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Abbreviations

AHIMS       Aboriginal Heritage Information Management System
AHIP        Aboriginal Heritage Impact Permit
BoM         Bureau of Meteorology
BWSEA       Broader Western Sydney Employment Area
DIPNR       Department of Infrastructure, Planning and Natural Resources
DP&E        Department of Planning and Environment
DPI         Department of Primary Industries
EPBC Act    Environment Protection and Biodiversity Conservation Act 1999
kV          kilovolt
LEP         Local environmental plan
LGA         local government area
MCA         Multi-criteria assessment
OEH         Office of Environment and Heritage
OSO         Outer Sydney Orbital
PACHCI      (Roads and Maritimes) Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PAD         Potential archaeological deposit
SHR         State Heritage Register
SoHI        Statement of heritage impact
TEC         Threatened ecological community
TSC Act     Threatened Species Conservation Act 1995
WSIP        Western Sydney Infrastructure Plan
WSPGA       Western Sydney Priority Growth Area
Executive summary

The Australian and NSW governments are funding a 10 year, $3.6 billion road investment program for western Sydney. The Western Sydney Infrastructure Plan will deliver new and upgraded roads to support integrated transport in the region and capitalise on the economic benefits from developing the proposed western Sydney airport at Badgerys Creek.

As part of the plan, Roads and Maritime Services is proposing to upgrade about 35 kilometres of The Northern Road between Narellan and Penrith. This will support the proposed western Sydney airport, the growing population of around 300,000 people in the South West Priority Land Release Area and Western Sydney Priority Growth Area, and more than 57,000 local jobs over the next thirty years. The upgrade is to improve safety, increase road capacity and to reduce future congestion and travel times. The Northern Road Upgrade will be delivered in four stages.

The Northern Road Upgrade Stage 4 is about 11 kilometres between Mersey Road, Bringelly and Littlefields Road, Luddenham. The road will be upgraded to a four lane road with a wide central median to allow for six lanes in the future.

The existing road to the south of Luddenham town centre needs to be diverted because part of the road is on land needed for the proposed western Sydney airport. The existing road must be realigned around the airport site to enable the construction and operation of the airport.

Roads and Maritime engaged Parsons Brinckerhoff to help identify a preferred route option for this section of the upgrade. A list of 12 options was developed and investigated for The Northern Road Upgrade Stage 4. Environmental investigation work and engineering analysis was carried out on the 12 options.

A workshop was held in April 2015 to shortlist feasible route options for community consultation. A variety of stakeholders from Roads and Maritime and other Australian and NSW government agencies took part, providing input and feedback from their different perspectives and technical disciplines.

The four shortlisted options identified at the workshop, (see Figure ES.1) were:

- **Central Option** realignment around the proposed airport site, reconnecting to The Northern Road existing alignment at Luddenham
- **Campbell Street Option** realignment around the proposed airport site and then passing through Luddenham along Campbell Street, connecting back to The Northern Road existing alignment just north of Luddenham
- **Eastern Option** realignment around the proposed airport site and then to the east of Luddenham, connecting back to The Northern Road existing alignment near Elizabeth Drive
- **Western Option** realignment around the proposed airport site and then to the west of Luddenham, connecting back to The Northern Road existing corridor north of Elizabeth Drive. This includes a sub-option to connect to The Northern Road just south of Elizabeth Drive.
Each of these options shares a common southern section that is located partly within Commonwealth land attached to the western Sydney airport site. A sub-option was developed to pass around this land if required. The sub-option is longer and would only be chosen if the Australian Government require the land for the operation of the proposed western Sydney airport.

During July and August 2015 Roads and Maritime consulted with the community to seek feedback on the four shortlisted options. The community told Roads and Maritime that the Central and Campbell Street options were not favoured due to land acquisition, heritage, noise and the impact on the Luddenham town centre. The Western and Eastern options were preferred and received similar levels of support. The main comments in favour of the Eastern Option are that it provides a connection to the Luddenham town centre, creating greater opportunities for the village and its businesses. The main comments in favour of the Western Option are that it is a straighter and more direct road alignment. Comments were received for all four options about the negative impacts the road may have on people’s homes and businesses.

Some early field investigations were carried out from July to September 2015 to assist in the route selection. These investigations, including Rapid Biodiversity, Aboriginal heritage and European heritage assessments, focused on the Western and Eastern options.

A workshop was held on 23 September 2015 to select a preferred option for The Northern Road Upgrade Stage 4 and included representatives from the Australian, NSW and local governments. The participants endorsed a proposal to not proceed with further assessment of the Central and Campbell Street options due to the expected high level of impact on land acquisition, heritage, noise, social amenity and feedback from the community.

The Western and Eastern options were assessed by the participants against a range of criteria including community, environment, heritage, cost, constructability, traffic, and integration with land use and transport, using information available at the time of the workshop. The assessment showed that for many criteria there was not a significant difference between the Western and Eastern options.
There has been some modification to the route alignment for the Eastern option that was displayed to the community in July 2015. The modifications are in the southern section of the route and are the result of advice from the Australian Government about the operational clearances required around the airport. Ongoing negotiation about the alignments will be required but Roads and Maritime did not want to delay the announcement of the preferred route until the alignment in this section is confirmed. Therefore, a wider corridor has been adopted on the preferred route map in Figure ES.2 in this area along Willowdene Avenue near the Commonwealth Land.

Preferred Route Option

The Eastern Option was selected as the preferred route for the project. Figure ES.2 shows the preferred route option. The Eastern Option was preferred because it better supports:

- Current development, maintaining and improving access through Luddenham
- Future development, providing links to the Western Sydney Priority Growth Area
- Airport connectivity, by offering additional opportunities to connect to the airport
- Future connection with the M12 Motorway due to proximity of the eastern alignment
- Airport construction programs, as it allows staging of the road’s construction and the closure of The Northern Road existing alignment through the proposed airport site at the earliest opportunity.
Figure ES1-2  Adjusted Eastern Option
1. **Introduction**

1.1 **Background**

Roads and Maritime Services (Roads and Maritime) has been investigating route options for the upgrade and realignment of The Northern Road between Mersey Road, Bringelly and Littlefields Road, Luddenham (referred to in this report as ‘The Northern Road Upgrade Stage 4’). The Northern Road Upgrade Stage 4 forms part of the Western Sydney Infrastructure Plan (WSIP).

The WSIP was announced by the Australian and NSW governments in April 2014 to support the proposed western Sydney airport at Badgerys Creek, Western Sydney Priority Growth Area (WSPGA) and the South West Priority Land Release Area (SWPLRA). WSIP consists of the following road development work:

- The Northern Road Upgrade between The Old Northern Road and Jamison Road, divided into four stages
- Bringelly Road Upgrade between The Northern Road and Camden Valley Way
- A new motorway between the M7 Motorway and The Northern Road generally parallel with Elizabeth Drive alignment, known as M12 Motorway
- Werrington Arterial Road
- Ross Street/Great Western Highway intersection upgrade
- Additional targeted local road upgrades in western Sydney, to be proposed and managed by local councils.

Part of The Northern Road currently lies within the site of the proposed western Sydney airport. The Northern Road therefore requires a new alignment outside the western Sydney airport site to facilitate construction and ongoing operation of the proposed airport.

The Northern Road between Mersey Road, Bringelly and Littlefields Road, Luddenham is currently predominantly one lane in each direction and is about 11 km long. The speed limit varies between 40 km/h (School Zone) and 80 km/h. The proposed upgrade would have two carriageways with an intended operating speed limit of 80 km/h.

1.2 **Need for the project**

In April 2014 the Australian Government announced that the site for the proposed western Sydney airport would be Badgerys Creek. The airport is expected to be operational by the mid-2020’s. It is currently planned that the new western Sydney airport would initially include a single runway. Further development of the airport would be staged in response to demand, with the full scale airport potentially consisting of parallel runways and capacity to handle up to about 80 million passengers per annum.

The existing alignment of The Northern Road to the south of the township of Luddenham currently crosses a substantial portion of the proposed western Sydney airport site. As a result, Roads and Maritime is currently investigating alternative route options for The Northern Road (referred to in this report as ‘The Northern Road Upgrade Stage 4’) (Route A9 and Tourist Road 18) between Mersey Road, Bringelly and Littlefields Road, Luddenham to avoid the proposed western Sydney airport site.
The Northern Road is one of the principal transport corridors in the south west region of Sydney. Substantial growth in traffic volumes on The Northern Road is predicted due to the residential and commercial developments in the South West Priority Land Release Area (SWPLRA), the WSPGA, and the development of the proposed western Sydney airport. The SWPLRA and WSPGA were previously known as the South West Growth Centre and Broader Western Sydney Employment Area and identified to include 110,000 new dwellings for about 300,000 residents and about 10,000 hectares of proposed new employment land. These developments are predominantly to the east of The Northern Road and north, east and south of the western Sydney airport site, with employment areas anticipated to allow for predominantly freight and logistics sectors, creating the potential for significant traffic generation.

The new alignment for The Northern Road Upgrade Stage 4 would provide capacity for increased traffic associated with the proposed western Sydney airport, as well as traffic growth due to development in the SWPLRA and the WSPGA. The Northern Road would also provide a key north-south connection between the proposed western Sydney airport and the M4 Western Motorway and M31 Hume Motorway.

1.3 Objectives

1.3.1 Western Sydney Infrastructure Plan program objectives

The four objectives for the WSIP program are:

- Development and demand – Support the proposed western Sydney airport, and land use change and residential growth; balancing functional, social, and environmental and value for money considerations
- Connectivity to airport – Provide a resilient connection to the western Sydney airport site for freight and people
- Integrated network – Provide road improvements to support and integrate with the broader transport network
- Customer focus – Provide meaningful engagement with customers and stakeholders throughout the program life.

1.3.2 Project objectives/assessment criteria

The Northern Road Upgrade Stage 4 project objectives that complement the WSIP program objectives are:

- Realignment of The Northern Road around the proposed western Sydney airport site to allow building and facilitation of the proposed airport
- Cater for future traffic demand to improve the flow of traffic to provide reliable journeys
- Improve transport connections from the south, including Campbelltown and the M31 Hume Motorway, to the proposed western Sydney airport and surrounding developments including the South West Priority Land Release and Western Sydney Priority Growth Area
- Improve facilities for public and active transport to promote sustainable and efficient journeys.

Supporting project development criteria were also developed in conjunction with these objectives. These criteria are not specifically reasons for undertaking the project or identifying a preferred route option, but inherently arise from the project and support justification for the preferred option. The supporting project development criteria are to:

- Minimise environmental impacts
- Deliver a cost effective proposal
- Improve road safety
- Maintain arterial road function
- Accommodate access to south western end of the airport.

These objectives were ratified by the Project Executive Steering Committee on 22 May 2015.
1.4 Objectives and purpose of this report

The key objectives of this Preferred Route Option Report is to:

- Describe the shortlist of route options presented to the community for engagement and for further ongoing analysis, investigation and refinement
- Analyse shortlisted options against existing major engineering and environmental constraints
- Identify a preferred route option to be taken forward for further ongoing analysis, investigation and refinement.

The structure and content of this report is:

- Section 1 – Introduction: Outlines the background and need for the options selection study for The Northern Road Upgrade Stage 4, the project objectives, and the purpose of the Strategic Route Options Report
- Section 2 – Options: Describes each of the shortlisted route options assessed
- Section 3 – Considerations: Analyses the various considerations and issues associated with the shortlisted route options
- Section 4 – Options comparison and preferred option: Assesses and scores the shortlisted options to determine a preferred route option
- Section 5 – Further Changes: Describes some changes that occurred following the assessment
- Section 6 – Conclusion: Identifies the preferred option and outlines the next stage in the project lifecycle.

1.5 Study area

The Northern Road Upgrade Stage 4 study area ('the study area') adopted for the generation of route alignment options, extended from Mersey Road, Bringelly at the southern end to the existing Sydney Water supply pipeline (Warragamba Pipelines), about nine kilometres to the north as shown in Figure 2.1. The northern extent was moved to Littlefields Road, Luddenham after shortlisting to join the southern extent of The Northern Road Upgrade Stage 3. The southern extent of the route options meets the northern extent of The Northern Road Upgrade Stage 2 at Mersey Road, Bringelly.

The study area covers two local government areas (LGA):

- Penrith City Council (generally to the north of Elizabeth Drive and 950 metres south of Park Road, Luddenham)
- Liverpool City Council (generally to the south of Elizabeth Drive and Park Road, Luddenham).

A section of the western Sydney airport site is also located at the southern end of the study area.

