Midland Highway – Symmons Plains to South of Perth

Submission to the Parliamentary Standing Committee on Public Works

Department of State Growth

Tasmania
Explore the possibilities

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Appendix A: Drawings

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1. Introduction

1.1 Background

The Midland Highway forms part of Tasmania's National Transport Network and is the major transport link between Tasmania's north and south. In May 2014, the Australian and Tasmanian Governments committed to the *Midland Highway Action Plan*, which is to provide $500 million in funding over 10 years for the upgrade of the Highway. The upgrades between Symmons Plains and south of Perth is a component of this Plan and also supports the *Midland Highway Partnership Agreement* that was developed between the Tasmanian Government and the seven Councils abutting the Midland Highway.

The Midland Highway is a gazetted high productivity (HPV) route. The highway between Symmons Plains and south of Perth is generally a two lane single carriageway with a posted speed limit of 110km/h. There is one section of dual overtaking lanes south of Woolmers Lane. The current AusRAP rating for the highway between Symmons Plains and south of Perth is predominantly one star and two star.

The existing road has deficiencies in stopping sight distance and geometric alignment for a 110km/h speed environment. The land adjacent to the highway within the project site is agricultural, used for grazing and cropping. There are currently 27 private accesses within the project site.

The upgrades to the Midland Highway between Symmons Plains and south of Perth will provide safety benefits to all road users, and will, in particular, help to reduce serious injuries and fatalities caused by head-on collisions through provision of a flexible safety barrier within a central median.

The project is now in Detailed Design Phase. Following extensive consultation with adjacent landowners, the existing road centerline has been realigned 3.0m to the east, from Chainage 9700m to Chainage 12960m. This has resulted in greater widening of the carriageway on the eastern side of the highway to avoid any impact on the Hawthorn hedgerows and Pioneer Avenue trees on the western side of the highway.

1.2 Project Objectives

The main objectives for the upgrades between Symmons Plains and south of Perth are:

- Upgrade the road to a minimum 3-Star AusRAP rating
- Reduce head-on collisions through provision of a flexible safety barrier within a central median
- Provide additional safe overtaking opportunities through a '2+1' lane arrangement
- Maintain a 110 km/h speed environment, consistent with the Tasmania standard for the National Highway
- Upgrades to the Leighlands Secondary Road and Woolmers Lane junctions
- Increased traffic flow efficiency due to the provision of two further overtaking opportunities within the project site, as detailed below in Table 1.
- Improvements to two substandard horizontal curves towards the northern end of the project; in the vicinity to Leighlands Secondary Road and Native Point, respectively
- Provision of turning facilities and safer property accesses.

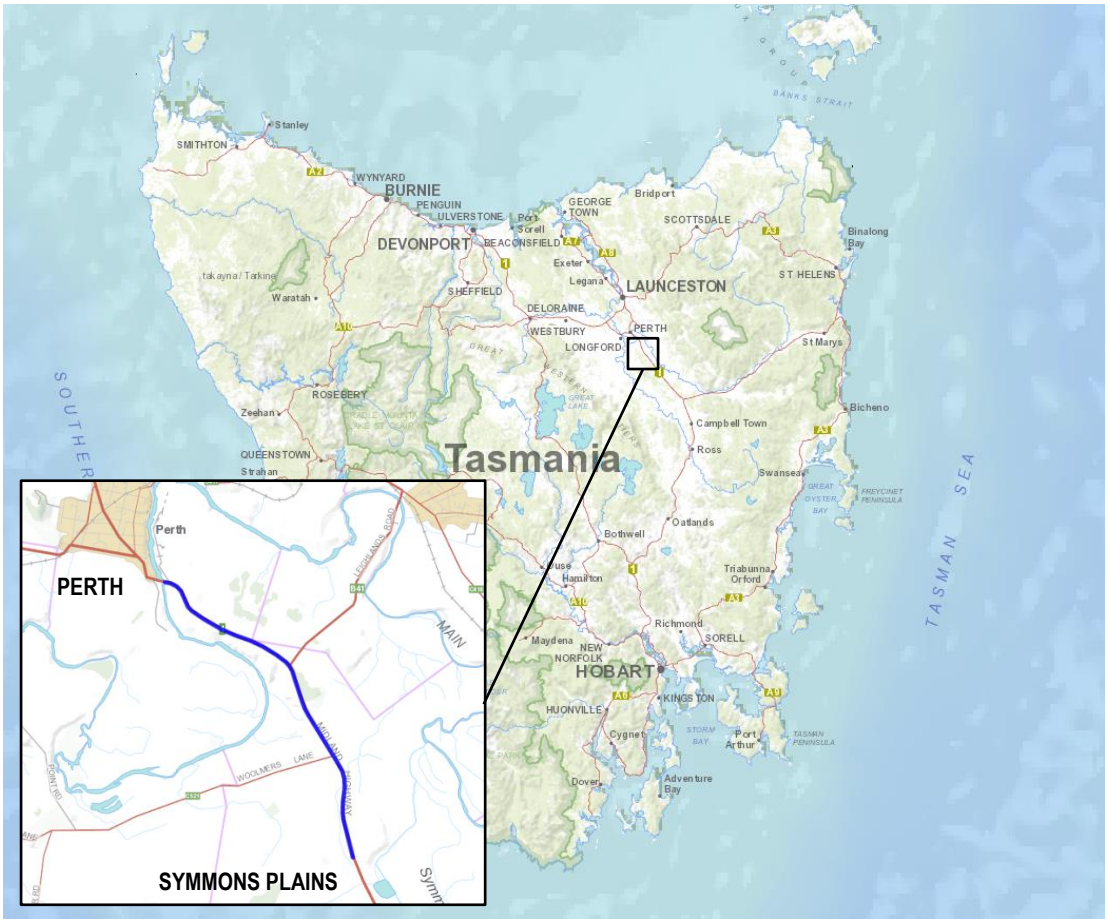
Table 1: Comparison of Existing and Proposed Overtaking opportunities

Direction	Current Overtaking Opportunities	Proposed Overtaking Opportunities
Northbound	1.35 km	3.1 km – in 2 locations
Southbound	1.35 km	3.0 km – in 2 locations

1.3 Project Location

The Project is located approximately 175km north of Hobart on the Midland Highway (A0087), from a location 3.6km north of the entrance to Symmons Plains Raceway to the bridge over the South Esk River at Perth (Department of State Growth Link 85, Chainage 6.5 (**E** 519065, **N** 5390921) to Link 90 Chainage 3.07 (**E** 515315, **N** 5396498). The Project site is designated Symmons Plains to south of Perth.

Figure 1-1 – Project Location Map



1.4 Strategic Context of the Project

1.4.1 Alignment with Approved Strategies

In May 2014, the Australian and Tasmanian Governments committed to the *Midland Highway Action Plan*, which is to provide $500 million in funding over 10 years for the upgrade of the highway. The upgrade between Symmons Plains and south of Perth is a component of this Plan and aims to improve safety to a minimum 3 Star AusRAP rating integrated with additional safe overtaking facilities, and a staged approach to capacity improvements.

1.4.2 Alignment with Planning Policies and Themes

The upgrade between Symmons Plains and south of Perth also supports the *Midland Highway Partnership Agreement 2010* that was developed between the Tasmanian Government and the seven Councils abutting the Midland Highway. Upgrading of the section of highway between Symmons Plains and south of Perth, located within the Northern Midlands Council municipality, was identified as a priority in the Agreement.

2. Project Details

2.1 Proposed Works

The scope of the Project is to improve safety and reduce head on crashes by providing a minimum AusRAP 3 star safety rating. This is to be achieved by widening the existing Midland Highway through the provision of alternating lengths of '2+1' lane arrangements between Symmons Plains and south of Perth (a distance of approximately 7.23km). The Project will also improve the horizontal and vertical alignment of the highway, facilitate safer access to adjacent land, provide turning facilities, and upgrades to the Woolmers Lane and Leighlands Secondary Road junctions.

The key outcomes of the Project are:

- Improvements to the overall capacity of the highway to cater for future traffic growth and freight movements
- Additional safe overtaking opportunities through provision of a '2+1' lane arrangement
- Head-on collisions will be reduced through provision of a flexible safety barrier within a central median
- The section of Midland Highway between Symmons Plains and South of Perth will be rated a minimum 3-Star under the AusRAP rating system

To provide sufficient turning opportunities for emergency vehicles and general traffic within the project site, breaks in the central median barrier have been provided at intersections, turn facilities and a limited number of accesses. One formal U turn facility (P-Turn) has been provided at the southern extent of the project site, just south of Woolmers Lane. Two existing G-Turns have been upgraded and one new G-Turn has been incorporated into the design to provide safer access at three significant access locations and based on the Department of State Growth's strategy for vehicle turns. All turn facilities within the project site have been designed to accommodate 26m B-Doubles.

A number of accesses along the highway will be upgraded or relocated as part of the works, with many designed as left-in / left-out arrangements accommodating 19m semi-trailers, unless otherwise specified. Nine property accesses will be closed and relocated following consultation with the property owners.

Other features within this Project's scope include upgrades to roadside drainage, pavement repairs, removal and replacement of heritage trees and hedgerows, extension of an existing stock underpass, and reinstatement of adjacent livestock lanes. The scope also includes all pre-construction activities such as the relocation of TasNetworks power poles and Telstra communication cables.

The proposed works are shown on the drawings included as Appendix A.

2.2 Design Speed

Within the project site, the highway is currently signposted at 110km/h (excluding a section at the northern extent which is posted for 80 km/h from Link 90, Ch 2.74 onwards). There are currently a number of sections where the existing highway does not meet the design guidelines for a 110km/h speed environment, for example horizontal and vertical curves which do not comply with minimum stopping sight distances and some accesses where safe intersection sight distances are not achieved. This safety upgrade will address these deficiencies.

The horizontal design speed adopted for the safety upgrades is generally 120km/h, i.e. 10km/h higher than the posted limit, except in some locations where value for money and safety benefits can be better achieved through the provision of a lower design speed. Instances where these conditions occur have been evaluated on a case-by-case basis.

The vertical alignment has been designed for 110km/h with any proposed improvements assessed against cost and safety benefits. The Preliminary Design has matched the existing road surface level (with shape correction and crown adjustment where required) in order to provide efficient use of existing pavement. The vertical alignment is compliant to 110km/h guidelines except for the northern most vertical crest which is only compliant to a 100km/h design speed. This was deemed to be acceptable given that this area is sign posted at 80km/h.

2.3 Road Cross Section

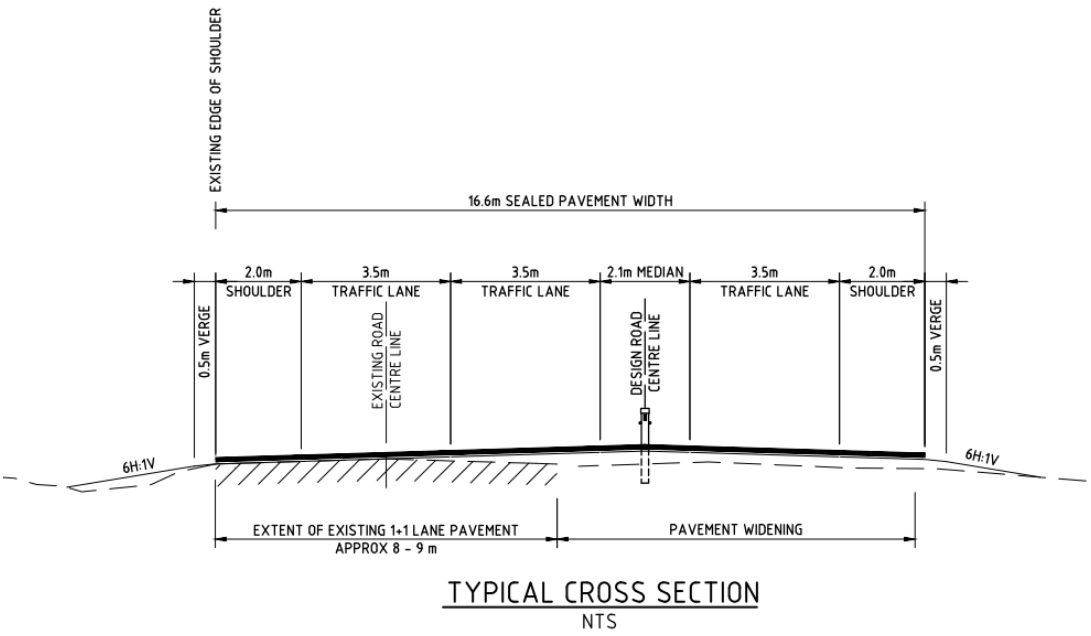
The Department of State Growth's '2+1' lane arrangement includes a flexible safety barrier within the central 2.1m median. In addition to the central median barrier, flexible safety barriers have also been provided to protect embankment batters with heights of 2.0m or greater and where flat, safe batters cannot reasonably be provided.

The upgraded highway will generally consist of the following:

- Lane widths of 3.5m
- Shoulder widths of 2.0m
- Median width of 2.1m with a flexible safety barrier located within a central median
- Verge width of 0.5m, plus widening to accommodate safety barrier

A typical cross-section of the '2+1' lane arrangement is shown in Figure 2-1 below.

Figure 2-1 – '2+1' Lane Arrangement



2.4 Drainage

Open drains have been specified as per the typical cross section for a '2+1' lane arrangement and also where required to account for both existing conditions and changes to roadside environment.

No kerb and channel is proposed to be installed along this project. Adequately sized open table drains will be constructed parallel to the new road pavement to collect existing and additional runoff generated over the widened highway sealed area.

There have been anecdotal reports of standing water accumulating adjacent to the highway at a low point on the curve south of Woolmers Lane. The culverts at this point have been observed to flow at

capacity when discharging this water, however when checked hydraulically, these were deemed to be of adequate capacity. Since the natural surface has a low-point on the eastern side of the highway in this location, it is recommended that the land owner install an overland surface drain to drain this area effectively.

Subsoil drains are anticipated to be required at a number of locations within the project and will generally be required where flow paths are able to travel through the pavement material. This will include areas where cut batters are present on both sides of the road.

It was determined that the existing culverts within the project site have sufficient hydraulic capacity to cope with a 1 in 50 year flood event and will be retained and extended as part of the works. Culvert endwalls that are situated within the proposed clear zone will be extended or upgraded with drivable endwalls if the pipe diameter is less than 450mm. Based on anecdotal evidence of flooding provided by landowners, there may be cause to clear the downstream side of some culverts where a large amount of vegetation may be prohibiting free drainage.

