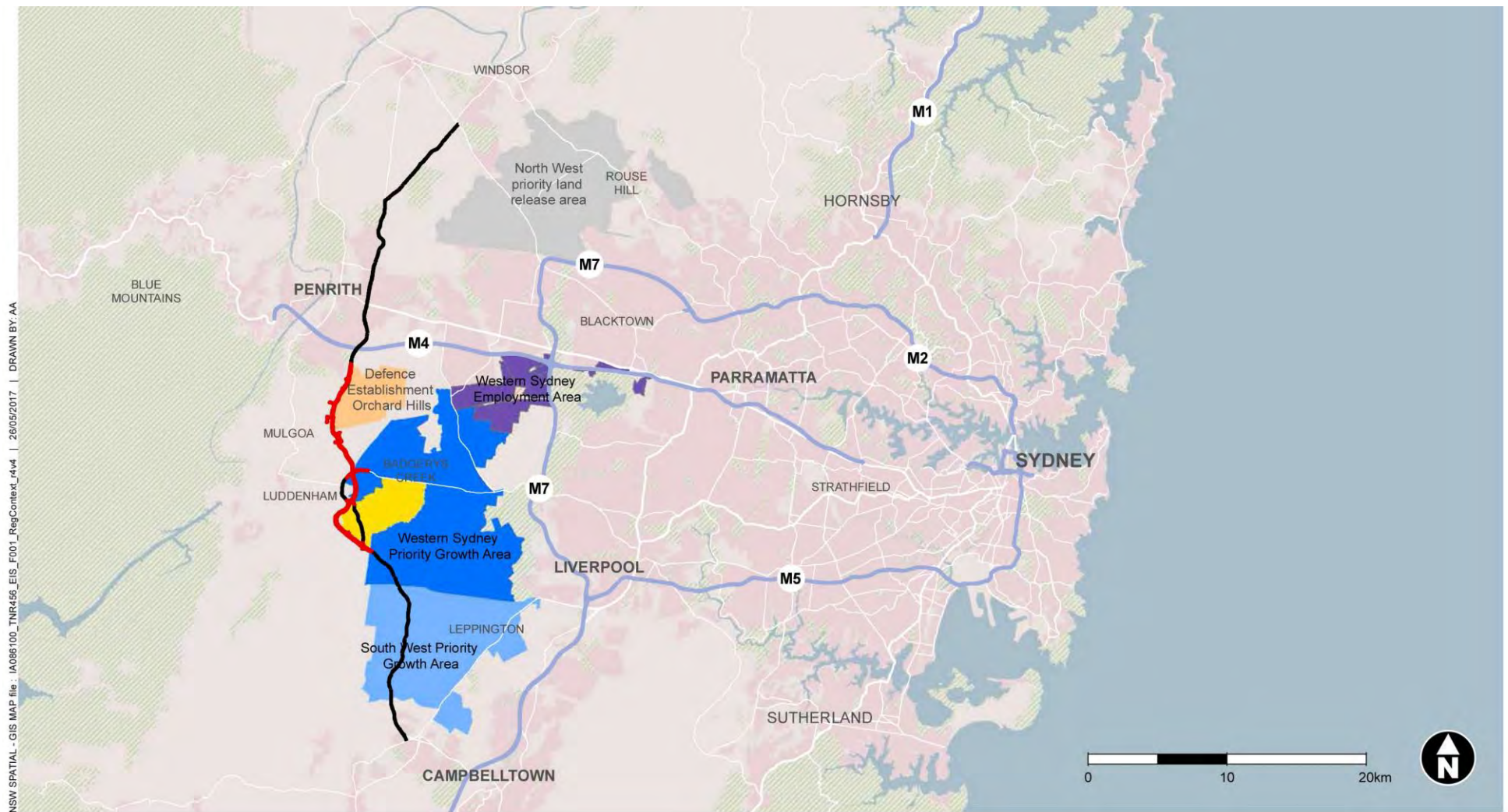
The project generally comprises the following key features:

- A six-lane divided road between Mersey Road, Bringelly and Bradley Street, Glenmore Park (two general traffic lanes and a kerbside bus lane in each direction). A wide central median would allow for an additional travel lane in each direction in the future, if required
- An eight-lane divided road between Bradley Street, Glenmore Park and just south of Glenmore Parkway, Glenmore Park (three general traffic lanes and a kerbside bus lane in each direction separated by a central median)
- About eight kilometres of new road between Mersey Road, Bringelly and just south of the existing Elizabeth Drive, Luddenham to realign the section of The Northern Road that currently runs through the Western Sydney Airport site
- About eight kilometres of upgraded and widened road between the existing Elizabeth Drive, Luddenham and just south of Glenmore Parkway, Glenmore Park
- Access to the Luddenham town centre from north of the realigned The Northern Road and the existing The Northern Road
- Twin bridges over Adams Road, Luddenham
- Four new traffic light intersections and new traffic lights at existing intersections
- Local road changes and upgrades to current access arrangements for businesses and private properties
- A new shared path for pedestrians and cyclists on the western side of The Northern Road and footpaths on the eastern side of The Northern Road where required.

A more detailed description of the project is found in Chapter 1 of The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park NSW Environmental Impact Statement/Commonwealth Draft Environmental Impact Statement (here in identified as the EIS) prepared by Roads and Maritime in June 2017.

Figure 1-1 shows the regional context of the project. Key features of the project as outlined in the EIS are provided in Figure 1-2.

A revised project description and associated figures are provided in Chapter 4 of this report, outlining the key changes to the project since exhibition of the EIS.



Legend

- | | | | |
|---|---|-------------------------------------|------------------------|
| The Northern Road upgrade - Mersey Road to Glenmore Parkway | Western Sydney Airport site (Commonwealth Land) | Western Sydney Employment Area | Reserves and parklands |
| The Northern Road | Defence Establishment Orchard Hills | South West Priority Growth Area | Growth centres |
| | | Western Sydney Priority Growth Area | Built areas |

Figure 1-1 | Location of the project

The Northern Road upgrade - Mersey Road to Glenmore Parkway

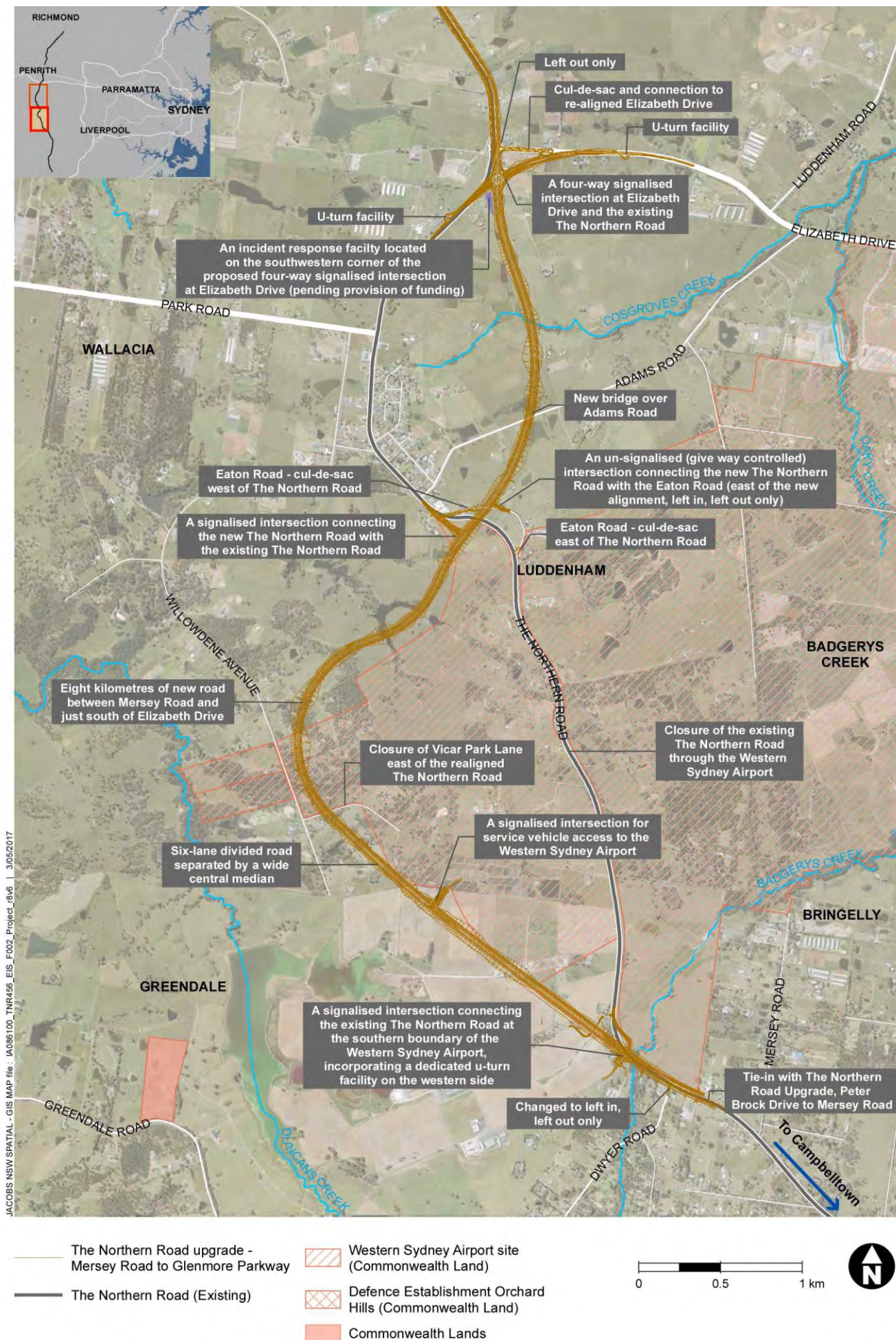


Figure 1-2 | Overview of the project

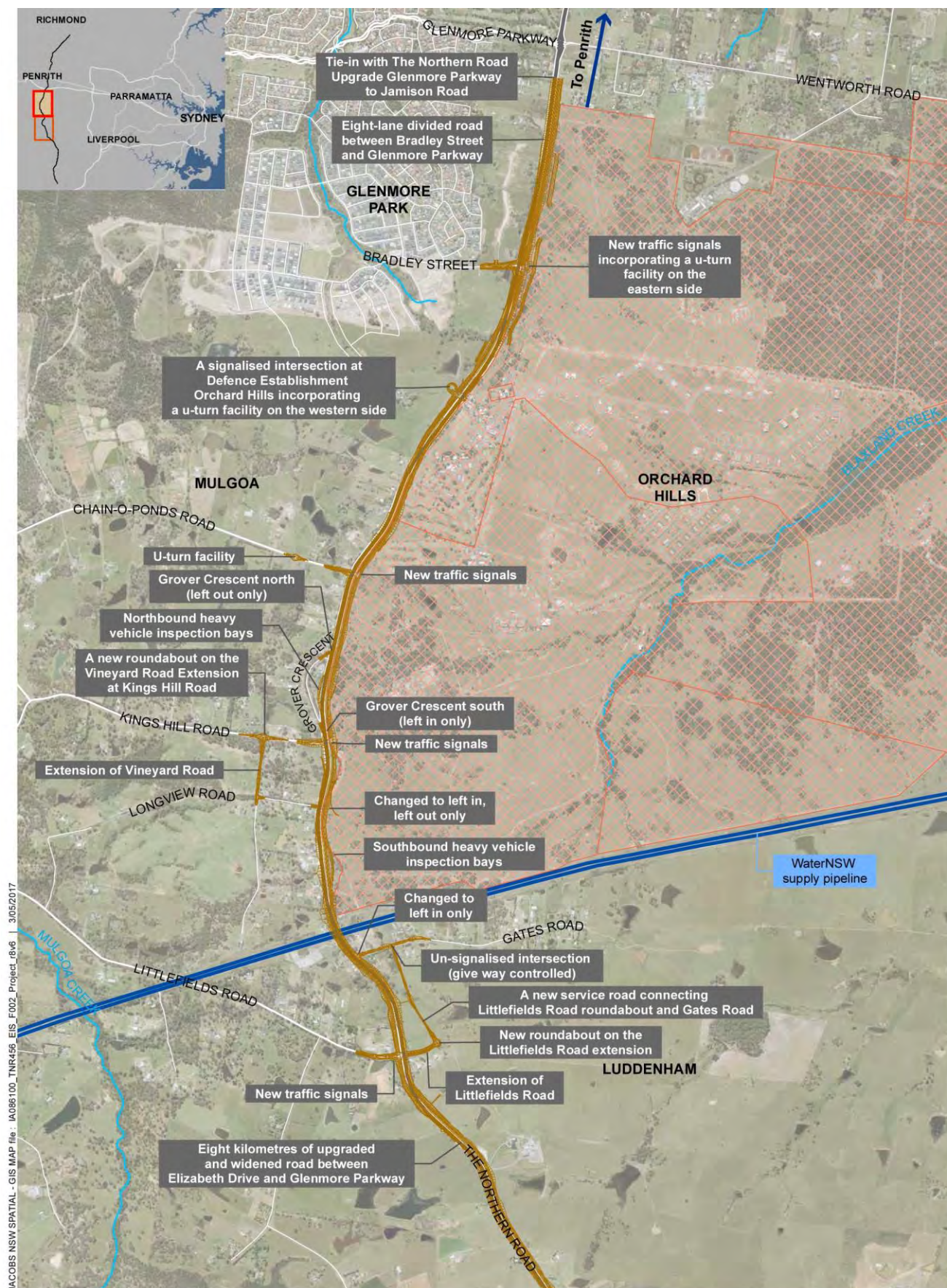


Figure 1-2 | Overview of the project

1.2 Statutory context

1.2.1 NSW Environmental Planning and Assessment Act 1979

Roads and Maritime is seeking project approval for the upgrade of The Northern Road between Mersey Road, Bringelly and about 100 m south of Glenmore Parkway, Glenmore Park under Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Clause 94 of the *State Environmental Planning Policy (Infrastructure) 2007* (the Infrastructure SEPP) applies to development for the purpose of a road or road infrastructure facilities and provides that these types of works are development which is permissible without consent (except land authorised under the *National Parks and Wildlife Act 1974*. As the project would not be carried out on land reserved under the *National Parks and Wildlife Act 1974*, the project is appropriately classified as being for the purpose of a „road“ and a „road infrastructure facility“ under the Infrastructure SEPP.

Clause 14 of the *State Environmental Planning Policy (State and Regional Development) 2011* declares development as State significant infrastructure if it is permissible without consent and specified in Schedule 3.

Clause 1 of Schedule 3 of the *State Environmental Planning Policy (State and Regional Development) 2011* specifies infrastructure or other development that would be an activity for which the proponent is also the determining authority and would, in the opinion of the proponent, require an EIS to be obtained under Part 5 of the EP&A Act.

Roads and Maritime formed the opinion that the project is likely to significantly affect the environment and would require an EIS to be obtained and consequently the project is State significant infrastructure under Part 5.1.

Clause 16 of the *State Environmental Planning Policy (State and Regional Development) 2011* enables the Minister to declare a project to be critical State significant infrastructure development. The project was declared to be critical State significant infrastructure (Schedule 5 of the *State Environmental Planning Policy (State and Regional Development) 2011*).

The SEARs for the project were issued on 28 July 2015 and amended SEARs were issued on 9 March 2016. The amended SEARs were in response to the decision by Roads and Maritime to assess and deliver the upgrade works between Glenmore Parkway, Glenmore Park and Jamison Road, Penrith as a separate, stand-alone activity to the project. A copy of the SEARs is provided in Appendix B of the exhibited EIS. That component of the program of works has been prepared under Part 5 of the EP&A Act.

Other than the EIS, no other environmental assessment has been, or is being carried out for the project for the purpose of any local or state plan or policy.

In accordance with the Secretary's requirements of section 115Z(6) of the EP&A Act, Roads and Maritime has prepared this submissions and preferred infrastructure report to respond to issues raised in submissions received during the exhibition of the EIS, as well as to describe and assess proposed changes and design refinements to the project.

The approval process under Part 5.1 of the EP&A Act is illustrated in Figure 1-3.

Further information on the assessment process is available on the NSW Department of Planning and Environment (DPE) website (www.planning.nsw.gov.au).

1.2.2 Commonwealth Environment Protection and Biodiversity Conservation Act

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act* (EPBC Act) proposed „actions“ that have the potential to significantly impact on matters of national environmental significance (MNES), the environment of Commonwealth land or that are being carried out by a Commonwealth agency must be referred to the Australian Government. If the Australian Minister for the Environment and Energy determines that a referred project is a

„controlled action“, the approval of that Minister would be required for the project in addition to the NSW Minister for Planning’s approval.

The project has the potential to significantly impact on MNES including EPBC listed Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest. The project would also significantly impact upon areas of Commonwealth Land associated with the Defence Establishment Orchard Hills (DEOH) and land purchased by the Australian Government for the Western Sydney Airport.

Accordingly, the project was referred to the then Australian Government Department of the Environment (now Department of the Environment and Energy) on 13 May, 2016. On 21 July, 2016, the Australian Minister for the Environment and Energy decided that the project has the potential to significantly impact on MNES and Commonwealth Land and is therefore a „controlled action“ and it be assessed by an EIS. In making this determination the delegate for the Minister issued to Roads and Maritime, on 24 August 2016, Guidelines for the Content of a draft Environment Impact Statement (Commonwealth EIS Guidelines).

To streamline the environmental assessment requirements under Part 5.1 of the EP&A Act and Part 8 of the EPBC Act, one EIS has been prepared that addresses both the SEARs and the Commonwealth EIS Guidelines. A copy of the SEARs and the Commonwealth EIS Guidelines are contained in Appendix B and Appendix C of the exhibited EIS respectively. For the purpose of this planning application for the project, Roads and Maritime is the proponent.

Roads and Maritime has prepared a Final EIS to meet requirements under Part 8 of the EPBC Act, specifically Division 6, Section 104 in relation to finalising the draft EIS. Accordingly, this Final EIS was prepared to:

- a) take account of any comments received within the period for comment; and
- b) contain a summary of any such comments and how those comments have been addressed.

Figure 1-3 outlines how the EPBC Act approval process would work in conjunction with the EP&A Act approval process outlined in Section 1.1.1. Further information on the assessment process is available on the Department of the Environment and Energy website (<https://www.environment.gov.au/epbc>).

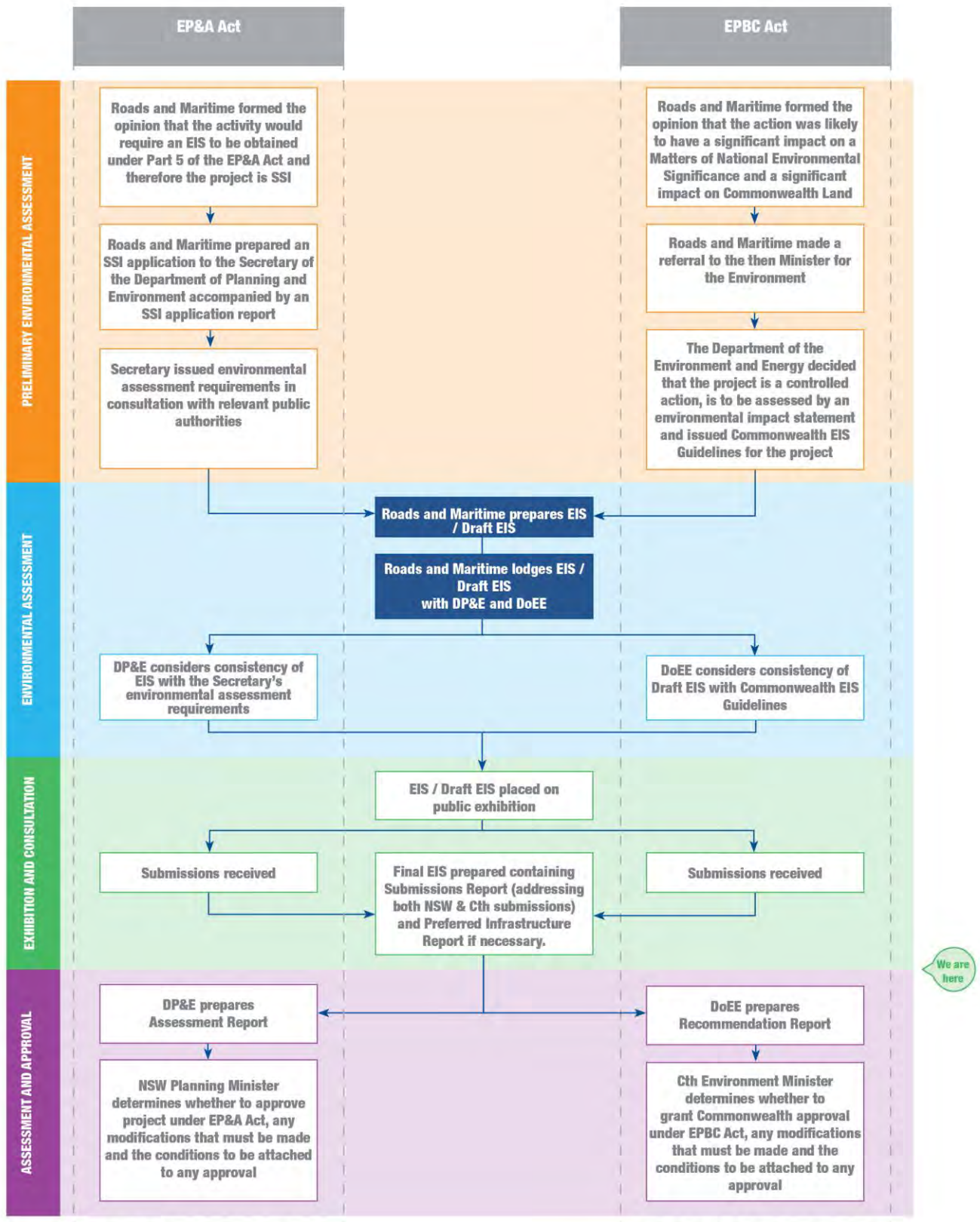


Figure 1-3 Approvals process under Part 5.1 of the EP&A Act and Part 8 of the EPBC Act

1.3 Community and stakeholder consultation

Prior to and during preparation of the EIS consultation was carried out with the community, Federal, State and local government agencies, special interest groups and relevant industry stakeholders that have specific interest in the project. Consultation would be ongoing throughout the construction and operation of the project.

1.3.1 Environmental impact statement exhibition

The EIS was publicly exhibited by DPE for 43 days between 21 June and 2 August 2017. To meet statutory requirements, the exhibition was advertised in The Australian and the Sydney Morning Herald newspapers on 21 June 2017. The EIS was made available for information and comment on the DPE website and at five public locations as listed in Table 1-1. Community information sessions were held to enable the public to meet project team members and find out more about the EIS and impacts.

Table 1-1 EIS exhibition locations

Location	Address
Penrith City Library	601 High Street, Penrith
Liverpool Library	170 George Street, Liverpool
Camden Council	70 Central Avenue, Oran Park
Narellan Library	Corner of Queen and Elyard Street, Narrellan
Nature Conservation Council	14/338 Pitt Street, Sydney

In addition to the statutory advertisements, the exhibition of the EIS and the community information sessions were advertised in the following local and community language newspapers between 28 June and 30 June 2017 to raise awareness of the consultation and information sessions:

- Liverpool City Champion (Wednesday 28 June 2017)
- Liverpool Leader (Wednesday 28 June 2017)
- Penrith Press (Thursday 29 June 2017)
- Penrith City Gazette (Thursday 29 June 2017)
- Western Weekender (Friday 30 June 2017).

The purpose of the community consultation was to:

- Inform community members and stakeholders about the EIS and concept design for The Northern Road upgrade between Mersey Road and Glenmore Parkway
- Seek comments and submissions from the community and stakeholders
- Continue to build a database of community members and stakeholders for Roads and Maritime to engage with through the development and delivery of the project.

Table 1-2 provides a summary of these activities and their community reach.

Table 1-2 Consultation activities carried out during the exhibition period

Tool / Activity	Details
Community update newsletter	A community update newsletter was produced including the key features of the proposal, details on the community information sessions and how to provide feedback on the EIS and concept design. The community update newsletters were distributed to about 4,000 properties. The newsletter was also made available on the Roads and Maritime website, WSIP portal and at community information sessions.
Media release	A media release was issued by Roads and Maritime on Wednesday 21 June 2017, titled <i>„Environmental Impact Statement released for the Bringelly to Glenmore Park section of The Northern Road Upgrade‘.</i>
Newspaper advertisement	Newspaper advertisements were placed in local papers between Wednesday 28 June and Friday 30 June 2017 to raise awareness of the consultation and information sessions. Publications included: • Liverpool City Champion (Wednesday 28 June 2017) • Liverpool Leader (Wednesday 28 June 2017) • Penrith Press (Thursday 29 June 2017) • Penrith City Gazette (Thursday 29 June 2017) • Western Weekender (Friday 30 June 2017).
Email notifications	Direct emails were sent from Roads and Maritime on Wednesday 21 June and Thursday 22 June 2017 to 1,500 stakeholders (community members and groups), local Members of Parliament (MPs) and other government stakeholders to announce the EIS and concept design as well as to raise awareness of the commencement of the consultation period, how to make a submission and details of the information sessions.
Webpage	The project webpage was updated on Wednesday 21 June with project information including the community update newsletter, links to the EIS and how to make a submission as well as information about the community information sessions. A total of 13,654 page views were recorded during the consultation period for www.rms.nsw.gov.au/thenorthernroad and 2,553 page views recorded for http://www.rms.nsw.gov.au/projects/sydney-west/the-northern-road/stage-4/index.html,
WSIP Portal	The WSIP portal was used during the consultation period with a new animation video providing a visual on the features and future look of the project. There were a total of 2,154 page views unique to the project during the consultation period.
Social Media (Facebook)	A Facebook advertisement was live between Thursday 22 June and Thursday 20 August 2017. The post targeted The Northern Road area and was published to target a broader geographic area and featured the project animation video. The advertisement included a link to information on how to make a formal submission on the project to the DPE. The Facebook advertisement reached 288,728 individual Facebook users.

Tool / Activity	Details
Community information sessions	Three community information sessions were held with around 125 people attending at the following locations: • Holy Family Primary School, Luddenham – Saturday 1 July, 10am to 1pm • Holy Family Primary School, Luddenham – Wednesday 19 July, 3pm to 1pm • Orchard Hills Masonic Centre – Saturday 22 July, 10am to 1pm.
Variable message signs (VMS)	Six variable message signs were displayed across The Northern Road and Elizabeth Drive during the consultation period to notify the community about the upcoming information sessions.
Stakeholder briefings	The project team briefed the following stakeholders: • Liverpool City Council – Thursday 22 June • Penrith City Council – Thursday 15 June.

1.3.2 Future consultation

As the project progresses and during construction, the project team would continue to work with the community to ensure they are informed about the project and have opportunities to provide feedback to the project team.

Key involvement activities and tools would include:

- Development and implementation of a detailed Community Involvement Plan
- Appointment of a dedicated Community Relations Manager for the project
- Regular notification of works and particularly night work (including targeted letterbox drops)
- 24-hour project information phone line
- Complaints management process
- Regular updates to the Roads and Maritime website
- Newsletters, information brochures and fact sheets
- Clear signage at construction sites
- Media releases and project advertisements in local and metropolitan papers
- Construction updates (including for councils, emergency services and bus operators)
- Email communication, and in some cases phone calls, to key stakeholders and those who have registered on the project database
- Ongoing liaison with, and support for, community members affected by property acquisition.

A detailed description of the consultation activities and other consultation processes (such as complaints management) that would be carried out during construction can be found in the Draft Community Consultation Framework in Appendix R of the EIS.

1.4 Purpose and structure of this report

During the exhibition of the EIS, a total of 39 submissions were made. The Secretary of the DPE provided copies of the submissions to Roads and Maritime and the Department of Environment and Energy. In accordance with section 115Z(6) of the EP&A Act:

The Secretary may require the proponent to submit to the Secretary:

- a) a response to the issues raised by those submissions, and
- b) a preferred infrastructure report that outlines any proposed changes to the State significant infrastructure to minimise its environmental impact or to deal with any other issue raised during the assessment of the application concerned.

Since the exhibition of the EIS, Roads and Maritime have made a number of design refinements to address the issues raised during the exhibition, to minimise its environmental impact and to address other issues raised during further review of the concept design. As such a preferred infrastructure report has been prepared to address the proposed changes to the project.

It includes information regarding additional studies carried out since the exhibition of the EIS and a description of changes to the project. Revised environmental management measures for the project are also included.

The following is an outline of the structure of this report:

- Chapter 1 – provides an overview of the project, its statutory context, outlines the consultation process prior to, during and post exhibition of the EIS, and outlines the purpose of this report
- Chapter 2 – sets out the issues raised in community submissions on the EIS and presents responses to those issues
- Chapter 3 - sets out the issues raised in government agency and utility provider submissions on the EIS and presents responses to those issues
- Chapter 4 - describes the changes to the project as a result of design refinements since exhibition of the EIS
- Chapter 5 – Outlines any additional assessment that has occurred since the exhibition of the EIS, in response to submissions and/or design refinements
- Chapter 6 – presents the safeguards and mitigation measures for the project which have been revised to address issues raised during public exhibition of the EIS or as a result of additional assessment in response to design refinements.

2 Response to community issues

2.1 Respondents

The DPE received a total of 39 submissions during exhibition of the EIS between 21 June and 2 August 2017.

Of these submissions 24 were received from community members including:

- Four from community special interest groups
- Nineteen from community members
- One from a private developer.

The community issues raised and Roads and Maritime's response to these issues forms the basis of this chapter. Chapter 3 addresses the remaining 15 submissions received from government agencies and utility providers which are assessed and responded to separately.

A list of submissions received from community members is provided in Table 2-1, including where in this report the issue has been addressed. Each community submission was assigned an individual number by DPE. These numbers are referred to in the Table 2-1 and throughout this chapter.

Table 2-1 List of respondents (community)

Respondent	Submission Number	Section where issues are addressed
Community group (Turtle Rescues NSW)	1	2.7.4
Individual	3	2.7.4
Individual	4	2.7.4
Individual	5	2.7.4
Individual	7	2.4.1, 2.7.1, 2.7.5
Individual	11	2.7.1, 2.7.5, 2.7.6, 2.7.7
Community group (Blacktown and District Environment Group)	12	2.7.1, 2.7.2, 2.7.5
Individual	13	2.5.3, 2.6.1, 2.6.3, 2.8.3, 2.8.4, 2.9.1, 2.13.1
Individual	14	2.8.4
Individual	15	2.5.3, 2.6.3
Individual	16	2.7.1, 2.7.4
Individual	17	2.7.2, 2.7.5, 2.7.6, 2.7.7
Individual	18	2.7.1, 2.7.5, 2.7.6, 2.7.7
Individual	19	2.7.4

Respondent	Submission Number	Section where issues are addressed
Individual	20	2.5.2
Individual	21	2.7.1, 2.7.2, 2.7.5, 2.12.2
Individual	22	2.6.3, 2.8.3, 2.10.1, 2.12.1, 2.12.2
Individual	23	2.3.1, 2.4.2, 2.4.3, 2.6.2, 2.6.3, 2.8.1, 2.8.2, 2.8.3, 2.8.4, 2.8.5, 2.8.6, 2.11.1, 2.11.2, 2.14.1, 2.14.2
Individual	24	2.4.2, 2.4.3, 2.6.3, 2.8.4, 2.8.5, 2.8.6, 2.11.1
Community group (Cumberland Conservation Network)	25	2.7.1, 2.7.2, 2.7.4
Community group (Mulgoa Valley Landcare Group)	27	2.4.1, 2.4.4, 2.7.3, 2.7.5, 2.7.6, 2.7.8
Individual	31	2.8.4
Individual	33	2.5.3
Business (APP Corporation on behalf of Waterhouse Group)	37	2.5.1

2.2 Overview of the issues raised by the community

As identified above, a total of 24 submissions were received from the community during exhibition of the EIS. Each submission has been examined individually to understand the issues raised. In many cases several issues were raised in a single submission. No form letters were received during submission of the EIS.

The issues raised in each submission have been extracted and collated, and corresponding responses to the issues have been provided. Where similar issues have been raised in different submissions, only one response has been provided.

The most common issues raised by the community related to:

- Consultation, including the timing of community sessions and the amount of consultation carried out for property acquisition
- Traffic and transport, including alternate design suggestions, safety issues and the maintenance of access during construction
- Noise and vibration impacts associated with construction and operation of the project
- Biodiversity issues, including:
 - the removal of existing, large remnant trees and the related fauna impacts
 - the removal Cumberland Plain Woodland
 - impacts to terrestrial and aquatic fauna including impacts from street lighting and impacts to fauna inhabiting farm dams
 - the impact of the project on wildlife corridors and habitat connectivity. Suggested additional fauna crossings, underpasses, fencing and other connectivity measures be

- included in the design
- the use of local native flora species for roadside plantings
- offsetting concerns, including the effectiveness of BioBanking to offset the losses of critically endangered vegetation communities in Western Sydney.
- Socio economic issues, including:
 - property value and compensation concerns
 - acquisition related to the design of the project
 - construction related impacts including the proximity of construction compounds
 - operational impacts including economic impacts on non-registered businesses and agricultural land.
- Non-Aboriginal heritage including comments that historical information has been incorrectly reflected in the non-Aboriginal heritage technical working paper
- Urban design and landscaping issues related to the impact of the project on the landscape character of the area and loss of rural aspect.

Figure 2-1 provides a summary of the issues raised.

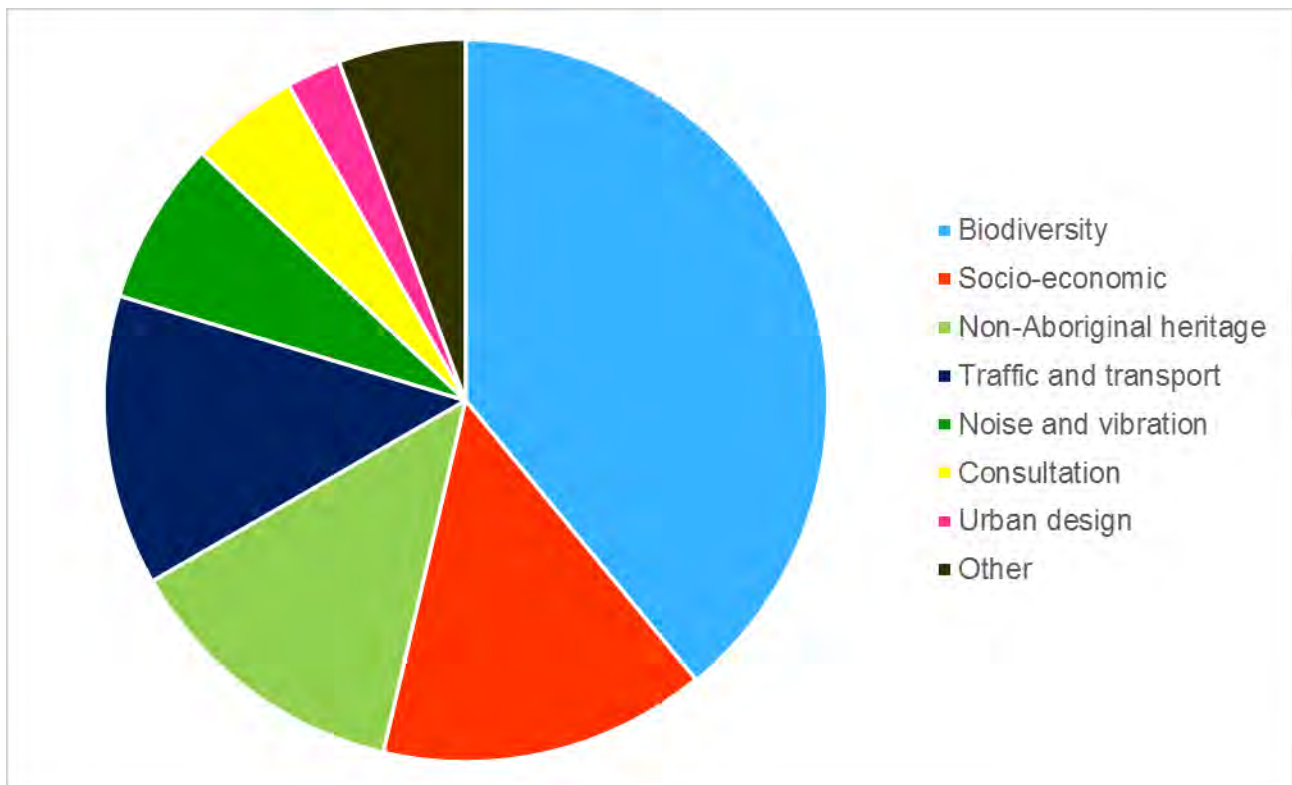


Figure 2-1 Summary of the types of issues raised by the community

2.3 General objections

2.3.1 Adequacy and independence of the EIS

Submission number(s)

23

Issue description

A respondent raised concerns that the EIS documents are written to provide support for Roads and Maritime carrying out the project.

Response

The project EIS was prepared by a team of qualified professionals and presents a balanced, merit-based EIS in accordance with the EP&A Act, the Secretary's Environmental Assessment Requirements (SEARs), the Commonwealth EIS Guidelines and applicable NSW and Commonwealth assessment policies.

The EIS was supported by a range of comprehensive technical studies (contained in Appendices G to Q of the EIS). These technical studies were prepared in accordance with the key issues identified in the SEARs and the Commonwealth EIS Guidelines, which included requirements issued by key Government regulatory agencies as well as industry standards and guidelines. The EIS, including all detailed technical studies, was reviewed by DPE and DoEE to confirm that it adequately addressed all requirements prior to being placed on public exhibition.

Consultants were engaged to prepare the EIS for the project via a competitive Request for Tender process. The preparation of the EIS also involved separate consultants outside of the lead EIS consultant including:

- Lyall and Associates (Appendix K – Flood Risk Assessment)
- Kelleher Nightingale Consulting (Appendix M - Aboriginal Cultural Heritage Assessment Report)
- Spackman Mossop and Michaels (Appendix O - Urban design, landscape character and visual impact assessment).

The engagement of specialist consultants to prepare the EIS is consistent with other major transport infrastructure projects of this size and scale.

2.4 Consultation

2.4.1 Level and quality of consultation

Submission number(s)

7

Issue description

The following issues were raised:

- Concern that insufficient consultation has been carried out for the project
- Unsatisfied that some exhibition information sessions were held during school holidays and on a Saturday.

Response

As outlined in Chapter 6 of the EIS, the community and stakeholder consultation effort for the project has included activities before and during the exhibition of the EIS. Additionally, Roads and Maritime has carried out an extensive community consultation program for other WSIP projects.

Consultation for the project began in July, 2015 when Roads and Maritime released a preliminary design and access strategy for The Northern Road Upgrade between Littlefields Road, Luddenham and Jamison Road, South Penrith. The consultation effort used a variety of communication and engagement methods including community information sessions, face-to-face meetings with individual property owners, businesses and residents that may be directly affected by the project, letterbox drops and mail outs and advertisements in various forms of media. Section 6.2.5 of the EIS provides a detailed account of the consultation effort carried out before preparation of the EIS.

Further consultation was carried out during the preparation of the EIS as outlined in section 6.2.6 of the EIS. This consultation included further community update newsletters (November 2015, February 2016 and July 2016), door knocks, media releases and four more community information sessions.

Roads and Maritime have endeavoured to consider all consultation comments throughout the development of the project. Section 6.3 of the EIS outlines the key issues raised by the community, community groups (including pedestrian and bicycle user groups), businesses and adjoining and affected landowners. It consolidates the issues raised for the purpose of the EIS and indicates where the issue is addressed in the EIS. The outcomes of this consultation process have informed the project's design and development of the project to date.

A project information line was also available throughout the exhibition period to answer questions from the community relating to the project.

Consultation throughout exhibition of the EIS (is outlined in section 1.3.1 of this report).
Community information sessions were held at:

Holy Family Primary School
Willowdene Avenue, Luddenham
Saturday 1 July 2017, 10am to 1pm
Wednesday 19 July 2017, 3pm to 7pm

Orchard Hills Masonic Centre
290 Homestead Road, Orchard Hills
Saturday 22 July 2017, 10am to 1pm

While the session held on Saturday 1 July was within school holidays, the other sessions were held outside of school holidays, one on the weekend and one mid-week. As described in Section 2.4.3, the exhibition period was also extended beyond the minimum 30-day requirement in the EP&A Act.

2.4.2 Property acquisition consultation

Submission number(s)

23, 24

Issue description

The respondents were concerned that consultation between directly affected properties (ie those to be acquired) and Roads and Maritime has been inadequate and inconsistent.

Response

Roads and Maritime would acquire properties for the project in accordance with the provisions of the NSW *Land Acquisition (Just Terms Compensation) Act 1991*. The acquisition process includes

the appointment of a dedicated case manager (Property Manager Acquisition) to help landowners understand their rights and provide a single point of contact right through the acquisition process. The case manager helps affected landowners who have the home acquired with finding new homes, find new schools for children and other services to ease the experience of moving. The case managers have also been involved in the partial acquisition on this project.

With regards to the respondents' property, there is more than one person who owns the property referred to in these submissions. The separate parties have different value and legal representation. Given the complexity of the property ownership Roads and Maritime has been in regular contact with the valuers and legal representatives of the property owners rather than individual owners during the acquisition phase work carried out to date.

Further meetings with the owners will occur during the negotiation phase which is expected to be scheduled once the owners' claims have been finalised.

2.4.3 Exhibition period

Submission number(s)

23, 24

Issue description

The respondents raised the following issues:

- Considered that the period of time allowed for comments on the EIS has been inadequate
- Concerned that the exhibition period did not cater for people that do not have the internet.

Response

Under the EP&A Act, the minimum duration for public exhibition of an Environmental Impact Statement is 30 days. For this project, the public exhibition period was extended from the statutory minimum of 30 days to a total of 43 days. All online documents were made web accessible and were able to be accessed free of charge.

The EIS was available in hard copy at a number of exhibition locations (refer to Table 1-1) and electronically available during the exhibition period between Wednesday 21 June 2017 and Wednesday 2 August 2017. This period allowed for additional time due to the public school holiday period which was taken into consideration.

As well as the community information sessions and hard copy exhibition locations, a project information line was also available throughout the exhibition period to answer questions from the community relating to the project.

2.5 Traffic and transport

2.5.1 Alternate design

Submission number(s)

37

Issue description

The respondent SmartWest.Sydney, raised the following issues:

- An objection to the exhibition design and location of The Northern Road with regard to delivering a western access intersection near the Western Sydney Airport
- Proposed an alternative design, constructed in two stages, that they believe would future proof The Northern Road and provide access to the Western Precinct.

Response

The location of the intersection within the Western Sydney Airport was specified by the federal Department of Infrastructure and Regional Development. The location of the intersection was then reviewed by Roads and Maritime to assess its suitability for the project. The proposed design provides scope for modification to a four-way intersection format, to support future development west of The Northern Road and Western Sydney Airport.

Roads and Maritime and Transport for NSW's Freight, Strategy and Planning Division reviewed the submission provided by SmartWest.Sydney in detail and the project team have carried out further consultation with the organisation since exhibition of the EIS. Following this review and consultation Roads and Maritime and Transport for NSW have found no compelling reason to modify the location proposed for the intersection.

2.5.2 Construction access and haulage

Submission number(s)

20

Issue description

The respondent was concerned that Willowdene Avenue would be used for construction haulage and that the road is not suitable for those activities.

Response

As outlined in section 5.4.13 of the EIS, designated access and haulage routes for construction vehicles entering and exiting construction areas and temporary ancillary facilities would be along The Northern Road and surrounding arterial network. The use of local roads by heavy vehicles to access temporary ancillary facilities would be limited as far as is reasonably practicable. This has been incorporated into the revised environmental management measures for the project (refer to Chapter 6).

Construction traffic on Willowdene Avenue would be limited to light vehicles needing to access The Northern Road construction corridor for the period where that section is under construction.

2.5.3 Safety

Submission number(s)

13, 15, 33

Issue description

The respondents raised the following issues:

- Concern regarding access to and from The Northern Road to their property via the proposed 100 metre merge across the bus lane. Respondent is also concerned that the bus lane may inhibit safe access to their property
- Concern regarding the safety of Longview Road as a result of increased traffic including access to existing driveways
- Concern regarding the potential for the Eastern Elizabeth Drive u-turn facility to impact the safety and amenity of nearby residents. Request that security/CPTED measures be installed at the Eastern Elizabeth Drive u-turn facility.

Response

The 100 m merge distance across bus lanes is set by the Road Rules 2014 Part 11 Division 6 Rule 158. The 100 m distance is consistent with operation of bus lanes across Sydney. This rule has been set for more than 20 years and the operational performance and monitoring of crash rates

across the State Road network has not prompted Roads and Maritime to review the 100 m designation.

The project does not include the upgrade of Longview Road beyond the tie-in points with The Northern Road and the Vineyard Road extension.

As outlined in Chapter 7-1 of the EIS (Traffic and Transport), the existing traffic numbers on Longview Road are low during both AM and PM peak periods.

Forecast traffic volumes on Longview Road are not expected to increase substantially above existing volumes (less than 30 vehicles an hour in the peak periods) or as a result of changes to access at Kings Hill Road.

The construction of a new link between Longview Road and Kings Hill Road (Vineyard Road extension) is proposed to facilitate existing right turn demand that would not be possible at Longview Road once the construction of a median along The Northern Road is completed as part of the project. Minimal additional traffic would be expected to use Longview Road as a result of the Vineyard Road extension, as some existing traffic that currently uses Longview Road to access Vineyard Road would be likely to use Kings Hill Road instead.

During construction of the project, access would be generally maintained at Kings Hill Road. Should traffic need to be redirected along Longview Road, this would be temporary and managed in accordance with the traffic management plan developed for the project.

Street lighting would be provided where required for the project to light the alignment. Signage, preventing the stopping of vehicles at the u-turn facility would also be provided.

Roads and Maritime would review the operation of the road once construction is completed in accordance with standard operational requirements.

2.6 Noise and vibration

2.6.1 Assessment methodology

Submission number(s)

13

Issue description

The respondent raised the following issues:

- Concern that current noise measurements have not been taken at the respondent's property in order to assess the direct effects of the increase in traffic noise at the property
- The respondent requests that a peer review of the noise assessment be carried out as a result.

Response

Long-term unattended noise monitoring was carried out at various locations within the noise and vibration study area for the EIS to identify the existing background noise levels to be applied for each noise catchment area (NCA). Receivers are grouped into NCAs to enable a logical grouping of receivers affected by the same works to assist with the assessment, consultation or notification regarding potential noise impacts during construction of the project. As identified in the EIS, NCA boundaries for the project were determined by considering:

- Factors affecting how construction noise would propagate into a given area (eg, topography and screening by buildings)
- The level of background noise in that area

- The type(s) of receivers within that area, eg, whether residences (for which noise goals are a function of emergence above the level of background noise) or commercial or industrial premises (for which fixed noise goals not dependent on the level of background noise apply)
- The grouping of receivers into bands of similar construction noise impact.

Background noise levels within each NCA were used to inform the identification of construction noise management levels (NMLs) to be applied at residential receivers within that NCA. It is noted that the results of background noise monitoring do not inform or influence the assessment of operational (traffic) noise from the project. The predicted increase in traffic noise levels at each residence is determined through noise modelling. Further response in relation to operational noise impacts is discussed in section 2.6.3 of this report.

A peer review of the noise and vibration technical working paper is not considered necessary. The EIS, including the noise and vibration technical working paper, has been sufficiently reviewed by the various specialists involved, Roads and Maritime technical experts and through the various government agencies during adequacy review of the EIS prior to exhibition. A response is also provided in section 2.3.1 regarding the adequacy and independence of the EIS.

2.6.2 Construction noise impacts

Submission number(s)

23

Issue description

In summary, the respondent raised the following issues:

- Concern regarding the lack of adequate noise mitigation for some properties near the project which have not been included for mitigation
- Concern regarding the management of intrusive noise impacts at properties during construction
- Concern regarding the determination and application of reasonable and feasible measures
- Concern regarding the staging of works and associated management and justification of noise impacts for both day time and out of hours works (OOHW)
- Concern regarding the management of noise complaints and how they will be dealt with to reduce the impacts of construction.

Response

As is typical of a road construction project, construction noise mitigation measures would be applied to the source of the noise to benefit all potentially impacted receivers rather than being applied at individual properties. As such there are no permanent construction noise mitigation measures proposed to be applied at or to an individual property as part of the project. Various types of at-property building insulation treatments are proposed to mitigate potential operational noise impacts for the project. Further detail and response to community submissions in relation to operational noise impacts and mitigation measures is provided in section 2.6.3.

The assessment of construction noise levels at each receiver is detailed in the noise and vibration technical working paper for the project (Appendix H of the EIS) and summarised in section 7.2.5 of the EIS. This includes the predicted noise levels during all standard hours (daytime) and out of hours works (OOHW) (Saturday afternoons, Sundays, evenings and nights), assessed against the relevant NMLs identified for each receiver. NMLs apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. Where the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels was at the most noise-affected point within 30 m of that residence.

The assessment predicted noise levels at each receiver was presented in the EIS and was based on indicative timeframes and staging of construction works as presented in Chapter 5 of the EIS, including indicative durations for each activity. However, the assessment did not specify the indicative duration of the most noise intensive plant use during each activity and what the worst case noise impact would be to any one receiver, including from ancillary facilities. Further information regarding the indicative duration of worst case noise impacts has been provided in Appendix A of this report (refer to Attachment 1). This information is indicative only and is subject to change upon engagement of a construction contractor(s) dependant on the final staging and scheduling of works.

Additional detail regarding indicative OOHW activities and justifications is also provided in Appendix A (refer to Attachment 2). As outlined in the EIS, OOHW activities would be associated with paving and bridge construction works as well as the use of ancillary facilities associated with those activities. OOHW for bridge construction works at Adams Road would likely utilise ancillary facilities C8, C9 and C10. Use of ancillary facilities for paving works during out of hours would be dependent on the location of works at the time. Further detail regarding out of hours work activities, locations and justification would be identified in the CEMP to be developed by the contractor once engaged.

All noise predictions in the EIS are based on the assumption that the standard and project-specific noise mitigation measures as outlined in Section 7.2.8 of the EIS are applied. In instances where after the application of standard and project-specific noise mitigation measures there still remain receivers at which NMLs are exceeded, the Roads and Maritime Construction Noise and Vibration Guideline (CNVG) (August 2016) directs that additional mitigation measures detailed in Appendix C of the CNVG should be considered where feasible and reasonable. These have been summarised in the noise and vibration technical working paper (Appendix H of the EIS, section 10.13 and Table 10-9). Further information is provided in Appendix A of this report for reference, including triggers for the application of additional mitigation measures (refer to Attachment 3) and further explanation of each „additional“ mitigation measure as per the CNVG (refer to Attachment 4).

An indicative assessment of the application of standard, project-specific and additional mitigation measures during each proposed construction activity for the project is presented in Appendix A (refer to Attachment 5). This includes the assessment of daytime and OOHW, assessed for two key OOHW periods as follows:

- OOHW period 1: Monday - Friday (6pm-10pm), Saturday (7am-8am & 1pm-10pm), Sunday / Public Holidays (8am-6pm)
- OOHW period 2: Monday - Friday (10pm-7am), Saturday (10pm-8am), Sunday / Public Holiday (6pm-7am).

This assessment acknowledged the increased sensitivity of late night works / early morning works during which time most people are likely to be sleeping (ie OOHW period 2) and the more stringent mitigation measures required during this time.

The NSW Interim Construction Noise Guideline (ICNG) requires the application of feasible and reasonable measures to mitigate construction noise and vibration impacts from a project. Further to this, the Roads and Maritime CNVG provides guidance regarding the identification of feasible and reasonable noise mitigation measures for construction works as outlined below.

Feasibility relates to engineering considerations (what can be practically built). These engineering considerations may include:

- The inherent limitations of different techniques to reduce noise emissions from road traffic noise sources
- Safety issues such as restrictions on road vision
- Road corridor site constraints such as space limitations

- Floodway and stormwater flow obstruction
- Access requirements
- Maintenance requirements
- The suitability of building conditions for at receiver treatments.

Selecting reasonable measures from those that are feasible involves judging whether the overall noise benefits provide significant social, economic or environmental benefits. The factors to be considered are:

- The noise reduction provided and the overall number of people that benefit from the mitigation
- Existing and future noise levels, including changes in noise levels in the build and design year and the extent of any exceedance of the noise criteria
- Potential for a mitigation measure to reduce noise during construction as well as from road traffic after the project is complete
- The cost of mitigation, including the cost of noise mitigation measures as a percentage of the total project cost and the ongoing maintenance and operational costs.
- Community views and preferences (typically gathered during the community consultation process following the noise assessment)
- Visual impacts for the community surrounding the road project and for road users. These are typically identified in the Environmental Assessment
- The wider community benefits arising from noise mitigation of the proposed road or road redevelopment
- Relative weighting of treatments with respect to protection of outdoor areas or only internal living spaces.

The ICNG and CNVG would be referred to in the preparation of the CNVMP with regards the mitigation measures to be applied during construction of the project.

The final construction noise management measures would be determined once the construction program and staging of works is confirmed upon engagement of the construction contractor(s). The contractor would document the relevant mitigation measures in the construction noise and vibration management plan (CNVMP) to be developed for the project.

The community would be informed and kept up to date regarding the staging and duration of works throughout the construction stage of the project through regular community consultation as detailed in the EIS and further summarised in section 1.3 of this report.

As detailed in the draft Community Involvement Plan (Appendix R of the EIS), a complaints management procedure for recording, responding and reporting of complaints would be adopted for the project. In accordance with this plan, complaints must be acknowledged within one working day. Where a complaint cannot be responded to immediately, a follow-up verbal response on what action is proposed must be provided to the complainant or enquirer within three working days. A written response to the person raising a complaint would be provided within 10 working days. Follow-up monitoring would be carried out to ensure any issues/complaints have been resolved satisfactorily and any corrective actions implemented.

2.6.3 Operational noise impacts

Submission number(s)

13, 15, 22, 23, 24

Issue description

In summary, the respondents raised the following issues:

- Concerns regarding the impact of increased traffic noise at their property, including consideration of the topography of their land and the potential implications in terms of increased noise impacts
- Concern regarding the lack of adequate noise mitigation for properties, limited to at-property treatment as opposed to noise walls or low noise pavement, or where a property has not been identified as being eligible for treatment
- Concern regarding operational noise impacts for properties around the Luddenham bypass, with no mitigation or compensation for these properties.

Response

Predicted traffic noise levels were modelled for future year scenarios to assess the potential increase in traffic noise at individual receivers generated as a result of the project (ie the "Build" scenario as referred to in the EIS). These predictions are based on a detailed noise model which includes detailed topographical information.

In accordance with section 6 of the Roads and Maritime Noise Mitigation Guideline (NMG), when evaluating if a receiver qualifies for consideration of noise mitigation, Roads and Maritime considers how far above the criterion the noise level is and also how much the noise level has increased by. These two considerations were applied for the project in the assessment and identification of receivers qualifying for the consideration of mitigation. Therefore, although some residences were assessed as being impacted by increased traffic noise levels as a result of the project, where the increase did not satisfy the NMG criteria, these residences did not qualify for consideration of noise mitigation.

As outlined in Section 7.2.6 of the EIS, the method for determining a receiver's eligibility for mitigation as outlined in the NMG was applied in the assessment of operational noise mitigation for the project. This included the consideration of the following mitigation measures in order of preference of application as per the NSW Road Noise Policy (RNP):

- Low noise pavement surfaces
- Noise mounds
- Noise walls
- At-property treatments.

As outlined in the EIS, noise mitigation in the form of at-property acoustic treatment was determined to be the most reasonable form of noise mitigation at eligible receivers for the project.

As indicated in the EIS noise and vibration technical working paper, operational (traffic) noise levels at receivers located on The Old Northern Road are predicted to be lower in the future if the project is built compared to if the project is not built. By way of example, the future daytime operational (traffic) noise level to the residence at 3057 The Old Northern Road, Luddenham is predicted to be 66dB(A) if the project is not built, and 64dB(A) if the project is built. This reduction in noise level is consistent for most receivers in Luddenham.

It is noted that due to a number of design refinements the vertical alignment has changed at some locations. A technical assessment of revised noise predictions has been carried out to identify further properties that qualify for the consideration of mitigation based on the design refinements as summarised in Table 4-1. This assessment identified one additional property for consideration

of mitigation. Roads and Maritime carried out additional consultation with this property owner in December 2017 to inform them of the outcomes of the assessment. All properties identified in the EIS as being eligible for the consideration of at-property treatment remains unchanged, with the predictions to be verified and associated effectiveness of mitigation to be confirmed post-construction.

2.7 Biodiversity

2.7.1 Removal of native vegetation

Submission number(s)

7, 11, 12, 16, 17, 18, 21, 25, 27

Issue description

The respondents raised the following issues

- Concern regarding impacts to large remnant trees, including hollow-bearing trees
- Concern regarding impacts to important trees, particularly *Eucalyptus molacanna* (sic) and two old-growth remnant trees recommended to be retained in the median where possible
- Concern regarding impacts to fauna during the tree removal process.

Response

The NSW Biodiversity Offsets Policy for Major Projects (BOPMP) provides a standard method for assessing impacts of major projects on biodiversity and determines offsetting requirements. In the State Significant Infrastructure (SSI) application process, the EIS must address the SEARs requested by DPE and apply the Framework for Biodiversity Assessment (FBA). The FBA adopts the BOPMP and provides an assessment methodology to identify terrestrial biodiversity values, assess impacts and quantify and describe biodiversity offsets required for unavoidable impacts.

The Biodiversity Assessment Report (BAR) was completed in accordance with the requirements specified by the SEARs issued on 28 July 2015, the amended SEARs issued on 9 March 2016 and Commonwealth EIS Guidelines issued on 24 August 2016. Additional assessment (refer to Appendix C – Technical memo, Biodiversity) has also been carried out in accordance with these requirements to assess some of the changes to biodiversity values and impacts as a result of design refinements as outlined in Chapter 4.

Despite avoidance and mitigation, residual impacts from the clearing of native vegetation and fauna habitat features is acknowledged in the EIS. These impacts have been quantified using the BioBanking Credit Calculator, and form the basis of offsets for the project. There would be impacts to the following matters which need to be offset via biodiversity credits:

- Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
- Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
- Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (including derived native grasslands)
- *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion
- *Pultenaea parviflora*
- *Marsdenia viridiflora* subsp. *viridiflora* - endangered population
- Cumberland Plain Land Snail
- Regent Honeyeater.

Cumberland Plain Woodland is listed as a critically endangered ecological community (CEEC) under the NSW *Threatened Species Conservation Act, 1995* (TSC Act). The project may significantly reduce the viability of this CEEC within the locality and therefore it was considered a matter for further consideration under the FBA. While not recorded during the surveys, there would also likely be impacts to potential habitat for the critically endangered Regent Honeyeater. This species was also considered a matter for further consideration.

The project would be likely to result in a range of impacts to biodiversity which are not covered under the FBA including impacts to the aquatic environment (including as a result of changes to hydrology), habitat fragmentation, edge effects, injury and mortality of fauna (including indirect impacts associated with vehicle strike), invasion and establishment of weeds, potential for invasion and spread of pathogens and disease, noise, vibration, dust, light and contaminant pollution, and a range of cumulative impacts to vegetation and associated species within the Cumberland Plain region.

Some of the higher quality patches of Cumberland Plain Woodland meet the description of the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (CPSWSGTF) CEEC listed under the EPBC Act. The plant species *Pultenaea parviflora* is also listed as vulnerable under the EPBC Act. Other Matters of National Environmental Significance that may be impacted by the project include habitat for the listed Regent Honeyeater, Swift Parrot, Grey-headed Flying-fox and Large-eared Pied Bat. The project has therefore been identified as a controlled action under the EPBC Act due to predicted significant impacts to listed threatened species and ecological communities and Commonwealth land. The controlled action is considered by DoEE, likely to have a significant impact on the following EPBC Act listed threatened species and ecological communities:

- Critically endangered – Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Cumberland Plain Woodlands)
- Critically endangered – *Lathamus discolor* (Swift Parrot)
- Critically endangered – *Anthochaera phrygia* (Regent Honeyeater)
- Vulnerable – *Pultenaea parviflora*
- Vulnerable – *Pteropus poliocephalus* (Grey-headed Flying-fox).

A Biodiversity Offset Strategy (BOS) has been prepared for the project (refer to Appendix I of the EIS). The project offsets will aim to provide „like for like“ offsets for all biodiversity values, with this being the minimum requirement for those matters listed under the EPBC Act. The final offset requirement for the project would be determined during development of the offset package.

The EIS recognises the loss of hollow-bearing trees as a long term-impact that would affect local fauna populations. The number of hollow-bearing trees was counted at each plot/transect location within the study area and this data forms a component of the assessment of ecosystem composition and function under the FBA. The impact to hollow-bearing trees is offset as part of the ecosystem credit requirement for the project.

Some large remnant hollow-bearing trees, including the trees located near the truck inspection bay at Orchard Hills would be removed by the project. The safe retention of these trees within the median is not a viable option due to road safety, line of sight and other engineering purposes. Additionally, the wide central median has been included in the design to allow for future road capacity upgrades, therefore these trees would likely be subject to removal in the future, regardless of whether or not they could be retained in the current design.

The EIS includes a mitigation measure for a two staged clearing process (EIS mitigation measure B-3), which the contractor would be required to incorporate into the flora and fauna management plan (FFMP) to be developed for the project and implemented during construction. This mitigation measure has been expanded on in the biodiversity technical assessment undertaken as part of this report (refer to Appendix C) and summarised below.

A staged habitat removal process is to be used when hollow-bearing trees are to be removed as follows:

- Make contact with vets and wildlife carers before works start to ensure they are willing to assist treating injured animals if necessary
- An experienced and licensed wildlife carer and/or ecologist will be present on site during all habitat removal activities to capture and relocate fauna that may be encountered
- Progressive habitat removal will take place around habitat identified and marked during the pre-clearing process. Remove non-hollow-bearing trees, undergrowth, feed-trees, regrowth and grass. Do not fell trees towards exclusion zones
- Identified habitat (e.g. hollow-bearing trees) will be left for at least 24 hours after removing non-habitat vegetation to allow fauna to escape. A licensed wildlife carer and/or ecologist will check hollow-bearing trees are not being used by fauna before felling. If necessary, fauna may need to be trapped and relocated to pre-determined habitat identified for fauna release
- Fell habitat trees as carefully as possible to avoid injury to any fauna still remaining in trees. Use equipment that would allow the habitat trees to be lowered to the ground with minimal impact (eg claw extension). Do not fell trees towards exclusion zones
- An experienced and licensed wildlife carer and/or ecologist will inspect habitat once it is removed e.g. after a tree is felled. Animals that emerge should be captured, inspected for injury then relocated to pre-determined habitat identified for fauna release
- All hollows have the potential to support fauna and will be placed in adjacent habitat until the following day for further inspection by a licensed wildlife carer and/or ecologist to verify no fauna is present. If possible, the hollows could be permanently relocated in adjacent areas. Inspect woody debris for fauna immediately before chipping to avoid injury or death to fauna that may be present
- The project manager and/or environment manager should ensure that the outcomes of the clearing process are recorded. Reporting is usually the responsibility of an ecologist or environment officer. Reports are to be submitted to relevant personnel eg environment manager or Roads and Maritime regional environmental staff
- Consider the seasonal impact of clearing on species identified in the environmental assessment or pre-clearing process or that are known to occur in the area.

2.7.2 Removal of threatened ecological communities

Submission number(s)

12, 21, 25

Issue description

The respondents raised the following issues:

- Concern regarding the impacts of the project on Cumberland Plain Woodland
- Concern regarding the impacts of the project on Cumberland Plain Shale Woodland and Shale-Gravel Transition Forest.

Response

The EIS identified the potential impacts to Cumberland Plain Woodland and this community is identified as a Matter for Further Consideration in the BAR as the project is considered likely to significantly reduce the viability of Cumberland Plain Woodland.

Based on the original construction footprint for the EIS design, the project would result in the direct clearing of about 33.83 ha of the TSC Act listed critically endangered Cumberland Plain Woodland

in the Sydney Basin Bioregion ecological community. Following design refinements, this impact has reduced by 2.96 ha to about 30.87 ha. It is noted that although the TSC Act has now been replaced by the *Biodiversity Conservation Act 2016*, the project commenced assessment under the old FBA prior to the TSC Act being repealed, and therefore continues to be assessed and referenced in relation to the TSC Act.

Based on the EIS construction footprint, the project would result in the direct clearing of about 16.37 ha of the EPBC Act listed critically endangered Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community. Following design refinements, this impact has been reduced by 1.29 ha to 15.08 ha.

2.7.3 Removal of threatened flora

Submission number(s)

27

Issue description

The respondent raised the following issues:

- Concern regarding the impact of the Vineyard Road extension on an east-west terrestrial corridor, which has been identified to contain threatened plants including *Pultenaea parviflora* and *Marsdenia viridiflora*
- Request that further detail on the timing of „ground truthing“ in the area is provided
- Loss of identified threatened plants must be offset by the permanent conservation of a nearby population.

Response

An additional targeted survey for *Pultenaea parviflora* and *Marsdenia viridiflora* subsp. *viridiflora* was carried out in an expanded study area around the Vineyard Road extension on 7 August 2017. This area was not able to be accessed during the fieldwork carried out for the original assessment due to the property owners consent not being available at the time of survey. An area of habitat of about 4.7 ha was surveyed by an experienced botanist following the methods described in the NSW Guide to Surveying Threatened Plants (OEH, 2016). Traverses of this habitat were carried out over a three-hour period for a distance of 3.13 km (3,131 m) (refer to Appendix C). The survey located a further six *Pultenaea parviflora* plants (two of which were in the construction footprint, and four outside of the footprint). No additional *Marsdenia viridiflora* subsp. *viridiflora* plants were recorded during the survey.

This data has been used in the amended assessment of impacts and calculation of offset requirements for the project (refer to Appendix C).

Impacts to habitat corridors are further addressed in Section 2.7.5, fragmentation of biodiversity links and habitat corridors. Offsetting is also discussed further in section 2.7.8.

2.7.4 Impacts to aquatic biodiversity

Submission number(s)

1, 3, 4, 5, 16, 19

Issue description

The respondents raised the following issues:

- Concern regarding impacts to aquatic species, such as turtles, near the project due to the dewatering and backfilling of farm dams
- Request that the project include measures to protect and manage fauna, including capture and relocation of fauna by an appropriately qualified person prior to the dewatering of farm dams.

Response

The construction and operation of the project has the potential to impact aquatic ecosystems due to changes in water quality, hydrology, habitat loss and instream barriers. Many of the watercourses in the study area are artificial dams, located in minor gullies which are either first or second order streams, and are not considered key fish habitat. Threatened species would be unlikely to be present within these dams, however there would potentially be native and invasive fish species colonising these dams as well as freshwater turtles and eels. If dams or creeks are to be dewatered during the construction of the project, then any native fish or aquatic fauna (including turtles) would need to be relocated in to a similar aquatic environment to which it was found by trained aquatic ecologists under a Fisheries Permit issued by NSW Department of Primary Industries (DPI).

The dewatering of streams and farm dams would be carried out in accordance with the relevant procedures to be outlined in the construction environmental management plan (CEMP) and relevant sub plans (e.g. the FFMP and soil and water management plan (SWMP)). This would include the management and re-location of Eastern long neck turtles and other aquatic species. All fish and aquatic fauna works would require a Fisheries Permit issued by the DPI under Section 37 of the *Fisheries Management Act 1994* (FM Act).

The selection of relocation sites would be conducted in consultation with DPI Fisheries upon permit application, and would consider permanence of water, any upstream disturbances, habitat, water quality conditions. Fish and other aquatic fauna would be relocated into a waterway with similar water quality and habitat characteristics to minimise stress. Where possible the relocation site would be within the same sub-catchment to avoid the inadvertent dispersal of fauna into unsuitable habitat.

During relocation, fish would be relocated into aerated transportation tubs. Tubs would be located in the shade during capture and transportation to avoid sudden changes in temperature. Frogs, turtles, fish and eels would be treated in a similar manner, however different fauna would not be transported within the same tub to prevent injury or consumption of smaller fauna. Turtles and frogs would be damp, but not submerged in water. Fish and other aquatic fauna would be transported to the recipient site as quickly as practical. Any invasive species would be euthanised in accordance with animal care and ethics permits requirements. Accurate records of species released or euthanised (in the case of exotic species) would be recorded and provided to DPI upon completion.

The EIS includes an existing mitigation measure for the development of a farm dam dewatering plan (EIS mitigation measure SWC-1), this measure would be revised as follows and incorporated into the revised environmental management measures for the project (refer to Chapter 6):

- A stream and farm dam dewatering plan would be prepared which includes:
 - a map showing locations of streams and farm dams to be dewatered and the selected relocation sites
 - fisheries Permit and Animal Care and Ethics requirements.
 - Methodology for dewatering streams and dams with consideration to aquatic ecology including the capture, storage, relocation, release of fish and other aquatic fauna
 - Euthanisation procedure (as required)
 - Location of any offsite discharge points
 - Requirements to manage encounters of poor water quality.