After the shortlisting process, described in Section 2.2 Shortlisted option descriptions, the assessment focussed on a modified study area based on the shortlisted option corridors.

1.6 Background information

The identification of current and future constraints that may impact on the development of the identified route alignment options was carried out through a review of various available background documents and databases relevant to the study area. Relevant database searches included:

- Australian Heritage Database
- State Heritage Register (SHR)
- Liverpool Local Environment Plan 2008
- Penrith Local Environment Plan 2010
- Roads and Maritime Heritage and Conservation section 170 Register
- Office of Environment and Heritage (OEH) Aboriginal Heritage Information Management System (AHIMS) database
- EPBC Protected Matters Search tool
- Department of Primary Industries (DPI) Records Viewer
• Atlas of Living Australia
• OEH Bionet Wildlife Atlas
• Bureau of Meteorology (BoM) Atlas of Ground Water Dependent Ecosystems.

Documents and planning strategies relevant to the options assessment were also reviewed. A list of these is included in Section 7 References.

Limitations

This report identifies potential environmental and engineering issues and constraints within The Northern Road Upgrade Stage 4 study area. These investigations were based largely on desktop assessments and other available data current at the time of preparing the report. Limited on-site verification of the available information has been carried out, as specified within the relevant section of this report.
2. Options Assessed

2.1 Original options (long list)

A series of preliminary routes was developed by Roads and Maritime in 2014 and early 2015. A preliminary workshop with key project team members in March 2015 was used to review the study area constraints and the preliminary route options. After this workshop, modifications were made and additional options or sub-options were added which comprised a total of 12 options for consideration (the ‘long list’). The long list of options identified for The Northern Road Upgrade Stage 4 is shown in Figure 2.1.

More detailed information about the long list of options and the process used to achieve the shortlist please refer to The Northern Road Upgrade Stage 4, July 2015, Options Identification Report RMS 15.302 ISBN:978-1-925357-47-9 (Roads and Maritime/Parsons Brinckerhoff, 2015), which is included in Appendix F and published on Roads and Maritime’s website.
Figure 2-1  Long list options
2.2 Shortlisted option descriptions

After the identification of the long list of options, a multi-criteria assessment was undertaken to refine this list to a shortlist of route alignment options. The four shortlisted route options were identified as follows:

- **Central Option** - realignment around the proposed airport site, reconnection to The Northern Road existing alignment south of Luddenham and widening of the existing road through Luddenham and to the north.
- **Campbell Street Option** - a similar alignment to the Central option with the route through Luddenham located along Campbell Street connecting to The Northern Road existing alignment north of Luddenham.
- **West Option** - west of Luddenham, connecting to The Northern Road existing corridor near Elizabeth Drive. This includes a sub-option to connect to The Northern Road north of Elizabeth Drive.
- **East Option** - east of Luddenham, connecting to The Northern Road existing alignment near Elizabeth Drive.

Each of these shortlisted options is described in greater detail in the following sections.

### 2.2.1 Common section (preferred Southern sub-option)

All of the shortlisted options identified share a common alignment from the southern point of the proposed upgrade at Mersey Road, Bringelly connecting to a common point at Willowdene Avenue, Luddenham.

The road upgrade in this section would be realigned to the west of the existing road for approximately four kilometres to avoid an area identified by the Commonwealth Department of Infrastructure and Regional Development as a Public Safety Zone.

The corridor for this portion of the upgrade is wider than the Willowdene Avenue corridor, and would be located on the western side of Willowdene Avenue to avoid Commonwealth land on the eastern side of Willowdene Avenue associated with the western Sydney airport. The options follow different routes to the north of this Commonwealth land.

### 2.2.2 Southern back-up sub-option

All of the route option alignments utilise Commonwealth land which has not been confirmed as available for The Northern Road Upgrade Stage 4. Should this land be identified as unavailable for the road upgrade, the Southern back-up sub-option would be adopted. The Southern back-up sub-option would require the road alignment to travel an additional 800 metres west to avoid land currently owned by the Commonwealth and is shown in Figure 2.2 to Figure 2.5 for each of the four shortlisted options.

Following the natural topography, this option would have a lower elevation and steeper grades which could increase vehicle operating costs. The Southern back-up sub-option would also result in increased earthworks volumes. Environmentally, the Southern back-up sub-option would increase clearing and would have a significant effect on Duncan’s Creek, which would require large drainage structures.

The Southern back-up sub-option is not considered a preferable option due to the increased length of the alignment and consequent impacts on travel time, area of road surface required and overall increase in potential environmental impact.
2.2.3 Central Option

The Central Option would maximise use of the existing The Northern Road corridor, reducing the area of land to be acquired. This option would significantly impact existing residences and businesses fronting The Northern Road.

The speed limit would be limited to 60 km/h through Luddenham which would reduce capacity and the road’s proposed arterial road function. This would place strain on traffic and could potentially lead to congestion. This option would also have the greatest potential noise impacts on local residences and businesses.

The maximum grade of this alignment would be about five per cent, which is greater than any other option. There are also considerably larger impacts on utilities compared to other routes due to the high concentration of utilities along The Northern Road between Roots Avenue and Park Road, Luddenham.

As this option follows the existing road alignment, which is on a ridgeline, the earthworks associated with this option would be less than other shortlisted options.

This option would be about 9915 metres long. The Central Option alignment is shown in Figure 2.2.
Figure 2-2  Central Option
2.2.4 Campbell Street Option

The Campbell Street Option was developed as an alternative to the Central Option in order to reduce the number of residences and businesses directly impacted by The Northern Road Upgrade Stage 4.

Similarly to the Central Option, the nature of the road environment through Luddenham associated with the Campbell Street Option would require the speed limit to be reduced to 60 km/h. The Campbell Street Option would also require a school zone at the Holy Family Church and Primary School near the intersection of Campbell Street and Willowdene Avenue.

As part of the Campbell Street Option, it is likely that the main connection into Luddenham would be via Park Road, Luddenham. The upgrade would connect to The Northern Road existing alignment north of Park Road.

This option would be about 9910 metres long. The Campbell Street Option is shown in Figure 2.3.
Figure 2-3 Campbell Street Option
2.2.5 Western Option

The Western Option would provide a route generally parallel to The Northern Road existing alignment and bypass Luddenham about 600 metres to the west of the existing road. The northern connection with the existing road would be about one kilometre north of Elizabeth Drive.

This option would pass about 200 to 300 metres west of significant community infrastructure including the Holy Family Church and Primary School and the Luddenham Showground.

This option would be the shortest route at 9890 metres. The Western Option alignment is shown in Figure 2.4.

2.2.6 Western Alternative sub-option

This option was developed as an alternative to the Western Option and is shown in Figure 2.4. The primary difference between the main Western Option and the Western Alternative sub-option is the location of the connection to The Northern Road existing alignment.

The Western Option would connect into the current alignment of The Northern Road about one kilometre north of Elizabeth Drive. The Western Alternative sub-option would connect to the existing The Northern Road alignment south of the Elizabeth Drive roundabout (about one kilometre south of the proposed Western Option tie in point).

The advantage of this sub-option would include a reduced volume of earthworks and smaller area of new road pavement required. The Western Option requires a new connection with Elizabeth Drive, likely an extension of about 250 metres extending in the same general westerly direction. The Western Alternative sub-option would also have a greater impact on utilities located along The Northern Road than the main Western Option.
Figure 2-4 Western Option
2.2.7 Eastern Option

The Eastern Option from Willowdene Avenue would turn north-east from the end of the common route alignment and would generally follow the northern boundary of the proposed western Sydney airport site. The Eastern Option would cross The Northern Road near the intersection with Eaton Road at the southern end of Luddenham.

This option would require acquisition of some Commonwealth land on the southern side of The Northern Road near the intersection with Eaton Road, Luddenham. A connection into The Northern Road would be provided at the location where the upgrade crosses near Eaton Road (southern access to Luddenham).

The Eastern Option would be located about 800 metres east of The Northern Road existing alignment through Luddenham and would join The Northern Road existing corridor before the Elizabeth Drive intersection.

A new connection between the existing The Northern Road and the new The Northern Road Upgrade will be provided near Elizabeth Drive intersection (northern access to Luddenham). Options for connections have not yet been developed.

This option is the longest route of all the options at about 10,360 metres long. The Eastern Option alignment is shown in Figure 2.5.
Figure 2-5  Eastern Option
3. Issues and constraints

The following sections provide an outline of the key issues and constraints that have been identified as part of the preferred option selection process, and likely impacts of the four shortlisted route alignment options.

As described in Section 2.2.1 Common section (preferred Southern sub-option), the route option alignments have a common section at the southern end of the upgrade, which has not been a focus of the investigation, as it does not provide an opportunity for distinction of relative benefits or constraints between the identified options.

The key issues and constraints identified for the Western Alternative sub-option and Southern back-up sub-option have not been discussed as part of the main consideration of route option alignment. However, some commentary has been provided in Section 3.16 Western alternative sub-option and Section 3.17 Southern back-up sub-option respectively.

The information provided in this Chapter is based on information that was available at the time of the shortlisting assessment. After the assessment of the options in order to identify a preferred option, additional information was identified. This information is presented in Chapter 5 of this report.

3.1 Community and socio-economic impacts

3.1.1 Community profile

A summary of the community profile for the broader study area was provided as part of the Options Identification Report prepared by Roads and Maritime in July 2015 (Roads and Maritime Services/Parsons Brinckerhoff 2015). Details of the community profile are included in Section 2.3.2 Social and amenity of this report, provided as Error! Reference source not found.

A discussion of the potential community and socio-economic impacts associated with each of the shortlisted options is below.

3.1.2 Community consultation

As part of a broader WSIP community consultation, the shortlisted route options for The Northern Road Upgrade Stage 4 were presented to the community and other stakeholders. A project issues register was developed with about 140 comments submitted specifically relating to The Northern Road Upgrade Stage 4. The community consultation was opened for comments between 13 July 2015 and 14 August 2015.

The findings of the community and stakeholder engagement are included in The Northern Road Stage 4 Options Analysis Community Feedback Report (Roads and Maritime 2015) provided as Appendix G. A summary is provided below.

Central Option and Campbell Street Option

The submissions received opposed the Central and Campbell Street options because of concerns related to land acquisition, heritage, noise, and town severance. In addition, concerns regarding the Campbell Street Option were raised about impacts on the Luddenham Showground and the Holy Family Church and School.

Western Option

The submissions received identified that this alignment would impact fewer properties and would be located mainly on farmland. Concerns were raised that a partial acquisition of farmland may impact the feasibility of the agricultural business. Submissions identified that the Western Option was considered to provide improved traffic flows due to the straighter alignment and ability to retain the 80km/h speed limit for the entire length.
Eastern Option

Submissions noted potential positive impacts for Luddenham traffic, due to diverting The Northern Road around Luddenham. Specifically, it was noted that the Eastern Option would allow traffic to have an unimpeded flow around the village while also allowing traffic to pass through the village, providing local access to businesses and residences. It was also noted that this option would allow better connection of cycle ways into Luddenham.

Some submissions suggested potential negative traffic implications associated with a longer route and more curves on the road.

Business stakeholders generally expressed a preference for the proposed Eastern Option, as it provided improved opportunities for connection to Luddenham and was expected to have less adverse business and socio-economic impacts within Luddenham.

3.2 Land use and property

A range of existing land uses were identified as part of the Options Identification Report prepared by Roads and Maritime in July 2015 (Roads and Maritime Services/Parsons Brinckerhoff 2015). Details of these land uses are included in Section 2.3.1 Environment of the Options Identification Report, provided as Appendix F.

A summary of the potential land use and property impacts associated with each of the shortlisted options is provided below. It is recognised that where rural properties are impacted, the overall impact to the property and its ongoing viability in its current use is difficult to determine without discussion with the landowners.

Central and Campbell Street options

The Central and Campbell Street options would impact a larger number of land parcels compared to other route options. The existing road corridor through the Luddenham town centre is currently narrower than the proposed design so widening would mean impacting houses and businesses in the town centre.

The Central and Campbell Street options would also have the greatest impact on social amenity of the Luddenham community, through severance and direct impacts to Sales Park and the Luddenham Showground respectively.

Western and Eastern Options

Both the Western and Eastern Options would have similar impacts to land use and properties within the study area. The Western and Eastern options would both pass through larger parcels of land which are more likely to be used for business purposes – in particular farming and agricultural businesses. It is possible that any potential partial acquisition of impacted lots could impact the viability of existing businesses on these properties. Whilst the potential for these impacts is acknowledged, specific impacts are not able to be determined based on the current strategic level of the corridor options and without more detailed landowner negotiations.

