



Queanbeyan City Council  
Dunns Creek Road Corridor Study and Alignment Planning  
Preliminary Design Update for Preferred Options

July 2015

# Executive summary

*This report is subject to, and must be read in conjunction with, the limitations set out in section 1.4 and the assumptions and qualifications contained throughout the Report.*

Queanbeyan City Council engaged GHD to undertake a corridor study in 2008 for Dunns Creek Road. GHD was subsequently engaged by Queanbeyan City Council to provide an update to the preferred Option 1B and Option 5 routes for amendments to connections at terminal points, cross section and minor grading as directed. The updated alignments now connect with the South Tralee development at the western end of the route. The previous proposed Option 1B eastern connection to Old Cooma Road incorporates a minor shift in alignment to reduce property and ecological impacts. The route length of Option 1B and Option 5 is 5.35 km and 5.30 km respectively.

As part of the work for this report, a P50 and P90 cost estimate has been prepared for the revised and updated concept design alignment options.

The P50 / P90 cost estimate for each Option [between Old Cooma Road and western edge of South Tralee] is as follows:

Option 1B:

- P50 estimate \$181M (including 39% contingency)
- P90 estimate \$205M (including 58% contingency).

Option 5:

- P50 estimate \$169M (including 40% contingency)
- P90 estimate \$192M (including 59% contingency).

Ecological and Heritage considerations were assessed as part of this report.

Based on this assessment and the methods and assumptions detailed within the report, Option 1B is likely to have the least ecological impact of the options. Biodiversity offset requirements for Option 1B may be slightly lower than for Option 5 due to the smaller area of Box-Gum Woodland to be removed.

Option 5 is likely to have a greater ecological impact as it would remove the largest area of Box-Gum Woodland and would likely result in direct impacts to more species known to occur in the alignment, including threatened flora.

Both options have the potential to impact on known sites of Aboriginal heritage. Although the Option 1B alignment contains more sites of Aboriginal heritage, at the current stage it is not known which option is likely to have the greatest impact. This would need to be determined through further detailed assessment.

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Appendix B – M Raven North Dunns Creek Road Estimate Report
Appendix C – Queanbeyan City Council Report for Dunns Creek Road Corridor Study and Alignment Planning Preliminary Design for Preferred Option, September 2008
Appendix D – Queanbeyan City Council Report for Dunns Creek Road Alignment Study Flora and Fauna Constraints of Option 1B and Option 5, July 2009
Appendix E – Assessment of likelihood of occurrence

# 1. Introduction

## 1.1 Background

Queanbeyan City Council (QCC) in 2008 engaged GHD to undertake a corridor study including an alignment planning phase investigation of a new road referred to as Dunns Creek Road, connecting Monaro Highway in the ACT and Old Cooma Road in NSW. The study was in response to the increasing traffic volumes associated with new land developments in South Queanbeyan. The preferred option developed in the 2008 report was alignment Option 1B.

This report is to be read in conjunction with the following reports previously prepared by GHD:

- Queanbeyan City Council Report for Dunns Creek Road Corridor Study and Alignment Planning Preliminary Design for Preferred Option, September 2008, provided in Appendix C
- Queanbeyan City Council Report for Dunns Creek Road Alignment Study Flora and Fauna Constraints of Option 1B and Option 5, July 2009, provided in Appendix D.

## 1.2 Proposed South Tralee development

With the development of the South Tralee subdivision (known as South Tralee Estate), the connection location for the proposed Dunns Creek Road route is to be amended to connect to the internal sub-arterial road as provided for in this development. As such, this current work does not include the length of Dunns Creek Road running through Tralee and does not include the grade separated rail crossing and interchange connection to the Monaro Highway. This work will be investigated separately once agreement from the ACT Government has been reached regarding a suitable connection point onto the Monaro Highway.

## 1.3 Purpose of this report

QCC has commissioned GHD to provide an updated concept design for Option 1B and Option 5 of the 2008 report, for the section of Dunns Creek Road between Old Cooma Road and the proposed South Tralee development using current design standards. For Option 1B, the proposed connection onto Old Cooma Road has been modified to reduce impacts on environment and property.

As part of this commission, GHD are also required to provide an assessment on impacts on the environmental, heritage and land acquisitions as well as provide P50 and P90 cost estimates on the current work.

## 1.4 Scope and limitations

This report has been prepared by GHD for Queanbeyan City Council and may only be used and relied on by Queanbeyan City Council for the purpose agreed between GHD and the Queanbeyan City Council as set out in section 1.3 of this report.

GHD otherwise disclaims responsibility to any person other than Queanbeyan City Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Queanbeyan City Council and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

GHD has engaged M Raven North to provide cost estimating services as outlined in section 4.5 of this report ("Cost Estimate") using information reasonably available to M Raven North employee(s) who prepared this report, and based on assumptions and judgments made by M Raven North as detailed in a separate report prepared by M Raven North and provided in Appendix D.

The Cost Estimates have been prepared for the purpose of establishing the P50 / P90 estimates based on Concept Design of the two updated preferred options and must not be used for any other purpose.

This design report and the separate cost estimate report are to be read in conjunction with one another as one comprehensive document.

## 2. Scope of investigation

The scope of the investigation is as follows:

- a. Update preliminary/concept design Options 1B and Option 5 from the previous studies to connect to the new subdivision layout available for South Tralee street layout
- b. Update geometry of the western section of the alignments to be consistent with the eastern portion
- c. Determination of climbing and descending lane requirements for construction of the project as a two lane road initially to match initial traffic demand
- d. A single cycle /shared path alignment to be located adjacent to the road shoulder on the northern side
- e. Create revised road boundaries to indicate proposed resumption requirements based on the ultimate four lane configuration
- f. Preparation of P50 and P90 cost estimates for both options in their two lane configurations
- g. Update the layouts to show impacts to properties, ecological community (i.e. flora and fauna) and heritage.

## 3. Corridor constraints

### 3.1 Introduction

A number of constraints have been amended to address further residential development within the area of interest since the initial reports.

### 3.2 Terminal points

#### 3.2.1 Western connection

The previous report indicated the western connection was at the intersection of Isabella Drive and the Monaro Highway. This required the provision of a grade separated interchange and the grade separated crossing of the existing rail infrastructure.

With the proposed development of the South Tralee Estate, connection of Dunns Creek Road alignment is now to the proposed intersection of Road 5, Road 27 and Road 16 of this estate. The intersection configuration as shown on the Concept Development Application Plan (refer C135085-D020 (B) in Appendix A) is a roundabout. Road 5, being the connecting through road, is of sub-arterial category. From the South Tralee development, additional investigation is required to determine an appropriate route, design and cost to connect to the Monaro Highway. This work is subject to reaching an agreement with the ACT Government on a suitable connection point.

#### 3.2.2 Eastern connection

For both alignments the connection at the eastern extent ceases at the intersection with Old Comma Road. For Option 1B, the location of the connection to Old Cooma Road incorporates minor changes to reduce impacts on property and environment. For Option 5, the location of the connection to Old Cooma Road remains unchanged from the previous 2008 report. For both Options, connection to Old Cooma Road is assumed to be controlled by traffic signals.

### 3.3 Update of design alignments

The two alignments selected to be updated as part of this project were Option 1B and Option 5 from the original study. Option 1B being a previously preferred alignment which runs along the northern side of a major ridge rising from Jerrabomberra Creek and Option 5 which follows an alignment generally along the southern edge of the original study corridor.

### 3.4 Changes to Options 1B and Option 5 from original study

The ecological and heritage impacts due to the realignment of the proposed options and additional are discussed in more detail in Section 3.5. The relationship of the updated Option 1B and Option 5 alignments, relative to existing residential boundaries, is depicted on drawing 23-15485-SK025 and SK026 respectively. Option 1B is 400 m from the nearest residential property boundary of Aspen Rise in Jerrabomberra and Option 5 is 300 m from the nearest Fernleigh Park residential property boundary.



### 3.5 Ecological and heritage constraints

GHD completed an ecological constraints assessment of Option 1B and Option 5 for Council in 2009 (see Queanbeyan City Council Report for Dunns Creek Road alignment study flora and fauna constraints of Option 1B and Option 5, July 2009 - Appendix D). Since the 2009 report was produced new ecological information relevant to the Dunns Creek Road corridor is now available including:

- Local and regional biolink corridor mapping
- Vegetation mapping at Lot 2 and Lot 4 [732A] Old Cooma Road
- Assessment of proposed biodiversity offset site at Lot 2 and Lot 4 [732A] Old Cooma Road
- Listing of additional threatened species under the NSW *Threatened Species Conservation Act 1995* (TSC Act).

The purpose of this section of the report is to address new information that needs to be included in the corridor study and outline any additional ecological constraints that may be present in addition to those already identified in the 2009 report.

Threatened species, populations and ecological communities listed under the TSC Act and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are considered in this section of the report.

#### 3.5.1 Flora and ecological communities

Two threatened ecological communities and five threatened flora species are known or likely to occur in the study area (see likelihood of occurrence assessment in Appendix E). Of these, one threatened ecological community and two threatened flora species are known to occur within the Option 1B and 5 alignments (Table 3-1 and Figure 3-1). Flora surveys have not been undertaken in the eastern section of Option 1B. However, during an inspection of the woodland in this section in 2009, it was observed that the dominant tree species are Red Stringybark (*Eucalyptus macrorhyncha*) and Norton's Box (*E. nortonii*), and that Box-Gum Woodland is not present.

Both options would result in the removal of Box-Gum Woodland, a threatened ecological community listed as endangered under the TSC Act and as critically endangered under the EPBC Act. The options would remove the following areas of Box-Gum Woodland:

- Option 1B – 17.7 hectares (TSC Act) and 7.2 hectares (EPBC Act)
- Option 5 – 24.5 hectares (TSC Act) and 16.9 hectares (EPBC Act).