Where the condition of the existing culvert warrants or where extension will result in insufficient cover, a new culvert will be provided to replace the existing.

2.5 Utilities

2.5.1 Overhead Power

Overhead power lines are present along the length of the route on the western side of the alignment. In some areas the poles are located in close proximity to the proposed road. Where practical, impact on the services has been avoided however it is estimated that relocation of 52 poles is required for the proposed design.

Based on the estimated extents of acquisition, likely new fence locations and the roadside clearzone, the initial stages of the relocation procedure have been commenced with TasNetworks. Relocation works may be conducted as part of an early works contract to ensure that the process is complete prior to construction activities commencing.

2.5.2 Telecommunications Cables

Underground Telstra cables are present along the majority of the eastern side of the alignment. The cables are mainly copper however some fibre optic cable is present north of Leighlands Secondary Road. Where practical, impact on services has been avoided, however it is estimated that relocation of 7300m of cable (essentially the length of the project on the eastern side) is required due to the widening required to achieve the “2+1” cross section.

2.5.3 Sewer and Water

There are no recorded TasWater services within the project site. Some minor private irrigation infrastructure is present along the job (crossing through culverts) however it is not anticipated to be a significant consideration for construction.

3. Social, Environmental Impacts and Stakeholder Engagement

3.1 Property Acquisition

Indicative new property boundaries have been determined based on the proposed '2+1' carriageway as per advice from State Growth. New property boundaries have been placed at the limit of the road clearzone or the extent of earthworks plus 2m.

A list of properties potentially affected by the road upgrades are detailed below along with estimated extents of acquisition.

Table 3-1: Estimate Property Acquisition

Side of Road	Chainage Range	Title	Approximate Area Acquired (m^2)
PD	6500 – 7900	CT164541/1 (Elsdon)	2,578
PD	7900 – 8500	CT107739/2	470
PD	8500 – 8580	CT107739/1	1480
PD	8600 – 9900	CT136251/1 (Woodhall)	1433
PD	9900 – 11580	CT140164/1 (Leighlands)	737
PD	11580 – 13450	CT53568/1 (Native Point)	0
CD	6800 – 7900	CT103870/1	0
CD	7900 – 8200	CT107739/2	1280
CD	8200 – 8500	CT136250/1	950
CD	8500 – 9900	CT136251/1 (Woodhall)	11,451
CD	9900 – 11460	CT140164/1 (Leighlands)	21,333
CD	11460 – 13450	CT53568/1 (Native Point)	23,804
		Total	**65,516**

3.2 Noise

The majority of dwellings within the project site are on the western side of the highway. Both the Elsdon and Woodhall residences are located approximately 800m west of the existing highway alignment. Noise impacts at these properties are expected to be minimal, especially since the upgraded highway is remaining in close proximity to its existing alignment in these locations.

The Leighlands residence is approximately 170m west of the existing highway. In this location, the highway is being realigned approximately 4m further east of its current alignment. Therefore noise impacts on this property are expected to be negligible since the highway will be moving further away.

The residence on the Native Point property is 1.8km from the existing highway. Whilst the highway is moving about 10m closer to the residence, due to the large distance between the dwelling and the highway, it is unlikely that this realignment will cause noise impacts to the property.

3.3 Flora

Flora and fauna surveys for the majority of the project area have been undertaken. The project will impact one plant species listed under the *Threatened Species Protection Act 1995* (TSPA). This species (*Haloragis heterophylla* – variable raspwort) is listed as rare under the Act, and occurs over relatively small area around the project site (10 square metres), of which 1 square metre is anticipated to be impacted by the works.

As part of the Detailed Design Phase, the Department will apply for a Permit to Take from the Department of Primary Industries, Parks, Water and Environment (DPIPWE), which is likely to be straightforward and not likely to require offset.

One threatened vegetation community listed under the Tasmanian *Nature Conservation Act 2002* was identified within the Project site:

- *Eucalyptus amygdalina* inland forest and woodland on Cainozoic deposits (mapped as DAZ)

This community is mapped in the Northern Midlands Interim Planning Scheme as priority habitat overlay. Assessment against the Biodiversity Code will be included in the Development Application Report for the proposed works. Some clearing of this community is required in vicinity of Leighlands Road to facilitate curve realignment at this location. In order to reduce environmental impacts, flexible safety barrier has been provided between the highway and trees in locations where the community has been retained in proximity to the new alignment.

The project footprint avoids impacting two large *Eucalyptus amygdalina* trees, which have been assessed as potential habitat trees for the Tasmanian Masked Owl (*Tyto novaehollandiae castanops,* listed as endangered under the TSPA, and as vulnerable under the Federal *Environment Protection and Biodiversity Conservation Act 1999*).

One small area (the proposed location for a G-turn facility on Leighlands Secondary Road) has not yet been assessed, and the Department of State Growth will undertake a flora and fauna survey in September 2016, and obtain any permits or other approvals (if required), prior to construction starting.

3.4 Fauna

The majority of habitat values present are restricted to foraging values for a number of threatened fauna. Two *Eucalyptus amygdalina* (black peppermint) trees occur which have the potential to form hollows in the future and be valuable habitat for the masked owl. These trees are located 20-30m from the proposed road alignment and are not affected.

3.5 Aboriginal Heritage

Aboriginal Heritage Tasmania has advised that there are no identified Aboriginal heritage sites in or near the road reserve within the Project site from Symmons Plains to south of Perth. The study area is considered to be low sensitivity and thus there is no requirement for an Aboriginal Heritage Investigation.

3.6 Historic Heritage Assessment

3.6.1. Hawthorn Hedgerow Plantings

A total of 12 separate Hawthorn hedgerows are present within the project site and are located on both sides of the highway. These hedgerows are primarily associated with the historic properties of ‘Native Point’ and ‘Leighlands’.

The proposed design impacts approximately 140 m of the intermittent Hawthorn Hedgerows (equivalent to 3.5% of those present along the route). This mainly arises at ‘Native Point’ property,

where the existing hedgerows form a narrow road corridor which is insufficient for the new, widened road formation. The proposed alignment will mainly occur on the eastern to retain hedgerows on the western side of the highway and impact on the eastern side only.

The Department is currently developing a landscaping plan with landowners to ensure there are no unreasonable impacts to heritage values as a result of the works.

3.6.2. Pioneer Tree Plantings

Thirteen separate Pioneer tree plantings were identified on both sides of the highway varying considerably in terms of species, age and extent of plantings. These sites have been assessed to be significant on a local and State level and thus minimising impacts on the plantings due to the road upgrades is recommended where practical.

Based on the Preliminary Design, it is estimated that the proposed works will impact approximately 34 of the Pioneer Trees (equivalent to around 18% of the total number along the length of the project). This estimate has been developed on the assumption that any trees within the road clear zone will require removal. Additional flexible safety barriers have been provided, where reasonable and practicable, to minimise the number of trees impacted. Removal of any heritage trees due to the road upgrades will be offset by planting replacement trees clear of the works, in accordance with a landscaping plan being developed in consultation with landowners and relevant approval authorities.

3.6.3. Heritage Properties

The project footprint is directly adjacent to the properties of 'Woodhall' and 'Native Point', which are listed on the Northern Midlands Interim Planning Scheme 2013 and on the Tasmanian Heritage Register. The area also includes vegetation that does not have statutory protection including the Pioneer Avenue trees and hedgerows. Impact upon these properties is unavoidable due to the widening of the road formation, and the proposed works includes roadside vegetation removal on the properties of Woodhall and Native Point. The design has been refined to minimise vegetation removal, particularly on the western side of the Highway, in close consultation with affected landowners.

The Department is developing of a landscaping plan with landowners to ensure there are no unreasonable impacts to heritage values as a result of the works. A Heritage Impact Statement has found that the proposed works, subject to the implementation of a Landscape Plan (developed and implemented in accordance with the Tasmanian Heritage Council Works Guidelines 13.5), will not have an unreasonable impact on the historic cultural significance of the sites.

The Department has submitted a Development Application with Northern Midlands Council for the proposed works on the listed properties.

3.7 Landscape and Visual Impacts

As detailed in Section 3.6.2 and 3.6.3, there are a number of historic trees and plantings which require removal as part of the works since they are within the earthworks footprint or calculated clear zones. Other significant trees within the project site will be retained and protected by providing safety barrier and localised batter works as required.

Following consultation with landowners, the road centreline has been realigned 3.0m to the east so that hedgerows on the western side can be retained, with hedgerow impacts restricted to the eastern side only. In order to maintain privacy for surrounding landowners, and the visual amenity and heritage values associated with the 'corridor' of hedgerows on the approach into Perth, Pioneer Trees and hedgerows on the eastern side of the highway may be replaced with new trees based on a landscaping plan, developed in conjunction with landowners and relevant approval authorities.

3.8 Stakeholder Engagement

3.8.1 Stakeholder Response

In conjunction with the Department of State Growth, public consultation and stakeholder engagement was undertaken as part of the scoping phase. Planned stakeholder engagement activities included visits with landowners adjacent to the works. Landowners have previously been sent correspondence regarding heritage and environmental field investigations being undertaken on their land.

Initial meetings with landowners were held and their comments, feedback on Concept Design and issues were considered in the Preliminary Design. The major concern was the impact on the pioneer avenue trees and hedgerows. The revised Preliminary Design was undertaken with the road centerline realigned 3.0m to the east to retain most of the trees and all hedgerows on the western side.

Public participation will continue to be facilitated through public notices and the development and maintenance of web page content and individual meetings as required.

The project is located within the Northern Midlands Council and is subject to the provisions in the Northern Midlands Interim Planning Scheme 2013. A planning permit from the Council is required as the works will not meet the exemption for minor upgrade of road infrastructure due to threatened vegetation communities being impacted by the works.

The key stakeholders for the safety upgrades between Symmons Plains and south of Perth are:

- Land owners
- Tasmanian Farmers and Grazers Association (TFGA)
- RACT
- Department of State Growth
- Department of Primary Industry Water and Environment
- Australian Government
- Northern Midlands Council
- Public utilities
    - Tas Networks
    - Telstra
- Heavy vehicle industry
- Passenger Transport operators
- School buses

3.9 Development Approvals

The project is located within the Northern Midlands municipality. Development in this area is subject to the provisions of the *Northern Midlands interim Planning Scheme 2013*. The project area is subject to the Utilities Zone (existing road reserve for Midland Highway) and Rural Resource Zone (adjacent agricultural land).

The project is a discretionary use/development under the provision of the Planning Scheme. As part of the discretionary planning application all affected landowners have been notified of the development. The Development Application has been lodged and is being considered by the Northern Midlands Council. As the nature of the development is discretionary, the Development Application will be advertised by Council for 14 days for public comment.

4 Project Program and Costs

4.1 Project Program

The critical path for the Project is based on the delivery of detailed design and tender documentation in July 2016. Meeting these critical dates will ensure that construction works can begin in the 2016 / 2017 summer construction season. The key dates for the Project are shown in **Table 4-1** below.

Table 4-1: Critical Project Tasks and Timing

Project Task	Completion Date / Timing	Critical Path?
Submission of Project Proposal Report Development and Delivery Phase for Federal Government approval	11 April 2016	**Yes**
Development application submission	11 May 2016	**Yes**
Parliamentary Standing Committee of Public Works submission	July 2016	**No**
Tender document delivered	26 July 2016	**Yes**
Advertisement of tender	18 August 2016	**Yes**
Award of contract	October 2016	**Yes**
Commencement of works	November 2016	**Yes**
Practical completion of works	April 2018	**Yes**
Project close out	April 2019	**No**

The key assumptions of the project schedule developed for the Symmons Plains to south of Perth project include:

- The Development Application is accepted by the Northern Midlands Council without any major representations or onerous conditions imposed.
- No environmental or heritage delays impact the Project
- Property acquisition negotiations are resolved during the development phase (including any requirements agreed with landowners).

4.2 Costs

Project cost estimates have been prepared based on the Preliminary Design and also the 'Best Practice Cost Estimation Standard for Publicly Funded Road and Rail Construction.' The total project outturn cost for the proposed upgrades to the Midland Highway between Symmons Plains and South of Perth is **$16.7 million** for the P50 case and **$19.3 million** for the P90 case. The nominal escalation rate applied in the cost estimates was 3.5%, made up of a real escalation of 1%,

over and beyond a Consumer Price Index of 2.5% pa. The P50 / P90 cost estimate summaries for the project are shown in Figure 3. Full cost estimates can be found in Appendix C.

The “Escalation Rate” applied to these cost estimates is determined by the cash flow, and the assumed rate of escalation each year from the date of these estimates to one year after practical completion. The predicted project cash flows are shown in Figure 4. Escalation has been applied to costs expended after 2014/2015 in the P90 estimate.

Jacobs has exercised reasonable skill, care and diligence in the preparation of the project cost estimate. Rates have been based on previous tender rates and experience. Quantities have been derived from the designs and are subject to change as the design is refined within the Detailed Design phases. Costs are subject to change as the design is refined within the Detailed Design phases. Costs are subject to revision with further investigation and design review and development.