Commonwealth land

All the options on the preferred (common) southern alignment would utilise Commonwealth land on the margins of the western Sydney airport site. Roads and Maritime will continue to work closely with the Commonwealth on a mutually acceptable approach to the potential use of this land.

The Eastern Option would also require use of an additional area of Commonwealth land next to The Northern Road near Eaton Road, Luddenham. Roads and Maritime will also continue to work closely with the Commonwealth regarding the potential availability of this land.
3.3 Airport

The Northern Road Upgrade Stage 4 is required to consider the operational clearances required at the end of the runways for the proposed western Sydney airport to ensure the airspace around the airport is appropriately protected. Roads and Maritime will continue to work with the Commonwealth Department of Infrastructure and Regional Development in this process.

All of the shortlisted options would result in the same location for access at the western end of the proposed airport. Based on discussions with the Commonwealth Department of Infrastructure and Regional Development, this access is understood to provide operational and commercial access, rather than passenger access which would be from the northern end of the airport site.

The Eastern Option would follow the northern boundary of the airport site closer than the other shortlisted options and provide improved opportunity to create additional access to the airport site from the north. The Eastern Option would potentially also provide access to the airport site during construction. However, no information regarding the proposed construction staging of the proposed airport was available at the time of preparing this report to confirm the potential opportunity.

3.4 Traffic and access

The Northern Road is identified in the NSW Long Term Transport Master Plan (Transport for NSW, December 2012) as a key transport corridor in western Sydney. The Northern Road Upgrade offers the opportunity to accommodate traffic increases attracted to this arterial road and from the extensive developments being planned in the region.

Road user safety, traffic speeds, local access and connectivity to the future planned road were key considerations in the selection of a preferred option.

Traffic surveys taken in 2012 (Sinclair Knight Merz, August 2012) indicated that The Northern Road (north of Dwyer Road) carried about 10,500 vehicles per day (average daily traffic), of which around 12 per cent were trucks. During the weekday morning and afternoon peaks, The Northern Road carried around 900 and 1,050 vehicles per hour respectively. An analysis of existing traffic flows indicated that it was operating with a Level of Service of D (a typically lower level of service) in the weekday morning and afternoon peak (north of Kings Hill Road), indicating it is close to capacity during peak periods.

A notable east-west movement of traffic exists between Park Road and Elizabeth Drive. The combined flows of The Northern Road (north-south) and the Park Road/Elizabeth Drive (east-west), place additional pressure on this section of The Northern Road.

Central and Campbell Street options

The Central and Campbell Street options would require a reduction in speed limit from 80 km/h to 60 km/h as they traverse the suburban environment of Luddenham. Further, the Campbell Street Option would require a 40 km/h school zone during school times. The large difference in speeds may cause congestion and increase the risk of speeding and/or crashes which would require additional safety management.

The proposed divided carriageway arrangement removes the ability to turn right into and out of properties and therefore restricts access. To maintain suitable access to properties there may be requirement for the provision of U-turns at controlled locations. This would have an impact on the operational functionality of both the Central and Campbell Street options.

Pedestrian demand to cross The Northern Road may exist along the Central and Campbell Street Options through Luddenham. Controlled crossing points would be required but are not likely to eliminate informal and unsafe crossings of The Northern Road Upgrade Stage 4.

The proposed arrangement for the upgrade would not permit parking along the upgraded The Northern Road. This is an issue for properties on the existing alignment along The Northern Road through Luddenham town centre where on-street parking is currently provided. The Central and Campbell Street options would have the greatest effect for on-street parking due to the removal of existing provisions.
The Central and Campbell Street Options would retain the existing connection between The Northern Road and Elizabeth Drive.

Western option

The Western Option would not pass through the township and an 80km/h speed environment could be maintained for the entire length of this option. However, it would require an extension of Elizabeth Drive to reinstate this connection. Access to Luddenham from the Western Option would be provided by intersections on Park Road to the west and Elizabeth Drive in the east. Existing sections of The Northern Road would be closed near Elizabeth Drive to provide local access only.

The Western Option would provide good access to the Park Road tourist route and the areas to the west. Preliminary advice from the Outer Sydney Orbital (OSO) Corridor study was that one OSO corridor option may be located west of Luddenham so the Western Option may result in less favourable arterial road network spacing.

The location of the intersection with the future M12 Motorway is unknown at this time. However, being a Motorway, it would require a grade-separated interchange with the upgraded The Northern Road. To help with acceleration and deceleration on the motorway ramps, it would be desirable to have the arterial road (The Northern Road) above the motorway. The Northern Road is currently located on the ridge line and all options except the Western Option would follow the existing road which is the most suitable location to allow the future M12 Motorway to pass beneath.

Eastern option

The Eastern Option would not pass through the Luddenham township and an 80km/h speed environment could be maintained for the entire length of this option. It would provide a good connection to Elizabeth Drive by reconnecting with the existing alignment of The Northern Road south of the current intersection. Access to Luddenham from the Eastern Option could be provided via a bypass using the existing The Northern Road alignment south of Elizabeth Drive to Eaton Road, Luddenham.

Preliminary advice indicated that the OSO corridor would be located west of Luddenham, potentially crossing The Northern Road near Elizabeth Drive. Based on this assumption, the Eastern Option would be likely to provide improved arterial capacity spacing as it would be located further away from the OSO corridor.

3.5 Road safety and road design

3.5.1 Road Safety

Any option adopted would be designed and constructed to current design and safety standards. There are some identified differences between the routes associated with the concentration of pedestrians and local traffic within Luddenham township.

Central Option

The Central Option would pass through part of the town centre along the existing alignment. Traffic volumes are expected to increase and local traffic and the community would be exposed to increasing traffic and related hazards as they interact with through traffic.

Campbell Street Option

The Campbell Street Option would pass The Holy Family Primary School requiring students and parents, living to the east (in the main township), to cross any new road at this location. Both pedestrian and vehicle traffic would experience a more complex and hazardous environment with the interaction of local and through traffic. Through traffic would be required to reduce speeds to 40 km/h during school times.
Western and Eastern options

The Western and Eastern options would effectively bypass the Luddenham township avoiding the main concentration of local traffic and potential community impacts.

3.5.2 Road design and operating principles

Table 3.1 identifies the geometric design parameters that were adopted to develop the route options:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Value adopted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Speed Limit</td>
<td>90 km/h</td>
</tr>
<tr>
<td>Preferred Posted Speed Limit</td>
<td>80 km/h</td>
</tr>
<tr>
<td>Maximum Longitudinal Grade</td>
<td>6%</td>
</tr>
<tr>
<td>Minimum Longitudinal Grade</td>
<td>0.5%</td>
</tr>
<tr>
<td>Stopping Sight Distance</td>
<td>126 m (reactions time 1.5s)</td>
</tr>
<tr>
<td>Minimum 'K' Value Crest Curve</td>
<td>35.5 m (reactions time 1.5s)</td>
</tr>
<tr>
<td>Minimum 'K' Value Sag Curve</td>
<td>35 m (reactions time 1.5s)</td>
</tr>
<tr>
<td>Cut Batter Slope</td>
<td>2H:1V</td>
</tr>
<tr>
<td>Fill Batter</td>
<td>4H:1V</td>
</tr>
<tr>
<td>Minimum radius at 3% superelevation</td>
<td>400 m</td>
</tr>
<tr>
<td>Minimum radius at 3% adverse cross fall</td>
<td>1280 m</td>
</tr>
</tbody>
</table>

Road Corridor

A nominal corridor width of 200 metres was adopted for each of the shortlisted options. This was selected to provide adequate width for the typical road reserve of 70 to 100 metres and flexibility to refine the alignment as more detailed engineering and constraint information became available.

In some locations where constraints were better known, such as through Luddenham, it was considered appropriate to reduce the corridor width. Table 3.2 provides commentary on the corridor widths adopted at different locations.

<table>
<thead>
<tr>
<th>Corridor width</th>
<th>Route options</th>
<th>Commentary</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 m</td>
<td>Central and Campbell Street options (through Luddenham)</td>
<td>Minimised impacts on nearby residents and businesses through township of Luddenham. Minimal requirement for embankments and cuttings.</td>
</tr>
<tr>
<td>200 m</td>
<td>Typical approach for all options</td>
<td>Allows flexibility to amend alignment as more constraints become apparent and design is refined.</td>
</tr>
<tr>
<td>200 m – 350 m</td>
<td>Options within The Northern Road corridor, north of Elizabeth Drive</td>
<td>The Northern Road existing alignment north of Elizabeth Drive includes some curves (vertical and horizontal) that could potentially be improved. The proposed corridor is wider in some locations to allow these improvements. It also allows widening on either side of The Northern Road.</td>
</tr>
</tbody>
</table>

Length of options

The Northern Road is an arterial route providing access for range of vehicles. A more direct route would reduce the distance travelled by road users and associated vehicle operating costs. The length of each of
the route option alignments is provided in Table 3.3 below. The Eastern Option would have the longest length which would be least preferred. However, the associated travel time and cost increases are not considered significant between each of the options identified.

Table 3-3 Length of options

<table>
<thead>
<tr>
<th></th>
<th>Central</th>
<th>Campbell Street</th>
<th>Western</th>
<th>Eastern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total length of option (km)</td>
<td>9.9</td>
<td>9.9</td>
<td>9.9</td>
<td>10.4</td>
</tr>
</tbody>
</table>

3.6 Utilities

Roads and Maritime engaged Aurecon to identify and investigate the impact of existing and future major utilities in the study area. The results of this investigation have been documented in a separate report (Western Sydney Infrastructure Plan – Utility Impact Investigation (Report No. 2: The Northern Road Upgrade Stage 4 – Revision B Ref:246136, Aurecon 2015).

The following assessment focuses on utilities identified as major and critical to each of the route option alignments. Major utility infrastructure impacted by the shortlisted route options is shown on Figure 3.1 below.

A 330 kilovolt (kV) TransGrid electrical transmission line transversely crosses all of the proposed options through the common alignment section at the southern end of Willowdene Avenue (refer to Figure 3.1). At this stage, all of the proposed route option alignments would avoid the existing transmission line towers. This utility will be modified with the development of the western Sydney airport site. Ongoing coordination would be required between the western Sydney airport and The Northern Road Upgrade Stage 4 projects to ensure that alteration to the transmission power line is consistent with the road upgrade.

Consideration of the identified utilities has also indicated that there are no known critical or major gas utilities impacted by the shortlisted options.

Central and Campbell Street options

An existing overhead 33 kV service is located on the eastern side of The Northern Road between Littlefields Road and Park Road and crosses The Northern Road at Park Road. Although this service would be impacted by all shortlisted options, it would have the highest impact on the Central option. The Central and Campbell Street options would require adjustment to the 33kV service along The Northern Road north of the point where the option connects with the existing alignment of The Northern Road.

Through the town of Luddenham, between Park Road and Roots Avenue there are two pole mounted transformers. Overhead lines cross the existing road alignment at seven locations. The street lighting in this area is overhead and is located along the western side of The Northern Road. The Central Option would have the greatest impact on these services and they would require relocation.

There are two water mains located along The Northern Road from Roots Avenue, Luddenham to Park Road, and along Park Road. They currently act as the single point of supply for the town of Luddenham and can be considered as critical due to the absence of other supply systems. The Central Option has the most significant impact on these water mains. The Central, Campbell Street and Western options would have some impact at Park Road, whilst the Eastern Option would avoid any impact.
Figure 3-1 Major utility infrastructure impacted
Telecommunication conduits are located along The Northern Road on both sides of the road from the Littlefields Road, Luddenham to Adams Road, Luddenham. These conduits contain both copper conduit and optic fibre. There is a risk that some of the associated conduits or pits contain asbestos. The Central Option would be the most affected by this as it follows the existing road in this area.

Telstra optic fibre is located along The Northern Road north of the intersection of Park Road. The impacts to the optic fibre are expected to be proportional to the length of the upgrade over the existing road north of Park Road, Luddenham. The Central and Campbell Street options would have the greatest impact to this utility.

**Western Option**

The Western option would be affected by same the overhead 33 kV as the Central and Campbell Street options. The extent of this impact would be significantly less due to the location where the option connects with The Northern Road.

**Eastern Option**

The Eastern Option would also be affected by the overhead 33 kV service located on the eastern side of The Northern Road between Littlefields Road and Park Road, Luddenham. The extent of impact is marginally less than the Central and Campbell Street options.