2.7.5 Fragmentation of biodiversity links and habitat corridors

Submission number(s)

7, 11, 12, 17, 18, 21, 25, 27

Issue description

The respondents also raised the following issues:

- A number of respondents raised concern regarding the impact of the project on wildlife corridors and habitat connectivity and suggested additional fauna crossings, underpasses, fencing and other connectivity measures be included in the design
- The EIS does not accurately assess existing wildlife permeability along The Northern Road
- Concern that the EIS lacks detail and credible solutions that manage the loss of Critically Endangered vegetation communities and fragmentation of landscapes in Western Sydney
- Construction of the bike track to Mulgoa Nature Reserve would impact wildlife connectivity
- Bike trails should not be installed through or across the Surveyors Creek Corridor
- Concern regarding impacts of the project on the Flame Robin, Rose Robin and Eastern Grey Kangaroos
- Specific assessment should be made of potential barriers to the annual migration of the Flame Robin and Scarlet Robin over The Northern Road, especially to known habitat in DEOH
- The height of the proposed fauna underpass (1.5 metres) is not suitable for Eastern Grey Kangaroos
- Services should be routed to avoid interfering with Surveyors Creek Corridor and its future restoration on both eastern and western (DEOH) sides
- Physical barriers more than two metres high should not be located along the DEOH boundary
- There has been insufficient consultation regarding a suitable solution for the safe movement of fauna in the vicinity of the DEOH site.

Response

Due to the linear nature of the project, it will result in fragmentation of habitats. Habitat fragmentation is considered an important impact of the project and fragmentation impacts and the impact of barriers are discussed in 7.3 of the EIS. The EIS acknowledges fully that there would be localised fragmentation of local wildlife corridors between the existing Northern Road and Willowdene Avenue where some intact habitat patches would be broken apart. The hard barrier introduced by the project would restrict fauna movement. The widening of the existing Northern Road in the north of the study area would further exacerbate the existing barrier effects of this roadway where it bisects Regional Corridor 17 as identified in the NSW Office of Environment and Heritage (OEH) BIOMAP.

As identified in Section 7.3 of the EIS, the BIO Map identifies areas for biodiversity investment funding within the Cumberland sub-region, termed priority investment areas, including core areas and biodiversity corridors of state and regional significance. This includes Regional Corridor 17 which connects the Mulgoa Nature Reserve to the vegetation on the DEOH site. This is shown in Figure 7-7 of the EIS. As noted in the EIS, the BIO Map has not been approved by the Chief Executive of OEH and therefore these biodiversity links have not been included in the FBA calculations. However, connectivity measures have been identified as discussed below and are included as part of the revised environmental management measures for the project (refer to Chapter 6).

The EIS acknowledges the existing habitat connectivity within the landscape. Connectivity value has been assessed in accordance with Appendix 5 of the FBA. The connecting links have been identified and a connectivity value score assigned. The EIS details that the project would impact on local area biodiversity links (as defined under the FBA). Several local area biodiversity links have been identified (refer to Figure 2.3 of the BAR). The EIS acknowledges that the existing Northern Road is a single carriage (two lanes) road and considered a barrier of a size that would sever a connecting link. As such, the connecting links identified in the EIS cross the existing Northern Road. The existing Northern Road does however contribute to a considerable reduction in local connectivity when compared to areas without existing roadways (the links are not severed but are highly modified). The Northern Road is a heavily used roadway and significant barrier effects are

currently present. The fence along the edge of the DEOH site does increase the barrier effect provided by the existing The Northern Road in this area. In this location, dispersal of fauna is currently limited but is not entirely prevented.

The EIS acknowledges that habitat connectivity would be altered during and after construction. There may be declines in population density and/or species richness within the remaining vegetation patches as a result of the project. There may also be an alteration to community composition, altered species interactions, and altered or ecosystem functioning in the locality as a result of the project. Due to the importance of connectivity, dispersal opportunities and habitat quality, for species at a local scale the project is considered likely to be detrimental to the dispersal of relatively sedentary species such as mammals, frogs, and reptiles. Local division of some wildlife populations, isolation of key habitat resources, loss of genetic interchange, and loss of population viability may result from the fragmentation caused by the project.

The impacts of altered connectivity on fauna species, including Eastern Grey Kangaroos and east-west obligatory migrant species such as the Flame Robin and Scarlet Robin, have been assessed according to the assessment process outlined in the FBA. The Flame Robin and Scarlet Robin are ecosystem credit species and direct impacts to these species, along with common species including the Eastern Grey Kangaroo, have been assessed in conjunction with general biodiversity values and they have been assessed as being at least moderately likely to be present in the habitats that would be impacted. Suitable habitat for these species is present and this is identified in the BAR. As with other fauna species, east-west obligatory migrant species such as the Flame Robin and Scarlet Robin would be detrimentally impacted by habitat fragmentation, as would macropods such as the Eastern Grey Kangaroo.

It is noted that the scope of the project does not include any separated bike trails that would impact on the corridor, the proposed shared path is immediately adjacent to the road corridor along the length of the upgrade. There are no plans for bike paths beyond this shared path.

Utilities would be relocated within the allocated easement available on either side of the road as assessed as part of the refined design footprint. This would include service relocations at the proposed Surveyors Creek crossing. The footprint within the DEOH site has been reduced where possible to minimise environmental impacts associated with the revised design. Mitigation measures including restoration of disturbed areas would be implemented as summarised in the revised environmental management measures for the project (refer to Chapter 6). This includes an update to existing environmental management measure SWC-3 which has been updated to in relation to rehabilitation of the realigned tributary of Surveyors Creek.

Connectivity measures are being considered during detailed design in accordance with the Wildlife Connectivity Guidelines for Road Projects (currently in preparation). In particular, maintenance of current connectivity and potential future connectivity has been considered in culvert design, lighting and fencing. Consultation with community members and the Penrith City Council was undertaken during the exhibition of the EIS to discuss proposed connectivity measures.

Connectivity between the Mulgoa Nature Reserve and the DEOH via Regional Corridor 17 (Surveyors Creek corridor) would be planned for in the future with construction of a fauna crossing to allow for future connectivity to the DEOH land. The proposed fauna crossing is currently a 2.4 m high dry passage underpass (refer to Figure 2-2). This is considered suitable for larger species such as the Eastern Grey Kangaroo based on monitoring results from Pacific Highway projects. However, the potential to increase the height of this underpass would be investigated during detailed design of project where reasonable and feasible. The culvert would lead from the Surveyors Creek corridor under the road and would exit at the new DEOH fencing within the road reserve. There is a second culvert that leads from this road reserve into the DEOH site. For DEOH security reasons, this second culvert would be blocked via bars at about 180mm spacing onto DEOH land. This is to prevent the public from gaining unauthorised access to the DEOH land through the underpass and to prevent animals from exiting the culvert onto the roadway. The bars would remain in place until a change in potential future land use would allow the removal of the DEOH fencing. While this would preclude larger animals crossing into the DEOH in the short term,

it would still allow for connectivity for smaller animals. Appropriate control of the crossing in interim period before the development on the east occurs will be considered further during detailed design. Fauna exclusion fencing would be provided either side of the crossing in accordance with Roads and Maritime standards.

Fauna passage would also be provided at Badgerys Creek with the construction of a fauna friendly drainage culvert of similar internal dimensions to the Surveyors Creek / DEOH culvert (refer to Figure 2-3).

The requirement for fauna passage at Surveyors and Badgerys Creek crossings have been incorporated into the revised environmental management measures for the project (refer to Chapter 6).

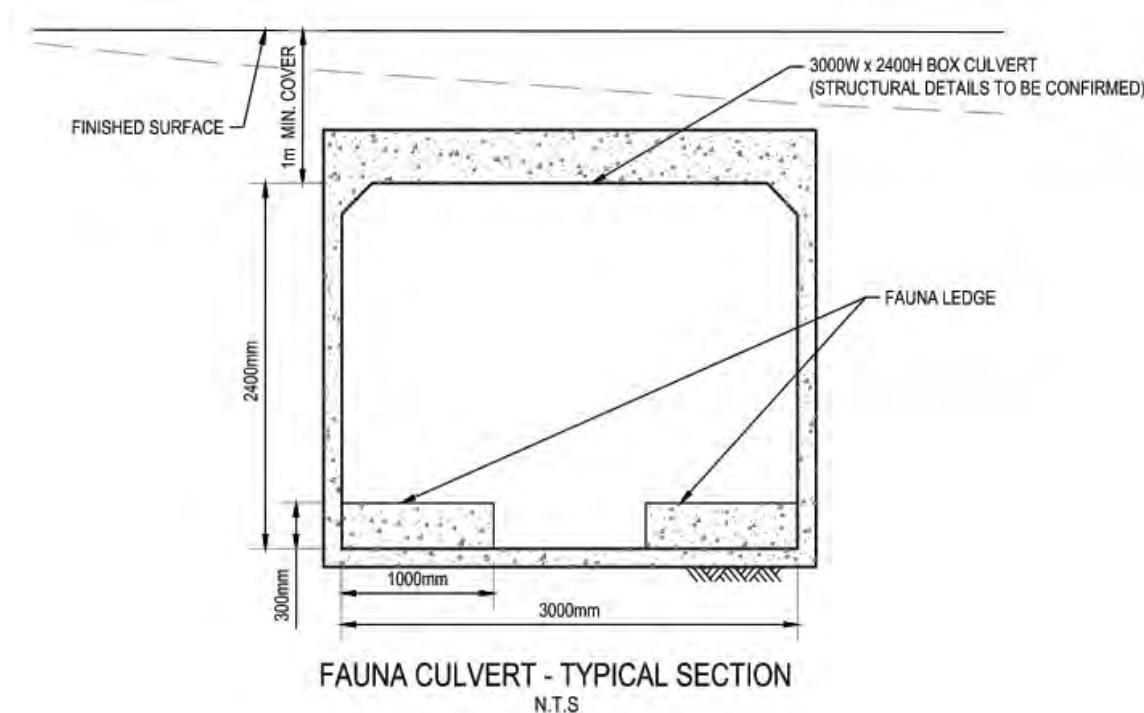


Figure 2-2 Cross section of the proposed culvert at the unnamed tributary of Surveyors Creek

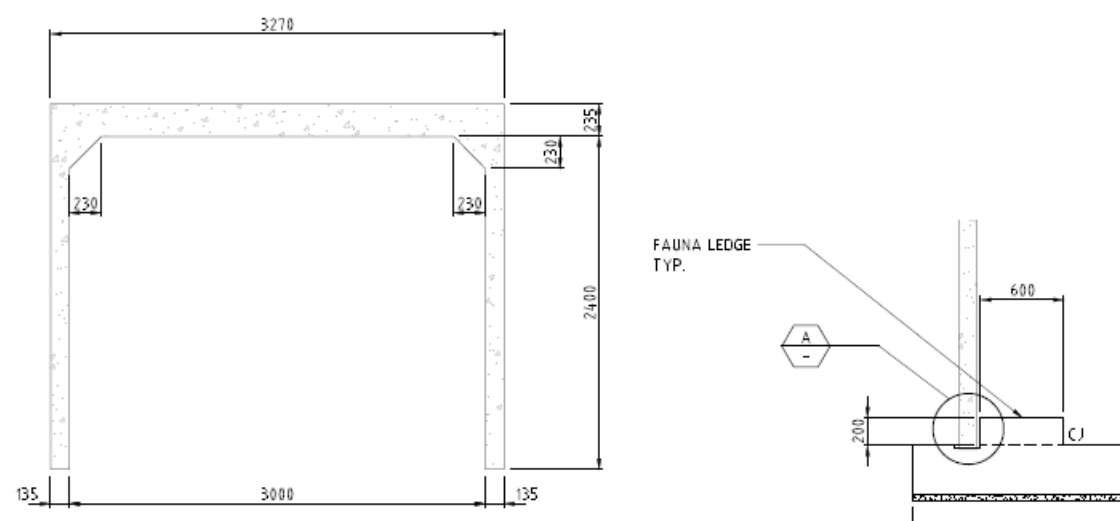


Figure 2-3 Cross section of the proposed culvert at Badgerys Creek

There is a particular fencing specification required for the DEOH boundary. A Class 2 chain link perimeter fence is required to be installed to delineate the base boundary, as it is adjacent to a public road. This fence would be a galvanised, rail-less chain wire security fence with gates 2.4 m high (unless increased during detailed design), topped with at least three strands of barbed (or similar) wire to a total height of three metres. The mesh size of the fence would be about 50 mm x 50 mm. The fence would be kept clear of trees and other vegetation to a distance of five metres. This fence would continue the current level of fragmentation in the landscape until it is removed in the future due to any proposed changes in land use.

2.7.6 Impacts due to lighting

Submission number(s)

11, 17, 18, 27

Issue description

The respondents raised the following issues:

- Concern regarding the impacts of light pollution on fauna
- Reduced street lighting would minimise impacts to native fauna
- Request for lighting to be limited to larger traffic intersections to reduce impacts to fauna, such as threatened bat and owl populations, as well as other nocturnal species
- Lighting should be excluded from the width of the Surveyors Creek Corridor on both eastern and western sides, and along the length of Cumberland Plain Woodland on the DEOH site.

Response

The EIS acknowledges that night works would be required during construction which would involve the use of temporary lighting. Additionally, street lighting would be provided as required to support the safe operation of the project. Street lighting would be designed to ensure relevant guidelines are adhered to, including on light spill. The immediate area surrounding the project construction activities, and the roadside during operation, would be subject to artificial lighting. This would essentially create permanent „daylight“ conditions in the area around the lights. Ecological light pollution may potentially affect nocturnal fauna by temporarily interrupting their life cycle. Due to the frequency and sustained nature of the lighting, it would be unlikely that animals would habituate to the light disturbance and a long-term impact in the area of lighting would be likely. Despite efforts to minimise the impacts of lighting, localised impacts from light spill would remain and this has been identified and assessed as a residual impact in the BAR for the project.

2.7.7 Impacts due to landscaping

Submission number(s)

11, 17, 18

Issue description

The respondents raised the following issues:

- The Orchard Hills stretch of road should be kept rural in character. Landscaping should be avoided along the DEOH boundary and Cumberland Plain Woodland verges should be retained
- The use of local native flora species for roadside plantings will create habitat, help retain local character, and reduce roadside maintenance
- The width of the existing Surveyors Creek Corridor on both western and eastern sides should be capped with suitable Cumberland Plain Woodland substrate via soil translocation following earthworks

- The Surveyors Creek Corridor and median strip and verges for chains adjoining the DEOH bushland should not be landscaped. The sites should be restored to BAM/FBA-criteria functional Cumberland Plain Woodland.

Response

An urban design and landscape concept has been developed for the project as documented in Section 8.5.3 the EIS, based on the project objectives and principles, to achieve an integrated design for the project. It incorporates the urban and landscape design concept plans for the project and a landscape planting concept including recommended species. As identified in the EIS, this would be adopted and further developed during detailed design and implemented as part of the Urban Design Landscape Plan (UDLP) for the project which is currently ongoing. This plan would be developed in consultation with Council, noting that there is a particular interest from the Community on the frontage of the DEOH site. Planting selection would be in keeping with the rural character of the area, and in accordance with DEOH security measures and road safety requirements.

The EIS includes a mitigation measure for the re-establishment of native vegetation (EIS mitigation measure B-6), which the contractor would be required to incorporate into the FFMP to be developed for the project and implemented during construction. This has been updated to include additional detail and would be included as part of the revised environmental management measures for the project (refer to Chapter 6).

Native vegetation would be re-established in disturbed areas and along the roadway using the following procedure:

- Ecologists and landscape architects will work together on the preparation of revegetation plans and specifications that clearly identify the locations of areas to be revegetated
- Allocate sufficient time for the collection of seed to be used in revegetation
- Carry out all seed collection in accordance with RTA Seed Collection QA Specification R176 and the Florabank Guidelines and Model Code of Practice
- Use experienced and licensed seed collectors to carry out seed collection
- Where possible, procured plants should be grown from local provenance seed where available
- Consideration should be given to a range of characteristics such as species, height and drought tolerance when procuring native plants
- Planting operations should be in accordance with RTA Landscape Planting QA Specification R179
- Use only plants that have been certified disease free for revegetation works
- Collect local native topsoils and leaf litter and store for use in revegetation works
- Soils in areas to be revegetated should match surrounding soil conditions as closely as possible unless adjacent areas are weedy or contaminated
- Ensure areas to be revegetated have an appropriate level of natural drainage
- Avoid compaction of soils in areas identified for revegetation. Where compaction has occurred, the soil should be loosened
- When planting consider seasonal risks of frost, drought, flooding and sun exposure to avoid damaging plants and to encourage growth
- Ensure plant spacing and diversity follows the landscaping plan for the project, reflects local conditions and is dense enough to ensure plants achieve a timely coverage of the ground

- Consider appropriate shade and drainage conditions when planting. Provide mulching around plants for dry or potentially weedy sites to help retain moisture and suppress weeds
- Inspection, monitoring and maintenance of revegetated areas should be conducted in accordance with the landscape management plan. Outline the roles and responsibilities in landscape management and revegetation plans including the schedule for monitoring and maintenance activities.

2.7.8 Offsetting

Submission number(s)

27

Issue description

The respondents raised the following issues:

- The EIS does not appear to find value in all of the mature canopy species being removed
- All habitat loss in a Critically Endangered vegetation system must be compensated
- The EIS underestimates the offsetting required to compensate for direct losses and for the flow-on effects associated with the project
- Concern regarding the offsetting of Conservation Lands located on the DEOH site
- Requests that Roads and Maritime provide the respondent transparency of the offset process
- Concern regarding the ineffectiveness of BioBanking to offset the losses of critically endangered vegetation communities in Western Sydney
- There are insufficient offsets available to supply the offset needs for current development
- Requests that Roads and Maritime procure land to be managed for conservation.

Response

The BOS outlines the offsets required for unavoidable (residual) biodiversity impacts associated with the project and demonstrates that appropriate offsets are available and can be delivered for the project. Roads and Maritime are currently working in consultation with OEH to determine the quantum of offsets or supplementary measures that would be required for the project. The preferred approach to securing offsets for the project is to purchase credits from the market. Where credits are unavailable for purchase on the market, Roads and Maritime would work with public and private landholders to enter a BioBanking and/or Stewardship Agreement on their land and then buy the credits issued.

Supplementary measures at a landscape scale are also being investigated in conjunction with the OEH. The final offset requirement for the project would be determined during development of the offset package in consultation with the OEH. Following discussions with Roads and Maritime, DoEE and OEH, it was decided that an additional supplementary measures package would be developed in consultation with OEH and DoEE with a focus on landscape scale measures within the local area. The package may include measures such as weed eradication programs within Cumberland Plain Woodland. This requirement has been incorporated into the revised environmental management measures for the project (refer to Chapter 6).

Detail regarding additional offsets for impact to Cumberland Plain Woodland and measures to secure offsets is provided in section 5.1.3.

2.8 Socio-economic and land use

2.8.1 General issues/errors

Submission number(s)

23

Issue description

The respondent raised the following issues:

- Table 4-18 Social Infrastructure on page 54 of the socio-economic technical working paper (Appendix J of the EIS) omits Luddenham Progress Hall, next to the Uniting Church, from the list of Cultural facilities.

Response

The respondent's advice is noted. The EIS (Table 4-18 - Social Infrastructure in the broader study area) should have included The Luddenham Progress Hall (Roots Avenue, Luddenham).

The project would not have a direct impact on the Luddenham Progress Hall. Indirect impacts to the hall from construction activities would be unlikely due to the distance of the hall from the construction area of the project.

2.8.2 Assessment methodology

Submission number(s)

23

Issue description

The respondent raised the following issues:

- While there is a broad brush quantitative discussion of grouped communities from the 2011 Census data (eg Luddenham-Mulgoa-Orchard Hills; or Greendale-Bringelly), there is little qualitative information especially regarding the difference between villages, as each have different histories and community make-up.

Response

The socio-economic technical working paper (Appendix J of the EIS), as summarised in Section 7.4 of the EIS, involved a process of analysing, monitoring and managing the intended and unintended social and economic impacts, both positive and negative, of the project. It involved identifying, assessing and evaluating changes to or impacts on, communities, business and industry that would be likely to occur as a result of the project, in order to mitigate or manage impacts and maximise benefits. This assessment was developed in accordance with the Roads and Maritime Environmental Impact Assessment Practice Note N05 – Socio-economic assessment and to address socio-economic matters outlined in the SEARs and the economic and social matters identified in the Commonwealth EIS Guidelines.

Information presented in the socio-economic technical working paper from the 2011 Census is based on the Statistical Area Level 2 (SA2) geographies defined by the ABS. They include:

- Glenmore Park-Regentville
- Mulgoa-Luddenham-Orchard Hills
- Badgerys Creek-Greendale
- The use of these ABS SA2 geographies is consistent with other Roads and Maritime socio-economic impact assessments.

The socio-economic technical working paper (Appendix J of the EIS) recognises the difference in social and demographic profiles of more recently developed areas (e.g. Glenmore Park) and more established rural localities (e.g. section 4.3.1, section 4.3.2 and section 4.3.5 of the technical working paper). The different community values associated with the villages and more recently developed urban areas are also recognised in section 4.5 of the technical working paper. This includes connections to the area of long-term residents.

The socio-economic technical working paper was also informed by the outcomes of consultation. This includes consultation with property owners and residents from across the study area.

The socio-economic technical working paper also recognises the different effects of the project on various communities. For example, section 6.1.2 of the working paper recognises the effects on social networks and community relationships associated with property acquisition, particularly for long-term residents, and older populations. Potential impacts on families that have had the same property for several generations are also recognised.

2.8.3 Property value and compensation

Submission number(s)

13, 22, 23

Issue description

The respondents raised the following issues:

- Concern regarding the impacts of the project on property values and request to be compensated for property devaluation
- Concern regarding changed access to private property, and the potential impact on property values, safety and compensation
- Compensation for partial or total acquisition does not account for the loss of heritage, family history, connection to the property and community, future use of the property, or increased traffic noise and loss of amenity
- The impacts on “registered” businesses are acknowledged as important within the report, however the compensation for property owners who also use their land for income-producing primary production (without operating a business open to the public) has not been considered.

Response

As outlined in section 7.4.4 of the EIS, property values are driven by a range of factors. It would be likely that external factors, such as the Western Sydney Airport and future urban development, may influence property values.

Roads and Maritime would acquire properties for the project in accordance with the provisions of the NSW *Land Acquisition (Just Terms Compensation) Act 1991*. Among other things, this Act provides the basis for assessing compensation.

Compensation is based on the assessment of the market value, unaffected by the road project, however as stated in the EIS, Roads and Maritime does not pay compensation to properties that are not materially impacted (i.e. property or buildings physically or structurally affected).

The owner may also choose to engage its own registered valuer to carry out a valuation of the property. The valuations on behalf of both Roads and Maritime and the property owner are discussed between the parties, including the respective valuers.

The total purchase price may where relevant, also include, in addition to the market value, reasonable costs arising from any need to relocate, such as:

- Legal costs including conveyancing fees
- Valuation fees

- Removalist costs
- Pest and building inspection costs
- Stamp duty costs in connection with the purchase of another property of equal value
- Mortgage re-establishment costs and other payments
- Solatium (an amount of money to compensate an owner for the inconvenience of having to move their primary residence).

Under the NSW *Land Acquisition (Just Terms Compensation) Act 1991*, where property compensation offers are in dispute, Roads and Maritime attempts to resolve the dispute by negotiation. The Valuer General provides independent valuations for all properties that are unable to be agreed between Roads and Maritime and the owner and as a resultant must be compulsorily acquired, in accordance with the NSW *Land Acquisition (Just Terms Compensation) Act 1991*.

The socio-economic assessment recognises that some properties impacted by property acquisition are used for home based businesses. As indicated in section 6.5 (working paper), where business properties are impacted by property acquisition, compensation for reasonable disturbance costs likely to arise would be considered by Roads and Maritime (Roads and Maritime, 2014). This would include compensation for any temporary disruption to business operations. The use of the term „registered businesses“ relates to ABS data on Counts of Australian Businesses.

The socio-economic assessment considered potential impacts on all businesses near the project that were identifiable through either a visual survey or desk-top research (e.g. internet searches). Direct impacts on land used for primary production, that were not clearly identified as a business, were considered as part of the assessment of agricultural uses (refer to section 6.6.2 of the working paper). This recognised that acquisition would impact on land used for primary production (e.g. dairy farming, cropping, grazing, horticultural production), with potential impacts related to such things as loss of productive land, impact on farm infrastructure, severance of agricultural properties, changes to the movement of farm equipment and changes to farm access.

Potential impacts on property owners and residents of property acquisition are addressed in section 6.1.2 of the socio-economic technical working paper (Appendix J of the EIS).

Management measures outlined in section 7.4.6 of the EIS involve effective and ongoing communications with the community and affected land owners and reflect Roads and Maritime’s commitment to consultation and negotiation with affected landowners in relation to land acquisition. This process is ongoing.

2.8.4 Acquisition

Submission number(s)

13, 14, 23, 24, 31

Issue description

The respondents raised the following issues:

- Questioning why partial property acquisition is occurring on private property instead of government land on the opposite side of the Northern Road
- There has been no assessment made of the environmental effects should government land be used rather than private land.
- Comment that the EIS does not adequately assess the impacts of stress related to property acquisition
- Concerns regarding the design of Gates Link Road and the related property impacts and acquisition.

Response

Chapter 4 of the EIS outlines the route options development process that was carried out during development of the project. In particular, a key component of the route options development was the consideration of minimising impacts to private property.

The selection of the preferred corridor was based on the preference to utilise the existing road reserve as much as possible to accommodate the road upgrade rather than investigate realignment options that would result in larger property acquisitions or property severance. Upgrading the road within the existing road corridor and widening to the east (Commonwealth Land side) was chosen as the preferred option as it would result in substantially less private property acquisition and because this has a lower project cost and higher overall performance against WSIP and project objectives.

The existing road reserve between Littlefield Road, Luddenham and Glenmore Parkway, Glenmore Park is generally about 40 m wide. Early in the project's design it was identified that an additional 20 m of corridor may be required to provide for the proposed upgrade of The Northern Road. While partial acquisition is occurring on both sides of the road, with more property impacted within the DEOH than private property on the western side of the road corridor.

Property Acquisition for the project will be conducted in accordance with the provisions of the NSW *Land Acquisition (Just Terms Compensation) Act 1991*. Among other things, the Act provides the basis for assessing compensation.

The acquisition process includes the appointment of a dedicated case manager (Property Manager Acquisition) to help landowners understand their rights and provide a single point of contact right through the acquisition process. The case managers have also been involved in the partial acquisition on this project.

The project has the potential to significantly impact on MNES including EPBC listed Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest. The project would also significantly impact upon areas of Commonwealth Land associated with the DEOH and land purchased by the Australian Government for the Western Sydney Airport. The EIS fully assesses the potential impacts to Commonwealth Land located within the DEOH site and the Western Sydney Airport site. All assessments within the EIS have been prepared that addresses both the SEARs and the Commonwealth EIS Guidelines.

The impacts of property acquisition are considered within the socio-economic technical working paper carried out for the project (Appendix J and section 7.4.4 of the EIS). The EIS outlined that disruption caused by changes due to property acquisition can result in a number of impacts including:

- Anxiety and stress about changes as well as uncertainty regarding the acquisition process. Consequential effects on health and well-being
- Disruption to community cohesion, social networks and community relationships, particularly if people need to move away from the local area and from existing social and support networks
- These impacts are likely to have the greatest effect on groups such as the elderly, people with disability, longer term residents and people on lower incomes who are often more reliant on personal and community networks.

It is acknowledged that stress is difficult to quantify. Management measures outlined in the EIS (refer section 7.4.6) involve effective and ongoing communications with the community and affected land owners and reflect Roads and Maritime's commitment to consultation and negotiation with affected landowners in relation to land acquisition. This process is ongoing.

Affected land owners were initially consulted with project's designs that were preliminary in nature and still subject to further survey and consultation. There were no formal agreements entered into between Roads and Maritime and landowners based on these plans.

Following further survey and discussions with all affected landowners, design refinements were made to the proposal at Gates Link Road. In summary, matters that were considered during the consultation and design process included:

- Further survey and optimal design considering the topography of the landscape
- Presence of dam infrastructure and access to water resources
- Maintenance of a constant width between The Northern Road and Gates Link Road to not preclude future land use
- Distance to properties and loss of land due to acquisition.

These are discussed below in more detail.

Roads and Maritime met with Penrith City Council on 29 June 2016 to discuss the proposal. One of the outcomes of these discussions was their request to ensure the design of Gates Link Road would not preclude future development of the land between The Northern Road (as upgraded) and the proposed Gates Link Road. The concept design was developed with this in mind and consultation was carried out based on the concept design.

A response during this early consultation phase was received from one of the potentially impacted property owners who raised concerns regarding their property being segmented and cut off from a dam on the property, being a primary water source for the property. Subsequent to this the alignment was redesigned as per the EIS design.

Another local resident potentially impacted by the design did not receive the initial community update in July 2016 and was subsequently consulted in August 2016 based on an advanced version of the EIS design. This resident expressed concerns regarding the loss of land at their property and the proposed road being located so close to their house.

A letter was also received from a third potentially impacted property owner in September 2016. This submission identified that the alignment of Gates Link Road was segmenting a large area of their land and making it unviable for future development. They requested a 200 m width between The Northern Road and Gates Link Road.

Considering all consultation outcomes and taking into consideration the topography and environmental constraints in and around this location of the project, including the presence of Cumberland Plain Woodland threatened ecological community and associated habitat for threatened fauna species, the design of Gates Link Road was amended post exhibition of the EIS as per the refined design presented in this document.

This design provides a width ranging between 100 m and 140 m between the proposed alignments of The Northern Road and Gates Link Road. This refined design was presented to impacted property owners during property adjustment discussions in August 2017.

While the refined design has moved further to the east since the EIS was exhibited, Roads and Maritime has reduced the amount of land required for acquisition in the area. This has resulted in some land being temporarily leased during construction instead of acquired for the operation of the project.

All affected property owners have been consulted regarding the following issues:

- Property adjustments would involve reinstating affected property access and driveways
- Offers of plant screening to reduce the visual and amenity impacts and improve privacy.

Further consultation has been carried out since the EIS exhibition, including consultation regarding the refined design, and will continue to be undertaken with landowners in the future.

2.8.5 Construction impacts

Submission number(s)

23, 24

Issue description

The respondents raised the following issues:

- There is little discussion of the effects of compounds on adjacent properties, especially pollution, from construction activities on grazing and other land, as well as noise
- Concern that impact of the construction and use of the new road on affected residents have been completely ignored because their number is considered low.

Response

A detailed socio-economic impact assessment has been carried out for the project and is provided in Appendix J of the EIS (socio-economic technical working paper) and section 7.4.4 of the EIS. The assessment was carried out in accordance with the SEARs and requirements of the Commonwealth EIS Guidelines.

The assessment included the consideration of impacts related to all construction activities and the temporary ancillary facilities (construction compounds). The assessment considered impacts to the surrounding socio-economic environment such as communities, commercial and residential considerations and also included a business impact assessment which identified potential impacts to businesses, including direct impacts and impacts from changed trade. Land use impacts during construction were also assessed as discussed in section 7.4.3 of the EIS. The use of land affected by temporary leases during construction would be temporarily disrupted or suspended for the duration of the lease.

Any structures, facilities or infrastructure located on the affected lands would likely be demolished and/or relocated, in consultation with the landowner. On completion of construction, any land not required for the project's long-term operation would be reinstated to its former condition.

The assessment of residual, construction related impacts (ie impacts after the application of environmental management measures) identified that the overall social impact of construction would likely be minor and that:

- Short-term changes to traffic and access, including reduced travel speeds, increased delays near construction works and temporary changes to accessibility for pedestrians and cyclists. This may require some motorists, pedestrians or cyclists to travel further to reach their destination. This would be necessary to ensure construction work is carried out safely. This impact would be minor and is not considered to be significant
- Short-term changes in local amenity for some residents, businesses and visitors near the project, associated with increased noise, dust and visual impacts. Overall, these impacts would be temporary and will be managed to an acceptable level. It is acknowledged that some people may experience ongoing amenity impacts that affect the use and enjoyment of their property during construction. This impact is not considered to be significant.

Management measures specific to construction noise are outlined in section 7.3.8 of the EIS. A CNVMP would be prepared and applied to all construction processes throughout the project. The CNVMP would include the requirement to monitor the effectiveness of construction mitigation measures at sensitive receivers. The frequency of monitoring would be outlined in the plan but would include the requirement for additional monitoring if complaints are received. The monitoring would be carried out to determine if construction methods or techniques need to be refined to minimise noise.

Since exhibition of the EIS, further detail has also been provided regarding the proposed out of hours works for the project. Appendix A also provides further detail regarding the application of mitigation measures for activities during standard and out of hours construction periods.

As outlined in section 7.4.6 of the EIS, a Community Involvement Plan will be prepared to ensure effective communication with affected community members and minimise impacts during the construction of the project. The Community Involvement Plan would be in addition to a range of additional and specific mitigation measures that would be used to minimise the impacts from issues such as noise and air emissions, temporary changes to traffic conditions and changes to amenity.

2.8.6 Operational impacts

Submission number(s)

23, 24

Issue description

The respondents raised the following issues:

- The working paper and relevant chapter in Volume One give more weight to the economic impacts on affected businesses than the impacts on property owners and residents who are not registered businesses.
- Each section in this working paper indicates there is little “significant” impact in terms of the project as a whole for all aspects of the analysis. However, there is no definition of what is significant or how this is measured or how many people have to be affected or the extent of the impact for it to be considered “significant”
- The measure of “significance” of each of the project impacts is not defined in this working paper nor Volume 1.

Response

Appendix J (Socio-economic assessment) of the EIS assesses directly affected agricultural uses (section 6.6.2). Some rural properties impacted by property acquisition comprise agricultural businesses. These include businesses that sell produce direct from the property.

Further information about broader impacts of construction and operation on agricultural uses and businesses in the study area is provided in section 6.6.3 of EIS Appendix J. In both cases, direct and indirect impacts on agricultural also assumes that impacts to those uses include registered and unregistered agricultural businesses. The assessment identifies that acquisition for the project would impact on land used for dairy farming, honey production, grazing, cropping and horticulture production. Potential impacts on directly affected agricultural businesses would generally be associated with:

- Loss of productive land, including land used for pasture, feed crop and horticulture production
- Direct impact on farm infrastructure such as dams, irrigation, fencing, sheds and storage areas, and other facilities, resulting in the loss of this infrastructure or the requirement for this infrastructure to be relocated
- Severance or fragmentation of larger agricultural properties, potentially isolating some parts of agricultural properties and impacting on the efficiency of farm management, and farming operations associated with the movement of livestock and/ or farm machinery and equipment
- Changes to the movement of farm equipment and livestock, including between different areas of farming properties
- Changes to farm access, including for vehicles transporting produce or delivering farming equipment and supplies.

The level of significance is dependent on a range of factors such as the extent of the impact (i.e. individuals, local or regional areas), whether the impact is temporary or permanent, and the

magnitude or severity of the impact. In evaluating significance, consideration is given to such things as the nature of the impacts (e.g. are they negative or positive), ability or capacity of communities to tolerate or respond to changes and whether the area affected is limited to people for whom individual arrangements can be made or extends to an area which requires more detailed strategies to be implemented.

The severity of impacts would depend on such things as the proportion of the socio-economic value lost or impacted and whether the impact would diminish over time. For example, impacts that have a lower level of significance would generally relate to those that result in minor changes to the social environment, quality of life or social conditions, and that would be easily reversible over time. Impacts with a high level of significance may include those that have a large, but temporary impact on quality of life or social conditions, and/ or that are likely to have serious social issues, temporary ceasing of social functions, while impacts that are considered to have a very high level of significance may be those that impact a large proportion of the population, or on quality of life or social conditions, or that cause irreparable damage to items of high community value or great social significance.

While the report recognises that some impacts are not expected to be significant in the context of the project as a whole (i.e. due to such things as duration, the extent of population affected, impact would be reversible over time), it also recognises that some impacts are likely to be a concern (or substantial) for some affected individuals (e.g. those affected by property acquisition).

Other potential socio-economic impacts on property owners and residents who are not registered businesses is assessed in Appendix J of the EIS and summarised below.

Potential socio-economic impacts during construction would include:

- Direct land use impacts associated with the location of construction compounds, temporarily disrupting use and access to land including rural or vacant land, residential and commercial uses
- Temporary decrease in local amenity for residents, community and business facilities and natural areas near to construction worksites and work areas, due to increased noise and dust from construction activities
- Increased construction traffic and temporary changes in local access and connectivity, including for motorists, public transport users, pedestrians and cyclists during construction resulting in delays and disruptions
- Temporary decrease in visual amenity due to the presence of construction works including light spill from any night-time construction works
- Removal and/or relocation of farm infrastructure near to the construction footprint, such as farm dams, fencing and internal roads
- Increased movement of construction vehicles within the construction footprint, potentially increasing the likelihood of the spread of weeds and pests between rural properties.

Overall, potential impacts would be short-term in nature. While these impacts may be a concern for some individuals, overall they are not expected to be significant, given the implementation of proposed environmental management measures.

The project would also impact positively with the creation of direct and indirect employment opportunities throughout the construction phase. The potential positive impacts of the project are expected to outweigh the negative impacts during construction of the project.

As identified in section 7.4.4 of the EIS, the main impact during operation of the project would be the required acquisition of properties including privately owned land, as well as land owned by Roads and Maritime, other NSW Government agencies and the Commonwealth Government. The majority of land to be partially, or fully acquired for the project comprises residential uses. A revised property acquisition table is provided in Table 5-9 of this document based on the revised design.

The acquisition of land required for the operation of the project would be permanent and would result in long-term impacts to property as a result of the project. Roads and Maritime would continue to consult with property owners to effectively mitigate potential land use and access impacts where possible through detailed design.

Roads and Maritime would acquire properties for the project in accordance with the provisions of the NSW *Property Acquisition (Just Terms Compensation) Act 1991*. Among other things, the Act provides the basis for assessing compensation.

The draft EIS identified some potential adverse impacts to local amenity at those properties where The Northern Road moves closer to homes, businesses or community facilities due to the realignment or widening of the road corridor.

Overall, the operation of the project would contribute to improved access and connectivity to community services and facilities at the regional, State and national level, within or near to the study area, through improved travel time savings and improved travel time reliability. Additionally, the project would provide improved access not only to the planned airport site, but also to the Western Sydney Priority Growth Area and the South West Priority Growth Area. Through improved access and connectivity, the project would help to stimulate economic development that would eventually benefit local communities in terms of improved social infrastructure in the project area.

2.9 Hydrology and flooding

2.9.1 Stormwater runoff

Submission number(s)

13

Issue description

Further information required regarding the impact of insufficient stormwater retention, and associated stormwater run-off, on the respondent's property.

Response

Roads and Maritime have conducted specific, further consultation with the landowner including providing relevant flood mapping from the EIS.

As demonstrated in Appendix K1 of the EIS (Table D.1 Summary table peak flow) the project would result in a decrease in the cross sectional area of the pipes upstream of the affected property. This decrease in the size of the culverts crossing The Northern Road upstream results in a decrease in the peak flow rates reaching the property (as is shown in Appendix K1 of the EIS, Table D.1).

The landowner was also provided the relevant drainage design plans and a suite of figures showing the relevant modelled results for:

- Change in flood levels for 1:2, 1:10, 1:50 and 1:100 between pre and post project
- Pre and post project predicted flood levels for 1:2, 1:10, 1:50, 1:100 and probable maximum flood (PMF).

2.10 Soils, water and contamination

2.10.1 Contamination

Submission number(s)

22

Issue description

Concern regarding the potential for the project to result in reduced water quality at dams on private property.

Response

Roads and Maritime proposes to implement water quality management measures to manage the suspended solids and associated contaminants from the road pavement runoff. The project would include grass swales as part of the drainage system conveying road pavement runoff. Grass swales provide water quality improvement because of the interaction between the flow and the vegetation along the length of the swale. The vegetation acts to spread and slow water velocities, which in turn aids the deposition of sediments. The proposed swales are highly efficient at providing suspended solid capture and reasonably efficient at reducing nutrients. The pollutant load reduction results vary depending on the swale length and slopes and from one pollutant to another. Modelling indicates the swales achieve reduction in Total Suspended Solids (TSS) of 78 per cent to 93 per cent, for Total Phosphorus a reduction 43 per cent to 64 per cent and for Total Nitrogen a reduction 11 per cent to 45 per cent).

Water quality would also be managed during the construction phase of the project. Prior to construction, baseline water quality monitoring would be carried out to identify parameters for monitoring during construction and to determine indicative existing water quality. The potential impact on receiving waterways during construction would generally be mitigated through erosion and sediment controls including appropriately sized temporary sediment basins. A SWMP would be prepared as part of the CEMP prior to the commencement of construction.

2.11 Non-Aboriginal heritage

2.11.1 General issues / errors

Submission number(s)

23, 24

Issue description

The respondents raised the following issues:

- Historical information has been incorrectly reflected in the non-Aboriginal heritage technical working paper (Appendix N of the EIS), and as a result there are errors which have been carried through into the published documents.
- In relation to Item 3: Warragamba Dam to Prospect Reservoir Pipeline, the focus in the report solely on the use of Chinese workers for a year on the pipeline fails to acknowledge the major engineering and historical impact of these large infrastructure projects on the wider community, growth of new settlements and the contribution to the multicultural community that developed in the area.
- In relation to Item 6: Weatherboard House and Sheds, Luddenham, the location of the original slaughterhouse is noted as being on the same site as the current slaughterhouse, and confirmation is provided that the Roots family lived there for a number of years.
- In relation to Item 7: "Pleasantview" House 1, Luddenham, it is suggested the authors clarify the statement with the owner (Mr Ken Hughes) as to who brought the building to the property as it is understood it may have been his father or grandfather that did so.
- In relation to Item 8: 'Luddenham Village' area: Chapel and School Site and Adams Road House, it is noted that Mrs Roots stated to Mrs Sales, that when she was a girl she attended the Primitive Methodist Chapel and school on the site. It is also noted that land was procured further along the Northern Road for the Methodist Church, in its current position. Subsequently the location of the original Primitive Methodist chapel and school was sited on land later owned

by Mr HL Sales approximately between 14 – 18 Eaton Road. The only use of the land from the time of his purchase (around 1920) was sheep grazing. It was sold on his death in the early 1970's.

- In relation to Item 8: 'Luddenham Village' area: Chapel and School Site and Adams Road House, it is noted that this was developed although not as extensively as early plans suggest and with larger lots in some cases.
- In relation to Item 9: Miss Lawson's Guesthouse, it is noted that Miss Lawson's name was Carrie not Cassie. The guesthouse had a slab kitchen. The guesthouse was still standing when Mr HCJ Sales was a boy in the 1920's. Mr Jack Vicary and Mr Dan Lawson lived in the guesthouse in its final years. When they died the land was auctioned and was bought by Mr HL Sales who used it for sheep grazing. Following his death in 1970, the land has been used solely for grazing. The land was consolidated with a further purchase of what is now 7, 15 and 25 Adams Road from Mr John Adams.
- In relation to Item 9: Miss Lawson's Guesthouse, it is noted that the location of wells, stone gatepost and road cutting as documented for survey area 4-13 are predominantly located further to the south.
- Noted that Figure 5-8 on page 52 of the non-Aboriginal heritage technical working paper actually shows the eastern view not the western view of Eaton Road.

Response

Additional assessment since exhibition of the EIS has been carried out as documented in the non-Aboriginal heritage technical memorandum prepared as part of this assessment (refer to Appendix D). The memorandum has been prepared in response to community and agency submissions received during exhibition, including those summarised above.

The assessment incorporates the results of further historical research and information gathered from local oral histories to update the histories and significance assessments for some of the heritage items assessed in the EIS as follows:

- Item 3: Warragamba Dam to Prospect Reservoir pipeline
- Item 5: Weatherboard house, slab hut and old dairy, Luddenham
- Item 6: Weatherboard house and sheds, Luddenham
- Item 7: "Pleasantview" House 1, Luddenham
- Item 8: „Luddenham Village" area
- Item 9: Miss Lawson's Guesthouse site
- Item 10: Lawson's Inn site.

The additional assessment also included a comparative analysis for Item 9: Miss Lawson's Guesthouse site and Item 10: Lawson's Inn site to aid the assessment of heritage significance for these sites. A comparative analysis provides a review of comparable sites to assist in the understanding of factors such as rarity and representativeness which inform the assessment of a place's significance. A comparative analysis can also be valuable in predicting the layout of the establishment by comparing a site to like sites as it could be easily assumed that what made one place successful would be replicated by other places.

The assessment of individual heritage items in Appendix D replaces those presented in section 5 of the non-Aboriginal heritage technical working paper and corresponding details in Section 8.3 of the EIS. This includes the documented histories and statements of heritage significance for these items. Although the significance assessments and associated statements of heritage significance have been updated for these items, there was no change in relation to whether or not these items satisfied the criteria for local or State listing, with no State significant heritage items identified for the project.

Further to this, research designs and excavation methodologies have been prepared for the following:

- Item 2: Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (in relation to Chaffey Brothers Irrigation Scheme Canal)
- Item 9: Miss Lawson's Guesthouse site
- Item 10: Lawson's Inn site.

The potential archaeological significance of these sites and expected impacts has been reflected in the updated assessment in Appendix D to reflect further knowledge of the sites.

In addition to the further historical research undertaken for the items above, it is acknowledged that in relation to Item 1: Remnants of The Northern Road, Figure 5-8 on page 52 of the non-Aboriginal heritage technical working paper for the EIS was incorrectly referenced, with this image facing east along Eaton Road not west as stated. The figure title is to be read as follows:

Figure 5-8: Eaton Road, facing east. Photo taken by Jennifer Chandler on 25 February 2016.

2.11.2 Construction impacts

Submission number(s)

23

Issue description

The respondents raised the following issues:

- In relation to Item 9: Miss Lawson's Guesthouse, a respondent expressed concern that the access to ancillary facility C8 as shown in the EIS will destroy the site, and that this is not captured in the assessment of ancillary facilities against the relevant SSI criteria as per Table 5-16 of the EIS.

Response

As outlined in the non-Aboriginal heritage technical memorandum (Appendix D), in relation to Item 9: Miss Lawson's Guesthouse site, it is noted that although the location of the proposed ancillary facility C8 overlaps with this item, construction and operation of the ancillary facility would not result in any additional impact to the site that would not already be impacted by construction of the road at this location (refer to Figure 5-8).

2.12 Urban design and visual impact

2.12.1 Lighting

Submission number(s)

22

Issue description

Concern regarding street lighting impacts on the respondent's property.

Response

The introduction of street lighting is required to support the safe functioning of the road. Street lighting would be designed to avoid unnecessary light spill on adjacent residents or sensitive receivers in accordance with *AS 1158.1-1986 – The lighting of urban roads and other public thoroughfares, performance and installation design requirements*. Street lighting in proximity to the airport has been specifically designed in accordance with aviation requirements.

2.12.2 Impacts to existing landscape character

Submission number(s)

21, 22

Issue description

Concern regarding the impact of the project on the landscape of the area and loss of rural aspect and privacy to private property.

Response

The EIS and Appendix O – Urban design, landscape character and visual impact assessment provides a detailed assessment of the urban design and visual amenity implications of the project and consideration of impacts on views and vistas.

The approach to the assessment follows the Roads and Maritime Services Guideline for Landscape Character and Visual Impact Assessment EIA-N04 (RMS, 2013) and includes an evaluation of the project's visual impact by comparing the sensitivity of viewpoints and the magnitude of the impact of the upgrade upon them. A total of five Landscape Character Zones (LCZ) were identified for the project. The EIS details that the LCZ are generally rural in nature and have a high sensitivity to impacts.

The assessment identifies that the project would fundamentally alter the character of the existing road north of Elizabeth Drive, and introduce a new road alignment into greenfield areas south of Elizabeth Drive. The change in road character, in particular the width of the road, combined with extensive earthworks and removal of vegetation and farm dams would have a considerable impact on the existing rural landscape along the route. The project would impact on all LCZs, due to the scale of the proposed works and the high sensitivity of surrounding areas, with some private properties significantly affected.

The EIS also notes that substantial land use changes are planned for areas along the project south of Elizabeth Drive and east of the new road alignment. They include the development of employment lands within the Western Sydney Priority Growth Area (WSPGA), the Western Sydney Airport and the development of urban centres and residential areas within the South West Priority Growth Area (SWPGA). The upgrade of The Northern Road would support these planned changes.

While landscape and mitigation measures may assist the integration of the project with surrounding areas and people may adjust to the landscape character and visual changes, the impacts themselves are not likely to significantly reduce over time, especially in those areas retaining a large rural component or situated at the interface with rural lands.

Project specific environmental management measures identified in the EIS (Table 8-35) have been developed with the aim of minimising or mitigating, as far as practical, the potential impacts of the project and support a range of urban design outcomes incorporated into the project's design.

The mitigation measures seek to integrate the proposed upgrade with the existing landscape while taking into account the planned changes to maximise the long-term fit of the project within its natural and built setting.

In the context of an urbanising landscape, it has been anticipated that the long-term landscape character changes brought about by the project would be consistent with the future planned character and use of the area.

Roads and Maritime is consulting with affected property owners to mitigate the impacts of the project.

2.13 Air quality

2.13.1 Impacts to health

Submission number(s)

13

Issue description

Concern regarding increased particulate pollution associated with traffic near the respondent's property and the impact this may have on human health, building elements and flora and fauna.

Response

Potential air quality impacts for the operational phase of the project as well as for a „do minimum“ scenario were modelled and compared against background levels (refer to section 8.6.6 of the EIS).

Air quality impacts were predicted to be minor, and the project was not predicted to result in air quality concentrations exceeding relevant criteria at surrounding receivers (excepting PM2.5 which is already exceeded as a result of elevated background levels). No specific environmental management measures have been recommended beyond traffic flow and composition verification monitoring once the road is in operation.

Though the project is not expected to result in unacceptable air quality concentrations at surrounding receivers during operations, concentrations were predicted to marginally increase relative to the „Do minimum“ option. Relative concentrations would also increase markedly along the portion of the project which takes a new route from the existing road around Luddenham, which was previously mostly unaffected by road-related emissions.

Regarding operation of the project, noting the low level of impacts generally predicted at a local scale, it is not expected that the project would result in any significant changes to regional air quality. Even in the instance of PM2.5, though the project may further elevate concentrations above the annually averaged criterion of 8 µg/m³ locally, this effect becomes comparable to the „do minimum“ option at around 200 m from the alignment and as such would not result in any material changes at a regional scale.

2.14 Cumulative impacts

2.14.1 Mitigation measures

Submission number(s)

23

Issue description

Concern that mitigation measures may not be adequate and coordinated between Roads and Maritime and other large infrastructure projects in the area to address the cumulative impacts of the project and other large infrastructure projects.

Response

Chapter 9 of the EIS provides a cumulative impact assessment for the project and other proposed developments within the region. Mitigation measures outlined in the EIS stipulate that consultation would be carried out with proponents of other nearby developments to increase the overall awareness of project timeframes and impacts in order to minimise them. These engagement activities would be monitored, assessed and reported regularly to ensure they are effective.

2.14.2 Impacts on property owners

Submission number(s)

23

Issue description

Concern regarding the acknowledgment and extent of discussion of cumulative impacts on individual property owners in the socio-economic impact assessment in the EIS.

Response

The socio-economic assessment does recognise potential impacts associated with long-term residents and family connections to land and that the area has experienced a loss of agricultural land associated with increasing urban development and the proposed Western Sydney Airport.

Potential impacts relating to stress and anxiety associated with property acquisition and disruption to social networks are described in section 6.1.2. Potential impacts associated with changes in local amenity are described in the urban design, landscape character and visual impact, and noise and vibration and air quality technical working papers as well as in section 6.8.2 of the socio-economic assessment.

Roads and Maritime acknowledge that substantial land use changes are planned for areas along the project south of Elizabeth Drive and east of the new road alignment. They include the development of employment lands within the WSPGA, the Western Sydney Airport and the development of urban centres and residential areas within the SWPGA. The upgrade of The Northern Road would support these planned changes.

Roads and Maritime has carried out consultation with directly affected property owners. Management measures outlined in Chapter 12 of the EIS involve effective and ongoing communications with the community and affected land owners and reflect Roads and Maritime's commitment to consultation and negotiation with affected landowners in relation to land acquisition and related impacts. This process is ongoing.

3 Response to government agency, local councils and utility provider issues and advice

3.1 Respondents

In addition to the 24 community submissions addressed in Chapter 2 of this report, the Department of Planning and Environment (DPE) received a total of 15 government agency, local council and utility provider submissions in response to exhibition of the EIS. This included submissions received up until 7 August 2017 in accordance with an extension granted by DPE to some government agencies.

The issues raised in each submission have been extracted and collated, and corresponding responses to the issues have been provided. Where similar issues have been raised in different submissions, only one response has been provided.

The most common issues raised by government agencies, local councils and utility providers are listed in Table 3-1.

This chapter addresses each government agency, local council and utility provider submission and associated response provided by Roads and Maritime. Each submission is outlined verbatim and individual responses have been provided specific to each submission.

3.2 Overview of the issues raised and advice provided

Responses to government agencies, local councils and utility providers are outlined within this chapter and summarised in Table 3-1.

Table 3-1 Summary of government agencies, local councils and utility providers' issues and advice

Respondent	Submission number	Section addressed	Issues raised
NSW Rural Fire Service (NSW RFS)	2	3.3	Requirements
Civil Aviation Safety Authority (CASA)	6	3.4	General support
Federal Member for Macarthur, Dr Mike Freeland MP	8	3.5	Traffic and transport
WaterNSW	9	3.6	- Utilities - Consultation - Traffic and transport – access - Noise and vibration - Property acquisition and temporary leases - Hydrology and flooding – Stormwater - Soils, water and contamination - Aboriginal heritage - Non-Aboriginal heritage - Urban design and visual impact

Respondent	Submission number	Section addressed	Issues raised
NSW Department of Planning and Environment, Division of Resources and Geoscience (GSNSW)	10	3.7	General support
Liverpool City Council	26	3.8	- General support - Traffic and transport - Noise and vibration - Socio-economic and land use - Hydrology and flooding - Soils, water and contamination - Aboriginal heritage - Non-Aboriginal heritage - Urban design and visual impact
TransGrid	28	3.9	Utilities
Penrith City Council	29	3.10	- General support - Ancillary facilities - Consultation - Traffic and transport - Noise and vibration - Biodiversity - Socio-economic and land use - Soils, water and contamination - Urban design and visual impacts - Air quality - Resource and waste management - Cumulative
NSW Office of Environment and Heritage (Heritage)	30	3.11	Non-Aboriginal heritage
NSW Department of Industry (Land and Forestry)	32	3.12	General support
Campbelltown City Council	34	3.13	General support
NSW Office of Environment and Heritage (Biodiversity)	35	3.14	- Biodiversity - Hydrology and flooding
NSW Environment Protection Authority	36	3.15	- Noise and vibration - Air quality - Water quality

Respondent	Submission number	Section addressed	Issues raised
NSW Department of Primary Industries	38	3.16	• Soil and water • Biodiversity • Socio-economic • General support • Assessment of route options • Mitigation measures
Sydney Water	39	3.17	• Utilities • Environment

3.3 NSW Rural Fire Service

3.3.1 Requirements

Issue description

The New South Wales Rural Fire Service (NSW RFS) has reviewed the information provided and advises it has no objections to the proposed upgrade. Subject to the following requirements;

- Public road access shall comply with section 4.1.3 (1) of *Planning for Bush Fire Protection 2006*.
- Landscaping shall comply with the principles as outlined within Appendix 5 of *Planning for Bush Fire Protection 2006* and the NSW RFS document Standards for Asset Protection Zone.

Response

Chapter 8.9 of the EIS identified that a search of the *Penrith City Council LGA – Bushfire Prone Land Map (2014)* and *Liverpool City Council – Bushfire Prone Land Map (2014)* was conducted to confirm that the project would be partly located within and near bushfire prone land.

With regards to construction of the project, measures to mitigate and manage bushfire would be developed and included as part of site-specific hazard and risk management measures within the project CEMP.

In addition, Roads and Maritime would further consider the requirements of *Planning for Bush Fire Protection 2006* during the detailed design of the project.

3.4 Civil Aviation Safety Authority

3.4.1 General support

Issue description

CASA has reviewed the Environmental Impact Statement and has no comment to make.

Response

Roads and Maritime acknowledges the support for the project by Civil Aviation Safety Authority.

3.5 Federal Member for Macarthur, Dr Mike Freeland MP

3.5.1 Traffic and transport

Issue description

The respondent raised concerns on behalf of constituents regarding congestion on local roads and transport corridors, and that this would be exacerbated by recent growth and development in the area including the Western Sydney Airport. The airport would add to traffic along The Northern Road and contribute to increased congestion where this links to Narellan Road.

The respondent calls for a new rail line, to link Leppington, Campbelltown and surrounding suburbs to the new airport and strongly believes that the provision of adequate public transport, and associated infrastructure is necessary to address the current problems facing our transport network, and in catering for future demand.

Additionally, the respondent believes that current upgrades to The Northern Road are inadequate, and believes the upgrade requires at least three to four lanes each way, rather than two.

Response

The project has been proposed to cater for expected growth as part of the \$3.6 billion WSIP to improve safety, increase road capacity and reduce travel times and congestion in the future.

Major land use changes associated with the South West Priority Growth Area and development of Western Sydney Airport and associated Western Sydney Airport Priority Growth Area, together with forecast growth in the regional centres of Penrith and Campbelltown, will drive a dramatic increase in traffic demand in the region which has been considered by the project.

Testing of the performance of The Northern Road under future year scenarios (2021 and 2031) shows that there would be insufficient capacity along The Northern Road under existing two-lane road network conditions where delays on The Northern Road at most number of intersections would be unacceptable (generally Level of Service E to F) and no further growth in traffic would be possible during peak periods.

Traffic modelling of the intersection performance along The Northern Road with the project shows that most of the intersections within the study area would have sufficient capacity to operate satisfactorily under the 2021 and 2031 future year traffic forecasts at Level of Service D or better.

Once complete, the project would cater for the substantial forecast traffic growth and provide connectivity to and from the Western Sydney Airport – connecting the M4 Western Motorway and the proposed M12 Motorway. The project would also improve road safety and public and active transport facilities, promoting more sustainable and efficient journeys.

Additionally, the project has incorporated a wide central median to allow for future growth with the addition of a travel lane in each direction in the future, if required.

3.6 WaterNSW

3.6.1 Utilities

Issue description

WaterNSW notes Section 5.4.10 (Vol.1) of the EIS discusses utilities and services, but does not identify the 11kV power supply crossing The Northern Road to supply the operation of WaterNSW's critical Cross Connection 2 (CC2). CC2 must be able to be operated during any water quality or quantity incidents, or where an issue with the integrity of one of the Pipelines arises requiring isolation of one or the other Pipelines. The power supply is also required to operate a sump pump for the pit containing the connecting valve and electrical controls. WaterNSW would require a 415 Volt generator to be hard-wired into the CC2 electrical switch room if the power were to be interrupted for a long period.

There is also a safety issue arising from the road being raised 1.5 metres closer to the power supply at this point. Depending on timing of works, this issue may be able to be addressed through the proposal by Cardno, acting for the Sydney Science Park development, to upgrade the power supply and underground it. Preliminary advice has been provided to Cardno on the basis the feeder will be accommodated in the widened Northern Road, i.e. that it is not located on land that will remain under the ownership of WaterNSW after acquisitions by RMS and subsequent boundary adjustments.

Table 5-14 in the EIS (Vol.1; s5.4.10; p.136) states "The water main crossing would need to have sufficient protection, otherwise there would be a need to relocate or replace the crossing so that connection to water mains are maintained." The proposal may result in Sydney Water temporarily not being able to pump water up to the Blue Mountains if the 450 mm and 900 mm rising mains are relocated. Depending upon the timing, an interruption to supply from the Orchard Hills Water Treatment Plant to the Blue Mountains storages may result in the depletion of available supplies. Close consultation with WaterNSW and Sydney Water is required regarding this aspect of the proposal.

Response

As stated in section 5.4.10 of the EIS, the extent of impact to utilities and services cannot be confirmed until the detailed design is finalised. A list of utilities that may require relocation is provided in Table 5.14 of the EIS. The 11kV power supply crossing The Northern Road to supply the operation of WaterNSW's critical Cross Connection 2 (CC2) was missing from Table 4-15. Since exhibition of the EIS, further identification of utilities has occurred and this includes the 11kV power supply line which is now shown on all current design drawings for the project.

Strategies to address impacts to the power supply crossing would be developed in close consultation with WaterNSW during the detailed design and construction of the project. Strategies may include protection or relocation of the utility, or adjustments to the project design to avoid any impacts.

The locations of water main crossings are well known as detailed in Table 5-14 of the EIS. The project would be designed to minimise impacts on utility services within and adjacent to the project. Roads and Maritime is committed to carrying out ongoing consultation with WaterNSW regarding all of their assets. A solution which would not involve significant depletion or interruption of water supplies will be sought.

Changes to utilities outside of the project construction footprint would be subject to separate environmental assessment and approval processes.

3.6.2 Consultation

Issue description

WaterNSW requests that if there are any amendments to the project arising from further assessment, and if these amendments have potential implications for WaterNSW, that the RMS consult with us on these amendments prior to making decisions.

WaterNSW would appreciate being provided with a copy of the submissions report.

Response

The items raised by WaterNSW are noted. Consultation has commenced with WaterNSW and would be ongoing during the final design and construction phases of the project, as required.

Chapter 4 of this report outlines the design refinements for the project. Table 4-1 outlines the design refinements and provides a brief justification as to the need for each of these refinements. Assessment of the potential impacts of the changes to the project is also provided in Chapter 4 of this report where applicable for consistency against the outcomes of the assessments provided in the EIS.

This submissions and preferred infrastructure report and all accompanying documents has been made available electronically at the Department of Planning and Environment - www.majorprojects.planning.nsw.gov.au. All online documents have been made web accessible and can be accessed free of charge.

3.6.3 Traffic and transport - Access

Issue description

WaterNSW owns and manages the Warragamba to Prospect Water Supply Pipelines corridor as a Controlled Area declared under the *Water NSW Act 2014*. Access is prohibited unless a written access consent has been obtained from WaterNSW. More information regarding access consents is available on WaterNSW's website at <http://www.watnsw.com.au/water-quality/catchment/manage/special-areas/access>.

WaterNSW access to the Pipelines corridor must be maintained at all times during construction for security and maintenance purposes. As previously specified, WaterNSW requires an 8.8 metre design turn path for service vehicles, and a 12.5 metre turn path for a truck.

WaterNSW requires security fencing to be installed to WaterNSW standards along the new boundaries. Any existing security fencing along boundaries that are not proposed to change must be maintained. Should the fencing be damaged, any repairs or replacement must occur to WaterNSW's standards and at RMS's expense. Any existing fencing proposed to be replaced must be removed and disposed of at a facility licenced to accept such waste.

Response

WaterNSW's comments regarding access to the Controlled Area associated with the Warragamba to Prospect Water Supply Pipelines corridor are noted. Roads and Maritime will consult further with WaterNSW on the required access and consents for the pipeline corridor during detailed design.

In accordance with the management measures outlined in the EIS, access to properties would be maintained at all time, unless otherwise agreed (in writing) with the property owner.

As requested by WaterNSW, the turn path for service vehicles has been designed to accommodate the vehicle sizes specified.

As with all aspects of construction near the pipeline corridor, fencing requirements would be developed in close consultation with WaterNSW during the remainder of the design and during construction of the project.

3.6.4 Noise and vibration

Issue description

WaterNSW notes the proposal includes adding an extra 1.5 metres of fill to form the road above the Warragamba Pipelines. The acceptability of this method - as opposed to installing an 'at-grade' bridge - should be verified with geotechnical sampling, and reviewed by WaterNSW's engineers.

Section 7.2.3 of the EIS (Vol.1; p.234) discusses vibration criteria, including for structural damage, and the German DIN Standard 4150-3 is proposed only for use where heritage structures are impacted. It should be noted the Pipelines are concrete lined and the potential for vibration from construction to impact the lining should not be underestimated. A precondition survey, including of the drainage works beside the pipeline stockpile site on the eastern side of the corridor, and vibration monitoring during construction is considered necessary, with the German Standard being applied. Mitigation measures should be incorporated in the CNVMP, with the use of rock-breaking machinery excluded in close proximity to the Pipelines.

Response

Further discussions with WaterNSW to justify the current proposal would be undertaken once geotechnical information is available.

Table 7-33 of the EIS provides the safe working distances for vibration intensive plant to be adopted during construction of the project, including distances required to prevent cosmetic damage (eg surface cracks) to conventional buildings in close proximity to the works. Where structures are more sensitive such as heritage items, the EIS states that more stringent conditions would be applicable and should be considered individually in accordance with the German Standard DIN 4150: Part 3-1999. This would be the case for the heritage listed WaterNSW pipelines in the vicinity of the proposed construction works.

This would be assessed and appropriate management measures incorporated into the CNVMP to be developed for the project once the final construction methodology is confirmed. The construction methodology would be developed in consultation with WaterNSW following the completion of geotechnical investigations and a pre-condition survey of the pipelines. The CNVMP would identify the safe working (buffer) distances for any vibration-intensive processes (eg rockbreaking or vibratory rolling) specifically proposed by the construction contractor. Where required, the CNVMP would investigate the use of alternative processes (eg ripping instead of rockbreaking) should it identify potential unacceptable vibration impacts to the pipeline from conventional work methods.

Additionally, where required, vibration monitoring would be carried out at the commencement of vibration-generating activities near the WaterNSW pipeline to confirm that vibration levels are within the acceptable range to prevent damage to the pipeline. These measures would be included into the CNVMP as required. This requirement has been incorporated into the revised environmental management measures for the project (refer to Chapter 6).

3.6.5 Property acquisition and temporary leases

Issue description

In Section 5.2.14 (Vol.1; Table 5-9) it is noted that the RMS proposes to acquire parts of lots currently owned and managed by WaterNSW as part of the Warragamba Pipelines corridor:

- land parcel 70 (RMS ID) is known as Lot A DP 341893
- land parcel 71 Lot A DP 341629 is incorrectly identified as Crown Land (road reserve). This lot is under the ownership of WaterNSW, and should be identified as such
- WaterNSW lots subject to acquisition and temporary leases have not been identified in Tables 5-9 or 5-10, but include Lot 1 DP 226972 and others according to previous correspondence between RMS and WaterNSW
- the Project Area on various figures (eg Figure 7-1 p.195 EIS Vol.1) identifies further WaterNSW lots will be impacted (Lot A DP 347475 and/ or Lot A DP 359606), however these lots are not listed in the EIS for either acquisition or lease.
- proposed lease areas must not interfere with WaterNSW access to and operation of the pipeline stockpile compound located on Lot 1 DP 226972.

WaterNSW's preference is for the acquisition to occur post-construction to allow accurate survey and acquisition to the new boundaries, with an access, works and services lease in place during the construction period to protect WaterNSW's interests.

Response

Table 5-9 of the EIS has been updated to reflect revised property acquisition requirements in response to design refinements for the project (refer to Table 4-1 in Chapter 4). The errors identified by WaterNSW have been corrected in the updated table with Lot A DP 341629 (RMS ID 71) identified as being under WaterNSW ownership. Additionally, Lot 1 DP226972 (RMS ID 72) under WaterNSW ownership would also be subject to partial acquisition.

Temporary leases for construction access and to facilitate construction works around the pipelines would be negotiated with WaterNSW. It is noted that the proposed areas for lease within

WaterNSW land has been reduced through the design refinement process (refer to details of the revised construction footprint in Chapter 4).

In summary, land currently owned and managed by WaterNSW would be subject to the following:

- Lot A DP341893 (RMS ID 70) – partial acquisition
- Lot A DP341629 (RMS ID 71) – partial acquisition and lease
- Lot 1 DP226972 (RMS ID 72) – partial acquisition, lease and easement.

Access to these lands would be carried out in accordance with the requirements of a site access schedule to be developed with each construction contractor and in consultation with affected land holders, including WaterNSW. In accordance with the EIS, access to properties would be maintained during construction wherever possible. Any alternative and/or temporary access arrangements would be agreed with WaterNSW prior to works commencing.

Post completion surveys would be carried out for all lease areas and any residual land identified would be transferred back to WaterNSW.

Property Acquisition for the project will be conducted in accordance with the provisions of the NSW *Land Acquisition (Just Terms Compensation) Act 1991*. Roads and Maritime would negotiate acquisition of land prior to the commencement of construction to allow for greater project certainty in advance of procuring construction contractors.

