

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
	<p>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.</p> <p>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.</p>		
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

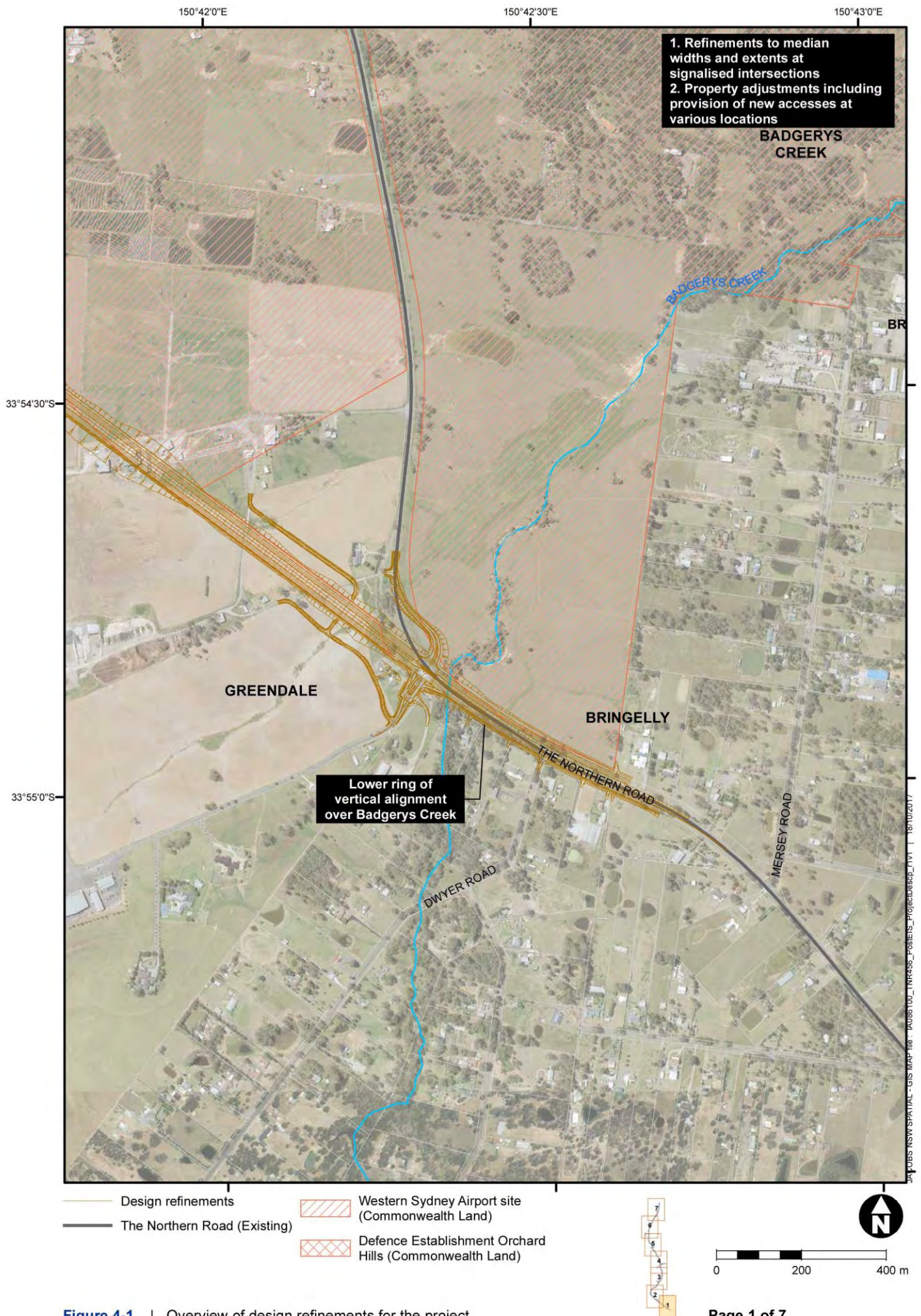