The Eastern Option would impact two existing telecommunication towers with associated equipment cabins. Although a road design that does not require relocation of the towers is considered possible. Some assessment of the structural stability of the communication towers may be required.

### 3.7 Topographical constraints

The existing alignment of The Northern Road follows a ridgeline. The township of Luddenham is located on the highest land within the study area. South of Park Road, Luddenham and to the west of The Northern Road alignment, the site can be considered steep terrain with significant creek lines and gullies. The Central and Campbell Street options are closer to the existing ground levels and require less earthworks but require steeper grades. The Western and Eastern options traverse undulating to steep terrain with relatively small incised gullies. The Western Option is considered slightly steeper terrain, and this is supported by the predicted higher earthworks quantities.

The overall differences in elevation for the Western Option is 32 metres (62 to 94 metres) and for the Eastern Option is 37 metres (65 to 102 metres). The smaller level difference associated with the Western Option is considered superior for vehicle operation. However, the overall grades are relatively flat and this is not considered a significant benefit.

#### Table 3-4 Topographical information summary

<table>
<thead>
<tr>
<th></th>
<th>Central</th>
<th>Campbell Street</th>
<th>Western</th>
<th>Eastern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest Level A.H.D (m)</td>
<td>106</td>
<td>101</td>
<td>102</td>
<td>94</td>
</tr>
<tr>
<td>Lowest Level A.H.D (m)</td>
<td>67</td>
<td>67</td>
<td>65</td>
<td>62</td>
</tr>
<tr>
<td>Level Difference (m)</td>
<td>39</td>
<td>34</td>
<td>37</td>
<td>32</td>
</tr>
</tbody>
</table>
3.8 Land use and planning

3.8.1 Existing land use and planning

Land use in the area of the proposed options is characterised by a mixture of low density residential, rural, commercial, recreational and transport uses. The land uses within the study area are generally consistent with the current zoning (refer to Figure 3.2 for details). Penrith Council updated their Local Environment Plan in February 2015 and are unlikely to revise their zoning for several years. The current Liverpool Council Local Environment Plan is dated 2008 and is being updated progressively to reflect the changes associated with the various releases of land associated with the area previously known as the South West Growth Centre that is now incorporated within the Western Sydney Priority Growth Area.

The study area contains a number of properties and facilities including:

- Private properties, including residential and businesses
- Farm land (primary production) – located east and west of The Northern Road south of Elizabeth Drive.
- Commonwealth land (western Sydney airport site) – located to the south east of the study area.
- Recreation areas/reserves:
  - Luddenham Showground – located along Park Road in Luddenham
  - Sales Park – the park includes a cricket pitch and is located along The Northern Road in Luddenham
  - Wilmington Reserve – the park includes a basketball court and is located along Jamison Street in Luddenham
  - Freeburn Park – located along Blaxland Avenue in Luddenham.

In April 2014, the Australian Government announced that the site for western Sydney’s new airport will be Badgerys Creek. This development is likely to encourage associated land use development. This is not reflected in the current land-use or zoning.

The southern extent of The Northern Road Upgrade Stage 4 is located at the boundary of the former South West Growth Centre. Other than a source of increased traffic growth and the need for this project, this development is not considered to influence the preferred option selection. Following the shortlisted options assessment, this area has been incorporated within the Western Sydney Priority Growth Area as described in Section 5.1.

Central and Campbell Street options

The Central and Campbell Street options would locate The Northern Road closer to existing residential development in Luddenham. These options would create greater separation within Luddenham. Sales Park and Luddenham Showground are directly impacted by the Central and Campbell Street options respectively.

Western Option

The Western Option would impact on land generally consisting of existing rural, rural residential and agricultural land uses. The Western Option would be seen as favourable in separating Luddenham from the areas to the west.
Figure 3-2  Existing Local Environment Plan Zoning
Eastern Option

The Eastern Option would also maintain a better connection for the Luddenham community with the rural and Mulgoa Valley areas.

There is an area at the south-western end of Luddenham shown in Figure 3.3 which is zoned R2, ‘low density residential’ but is currently large land parcels generally consistent with rural or rural-residential land use.

![Figure 3-3 Eastern Option crossing R2 residential land](image)

A development application DA-147/2005 was approved for 107 residential lots in this area. However, Liverpool Council advised that work was not progressed and so this approval is considered to have lapsed. The Eastern Option would impact part of the existing lot associated with this development.

3.8.2 Future land use and development

Broader Western Sydney Employment Area/Western Sydney Priority Growth Area

The area to the east of Luddenham at the time of the assessment was identified as part of the Broader Western Sydney Employment Area (BWSEA). BWSEA has since been incorporated into the Western Sydney Priority Growth Area (WSPGA) which is described further in Section 5.1 WSPGA.

The Draft Structure Plan for BWSEA, was identified to provide ‘2100 hectares of employment land over the next 30 years to meet existing demand as well as preservation of a further 4250 hectares of additional employment lands…to serve future employment in Western Sydney’ (Department of Planning & Infrastructure, 2013.). The structure plan is undergoing revision and was not available for consideration as part of the assessment of the shortlisted options and the available draft information was used.

The Draft Structure Plan did not consider the relocation of The Northern Road. However, it did consider the need for a north-south secondary road on the eastern side of Luddenham. This road forms a western boundary for the proposed development (refer to Figure 3.4 for an extract of the Draft Structure Map).

Mulgoa Valley

Penrith Council has identified an area to the north west of the main study area known as ‘Mulgoa Valley’. This area of land is identified in the Penrith Local Environmental Plan (LEP) 2010. The LEP identifies the objectives of this area as being:

- To protect and enhance the rural landscape of the valley, including its agricultural qualities, cultural heritage values and the setting of the villages of Mulgoa and Wallacia
- To ensure development in the valley protects and utilises its tourism and recreational potential and is consistent with conserving its rural and natural landscape, heritage and agricultural qualities
- To ensure traffic generating development is suitably located so as not to adversely affect the safety, efficiency and rural character of roads, particularly Mulgoa Road.

Council’s current policy position for the land to the west of The Northern Road includes a growth management philosophy that seeks to preserve Penrith’s rural lands and provide opportunities for agricultural pursuits and other rural uses taking into account environmental impacts. The Rural Lands Strategy designated the land immediately west of The Northern Road as partly Rural Conservation (Landscape) because of its similarities with the Mulgoa Valley, particularly with regard to landscape character and lot size, and partly Rural Conservation (Agriculture).

Central and Campbell Street options

The Central and Campbell Street options would require an additional north-south road as part of BWSEA. To provide the same level of connection, this proposed north-south road would require an additional connection to The Northern Road, south of Luddenham. This connection has not been considered or included as part of the options assessment but is likely to follow a route generally similar to the Eastern Option.

Western option

Like the Central and Campbell Street options, the Western Option would also require an additional north-south road as part of BWSEA. Considerations for this have not been included as part of the options assessment.

While the Western Option would not directly traverse the land identified as ‘Mulgoa Valley’, Penrith City Council currently considers that the Mulgoa Valley currently provides an important land use context in the same way as the western Sydney airport and BWSEA. In addition, The Northern Road currently provides a boundary between the proposed employment lands to the east and the rural lands to the west.

Eastern option

The Eastern Option can be seen as more favourable compared to other options as the road would provide a physical barrier and separation between Luddenham and the Broader Western Sydney Employment Area (now known as Western Sydney Priority Growth Area). The Eastern Option would provide the connection shown in the BWSEA Structure Plan and so is likely to avoid the requirement for an additional north-south route to the south of Elizabeth Drive.
Figure 3-4  Broader Western Sydney Employment Area Draft Structure Map Extract, Department of Planning & Infrastructure, 2013
3.9 Environment and planning

3.9.1 Matters of National Environmental Significance

Searches of the Environment Protection and Biodiversity Conservation (EPBC) Protected Matters Search tool were undertaken on 29 January (nghenvironmental, 2015) and 27 April 2015 by Parsons Brinckerhoff, to further refine the search area surrounding the identified route alignment options. The searches identified 12 migratory bird species and 26 additional threatened species which were recorded within 10 kilometres of the study area that are listed under the EPBC Act. The 26 threatened species included two amphibians, four birds, two fish, six mammal, one reptile and 11 flora species.

Three Threatened Ecological Communities (TECs) have also been identified with the potential to occur within 10 kilometres of the identified options. This includes one bird species, two flora species and one flora community.

The EPBC Protected Matters Search tool also identified one Commonwealth Heritage Place as a Matter of National Environmental Significance, as potentially occurring within or in proximity to the study area (the Orchard Hills Cumberland Plain Woodland). This area is located next to the study area, immediately north of the Warragamba Pipelines. It is not expected to be impacted by any of the shortlisted options.

3.9.2 Biodiversity

3.9.2.1 Biodiversity investigations

A series of investigations has been undertaken with reference to the identification of existing biodiversity factors which may be impacted by the identified route alignment options. The following investigations have been undertaken:

- A desktop environmental assessment was conducted by nghenvironmental (2015) as part of the preparation of a preliminary environmental investigation for the study area.
- During the options identification stage, an additional desktop environmental assessment was conducted by Parsons Brinckerhoff (2015) that considered the whole of the study area for all identified options.
- Subsequent to the desktop assessment undertaken by Parsons Brinckerhoff, a rapid biodiversity assessment (including some field verification investigation) was undertaken to assess the significant ecological values. This assessment was focussed only on the Western and Eastern options. This assessment was undertaken by the consultancy company Jacobs in September 2015 and is included in Appendix H.
- In addition to the rapid biodiversity assessment undertaken by Jacobs (2015) the Draft Biodiversity Assessment undertaken for the western Sydney airport (GHD, 2015) was reviewed. The assessment included consideration of, in addition to the wider western Sydney airport site, the existing Commonwealth land parcels of land on the eastern and western sides of Willowdene Avenue. The outcomes presented in this report, with respect to identified vegetation and flora/fauna species were generally consistent with the outcomes of the Jacobs report.

A summary of the findings of all the investigation undertaken to date is summarised below.

3.9.2.2 Existing environment

Vegetation

The biodiversity assessments undertaken have identified two native vegetation communities within the study area that are listed as a TEC. These are:

- Cumberland Plain Woodland in the Sydney Basin Bioregion (consists of Cumberland Shale Hills Woodland and Cumberland Shale Plains Woodland)
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.
Figure 3.5 provides an overview of the existing Cumberland Woodland vegetation in relation to the shortlisted options. The Cumberland Plain Woodland is classified as Critically Endangered by both the Threatened Species Conservation Act 1995 (TSC Act) and EPBC Act. However, each identified area of vegetation must meet a set of condition thresholds (which requires a field validation) for this classification to be confirmed. The River-Flat Eucalypt Forest was classified as Endangered under the TSC Act but was not classified by the EPBC Act. Both vegetation communities are considered to be Critically Endangered.

The estimated impact areas of TEC potentially impacted by each option are summarised in Table 3.5.

Table 3-5  Area of affected threatened ecological communities and estimated offsets areas

<table>
<thead>
<tr>
<th>Threatened ecological community</th>
<th>Comparative impact (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSC Act</td>
<td></td>
</tr>
<tr>
<td>Cumberland Plain Woodland in the Sydney Basin Bioregion (Endangered)</td>
<td>21.0</td>
</tr>
<tr>
<td>River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered)</td>
<td>5.1</td>
</tr>
<tr>
<td>EPBC Act</td>
<td></td>
</tr>
<tr>
<td>Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Critically Endangered)</td>
<td>1.0</td>
</tr>
<tr>
<td>Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Critically Endangered)</td>
<td>10.8</td>
</tr>
<tr>
<td>Total known and potential</td>
<td>11.8</td>
</tr>
</tbody>
</table>

Data source: Jacobs Rapid Biodiversity Assessment Stage 4: Methods and Findings Report, September 2015

Flora and fauna species

The investigations identified 17 threatened migratory bird species and 74 threatened species listed under the TSC Act and EPBC Act that have been recorded previously or are predicted to occur within the locality of the shortlisted options.

