Transport Impact Assessment

Lot M1254 Proposed Chicken Farm

CW1176500



Prepared for

ProTen Western Australia Pty Ltd

7 July 2021

Cardno

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Document Information

Prepared for	ProTen Western Australia Pty Ltd
Project Name	Lot M1254 Proposed Chicken Farm
File Reference	CW1176500-TR-RP-001-A-Lot M1254 Hunter Rd TIA.docx
Job Reference	CW1176500
Date	7 July 2021
Version Number	A
Effective Date	7/07/2021
Date Approved	7/07/2021

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Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
A	7 July 2021	For Issue	RR	SGL

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Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

Table of Contents

1	Introduction		1
2	Existing Situation		2
	2.1	Existing Land Use	2
	2.2	Existing Access Arrangement	3
	2.3	Existing Road Network	4
	2.4	Existing Traffic Volume	7
	2.5	Restricted Access Vehicle (RAV) Network	8
	2.6	Pedestrian / Cycling Access	8
	2.7	Public Transport Access	8
	2.8	Crash History	9
3	Proposed Development		10
	3.1	Proposed Land Use	10
	3.2	Proposed Access Arrangement	11
	3.3	Parking Requirements	11
4	Changes to the Surrounding Transport Network		12
	4.1	Road Network	12
	4.2	Proposed RAV Network	13
	4.3	Pedestrian and Cycling Facility	13
	4.4	Public Transport Facilities	13
5	Integration with Surrounding Area		14
	5.1	Surrounding Attractors/Generators	14
	5.2	Changes to the Surrounding Area	14
6	Analysis of Transport Network		15
	6.1	Development Traffic Generation	15
	6.2	Development Traffic Distribution	16
	6.3	Traffic Analysis	17
	6.4	Turn Warrant Assessment	18
7	Summary		20

Appendices

Appendix A Site Plan

Appendix B Road Upgrades Concept

Appendix C WAPC Checklist

Tables

Table 2-1 Existing Mid-block Traffic Volumes (Two-way) 7
Table 6-1 Estimated Trip Generation 15

Figures

Figure 1-1 Site Location 1
Figure 2-1 Site Locality within Shire of Gingin Scheme Zone Map 2
Figure 2-2 Existing Access 3
Figure 2-3 Existing Road Network 5
Figure 2-4 Existing Condition of Brand Highway – Looking South 6
Figure 2-5 Existing Condition of Hunter Road – At Approach to Brand Highway 6
Figure 2-6 Existing Condition of Hunter Road – Looking East 6
Figure 2-7 Existing RAV Network 8
Figure 2-8 Crash Location 9
Figure 3-1 Site Layout 10
Figure 3-2 Proposed Access Arrangement 11
Figure 4-1 Concept Sketch of the Proposed Upgrade 12
Figure 6-1 Development Traffic Distribution 16
Figure 6-2 Development Traffic Flow 16
Figure 6-3 Calculation of QM 18
Figure 6-4 Turning Volume (2031 Background Traffic Volumes) 19
Figure 6-5 Assessment Results 19

1 Introduction

Cardno has been commissioned by Proten Western Australia Pty Ltd to prepare a Transport Impact Statement for a proposed chicken farm at Lot M1254 Hunter Road, Orange Springs in the Shire of Gingin (the "Site"). The location of the Site is illustrated in **Figure 1-1.** The Site shares its northern boundary with the neighbouring Shire of Dandaragan.

This report has been prepared in accordance with the *Western Australian Planning Commission (WAPC) Transport Impact Assessment Guidelines Volume 4 – Individual Developments (2016)* and the relevant WAPC Checklist included at **Appendix C.**

This report will specifically focus on traffic generation, access arrangement, and required upgrades to support the proposed development.

Figure 1-1 Site Location



Source: Landgate

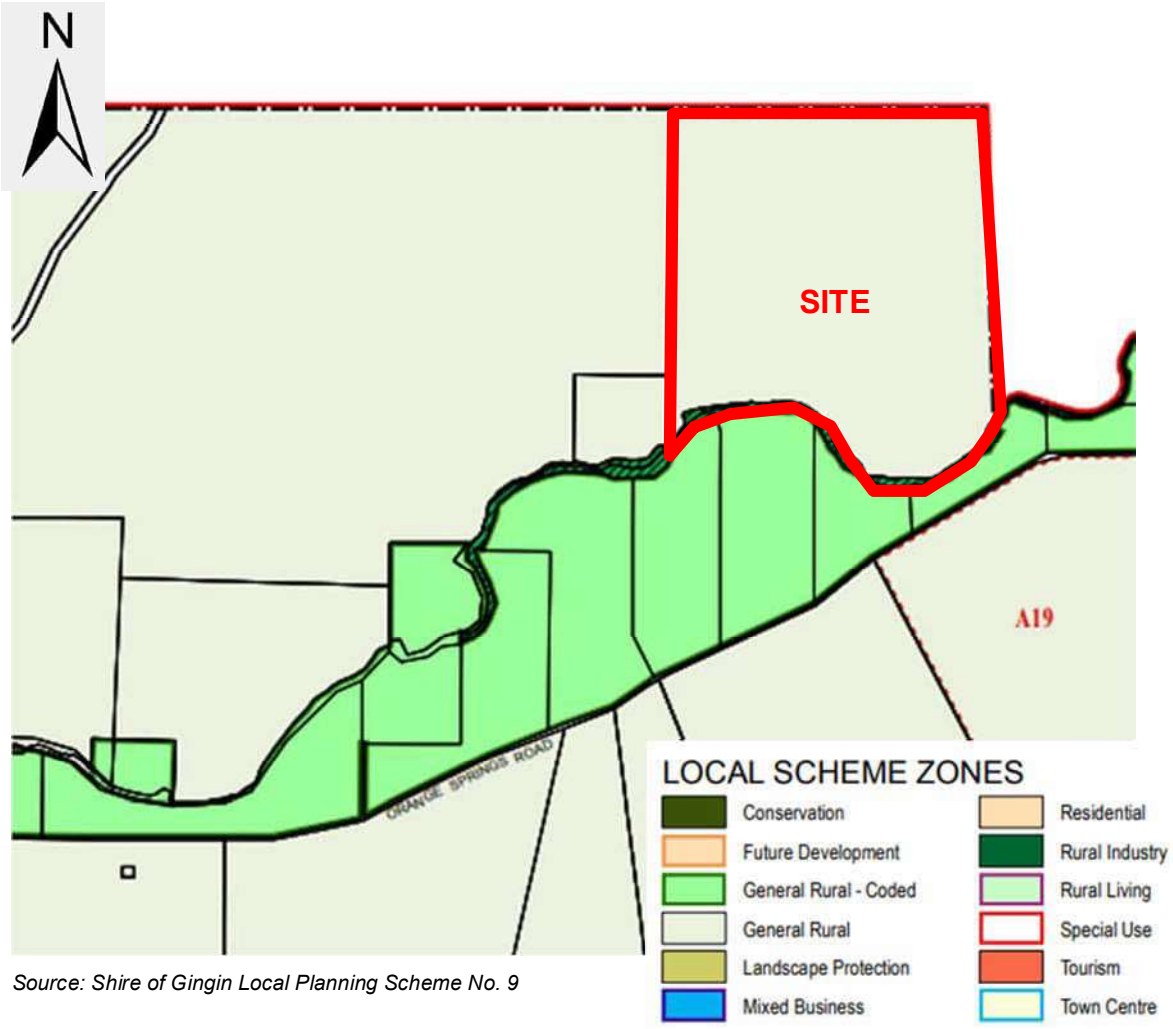
2 Existing Situation

2.1 Existing Land Use

The Site is zoned as 'General Rural' under the *Shire of Gingin Local Planning Scheme No. 9,* as shown in **Figure 2-1**. The Site was previously used as a plantation.

The Site is surrounded by 'General Rural' land use.