3.6.6 Hydrology and flooding – Stormwater

Issue description

Table 5.1 of Appendix K notes the potential project related impacts include an increase in the rate and volume of runoff discharging to the open trenches of the Warragamba Pipelines, which could increase the likelihood of bank instability and also cause added wetting of the ground around the concrete support plinths.

WaterNSW requires that there is no increase in stormwater flows into the Pipelines corridor over the pre-development state. While it is WaterNSW's preference that any additional runoff or increase in peak flow hydrographs (for any storm) due to the increase in impervious area due to road widening be drained away from the WaterNSW corridor, WaterNSW supports the proposal for the provision of a new pipes trunk drainage line conveying the runoff to discharge to drainage line BLC DL06 via an armoured spreader on DEOH land, as identified on Figure 6.2 Sheet 2 of Appendix K, and in Vol.1 of the EIS (s5.2.7; Table 5-5; p.107). The headwall is to be located on DEOH land, and not within the WaterNSW boundary.

Additional discharge to rural dams in the area surrounding the project resulting in increased flows into the Pipelines corridor must also be addressed, for example:

- into drainage line BLC DL03 from the works in the vicinity of Gates Road on Lot 23 DP 207317 (Appendix K; Figure 6.2; Sheet 2)
- the diversion of flow from a section of the new six-lane road west along Littlefields Road where it would discharge to an existing dam located on the southern side of the road adjacent to the limit of works, which flows into the Pipeline corridor further west (Appendix K; Figure 6.1; Sheet 1).

The EIS (Vol.1; s8.2.6; Figure 8-7; p.488) identifies that a sediment basin is proposed for near the intersection of Gates Road and The Northern Road. The overflow drainage path for this basin has not been identified. Any spill or overflow from this basin must be directed away from the Warragamba Pipelines corridor to avoid the possibility of sediment laden water entering the corridor.

All areas of WaterNSW land impacted by the proposal should be stabilised and restored after construction is concluded.

Response

Roads and Maritime can confirm that the project would not result in an increase in either the rate or volume of runoff discharging to drainage line BLC DL03 (refer peak flow rates set out in Table C1 in Appendix C of Appendix K of the EIS).

Flood modelling provided in the EIS shows that the project would result in less than a 10 per cent increase in peak flows in drainage line MC DL09 at a location a short distance downstream of the road corridor (refer Peak Flow Location Identifier MC Q09 on Figure 6.1 in Appendix K of the EIS).

The impact of the project on peak flows in Mulgoa Creek where it crosses the pipeline corridor would be negligible given the project would also result in a reduction in peak flows discharging to Mulgoa Creek via several of its tributary arms (for example, drainage lines MC DL01, MC DL02, MC DL03, MC DL04, MC DL05, MC DL06, MC DL07 and MC DL08).

Further discussions with WaterNSW about drainage infrastructure, including the headwall, would be carried out during the detailed design. Infrastructure associated with drainage would not be located on DEOH land due to the environmental sensitivity of the site being an area of natural heritage significance associated with the Commonwealth heritage listed Orchard Hills Cumberland Plain Woodland.

Since exhibition of the EIS, refinements have been made to the proposed road and pavement drainage design and the strategy for construction drainage management. This has resulted in the change to some sediment basin locations. There is no longer a sediment basin proposed near the intersection of Gates Road and The Northern Road.

All areas subject to disturbance would be stabilised and restored to its pre-works condition or similar in consultation with landowners. This is reflected in the mitigation measures committed to in the EIS including SWC-6 (soil and water), SE-2 (socio-economic) and AQ-3 (air quality), as well as the sustainability objectives for the project as outlined in Chapter 10 of the EIS.

3.6.7 Hazard and risk

Issue description

WaterNSW requests that all refuelling, oil changes and vehicle wash-downs are conducted within the construction compounds and appropriate mitigation measures are adopted to prevent spills and leaks at all other operational locations.

A tested emergency response plan must be in place in the event of damage/breakage of the Pipeline during bulk earthworks and road construction works.

WaterNSW requires notification of any incident such as a vehicle accident, discovery of any heritage items, spill or fire that affects or could affect the Warragamba Pipelines including the corridor. Any such incident should be reported to Water NSW on the Incident Notification Number 1800 061 069 (24-hour service) as a matter of urgency.

Response

Chapter 8.7 of the EIS (Resources and Waste Management) and Chapter 8.9 of the EIS (Hazard and Risk) both assess the potential for accidental spill and leaks associated with construction and operation of the project.

The potential for such incidents to occur is considered to be low and the environmental management measures such as those identified in section 8.9.3 would reduce the likelihood of impact to the environment, construction personnel and the public.

The EIS mitigation measures have been developed with the aim of minimising or mitigating, as far as practical, hazards and risks associated with construction and operation of the project. Hazard and risk management planning would be incorporated throughout the CEMP, which may include items such as:

- Details of the hazards and risks associated with construction activities

- Risk management measures, including those identified in Chapters 7 and 8 of this EIS
- Procedures to comply with all legislative and industry standard requirements
- Contingency and emergency response plans, as required
- Site-specific Work, Health and Safety plans and activity specific Safe Work Method Statements
- Training for all personnel (including subcontractors) in site inductions, including the recognition and awareness of site hazards and the locations of relevant equipment to protect themselves and manage any spills.

As requested, Roads and Maritime would also notify WaterNSW of any incident such as a vehicle accident, discovery of any heritage items, spill or fire that affects or could affect the Warragamba Pipelines including the corridor.

3.7 NSW Department of Planning and Environment, Division of Resources and Geoscience (GSNSW)

3.7.1 General support for the project

Issue description

The New South Wales Department of Planning & Environment, Division of Resources and Geoscience, Geological Survey of New South Wales (GSNSW) has reviewed the subject area in conjunction with advice previously supplied relating to the Draft EIS (our ref: OUT16/47611). GSNSW has no further comments at this stage. The proposal is unlikely to restrict exploration activities in the vicinity of the Northern Road Upgrade.

Response

Roads and Maritime acknowledges the support for the project by NSW Department of Planning and Environment's (GSNSW).

3.8 Liverpool City Council

3.8.1 General support for the project

Issue description

Council supports the project and delivery plan as part of the Western Sydney Airport ground transport improvement works.

Response

Roads and Maritime acknowledges the support for the project by Liverpool City Council.

3.8.2 Traffic and transport

Issue description

Council appreciates that the project includes two traffic lanes and a bus lane in each direction.

It is noted that traffic assessment has been undertaken for 2031 traffic conditions. Stage 1 of the Western Sydney Airport is scheduled for completion by 2030, with further stages to follow. As The Northern Road is a significant north-south road corridor adjacent to the airport, it is important to ensure that the project is designed to cater for long-term growth.

The traffic assessment should cater for 20-30-year growth to ensure that adequate road reservation is identified at major intersection points as part of the project. To this end, it is

suggested that Transport for New South Wales (TfNSW) Land Use Forecasts for 2051 are used for additional traffic modelling.

Council also notes that the section of the project in the Liverpool LGA includes two proposed signalised intersections with an access road to the Western Sydney Airport, and a realigned Elizabeth Drive. The intersection layouts are based on forecast 2031 traffic conditions.

To accommodate future traffic conditions, Council suggests that provision (ie road reservation) should be made for full or partial grade separation at these intersections. In addition, the intersection with the proposed M12 Motorway should be considered as a grade separate intersection.

Response

Assessment of intersection capacity and performance has been carried out for traffic forecasts up to and including 2041 and include assumptions relating to the likely traffic generation of the Western Sydney Airport at this time. Intersections within the proposal have been designed with sufficient capacity to perform satisfactorily under 2041 forecast peak period traffic volumes. We note that for operational modelling and road design, forecasting of traffic flows further than 20 years is generally not reliable.

The grade separation of the intersections of The Northern Road with Elizabeth Drive and the southern access to Western Sydney Airport site is not warranted under the forecast 2041 traffic volumes. Forecast traffic volumes for M12 show that the interchange with M12 and The Northern Road would operate satisfactorily as a standard single-point signalised interchange.

Issue description

The Northern Road is a significant north-south freight route and the Airport will be expected to generate significant freight movements. Therefore, consideration should be given to the provision of heavy vehicle facilities including parking bays.

Response

The Transport Planning Branch in Transport for NSW and the Roads and Maritime Freight Branch administer the freight policy for NSW which includes identifying areas for the provision of heavy vehicle rest areas, de-coupling facilities and parking areas. The Northern Road corridor, being primarily metropolitan in nature is not currently a priority under the freight policy.

The Northern Road Upgrade has no provision in the design for a heavy vehicle inspection area, de-coupling facility or parking area for northbound traffic. However, between Littlefields Road, Luddenham and Glenmore Parkway, Glenmore Park, the project does include a southbound heavy vehicle inspection bay.

Issue description

Council suggests that for uniformity, the project should include appropriate bus shelters with real time bus service information along its entire length.

Response

The predominant land use along the project corridor is rural residential as opposed to the highly urbanised environments referred to by Council where bus shelters have previously been provided. Roads and Maritime has formed the view that the existing passenger demand in the short-term does not warrant the implementation of bus shelters.

Issue description

Council notes that the project currently includes a shared path along the western side and a provision of a footpath along the eastern side of the road. The Northern Road is a major north-south regional bicycle route, and it is suggested that in addition to the shared path on the western side, a shared path should be provided along the eastern side.

Response

The current shared path provision is consistent with the shared path being provided along the rest of The Northern Road (north of Bradley Street) which is being provided on the western side.

Given the location of existing development adjacent to The Northern Road (primarily on the western side), lack of development opportunities on the eastern side, due to DEOH and Western Sydney Airport and the provision of pedestrian crossings at all signalised intersections along the proposal, the provision of a shared path on both side of The Northern Road is not warranted.

Issue description

Council requests that where local roads will be affected during construction, Council and local communities are to be appropriately informed. Appropriate road occupancy permits are to be obtained prior to commencement of construction works. Copies of construction traffic management plans and associated traffic control plans during different construction stages are to be submitted to Council.

Response

The EIS mitigation measures identified in Table 7.14 of the EIS have been developed with the aim of effectively minimising or mitigating, as far as practical, traffic and transport impacts from construction of the project. Specific outcomes that would be achieved through the implementation of effective environmental management measures include:

- Carry out works in accordance with the relevant Traffic Management Plans and associated traffic control plans
- Ensure safe and continuous traffic movement for construction workers and the general public
- Maintain the capacity of existing roads where possible during construction in order to minimise road user delays
- Maintain continuity of access to local roads and properties
- Appropriate consultation with impacted residents and businesses and stakeholders
- Compliance with the relevant legislative requirements and project conditions of approval.
- Roads and Maritime would consult with Council and local communities where local roads will be affected during construction.

Appropriate road occupancy permits would be obtained prior to commencement of construction works. Copies of construction traffic management plans and associated traffic control plans would be provided to Council for the various construction stages.

Issue description

It is noted that a number of major construction works, including the following, will occur at the same time within the local region and result in increased construction vehicles:

- The Northern Road upgrade between Glenmore Parkway and Jamison Road;
- Earth work on the Western Sydney Airport site; and
- Bringelly Road upgrade (Stage 1 and 2).

Due to the increase in volume of construction vehicles along Elizabeth Drive, it is suggested that interim treatments such as traffic control signals be provided at the following intersections:

- Elizabeth Drive/Western Road intersection
- Elizabeth Drive/Devonshire Rd intersection

Council also suggests that the existing applicable 80 km/hr speed limit along Elizabeth Drive, near Western Road, is to be relocated further west of the Kemps Creek Village.

Response

Section 7.1.3 of the EIS provides an assessment of potential construction traffic generation impacts associated with the project. Based on arrivals to and departures from site at peak periods each working day, traffic generation would likely be in the order of 230 additional light vehicle movements per day (115 in the morning and 115 in the afternoon).

The majority of this traffic would likely travel along The Northern Road from the north, with a small proportion travelling along Elizabeth Drive from the east. This volume of traffic would be well within the capacity that these roads have been designed for and within the daily fluctuation of observed traffic volumes along The Northern Road and Elizabeth Drive. As such, the installation of traffic signals at the stated locations along Elizabeth Drive are not required. This additional construction traffic, combined with general impacts to traffic related to construction activities would likely to impact traffic operation and require a range of traffic management activities including:

- Reduced speed limits at traffic switches
- Reduced speed limits and active traffic control would be required wherever construction activities would be taking place near live traffic.

Potential cumulative traffic impacts may occur as a result of construction works occurring at the same time in relation to the different stages of the project or other nearby projects.

Cumulative construction traffic impacts would be managed through the implementation of suitable mitigation measures (refer to Chapter 6). This includes the requirement for staging plans to be prepared in consultation with adjoining contractors and for each stage of the project (management measure T-2). Additionally, construction traffic management plans for this project would be developed in consultation with plans for other projects to assist in spreading the traffic load over the network and to minimise construction traffic being concentrated on any one particular route (management measure CI-3).

The TMP, to be developed with other concurrent projects, would identify interim traffic controls, including appropriate speed limits, required on Elizabeth Drive, and would be developed in consultation with Council.

Issue description

The proposed bridge across Adams Road is to include appropriate provision for future four lane road widening and safety barriers.

Response

Design of the Adams Road Bridge includes appropriate provision for future four lane road widening and safety barriers.

Issue description

The bypass may change the road classification and maintenance responsibilities of the road section through the Luddenham Village. In this regard, Council requests that the RMS and Council enter into a Memorandum of Understanding on future road classification, maintenance responsibilities, and financial implications on the road section through the Luddenham Village.

Response

At the end of construction, a completion survey will be undertaken by Roads and Maritime and a dedicated gazettal plan will be developed along with public road classification. At this time, Roads and Maritime would also discuss future maintenance responsibilities with Council.

Issue description

Council has been making representations for a rail link to be provided to the airport and considers that while the project includes bus lanes, the ground transport plan should include an extension of the South West Link from Leppington to the Airport.

Response

While Council's support for an extension of the South West Link from Leppington to the Western Sydney Airport is acknowledged it is beyond the scope of this project and no further consideration to this issue is provided.

Issue description

The Northern Road links Camden, Liverpool and Penrith LGA's. The three Councils have various forms of entry statements to their respective LGA's. It is requested that gateway treatment is to be provided in consultation with the relevant Councils. Appropriate location and road spaces should also be identified in consultation with the relevant Councils.

Response

The provision of gateway signage is beyond the project scope. Roads and Maritime would work with Council to identify suitable locations for Council gateway signage or other features.

3.8.3 Noise and vibration

Issue description

The project is to ensure that existing properties that would be exposed to increased traffic noise are assessed and if required, attenuation measures are implemented.

Response

The EIS and associated noise and vibration technical working paper (Appendix H of the EIS) included a detailed, qualitative assessment of the project's potential operational traffic noise impacts to existing properties. The assessment identified 77 receivers that qualify for consideration of noise mitigation, which is proposed in the form of at-property acoustic treatments.

It is noted that due to a number of design refinements including changes to the vertical alignment at some locations, a technical assessment of revised noise predictions has been carried out to identify further properties that qualify for the consideration of mitigation based on the design refinements as summarised in Table 4-1. This assessment identified one additional property for consideration of mitigation. Roads and Maritime carried out additional consultation with this property owner in December 2017 to inform them of the outcomes of the assessment. All properties identified in the EIS as being eligible for the consideration of at-property treatment remain unchanged, with the predictions to be verified and associated mitigation to be confirmed post-construction.

Issue description

It is noted that night-time construction activities would be supported by out-of-hours operation. Noise mitigation measures should be provided in accordance with EPA requirement.

Response

Refer to response in section 2.6 of this report.

3.8.4 Socio-economic and land use

Issue description

Handover of the existing road section through Luddenham Town Centre.

Council notes that as part of the project, The Northern Road is being realigned to bypass Luddenham Town Centre. Council agrees with this arrangement as it will preserve the residential

amenity of the Luddenham Town Centre; however, the bypass could have significant impacts on the existing businesses in the town centre that rely upon passing traffic.

Council requests that funding be provided for appropriate signage and consultation with the business in the town centre to ensure the impact of the bypass can be minimised and for the centre to attract some passing trade.

Response

Management measures that would be put in place to minimise the impact of the bypass of Luddenham Town Centre and attract passing trade include:

- Appropriate road signage will be provided in accordance with the *Roads and Maritime Services Guidelines Tourist Signposting* (2012) to provide guidance to passing patrons on access to shops and services, including within Luddenham Town Centre
- Roads and Maritime, in consultation with Council will provide monetary support for preparation of plans to revitalise Luddenham town Centre for the purpose of encouraging motorists to continue to pass through or visit the town.

Issue description

Council appreciates that this project could generate significant employment opportunities for local residents during construction and requests that local businesses be given the opportunity to tender for works and be part of this major project.

Council suggests that procurement workshop(s) be held inviting local businesses and interested contractors to attend. The ICN Gateway, or similar a platform, could also be a useful tool to engage with local business to ensure local content and opportunity is maximised on the project. In addition, consideration should be given to apprentices from the local TAFE colleges.

Response

Roads and Maritime proposes to hold an industry event for the project in the last quarter of 2017.

Procurement for the staged delivery of the project would be via competitive tender processes.

Engagement of any local apprentices, suppliers and sub-contractors would be at the discretion of the successful construction contractor. As part of the tender process, the contractor would also be required to prepare a Small to Medium Enterprise (SME) Participation Plan in line with the NSW Government SME Policy Framework to show how their tender will support local industry, including jobs, skills and capability development.

3.8.5 Hydrology and flooding

Issue description

The project includes crossings at Badgerys Creek, Cosgrove Creek and Duncans Creek, and a number of minor drainage systems.

Mainstream and Overland Flooding - The proposed road upgrade works will involve filling a number of existing farm dams, removal of earth dams and upgrade of spillways of existing dams.

Council notes that the road works may increase the frequency and/or depth of overtopping the earth embankment and result in an increase in both the rate and volume of runoff discharging to a number of receiving waterways.

The project is expected to increase peak flows with associated increase in scouring. Impacts and comments on the three creeks to be impacted are as follows:

- Cosgrove Creek - Peak flows at the project boundary will increase by up to 100%. While a number of flood mitigation measures have been proposed, there would be residual impacts including an increase in peak flood levels by up to 300mm.

- Duncans Creek - Peak flows will increase by more than 100%. While mitigation works have been proposed, there will also be residual impacts of flooding and flood levels by up to 50mm. Upstream of Duncans Creek, the project would result in an increase of flood levels up to 500mm in a 100-year flood event.
- Badgerys Creek - Two (2) existing properties located upstream of Badgerys Creek crossing would be adversely affected by flooding.

Response

Roads and Maritime considers that the impact of the project on flooding and drainage patterns in presently undeveloped pastoral land would be within acceptable limits. These minor impacts would be accounted for as the area is developed over time and further drainage infrastructure is implemented.

The flooding and drainage strategy that has been developed for the project is aimed at preventing adverse flooding conditions from being experienced in existing development that is located on both the upstream and downstream sides of the road corridor for events with annual exceedance probabilities (AEP"s) up to 1 per cent.

The strategy allows for minor impacts in presently undeveloped pastoral land during storms with AEP up to 1 per cent in preference to providing a large number of detention basins along the project which would have impacts to biodiversity and property acquisition.

Roads and Maritime has lowered the vertical alignment of the road to mitigate the impact the project would otherwise have on flooding behaviour in the vicinity of the existing dwellings upstream of Badgerys Creek.

Further consultation has been carried out with Liverpool City Council to discuss modelling work and assessment carried out since exhibition of the EIS.

Issue description

It is noted that flood modelling has been undertaken for 2, 10, 100-year Average Recurrence Intervals (ARI) and the Probable Maximum Flood (PMF) events. Council considers that additional flood modelling shall be undertaken for 20-year event and a flood impact assessment shall be undertaken for all the design events.

Response

Roads and Maritime considers that the assessment of storms with ARI"s of 2, 10 and 100 years, as well as the PMF provides a sufficient level of understanding of the impact the project would have on flooding and drainage patterns over the full range of potential storm events.

Further consultation has been carried out with Liverpool Council to discuss modelling work and assessment carried out since exhibition of the EIS.

Issue description

The project involves significant catchment modification, which will adversely impact on flooding, drainage and environmental health of the waterways. The project would significantly increase impervious areas, resulting in increased peak flows and volume of runoff from the road surface.

Council requests that any potential flooding, drainage and environmental health impacts should be assessed and addressed to ensure that the pre-road construction flooding regime is maintained or improved.

Flood impact assessment for all the design flood events including the 1% AEP and the PMF shall be submitted for Council"s review and endorsement. The flood maps should include the following:

- Flood level contours and depths;
- Velocity vectors for both pre and post development conditions;
- Flood depth difference; and

- Velocity difference maps.
- The flood maps shall ensure that no private property is adversely affected by flooding due to proposed road works.

Appropriate and adequate flood mitigation works including detention basins shall be incorporated to ensure flood levels, peak flows and velocities across the catchment area are controlled to existing conditions or improved.

Response

The flooding and drainage strategy that has been developed for the project is aimed at preventing adverse flooding conditions from being experienced in existing development that is located on both the upstream and downstream sides of the road corridor for events with AEP's up to 1 per cent.

The strategy allows for minor impacts in presently undeveloped pastoral land during storms with AEP up to 1 per cent in preference to providing a large number of detention basins along the road corridor. Roads and Maritime considers that the impact the project will have on flooding and drainage patterns in presently undeveloped pastoral land would be within acceptable limits, noting that most of the land which lies adjacent to the road corridor will undergo development in coming years, when the minor impacts of the project can be taken into account.

The approval process for the project is under Part 5.1 of the EP&A Act is illustrated in Figure 1-3. The project has been declared State significant infrastructure under the *State Environmental Planning Policy (State and Regional Development) 2011*. As such, the project is permissible without consent. The flood impact assessment provided in the EIS and this report will be determined by the Secretary of the Department of Environment and Planning. While Roads and Maritime will consult with and seek input from Council throughout all stages of the project there is no legislative requirement to have flooding assessments formally endorsed by Council.

3.8.6 Soils, water and contamination

Issue description

The proposed road upgrade would generate substantial amounts of solid and liquid pollutants. If appropriate mitigation measures are not implemented, it would significantly impact on water quality of the adjoining waterways.

It is noted that 50 temporary sediment basins will be constructed to control water quality during the construction phase. A number of roadside swales will also be constructed at locations where sensitive receiving waterways have been identified, to control water quality to an acceptable level during operation.

Council has met with RMS representatives and discussed the need for the following additional assessments:

- A detailed water quality modelling using MUSIC model should be undertaken to assess impact of the proposed road upgrade and to determine provision of water quality treatments, including gross pollutant traps (GPT), bio-swales and bio-retention basin. The design of water quality treatment should be designed to ensure pollution reduction targets are achieved in accordance with Liverpool City Council's Development Control Plan.
- Comprehensive on-site stormwater treatment facilities should be designed and constructed to ensure all gross pollutants, nutrients and liquid contaminants (including spill of fuels, oils, lubricants) are captured and removed from the stormwater runoff before entering into the natural waterways.
- A fail-safe emergency water quality management system shall be in place at all times.
- The maintenance of GPTs should be the responsibility of RMS.

Response

Roads and Maritime has held a technical workshop with Council representatives (19th September, 2017) to discuss the above stormwater and drainage issues raised by Council.

The soils, water and contamination technical working paper (Appendix L of the EIS) incorporated the results of the MUSIC model developed for the project. This provided an estimate of the annual average pollutant load reductions achieved through the proposed water quality treatment controls. These controls consisted of a number of vegetated swales proposed upstream of sensitive receiving waterways as a priority, with additional swales provided elsewhere, where possible.

During the design process, refinements were made to the proposed road and pavement drainage design. The amended design proposes 23 operational water quality swales (a reduction from the 24 proposed in the EIS).

Pollutant removal is facilitated by the interaction between the flow and the vegetation along the length of the swale. Rock check dams have also been proposed to provide additional treatment by slowing down the runoff and allowing it to temporarily pond during storm events. The location and size of each swale has been optimised to maximise filtering out of suspended materials and pollutants, including those proposed upstream of identified sensitive receiving waterways (i.e. Key Fish Habitat). GPTs and water quality basins have been considered as part of the water quality treatment type selection process.

Since the generation of gross pollutant loads from the upgraded road would be significantly lower than those generated from an urbanised catchment of residential or commercial land use, it was decided that any gross pollutants from the upgraded road would be removed at the swales as part of a road maintenance program.

Space constraints along a narrow road corridor was the main reason for not adopting specific water quality basins. These constraints included private and commonwealth properties, utilities, topographical constraints and clearing of trees and valuable vegetation.

The details of the revised water quality control strategy for the project is provided in section 5.2.2 of this report.

Additionally, revised MUSIC Modelling has been carried out for the project based on the refined design. The result of the MUSIC modelling for the refined design, including a comparative assessment against the results of the EIS model, are also provided in section 5.2.2 and indicates that pollutant load reductions can be achieved as follows:

- Total suspended solids (ranged from 31 per cent to 93 per cent)
- Total phosphorous ranged from (17.2 per cent to 75 per cent)
- Total nitrogen (range from 5.3 per cent to 49 per cent).

The results of the MUSIC modelling, which are measured in annual pollutant load reductions, indicate that the refined road and pavement drainage would generally result in an improvement in water quality compared to that which was previously achieved (and assessed within the EIS).

The Water Management Policy of Liverpool City Council (section 4.1j) refers to pollutant load reductions for suspended solids, total phosphorus and total nitrogen. General policy pollutant load reductions are not available in the latest Council General Development Control Plans (DCP), however a previous *DCP 2008, Part 1, General Controls for all Development* (section 6.4) indicates that post development water quality shall be reduced by 45 per cent for Total Phosphorus and Total Nitrogen and by 80 per cent for Total Suspended Solids.

Due to the limited space available along the road corridor to provide additional water quality controls, these targets were not always achieved.

Additionally, the option to include at least one dry biofiltration basin, as well as a limited number of traditional wet permanent basins is also being considered.

As above, a comprehensive suite of on-site stormwater treatment controls is proposed as part of the refined design. There are still no gross pollutant traps or spill containment basins being proposed, however the gross pollutant loads generated from the road catchment are considered small and less than those generated from an urban catchment. The improvement of the road geometry for both horizontal and vertical alignments means that the current risk of accidental spills is likely to have been reduced and therefore the risk of accidental spills has not increased when compared to existing conditions.

The current arrangement of proposed water quality controls has been coordinated between the design teams and Roads and Maritime. Any recommended changes or additions requested by Council that can be justified can be considered in coordination with Roads and Maritime.

3.8.7 Aboriginal heritage

Issue description

Council notes that the project would have the following heritage impacts and appropriate treatments are to be implemented:

Aboriginal Cultural Heritage - Reports and photo archival has been undertaken for an Aboriginal Heritage Impact Permit (AHIP) and associated excavation salvage. Council requests a copy of this report for its records.

Response

As identified in section 2.2.1 of the EIS, no AHIP is required for any project approved under Part 5.1 of the EP&A Act, which applies to this project. Table 8.23 of the EIS outlines environmental management measures that have been developed to specifically manage potential impacts which have been predicted as a result of the project. Further detail regarding the management outcomes to be implemented in accordance with the management procedures for the project is provided in the EIS Appendix M - Aboriginal Cultural Heritage Assessment Report – including archaeological salvage excavation.

Council would be provided copies of heritage reports and photo archival results. Release of sensitive information would be carried out in accordance with the wishes of Aboriginal stakeholders. This requirement has been incorporated into the revised environmental management measure for the project (refer to Chapter 6).

3.8.8 Non-Aboriginal heritage

Issue description

Non-Indigenous Heritage Assessment

Council is concerned that the report may not have addressed all the requirements of the NSW Heritage Division Guidelines, in particular, the assessment conditions and options analysis. In addition, the project will affect the following four sites:

Lawson's Inn site - This site is identified as a heritage site under the Liverpool Local Environmental Plan (LLEP) 2008. The project would impact on the curtilage and not affect the archaeology. Council considers that the artefacts should remain in-situ with the proposal designed around it.

Miss Lawson's Guesthouse - This site is not listed as a heritage item under the Liverpool Local Environmental Plan 2008. Council requests that prior to demolition, further detailed investigations should be undertaken to determine the extent of the remains.

Lot 502 DP 580982 and Lot A, DP 160890 - The Environmental Impact Statement does not provide an appropriate assessment of these heritage sites nor substantive evidence that the archaeological relics cannot be preserved. Council requests that all buildings, objects or items to be removed or demolished are to be photographically archived in accordance with NSW Heritage Division guidelines and copies provided to Council.

Response

Chapter 4 of the EIS outlines the process that was undertaken in the selection of the preferred project route assessed in the EIS, and the alternatives considered. This included consideration of impacts to non-Aboriginal heritage items and place. The merits of the project were considered in the context of other alternatives and a detailed route options development process was carried out early in project planning to avoid or minimise potential environmental impacts from the project where possible. The preferred option outlined in this EIS was deemed to be in the public interest as it would provide the best outcome of supporting the Western Sydney Airport and catering for the growth in travel demand as a result of the planned land use changes in the region.

Additional assessment since exhibition of the EIS has been carried out as documented in the non-Aboriginal heritage technical memorandum prepared as part of this assessment (refer to Appendix D). The memorandum has been prepared in response to community and agency submissions received during exhibition. A summary of the findings is presented in the response in section 2.11.1.

It is noted that Item 10: Lawson's Inn site is currently listed on the Liverpool LEP but as identified in the EIS and subsequent assessment presented in Appendix D of this report, previous heritage assessments (Artefact Heritage 2015; Australian Museum Consulting 2014) have determined the location of the listing on the LEP (Lots 1 & 2 DP851626) is not the actual location of the Lawson's Inn site. A search of the NSW Deeds Registration Branch by RD Williamson (Legal Searcher), on behalf of Jacobs, in July 2016 revealed details of the land titles information, up to Primary Application No. 56452 for Lot 2 DP623457, the land on which the Lawson's Inn site is situated. Lot 2 DP623457 has been identified as the correct location of Lawson's Inn, and is situated on the opposite side of The Northern Road, to the north of the LEP listed location. The correct location was assessed in the EIS and the additional assessment in Appendix D of this report.

The non-Aboriginal heritage technical memorandum in Appendix D includes a copy of and incorporates the findings of a research design and excavation methodology which has been prepared for each of the following sites:

- Item 2: Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (in relation to Chaffey Brothers Irrigation Scheme Canal)
- Item 9: Miss Lawson's Guesthouse site
- Item 10: Lawson's Inn site.

It is noted that further historical research has identified that Item 10: Lawson's Inn site is located outside of the project boundary, noting that design refinements associated with changes to batters at the tie in point to Eaton Road has resulted in avoiding areas of high archaeological potential, and therefore impact to any remnants of the Inn building are not expected. An excavation methodology has been prepared for areas around the Inn site within the project boundary that may potentially contain relics and artefacts associated with the Inn site. If during testing archaeological resources are identified within these areas of low archaeological potential to be impacted by the project, then the design would be reviewed and where reasonable and feasible adjusted to avoid where possible or minimise these impacts.

The research design and methodology for each item listed above includes the proposed management of artefacts if identified. In general, artefacts recovered from the site would be managed by a dedicated artefact manager and in accordance with the process outlined below:

- All artefacts that are retained will be catalogued by using a system that identifies and allows easy retrieval of the item
- The specialists' cataloguers will produce reports on the artefacts outlining issues of importance
- Important artefacts will be assessed for materials conservation treatment which would include the gluing of pottery or the conservation of important metal or leather materials

- Artefacts which are the subject of materials conservation may be used in artefact displays in interpretation of the stations.

The subsequent excavation report to be developed would contain an analysis of artefacts and their deposits and contexts in the final report.

Artefacts would be categorised into three groups; special finds, reference collection and discard collection. This latter category would be used for those materials whose archaeological research potential has been realised and retention is no longer required. The final repository for special finds and reference collection would be determined in consultation with Roads and Maritime and may include donation to a local museum.

In relation to the canal as part of Item 2, an archival photographic recording would be made of the extent of the canal to be impacted by the works, in accordance with the Heritage Division of the OEH guidelines (Heritage Council of NSW 2006) prior to its excavation. Photographic records of archaeological deposits at Item 9 Miss Lawson's Guesthouse and Item 10 Lawson's Inn would also be recorded in excavation reports in accordance with the Heritage Division of the OEH guidelines (Heritage Council of NSW 2006).

No other identified in tact heritage buildings, objects or items are proposed to be demolished by the project, therefore photographic archival recording is not proposed in relation to any other heritage item.

3.8.9 Urban design and visual impact

Issue description

RMS should develop a landscaping plan for road verge areas in consultation with Council. Council will provide a list of approved plant species and plant density for road verge areas. For the appropriate of maintenance of verge area, the gradient of the verge shall not exceed 1:4.

Response

An urban design and landscaping plan would be prepared for each section of the project design to incorporate the urban design strategy and concept plan outlined in Appendix O of the EIS. This would include urban design treatments to reduce visual impacts during operation of the project. In general, the plan would include:

- Location and identification of existing vegetation and proposed landscaped areas, including species to be used
- Built elements including retaining walls and Adams Road Bridge
- Design treatments for stormwater quality measures and infrastructure
- Pedestrian and cyclist elements including footpath location, paving types and pedestrian crossings
- Fixtures such as seating, lighting, fencing and signs
- Details of the staging of landscape works taking account of related environmental controls such as erosion and sedimentation controls and drainage
- Procedures for monitoring and maintaining landscaped or rehabilitated areas.

Additionally, construction management measures are proposed to reduce visual and landscape character impacts during construction of the project as a result of general construction activities, ancillary facilities and vegetation loss.

Cutting and batter slopes have generally been designed to be 1 in 4 slope. During detailed design, some batters may be locally steepened to 1 in 2 at pinch points (or be replaced by retaining walls) or as steep as 1 in 1.5 at the bridge spill-through abutments.

Development of the landscaping plan would include consultation with Council regarding its maintenance requirements.

3.9 TransGrid

3.9.1 Utilities

Issue description

Thank you for the opportunity for TransGrid to provide its comment in relation to the exhibition of the EIS for the abovementioned road upgrade.

You would be aware that TransGrid operates the NSW high voltage electricity transmission system. In this regard, TransGrid has both owned land and high voltage transmission lines that are affected by The Northern Road upgrade between Bringelly and Glenmore Park. TransGrid's assets are essential to the State's electricity network and the reliability of power supply to the people of Western Sydney and NSW.

TransGrid has a statutory responsibility to maintain electricity supply to the people of NSW and there are associated restrictions and requirements to ensure both the safety of the public and the security of the infrastructure, where development occurs within an easement area or in close proximity to transmission lines.

TransGrid has two high voltage transmission lines as well as owned land affected by the proposed upgrade of The Northern Road, the impact on TransGrid's infrastructure and land is discussed below.

It is noted that The Northern Road upgrade involves a realignment of the road around the future Western Sydney Airport site at Badgerys Creek. TransGrid's single circuit 330 kV #39 Transmission Line crosses The Northern Road in this area. Therefore, TransGrid has been working closely with government, the various utility providers and other stakeholders involved with the development of the future airport in relation to specific impacts for TransGrid's infrastructure.

In this regard it will be necessary for utility and infrastructure providers, such as RMS and TransGrid to liaise closely and ensure an ongoing good working relationship during the planning and construction phases of these works to ensure both public safety and access to essential infrastructure is maintained.

Response

TransGrid's comments regarding the single circuit 330 kV #39 Transmission Line are noted.

As stated in section 5.4.10 of the EIS, the extent of impact to utilities and services could not be confirmed until the detailed design is finalised. A list of utilities that may require relocation is provided in Table 5.14 of the EIS. Since exhibition of the EIS, further identification and design, considering utilities has occurred and this includes the #39 Transmission Line.

Strategies to address impacts to utilities are being developed in close consultation with all utility providers during the remainder of the design and this will continue during construction of the project. Strategies may include protection or relocation of the utility, or adjustments to the project design to avoid any impacts.

Issue description

In addition to TransGrid's #39 Transmission Line mentioned above; approximately 300m south of Glenmore Parkway TransGrid's double circuit 330 kV 32/38 Transmission Line crosses The Northern Road. This is an essential high voltage supply feeder into Western Sydney.

On the western side of The Northern Road in this area, TransGrid owns land which is almost entirely affected by the easement corridor for the #32/38 transmission line. The subject land, being, Lots 9 and 10 DP 26658 is affected by both a proposed property adjustment and a temporary lease

for the road upgrade. The impact of the transmission line on the land means neither asset can be considered in isolation.

As such TransGrid has concerns in relation to both the property adjustment, and the lease in relation to continued safe access to, and security of the infrastructure.

Response

Consultation with utility and infrastructure providers would be ongoing as part of the project. The necessary approvals would be obtained from TransGrid for all proposed work near TransGrid high voltage infrastructure and the appropriate WorkCover Guidelines for Working in Proximity to High Voltage Transmission Lines implemented for any approved works within the corridor.

Issue description

Essentially any approval that would impact TransGrid land must require the site to be remediated so that soils and water course are stable and do not result in sedimentation issues, or impact safe and stable vehicular access around the base of the transmission line structure. The site must be clean and tidy (all rubbish removed), and any environmental incidents that may occur on site (e.g. oil spills) will be reported to TransGrid's Corporate Environment Manager.

Specifically, in relation to any environmental mitigation measures TransGrid advises that all environmental incidents, and near misses, on TransGrid land must be reported to TransGrid. All pollution incidents that threatens or harms the environment shall be reported immediately to relevant authorities, in accordance with the *Protection of the Environment Operations Act 1997 (POEO Act)*.

Environmental spill kits containing spill response materials suitable for the works being undertaken shall be kept on site at all times and be used in the event of a spill. Any spills shall be contained, cleaned up promptly and immediately reported to TransGrid.

On completion of the work disturbed areas shall be stabilised, and returned as close as possible to original condition.

Response

Chapter 8.7 of the EIS (Resources and Waste Management) and Chapter 8.9 of the EIS (Hazard and Risk) of the EIS both assess the potential for accidental spill and leaks associated with construction and operation of the project.

The potential for such incidents to occur is considered to be low and the environmental management measures such as those identified in section 8.9.3 of the EIS would reduce the likelihood of impact to the environment, construction personnel and the public.

Project-specific environmental management measures have been developed with the aim of minimising or mitigating, as far as practical, hazards and risks associated with construction and operation of the project. Hazard and risk management planning would be incorporated throughout the CEMP, which may include items such as:

- Details of the hazards and risks associated with construction activities
- Risk management measures, including those identified in Chapters 7 and 8 of the EIS
- Procedures to comply with all legislative and industry standard requirements
- Contingency and emergency response plans, as required
- Site-specific Work, Health and Safety plans and activity specific Safe Work Method Statements
- Training for all personnel (including subcontractors) in site inductions, including the recognition and awareness of site hazards and the locations of relevant equipment to protect themselves and manage any spills.

As requested, Roads and Maritime would also notify TransGrid of any incident that affects or could affect TransGrid assets.

The relevant mitigation measures in the EIS, including erosion and sediment controls and incident response and notification procedures would be implemented during construction. In addition, all leased areas would be reinstated in accordance with any conditions of approval.

Issue description

TransGrid's Engineers have assessed the preliminary designs in relation to vertical and horizontal safe clearances to the transmission line, as well as any change to clearance to the distribution lines. It appears that there are no concerns in relation to the vertical clearances, however the transmission structure (#616) is located less than 10 metres from the road reserve where works will take place. This is well within what TransGrid will typically accept as a safe horizontal clearance, and any approval must ensure that work is conducted in accordance with TransGrid requirements, there is safe access to this structure and sufficient room to set up heavy maintenance vehicles.

In this regard TransGrid has been in consultation with RMS throughout the design process and will continue to work with RMS and its designers to obtain a suitable and safe outcome.

Specifically, with regard to TransGrid's access for maintenance works and the carrying out of maintenance activities on its line the following is advised:

- The proposed pavement (type 9) between Ch106.02 and Ch106.03 (drawing SM- 2224) appears to be situated at the location of TransGrid's existing access gate.
- Confirmation is requested if TransGrid's access point (the access gate) is proposed to remain at this location for TransGrid's maintenance vehicles.
- We are concerned that the new pavement route (type 9) is shown as ending in close proximity to the grassed drainage channel and may restrict the manoeuvring of TransGrid's vehicles when accessing the tower.
- Also, the new pavement (type 9) with the raised surface levels and batter extending towards the tower also limits the amount of space left available for the setup of vehicles (required on both sides of the transmission line structure, being a double circuit tower). It is requested that it be considered to move this new pavement (type 9) location further away from the structure.
- It is essential that any access means (such as new pavement) to Structure 616 and the easement, be designed to cater for the weight and size of TransGrid's maintenance vehicles - to withstand the 40-ton load capacity of maintenance trucks.
- With proposed batter works to bound two sides of Structure 616, possible water retention around the structure is of concern and this may become an issue. Tower legs could be subject to corrosion and as a result may require reinforcement and foundation repair works to be undertaken. This would need to be assessed after completion of works.
- It is requested that during construction works, adequate precaution be taken to protect the structure from accidental damage, and the easement area is not to be used for temporary storage of construction spoil, topsoil, gravel or any other construction material.

Response

TransGrid's access requirements are noted. Consultation with TransGrid would be ongoing as part of the project. The necessary approvals would be obtained from TransGrid for all proposed work near TransGrid high voltage infrastructure and the appropriate WorkCover Guidelines for Working in Proximity to High Voltage Transmission Lines implemented for any approved works within the corridor.

Roads and Maritime can confirm that in accordance with the management measures outlined in the EIS, access to properties would be maintained at all time, unless otherwise agreed (in writing) with the property owner.

Issue description

TransGrid is concerned that the proposed acquisition of part of the freehold of this holding will restrict the only safe access for heavy maintenance vehicles (up to 40 tonne) that are required access the land for maintenance of this transmission line.

For this reason, TransGrid has formally objected to RMS in relation to the freehold acquisition of this part of its land (part Lot 9). However, TransGrid is not opposed to the grant of an easement to RMS (provided suitable heavy vehicle access can be maintained) It is understood from previous discussions with RMS that an easement would be sufficient in the specific circumstances related to this parcel of land. TransGrid requests appropriate consideration is given to this issue as TransGrid has as yet had no formal response from RMS addressing these concerns.

Proposed lease:

The proposed RMS lease area poses concerns for TransGrid as it is understood that the area is to be leased to facilitate adjustments to the water course on TransGrid's land and "...new and upgraded drainage infrastructure".

TransGrid has already stated its concerns in relation to stability of land around the structure and the need for heavy maintenance vehicles to gain access around this structure, this issue needs to be satisfactorily addressed in any approval for the project and prior to TransGrid agreeing to any lease of its land impacted by the transmission line.

Response

Roads and Maritime have changed the property acquisition to an easement acquisition on Lot 9 of TransGrid's property. The relevant property acquisition sketches have been updated and provided to TransGrid on 12 September and further consultation with Transgrid occurred on 22 September to discuss the easement. Further consultation between Roads and Maritime Property Services and TransGrid is ongoing.

Transgrid has also provided Roads and Maritime with specifications of the vehicles required to carry out maintenance and the requirements for access to the site. As such, Roads and Maritime have agreed to widen the existing driveway and provide a pad suitable to TransGrid's needs. Access to the site would be left in, left out only.

Roads and Maritime will continue to consult with TransGrid regarding access and maintenance requirements.

Issue description

Also as the land is within a transmission easement corridor there can be no stockpiling of soil or construction materials, and the usual TransGrid restrictions for third party development within easements relates, along with the appropriate WorkCover Guidelines for Working in Proximity to High Voltage Transmission Lines.

Response

There would be no stockpiling of soil or construction materials within the transmission easement corridor, this would be incorporated into the CEMP. This measure has been added to the project environmental management measures outlined in Chapter 6.

The necessary approvals would be obtained from TransGrid for all proposed work near TransGrid high voltage infrastructure and the appropriate WorkCover Guidelines for Working in Proximity to High Voltage Transmission Lines implemented for any approved works within the corridor.

Issue description

There are a number of high voltage transmission lines that traverse this section of The Northern Road upgrade. It is essential that TransGrid's concerns about access to, and the security of, this essential electrical infrastructure be appropriately in any approval.

For all proposed work near TransGrid high voltage infrastructure it is imperative that RMS and any other relevant stakeholders obtain necessary approvals from TransGrid, and liaise closely to ensure public safety is maintained during and post construction.

TransGrid looks forward to working amicably with RMS on The Northern Road upgrade to ensure that the project can be delivered, while maintaining public safety and access for operation and maintenance purposes to TransGrid's infrastructure. This can only be achieved by ensuring TransGrid's concerns and mitigation requirements are considered in relation to all work near its high voltage infrastructure.

Response

Consultation with TransGrid would be ongoing as part of the project. The necessary approvals would be obtained from TransGrid for all proposed work near TransGrid high voltage infrastructure and the appropriate WorkCover Guidelines for Working in Proximity to High Voltage Transmission Lines implemented for any approved works within the corridor.

3.10 Penrith City Council

3.10.1 General support

Issue description

Road Widening The proposed increased number of lanes along The Northern Road is supported. The increase to the number of lanes would improve road capacity and travel times.

Response

Roads and Maritime acknowledges the support for the project by Penrith City Council.

3.10.2 Ancillary facilities

Issue description

The EIS indicates that "wherever possible compound site locations have been limited to areas that would not require vegetation clearing beyond that already required for the project" (p 579). This is supported. Clarification, however, is requested on whether the large number of scattered remnant trees on site C17, north of the water supply pipeline, will all need to be removed.

Response

There have been a number of design refinements which have resulted in an overall reduction to the construction and operational footprints for the project (refer to Chapter 4 of this report). Efforts have been made to reduce the impact of the project on vegetation, including a reduction to the footprint associated with ancillary facility C17. Further to this, construction contractors would be required to minimise impacts on existing vegetation during establishment and operation of all ancillary facilities.

3.10.3 Consultation

Issue description

The EIS identifies a range of construction environmental management sub-plans (pp 729-735) and identifies who will be consulted in their preparation. While "other relevant agencies" are identified, Council should be consulted on all sub-plans.

Response

Council will be consulted as required in the development of relevant construction environmental management plan sub plans and in accordance with the project's conditions of approval.

3.10.4 Traffic and transport

Issue description

The EIS provides limited detail on the underlying land use assumptions, particularly for the WSPGA. It is presumed that the RMS and its consultants have had detailed discussions and shared information with relevant State and Federal government agencies to ensure the EIS is based on reliable traffic forecasts to inform the design of the project and assess traffic and transport impacts. It is requested that further information on the underlying land use assumptions for the WSPGA is made available and addressed within an addendum or revision to the EIS.

Response

The traffic forecasts used for assessment of the project were based on the standard land use scenario developed by Transport for NSW and adopted in Roads and Maritime Strategic Traffic Assignment Model (STAM) and are consistent with DPE forecasts for land use at the time of assessment.

Population forecasts are based on three key datasets from the DPE:

- 2013 Local Government Area (LGA) Population Projections
- 2012 Metropolitan Development Program (MDP) dwelling supply forecasts and
- 2013 Lot Release Schedule for the North West and South West Greenfield areas.

The land use scenario also considered further information on Urban Activation Precincts, zoning changes and longer-term residential directions.

Employment forecasts are based on trends using ABS Journey to Work data, forecasts of employment by industry and DPE Major Projects register. The Bureau of Statistics and Analytics (BSA) Employment Forecasting Model uses a top-down approach in producing forecasts of jobs by distributing employment to 34 industries and then eventually into 59 SA3 regions. The model then considers new developments and trends to distribute Industry-Region control totals to the travel zone level.

Assessment of intersection capacity and performance has been carried out for traffic forecasts up to and including 2041 (the last year for which forecasts were available) and includes assumptions relating to the likely traffic generation of the Western Sydney Airport at these horizon years. Intersections within the proposal have been designed with sufficient capacity to perform satisfactorily under 2041 forecast peak period traffic volumes.

Issue description

The EIS indicates that traffic forecasts are based on the operation of the WSA by the mid-2020s (p 188). The EIS relies upon the Western Sydney Airport Draft Environmental Impact Statement 2016 (DIRD, 2016) as its information source. The independent peer review of the WSA Draft EIS (to which Council contributed), identified some issues with the traffic and transport assessment for Stage 1 (2030) of the WSA. They included that freight traffic generation within the airport precinct (outside of air cargo) and private vehicle traffic generation from land uses within the airport precinct (outside of air passengers and direct airport employees) had not been assessed. While this additional traffic generation may be relatively minor, it is suggested that RMS and its consultants review the traffic forecasts attributed to the WSA to ensure all traffic generation is included, given a key objective of the project is to provide a resilient connection to the WSA site for freight and people (p 31).

Response

The assessment of intersection capacity and performance has been carried out for traffic forecasts up to and including 2041 (the last year for which forecasts were available) and includes assumptions relating to the likely traffic generation of the Western Sydney Airport at these horizon years (based on the information publicly available at the time). Intersections within the proposal

have been designed with sufficient capacity to perform satisfactorily under 2041 forecast peak period traffic volumes.

Issue description

The EIS does not consider the alternative of a combination of public transport (rail) and road development (p 34), but recognises that there are a number of large public transport projects currently being constructed or planned, including the Joint Scoping Study on Western Sydney rail needs. While it is appreciated that the EIS cannot consider Western Sydney rail needs at this time, the north south rail link is critical to connect the broader Western Sydney region, including the WSA, WSPGA and SWPGA, and as such an upgraded, integrated road network should not be solely relied upon to provide these critical north south connections.

Response

Wider transport planning and land use integration is being considered by Greater Sydney Commission, DPE and Transport for NSW.

Chapter 9 of the EIS considers the cumulative impacts of the project in conjunction with other committed projects that were known at the time of assessment. Additional north south rail capacity was not committed by Government at the time of carrying out the assessment.

Issue description

There are various references throughout the EIS to footpaths on the eastern side of The Northern Road “where required” (pp 4 and 77), “as required” (p 79), “where warranted” (p 109) and “such as between bus stops and adjacent intersections” (p 210). It is recommended that this be clarified in the detailed design phase.

Response

Details associated with the provision of a footpath along the eastern side of The Northern Road would be determined during the detailed design phase. Given the location of existing development adjacent to The Northern Road (primarily on the western side), lack of development opportunities on the eastern side, due to DEOH and Western Sydney Airport and the provision of pedestrian crossings at all signalised intersections along the proposal, the provision of a shared path on both side of The Northern Road is not warranted.

Issue description

Council requests continued involvement in the design of The Northern Road upgrades including the proposed connection to the M12 Motorway.

Response

Roads and Maritime will continue to consult with Council in relation to the design of The Northern Road upgrades and the proposed M12 connection.

Issue description

The design proposes a continuous bus lane in each direction between Mersey Road, Bringelly and Glenmore Parkway, Glenmore Park. The bus lanes are to be 24 hour with parking not permitted in the bus lanes.

Response

The operation of the proposed bus lanes is being finalised as part of detailed design for the project and would be confirmed in consultation with Council and bus operators.

Parking would not be permitted in the bus lanes.

Issue description

The provision of dedicated bus lanes is supported, however, there is no provision made to provide bus shelter infrastructure along the upgraded route. It is not reasonable to expect Council to

provide this infrastructure. The bus shelters are a key facility of a major public transport route and enhance the public transport experience, promoting mode shift.

RMS has just completed the Werrington Arterial Road project and provided bus shelters in both directions. Council has received confirmation from RMS that TNR3 will be providing bus shelters to suit Council's requirements. Bus shelters have been provided at each bus stop location by RMS. It is imperative that all stages of TNR are consistent in their delivery of infrastructure including bus shelters. Therefore, Council is urging RMS to reconsider its commitment for provision of bus shelters along TNR project.

As part of the bus shelters supply and installation process the RMS must ensure that the supplier provides a certificate that bus infrastructure has been designed and installed to meet all relevant standards and DDA compliance.

Response

The predominant land use along the project is rural residential. This is in contrast to the highly urbanised environment where The Northern Road Stage 3 (TNR3) is currently being delivered and where bus shelters have previously been committed to.

Roads and Maritime has formed the view that the existing passenger demand in the project location in the short-term does not warrant the implementation of bus shelters.

Issue description

The proposed TNR project has not provided any truck layby area within this project. At a Council meeting in March 2017, concerns were raised about the upgrade of TNR regarding removal of the existing lack truck layby area south of Glenmore Parkway. Council wrote a letter to RMS in April 2017, seeking their advice regarding the RMS Strategy/Policy on the provision of truck layby areas. Council believes that this is an important road safety initiative and therefore Council is urging RMS to reconsider its commitment for provision of a truck layby area along TNR project.

Response

The Transport Planning Branch of Transport for NSW and the Roads and Maritime Freight Branch administer the freight policy for NSW which includes identifying areas for the provision of heavy vehicle rest areas, de-coupling facilities and parking areas. The Northern Road corridor, being primarily metropolitan in nature is not currently a priority under the freight policy.

The project has no provision for a heavy vehicle inspection area, de-coupling facility or parking area for northbound traffic. However, between Littlefields Road, Luddenham and Glenmore Parkway, Glenmore Park, the project does include a heavy vehicle inspection bay for southbound traffic.

Issue description

Council requests that RMS consult with local residents and respond to any substantial objections prior to proceeding with the proposed new local road connections and upgrades for the following:

- New eastern extension of Littlefields Road
- New roundabout in the proposed eastern extension of Littlefields Road
- New connection from Gates Road through to Littlefields Road
- New extended Vineyard Road
- New roundabout in Kings Hill Road
- New alignment of The Northern Road and Elizabeth Drive (south of the current Elizabeth Drive).

Response

Roads and Maritime would consult with local residents prior to proceeding with new local road connections and upgrades.

Response to submissions from the local community regarding general traffic and transport related issues are included in Section 2.5 of this report. Additionally, any changes to impacts to local roads since exhibition of the EIS as a result of the design refinements is discussed in Section 5.1.1 of this report.

Issue description

As outlined within the Biodiversity comments within this submission, Council supports in principle the provision of a roundabout to facilitate U-turns in Kings Hill Road. However, it should be noted that an existing load limit applies to the section between The Northern Road and proposed extension of Vineyard Road. An application must be made to Council's Local Traffic Committee (LTC) to remove the load limit on that small section of Kings Hill Road from The Northern Road to the proposed roundabout.

Response

Roads and Maritime will consult with Penrith Council's Local Traffic Committee regarding the existing load limit on Kings Hill Road.

Issue description

The Kings Hill Road from The Northern Road to the proposed roundabout would require significant pavement upgrade to cater for the increase in heavy vehicle movements. As would the pavement design for the new roundabout.

Response

Roads and Maritime proposes to upgrade the pavement on Kings Hill Road. The requirements for the upgrade will be discussed further with Council.

Issue description

The proposed upgrade TNR project has realigned the existing The Northern Road to an easterly direction to bypass Luddenham town centre. The proposed realignment will reduce in traffic within the town centre, at the same time which may impact on local businesses that rely on passing trade. Consideration should be given to provide appropriate directional signage for traffic in the vicinity for easy access to the Luddenham town centre. Brown Tourist signage to attract passing trade into the community and for historic sites may be considered.

Response

During operation of the project the following management measures would be put in place to minimise the impact of the bypass of Luddenham Town Centre and attract passing trade:

- Appropriate road signage will be provided in accordance with the Roads and Maritime Services *Guidelines Tourist Signposting* (2012) to provide guidance to passing patrons on access to shops and services, including within Luddenham Town Centre
- Roads and Maritime, in consultation with Penrith Council will provide monetary support for preparation of plans to revitalise Luddenham town Centre for the purpose of encouraging motorists to continue to pass through or visit Luddenham Town Centre.

Issue description

The proposed provision of a new shared path improving safety for pedestrians and cyclists also provides an alternative mode of transport. Whilst the inclusion of safe infrastructure for cyclists and pedestrians is acknowledged and welcomed, the nature of any cycling facility should meet the needs of the likely future user groups of the facility. The automatic provision of a shared-use path for bike riders is not always appropriate. Consideration should be given to the following points:

The Northern Road is currently used by long distance and club riders. As a major transport link to the airport, the road should provide for all modes of transport. In the case of cycle infrastructure, it should not only provide for the existing users, but also the likely future users, being riders who may choose to commute to/from work in and around the airport precinct. In this regard, the cycle facility should be continuous and direct, to be attractive to the user.

Intersection crossing treatments should be provided to give the same priority to bike riders as other vehicles. It should not be expected that bike riders are required to stop and cross at intersections with bicycle crossing lanterns on the same phase as pedestrians. The multiple crossing points and delays for a long distance bike commuter is not reasonable. A long distance rider will alternatively use the road, rather than ride on a slow, disconnected shared-use path. This particularly applies to the club training cyclists, riding long distances every weekend, often every day.

Complimentary on-road and off-road facilities are typically not necessary; a separated continuous on-road facility is preferred in this instance to cater for the likely users. However, if the discontinuous SUP only is proposed, then on-road lanes should also be included. Improved separation to travel lanes is also preferred for the cycle facility.

It is important that RMS consult with the local cycling clubs regarding the nature of the facility and ensure that the design, separation and intersection treatments are supported.

Response

The current shared path provision is consistent with the shared path being provided along the rest of The Northern Road (north of Bradley Street) which is being provided on the western side of the project. Given the location of existing development adjacent to The Northern Road (primarily on the western side), lack of development opportunities on the eastern side, due to DEOH and Western Sydney Airport and the provision of pedestrian crossings at all signalised intersections along the proposal, the provision of a shared path on both sides of The Northern Road is not warranted.

Roads and Maritime consulted with the following local and regional bicycle groups during preparation and exhibition of the EIS:

- Bicycle NSW
- Western Sydney Mountain Bike Club (WSMTB Club)
- CAMWEST Cyclist Group
- Mountain Bike Australia
- Western Sydney Cycling Network
- Bicycle Network
- Penrith Cycling Club
- Macarthur Collegians Cycling Club.

No submissions regarding the project were received from these groups. The provision of a shared path and no on-road cycling facilities is considered an appropriate treatment for the project.

3.10.5 Noise and vibration

Issue description

Construction is to be staged, with construction anticipated to occur over a three-year period (early 2018 to late -2020), with works generally being carried out during standard working hours “where feasible and reasonable.” It is noted that to minimise disruption to the Northern Road and the surrounding road network, some construction activities will be carried out outside of standard hours, including installation of traffic controls, night paving and key bridge construction works; however, as a standard noise management practice, where possible, the noisier activities should be restricted to standard work hours.

Response

Refer to response in section 2.6.2 of this report.

Issue description

Generally, the assessment concludes that the project's construction phase will substantially impact the community, including triggering some receivers to be moderately and highly noise affected, particularly during periods where noise-intensive processes operate at their nearest point to receivers. Further, modelling predicts that during out of hour's works, some residences may be exposed to exceedances of more than 25dB (A) above the sleep disturbance screening criteria. It is requested that the RMS commit to undertaking the detailed design identified in the Noise and Vibration Impact Assessment with subsequent community consultation to ensure that construction noise and vibration impacts upon nearby receivers – residential and non-residential - are minimised and scheduled for the shortest possible duration.

Response

Refer to response in section 2.6.2 of this report.

Issue description

It is requested that the project's CNVMP specifically nominate the additional mitigation and community consultation measures it will apply to mitigate the predicted noise and vibration criteria exceedances identified in the Noise and Vibration Assessment. In particular, the CNVMP should explicitly assess the potential for sleep disturbance and address how the identified maximum noise level events would be managed to alleviate impacts to sensitive receivers.

Response

Refer to response in section 2.6.2 of this report.

Issue description

Where exceedances of the human response vibration criteria are identified at the detailed design stage, RMS should ensure that additional assessment is undertaken in line with the recommendations of the Noise and Vibration Impact Assessment.

Response

Table 7-34 of the EIS identifies that vibratory rolling is expected to be carried out within 100 m of residences (for various stages of works) and so may impact human comfort within those residences. In these cases, the relevant mitigation measures outlined in Appendix C of the Roads and Maritime CNVG are to be followed in order to mitigate any such potential impacts. These measures include notification strategies, vibration monitoring, offering of periods of respite and offering of alternative accommodation. The precise location of vibration-intensive works and the final section of plant would be confirmed by the construction contractor once engaged, and the relevant mitigation measures incorporated into the CNVMP.

Issue description

Once road upgrades are complete, modelling predicts that without noise mitigation, most receivers in the study area are expected to experience some increase in traffic noise. For receivers close to the alignment, the increase may result in an exceedance of the operational noise criteria. Further, some properties may also experience sleep disturbance impacts. In turn, there are 77 receivers that qualify for consideration of noise mitigation. All triggering receivers are residences other than three classroom buildings at Luddenham Public School. This list may be further refined during the detailed design phase. The assessment determines that mitigation of operational impacts will be delivered as at-building acoustic treatments rather than as either low noise road pavement or noise barriers, as this is the most "reasonable" application of mitigation given the proximity of the dwellings to the roadway and the spatial separation of the eligible buildings. It is requested that the RMS commit to undertaking the further detailed design identified as being required in the NVIA, along with subsequent community consultation to ensure that appropriate and effective noise

mitigation measures are implemented. The selected mitigation measures and at-building acoustic treatments should be selected and implemented so as to respond to the concerns of the noise-affected community and ensure that the noise levels at sensitive receivers comply with applicable noise criteria.

Response

Refer to response in section 2.6.2 of this report.

Issue description

In line with the recommendations of the NVIA, post-construction traffic measurements should be collected to verify that traffic volumes and characteristics are not materially different from the forecast numbers considered in the NVIA. Where material differences are identified, further assessment should be completed to confirm that the level of impacts remain consistent with the predictions of this study.

Response

In accordance with the EIS mitigation measures (NV-5 specifically), an operational noise review would be carried out within 12 months of the commencement of operation of the project. This would include monitoring to compare actual noise performance of the project against predicted noise performance and an assessment of the performance and effectiveness of applied noise mitigation measures together with a review and if necessary, reassessment of all feasible and reasonable mitigation measures. Identification of any additional feasible and reasonable measures that would be implemented with the objective of meeting the criteria in the NSW Road Noise Policy (DECCW, 2011), when these measures would be implemented and how their effectiveness would be measured and reported.

3.10.6 Biodiversity

Issue description

The proposal seeks to remove over 38.7 hectares of remnant native vegetation from the Cumberland Plain, almost all of which is already listed as Endangered or Critically Endangered. The EIS states that “The BIO Map (Office of Environment and Heritage 2015a) has not been approved by the Chief Executive of OEH and therefore these biodiversity links have not been included in the FBA (Framework for Biodiversity Assessment) calculations” (pp 293-294). The biodiversity links referred to include land on the site of the Orchard Hills Defence Establishment and regional corridor 17 linking the Mulgoa Nature Reserve to vegetation on the Defence Establishment site. This statement is concerning and it is considered to be reasonable and necessary that these links are included in the FBA as widening of The Northern Road will increase its barrier effects and result in the core area on the Defence Establishment site (which is also Priority Conservation Land) being further isolated with long term impacts on its viability.

The OEH’s website indicates that the BIO Map “comprises core areas of bushland and corridors that are important at a state and regional level for biodiversity outcomes”. It does not suggest that the BIO Map should not be used to guide government decision making. These links are also zoned E2 Environmental Conservation under Penrith LEP 2010, and as such, considered important to Penrith City’s biodiversity network.

Response

Refer to section 2.7.5 for a response to issues regarding the fragmentation of biodiversity links and habitat corridors.

Issue description

Further consideration should be given to having a u-turn facility in Kings Hill Road and whether this has potential to reduce the fragmentation of a potential west-east biodiversity corridor between the Mulgoa Valley and the Defence Establishment site, or at least through the Mulgoa Valley.

Response

The proposed design at Kings Hill Road includes a roundabout which would provide a u-turn facility for motorists. The proposed design in this area also includes a link road between Kings Hill Road and Longview Road. The intersection of Longview Road and The Northern Road would be left-in and left-out only and therefore the link road would be required to ensure motorists travelling south on the Northern Road can access Longview Road. The connectivity value of the vegetation and the impact of the proposed design on fragmentation have been assessed in BAR.

Refer to section 2.7.5 of this report for a response to issues regarding the fragmentation of biodiversity links and habitat corridors, including proposed management measures to reduce impacts of the project on connectivity.

Issue description

At least two Threatened Ecological Communities, two threatened plants, six threatened animals and two migratory birds will be impacted by the upgrade:

- Cumberland Plain Woodland CEEC - approx 29.15ha
- River Flat Eucalypt Forest EEC - approx. 4.29ha
- *Pultenaea parviflora* (4 known plants) - Endangered (NSW) Vulnerable (Cth)
- *Marsdenia viridiflora* subsp. *viridiflora* (35 known plants) - Endangered (NSW) Vulnerable (Cth)
- Cumberland Plain Land Snail (*Meridolum corneovirens*) - Endangered (NSW)
- Regent Honeyeater (*Anthochaera Phrygia*) - Critically Endangered (Cth and NSW)
- Grey Headed Flying Fox (*Pteropus poliocephalus*) - Vulnerable (Cth and NSW)
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) – Vulnerable
- Etern False Pipistrelle (*Falsistrellus tasmaniensis*) – Vulnerable
- Eastern Free-tail Bat (*Mormopterus norfolkensis*) – Vulnerable
- Latham's Snipe
- Cattle Egret.

Response

Noted.

Issue description

It is noted that Table 4.2 of the Biodiversity Technical Working Paper states that *Marsdenia viridiflora* subsp. *viridiflora* cannot withstand further loss. The project however proposes to remove 35 known individuals. Further, the offset strategy identifies this as a having „Red Flag“ status and no credits being available to purchase. Justification has not been provided as to why this is an acceptable loss and this needs to be further addressed.

Response

As identified in the BAR, some impacts as a result of the project cannot be avoided even after the implementation of suitable environmental management measures (i.e. residual impacts). It is noted that the residual impact of the project on *Marsdenia viridiflora* subsp. *viridiflora* has been reduced to the removal of 31 known individuals, with the proposed retention of 4 plant species identified as part of the refined design (refer to section 5.1.3). Notwithstanding this, as identified in the BAR, the *Marsdenia viridiflora* subsp. *viridiflora* population has been identified as a species credit species that cannot withstand further loss and this has informed the assessment that has been carried out according to the FBA.

An offset requirement has been determined for this species as detailed in the BOS. The BOS does not refer to the 'Red Flag' status of any species. "Red Flag" areas are a concept from the BioBanking Assessment Methodology and do not apply to Major Projects assessed under the FBA.

As detailed in Section 2.7.8, the preferred approach to securing offsets for the project is to purchase credits from the market. Where credits are unavailable for purchase on the market, Roads and Maritime would work with public and private landholders to enter a BioBanking and/or Stewardship Agreement on their land and then buy the credits issued. Following discussions with Roads and Maritime, DoEE and OEH, it was decided that an additional supplementary measures package would be developed in consultation with OEH and DoEE with a focus on landscape scale measures within the local area.

Issue description

Mitigation measures have not been identified in detail and should be identified in order to determine the level of impact. Mitigation measure must include:

- Use of local provenance seed in all plantings.
- All areas that are to be grassed are to use direct seeding of native grasses and herbs as per Greening Australia's Grassy Groundcover Restoration.
- Reuse of topsoil from high quality bushland patches in vegetated fauna crossings and other areas to be revegetated.

Response

An urban design and landscape concept has been developed for the project as documented in the EIS, based on the project objectives and principles, to achieve an integrated design for the project. It incorporates the urban and landscape design concept plans for the project and a landscape planting concept including recommended species. As identified in the EIS, this would be adopted and further developed during detailed design and implemented as part of the Urban Design Landscape Plan (UDLP) for the project which is currently ongoing. There may be scope to include transplanting native species from areas to be cleared into revegetation areas but this would depend on the type of species being removed and the likely success of transplanting.

Plants to be used in revegetation would be sourced from local provenance seed where available and seed collection would be undertaken before clearing. There may be the opportunity for reuse of topsoil from cleared areas depending on the quality of the vegetation to be removed as the topsoil could contain a significant load of seed from exotic species and may not be suitable for reuse. Roads and Maritime would consider reuse of topsoil as part of the UDLP for the project.

Further details of the existing mitigation measures for the project as outlined in the EIS are provided in Appendix C. New or revised environmental management measures as proposed in Appendix C have been incorporated into the revised environmental management measures included in Chapter 6 of this report.

Issue description

The loss of habitat, especially the loss of hollows and remnant trees has not been adequately assessed or quantified in the EIS. The EIS must identify the number of tree hollows, standing dead trees and large, remnant trees will be impacted by this proposal. It must also include the areas of vegetation that have not been included in the impacts assessments as outlined above. Several habitat trees are located within the road shoulder or median strip and can be retained rather than removed.

Response

Refer to section 2.7.1 for a response to issues regarding the removal of native vegetation, including impacts to hollow-bearing trees.