Figure 4-1: P50 / P90 Cost Estimate Summary

Base Estimate (Owners Cost + Construction Cost)	$ 13,988,210.75	
	P50	P90
Inherent risk allowance	$ 1,193,930	$ 2,451,369
Contingent risk allowance	$ 741,324	$ 1,965,969
Base Estimate + Contingency (Inherent + Contingent)	**$ 15,923,465**	**$ 18,405,549**
Total contingency % above base estimate	14%	32%
Escalation (Nominal - applied to base case + contingency)	**$ 752,571**	**$ 879,905**
Total Out turn	**$ 16,676,000**	**$ 19,286,000**

Total Out turn Cost	P50	P90
	$ 16,676,000	$ 19,286,000

Figure 4-2: P50 / P90 Cash Flow Summary

Overall Cash Flow

P50 Cash Flow	Financial Year 2014 / 2015	2015 / 2016	2016 / 2017	2017 / 2018
Project Identification and Scoping	$ -	$ 348,144	$ -	$ -
Project Development	$ -	$ 839,026	$ 209,756	$ -
Project Delivery (incll. CA)	$ -	$ -	$ 6,925,207	$ 5,666,078
Inherent Risk	$ -	$ -	$ 656,662	$ 537,269
Contingent Risk	$ -	$ -	$ 407,728	$ 333,596
Escalation costs (nominal)	$ -	$ -	$ 286,977	$ 465,594
Sub-Total (annual)	$ -	$ 1,187,170	$ 8,486,330	$ 7,002,536
Accumulative Total	$ -	$ 1,187,170	$ 9,673,500	$ 16,676,036

P90 Cash Flow	Financial Year 2014 / 2015	2015 / 2016	2016 / 2017	2017 / 2018
Project Identification and Scoping	$ -	$ 348,144.00	$ -	$ -
Project Development	$ -	$ 839,025.60	$ 209,756.40	$ -
Project Delivery (incll. CA)	$ -	$ -	$ 6,925,206.61	$ 5,666,078.14
Inherent Risk	$ -	$ -	$ 1,348,253.20	$ 1,103,116.26
Contingent Risk	$ -	$ -	$ 1,081,282.81	$ 884,685.94
Escalation costs (nominal)	$ -	$ -	$ 334,757.47	$ 545,147.63
Sub-Total (annual)	$ -	$ 1,187,170	$ 9,899,256	$ 8,199,028
Accumulative Total	$ -	$ 1,187,170	$ 11,086,426	$ 19,285,454

4.2 Risk Assessment

The Department of State Growth has established a Risk Assessment process which has been set up to support delivery of this project. The risk assessment includes impact, risk rating, mitigation strategies and revised risk rating, throughout the Planning, Scoping and Delivery Phases of the project. The rating system for the risk assessment is defined in Table 4-3. The risk assessment has been continually updated throughout the project lifecycle as appropriate.

Table 4-3: Risk Ratings

Risk Rating	Risk Action Levels
VH - Very High	▪ Minister/Secretary decision/direction may be required ▪ Provide memorandum to Manager Project Services ▪ Include in Project Monthly Report
H – High	▪ Take immediate action to further control the risk ▪ Include in Project Monthly Report ▪ Consider providing supplementary advice to Manager Project Services
M – Medium	▪ Proactively manage risks ▪ Report to Project Steering Committee through risk register ▪ Review for improvement opportunities
L – Low	▪ Monitor risk, reduce if practicable

The risk assessment considered the key areas such as scope, communication, design, approvals, construction and implementation. Mitigations strategies have been developed for all of the risk items identified within these general areas. At this stage the residual risk ratings for all the items are either Medium or Low. A consolidated list of the identified risk events for the project has been incorporated into the P50 / P90 cost estimates attached in Appendix C. Currently the major risks identified include:

- Tight project timeframes
- Stakeholder opposition and protracted landowner negotiations
- Discovery of an unlisted site with heritage values
- Geotechnical risks
- Delays caused by protracted service relocations

5 Conclusion

The Symmons Plains to South of Perth Safety Upgrade Project will improve the current deficiencies in safety along the Midland Highway and in particular will help to reduce head-on collisions and reduce the severity of other casualty crashes due to the installation of a central flexible safety barrier. The Project will also provide a staged approach to capacity improvements and additional safe overtaking opportunities in each direction of travel.

An analysis of the proposed design using the AusRAP star rating assessment confirmed that this upgraded section of the Midland Highway will achieve an average overall 3 star AusRAP rating which was the key project objective.

The safety upgrade forms part of the *Midland Highway Action Plan*, a 10-year, $500 million commitment made by the Australian and Tasmanian Governments in May 2014. The upgrade between Symmons Plains and south of Perth will support the following key objectives for the *Midland Highway Action Plan*:

- A 3 star safety rating along the Midland Highway
- Provision of additional safe overtaking opportunities
- Maintain a 110km/h speed environment along the Midland Highway

The Project also supports the *Midland Highway Partnership Agreement* which was developed between the Tasmanian Government and the seven Councils abutting the Midland Highway. Upgrading of the Highway between Symmons Plains and south of Perth was identified as a priority in the Agreement.

It is recommended the project be approved.

Appendix A: Drawings

MIDLAND HIGHWAY (A0087)

SYMMONS PLAINS TO SOUTH OF PERTH

PRELIMINARY DESIGN

JACOBS

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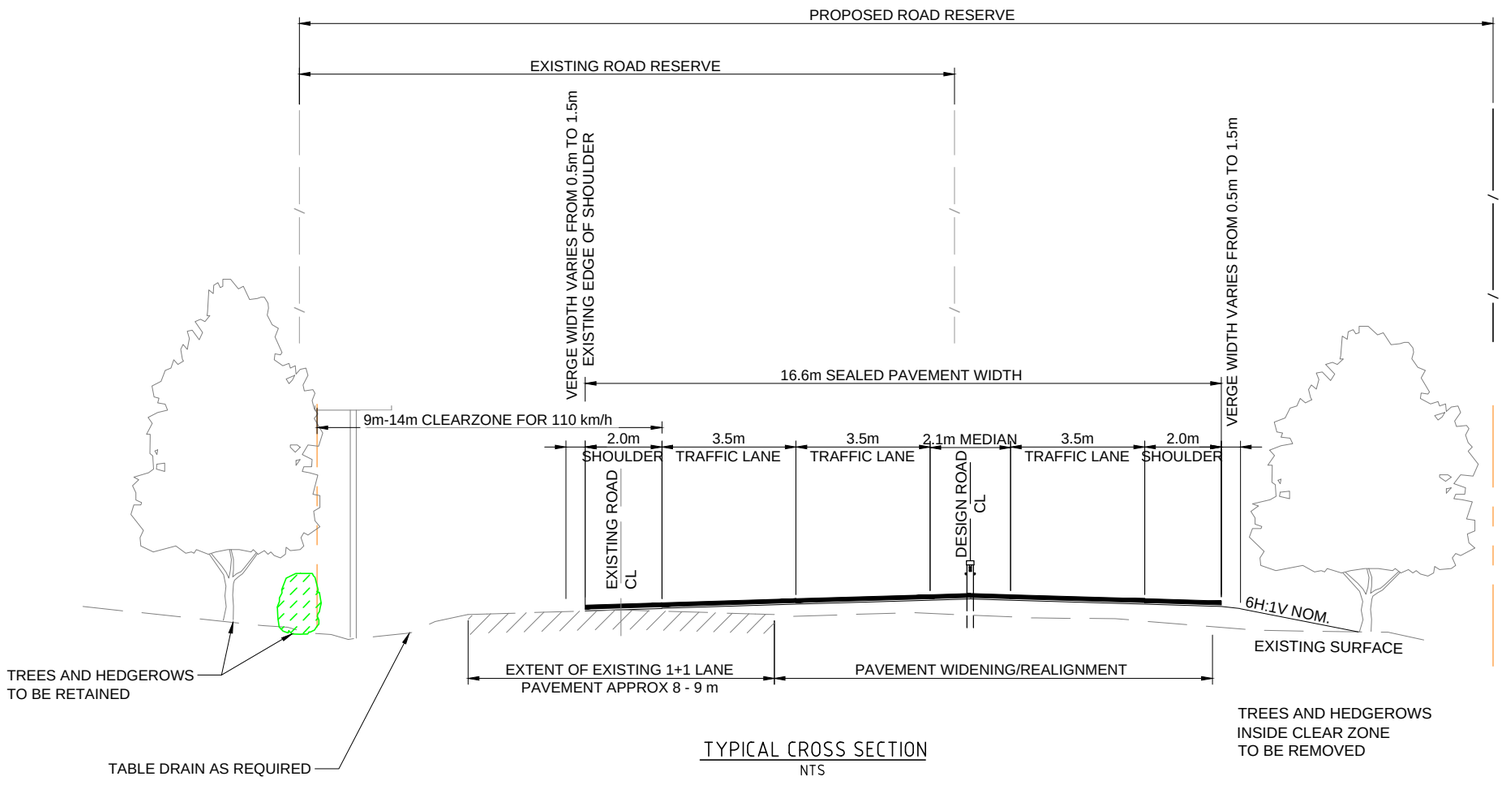
Fax: +61 3 6224 2325
Web: www.jacobsskm.com

SETOUT REVIEW NAME #### SIGNED #### DATE ####	DESIGNED NAME #### SIGNED #### DATE ####	THESE DRAWINGS HAVE BEEN CHECKED, TAKEN TO SITE AND VERIFIED THAT THEY ARE APPROPRIATE FOR SITE CONDITIONS AND CONSTRAINTS. THE DRAWINGS ARE RECOMMENDED FOR ACCEPTANCE. DESIGN MANAGER (DESIGN ORGANISATION) #### SIGNED #### DATE ####	I CERTIFY THESE DRAWINGS HAVE BEEN PREPARED IN ACCORDANCE WITH THE BRIEF AND AS DETAILED IN THE FINAL DESIGN REPORT. PRINCIPAL (DESIGN ORGANISATION) #### SIGNED #### DATE ####	Department of State Growth THESE DRAWINGS HAVE BEEN PREPARED IN ACCORDANCE WITH THE DESIGN BRIEF AND PROJECT SCOPE. THE DRAWINGS ARE RECOMMENDED FOR ACCEPTANCE. PROJECT MANAGER #### SIGNED #### DATE ####	CONTRACT No.	DRAWING S104200-0600-CR-DA-1001.dwg	PRINTED DATE 11-May-16, 4:45 PM	No. of SHEETS -
STRUCTURAL REVIEW NAME #### SIGNED #### DATE ####	DESIGN REVIEW NAME #### SIGNED #### DATE ####			ACCEPTED MANAGER #### #### SIGNED #### DATE ####	REGISTRATION NUMBER A130022.000 ROAD LINK No. START: LINK 85, CH 6.5 FINISH: LINK 90, CH 3.07		SHEET No. 000 REVISION P1

LEGEND:

- PROPOSED FLEXIBLE SAFETY BARRIER
- PROPOSED THRIE BEAM/W-BEAM SAFETY BARRIER
- PROPOSED TABLE DRAIN
- PROPOSED EARTHWORKS - FILL
- PROPOSED EARTHWORKS - CUT
- PROPOSED EDGE OF VERGE
- PROPOSED PROPERTY FENCE LINES
- 2 ACCESS CLOSED
- 5 ACCESS RETAINED

- EUCALYPTUS AMYGDALINA, HABITAT TREE
- Hh - HALORAGIS HETEROPHYLLA (R/-)
- (FPU) PLANTATIONS UNVERIFIED
- (DAZ) EUCALYPTUS AMYGDALINA INLAND FOREST AND WOODLAND ON CAINOZOIC DE
- HEDGEROWS
- PIONEER AVENUE TREES TO BE RETAINED
- PIONEER AVENUE TREES TO BE REMOVED
- TREES TO BE REMOVED



TYPICAL CROSS SECTION
NTS

WARNING
BEWARE OF UNDERGROUND SERVICES.
THE LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THE EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL SERVICES ARE SHOWN.

No.	Amendment Description	Initials	Date
1	PRELIMINARY DESIGN		23/04/2016

A3 original | This sheet may be prepared using colour and may be incomplete if copied

SCALES

Co-ordinate System: GDA/MGA 55 | Height Datum: AHD 83

JACOBS

Tasmanian Government

DESIGNED M.YOSHIDA
REVIEWED A.LOVIBOND

Department of State Growth

MIDLAND HIGHWAY (A0087)
SYMMONS PLAINS TO SOUTH OF PERTH
DEVELOPMENT APPLICATION
LEGEND AND TYPICAL SECTION

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
TBC	IS104200-0600-CR-DA-0101.dwg	11-May-16, 4:43 PM	100

REGISTRATION NUMBER
A130022.000

REVISION 1

TELSTRA TO BE RELOCATED
FOR FULL LENGTH OF PROJECT

CT164541/1
C&A PROPERTIES P/L
ELSDON

EXTEND EXISTING Ø375
BOTH SIDES

CT 6525

6300
6297
6320
6340
6360
6380
6400
6420
6440
6460
6480
6500
6520
6540
6560
6580
6600
6620
6640
6660

E(OH)

TO PERTH

MIDLAND HWY

JOINS BELOW

LIMIT OF WORKS

TIE INTO EXISTING

TO CAMPBELL TOWN

CT103994/1
P.J&N.J
CHILVERS

EXTEND EXISTING Ø375
BOTH SIDES

CT164541/1
C&A PROPERTIES P/L
ELSDON

PROPOSED P-TURN FACILITY
AND PROPERTY ACCESS
FOR B-DOUBLE
4

PROPOSED INTERNAL ACCESS
EXTENT TO BE CONFIRMED

ELSDON
ACCESS

INSTALL CULVERT Ø375
ACROSS P-TURN ACCESS

2

INSTALL Ø375 CULVERT
ACROSS HIGHWAY

TO PERTH

6660
6680
6700
6720
6740
6760
6780
6800
6820
6840
6860
6880
6900
6920
6940
6960
6980
7000
CT 7014
7020
7040

JOINS ABOVE

MIDLAND HWY

JOINS SHEET 103

3

INSTALL CULVERT Ø375
ACROSS ACCESS

REMOVE EXISTING
CULVERTS

5&6 CLOSE AND CONSTRUCT NEW ACCESS
AT CH 6880

TO CAMPBELL TOWN

CT103994/1
P.J&N.J
CHILVERS

PROPOSED INTERNAL ACCESS
EXTENT TO BE CONFIRMED

WARNING
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No.	Amendment Description	Initials	Date
1	PRELIMINARY DESIGN		23/04/2016

A3 original | This sheet may be prepared using colour and may be incomplete if copied

SCALES
0 10 20 30 40 50m
SCALE 1:1000 (A3)

Co-ordinate System: GDA/MGA 55 | Height Datum: AHD 83

JACOBS

Tasmanian Government

DESIGNED M.YOSHIDA
REVIEWED A.LOVIBOND

Department of State Growth

MIDLAND HIGHWAY (A0087)
SYMMONS PLAINS TO SOUTH OF PERTH
DEVELOPMENT APPLICATION
SHEET 1

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
TBC	IS104200-0600-CR-DA-0101.dwg	11-May-16, 4:43 PM	101

REGISTRATION NUMBER
A130022.000

REVISION 1

TELSTRA TO BE RELOCATED
FOR FULL LENGTH OF PROJECT

EXTEND EXISTING Ø450
BOTH SIDES

7 CLOSE AND CONNECT TO NEW
INTERNAL ACCESS
PARALLEL TO HIGHWAY

CT164541/1
C&A PROPERTIES P/L
ELSDON

8 CLOSE AND CONNECT TO NEW
INTERNAL ACCESS
PARALLEL TO HIGHWAY

CT103994/1
P.J&N.J
CHILVERS

MIDLAND HWY

TO PERTH

TO CAMPBELL TOWN

JOINS SHEET 101

JOINS SHEET 103

CT164541/1
C&A PROPERTIES P/L
ELSDON

EXTEND EXISTING Ø450
BOTH SIDES

CT103994/1
P.J&N.J
CHILVERS

MIDLAND HWY

TO PERTH

TO CAMPBELL TOWN

JOINS SHEET 101

JOINS SHEET 103

WARNING
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SCALE 1:1000 (A3)