Figure 2-1 Site Locality within Shire of Gingin Scheme Zone Map

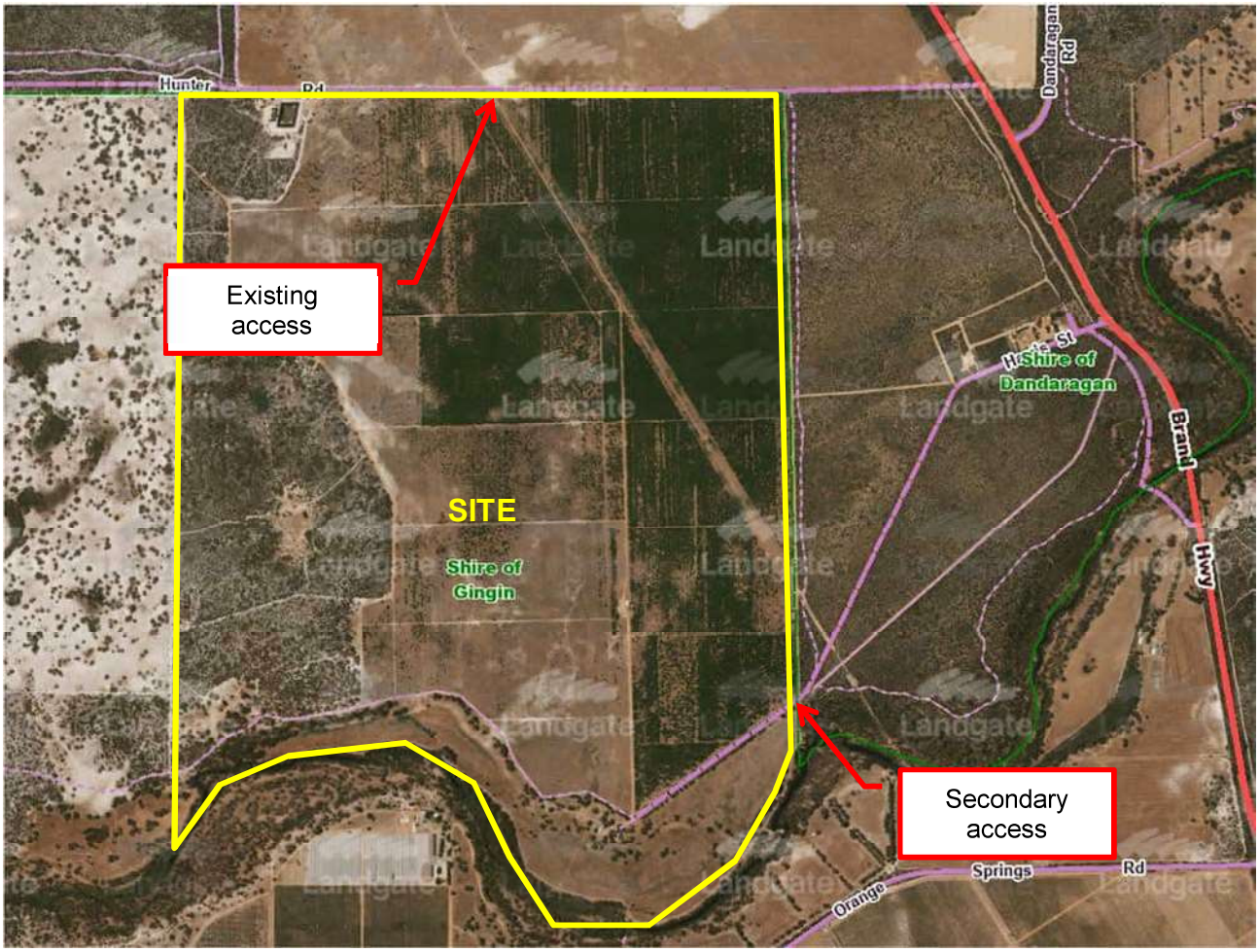


Source: Shire of Gingin Local Planning Scheme No. 9

2.2 Existing Access Arrangement

The access to the site is located on the north side of the lot as shown in **Figure 2-2.** The site access fronts Hunter Road, which is a gravel road that connect the Site to Brand Highway. While the Site is located within the Shire of Gingin, Hunter Road is wholly located within the neighbouring Shire of Dandaragan. In addition, there is a secondary access from Harris Street located on south east corner of the site.

Figure 2-2 Existing Access



2.3 Existing Road Network

Figure 2-3 shows the layout and classification of the roads surrounding the Site.

Road classifications are defined in the Main Roads Functional Hierarchy as follows:

- **Primary Distributors (light blue):** Form the regional and inter-regional grid of MRWA traffic routes and carry large volumes of fast-moving traffic. Some are strategic freight routes, and all are National or State roads. They are managed by Main Roads.
- **Regional Distributors (red):** Roads that are not Primary Distributors, but which link significant destinations and are designed for efficient movement of people and goods within and beyond regional areas. They are managed by Local Government.
- **District Distributor A (green):** These carry traffic between industrial, commercial and residential areas and connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining property. They are managed by Local Government.
- **District Distributor B (dark blue):** Perform a similar function to District Distributor A but with reduced capacity due to flow restrictions from access to and roadside parking alongside adjoining property. These are often older roads with traffic demand in excess of that originally intended. District Distributor A and B roads run between land-use cells and not through them, forming a grid that would ideally be around 1.5 kilometres apart. They are managed by Local Government.
- **Local Distributors (orange):** Carry traffic within a cell and link District Distributors at the boundary to access roads. The route of the Local Distributor discourages through traffic so that the cell formed by the grid of District Distributors only carries traffic belonging to or serving the area. These roads should accommodate buses but discourage trucks. They are managed by Local government.
- **Access Roads (grey):** Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. These roads are bicycle and pedestrian friendly. They are managed by Local government.

Figure 2-3 Existing Road Network



Source: Main Roads Mapping information Centre

The characteristics of the surrounding road network are discussed as follows:

- **Hunter Road:** Located along the northern boundary of the Site. The road is wholly located within the neighbouring Shire of Dandaragan. The road is classified as an *Access Road*. It is a two-way road, with single carriageway and unsealed surface which varies from 6.0 to 6.5m wide, approximately. The rural default speed limit of 110km/h applies to this road. No pedestrian or cycling facilities are provided. The road terminates at Brand Highway to the east.

  Cardno has been informed by the Shire it is not built in to suitable gravel road construction standards to withstanding year-round heavy vehicle movements and would need to be upgraded to accommodate the regular heavy vehicle movements generated by the proposed development.

- **Brand Highway:** Located to the east of the Site, Brand Highway is classified as *Primary Distributor* with a posted speed of 110 km/h. It forms a part of the RAV 7 network. The road is two-way, two-lane, sealed road. In the vicinity of Hunter Road intersection, the width of the seal is 11m which consists of 2m shoulders and 7m traffic lanes (3.5m each direction). No dedicated pedestrian/cycling facility are provided.

- **Harris Street:** This road is located on south eastern corner of the Site. It is a two-way single carriageway road classified as an Access Road and is part of the RAV 4 network. The rural default speed limit of 110km/h applies to this road. The road is wholly located within the neighbouring Shire of Dandaragan. It terminates to the east at Brand Highway. The road is only sealed for approximately the first 250m from Brand Highway. No pedestrian or cycling facilities are provided.

Figure 2-4 Existing Condition of Brand Highway – Looking South



Figure 2-5 Existing Condition of Hunter Road – At Approach to Brand Highway



Figure 2-6 Existing Condition of Hunter Road – Looking East



2.4 Existing Traffic Volume

The existing two-way traffic volume of road in the vicinity of the Site is shown in **Table 2-1.**

No traffic volumes are available for Hunter Road and existing traffic volumes are likely to be no more than 5-10 vehicle movements per day. During approximately 2 hours on site, the Cardno team did not observe any other vehicles using this road.