Issue description

Mitigation measures have not been identified and must be identified in order to determine the level of impact. Mitigation measure must include:

- Re-use of natural hollows in nearby bushland and reserves
- Re-use of large woody debris in nearby bushland and reserves
- Installation of suitable habitat boxes (made from hardwood and species specific) in nearby bushland and reserves.

Response

Further details of the mitigation measures for the project as outlined in the EIS are provided in Appendix C. Additional mitigation measures proposed for the project are outlined in Chapter 6 of this report.

Issue description

There are three key points where regional connectivity will be impacted as a result of the road widening. Two of these are within the Penrith LGA being:

- Kings Hill Rd Mulgoa
- Glenmore Park Biodiversity Corridor - this is also identified in the Cumberland Conservation Corridors Map and in OEH's BIO Map which falls under the Cumberland Plain Recovery Plan. This importance of this linkage is not fully assessed as the EIS does not identify the connection through to Mulgoa Nature Reserve via the Glenmore Park Biodiversity corridor. This should be rectified and a full assessment of the impacts undertaken.

Loss of connectivity is a major threat on the Cumberland plain. No measures have been identified to mitigate these impacts on regional connectivity. The EIS states that they will refer to RMS Guidelines, but nothing is detailed. A number of connectivity mitigation measures must be implemented at these key locations. Mitigation measures need to include:

- A flood Culvert PXD2 is already proposed at the key connectivity point at Surveyors Creek. Alongside flood Culvert PXD2, a fauna underpass culvert is to be located to link the Glenmore Park/Surveyors Creek Biodiversity Corridor with the vegetation on the defence land. This would require the culvert to be doubled so that one side can allow for fauna movement. The fauna underpass must be independent of the drainage culvert, elevated above regular drainage levels, and a natural earth floor and with a slight angle to self-drain any water entering. The culvert for fauna must be a minimum of 3m high to provide for Eastern Grey Kangaroos, with a natural earth bottom as outlined above, and contain hardwood logs and rocks to allow escape from flooding and predators. Suitable vegetation is to be provided on either side to provide protection to fauna on approach and departure. Due to security, the culvert would need to have a grate across it to prevent access, but it would mean that in future the potential is there to open it up for fauna movement and would avoid the road upgrade sterilising future connectivity opportunities.
- Fauna rope bridges and glider poles with vegetated rest points in the median strip to provide a two-stage crossing at suitable points along the roadway.
- Suitably placed floppy-top fencing to manage and guide fauna crossings.

Response

Refer to section 2.7.5 for discussion regarding the fragmentation of biodiversity links and habitat corridors.

Issue description

The Cumberland Plain Mitchell Landscape is an over-cleared landscape with 89 per cent of native vegetation having been cleared. Due to the likely expansion of western Sydney further impacts to biodiversity are likely to result in this region. The EIS outlines other projects that are having or will have an impact on the regions biodiversity:

- The predicted impacts from the Northern Road Upgrade – Glenmore Parkway, Glenmore Park to Jamison Road, Penrith are anticipated at about 2.4 ha of remnant native vegetation and up to 3.9 ha of planted vegetation along the M4 Motorway (6.3 ha in total)
- The predicted impacts from the Northern Road Upgrade Narellan to Bringelly are anticipated at about 59.2 ha of native vegetation
- The construction footprint of the M4 Managed Motorway project is anticipated to impact on about 31.25 ha of planted and remnant vegetation in various states of condition. This area of clearing includes 3.82 ha of remnant vegetation
- The footprint of the Western Sydney Airport is predicted to impact on 280.8 ha of native vegetation

Additional future impacts include the South West Growth Centres, realignment of transmission lines, provision of water pipelines, and the proposed M12 Motorway and other future orbital road links.

Response

Noted, as per BAR.

3.10.7 Socio-economic and land use

Issue description

The EIS states that “Roads and Maritime will, in consultation with Liverpool Council, provide appropriate support for preparation of plans to revitalise Luddenham town centre, for the purpose of encouraging motorists to continue to pass through or visit the town” (pp 420 and 424 (SE-14)). Given part of the village of Luddenham is within Penrith City, Council would also like to be included in this environmental management measure.

Response

Liverpool Council as well as Penrith City Council would be consulted in the preparation of plans to revitalise Luddenham town centre (See revised management measures SE-13).

Issue description

The EIS identifies 142 properties for full and partial acquisition. Clarification is sought on when information on acquisition is likely to be provided to Council for inclusion on Section 149 certificates.

Response

Roads and Maritime are still in the process of finalising exact boundaries for acquisition for the project. Following finalisation of all boundaries, appropriate information will be provided to Council. This is expected to occur by mid-2018.

3.10.8 Soils, water and contamination

Issue description

Whilst detailed contamination investigations have not yet been conducted, it is expected that land contaminated through existing and historical uses will be disturbed through the construction program. It is requested that the RMS ensure that comprehensive and detailed contaminated land investigation, remediation and validation procedures and protocols are prepared and implemented

as part of the contaminated land management plan and that consultation with the NSW EPA occur, should land contamination be identified.

Response

A contaminated land management plan would be developed for the project, which would outline the investigation and management requirements for the project. As above, all sub plans would be carried out in consultation with Council. The plan would include procedures for the management of contamination if encountered, including consultation with the NSW EPA as required.

Issue description

It is recommended that the RMS ensure that the recommendations of the Stage 1 Contamination Assessment, as detailed in Section 6.2 „Recommendations“ are considered during the Phase 2 assessment. To mitigate impacts to human health and the environment, intrusive sampling and analysis of soils should be undertaken prior to the disturbance of any known or potentially contaminated land.

Response

Recommendations of the Stage 1 contamination investigation would be implemented including the requirement for a Phase 2 assessment. Outcomes of the assessment and further investigation and management measures would be documented in the contaminated land management plan.

Issue description

All remediation works in the Penrith Local Government Area require development consent. Clause 11(4) of SREP 20 states that consent is required for remediation of contaminated land, and clause 9(d) of SEPP 55 identifies any remediation work as Category 1 remediation work (work needing consent) where it is required by a Regional Environmental Plan. A Remediation Action Plan (RAP) should be included for consideration and approval by the consent authority in line with Clause 17 (1) (C) of SEPP 55 should land remediation works be required. A notice of completion of remediation work on any land within the Penrith Local Government Area should also be provided to Penrith City Council. The contamination land management plan as part of the broader CEMP and the Unexpected Finds Protocol should be prepared with consideration to the above.

Response

The approval process for the project is under Part 5.1 of the EP&A Act is illustrated in Figure 1-3. Any remediation works required for the project would be carried out in accordance with the conditions of approval and relevant legislative requirements. The project has been declared State significant infrastructure under the *State Environmental Planning Policy (State and Regional Development) 2011*. As such, the project is permissible without consent. Any remediation requirements will be determined by the Secretary of the Department of Environment and Planning.

While Roads and Maritime will consult with and seek input from Council throughout all stages of the project there is no legislative requirement for development consent endorsed by Council

Issue description

Whilst odour arising from uncovered contaminated or hazardous materials is identified as a local air quality risk and subsequent management measures proposed, there is further potential for air quality impacts to arise through the disturbance of unidentified contaminated land. Measures and safeguards to minimise air quality impacts and risk to human health associated with disturbance of these lands, should be addressed in the CEMP.

Response

The CEMP would include relevant measures to manage impacts associated with the disturbance of contaminated land, included unexpected contamination finds. This would include asbestos management procedures if encountered. These procedures would be developed to manage air quality impacts and risks to human health associated with disturbance of contaminated land.

Issue description

The project footprint contains and is in relatively close proximity to a number of water bodies and other sensitive receiving environments, which may be impacted during the construction and operation of the development. The proposed works have the potential to impact on surface water quality during the construction works due to the movement of sediment-laden runoff caused by excavation activities, vegetation removal, and other surface work, particularly before or during periods of heavy rainfall. The erosion, sediment and water quality control measures proposed to be implemented prior to, during and post construction works should effectively manage potential water quality issues during the construction stage provided scheduled monitoring and regular maintenance of these measures is undertaken.

Response

The soil and water management measures outlined in section 8.2.2 of the EIS would be implemented and incorporated into the relevant management plans for the project, including monitoring and maintenance requirements.

3.10.9 Urban design and visual impacts

Issue description

Sheet 13 of the Urban Design Concept Plans (Page 87) indicates the planting of clumps of trees to balance screening with occasional views from the road corridor. The Mulgoa Valley has an established landscape and heritage character and replanting along the corridor should suitably respond to this character in terms of species type, groupings and plant locations.

Response

Roads and Maritime would carry out further consultation with Council during finalisation of the landscaping plan being developed as part of detailed design. As outlined in the landscape design in the EIS, the development of the planting concept and layouts for vegetation during detailed design, would ensure placement and species selection is in accordance with all relevant requirements. This includes the Roads and Maritime Landscape Guideline (RTA 2008), clear zone and stopping sight distance requirements, the Obstacle Limitation Surface (OLS) requirements for the Western Sydney Airport, and biodiversity offset requirements.

Issue description

In the Urban Design Strategy (5.2), the general principles for vegetation and views for all three zones are considered to be inadequate. To guide a coordinated design, additional principles should be included to address:

- Conflicts between the provision of best conditions for vegetation to thrive, and potential constraints such as compacted sub-soil and ground conditions in areas of cut and fill, underground and other services infrastructure e.g. power, maintenance access requirements
- Further clarification on how Councils can safely, effectively and efficiently maintain verges with respect to batters, plant species and intended management measures
- Further clarification on how Roads and Maritime Services contractors can safely, effectively and efficiently maintain medians

Response

Roads and Maritime acknowledges Council's advice regarding the Urban Design and Landscape Plan and will continue to consult with Council during finalisation of the landscaping plan being developed as part of detailed design.

Issue description

Figure 25 of the Urban Design Strategy does not address the local government boundary between Penrith City and Liverpool. Further consideration should be given to the provision of signage and other potential landscape features to mark the boundary.

Response

The provision of gateway signage is beyond the project scope. Roads and Maritime would work with Council to identify suitable locations for Council gateway signage or other features.

Issue description

Road elements (5.3) does not address the following, which have the potential to impact the landscape amenity of the road corridor and surrounding landscape context:

- Infrastructure such as underground power and drainage. These should be coordinated with the vegetation and views concepts so they are located and aligned to not compromise optimum locations and conditions for planting
- Signage including identity gateway markers at the LGA boundary

Response

The EIS identifies a number of underground utilities and services that may be impacted by the project. The extent of impacts would be confirmed prior to finalising the detailed design. Strategies to address impacts may include utility protection, realignment or relocation, or adjustments to the project design to avoid impacts. Consultation with utility and infrastructure providers is ongoing and will specifically include landscaping and urban design outcomes for the project, however there are currently no plans to relocate utilities to allow for optimal roadside planting and landscaping.

Gateway signage at the LGA boundary is beyond the project scope. Roads and Maritime would work with Council to identify suitable locations for Council gateway signage or other features.

Issue description

Road elements – cuttings (5.3.3) – soils should be ameliorated to enable planting to restore landscape character and bushland areas.

Response

Roads and Maritime would carry out further consultation with Council during finalisation of the landscape plan being developed as part of detailed design. The rehabilitation of disturbed areas would be carried out in accordance with Roads and Maritime Guideline for Batter Surface Stabilisation (Roads and Maritime April 2015) which includes specific requirements for soil amelioration where required.

The construction contractor, once selected, would be required to ensure all disturbed areas are reinstated and that revegetation and planting is carried out in accordance with the landscape plan and conditions of approval for the project.

The following new mitigation measures will be implemented for the project:

- Rehabilitation of the disturbed areas of the site would be undertaken in accordance with Roads and Maritime Batter Stabilisation Guidelines and Roads and Maritime contractor specifications.

Issue description

The following comments regarding „Landscape Design“ (Section 5.4) should be further considered and addressed:

- Vegetation – plants should be grown provenance stock
- Hoop and Bunya Pines are recommended over coastal Norfolk Island Pines

- Cumberland Plain Woodland species should include *Melaleuca* sp.
- Riparian species should include *Casuarina*, *Ficus coronata*, *Melia*, *Callistemon* and *Acacia*
- Median and verge species should include pasture grasses

Response

Roads and Maritime would carry out further consultation with Council during finalisation of the landscape plan being developed as part of detailed design. The landscape design in the EIS provides an indicative plant species selection that would be further refined during detailed design in consultation with relevant stakeholders.

Issue description

The following comments regarding „Urban Design Concept Plans“ (pp81-89) should be further considered and addressed:

- The description of PM4 is not clear – it should include tree planting
- Sheet 7 – The feature avenue of Hoop Pines into Luddenham should be planted on both sides of the road to enable an „avenue“ effect. Power should be relocated underground if necessary. An extension of the avenue towards the intersection will enable it to be appreciated by TNR users, and promote the town as a bypass destination. Similarly, other landscape features including Council branded signage should be incorporated into the intersection
- Sheet 7 – The statement should address unsightly views into the incident response facility by northbound traffic, through vegetation, built form design excellence, improved circulation routes to reduce visual impact
- Sheet 7 –The statement should address the change in local government areas through Council branded signage and other features
- Sheet 10 – there is opportunity for PM2 i.e. inclusion of planted trees between CH10050 and 10325 (east) and this should be further explored
- Sheet 11 – the VMS at the pipeline is considered inappropriate given this is a feature in the landscape which has potential to be highlighted.

Response

Roads and Maritime acknowledges Council's advice regarding the Urban Design and Landscape Plan and will continue to consult with Council regarding the operational requirements of the road and the feasibility of Council's advice.

3.10.10 Air quality

Issue description

During construction, the primary risk to local air quality is dust emissions (particulate matter and combustible matter) generated during works involving the stripping of topsoil and clearing of vegetation, earthworks, stockpiling, the movements and handling of soils, and traffic movements on unpaved roads. Those receivers located close to the site works (~ 20m) and in the direction of prevailing winds will be the most susceptible to air quality-related impacts, particularly during dry hot periods. Potential impacts to air quality during the operational phase of the project are generally associated with motor vehicle emissions arising from changes in the volumes of motor vehicles and proximity to sensitive receptors. Safeguards and environmental management measures have been identified to manage and mitigate impacts predicted as a result of the proposed work; these measures, including air quality monitoring, reporting and compliance requirements, will be further developed and detailed in the CEMP which should form conditions of consent.

Response

Noted.

3.10.11 Resource and waste management

Issue description

It is requested that the RMS ensure that a comprehensive waste management plan is prepared and implemented to ensure that all waste arising from the construction of the project, including contaminated material and asbestos, is appropriately collected, transported and disposed of lawfully at a lawful waste management facility. Measures to this effect should be included in the plan.

Response

A waste management plan would be developed for the project, including procedures for the management of contamination and asbestos if encountered.

3.10.12 Cumulative

Issue description

Chapter 9 of the EIS discusses the potential cumulative impacts of this project and other projects proposed in the area, including the WSA. The construction timeframe for this project and the aviation infrastructure works for the airport is outlined on page 672. There are, however, site preparation activities associated with the airport, including substantial earthworks, scheduled to commence in 2018 ahead of the aviation infrastructure works which should also be considered in this assessment.

Response

Both site preparation activities and aviation infrastructure works for the planned Western Sydney Airport have been considered within the cumulative impacts section in Chapter 9 of the EIS. This includes consideration of impacts related to bulk earthworks. While the EIS considered the overlap of Aviation Infrastructure works from mid-2019, it is noted that bulk earthworks may begin earlier. Information on the Western Sydney Airport website (August 2017) states that the construction for the airport is likely to start in 2018. The cumulative impact assessment has been updated to reflect this additional period of overlap (refer to section 5.2.10).

Issue description

Chapter 9 considers cumulative traffic impacts and suggests that, during construction, vehicles may use alternative routes to travel north or south through the area to avoid delays, such as Mulgoa Road, Luddenham Road and Mamre Road. The environmental management measures suggest that consultation be undertaken with local communities potentially affected (p 688). Council should also be included in this consultation process.

Response

Local communities as well as Council would be consulted with regards alternate travel routes required during construction.

3.11 NSW Office of Environment and Heritage (Heritage)

3.11.1 Non-Aboriginal heritage

Issue description

The Project seeks to upgrade 16 kilometres of The Northern Road between Glenmore Parkway, Glenmore Park and Mersey Road, Bringelly. No State Heritage Register items have been identified as being affected, however there are two historical archaeological sites, one s170 registered item

and one item on the Commonwealth Heritage Register (CHL) will be impacted by these works. A number of „potential“ heritage items are also discussed, however it remains unclear what level of significance, if any, these sites may retain.

I note the previous advice dated 23 January 2017 regarding the adequacy of the draft Environmental Impact Statement (EIS). The Department was advised of the following elements that did not satisfy the SEARS for this project:

An Excavation Methodology and research design to manage the historical archaeological sites impacted by the proposed upgrade works; and

The assessment required additional assessment of significance for all of the items identified within the study area as likely to retain heritage significance and which would be impacted. This was particularly raised as a concern for potential state significant archaeological sites such as Lawson’s Inn and Miss Lawson’s Guest House.

Response

The non-Aboriginal heritage assessment carried out for the EIS identified two registered heritage items (known items) and an additional eight „potential“ heritage items within the study area. This initial identification of known and potential heritage items was based on a desktop review and site survey. Assessments of significance were carried out for all 10 items, only four of which were identified as having heritage significance as follows:

- Item 2: Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (in relation to Chaffey Brothers Irrigation Scheme Canal) – Commonwealth heritage significance
- Item 3: Warragamba Dam to Prospect Reservoir pipeline – local heritage significance
- Item 9: Miss Lawson’s Guesthouse site – local heritage significance
- Item 10: Lawson’s Inn site – local heritage significance.

The remaining six items were not identified as being of heritage significance and were therefore not considered further in terms of impacts.

As outlined in section 2.11.1, additional assessment since exhibition of the EIS has been carried out (refer to Appendix D). This includes updated histories and statements of heritage significance for a number of known and potential heritage items. This included a comparative analysis for Item 9: Miss Lawson’s Guesthouse site and Item 10: Lawson’s Inn site to aid the assessment of heritage significance for these sites in accordance with the relevant guidelines.

Additionally, the non-Aboriginal heritage technical memorandum in Appendix D includes a copy of and incorporates the findings of a research design and excavation methodology for the following potentially impacted sites:

- Item 2: Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (in relation to Chaffey Brothers Irrigation Scheme Canal)
- Item 9: Miss Lawson’s Guesthouse site
- Item 10: Lawson’s Inn site.

There would be no impact to any of the items of heritage significance associated with Item 3: Warragamba Dam to Prospect Reservoir pipeline, therefore no further archaeological investigation is proposed for this item. Development requirements for the pipeline are discussed further below.

Further to this, as noted in the technical memorandum in Appendix D of this report, a previous assessment by Australian Museum Consulting reviewed the Liverpool LEP listing for Item 10: Lawson’s Inn site and considered it to be of State heritage significance. However, this study did not include a full significance assessment of the site against the NSW Heritage Council’s criteria for heritage assessment, including no comparative analysis. Although the findings of the Australian Museum Consulting report were taken into consideration in the assessment of significance for the

purpose of this assessment (refer to Appendix D), the site was still determined to be of local heritage significance.

In summary, although the significance assessments and associated statements of heritage significance have been updated for these items based on the results of this additional assessment, there was no change in relation to whether or not these items satisfied the criteria for local or State listing, with no State significant heritage items identified for the project.

The statements of heritage impact and associated mitigation measures for the four sites of heritage significance have also been updated in Appendix D to reflect the outcomes of this additional assessment.

Issue description

The Warragamba Supply Scheme Pipeline

The Heritage register searches within Appendix N do not consider state government agencies, such as WaterNSW, other than the Roads and Maritime Services. The Warragamba Supply Scheme (Warragamba to Prospect Reservoir Pipeline) is listed under s.170 of the Heritage Act 1977 by WaterNSW. The requirements of s.170 of the Heritage Act 1977 still apply for items so listed, because the provisions of s89J of the Environmental Planning and Assessment Act 1979 for State significant development do not suspend these portions of the Heritage Act 1977. Compliance with the State Government Agency's Total Asset Management System (TAMS) is required when changes are proposed to a heritage item listed on a s170 register. The EIS and Appendix N discuss compliance with relevant guidelines for development adjacent to the Warragamba Supply System pipeline as mitigation for the proposed impact but do not specify what the mitigation will be. It is therefore not possible to advise appropriate conditions of consent for mitigation. This should be included in the EIS so that appropriate conditions of consent can be included.

Response

The non-Aboriginal heritage technical memorandum (Appendix D) includes an updated assessment of heritage significance for Item 3: Warragamba Dam to Prospect Reservoir pipeline, including reference to the Warragamba Supply Scheme which is registered on the s. 170 NSW State agency heritage register (no. 4580161). The listing includes the Warragamba Dam, associated infrastructure and pipelines. However, since the significance assessment in the listing relates to the entire scheme focusing on the dam, a new assessment of significance was carried out against the relevant NSW Heritage Council criteria for the purpose of this assessment with a focus on the pipeline (refer to Appendix D).

The statement of heritage impact was also updated, with no physical impact expected to the pipeline as a result of the project subject to the application of relevant mitigation measures. This is consistent with the outcomes of the EIS, however further detail has been provided in Appendix D with regards the mitigation measures applicable to this item as per the *Guidelines for development adjacent to the Upper Canal and Warragamba Pipelines* (Sydney Catchment Authority 2012). This guideline outlines risks to the pipeline as a result of construction works in the vicinity and includes measures which would be implemented for the project as follows:

- Consultation with the Sydney Catchment Authority (SCA) to identify key issues relevant to particular locations to ensure the proponent or authority has the information needed to implement SCA requirements or recommendations
- Access to the Upper Canal and Warragamba Pipelines „Controlled Areas“, outlining access approvals and site inspections and access for SCA staff and contractors
- Risks during construction and site preparation – including vibration caused by jack hammering, pile driving or rock breaking, cut and fill works, erosion, sedimentation and stormwater impacts, dust, windblown rubbish and other airborne pollutants and illegal storage of construction materials. The SCA recommends that consent authorities require a Construction Environmental Management Plan be completed as a condition of consent for new large subdivisions and major development adjacent to the Upper Canal and

Warragamba Pipelines corridors. The Construction Environmental Management Plan should identify any potential impacts of the corridors and the range of controls to be implemented during the construction phase to avoid these impacts

- Erosion and sediment control – management of eroded sediment during any construction phase when the removal of vegetation and disturbance of groundcover in the currently predominately rural areas
- Stormwater management – the SCA requires that no stormwater beyond pre-development levels enters the corridors
- Public safety and security of water supply, including security fencing
- Road and pedestrian crossings
- Land uses and landscaping along corridor boundaries (Sydney Catchment Authority 2012: 7-17).

The guideline also provides guiding principles for development proposed within and adjacent to the Warragamba Pipeline corridor which would also be implemented for the project, Further detail is provided in Appendix D.

Issue description

Orchard Hills Cumberland Plain Woodland, Commonwealth Heritage List (CHL)

The Chaffey Brothers Irrigation Scheme canal (also associated with the Mulgoa Irrigation scheme) is assessed by GML Heritage as retaining high significance. This canal system is described as series of shallow depressions in poor condition with some wooden beams noted in association with them. It is unclear how the impacts on the canal, from the northern section of the proposed road upgrade, would be mitigated other than by proposed archival recording. This may be a suitable mitigation option however, the discussion has not stated what the heritage management plan prepared by GML Heritage has advised about the section of the canal. It would be appropriate for the mitigation to reference this HMP to justify the approach proposed.

Response

As identified in the EIS, Item 2: Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place incorporates the Chaffey Brothers Irrigation Scheme Canal. The canal is ranked as high significance in the Heritage Management Plan (HMP) prepared for the DEOH site by Godden Mackay Logan (GML) in 2013. The EIS identified impact to a small portion of the northern extent of the canal where it overlaps with the project, some of which was identified as being in poor condition as it is extremely shallow from erosion. The assessment in the EIS also identified the canal as being situated within an area of the DEOH site ranked in the HMP as having a low tolerance for change in relation to new development and demolition/remediation.

Chapter 6 of the HMP outlines the heritage management strategies and guidelines for the DEOH site, including any new development, demolition or remediation on the site. The HMP requires that impacts to the canal in relation to any new development within the DEOH site be avoided. Additionally, any demolition of built heritage items should take into account the heritage value of the item and its tolerance for change, as well as its relationship to other related elements of heritage value. Demolition of elements of moderate to high retention value should be avoided.

Although the canal in the context of the DEOH site is ranked as being of high significance with a low tolerance for change, the EIS concluded that given the project is impacting a small proportion of the overall canal, and that the section being impacted is of relatively poor quality, the overall impact on the historic heritage values was not considered to be significant with the implementation of the proposed management measures for the project.

The non-Aboriginal heritage technical memorandum in Appendix D provides updated statements of heritage impact for potentially impacted heritage items, including item 2. This incorporates the

outcomes of further historical assessment for as well as an archaeological research design and excavation methodology prepared for the canal (refer to Appendix D).

In addition to the EIS mitigation measures for this site which included archival photographic recording, archaeological investigation in the form of test excavation is also proposed for the extent of the canal to be impacted by the project as requested by the Department of Environment and Energy.. The investigation would include clearance of vegetation, hand excavation of topsoil/overburden, and mechanical excavation of trenches across the canal in accordance with the archaeological research design and excavation methodology (refer to Appendix D for further details).

Issue description

Historical Archaeological Sites and relics

The EIS has identified two historical archaeological sites within the project impact zone, both have been assessed as being of local significance by Appendix N. These items include Lawson's Inn Site (Item 10) and Miss Lawson's Guesthouse, Luddenham (Item 9). The historical assessment for these two items failed to search the NSW Land Title system prior to 1963. This is a concerning gap in the site history without any explanation such as Crown Land ownership.

It is therefore considered that Appendix N does not satisfy the stated requirements of the SEARS in terms of its historical investigation, analysis and significance assessments for each of the items which have been identified as „potential“ through this investigation. Also the analysis and historical investigation presented does not meet the standards of the NSW Heritage Manual 1996 for investigating and assessment of significance of heritage items in NSW. Archaeological assessments should also consider comparative analysis in assessing significance and that has not been addressed in the assessment.

Response

As outlined in the response to community submissions in section 2.11.1, further historical research has been undertaken for the purpose of this assessment which has informed updated assessments of significance for Item 9: Miss Lawson's Guesthouse site and Item 10: Lawson's Inn site. Comprehensive land ownership research on the properties was undertaken, producing a chain of ownership and tenancy from first grant to the present. Research provided considerable additional material to inform a revised assessment of heritage significance, consistent with the NSW Heritage Manual 1996, however, this did not alter the previously ascribed local level of significance for Item 9: Miss Lawson's Guesthouse site, and confirmed a local level of heritage significance, rather than state, for Item 10: Lawson's Inn.

The archaeological assessments for Items 9 and 10, include a comparative assessment of similar sites, which has been used to inform the determination of Criteria F and G – Rarity and Representativeness, and to provide models for predicted site organisation and archaeological potential.

Issue description

Assessment of Significance for item within the project area:

Previous comments provided on 23 January 2017 raised concern with the insufficient assessment of heritage items and potential heritage items in the draft EIS. The current EIS raises the same concern. The identified items are either assessed as retaining heritage significance at a local or state level, and are to be avoided or mitigated by the project, or they are not significant and require no heritage management. The EIS must be clear in this argument.

Response

As identified above, a total of 10 items potentially impacted by the project were assessed for heritage significance (two registered heritage items and eight „potential“ heritage items). These included:

- Item 1: Remnant of The Northern Road – no potential heritage significance
- Item 2: Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (in relation to Chaffey Brothers Irrigation Scheme Canal) – Commonwealth heritage significance
- Item 3: Warragamba Dam to Prospect Reservoir pipeline – local heritage significance
- Item 4: Fruit Orchard, Luddenham – no potential heritage significance
- Item 5: Weatherboard House, Slab Hut and Old Dairy, Luddenham – no potential heritage significance
- Item 6: Weatherboard House and Sheds, Luddenham – no potential heritage significance
- Item 7: „Pleasantview“ House 1, Luddenham – no potential heritage significance
- Item 8: Luddenham Village area: Chapel and School Site and Adams Road House – no potential heritage significance
- Item 9: Miss Lawson’s Guesthouse site – local heritage significance
- Item 10: Lawson’s Inn site – local heritage significance.

As outlined above, only four were identified as having heritage significance and were further assessed in relation to potential impacts as a result of the project. Updated statements of heritage significance, further clarity on which items are considered to meet criteria thresholds for heritage significance, updated statements of heritage impact and associated mitigation measures are all provided in Appendix D.

Issue description

The level of historical research needed to underpin and investigate significance is not demonstrated in the archaeological assessment. This is clear in the supporting assessments of significance for these items for example:

Item 5: weatherboard house, slab hut and old dairy, Luddenham, where no additional research was provided because the team had difficulty in searching Old System land titles in NSW. The information supporting the assessment of this item was provided by one source only. No additional historical analysis was undertaken to support this work. Inadequate investigation of historical land titles in NSW may have led to the same error for multiple items considered for this project. This is considered to be an inadequate submission against the requirements of the Heritage Manual, 1996 for Investigating and Assessing significance.

Response

As outlined in the response to community submissions in section 2.11.1 and above, further historical research including searches of the Old System of land titles in NSW provided considerable additional material to inform a revised assessment of heritage significance (including for item 5) consistent with the NSW Heritage Manual 1996. The updated assessments are included within Appendix D.

Issue description

Item 9 (Miss Lawson’s Guesthouse site) was associated with Item 10 (Lawson’s Inn Site) and dates from the same time, circa 1830s. It would be fully impacted by the proposed works; the proposed approach is open area salvage of this archaeological site. It is noted the site may retain a higher level of significance than local, however the supporting assessment has been inadequate in demonstrating detailed site specific historical research and comparative analysis to support the significance assessment. Archaeological sites may satisfy multiple values under the significance criteria other than just Criterion „e“ for research potential. The mitigation is considered to be inadequate because it does not provide the detailed response required by the SEARS.

Response

As outlined in the response to community submissions in section 2.11.1 and above, further historical research and survey has been undertaken for the purpose of this assessment which has informed updated assessments of significance for each item included in Appendix D. However, this did not alter the previously ascribed local level of significance for Item 9: Miss Lawson's Guesthouse site. The updated assessment in Appendix D has also included comparative analysis in the case of Item 9: Miss Lawson's Guesthouse site and Item 10: Lawson's Inn site.

The Archaeological research designs for Items 9 and 10 consider the multiple possible heritage values of the potential archaeological remains on these sites (Kottaras and Desic, 2017 see Appendix D). The excavation strategy allows different elements of potential heritage significance to be investigated, should these become apparent. Additional research supporting the research designs has provided considerable new information on each of the sites, suggesting they were less functionally interconnected than previously understood.

Issue description

Item 10 (Lawson's Inn Site) is a circa 1830s inn site, and has been assessed previously as being of state significance, however, it has been argued that the site is of local significance. There is no justification for this change in significance for this item. The mitigation proposed is also unclear because the EIS has argued in Section 7 that full archaeological sites for Items 9 and 10 will be salvaged. However, the executive summary of the Appendix (Table 2, page xvi) specifically states „around a quarter of the site (Item 10) would be directly impacted by construction". Partial excavation of this site is not supported where full impacts may occur through construction and other associated activities which would represent indirect impacts as well as direct impacts. It is recommended this is resolved in the EIS as either completely avoiding the site or fully salvaging the site within an appropriate excavation methodology. The excavation would need to include a methodology an Archaeological Research Design and the nomination of an Excavation Director who meets the Heritage Council Criteria.

Response

The non-Aboriginal heritage technical memorandum in Appendix D includes a copy of and incorporates the findings of a research design and excavation methodology for a number of potentially impacted sites, including item 10: Lawson's Inn.

As noted above and in the technical memorandum in Appendix D of this report, a previous assessment by Australian Museum Consulting reviewed the Liverpool LEP listing for Item 10: Lawson's Inn site and considered it to be of State heritage significance. However, this study did not include a full significance assessment of the site against the NSW Heritage Council's criteria for heritage assessment, including no comparative analysis. Although the findings of the Australian Museum Consulting report were taken into consideration in the assessment of significance for the purpose of this assessment (refer to Appendix D), the site was still determined to be of local heritage significance.

Although construction of the project would directly impact on a portion of the historical curtilage of Lawson's Inn, based on the updated assessment (Appendix D) the inn building, known associated outbuildings and the bulk of anticipated archaeological evidence will be avoided. The Archaeological research design identifies the risk of impacts to associated archaeological deposits that may still be present within the project boundary, and proposes a mitigation protocol.

These areas within the project boundary have been assessed as being of low archaeological potential and would be subject to test excavation in accordance with the research design and methodology for the site to determine the presence of potential heritage (refer to Appendix D).

Issue description

It is recommended that the following additional information be sought from the applicant prior to determination of the application by the Department to address the management of the following heritage items: Orchard Hill Cumberland Plain Woodland (Chaffey Brothers Irrigation Scheme) and Warragamba Supply Scheme pipeline and the identified archaeological sites as follows:

1. Warragamba Supply Scheme

Information to clarify mitigation measures for the proposed impact to this item so that appropriate conditions of consent can be included, where appropriate.

2. Orchard Hill Cumberland Plain Woodland (Chaffey Brothers Irrigation Scheme)

Information to clarify how the proposed mitigation measure of archival recording complies with the advice in the heritage management plan prepared by GML Heritage for management of this high significant item.

3. Historical Archaeological Sites:

a) A full detailed historical archaeological assessment that satisfies the guidelines „Assessing Historical Archaeological Sites and Relics, 2009“ and „Archaeological Assessment 1996“ shall be prepared by the Applicant for item 8 (Lawson’s Inn site) (sic) and Item 9 (Miss Lawson’s Guesthouse site) by an historical archaeologist who has demonstrated experience in excavating and assessing sites of state heritage significance in the state of NSW.

b) This assessment shall include a detailed excavation methodology and research design prepared by the nominated excavation director for the full mitigation of these sites, where the detailed design cannot avoid impact to them. The Excavation program must be undertaken by a person who can demonstrate open area salvage of local and potentially state significant sites in NSW under the Heritage Council of NSW Excavation Director criteria. These documents must be prepared and submitted for the review of the Heritage Council of NSW or its delegate and the approval of the Secretary of the Department of Environment and Planning.

Response

1. Warragamba Supply Scheme

As outlined above, the updated assessment in Appendix D confirms the EIS findings that the project would not result in physical damage to the pipelines. Further detail has also been provided in the statement of impact for this item, with reference to the mitigation measures included in the *Guidelines for development adjacent to the Upper Canal and Warragamba Pipelines* (Sydney Catchment Authority 2012). The listed mitigation measures and guiding principles would be implemented for the project.

2. Orchard Hill Cumberland Plain Woodland (Chaffey Brothers Irrigation Scheme)

As outlined above, the EIS refers to the canal as being ranked of high significance in the HMP prepared for the DEOH site by GML. The EIS also identified the canal as being situated within an area of the DEOH site ranked in the HMP as having a low tolerance for change in relation to new development and demolition/remediation. However, the EIS concluded that given the project is impacting a small proportion of the overall canal, and that the section being impacted is of relatively poor quality, the overall impact on the historic heritage values was not considered to be significant. This still applies in relation to the updated assessment prepared for the purpose of this report (Appendix D). Further to consultation with DOEE, archaeological investigation in the form of test excavation is proposed and would be undertaken in accordance with the research design and excavation methodology prepared for this site (refer to Appendix D).

3. Historical Archaeological Sites

As outlined in the response to community submissions in section 2.11.1 and above, further historical research has been undertaken for the purpose of this assessment which has informed updated assessments of significance for each item. The historical archaeological assessment

conforms to the guidelines „Assessing Historical Archaeological Sites and Relics, 2009“ and „Archaeological Assessment 1996“.

Additionally, the non-Aboriginal heritage technical memorandum in Appendix D includes a copy of and incorporates the findings of a research design and excavation methodology for a number of impacted sites, including Item 9: Miss Lawson’s Guesthouse site and Item 10: Lawson’s Inn site.

Updated assessments for Item 9 and 10 have been prepared by appropriately qualified archaeologists in accordance with the following Heritage Council Guidelines „Assessing Historical Archaeological Sites and Relics, 2009“ and „Archaeological Assessment 1996“.

3.12 NSW Department of Industry (Land and Forestry)

3.12.1 General support

Issue description

The NSW Roads and Maritime Services (RMS) has submitted a State Significant Infrastructure application for The Northern Road Upgrade Project.

Therefore, Department of Industry - Lands & Forestry has no comments at this stage of the proposed Project.

Response

Roads and Maritime acknowledges the support of for the project by the NSW Department of Industry (Land and Forestry).

3.13 Campbelltown City Council

3.13.1 General support

Issue description

I refer to the Environmental Impact Statement accompanying the subject project and the public exhibition of the same and general invitation to comment thereon.

The proposed road upgrade is supported by Council as an important element in servicing existing local communities and local development, the proposed Western Sydney Airport, the South West Priority Growth Area and importantly broader district level travel and transport aspirations.

Council encourages the expeditious construction of the proposed road upgrade in a timely and environmental sensitive manner, as part of a more comprehensive transport network.

Response

Roads and Maritime acknowledges the support of for the project by the NSW Department of Industry (Land and Forestry).

3.14 NSW Office of Environment and Heritage (Biodiversity)

3.14.1 Biodiversity

Issue description

Vegetation Zone 8 has been described in the BAR and entered into the Credit Calculator as Plant Community Type (PCT) 806 (HN627) 'Derived grasslands on shale hills of the Cumberland Plain (50-300m as/)''. This derived PCT has no benchmarks or estimated percent cleared in the Catchment Management Area (CMA) available in the NSW Vegetation Information System (VIS) Classification Database or the Credit Calculator. Derived PCTs can only be used where the assessor has been unable to determine the original PCT (FBA, s.5.2.1.11). According to Sections

3.1.2 and 3.2 of the BAR, the assessor has identified the original vegetation as PCT 850 (HN529) 'Grey Box- Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion'. Information is therefore required supporting the view that PCT 850 is the likely original PCT. Following this, OEH can advise on the next steps with respect to PCT selection and benchmarks for the assessment of Vegetation Zone 8 plot data.

Response

Vegetation Zone 8 was originally described in the BAR and entered into the credit calculator as Plant Community Type (PCT) 806 (HN627) 'Derived grasslands on shale hills of the Cumberland Plain (50-300m asl)'. This vegetation is derived native grassland that has resulted from the removal of the original tree canopy and shrub layer. In some parts the shrub layer is regenerating although no tree canopy remains. This native grassland vegetation is considered most likely derived from a former cover of PCT 850 (HN529) „Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion” given the landscape position, location adjacent to PCT 850, and species composition of the ground layer.

In accordance with the FBA, an assessor must only identify PCTs on the development site that are described in the vegetation information system (VIS) Classification Database as derived or secondary vegetation communities where the assessor cannot determine the original PCT (FBA, s.5.2.1.11). As such Vegetation Zone 8 has been reassigned to PCT 850, as reflected in the revised assessment included in Appendix C.

Issue description

Benchmarks for HN528 and HN529 should be 1 and 50 m for 'Number of Trees with Hollows' and 'Fallen Logs' respectively. These benchmarks should be updated manually in the Credit Calculator with a note made in a revised BAR. It should be noted these updates are based on OEH advice and do not constitute the use of 'More Appropriate Local Data'.

Response

For HN528 and HN529, the benchmark data for the site attributes „Number of Trees with Hollows' and 'Fallen Logs' do not have any values assigned to them in the credit calculator. The OEH have advised that these value should be 1 and 50 m for 'Number of Trees with Hollows' and 'Fallen Logs' respectively.

These benchmarks have been manually updated in the credit calculator and the data has been used in the revised assessment included in Appendix C.

Issue description

There are at least nineteen inconsistencies with plot/transect data entered in the Credit Calculator when compared to the values provided in Appendix A of the BAR (in particular values for 'Native Plant Species'). It is recommended a copy of all raw field data sheets be provided to OEH for review and to determine whether the values in Appendix A (or the Credit Calculator) are correct.

Response

There were some inconsistencies identified with the plot/transect data entered in the credit calculator when compared to the values provided in Appendix A of the BAR. All data entered into the credit calculator has been checked and amended as necessary.

All data entered into the credit calculator has been checked for consistency with the field sheets. A copy of all raw field data sheets is provided in Appendix C.

Issue description

Plot 31 for 'Grey Box- Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion - Moderate/Good' has not been entered in to the Credit Calculator. Although the respective vegetation zone already exceeds the minimum number of plot/transects required, Table 3.1, Section 3.2 and Appendix A of the BAR indicate that Plot 31 was utilised. It is

recommended the Credit Calculator be corrected to include Plot 31 or reference to it be removed from the revised BAR.

Response

Plot 31 was an original Rapid Biodiversity Assessment (RBA) plot carried out on the roadside along Willowdene Avenue. This plot was not used in the revised assessment as presented in this Memorandum as it was located outside of the revised construction footprint and landscape assessment area.

Issue description

The legend of Figure 3.1 (Vegetation survey locations) refers to HN528 as being in 'low' condition, however, Table 3.2 and the credit calculator, HN528 is in 'Moderate/Good' or 'Moderate/Good_Poor' condition. There also seems to be some duplication of PCT names in the legend of Figure 3.1. It is recommended these errors be addressed in the revised BAR.

Response

The legend of Figure 3.1 has been amended to show the correct classification of HN528 as Moderate/Good_Poor and the duplication with labelling has been removed (refer to Appendix C).

Issue description

Table 6.1 (Summary of biodiversity values assessed under the FBA) is missing the area of impact (4.68 ha) for vegetation zone 4 (PCT 849), meaning the total of 6.67 ha shown for 'Grey Box-Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion' should be 11.35 ha. It is recommended this error be addressed in the revised BAR (it is understood vegetation zone 4 is later excluded (Section 8 of the BAR) from further assessment due to having a site value score of <17).

Response

The impacts to Vegetation Zone 4 have been included in Table 3.3 in Appendix C to provide an overview of all impacts to native vegetation. Due to the manual override of the „Number of Trees with Hollows' and 'Fallen Logs' for HN528, Vegetation Zone 4 now has a site score of 29.17 and requires an offset to be calculated.

Issue description

Species credit species *Pultenaea pedunculata* (Matted Bush-pea) was predicted by Credit Calculator for survey but has not been included in the BAR. It is recommended this species be addressed in the revised BAR.

Response

Species credit species *Pultenaea pedunculata* (Matted Bush-pea) was predicted by the credit calculator for survey but has not been included in the BAR.

Pultenaea pedunculata has recently been found in Mulgoa Nature Reserve and there is a record of *Pultenaea pedunculata* from October 2015 about 10-11km south of the study area made from Wivenhoe Conservation area at Cobbity. Prior to this record, the nearest record of *Pultenaea pedunculata* was from Prestons from 1998, around 16 km to the south east of the project.

The habitat assessment table for the BAR was created in September 2015 before the bulk of the ecological surveys were carried out from 2/9/2015 to 10/9/2015. The survey was based off the survey matrix generated by the credit calculator in September 2015. *Pultenaea pedunculata* was not identified as a species for targeted survey in the original survey matrix so this species was not targeted in the detailed field surveys for the BAR. The credit calculator is linked to a threatened species database that is constantly being updated. It is likely that the distribution data for *Pultenaea pedunculata* was edited causing it to appear in the credit calculator after the September 2015 surveys had been completed.

Despite its omission from the credit calculator at the time, the targeted surveys for other threatened plants (including *Pultenaea parviflora*) for the BAR were carried out from September 2015 to February 2016 within the flowering period and optimal survey period for *Pultenaea pedunculata*. *Pultenaea pedunculata* was not found within the study area during the surveys but there is a high likelihood that *Pultenaea pedunculata* would have been encountered during the surveys if the species was present in the habitat at that time.

A summary of the assessment for *Pultenaea pedunculata* is provided in Appendix C.

Issue description

It is unclear why the habitat assessment table for threatened fauna species does not include the number of Atlas records in the 'Number of records' column. It is recommended this information be included in the revised BAR.

Response

The habitat assessment table for threatened fauna species in the BAR did not include the number of Atlas records in the 'Number of records' column. This information is now included in Appendix C.

Issue description

The BAR and Biodiversity Offset Strategy (BOS) refer to the Grey-headed Flying-fox as an ecosystem credit species. It is, however, both an ecosystem and species credit species. OEH understands while no impact to camps (species credits) have been identified and that therefore no species credits are required for the Grey-headed Flying-fox, it is recommended the revised BAR and BOS make this clear.

Response

The BAR and BOS refer to the Grey-headed Flying-fox as an ecosystem credit species. It is, however, both an ecosystem and species credit species. The Grey-headed Flying-fox is a dual credit species because foraging habitat is broad ranging but breeding camps are localised and, if impacted, must be offset by protecting and enhancing another breeding camp.

As no breeding camps would be impacted by the project and only foraging habitat was present, the Grey-headed Flying-fox was only identified as an ecosystem credit species. No species credits are required for the Grey-headed Flying-fox.

Issue description

The GIS shapefile (CD_TNREISVegetationZonesJacobs_20170110_V03) for native vegetation cover does not include all the areas mapped as native vegetation. OEH accepts the exclusion of derived native grassland where the original PCT had a woody over-storey, however, it is unclear why other areas of native vegetation identified as being in moderate good condition have been excluded. It is recommended justification for the exclusion of these areas in accordance with the FBA be provided, or the native vegetation cover shapefile be amended and appropriate recalculations be made to address the missing areas in the revised BAR.

Response

The revised percent extent of native vegetation cover in the landscape and area to perimeter ratio calculations were carried out using ESRI ArcGIS software. To complete the assessment of landscape values, a 550 m buffer was established from the outside edge of the construction footprint. While this is a linear road project there are some detached construction compounds which made using a buffer from the centreline impossible.

Once the native vegetation cover had been digitised, the extent of native vegetation in the landscape before and after the project was recalculated (refer to Table 4.3 in Appendix B). Current percent native vegetation cover is estimated at 12.26 per cent (score 2.5 as outlined in Table 16 of Appendix 5 of the FBA). After the project percent native vegetation cover is estimated at 11.13 per cent (score 2.5 as outlined in Table 16 of Appendix 5 of the FBA). The score for percent native vegetation cover is 0.

Issue description

The BAR does not adequately detail the measures taken to avoid impacts to Cumberland Plain Woodland and River-flat Eucalypt Forest as well as areas of habitat for the *Marsdenia viridiflora* subsp. *viridiflora* endangered population, *Pultenaea parviflora*, Regent Honeyeater and Cumberland Plain Land Snail in accordance with the FBA [sections 8.3.1.3(a) or 8.3.1.3(c)]. It is recommended these matters be addressed in the revised BAR.

Response

The BAR details the measures taken to avoid impacts to Cumberland Plain Woodland and River-flat Eucalypt Forest as well as areas of habitat for the *Marsdenia viridiflora* subsp. *viridiflora* endangered population, *Pultenaea parviflora*, Regent Honeyeater and Cumberland Plain Land Snail.

Section 8.3.1.3 of the FBA states that the proponent must seek to avoid the direct impacts of the Major Projects on all biodiversity values at the development site including impacts on:

- Endangered ecological communities (EECs) and critically endangered ecological communities (CEECs)
- PCTs that contain threatened species habitat
- Areas that contain habitat for vulnerable, endangered or critically endangered threatened species or populations, as determined in accordance with Step 5 in section 6.5.

Section 7.1 of the BAR outlines the measures that were taken to avoid impacts to EECs, CEECs, PCTs that contain threatened species habitat, and areas that contain habitat for vulnerable, endangered or critically endangered threatened species or populations. Chapter 4 of the EIS describes the alternatives to the project that were considered as part of the project development process and explains how and why the project was selected as the preferred option. Chapter 4 of the EIS also outlines how particular elements of the project have been refined.

All of the *Pultenaea parviflora* and *Marsdenia viridiflora* subsp. *viridiflora* records within the study area were made from habitat directly adjacent to the existing Northern Road and Kings Hill Road within Segment 1 that would be subject to road widening. There were no options for avoiding impacts to these species, as the existing road would be widened in this area instead of realigning the road. Avoiding impacts to these species would require realignment of the existing Northern Road which would have greater impact than the widening.

For Segment 2 of the project, a RBA was carried out in the area of the four short listed options under consideration. The aim of the RBA was to make an initial preliminary assessment of significant ecological values potentially affected by the Segment 2 short listed options to inform EIS. The RBA involved desktop analysis and field surveys and included plot-based vegetation condition assessment, fauna habitat assessment and targeted searches for threatened species. An analysis of the biodiversity data was carried out with reference to the short listed route options proposed (i.e. east versus west options). The analysis was carried out within a GIS by overlaying the short listed options onto the vegetation mapping layer that showed threatened ecological communities (TECs) and known or potential habitat for threatened species. Potential worst-case impacts were quantified based on a 100 m wide corridor and considered impacts to TECs, further fragmentation of woodland, and the direct loss of vegetation / habitat. Impacts to TECs (i.e. Cumberland Plain Woodland and River-flat Eucalypt Forest) were estimated to be greater for the eastern option. The total loss of vegetation and habitat (including habitat for Regent Honeyeater, Cumberland Plain Land Snail) would also be greatest with the eastern option. The western option was chosen for the project as there were predicted to be lesser impact to TECs and habitats.

The impact calculations as part of the BAR were based on a worst case scenario involving clearing of all vegetation and habitat within the construction boundary based on the EIS design. The revised footprint has been assessed and would result in the following reduction of impact to:

- Native vegetation has decreased by 3.50 ha compared to the EIS design

- Four *Marsdenia viridiflora* subsp. *viridiflora* plants along the DEOH fence has been avoided as this area won't be used for construction or operation
- *Pultenaea parviflora* has increased to six plants after the additional targeted survey for *Pultenaea parviflora* and *Marsdenia viridiflora* subsp. *viridiflora* was carried out in an expanded study area around the Vineyard Road extension on the 7th August 2017. Six *Pultenaea parviflora* plants were found in the area of the Vineyard Road extension of which four would be avoided as they are outside of the construction footprint
- Habitat for the EPBC Act listed species" Grey-headed Flying-fox, Regent Honeyeater, Swift Parrot and Large-eared Pied Bat has been reduced by 2.15 ha
- The TSC Act listed critically endangered Cumberland Plain Woodland in the Sydney Basin Bioregion ecological community has reduced by 2.96 ha
- The TSC Act listed River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions endangered ecological community has been reduced by 0.43 ha
- The EPBC Act listed critically endangered Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community has been reduced by 1.29 ha.

Further opportunities to reduce impacts to biodiversity would be investigated and considered during detailed design of the project. Additionally, mitigation measures would be implemented to further mitigate any potential biodiversity impacts to biodiversity during construction of the project (refer to Chapter 6).

Issue description

Impacts to two entities are identified in the BAR as requiring further consideration: Cumberland Plain Woodland and Regent Honeyeater. The additional information required by the FBA (s9.2.4 and s9.2.5) has been provided and considered by OEH. In accordance with s9.2.1.1(c) of the FBA, OEH considers the loss of approximately 29.15 ha moderate/good condition Cumberland Plain Woodland (including 1.25 ha in high condition), and associated indirect impacts resulting from fragmentation, to be unacceptable without the implementation of additional offsets (above those already calculated), supplementary measures or other actions. It is recommended the BOS be updated, in consultation with OEH, to address this matter. OEH is satisfied with the number of Regent Honeyeater credits calculated and to be provided to offset impacts to this species' habitat; no additional offsets, supplementary measures or other actions are required for this species.

Response

Roads and Maritime are currently working in consultation with OEH to address this matter and determine the quantum of offsets or supplementary measures that are required. Supplementary measures at a landscape scale are being investigated in conjunction with the OEH.

Following discussions with Roads and Maritime, DoEE and OEH, it was decided that an additional supplementary measures package would be developed in consultation with OEH and DoEE with a focus on landscape scale measures within the local area. The package may include measures such as weed eradication programs within Cumberland Plain Woodland.

Issue description

Sections 3.7 and 3.9 of the BOS identifies that no credits are available to meet the respective 2,021 and 1,400 credit offset requirements for the Regent Honeyeater and *Marsdenia viridiflora* subsp. *viridiflora* - endangered population, but that land may be available (for future creation of credits) via an expression of interest on the BioBanking Public Register. OEH recommends further information be provided detailing the measures that will be taken to secure the required credits for these species. It should be noted that variation rules are not available for Critically Endangered species.

Response

The BOS identifies that no credits are available to meet the offset requirements for the Regent Honeyeater and *Marsdenia viridiflora* subsp. *viridiflora* - endangered population, but that land may be available (for future creation of credits) via an expression of interest on the BioBanking Public Register.

If credits for Regent Honeyeater and *Marsdenia viridiflora* subsp. *viridiflora* (or any other required credit) are unavailable for purchase on the market, the first step is that Roads and Maritime would work with public and private landholders to enter a BioBanking Agreement on their land and then purchase the credits issued.

Issue description

OEH is aware that the Department of Defence will need to clear vegetation to provide vehicle access along the inside of the new fenceline in some parts of the project. OEH considers any clearing of vegetation required a consequence of the project which should be addressed in the assessment of impacts. It is unclear if this has occurred. If not, an adjustment to the calculations of offset credits will be necessary prior to the approval of the BOS.

Response

The potential loss of vegetation and habitat associated with the project is summarised in Table 3.3 in Appendix C. The construction footprint would impact on up to about 40.79 ha of native vegetation (refer to Table 3.3 in Appendix C). This is a decrease of 3.50 ha in comparison to the EIS design (the original impact to all Vegetation Zones was 44.29 ha). These impacts have been quantified based on the refined design footprint and take into consideration potential temporary disturbance during construction including compound sites and upgrading of drainage.

This refined design and associated re-calculation also takes into account the clearing that the Department of Defence will need to clear vegetation to provide vehicle access along the inside of the new fence line in some parts of the project.

Issue description

The BAR notes that surveys were constrained by property access. It should be noted that threatened species surveys for these areas will need to be completed (and new calculations performed, if necessary) prior to the finalisation of the BOS.

Response

An additional targeted survey for *Pultenaea parviflora* and *Marsdenia viridiflora* subsp. *viridiflora* was carried out in an expanded study area around the Vineyard Road extension on 7 August 2017. This area was not able to be accessed during the fieldwork carried out for the EIS. An area of habitat of about 4.7 ha was surveyed by an experienced botanist following the methods described in the *NSW Guide to Surveying Threatened Plants* (OEH, 2016). Traverses of this habitat were carried out over a three-hour period for a distance of 3.131 km (3,131 m) (refer to Figure 5-1).

The survey located a further six *Pultenaea parviflora* plants (two of which were in the construction footprint, and four outside of the footprint). No additional *Marsdenia viridiflora* subsp. *viridiflora* were recorded. The additional impact to *Pultenaea parviflora* has been included in the reassessment of impacts (refer to Appendix C and section 5.1.3).

3.14.2 Hydrology and flooding

Issue description

Appendices C and D (of the Mulgoa to Glenmore Park Technical Paper) provide comparisons of peak flows which show increase in peak flows (5% to >100%) in affected areas in frequent events such as 2 and 10 year ARI and the 1% AEP event. It is indicated these increases are acceptable as the affected areas are limited to undeveloped pastoral lands. OEH highlights that increasing the peak flows would result in more frequent inundation to affected pastoral lands which would

increase damages and flood liability on owners of these lands. Similarly, Chapter 7 of the Technical Papers also shows significant increases in level of the PMF (up to 2m) which results in significant flood risk to undeveloped pastoral lands. OEH recommends the impact of the project on flood damages and emergency management planning be assessed and consulted with land owners and relevant councils in the early stage of the planning.

Response

Roads and Maritime considers that the potential impact the project would have on flooding and drainage patterns in presently undeveloped pastoral land, would be within acceptable limits. It is also acknowledged that the majority of land adjacent to the road corridor is likely to undergo significant development as part of the proposed land-use changes identified for the region (such as the WSPGA and the Western Sydney Airport). The minor impact of the project is not considered likely to preclude and development on adjacent land due to changes in flood and drainage patterns.

Issue description

Significant increases in level of the PMF would also affect four existing dwellings resulting in over floor flooding (D1 to D4 as shown in Figure 7.27). Two of these dwellings, being D3 and D4, are not flood affected in existing conditions. The Technical Paper recommends the level of the road be lowered where it crosses Badgerys Creek to limit the impacts of the project to two of the above mentioned dwellings (D1 and D2 as shown in Figure 7.30) and limit the increase in over floor flooding to 0.2 m. OEH recommends this be investigated in more detail and considering:

- Whether the road is being and will be used as a flood evacuation route.
- Whether the road will be trafficable in flood events up to 500 year ARI.

Response

Roads and Maritime has committed to lowering the vertical alignment of the road to mitigate the impact the project would otherwise have on flooding behaviour in the vicinity of the existing dwellings noted by the respondent.

The Northern Road between Mersey Road and Elizabeth Drive is not proposed as a flood evacuation route and hence does not require a minimum hydrologic standard of 500 year ARI.

Issue description

Table 7.1 provides summary of residual impacts of the project after the implementation of proposed mitigation measures on catchment hydrology and hydraulic. The Technical Papers adopt an approach of relying on potential increase in vegetation growth due to the increase in the runoff volume to mitigate the scour risk. OEH does not support this approach and recommends that, where there is a risk of scour, identified measures, such as planned vegetation management, be proposed and implemented. The implementation of appropriate streambank vegetation measures is essential in reducing ongoing erosion, sedimentation and impact on waterway health.

Response

Table 7.1 in the EIS Appendix K1 (Flooding and hydrology) outlines proposed mitigation measures where there would be a risk of scour due to increased volume and rate of water flow.

Scour protection measures such as rock mattresses would be installed at transverse drainage inlets and outlets, and rock lined spillways would be installed in permanent basins to mitigate erosion and scour risks.

Table 7.1 notes that despite installation of such mitigation measures, there may be some residual scour potential and that this risk would be further mitigated by increased vegetation expected in areas that may become wetter due to predicted flows.

Scour protection measures would be monitored for effectiveness during construction and operation and corrective measures would be implemented where required.

Planned vegetation management for the project would be undertaken in accordance with the landscape plan.

3.15 NSW Environment Protection Authority

3.15.1 Noise and vibration

Issue description

The EPA has concerns regarding the measured “rating background level” (RBL) for Saturday afternoon. This period between 1pm and 6pm Saturdays is described in the EIS as “Out of Hours Works – Day”. The RBL in this period is up to 7 dB(A) above what is measured during standard construction hours.

The EPA’s concerns are:

- That the RBL was assessed using only one day of data. Part 3 of the NSW Industrial Noise Policy states that the equivalent to one week’s worth of valid data covering the days and times of operation of the development should be used in determining RBL. This is designed to ensure multiple measurements are taken for each period and the median of data is used to set the RBL. Using only one Saturday afternoon of monitoring data does not give enough data to obtain a representative RBL for each catchment.
- There is no assessment undertaken as to why the RBL on Saturday afternoon is higher than the standard construction hours RBL. Traffic data for the Saturday afternoon period is not broken down to cover this period so the higher RBL cannot be linked to increased traffic.

The EPA recommends that the proponent either:

- Undertake further monitoring for the Saturday afternoon period, and
- Provide further justification as to why the RBL in this period is higher, or
- Use the RBL from standard construction hours in the Saturday afternoon period.

Response

Roads and Maritime acknowledges that the information presented in Table 10-3 of the noise and vibration technical working paper (and corresponding Table 7-19 of the EIS) is incorrect in relation to the rating background level (RBL) and associated NML values for the OOHW Day period (ie between 1pm and 6pm Saturdays). As per the recommendation from the EPA, it is proposed to apply the RBL from standard construction hours to the Saturday afternoon period instead during further assessment as part of the development of the CNVMP.

It is noted that this error does not largely affect the outcome of the impact assessment which was based on works during standard day time hours (which would account for revised OOHW Day impacts) and OOHW works which is assessed against the OOHW Night NMLs. Accordingly, this error would not change the outcome of the noise impact assessment, including assessment of potential for sleep disturbance.

Issue description

Recommended Condition of Consent

Hours of operation:

Standard construction hours

- Unless permitted by an environment protection licence, construction works and activities must:
 - a) only be undertaken between the hours of 7:00 am and 6:00 pm Monday to Friday
 - b) only be undertaken between the hours of 8:00 am and 1:00 pm Saturday

- c) not be undertaken on Sundays or Public Holidays.
- All works and activities must be undertaken in a manner that will minimise noise and vibration impacts on sensitive receivers.
- The licensee must ensure that all feasible and reasonable noise and vibration mitigation and management measures are implemented during construction work authorised by this licence, in accordance with the Interim Construction Noise Guideline (DECC, 2009).

High noise impact works

High noise impact works and activities, except as expressly permitted by an EPL, must only be undertaken:

- a) between the hours of 8:00am to 6:00pm Monday to Friday;
- b) between the hours of 8:00am to 1:00pm Saturday; and
- c) in continuous blocks not exceeding 3 hours each with a minimum respite from those activities and works of not less than 1 hour between each block.

For the purposes of this condition „continuous“ includes any period during which there is less than a 1-hour respite between ceasing and recommencing any of the work that is the subject of this condition.

Response

Noted. All relevant conditions of consent would be adhered to in the staging and scheduling of works and associated mitigation measures to be documented in the CNVMP. Work required to be undertaken out of standard hours would be in accordance with the conditions of approval and any environmental protection licence for the project.

Issue description

Community concerns may arise from noise impacts associated with the early arrival and idling of construction vehicles at the development site and in the area surrounding the site.

The proponent be required to ensure construction vehicles do not arrive at the project site or in surrounding areas outside approved construction hours.

Response

Noted. This condition of consent would be adhered to in the staging and scheduling of works and associated mitigation measures to be document in the CNVMP. This recommended measure is in line with the existing management measures identified in the EIS.

3.15.2 Air quality

Issue description

The proponent must ensure that during the construction phase of the project all works are undertaken by such means as may be necessary to minimise dust emissions on the premises and to minimise the release of dust from the premises. This includes:

- Proactive controls to help ensure that the project does not cause exceedances of relevant particle impact assessment criteria.
- Reactive management strategies to ensure that the project impacts are acceptable under adverse conditions, including adverse weather or elevated background concentrations.

The proponent must ensure that construction work is carried out by such practicable means as may be necessary to minimise dust emissions on the premises, and prevent dust emissions from the premises.

Response

Roads and Maritime have experience managing potential air quality impacts associated with the construction of large-scale road development projects. All feasible and reasonable measures to minimise dust would be implemented. section 8.6.8 of the EIS commits to implementing a range of both proactive and reactive control measures to manage impacts associated with dust/particulate matter.

Weather conditions such as wind direction, wind speed, soil moisture and rainfall or dew would substantially influence the day to day potential for dust generation and suspension. Accordingly, project personnel involved in the activities above need to consider the factors affecting dust generation in consultation with their environmental representatives to ensure appropriate mitigation measures are adopted.

Regular monitoring and inspections would be carried out during construction to confirm the effectiveness of mitigation measures.

Issue description

The environmental impacts associated with off road diesel equipment can be a major source of fine particles. The EPA recommends that the proponent assess the environmental impacts associated with heavy vehicles including off road diesel equipment and plant used in the construction of the project.

- This should include but is not limited to:
- Compliance with relevant and current emission standards as prescribed in Australian Design Rules for heavy duty engines and vehicles.
- Strategies for minimising air emissions from off road diesel equipment including but not limited to graders, bulldozers, loaders etc.
- Confirmation that all off road diesel equipment will meet best available diesel emissions standards or be fitted with an appropriate diesel exhaust treatment device where possible.
- The EPA recommends the unnecessary idling of engines be further reduced. Diesel plant engines should be turned off when not in active use and truck engines should be turned off during periods of inactivity and while waiting to load or unload material for three minutes or more.

Response

Emissions and pollutants associated with the operation of diesel powered machinery and plant equipment are generally considered to be too small, too infrequent or too widely distributed to generate any significant off-site pollutant concentrations.

A number of specific environmental mitigation and management measures were identified in section 6.8.6 of the EIS to minimise air quality impacts associated with emissions from general construction activities. These include:

- Inspecting the plant/equipment prior to commencement of works on site
- Conduction routine servicing and maintenance, and subsequent inspections to ensure that equipment continues to operation efficiently.

A CEMP and sustainability strategy would be implemented for the project which would include a number of targets (including for air quality) which would address air emissions including diesel vehicles both on and off road. Additionally, the contractor will be required to produce an air quality management plan which would need to outline the measures to be taken to ensure management of plant and equipment.

As described in section 12.2.2 of the EIS, the CEMP is the overarching management plan for a suite of environmental management documents. It provides a structured and systematic approach to environmental management during construction to:

- Ensure compliance with all applicable environmental laws, obligations and approvals
- To minimise environmental impacts.

The CEMP, including all air quality specific measures would be prepared in consultation with the EPA. It would be provided to the EPA for comment, together with other agency referrals.

3.15.3 Water quality

Issue description

Erosion and sediment control measures should be developed and managed in accordance with Managing Urban Stormwater Soils and Construction, 4th Edition published by Landcom (the „Blue Book“) and Volume 2D Main Road Construction published by DECC (2008). Volume 2D advises that main road construction requires a stronger emphasis on some management principles, particularly:

- erosion control as a pollution prevention strategy
- runoff separation by diverting „clean“ stormwater runoff around the site or away from operational areas
- management and maintenance of long-term controls.

The following Condition of Consent are recommended:

- Erosion and sediment control measures must be developed and managed in accordance with Managing Urban Stormwater Soils and Construction, 4th Edition published by Landcom (the „Blue Book“) and Volume 2D Main Road Construction published by DECC (2008).
- The Proponent shall not cause or permit any waters to be polluted, as defined under Section 120 of the POEO Act.

Response

For the construction phase, the erosion and sediment control measures to be implemented are outlined in Table 8-16 of the EIS and are in accordance with the requirements of the Blue Book (Soils and Construction, 2008 Volume 2D Main Road). The measures contained in the Blue Book are based on field experience and have been previously demonstrated to be effective in mitigation during construction. Strict conformance with the requirements of the Blue Book during the construction period would be required to ensure that the predicted effectiveness is achieved.

As per the Blue Book, a construction SWMP would be prepared as part of the CEMP (see SWC-1) and would contain the construction phase erosion and sediment control measures from Table 8-16. The SWMP would include the requirement for monitoring the effectiveness of mitigation measures through site inspections, monitoring reports and audits. The SWMP includes the provision for continuous improvement through reviews and updates where opportunities for improvement have been identified.

The *Protection of the Environment Operations Act 1997* (POEO Act) establishes the NSW environmental regulatory framework and includes a licensing requirement for certain activities. Environment protection licences (EPLs) are a central means to control the localised, cumulative and acute impacts of pollution in NSW. Any discharge would be in accordance with the EPL for the project.

3.16 NSW Department of Primary Industries

3.16.1 Soil and water

Issue description

Works on waterfront land should be undertaken in accordance with the DPI Water Guidelines for Controlled Activities on Waterfront Land (available at <http://www.water.nsw.gov.au/water-licensing/approvals/controlled-activity>).

Response

The *Water Management Act 2000* defines waterfront land as the bed of any river, lake or estuary and any land within 40 m of the river banks, lake shore or estuary mean high water mark.

As stated in section 8.2.3 of the EIS, all works on waterfront land would be carried out in accordance with the *DPI Water Guidelines for Controlled Activities on Waterfront Land* (2012), including but not limited to those related to instream works and waterway crossings.

Issue description

Watercourse crossings over key fish habitat (as mapped by DPI Fisheries in http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/634354/Sydney_updated.pdf) should be designed and constructed to maintain fish passage, in accordance with the DPI Fisheries Policy and guidelines for fish habitat conservation and management (available at <http://www.dpi.nsw.gov.au/fishing/habitat/publications/pubs/fish-habitat-conservation>).

Response

Noted. As outlined throughout the EIS in particular Sections 7.3 (for biodiversity) and 8.2 (for water quality), waterway crossings throughout the project have been designed in accordance with *Policy and Guidelines for Fish Habitat Conservation and Management* (update 2013) (Department of Primary Industries 2013), *Fish Passage Requirements for Waterway Crossings* (Fairfull & Witheridge 2003), and *Policy and Guidelines for fish Friendly Waterway Crossings* (DPI 2004).

These guidelines provide an effective mitigation, built into design, to minimise impacts to fish and other aquatic wildlife from road projects which may improve the survival rate and protect threatened fish species.

Issue description

The Soil and Water Management Plan should be developed in consultation with DPI Fisheries and DPI Water.

Response

The SWMP developed for construction of the project would be developed in consultation with DPI Fisheries and DPI Water.

Issue description

The EIS notes 50 temporary sediment basins are proposed to be located along the alignment (see Section 8.2.6, page 484). Figure 8.7 shows the location of the sediment basins but it does not overlay the watercourses/ stream order so it is difficult to determine if any of the basins are proposed to be located within the watercourses or riparian corridors. The proponent should clarify if any basins are proposed to be located online or within the riparian corridors. Where possible it is recommended the basins are located outside the corridors, especially where there is remnant native vegetation.