Co-ordinate System: GDA/MGA 55 | Height Datum: AHD 83

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Tasmanian Government

DESIGNED M.YOSHIDA
REVIEWED A.LOVIBOND

Department of State Growth

MIDLAND HIGHWAY (A0087)
SYMMONS PLAINS TO SOUTH OF PERTH
DEVELOPMENT APPLICATION
SHEET 2

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
TBC	IS104200-0600-CR-DA-0101.dwg	11-May-16, 4:44 PM	102

REGISTRATION NUMBER
A130022.000

REVISION 1

TELSTRA TO BE RELOCATED
FOR FULL LENGTH OF PROJECT

POWER POLES INSIDE
THE CLEAR ZONE
TO BE RELOCATED CH
7780 TO 7980

CT107739/2
ANNE YOUL

LEFT IN / LEFT OUT 9

INSTALL CULVERT Ø375
ACROSS ACCESS

JOINS SHEET 102

TO CAMPBELL TOWN

MIDLAND HWY

TO PERTH

JOINS BELOW

INSTALL CULVERT Ø375
ACROSS ACCESS

LEFT IN / LEFT OUT 11

EXTEND EXISTING
2xØ750 AND Ø600 BOTH
SIDES

CT107739/2
ANNE YOUL

JOINS ABOVE

TO CAMPBELL TOWN

MIDLAND HWY

TO PERTH

JOINS SHEET 104

CT107739/2
ANNE YOUL

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Co-ordinate System: GDA/MGA 55 | Height Datum: AHD 83

JACOBS

Tasmanian Government

DESIGNED M.YOSHIDA
REVIEWED A.LOVIBOND

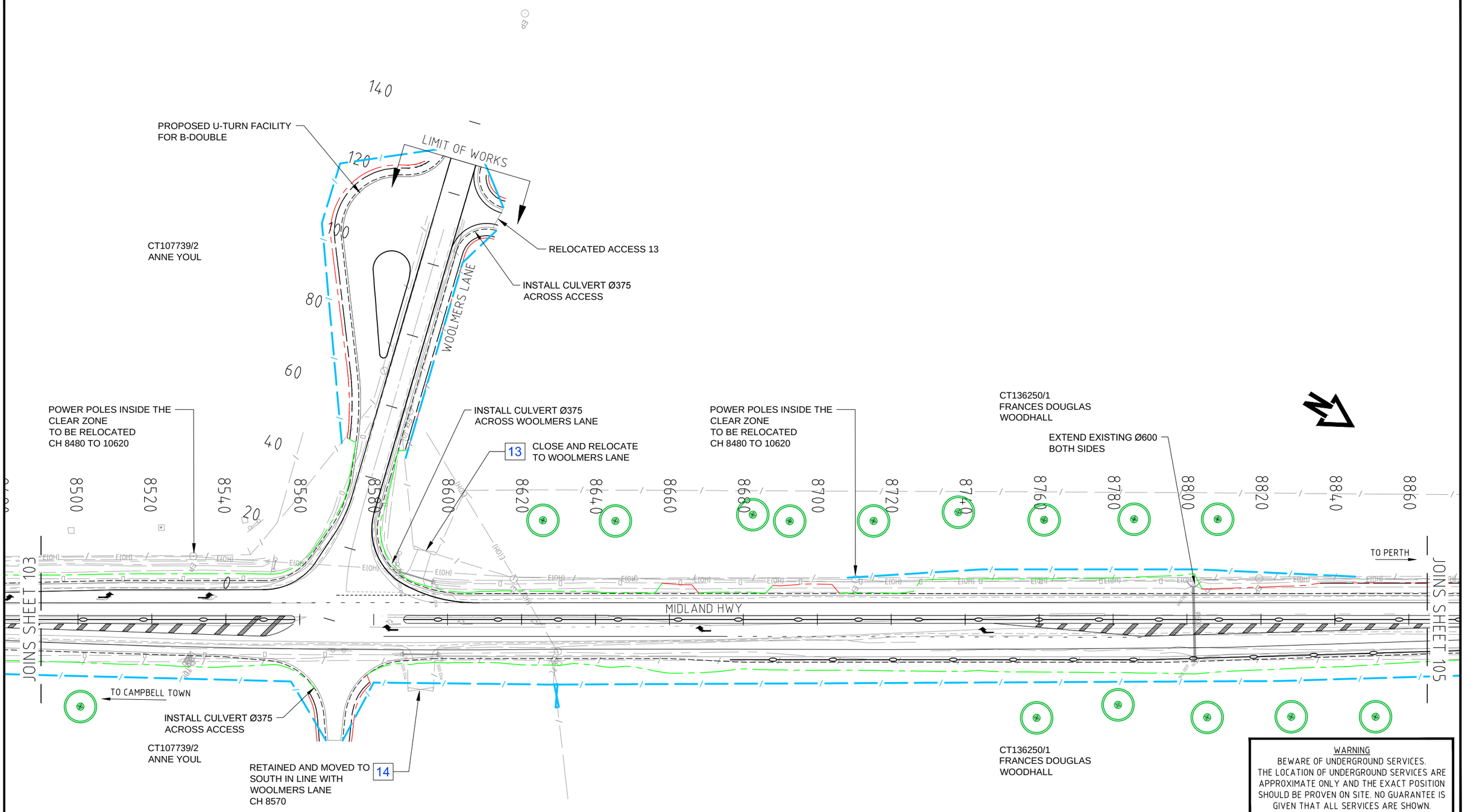
Department of State Growth
MIDLAND HIGHWAY (A0087)
SYMMONS PLAINS TO SOUTH OF PERTH
DEVELOPMENT APPLICATION
SHEET 3

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
TBC	IS104200-0600-CR-DA-0101.dwg	11-May-16, 4:46 PM	103

REGISTRATION NUMBER
A130022.000

REVISION 1

TELSTRA TO BE RELOCATED
FOR FULL LENGTH OF PROJECT



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SCALES
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SCALE 1:1000 (A3)

Co-ordinate System: GDA/MGA 55 Height Datum: AHD 83

JACOBS

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DESIGNED M.YOSHIDA
REVIEWED A.LOVIBOND

Department of State Growth
MIDLAND HIGHWAY (A0087)
SYMMONS PLAINS TO SOUTH OF PERTH
DEVELOPMENT APPLICATION
SHEET 4

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
TBC	IS104200-0600-CR-DA-0101.dwg	11-May-16, 4:46 PM	104

REGISTRATION NUMBER
A130022.000

REVISION 1

TELSTRA TO BE RELOCATED
FOR FULL LENGTH OF PROJECT

CT136250/1
FRANCES DOUGLAS
WOODHALL

POWER POLES INSIDE
THE CLEAR ZONE
TO BE RELOCATED
CH 8480 TO 10620

EXTEND EXISTING Ø375
BOTH SIDES

8860 8880 8900 8920 8940 8960 8980 9000 9020 9040 9060 9080 9100 9120 9140 9160 9180 9200 9220 9240

JOINS SHEET 104

TO CAMPBELL TOWN

MIDLAND HWY

TO PERTH

JOINS BELOW

CT136250/1
FRANCES DOUGLAS
WOODHALL

CT136250/1
FRANCES DOUGLAS
WOODHALL

POWER POLES INSIDE
THE CLEAR ZONE
TO BE RELOCATED
CH 8480 TO 10620

9240 9260 9280 9300 9320 9340 9360 9380 9400 9420 9440 9460 9480 9500 9520 9540 9542 9560 9580 9600

JOINS ABOVE

TO CAMPBELL TOWN

MIDLAND HWY

TO PERTH

JOINS SHEET 106

EXTEND EXISTING Ø375
BOTH SIDES

CT136250/1
FRANCES DOUGLAS
WOODHALL

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No.	Amendment Description	Initials	Date
1	PRELIMINARY DESIGN		23/04/2016

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SCALES
0 10 20 30 40 50m
SCALE 1:1000 (A3)

Co-ordinate System: GDA/MGA 55 | Height Datum: AHD 83

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DESIGNED M.YOSHIDA
REVIEWED A.LOVIBOND

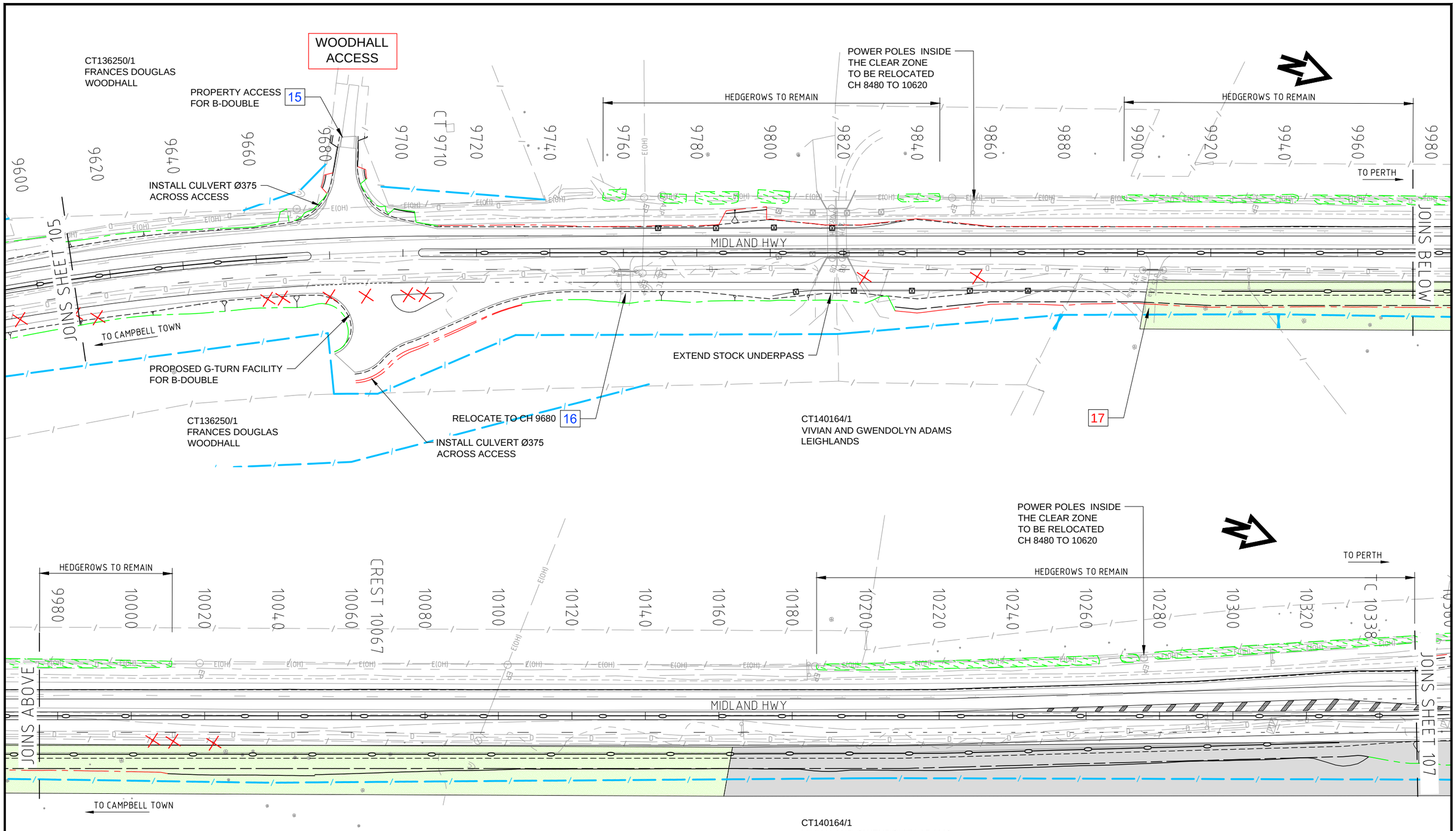
Department of State Growth

MIDLAND HIGHWAY (A0087)
SYMMONS PLAINS TO SOUTH OF PERTH
DEVELOPMENT APPLICATION
SHEET 5

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
TBC	IS104200-0600-CR-DA-0101.dwg	11-May-16, 4:47 PM	105

REGISTRATION NUMBER
A130022.000

REVISION 1



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No.	Amendment Description	Initials	Date
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SCALE 1:1000 (A3)

Co-ordinate System: GDA/MGA 55 | Height Datum: AHD 83

JACOBS | Tasmanian Government

DESIGNED M.YOSHIDA
REVIEWED A.LOVIBOND

Department of State Growth

MIDLAND HIGHWAY (A0087)
SYMMONS PLAINS TO SOUTH OF PERTH
DEVELOPMENT APPLICATION
SHEET 6

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
TBC	IS104200-0600-CR-DA-0101.dwg	11-May-16, 4:47 PM	106

REGISTRATION NUMBER
A130022.000

REVISION 1

LEIGHLANDS ACCESS

HEDGEROWS TO REMAIN

CT7157/1
GWENDOLYN ADAMS
LEIGHLANDS HOUSE

EXTEND EXISTING Ø300
BOTH SIDES

18 LEIGHLANDS ENTRANCE

POWER POLES INSIDE
THE CLEAR ZONE
TO BE RELOCATED
CH 8480 TO 10620

HEDGEROWS TO BE REMOVED
WHERE < 2m FROM LIMIT OF
EARTHWORKS. CH 10608 TO
10632

HEDGEROWS TO REMAIN

POWER POLES TO REMAIN
CH 10620 TO 12620

TO PERTH

JOINS SHEET 106

JOINS SHEET 108

MIDLAND HWY

TO CAMPBELL TOWN

20&21
REALIGN ACCESS

CT140164/1
VIVIAN AND GWENDOLYN ADAMS
LEIGHLANDS

PROPOSED G-TURN FOR
LEIGHLANDS ACCESS

INSTALL Ø375 CULVERT
ACROSS ACCESS

EXTEND EXISTING Ø375
RHS

INSTALL STREET LIGHTING
NEAR INTERSECTION

INSTALL CENTRAL ISLAND

EXTEND EXISTING Ø450
RHS

INSTALL STREET LIGHTING
NEAR INTERSECTION

INSTALL Ø375 CULVERT
ACROSS ACCESS

100 ACCESS TO BE RELOCATED
TO NEW G-TURN ON LEIGHLANDS RD
AT CH 130

LEIGHLANDS ROAD

PROPOSED G-TURN FACILITY
AND ACCESS FOR B-DOUBLE

TIE INTO EXISTING

LIMIT OF WORKS

TELSTRA TO BE RELOCATED
FOR FULL LENGTH OF PROJECT

WARNING
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No.	Amendment Description	Initials	Date
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SCALES
0 10 20 30 40 50m
SCALE 1:1000 (A3)