Table 2-1 Existing Mid-block Traffic Volumes (Two-way)

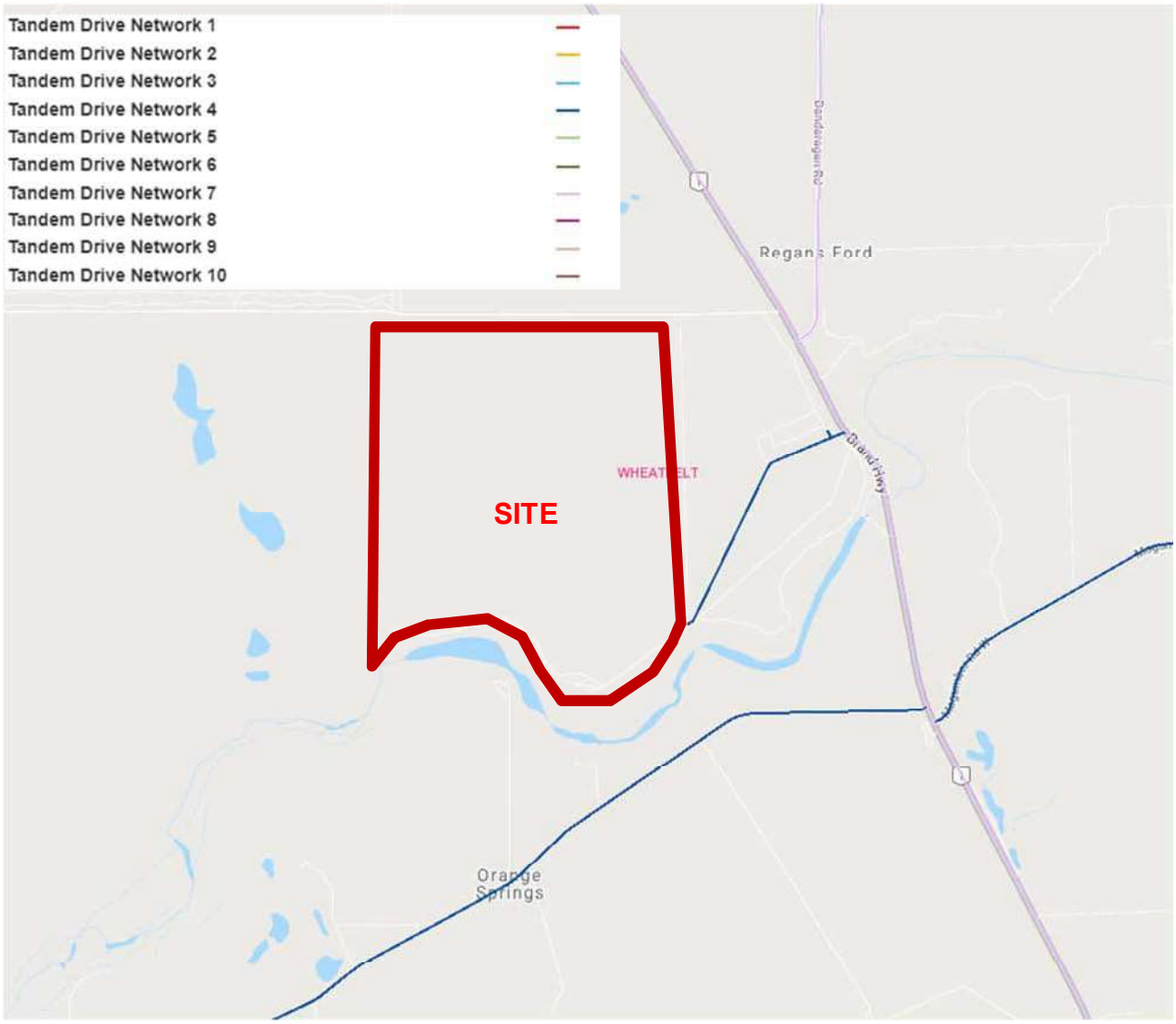
Road Name	Year	Average Two-way Daily Traffic Volume	Average Two-way AM Peak Traffic Volume	Average Two-way PM Peak Traffic Volume	Heavy Vehicle %
Brand Highway (North of Dandaragan Road)	2019	1,936	161 (11:00-12:00)	176 (12:00-13:00)	27.8%
Brand Highway (South of Mogumber Road West)	2020	2,310	215 (11:00-12:00)	215 (12:00-13:00)	24.9%

Source: Main Roads Traffic Maps

2.5 Restricted Access Vehicle (RAV) Network

The existing RAV network is shown below in **Figure 2-7**. Up to RAV 7 sized vehicles can use Brand Highway. RAV 4 vehicles are allowed on Harris Street, with conditions that permit must carried of all time. No RAV access is available via Hunter Road at the present time.

Figure 2-7 Existing RAV Network



Source: MRWA HVS Network

2.6 Pedestrian / Cycling Access

No dedicated pedestrian and cycling facilities are available in the vicinity of the Site.

2.7 Public Transport Access

The area in the vicinity of the Site is not serviced by public transport, other than TransWA service along Brand Highway servicing Kalbarri / Geraldton – Perth routes.

2.8 Crash History

A study of the recent crash history of the following road sections have been conducted for the latest available 5-year crash data (2016-2020):

- Hunter Road;
- Brand Highway SLK 77.21-77.61 (200m north and south of Hunter Road); and
- Brand Highway and Hunter Road intersection.

The crash data showed that there are only 1 crash within the extracted data, a head-on crash occurred on Brand Highway, south of Hunter Road as shown in **Figure 2-8.** The crash occurred in early morning in dark condition and involved 2 heavy haulage trucks. It resulted in one of the drivers needing to be hospitalised.