Threatened species identified included: four amphibians; 26 birds; two fish; 12 mammals; one reptile; one invertebrate; and 28 flora species. Searches of the DPI records and BOM Atlas of Ground Water Dependent Ecosystems suggests that there are no threatened species occurring within the waterways or groundwater dependent ecosystems in the study area.
Figure 3-5  Ecological values and constraints
3.9.3 Heritage (Non-Aboriginal)

Non-Aboriginal heritage investigations

Two primary non-Aboriginal investigations have been undertaken with respect to the identification of potential non-Aboriginal heritage factors which may be impacted by the identified route alignment options. The following investigations have been undertaken:

- A review of the following relevant heritage registers and statutory listings was completed on 26 March 2015 (nghenvironmental 2015) and is detailed in Appendix F
- Parsons Brinckerhoff engaged Artefact Heritage in June 2015 to undertake a non-Aboriginal (historic) heritage constraint and risk analysis. The findings of the analysis were reported in The Northern Road, Stage 4, Route Options Assessment, Non-Aboriginal Heritage Constraints Report, (Artefact, September 2015) and used as part of evaluation of the identified options. This report has been provided as Appendix C.

Existing environment

This section summarises the report’s findings and focuses on the comparative issues between the four shortlisted options.

Nineteen listed heritage items were identified in the study area. These have been summarised in Table 3.6, and mapped on Figure 3.6.

Table 3-6 Summary of identified heritage items

<table>
<thead>
<tr>
<th>Item</th>
<th>Location</th>
<th>Description of items</th>
<th>Significance</th>
<th>Government authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lawson’s Inn Site</td>
<td>The Northern Road, opposite junction with Eaton Road, Luddenham</td>
<td>Inn/tavern Archaeological</td>
<td>Local</td>
<td>Liverpool</td>
</tr>
<tr>
<td>Luddenham Public School</td>
<td>The Northern Road, Luddenham</td>
<td>School</td>
<td>Local</td>
<td>Liverpool</td>
</tr>
<tr>
<td>Willingham Reserve</td>
<td>17 Jamison Street, Luddenham</td>
<td>Oval/reserve</td>
<td>Local</td>
<td>Liverpool</td>
</tr>
<tr>
<td>Brick Cottage</td>
<td>Park Road, Luddenham</td>
<td>Residential</td>
<td>Local</td>
<td>Penrith</td>
</tr>
<tr>
<td>Brick Cottage</td>
<td>Campbell St, Luddenham</td>
<td>Residential</td>
<td>Local</td>
<td>Penrith</td>
</tr>
<tr>
<td>Luddenham Progress Hall</td>
<td>The Northern Road, Luddenham</td>
<td>Community Hall</td>
<td>Local</td>
<td>Penrith</td>
</tr>
<tr>
<td>Luddenham Uniting Church</td>
<td>The Northern Road, Luddenham</td>
<td>Church and Cemetery/graveyard</td>
<td>Local</td>
<td>Penrith</td>
</tr>
<tr>
<td>St. James Church of England</td>
<td>The Northern Road, Luddenham</td>
<td>Church</td>
<td>Local</td>
<td>Penrith</td>
</tr>
<tr>
<td>Timber Cottages</td>
<td>29 and 41 The Northern Road, Luddenham</td>
<td>Cottages</td>
<td>Local</td>
<td>Penrith</td>
</tr>
<tr>
<td>Showground</td>
<td>428-452 Park Road</td>
<td>Showground/landscape</td>
<td>Local</td>
<td>Penrith</td>
</tr>
<tr>
<td>Irrigation canal</td>
<td>Mulgoa Road, Queenshill Drive, Littlefields Road and The Northern Road</td>
<td>Irrigation canal – Archaeological site</td>
<td>Local</td>
<td>Penrith</td>
</tr>
</tbody>
</table>

All identified non-Aboriginal heritage items, with the exception of the irrigation canal site (north-west corner of the study area), are located in or next to the Luddenham town centre. The majority of these items are located along The Northern Road.
These items would be potential constraints to the Central and Campbell Street options which pass through or close Luddenham town. It is likely that the selection of either of these two shortlisted options would impact the heritage in the area.

The listed heritage items and archeological sites potentially impacted by each shortlisted option are provided in Table 4.6 and Table 4.7. This includes two potential locations for the Lawson’s Inn site, as current research suggested that the site has been incorrectly located on the western side of The Northern Road. It is thought that as the alignment of The Northern Road was altered in the 20th century, to bypass a sharp bend on which Lawson’s Inn had been constructed and the actual site is located on the eastern side of The Northern Road as it exists today. This was further substantiated following a site visit undertaken by Artefact in September 2015 (refer to Section 3.2 Amended and additional potential archaeological items of Appendix C Non-Aboriginal heritage constraints report).
Figure 3-6  Identified heritage items within study area
3.9.4 Aboriginal heritage investigations

Two primary Aboriginal investigations have been undertaken with respect to the identification of potential Aboriginal heritage factors which may be impacted by the identified route alignment options. The following investigations have been undertaken:

- A search of the OEH Aboriginal Heritage Information Management System (AHIMS) was undertaken by nghenvironmental on 2 February 2015 (nghenvironmental, 2015).
- Subsequent to the desktop assessment undertaken by nghenvironmental, a preliminary assessment of Aboriginal heritage was undertaken in September 2015 by Kelleher Nightingale Consulting Pty Ltd. The preliminary investigations identified a series of potential archaeological deposits (PADs) within each of the shortlisted options.

Existing environment

The Aboriginal Land Councils for the region are Deerubbin and Gandangara Local Aboriginal Land Councils. The OEH AHIMS search (nghenvironmental, 2015) identified eight Aboriginal heritage sites within the study area. A summary of the AHIMS search undertaken is included in Table 3.7.

Table 3-7 Summary of AHIMS search results

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Site name</th>
<th>Site context</th>
<th>Site feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>45-5-2617</td>
<td>B 31</td>
<td>Open site</td>
<td>Artefact</td>
</tr>
<tr>
<td>45-5-2618</td>
<td>B 32</td>
<td>Open site</td>
<td>Artefact</td>
</tr>
<tr>
<td>45-5-2629</td>
<td>B 39</td>
<td>Open site</td>
<td>Artefact</td>
</tr>
<tr>
<td>45-5-2636</td>
<td>B 6</td>
<td>Open site</td>
<td>Artefact</td>
</tr>
<tr>
<td>45-5-2642</td>
<td>B 24</td>
<td>Open site</td>
<td>Artefact</td>
</tr>
<tr>
<td>45-5-2643</td>
<td>B 25</td>
<td>Open site</td>
<td>Artefact</td>
</tr>
<tr>
<td>45-5-2670</td>
<td>B 92</td>
<td>Open site</td>
<td>Artefact</td>
</tr>
<tr>
<td>45-5-2671</td>
<td>B 91</td>
<td>Open site</td>
<td>Artefact</td>
</tr>
</tbody>
</table>

Of the eight Aboriginal sites identified, all are grouped within a radius of about 1.7 kilometres and located at the southern extent of the study area. Seven Aboriginal sites are located within the airport site and would not be impacted by any shortlisted options. The remaining site is also not expected to be impacted by any shortlisted options as it is located along the southern border of the study area, to the south of the existing alignment of The Northern Road.

Preliminary field assessment identified 24 PADs within the study area. Each of the PAD areas exhibits a high potential to contain intact Aboriginal archaeological deposit. The identified PADs are distributed equally across the study area with all potential route options having roughly equal impact on Aboriginal heritage.

Roads and Maritime has also advised that Lot 7004 DP930552 (Willmington Reserve located along Jamison Street) is the subject of a native title claim lodged by Gandangra Local Aboriginal Land Council on 19 March 2008. There are currently no other identified National Native Title Tribunal Register claims in the study area.

3.9.5 Flooding

The investigations undertaken as part of the shortlisting of options identified that flooding was not a key issue or constraint for the options and would not therefore be a factor in the selection of a preferred option. Details of the creeks and flooding are contained in the Options Identification Report in Appendix F.
3.10 Urban design and visual impacts

3.10.1 Legibility and general accessibility

A summary of the visual and landscape character for the broader study area was provided as part of the Options Identification Report prepared by Roads and Maritime in July 2015 (Roads and Maritime Services/Parsons Brinckerhoff 2015). Details of the urban visual and landscape character are included in Section 2.3.5 Urban design and visual impact of the Options Identification Report, provided as Appendix F.

The urban design desktop review has considered the four options for ease of which people can understand the road environment which they are driving in (legibility) and the accessibility to Luddenham including the existing road network and residential/commercial properties along the options. A discussion of the potential urban design impacts associated with each of the shortlisted options is provided below.

Central Option

Legibility

The Central Option would utilise much of the existing road corridor improving overall road legibility for motorists due to the presence of existing road infrastructure along the alignment. The road would pass through much of Luddenham, providing motorists with a sense of entering and leaving a built up area.

Accessibility

The Central Option would provide good vehicular access to Luddenham town centre from the south, with an intersection in close proximity to the town. Good vehicular connectivity to Park Road and Elizabeth Drive would also be provided. This option would isolate the main retail area of Luddenham to the south of Adams Road.

Campbell Street Option

Legibility

The Campbell Street Option would utilise the entire existing The Northern Road alignment to the north of Luddenham, improving the overall legibility for motorist due to the presence of existing road infrastructure along the alignment. The road would pass through the outskirts of Luddenham, providing motorists with a sense of entering and leaving a built up area.

Accessibility

The Campbell Street Option would provide good vehicular access to Luddenham from the north as well as good connectivity to Park Road and Elizabeth Drive. No vehicular connectivity would be provided to Luddenham from the south, potentially isolating the key retail area to the south of Adams Road and properties in this vicinity.

Western Option

Legibility

The Western Option would utilise less of The Northern Road existing alignment to the north of Luddenham, requiring a new road corridor through rural land. Due to the distance of the alignment to Luddenham, there would be no sense of approaching a built up area.

Accessibility

Vehicular access to Luddenham would be limited as part of the Western Option, with only one connection to the north of the town at Park Road. There would be good vehicular connectivity to Park Road although a more distant connection to Elizabeth Drive.
Eastern Option

Legibility

The Eastern Option would utilise part of The Northern Road existing alignment to the north of Luddenham, improving road legibility due to the presence of existing road infrastructure in the local context.

Accessibility

There would be good vehicular access to Luddenham from connections to the north and south of the town as part of the Eastern Option. This option crosses The Northern Road existing alignment close to the southern end of the township and provides good access to the main retail area.

3.10.2 Town centre structure and expansion

Central Option

The Central Option passes through Luddenham township bisecting the western and eastern sides of the town with a potential significant impact on residential and commercial premises either side of the road. There would be an increase of traffic through the town centre, intensifying traffic noise and reducing pedestrian amenity. This is likely to have an adverse impact on the character of Luddenham town centre.

The road corridor also bisects Sales Park and sporting oval, impacting connectivity to these facilities from the town centre. Luddenham Showground and properties along the western edge of Luddenham would also be isolated from the town centre.

In the long term, the alignment may provide opportunity for expansion and re-development of the town and commercial precinct as part of the future growth of the precinct.

Campbell Street Option

The Campbell Street Option bypasses the main centre of the Luddenham township, leaving the town centre unchanged. This would lead to a reduction of traffic along the bypassed The Northern Road, decreasing traffic noise through the town centre. This option would isolate parts of Luddenham including Luddenham Showground, the Holy Family Church and Primary School and some properties along the western edge of Luddenham.

The proximity of the proposed option to Luddenham town centre may drive new development in the short to mid-term. The long term development of the entire growth centre would change the character of Luddenham and surrounds to a more urban context.

Western Option

The Western Option bypasses Luddenham, leaving the town centre unchanged and maintaining its sense of place and local identity. There would be a reduction of traffic through the town, decreasing noise and providing a quieter urban environment. The alignment allows space for Luddenham to expand, although is unlikely to drive new development within the town in the short to mid-term. Future development may be restricted due to isolation of the town centre. In the long term, development is likely to occur on the western side of Luddenham which will change the character of Luddenham and surrounds to a more urban context.

Eastern Option

The alignment bypasses Luddenham, leaving the town centre intact and maintaining its sense of place and local identity. This would cause a reduction of traffic through the town, decreasing noise and providing a quieter urban environment. The good connection at each end of the town centre would maintain the town structure better than the other options.
The alignment allows space for Luddenham township to expand on the eastern side and may drive new development within the town in the short to mid-term. In the long term, development of the entire growth centre would change the character of Luddenham and surrounds to a more urban context. The Eastern Option is likely to create a boundary between residential expansion to Luddenham and the commercial development to the east identified in the WSPGA structure plan.

3.11 Noise impacts

A noise impact assessment has not been undertaken on the shortlisted options. Notwithstanding, there are some general impacts that have been identified as part of this options assessment which are provided below. There are a number of sensitive receivers within the study area that include residential properties, businesses, rural properties and recreational areas as well as the following specific receivers:

- Holy Family Church and Primary School, located at the corner of Campbell Street and Willowdene Avenue, Luddenham
- Luddenham public school – located at 24 Jamison Street but also has frontage to The Northern Road
- St James Church of England and associated cemetery – located along The Northern Road at Luddenham
- Luddenham Uniting Church and associated cemetery - located along The Northern Road at Luddenham.