Response

The potential impact on receiving waterways during construction would be effectively mitigated through erosion and sediment controls including appropriately sized temporary sediment basins in accordance with the requirements of the Blue Book.

The proposed locations and sizes of the 50 construction phase sediment basins for the construction phase of the road upgrade are presented in Table 8-15 of the EIS and shown in Figure 8-7 of the EIS. Additionally, detailed information regarding every watercourse crossed by the proposed alignment is provided in Table 7-50 of the EIS.

The design of the sediment basins would be confirmed in conjunction with construction contractors and outlined in the SWMP for the project.

Temporary sediment basins would be located to avoid riparian areas and areas of remnant vegetation. Section 3.16.2 below provides further response regarding the mapping of riparian corridors for the project.

Issue description

The EIS indicates the project would require up to 50 to 60 ML of water (non-potable and potable) and would be sourced from existing water sources along the proposed new alignment (section 5.4.18, page 157). Clarification is required if the water supply from existing water sources only refers to the existing farm dams or if it is proposed to extract water from the local creeks.

Response

Section 5.4.18 of the EIS states that water would be available along the project alignment from existing filling points (potable water requiring metered standpipes) and potentially from the existing water sources along the proposed new alignment. Where existing water sources are not available, water would be transported to site as required.

Existing water sources refers to existing farm dams located along or adjacent to the project. Water would only be sourced from farm dams in consultation with landowners. It is not expected that water would be sourced from local creeks.

Issue description

The EIS notes sections of the un-named tributary of Surveyors Creek need to be realigned where it runs along the eastern side of the Northern Road near Bradley Street (Section 5.2.8, page 109). It indicates the work would involve constructing a new channel alignment including establishing natural bed and bank profiles (section 5.4.8, page 134). The realigned creek should mimic a natural creek system from the local area. A vegetated riparian corridor should be provided along either side of the realigned creek. The riparian corridor width should be consistent with the DPI Water guidelines.

Response

Section 5.4.8 of the EIS states that the tributary of Surveyors Creek on the eastern side of The Northern Road would need to be permanently realigned to accommodate the widened road formation. The tributary is located within the DEOH site on Commonwealth Land. As such realignment of the creek would be carried out in consultation with Defence. It is anticipated that the work would typically involve:

- Removing vegetation (mostly shrubs and grasses) and topsoil
- Constructing the new channel alignment, including establishing natural bed and bank profiles
- Installing scour protection measures
- Establishing vegetation early in the process
- Diverting the creek to the new channel.

The Department's requirements for the realignment of the un-named tributary of Surveyors Creek is noted. Where possible, realignment would be carried out in accordance with the DPI Water guidelines.

The existing environmental management measure SWC-3 has been updated to include the following in relation to rehabilitation of the realigned tributary of Surveyors Creek:

- The permanent stabilisation measures would consist of soft engineering solutions where reasonable and feasible and the realigned creek would mimic a natural creek system of the local area
- The riparian corridor along either side of the realigned creek would be rehabilitated in accordance with the Vegetation Management Plan to be developed for the project in accordance with the DPI Water guidelines.

3.16.2 Biodiversity

Issue description

A Vegetation Management Plan should be developed in consultation with DPI Water.

Response

A new mitigation measure would be added to the revised environmental management measures for the project as follows (refer to management measure B-19 in Chapter 6):

A Vegetation Management Plan would be prepared in consultation with DPI Water prior to construction commencing, including details on:

- The riparian corridor widths along the watercourses in proximity to the project (so that these areas can be avoided where possible)
- Riparian areas potentially temporarily or permanently impacted by the project
- The rehabilitation of riparian areas temporarily impacted
- Riparian offsets as required in accordance with DPI guidelines for the riparian areas permanently impacted.

The Vegetation Management Plan will include a scaled map which identifies:

- The riparian corridor widths in proximity to the project so that these areas can be avoided where possible
- Riparian areas potentially temporarily or permanently impacted by the project
- Rehabilitation and/or riparian offset areas as required. Where the project encroaches on the outer riparian corridor (outer 50% of the vegetated riparian zone) the activity will be offset by connecting an equivalent area to the riparian corridor to ensure the average width of the vegetated riparian zone can be achieved over the length of the watercourse.

Issue description

Should any native fish need to be relocated as part of dam or stream dewatering activities, then a qualified ecologist with a relevant permit issued under section 37 of the *Fisheries Management Act 1994* must be onsite to relocate any locally occurring native fish species according to the permit conditions. There is to be no relocation of any non-native fish species.

Response

Refer to response in section 2.7.4.

Issue description

Mitigation measures B-10 to B-13 and SWC1 to SWC8 should be included as conditions of approval.

Response

Noted.

Issue description

The EIS includes an Environmental Management Measure to “avoid activities in aquatic habitats and riparian zones as much as possible” (Table 12.4, B-10, page 751). The proponent should map the riparian corridor widths along the watercourses and identify the setbacks on the ground to implement this measure. Figures 2.1 and 2.2 in Appendix I show the stream order of the watercourses in proximity to the project. The DPI Water Guidelines for controlled activities on waterfront land (2012) identify the stream order and the associated riparian corridor widths.

Riparian land temporarily disturbed by the project should be rehabilitated following construction with native species from the relevant local native vegetation community. Where riparian land is permanently impacted by the project, riparian offsets should be provided along the relevant watercourse in the vicinity of the works.

A scaled map should be provided which identifies:

- the riparian corridor widths in proximity to the project so that these areas can be avoided where possible
- riparian areas potentially temporarily or permanently impacted by the project
- riparian offset areas.

Response

Refer to section 3.16.2.

Issue description

The EIS notes aquatic habitat assessments were undertaken over two days in February 2016 but due to the limited water availability and limited aquatic habitat macroinvertebrate surveys were deemed unnecessary (section 7.3.1, page 232). Figure 4.3 in Appendix I indicates aquatic surveys were undertaken at 5 sites and 4 of these were farm dams. The proponent should clarify why macroinvertebrate survey monitoring is not proposed along the tributaries of Blaxland Creek on the Orchard Hills Defence Establishment lands (Commonwealth land) and Badgerys Creek and Cosgroves Creek, particularly as the EIS notes that:

- the tributaries of Blaxland Creek at Orchard Hills are among the least disturbed catchments remaining in the Cumberland Plain and are regarded as possibly the most pristine creek system on Wianamatta Shale left in Western Sydney (page 316). It also outlines these tributaries are richer in aquatic macroinvertebrate genera than most other creeks of western Sydney and that the macroinvertebrate community of this catchment has a high representation of disturbance –sensitive species (Table 6.28, page 537). The EIS also indicates the scour potential along three of these tributaries would increase and ground conditions would become wetter as a result of an increase in the rate and volume of flow discharging these tributaries (page 552. While the EIS notes these impacts are not expected to extend to the aquatic areas mapped as moderate to high significance, macroinvertebrate monitoring (baseline, during and post construction) along these creeks would assist to verify that the project has not had an adverse impact.
- the project directly traverses Badgerys Creek and Cosgroves Creek (page 325) and Badgerys Creek maintains permanent residual pools (Table 7.4.1, p 293 and Table 7.50, page 326) and Cosgroves Creek at the time of inspection consisted of a series of disconnected pools. The EIS notes that natural creek lines such as Badgerys Creek at the southern end of the project would be altered (page 608).

Response

Site inspections for the aquatic assessment were visual only, no fish surveys or macroinvertebrate surveys were carried out. Due to the low likelihood of threatened fish species being present, limited water availability and limited aquatic habitat, fish and macroinvertebrate surveys were deemed unnecessary at the EIS stage.

The EIS included an existing management measure for the development of a proposed water quality monitoring program (SWC-2). This measure has been amended in the revised environmental management measures for the project (refer to Chapter 6 of this report) to incorporate details of the duration of proposed monitoring at each stage of the project and requirements for monitoring locations upstream and downstream of potential impacts. This includes water quality monitoring at key fish habitat locations identified in the EIS as follows:

- Badgerys Creek (287912.65E / 6244897.30N)
- Cosgroves Creek (287247.11E / 6249490.76N)
- „Site 29a“ (286060.62 E / 6246544.14N), an intermittent stream
- The large dam at „Site 39“ (286460.594 E, 6247352.348N), fed by several minor 1st and 2nd order streams. These streams are ephemeral with minimal channel definition, only flowing when the upstream dams overflow
- Unnamed tributary of Surveyors Creek (286887.04E/6257728.90N).

These monitoring locations have been incorporated into Figure 5-4 of this report.

Issue description

The EIS notes existing culverts would be upgraded and enlarged to cater for increased flows (page 108). It indicates a total of 11 culverts will be installed and/or replaced at the waterway crossing locations (page 477). It is recommended the design of any upgraded and/or new culverts incorporates naturalised bases and a combination of elevated "dry" cells to encourage terrestrial movement, and recessed "wet" cells to facilitate fish passage.

The EIS notes temporary watercourse crossings may also be required for watercourses traversed by the project and if required the crossings would likely comprise a temporary causeway with culverts to maintain low flows (page 135). The EIS notes all works on waterfront land would be carried out in accordance with the DPI Water Guidelines (page 477). It is recommended this is included as an Environmental Management Measure and condition of approval.

Response

As outlined in section 7.3 of the EIS, detailed design of culverts has been carried in accordance with Fairfull & Witheridge (2003) and DPI (2004) to ensure that barriers to fish are not created and associated long-term impacts to the existing hydrology are minimised.

Five waterway crossings in the study area, including the revised footprint, have been identified as Type 1 – Key Fish Habitats (DPI 2013), as they contain a combination of native aquatic plants and/or woody snags. These watercourses are impacted, intermittently flowing waterways which are also identified as Class 2 – Moderate Key Fish Habitat (Fairfull and Witheridge, 2003) due to the presence of limited in stream aquatic vegetation. Key fish habitats are shown on Figure 5-4 of this report for reference.

Refer to section 2.7.5 for discussion regarding the fragmentation of biodiversity links and habitat corridors.

Issue description

Figures 7.7 and 7.8 (page 8 of 9 and page 3 of 3) in the EIS show a regional corridor along Surveyors Creek which links the Mulgoa Nature Reserve near Glenmore Park to creeks in the Orchard Hills Defence Establishment lands. The widening of the Northern Road would increase the barrier effects of the road where it bisects the corridor (page 342). It is recommended the project incorporates Environmental Management Measures to maintain and/or improve this corridor connection.

Response

Refer to section 2.7.5 for discussion regarding the fragmentation of biodiversity links and habitat corridors.

3.16.3 Socio-economic

Issue description

DPI recommends the conditions of approval acknowledge:

- The actions identified in Table 7-63 (Socio-economic and land use environmental management measures) to address impacts on agribusinesses.
- The continued consultation with landholders in regard to mitigation and compensation measures for relocation of farm infrastructure and access to agribusinesses pre and during construction.

Response

Noted. Many of the mitigation measures outlined in section 7.4.6 of the EIS involve effective and ongoing communications with the community and affected land owners. Should the project be approved, it is anticipated conditions of approval for the project would require the preparation of a Community Involvement Plan (CIP), Community Communications Strategy (CCS) or similar document for the construction phase of the project. Community and stakeholder involvement would be tailored to each phase of the project enabling appropriate consideration and balancing of community and stakeholder's social, economic, environment and functional issues to achieve best for project outcomes.

Issue description

There are several sections of this road for which Department of Industry – Lands & Forestry records show ownership as Shared Crown/Council Road, as follows (listed north to south, Luddenham to Bringelly):

- Plan No: 21594-3000R (approx. 2.5 ha) for the Northern Rd between Park Rd and Purves Rd, which is south of Elizabeth Drive, Luddenham
- Plan No: 21594-3000R (approx. 1ha) for the Northern Rd at the intersection with Park Rd
- Plan No 14004 -3000R (approx. 1.5ha) for the section of the Northern Rd south of Eaton Rd Luddenham.
- Plan No 14005-3000R (approx. 4.5 ha)
- A section of the Northern Rd (approx. 3.5ha)
- DP250961 (approx. 3 ha)
- DP 250961 (approx. 3.5ha) for the Northern Road between the section west of Dwyer Rd and Vicar Park Lane, Bringelly

Lands records show that sections of the Northern Rd outside the strip between Luddenham to Bringelly are managed by the Local Government Authority. Roads in shared Crown/Council ownership should preferably be transferred as necessary to one managing authority, such as Local Government

Response

At completion of the project, a completion survey will be undertaken by Roads and Maritime and a dedicated gazettal plan will be developed along with public road classification.

3.16.4 General support

Issue description

DPI supports the eastern option for the road corridor around Luddenham Village as it has relatively smaller impact on large lot agricultural premises.

Response

Roads and Maritime acknowledges the support for the project by NSW Department of Primary Industries.

3.16.5 Assessment of route options

Issue description

The EIS notes the assessment of route options considered minimising potential impacts on areas of biological diversity and ecological integrity (Table 4.9, page 72). Clarification is required if the assessment considered minimising impacts on watercourses and riparian land that the project crosses.

Response

The options assessment prepared by WSP for the proposal in July 2015 considered the presence of and impacts to waterways in the study area as a result of the proposal. The western most options (Options 5, 6 and 7) were considered to have the greatest impact on waterways in the area. Option 9, which was further to the east than Options 5, 6, and 7, was chosen as the preferred option. Section 4.3.3 of the EIS outlines the evaluation process of the long-listed route options.

3.16.6 Mitigation measures

Issue description

DPI recommends the project includes the following Environmental Management Measures:

- All works on waterfront land should be carried out in accordance with DPI Water Guidelines for controlled activities on waterfront land
- A Vegetation Management Plan should be prepared in consultation with DPI Water prior to construction commencing, including details on:
 - the riparian corridor widths along the watercourses in proximity to the project (so that these areas can be avoided where possible)
 - riparian areas potentially temporarily or permanently impacted by the project
 - the rehabilitation of riparian areas temporarily impacted
 - riparian offsets for the riparian areas permanently impacted.
- Macroinvertebrate monitoring is to be undertaken in the following areas:
 - the tributaries of Blaxland Creek at Orchard Hills to verify that the mitigation measures are mitigating potential impacts on the sensitive macroinvertebrate community of this catchment
 - upstream and downstream of Badgerys Creek and Cosgroves Creek where the project traverses these creeks.
- The proposed water quality monitoring program (SWC-2) should incorporate details on the duration of the baseline monitoring and the construction and operational water quality monitoring. It is recommended the program includes monitoring locations upstream and downstream of potential impacts. The EIS notes the monitoring program will also monitor the effectiveness of the swales (see Section 5.2.12, page 114). SWC-2 indicates the monitoring program would include the requirement to monitor the effectiveness of control measures but it is suggested it includes specific reference to monitoring the effectiveness of the swales.
- Environmental Management Measure SWC-3 to stabilise the realigned tributary of Surveyors Creek should be amended to add that:

- the permanent stabilisation measures should consist of soft engineering solutions where reasonable and feasible and the realigned creek should mimic a natural creek system of the local area.
 - the riparian corridor along either side of the realigned creek should be rehabilitated with local native species and the width of the corridor is consistent with the DPI Water guidelines.
- Environmental Management Measure SWC-4 to construct 50 temporary sediment basins should be amended to add that:
 - the basins are to be located outside of the riparian corridors where possible. If it is necessary to locate the basins in the riparian corridor the basins should avoid disturbing remnant native vegetation.
 - Topsoil (and seedbank) should be removed from native vegetation areas that are to be permanently cleared and relocated and used in the revegetation of riparian areas,
 - Native plants should be transplanted from the areas to be permanently cleared to riparian land that is to be revegetated.

Response

Section 8.2 of the EIS (Soils, water and contamination) states that all works on waterfront land would be carried out in accordance with the DPI *Water Guidelines for Controlled Activities on Waterfront Land* (2012), including but not limited to those related to instream works and waterway crossings. This has been incorporated into the revised environmental management measures for the project (refer to measure B-20 in Chapter 6 of this report).

A Vegetation Management Plan would be prepared in consultation with DPI Water prior to construction commencing. Refer to previous response in section 3.16.2. This new measure has been incorporated into the revised environmental management measures for the project (refer to measure B-19 in Chapter 6 of this report).

As outlined in the previous response in section 3.16.2, the EIS includes an existing management measure for the development of a proposed water quality monitoring program (SWC-2). This measure has been amended in the revised environmental management measures for the project (refer to Chapter 6 of this report) to incorporate details of the duration of proposed monitoring at each stage of the project and requirements for monitoring locations upstream and downstream of potential impacts. Monitoring the effectiveness of control measures has also been updated to include monitoring of swales during operation of the project. The water quality monitoring locations have been incorporated into Figure 5-4 of this report, as per the key fish habitat locations identified in the EIS.

The existing environmental management measure SWC-3 has been updated to include the following in relation to rehabilitation of the realigned tributary of Surveyors Creek:

- The permanent stabilisation measures would consist of soft engineering solutions where reasonable and feasible and the realigned creek would mimic a natural creek system of the local area
- The riparian corridor along either side of the realigned creek would be rehabilitated in accordance with the Vegetation Management Plan to be developed for the project in accordance with the DPI Water guidelines.

The EIS includes an existing management measure for the provision of temporary sediment basins during construction (SWC-4). This measure has been amended in the revised environmental management measures for the project (refer to Chapter 6 of this report) to include that the basins would be located outside of riparian corridors where possible, or where it is necessary to locate the basins in the riparian corridor they would be constructed to avoid disturbing remnant native vegetation. This is linked to the revised biodiversity environmental management measures in relation to the identification and management of riparian corridors.

Additional biodiversity related measures have also been incorporated into the revised environmental management measures for the project as follows (refer to Chapter 6 of this report):

- Roads and Maritime would consider reuse of topsoil as part of the Urban Design Landscape Plan (UDLP) for the project (refer to management measure B-21).
- Roads and Maritime would consider transplanting native species from areas to be cleared into revegetation areas, depending on the type of species being removed and the likely success of transplanting. Plants to be used in revegetation would be sourced from local provenance seed where appropriate and available, and associated seed collection would be undertaken prior to clearing (refer to management measure B-22)
- Rehabilitation of the disturbed areas of the site would be undertaken in accordance with Roads and Maritime Batter Stabilisation Guidelines and Roads and Maritime contractor specifications (refer to management measure B-23).

3.17 Sydney Water

3.17.1 Utilities

Issue description

Sydney Water must be consulted with regarding the following:

- Sydney Water confirms that they are major trunk and reticulation assets within the proposed The Northern Road Upgrade area.
- These assets are used to supply services as per the Sydney Water Operating Licence & regulatory requirements.
- The DN900 and DN750 Raw Water mains is a critical piece of infrastructure transporting water to the Orchard Hills Filtration Plant and supply more than 250,000 of our existing customers.

Response

Noted. The EIS has identified a range of Sydney Water assets within the project area (refer to section 5.4.10 of the EIS). In accordance with the future consultation requirements outlined in section 6.4 of the EIS, Sydney Water would be consulted regarding any impacts to any major trunk or reticulation assets within the project, particularly the DN900 and DN750 Raw Water mains which are understood to supply more than 250,000 customers.

Issue description

For any adjustments of Sydney Water assets:

- Existing Water and Wastewater mains are to be replaced like for like, unless otherwise advised.
- New mains are to be designed and constructed to WSA 03-2011-3.1 SW Edition-2012.
- Water mains must not be located within the roads batter slope, either located at the toe or road shoulder.
- Sydney Water's Asset Adjustment and Protection Manual provides further details and is available on the Sydney Water Website.
- Adjustment/protection, building over/adjacent to asset and/or Section 73 applications are to be submitted through our standard processes. Instructions of the processes and any of related policies can be found on Sydney Water's website.

A Sydney Water accredited Water Servicing Coordinator can assist with in this process regarding the adjustment/deviation/protection of any/all Sydney Water assets impacted along the proposed route of this proposal and submission of subsequent applications required.

The assessment of asset adjustments can be undertaken through the Sydney Water Asset Adjustment process, which will consider the need for relocation or protection of our assets. Additionally, if assets are required to be changed, environmental approval will need to cover any works identified that may fall outside of the project boundary, but will be a result of the project works.

Sydney Water reserves the right to assess, based on final project layout & construction design prepared by the project team and/or their contractors, the impacts on our assets located within the project scope and the potential needs for adjustments funded by the project to accommodate accessibility of our pipes for operational & maintenance purposes, new pavement locations & changes to structures.

Amplification of the mains may be required to facilitate future growth along the development corridor. This will be assessed as adjustment applications are referred to Sydney Water for investigation. Sydney Water has previously met with RMS to outline our requirements for the allocation of space for the construction of future trunk assets required to service growth.

Access will need to be retained throughout the life of the project. Staging and timing will need to be undertaken as part of the design work and delivery of the project, to allow for shutdown & reconnection of our assets to ensure that Sydney Water maintains services to our customers in line with our Operating Licence.

Response

Any adjustments to Sydney Water assets would be carried out in consultation with Sydney Water and in accordance with Sydney Water specifications outlined above and in the attachments to Sydney Water's submission.

Issue description

Works impacting Sydney Water assets (i.e. DN900 & DN750 Raw Water mains) may impact the timing of RMS's programmed works which could add additional costs to the project. It is essential that RMS provide current Management Control Plans (MCP) regarding these projects to Sydney Water, and that updated copies continue to be forwarded to Sydney Water when changes to the programme occur.

Response

As outlined in section 5.4.10 of the EIS, the extent of impact to utilities and services cannot be confirmed until the detailed design is finalised. However, prior to construction, strategies to address potential impacts to the water mains would be developed in consultation with Sydney Water and all efforts would be made to protect the DN900 and DN750 Raw Water mains in accordance with Sydney Water guidelines.

In the event that adequate protections cannot be achieved, these mains would need to be relocated or replaced. These works would be carried out in close collaboration with Sydney Water, and Roads and Maritime would provide current Management Control Plans to Sydney Water for review prior to the commencement of construction.

Issue description

The Northern Road Stage 4 from Mersey Road (just north of) to Adams Road (just north of) Case 154155 has been submitted by WSC (Cardno). An investigation and Letter of Requirements/Works Deeds was issued on 03/02/17. The existing DN150 water main needs to be adjusted. The design plans received 11/07/17 currently being reviewed by internal stakeholders.

Response

Noted.

Issue description

The Northern Road Stage 5 from The Littlefield Road Luddenham and Glenmore Parkway Glenmore Park. RMS has been in discussions with Sydney Water's Delivery Management regarding a trial agreement for the delivery of the pipe adjustment works, however, this is now to include the cut-in works.

Response

Noted. Discussion between Roads and Maritime and Sydney Water regarding a trial agreement for the delivery of pipe adjustment works would be ongoing and would include potential to carry out cut-in works.

Issue description

Stage 6 relates to Northern Road from Adams Road to Littlefields Road. A feasibility Letter of Requirements was issued on 03/02/17. Feasibility letters are only valid on the day that they are issued as their purpose is to provide advice.

There are no water or sewer assets that are impacted. Sydney Water owned land that has received a partial property acquisition from RMS. This property acquisition has been passed on to Group Property for review. The sites are Lot 12 in DP 30775 & Lot 12 in DP 232322.

Response

Noted.

Issue description

Sydney Water drinking water and wastewater mains:

- Sydney Water has no wastewater related comments in relation to the proposed development.
- However, the subject development may impact existing drinking water mains along the Northern Road. Adequate protections of the water main are required during the road works in accordance with the attached technical guidelines.
- Given certain sections of water mains are in Defence Establishment, Orchard Hills's Land, a detailed Review of Environmental Factors may be required in dealing with any unexploded explosives that may exist.
- There are high voltage electric cables on pylons in the area, which could be a potential hazard for maintenance staff when attending repair work on the main. This safety issue needs to be addressed in the EIS to minimise the risks of touching HV transmission lines.

Response

As outlined in section 5.4.10 of the EIS, the extent of impact to utilities and services cannot be confirmed until the detailed design is finalised. However, prior to construction, strategies to address potential impacts to the water mains would be developed in consultation with Sydney Water and all efforts would be made to protect the DN900 and DN750 Raw Water mains in accordance with Sydney Water guidelines.

In the event that adequate protections cannot be achieved, these mains would need to be relocated or replaced. These works would be carried out in close collaboration with Sydney Water and in accordance with the technical guidelines attached to Sydney Water's submission.

Any works within DEOH land would be carried out in consultation with Department of Defence. Works would not commence until a detailed assessment of unexploded ordinance has been completed and any identified ordinance had been cleared.

Potential hazards and risks associated with the construction of the project have been assessed in section 8.9 of the EIS. The likelihood of impacting on high voltage electrical cable would be minimised by undertaking utility checks, consulting with the relevant service infrastructure

providers and if required, protecting utilities within the project area prior to the commencement of construction.

3.17.2 Environment

Issue description

Sydney Water has no comments in relation to environmental impacts relating to the subject proposal.

Response

Noted.

4 Project changes and design refinements

4.1 Overview

The EIS for the project was prepared based on a concept project design (refer Chapter 5 of the EIS). This design has since been refined to account for design changes and in response to submissions received during exhibition of the EIS.

Roads and Maritime identified the need for a number of design refinements to assist in the constructability, to provide for the additional safety of road users and to minimise the environmental impact of the project.

This chapter describes the proposed changes to the project. The results of further assessment undertaken to assess the changes are described in Chapter 5.

4.2 Project changes

4.2.1 Design refinements

An overview of the design refinements for the project is provided in Table 4-1. This includes details of the justification for the change and any further environmental assessment undertaken since exhibition of the EIS in order to assess the change. Figure 4-2 provides an overview of the key design refinements.

Table 4-1 Overview of design refinements and further assessment undertaken

Design refinement / location	Justification for refinement	Further assessment provided	Where addressed in this report
Changes to staging and delivery			
Bus lanes converted from continuous lanes along the main alignment to priority lanes at intersections only at opening with provision for continuous lanes in the future as demand requires.	The project will include bus priority at intersections for project opening. There is currently not the bus frequency along The Northern Road to warrant a dedicated bus lane. Further consideration of timing for the implementation of bus lanes between intersections will be undertaken in conjunction with the TfNSW as they develop and implement the new regional bus network to support the Western Sydney Airport and Priority Growth areas.	Changes to the staging and delivery of the project have not resulted in an increase to the construction or operational footprint of the project. The changes have been considered with regards to traffic and transport assessment.	Section 5.1.1
Staging of the incident response facility	The provision of this facility would be delayed to be in line with commencement of airport operations and M12 Motorway.	No further assessment has been carried out.	N/A
Staging of Littlefields Road, Luddenham, to Glenmore Parkway Glenmore Park (see Table 4-3)	The complexities of utility relocations have become further understood during detailed design resulting in a delayed construction start date and extended construction timeframes of about two years.	Changes to the staging and delivery of the project have not resulted in an increase to the construction or operational footprint of the project.	N/A

Design refinement / location	Justification for refinement	Further assessment provided	Where addressed in this report
Cuttings, embankments and median			
Changes to batter slopes at various locations along the alignment.	Steepening of some batters to a maximum of 1:2 slope has occurred to minimise property impacts particularly on DEOH land. Some batters have been steepened to avoid existing utilities such as water mains.	Refinements to batters and medians have not resulted in an increase to the construction or operational footprint of the project. Changes to the end height of batter slopes has been considered as part of the revised noise and vibration and hydrology and flooding assessments.	Section 5.1.2 and Appendix B Section 5.2.1
Provision of a section of split carriage way for a short section between Gates Road and Longview Road.	To reduce batter impact to properties and improve driveway access gradients on the western side of the alignment.	Splitting of the carriageway and change to elevation of the road has been considered as part of the revised noise and vibration and hydrology and flooding assessments.	Section 5.1.2 and Appendix B Section 5.2.1
Refinements to the width of the median at various locations.	Changes to median for consistency between project stages. Medians narrowed in some locations to reduce project footprint and at intersections to reduce length of staged pedestrian crossings.	Refinements to batters and medians have not resulted in an increase to the construction or operational footprint of the project. Refinements have been considered as part of the revised hydrology and flooding assessment.	N/A

Design refinement / location	Justification for refinement	Further assessment provided	Where addressed in this report
Utilities and services			
Relocation of Endeavour Energy substation from private property to within the road corridor and shared path areas.	Adjustments have been made to reduce property impacts on the western side of the road corridor.	Refinement has resulted in a reduction of impacts beyond the road corridor and as such no further assessment has been carried out. Refinements have been made in consultation with utility providers.	Response to Submission in Chapter 3.
Design criteria (geometry and alignment)			
Superelevation adjustments, changes to the radius of vertical curves and refinements to longitudinal grading at various locations along the alignment.	Compliant super elevations to reduce aquaplaning at several locations. Curve radius generally increased to achieve the required approach sight distance. Grading adjustments to generally improve stormwater drainage management and reduce aquaplaning.	Superelevation adjustments and changes to vertical alignments in some locations have resulted in changes to the height of the road pavement. Where this has occurred it has been considered as part of the revised noise and vibration and hydrology and flooding assessments.	Section 5.1.2 and Appendix B Section 5.2.1
Changes to the vertical alignment (elevating or lowering) of the road.	Minor adjustments to the elevation of the alignment have been made to assist in the management of drainage and to reduce potential impacts of operational road noise.	Superelevation adjustments and changes to vertical alignments in some locations have resulted in changes to the height of the road pavement. Where this has occurred it has been considered as part of the revised noise and vibration and hydrology and flooding assessments.	Section 5.1.2 and Appendix B Section 5.2.1

Design refinement / location	Justification for refinement	Further assessment provided	Where addressed in this report
Local road changes and upgrades			
Refinement of Vineyard Road extension.	Road has been realigned to reduce property impacts and avoid the 750 mm watermain.	Refinement of Vineyard Road extension has been considered in all revised assessments related to changes in footprints such as Biodiversity, Non-Aboriginal and Aboriginal Heritage.	Chapter 5 Appendix C Appendix D
Adjustment to the alignment of the roundabout at Kings Hill Road and Vineyard Road.	To avoid existing water main fittings.	Although a minor refinement, additional biodiversity survey at Kings Hill Road has been carried out.	Appendix C
Gates Link Road alignment realigned further to the east.	Realignment to ensure resident can maintain access to property's water supply and allow for constant width between link road and The Northern Road to not preclude future land use. Refinements have also been made to fit with the proposed drainage strategy and reduce earthworks.	Refinement of Gates Link Road has been considered in all revised assessments related to changes in footprints such as Biodiversity, Non-Aboriginal and Aboriginal Heritage.	Chapter 5 Appendix C Appendix D
Minor adjustments to medians and kerbs along local roads.	General changes to raised medians and kerbs in accordance with Austroads Part 4A, Table 6.1.	No further assessment required.	N/A

Design refinement / location	Justification for refinement	Further assessment provided	Where addressed in this report
The cul-de-sac at Elizabeth Drive has been reconfigured to allow for entry and exit from/to Elizabeth Drive only. Exit from the cul-de-sac to The Northern Road has been removed and replaced with u-turn facility. Second lane opening at u-turn facility on Elizabeth Drive (west of intersection with Northern Road) has been removed and replaced with give way entry into the main traffic.	The left turn onto The Northern Road from the existing Elizabeth Drive was removed due to concerns about the proximity to signalised intersection and traffic management and safety issues. To eliminate weaving over a short distance before the intersection.	Changes to the configuration at Elizabeth Drive have been considered with regards to traffic and transport assessment.	Section 5.1.1
Grover Crescent (north) access changed to left in, left out Grover Crescent (south) access removed.	Improved safety for vehicles entering The Northern Road from Grover Crescent	Changes to Grover Crescent have been considered with regards to traffic and transport assessment.	Section 5.1.1
Intersections			
Refinements to median widths and extents at signalised intersections.	Refinements made to reduce the length of staged pedestrian crossings. The extent of concrete infill of medians on the approach to intersections has also been reduced and replaced with landscaping to enhance urban design outcomes.	Refinements have not resulted in an increase to the construction or operational footprint of the project. As such, no additional assessments have been carried out specific to this refinement.	N/A
Left turn slip lanes removed and splitter islands added to Littlefields Road, Chain-O- Ponds Road, u-turn opposite DEOH and Bradley Street.	Removal of slip lanes allows vehicles to use the bus lane on approach to the intersections for left turns.	Changes to turning movements at these intersections have been considered as part of the additional traffic assessment	Section 5.1.1

Design refinement / location	Justification for refinement	Further assessment provided	Where addressed in this report
Reconfiguration of Littlefields Road intersection to have a left-straight lane and a right turn lane to allow changed signal phasing.	Reconfiguration to allow for staged pedestrian crossings and to accommodate 26m B-Double vehicles.	Changes to the turning movements at intersections have been considered as part of the additional traffic assessment	Section 5.1.1
Round-about on Littlefields Road changed to a u-turn facility.	Additional u-turn facility to accommodate large vehicle access to adjoining property, replacing previously proposed roundabout.	No further assessment required.	N/A
U-turn stub added to roundabout opposite DEOH entrance.	To allow 26 metre b-doubles to access the left lane.	Operational footprint change is within the area previously assessed as part of the EIS construction footprint. No further assessment required.	N/A
Heavy vehicle inspection bays			
Removal of northbound heavy vehicle inspection bays.	After a review of the proposed HVIS at Grover Crescent, it was determined that this site was not suitable from a road safety or operational prospective for the implementation of a HVIS. Several other locations have been identified and investigated, however each of these sites have issues with road safety, operation of the facility, property acquisition, property access and/or utilities. Further to this, there are currently unknowns in regard to the locations of the proposed M12 and Outer Sydney Orbital (M9) and how they interface with The Northern Road upgrade - which may have impacts on the locations of potential northbound HVIS.	No further assessment has been carried out as a result of removing the northbound heavy vehicle inspection bays.	Response to Submission in Chapter 3

Design refinement / location	Justification for refinement	Further assessment provided	Where addressed in this report
	The Roads and Maritime Heavy Vehicle Compliance Section identified and confirmed that there is currently no northbound HVIS. As such, the project was providing a new facility and not replacing an existing facility, as was thought throughout the early project design stages. The northbound facility to the south of Glenmore Parkway which was thought to be a HVIS is an informal truck parking bay. Provision of new facilities is beyond project scope and funding constraints mean additional scope is not possible. No new northbound HVIS is to be provided as part of the project. It was also decided that as the truck parking bay is an informal site and would have similar issues to a HVIS that this facility would not be provided as part of the upgrade of The Northern Road.		
Traffic management facilities			
Removal of Variable Message Signs (VMS) at the approaches to Elizabeth Drive and heavy vehicle inspection bays.	Further investigation determined that a VMS was not required on approach to the heavy vehicle inspection station. Space has been allowed for implementation of VMS required on the TNR southbound approach to the M12 for the future installation of a VMS.	The removal of Variable Message signs has been considered in the revised Urban Design and Visual Impact assessment	Section 5.2.5

Design refinement / location	Justification for refinement	Further assessment provided	Where addressed in this report
Staging of the incident response facility.	The provision of this facility would be delayed to be in line with commencement of airport operations and M12 Motorway.	No further assessment has been carried out.	N/A
Flooding and water quality infrastructure			
Refinements to drainage and water quality infrastructure.	Refinements to road design (described above) has required some changes to the proposed road and pavement drainage design.	Changes to drainage and water quality infrastructure have resulted in a revised water quality assessment and revised flooding and hydrology assessment.	Section 5.2.2Section 5.2.1
Property adjustments			
Property adjustments including provision of new accesses at various locations.	To ensure property access is maintained.	Carried out in consultation with affected property owners. This consultation is ongoing. No further assessment currently required.	N/A

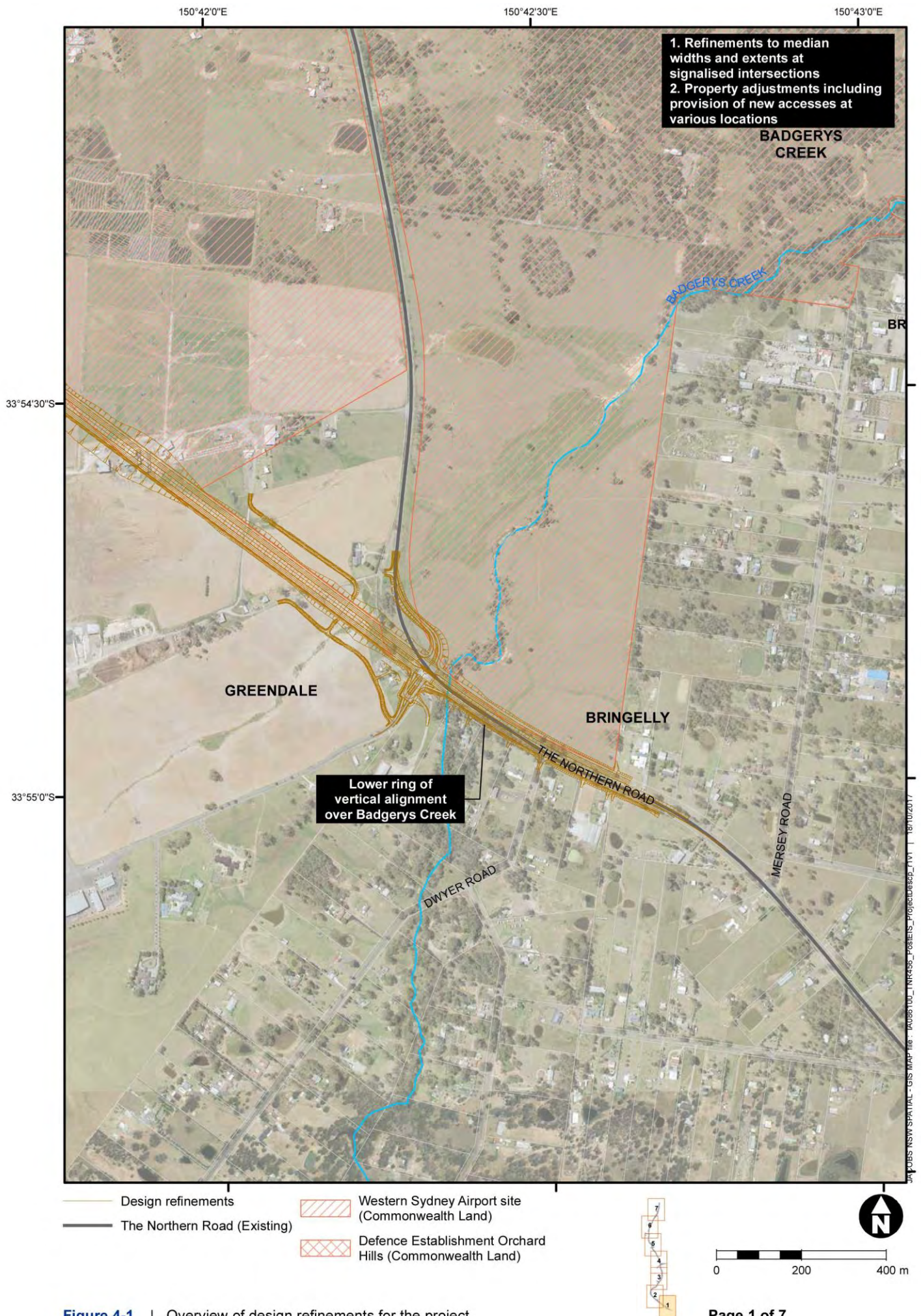
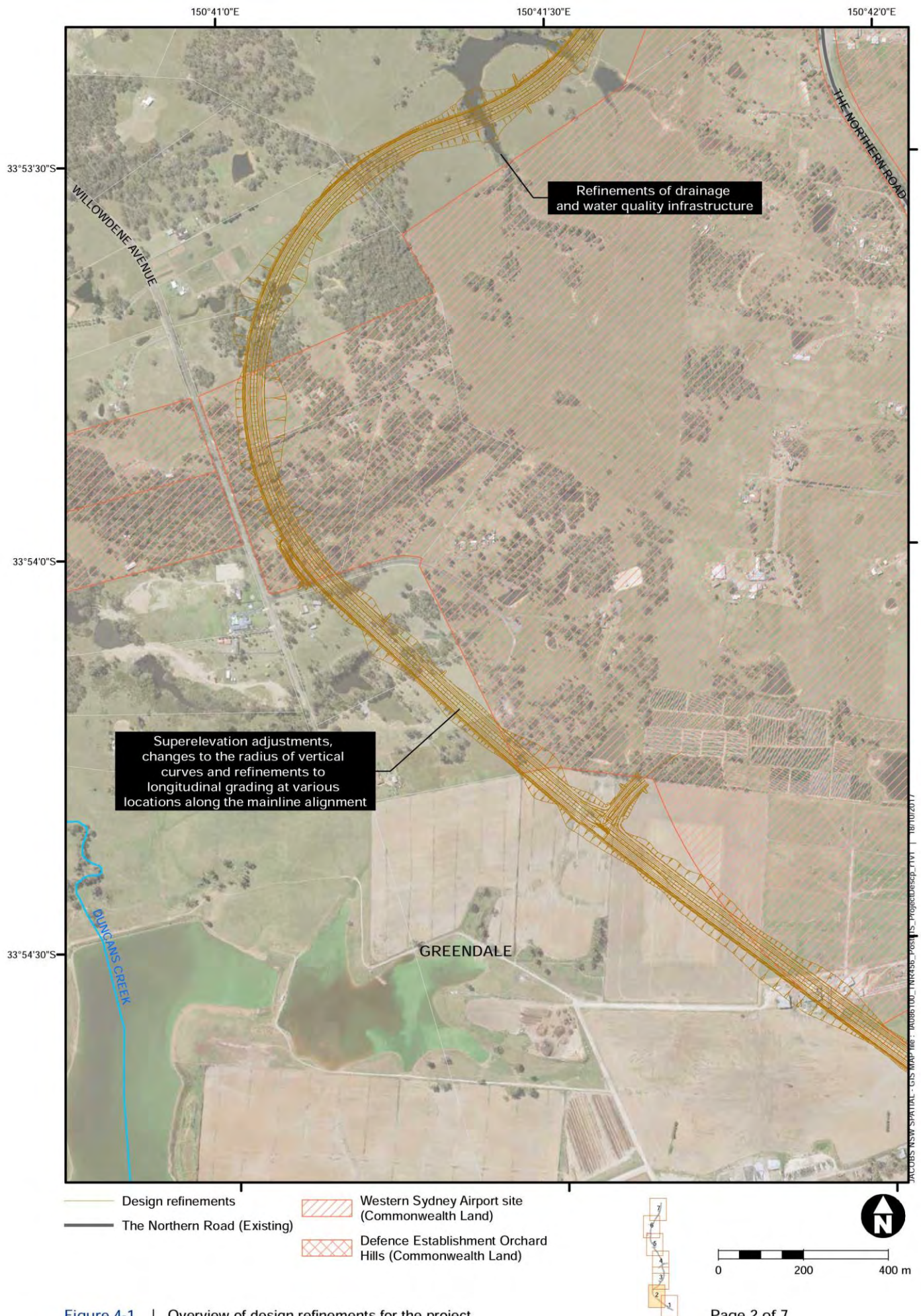


Figure 4-1 | Overview of design refinements for the project



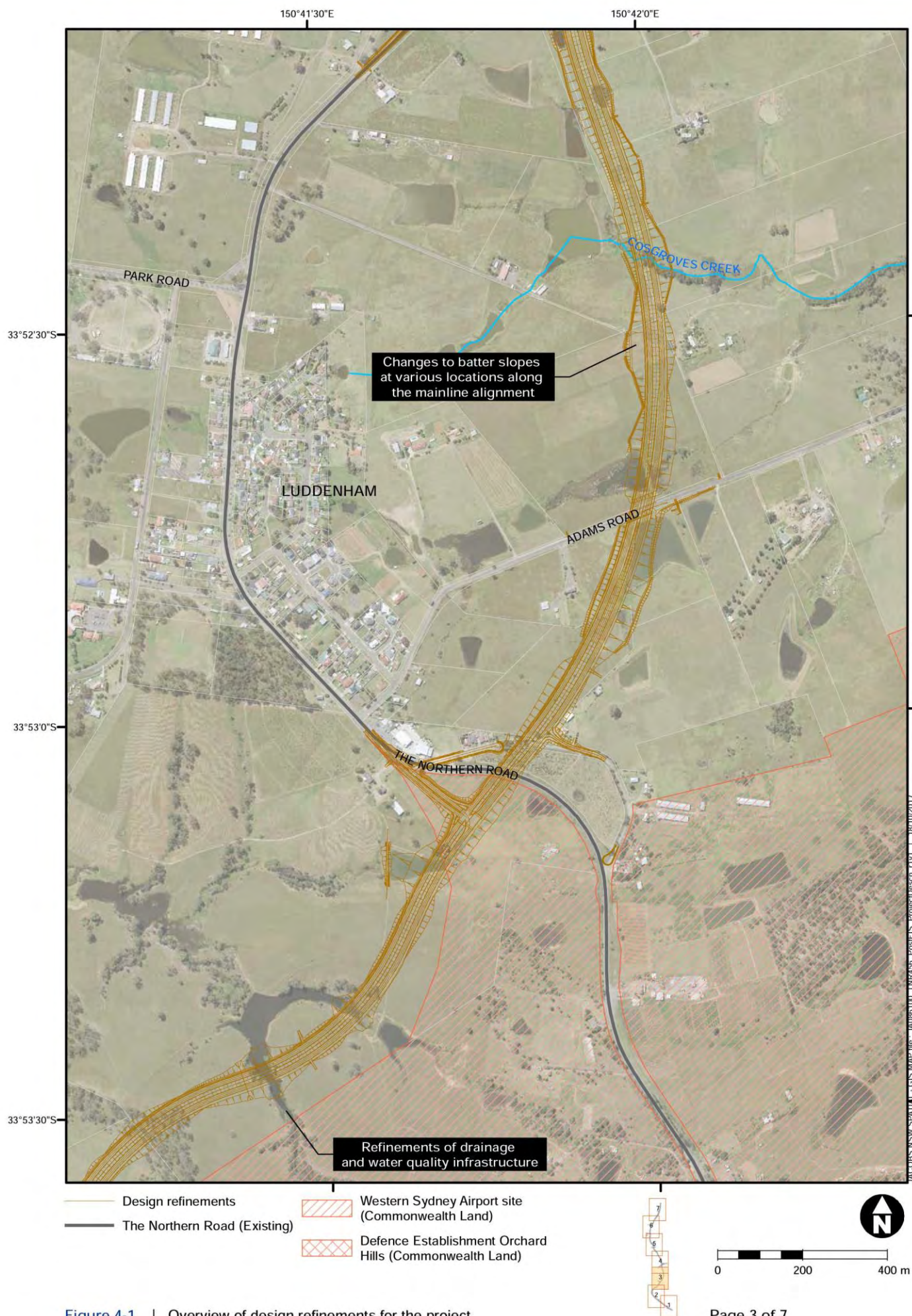


Figure 4-1 | Overview of design refinements for the project

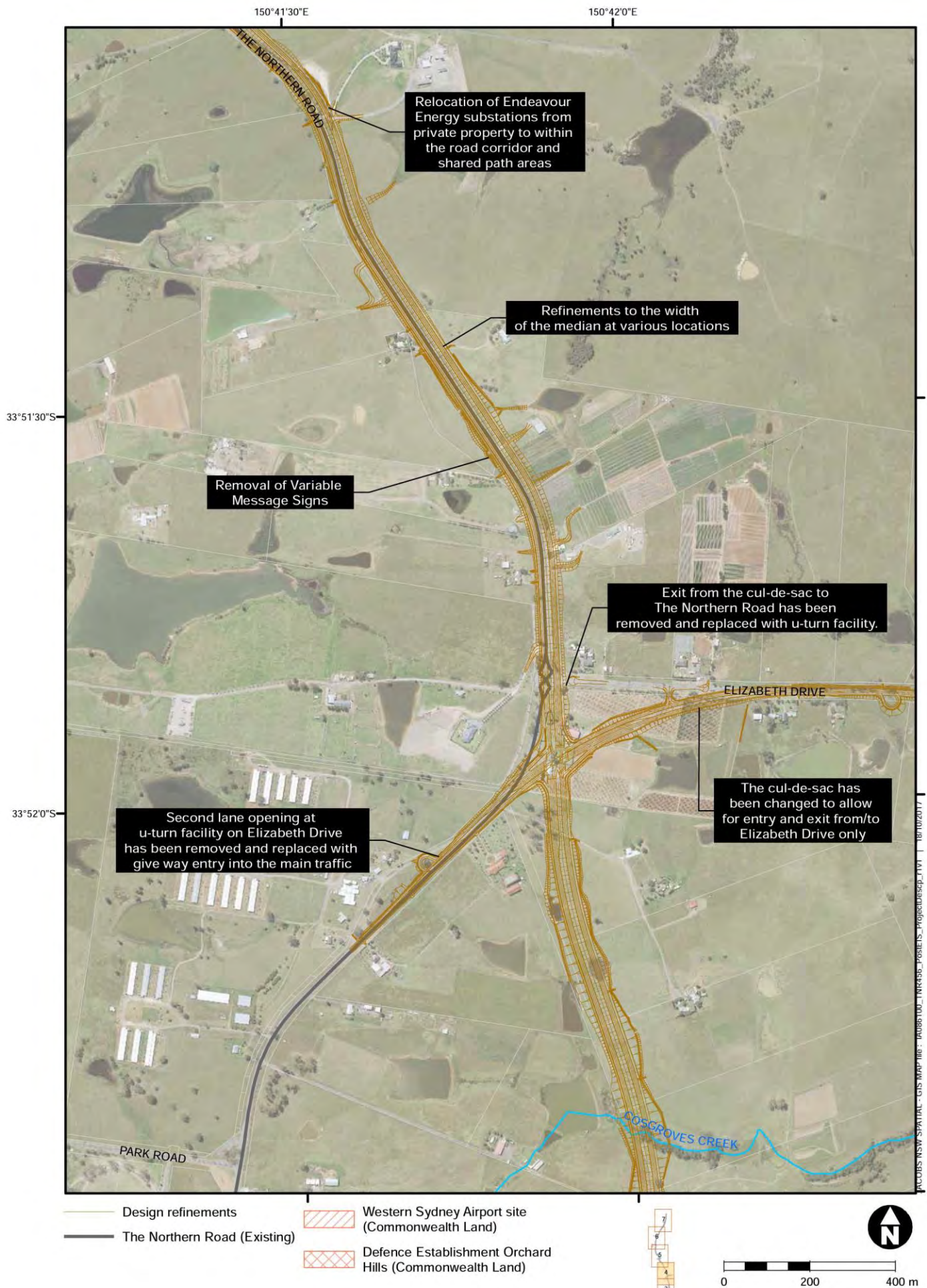


Figure 4-1 | Overview of design refinements for the project

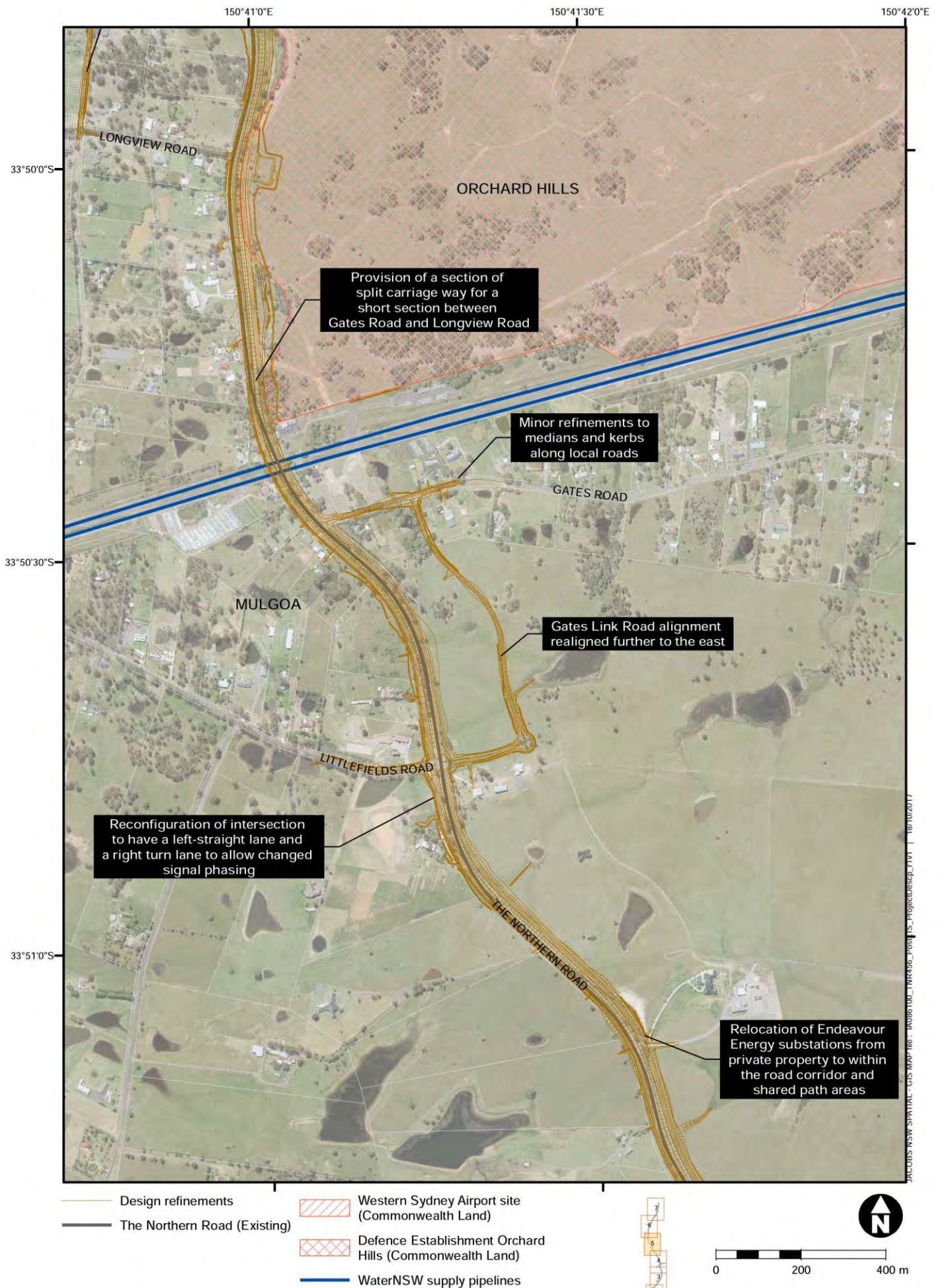


Figure 4-1 | Overview of design refinements for the project

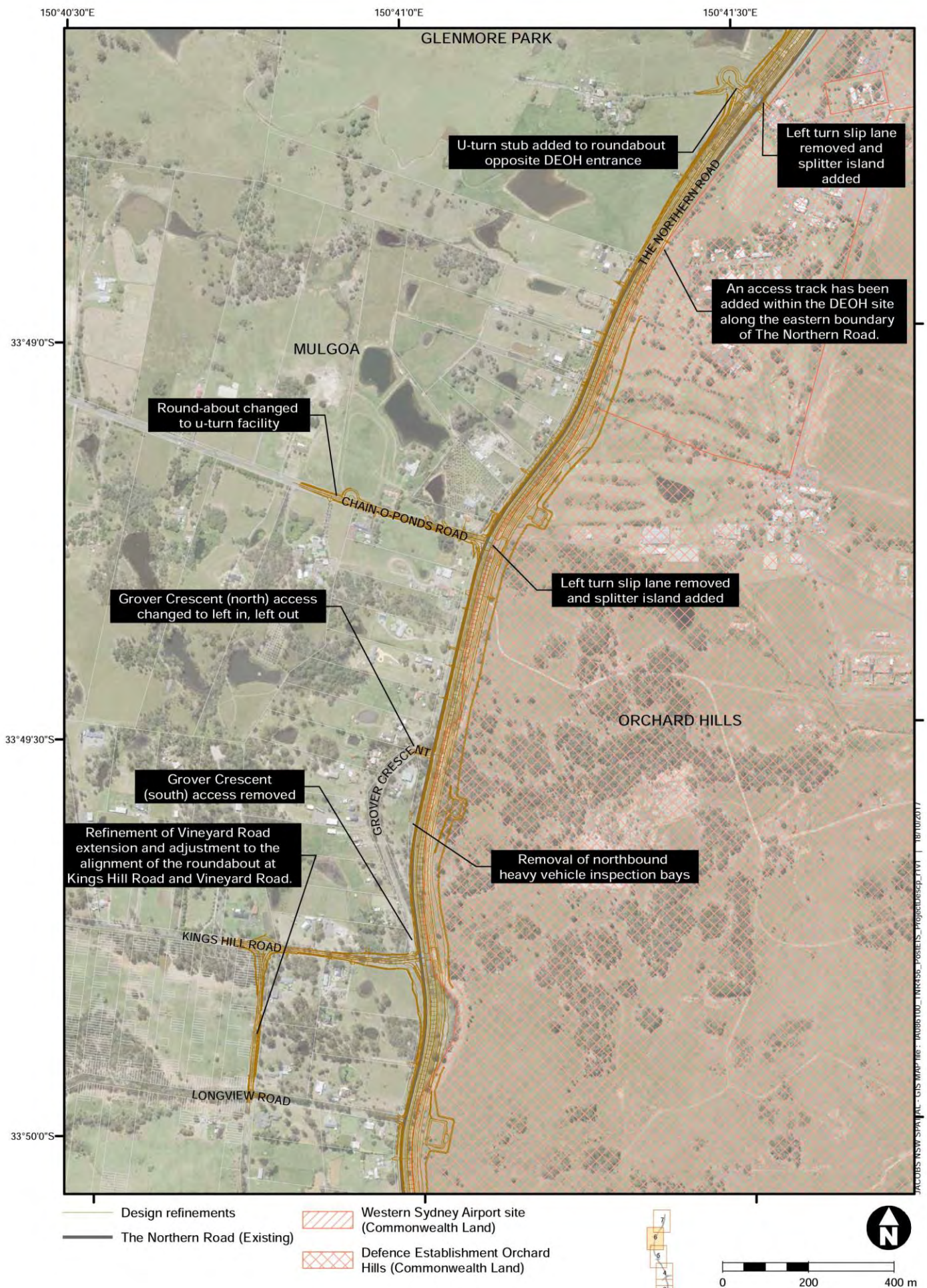
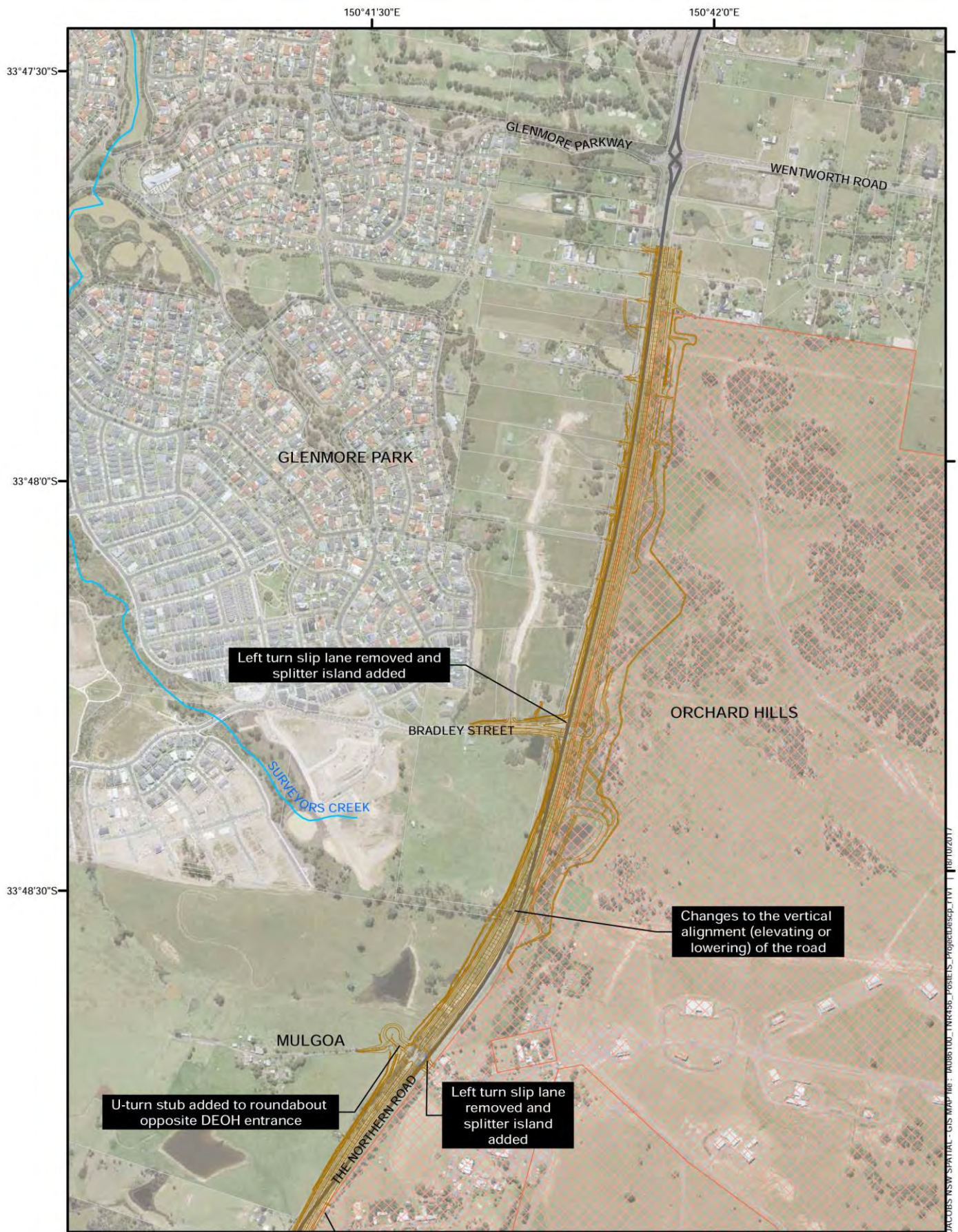


Figure 4-1 | Overview of design refinements for the project



- Design refinements
- The Northern Road (Existing)
- Western Sydney Airport site (Commonwealth Land)
- Defence Establishment Orchard Hills (Commonwealth Land)

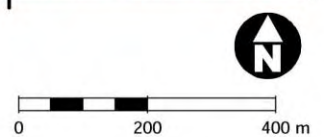


Figure 4-1 | Overview of design refinements for the project

4.2.2 Corridor width and project footprint changes

Some of the design refinements outlined above have resulted in changes to the projects construction and operational footprints.

Table 4-2 provides a comparison of the construction and operational footprints calculated for the design refinements against the footprints assessed in the EIS, with reductions of 10 ha and 16 ha identified respectively. An error in the EIS footprint calculations (EIS – original) was identified during the footprint assessment which has been corrected in the table (EIS – revised).

Table 4-2 also shows a comparison of the Commonwealth land impacted by the project, with an overall reduction of 2 ha across the DEOH site and the WSA sites.

Table 4-2 Revised footprint areas for project stages

Footprint / area	EIS (ha) – original	EIS (ha) - revised	Design refinements (ha)	Change
Construction	278	280	270	10 ha reduction
Operation	202	202	186	16 ha reduction
DEOH	25	25	24	1 ha reduction
WSA	20	23	22	1 ha reduction

Figure 4-2 provides a comparison of the EIS and the refined design construction footprints. Figure 4-3 provides a comparison of the EIS and the refined design operational footprints.

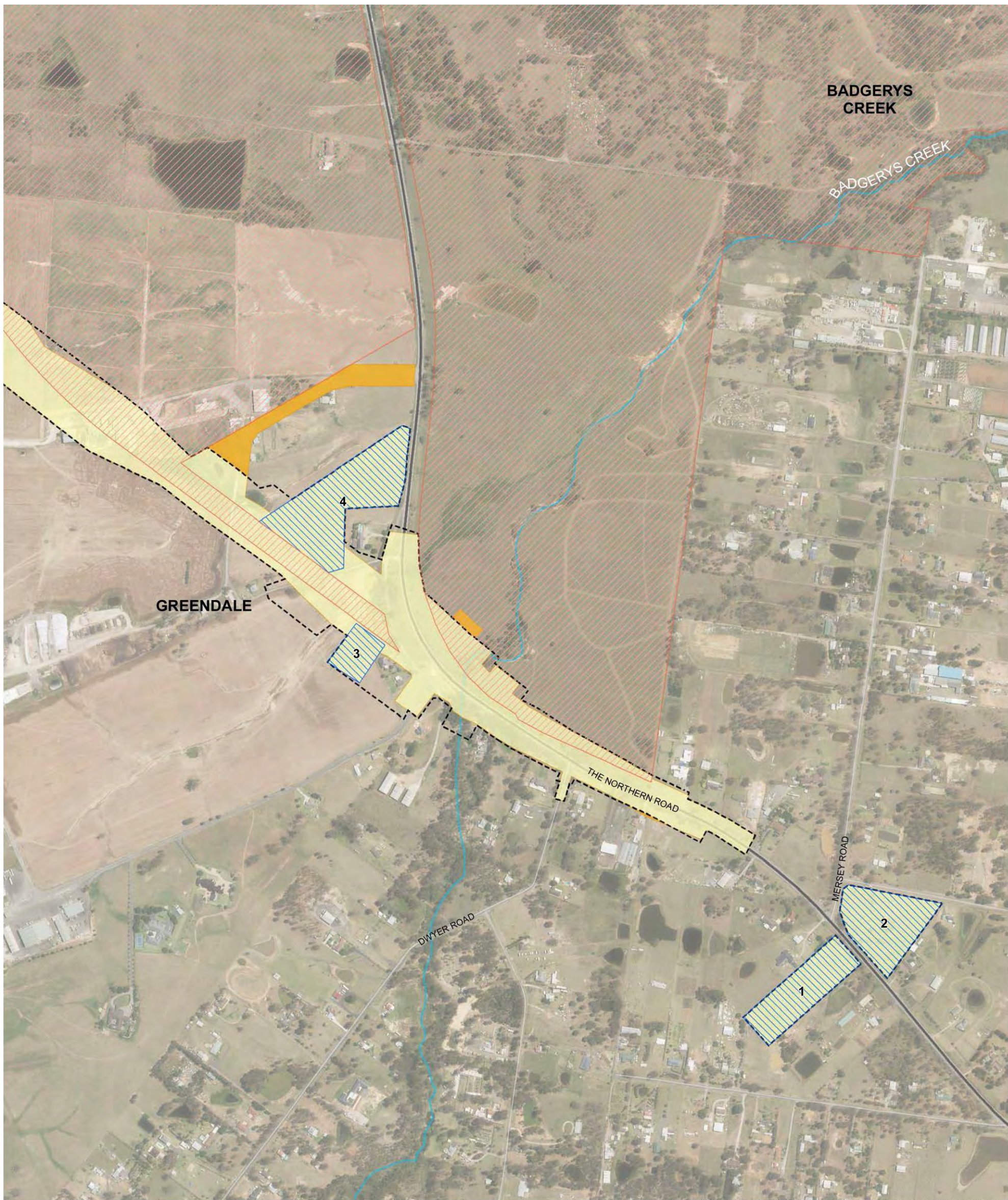
4.2.3 Project timing changes

Table 5-18 in the EIS outlined the indicative construction timeframe for the various construction stages of the project. Further refinement of the proposed construction staging for the project has been provided and is shown in Table 4-3. The timing of these stages would be confirmed once a construction contractor is appointed to the project.