Figure 2-8 Crash Location



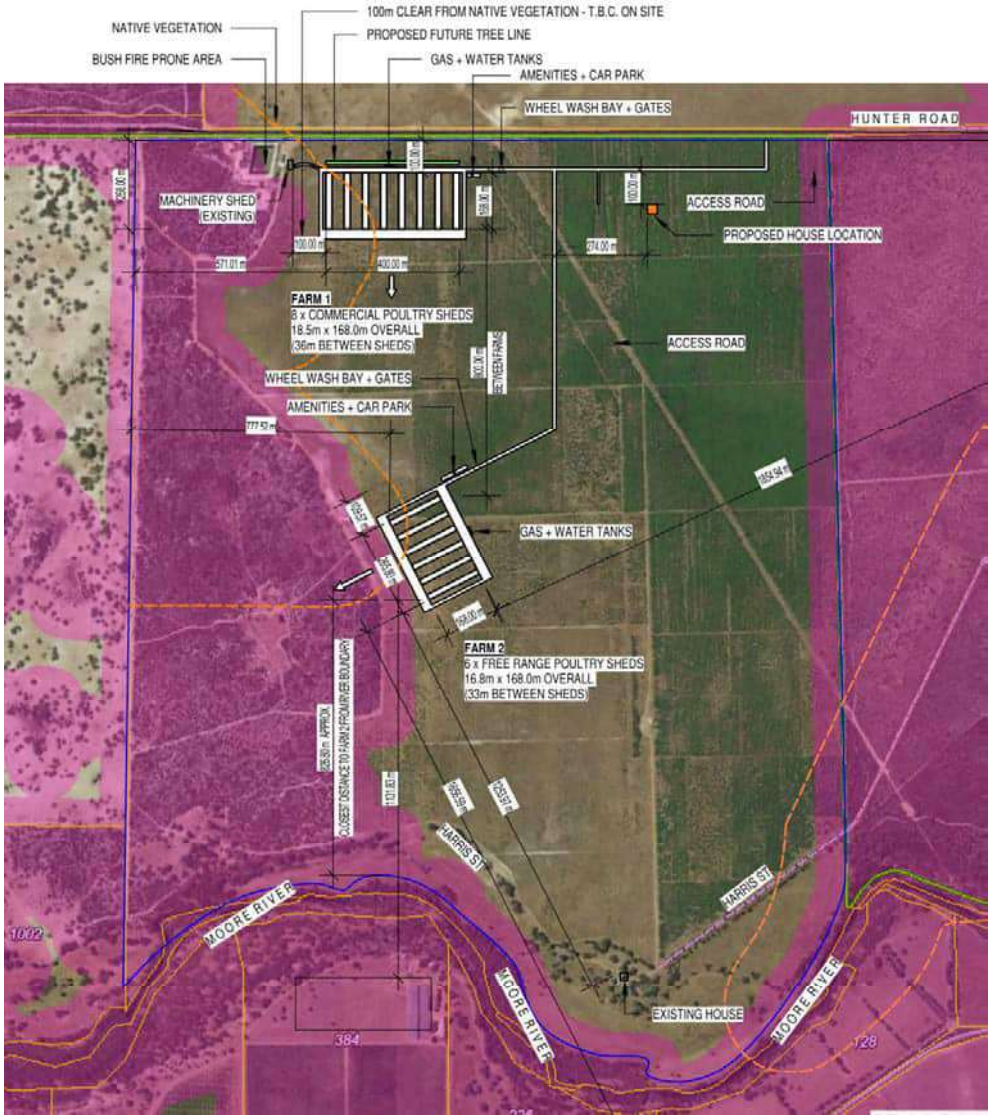
3 Proposed Development

3.1 Proposed Land Use

The Site is proposed to be developed into a chicken farm consisting of 2 farms, one consisting of 8 sheds and the other 6 sheds as shown in **Figure 3-1 (**and **Appendix A)**. In addition to the sheds, there will also be supporting amenities such as car parks and a house for employees to live on site.

The Site is expected to operate between 7AM to 4PM every day.

Figure 3-1 Site Layout

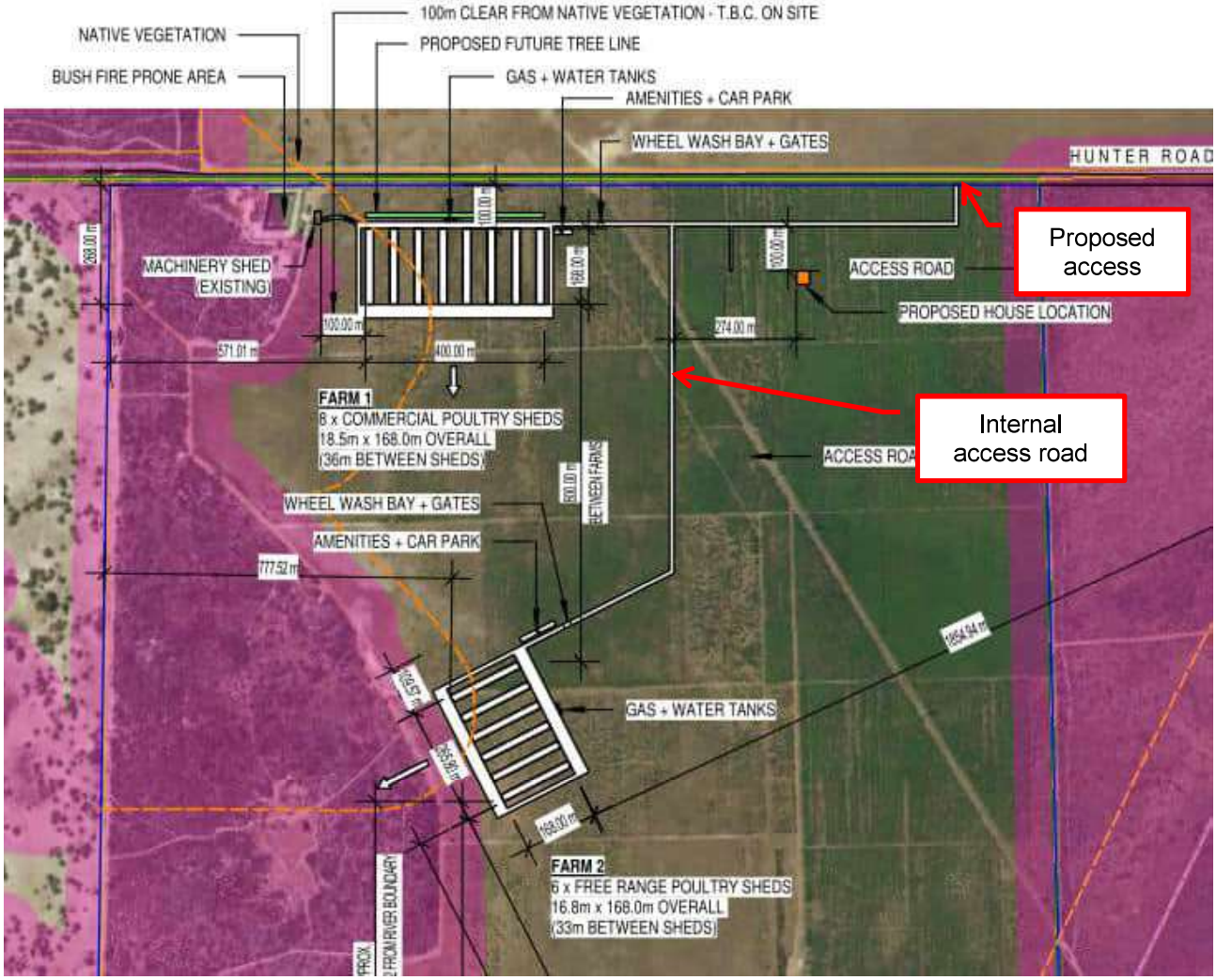


3.2 Proposed Access Arrangement

Access of the site is proposed to be located on the north east corner of the lot approximately 860m west of Brand Highway (approximately Hunter Road SLK 0.86) with internal access road linking to various buildings within the Site as shown in **Figure 3-2.**

Vehicle types that would enter the site would include light vehicles, small single axle trucks, 19m semi-trailer, and 27.5m B-doubles. A gravel crossover will be constructed to Shire standards to accommodate the largest vehicles entering and exiting the site.

Figure 3-2 Proposed Access Arrangement



3.3 Parking Requirements

The Shire of Gingin Local Planning Scheme No. 9 does not have requirement for parking supply for chicken farm / animal husbandry use. However, parking demand would only be limited to the 4 casual staff that would be commuting to the Site, which can be easily accommodated within the proposed car park within the site.

4 Changes to the Surrounding Transport Network

4.1 Road Network

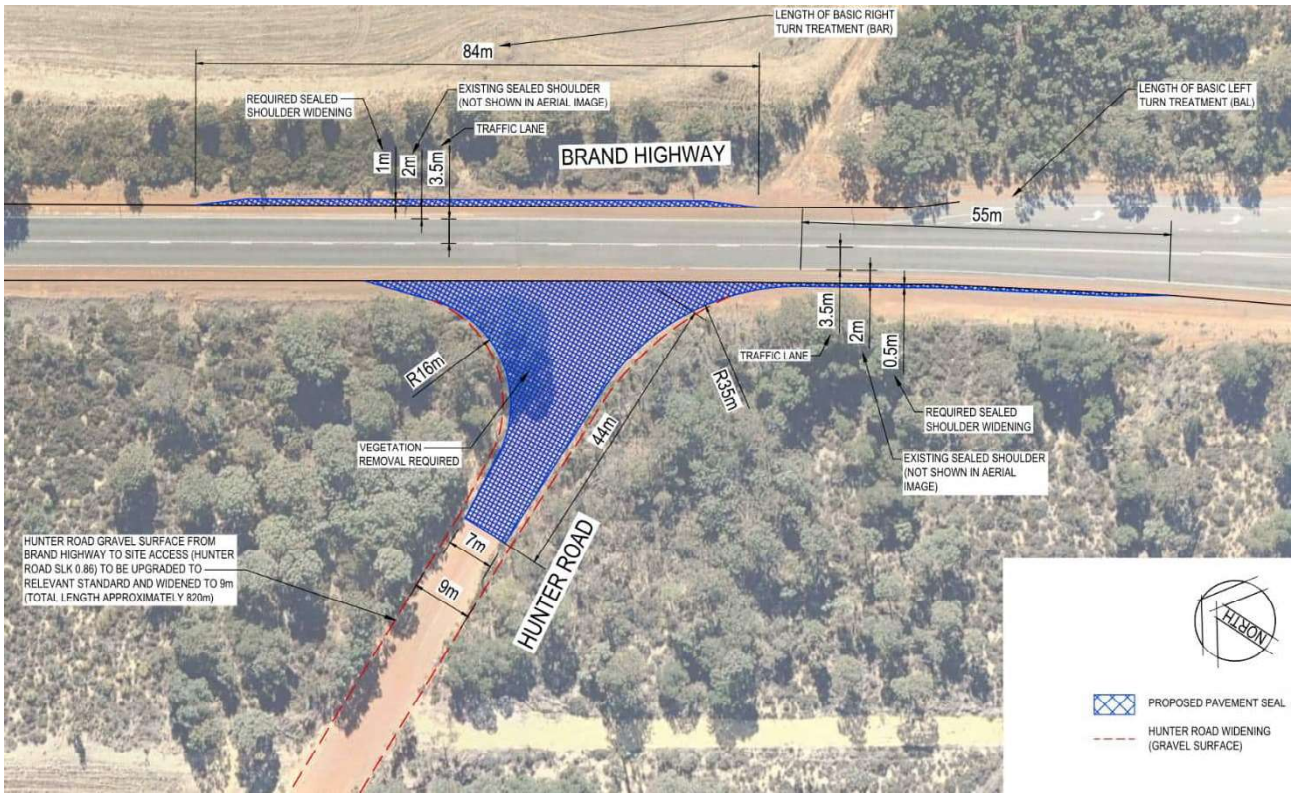
A pre-lodgement meeting was held in 10 June 2021 with the Shire of Dandaragan at which Cardno was informed that there are no road upgrades to Hunter Road currently proposed by the Shire.