Figure 4-1 | Overview of design refinements for the project



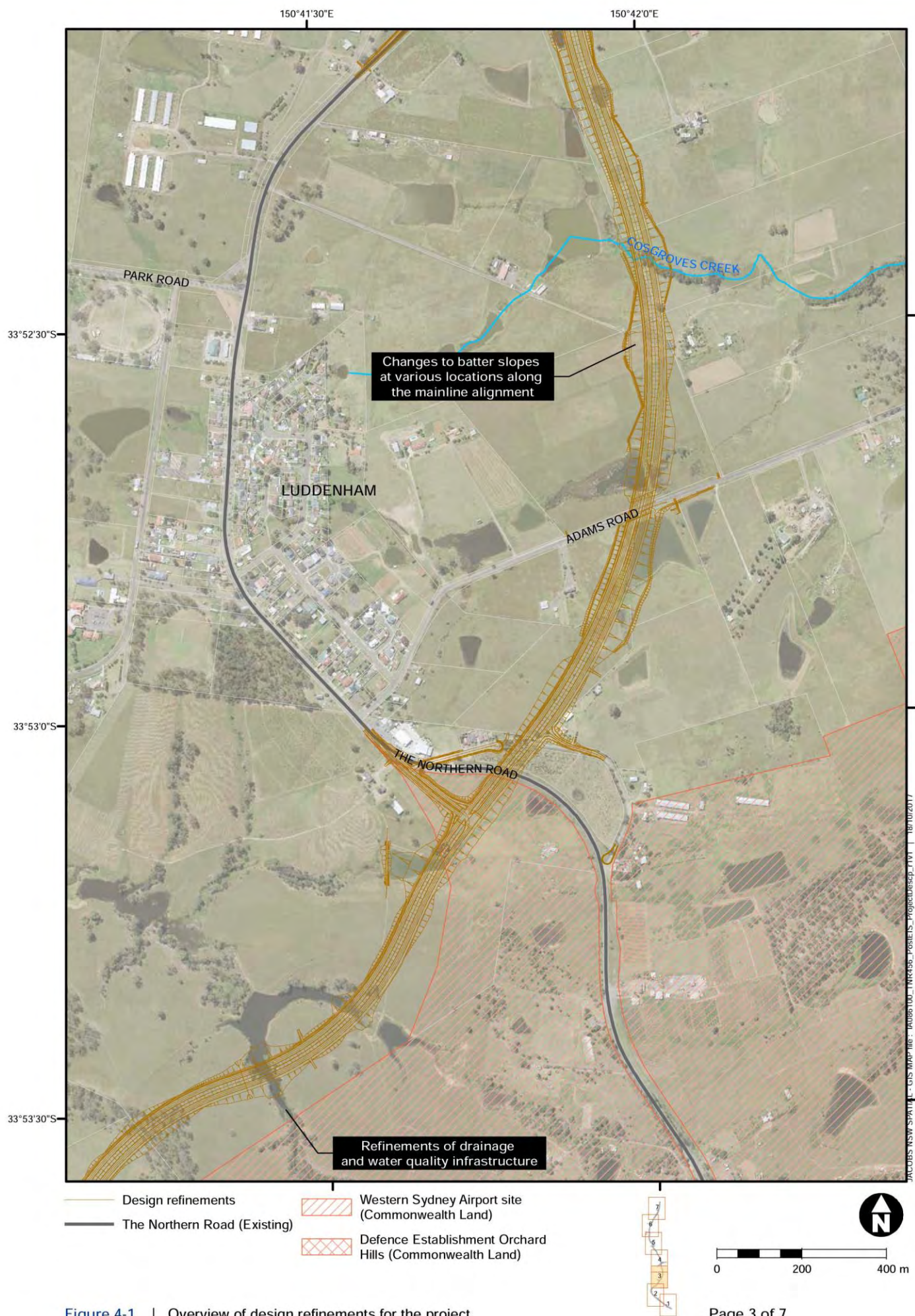


Figure 4-1 | Overview of design refinements for the project

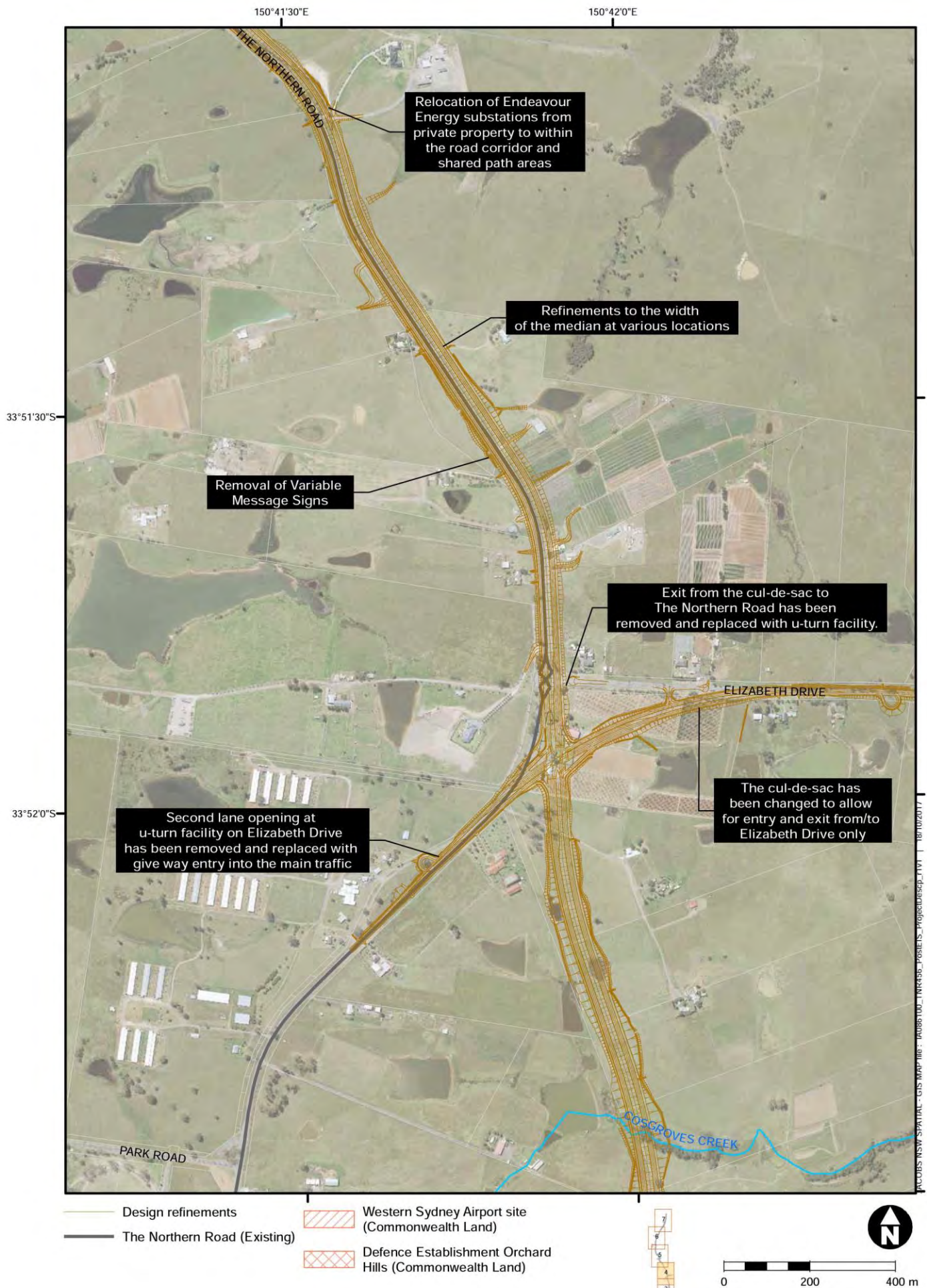


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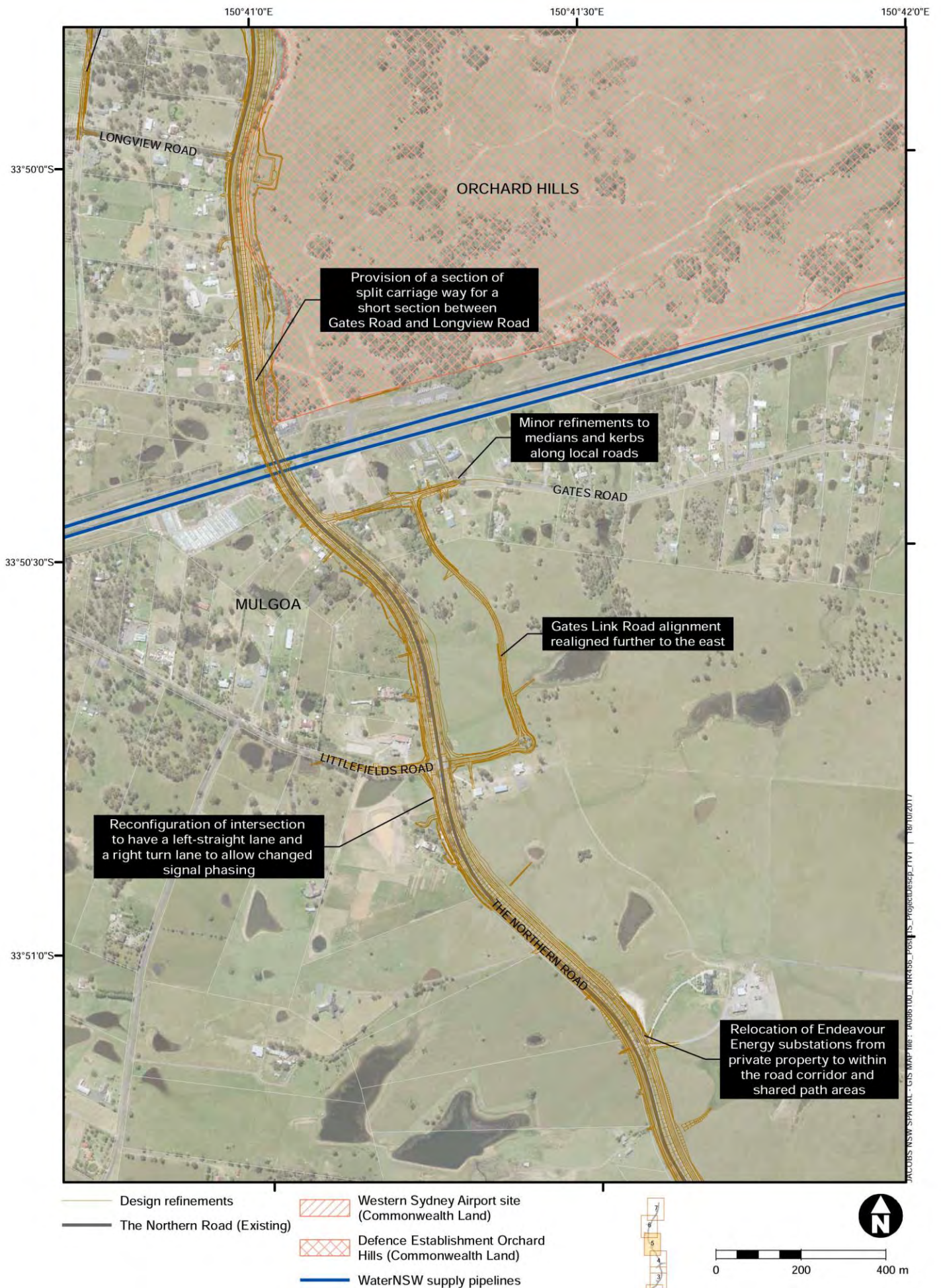