The existing road and associated noise is located within the township. Given the generally rural nature of the corridor and based on site visits, the background noise levels are likely to be very low. Therefore, any locations where the upgrade moves away from The Northern Road existing corridor, would create impacts to residences that are not currently exposed to road noise. Options that bypass the Luddenham Town Centre would create a significant benefit to residences and other sensitive receivers within the township.

Central and Campbell Street options

The Central and Campbell Street options, being located closest to more sensitive receivers including residents, would be expected to have the greatest noise impacts.

Western Option

The Western Option would be likely to impact less residents than the Eastern Option given there are less residents on the western side of the ridge line through Luddenham township. The Western Option, in the vicinity of the Holy Family Church and Primary School, would be likely to have some adverse impact.

Eastern Option

The Eastern Option, being located downhill from Luddenham township, is likely to impact more residents than the Western Option. The Eastern Option would also be closer to a larger number of properties than the Western Option, therefore resulting in an increased comparative impact.

3.12 Geotechnical conditions

Desktop geotechnical investigations were undertaken as part of the options identification and shortlisting process. The regional geology and soils landscape figures are provided in Appendix F and indicate that there is minimal variation in the geology and soil landscape. The findings of the investigation determined that the geotechnical conditions were not a key issue for the determination of a preferred option and there was little or no difference between the geotechnical conditions for each of the route option alignments.
3.12.1 Contamination

A search of the EPA Contaminated Land record was carried out on 4 February 2015 (nghenvironmental, 2015). A total of four current notices relating to two sites within the Liverpool LGA and six current notices relating to eight sites within the Penrith LGA were identified. The Elura Liquid Waste Disposal Site was the only site located within Luddenham at Lot 4 The Northern Road, Luddenham (Lot 4 DP 241556).

This was investigated further as part of this study and it was determined that the lot and DP were incorrect and that the above site refers to The Caltex service station on the corner of The Northern Road and Park Road, Luddenham. This site is currently under assessment by the EPA (Environment Protection Agency, 2015) to determine whether regulation is required.

There is a risk associated with asbestos associated with existing telecommunications infrastructure in the ground (pits and conduits) and with existing dwellings and structures that require demolition or alteration (refer to Section 3.6 Utilities).

Considering the primary land uses in the study area, particularly agricultural uses, potential contaminants such as pesticides or fuels from existing road run-off may be present within each of the route option alignments. There is potential for contaminants to concentrate within farm dams over time.

Central Option

The Central Option has potential contamination risks associated with the Caltex Service Station. Compared to the other options, this option has a higher risk associated with asbestos in existing dwellings and older telecommunications infrastructure.

Campbell Street Option

Similar to the Central Option, the Campbell Street Option presents a minor risk associated with the Caltex Service Station.

Western and Eastern options

The Western and Eastern options have a higher potential risk associated with potential contamination from agricultural activities.

3.13 Constructability

It is generally preferable to build new carriageways in greenfield alignments rather than following existing roads due to the following issues associated with working over or adjacent to existing roads:

- Increase the number of construction stages
- Increase complexity with connecting to existing work (particularly drainage and pavements)
- Increase conflicts with existing utilities
- Introduce tighter constraints on available working space and time
- Increase the difficulty for access
- Increase the risk to the safety of road users and construction personnel.

Therefore, the Western and Eastern options would provide greater opportunity for greenfield construction by avoiding the existing road network through Luddenham. Further to this, both the Western and Eastern options would have no issues with access to the greenfield sections from the existing road network.

The following sections provide more detail regarding each option with respect to constructability, with a focus on the differences to each of the other options, rather than overall constructability.

Central Option

The Central Option would be approximately 9.9 kilometres in length with 50 per cent of the upgrade over existing roads. The comparative increase in this length would occur through Luddenham township. This would pose increased complexity to construction staging with side tracks and temporary intersections to be
completed to facilitate access to the new works and only one carriageway being constructed at a time. Access to properties would also be problematic to manage through construction.

The Central Option would also present the least favourable option with respect to available construction working zones. This may increase risks during construction when preparing foundations if excavation depth becomes deeper than expected, and also in drainage installation. This alignment though Luddenham would also increase construction risk with regards to utility relocations and heritage items known to be in this location.

Overall, the quantities of work would be the lowest of the options. However, the alignment would increase construction complexity and risk.

Campbell Street Option

The Campbell Street Option would comprise a similar length and proportion of greenfield length as the Central Option. The Campbell Street Option would be considered slightly favourable over the Central Option as the impact on utilities and heritage items would be reduced (although still present). The Campbell Street Option would be likely to be less complex constructing along Campbell Street rather than The Northern Road due to the proximity of the town, the geometry of the existing road and the lower traffic volumes.

Western Option

The Western Option would have the shortest length of the upgrade over existing roads, by about 1,900 metres (or about 20 per cent) and therefore would offer the most attractive construction option. However, the requirement for connection of side roads such as Elizabeth Drive has not been included within this assessment.

This option is also likely to require a bridge across the upgrade at Willowdene Avenue which is not currently considered a complex activity. The crossing at Park Road would require some temporary works and staging including utilities.

The quantity of earthworks required would be the largest of the four base options and have the highest potential for increased corridor width to alleviate risks with surplus material. However, it would also potentially be the least complex.

Eastern Option

The Eastern Option would include about 3,000 metres over existing roads, which is about 30 per cent of the upgrade length. There would be a construction risk associated with foundation construction within the vicinity of rural dam locations which are location within the proximity of this alignment. However this is not considered to be a significant risk.

The Eastern Option is anticipated to require a bridge at Adams Road. While this would comprise an extra activity, the access and bridge type are not considered to be complex and therefore is not considered to be a significant issue.

The Eastern Option would require separate works areas either side of The Northern Road at the crossing point near Eaton Road to the south of Luddenham township. This may not be desirable for access along the works particularly for earthworks movements if there is a potential shortfall of material or a need to transport earthworks across The Northern Road.

Temporary works and traffic staging would be required to construct the crossing point with The Northern Road existing alignment.

### 3.14 Construction staging

One of the project objectives is the realignment of The Northern Road around the proposed western Sydney airport site to allow building and operation of the western Sydney airport. The proposed timeframes for the airport construction requires this realignment within a compressed timeframe. This objective does not require the entire The Northern Road Upgrade Stage 4 to be completed before construction of the proposed western
Sydney airport site commencing. Whilst it is expected that The Northern Road Upgrade Stage 4 would be constructed as one project, the ability to stage construction is considered an advantage. Staging would potentially allow for the realignment around the airport to be completed earlier than the entire upgrade.

Staging requires the ability to connect the upgrade route back to The Northern Road. Therefore, options that provide flexibility to stage the works by connecting back to, or crossing The Northern Road are considered to be an advantage. The shorter the distance to the point of reconnection, the greater the advantage this option holds for staging. Table 3.8 below provides details of the length for each option.

The Central and Eastern options with the shortest length would be the preferred options for construction staging.

Table 3-8  
<table>
<thead>
<tr>
<th></th>
<th>Central</th>
<th>Campbell Street</th>
<th>Western</th>
<th>Eastern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of construction stage to bypass western Sydney airport site</td>
<td>6.0 km</td>
<td>7.0 km</td>
<td>9.0 km</td>
<td>6.0 km</td>
</tr>
</tbody>
</table>

3.15  Costs

For each of the shortlisted options, an example design was prepared for cost comparison. The designs were developed to strategic level with a high potential for some variance through the further development of the design. Given the strategic level of the design, the difference between the costs presented at the workshop are relatively small. Therefore, cost is not considered to provide a differentiation factor for any of the identified shortlisted options. Subsequent to the cost estimate information available at the workshop, further estimating work has been undertaken which has changed the overall and relative cost estimates. The updated information is provided in Table 5.1.

3.16  Western alternative sub-option

The Western Alternative sub-option differs from the Western Option to the north of Park Road, Luddenham. The primary difference with these two options would be the location that the upgrade connects to The Northern Road existing alignment. The Western Option connects to The Northern Road about one kilometre north of Elizabeth Drive. The Western Alternative sub-option would connect to The Northern Road at Elizabeth Drive.

A summary of considerations and key issues when comparing the Western Option with the Western Alternative sub-option is provided in Table 3.9. There are a number of areas that there was no difference and this has not been included within the table.

Table 3.9  Western Alternative comparative considerations and key issues

<table>
<thead>
<tr>
<th>Issue</th>
<th>Western Option</th>
<th>Western Alternative sub-option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>A significant impact on six larger agricultural lots (full impact unable to be determined).</td>
<td>A significant impact on three larger agricultural lots (full impact unable to be determined).</td>
</tr>
<tr>
<td></td>
<td>Minor impact to free range chicken broiler farm (identified as a significant business operation).</td>
<td>Significant impact to free range chicken broiler farm (identified as a significant business operation).</td>
</tr>
<tr>
<td>Traffic and access</td>
<td>Requires extension of Elizabeth Drive or new intersection.</td>
<td>Retains existing Elizabeth Drive intersection location.</td>
</tr>
<tr>
<td></td>
<td>Located off the ridge line north of Elizabeth Drive, is not well located to suit a future</td>
<td>Located on the ridge line north of Elizabeth Drive, is well located to suit a future</td>
</tr>
</tbody>
</table>
### Issue

<table>
<thead>
<tr>
<th></th>
<th>Western Option</th>
<th>Western Alternative sub-option</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>interchange with the M12 Motorway.</td>
<td>interchange with the M12 Motorway.</td>
</tr>
<tr>
<td>Total length</td>
<td>9.9 km.</td>
<td>10.4 km.</td>
</tr>
<tr>
<td>Topography and</td>
<td>Steepest grade between two and three per cent.</td>
<td>Steepest grade around 1%.</td>
</tr>
<tr>
<td>grades</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constructability</td>
<td>Less interaction with The Northern Road and less</td>
<td>More interaction with The Northern Road and more</td>
</tr>
<tr>
<td></td>
<td>construction staging.</td>
<td>construction staging.</td>
</tr>
</tbody>
</table>

#### 3.17 Southern back-up sub-option

The Southern back-up option is located outside the Commonwealth land fronting Willowdene Avenue. This sub-option is longer than the preferred and requires two crossings of Duncans Creek. This sub-option was determined to be inferior to the preferred common route through this section as part of the shortlisting process. The findings are detailed in Appendix F Options identification report.
4. Option comparison and preferred option selection

4.1 Option Comparison

The following provides a comparison of the Options based on the key considerations outlined in Section 3.

Community

Overall, the Central and Campbell Street options were not supported by the local community. These options would result in a range of potentially adverse impacts. Submissions nominated that the Eastern Option provided a preferable connection into the Luddenham township with associated benefits to businesses.

Land Use and property

The Central and Campbell Street options would have the greatest impact on property acquisition. The Western and Eastern options would need a fewer number of properties for acquisition. There is no clear differentiation between the Western and Eastern options in terms of property acquisition. However, some of the lots impacted by the Western Option are larger and have more significant business operations. Further discussion would be required with affected land owners to identify the extent and potential impacts of any land acquisition. The potential property impact of the shortlisted routes have been summarised in Table 4.1 below.

Table 4-1 Summary of potential property impact

<table>
<thead>
<tr>
<th></th>
<th>Central</th>
<th>Campbell Street</th>
<th>Western</th>
<th>Eastern</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of total land acquisitions</td>
<td>42</td>
<td>28</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>No. of partial land acquisitions</td>
<td>41</td>
<td>45</td>
<td>36</td>
<td>37</td>
</tr>
</tbody>
</table>

Traffic and Access

The Central and Campbell Street options would have the largest potential impact on road user safety. The Western and Eastern options would allow for an 80km/h speed environment to be retained for the entire length. The Eastern Option could be considered as favourable due to better connectivity to future planned roads based on preliminary structure plans. The impact of the shortlisted options on key traffic considerations has been summarised in Table 4.2 below.
Table 4-2  Traffic and access key issues

<table>
<thead>
<tr>
<th></th>
<th>Central</th>
<th>Campbell Street</th>
<th>Western</th>
<th>Eastern</th>
</tr>
</thead>
<tbody>
<tr>
<td>School zones</td>
<td></td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local access issues - No right turn</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedestrian safety issues</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On Street parking removal</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good consideration for connection to future roads:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Elizabeth Drive</td>
<td></td>
<td></td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>- M12</td>
<td></td>
<td>Y</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>- Outer Sydney Orbital*</td>
<td></td>
<td></td>
<td>Y</td>
<td></td>
</tr>
</tbody>
</table>

Note *: Based on information available about OSO alignment at time of design and safety

The Western and Eastern options would remove through traffic from the Luddenham township resulting in a safer local traffic environment and would be preferred to the Central and Campbell Street options.