Table 4-3 Revised construction timeframe for project stages

Project construction stage	Project construction timing*				
	2018	2019	2020	2021	2022
Mersey Road, Bringelly, to Eaton Road, Luddenham					
Littlefields Road, Luddenham, to Glenmore Parkway, Glenmore Park					
Littlefields Road, Luddenham to Eaton Road, Luddenham					

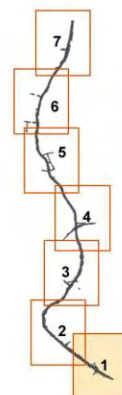
* incident response facility to be delivered in mid 2020s



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_PosEISConstBoundary_EISConstFootprint | 18/10/2017 | DRAWN BY: AA

Legend

- EIS construction footprint
- Refined design construction footprint
- Construction compound sites
- Western Sydney Airport site (Commonwealth Land)
- Additional areas of construction footprint due to design refinements

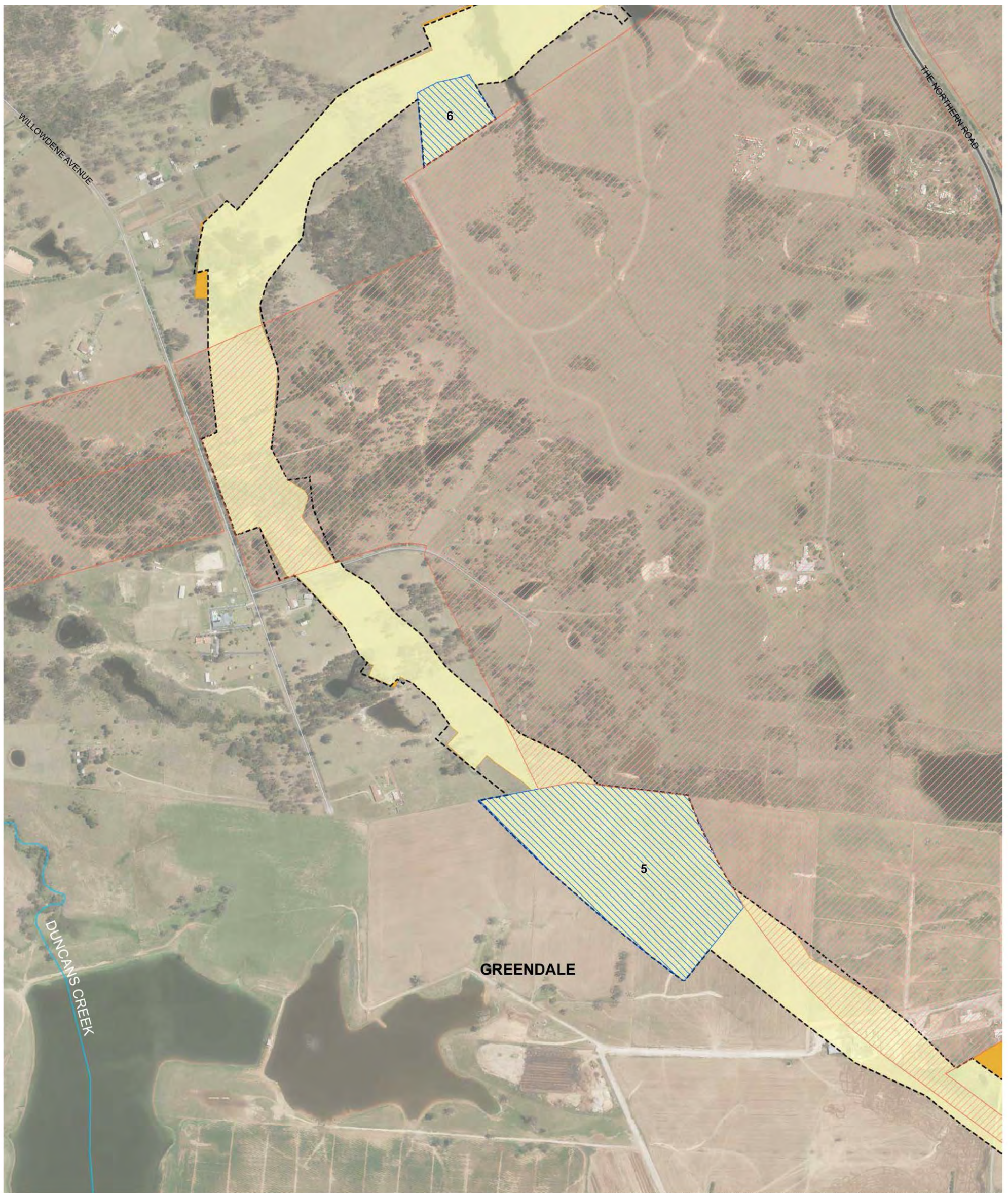


The Northern Road upgrade -
Mersey Road to Glenmore Parkway
**Construction Boundary and
Compound Sites**

Figure 4-2 | Comparison of EIS and refined design construction footprints

JACOBS

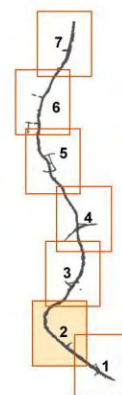
NSW Spatial | ANZ Infrastructure and Environment | www.jacobs.com



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_PosEISConstBoundary_EISConstFootprint | 18/10/2017 | DRAWN BY: AA

Legend

- EIS construction footprint
- Refined design construction footprint
- Construction compound sites
- Western Sydney Airport site (Commonwealth Land)
- Additional areas of construction footprint due to design refinements



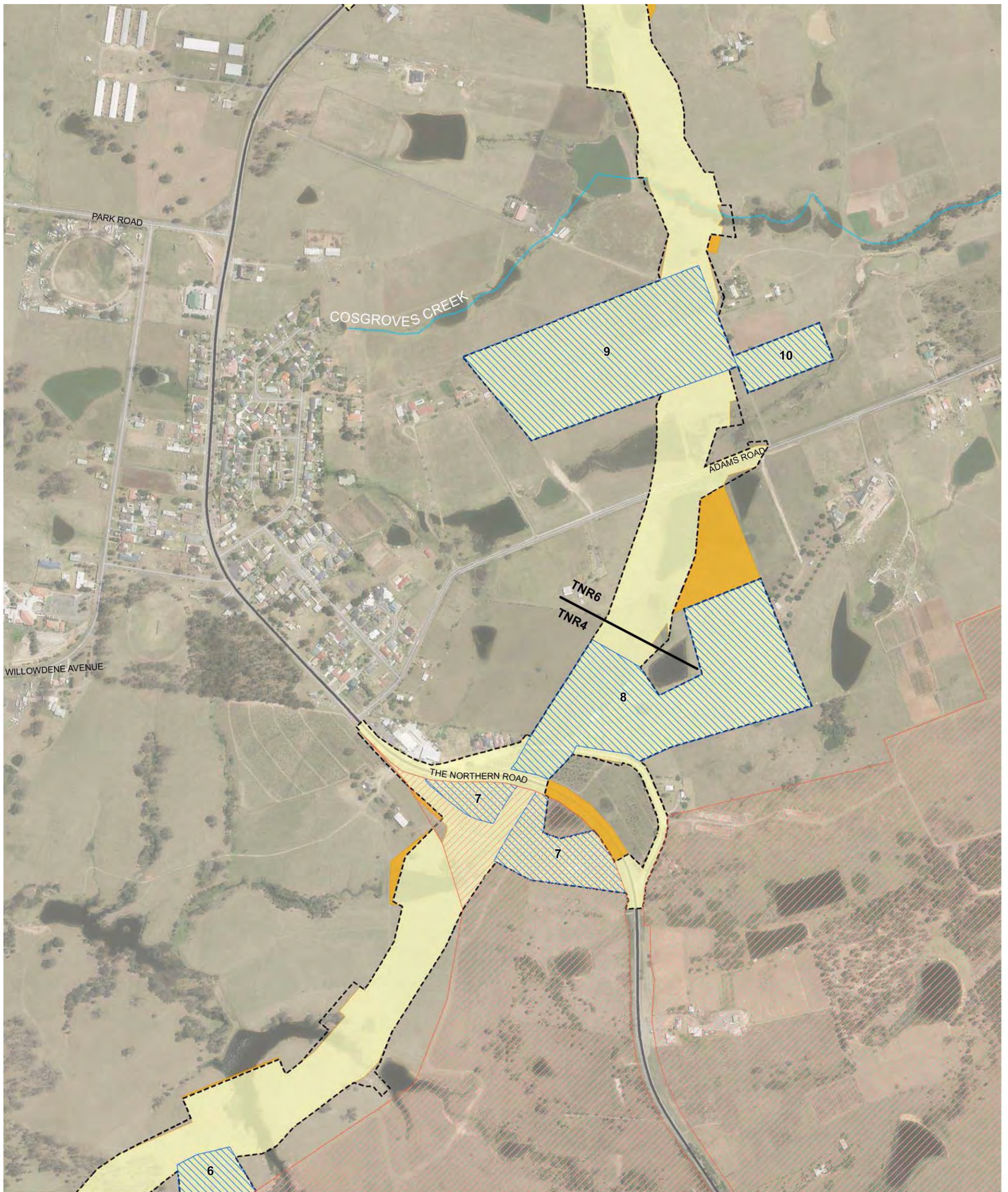
0 250 500 m
A3
1:7,500



Figure 4-2 | Comparison of EIS and refined design construction footprints

JACOBS

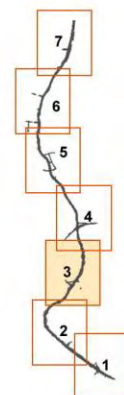
NSW Spatial | ANZ Infrastructure and Environment | www.jacobs.com



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_PostEISConstBoundary_EISConstFootprint | 18/10/2017 | DRAWN BY: AA

Legend

- EIS construction footprint
- Refined design construction footprint
- Construction compound sites
- Western Sydney Airport site (Commonwealth Land)
- Additional areas of construction footprint due to design refinements



0 250 500 m
A3
1:7,500



The Northern Road upgrade -
Mersey Road to Glenmore Parkway
**Construction Boundary and
Compound Sites**

Figure 4-2 | Comparison of EIS and refined design construction footprints

JACOBS

NSW Spatial | ANZ Infrastructure and Environment | www.jacobs.com



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_PostEISConstBoundary_EISConstFootprint | 18/10/2017 | DRAWN BY: AA

Legend

- EIS construction footprint
- Refined design construction footprint
- Construction compound sites
- Additional areas of construction footprint due to design refinements

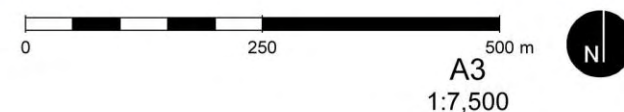
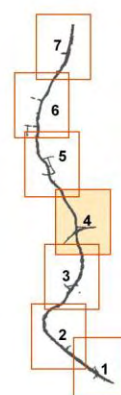


Figure 4-2 | Comparison of EIS and refined design construction footprints

JACOBS

NSW Spatial | ANZ Infrastructure and Environment | www.jacobs.com



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_PostEISConstBoundary_EISConstFootprint | 18/10/2017 | DRAWN BY: AA

Legend

- EIS construction footprint
- Refined design construction footprint
- Construction compound sites
- Defence Establishment
- Orchard Hills (Commonwealth Land)
- Additional areas of construction footprint due to design refinements

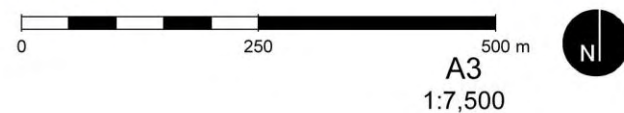
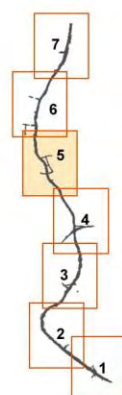


Figure 4-2 | Comparison of EIS and refined design construction footprints

JACOBS

NSW Spatial | ANZ Infrastructure and Environment | www.jacobs.com



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_PostEISConstBoundary_EISConstFootprint | 18/10/2017 | DRAWN BY: AA

Legend

- EIS construction footprint
- Refined design construction footprint
- Construction compound sites
- Defence Establishment
- Orchard Hills (Commonwealth Land)
- Additional areas of construction footprint due to design refinements

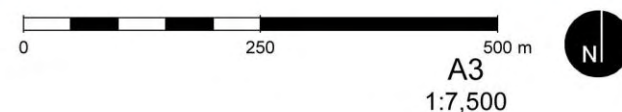
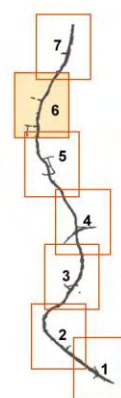
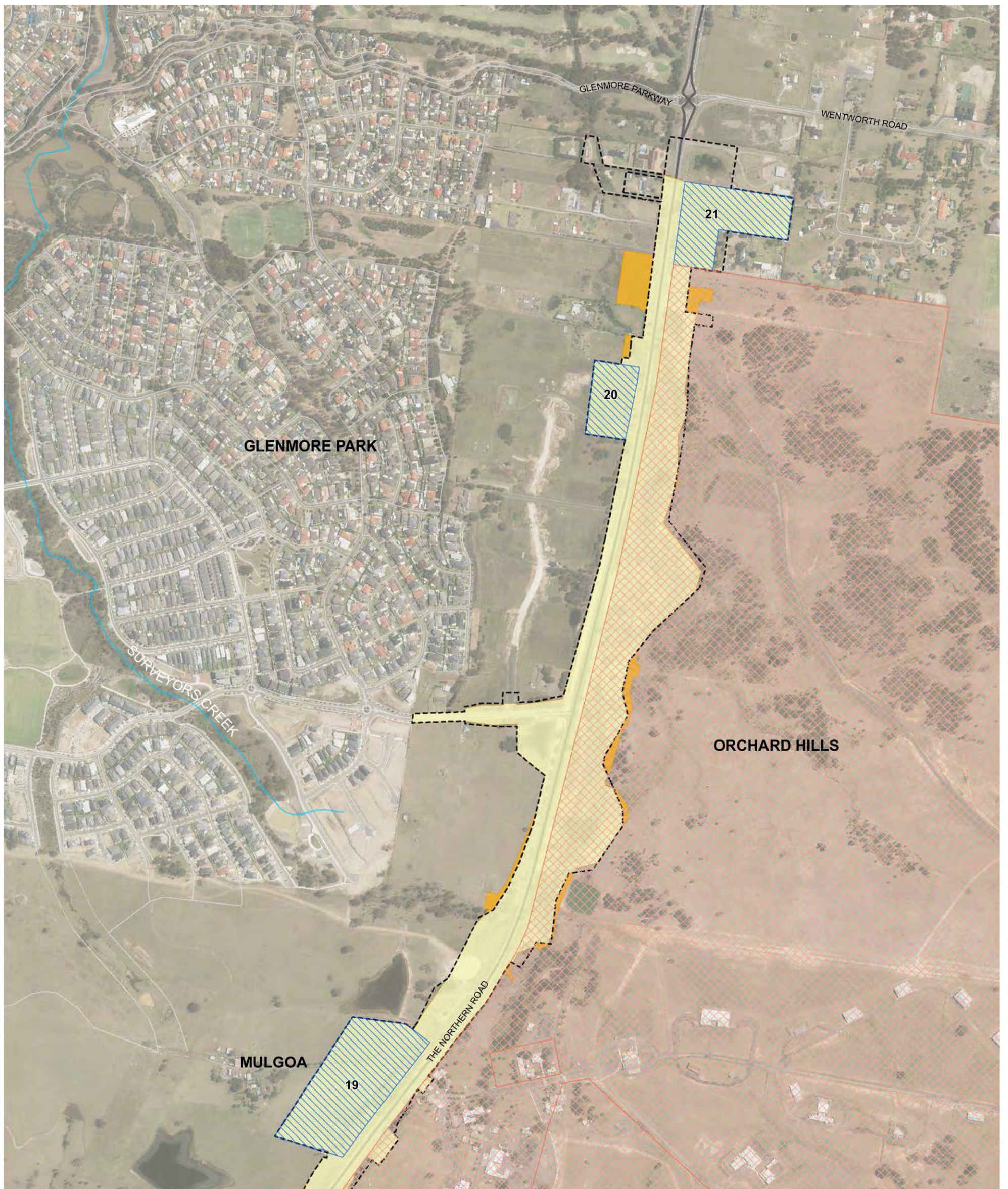


Figure 4-2 | Comparison of EIS and refined design construction footprints

JACOBS

NSW Spatial | ANZ Infrastructure and Environment | www.jacobs.com



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_PostEISConstBoundary_EISConstFootprint | 18/10/2017 | DRAWN BY: AA

Legend

- EIS construction footprint
- Refined design construction footprint
- Construction compound sites
- Defence Establishment
- Orchard Hills (Commonwealth Land)
- Additional areas of construction footprint due to design refinements

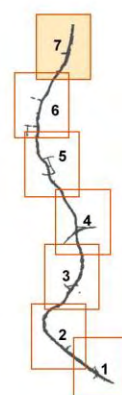


Figure 4-2 | Comparison of EIS and refined design construction footprints

JACOBS

NSW Spatial | ANZ Infrastructure and Environment | www.jacobs.com



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_PostEISOperBoundary_EISOperFootprint | 18/10/2017 | DRAWN BY: AA

Legend

- EIS operational footprint
- Refined design operational footprint
- Additional areas of operational footprint due to design refinements
- Western Sydney Airport site (Commonwealth Land)

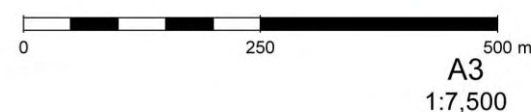
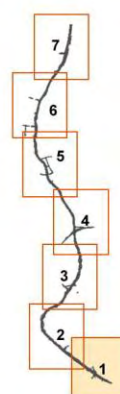


Figure 4-3 | Comparison of EIS and refined design operational footprints

JACOBS

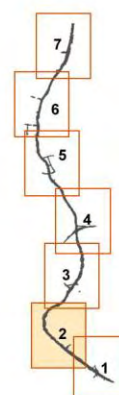
NSW Spatial | ANZ Infrastructure and Environment | www.jacobs.com



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_PostEISOperBoundary_EISOperFootprint | 18/10/2017 | DRAWN BY: AA

Legend

- EIS operational footprint
- Refined design operational footprint
- Additional areas of operational footprint due to design refinements
- Western Sydney Airport site (Commonwealth Land)



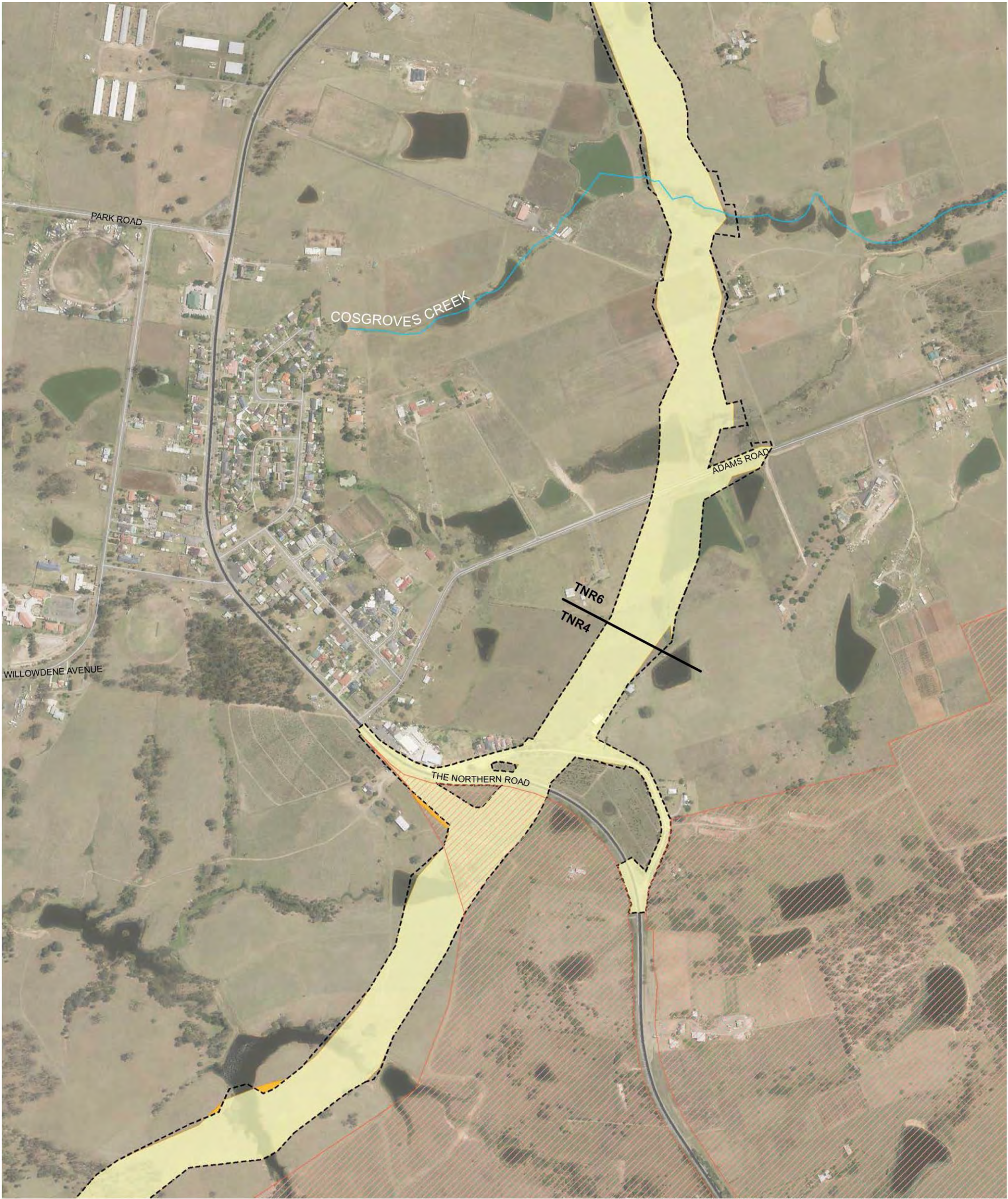
0 250 500 m
A3
1:7,500



Figure 4-3 | Comparison of EIS and refined design operational footprints

JACOBS

NSW Spatial | ANZ Infrastructure and Environment | www.jacobs.com



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_PosEISOperBoundary_EISOperFootprint | 18/10/2017 | DRAWN BY: AA

Legend

- EIS operational footprint
- Refined design operational footprint
- Additional areas of operational footprint due to design refinements
- Western Sydney Airport site (Commonwealth Land)

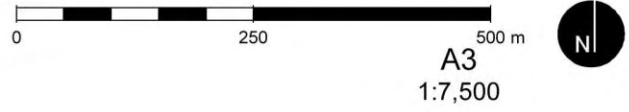
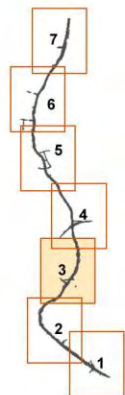


Figure 4-3 | Comparison of EIS and refined design operational footprints



NSW Spatial | ANZ Infrastructure and Environment | www.jacobs.com



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_PosEISOperBoundary_EISOperFootprint | 18/10/2017 | DRAWN BY: AA

Legend

- EIS operational footprint
- Refined design operational footprint
- Additional areas of operational footprint due to design refinements

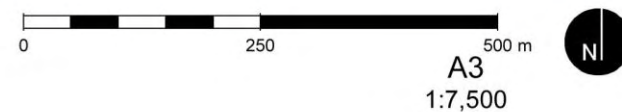
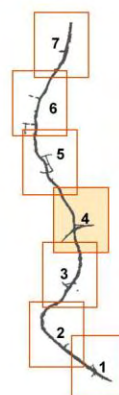


Figure 4-3 | Comparison of EIS and refined design operational footprints

JACOBS

NSW Spatial | ANZ Infrastructure and Environment | www.jacobs.com



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_PostEISOperBoundary_EISOperFootprint | 18/10/2017 | DRAWN BY: AA

Legend

- EIS operational footprint
- Refined design operational footprint
- Additional areas of operational footprint due to design refinements
- Defence Establishment Orchard Hills (Commonwealth Land)

0 250 500 m
A3
1:7,500

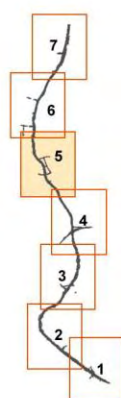
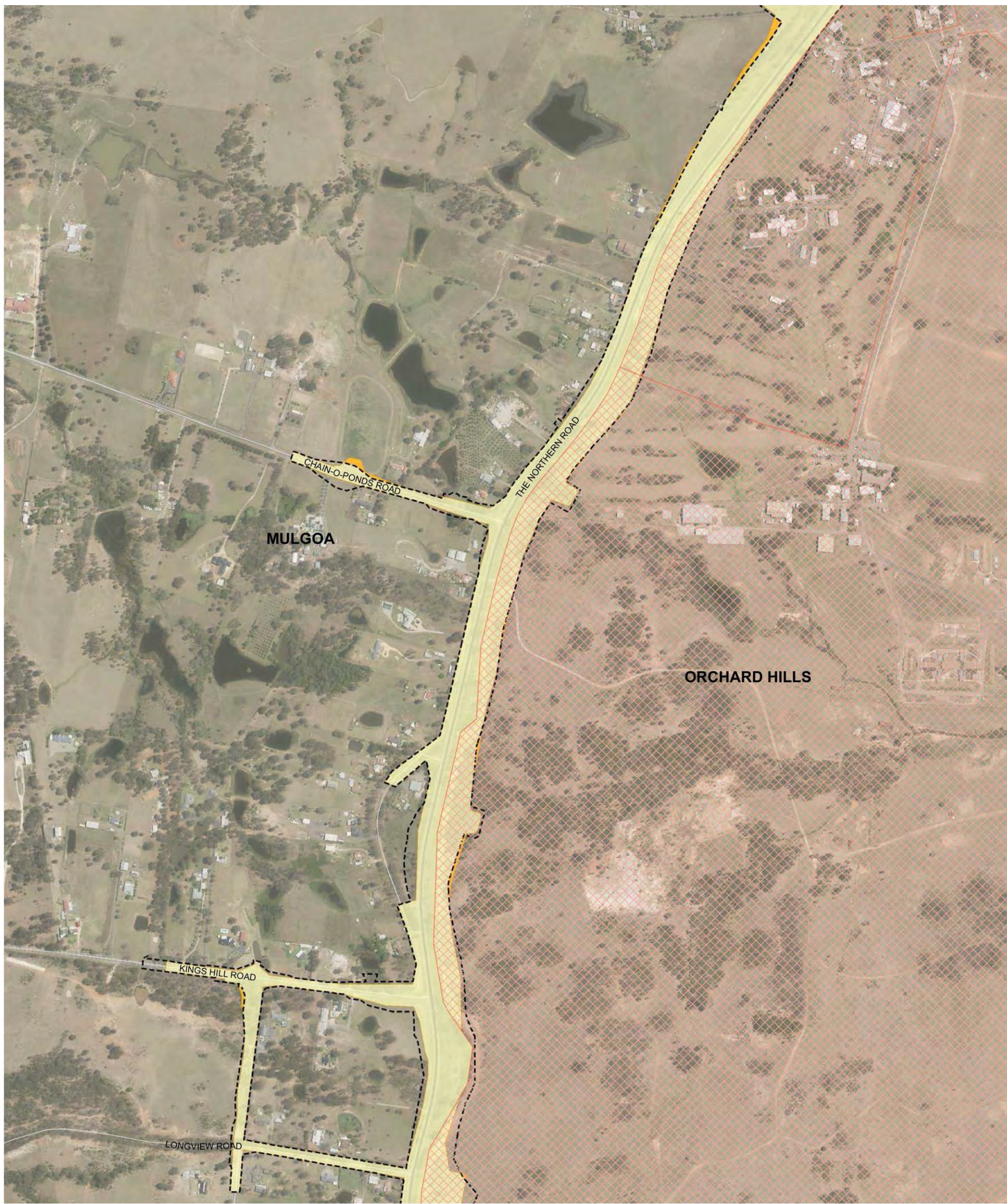


Figure 4-3 | Comparison of EIS and refined design operational footprints

JACOBS

NSW Spatial | ANZ Infrastructure and Environment | www.jacobs.com



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_PostEISOperBoundary_EISOperFootprint | 18/10/2017 | DRAWN BY: AA

Legend

- EIS operational footprint
- Refined design operational footprint
- Additional areas of operational footprint due to design refinements
- Defence Establishment Orchard Hills (Commonwealth Land)

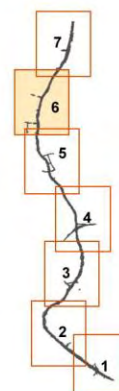


Figure 4-3 | Comparison of EIS and refined design operational footprints

JACOBS

NSW Spatial | ANZ Infrastructure and Environment | www.jacobs.com



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_PostEISOperBoundary_EISOperFootprint | 18/10/2017 | DRAWN BY: AA

Legend

- EIS operational footprint
- Refined design operational footprint
- Additional areas of operational footprint due to design refinements
- Defence Establishment Orchard Hills (Commonwealth Land)

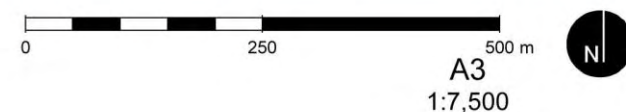
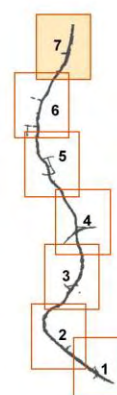


Figure 4-3 | Comparison of EIS and refined design operational footprints

JACOBS

NSW Spatial | ANZ Infrastructure and Environment | www.jacobs.com

4.2.4 Project description changes

As a result of the changes to the project as outlined in this chapter, the project description as detailed in the EIS has been modified to account for the following changes:

- Access from the existing Elizabeth Drive cul-de-sac to The Northern Road has been removed and replaced with a u-turn facility (previously left out only)
- Access to Grover Crescent south has been removed (previously left in only), and access to Grover Crescent north has been changed to left in and left out only (previously left out only)
- Removal of the northbound heavy vehicle inspection bays adjacent to Grover Crescent
- Proposed staging of bus lane delivery as demand requires.

A revised project description incorporating these changes to the project is provided below.

Revised project description (post exhibition)

The project involves upgrading the 16 km section of The Northern Road between Mersey Road, Bringelly and Glenmore Parkway, Glenmore Park.

The project generally comprises the following key features:

- A six-lane divided road between Mersey Road, Bringelly and Bradley Street, Glenmore Park (two general traffic lanes and a kerbside bus lane in each direction to be delivered when demand requires). The wide central median would allow for an additional travel lane in each direction in the future, if required
- An eight-lane divided road between Bradley Street, Glenmore Park and about 100 m south of Glenmore Parkway, Glenmore Park (three general traffic lanes and a kerbside bus lane in each direction separated by a median to be delivered when demand requires)
- About eight kilometres of new road between Mersey Road, Bringelly and just south of the existing Elizabeth Drive, Luddenham, to realign the section of The Northern Road that currently bisects the Western Sydney Airport site and to bypasses Luddenham
- About eight kilometres of upgraded and widened road between the existing Elizabeth Drive, Luddenham and about 100 m south of Glenmore Parkway, Glenmore Park
- Closure of the existing The Northern Road through the Western Sydney Airport site
- Tie-in works with the following projects:
 - The Northern Road Upgrade, between Peter Brock Drive, Oran Park and Mersey Road, Bringelly (to the south)
 - The Northern Road Upgrade, between Glenmore Parkway, Glenmore Park and Jamison Road, South Penrith (to the north).
- New intersections including:
 - a traffic light intersection connecting the existing The Northern Road at the southern boundary of the Western Sydney Airport, incorporating a dedicated u-turn facility on the western side
 - a traffic light intersection for service vehicles accessing the Western Sydney Airport, incorporating 160 m of new road connecting to the planned airport boundary
 - a traffic light intersection connecting the realigned The Northern Road with the existing The Northern Road (west of the new alignment) south of Luddenham
 - a 'give way' controlled intersection (that is, no traffic lights) connecting the realigned The Northern Road with Eaton Road (east of the new alignment, left in, left out only)
 - a four-way traffic light intersection formed from the realigned Elizabeth Drive, the realigned The Northern Road and the existing The Northern Road, north of Luddenham
 - a traffic light intersection at the Defence Establishment Orchard Hills entrance, incorporating a u-turn facility.

- New traffic lights at four existing intersections:
 - Littlefields Road, Luddenham
 - Kings Hill Road, Mulgoa
 - Chain-O-Ponds Road, Mulgoa
 - Bradley Street, Glenmore Park incorporating a u-turn facility.
- Modified intersection arrangements at:
 - Dwyer Road, Bringelly (left in, left out only)
 - Existing Elizabeth Drive, Luddenham (access removed)
 - Gates Road, Luddenham (left in only)
 - Longview Road, Luddenham (left in, left out only)
 - Grover Crescent south, Mulgoa (access removed)
 - Grover Crescent north, Mulgoa (left in, left out only).
- Dedicated u-turn facilities at:
 - the existing The Northern Road at Luddenham, south-west of Elizabeth Drive
 - the existing Elizabeth Drive, Luddenham around 800 m east of The Northern Road
 - Chain-O-Ponds Road, Mulgoa
- Twin bridges over Adams Road, Luddenham
- Local road changes and upgrades, including:
 - closure of Vicar Park Lane, east of the realigned The Northern Road, Luddenham
 - Eaton Road cul-de-sac, west of the realigned The Northern Road, Luddenham
 - Eaton Road cul-de-sac, east of the realigned The Northern Road, Luddenham
 - Elizabeth Drive cul-de-sac, about 300 m east of The Northern Road with a connection to the realigned Elizabeth Drive, Luddenham
 - Extension of Littlefields Road, east of The Northern Road, Mulgoa
 - a new roundabout on the Littlefields Road extension, Mulgoa
 - a new service road between the Littlefields Road roundabout and Gates Road, including a 'give way' controlled intersection (that is, no traffic lights) at Gates Road, Luddenham
 - extension of Vineyard Road, Mulgoa between Longview Road and Kings Hill Road
 - a new roundabout on the Vineyard Road extension at Kings Hill Road, Mulgoa.
- A new shared path on the western side of The Northern Road and footpaths on the eastern side of The Northern Road where required
- The upgrading of drainage infrastructure
- Operational ancillary facilities including:
 - heavy vehicle inspection bays for southbound traffic, adjacent to Longview Road, Mulgoa
 - an incident response facility on the south-western corner of the proposed four-way traffic light intersection at Elizabeth Drive, Luddenham to be implemented for the operation of the Western Sydney Airport and the proposed M12 Motorway.
- Roadside furniture and lighting as required
- The relocation of utilities and services
- Changes to property access along The Northern Road (generally left in, left out only)
- Establishment and use of temporary ancillary facilities and access tracks during construction
- Property adjustments as required
- Clearance of unexploded ordinance (UXO) within the Defence Establishment Orchard Hills as required.

5 Additional assessment

Additional investigations or assessment have been carried out during the EIS exhibition period due to project design refinements as outline in Chapter 4 of this report, and in response to submissions received from Government agencies and the community as outlined in Chapter 2 and Chapter 3 of this report respectively.

Table 5-1 provides a summary of the additional assessments carried out including a summary of their scope, the reason the assessment was required and where the additional assessment id provided in this report.

Table 5-1 Summary of additional assessments since exhibition of the EIS

Assessment	Need for further assessment	Where addressed in this report
Noise and vibration	To assess project design refinements associated with minor changes to the vertical and horizontal alignment of the project.	Appendix B Summarised in Section 5.1.2
Biodiversity	To assess project design refinements that resulted in changes to the footprint of the project and in response to submissions.	Appendix C Summarised in Section 5.1.3 and throughout response to submissions
Water quality	To assess project design refinements associated with revised pavement drainage and changes to footprint.	Section 5.2.2
Aboriginal Heritage	Revised desktop assessment to assess project design refinements that resulted in changes to the footprint of the project	Section 5.2.3
Non-Aboriginal Heritage	To assess project design refinements that resulted in changes to the footprint of the project and in response to submissions.	Appendix D Summarised in Section 5.2.4 and throughout response to submissions
Hydrology and flooding	To assess project design refinements associated with revised pavement drainage.	Summarised in Section 5.2.1

The changes to the project as outlined in section 4.2 have been assessed for consistency against the outcomes of the assessments provided in the EIS. Consideration of these refinements against the issues assessed in the EIS is provided below. Where required, additional technical assessment has been provided as appendices to this submissions and preferred infrastructure report.

5.1 Key issues

5.1.1 Traffic and transport

The design refinements outlined in Figure 4-1 have been considered against the outcomes of the traffic and transport assessment carried out for the EIS as outlined in Chapter 7.1 of the EIS. Refinements that could have potential to result in minor changes to the traffic and transport assessment include:

- Changes to staging and delivery
- The provision of split carriageway between Gates Road and Longview Road
- Refinements to medians and kerbs along the main alignment and local roads
- Refinements to intersections
- Assessment of potential construction impacts.

Section 7.1.3 of the EIS provided an assessment of potential construction traffic impacts associated with the project. The design refinements outlined in this report have been reviewed against the outcomes of EIS construction traffic assessment.

Intersection performance

Section 7.1.4. of the EIS provides an analysis of the intersection performance along The Northern Road with the project. The analysis shows that most of the intersections within the study area would operate satisfactorily under the 2021 and 2031 future year scenarios with Level of Service (LoS) C or better. The only exception being the intersection of The Northern Road and Elizabeth Drive which would be operating near capacity in the evening peak hour at LoS D by 2021. This is due to the large volumes of conflicting traffic movements that are forecast to travel through this intersection by 2021.

A review of the design refinements provided in Table 4-1 has the following implications for intersection performance:

- Changes to staging and delivery of the proposed bus lanes is unlikely to affect the performance of intersections. The intersections would be built with the ultimate number of lanes at the stop line and would allow for a „bus jump“ (traffic light phasing staged to allow bus priority). Given the very small number of buses using The Northern Road, buses merging back into general traffic lanes would not alter the performance of the intersections
- Refinements to median lengths at signalised intersections would not change accessibility or functionality as long as the median is retained. Overall, this would have negligible impact on traffic arrangements and therefore the operation and Level of Service (Los) of the intersections
- Addition of splitter islands allows for pedestrians crossing side streets to be separated from left turning traffic, removing this conflict and separating left turning vehicles from buses. Due to the low forecast pedestrian volumes along The Northern Road and the relatively low volumes of left turning traffic at most intersections, this would have minimal impact on intersection performance, in most cases a very minor improvement

- Signal phasing changes would allow for shorter minimum phase times for Littlefields Road and Gates Road extension. This would result in a very minor improvement in operation by reducing minimum phase time for side streets in the event of a pedestrian fall across The Northern Road.

Travel times

Section 7.1.4. of the EIS provides a comparison of modelled travel times along the existing The Northern Road corridor with and without the project. The modelled travel times indicate that the project would result in reduction of travel times in both directions along The Northern Road when comparing the project scenario with the „Do Minimum“ scenario. In this section, northbound travel times are likely to remain similar to those without the project since the project would introduce delays at five new signalised intersections.

A review of the design refinements provided in Table 4-1 has the following implications for travel times with the introduction of the project:

- Changes to staging and delivery of the proposed bus lanes may result in a very small increase in bus travel time due to the fact that buses would be required to merge in and out of the general traffic lanes at the approached to bus stops (either at intersections or mid-block) rather than utilise a stand-alone bus lane. Changes to travel times for general traffic would be negligible as the number of buses that use The Northern Road is very small
- Provision of a section of split carriage way for a short section between Gates Road and Longview Road would have no impact of the modelled traffic arrangements or travel times
- Changes to the width of the median would not change the functionality of the main alignment and would therefore have no impact of traffic arrangements and not result in changes to travel times.

Impacts on local roads and access

The project would include the provision of a wide central median that would remove existing right turns at some intersections and property accesses. Table 7-13 of the EIS summarised the changes to access as a result of the project and also outlines the maximum additional travel distance and time that would result from changes to access.

A review of the design refinements provided in Table 4-1 has the following implications for local roads and access:

- Changes to staging and delivery of the proposed bus lanes is unlikely to result in additional impacts to local roads or property access during the initial construction of the project. Should provision for continuous lanes be required in the future, as demand requires, construction impacts similar to those described in this report may be experienced although those impacts would be in mid-block areas where the continuous lanes would be connected to the intersection bus lane areas.
- Changes to the width and length of the median would not result in a change of access to and from the main alignment and would therefore have no impact on traffic arrangements or further access issues
- Changes at Elizabeth Drive would result in small increases in travel distance for trips accessing the properties on the cul-de-sac (up to an additional 150 m). Reassignment of this traffic would not substantially affect the operation of the intersection of The Northern Road and Elizabeth Drive.

The potential construction traffic and transport impacts due to the proposed design refinements have also been considered. Overall, potential construction related impacts associated with the refined design for the project are considered consistent with those presented in the EIS. This is

due to the fact that, in general, the design refinements have only marginally altered the design of the road when compared to the EIS design. Additionally, construction plant and equipment, and haulage routes would be the same as outlined in the EIS.

5.1.2 Noise and vibration

As outlined in section 4.2 of this report, there have been a number of design refinements since exhibition of the EIS for the project which have resulted in minor changes to the project's horizontal and vertical alignments. These changes have the potential to alter some of the operational noise predictions presented in the EIS, and the associated number of receivers identified as qualifying for consideration of noise mitigation.

An assessment has been carried out to identify additional receivers that would potentially qualify for consideration of noise mitigation as a result of these design refinements (in addition to the 77 mitigation-eligible receivers identified in the EIS). The results of the technical assessment are presented in Appendix B.

In summary, one additional residential receiver (2778-2828 The Northern Rd, Luddenham) was identified as likely to qualify for consideration of noise mitigation, bringing the total to 78 receivers. Roads and Maritime carried out additional consultation with this property owner in December 2017 to inform them of the outcomes of the assessment. As identified in the EIS, further assessment and verification of noise impacts and any additional mitigation measures would be determined post-construction.

The potential construction noise and vibration impacts due to the proposed design refinements have also been considered as part of this assessment. Overall construction related noise and vibration impacts associated with the design refinements for the project are considered consistent with those presented in the EIS. This is due to the fact that, in general, the design refinements have only marginally altered the horizontal alignment when compared to the EIS design. Additionally, construction plant and equipment and haulage routes would be the same as outlined in the EIS. Further information regarding potential worst case noise impacts, out of hours works and the application of standard and additional mitigation measures as outlined in Roads and Maritime's CNVG (2016) is presented in Appendix A of this report, to support the response to submissions in section 2.6 of this report.

5.1.3 Biodiversity

As outlined in section 4.2 of this report, there have been a number of design refinements to the project since exhibition of the EIS which have resulted in changes to the project's construction footprint. This has affected the calculated direct impacts of the project as assessed within the BAR and corresponding information presented in section 7.3 of the EIS.

A revised assessment of the impacts under the FBA has been carried out including recalculation of landscape values, impacts to native vegetation (including threatened ecological communities), impacts to threatened species, and impacts to MNES, including impacts to the environment of commonwealth land.

The assessment is presented in Appendix C (Technical Memorandum – Biodiversity) and includes both the assessment of project changes as well as response to submissions relevant to biodiversity. A summary of the revised impacts of the project is presented below, with comparison against the results presented in the BAR and section 7.3 of the EIS.

Existing environment

Landscape values

Alteration to the proposed construction footprint has resulted in the need for recalculation of landscape value components including the percent extent of native vegetation cover in the landscape and the area to perimeter ratio. The connectivity value and patch size calculations

remain valid with the design change therefore no recalculation of these values were required. The results are presented in Appendix C.

Table 5-2 provides a summary of the revised landscape component scores based on the revised construction footprint.

Table 5-2 Summary of the revised landscape component scores for the project

Threatened species	EIS design	Refined design	Change
Score for per cent native vegetation cover	1.25	0	Slight reduction
Score for connectivity value class	2.5	2.5	No change
Area / perimeter ratio score	1	2	Slight increase
Average patch size score	12.5	12.5	No change

The landscape value score as determined by the BioBanking credit calculator is 17, similar to that previously assessed in the BAR in which the landscape value score was calculated as 17.25.

Assessment of potential impacts

Removal of TSC Act listed threatened ecological communities

The potential loss of vegetation and habitat associated with the revised construction footprint for the project has been assessed in Appendix C, and summarised in Table 5-3. In summary, the revised construction footprint would impact on up to about 40.79 ha of native vegetation. This is a decrease of 3.50 ha when compared to the assessment of the EIS design.

Based on the refined design, the overall impact to the critically endangered Cumberland Plain Woodland in the Sydney Basin Bioregion ecological community has reduced by 2.96 ha. The impact to the River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions endangered ecological community has been reduced by 0.43 ha.

Table 5-3 Revised impacts to native vegetation (assessed under the FBA)

Vegetation zone	PCT	Condition	Status (TSC Act)	Impact (ha) - EIS design	Impact (ha) - refined design	Change
1	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Moderate/ Good	CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion	6.67	5.38	1.29 ha reduction
2	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	Moderate/ Good	EEC River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	2.53	2.43	0.1 ha reduction

Vegetation zone	PCT	Condition	Status (TSC Act)	Impact (ha) - EIS design	Impact (ha) - refined design	Change
3	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Moderate/ Good	CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion	4.92	4.92	No change
4*	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Moderate/ Good_Poor	CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion	4.68	4.30	0.38 ha reduction
5	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Moderate/ Good_Poor	CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion	3.21	3.11	0.1 ha reduction
6	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	Moderate/ Good_Poor	EEC River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	1.76	1.43	0.33 ha reduction
7	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Moderate/ Good_High	CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion	1.25	1.37	0.12 ha increase
8	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Moderate/ Good_Derived grassland	CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion	12.01	10.81	1.2 ha reduction
9	<i>Phragmites australis</i> and <i>Typha orientalis</i> coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate/ Good_Other	-	6.17	6.05	0.12 ha reduction
10	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Moderate/ Good_Medium	CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion	1.09	0.98	0.11 ha reduction
Totals				44.29	40.79	3.50 ha reduction

Note: * = The impacts to Vegetation Zone 4 have been included in Table 5-3 to provide an overview and comparison of impacts to native vegetation. Due to the manual override of the „Number of Trees with Hollows' and 'Fallen Logs' for HN528, Vegetation Zone 4 now has a site score of 29.17 and requires an offset to be calculated. A discussion on biodiversity impacts is included below.

Removal of EPBC Act listed threatened ecological communities

The assessment of impacts based on the EIS design identified that the project would result in the direct clearing of about 16.37 ha of the critically endangered Cumberland Plain Shale Woodlands

and Shale-Gravel Transition Forest ecological community. After detailed design, this impact has been reduced by 1.29 ha to 15.08 ha (refer to Table 5-4).

Table 5-4 Summary of impacts to the critically endangered Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community

Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest condition category	EIS design impact (ha)	Refined design impact (ha)	Change
Category A (core)	10.69	9.99	0.70 ha reduction
Category C	1.47	1.50	0.03 ha increase
Category C Derived Native Grassland	4.21	3.59	0.62 ha reduction
Total	16.37	15.08	1.29 ha reduction

Removal of threatened plants

The EIS identified that the project would impact the following threatened plant species and endangered population:

- *Pultenaea parviflora* (Endangered – TSC Act)
- *Marsdenia viridiflora* subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas (Endangered population – TSC Act).

The impact to these plants has been recalculated based on the refined design. The revised calculations also incorporate the results of an additional targeted survey conducted for *Pultenaea parviflora* and *Marsdenia viridiflora* subsp. *viridiflora* and other threatened plants around the Vineyard Road extension on the 7 August 2017. This was to account for the construction footprint changes at this location. Additionally, as stated in the BAR, this area was not able to be accessed during the fieldwork carried out for the original assessment therefore additional survey was required at this location following design refinements. The survey located a further six *Pultenaea parviflora* plants (two of which were in the construction footprint, and four outside of the footprint). No additional *Marsdenia viridiflora* subsp. *viridiflora* were recorded (refer to Figure 5-1).

The EIS construction footprint contained (and therefore would have removed) all known individuals and habitat for the *Marsdenia viridiflora* subsp. *viridiflora* endangered population in the study area. The refined design has resulted in the avoidance of four *Marsdenia viridiflora* subsp. *viridiflora* plants in the area of the DEOH fence between Kings Hill Road and Longview Road (see Figure 5-2). There is no requirement to impact on the location of these plants and exclusion zones would be established around the plants during construction in accordance with standard Roads and Maritime procedure. This reduces the overall impact to 31 individuals.

The EIS construction footprint contained (and therefore would have removed) all four known *Pultenaea parviflora* plants within the EIS design footprint as well as the two additional plants recorded in the Vineyard Road extension during the August 2017 survey (six *Pultenaea parviflora* plants in total). The August 2017 survey of the Vineyard Road extension recorded six additional *Pultenaea parviflora* plants of which four are outside of the construction footprint. The impact assessed in the EIS was to four *Pultenaea parviflora* plants because the extent of habitat along Vineyard Road extension was unable to be surveyed at the time. The overall impact to *Pultenaea parviflora* is now estimated at six plants.

Table 5-5 Summary of threatened plant species impacts from the refined design footprint

Threatened species	Ecosystem or species credit species	Status		EIS impact	Refined design impact	Change
		TSC Act	EPBC Act			
Pultenaea parviflora	Species credit species	Endangered	Vulnerable	4 individuals	6 individuals	2 additional plants to be impacted 4 additional plants avoided
Marsdenia viridiflora subsp. viridiflora – endangered population	Species credit species	Endangered population	Not listed	35 individuals	31 individuals	4 individuals avoided

Removal of threatened fauna species habitat and habitat features

Impacts to threatened fauna species habitat and habitat features have been recalculated based on the refined design as summarised in Table 5-6. Overall, based on the refined design, the project would have less impact on threatened fauna species habitat and habitat features than the design assessed as part of the EIS.



Figure 5-1 | Additional targeted survey for *Pultenaea parviflora* and *Marsdenia viridiflora* subsp. *viridiflora* undertaken in the Vineyard Road extension

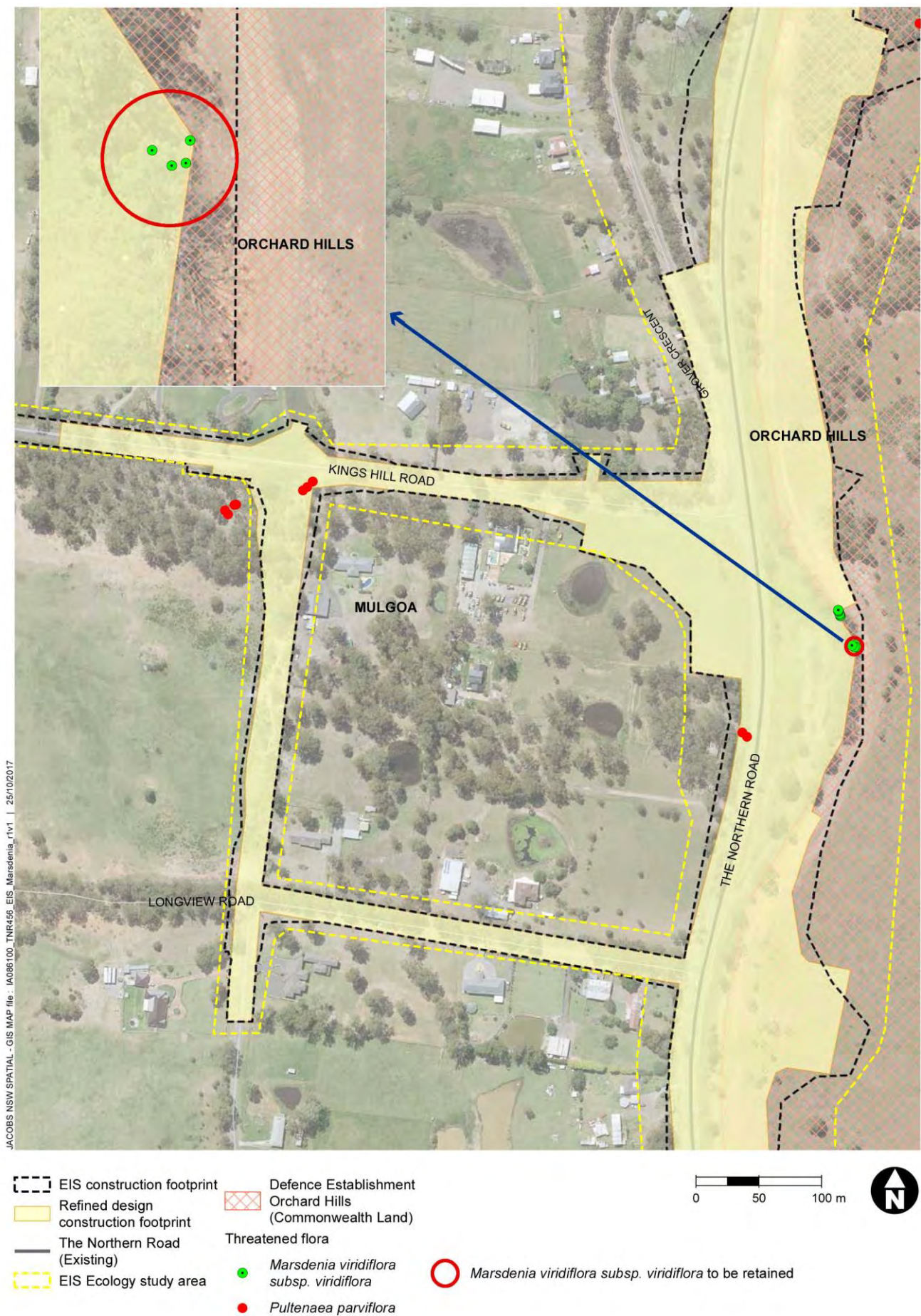


Figure 5-2 | *Marsdenia viridiflora* subsp. *Viridiflora* to be retained

Table 5-6 Summary of threatened fauna species impacts from the refined design footprint

Threatened species	Status		EIS design habitat impact (ha)	Refined design habitat impact (ha)	Change
	TSC Act	EPBC Act			
Cumberland Plain Land Snail	Endangered	Not listed	13	12.40	0.60 ha avoided
Grey-headed Flying-fox	Vulnerable	Vulnerable	26.25	24.10	2.15 ha avoided
Regent Honeyeater	Critically endangered	Critically endangered	26.25	24.10	2.15 ha avoided
Swift Parrot	Endangered	Critically endangered	26.25	24.10	2.15 ha avoided
Large-eared Pied Bat	Vulnerable	Vulnerable	26.25	24.10	2.15 ha avoided

Fragmentation of biodiversity links and habitat corridors

As outlined in section 2.7.5 of this report, the EIS acknowledged that the operation of the project would create barrier effects that restrict fauna movement, particularly for fauna groups such as mammals, frogs, and reptiles. Mobile species such as birds and bats may not be affected to the same extent.

The EIS identified that the detailed design of culverts would ensure that barriers to fish are not created and associated long-term impacts to the existing hydrology are minimised. Additionally, in response to submissions, two fauna crossings have been included as part of the refined design of culverts at Badgerys Creek and Surveyors Creek crossings. Further details are provided in section 2.7.5 of this report, including cross sections of the proposed culverts incorporating fauna passage.

Summary of impacts to the environment on Commonwealth

The EIS provided a summary of potential impacts to the environment of Commonwealth land as a result of the project, including biodiversity impacts associated with clearing of vegetation on Commonwealth land. This has been recalculated based on the refined design construction footprint as summarised in Table 5-7. In summary, there would be a decrease in clearing of remnant native vegetation by approximately 0.88 ha. This incorporates a decrease in clearing of the Critically endangered Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community by 0.8 ha.

Table 5-7 Revised impacts to vegetation on Commonwealth land

Feature	Original impact	Revised impact after design refinements	Change
Remnant native vegetation (excluding man-made dams)	13.34 ha	12.46 ha	0.88 ha decrease
Critically endangered Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community	10.07 ha	9.27 ha	0.80 ha decrease

Environmental management measures

A number of additional environmental management measures have been identified as a result of the revised assessment of impacts as outlined in this section, as well as in response to community and stakeholder submissions as outlined in Chapter 2 and Chapter 3 of this report.

Additional biodiversity measures for the project been incorporated into the revised environmental management measures outlined in Chapter 6 this report. In summary, the revised management measures relate to:

- The preparation of a Vegetation Management Plan (VMP) in consultation with DPI Water prior to construction
- The reuse of topsoil as part of the Urban Design and Landscape Plan for the project
- Consideration of transplanting native species from areas to be cleared into revegetation areas
- The set-up of exclusion areas in the proximity of *Marsdenia viridiflora* and *Pultenaea parviflora*.

Biodiversity offsets

A summary of the biodiversity offset credits required for the project based on the refined design is presented in Appendix C, including a comparison against the previous calculations prepared as part of the EIS. The revised credit calculations take into account the amendments to the landscape assessment, altered areas of impact, avoidance of some threatened species impacts, amendment of some benchmark data in the BioBanking credit calculator, and reassignment of the Derived Native Grassland to HN 529.

5.1.4 Socio-economic and land use

Property impacts

Section 7.4 of the EIS provides an assessment of the project's likely impacts on the socio-economic environment of the project area during both construction and operation of the project. This assessment includes details of temporary and permanent acquisitions required.

Project design refinements have resulted in minor changes to the project construction and operational footprint and therefore the location and type of acquisition has also changed.

The proposed design refinements would generally result in a reduction in property impacts associated with the operation of the project. These properties would include a combination of privately owned land as well as land owned by Roads and Maritime, other NSW Government agencies and the Commonwealth Government. The majority of land to be partially or fully acquired for the project comprises residential uses. Table 5-8 compares the EIS predicted property impacts against the revised property impacts taking into consideration the proposed design refinements.

Table 5-8 Revised property impacts table (EIS vs refined design)

Assessment	Impacted lots	Impacted owners	Impacted houses	Impacted sheds
Predicted property impacts (EIS)	142	83	10	16
Revised property impacts (current refined design)	121	76	8	15

Generally, affected properties would be partially acquired by Road and Maritime where only part of the property would be directly impacted by the project. In some instances, Roads and Maritime would give consideration to total acquisition (dual offer) or acquisition of any residual parcels created by the location and design of the project. This would provide affected property owners with a level of flexibility or choice during the property acquisition process in relation to property decisions. For example, some property owners may want to retain residual parcels for future use. Roads and Maritime would continue to consult with land owners through the detailed design about these land parcels. The acquisition of land required for the operation of the project would be permanent and would result in long-term impacts to property as a result of the project.

Table 5-9 provides a revised summary of property acquisitions required for the project taking into consideration the proposed design refinements.

Table 5-9 Revised summary of property acquisitions

Property ID	Property (lot number)	Existing land use*	Acquisition type	Dwellings affected	Buildings (sheds) affected
1	Lot 1 DP235845	Residential	Partial	-	-
2	Lot 97 DP27550	Residential	Partial	-	-
3	Lot 1 DP250684	Residential	Partial	-	-
4	Lot 96 DP27550	Residential / business	Partial	-	-
5	Lot 95 DP27550	Residential / business	Partial	-	-
6	Lot 94 DP27550	Residential	Partial	-	-
7	Lot 93 DP654182	Residential	Partial	-	-
8	Lot 92 DP27550	Business	Partial	-	-
9	Lot 102 DP812653	Rural / residential	Partial	-	-
10	Lot 1 DP838361	Rural / Western Sydney Airport / Commonwealth land	Partial	-	Yes (2)
11	Lot 11 DP1092165	Rural residential	Partial	-	Yes (2)

Property ID	Property (lot number)	Existing land use*	Acquisition type	Dwellings affected	Buildings (sheds) affected
12	Lot 27 DP259698	Residential	Partial	-	-
13	Lot 28 DP259698	Residential	Partial	-	-
14	Lot 33 DP259698	Rural residential	Partial	-	-
15	Lot 22 DP258581	Rural residential	Partial	-	-
16	Lot 21 DP258581	Residential	partial	Yes (1)	-
17	Lot 20 DP258581	Residential	Partial	-	Yes (1)
18	Lot 2 DP851626	Business	Partial	-	-
19	Lot 1 DP851626	Rural	Partial	-	-
20	Lot 2 DP623457	Business	Partial	-	-
21	Lot 21 DP614481	Residential	Partial	-	-
22	Lot 1 DP250030	Residential	partial	Yes (1)	Yes (1)
23	Lot 1 DP90157	Residential	Partial	-	-
24	Lot 2 DP250030	Residential	Partial	-	-
25	Lot 3 DP250030	Residential	Partial	-	-
26	Lot 2 DP519034	Residential	Partial	-	-
27	Lot 104 DP846962	Residential	Partial	-	-
28	Lot 3 DP827223	Residential	Partial	-	-
29	Lot 103 DP846962	Residential	Partial	-	-
30	Lot 102 DP846962	Residential	Partial	-	-
31	Lot 1 DP232996	Rural residential	Partial	-	-
32	Lot 101 DP846962	Residential	Partial	-	-
33	Lot 100 DP846962	Residential	Partial	-	-
34	Lot 5 DP232324	Crown land (road reserve)	Full	-	-
35	Lot 4 DP232324	Crown land (road reserve)	Full	-	-

Property ID	Property (lot number)	Existing land use*	Acquisition type	Dwellings affected	Buildings (sheds) affected
36	Lot 3 DP911607	Crown land (road reserve)	Full	-	-
37	Lot 1 DP517853	Rural Residential	Partial	Yes (2)	Yes (4)
38	Lot 2 DP517853	Rural residential	Partial	-	-
39	Lot 1 DP1169433	Residential/ business	Partial	-	-
40	Lot 3 DP32026	Residential/ business	Partial	Yes (1)	-
41	Lot 504 DP581138	Residential	Partial	-	-
42	Lot 2 DP32026	Residential/ business	Partial	Yes (1)	Yes (1)
43	Lot DP160890	Residential/ business	Partial	Yes (1)	-
44	Lot 5 DP599382	Residential	Partial	-	-
45	Lot 1 DP200435	Residential/ business	Partial	-	-
46	Lot 501 DP580982	Residential	Partial	-	-
47	Lot 12 DP249113	Residential	Partial	-	-
48	Lot 11 DP249113	Residential	Partial	-	-
49	Lot 10 DP249113	Residential	Partial	-	-
50	Lot 9 DP249113	Residential	Partial	-	-
51	Lot 1 DP109697	Residential	Partial	-	-
52	Lot 8 DP249113	Residential	Partial	-	Yes (1)
53	Lot 7 DP249113	Residential	Partial	-	-
54	Lot 101 DP580082	Business	Partial	-	-
55	Lot 11 DP30775	Residential	Partial	-	-
56	Lot 12 DP30775	Sydney Water pumping station	Partial	-	-
57	Lot 13 DP30775	Residential	Partial	-	Yes (1)

Property ID	Property (lot number)	Existing land use*	Acquisition type	Dwellings affected	Buildings (sheds) affected
58	Lot 14 DP30775	Residential	Partial	-	-
59	Lot 22 DP32053	Rural	Partial	-	-
60	Lot 15 DP30775	Residential	Partial	-	-
61	Lot 23 DP207317	Residential	Partial	-	-
62	Lot 2 DP32053	Residential/ rural	Partial	-	-
63	Lot 1 DP420840	Residential	Partial	-	-
64	Lot 16 DP30775	Residential	Partial	-	Yes (1)
65	Lot A DP341893	Water NSW asset maintenance	Partial	-	-
66	Lot A DP341629	Water NSW asset maintenance	Partial	-	-
67	Lot 1 DP226972	Water NSW asset maintenance	Partial	-	-
68	Lot 22 DP843123	Residential	Partial	-	Yes (1)
69	Lot 68 DP651114	Residential	Partial	-	-
70	Lot 71 DP668758	Residential	Partial	-	-
71	Lot 73 DP2120	Residential	Partial	-	-
72	Lot 1 DP1064093	Residential	Partial	-	-
73	Lot 1 DP232322	Crown land (road reserve)	Full	-	-
74	Lot 77 DP659462	Business	Partial	-	-
75	Lot 10 Sec H DP2234	Vacant	Full	-	-
76	Lot 36 DP959167	Vacant	Partial	-	-
77	Lot 101 Sec H DP2234	Vacant	Partial	-	-
78	Lot 100 Sec H DP2234	Vacant	Partial	-	-
79	Lot 99 Sec H DP2234	Vacant	Partial	-	-
80	Lot 98 Sec H DP2234	Vacant	Partial	-	-
81	Lot 97 Sec H DP2234	Vacant	Partial	-	-

Property ID	Property (lot number)	Existing land use*	Acquisition type	Dwellings affected	Buildings (sheds) affected
82	Lot 96 Sec H DP2234	Vacant	Partial	-	-
83	Lot 37 DP959167	Vacant	Partial	-	-
84	Lot 84 Sec H DP2234	Vacant	Partial	-	-
85	Lot 83 Sec H DP2234	Vacant	Partial	-	-
86	Lot 38 DP959167	Residential	Partial	-	-
87	Lot 75 Sec H DP2234	Residential	Partial	-	-
88	Lot 74 Sec H DP2234	Residential	Partial	-	-
89	Lot 73 Sec H DP2234	Residential	Partial	-	-
90	Lot 72 Sec H DP2234	Residential	Partial	-	-
91	Lot 71 Sec H DP2234	Residential	Partial	-	-
92	Lot 70 Sec H DP2234	Residential	Partial	-	-
93	Lot 69 Sec H DP2234	Residential	Partial	-	-
94	Lot 1 DP202647	Business	Partial	-	-
95	Lot 68 Sec H DP2234	Residential	Partial	-	-
96	Lot 67 Sec H DP2234	Residential	Partial	-	-
97	Lot 66 Sec H DP2234	Residential	Partial	-	-
98	Lot 65 Sec H DP2234	Residential	Partial	-	-
99	Lot 64 Sec H DP2234	Residential	Partial	-	-
100	Lot 63 Sec H DP2234	Residential	Partial	-	-
101	Lot 42 DP878814	Residential	Partial	-	-
102	Lot 62 Sec H DP2234	Residential	Full	-	-
103	Lot 23 DP29081	Residential	Partial	-	-
104	Lot 61 Sec H DP2234	Residential	Full	-	-
105	Lot 60 Sec H DP2234	Residential	Partial	-	-
106	Lot 24 DP29081	Residential	Partial	-	-
107	Lot 10 DP29081	Residential	Partial	-	-

Property ID	Property (lot number)	Existing land use*	Acquisition type	Dwellings affected	Buildings (sheds) affected
108	Lot 3 DP238092	Commonwealth Department of Defence uses	Partial	-	-
109	Lot 31 DP244610	Residential	Partial	-	-
110	Lot 32 DP244610	Residential	Partial	-	-
111	Lot 2 DP224861	Rural residential	Partial	-	-
112	Lot 1 DP224861	Residential	Partial	Yes (1)	-
113	Lot 7 DP4832	Residential	Partial	-	-
114	Lot 500 DP1133119	Residential	Partial	-	-
115	Lot 1 DP551558	Residential	Partial	-	-
116	Lot 1 DP238092	Commonwealth Department of Defence uses	Partial	-	-
117	Lot 5 DP26658	Rural residential	Partial	-	-
118	Lot 6 DP26658	Rural residential	Partial	-	-
119	Lot 7 DP26658	Rural residential	Partial	-	-
120	Lot 1 DP711076	Residential	Partial	-	-
121	Lot 2 DP711076	Vacant	Partial	-	-

Notes:

* Information on existing land use is based on a review of aerial photography and visual inspections

** Strip of land located along road reserve

Roads and Maritime would acquire properties for the project in accordance with the provisions of the *NSW Property Acquisition (Just Terms Compensation) Act 1991*. Among other things, the Act provides the basis for assessing compensation.

Access to residual property parcels would be maintained through the current design via either The Northern Road or the local road network, however some permanent changes may be required. Roads and Maritime would continue to consult with property owners to effectively mitigate potential land use and access impacts where possible through detailed design.

Where partial acquisition of rural properties would occur, infrastructure such as fencing, dams, sheds and other structures, within the project construction footprint would be demolished or relocated due to the project. Any relocation of rural infrastructure for the project would be carried out in consultation with the property owner, prior to the removal of the infrastructure.

As outlined in section 3.10.2, there have been a number of design refinements which have resulted in an overall reduction to the construction footprint and associated lease areas, including ancillary facility C17. Additionally, a lease area within WaterNSW land previously proposed for drainage works would no longer be required based on the refined design. Other minor changes to temporary

leases of land may be required to accommodate the design refinements. This would result in limited changes to impacts on farm infrastructure such as dams, irrigation, fencing, shed and storage areas, and other facilities. Where this infrastructure would be demolished and reinstated or relocated as a result of the project, this would be carried out in consultation with the property owner, prior to the removal of the infrastructure.

No additional environmental management measures have been proposed beyond those identified in the EIS.

Land use impacts during operation

The proposed design refinements would result in an overall reduction in the size of the operational footprint of 16.26 ha. As outlined in Table 5-10, the proposed design refinements would result in a net decrease in the land required by the project for all land uses with the exception of land that is currently zoned for infrastructure, mainly transport of other infrastructure corridors; which would experience an increase of 0.05 ha. Where this land lies within the operational footprint of the project design it would remain in use as infrastructure and would be zoned accordingly.

Primary production uses would still comprise the largest area of land directly impacted by the project. As a result of the proposed design refinements, 11.56 ha of land currently used for primary production, and earmarked for rezoning to infrastructure land use within the EIS, would no longer be impacted by the project.

Table 5-10 Revised extent of directly affected land uses within the operational footprint

Land use	Penrith LGA		Liverpool LGA		Total region	
	Land in operational footprint (ha)	Change from EIS (- / + ha)	Land in operational footprint (ha)	Change from EIS (- / + ha)	Land in operational footprint (ha)	Change from EIS (- / + ha)
Environmental uses	1.20	-0.19	6.00	-0.34	7.20	-0.53
Primary production uses	20.19	-8.19	73.97	-3.37	94.17	-11.56
Transport and other corridors	44.88	-0.16	13.22	+0.21	58.10	+0.05
Urban	3.35	-1.23	1.04	-0.31	4.39	-1.54
Special category	20.05	-2.55	2.10	-0.15	22.16	-2.69
Total	89.67	-12.32	96.34	-3.94	186.01	-16.26

The use of land affected by temporary leases during construction would be temporarily disrupted or suspended for the duration of the lease. Any structures, facilities or infrastructure located on the affected lands would likely be demolished and/or relocated, in consultation with the landowner. On completion of construction, any land not required for the project's long-term operation would be reinstated to its former use.