Figure 4-1 | Overview of design refinements for the project

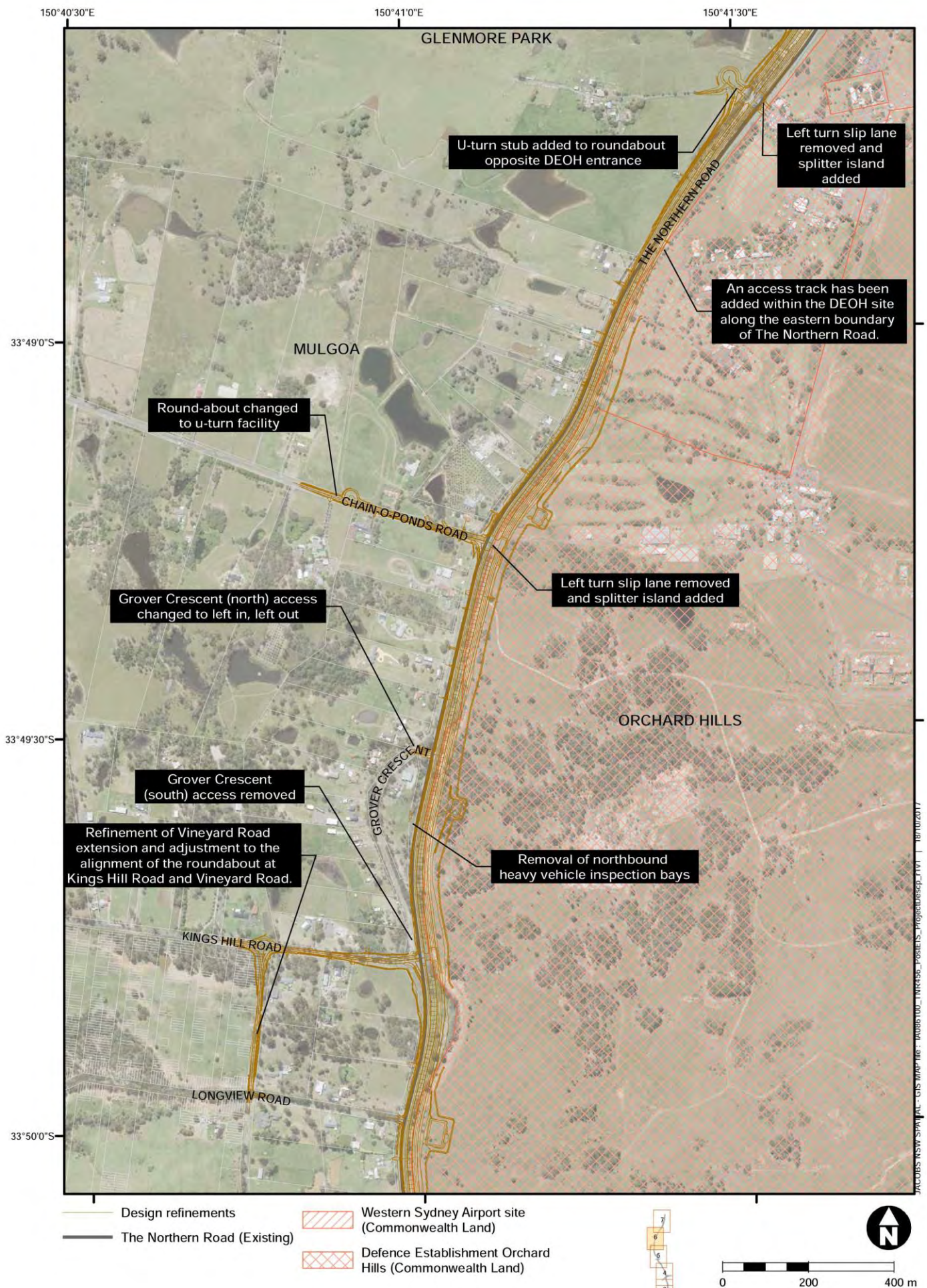
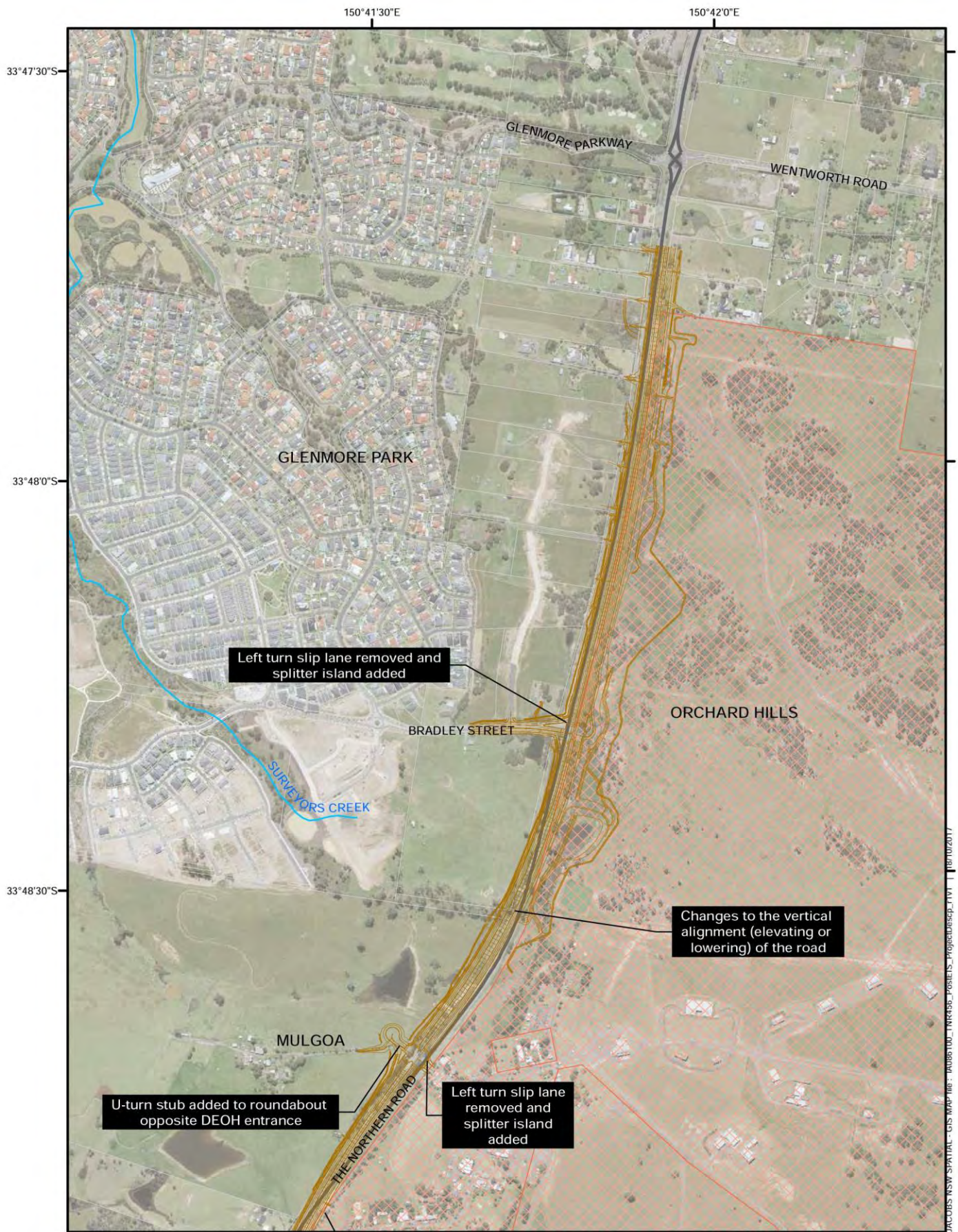