However, to accommodate the truck movements in and out of the Site, the following upgrades are proposed:

- The Brand Highway / Hunter Road intersection would be widened to accommodate the swept paths of the design vehicle (RAV4) and provide a BAL and BAR turn treatments on Brand Highway. This will involve minor widening on Brand Highway to reach the required minimum pavement width (traffic lane + shoulder) of 6.5m for the southbound lane for BAR and 6m in the northbound lane for BAL.
- Hunter Road between Brand Highway and SLK 0.86 (site access) would be upgraded and widened to a 9m formation with 150mm of gravel, and a 7m wide sealed surface.

Figure 4-1 below shows an indicative concept sketch of the proposed upgrade (also in **Appendix B**). Main Roads WA have been engaged with these upgrade proposals and have stated no objection. Detailed design, including refinements to the concept, would be progressed in consultation with Main Roads following development approval.

Figure 4-1 Concept Sketch of the Proposed Upgrade



4.2 Proposed RAV Network

The development also proposed the inclusion of Hunter Road from Brand Highway to the Site access (approximately 860m) to the RAV network to allow RAV 4 enter and exit the Site.

Both Main Roads WA and the Shire of Dandaragan have been consulted at pre-lodgement stage and indicated no objection. Following detailed design, a formal RAV Route Assessment will be undertaken in consultation with the Shire and Main Roads to determine whether any conditions would need to be applied.

4.3 Pedestrian and Cycling Facility

The development is not proposing any changes to the pedestrian and cycling facility in the surrounding road network.

4.4 Public Transport Facilities

The development is not proposing any changes to the public transport facility.

5 Integration with Surrounding Area

5.1 Surrounding Attractors/Generators

The proposed development is chicken farm located in a rural area and as such would not be generating traffic from the surrounding area nor would there be any significant attractor to which the development traffic would go to.

5.2 Changes to the Surrounding Area

Cardno has been made aware of two preliminary planning proposals in the vicinity of the site:

- Lot M2127 (west of the Site) – sand silica extraction (Proponent: Desameja)
- Lot 801 (north of the Site, within Shire of Dandaragan) – large scale extractive industry (Proponent: Image Resources)

It is understood that Desameja may develop and operate within 12 months, whilst Image Resources is unlikely to be operational for 2-3 years. At the current time, no development application has been submitted for either proposal.

It is understood that both of these operations would likely use vehicles up to RAV10 size and therefore require a larger intersection with Brand Highway that what is required to accommodate this development.

As these planning proposals are yet to be formalised, this Application proposes only the work necessary to accommodate RAV4 vehicles. Should one or more of the other planning proposals progress within the immediate future, there may be an opportunity for both parties to collaborate to deliver a single intersection/road upgrade that accommodates the larger vehicles. It is anticipated that this will be explored following development approval.

6 Analysis of Transport Network

6.1 Development Traffic Generation

Trip generation for the Site is determined from a first principles approach based on the operational information provided by the applicant and summarised as follows:

- Staff members
  - 4 casual employees arriving on site at 7AM and leave 4PM.
  - Other staff members live on site and do not generate trips on the external road network.
- 247 trucks over a 60-day cycle for all 14 sheds combined, consisting of the following:
  - Placement – 16 single axle trucks
  - Bird removal – 150 trucks (typically 19m semi-trailers)
  - Feeding – 46 trucks (typically 27.5m B-doubles)
  - Clean up – 35 trucks (typically 19m semi-trailers)

It should be noted that the total truck movements (247 trucks) occurs over a period of 60 days and each shed operates on its own cycle and do not coincide with each other – i.e. bird placement for Shed 1 occurs on a different day to bird placement for Shed 2, truck movements for clean out occurs over the last 2 weeks of the cycle, and so on.

Based on the above, there is an average of 4 trucks per day visiting the site within the 60-day cycle. For the purpose of a robust assessment, the daily truck movements are doubled to 8 trucks per day and it is assumed that 2 trucks would arrive at each of the AM and PM peak hours. Trucks are assumed to arrive and depart at the same peak hour. For the purpose of a robust assessment, a "worst-case" scenario approach has been considered where all regular deliveries / pick-ups occur on the same peak hour.

Table 6-1 below provides a summary of the total estimated trips generated by the Site for a typical "worst case" day.

Table 6-1 Estimated Trip Generation

	AM Peak Hour		PM Peak Hour		Daily	
	In	**Out**	**In**	**Out**	**In**	**Out**
Staff	4	0	0	4	4	4
Trucks	2	2	2	2	8	8
Total	**6**	**2**	**2**	**6**	**12**	**12**

The development is expected to have a maximum trip generation of approximately 8 vehicles in the AM peak hour and 8 vehicles in the PM peak hour. An estimated total of 24 daily vehicle trips are anticipated for the Site for the worst-case scenario.

6.2 Development Traffic Distribution

The development traffic is then distributed to the external road network with the distribution assumptions shown in **Figure 6-1.** The resultant development traffic flow is shown in **Figure 6-2.**