Co-ordinate System: GDA/MGA 55 | Height Datum: AHD 83

JACOBS | Tasmanian Government

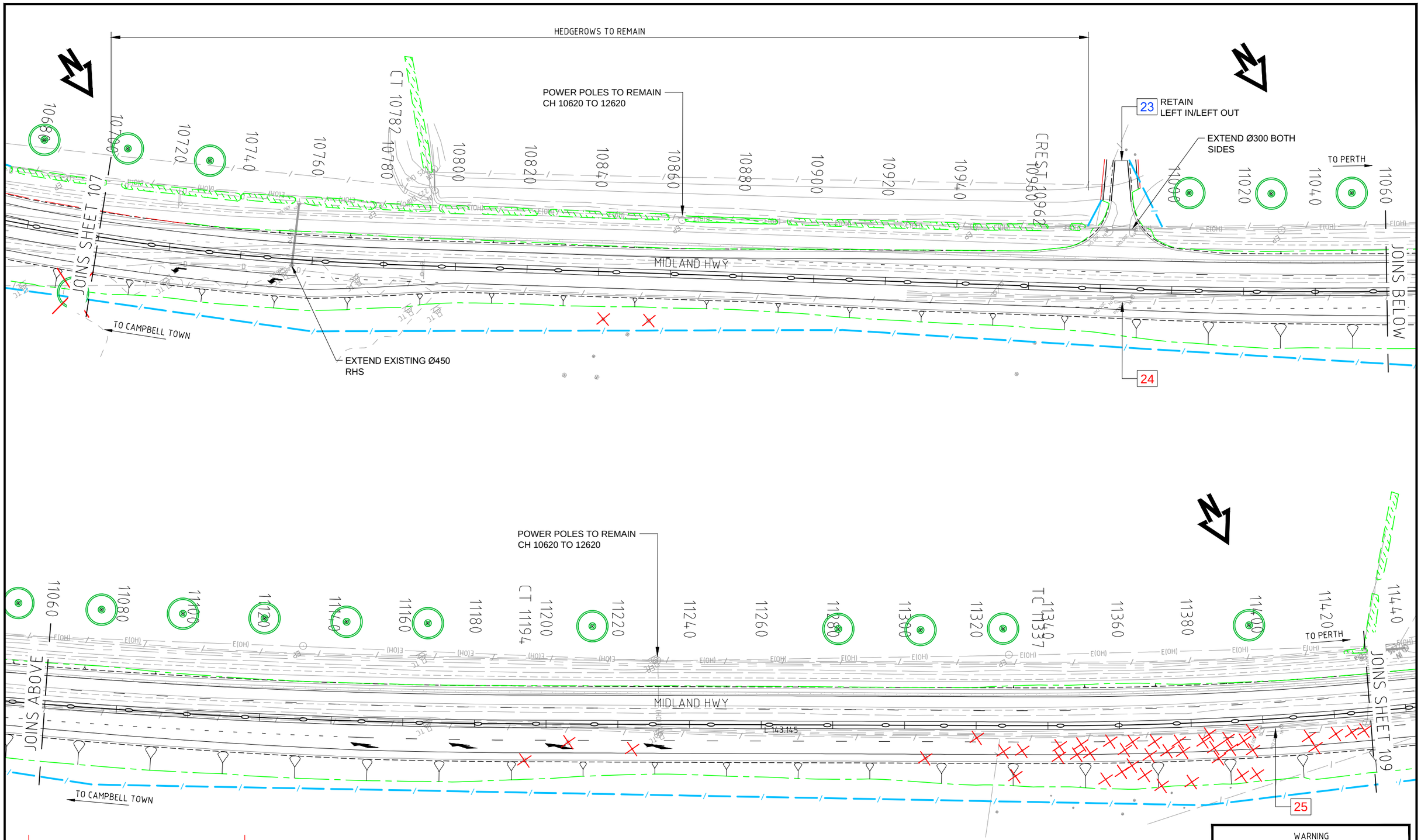
DESIGNED M.YOSHIDA
REVIEWED A.LOVIBOND

Department of State Growth
MIDLAND HIGHWAY (A0087)
SYMMONS PLAINS TO SOUTH OF PERTH
DEVELOPMENT APPLICATION
SHEET 7

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
TBC	IS104200-0600-CR-DA-0101.dwg	11-May-16, 4:48 PM	107

REGISTRATION NUMBER
A130022.000

REVISION 1



TELSTRA TO BE RELOCATED
FOR FULL LENGTH OF PROJECT

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SCALES
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Co-ordinate System: GDA/MGA 55 | Height Datum: AHD 83

JACOBS | Tasmanian Government

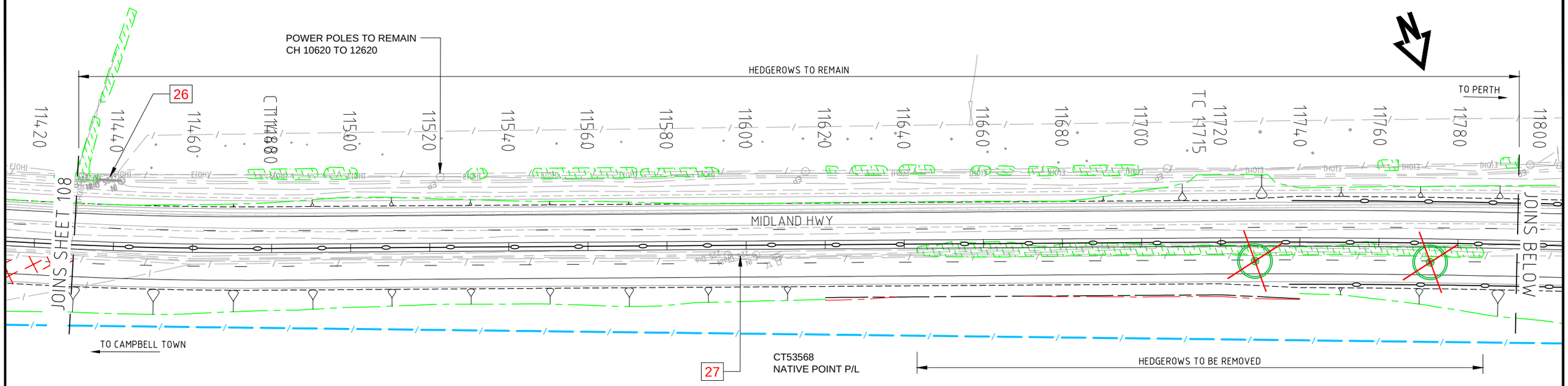
DESIGNED M.YOSHIDA
REVIEWED A.LOVIBOND

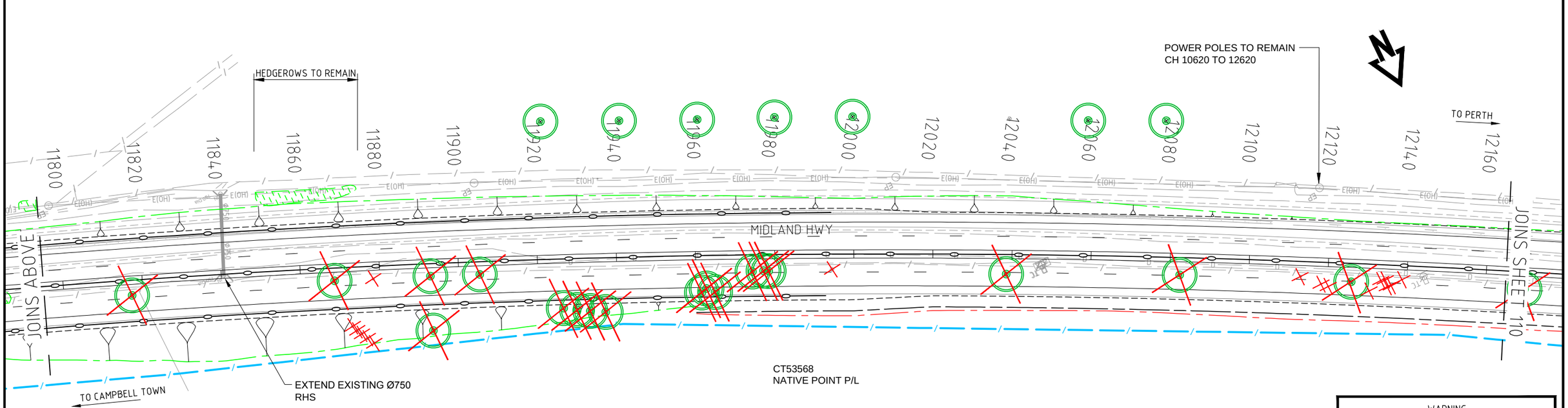
Department of State Growth
MIDLAND HIGHWAY (A0087)
SYMMONS PLAINS TO SOUTH OF PERTH
DEVELOPMENT APPLICATION
SHEET 8

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
TBC	IS104200-0600-CR-DA-0101.dwg	11-May-16, 4:48 PM	108

REGISTRATION NUMBER
A130022.000

REVISION 1





TELSTRA TO BE RELOCATED
FOR FULL LENGTH OF PROJECT

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No.	Amendment Description	Initials	Date
1	PRELIMINARY DESIGN		23/04/2016

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SCALES
0 10 20 30 40 50m
SCALE 1:1000 (A3)

Co-ordinate System: GDA/MGA 55 | Height Datum: AHD 83

JACOBS

Tasmanian Government

DESIGNED M.YOSHIDA
REVIEWED A.LOVIBOND

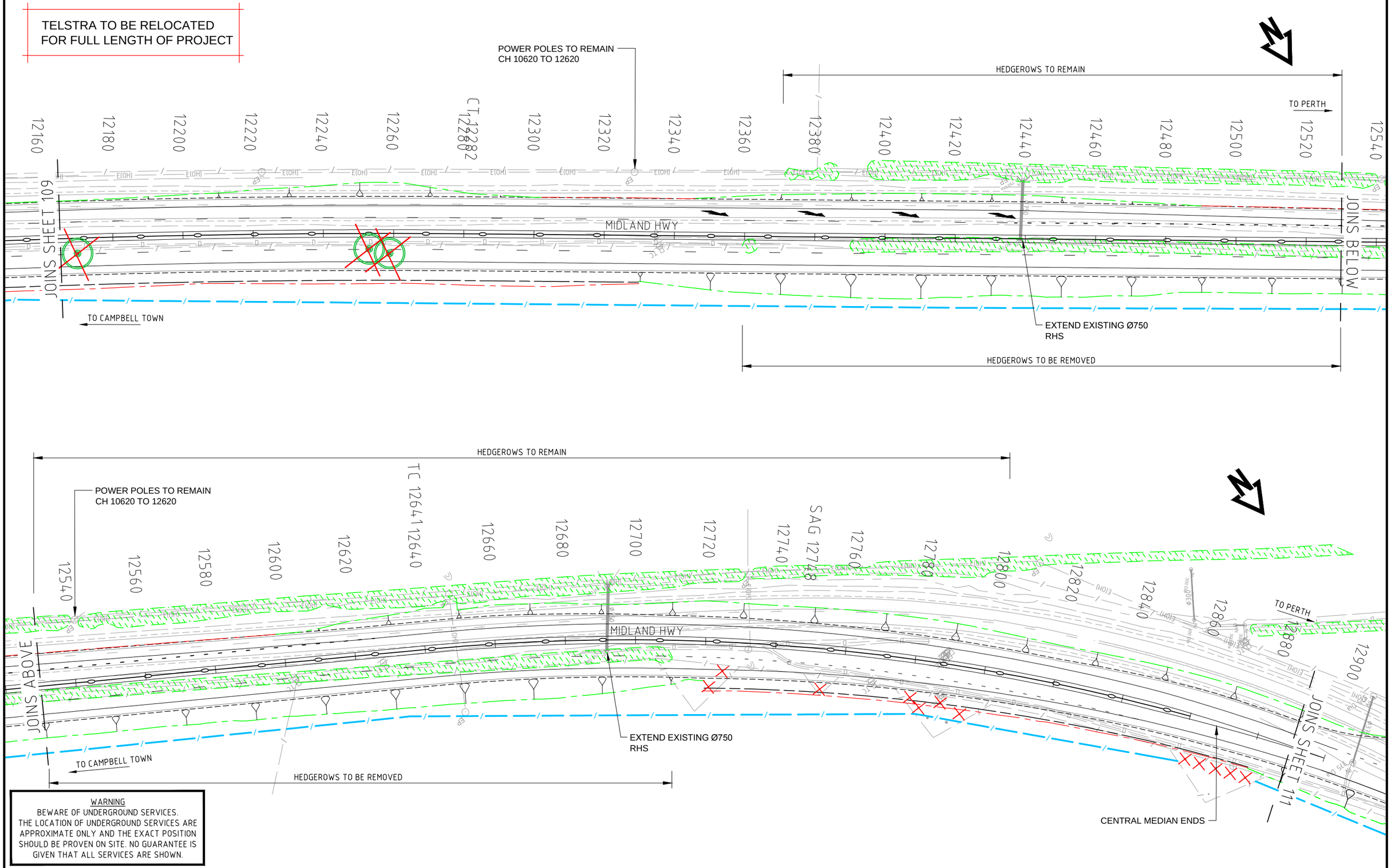
Department of State Growth
MIDLAND HIGHWAY (A0087)
SYMMONS PLAINS TO SOUTH OF PERTH
DEVELOPMENT APPLICATION
SHEET 9

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
TBC	IS104200-0600-CR-DA-0101.dwg	11-May-16, 4:48 PM	109

REGISTRATION NUMBER
A130022.000

REVISION 1

TELSTRA TO BE RELOCATED
FOR FULL LENGTH OF PROJECT



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Co-ordinate System: GDA/MGA 55 | Height Datum: AHD 83