Figure 4-1 | Overview of design refinements for the project



- Design refinements
- The Northern Road (Existing)
- Western Sydney Airport site (Commonwealth Land)
- Defence Establishment Orchard Hills (Commonwealth Land)

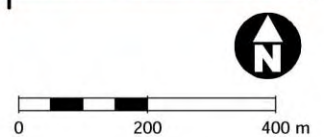


Figure 4-1 | Overview of design refinements for the project

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.

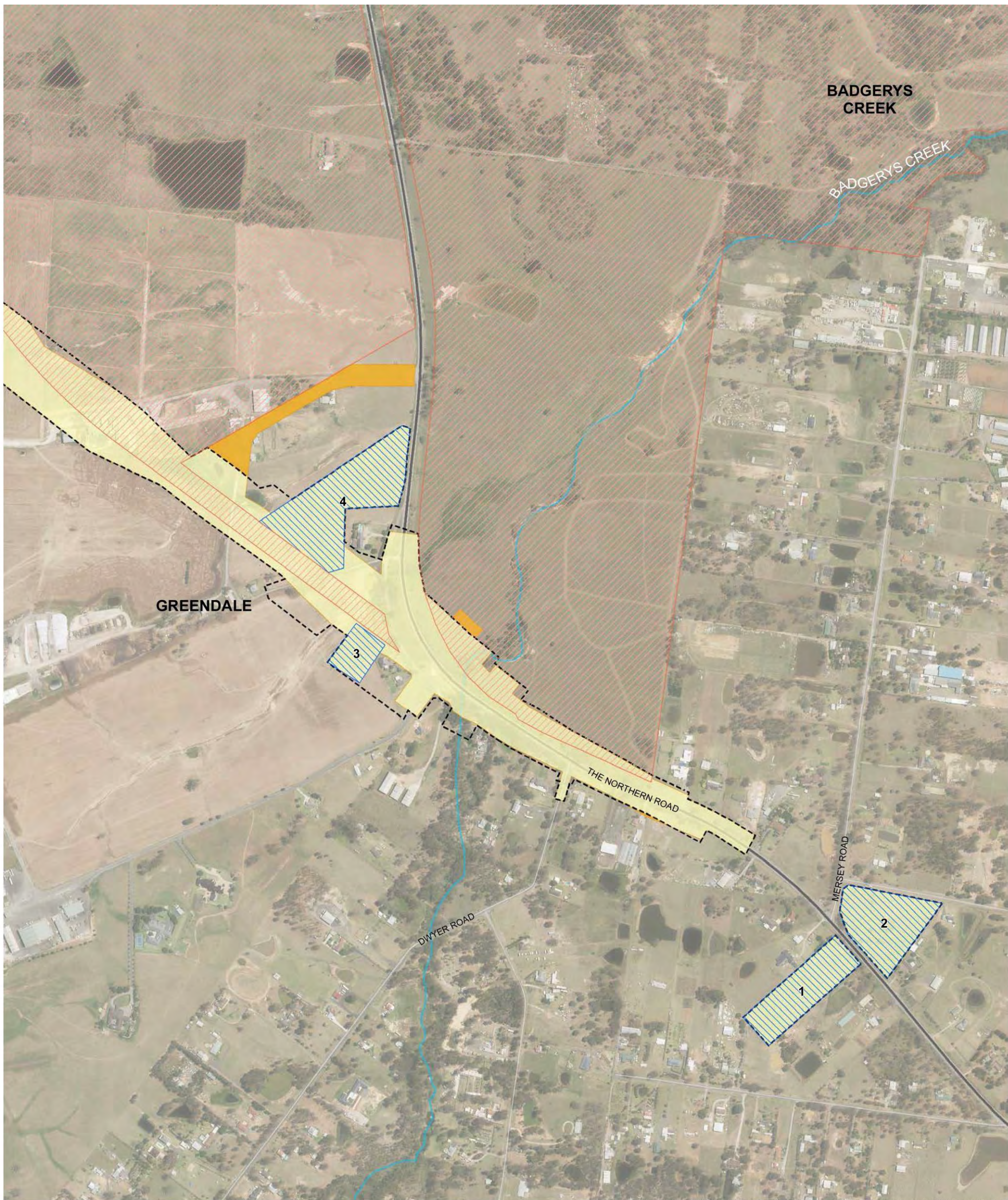
4.2.3 Project timing changes

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					

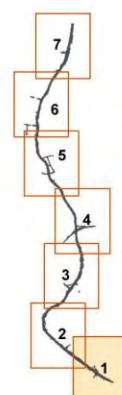
* incident response facility to be delivered in mid 2020s



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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