Table 3-1 Listed flora and ecological communities known to occur in the alignments of Options 1B and 5

Species / Community	Status	Alignment location
<b>Flora</b>		
Hoary Sunray ( <i>Leucochrysum albicans</i> var. <i>tricolor</i> )	E – EPBC Act	Known from just south of Option 5. Potential habitat is present between Option 1B and Option 5
Silky Swainson-pea ( <i>Swainsona sericea</i> )	V – TSC Act	Known from Option 5
Small Purple-pea ( <i>Swainsona recta</i> )	E – EPBC Act E – TSC Act	Known from rail corridor to the south west of common route
<b>Ecological communities</b>		
Natural Temperate Grassland of the Southern Tablelands and Australian Capital Territory	E – EPBC Act	Occurs just south of the common route
White Box Yellow Box Blakely's Red Gum grassy woodland and derived native grassland (Box-Gum Woodland)	CE – EPBC Act E – TSC Act	Known from Options 1B and 5.

*E* - endangered, *CE* – critically endangered, *V* – vulnerable

### 3.5.2 Fauna and fauna habitats

Nineteen listed fauna species are known or likely to occur in the study area (see likelihood of occurrence assessment in Appendix E). These include:

- Thirteen (13) birds
- Three (3) reptiles
- Two (2) bats
- One (1) invertebrate.

Of these, seven threatened fauna species have been recorded within the Option 1B and 5 alignments (see Table 3-2 and Figure 3-1). Fauna surveys have not been undertaken in the eastern section of Option 1B. Further surveys would be required to assess the potential impacts of Option 1B in this section.

Table 3-2 Listed fauna known to occur in the alignments of Options 1B and 5

Species	Status	Alignment location
Brown Treecreeper (eastern subspecies) ( <i>Climacteris picumnus victoriae</i> )	V – TSC Act	Known from habitat between Option 1B and Option 5 and from just south of the common route
Diamond Firetail ( <i>Stagonopleura guttata</i> )	V – TSC Act	Known from the common route
Flame Robin ( <i>Petroica phoenicea</i> )	V – TSC Act	Known from Option 5
Gang-gang Cockatoo ( <i>Callocephalon fimbriatum</i> )	V – TSC Act	Known from south of Option 5
Golden Sun Moth ( <i>Synemon plana</i> )	E – TSC Act CE – EPBC Act	Known from Option 5, common route and habitat between Options 1B and 5
Hooded Robin (south-eastern form) ( <i>Melanodryas cucullata cucullata</i> )	V – TSC Act	Known from the common route
Pink-tailed Worm-lizard ( <i>Aprasia parapulchella</i> )	V – TSC Act V – EPBC Act	Known from Options 1B and 5.
Speckled Warbler ( <i>Chthonicola sagittata</i> )	V – TSC Act	Known from Option 5 and common route.

*E* - endangered, *CE* – critically endangered, *V* – vulnerable

### 3.5.3 Local and regional biolinks

Local and regional biolinks (vegetation corridors) are important as they provide linkages between large or important areas of habitat. They provide opportunities for flora and fauna, to disperse, access resources and exchange genetic material (BES 2008). There are two main types of biolinks in the study area:

- Regional biolink – covering all of the common route and about 40 percent of the alignments for Options 1B and 5
- Local biolink – covering about 60 percent of the alignments for Options 1B and 5 (see Figure 3-2).

Construction of Dunns Creek Road would reduce the connectivity of these regional and local biolinks.

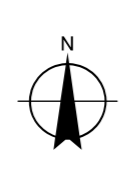
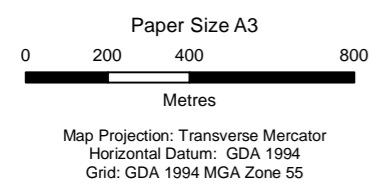
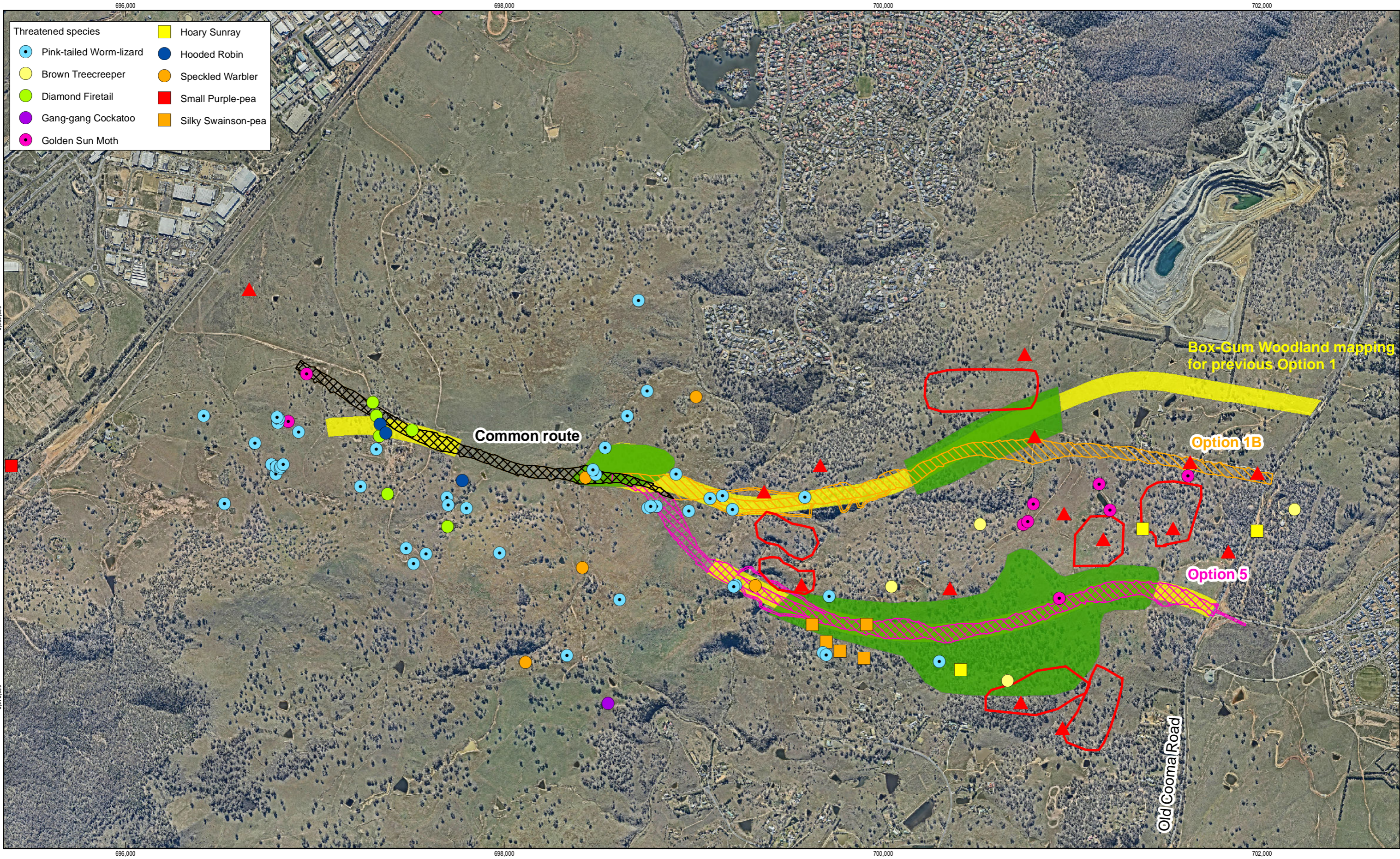
### 3.5.4 Vegetation mapping at Lot 2 and Lot 4 [732A] Old Cooma Road

Native vegetation has been mapped at Lot 2 and Lot 4 [732A] west of Old Cooma Road. This property shares its southern boundary with most of Option 5 (see map in Appendix F). The vegetation mapping was completed as part of a potential biodiversity offsets prospect for the proposed Ellerton Drive extension to the north. Three vegetation and condition types were identified:

- Red Stringybark – Red Box – Long-leaved Box – Scribbly Gum shrub – tussock grass open forest (moderate to good)
- Yellow Box - Blakely's Red Gum grassy woodland (moderate to good – disturbed)
- Yellow Box - Blakely's Red Gum grassy woodland (moderate to good).

The Yellow Box – Blakely's Red Gum grassy woodland (in both condition states) is likely to meet the classification criteria for TSC Act Box-Gum Woodland. At least part of the woodland may also meet the classification criteria for EPBC Act Box Gum Woodland.

The mapping of TSC Act and EPBC Act Box-Gum Woodland is generally consistent with the previous mapping completed by GHD in 2009 for Option 5.



LEGEND					
	Heritage site		Option 1B		Box-Gum Woodland TSC Act/EPBC Act
	Aboriginal heritage PAD		Option 5		Box-Gum Woodland TSC Act
			Common route		