JACOBS | Tasmanian Government

DESIGNED M.YOSHIDA
REVIEWED A.LOVIBOND

Department of State Growth

MIDLAND HIGHWAY (A0087)
SYMMONS PLAINS TO SOUTH OF PERTH
DEVELOPMENT APPLICATION
SHEET 10

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
TBC	IS104200-0600-CR-DA-0101.dwg	11-May-16, 4:49 PM	110

REGISTRATION NUMBER
A130022.000

REVISION 1

TELSTRA TO BE RELOCATED
FOR FULL LENGTH OF PROJECT

INSTALL Ø375 CULVERT
ACROSS ACCESS

30 PROPOSED G-TURN FACILITY
AND PROPERTY ACCESS

POWER POLES
INSIDE THE CLEAR ZONE
TO BE RELOCATED
CH 12620 TO 13100

TO PERTH

JOINS BELOW

MIDLAND HWY

JOINS SHEET 110

TO CAMPBELL TOWN

EXTEND EXISTING Ø375
RHS

29

NATIVE POINT
ACCESS

EXTEND EXISTING Ø375
RHS

INSTALL Ø375 CULVERT
ACROSS ACCESS

EXTEND EXISTING Ø375
BOTH SIDES

RETAIN EXISTING BRIDGE
AND GUARD RAIL

TO PERTH

LIMIT OF WORKS

JOINS ABOVE

TO CAMPBELL TOWN

EXTEND EXISTING Ø600
LHS

MIDLAND HWY

TIE INTO EXISTING

EXTEND EXISTING Ø375
RHS

RETAIN EXISTING
STOCK UNDERPASS

31

WARNING
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Co-ordinate System: GDA/MGA 55 | Height Datum: AHD 83

JACOBS | Tasmanian Government

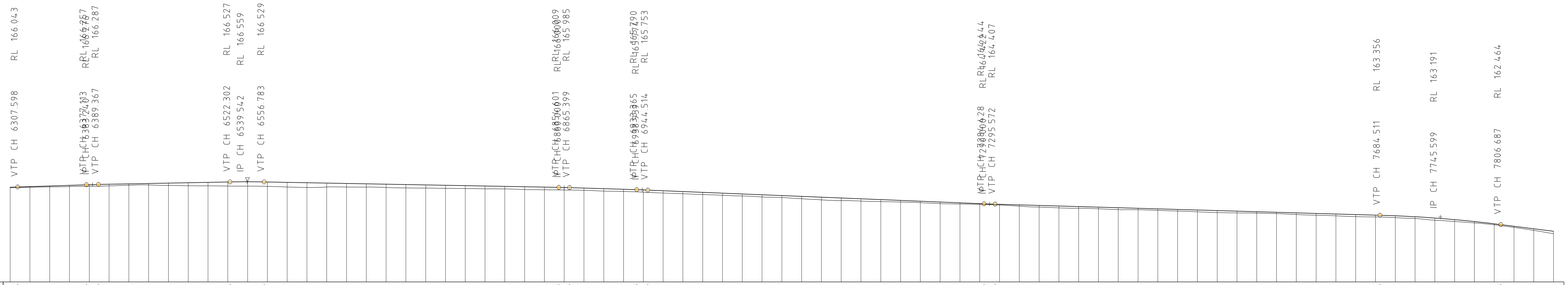
DESIGNED M.YOSHIDA
REVIEWED A.LOVIBOND

Department of State Growth
MIDLAND HIGHWAY (A0087)
SYMMONS PLAINS TO SOUTH OF PERTH
DEVELOPMENT APPLICATION
SHEET 11

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
TBC	IS104200-0600-CR-DA-0101.dwg	11-May-16, 4:49 PM	111

REGISTRATION NUMBER
A130022.000

REVISION 1



DATUM RL 157.0

VERTICAL DATA
L=28.81 R=8400
0.31%
L=12.25 R=9700
0.18%
L=34.48 R=9700
-0.17%
L=10.8 R=9700
-0.29%
L=11.15 R=11200
-0.39%
L=11.14 R=9700
-0.27%
L=122.18 R=13300
-1.19%

DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL	CHAINAGE
166.023	165.985	6300.000
166.081	166.024	6320.000
166.143	166.057	6340.000
166.204	166.090	6360.000
166.265	166.119	6380.000
166.306	166.151	6400.000
166.342	166.216	6420.000
166.378	166.241	6440.000
166.415	166.196	6460.000
166.451	166.167	6480.000
166.487	166.156	6500.000
166.523	166.136	6520.000
166.543	166.130	6540.000
166.523	166.103	6560.000
166.488	166.050	6580.000
166.453	166.001	6600.000
166.418	166.044	6620.000
166.384	166.044	6640.000
166.349	166.041	6660.000
166.314	166.000	6680.000
166.279	165.957	6700.000
166.244	165.943	6720.000
166.209	165.921	6740.000
166.174	165.898	6760.000
166.139	165.876	6780.000
166.105	165.861	6800.000
166.070	165.802	6820.000
166.035	165.783	6840.000
165.998	165.761	6860.000
165.943	165.728	6880.000
165.886	165.660	6900.000
165.829	165.621	6920.000
165.770	165.555	6940.000
165.693	165.474	6960.000
165.616	165.402	6980.000
165.539	165.325	7000.000
165.462	165.257	7020.000
165.385	165.192	7040.000
165.308	165.099	7060.000
165.231	165.040	7080.000
165.154	164.925	7100.000
165.077	164.819	7120.000
165.000	164.752	7140.000
164.923	164.709	7160.000
164.846	164.653	7180.000
164.769	164.616	7200.000
164.692	164.553	7220.000
164.615	164.466	7240.000
164.538	164.426	7260.000
164.461	164.399	7280.000
164.395	164.330	7300.000
164.341	164.220	7320.000
164.287	164.132	7340.000
164.233	164.059	7360.000
164.179	164.016	7380.000
164.125	163.972	7400.000
164.071	163.891	7420.000
164.017	163.883	7440.000
163.963	163.819	7460.000
163.909	163.759	7480.000
163.855	163.685	7500.000
163.800	163.610	7520.000
163.746	163.580	7540.000
163.692	163.556	7560.000
163.638	163.510	7580.000
163.584	163.425	7600.000
163.530	163.360	7620.000
163.476	163.298	7640.000
163.422	163.224	7660.000
163.368	163.197	7680.000
163.305	163.125	7700.000
163.212	163.040	7720.000
163.090	162.887	7740.000
162.937	162.761	7760.000
162.755	162.628	7780.000
162.542	162.445	7800.000
162.306	162.198	7820.000
162.068	161.916	7840.000
161.830	161.603	7860.000

HORIZONTAL DATA
R1000m
R2200m
R1100m

SUPERELEVATION
LHS and RHS -3.0%
LHS5%
LHS4%
RHS-5%
RHS-5%
RHS-3%
LHS and RHS -2.8%
LHS3%
LHS3%
LHS4%
RHS-3%
RHS-4%
LHS4%
RHS-3%
RHS-3%
LHS and RHS -2.9%

6300.001 6325.000 6395.000 6425.000 6465.000 6500.000 6560.000 6565.000 6950.000 7035.000 7365.000 7385.000 7640.000 7655.000 7720.000 7725.000 7810.000 7860.000

SCALE 1:2000H
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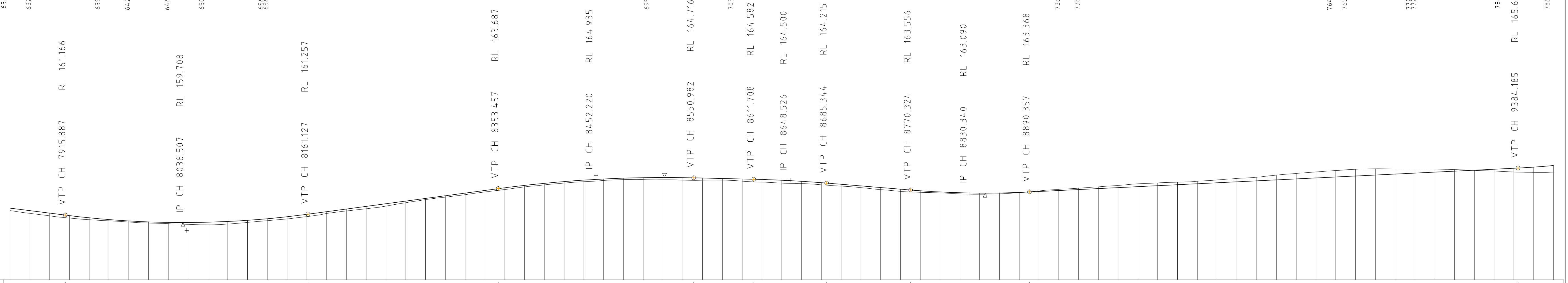

DATUM RL 155.0

VERTICAL DATA
-1.19%
L=245.24 R=10000
1.26%
L=197.53 R=13300
-0.22%
L=73.64 R=13300
-0.78%
L=120.03 R=9700
0.46%
L=151.63 R=8400

DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL	CHAINAGE
161.830	161.603	7860.000
161.593	161.329	7880.000
161.355	161.096	7900.000
161.118	160.887	7920.000
160.908	160.729	7940.000
160.739	160.624	7960.000
160.609	160.509	7980.000
160.520	160.415	8000.000
160.470	160.350	8020.000
160.461	160.291	8040.000
160.491	160.241	8060.000
160.561	160.319	8080.000
160.672	160.472	8100.000
160.822	160.638	8120.000
161.013	160.810	8140.000
161.243	161.024	8160.000
161.496	161.319	8180.000
161.749	161.564	8200.000
162.001	161.773	8220.000
162.254	162.026	8240.000
162.507	162.351	8260.000
162.759	162.645	8280.000
163.012	162.878	8300.000
163.265	163.114	8320.000
163.517	163.371	8340.000
163.768	163.604	8360.000
163.996	163.853	8380.000
164.194	164.046	8400.000
164.362	164.222	8420.000
164.499	164.353	8440.000
164.607	164.466	8460.000
164.684	164.556	8480.000
164.732	164.553	8500.000
164.749	164.529	8520.000
164.736	164.496	8540.000
164.696	164.488	8560.000
164.652	164.502	8580.000
164.608	164.401	8600.000
164.561	164.308	8620.000
164.489	164.215	8640.000
164.387	164.171	8660.000
164.255	164.053	8680.000
164.101	163.929	8700.000
163.946	163.783	8720.000
163.791	163.596	8740.000
163.636	163.426	8760.000
163.485	163.338	8780.000
163.371	163.286	8800.000
163.298	163.190	8820.000
163.266	163.153	8840.000
163.275	163.196	8860.000
163.325	163.308	8880.000
163.412	163.473	8900.000
163.505	163.622	8920.000
163.597	163.727	8940.000
163.689	163.863	8960.000
163.782	163.996	8980.000
163.874	164.151	9000.000
163.967	164.236	9020.000
164.059	164.302	9040.000
164.152	164.393	9060.000
164.244	164.518	9080.000
164.336	164.655	9100.000
164.429	164.776	9120.000
164.521	164.979	9140.000
164.614	165.136	9160.000
164.706	165.284	9180.000
164.799	165.408	9200.000
164.891	165.538	9220.000
164.983	165.577	9240.000
165.076	165.566	9260.000
165.168	165.559	9280.000
165.261	165.548	9300.000
165.353	165.506	9320.000
165.445	165.423	9340.000
165.538	165.363	9360.000
165.630	165.276	9380.000
165.738	165.236	9400.000
165.892	165.262	9420.000