Figure 6-1 Development Traffic Distribution

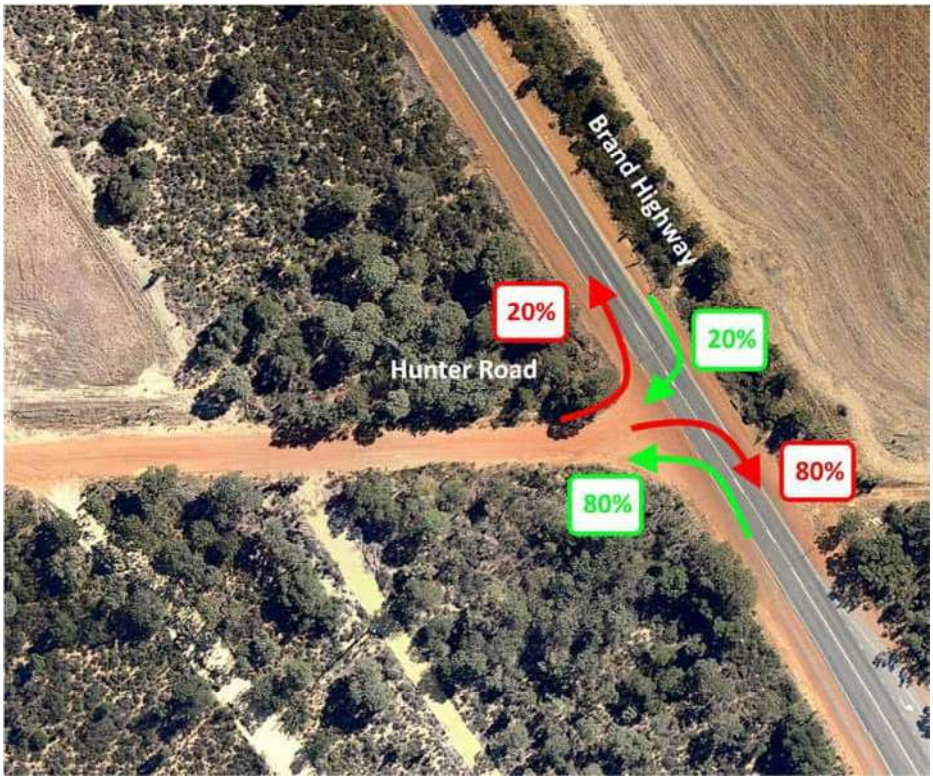
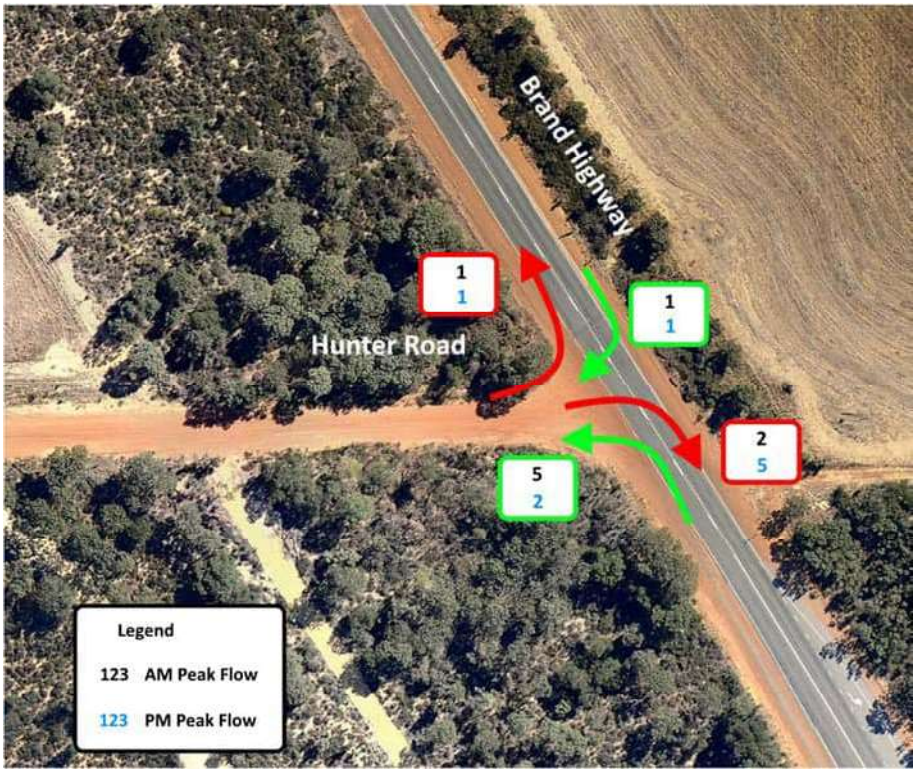


Figure 6-2 Development Traffic Flow



6.3 Traffic Analysis

The development is only expected to generate 24 daily trips which is approximately 1% of the daily volume of Brand Highway. This is a very low addition to the road network and would not have material impact. Similarly, the highest number of turning movement into or out of Hunter Road is 5 vehicles in the peak hour. This magnitude of turning volume is low and can be accommodated by the intersection, therefore no detailed assessment (e.g. SIDRA) is necessary.

6.4 Turn Warrant Assessment

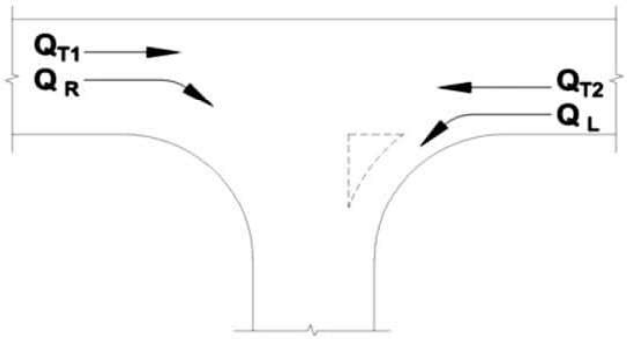
6.4.1 Assessment Parameters

A turn warrant assessment had been undertaken as per the equation provided in Main Roads WA Supplement to Austroads Guide to Road Design Part 4. This assessment provides a warrant for the preferred minimum turn treatments on major roads (i.e. the road that has traffic priority over another at an intersection).

The preferred turn treatments are determined by the following parameters:

- **QL or QR**: peak hour turning movement volume;
- **QM**: traffic volume on the major road, see **Figure 6-3** for the calculation of QM for a two-way two-lane road; and
- **design speed –** 120km/h design speed is adopted which 10km/h above the posted speed limit of Brand Highway.
- **Traffic volume:**
  - Traffic volume for Brand Highway is sourced from MRWA Traffic Map (Site 16034, north of Dandaragan Road).
  - For sensitivity testing, the peak hour traffic of Brand Highway, which is in midday, will be used and increased by 6.7% per annum to 2031. The growth rate was derived from traffic history data of Brand Highway sourced from MRWA Traffic Map (Site 50714, South of Mogumber Road).
  - As the assumed peak hours (morning and afternoon) of the Site does not coincide with the peak hour of Brand Highway, the peak hour with the highest number of turning movement, i.e. AM peak will be used.

Figure 6-3 Calculation of QM



Road type	Turn type	Splitter island	Q_M (veh/h)
Two-lane two-way	Right	No	= $Q_{T1} + Q_{T2} + Q_L$
		Yes	= $Q_{T1} + Q_{T2}$
	Left	Yes or no	= Q_{T2}
Four-lane two-way	Right	No	= 50% x $Q_{T1} + Q_{T2} + Q_L$
		Yes	= 50% x $Q_{T1} + Q_{T2}$
	Left	Yes or no	= 50% x Q_{T2}
Six-lane two-way	Right	No	= 33% x $Q_{T1} + Q_{T2} + Q_L$
		Yes	= 33% x $Q_{T1} + Q_{T2}$
	Left	Yes or no	= 33% x Q_{T2}

Source: TMR (2016a).

6.4.2 Brand Highway / Hunter Road Turn Warrant

Figure 6-4 shows the adopted volume for the purpose of the assessment and **Figure 6-5** shows the input parameters inserted into the spreadsheet provided by Main Roads WA.

The result shows that BAL and BAR treatments would be required on Brand Highway.