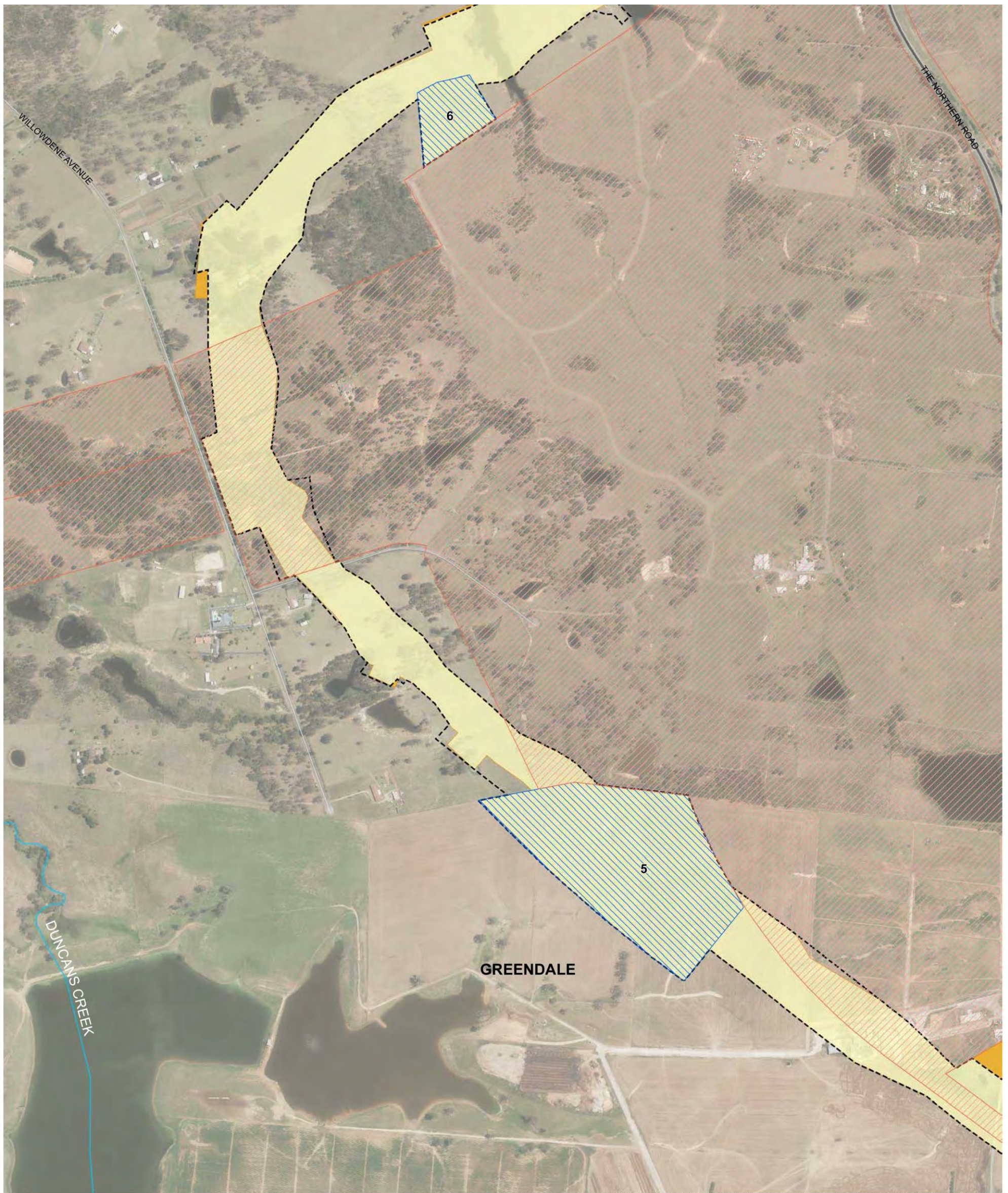


The Northern Road upgrade -
Mersey Road to Glenmore Parkway
**Construction Boundary and
Compound Sites**

Figure 4-2 | Comparison of EIS and refined design construction footprints

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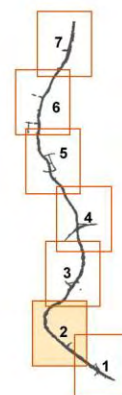
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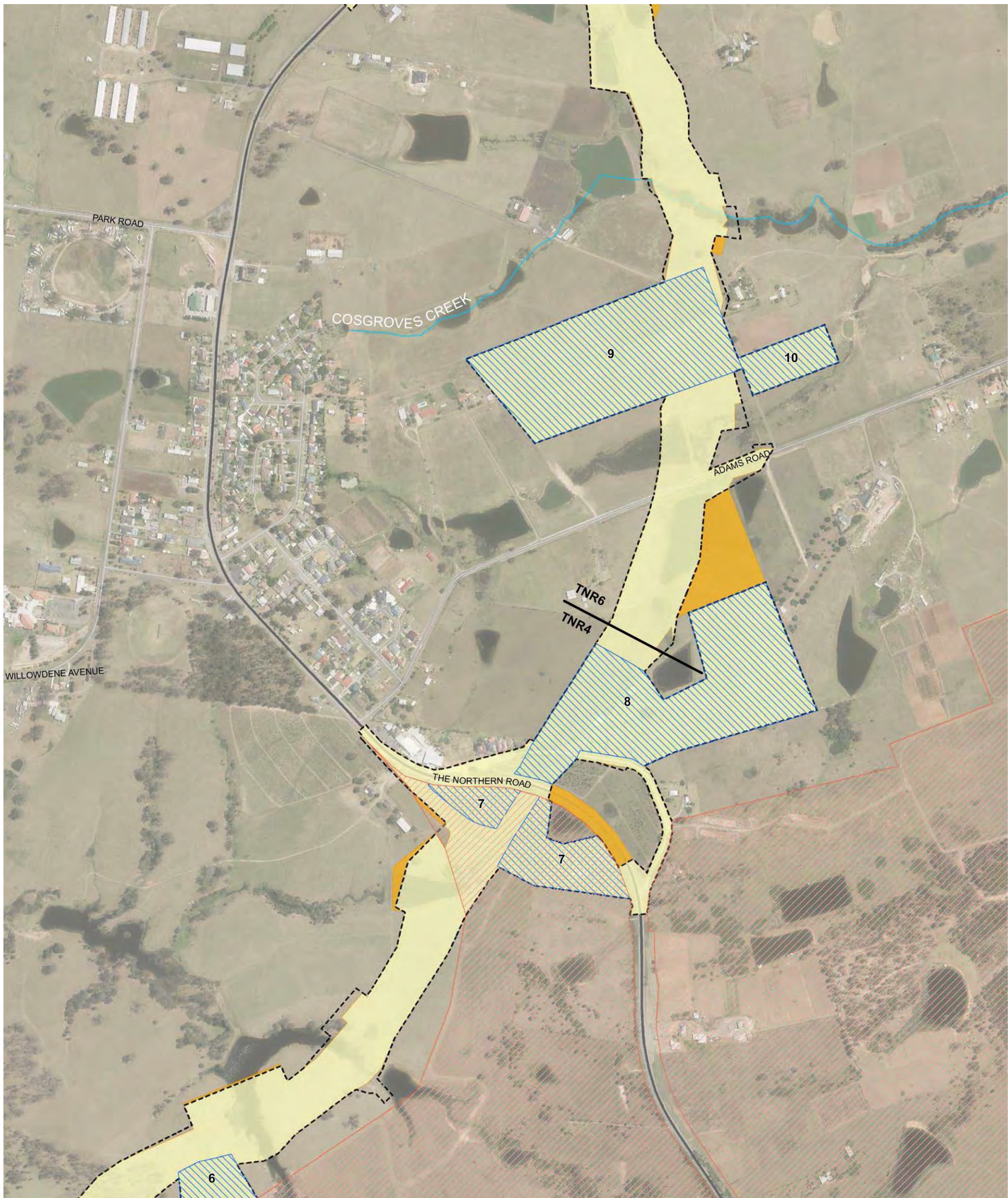
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Figure 4-2 | Comparison of EIS and refined design construction footprints