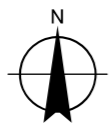
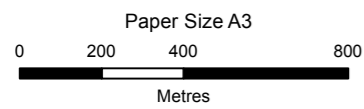
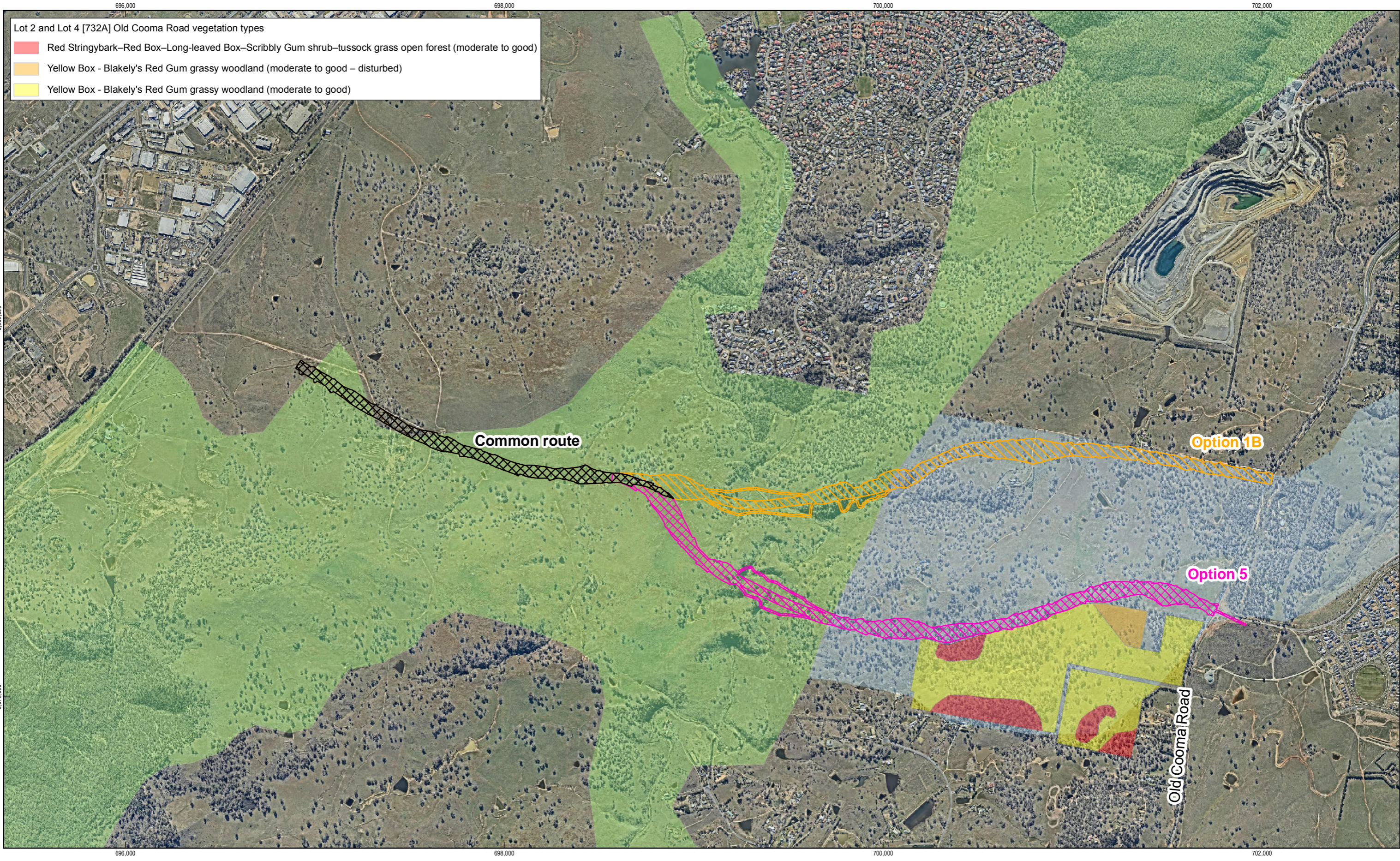


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### Known ecological and heritage constraints

### Figure 3-1



Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 55



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**Biolinks and Lot 2 and Lot 4 [732A] Old Cooma Road vegetation types**

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**Figure 3-2**

### 3.5.5 Biodiversity offsets

The GHD (2009) report provided a preliminary assessment of the biodiversity offset requirements for each option. These were based on the Property Vegetation Planner and Threatened Species Assessment Tool. Since this report was completed, the OEH BioBanking Assessment Methodology (BBAM) has been released.

The BBAM is used to assess the biodiversity values of a development site for the purpose of obtaining a BioBanking statement or a biobank site and ultimately a BioBanking agreement (OEH 2014).

The BBAM has two different classes of biodiversity credits:

- Ecosystem credits – those credits that are created or required for all impacts on biodiversity values including threatened species that can be reliably predicted by habitat surrogates
- Species credits – those credits that are created or required for impacts on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates (OEH 2009).

All of the options are likely to require both ecosystem and species credits. Most are likely to be ecosystem credits; however, loss of habitat for species such as the Pink-tailed Worm-lizard (for both options) would require species credits.

Given the close proximity of the alignment options and similar requirements for habitat removal, the ecosystem credits required for each option are likely to be similar. The number of ecosystem credits is related to the extent, vegetation type and condition of habitat to be removed.

### 3.5.6 Heritage constraints

A number of potential archaeological deposits (PADs) have been recorded in the study area. The alignment options occur on the boundary of these PADs as outlined below and in Figure 3-1:

- Option 1B – PAD on southern boundary of the central section
- Option 5 – PAD on northern boundary of the central section.

Four more PADs are located in the study area, including:

- Two PADs located between the eastern sections of Options 1B and 5
- Two PADs located south of the eastern section of Option 5.

In addition, two sites of Aboriginal cultural heritage material were identified. The first was an isolated find (Option 1B) and the second was a low density artefact scatter located on a small terrace adjacent to Jerrabomberra Creek (Option 1B). Both sites are small and the numbers of artefacts present are of low density (Dearling 2009).

Previous survey by Navin Officer (2003) identified a further 13 Aboriginal sites in the study area. Three of these occur on the eastern section of Option 1B (see Figure 3-1).

A revised Australian Heritage Information Management System (AHIMS) was conducted for the Dunns Creek Road corridor with a buffer of about one kilometre around the corridor. Sites with the potential to be impacted by the alignment options would require further specialist investigation.

All of the options have the potential to impact sites of Aboriginal heritage and are likely to require an Aboriginal Heritage Impact Permit (AHIP) under section 90A of the *National Parks and Wildlife Act 1974*.

### 3.5.7 Summary of known ecological and heritage constraints

Table 3-3 provides a summary of impacts to known ecological constraints and Aboriginal heritage sites. It is not intended to be a complete summary of all species and Aboriginal heritage sites that may occur. Further surveys would be required to determine the direct and indirect impacts of road construction on ecology and heritage.

Table 3-3 Summary of impacts to known ecological constraints and Aboriginal heritage sites

Constraint type	Option 1B	Option 5
<b>Ecological constraints</b>		
Box Gum Woodland (TSC Act)	Removal of about 17.7 hectares of the community	Removal of about 24.5 hectares of the community
Box-Gum Woodland (EPBC Act)	Removal of about 7.2 hectares of the community	Removal of about 16.9 hectares of the community
Threatened flora		Removal of known habitat for Hoary Sunray and Silky Swainson-pea.
Threatened fauna	Removal of known habitat for Brown Treecreeper, Diamond Firetail, Hooded Robin, Speckled Warbler, Golden Sun Moth and Pink-tailed Worm-lizard	Removal of known habitat for Brown Treecreeper, Diamond Firetail, Hooded Robin, Gang-gang Cockatoo, Golden Sun Moth, Pink-tailed Worm-lizard and Speckled Warbler
<b>Aboriginal heritage constraints</b>		
PADs	PAD near southern boundary of the central section	PAD near northern boundary of the central section
Other sites	Isolated find and artefact scatter near northern boundary. Three undescribed sites on the eastern section.	

### 3.5.8 Option recommendation based on ecological and heritage constraints

The recommendation for a preferred alignment option is based on the following methods and assumptions:

- This short report is based on previous limited surveys and desktop assessment only
- No field surveys have been completed for the western portion of the common route and eastern portion of Option 1B, where the updated alignment deviates from the original study alignment. However, as noted in Section 3.5.1, during inspections of the eastern section of Option 1B it was observed that Box-Gum Woodland is not present. Further surveys would be required to fully assess potential impacts on listed biota
- Impacts are based solely on the species known to occur in the study area and do not include any other species that may potentially occur in the study area. Further species may be detected with targeted and intensive survey effort
- Other potentially occurring species are described in Appendix E
- The areas of threatened ecological communities likely to be impacted are preliminary estimates only. These areas may increase or decrease with final road design and further mapping of vegetation types and threatened ecological communities
- Both options may have a significant impact on threatened species and ecological communities and would require a Species Impact Statement
- Both options would require biodiversity offsets for NSW and Commonwealth listed species. All options are likely to require both ecosystem and species credits for biodiversity offsets
- This report does not include a detailed assessment of impacts to known sites of Aboriginal heritage.

Based on this preliminary assessment, Option 1B is likely to have the least ecological impact of the options. Biodiversity offset requirements for Option 1B may be slightly lower than for Option 5 due to the smaller area of Box-Gum Woodland to be removed.

Option 5 is likely to have a greater ecological impact as it would remove the largest area of Box-Gum Woodland and would likely result in direct impacts to more species known to occur in the alignment, including threatened flora.

Both options have the potential to impact on known sites of Aboriginal heritage. Although the Option 1B alignment contains more sites of Aboriginal heritage, at the current stage it is not known which option is likely to have the greatest impact. This would need to be determined through further detailed assessment.



# 4. Road design

## 4.1 Design standards

### 4.1.1 Design speed

The design speed adopted for the two alignments is maintained at 80 km/hr as per the original study. The alignment adopted west of Jerrabomberra Creek was upgraded from the previous alignment to have a minimum horizontal radius of 400 m (Option 5) and 600 m (Option 1B). The maximum grade for both options was maintained at 9% as per the previous study.

### 4.1.2 Cross section

The previous study brief required the development of the design of a two lane single carriageway road with a road reserve sufficient to accommodate a four lane dual carriageway road.

The new design criteria maintained the existing lane and shoulder widths and revised the requirement for climbing lanes in line with Austroads recommendations.

#### **Cross section**

The adopted cross section for the two lane single carriageway road is:

- 3.5 m lane width
- 2.5 m shoulder width
- 1.0 m verge
- 2.5 m path reserve
- 3.0 m gutter.

The adopted cross section for the four lane dual carriageway road is:

- 3.5 m lane width
- 2.5 m shoulder width
- 1.0 m verge
- 2.5 m path reserve
- 3.0 m gutter
- 6.0 m median (includes 1.0 m shoulder width).

#### **Fill slopes**

- 6 : 1 where height of fill batter is less than 3 m
- 2 : 1 where height of fill batter is greater than 3 m.

#### **Cut Slopes**

- 1 : 1 where top of lowest cut batter is more than 5 m below natural surface and a cut batter height of 5 m
- 2 : 1 all other cut batters to a maximum cut batter height of 7 m. A bench 3 m wide has been included between successive cut batters

These assumptions are based on preliminary geotechnical advice as per the previous study and would need to be confirmed by further detailed investigations.