HORIZONTAL DATA
R-600m

SUPERELEVATION
RHS6%
LHS-3%
LHS-6%
RHS6%
LHS-6%
LHS-3%
LHS and RHS -3.0%

7860.001 7890.000 7935.000 8260.000 8305.000 8380.000 8385.000 9420.000

SCALE 1:2000H
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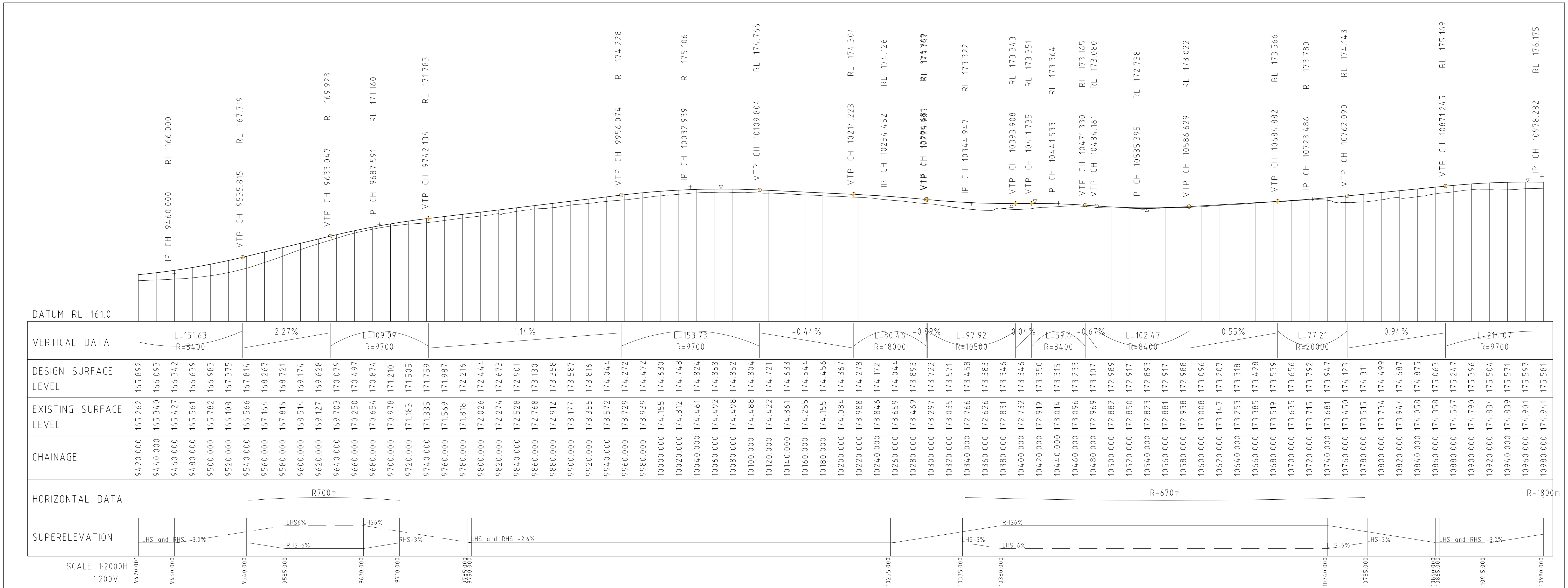
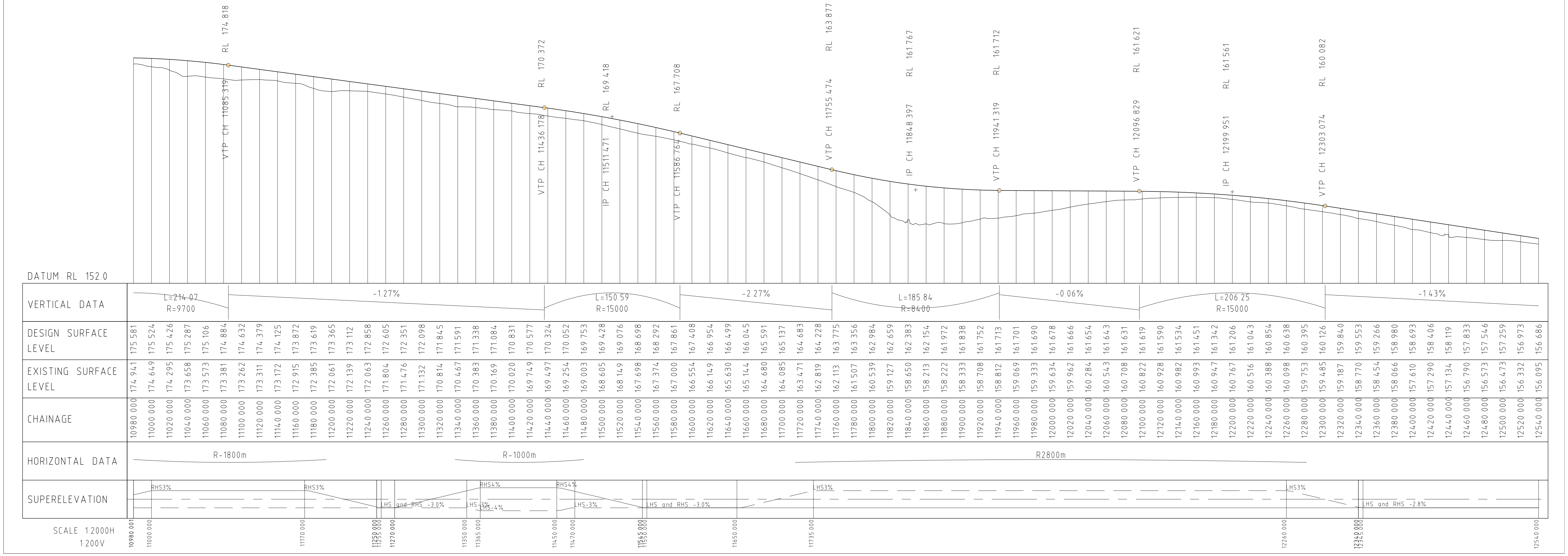


DESIGN SURFACE LEVEL	165.892	166.093	166.342	166.639	166.983	167.375	167.814	168.267	168.721	169.174	169.628	170.079	170.497	170.874	171.210	171.505	171.759	171.987	172.216	172.444
EXISTING SURFACE LEVEL	165.262	165.340	165.427	165.561	165.782	166.108	166.566	167.164	167.816	168.514	169.127	169.703	170.250	170.654	170.978	171.183	171.335	171.569	171.818	172.026
CHAINAGE	9420.000	9440.000	9460.000	9480.000	9500.000	9520.000	9540.000	9560.000	9580.000	9600.000	9620.000	9640.000	9660.000	9680.000	9700.000	9720.000	9740.000	9760.000	9780.000	9800.000

DESIGN SURFACE LEVEL	172.673	172.901	173.130	173.358	173.587	173.816	174.044	174.272	174.472	174.630	174.748	174.824	174.858	174.852	174.804	174.721	174.633	174.544	174.456	174.367
EXISTING SURFACE LEVEL	172.274	172.528	172.768	172.912	173.177	173.355	173.572	173.729	173.939	174.155	174.312	174.461	174.492	174.498	174.488	174.422	174.361	174.255	174.155	174.084
CHAINAGE	9820.000	9840.000	9860.000	9880.000	9900.000	9920.000	9940.000	9960.000	9980.000	10000.000	10020.000	10040.000	10060.000	10080.000	10100.000	10120.000	10140.000	10160.000	10180.000	10200.000

DESIGN SURFACE LEVEL	174.278	174.172	174.044	173.893	173.722	173.571	173.458	173.383	173.346	173.346	173.350	173.315	173.233	173.107	172.989	172.917	172.893	172.917	172.988	173.096
EXISTING SURFACE LEVEL	173.988	173.846	173.659	173.469	173.297	173.035	172.766	172.626	172.831	172.732	172.919	173.014	173.096	172.969	172.882	172.850	172.823	172.881	172.938	173.008
CHAINAGE	10220.000	10240.000	10260.000	10280.000	10300.000	10320.000	10340.000	10360.000	10380.000	10400.000	10420.000	10440.000	10460.000	10480.000	10500.000	10520.000	10540.000	10560.000	10580.000	10600.000

DESIGN SURFACE LEVEL	173.207	173.318	173.428	173.539	173.656	173.792	173.947	174.123	174.311	174.499	174.687	174.875	175.063	175.247	175.396	175.504	175.571	175.597	175.581
EXISTING SURFACE LEVEL	173.147	173.253	173.385	173.519	173.635	173.715	173.681	173.450	173.515	173.734	173.944	174.058	174.358	174.567	174.790	174.834	174.839	174.901	174.941
CHAINAGE	10620.000	10640.000	10660.000	10680.000	10700.000	10720.000	10740.000	10760.000	10780.000	10800.000	10820.000	10840.000	10860.000	10880.000	10900.000	10920.000	10940.000	10960.000	10980.000

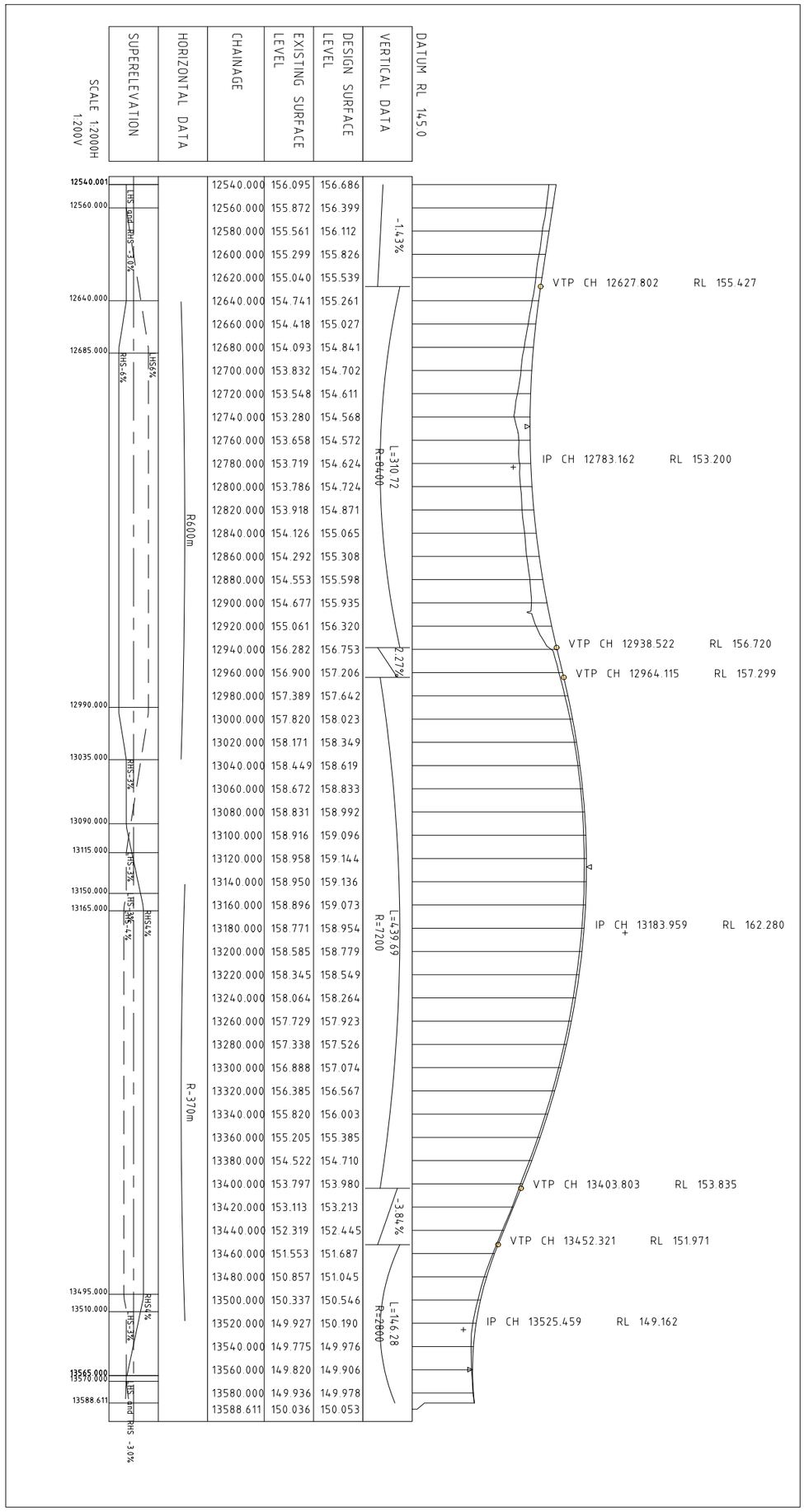


DESIGN SURFACE LEVEL	175.581	175.524	175.426	175.287	175.106	174.884	174.632	174.379	174.125	173.872	173.619	173.365	173.112	172.858	172.605	172.351	172.098	171.845	171.591	171.338
EXISTING SURFACE LEVEL	174.941	174.649	174.295	173.658	173.573	173.381	173.262	173.311	173.172	172.915	172.385	172.061	172.139	172.063	171.804	171.476	171.132	170.814	170.467	170.383
CHAINAGE	10980.000	11000.000	11020.000	11040.000	11060.000	11080.000	11100.000	11120.000	11140.000	11160.000	11180.000	11200.000	11220.000	11240.000	11260.000	11280.000	11300.000	11320.000	11340.000	11360.000

DESIGN SURFACE LEVEL	171.084	170.831	170.577	170.324	170.052	169.753	169.428	169.076	168.698	168.292	167.861	167.408	166.954	166.499	166.045	165.591	165.137	164.683	164.228	163.775
EXISTING SURFACE LEVEL	170.169	170.020	169.749	169.497	169.254	169.003	168.605	168.149	167.698	167.374	167.000	166.554	166.149	165.630	165.144	164.680	164.085	163.471	162.819	162.113
CHAINAGE	11380.000	11400.000	11420.000	11440.000	11460.000	11480.000	11500.000	11520.000	11540.000	11560.000	11580.000	11600.000	11620.000	11640.000	11660.000	11680.000	11700.000	11720.000	11740.000	11760.000

DESIGN SURFACE LEVEL	163.356	162.984	162.659	162.383	162.154	161.972	161.838	161.752	161.713	161.701	161.690	161.678	161.666	161.654	161.643	161.631	161.619	161.590	161.534	161.451
EXISTING SURFACE LEVEL	161.507	160.539	159.127	158.650	158.213	158.222	158.333	158.708	158.812	159.069	159.333	159.634	159.962	160.284	160.543	160.708	160.822	160.928	160.982	160.993
CHAINAGE	11780.000	11800.000	11820.000	11840.000	11860.000	11880.000	11900.000	11920.000	11940.000	11960.000	11980.000	12000.000	12020.000	12040.000	12060.000	12080.000	12100.000	12120.000	12140.000	12160.000

DESIGN SURFACE LEVEL	161.342	161.206	161.043	160.854	160.638	160.395	160.126	159.840	159.553	159.266	158.980	158.693	158.406	158.119	157.833	157.546	157.259	156.973	156.686
EXISTING SURFACE LEVEL	160.947	160.767	160.516	160.388	160.098	159.753	159.485	159.187	158.770	158.454	158.066	157.610	157.290	157.134	156.790	156.573	156.473	156.332	156.095
CHAINAGE	12180.000	12200.000	12220.000	12240.000	12260.000	12280.000	12300.000	12320.000	12340.000	12360.000	12380.000	12400.000	12420.000	12440.000	12460.000	12480.000	12500.000	12520.000	12540.000



CHAINAGE	EXISTING SURFACE LEVEL	DESIGN SURFACE LEVEL
12540.000	156.095	156.686
12560.000	155.872	156.399
12580.000	155.561	156.112
12600.000	155.299	155.826
12620.000	155.040	155.539
12640.000	154.741	155.261
12660.000	154.418	155.027
12680.000	154.093	154.841
12700.000	153.832	154.702
12720.000	153.548	154.611
12740.000	153.280	154.568
12760.000	153.658	154.572
12780.000	153.719	154.624
12800.000	153.786	154.724
12820.000	153.918	154.871
12840.000	154.126	155.065
12860.000	154.292	155.308
12880.000	154.553	155.598
12900.000	154.677	155.935
12920.000	155.061	156.320
12940.000	156.282	156.753
12960.000	156.900	157.206
12980.000	157.389	157.642
13000.000	157.820	158.023
13020.000	158.171	158.349
13040.000	158.449	158.619
13060.000	158.672	158.833
13080.000	158.831	158.992
13100.000	158.916	159.096
13120.000	158.958	159.144
13140.000	158.950	159.136
13160.000	158.896	159.073
13180.000	158.771	158.954
13200.000	158.585	158.779
13220.000	158.345	158.549
13240.000	158.064	158.264
13260.000	157.729	157.923
13280.000	157.338	157.526
13300.000	156.888	157.074
13320.000	156.385	156.567
13340.000	155.820	156.003
13360.000	155.205	155.385
13380.000	154.522	154.710
13400.000	153.797	153.980
13420.000	153.113	153.213
13440.000	152.319	152.445
13460.000	151.553	151.687
13480.000	150.857	151.045
13500.000	150.337	150.546
13520.000	149.927	150.190
13540.000	149.775	149.976
13560.000	149.820	149.906
13580.000	149.936	149.978
13588.611	150.036	150.053

Appendix B: P50 / P 90 Cost Estimates

Midland Highway - Symmons Plains to South of Perth: Safety Upgrade

Project Name: Midland Highway - Symmons Plains to South of Perth: Safety Upgrade

Project Phase: Preliminary Design

Brief reference number	2220-1-8	Project completion:
State Growth Project Number	A130022.000	Apr-18
Consultant Project number	IS104200	
Date	22/03/2016	

Description of Scope

The scope of the Project to widen the existing Midland Highway to provide alternating lengths of "2+1" lane arrangements from the end of existing 2+1 length of highway at Symmons Plains to the Perth Bridge over the south Esk river, Link 85/Chainage 6.5 to Link 90 / chainage 3.07 a total length of approximately 7.23km. The Project will also improve the horizontal alignment of the highway, localised improvements to vertical curves and an upgrade of the Leighlands Secondary Road junction. The Project is currently in the Preliminary Design Phase.