Utilities

The level of impact of each of the shortlisted options is summarised in Table 4.3 below. The Central and Campbell Street options have the greatest impact on utilities due to following The Northern Road for the greatest length of the shortlisted options. However, due to the extent of impact, utility relocations are not considered significant in differentiating between route options.

Table 4-3  Utilities impact summary

<table>
<thead>
<tr>
<th></th>
<th>Central</th>
<th>Campbell Street</th>
<th>Western</th>
<th>Eastern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical utilities</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>Water utilities</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

Note: High level of impact (H); Moderate level of impact (M); Low level of impact (L)

Existing Land Use

The Central and Campbell Street options have a greater effect on residential property currently zoned as village (RU5). The Western Option generally impacts larger agricultural lots zoned as primary production, while the Eastern Option impacts land zoned as low density residential (R2) and large lot residential (R5).
### Table 4-4  Land use impacted summary

<table>
<thead>
<tr>
<th>Land zoning impact</th>
<th>Central</th>
<th>Campbell Street</th>
<th>Western</th>
<th>Eastern</th>
</tr>
</thead>
<tbody>
<tr>
<td>RU1 – Primary production</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>RU2 – Rural landscape</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>RU4 – Rural small holdings</td>
<td></td>
<td></td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>RU5 – Village</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R2 – Low density residential</td>
<td></td>
<td></td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>R5 – Large lot residential</td>
<td></td>
<td></td>
<td></td>
<td>Y</td>
</tr>
</tbody>
</table>

**Future Land use Integration**

The Eastern Option would integrate better with the proposed development on the eastern side of Luddenham and is considered the preferred option for future land use integration. The Eastern Option provides the opportunity for The Northern Road to continue to provide a boundary between the proposed employment lands to the east and the rural lands to the west.

**Biodiversity**

Overall, the rapid biodiversity assessment identified that fragmentation would be comparable for each option although the southern back up option around Duncans Creek would likely result in greater vegetation loss and fragmentation. Both the Western and Eastern options would impact on some planted communities. The Eastern Option would result in a slightly greater level of vegetation impact to both vegetation listed under the TSC Act and the EPBC Act providing a slight dis-advantage for this option.
### Table 4-5  Biodiversity impact summary

<table>
<thead>
<tr>
<th></th>
<th>Central option</th>
<th>Campbell Street Option</th>
<th>Western option</th>
<th>Eastern option</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biodiversity impacts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| With respect to the Central Option, this option would result in similar impacts to those identified for the Western and Eastern options to the north and south of the Luddenham Township. However, it would result in less overall impact to existing ecology through the town centre due to the disturbed/built up nature of this section of the option. Potential ecological impacts through this section would be expected to generally consist of planted street trees and similar vegetation. | This option would have similar impacts to those identified for the Central Option. | ■ A small area of Cumberland Plain Woodland was identified which would qualify for EPBC listing  
■ The remaining areas of identified Cumberland Plain Woodland was considered of lesser quality, but would qualify for state listing  
■ Evidence of two Cumberland Plain Woodland snails was observed  
■ No threatened fauna was identified across this option. | ■ Very little Cumberland Plain Woodland was observed. The route has been highly impacted, largely by clearing for farming  
■ One patch of potential Cumberland Plain Woodland was identified. However, access and an assessment was not possible to verify the current composition of this area  
■ Evidence of one Cumberland Plain Woodland snail was observed  
■ No threatened fauna was identified across this option. | |
| **Cumberland Plain Woodland**  |                |                        |                |                |
| Cumberland Plain Woodland was identified which would qualify for EPBC listing | The remaining areas of identified Cumberland Plain Woodland was considered of lesser quality, but would qualify for state listing | Evidence of two Cumberland Plain Woodland snails was observed | |
| The remaining areas of identified Cumberland Plain Woodland was considered of lesser quality, but would qualify for state listing | Evidence of one Cumberland Plain Woodland snail was observed | | |
| No threatened fauna was identified across this option. | | | |

### Non Aboriginal Heritage Study Summary

The listed heritage items and archaeological constraints impacted by each of the route options are provided in Table 4.6 and Table 4.7.

#### Table 4-6  Heritage constraints associated with each shortlisted option

<table>
<thead>
<tr>
<th>Listed heritage items potentially impacted</th>
<th>Central</th>
<th>Campbell Street</th>
<th>Western</th>
<th>Eastern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weatherboard cottage (29 The Northern Road)</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weatherboard cottage (41 The Northern Road)</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Luddenham Progress Hall, Uniting Church and cemetery</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St James Anglican Church</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lawson's Inn site</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>Luddenham Showground</td>
<td></td>
<td></td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Brick Cottage (Campbell Street)</td>
<td></td>
<td></td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Brick Cottage (former, Park Road)</td>
<td></td>
<td></td>
<td></td>
<td>Y</td>
</tr>
</tbody>
</table>
Table 4-7 Potential archaeological constraints associated with each shortlisted option

<table>
<thead>
<tr>
<th>Archaeological sites potentially impacted</th>
<th>Central</th>
<th>Campbell Street</th>
<th>Western</th>
<th>Eastern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luddenham Uniting Church and Cemetery</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St James Anglican Church cemetery</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lawson’s Inn site (potential archaeological remains)</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Mrs Paines House’</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site of Barn</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earlier alignments of The Northern Road</td>
<td></td>
<td></td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Harris’ cottage/farmstead</td>
<td></td>
<td></td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Former chapel/school</td>
<td></td>
<td></td>
<td></td>
<td>Y</td>
</tr>
</tbody>
</table>

The results of this assessment suggest:

- The Central Option is likely to have the greatest impact on heritage items
- The Campbell Street and Central options would impact more heritage items than the Western and Eastern options
- The Eastern Option has a greater potential to impact Archaeological sites than the Western option

Aboriginal Heritage

The preliminary investigations noted that both the Western and Eastern options would have the potential to impact on Aboriginal archaeological heritage with no substantial constraints identified for either option. The Western and Eastern options are expected to have similar impacts on Aboriginal heritage, thus neither option presented itself as a preferred (low heritage impact) option for this criteria. Overall, archaeological differences between the Western and Eastern options were identified as being minimal.

Urban Design

The Central and Campbell Street options would have the greatest impact on Luddenham’s structure, bisecting the town and disrupting connections to public amenities such as Sales Park and Luddenham Showground. The Western and Eastern options leave the current town structure unaltered – maintaining Luddenham’s sense of place and local identity.

The Eastern Option would provide the best vehicular accessibility to Luddenham town centre with connections in the north and south. This option also services the key retail area to the south of Adams Road. The other options would provide reduced access to Luddenham town centre with only one connection to the north or south which isolates the retail area. The Western Option would have the least connectivity to Luddenham town centre with a more distant connection via Park Road.

The future expansion of Luddenham is likely to be enabled by the Western and Eastern options, leaving greater space for the town to grow. The Eastern Option may create a physical boundary between residential expansion and the commercial development to the east identified in the WSPGA structure plan.
Noise Impacts

The Central and Campbell Street options will have a higher noise impact and the Western and Eastern options would have similar impacts. The severity of the impact and likely mitigation measures have not been assessed and therefore no quantifiable difference between the Western and Eastern options with respect to noise impacts can be made at this time. Based on the information available, there is no identified preference between the Western and Eastern options based on noise impacts.

Contamination

The Central Option would represent the least preferred option due to potential contaminants associated with existing land uses and road surfaces. There is no distinguishable difference at this time between the Campbell, Western and Eastern options.

Constructability

The Western and Eastern options offer significant advantages over the Central and Campbell Street options through the removal of significant interaction between the Luddenham township community and traffic during construction. A summary of key constructability issues is provided in Table 4.8.

The Western Option is the preferred option for constructability. However, the advantages of this option over the Eastern Option are not considered significant.

Table 4-8 Constructability key issues summary

<table>
<thead>
<tr>
<th></th>
<th>Central</th>
<th>Campbell Street</th>
<th>Western</th>
<th>Eastern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of construction stages</td>
<td>H</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Complexity with connection to existing work</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Conflicts with existing utilities</td>
<td>H</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Working space and time constraints</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Difficulty for access</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Risk to the safety of road users and construction personnel</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

Note: High level of impact (H); Moderate level of impact (M); Low level of impact (L)

Construction Staging

The Central and Eastern options with the shortest length would be the preferred options for construction staging to facilitate the closure of the section of the existing The Northern Road that transverses the Western Sydney Airport site.

Cost Summary

Based on the small difference between the costs of options it is not considered to provide a factor for differentiation between options.
4.2 Preferred Option Selection process

The analysis and issues detailed in Section 3 and Section 4.1 formed the basis for a multi-criteria assessment (MCA) to determine the Preferred Option.

To help with the MCA, a workshop was held on 23 September 2015 with a range of stakeholders from Roads and Maritime, as well as Federal and other State government agencies, and Penrith and Liverpool Council. The intent of the workshop was to provide comments and evaluate the options against assessment criteria so that a preferred option could be recommended to progress the project. The workshop report is included as Appendix B of this report.

The first action of the workshop was to endorse a project team recommendation that the Central and Campbell Street options were not included in the MCA because they were considered to be less favourable in a range of areas as detailed in Section 3 and not suitable for selection as a preferred option. This was consistent with the findings of the shortlisting process and the community consultation feedback. The workshop participants supported this approach.

The workshop then focused on commenting on and evaluating the Eastern and Western options against assessment criteria.

The MCA process identified a range of criteria relevant to the project. A weighting was assigned to each criteria based on its relative importance to the overall project. The criteria were generally similar to the shortlisting criteria used to assess the long list options with some refinement to suit the two options being assessed, removing criteria no longer considered relevant.

The criteria and weightings were prepared before the workshop and issued to participants. As part of the workshop process the weightings of criteria 1A (Project Delivery) and 1B (Staging of Construction) as provided in Appendix 2 of the Preferred Option Workshop Report (Appendix B) were adjusted from 15 per cent and five per cent respectively to 10 per cent each to reflect the overall importance of the ability to stage the project. This met the overall Criteria 1 objective of supporting the airport construction and should other priorities (including funding) change, the ability to stage the works would be a significant benefit to the project.

Following presentations on the considerations and issues associated with the two options, the workshop participants scored each criteria between one (least preferred) and five (most preferred) for both options. The approach was to initially assume options were equal with a three (neutral) scoring and options with identified benefits were given a higher score of four or five and options with a disadvantage were given a lower score of two or one. This scoring was undertaken by five separate table groups and the details of the commentary and scoring from each table is included in the workshop report provided in Appendix B of this report.

Generally, scoring was consistent across each of the individual groups and adopted in the MCA. However, there was some variation or inconsistency between the scoring at each table. There was not an opportunity to debate and develop consensus on scoring, so this assessment has taken guidance from the workshop commentary to develop an ‘adopted score’.