The typical cross sections for the single carriageway and dual carriageway configuration are shown on drawing 23-15485-SK010 provided in Appendix A.

## 4.2 Road design

### 4.2.1 Alignment changes

The original alignments for Options 1B and 5 were adopted for the majority of the length but with the following modifications:

#### **Option 1B**

- Option 1B was shortened to link into the western terminal point as described in section 3.2.1.
- Horizontal alignment improvements were implemented west of Jerrabomberra Creek to align the standard of geometry with that adopted previously east of the creek
- The vertical grading between Ch 5200 – and Ch 6250 was amended to improve the ride and appearance
- The linkage to Old Cooma Road from Ch 5700 to Ch 7647 was realigned south of the boundary of Lot 1 on DP 513432 and Lot 2 on DP 1186512 to avoid environmental concerns affecting these allotments.

#### **Option 5**

- Option 5 was shortened to link into the western terminal point as described in section 3.2.1.
- Horizontal alignment improvements were implemented west of Jerrabomberra Creek to align the standard of geometry with that east of the creek to match that adopted in Option 1B.

### 4.2.2 Geometric design

The geometric design was undertaken using 12D Model design software. The options were adopted from the previous study and only minor amendments implemented to the horizontal and vertical grading.

The minimum curve radius for horizontal and vertical alignment east of Jerrabomberra Creek was adopted west of the creek on both alignments.

The cycle/shared path was designed independently in the previous study but is now aligned parallel with the road carriageways. The grading does not meet the Austroads design standards for cycle paths, but allows for reductions in the property acquisitions and corridor widths. It is recommended that the cycle/shared path not be formally line marked and signed as a cycle path. Connection to existing and proposed cycle facilities at the terminal locations has not been considered as part of this study.

The geometric design does not allow for the following items due to the preliminary nature of this study:

- Public transport requirements
- Optimisation of earthworks / pavement construction techniques
- Optimisation of bridge length, alignment or construction
- Inclusion of roadside and median design including safety measures and barriers
- Avoidance of services
- Optimised longitudinal and cross drainage solutions.

### 4.2.3 Climbing lanes

A review of climbing lanes was undertaken in line with Austroads Part 3 - Geometric design manual. This details the warrant that climbing lanes should be considered where the through speed of truck traffic is less than 40 km/hr and where there are limited overtaking opportunities in the adjacent 5 km, and long grades exist over 8%.

As the road lane configuration and geometry including opportunity to overtake is not able to be determined beyond the terminal connection points of the alignments, a conservative approach was used to determine climbing lane requirements. As the terminal points of the roads involved intersections that include stop conditions, the starting speed for a truck entering the alignments was adopted at 25 km/hr. The truck speeds were then assessed against Figure 9.3 of Part 3 Austroads to determine spot speeds along the alignment in both directions.

The climbing lanes configuration is to be constructed as final four-lane earthworks and pavement. The additional fourth lane of pavement was allowed for descending requirements as truck speed regularly match those of climbing while descending over steep gradients.

Brake fade in heavy vehicles is a potential issue of steep downgrades:

- Option 1B – 1.1 km greater or equal to 9% continuous downgrade
- Option 5 – 675 m greater or equal to 9% continuous downgrade.

Both alignments have steep downgrades not in excess of the warrant provided within “Austroads Part 6 – Roadside design, Safety and Barriers” to be considered for treatment to reduce the risk of runaway vehicles. The effect of a combination of adjacent downgrades though would have to be assessed in future design review.

The design of containment facilities if required would potentially add to the earthworks and land resumption requirements.

A switch from the four lane configuration to a two lane configuration has been provided over a transition length of 150 metres.

Proposed arrangement of two / four lane configuration is detailed on the plan and longitudinal sections provided in Appendix A.

### 4.2.4 Future second carriageway

The additional earthworks extents were modelled for the entire alignments to be four lane configurations. This allowed for the property acquisitions to be assessed now for these future requirements.

The additional earthworks extents were not included in the cost estimate other than where required for the construction of climbing lanes.

## 4.3 Drainage

### 4.3.1 Culvert road crossings

A preliminary assessment of the road cross drainage was undertaken with the appropriate catchments and based on a 100 year average return interval (ARI) event. The details of the culvert location and catchment areas are provided in Table 4-1 below for Option 1B and Table 4-2 for Option 5. Conservative values of 0.9 for coefficient of runoff where determining catchment runoff. Average pipe flow velocities of 2 m/s were adopted in sizing the culverts.

Table 4-1 Culvert design Option 1B

Culvert Chainage	Catchment Area (ha)	Time of Concentration (min.)	Intensity (mm/hr)	Design Discharge (cumecs)	Proposed Culvert
2450	16.8	18	106	4.46	Ø1800 RCP
2850	10.9	15	117	3.19	Ø1500 RCP
3600	37.8	25	88	8.32	3600 x 1200 RCBC
3920	286	90	39	27.98	3/3600 x 1500 RCBC
5400	4.2	8	159	1.67	Ø1050 RCP
5750	17.9	24	88	3.94	Ø1650 RCP
6890	46.4	28	80	9.29	3600 x 1500 RCBC
7080	2.4	5	194	1.16	Ø900 RCP

Table 4-2 Culvert design Option 5

Culvert Chainage	Catchment Area (ha)	Time of Concentration (min.)	Intensity (mm/hr)	Design Discharge (cumecs)	Proposed Culvert
2450	16.8	18	106	4.46	Ø1800 RCP
2850	10.9	15	117	3.19	Ø1500 RCP
3600	37.8	25	88	8.32	3600 x 1200 RCBC
3920	286	90	39	27.98	3/3600 x 1500 RCBC
5600	9.4	14	121	2.85	Ø1500 RCP
6150	15.1	15	117	4.42	Ø1800 RCP
7200	6.7	8	159	2.67	Ø1350 RCP

### 4.3.2 Jerrabomberra Creek

The vertical alignment of the road crossing indicates that a bridge structure is appropriate. No flood modelling has been undertaken as part of this or the previous study and therefore bridge waterway requirements are not known. While alignment refinements will be required in future to limit the length and complex geometry of a bridge design, a span has been adopted to limit the required embankment construction that will affect the watercourse.

Bridge lengths adopted are:

- Option 1B – 550 m (Ch 4600 – Ch 5150)
- Option 5 – 530 m (Ch 4970 – Ch 5500).

The bridge width adopted for both options is 15.845 m (internal dimension between barriers).

## 4.4 Property impact

Property impacts for each alignment option are listed below. The areas listed are to the extents of the proposed road reserve boundary for dual carriageway construction.

The property impact was assessed by the following criteria:

- Boundaries to be minimum corridor width of 65 m for the whole route.
- Where low cut batter or a fill batter, width to property boundary is batter extent plus 4 m
- Where high cut (benched), width to property boundary is batter extent plus 10 m.

The additional width at the batter extent for high cuts allows for the possibility that batters may have to be laid back from the slopes used in the assessment due to unknown soil / rock conditions.

Refer to sketch plans 23-15485-SK025 and SK026 provided in Appendix A for details of the extent of road works and the assumed land resumption boundary for Options 1B and 5 respectively.

Table 4-3 Property impacts Option 1B

Lot No / DP	Land Resumption Area (ha)
Lot 181 / DP 754912	0.094
Lot 1 / DP 1140653	0.032
Lot 226 / DP 665411	1.933
Lot 2 / DP 1006051	3.077
Lot 1 / DP 224095	0.629
Lot 10 / DP 565362	11.126
Lot 11 / DP 565362	2.584 (west of Jerrabomberra Creek)
Lot 11 / DP 565362	6.081 (east of Jerrabomberra Creek)
Lot 1 / DP 1004115	8.362
Lot 99 / DP 754881	6.103
Lot 148 / DP 727670	2.273

Table 4-4 Property impacts Option 5

Lot No / DP	Land Resumption Area (ha)
Lot 181 / DP 754912	0.094
Lot 1 / DP 1140653	0.032
Lot 226 / DP 665411	1.933
Lot 2 / DP 1006051	3.077
Lot 1 / DP 224095	0.629
Lot 10 / DP 565362	11.435
Lot 11 / DP 565362	3.838 (west of Jerrabomberra Creek)
Lot 11 / DP 565362	6.666 (east of Jerrabomberra Creek)
Lot 2 / DP 1000529	6.306
Lot 99 / DP 754881	3.988
Lot 150 / DP 727670	2.339

#### 4.5 Road safety

A road safety review has not been completed within this study. GHD recommends that if the project progresses to concept and detailed design, the appropriate Road Safety Audits linked to these design progressions be undertaken to provide for an assessment of road safety

#### 4.6 Constructability

From inspection, it appears that both options considered have similar constructability issues with regard to terrain and river crossings.

## 5. Cost estimate

M Raven North has been engaged by GHD to undertake P50 / P90 Empirical Estimates for each of the alignment options at Concept Design stage. A summary of the P50 / P90 cost estimates is given in Table 5-1 below.

The construction dates utilised by M Raven North were adopted for estimation purposes only and do not represent a commitment for final design and construction.

The extent of the M Raven North's estimate is from the eastern edge of South Tralee Subdivision to the intersection of Dunns Creek Road and Old Cooma Road. Costs for works within South Tralee or connection to the Monaro Highway for each option will be in addition to those calculated within the estimates included in this study.

The cost estimation methodology, assumptions and detailed findings are included in a separate report prepared by M Raven North and provided in Appendix B.

Table 5-1 P50 / P90 Empirical estimates

Alignment Option	Route Length (km)	P50 estimate (including contingency) (\$ Million)	P90 estimate including contingency (\$ Million)
Route 1B	5.35	181 including 39% contingency	205 including 58% contingency
Route 5	5.30	169 including 40% contingency	192 including 59% contingency

## 6. References

BES (2008). *Biodiversity Study Findings Report Queanbeyan Local Government Area*. Unpublished report to Queanbeyan City Council.