Figure 6-4 Turning Volume (2031 Background Traffic Volumes)

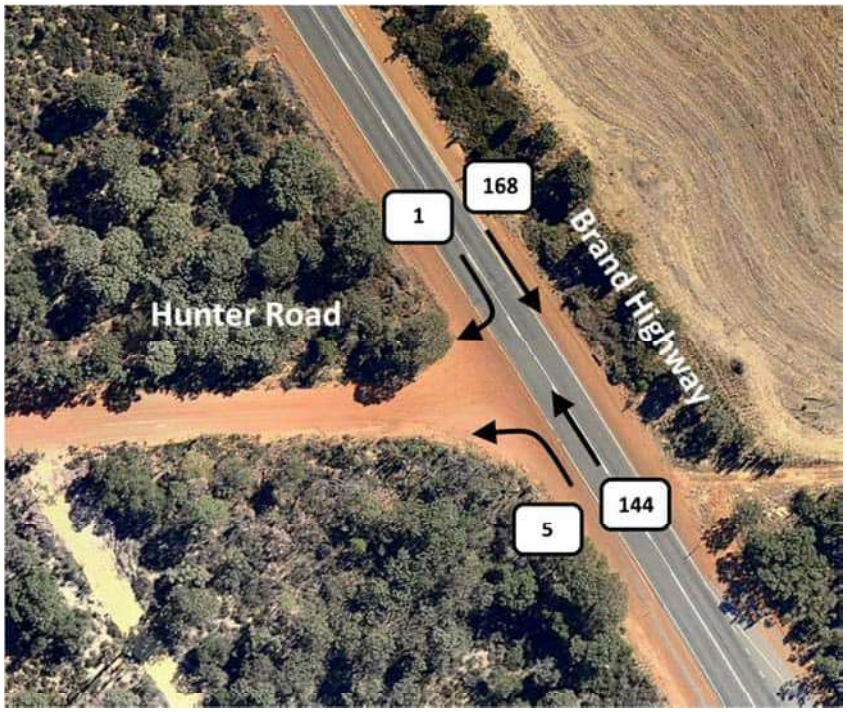


Figure 6-5 Assessment Results

INTERSECTION WARRANTS

Main Roads WA Supplement to Austroads Guide to Road Design - Part 4 A.8

DESIGN SPEED =	120km/h
SPLITTER ISLAND YES / NO =	No
DUAL CARRIAGEWAY YES / NO =	No

MOVEMENT	**COUNT (v/h)**	**HV (%)**
Q_{T1} =	168	36
Q_R =	1	40
Q_{T2} =	144	31
Q_L =	5	40

RIGHT TURN ASSESSMENT

Q_m =	317
% HV =	33.792
x =	0.51
TREATMENT =	**BAR**

LEFT TURN ASSESSMENT

Q_m =	144
% HV =	31.000
x =	0.47
TREATMENT =	**BAL**

7 Summary

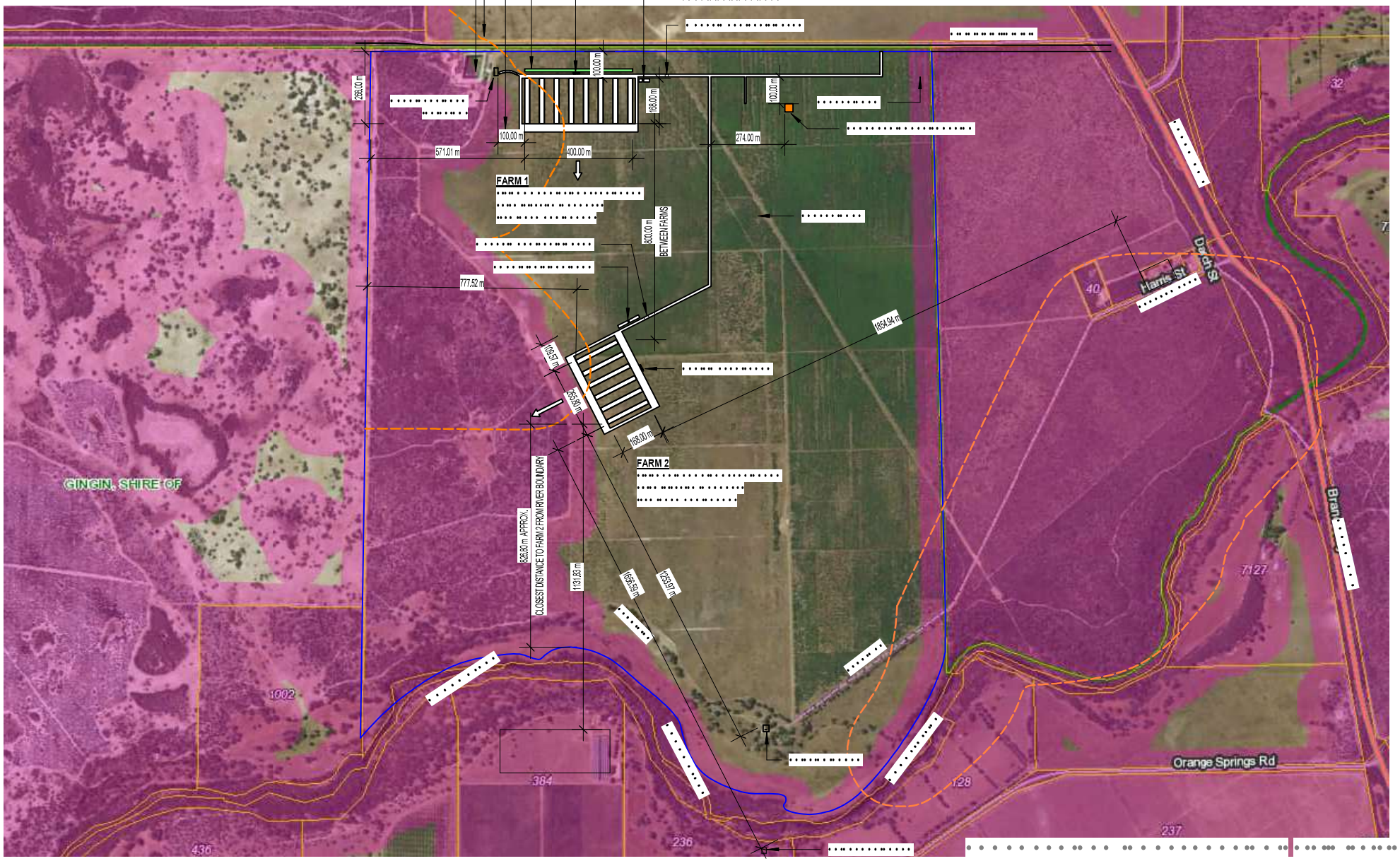
This Transport Impact Assessment (TIA) outlines the transport aspects of the proposed development focusing on traffic generation, access arrangement, and required upgrades to support the proposed chicken farm at Lot M1254 Hunter Road, Orange Springs, Shire of Gingin.

The following conclusions have been made in regards to the proposed development:

- The Site is proposed to be developed into a chicken farm. It will consist of 2 farms, one consisting of 8 sheds and the other 6 sheds. In addition to the sheds, there will also be supporting amenities such as car parks and a house.
- Site access will be located on the north east corner of the lot and fronting Hunter Road. Internal road network will be provided to link the Site access to various building within the Site. Note that Hunter Road is wholly within the neighbouring Shire of Dandaragan.
- To support the truck movements in and out of the Site, Hunter Road would need to be upgraded. Minor pavement widening on Brand Highway would also be required to accommodate the required turn treatments.
- The development is expected to have a maximum trip generation of approximately 8 vehicles in the AM peak hour and 8 vehicles in the PM peak hour. An estimated total of 24 daily vehicle trips are anticipated for the Site for the worst-case scenario. This magnitude of trip generation is very low and would have no material impact to the road network from traffic capacity perspective.