The adopted score is provided in Appendix A of this report together with the workshop table scores included as average, maximum and minimum scores. The adopted score is provided in Table 4.10 with commentary supporting the scoring.
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weighting</th>
<th>Western Option</th>
<th>Eastern Option</th>
<th>Commentary/Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Support airport construction</td>
<td>20%</td>
<td>0.50</td>
<td>0.60</td>
<td>Eastern Option slightly preferred</td>
</tr>
<tr>
<td>1A Project delivery</td>
<td>10%</td>
<td>3</td>
<td>2</td>
<td>The Eastern Option has a longer length with a greater length over the existing road and is likely to require more construction time.</td>
</tr>
<tr>
<td>1B Staging of Construction</td>
<td>10%</td>
<td>2</td>
<td>4</td>
<td>The Eastern Option offers significant benefits through the ability to stage the construction with a connection to The Northern Road where it crosses near Eaton Road.</td>
</tr>
<tr>
<td>2 Land-use integration</td>
<td>15%</td>
<td>0.33</td>
<td>0.66</td>
<td>Eastern Option strongly preferred</td>
</tr>
<tr>
<td>2A Current Development</td>
<td>6%</td>
<td>2</td>
<td>4</td>
<td>The Eastern Option is considered to integrate better with current development largely through maintaining suitable access through the southern end of Luddenham. It was considered that Luddenham is more strongly associated with the Mulgoa Valley and rural areas to the west of Luddenham and the Western Option would separate the two areas.</td>
</tr>
<tr>
<td>2B Future Development</td>
<td>6%</td>
<td>2</td>
<td>5</td>
<td>The linkage to BWSEA (WSPGA) is a clear advantage of the Eastern Option. Penrith Council intends to maintain the current largely rural zoning west of Luddenham and the Western Option located within this area would not be consistent with this current and retained zoning.</td>
</tr>
<tr>
<td>2C Airport Connectivity</td>
<td>3%</td>
<td>3</td>
<td>4</td>
<td>The Eastern Option offers additional opportunities to connect either to Adams Road, or direct into the airport site. The Eastern Option better facilitates a 'ring road' approach to the airport site.</td>
</tr>
<tr>
<td>3 Community</td>
<td>18%</td>
<td>0.42</td>
<td>0.60</td>
<td>Eastern Option strongly preferred</td>
</tr>
<tr>
<td>3A Property Acquisition</td>
<td>6%</td>
<td>3</td>
<td>3</td>
<td>There was no identifiable difference. Both options impact a significant number of land owners with a variety of different impacts.</td>
</tr>
<tr>
<td>3B Impact on existing business</td>
<td>6%</td>
<td>2</td>
<td>3</td>
<td>The impact on rural businesses was not able to be determined clearly at this time. The Western Option does not easily allow access or suitable connection to the service station and shops at the southern end on Luddenham. The eastern option does allow access through Luddenham.</td>
</tr>
<tr>
<td>3C Community Preference</td>
<td>6%</td>
<td>2</td>
<td>4</td>
<td>The community identified clearly that the Eastern Option would provide better access into Luddenham. Further, it was seen that the Eastern Option was favourable due to concerns about the impact of partial land acquisition to the functionality of land use.</td>
</tr>
<tr>
<td>Criteria</td>
<td>Weighting</td>
<td>Western Option</td>
<td>Eastern Option</td>
<td>Commentary/Justification</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------</td>
<td>----------------</td>
<td>----------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>4 Environment</td>
<td>18%</td>
<td>0.54</td>
<td>0.49</td>
<td>Western Option slightly preferred</td>
</tr>
<tr>
<td>4A Non-Aboriginal Heritage</td>
<td>5%</td>
<td>3</td>
<td>2</td>
<td>The Eastern Option impacts some items of local significance. The Western Option impacts the Mulgoa Valley and the listed site of a former brick cottage. Therefore the options are rated as equal.</td>
</tr>
<tr>
<td>4B Aboriginal Heritage</td>
<td>5%</td>
<td>3</td>
<td>3</td>
<td>Both options impact potential archaeological deposits and there is no clear advantage to either option.</td>
</tr>
<tr>
<td>4C Biodiversity</td>
<td>5%</td>
<td>3</td>
<td>2</td>
<td>Both options impact potential threatened vegetation and threatened species. The western option would result in a slightly smaller level of vegetation impact to both vegetation listed under the TSC Act and the EPBC Act providing a slight advantage for this option.</td>
</tr>
<tr>
<td>4D Noise Impacts</td>
<td>3%</td>
<td>3</td>
<td>3</td>
<td>The Eastern Option would potentially impact more houses that the Western Option, but the Western Option is considered to impact more residents in areas with minimal background noise. The Western Option would also have a more significant impact on the Holy Family Church and Primary School.</td>
</tr>
<tr>
<td>5 Functionality</td>
<td>17%</td>
<td>0.51</td>
<td>0.53</td>
<td>Eastern Option slightly preferred</td>
</tr>
<tr>
<td>5A Maintain arterial road function</td>
<td>6%</td>
<td>3</td>
<td>2.5</td>
<td>Both options are considered to meet the required arterial road function. The Eastern Option has been scored slightly lower through the longer length.</td>
</tr>
<tr>
<td>5B Future motorway connection</td>
<td>5%</td>
<td>3</td>
<td>4</td>
<td>The Eastern Option located on the ridge line to the north of Elizabeth Drive is considered to provide an advantage over the Western Option.</td>
</tr>
<tr>
<td>5C Operation</td>
<td>6%</td>
<td>3</td>
<td>3</td>
<td>The grades are all acceptable and the difference in overall travel time is considered insignificant so the options were scored equal.</td>
</tr>
<tr>
<td>6 Relative Cost/Constructability</td>
<td>12%</td>
<td>0.36</td>
<td>0.36</td>
<td>No differentiation</td>
</tr>
<tr>
<td>6A Cost/Constructability</td>
<td>12%</td>
<td>3</td>
<td>3</td>
<td>The design and estimates are at strategic level only and business compensation has not been included in property acquisition costs to the slightly higher cost associated with the Eastern Option is not considered sufficient to differentiate the scores.</td>
</tr>
</tbody>
</table>

| TOTAL                     | 100%      | 2.66           | 3.19           |                                                            |
The outcomes of the MCA can be summarised that the Eastern Option scored higher in the following areas:

- Land use integration
- Community feedback
- Support airport construction
- Functionality.

The Western Option scored higher only in the area of environment with no differentiation identified for cost and constructability.

To determine whether the weighting or individual scoring in determining the MCA scores could unjustly influence the identification of a preferred option, some basic sensitivity testing was undertaken which is included as Appendix A of this report. This testing included:

- A summation of the raw scores (which removes any weighting) producing scores of 43 and 51.5 for the Western and Eastern options respectively.
- Removing the criteria for staging of construction and reducing cost and constructability. This produced weighted scores of 2.70 and 3.10 for the Western and Eastern options respectively.
- Removing the criteria for staging of construction reducing weighting to criteria related future use and increased weighting to current use. This produced weighted scores of 2.75 and 2.96 for the Western and Eastern options respectively.
- Increasing future land use weighting (in response to a suggestion in the workshop). This produced weighted scores of 2.66 and 3.22 for the Western and Eastern options respectively.
- Adjusting individual scores to reflect different views presented at the workshop. This produced weighted scores of 2.72 and 3.13 for the Western and Eastern options respectively.

Due to the higher score of the Eastern Option in all sensitivity tests, no scoring was undertaken to compare the Western Option and the Western Alternative sub-option. It is noted that a significant part of the difference between these options would relate to land use and business impacts and to suitably assess these options a revised MCA process may be required.

No scoring was undertaken for the Southern Back-up sub-option because there was a clear preference for the Southern Preferred sub-option (the common route option alignment).

The MCA process identified that the Eastern Option scored higher overall.
5. Additional information

Following the assessment workshop and MCA further information became available which may impact the assessment. The changes and the impacts to the assessment are outlined below.

5.1 Western Sydney Priority Growth Area

On 8 October 2015 the State Government announced the new WSPGA which shows an extended area for consideration for future urban development that extends further west than the previous BWSEA footprint.

Figure 5.1 below shows in blue the area that was the BWSEA (north of the ‘Badgerys Creek Airport Precinct’ shown in yellow) and is currently subject to structure planning by DP&E. The dotted line indicates the boundary of the WSPGA which is a shows a new wider area for consideration for potential for development.

The change to the extent of the area being considered as part of the structure planning changes the assumption which had been made about the future land use in the area when assessing land use integration, Criteria 2B. This was a key criterion where the Eastern Option performed better than the Western Option.

The area being considered by the structure plan is mainly to the east of Luddenham township. Therefore, the Eastern Option is still considered more likely to integrate into the future development than the Western Option.
5.2 Commonwealth land

The Department of Infrastructure and Regional Development (DIRD) provided ‘in principle’ agreement on 7 October 2015 to use five parcels of Commonwealth land to the west and north-west of the western Sydney airport site for use for The Northern Road if required. This agreement included land on the eastern side of Willowdene Avenue. DIRD had previously advised during the shortlisting process that the land to the east of Willowdene Avenue was unavailable for use in the development of options for The Northern Road Upgrade Stage 4.

Locating The Northern Road to the eastern side of Willowdene Avenue would have benefits over the route adopted during the assessment. These benefits would include:

- Less properties and less area would be impacted
- Improved travel time with improved grades and a shorter route length
- Lower potential visual intrusion
- Better integration with current development.

These benefits are reflected in the scoring at the Shortlisting Workshop (with a score of 3.3 for this revised route location compared to 3.1 for the route location adopted in the shortlisted options). The Eastern Option is being adjusted on the Commonwealth land near Willowdene Avenue to take advantage of these benefits. Ongoing negotiation over the acceptability of alignments with DIRD will be required.

Roads and Maritime did not want to delay the announcement of the preferred route until the alignment in this section is confirmed. Therefore, a wider corridor has been shown on the preferred route map in Figure ES.1 in this area along Willowdene Avenue near the Commonwealth Land until the alignment is confirmed.

This section of the route is common to the four route options and is not considered to impact the preferred route option selection.
5.3 Airport requirements

The alignment for the proposed preferred route between Mersey Road and Willowdene Avenue has changed. The previous alignment was located further to the west to avoid airport operational requirements associated with the southern runway as advised by DIRD.

DIRD has now advised that a route closer to the boundary of the airport is possible. This allows a more direct route to be adopted which is preferable to the previous alignment.

As a result the alignment in this area has been relocated from what was shown in the route options at the shortlisting stage and exhibited to the community in July 2015.

This section of the route is common to the four route options and is not considered to impact the preferred route option selection.

5.4 Updated Cost Comparison

Subsequent to the cost estimate information available at the workshop, further estimating work undertaken indicated a change in property acquisition and environmental offset estimates. This changed the overall and relative cost estimates. The updated information is provided in Table 5.1. However, the position determined in the workshop that price was not a differentiating factor has not changed.

<table>
<thead>
<tr>
<th></th>
<th>Central</th>
<th>Campbell Street</th>
<th>Western</th>
<th>Eastern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost relative to the Western Option</td>
<td>-2.9%</td>
<td>-4.6%</td>
<td>0.0%</td>
<td>-5.3%</td>
</tr>
</tbody>
</table>

5.5 Impact on assessment and scoring

The changes outlined in Section 5.1 Western Sydney Priority Growth Area impacted the scoring. Revised scoring based on these changes is provided in Appendix A Multi-criteria assessment.

The results of the revised scoring show the Eastern Option still scores higher than the Western Option. However, the margin between the route options was reduced. The revised scores for the Western and Eastern Options were 2.66 and 3.08 respectively.

The changes with respect to Commonwealth land and airport requirements have impacted the route location, but are not considered to impact the scoring or route selection as these changes are common to all route options.
6. Conclusion

The route options assessment of the four shortlisted options for The Northern Road Upgrade Stage 4 has identified the following:

- The Central and Campbell Street options are considered to be less favourable and should not be adopted or progressed further as part of the preferred option assessment.
- The Western Option is considered to be a suitable option but scored lower than the Eastern Option in a number of areas.
- The Eastern Option is considered to be superior to other options including, better access to Luddenham, support from the local community, improved access to the proposed airport, better traffic management and safety, fewer urban design and visual impacts.

The Eastern Option is recommended as the preferred option for The Northern Road Upgrade Stage 4.

There are impacts identified as part of the options assessment process that will require further investigation and mitigation as part of the further development of the project, including concept design and environmental assessment.

The Eastern Option would require the use of Commonwealth land to the north of the proposed western Sydney airport site which would need formal confirmation before this route being adopted as the preferred option. Negotiations over the use of this land are continuing. Should negotiations identify that this land is not available, further assessment of the preferred option would be required.

6.1 The Preferred Option

The Eastern Option as is recommended as the preferred option.

Some modifications have been made to the Eastern Option that was displayed to the community in July 2015. Figure 6.1 illustrates the modified Eastern Alignment that is proposed as the preferred option for The Northern Road Upgrade Stage 4.

These modifications are as a result of the additional information as outlined in Section 5 and further investigations and development undertaken since July 2015. Annotations on Figure 6.1 show the modifications that have been made to the Eastern Option alignment.
Figure 6-1 Adjusted Eastern Option

- Commonwealth land
- Western Sydney Priority Growth Area
- Existing roads
- Northern/southern divide
- Eastern Option 200 metre corridor. It is expected the road corridor would be 70 metres wide and would fall somewhere within this area
- Former southern alignment
- M12 study area

The alignment in this area is wider than shown previously. This will allow us to plan a route in this area that will minimise the division of properties, minimise the impact on utilities and require less earthworks.

Corridor is wider than 200 metres in this section until the operational needs of the airport are determined. Corridor will be 70 metres wide and will fall within this area.

Southern alignment, now moved further east in this section.
7. References

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