Dearling, C. (2009). *Archaeological and Heritage Assessment. Field Based Study. Proposed New Road – Dunns Road, Jerrabomberra, NSW*. Unpublished report prepared for GHD Canberra.

GHD (2009) *Report for Dunn's Creek Road Alignment Study Flora and Fauna Assessment of Option 1B and Option 5*.

Navin Officer (2003). *Tralee Local Environmental Study*. Unpublished report to URS Corp Australia.

OEH (2009) *BioBanking Assessment Methodology*. Office of Environment and Heritage, Sydney.

OEH (2014) *BioBanking Assessment Methodology 2014*. Office of Environment and Heritage, Sydney.



# Appendices

# Appendix A – Drawings - Queanbeyan City Council Dunns Creek Road Alignment Study Option 1B and Option 5

## GHD Drawing Set:

23-15485-SK001	Cover Sheet, Locality Plan and Drawing List
23-15485-SK010	Typical Sections
23-15485-SK015	Option 1B Plan and Longitudinal Section – Sheet 1 of 2
23-15485-SK016	Option 1B Plan and Longitudinal Section – Sheet 2 of 2
23-15485-SK020	Option 5 Plan and Longitudinal Section – Sheet 1 of 2
23-15485-SK021	Option 5 Plan and Longitudinal Section – Sheet 2 of 2
23-15485-SK025	Option 1B Land Resumption Plan
23-15485-SK026	Option 5 Land Resumption Plan

## Supplementary Drawing Set:

C135085-D020 (B)	South Tralee Estate Concept Development Application Street Hierarchy and typical Cross Section locations
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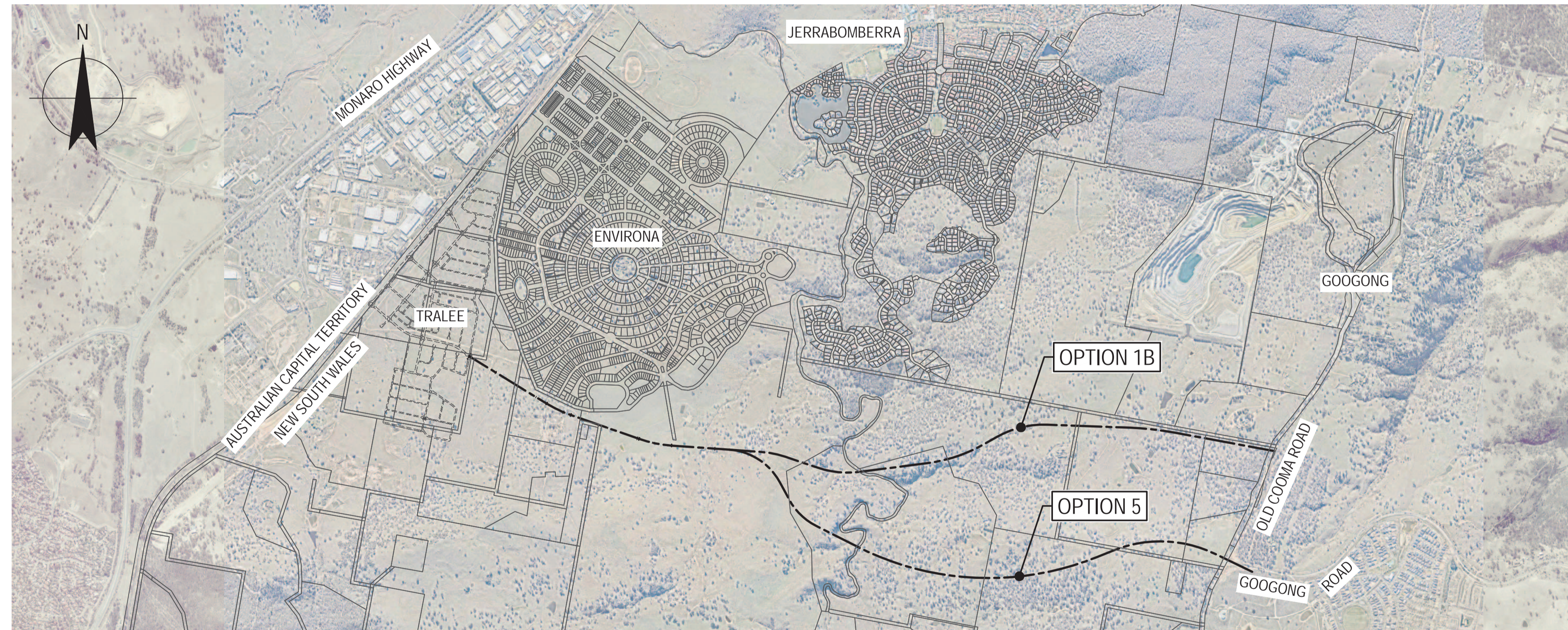


# QUEANBEYAN CITY COUNCIL

## DUNNS CREEK ROAD ALIGNMENT STUDY

### OPTION 1B & OPTION 5

# 23-15485



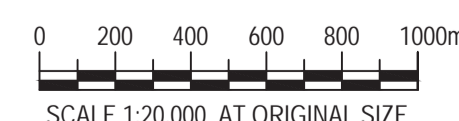
LOCALITY PLAN  
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#### DRAWING LIST

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23-15485-SK010	TYPICAL SECTIONS
23-15485-SK015	OPTION 1B PLAN AND LONGITUDINAL SECTION - SHEET 1 OF 2
23-15485-SK016	OPTION 1B PLAN AND LONGITUDINAL SECTION - SHEET 2 OF 2
23-15485-SK020	OPTION 5 PLAN AND LONGITUDINAL SECTION - SHEET 1 OF 2
23-15485-SK021	OPTION 5 PLAN AND LONGITUDINAL SECTION - SHEET 2 OF 2
23-15485-SK025	OPTION 1B LAND RESUMPTION PLAN
23-15485-SK026	OPTION 5 LAND RESUMPTION PLAN

PRELIMINARY

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C	REVISED ISSUE		LDS	JE*	CW*	15.05.15
B	REVISED LAYOUT		LDS	GSP*	CW*	13.04.15
A	PRELIMINARY ISSUE		LDS	GSP*	CW*	24.03.15



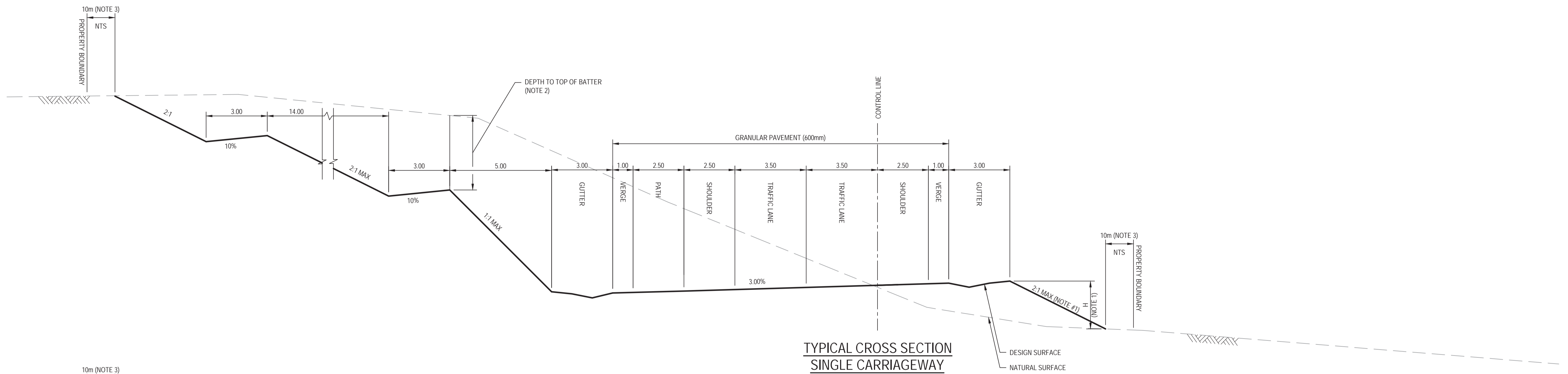
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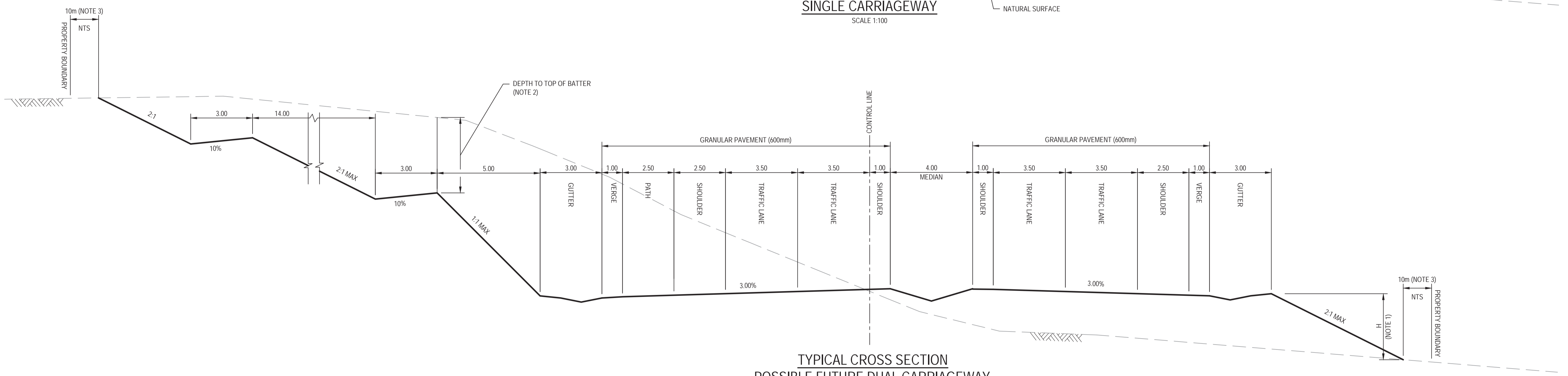
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Project	DUNNS CREEK ROAD ALIGNMENT STUDY
Title	COVER SHEET, LOCALITY PLAN AND DRAWING LIST
Original Size	A1
Drawing No:	23-15485-SK001

Rev: D



TYPICAL CROSS SECTION  
SINGLE CARRIAGEWAY

SCALE 1:100



TYPICAL CROSS SECTION  
POSSIBLE FUTURE DUAL CARRIAGEWAY

SCALE 1:100

NOTES:

- FILL BATTERS TO HAVE THE FOLLOWING SLOPES:  
H < 3m THEN X = 6  
H > 3m THEN X = 2
- WHERE DEPTH TO TOP OF FIRST CUT BATTER IS GREATER THAN 5m BELOW NATURAL SURFACE, A 5m HIGH AND 1 ON 1 BATTER WILL BE ADOPTED.
- MINIMUM ROAD RESERVE SET AT 65m.  
4m OFFSETS ADOPTED WHERE SMALL CUTS AND FILLS EXIST.  
10m OFFSETS ADOPTED IN LARGE CUTS.