No additional environmental management measures have been proposed beyond those identified in the EIS.

Social and economic impacts

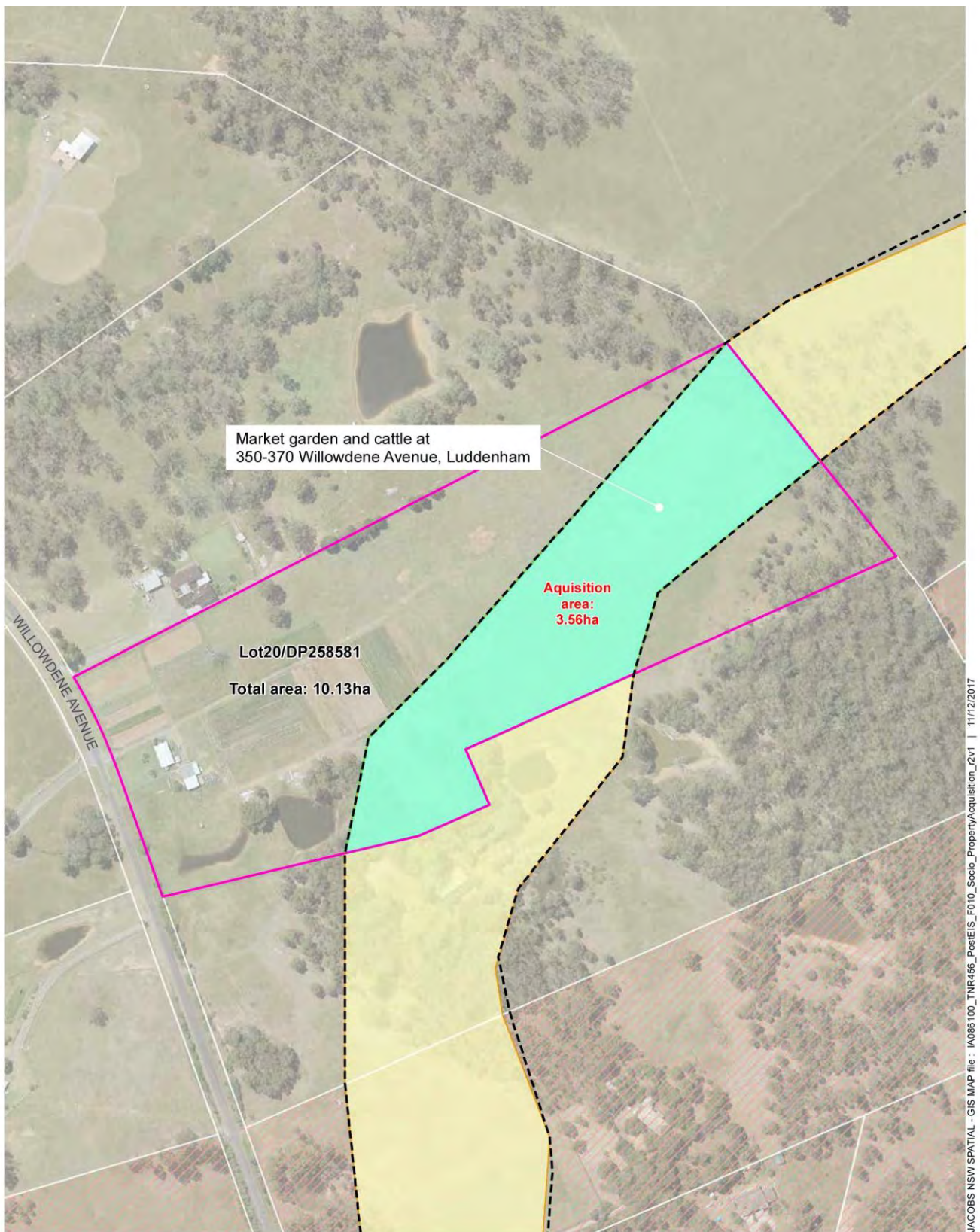
The EIS considered a range of potential social and economic impacts associated with project. The design refinements would not result in a significant change to the social and economic impacts outlined in the EIS. No additional environmental management measures have been proposed beyond those identified in the EIS.

Impacts on local businesses

An error was identified in the EIS in relation to Figures 7-13 and 7-14 of the EIS which show the location of directly affected businesses and agricultural businesses respectively. These figures correspond to Table 7-62 of the EIS which summarises the potential impacts to businesses. It has been identified that some of the impacted primary production lots identified in this table of the EIS were not included in the corresponding figures as follows:

- Market Garden and Cattle at 350-370 Willowdene Avenue, Luddenham
- Primary production at 2422-2430 The Northern Road, Luddenham
- Primary production at 28 Eaton Road, Luddenham.

These additional properties are shown in Figure 5-3.



Legend

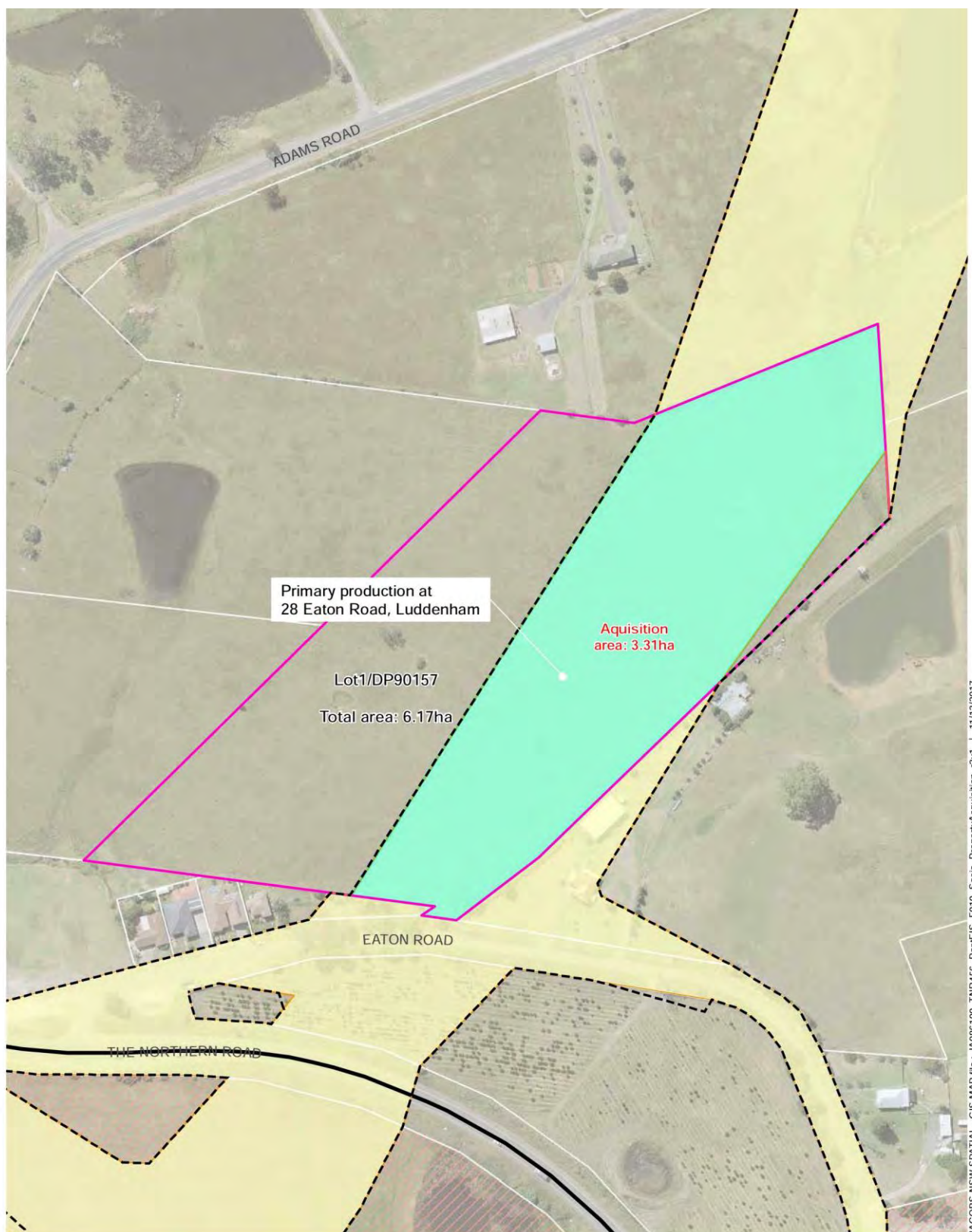
- EIS operational footprint
- Refined design operational footprint
- Land to be acquired for road purposes
- Lot boundary
- Western Sydney Airport site (Commonwealth Land)

0 100 200 m



Figure 5.3 | Directly affected businesses not shown in the EIS

Page 1 of 3



Legend

- The Northern Road
- EIS operational footprint
- Refined design operational footprint
- Western Sydney Airport site (Commonwealth Land)
- Land to be acquired for road purposes
- Lot boundary

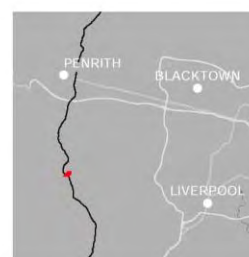
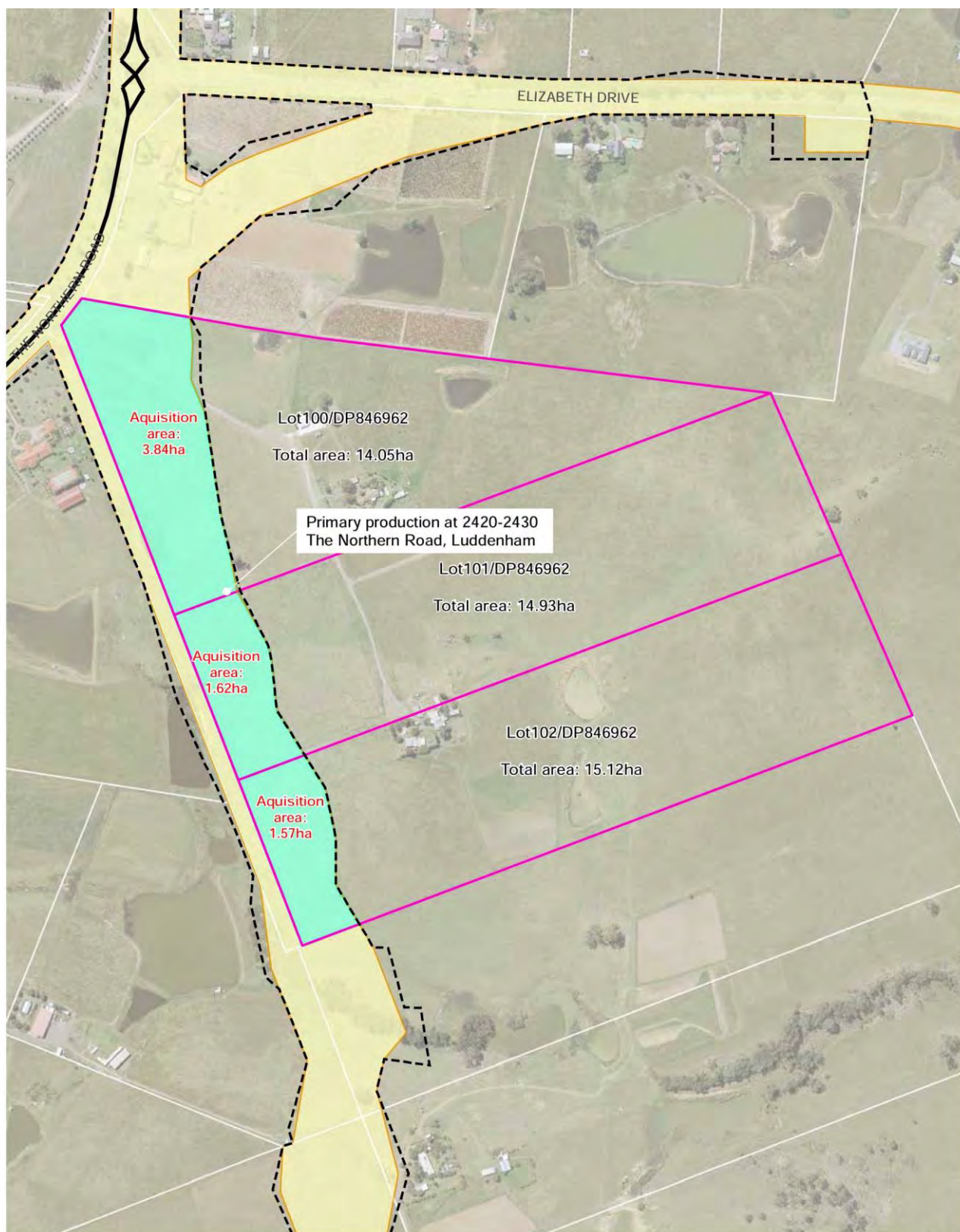


Figure 5.3 | Directly affected businesses not shown in the EIS

Page 2 of 3



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_PostEIS_F010_Socio_PropertyAcquisition_r2v1 | 11/12/2017

Legend

- The Northern Road
- EIS operational footprint
- Refined design operational footprint
- Land to be acquired for road purposes
- Lot boundary

0 100 200 m



Figure 5.3 | Directly affected businesses not shown in the EIS

Page 3 of 3

5.2 Other issues

5.2.1 Hydrology and flooding

The design refinements outlined in Table 4-1 have been considered against the outcomes of the hydrology and flooding assessment carried out for the EIS as outlined in section 8.1 of the EIS. Refinements that could have potential to result in minor changes to the hydrology and flooding assessment include:

- Refinements to drainage and water quality infrastructure
- Refinements to cuttings, embankments and median along the main alignment
- Geometry and alignment changes along the main alignment and local roads
- Refinements to medians and kerbs along the main alignment and local roads.

Section 8.1.3 of the EIS provided an assessment of potential impact of the project on flooding behaviour during construction of the project. The design refinements outlined in this report have been reviewed against the outcomes of EIS construction flooding and hydrology assessment.

Assessment methodology

Design checks have been carried out to compare and check the consistency of the design exhibited in the EIS and the current project design:

- The transverse drainage was checked by:
 - comparing culvert locations, types and dimensions
 - remapping of the catchments contributing to each structure and comparison of those areas
 - re-run of the TUFLOW model for the section of the main alignment about 600m north of Chain-O-Ponds Road to confirm that flooding conditions were not exacerbated in existing development located downstream of the road corridor
 - re-run of the TUFLOW model for Badgerys Creek where the main alignment has been lowered to confirm that the resulting afflux is comparable to the findings of the sensitivity study that is presented in the EIS.
- The pavement drainage was checked by:
 - comparing outlet locations with those shown in the EIS
 - remapping of the catchments draining to outlets and comparing with the areas shown in the EIS.
 - checked peak flows in drainage line MC DL16 to make sure that the rate of flow had not been increased in private property.
- Catch drain types, lengths and locations were checked against the EIS design
- The lengths of scour protection at the inlets and outlets of transverse drainage structures have been compared against the EIS design.

Assessment of potential operational impacts

The potential impacts of the project on flooding behaviour and the scour potential within receiving drainage lines has been considered during the design phases of the project and is ongoing as the design is finalised. Detailed flood modelling has been carried out to identify the potential residual flooding and drainage related impacts of the project following the incorporation of a preferred set of transverse drainage upgrade and flood mitigation measures into its design.

The design checks outlined above have indicated that the finalised drainage design for the project can be developed to ensure performance is consistent with the commitments made in the EIS.

Assessment of potential construction impacts

The potential construction hydrology and flooding impacts due to the proposed design refinements have also been considered. Overall, potential construction related impacts associated with the refined design for the project are considered consistent with those presented in the EIS. This is due to the fact that, in general, the design refinements have only marginally altered the design of the road when compared to the EIS design. Additionally, construction plant and equipment, construction timings and haulage routes would be the same as outlined in the EIS.

5.2.2 Soils, water and contamination

During the design refinement process, design refinements were made to the proposed road and pavement drainage design.

The refined design proposes 23 operational water quality swales (a reduction from the 24 proposed in the EIS). Pollutant removal is facilitated by the interaction between the flow and the vegetation along the length of the swale. Rock check dams are also proposed to provide additional treatment by slowing down the runoff and allowing it to temporarily pond during storm events. The location and size of each swale has been optimised to maximise filtering out of suspended materials and pollutants, including those proposed upstream of identified sensitive receiving waterways (i.e. Key Fish Habitat).

GPTs and water quality basins have been considered by Roads and Maritime as part of the water quality treatment type selection process. Since the generation of gross pollutant loads from the upgraded road is significantly lower than those generated from an urbanised catchment of residential or commercial landuse, any gross pollutants from the upgraded road would be removed at the swales as part of a road maintenance program.

Space constraints along a narrow road corridor was the main reason for not adopting specific water quality basins. These constraints included private and commonwealth properties, utilities, topographical constraints and clearing of trees and valuable vegetation.

The details of these swales are summarised in Table 5-11 and shown in Figure 5-4.

Table 5-11 Water quality treatment measures – Swales

Stage	Swale name	Swale length (m)	Receiving Creek	Catchment area to swale (ha)
Between Mersey Road, Bringelly and Eaton Road, Luddenham	S1*	257	Badgerys Creek	4.45
	S2*	136	Badgerys Creek	8.63
	S3	111	Duncans Creek	1.88
	S4	62	Duncans Creek	0.75
	S5*	83	Unnamed Creek	3.17
	S6*	38	Unnamed Creek	3.32
	S7*	65	Narro Dam	1.31
	S8*	40	Narro Dam	4.42

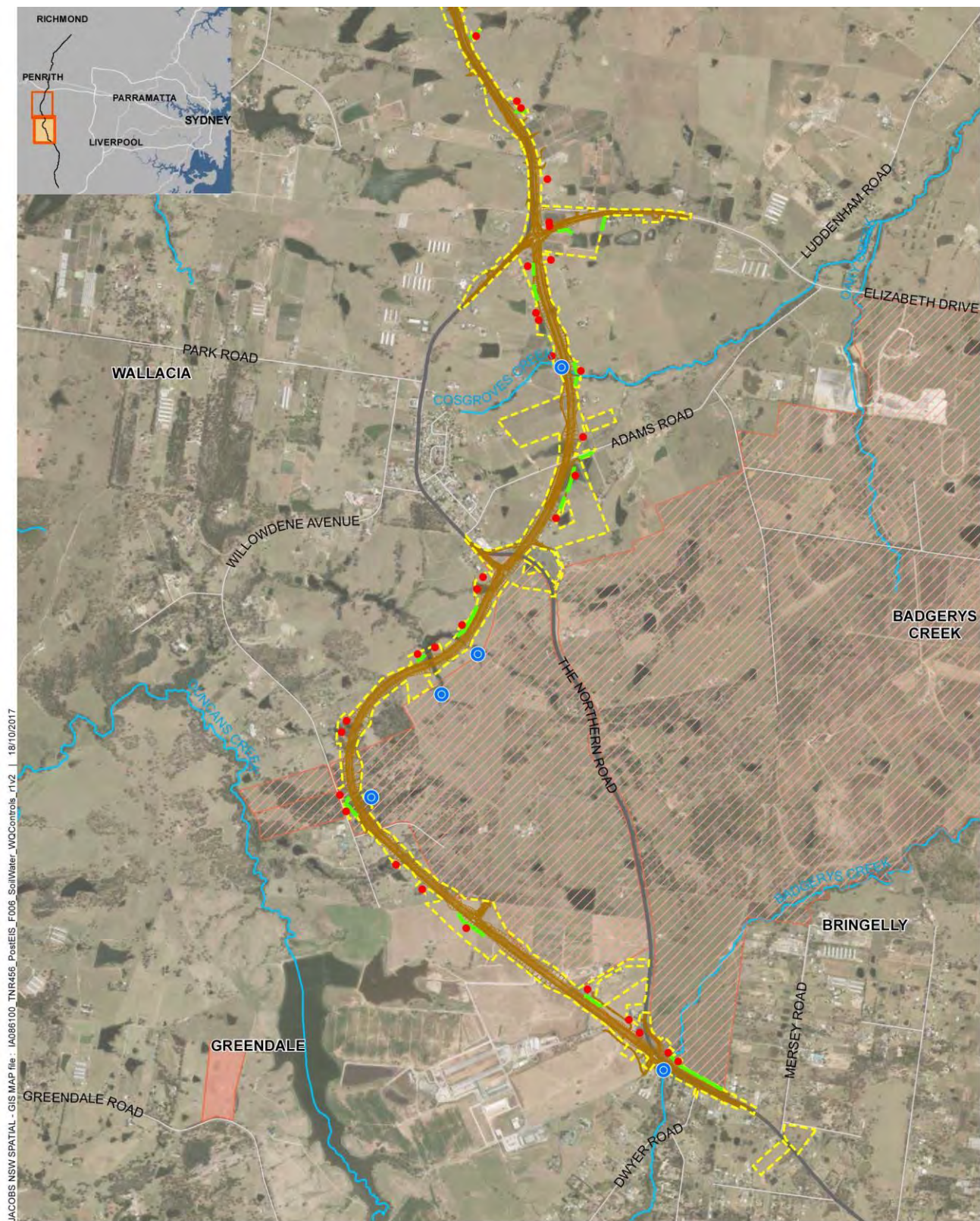
Stage	Swale name	Swale length (m)	Receiving Creek	Catchment area to swale (ha)
Between Eaton Road, Luddenham and Littlefields Road, Luddenham	S9	70	Adams Road Culvert	3.18
	S10	160	Adams Road Culvert	3.36
	S11	100	Adams Road Culvert	4.73
	S12*	60	Cosgroves Creek	0.39
	S13*	80	Cosgroves Creek	4.64
	S14	100	Unnamed Creek	0.26
	S15	80	Unnamed Creek	0.26
	S16	70	Unnamed Creek	3.49
	S17	40	Unnamed Creek	3.49
	S18	75	Unnamed Creek	2.53
	S19	80	Unnamed Creek	3.22
	S20	90	Unnamed Creek	0.36
Between Littlefields Road, Luddenham and Glenmore Parkway, Glenmore Park	S21	75	Unnamed Creek	3.40
	S22*	57	Surveyors Creek	1.40
	S23*	85	Surveyors Creek	0.41

*represents sensitive receiving waterway or creek

In addition to the 23 swales outlined above, two detention basins have been proposed to mitigate hydrological and flooding impacts (refer to Table 5-12 and Figure 5-4). The primary purpose of the detention basins is to provide peak flow mitigation for hydrology purposes, however an opportunity was presented to utilise the same area to also provide water quality treatment over the same footprint. This was achieved by creating a wet basin below the normally dry detention space. Therefore, these basins also provide pollution load reductions. No detention basins were originally proposed as part of the EIS.

Table 5-12 Water quality design refinements – Detention basins

Stage	Swale name	Swale length (m)	Receiving Creek	Catchment area to swale (ha)
Between Littlefields Road, Luddenham and Glenmore Parkway, Glenmore Park	P2140R	3775	Unnamed Creek	4.50
	P3650R	1170	Unnamed Creek	3.90



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_PostEIS_F006_SoilWater_WQControls_r1v2 | 18/10/2017

- The Northern Road upgrade - Mersey Road to Glenmore Parkway
- The Northern Road (Existing)
- Project area
- Western Sydney Airport site (Commonwealth Land)
- Defence Establishment Orchard Hills (Commonwealth Land)
- Commonwealth Lands
- Sediment basins (construction phase)
- Operational wet detention basins
- Water quality treatment swale (permanent)
- Key fish habitat / water quality monitoring sites

0 0.5 1 km

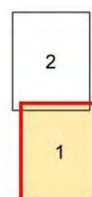


Figure 5-4 | Water quality controls

Page 1 of 2

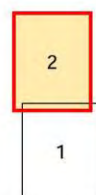
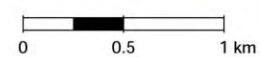
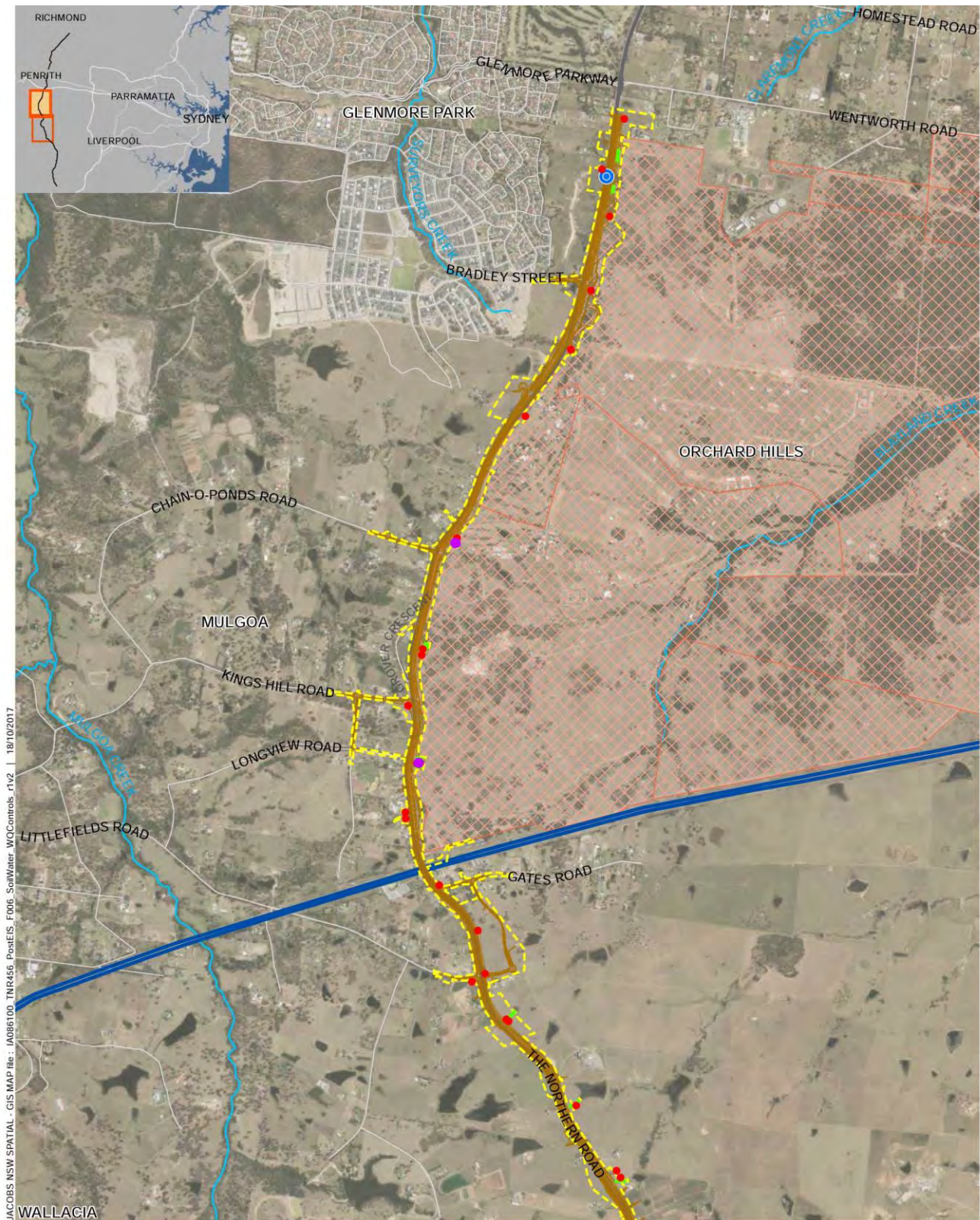


Figure 5-4 | Water quality controls

Page 2 of 2

Assessment methodology

Water quality modelling using the MUSIC - Model for Urban Stormwater Improvement Conceptualisation (MUSIC), was also carried out to identify the pollutant load reductions that can be achieved by permanent water quality swales (with rock check dams) for total suspended solids, total nitrogen and total phosphorus.

The catchment draining to an individual control measure was delineated by considering the formation of the proposed carriageway and the proposed pipe drainage network. The total catchment area was divided into two sub-catchments according to the different land-use characteristics of the „impervious road catchment“ area, and the batter slope or „pervious road side“ area.

The MUSIC model was set up to represent proposed catchment conditions. Models of the swales were created by adopting the sub-catchment areas estimated in the catchment analysis. Rock check dams were also added to the model as per the design of typical swale details.

The results of the MUSIC model were compared against the result previously achieved for the road and pavement drainage proposed in the EIS.

Construction impacts

The potential impact on receiving waterways during construction would be effectively mitigated through erosion and sediment controls including appropriately sized temporary sediment basins in accordance with the requirements of the Blue Book. The Blue Book criteria of „Minimum 150 m³ of annual sediment loss would be adopted. Impacts associated with the construction of this infrastructure would generally be consistent with the design proposed in the EIS and would not result in any additional impacts on water quality.

The proposed design refinements would not result in any additional impacts to soils or contamination during construction beyond that which was assessed in the EIS.

Operational impacts

The result of the MUSIC modelling for the 23 swales (S1-S23) (refer to Table 5-13) indicates that pollutant load reductions can be achieved as follows:

- Total suspended solids (ranged from 31 per cent to 93 per cent)
- Total phosphorous ranged from (17.2 per cent to 75 per cent)
- Total nitrogen (range from 5.3 per cent to 49 per cent).

Table 5-13 Annual average pollutant load reduction for the proposed vegetated swales

Swales	Total suspended solids (%)	Total phosphorous (%)	Total nitrogen (%)
S1	82	55	19
S2	70	45	13
S3	87	60	30
S4	74	46	15
S5	86	67	37
S6	92	75	49
S7	88	60	30
S8	56	39	12

Swales	Total suspended solids (%)	Total phosphorous (%)	Total nitrogen (%)
S9	80.1	58.1	17.8
S10	66.1	32.1	23.1
S11	67.1	35.1	11.8
S12	92.9	73.1	48.6
S13	71.3	50.3	12.9
S14	21.8	20.6	31.7
S15	73.6	73.6	48.7
S16	62.3	42.7	9.5
S17	31	17.2	5.3
S18	76.3	54.6	15.7
S19	78.5	56.1	16.7
S20	91.3	67.9	29.5
S21	67	47	14
S22	78	59	21
S23	93	72	42

The results of the MUSIC modelling for the two proposed basins (P2140R and P3650R) are outlined in Table 5-14.

Table 5-14 Annual average pollutant load reduction for the proposed basins

Basin	Total suspended solids (%)	Total phosphorous (%)	Total nitrogen (%)
P2140R	89	76	56
P3650R	77	64	40

The results of the MUSIC modelling, which are measured in annual pollutant load reductions, indicate that the refined road and pavement drainage would generally result in an improvement in water quality compared to that which was previously achieved (and assessed within the EIS).

The Water Management Policy of Liverpool City Council (section 4.1j) refers to pollutant load reductions for suspended solids, total phosphorus and total nitrogen. General policy pollutant load reductions are not available in the latest Council General DCPs, however a previous DCP 2008, Part 1, General Controls for all Development (section 6.4) indicates that post development water quality shall be reduced by 45 per cent for TP and TN and by 80 per cent for TSS.

The Penrith City Council Water Sensitive Urban Design Policy (section 3.2) indicates that pollutant load reductions should be 45 per cent for TN, 65 per cent for TP, 85 per cent for TSS and 90 per cent for gross pollutants.

The percentage reductions that are achieved by the proposed controls indicate that those reductions are not always achieved. This is due to site constraints that do not allow the provision of additional permanent water quality controls.

The proposed design refinements would not result in any additional impacts to soils or contamination during operation beyond that which was assessed in the EIS.

Environmental management measure

The EIS identified environmental management and mitigation measures that Roads and Maritime would adopt with regards to operational water quality; specifically, that 24 water quality swales would be constructed upstream of identified sensitive receiving waterways (refer to section 12 of the EIS). As described above, this would now comprise 23 water quality swales and two basins.

Consistent with the EIS, an Operational Water Quality Management Plan would be established which would outline monitoring and reporting requirements to confirm the effectiveness of these water quality measures, and identify if any additional measures are required.

5.2.3 Aboriginal heritage

As outlined in section 4.2 of this report, there have been a number of design refinements since exhibition of the EIS for the project which have resulted in changes to the construction footprint (ie the area of disturbance). The assessment of these changes in relation to Aboriginal heritage is outlined below.

Kelleher Nightingale Consulting (KNC) carried out the Aboriginal heritage assessment as part of the EIS. For the purpose of this report, KNC carried out a desktop assessment in September 2017 to assess the potential impact of the proposed design refinements on Aboriginal cultural heritage in comparison to the EIS design. The results of this assessment are outlined below.

Impact assessment

The assessment concluded that the proposed design refinements would not result in any additional impact on Aboriginal cultural heritage and are consistent with the impacts identified in the EIS. That is, a total of 28 Aboriginal archaeological sites would be impacted by the project as identified in the EIS, with 12 sites totally impacted and 16 sites partially impacted by the project.

Environmental management measure

Due to there being no change in impact, the design refinements would not result in any revised or additional environmental management measures for the project. The management measures identified in the EIS for Aboriginal cultural heritage would be implemented for the project.

5.2.4 Non-Aboriginal heritage

As outlined in section 4.2 of this report, there have been a number of design refinements since exhibition of the EIS for the project which have resulted in changes to the construction footprint (ie the area of disturbance). The assessment of these changes in relation to non-Aboriginal heritage is outlined below.

For the purpose of this assessment, a staged desktop assessment was carried out between June and September 2017 to assess the potential impact of the proposed design refinements on non-Aboriginal heritage in comparison to the EIS design. Additionally, a non-Aboriginal heritage technical memorandum was prepared in response to community and agency submissions, which reflected the refined design (refer to Appendix D). The results of this assessment are outlined below.

Existing environment

As outlined in the response to community and agency submissions, further historical research has been carried out and the associated assessments of heritage significance of some items assessed

in the EIS have been updated. Although the statements of heritage significance for some items were updated to reflect increased knowledge of these sites, there was no change to whether or not an item satisfied the criteria for local or State heritage listing, with no items of State heritage significance identified for the project.

Impact assessment

The desktop assessment focused on new areas of the construction (i.e. disturbance) footprint not previously assessed as part of the EIS. The assessment did not identify any new areas that overlap with registered historical heritage items, and did not identify any new impacted areas as having the potential for heritage items. However, the assessment identified a number of revised impacts to heritage items previously identified and assessed as part of the EIS as follows:

- Item 2: Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (including the Chaffey Brothers Irrigation Scheme Canal) – new areas of the construction footprint extend further into the DEOH, with increased impacts to the Orchard Hill Cumberland Plain Woodland site in relation to impacts to natural heritage and to historic heritage associated with the Chaffey Brothers Irrigation Scheme Canal located within the site. It is noted that some areas of the footprint have also reduced the impact to this item. An assessment of the area of the heritage features directly impacted by the revised footprint has been carried out and is presented below in comparison to the impact assessed as part of the EIS:
 - About 2.36 per cent of the northern part of the canal would be impacted based on the refined design construction footprint (refer to Figure 5-5), a slight reduction in comparison to the previously identified 2.43 per cent assessed in the EIS
 - About 9.28 ha of native vegetation within the Orchard Hills Cumberland Plain Woodland site would be impacted based on the refined design construction footprint (refer to Figure 5-6), a reduction in comparison to the previously identified 9.68 ha identified in the EIS. The revised footprint would not change the outcome of the EIS, with areas of low to moderate natural heritage significance being impacted, no areas of high significance are impacted as a result of the proposed design refinements. Additionally, there is no change to the tolerance for change of areas proposed to be impacted as a result of the proposed design refinements.
- Item 3: Warragamba Dam to Prospect Reservoir pipeline – an extension of the construction footprint in the location of the WaterNSW pipelines is located adjacent to an area of potential heritage significance not previously identified as part of the EIS. This area includes four concrete building foundations associated with the pipeline depot building (refer to Figure 5-7). The area was previously identified and surveyed by Jacobs in September 2016, however did not overlap with the design at the time and was therefore not further assessed or documented as part of the EIS. The design refinements have resulted in a change to the construction footprint at this location, with impacts to these heritage features avoided. A low risk remains that unknown potential heritage items associated with the pipeline may be located within this new impact area. With the implementation of the revised environmental management measures (see below), no additional heritage impacts are expected.
- Item 9: Miss Lawson's Guesthouse site – a research design and excavation methodology has been prepared for the site (refer to Appendix D) which has identified further details about the site and associated features (refer to Figure 5-8).
- Item 10: Lawson's Inn Site – a research design and excavation methodology has been prepared for the site (refer to Appendix D) which has identified through historical photographs and maps that the location of the Inn site is expected to be outside the project footprint. This has further informed the proposed management of the site. Where the EIS predicted about a third of the site would be impacted by the project, it is now expected that the main Inn site can be avoided and about one quarter of the curtilage of

the site is expected to be impacted. This part of the site has been identified as being of low archaeological significance based on further archaeological research (refer to Figure 5-9). If during testing significant archaeological resources are identified within these areas of low archaeological potential to be impacted by the project, then the design would be reviewed and where reasonable and feasible adjusted to avoid where possible or minimise these impacts.

No new potential heritage items were identified as part of this desktop assessment.

Environmental management measure

A research design and excavation methodology has been prepared for item 2 in relation to the canal (refer to Appendix D), with a requirement for archaeological investigation of the canal in the form of test excavation of the portion of the canal to be impacted. This would be implemented in addition to photographic archival recording of the item already proposed as part of the EIS.

An additional environmental management measure is also proposed to avoid potential impacts to the historical building footings identified on WaterNSW land associated with the item 3. This area is to be fenced off as an exclusion zone to avoid potential impacts as a result of the proposed drainage infrastructure works adjacent to this feature.

Additionally, research designs and excavation methodologies have also been prepared for items 9 and 10 as incorporated into Appendix D of this report. Further archaeological investigation would be undertaken in accordance with these requirements, including test excavation and salvage excavation for item 9 and test excavation of a portion of item 10.

As identified above, in relation to item 10: Lawson's Inn site, if during testing significant archaeological resources are identified within these areas of low archaeological potential to be impacted by the project, then the design would be reviewed and where reasonable and feasible adjusted to avoid where possible or minimise these impacts.

These measures have been incorporated into the revised environmental management measure for the project, as outlined in Chapter 6 of this report.

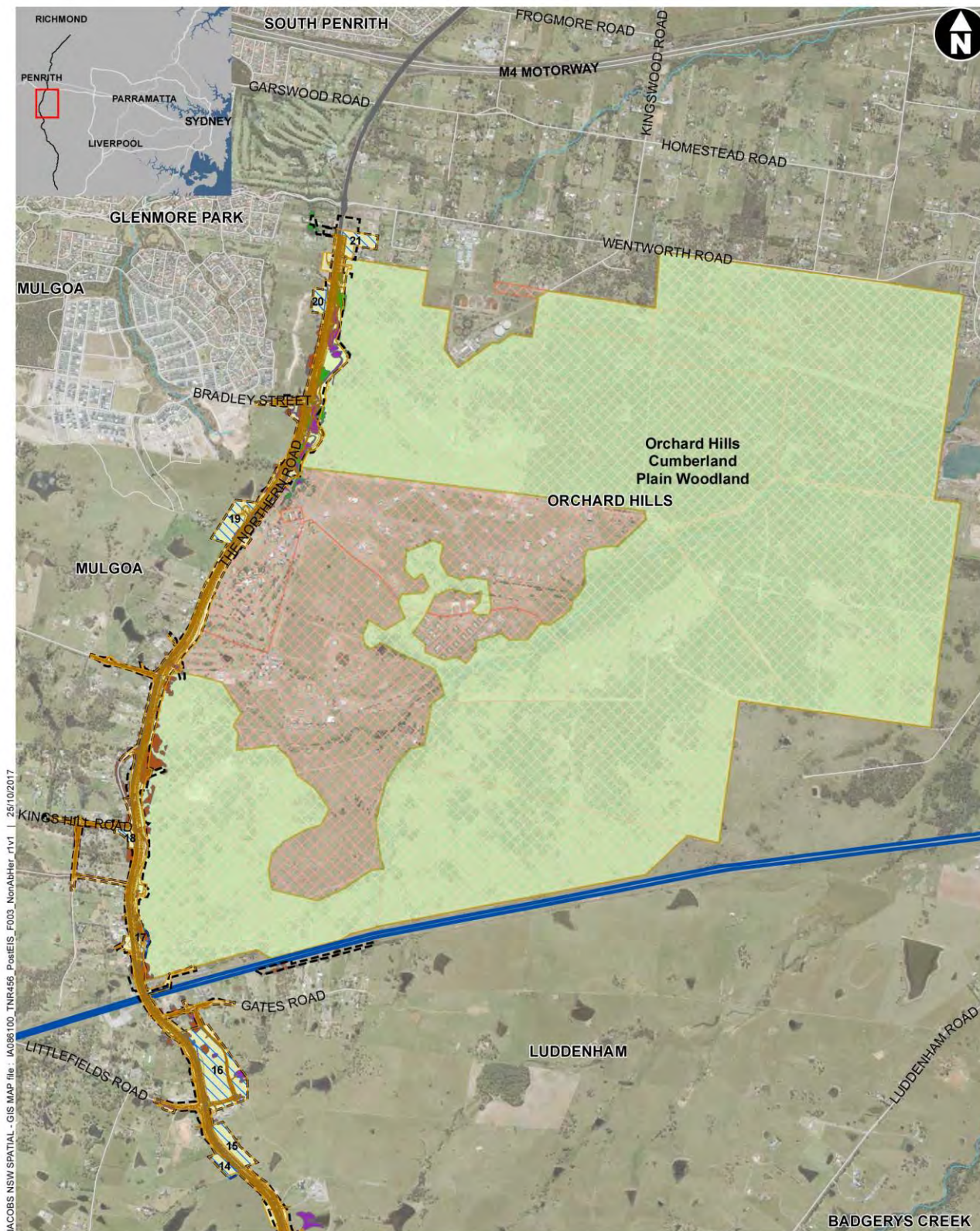




Figure 5-6 | Location of Orchard Hills Cumberland Plain Woodland showing extent of Chaffey Brothers Irrigation Scheme Canal (item 2) in relation to proposed works



Figure 5-7 | Location of Warragamba Dam to Prospect Reservoir Pipeline (Item 3) in relation to proposed works

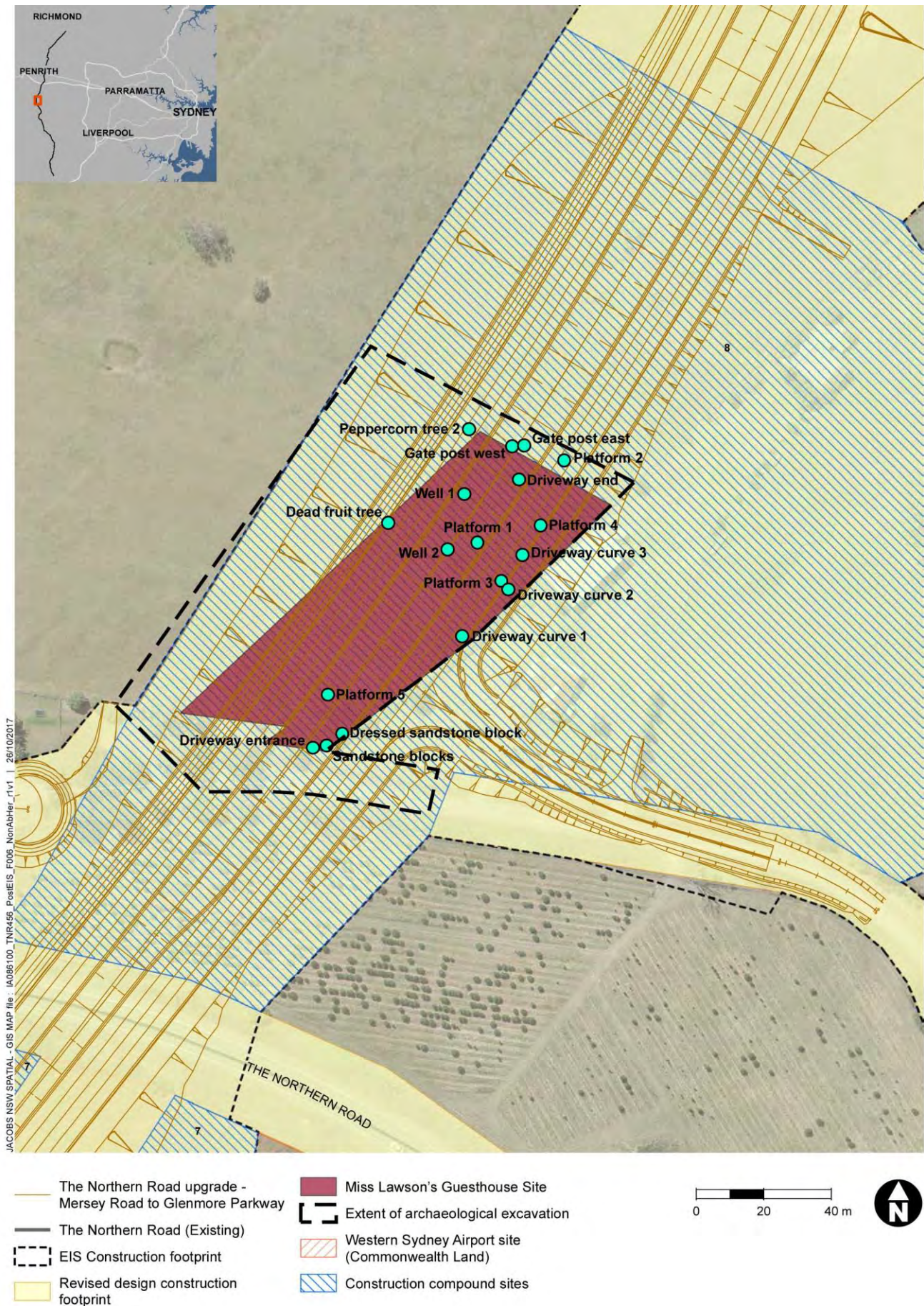
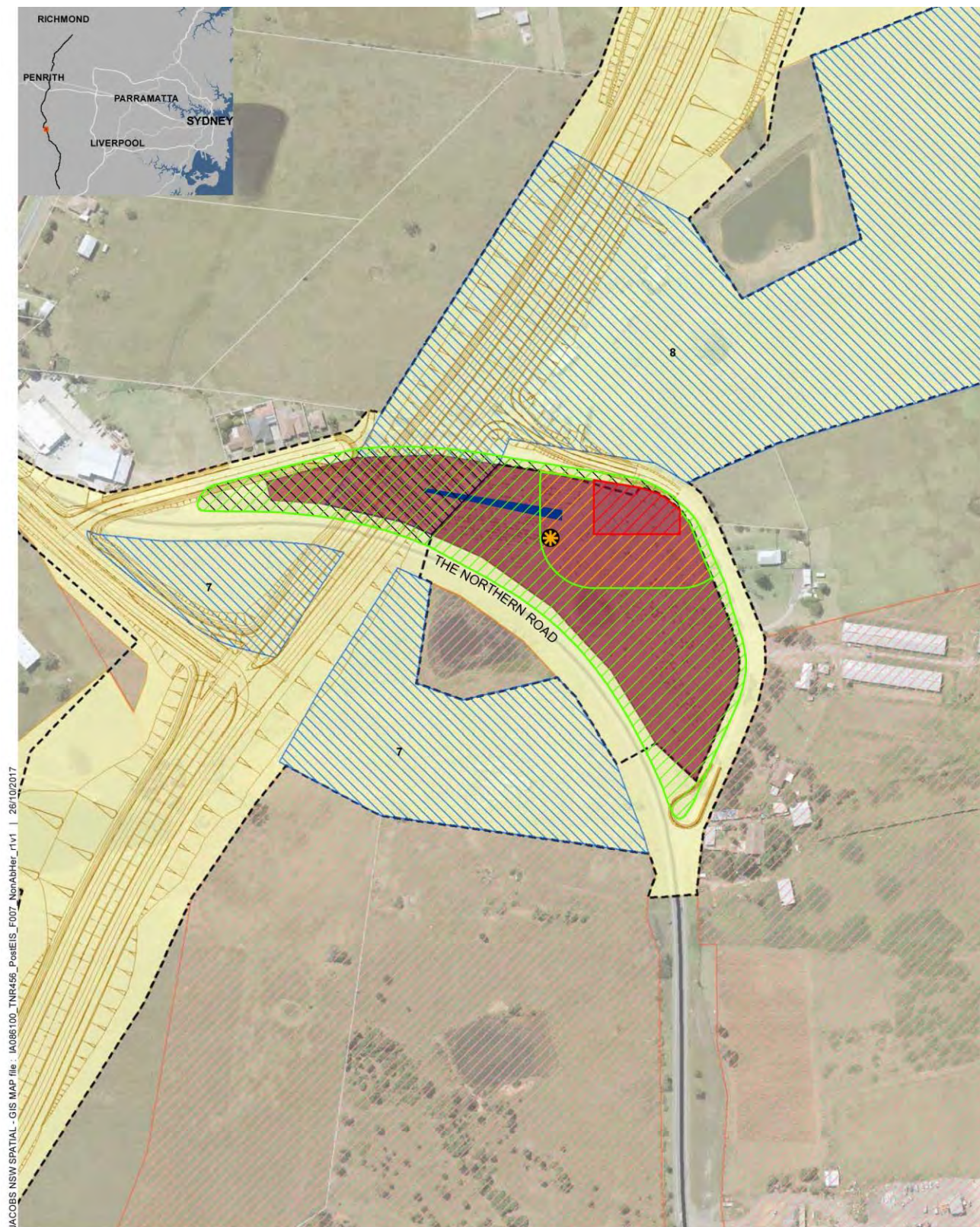


Figure 5-8 | Location of Miss Lawson's Guesthouse Site (Item 9) in relation to proposed works



JACOBS NSW SPATIAL - GIS MAP file: IA086100_TNR456_PostEIS_F007_NonAbbr_r1v1 | 26/10/2017

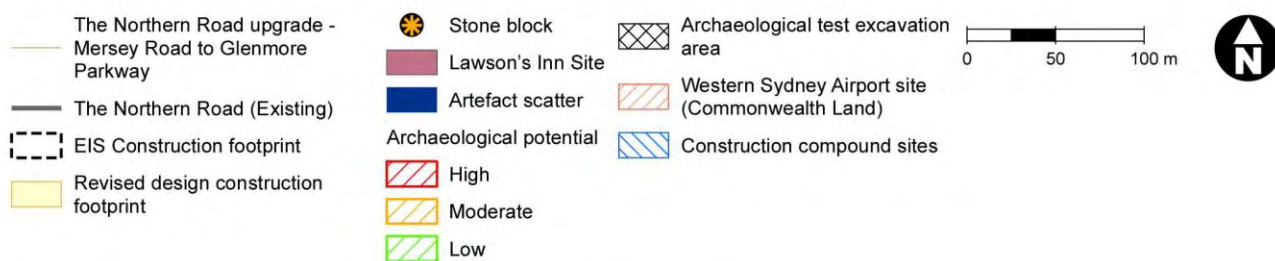


Figure 5-9 | Location of Lawson's Inn Site (Item 10) in relation to proposed works

5.2.5 Urban design and visual impacts

An urban design concept and Landscape Character and Visual Impact Assessment (LCVIA) was presented as Appendix O of the EIS and summarised in section 8.6 of the EIS. The findings of the LCVIA have been reviewed considering the project design refinements presented in Table 5-1.

The design refinements are located entirely within the area assessed during the EIS investigations, and further site investigations were not required. The design refinements have also not resulted in the development of new landscape character zones (LCZs) or viewpoints.

Potential construction impacts

Potential impacts to each of the LCZs as a result of the establishment and use of ancillary facilities during construction is summarised in section 8.5.4 of the EIS. The proposed design refinements would not alter the construction impacts presented in the EIS. Impacts as a result of typical construction activities would generally be temporary short-term, direct and indirect impacts. The removal of vegetation during construction would result in long-term impacts, which would be reduced in some areas during operation of the project as vegetation becomes established.

Landscape character impacts

A qualitative assessment of landscape character impacts across the five identified LCZs for the project is detailed in the Urban Design and Visual Impact Assessment (Appendix O of the EIS). The result of these assessments ranges from moderate to high, and is summarised in Table 8-33 of the EIS.

The five LCZs and the visual environment presented in the EIS remain unchanged. Sensitivity of the zone, and the magnitude of the proposed upgrade in that zone also remain unchanged. The proposed design refinements would not alter the landscape character zone impact ratings presented in the EIS however the following has been considered:

- Geometry and alignment refinements such as changes to batter slopes, vertical alignments and super elevation adjustments would occur within all five LCZs. Changes to intersection configurations would also occur within all five LCZs. Refinements are generally minor and would not impact the existing landscape character impact rating
- Changes to batter slopes would occur within all five LCZs. Steepening of some batters to a maximum of 1:2 slope has occurred to minimise property impacts but could result in minor changes to the existing landscape character impact rating presented in the EIS, however ratings were already assessed as Moderate to High
- The removal of VMS would occur within LCZ 3 (Luddenham Plateau) and LCZ 4 Cosgrove Creek. The removal of VMS is likely to result in less impact to the landscape character in these areas. Despite this, the impact rating for both LCZ remains unchanged
- Removal of the northbound heavy vehicle inspection bays (at Grover Crescent) would occur within LCZ 5 (Mulgoa-Orchard Hills). The removal is likely to result in less impact to the landscape character in these areas. Despite this, the impact rating for both LCZ remains unchanged
- Local road upgrades at Kings Hill Road, Vineyard Road extension and Gates Link Road would all occur within LCZ 5. LCZ 5 is a largely linear zone along the existing road corridor. Due to the variable topography and tree cover, proposed changes would be more easily absorbed and not widely visible beyond the road corridor. The changes to alignments of the local roads in this LCZ are relatively minor and would not impact the existing landscape character impact rating of Moderate.

Visual impacts

The potential visual impact of the project was assessed in relation to a number of key viewpoints and groups of viewpoints in Appendix O of the EIS). Table 8-34 of the EIS provides a summary of the visual impact at each viewpoint and each group of viewpoints.

A total of 19 viewpoints form the basis of the visual impact assessment in the EIS and this has not changed due to design refinements. The viewpoints are generally focused on locations that would be commonly viewed by the local community. The assessment indicates that the proposed upgrade of The Northern Road would have a high visual impact on two thirds of the assessed views.

The installation of VMS contributed to high visual impact ratings at Viewpoints 13, 15 and 18. At these locations it was noted that the VMS would be a large built structure that would be inconsistent with the surrounding rural environment. Removal of VMS is likely to reduce the visual impact at those viewpoints.

Minor refinements such as geometry changes, intersection changes and kerb and median refinements would be unlikely to affect the visual impact assessment provided in the EIS.

Urban Design Concept

An urban design strategy and concept plan is outlined in Appendix O of the EIS. The concept plan was based on the urban design and objectives and principles established for the project.

Roads and Maritime has reviewed design refinements against the urban design principles and advised additional assessment of the refined design by urban design specialist is not required. The urban design concept would be further refined during detailed design in conjunction with the construction contractors for the project and in consultation with relevant stakeholders such as Penrith and Liverpool City Councils.

5.2.6 Air quality

Construction activities have the potential to increase airborne particulate matters and cause nuisance impacts where construction is in proximity to sensitive receivers such as residential dwelling and community areas. Operational air quality impacts are associated with motor vehicle emissions arising from changes in the volumes of motor vehicles, model of travel (such as free flow or congestion) and proximity to sensitive receivers.

The refinements to the proposed design would not substantially alter the distance to sensitive receivers or traffic conditions and would be unlikely to substantially alter the air quality impacts. No additional environmental management measures have been proposed beyond those identified in the EIS.

5.2.7 Resources and waste management

During construction, earthworks would be required across the project area including for road widening, bridge construction and drainage. These works would generate spoil in surplus to that which can be reused on site. The proposed design refinements, including the changes to the batter slopes, would have only a negligible increase in surplus spoil. Surplus spoil that could not be reused on-site would be transported for beneficial reuse off-site in accordance with the relevant EPA resource recovery exemption or disposed at a licensed waste facility.

It is unlikely that the proposed design refinements would result in any other increase in waste generation or resource use during construction or operation. No additional environmental management measures have been proposed beyond those identified in the EIS.

5.2.8 Climate change and greenhouse gas

During construction, the greatest sources of greenhouse gas emissions are associated with the combustion of fuel by plant and equipment, the use of bitumen as part of the asphaltting process and the removal of vegetation. The design refinements would not result in any significant changes to these emission generating activities and therefore would be unlikely to result in more than a negligible increase in the greenhouse gas emissions.

During operation, greenhouse gas emissions are generally attributed to the combustion of fuel for road transport. The design refinements would not result in a substantial change in traffic volumes, congestion (level of service), or average speeds and therefore would be unlikely to result in more than a negligible increase in greenhouse gas emissions.

The design refinements would not result in a change to the climate change risks assessment outlined in the EIS. No additional environmental management measures have been proposed beyond those identified in the EIS.

5.2.9 Hazard and risk

The proposed design refinements would not result in any additional hazards or risks during the construction and operation of the project. Further, several of the design refinements were specifically designed to reduce potential safety risks including:

- The removal of the left turn onto The Northern Road from the existing Elizabeth Drive due to safety concerns about the proximity to the signalised intersection.
- The removal of left out Grover Crescent (south) access to increase safety of vehicles entering The Northern Road from Grover Crescent.

No additional environmental management measures have been proposed beyond those identified in the EIS.

5.2.10 Cumulative impacts

The EIS assessed the cumulative impact of potential construction and operational phase interfaces of the project with other projects in the vicinity.

As identified in the EIS, the construction timeframes of the other components of The Northern Road Upgrade would overlap with that proposed for the project and therefore are likely to result in cumulative impacts during those periods. As indicated in section 4.2.3 of this report, the project start and finish date would be delayed from what was assessed in the EIS, however this is not expected to significantly change the outcome of cumulative impacts of the project with this or other projects.

The EIS also identified potential cumulative impacts with other nearby developments that are not related to The Northern Road Upgrade program of work and which are likely to be under construction at a similar time to the project including:

- Western Sydney Airport
- Urban growth areas in western Sydney
- M12 Motorway
- M4 Smart Motorway civil work
- Other State Significant Developments proposed within the Penrith and Liverpool LGAs and in proximity to the project.

With regard to the Western Sydney Airport, the EIS stated that aviation infrastructure works are scheduled to overlap with the project's construction schedule by about one year – starting in mid-2019. Site preparation activities associated with the Western Sydney Airport, including substantial

earthworks are scheduled to commence in 2018 ahead of the aviation infrastructure works. The overlap of impacts would be larger than identified in the EIS, about two years rather than one.

Key cumulative impact considerations assessed as part of the EIS in relation to potential cumulative impacts associated with these projects included:

- Traffic and transport
- Noise and vibration
- Biodiversity
- Visual amenity, built form and urban design
- Air quality
- Socio-economic.

The outcomes of the EIS would generally be consistent with the project changes assessed in this report, taking into account taking into account revised impacts of the project as outlined above.

The additional construction timeframes associated with Western Sydney Airport site preparation activities would result in longer-term traffic and transport related impacts along the Northern Road. Construction traffic generated by the site preparation works would impact primarily on the arterial road network, including The Northern Road, with additional trucks travelling along the key arterials through the surrounding area. This would mean that higher than normal car and truck movements would be expected over a longer timeframe compared to that discussed in the EIS.

Construction activities and the additional traffic associated with them are likely to result in lower travel speeds and increased delays at intersections along The Northern Road. Increased heavy vehicle volumes may also result in delays in sections where cars are unable to overtake vehicles along The Northern Road.

The additional timeframes associated with the cumulative impacts of the Western Sydney Airport have not resulted in any additional management measures.

6 Revised environmental management measures

The environmental impact statement (EIS) for the project identified a range of environmental outcomes and management measures that would be required to avoid or reduce the environmental impacts.

After consideration of the issues raised in the public submissions, the environmental management measures for the project have been revised. Should the project be approved, the environmental management measures in Table 6-1 will guide the subsequent phases of project development. Additional and/or modified environmental management measures to those presented in the EIS have been italicised and deleted measures, or parts of measures, have been struck out.

6.1 Construction safeguards and management measures

These safeguards would minimise potential adverse impacts of the project. All safeguards described in this EIS would be incorporated into the contractor's CEMP. The timing and responsibility for the implementation of the safeguards would also be outlined in the CEMP. Roads and Maritime would retain responsibility for some of the safeguards including those related to detailed design, however the construction contractor would be responsible for implementing the majority of safeguards. The estimated costs of environmental mitigation measures have been captured in project capital costs and, whilst difficult to quantify specifically, would represent less than 10 per cent of project costs.

Table 6-1: Summary of revised environmental management measures

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Construction impacts	T-1	A Construction Traffic Management Plan (CTMP) would be developed, approved, implemented and monitored as part of the project. The TMP would: - Outline the general principles and procedures for the development of specific construction traffic control plan (CTP"s), taking into consideration where possible other construction works utilising similar haulage and access routes - Ensure safe and continuous traffic movement for construction workers and the general public - Maintain the capacity of existing roads where possible - Identify the requirements for temporary speed	Construction contractor	Pre-construction	Proven to be effective. Monitoring and reporting requirements of the CTMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		restrictions where traffic may pose a safety risk to workers • Maintain continuity of access to local roads and properties, particularly along the existing alignment of The Northern Road (may require temporary u-turn facilities). Where access is affected, RMS would consult with residents for alternative access arrangements • Details of access to construction sites including measures to prevent construction vehicles queuing on public roads • Provide temporary traffic control where necessary • Provide appropriate warning and signage for traffic in the vicinity of work areas • Include methods to minimise road user delays such as undertaking works around live traffic including tie-in and bridge work outside of peak periods • Undertake construction activities off-line where possible to minimise the requirement to operate temporary traffic control and reduced speed zones • Develop a communication plan to advise local residents and businesses of any changes to traffic conditions during construction • Consult with bus operators regarding temporary bus stop relocations during construction and proposed bus stops during operation. • <i>Ensure the use of local roads by heavy vehicles to access temporary ancillary</i>			

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		<i>facilities would be limited as far as is reasonably practicable.</i>			
Construction staging	T-2	Staging plans to be prepared in consultation with adjoining contractors and for each stage of the upgrade.	Construction contractor	Construction	Proven to be effective. The requirements for staging plans would be outlined within the TMP. Monitoring and reporting requirements of the TMP to confirm effectiveness of measures.
Road damage	T-3	Undertake a pre-construction dilapidation survey of local roads used for construction. Defects caused by construction activities would be rectified prior to completion of construction.	Construction contractor	Construction	Proven to be effective.
Property access	T-4	Access to properties along affected roads would be maintained during construction. The need for any alternative and/or temporary access arrangements would be agreed with affected property managers/owners.	Construction contractor	Construction	Proven to be effective. Access arrangements would be outlined in the TMP, the effectiveness of those arrangements and the need for any alternative and/or temporary access arrangements would be agreed with affected property owners.
<i>Local road upgrades</i>	<i>T-5</i>	<i>Roads and Maritime will consult with Councils regarding the requirements for upgrade of local roads.</i>	<i>Roads and Maritime</i>	<i>Construction</i>	<i>Expected to be effective.</i>
<i>Property access</i>	<i>T-6</i>	<i>Roads and Maritime will consult further with all utility providers on required access and consents for utility corridors prior to construction</i>	<i>Roads and Maritime</i>	<i>Pre-construction</i>	<i>Expected to be effective.</i>

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Construction noise impacts	NV-1	Construction Noise and Vibration Management Plan (CNVMP) would be prepared during the detailed design stage of the project and applied to all construction processes throughout the project. The CNVMP would be prepared in accordance with the requirements in the ICNG and RMS CNVG. The CNVMP would nominate: - Noise goals at all sensitive receivers - Restrictions on the hours of construction activity including an out-of-hours work procedure - Works programming that has the aim of minimising impacts on sensitive receivers - Noise and vibration mitigation measures consistent with the RMS CNVG - The project's commitments to noise and vibration monitoring and reporting <i>including:</i> <i>vibration monitoring of work in the vicinity of the Warragamba Dam pipeline</i> <i>safe working distances for vibration intensive plant to be adopted in proximity to the Warragamba Dam pipeline</i> - Protocols for engaging with and notifying residents of any work processes that may impact them - Describe an out-of-hours work procedure (with proforma) to be applied to all construction assessments, which is consistent with the applicable Environmental Protection Licence (EPL) for the project.	Construction contractor	Construction	Expected to be effective. Monitoring and reporting to confirm effectiveness of measures. Continuous improvement to be achieved through ongoing evaluation of monitoring results.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		• A complaints mechanism so that residents may contact the project manager • A protocol to enable the project to respond quickly to non-compliances.			
	NV-2	Viable mitigation measures that would be expected to be deployed by the construction contractor once the final construction sequencing and scheduling is known include: • Restricting works to standard construction hours as far as practicable, considering safety and traffic management requirements • Selecting quieter plant and equipment • Erecting temporary acoustic hoarding to reduce noise from works within a confined area • Deploying mobile hoardings (eg, acoustic screen curtains mounted on a wheeled trailer) to track moving, but tightly-contained processes • Maximising offset distances between receivers and noisy plant or activities • Orientating plant and processes away from residences, where reasonably practicable • Scheduling works for times outside of	Construction contractor	Construction	Expected to be effective. Monitoring and reporting to confirm effectiveness of measures. Continuous improvement to be achieved through ongoing evaluation of monitoring results.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		heightened sensitivity for the impacted receiver, eg, outside of school hours • Scheduling respite periods for noise-intensive processes undertaken near receivers, eg limiting operation of pavement sawing to three hours at a time • Planning any OOHW so that noisier works are carried out in the earlier part of the evening or night-time • Minimising the number of consecutive nights of works adjacent to any particular set of receivers • Restricting heavy vehicle movements, heavy deliveries and loading and unloading processes to daytime periods and to areas well away from receivers • Regularly maintaining and monitoring plant and equipment to ensure that their noise emissions are not excessive • Minimising the annoyance from reversing alarms by either fitting closed circuit monitors or non-tonal reversing alarms (“quackers”) on vehicles or deploying „spotters” to oversee reversing movements • Reducing throttle settings and switching off equipment when it is not being used. • <i>Hoarding (2.4 metres) to be installed at the perimeter of all ancillary facilities except where it can be justified that the acoustic benefit of the hoarding is not warranted</i> • <i>Haulage routes will be located as far away as possible from residential receivers, where this</i>			

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		<i>is reasonable and feasible</i> <i>Where it has been identified as necessary (eg in response to community complaints), noise monitoring will be undertaken to check that the noise mitigation measures are effective</i> <i>Static noise sources, such as generators, pumps and lighting towers, will be located as far as possible from sensitive receivers</i> <i>Loading and unloading will be carried out away from sensitive receivers, where practicable</i> <i>Ensure all deliveries occur during standard construction hours where reasonable and feasible.</i>			
	NV-3	Implement operational noise mitigation early in the construction program, where possible, to minimise construction noise impacts	Roads and Maritime	Construction	Proven to be effective
General construction impacts	B-1	- A Flora and Fauna Management Plan (FFMP) would be developed for the project. The plan would include procedures for pre-clearance surveys that are consistent with the Roads and Maritime Biodiversity Guidelines (RTA, 2011). The FFMP would outline: - Details of pre-construction surveys to verify the construction boundaries/ footprint of the project and to confirm the vegetation to be cleared as part of the project, identify habitat trees to be felled in a staged approach and identification of fauna release areas should fauna be encountered during vegetation removal	Contractor	Pre-construction	Proven to be effective. Monitoring and reporting requirements of the FFMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		- Updated sensitive aerial vegetation maps based on clearance surveys and previous survey work - Exclusion zones and fencing or other means to demarcate vegetation to be retained (endangered ecological communities) in close proximity to the works - Clearing of vegetation and removal of bush rock (Guide 7) including implementation of the pre-clearing process (Guide 1) and the associated staged habitat removal process where hollow-bearing trees, habitat trees or bush rock is to be removed - Weed management (see Guide 6) through the use of mechanical weed control methods such as slashing or mowing, as well as a range of herbicides - Pathogen management (see Guide 7) through the implementation of hygiene protocols such as the provision of vehicle and boot wash down facilities and ensuring vehicles and footwear are free of soil before entering or exiting the site, as well as the establishment of exclusion zones and designated access tracks - Mechanism for the monitoring, review and amendment of this sub-plan.			