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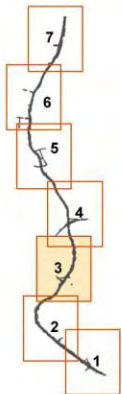
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Figure 4-2 | Comparison of EIS and refined design construction footprints

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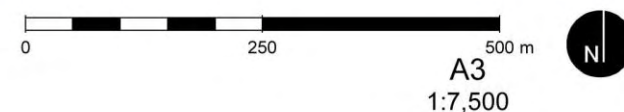
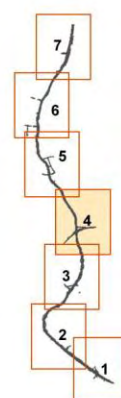


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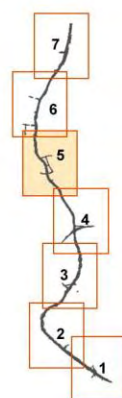
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Figure 4-2 | Comparison of EIS and refined design construction footprints

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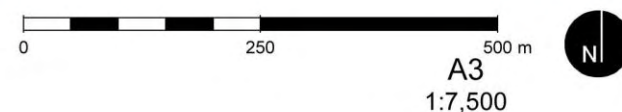
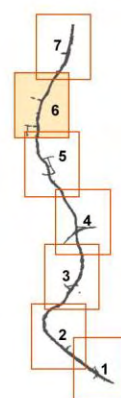
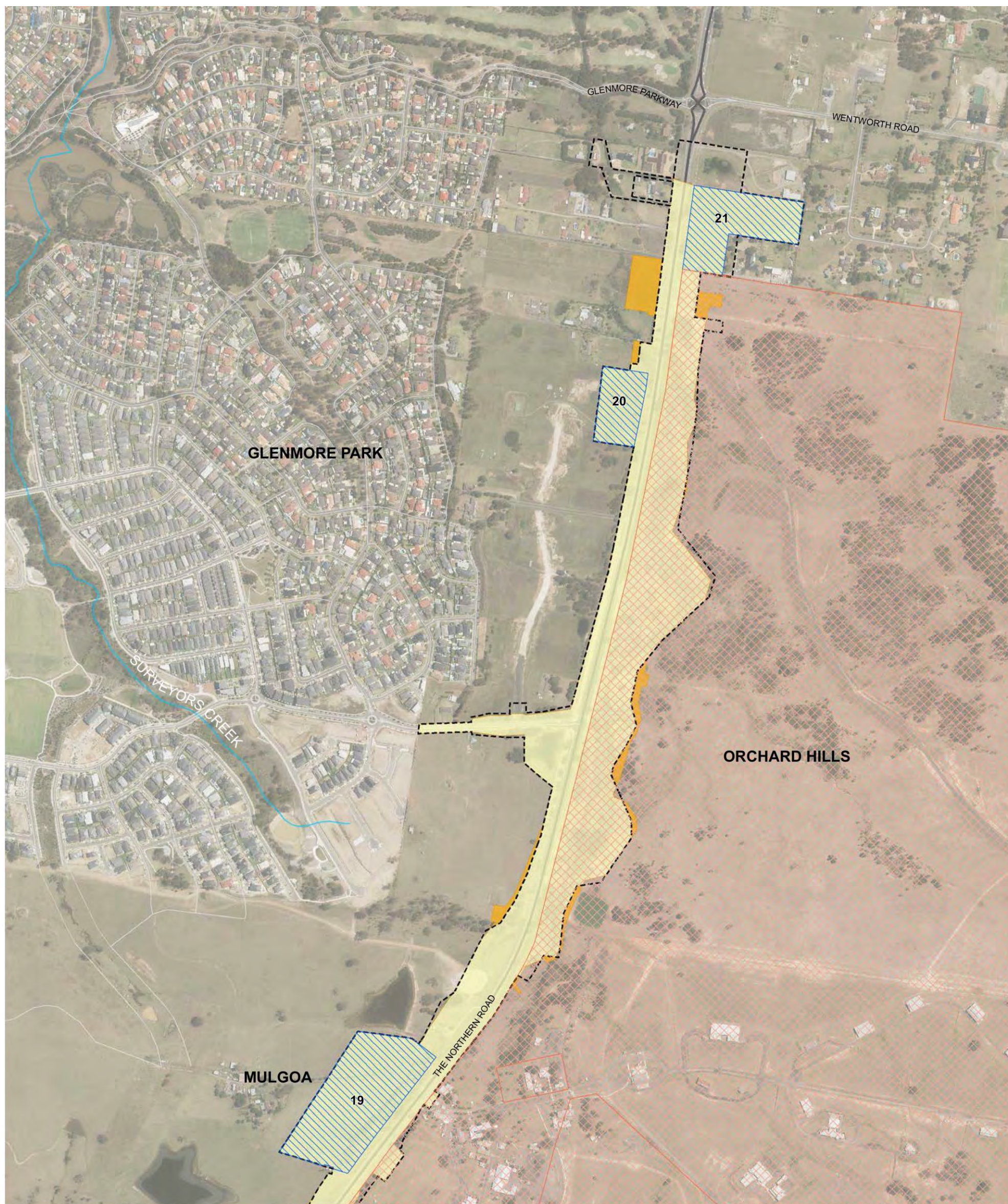


Figure 4-2 | Comparison of EIS and refined design construction footprints

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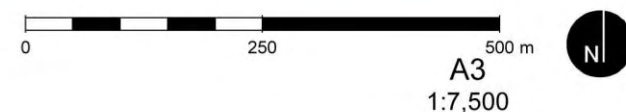
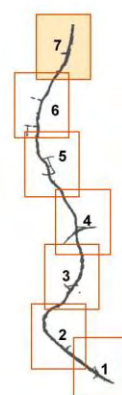


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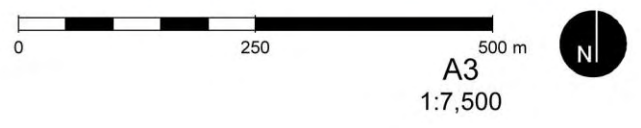
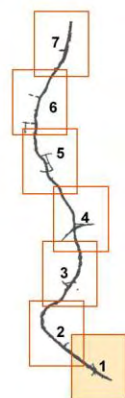