PRELIMINARY

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date
B	UPDATED SECTION VERGE AND MEDIAN		LDS	GSP*	CW*	13.04.15
A	PRELIMINARY ISSUE		LDS	GSP*	CW*	24.03.15



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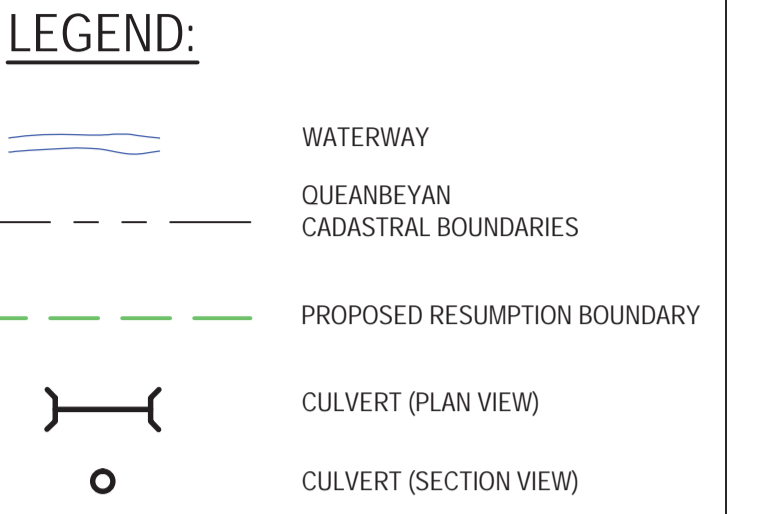
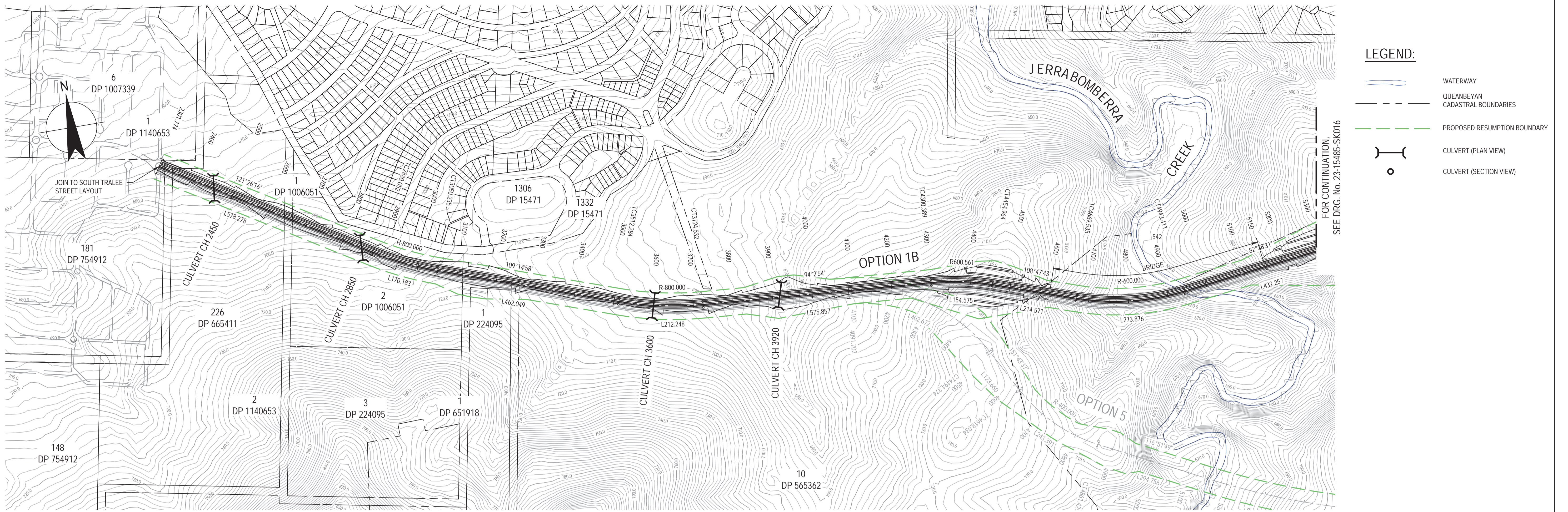
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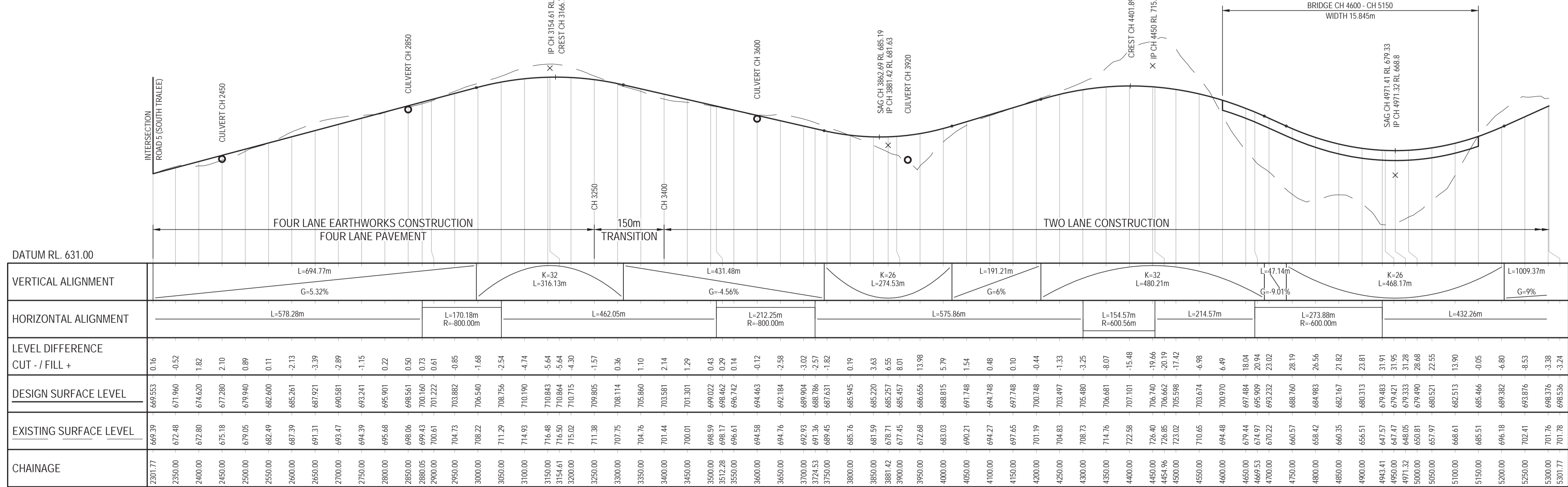
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Rev: B



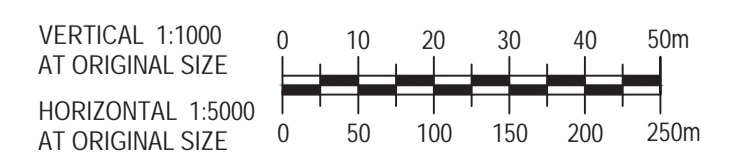
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SCALE 1:5000