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Removal of native vegetation, threatened species and threatened species habitat	B-2	Native vegetation removal would be minimised through detailed design.	Roads and Maritime	Detailed design	Expected effective. The design has been optimised throughout design options to minimise impacts to vegetation
	B-3	Pre-clearing surveys would be undertaken in accordance with <i>Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (NSW Roads and Traffic Authority, 2011). These measures would be outlined in the FFMP and would include monitoring and review procedures to be implemented to ensure the effective implementation of these measures, including but not limited to the following: - Identify and locate habitat features on site, and mark those to be protected during clearing - Identify suitable habitat areas for fauna relocation (if encountered during clearing works) 24 hours prior to clearing, licensed wildlife carers and/or ecologists should capture and/or remove fauna that have the potential to be disturbed as a result of clearing activities and relocate to the pre-determined location (as above) - Carry out staged habitat removal (Guide 4) where fauna habitat features have been identified and marked.	Contractor	Pre-construction	Proven to be effective if done in accordance with the Biodiversity Guidelines. Monitoring and reporting requirements of the FFMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
	B-4	Vegetation removal would be undertaken in accordance with <i>Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (NSW Roads and Traffic Authority, 2011). These measures would be outlined in the FFMP and would include monitoring and review procedures to be implemented to ensure the effective implementation of these measures, including but not limited to the following: - Carefully clear vegetation so as not to mix topsoil with debris and to avoid impacts to surrounding native vegetation - Retain stumps in riparian zones and aquatic habitats to reduce the potential for bank erosion - Separate woody vegetation into millable timber, secondary re-use (Guide 5) or exotic (non-native) vegetation - Non-woody vegetation should be incorporated into the stripping of topsoil to retain any organic materials and nutrients - The staged habitat removal process is to be used when identified habitat is to be removed, with a licensed wildlife carer or ecologist on site - Undertake bush rock removal in a way that minimises damage to the bush rock, avoids excessive soil disturbance and avoids climatic seasons when species are utilising this resource	Contractor	Construction	Proven to be effective if done in accordance with the Biodiversity Guidelines. Monitoring and reporting requirements of the FFMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		The Australian Standard AS 4373 Pruning of amenity trees should be followed for all pruning works.			
	B-5	The unexpected species find procedure is to be followed under Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic Authority, 2011) if threatened ecological communities, flora or fauna not assessed in the biodiversity assessment, are identified in the project site. The procedure is as follows: - Threatened flora or fauna species unexpectedly encountered Stop work - Notify the environment manager - Environmental manager would arrange for an ecologist to conduct an assessment of significance of the likely impact, develop management options and notify OEH, DPI and DoEE as appropriate - If a significant impact is not likely to occur, recommence work and maintain regular inspections, - If a significant impact is likely to occur: - Consult with OEH, DPI and DoEE as appropriate, - Obtain approvals, licenses or permits as required, - Recommence works once advice is sought and necessary approvals, licences and permits are obtained,	Contractor	Construction	Proven to be effective. Reporting requirements of the FFMP to be adhered to.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		Include species in subsequent inductions, toolbox talks and update the CEMP.			
Removal of native vegetation, threatened species and threatened species habitat	B-6	Native vegetation would be re-established in accordance with <i>Guide 3: Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (NSW Roads and Traffic Authority, 2011). These measures would be outlined in the FFMP and would include monitoring and review procedures to be implemented to ensure the effective implementation of these measures, including but not limited to the following: <i>Ecologists and landscape architects will work together on the preparation of revegetation plans and specifications that clearly identify the locations of areas to be revegetated.</i> - Use experienced and licensed seed collectors to carry out seed collection in accordance with RTA Seed Collection QA Specification R176 and the Florabank Guidelines and Model Code of Practice. - Planting operations should be in accordance with RTA Landscape Planting QA Specification R179. - Collect local native topsoils and leaf litter and store for use in revegetation works. - Ensure areas to be revegetated have an appropriate level of natural drainage, avoid compaction of soils in those areas and ensure suitable moisture requirements are maintained.	Contractor	Post construction	Proven to be effective if done in accordance with the Biodiversity Guidelines. Monitoring and reporting requirements of the FFMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		- Implement planting as per the planting plan for the project, including planting during suitable conditions, spacing and diversity of plants, etc. - Inspection, monitoring and maintenance of revegetated areas should be conducted in accordance with the Landscape Management Plan.			
	B-7	Habitat removal would be minimised through detailed design.	Roads and Maritime	Detailed design	Proven to be effective if done in accordance with the Biodiversity Guidelines.
	B-8	Habitat removal would be undertaken in accordance with <i>Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (NSW Roads and Traffic Authority, 2011). These measures would be outlined in the FFMP and would include monitoring and review procedures to be implemented to ensure the effective implementation of these measures, including but not limited to the following: - Carefully clear vegetation so as not to mix topsoil with debris and to avoid impacts to surrounding native vegetation. - Retain stumps in riparian zones and aquatic habitats to reduce the potential for bank erosion. - Separate woody vegetation into millable timber, secondary re-use (Guide 5) or exotic (non-native) vegetation.	Contractor	Construction	Proven to be effective if done in accordance with the Biodiversity Guidelines Monitoring and reporting requirements of the FFMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		- Non-woody vegetation should be incorporated into the stripping of topsoil to retain any organic materials and nutrients. - The staged habitat removal process is to be used when identified habitat is to be removed, with a licensed wildlife carer or ecologist on site. - Undertake bush rock removal in a way that minimises damage to the bush rock, avoids excessive soil disturbance and avoids climatic seasons when species are utilising this resource. - The Australian Standard AS 4373 Pruning of amenity trees should be followed for all pruning works.			
	B-9	Habitat would be replaced or re-instated in accordance with Guide 5: Re-use of woody debris and bushrock and <i>Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (NSW Roads and Traffic Authority, 2011). These measures would be outlined in the FFMP and would include monitoring and review procedures to be implemented to ensure the effective implementation of these measures, including but not limited to the following: - Separate weeds from native vegetation. - Carry out removal, stockpiling, transportation and relocation of woody debris and/or bush rock in a manner that minimises disturbance to native vegetation or bush rock. - Engage an ecologist to provide advice on	Contractor	Construction	Proven to be effective if done in accordance with the Biodiversity Guidelines. Monitoring and reporting requirements of the FFMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		positioning woody debris and bush rock in designated relocation areas. Keep topsoil disturbance to a minimum.			
Aquatic impacts	B-10	Aquatic habitat would be protected in accordance with <i>Guide 10: Aquatic habitats and riparian zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (NSW Roads and Traffic Authority, 2011) and section 3.3.2 Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013 (Department of Primary Industries, 2013). These measures would be outlined in the FFMP and would include monitoring and review procedures to be implemented to ensure the effective implementation of these measures, including but not limited to the following: - Avoid activities in aquatic habitats and riparian zones as much as practicable - Establish exclusion zones and set up exclusion fencing around sensitive area - Keep vehicles and machinery away from the banks of a waterway where possible - Refuelling of vehicles and plant, and chemical storage and decanting should not take place within 50 m of aquatic habitats - Avoid clearing within the riparian zone during periods when flooding is likely to occur - Retain the roots of trees on the bank of a	Contractor	Construction	Proven to be effective if done in accordance with the Biodiversity Guidelines. Monitoring and reporting requirements of the FFMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		waterway in order to maintain bank stability • During rehabilitation, stabilise the banks of the waterway through revegetation and/or armouring according to available landscape plans • Remove all temporary works, flow diversion barriers and sediment control barriers within aquatic habitats as soon as practicable and in a manner that does not promote future channel erosion.			
Removal of woody debris	B-11	All large woody debris or snags would be relocated instream (Guide 10).	Contractor	Construction	Expected to be effective.
Changes to hydrology	B-12	Changes to existing surface water flows would be minimised through detailed design.	Roads and Maritime	Detailed design	Expected to be effective. Drainage upgrades for the project have been designed and optimised to minimise changes to existing flows as much as possible.
	B-13	Measures to mitigate potential water quality impacts during construction are outlined in section 8.1 and section 8.2 of the EIS.	Contractor	Construction	N/A

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Fragmentation of identified biodiversity links and habitat corridors	B-14	Identified connectivity measures have been considered <i>at Surveyors Creek and Badgerys Creek to be further considered</i> during design in accordance with the <i>Wildlife Connectivity Guidelines for Road Projects</i> (RMS in prep). In particular, design where connectivity has been considered is to include culvert design, lighting and fencing. <i>Opportunities for increasing the height of culverts proposed to provide fauna underpass at these locations would be investigated during detailed design of the project where reasonable and feasible.</i>	Roads and Maritime and Contractor	Detailed design, during construction and post construction	Expected to be effective if done in accordance with the Wildlife Connectivity Guidelines. Monitoring and reporting requirements of the FFMP to confirm effectiveness of measures.
Edge effects on adjacent native vegetation and habitat	B-15	Exclusion zones would be set up at the limit of clearing in accordance with <i>Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (NSW Roads and Traffic Authority, 2011). These measures would be outlined in the FFMP and would include monitoring and review procedures to be implemented to ensure the effective implementation of these measures, including but not limited to the following: - Identify exclusion zones on a suitable plan as required to prevent damage to native vegetation and fauna habitats and prevent the distribution of pests, weeds and disease - Mark out exclusion zones on site with temporary markings such as pegs or paint and where possible use a qualified surveyor - Erect signs to inform personnel of the purpose of exclusion zone fencing - Ensure all exclusion zones are regularly	Contractor	Construction	Proven to be effective if done in accordance with the Biodiversity Guidelines. Monitoring and reporting requirements of the FFMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		inspected and repairs to fencing are made where required • Maintain exclusion fencing until the risk to disturbance within the excluded zone has been eliminated through other means. Removal of fencing should be undertaken in consultation with environmental staff • Communicate the importance of exclusion zones, and any changes to the zones, to all site staff and visitors (eg in toolbox talks and inductions) • <i>Exclusion zones would be established around Marsdenia viridiflora subsp. viridiflora plants proposed to be retained in the area of the DEOH fence between Kings Hill Road and Longview Road, in accordance with standard Roads and Maritime procedure</i> • <i>Exclusion zones would be established around the four Pultenaea parviflora plants to be retained in the area of the Vineyard Road extension in accordance with Roads and Maritime procedure</i> • <i>Roads and Maritime will investigate options for salvage of genetic material and/or translocation of Marsdenia viridiflora subsp. viridiflora and Pultenaea parviflora plants that are to be impacted prior to construction.</i>			

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Injury and mortality of fauna	B-16	Fauna would be managed in accordance with <i>Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (NSW Roads and Traffic Authority, 2011). These measures would be outlined in the FFMP and would include monitoring and review procedures to be implemented to ensure the effective implementation of these measures, including but not limited to the following: • Allow fauna to leave an area without intervention as much as possible. • Use a licensed fauna ecologist or wildlife carer with specific animal handling experience to carry out any fauna handling. • Include the procedures to follow if fauna is found or injured on site in project inductions. • Release fauna into pre-determined habitat identified for fauna release. • Release fauna into similar habitats, as near as possible to their capture location. Release nocturnal fauna at dusk. • Temporary fauna fencing may be required on projects to reduce the chances of road kill/injury from public traffic or construction machinery.	Contractor	Construction	Proven to be effective if done in accordance with the Biodiversity Guidelines. Monitoring and reporting requirements of the FFMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Invasion and spread of weeds	B-17	Weed species would be managed in accordance with <i>Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (NSW Roads and Traffic Authority, 2011). These measures would be outlined in the FFMP and would include monitoring and review procedures to be implemented to ensure the effective implementation of these measures, including but not limited to the following: • Use an ecologist or person trained in weed management and identification to undertake a site weed assessment to identify and describe or map weed infested areas within the site and adjacent areas. • Develop a Weed Management Plan for the site. • Map and mark areas that are infested with weeds as an exclusion zone with fencing and signage to limit access by personnel and vehicles. • Minimise soil disturbance within weed infested areas. • Use mechanical weed control methods such as slashing or mowing, as well as a range of herbicides to avoid the development of herbicide resistance • Mow/slash areas infested with weeds before they seed. This may reduce the propagation of new plants. • Clean machinery, vehicles and footwear before moving to a new location.	Contractor	Construction	Proven to be effective if done in accordance with the Biodiversity Guidelines. Monitoring and reporting requirements of the FFMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		- Securely cover loads of weed-contaminated material to prevent weed plant material falling or blowing off vehicles. - Dispose of weed-contaminated soil at an appropriate waste management facility.			
Invasion and spread of pathogens and disease	B-18	Pathogens would be managed in accordance with <i>Guide 7 – Pathogen Management: Protecting and managing biodiversity on RTA projects</i> (NSW Roads and Traffic Authority, 2011). These measures would be outlined in the FFMP and would include monitoring and review procedures to be implemented to ensure the effective implementation of these measures, including but not limited to the following: - Ensure vehicles and footwear are free of soil before entering or exiting the site (ie directed to wash down area before entering or exiting the site). - Provide vehicle and boot wash down facilities. - Set up exclusion zones with fencing and signage to restrict access into contaminated areas. - Restrict vehicles to designated tracks, trails and parking areas.	Contractor	Construction	Proven to be effective if done in accordance with the Biodiversity Guidelines. Monitoring and reporting requirements of the FFMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
<i>Impacts to riparian corridors</i>	<i>B-19</i>	<i>A Vegetation Management Plan (VMP) would be prepared in consultation with DPI Water prior to construction commencing, including details on:</i> <i>• The riparian corridor widths along the watercourses in proximity to the project (so that these areas can be avoided where possible)</i> <i>• Riparian areas potentially temporarily or permanently impacted by the project.</i> <i>• The rehabilitation of riparian areas temporarily impacted</i> <i>• Riparian offsets for the riparian areas permanently impacted</i> <i>The VMP would include a scaled map should be provided which identifies:</i> <i>• The riparian corridor widths in proximity to the project so that these areas can be avoided where possible</i> <i>• Riparian areas potentially temporarily or permanently impacted by the project.</i> <i>• Riparian offset areas.</i>	<i>Construction contractor</i>	<i>Prior to construction</i>	<i>Proven to be effective if done in accordance with the Biodiversity Guidelines.</i> <i>Monitoring and reporting requirements of the VMP to confirm effectiveness of measures.</i>
<i>Impacts to riparian corridors</i>	<i>B-20</i>	<i>All works on waterfront land would be carried out in accordance with the DPI Water Guidelines for Controlled Activities on Waterfront Land (2012).</i>	<i>Construction contractor</i>	<i>Construction</i>	<i>Proven to be effective if done in accordance with the Guidelines.</i>
<i>Revegetation</i>	<i>B-21</i>	<i>Roads and Maritime would consider reuse of topsoil as part of the Urban Design Landscape Plan (UDLP) for the project.</i>	<i>Roads and Maritime</i>	<i>Prior to construction</i>	<i>Proven to be effective if done in accordance with the Biodiversity Guidelines.</i> <i>Monitoring and reporting requirements of the UDLP to confirm effectiveness of measures.</i>

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
<i>Revegetation</i>	<i>B-22</i>	<i>Roads and Maritime would consider transplanting native species from areas to be cleared into revegetation areas, depending on the type of species being removed and the likely success of transplanting. Plants to be used in revegetation would be sourced from local provenance seed where appropriate and available, and associated seed collection would be undertaken prior to clearing.</i>	<i>Roads and Maritime</i>	<i>Prior to construction</i>	<i>Proven to be effective if done in accordance with the Biodiversity Guidelines. Monitoring and reporting requirements of the UDLP to confirm effectiveness of measures.</i>
<i>Revegetation</i>	<i>B-23</i>	<i>Rehabilitation of the disturbed areas of the site would be undertaken in accordance with Roads and Maritime Batter Stabilisation Guidelines and Roads and Maritime contractor specifications.</i>	<i>Construction contractor</i>	<i>Construction</i>	<i>Proven to be effective if done in accordance with guidelines</i>
<i>Biodiversity offsets</i>	<i>B-24</i>	<i>Offsets requirements (including Biobanking credits and additional supplementary measures) would be delivered in accordance with a Biodiversity Offset Strategy and supplementary measures package for the project in consultation with OEH and DOEE.</i>	<i>Roads and Maritime</i>	<i>Construction</i>	<i>Proven to be effective if done in accordance with guidelines</i>

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
General socio-economic impacts	SE-1	A Draft Community Involvement Plan would be prepared to guide community engagement during construction of the project and would be updated throughout construction. Communication would be with the local community, stakeholders and the wider region. The Draft Community Involvement Plan includes: • Guiding principles overall approach to community and stakeholder involvement • A comprehensive list of identified stakeholders • A register of specific issue communications strategies • Requirements for the project regarding access to information, complaints and inquiries procedures and community consultation • A range of communication tools applicable to the project • Contact names and details • Complaints procedures.	Roads and Maritime	Construction	Proven to be effective. To ensure flexibility in the communications approach to the project, communications and engagement activities would be monitored, assessed and reported regularly.
	SE-2	Areas affected by construction would be reinstated and restored in accordance with the urban design and landscape strategy.	Construction contractor	Construction	See Chapter 8.5 of the EIS
Noise and vibration during construction and operation	SE-3	Mitigation measures specific to construction noise and vibration can be found in section 7.2 of the EIS for this project.	Construction contractor/ Roads and Maritime	Pre-construction and during construction	See Chapter 7.2 of the EIS

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Air quality during construction and operation	SE-4	Mitigation measures specific to construction air quality can be found in section 8.6 of the EIS for this project.	Construction contractor/ Roads and Maritime	Pre-construction and during construction	See Chapter 8.6 of the EIS
Property acquisition	SE-5	Provide appropriate compensation in accordance with the <i>NSW Land Acquisition (Just Terms Compensation) Act 1991</i> for properties to be partially or fully acquired for the project.	Roads and Maritime	Pre-construction	N/A
	SE-6	Impact from the acquisition on owners' remaining holdings would be considered in the acquisition process. As required and in consultation with owners, Roads and Maritime would engage the use of appropriately qualified professionals to carry out property assessments and identify alternate opportunities for any remaining land holdings.	Roads and Maritime	Pre-construction	N/A
Property acquisition	SE-7	Undertake property adjustments and relocation of infrastructure (for example, fencing, dams, property access) in consultation with the property owner.	Construction contractor	Construction	Expected to be effective if carried out in accordance with consultation requirements
	SE-8	Undertake any adjustments to the Orchard Hills golf course, in consultation with the managers of the Orchard Hills Golf Club.	Roads and Maritime/ Construction contractor	Construction	Expected to be effective if carried out in accordance with consultation requirements.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Business and economic activity	SE-9	On-going consultation with local business owners, including owners of agricultural businesses, located close to construction works about the timing, duration and likely impact of construction activities on their business operations would be carried out.	Construction contractor/ Roads and Maritime	Construction	Expected to be effective. To ensure flexibility in the communications approach to the project, communications and engagement activities would be monitored, assessed and reported regularly.
	SE-10	Relocate and/or remove farm infrastructure, including farm dams, as required and in consultation with affected land owners.	Construction contractor	Construction	Expected to be effective if carried out in accordance with consultation requirements.
	SE-11	Maintain a business impact risk register to identify and manage the specific impacts associated with construction related works for individual businesses.	Construction contractor	Construction	Expected to be effective. Monitoring and reporting would be required to measure the effectiveness.
	SE-12	Access to existing businesses would be provided on a continuous basis throughout the construction of the project.	Construction contractor	Construction	Proven to be effective. Access arrangements would be outlined in the TMP, the effectiveness of those arrangements and the need for any alternative and/or temporary access arrangements would be agreed with affected property owners.
	SE-13	Roads and Maritime would undertake the project	Roads and	Construction	Expected to be effective.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		in accordance with the <i>NSW Government Policy on Aboriginal Participation in Construction</i> (NSW Finance and Services, 2016). <i>As part of the tender process, the contractor would also be required to prepare a Small to Medium Enterprise (SME) Participation Plan in line with the NSW Government SME Policy Framework to show how their tender will support local industry, including jobs, skills and capability development.</i>	Maritime / Construction contractor		Contractors for all projects covered by this policy must provide an Aboriginal Participation Plan to the contracting agency within 60 days of the contract being awarded.
Access and connectivity	SE-14	The Traffic Management Plan would include a signage strategy (consistent with Roads and Maritime policy) to provide guidance to passing patrons on access to shops, services and businesses during construction.	Construction contractor	Construction	Proven to be effective. Monitoring and reporting requirements of the TMP to confirm effectiveness of measures.
	SE-15	Access to properties would be provided on a continuous basis throughout the construction of the project Where temporary changes to property access are required, alternate access should be determined in consultation with affected property owners and tenants.	Construction contractor	Construction	Proven to be effective. Access arrangements would be outlined in the TMP, the effectiveness of those arrangements and the need for any alternative and/or temporary access arrangements would be agreed with affected property owners.
	SE-16	Access for pedestrians and cyclists near construction works would be maintained, including consideration of pedestrian access needs for elderly people, children and people with disability.	Construction contractor	Construction	Proven to be effective. Monitoring and reporting requirements of the TMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
	SE-17	Mitigation measures specific to Traffic and Transport can be found in section 7.1 of the EIS for this project.	Construction contractor	Construction	See Chapter 7.1 of the EIS
Cumulative impacts	SE-18	Mitigation measures specific to cumulative impacts can be found in Chapter 9.	Refer to Chapter 9	Refer to Chapter 9	See Chapter 9 of the EIS
<i>Impacts to utilities</i>	<i>SE-19</i>	<i>Strategies to address impacts to utilities would be developed in consultation with utility providers during detailed design and during construction of the project.</i>	<i>Roads and Maritime</i>	<i>Pre-construction Construction</i>	<i>Expected to be effective</i>
Impacts on flood behaviour during construction	FH-1	Temporary works would consider flood impacts during construction. Should construction staging require a temporary departure from the design (eg higher embankments for preloading, temporary diversions or temporary crossings), flood impacts would be assessed before finalising the approach.	Construction contractor	Construction	Expected to be effective Monitoring and reporting requirements of the Soils and Water Management Plan (SWMP) to confirm effectiveness of measures.
	FH-2	Appropriate scour protection measures would be implemented along any temporary drainage lines within the project construction area. Scour protection would be added to the outlets of the upgraded transverse drainage Scour protection measures would also be incorporated on the inlet of the upgraded transverse drainage in order to prevent damage to the structure during major flood events. Scour protection measures would take the form of dumped rock riprap or reno mattress.	Contractor	Pre-construction	Expected to be effective Monitoring and reporting requirements of the SWMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
	FH-3	A contingency plan to be prepared to manage a potential flood event during construction that would outline procedures to reduce the likelihood, including removing plant/equipment and stabilising exposed areas. This plan would consider the likelihood of flooding, evacuation routes, warning times, and potential impacts from the site flooding.	Construction contractor	Construction	Proven to be effective. Monitoring and reporting requirements of the SWMP to confirm effectiveness of measures.
<i>Drainage infrastructure</i>	<i>FH-4</i>	<i>Roads and Maritime will consult further with all utility providers regarding any drainage infrastructure required within their utility corridors prior to construction</i>	<i>Roads and Maritime</i>	<i>Pre-construction</i>	<i>Proven to be effective.</i>
General construction impacts	SWC-1	A Soil and Water Management Plan (SWMP) would be developed in accordance with the Roads and Maritime specification G38 – Soil and Water Management and the Blue Book – <i>Soils and Construction – Managing Urban Stormwater Volume 1</i> (Landcom, 2004) and Volume 2D (DEC, 2008a). The SWMP would include but not be limited to: • An erosion and sedimentation control plan and maintenance schedule for ongoing maintenance of temporary erosion and sediment controls • A Sediment Basin Management Plan to guide appropriate management of runoff during construction and operation • An incident emergency spill plan which would include measures to avoid spillages of fuels, chemicals and fluids onto any surfaces or into any nearby waterways • Preparation of a wet weather rain event which	Construction contractor	Pre-construction	Proven to be effective. Monitoring and reporting requirements of the SWMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		includes a process for monitoring potential wet weather and identification of controls to be implemented in the event of wet weather • Provision of a maintenance schedule for ongoing maintenance of erosion and sedimentation controls • A review process by a soil conservationist and a process for updating the report to address any recommendations • A <i>stream and</i> farm dam dewatering plan to be prepared include: – A map showing locations of <i>streams and</i> farm dams to be dewatered <i>and the selected relocation sites</i> – <i>fisheries Permit and Animal Care and Ethics requirements</i> – Methodology for dewatering <i>streams and</i> dams with consideration to aquatic ecology <i>including the capture, storage, relocation, release of fish and other aquatic fauna</i> – <i>Euthanasia procedure (as required)</i> – Location of any offsite discharge points – Requirements to manage encounters of contaminated water.			

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Water quality during construction	SWC-2	A water quality monitoring program would be developed during detailed design which would outline the pre-construction baseline water quality monitoring to be undertaken, as well as the ongoing construction and operational water quality monitoring requirements. The program would be updated once the construction and operational phase water quality monitoring parameters have been determined (based on the results of the baseline water quality monitoring). The program would include specific monitoring locations, frequency, parameters, and relevant procedures to be implemented. This would include a procedure to be followed in the event that monitoring results during construction or operation indicate an exceedance of the specified criteria, including any stop works requirements, relevant non-conformance, corrective and preventative actions, reporting and review procedures. This would include a requirement to review the effectiveness of control measures and identify any potential additional controls or revised work procedures or management measures that may need to be implemented. It is noted that any sample locations or access requirements within the DEOH site would be determined in consultation with Department of Defence (DoD).	Construction contractor / Roads and Maritime	Pre-construction / construction / operation	Proven to be effective.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
	SWC-3	The realignment of the tributary of Surveyors Creek would be progressively stabilised to avoid potential scour and sedimentation and permanent stabilisation measures would be implemented as soon as practicable. <i>The permanent stabilisation measures would consist of soft engineering solutions where reasonable and feasible and the realigned creek would mimic a natural creek system of the local area.</i> <i>The riparian corridor along either side of the realigned creek would be rehabilitated in accordance with the Vegetation Management Plan to be developed for the project in accordance with the DPI Water guidelines.</i>	Construction contractor	Construction	Expected to be effective. Monitoring and reporting to confirm effectiveness of measures. Continuous improvement to be achieved through ongoing evaluation of monitoring results.
	SWC-4	50 temporary sediment basins are proposed during construction of the project. <i>Appropriately sized sediment basins would be designed, implemented and managed during construction in accordance with the requirements of the Blue Book. Temporary sediment basins would be located outside of the riparian corridor where possible.</i>	Construction contractor	Construction	Proven to be effective Temporary basins have been designed to provide sufficient volume for settling and storage of sediments.
Soil salinity impacts	SWC-5	Durability and aggressivity samples of soil material would be collected and analysed prior to the construction phase, to determine potential impacts of soil salinity on pavement infrastructure.	Contractor	Pre-construction	Proven to be effective.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Sedimentation and Erosion	SWC-6	Erosion and sediment controls would be implemented before construction starts in accordance with Blue Book requirements: - Sediment basins would be regularly serviced and maintained to comply with water quality and capacity requirements - Clearing of vegetation and site stabilisation of disturbed areas would be undertaken progressively to limit the time disturbed areas are exposed to erosion prices - High risk soil and erosion activities such as earthworks would not be undertaken immediately before or during high rainfall or wind events - Stockpiling of topsoil separately for potential reuse in landscaping and rehabilitation works - Permanent catch drains would be installed behind cut faces to act as diversion drains during the construction phase - Erosion and sediment control measures would be maintained until the works are complete and areas are stabilised by revegetation	Construction contractor	Construction	Proven to be effective. Monitoring and reporting built into the SWMP to confirm effectiveness of measures.
Sedimentation and Erosion	SWC-7	A soil conservationist from Roads and Maritime Erosion, Sedimentation and Soil Conservation Consultancy Services would be engaged to review the erosion and sedimentation plans and conduct routine inspections of the construction works.	Roads and Maritime	Pre-construction	Proven to be effective. Monitoring and reporting requirements of the SWMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Impacts to water pollution (surface water and groundwater)	SWC-8	All fuels, chemicals, and liquids would be stored at least 50 m away from the existing stormwater drainage system and would be stored in an impervious bunded area within the compound site. The refuelling of plant and maintenance machinery would be undertaken <i>at least 50m from waterways with appropriate spill containment mechanisms in place such as impervious bunding and the provision of spill kits nearby</i>. in impervious bunded areas in the designated compound area. Vehicle wash downs and/or concrete truck washouts would be undertaken within a designated bunded area of an impervious surface or undertaken off-site. Disposal of dam water would be done in accordance <i>with the stream and</i> farm dam dewatering plan.	Construction contractor	Construction	Expected to be effective. Monitoring and reporting to confirm effectiveness of measures. Continuous improvement to be achieved through ongoing evaluation of monitoring results.
Impacts to water pollution (surface water and groundwater)	SWC-9	It is not expected that specific controls for groundwater would be required. This is primarily due to the low to very low permeability of Wianamatta Shale and subsequently minor to negligible extent of drawdown and negligible seepage through identified road cuttings. The expected groundwater inflows are anticipated to be in the order of 0.1 L/s/km of cuttings, although probably much less. It is considered prudent that if groundwater is encountered during excavation works the groundwater monitoring plan detailed below should be implemented.	Construction contractor	Construction	N/A

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Disturbance of contaminated or potentially contaminated land	SWC-10	Intrusive investigations should be undertaken in the vicinity of moderate risk areas including service stations (operational and non-operational), stockpiles and market gardens. A Contaminated Land Management Plan would be prepared in accordance with the <i>Contaminated Land Management Act 1997</i>, relevant EPA Guidelines and Roads and Maritime Guideline for Management of Contamination (Roads and Maritime,2013) and would include at a minimum: • Contaminated land legislation and guidelines including any relevant licences and approvals to be obtained • Identification of locations of known or potential contamination and preparation of a map showing these locations • Identification of rehabilitation requirements, classification, transport and disposal requirements of any contaminated land within the construction footprint • Measures to manage stockpiled potentially contaminated soil in accordance with the requirements of NSW EPA Waste Guidelines • Contamination management measures including waste classification and reuse procedures and unexpected finds procedures for unanticipated discovery of contaminated material during construction • Asbestos handling and disposal requirements in accordance with NSW EPA guidelines • Excavated material that is not suitable for on-	Construction contractor	Construction	Proven to be effective. Monitoring and reporting requirements of the CLMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		site reuse or recycling would be transported to a site that may legally accept that material for reuse or disposal.			
Encountering UXO	SWC-11	For UXO"s, an investigation should be undertaken to confirm the likelihood of UXO"s being present within the areas of the project within DEOH. The investigation should be undertaken prior to construction activities by a suitably qualified consultant registered on the Commonwealth Department of Defence UXO Panel (DUXOP) now subsumed into the Defence Environment and Heritage Panel (DEHP).	Construction contractor	Construction	Proven to be effective
<i>Soil stockpiling</i>	<i>SWC-12</i>	<i>There would be no stockpiling of soil or construction materials within utility easement corridors.</i>	<i>Construction contractor</i>	<i>Construction</i>	<i>Proven to be effective</i>
Aboriginal construction heritage management plan	AH-1	A Construction Cultural Heritage Management Plan (CHMP) would be prepared prior to construction and implemented as part of the CEMP. The CHMP would include details on: • The policy basis for management measures • The erection of any temporary fencing for the protection of heritage sites being partially impacted • Unexpected finds procedures • Responsibilities for heritage management • Salvage excavation methodologies • Consultation requirements	Construction Contractor	Pre-construction	Proven to be effective. Monitoring and reporting requirements of the CHMP to confirm effectiveness of measures. Specific measures carried out in accordance with agreed guidelines and by qualified archaeologists.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		Procedures for monitoring and reporting on the effectiveness of measures.			
Archaeological sites partially impacted by the project	AH-2	The location of the portions of these sites to be conserved would be identified in the CHMP, Construction Heritage Sites Map and project inductions to ensure they are not inadvertently damaged as a result of construction works. The portion of the site outside the project boundary would be fenced off prior to the commencement of construction works in accordance with the management procedures outlined in the CHMP. Archaeological salvage excavation would be undertaken for the impacted portion of the following sites in accordance with the salvage excavation methodology detailed in Appendix M: - B6 - TNR AFT 08 - TNR AFT 11 - TNR AFT 12 - TNR AFT 13 - TNR AFT 14 - TNR AFT 20 - TNR AFT 22 - TNR AFT 24 - TNR AFT 26 - TNR AFT 27	Construction contractor	Construction	Expected to be effective. Salvage excavation activities would be carried out in accordance with the methodology outlined in the Cultural Heritage Assessment Report (CHAR) by a qualified team and in consultation with relevant stakeholder groups. The salvage methodology is considered bot efficient and effective.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		- TNR AFT 29 - TNR AFT 30 - TNR AFT 31 - TNR AFT 33			
Archaeological sites wholly impacted by the project	AH-3	Archaeological salvage excavation would be undertaken for the following wholly impacted sites in accordance with the management procedures outlined in Appendix M: - TNR AFT 06 - TNR AFT 07 - TNR AFT 16 - TNR AFT 17 - TNR AFT 19 Archaeological salvage excavation must be completed prior to any activities which may harm Aboriginal objects in accordance with the management procedures outlined in Appendix M. No construction activities would occur on lands to be salvaged until the relevant archaeological excavations at the nominated site have been completed.	Roads and Maritime	Pre-Construction	Expected to be effective. Salvage excavation activities would be carried out in accordance with the methodology outlined in the CHAR by a qualified team and in consultation with relevant stakeholder groups.
Unexpected identification of skeletal remains	AH-4	In the event of the unexpected discovery of suspected archaeological Aboriginal human remains during the proposed works, in addition to the procedures outlined in the Roads and Maritime Unexpected Heritage Items Procedure (2015a), the CHMP would require that Roads and Maritime immediately notify the identified knowledge holders of the	Construction contractor	Construction	Expected to be effective if carried out in accordance with procedures outlined in CHAR.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		discovery. If the material is confirmed to be archaeological Aboriginal human remains that consultation would occur with the identified knowledge holders. Procedures for Handling Human Remains are detailed in Appendix M and summarised below: - As soon as remains are exposed, all work is to halt at that location immediately and the Project environmental manager on site is to be immediately notified to allow assessment and management: - Stop all activities - Secure the site. - Contact police as the discovery of human remains triggers a process which assumes that they are associated with a crime. The NSW Police retain carriage of the process until such time as the remains are confirmed to be Aboriginal or historic - The relevant approval authority(s) will be notified when human remains are found - Once the police process is complete and if remains are not associated with a contemporary crime contact the relevant approval authority(s) who will determine the process in consultation with OEH and/or the Heritage Office as appropriate: - If the remains are identified as Aboriginal, the site is to be secured and the approval authority(s) and all Aboriginal stakeholders are to be notified in writing. The approval authority(s) will act in consultation with OEH as appropriate. OEH will be notified in writing according to the approval authority(s)			

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		instructions or - If the remains are identified as non-Aboriginal (historical) remains, the site is to be secured and the approval authority(s) is to be contacted, who will act in consultation with the Heritage Division as appropriate. The Heritage Division will be notified in writing according to the approval authority(s) instructions - Once the police process is complete and if the remains are identified as not being human work can recommence once the appropriate clearances have been given.			
Unexpected identification of Aboriginal objects	AH-5	Where there is a proposed change to the project (once approved), this change will be considered in the context of potential impact to Aboriginal cultural heritage, whether increased or reduced. Where a proposed change to the approved project occurs outside of the project boundary, further heritage assessment will be required in consultation with the appointed Archaeologist to determine if there would be an impact on Aboriginal cultural heritage. Where the change is considered to have a neutral or lesser significant impact on Aboriginal cultural heritage than that identified for the approved project (as per this assessment), it would be considered a consistent impact. Where the change to the approved project is considered to have a more significant impact on Aboriginal cultural heritage than that identified in the EIS, it would be considered an inconsistent	Construction contractor	Construction	Expected to be effective if carried out in accordance with procedures outlined in CHAR.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		impact. In this case, Roads and Maritime would require a modification to the approved project, and further consultation with Aboriginal stakeholders would be required to be undertaken.			
<i>Consultation</i>	<i>AH-6</i>	<i>Council would be provided copies of heritage reports and photo archival results. Release of sensitive information would be carried out in accordance with the wishes of Aboriginal stakeholders.</i>	<i>Roads and Maritime</i>	<i>Construction</i>	<i>Proven to be effective.</i>
Construction impacts to non-Aboriginal heritage items and places	NAH-1	A Construction Cultural Heritage Management Plan would be prepared as part of the CEMP prior to construction in consultation with the NSW Heritage Division of OEH. As a minimum, the plan would include the following: • Induction protocols for staff and project personnel to undertake a cultural heritage induction, to assist them in understanding and complying with their legal obligations under the <i>Heritage Act 1977</i> • A list, plan and GIS layer showing the location of identified heritage items • A significance assessment and statement of significance for each item • Detail the mitigation measures identified and	Construction contractor	Pre-construction	Proven to be effective. Monitoring and reporting requirements of the CHMP to confirm effectiveness of measures. Specific measures carried out in accordance with agreed guidelines and by qualified archaeologists.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		when the measures are to be implemented • Provide protocols and procedures to be enacted during construction to ensure the protection of items of heritage significance • An unexpected finds procedure in the event that further sites are identified during works • The separate procedure for the discovery of skeletal remains (highly effective).			
Orchard Hills Cumberland Plain Woodland (Chaffey Brothers Irrigation Scheme Canal)	NAH-2	Archival photographic recording in accordance with the Heritage Division of the OEH guidelines. This would include: • Report (paper), thumbnails, CD-R and prints (10.5x14.8cm) to NSW Heritage Office • Report (paper), thumbnails and CD-R to State Library of NSW • Report (paper), thumbnails and CD-R to Owner/client • Report (paper), thumbnails and CD-R to Local Council • Report (paper), thumbnails and CD-R to Local Council Library.	Construction contractor	Construction	Proven to be effective. An archival photographic recording would be made of the extent of the canal, including the section outside the project area, in accordance with the Heritage Division of the OEH guidelines (Heritage Council of NSW 2006) prior to its demolition
	NAH-3	<i>Archaeological investigation of the portion of the canal to be impacted by the project, including test excavation in accordance with the research design and excavation methodology for the item.</i>	<i>Roads and Maritime</i>	<i>Pre - construction</i>	

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
<i>Warragamba Dam to Prospect Reservoir pipeline</i>	<i>NAH-4</i>	<i>The construction contractor would identify suitable measures to be incorporated into the CEMP to prevent physical damage to the pipeline in accordance with The Guidelines for development adjacent to the Upper Canal and Warragamba Pipelines (Sydney Catchment Authority 2012). These measures would be developed in consultation with Roads and Maritime and the Sydney Catchment Authority and include measures for the management of potential vibration impacts, erosion and sediment controls and agreed site access protocols.</i>	<i>Construction contractor</i>	<i>Construction</i>	<i>Expected to be effective if carried out in accordance with procedures outlined in CEMP.</i>
	<i>NAH-5</i>	<i>An exclusion zone would be established to protect the depot building footings associated with the pipelines (item 3), which are immediately adjacent to the proposed drainage infrastructure works within WaterNSW land.</i>	<i>Construction contractor</i>	<i>Construction</i>	<i>Expected to be effective if carried out in accordance with procedures outlined in CHMP.</i>
	<i>NAH-6</i>	<i>Roads and Maritime would consult with WaterNSW with all aspects of construction near the pipeline corridor during detailed design and construction of the project</i>	<i>Roads and Maritime Construction contractor</i>	<i>Construction</i>	<i>Expected to be effective.</i>

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Miss Lawson's guesthouse site	NAH-3 NAH-7	Detailed salvage archaeological investigation of the site. <i>Archaeological investigation of the item including test and salvage excavation in accordance with the research design and excavation methodology.</i>	Roads and Maritime	Pre - construction	Expected to be effective. Salvage Test and salvage excavation would be carried out in accordance with the Heritage Division of OEH guidelines including an appropriate <i>the</i> research design and methodology <i>for the site</i> in order to best realise the research potential of this area of the site.
Lawson's Inn site	NAH-4 NAH-8	Detailed salvage archaeological investigation of the site. <i>Archaeological investigation of the item including test excavation in accordance with the research design and excavation methodology.</i> <i>If during testing significant archaeological resources are identified within areas of low archaeological potential to be impacted by the project, then the design would be reviewed and where reasonable and feasible adjusted to avoid where possible or minimise these impacts.</i>	Roads and Maritime	Pre - construction	Salvage <i>Test and salvage</i> excavation would be undertaken under the supervision of an appropriately qualified and experienced historical archaeologist in accordance with the Heritage Division of OEH criteria <i>for sites of local significance</i> .
Unexpected impacts on heritage values	NAH-5 NAH-9	The project's Construction Environmental Management Plan would include „unexpected finds“ procedures to guide the management of any archaeological sites identified during construction. The management response would vary depending on the nature of the find, its significance and likely impacts.	Construction contractor	Construction	Expected to be effective if carried out in accordance with procedures outlined in CHMP.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Urban design	UD-1	The urban design and landscape concept developed for the project would be adopted during detailed design. This would include design treatments for: • Location and identification of existing vegetation and proposed landscaped areas, including species to be used • Built elements including retaining walls and Adams Road Bridge • Design treatments for stormwater quality measures and infrastructure • Pedestrian and cyclist elements including footpath location, paving types and pedestrian crossings • Fixtures such as seating, lighting, fencing and signs • Details of the staging of landscape works taking account of related environmental controls such as erosion and sedimentation controls and drainage • Procedures for monitoring and maintaining landscaped or rehabilitated areas.	Contractor	Detailed Design / Construction / Operation	Expected to be effective. Urban design outcomes have been incorporated into concept design and would be further refined during detailed design of the project in consultation with a range of stakeholders including State Government agencies, Penrith City Council, Liverpool City Council and the local community.
Lighting impacts	UD-2	The design of temporary lighting must avoid unnecessary light spill on adjacent residents or sensitive receivers and be designed in accordance with AS 1158.1-1986.	Contractor	Detailed Design / Construction	Proven effective if carried out in accordance with AS 1158.1-1986.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Visual impacts from construction sites	UD-3	Consider the provision of barriers to screen views from visually sensitive nearby areas such as rural dwellings, residential and recreational areas.	Contractor	Construction	Expected to be effective. Monitoring and reporting requirements of the CEMP to confirm effectiveness of measures.
Visual impacts from construction sites	UD-4	Contain construction activities within the construction works zone boundary and occupy the minimum area practicable for limiting impacts on adjoining areas, including the extent of native vegetation clearing.	Contractor	Construction	Expected to be effective. Monitoring and reporting requirements of the CEMP to confirm effectiveness of measures.
Visual impacts as a result of vegetation loss	UD-5	Construction programming must show how progressive rehabilitation of disturbed areas would be undertaken to minimise the duration and extent of temporary visual and landscape character impacts and to minimise soils exposure and the potential for erosion and dust generation.	Contractor	Construction	Expected to be effective. Monitoring and reporting requirements of the CEMP to confirm effectiveness of measures.
Visual impacts as a result of vegetation loss	UD-6	Existing trees to be retained within construction areas are to be identified, protected and maintained in accordance with AS4970 Trees on Development Sites, or as otherwise directed by a qualified ecologist or arborist.	Contractor	Construction	Proven effective if carried out in accordance with AS4970 Trees on Development Sites.
Excessive exhaust emissions arising from plant and equipment	AQ-1	Plant and equipment would be operated in a proper and efficient manner by: - Inspecting the plant/equipment prior to commencement of works on site - Conducting routine servicing and maintenance, and subsequent inspections to ensure that equipment continues to operate efficiently.	Construction contractor	Construction	Expected to be effective. Monitoring and reporting requirements of the CEMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Dust generation and emissions at compound locations	AQ-2	<i>Dust and emissions generation at compounds would be managed by:</i> • Installation of perimeter screening around compound sites • Impose low speeds limits around compound sites to limit the generation of dust from vehicle movements • Apply wheel-wash or rumble grid facilities at access points to limit the tracking of materials beyond the site boundary • Ensure that compound area surfaces are well compacted or sealed to limit the potential for dust generation • Regularly water stockpiles and limit the amount of materials stockpiled around the site • Position stockpiling areas as far as possible from surrounding receivers • Limit stockpiling activities during conditions where winds are blowing strongly in the direction(s) from the stockpiling location to nearby receivers • Consultation would be carried out consistent with the Community Consultation Framework in relation to air quality near ancillary sites and relevant incident management process during construction.	Construction contractor	Construction	Expected to be effective. Monitoring and reporting requirements of the CEMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Dust generation and emissions from construction activities and materials haulage	AQ-3	<i>Dust generation and emissions from construction activities and materials haulage would be managed by:</i> • Impose low speeds limits across all site haulage routes • Ensure that all loads are covered when materials are being hauled to and from site • Wherever possible, position internal haulage routes away from surrounding receivers • Regular watering of exposed and disturbed areas especially during inclement weather conditions • Wherever possible, minimise the extent of disturbed and exposed surfaces, and restore as soon as possible • Adjust the intensity of activities based on measured dust levels, weather forecasts and the proximity of and direction of the works in relation to the nearest surrounding receivers • Ensure that any material exposed areas are secured during project shutdown periods to prevent any dust emanating over adjacent roads • Install depositional dust gauges to quantify dust levels and determine whether control measures are adequate or whether further actions are required • These gauges should be installed at regular intervals along the project alignment at representative receiver locations. Gauges should also be installed around major construction compound and stockpiling locations.	Construction contractor	Construction	Expected to be effective. Monitoring and reporting requirements of the CEMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Windborne dust emanating from non-vegetated surfaces	AQ-4	<i>Windborne dust emanating from non-vegetated surfaces would be managed by:</i> - Stage work to ensure that finished areas are revegetated as soon as possible - Regularly maintain and water revegetation areas to aid the establishment of adequate vegetation cover.	Construction contractor	Construction	Expected to be effective. Monitoring and reporting requirements of the CEMP to confirm effectiveness of measures.
Odours arising from uncovered contaminated and/or hazardous materials.	AQ-5	Application of odour suppressing agents to materials as necessary to minimise related impacts should any contaminated or hazardous materials be uncovered during the works.	Construction contractor	Construction	Expected to be effective. Monitoring and reporting requirements of the CEMP to confirm effectiveness of measures.
Cumulative dust impacts arising from con-current construction of the proposed upgrade and the Western Sydney Airport	AQ-6	Develop construction program in consultation with the contractor(s) developing the Western Sydney Airport site. Maintain consultation through the course of both projects to plan activities in a manner which limits potential air quality-related impacts. Wherever possible and practical, co-ordinate activities with a high potential to generate dust so that they do not occur at the same time. Stop activities if dust is observed to be emanating from the airport.	Construction contractor	Prior to and during construction	Expected to be effective. Monitoring and reporting requirements of the Operational Environmental Management Plan (OEMP) to confirm effectiveness of measures.
Inappropriate handling and/ or disposal of waste	WR-1	The waste minimisation hierarchy principles of avoid/reduce/reuse/ recycle/dispose would be used	Construction contractor	Construction	Proven to be effective

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
	WR-2	A project-specific Construction Waste and Energy Management sub-plan (CWEMP) would be prepared before construction. The plan would adopt the Resources Management Hierarchy principles of the WARR Act and include: • The major construction related waste streams expected to be generated from the project • The major sources of construction related energy consumption (fuel and power) • Classification of waste streams • Waste orders and exemptions • Re-use and recycling practices to be implemented • Measures to be applied where waste is required to be handled and stored onsite prior to onsite reuse or offsite recycling/disposal • Specific measures to manage vegetation waste • Energy conservation best practice and the reduction of greenhouse gases by adopting energy efficient work practices • A resource management strategy detailing beneficial reuse options for surplus and/or unsuitable material • Procedures for the identification, handling and disposal of hazardous materials including potential asbestos waste • Protocols for engaging with and notifying residents of any work processes that may impact them • A complaints mechanism so that residents	Construction contractor	Pre-Construction	Proven to be effective. Monitoring and reporting requirements of the CWEMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
		may contact the project manager A protocol to enable the project to respond quickly to non-compliances.			
Inappropriate handling and/ or disposal of waste	WR-3	All wastes, including contaminated wastes, would be identified and classified in accordance with the Waste Classification Guidelines: Part 1 Classifying Waste.	Construction contractor	Construction	Proven to be effective. Monitoring and reporting requirements of the CWEMP to confirm effectiveness of measures.
	WR-4	Disposal of any non-recyclable waste would be in accordance with the POEO Act and Waste Classification Guidelines: Part 1 Classifying Waste.	Construction contractor	Construction	Proven to be effective. Monitoring and reporting requirements of the CWEMP to confirm effectiveness of measures.
	WR-5	Trees and plant material would be mulched or chipped on-site and used in landscaping where practicable to stabilise disturbed soils where possible.	Construction contractor	Construction	Proven to be effective. Monitoring and reporting requirements of the CWEMP to confirm effectiveness of measures.
Inappropriate disposal of excavated material that cannot be reused in the project	WR-6	Where possible and fit for purpose, spoil would be beneficially reused within the project before off-site reuse or disposal options is pursued.	Construction Contractor	Construction	Proven to be effective. Monitoring and reporting requirements of the CWEMP to confirm effectiveness of measures.
	WR-7	Excavated material that is not suitable for on-site reuse or recycling would be transported to a site that may legally accept that material for reuse or disposal.	Construction Contractor	Construction	Proven to be effective. Monitoring and reporting requirements of the CWEMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
	WR-8	Before being transported from construction sites, excavated spoil would be classified in accordance with the Waste Classification Guidelines: Part 1 Classifying Waste (EPA, 2014) to ensure appropriate reuse or disposal.	Construction Contractor	Construction	Proven to be effective. Monitoring and reporting requirements of the CWEMP to confirm effectiveness of measures.
	WR-9	A Spoil Management Strategy would be developed prior to the commencement of construction and implemented during construction. The strategy would identify spoil disposal site(s) and describe the management of spoil on-site and during off-site transport.	Construction Contractor	Construction	Proven to be effective. Monitoring and reporting requirements of the CWEMP to confirm effectiveness of measures.
Resource use	WR-10	Wherever feasible and reasonable, construction material would be sourced from within the Sydney region.	Construction Contractor	Construction	Proven to be effective.
<i>Water use</i>	<i>WR-11</i>	<i>Where water is sourced from far dams, it would be done so in consultation with landowners</i>	<i>Construction Contractor</i>	<i>Construction</i>	<i>Proven to be effective.</i>
Emissions of greenhouse gases during construction	GHGC-1	Identify recycled materials (such as recycled aggregates in road pavement and surfacing; steel with recycled content) for use in construction or operation of the project where they are cost, quality and performance competitive.	Construction contractor	Detailed design	Expected to be effective if carried out in accordance with the project-specific Construction Waste and Energy Management sub-plan (CWEMP)
	GHGC-2	Use of modern diesel engine equipment, to ensure highest fuel efficiency ratings.	Construction contractor	Construction	Proven to be effective.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
	GHGC-3	Specification of the use of biofuels, or biofuel blends in construction plant and equipment.	Construction contractor	Pre-construction	Proven to be effective
	GHGC-4	Provision of clear guidance to construction staff on equipment start up and shut down procedures to ensure that they are not left idling when not in use.	Construction contractor	Pre-construction	Proven to be effective. Induction and training requirements of the CEMP to confirm effectiveness of measures.
	GHGC-5	Review of cut and fill balances for earthworks to ensure material is transported the least possible distances.	Construction contractor	Construction	Expected to be effective. To be confirmed during detailed design
	GHGC-6	Review of local options for import and export of fill materials as needed to reduce excess fuel used during transport.	Construction contractor	Construction	Expected to be effective. To be confirmed during detailed design
	GHGC-7	Specification and certification of steel from recycled sources where suitable for offsetting virgin steel	Construction contractor	Construction	Proven to be effective.
Emissions of greenhouse gases during construction	GHGC-8	Specification of materials with low embodied energy / embodied GHG content, such as: Replacement of Portland cement in concrete mixes with low carbon alternatives such as fly-ash Use of warm mix asphalt versus hot mix.	Construction contractor	Detailed design	Proven to be effective.
	GHGC-	A project-specific Construction Waste and	Construction	Pre-	Proven to be effective.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
	9	Energy Management sub-plan (CWEMP) would be prepared before construction. The plan would adopt the Resources Management Hierarchy principles of the WARR Act and include: • The major construction related waste streams expected to be generated from the project • The major sources of construction related energy consumption (fuel and power) • Classification of waste streams • Waste orders and exemptions • Re-use and recycling practices to be implemented • Specific measures to manage vegetation waste • Energy conservation best practice and the reduction of greenhouse gases by adopting energy efficient work practices • A resource management strategy detailing beneficial reuse options for surplus and/or unsuitable material • Procedures for the identification, handling and disposal of hazardous materials including potential asbestos waste • Protocols for engaging with and notifying residents of any work processes that may impact them • A complaints mechanism so that residents may contact the project manager • A protocol to enable the project to respond quickly to non-compliances.	contractor	construction	Monitoring and reporting requirements of the CWEMP to confirm effectiveness of measures.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
General	HR-1	Hazard and risk management planning would be incorporated throughout the CEMP, which may include items such as: • Details of the hazards and risks associated with construction activities • Risk management measures, including those identified in Chapters 7 and 8 of this EIS • Procedures to comply with all legislative and industry standard requirements • Contingency <i>and emergency response</i> plans, as required • Site-specific Work, Health and Safety plans and activity specific Safe Work Method Statements Training for all personnel (including subcontractors) in site inductions, including the recognition and awareness of site hazards and the locations of relevant equipment to protect themselves and manage any spills.	Construction contractor	Construction	Proven to be effective. Monitoring of safety measures would occur daily as part of routine site management procedures, for movement of hazardous goods, safe workplace practices, and regular testing and monitoring of any fire and life safety systems.
Storage of dangerous goods and hazardous substances	HR-2	Storage of dangerous goods and hazardous materials would occur in accordance with suppliers' instructions and relevant Australian Standards and may include bulk storage tanks, chemical storage cabinets / containers or impervious bunds.	Construction contractor	Construction	Proven to be effective. Monitoring of safety measures would occur daily as part of routine site management procedures, for movement of hazardous goods, safe workplace practices, and regular testing and monitoring of any fire and life safety systems.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
	HR-3	Storage, handling and use of dangerous goods and hazardous substances would be in accordance with the <i>Work Health and Safety Act 2011</i> and the <i>Storage and Handling of Dangerous Goods Code of Practice</i> (WorkCover NSW, 2005).	Construction contractor	Construction	Proven to be effective if carried out in accordance with <i>Work Health and Safety Act 2011</i> and the <i>Storage and Handling of Dangerous Goods Code of Practice</i> (WorkCover NSW, 2005).
Storage of dangerous goods and hazardous substances	HR-4	Secure, bunded areas would be provided around storage areas for oils, fuels and other hazardous liquids.	Construction contractor	Construction	Proven to be effective. Monitoring of safety measures would occur daily as part of routine site management procedures, for movement of hazardous goods, safe workplace practices, and regular testing and monitoring of any fire and life safety systems.
	HR-5	Material Safety Data Sheets would be obtained for dangerous goods and hazardous substances stored onsite prior to their arrival.	Construction contractor	Construction	Proven to be effective.
Contamination from transportation of hazardous goods	HR-6	Transport all hazardous substances in accordance with relevant legislation and codes, including the Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998 and the „Australian Code for the <i>Transport of Dangerous Goods by Road and Rail</i> ” (National Transport Commission, 2008).	Construction Contractor	Construction	Proven to be effective. Monitoring of safety measures would occur daily as part of routine site management procedures, for movement of hazardous goods, safe workplace practices, and regular testing and monitoring of any fire and life safety systems.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Bushfire	HR-7	Measures to mitigate and manage bushfire would be developed and included as part of site-specific hazard and risk management measures within the CEMP <i>The road is to be designed with consideration to the requirements of the Planning for Bush Fire Protection 2006.</i>	Construction Contractor	Construction	Proven to be effective.
<i>Warragamba Pipelines</i>	<i>HR-8</i>	<i>Roads and Maritime would notify WaterNSW of any incident such as vehicle accident, discovery of any heritage items, spill or fire that affects or could affect the Warragamba Pipelines including the corridor.</i>	<i>Roads and Maritime</i>	<i>Construction</i>	<i>Expected to be effective. Monitoring and reporting requirements of the CEMP to confirm effectiveness of measures.</i>
Cumulative impacts	CI-1	Consultation would be undertaken with local communities potentially affected by the impacts of multiple projects in addition to the project.	Roads and Maritime / Construction Contractor	Construction	Expected to be effective. To ensure flexibility in the communications approach to the project, communications and engagement activities would be monitored, assessed and reported regularly.
Cumulative impacts	CI-2	Where relevant, consultation would be undertaken with proponents of other nearby developments to increase the overall awareness of project timeframes and impacts.	Roads and Maritime / Construction Contractor	Construction	Proven to be effective. To ensure flexibility in the communications approach to the project, communications and engagement activities would be monitored, assessed and reported regularly.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
	CI-3	Construction traffic management plans for this project should be developed in consultation with plans for these projects so that increased traffic on the local road network would be spread over the road network to ensure that construction traffic is not concentrated on any one particular route if there are alternatives available <i>other projects to assist in spreading the traffic load over the network and to minimise construction traffic being concentrated on any one particular route.</i>	Roads and Maritime / Construction Contractor	Construction	Proven to be effective. Monitoring and reporting requirements of the TMP to confirm effectiveness of measures.

6.2 Operational environmental management

Once construction on the Northern Road upgrade has been completed, the responsibility for ongoing operational management would be handed back to Roads and Maritime from the construction contractor.

The maintenance and management of the Roads and Maritime road asset network in the Sydney region has been vested to private organisations that carry out all operational aspects of the network on behalf of Roads and Maritime in the form of Stewardship Maintenance Contracts. The obligations under the Roads Act 1993, the Environmental Planning and Assessment Act 1979 and the State Infrastructure Planning Policy (Infrastructure) 2007 and all other relevant legislation is the responsibility of the private organisations as an agent of Roads and Maritime. In addition, organisations contracted to provide operational maintenance for Roads and Maritime are bound to address any operational requirements provided by the Minister through the Conditions of Approval for the project.

Roads and Maritime manage their legislative and environmental management obligations through the use of a number of procedures, guidelines, guidance notes, and technical notes to provide guidance and set expectations in environmental planning and management of the road network and assets. Specifications, including, but not limited to Routine Services Specification (M3); General Specification – Environmental Protection (Management Systems) Maintenance (G36M); General Specification – Soil and Water Management (G38) are used to outline the environmental planning and management expectations and requirements of the Stewardship Maintenance Contractors. The Stewardship Maintenance Contractors are also required to operate under an Environmental Management System, have a program Environmental Management Plan and have specific Construction Environmental Management Plans activities that are carried out on the network.

The iterative design and EIS process has enabled Roads and Maritime to avoid and minimise environmental impacts from the project where possible. Where environmental controls have been incorporated into the design there is a program of monitoring and review including independent auditing, to ensure the controls comply with stated objectives (refer Table 6-2).

Specific monitoring that would be considered during operation of the project may include:

- Noise monitoring to compare actual noise performance of the project against predicted noise performance
- Monitoring and maintaining landscaped or rehabilitated areas
- Monitoring of surface water quality in order to:
 - assess and manage impacts on the receiving waters as the site stabilises
 - assist in deciding when the site has stabilised
 - identify water quality conditions after development.

Table 6-2 Summary of operational environmental safeguards and management measures

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Operational noise impacts	NV-4	Where noise barriers and/or low noise pavements are not considered feasible and/or reasonable, noise impacts at affected dwellings would be mitigated by at-property treatments.	Roads and Maritime	Operation	Proven to be effective To be carried out in consultation with affected residents
	NV-5	Within 12 months of the commencement of operation of the project an operational noise review would be undertaken. This would include: • Monitoring to compare actual noise performance of the project against predicted noise performance • An assessment of the performance and effectiveness of applied noise mitigation measures together with a review and if necessary, reassessment of all feasible and reasonable mitigation measures • Identification of any additional feasible and reasonable measures that would be implemented with the objective of meeting the criteria in the <i>NSW Road Noise Policy</i> (DECCW, 2011), when these measures would be implemented and how their effectiveness would be measured and reported.	Roads and Maritime	Operation	Proven to be effective

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Noise, light and vibration	B-25	Shading and artificial light impacts would be minimised through detailed design. Measures to mitigate potential noise and vibration impacts are provided in section 7.2 of the EIS.	Roads and Maritime	Detailed design	Expected to be effective.
Operational socio-economic impacts	SE-20	Appropriate road signage would be provided in accordance with the Roads and Maritime Services Guidelines Tourist Signposting (2012) to provide guidance to passing patrons on access to shops and services, including within Luddenham town centre. <i>Liverpool Council as well as Penrith City Council would be consulted in the preparation of plans to revitalise Luddenham town centre and appropriate gateway signage or other features.</i>	Construction contractor <i>Roads and Maritime</i>	Construction	Proven to be effective. Monitoring and reporting requirements of the TMP to confirm effectiveness of measures.
Operational socio-economic impacts	SE-21	Roads and Maritime will, in consultation with Liverpool Council <i>and Penrith City Council</i> , provide appropriate <i>monetary</i> support for preparation of plans to revitalise Luddenham town centre, for the purpose of encouraging motorists to continue to pass through or visit the town. Any streetscape and landscape treatments would be determined after finalisation of any town centre revitalisation plans.	Roads and Maritime	Pre-construction and construction	Expected to be effective. Roads and Maritime have experience with similar by-pass projects in NSW.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Impacts on flood behaviour during operation	FH-5	The transverse drainage and flood mitigation strategy would continue to be refined during detailed design. If the properties are still impacted, and if mitigation is required, this would be investigated in consultation with the landowners. It would include but not be limited to: • Identification of potential flood impacts to the project and adjoining areas, including consideration of local drainage catchment assessments and climate change implications on rainfall, drainage • Design and mitigation measures to protect proposed operations and not worsen existing flooding characteristics during construction and operation, including soil erosion and scouring • Drainage system upgrades and preparation of a Flood and Emergency Management Plan.	Roads and Maritime	Detailed design	Proven to be effective. Further design development would be carried out at detailed design stage to reduce the potential for flood attributable to the project in the affected properties
	FH-6	The 100 year ARI flood level is to be adopted in the assessment of measures which are required to mitigate any adverse impacts attributable to the project. Changes in flood behaviour under PMF conditions would also be assessed in order to identify impacts on critical infrastructure and substantial changes in flood hazards as a result of the project.	Roads and Maritime	Detailed design	Proven to be effective. Further design development would be carried out at detailed design stage to reduce the potential for flood attributable to the project in the affected properties

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
	FH-7	A floor level survey would be undertaken in affected areas to determine whether the project would increase flood damages in adjacent developments (ie in properties where there is a potential for increases in peak flood levels for events up to the 100 year ARI flood).	Roads and Maritime	Detailed design	Proven to be effective. Further design development would be carried out at detailed design stage to reduce the potential for flood attributable to the project in the affected properties
Reductions in water volumes	FH-8	Consultation would be carried out with each affected landholder where reductions in the volume of flow would cause existing dams to fill less frequently, reducing the available yield.	Roads and Maritime	Detailed design	Expected to be effective if carried out in accordance with consultation requirements
Operational water quality	SWC-13	24 water quality swales are proposed, including those upstream of identified sensitive receiving waterways. <i>Water quality swales will be implemented for the proposal, including upstream of identified sensitive receiving waterways.</i>	Roads and Maritime	Detailed Design Operation	Expected to be effective. The proposed swales have been optimised by increasing their base width to provide additional water quality treatment Monitoring and reporting requirements of the Water Quality Management Plan (WQMP) to confirm effectiveness of measures and if any additional measures are required.

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Roadside air quality during operations	AQ-7	- Post-construction traffic measurements should be collected to verify that traffic volumes and characteristics are not materially different from the forecast numbers considered in this assessment. - Where material differences are identified, further assessment should be completed to confirm that the level of impacts remain consistent with the predictions of this study.	Roads and Maritime Services	Operation	Expected to be effective. Monitoring and reporting requirements of the OEMP to confirm effectiveness of measures.
<i>Landscaping</i>	<i>UD-7</i>	<i>Development of the landscaping plan would include consultation with Council regarding its maintenance requirements</i>	<i>Construction contractor</i>	<i>Operation</i>	<i>Expected to be effective.</i> <i>Monitoring and reporting requirements of the OEMP to confirm effectiveness of measures.</i>
Emissions of greenhouse gases during operation	GHGC-10	Opportunities to use renewable energy for road operation would be investigated.	Roads and Maritime	Detailed design	Expected to be effective. To be confirmed during detailed design

Potential impact	Ref #	Environmental management measure	Responsibility	Timing	Effectiveness of measures
Incident response	HR-9	An Incident Response Management Plan would be developed and implemented. The response to incidents within the motorway would be managed in accordance with the memorandum of understanding between Roads and Maritime and the NSW Police Service, NSW Rural Fire Service, NSW Fire Brigade and other emergency services. An incident response facility has been provided for the project.	Roads and Maritime	Operation	Proven to be effective Proven to be effective. Monitoring of safety measures would occur daily as part of routine site management procedures, for movement of hazardous goods, safe workplace, and regular testing and monitoring of any fire and life safety systems.

7 References

Artefact Heritage 2015 *The Northern Road. Stage 4, Route Options Assessment. Non-Aboriginal Heritage Constraints Report*. Report to Parsons Brinckerhoff on behalf of Roads and Maritime Services, Rose Bay NSW

Australian Government 2016, *Western Sydney Airport Environmental Impact Statement*, Canberra

Australian Museum Consulting 2014 *Badgerys Creek Initial Environmental Survey: Historic Heritage*. A report to SMEC Australia, Sydney NSW

Australian Standard AS 1158.1-1986 – *The lighting of urban roads and other public thoroughfares, performance and installation design requirements*

Department of Environment and Climate Change 2008, *Managing Urban Stormwater-Volume 2D Main Road Construction, NSW Department of Environment, Climate Change and Water (known as the Blue Book Volume 2)*: Sydney.

Department of Environment and Climate Change and Water (DECCW) 2011, *NSW Road Noise Policy*, Sydney South

Department of Finance & Services 2016, *NSW Government Policy on Aboriginal Participation in Construction. NSW Department of Finance, Services and Innovation*

Department of Primary Industries 2003, *Policy and Guidelines for Fish Friendly Waterway Crossings, Department of Primary Industries*

Department of Primary Industries 2013, *Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (2013 update)*

Department of Primary Industries 2012, *Water Guidelines for Controlled Activities on Waterfront Land*

Desic, R. and P. Kottaras 2017 *The Northern Road Upgrade: Item 10 - Lawson's Thistle Inn and Store archaeological site, Archaeological Assessment and Research Design*. Prepared for Roads and Maritime Services, EMM Consulting, St Leonards

Environment Protection Authority 2014, *Waste Classification Guidelines Part 1: Classifying waste, EPA*, Sydney South

Heritage Office and Department of Urban Affairs & Planning 1996, *NSW Heritage Manual*

Fairfull, S and Witheridge, G 2003, *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings*. NSW Fisheries, Cronulla

Godden Mackay Logan 2013 *Defence Establishment Orchard Hills NSW Heritage Management Plan*. A report to Department of Defence

Heritage Council of NSW 2006 *Photographic Recording of Heritage Items Using Film or Digital Capture*. Sydney: NSW Government

Kottaras, P. 2017a *The Northern Road Upgrade: Item 9 - Miss Lawson's Guesthouse Archaeological Site, Research Design and Excavation Methods*. Report prepared for Roads and Maritime Services, EMM Consulting, St Leonards.

Kottaras, P. 2017b *The Northern Road Upgrade: Mulgoa Irrigation Canal, Archaeological Research Design and Excavation Methods*. Prepared for Roads and Maritime Services, EMM Consulting, St Leonards.

Landcom 2004, *Managing Urban Stormwater- Soils and Construction, Volume 1, 4th Edition (known as the Blue Book Volume 1)*, Sydney.

NSW Rural Fire Service 2016, *Planning for Bush Fire Protection 2006*

Office of Environment and Heritage 2016, *NSW Guide to Surveying Threatened Plants, Office of Environment and Heritage*, Sydney

Roads and Maritime Services 2012, *Tourist Signposting guide*

Roads and Maritime Services 2013, *Guideline for Management of Contamination*

Roads and Maritime Services 2013, *Environmental Impact Assessment Practice Note N04 - Landscape Character and Visual Impact Assessment (EIA-N04)*

Roads and Maritime Services 2014, *Environmental Impact Assessment Practice Note N05 – Socio-economic assessment (EIA-N05)*

Roads and Maritime Services 2016, *Construction Noise and Vibration Guideline*

Roads and Maritime Services 2017, *The Northern Road Upgrade, Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park, NSW Environmental Impact Statement / Commonwealth Draft Environmental Impact Statement*. June 2017, Sydney

Roads and Traffic Authority 2011, *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects*, NSW Roads and Traffic Authority, Sydney

Roads and Traffic Authority 2011, *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects*

Sydney Catchment Authority 2012 *Guidelines for development adjacent to the Upper Canal and Warragamba Pipelines*, Sydney, NSW

WorkCover NSW 2005, *Work Health and Safety Act 2011 and the Storage and Handling of Dangerous Goods Code of Practice*.



rms.nsw.gov.au/autorenew



13 22 13



Customer feedback
Roads and Maritime
Locked Bag 928,
North Sydney NSW 2059

December 2017
RMS 17.629