Figure 4-3 | Comparison of EIS and refined design operational footprints



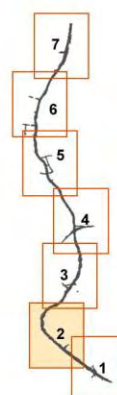
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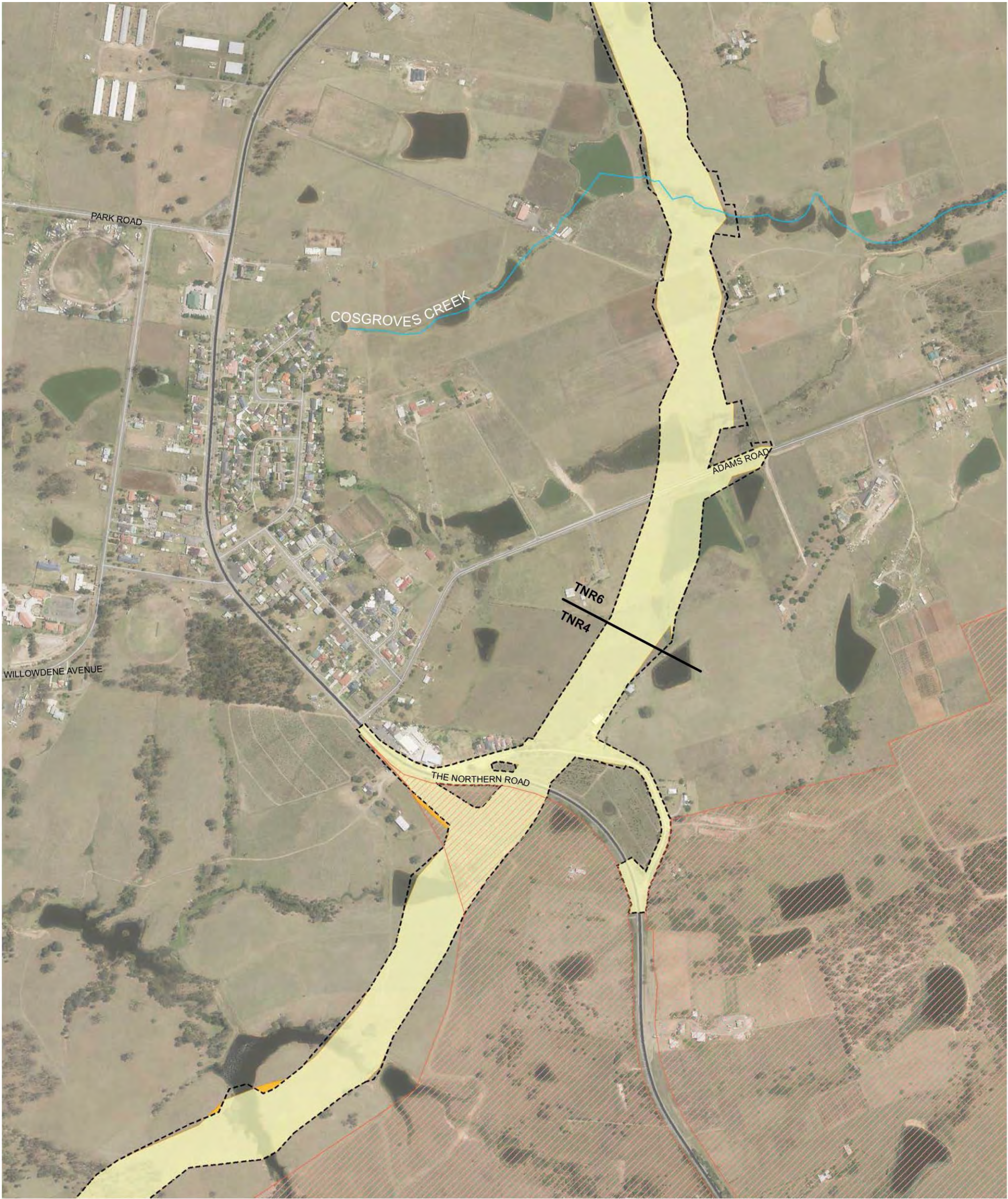
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Figure 4-3 | Comparison of EIS and refined design operational footprints

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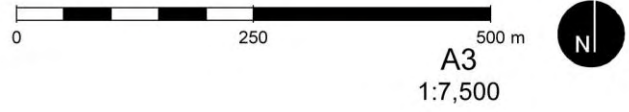
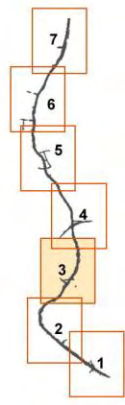
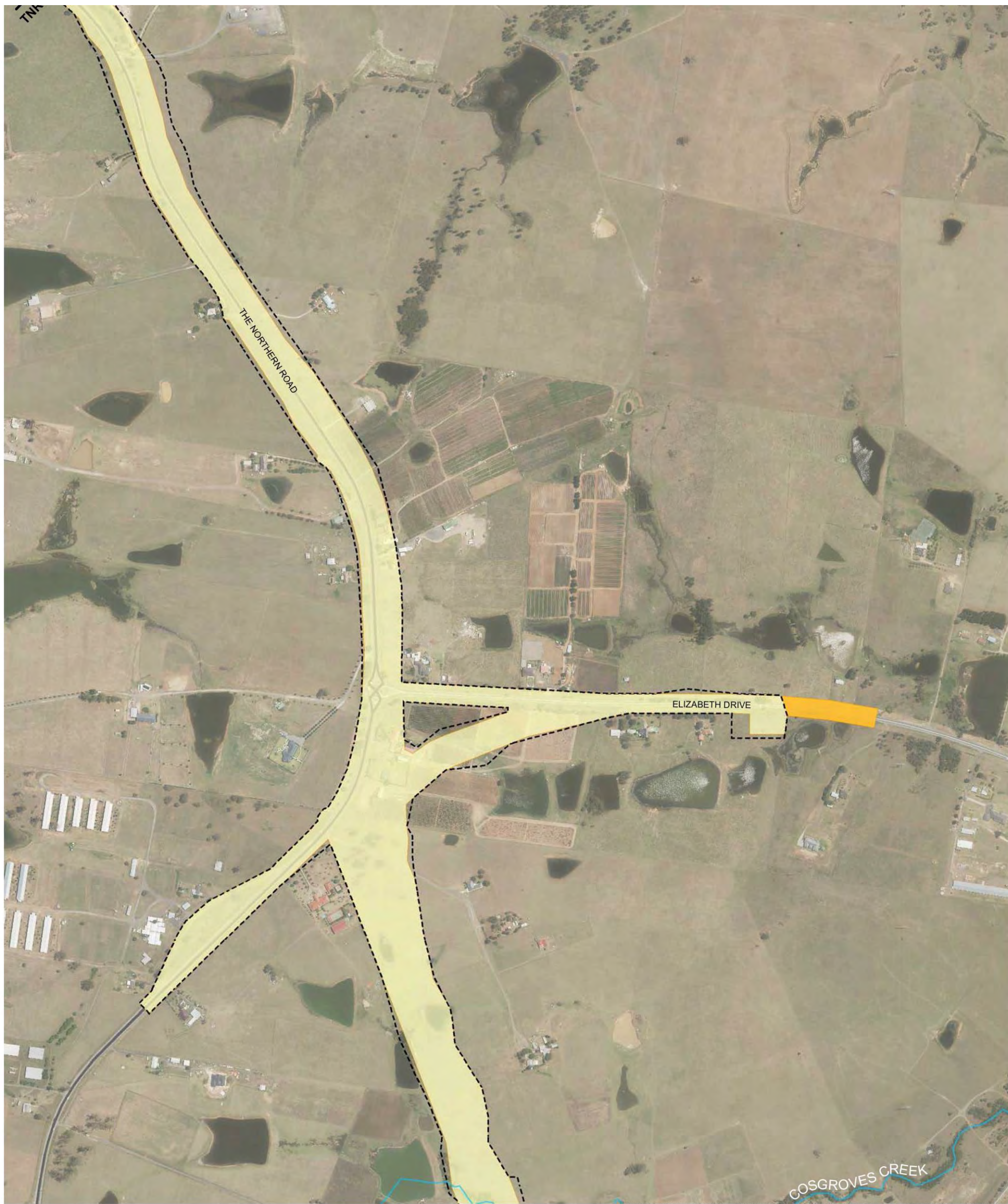