LONGITUDINAL SECTION - OPTION 1B  
SCALE 1:5000H, 1:1000V

**PRELIMINARY**

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C	UPDATED DETAILS	ESP	GSP*	CW*	15.04.15	
B	REVISED LAYOUT	LDS	GSP*	CW*	13.04.15	
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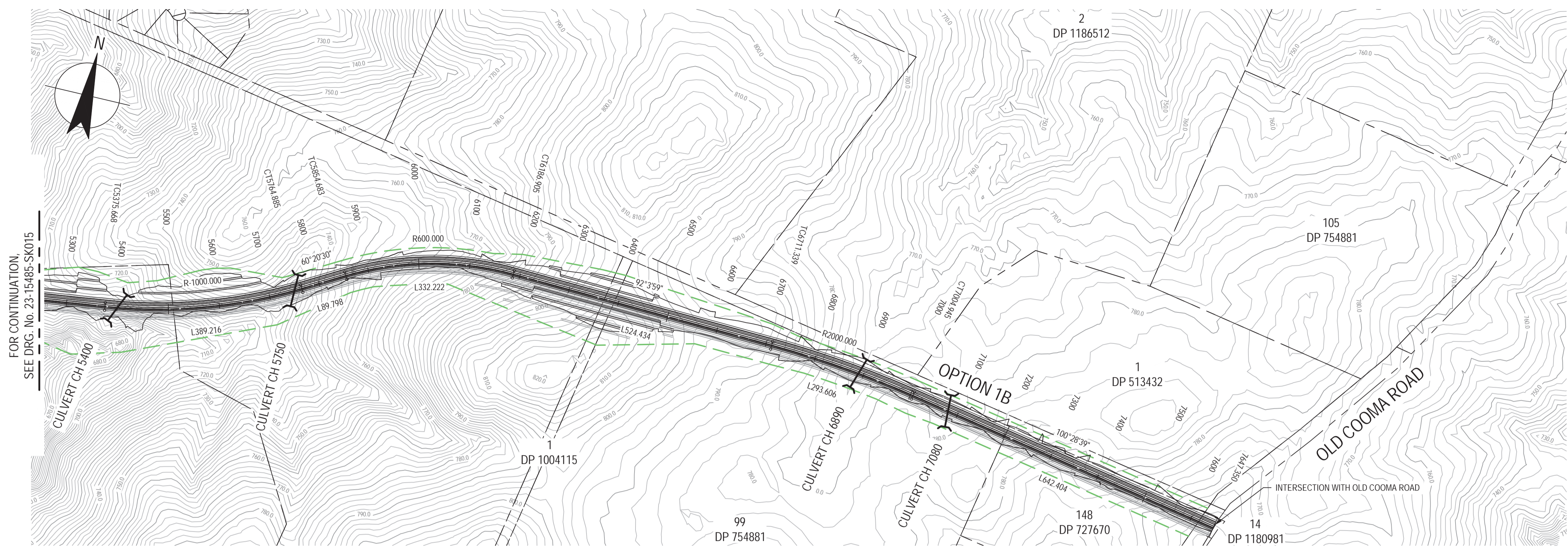
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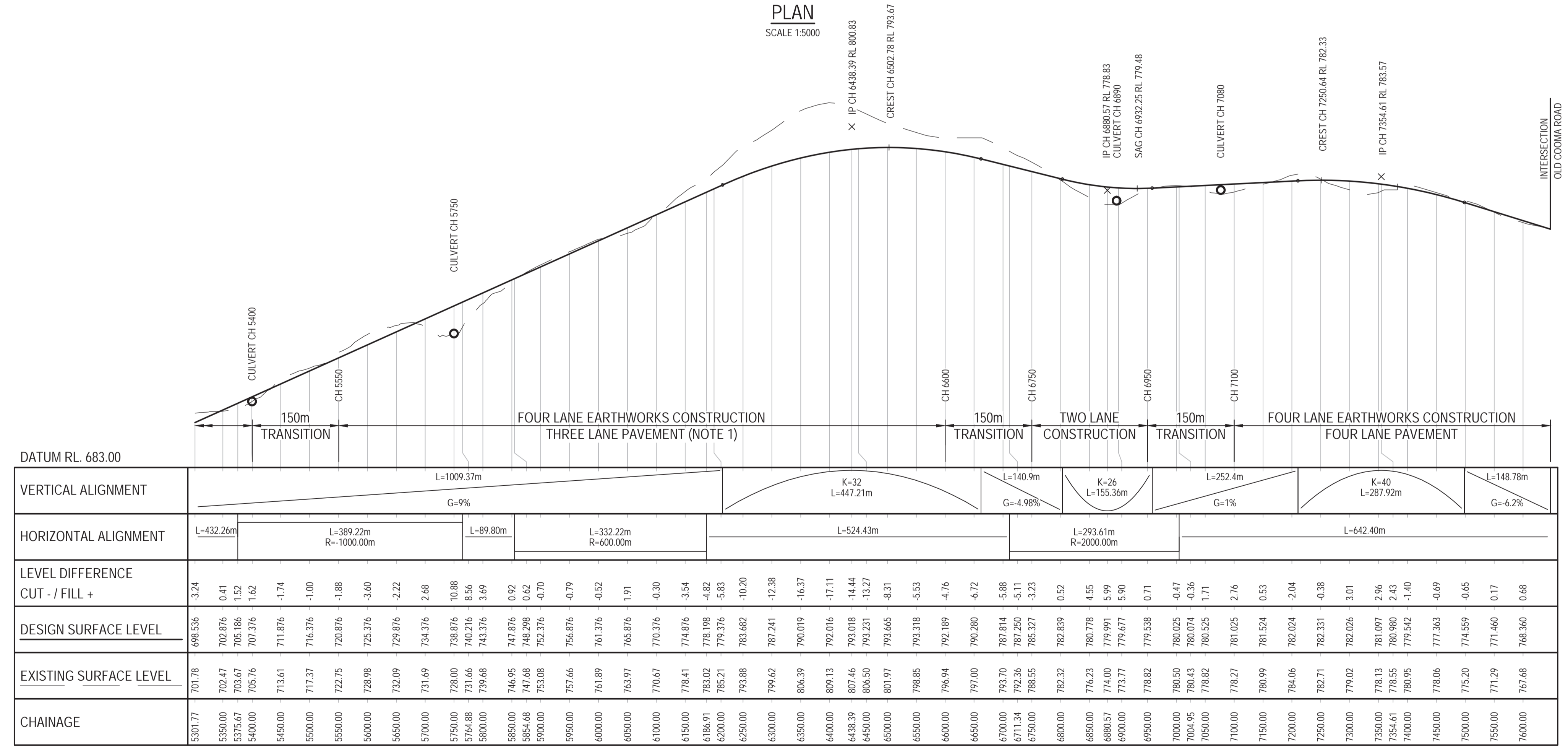
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Original Size	<b>A1</b>
Drawing No:	<b>23-15485-SK015</b>
Rev:	<b>E</b>



**LEGEND:**

- WATERWAY
- QUEANBEYAN CADASTRAL BOUNDARIES
- PROPOSED RESUMPTION BOUNDARY
- CULVERT (PLAN VIEW)
- CULVERT (SECTION VIEW)

**PLAN**  
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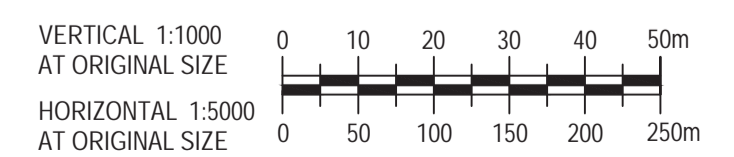


**LONGITUDINAL SECTION - OPTION 1B**  
SCALE 1:5000H, 1:1000V

**NOTE:**  
1. LANE CONFIGURATION WOULD BE TWO LANES UPHILL AND ONE LANE DOWNHILL.

**PRELIMINARY**

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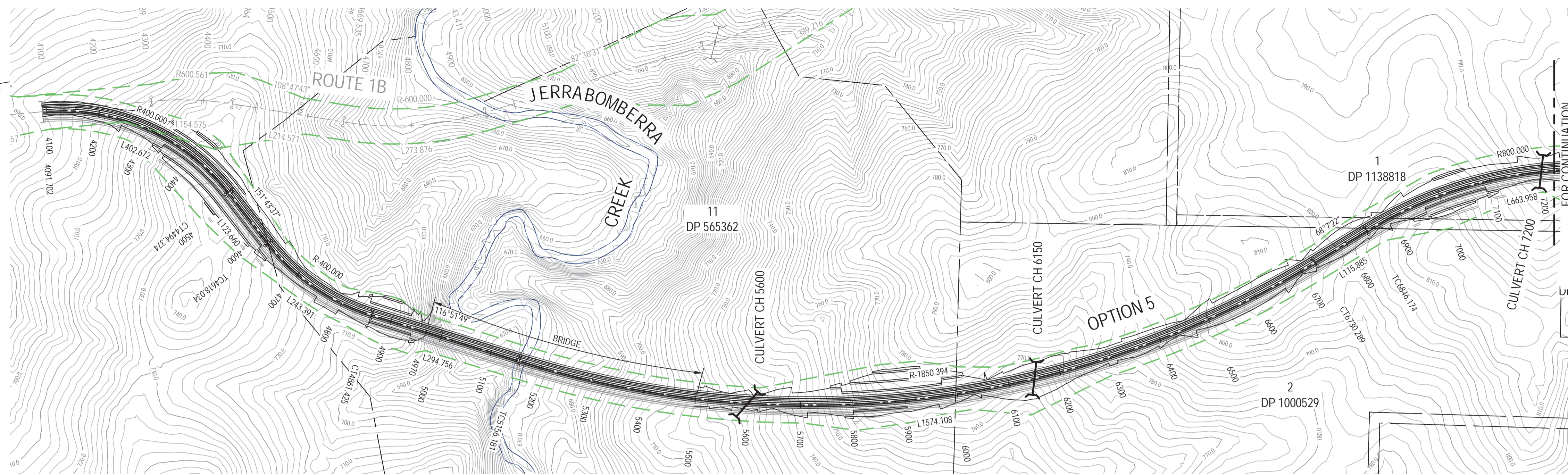
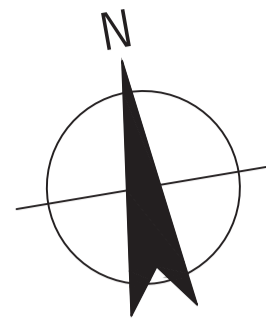
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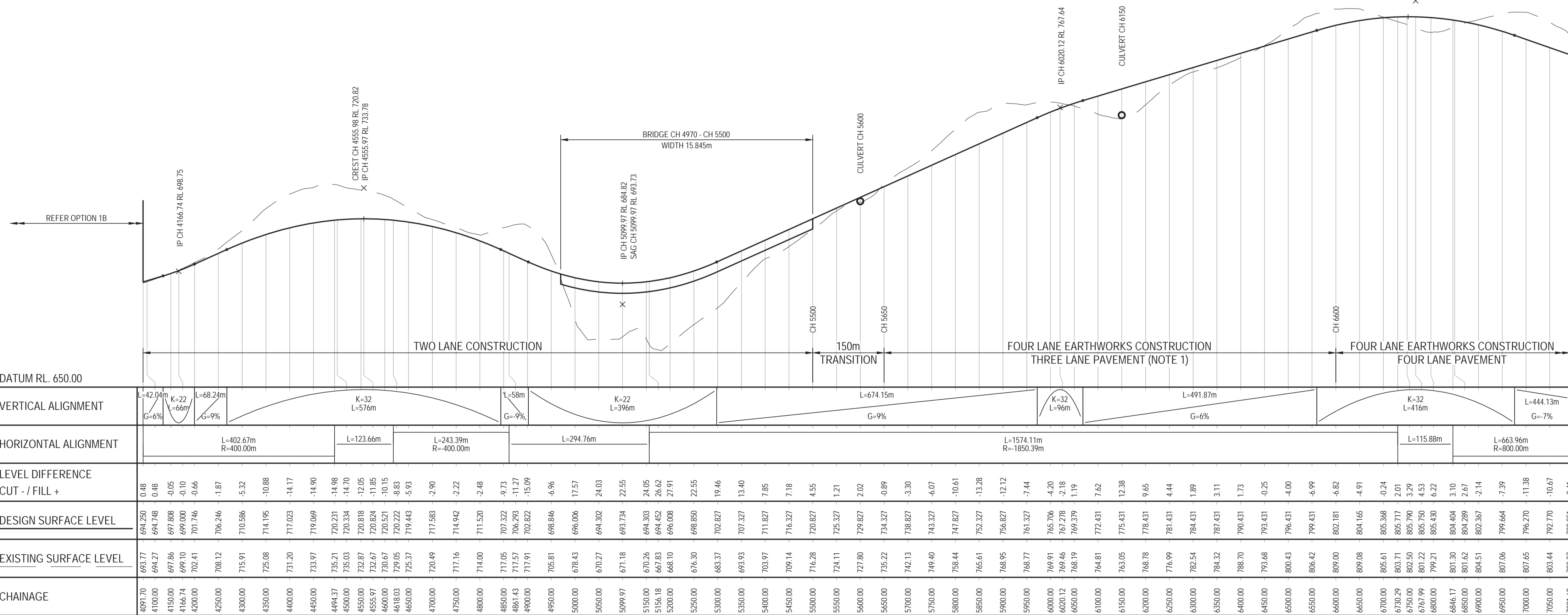
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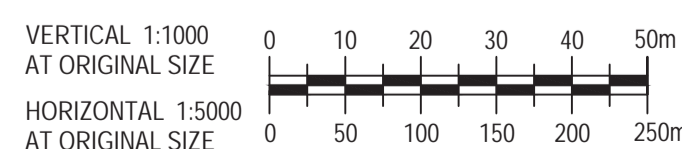
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**LONGITUDINAL SECTION - OPTION 5**  
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**NOTE:**  
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No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date