Other features within this Project's scope include the provision of U-Turn facilities and safer property accesses, upgrades to roadside drainage and extension of stock underpasses. The scope also includes all pre-construction activities such as the relocation of TasNetworks electrical power poles and Telstra communication cables.

Rates:

Rates are based on State Growth supplied rates for the Perth to Breadalbane upgrade project and past experience including recent Midland Highway projects. The rates are subject to change depending on market conditions.

Quantities:

Quantities have been taken from the Preliminary design model. Inherent Contingencies have been slightly adjusted to reflect the recent change in the revised preliminary design and revised pavement design for section from Ch 9700 to Ch 12960.

Escalation:

A 3.5% escalation rate has been applied to activities outside of the 2015/2016 construction season.

Summary of results:

Base Estimate (Owners Cost + Construction Cost)	$	13,963,210.75
	P50	P90
Inherent risk allowance	$ 1,267,905	$ 2,543,037
Contingent risk allowance	$ 752,623	$ 1,992,574
Base Estimate + Contingency (Inherent + Contingent)	$ 15,983,739	$ 18,498,821
Total contingency % above base estimate	14%	32%
Escalation (Nominal - applied to base case + contingency)	$ 725,039	$ 854,066
Total Out turn	$ 16,709,000	$ 19,353,000

	P50	P90
Total Out turn Cost	$ 16,709,000	$ 19,353,000

Overall Cash Flow

P50 Cash Flow	Financial Year 2014 / 2015	2015 / 2016	2016 / 2017	2017 / 2018
Project Identification and Scoping	$ -	$ 869,120	$ -	$ -
Project Development	$ -	$ 981,656	$ -	$ -
Project Delivery (incll. CA)	$ -	$ -	$ 6,661,839	$ 5,450,596
Inherent Risk	$ -	$ -	$ 697,348	$ 570,557
Contingent Risk	$ -	$ -	$ 413,943	$ 338,680
Escalation costs (nominal)	$ -	$ -	$ 272,060	$ 452,979
Sub-Total (annual)	$ -	$ 1,851,000	$ 8,045,000	$ 6,812,813
Accumulative Total	$ -	$ 1,851,000	$ 9,896,000	$ 16,708,813

P90 Cash Flow	Financial Year 2014 / 2015	2015 / 2016	2016 / 2017	2017 / 2018
Project Identification and Scoping	$ -	$ 869,120.00	$ -	$ -
Project Development	$ -	$ 981,656.00	$ -	$ -
Project Delivery (incll. CA)	$ -	$ -	$ 6,661,839.11	$ 5,450,595.64
Inherent Risk	$ -	$ -	$ 1,398,670.08	$ 1,144,366.43
Contingent Risk	$ -	$ -	$ 1,095,915.49	$ 896,658.13
Escalation costs (nominal)	$ -	$ -	$ 320,474.86	$ 533,590.65
Sub-Total (annual)	$ -	$ 1,851,000	$ 9,477,000	$ 8,025,211
Accumulative Total	$ -	$ 1,851,000	$ 11,328,000	$ 19,353,211

Contract Value Estimations for:

Project Name	Midland Highway - Symmons Plains to South of Perth: Safety Upgrade	
Brief reference number	2220-1-8	Project completion:
State Growth Project Number	A130022.000	Apr-18
Consultant Project number	IS104200	
Date	22/03/16	

Assumptions

CPI	2.0%
Real escalation	1.5%
Nominal escalation	3.5%

Midland Highway - Symmons Plains to South of Perth: Safety Upgrade

Project Cash Flow

Totals

P50 Cash Flow	Financial Year 2014 / 2015	2015 / 2016	2016 / 2017	2017 / 2018	2018 / 2019
Project Identification and Scoping		$ 869,120			
Project Development		$ 981,656			
Project Delivery (incll. CA)		$ -	6,661,839	$ 5,450,596	
Inherent Risk		$ -	697,348	$ 570,557.26	
Contingent Risk		$ -	413,943	$ 338,680.50	
Escalation costs (nominal)		$ -	272,060	452,979	
Sub-Total (annual)	$ -	$ 1,851,000	$ 8,045,000	$ 6,813,000	$ -
Accumulative Total	$ -	$ 1,851,000	$ 9,896,000	$ 16,709,000	$ 16,709,000

P90 Cash Flow	Financial Year 2014 / 2015	2015 / 2016	2016 / 2017	2017 / 2018	2018 / 2019
Project Identification and Scoping	$ -	$ 869,120			
Project Development	$ -	$ 981,656			
Project Delivery (incll. CA)		$ -	6,661,839	5,450,596	
Inherent Risk		$ -	1,398,670	$ 1,144,366.43	
Contingent Risk		$ -	1,095,915	$ 896,658.13	
Escalation costs (nominal)		$ -	320,475	533,591	
Sub-Total (annual)	$ -	$ 1,851,000	$ 9,477,000	$ 8,025,000	$ -
Accumulative Total	$ -	$ 1,851,000.00	$ 11,328,000.00	$ 19,353,000.00	$ 19,353,000.00

P90 AND P50 COST ESTIMATION FOR:

Project Name	Midland Highway - Symmons Plains to South of Perth: Safety Upgra
Brief reference number	2220-1-8 Project completion:
State Growth Project Number	A130022.000 Apr-18
Consultant Project number	IS104200
Date	22/03/16

ID	Description	Estimate				
		Unit	Billed Qty	Net Rate	Net amount	
1.0	Project Identification and Scoping					
1.1	Project identification consultancy	item	1.00	$ 115,791.00	$ 115,791.00	
1.2	State Growth Management	item	1.00	$ 192,931.00	$ 192,931.00	
1.3	Consultant project scoping phase activities (engineering survey, environmental and heritage investigations)	item	1.00	$ 210,186.00	$ 210,186.00	
1.4	State Growth Project Management Scoping phase	item	1.00	$ 350,212.00	$ 350,212.00	
	Subtotal Identification and Scoping				$ 869,120.00	
2.0	Project Development Including Preconstruction Activities					
2.1	Project development phase activities (preliminary design, detailed design, Tender documentation)	item	1.00	$ 433,398.00	$ 433,398.00	
2.2	State Growth Project Management Scoping to Development	item	1.00	$ 548,258.00	$ 548,258.00	
	Subtotal Development				$ 981,656.00	
3.0	Contract Administration and Owners Costs					
3.1	State Growth Project Management Delivery Phase cost per annum	item	1.00	$ 75,000.00	$ 75,000.00	
3.2	Acquisition and Utilities relocation costs	item	1.00	$ 861,720.00	$ 861,720.00	
3.3	Contract Admin costs	item	1.00	$ 650,000.00	$ 650,000.00	
3.4	Insurances	%	$ 10,484,719.50	0.39%	$ 40,995.25	
	Subtotal Contract Administration				$ 1,627,715.25	
	Total Owners Costs				$ 3,478,491.25	
4.0	Construction					
4.1	PROJECT SPECIFIC ITEMS	item	1.00	$ 599,007.50	$ 599,007.50	
4.2	EARTHWORKS	Item	1.00	$ 992,213.00	$ 992,213.00	
4.3	DRAINAGE	Item	1.00	$ 313,842.00	$ 313,842.00	
4.4	PAVEMENT	Item	1.00	$ 5,066,046.00	$ 5,066,046.00	
4.5	BITUMINOUS SURFACING	Item	1.00	$ 1,230,881.25	$ 1,230,881.25	
4.6	TRAFFIC FACILITIES	Item	1.00	$ 1,091,204.75	$ 1,091,204.75	
4.7	LANDSCAPING	Item	1.00	$ 295,875.00	$ 295,875.00	
4.8	MISCELLANEOUS	Item	1.00	$ 494,500.00	$ 494,500.00	
4.9	PRECAST UNITS	Item	1.00	$ 105,050.00	$ 105,050.00	
4.10	SCHEDULE TEN ITEMS	Item	1.00	$ 296,100.00	$ 296,100.00	
	Total Construction Costs (TCC)				$ 10,484,719.50	
	Base Estimate (Owners Cost + Construction Cost)				$ 13,963,210.75	
					P50	P90
	Inherent risk allowance				$ 1,267,905	$ 2,543,037
	Contingent risk allowance				$ 752,623	$ 1,992,574
	Base Estimate + Contingency (Inherent + Contingent)				$ 15,983,739	$ 18,498,821
	Escalation (Nominal - applied to base case + contingency)				$ 725,039	$ 854,066
	Total contingency % above base estimate				14%	32%
	Total Out turn				$ 16,709,000	$ 19,353,000

CONTINGENT RISKS FOR:

Project Name	Midland Highway - Symmons Plains to South of Perth: Safety Upgrade
Brief reference number	2220-1-8
State Growth Project Number	A130022.000
Consultant Project number	IS104200
Date	22/03/2016
Project completion:	Apr-18

Summary Description	Likelihood of occurring	Likelihood of not occurring	Consequence of occurring					
			Description Min	Min Value	Description Most Likely	ML Value	Description Max	Max Value
				10.00		50.00		90.00
The limited Time available to complete the Development & Documentation Phase affects the quality, cost and Practical Completion of the project. Delays caused by Government approvals for example PPR approval or PSCPW recommendations	20%	80%	Program to be identified during the Development Phase.	$ 8,000.00	1) Development and Delivery PPR includes known and potential stakeholder issues and concerns. 3) Stakeholder Engagement and Project Execution Management Plan to be maintained throughout the life of the project.	$ 120,000.00	Construction duration extends over two construction seasons. Project Development Phase delayed awaiting funding approvals, re-design required to meet approval conditions.	$ 300,000.00
The Quality of the Tender documentation is governed by the time available and the number and complexity of issues that need to be resolved in the Preliminary and Detailed Design phases.	20%	80%	Quality Plan to be identified during the Development Phase and rigorous checking of the RFT documents to take place.	$ 10,000.00	As part of the preliminary design review, a list of outstanding issues needs to be developed to ascertain their likelihood of being resolved in the time available during the Detailed Design phases.	$ 50,000.00	Substantial variations from Contractor during the delivery phase.	$ 300,000.00
The expected final Cost of the project is affected by the time available for design, and the number and complexity of the project issues.	20%	80%	Funding submission based on P90 cost estimate.	$ 25,000.00	Project Contingency amounts need to be reviewed with the level of confidence in the resolution of the issues and the time available for design.	$ 180,000.00	Project runs over two construction seasons with substantial variations.	$ 675,000.00
Protracted landowner negotiations regarding impact on access affects program and project costs	25%	75%	Start Stakeholder engagement early in the design stage	$ 25,000.00	Stakeholder consultation, design to consider stakeholder requirements	$ 180,000.00	Landowner negotiations delay to project design and Development Application approval	$ 600,000.00
The Planning Permit has a number of unexpected conditions resulting in appeal and Stakholder opposition	50%	50%	Allow for unexpected Planning Permit conditions within the cost estimate contingencies.	$ 50,000.00	Continued engagement with Council throgh the Project Development Phase to identify likely council requirements for road upgrades to identify particular issues of concern and possible design solutions. .	$ 144,000.00	Construction delayed until 2016/2017, increased design and construction costs to accommodate onerous conditions.	$ 487,500.00
Project delays due to environmental constraints: Permit to Take process or potential EPBC referral	20%	80%	1) Include Permit to Take conditions within cost estimate contingencies. 2) Permit to to Take from DPIPWE will not cause project delays if works are not affecting the species unnecessarily. 3) A permit to take application under the TSPA is likely to be straightforward 4)Design to avoid impacts and need for permits.	$ 15,000.00	Seek necessary approvals in the Development Phase.	$ 30,000.00	Construction delayed until 2017/2018, increased design and construction costs to accommodate onerous conditions.	$ 150,000.00
Historic Heritage permits are required and not approved in a timely manner	25%	75%	Allow sufficient time with the proposed Development Phase program for approval times for Aboriginal Heritage. Approval process to begin as early as possible in the Development Phase.	$ 20,000.00	Allow sufficient time with the proposed Development Phase program for approval times for Aboriginal Heritage.	$ 120,000.00	Heritage permits delay construction of southern section of project until 2016/2017.	$ 150,000.00
Discovery of unlisted site/object with heritage values	20%	80%	Unanticipated Aboriginal artifact paperwork completed resulting in minimal delay	$ 25,000.00	Undertake historic and Aboriginal heritage field investigations within the Scoping Phase and seek necessary approvals in the Development Phase.	$ 150,000.00	Unanticipated Aboriginal artifact paperwork completed resulting in significant issues	$ 450,000.00
Unforeseen ground condition or latent condition	40%	60%	Allow for unforeseen ground conditions within cost estimate contingencies.	$ 120,000.00	Undertake detailed geotechnical investigations to determine site conditions as accurately as possible. Tender documents to allow for rock excavation and unsuitable material provisional quantities.	$ 480,000.00	Construction program delayed, potential re-design costs and Contractor variations.	$ 1,500,000.00
Service relocation cost increases.	20%	80%	Allow for service relocation cost increases within cost estimate contingencies.	$ 25,000.00	Contracts with service providers limit the possibility for service relocation cost increases.	$ 150,000.00	Relocation costs are significantly more than those used in cost estimates which increases the required project budget.	$ 350,000.00
Unforseen issues	20%	80%		$ 105,000.00		$ 600,000.00		$ 1,750,000.00

@risk output

Contingency allowance	P50	$	752,623.33
Contingency allowance	P90	$	1,992,573.62