Figure 4-3 | Comparison of EIS and refined design operational footprints



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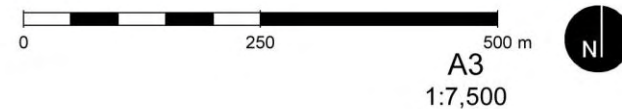
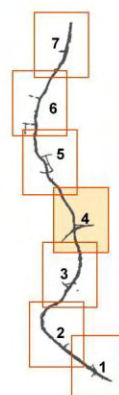


Figure 4-3 | Comparison of EIS and refined design operational footprints

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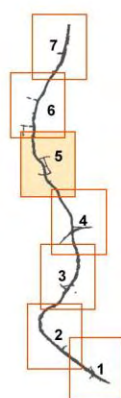
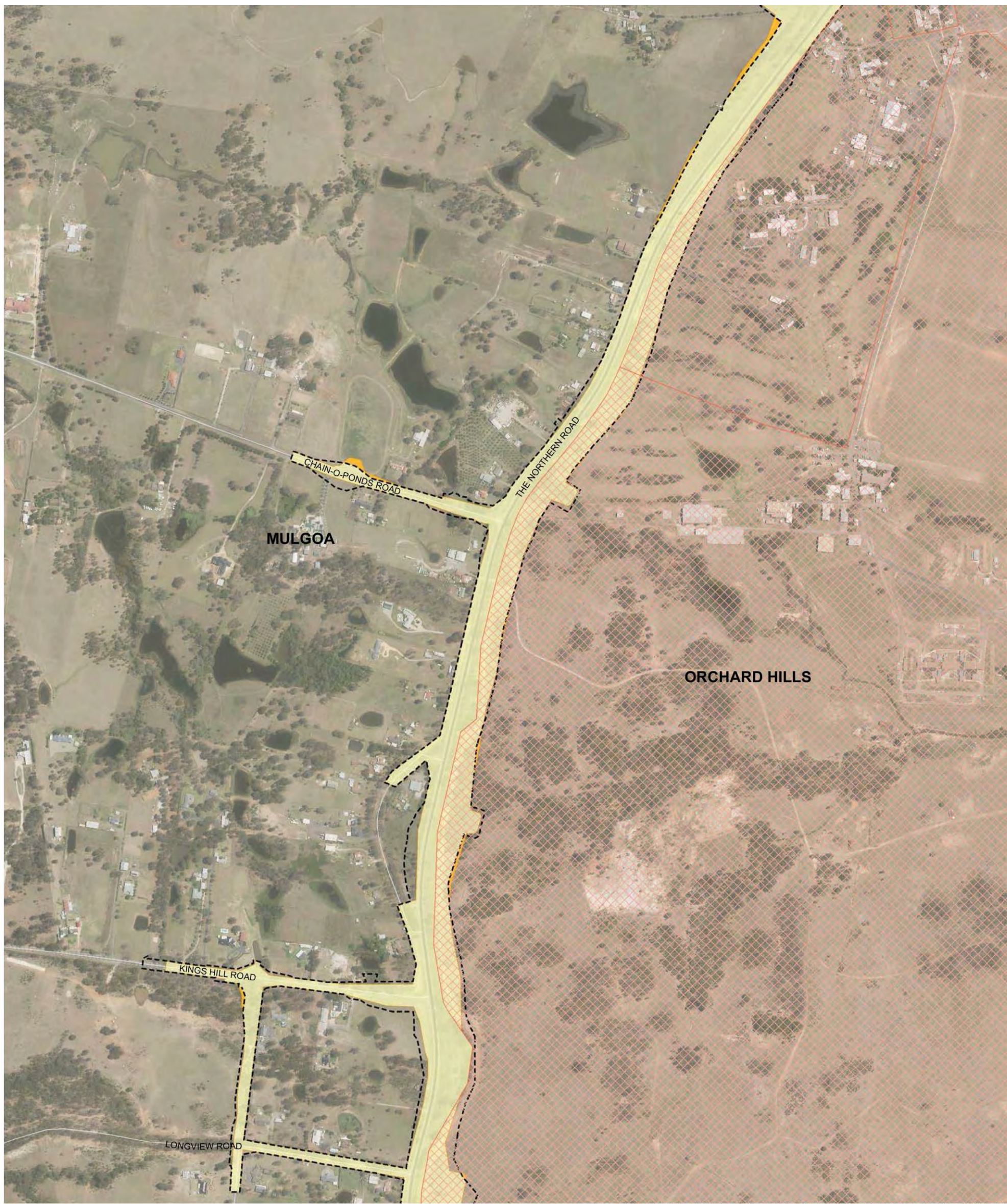


Figure 4-3 | Comparison of EIS and refined design operational footprints

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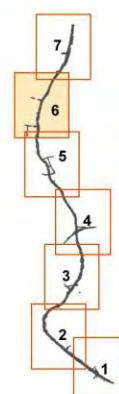


Figure 4-3 | Comparison of EIS and refined design operational footprints

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- Additional areas of operational footprint due to design refinements
- Defence Establishment Orchard Hills (Commonwealth Land)

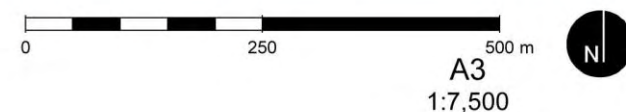
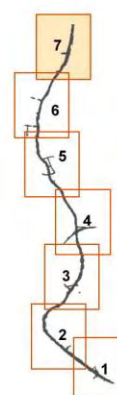


Figure 4-3 | Comparison of EIS and refined design operational footprints

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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.