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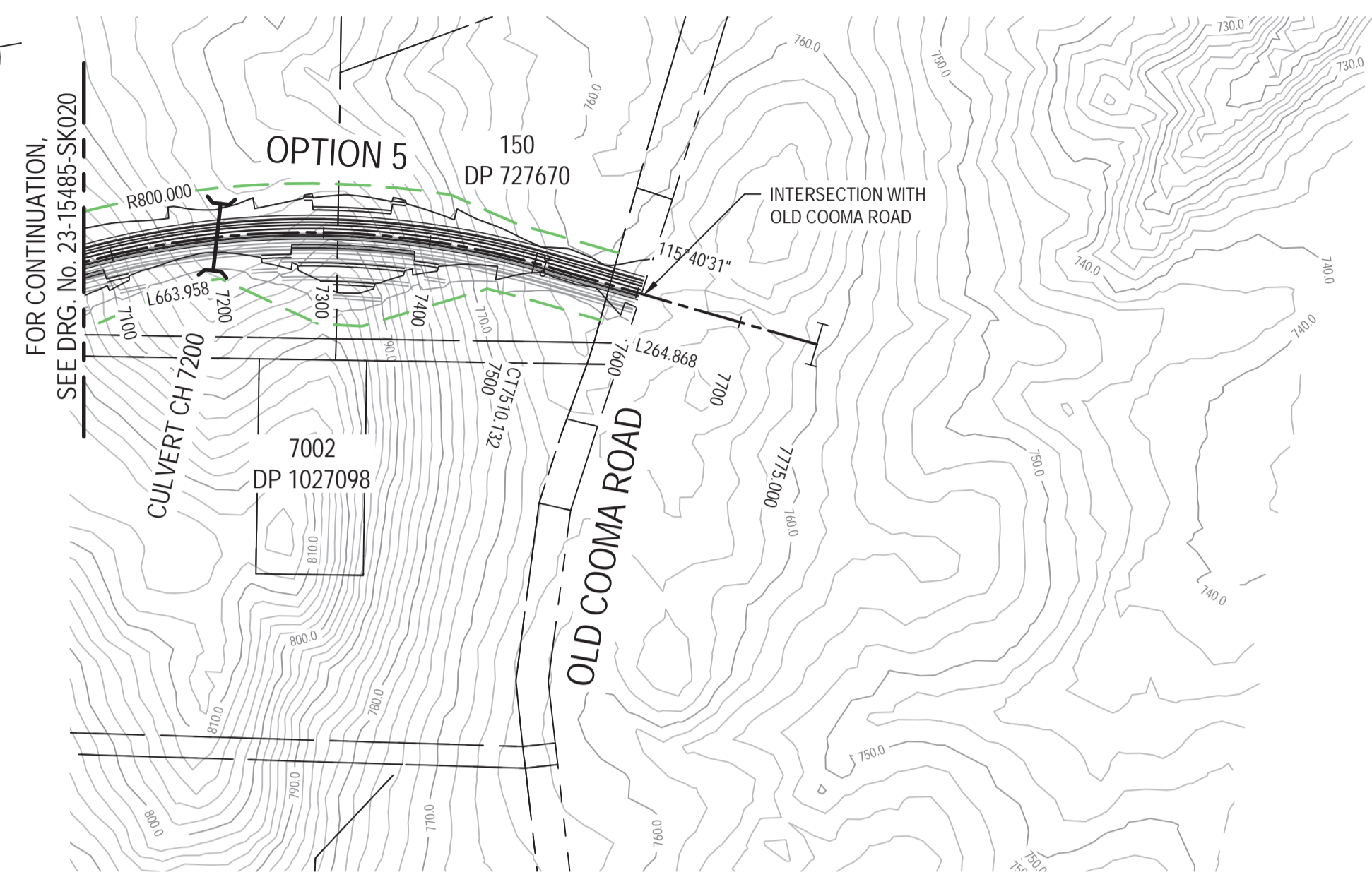
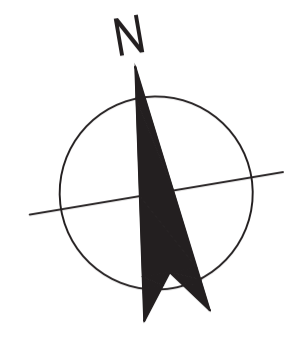
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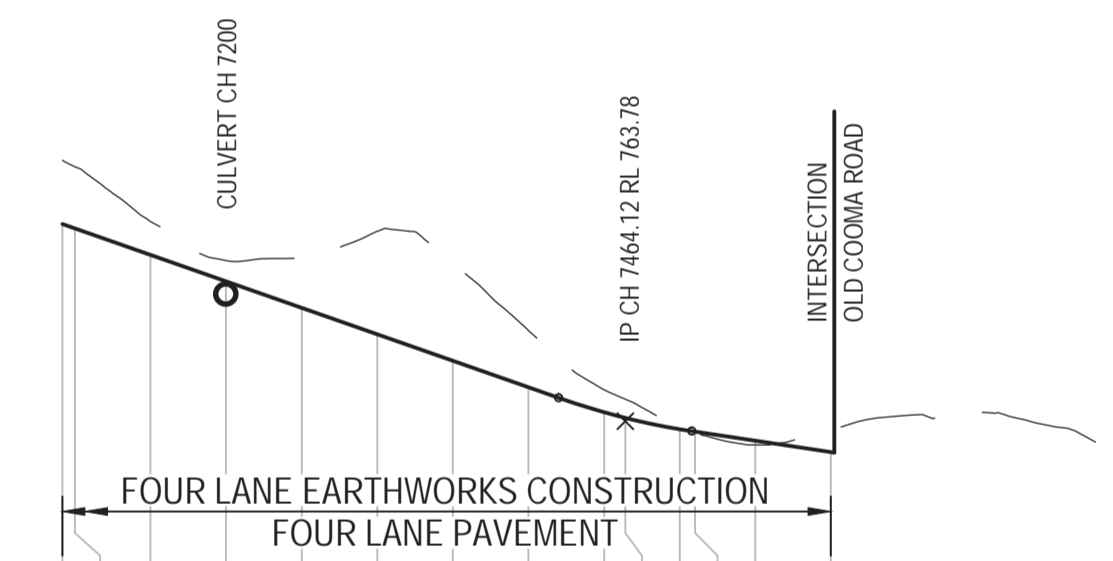
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**PLAN**  
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**LEGEND:**

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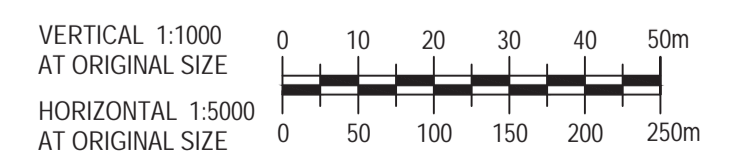


VERTICAL ALIGNMENT														
HORIZONTAL ALIGNMENT	L=663.96m R=800.00m						L=264.87m							
LEVEL DIFFERENCE CUT - / FILL +	-8.41	-8.17	-4.44	-2.76	-6.77	-13.61	-12.86	-7.51	-2.96	-2.46	-0.35	0.08	0.56	-2.90
DESIGN SURFACE LEVEL	789.851	789.270	785.770	782.270	778.770	775.270	771.770	768.270	764.972	764.221	762.720	762.401	761.205	759.705
EXISTING SURFACE LEVEL	798.27	797.44	790.21	785.03	785.54	788.88	784.63	775.78	767.93	766.68	763.07	762.32	760.64	762.60
CHAINAGE	7097.69	7100.00	7150.00	7200.00	7250.00	7300.00	7350.00	7400.00	7450.00	7464.12	7500.00	7510.13	7550.00	7600.00

**LONGITUDINAL SECTION - OPTION 5**  
SCALE 1:5000H, 1:1000V

**PRELIMINARY**

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A	PRELIMINARY ISSUE	LDS	GSP*	CW*	24.03.15	
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Rev:	<b>E</b>