APPENDIX A

SITE PLAN



SANTREV
THE POULTRY HOUSE CONSTRUCTION SPECIALISTS

SANTREV PTY LTD
PO Box 95, Ipswich
Queensland Australia 4305

H	CONCEPT DRAWINGS FOR REVIEW	01/07/2021
J	CONCEPT DRAWINGS FOR REVIEW	06/07/2021

KIRI PARK POULTRY FARMS

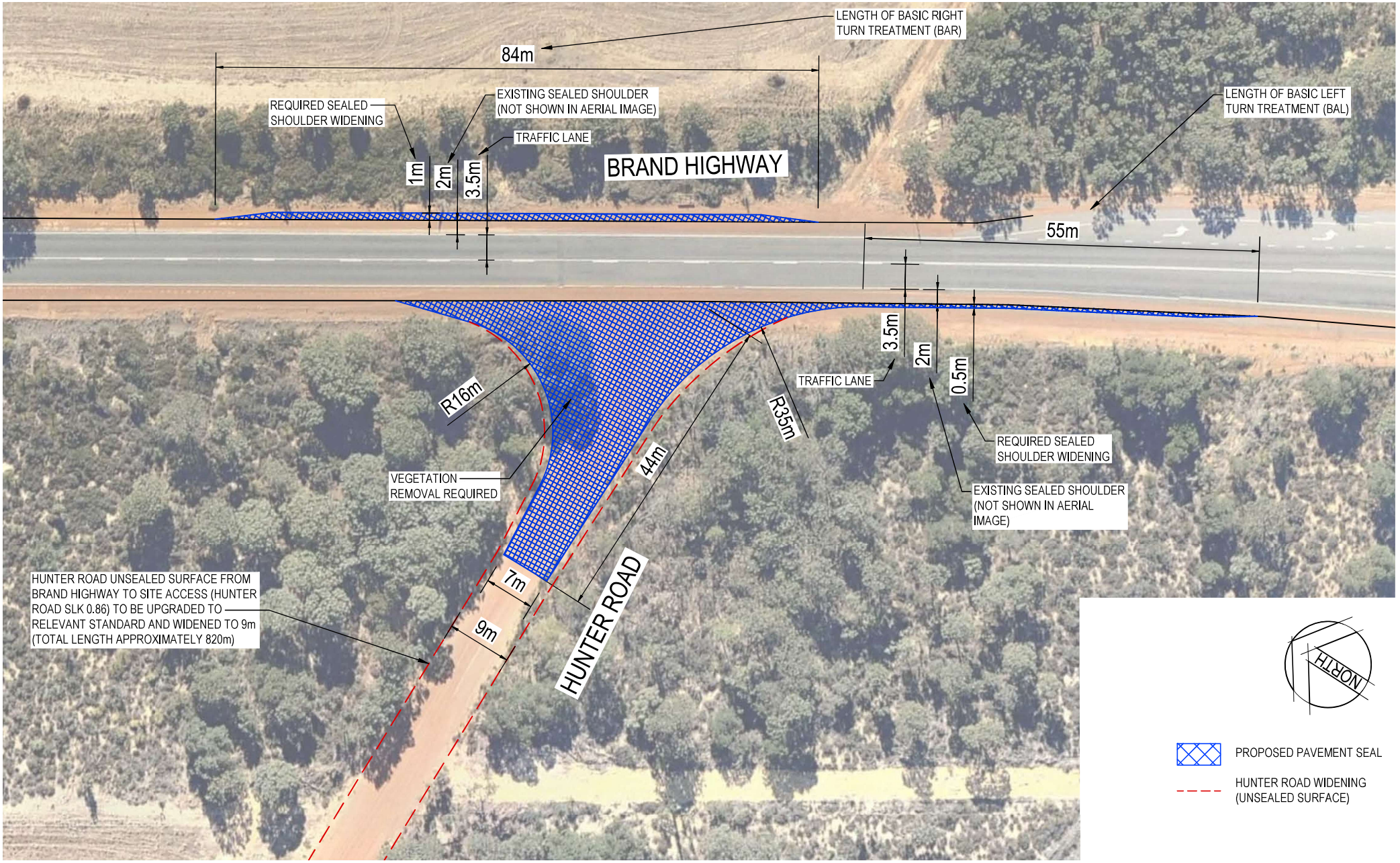
For:

Project Address:

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APPENDIX B

ROAD UPGRADES CONCEPT



DATE PLOTTED: 7 July 2021 8:51 AM BY: RAYMOND RACHMAT
CAD File: K:\Projects\CW1176500_ProTen Western Australia Pty Ltd_Hunter Farm Rd_Traffic Management\5_Technical\Traffic\CAD\CW1176500-Hunter Rd V2.dwg

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PROTEN WA

LOT M1254 HUNTER ROAD

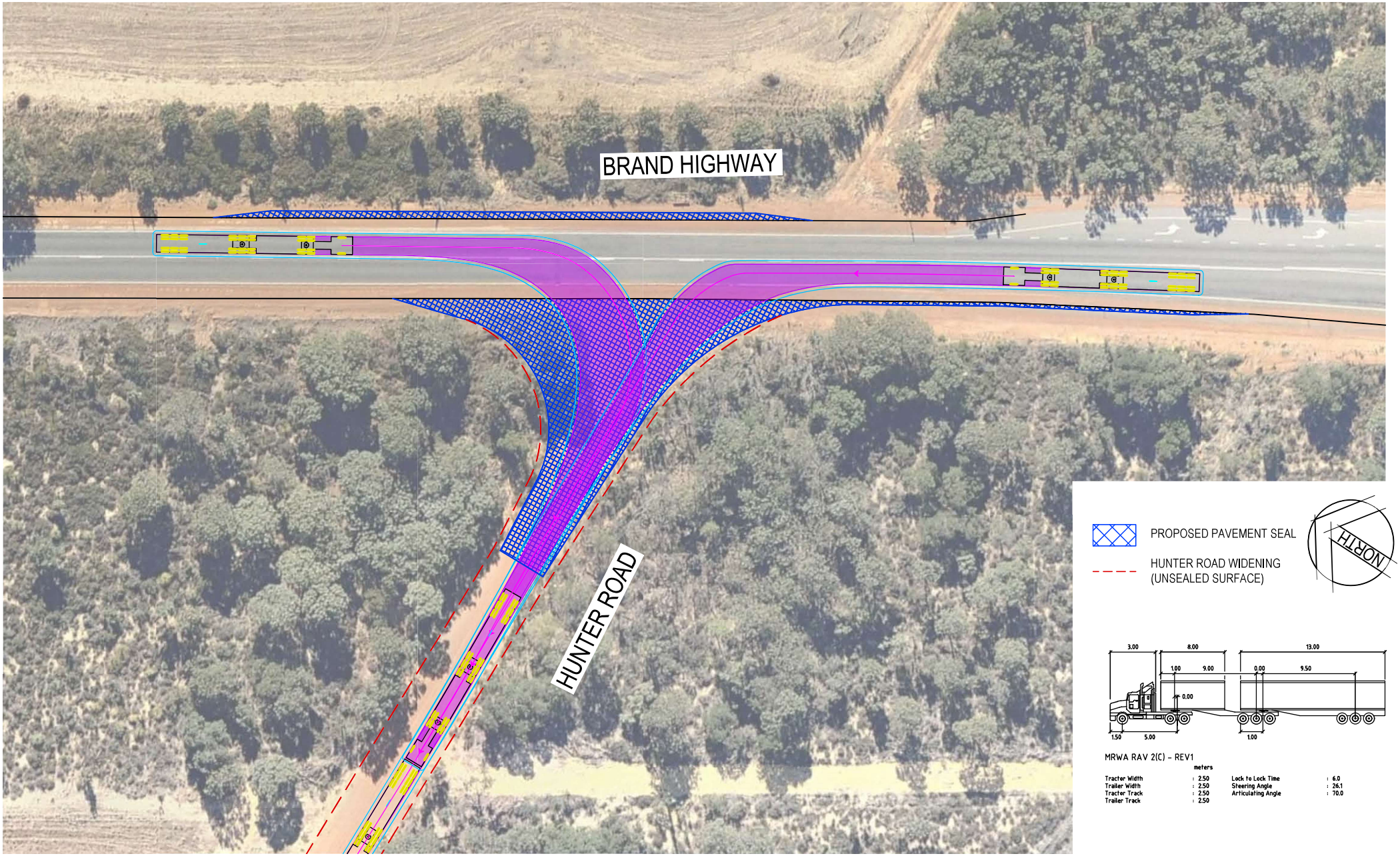
BRAND HIGHWAY & HUNTER ROAD INTERSECTION

INDICATIVE UPGRADE REQUIRED

Date	Scale	Size
14.05.2021	1:500	A3

CW1176500-TR-SK001
Drawing Number

B
Revision



MRWA RAV 2(C) – REV1

	meters		
Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 2.50	Steering Angle	: 26.1
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 2.50		

DATE PLOTTED: 7 July 2021@11:51 AM BY: RAYMOND RACHMAT
CAD File: K:\Projects\CW1176500_ProTen Western Australia Pty Ltd_Hunter Farm Rd_Traffic Management\5_Technical\Traffic\CAD\CW1176500-Hunter Rd V2.dwg

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PROTEN WA

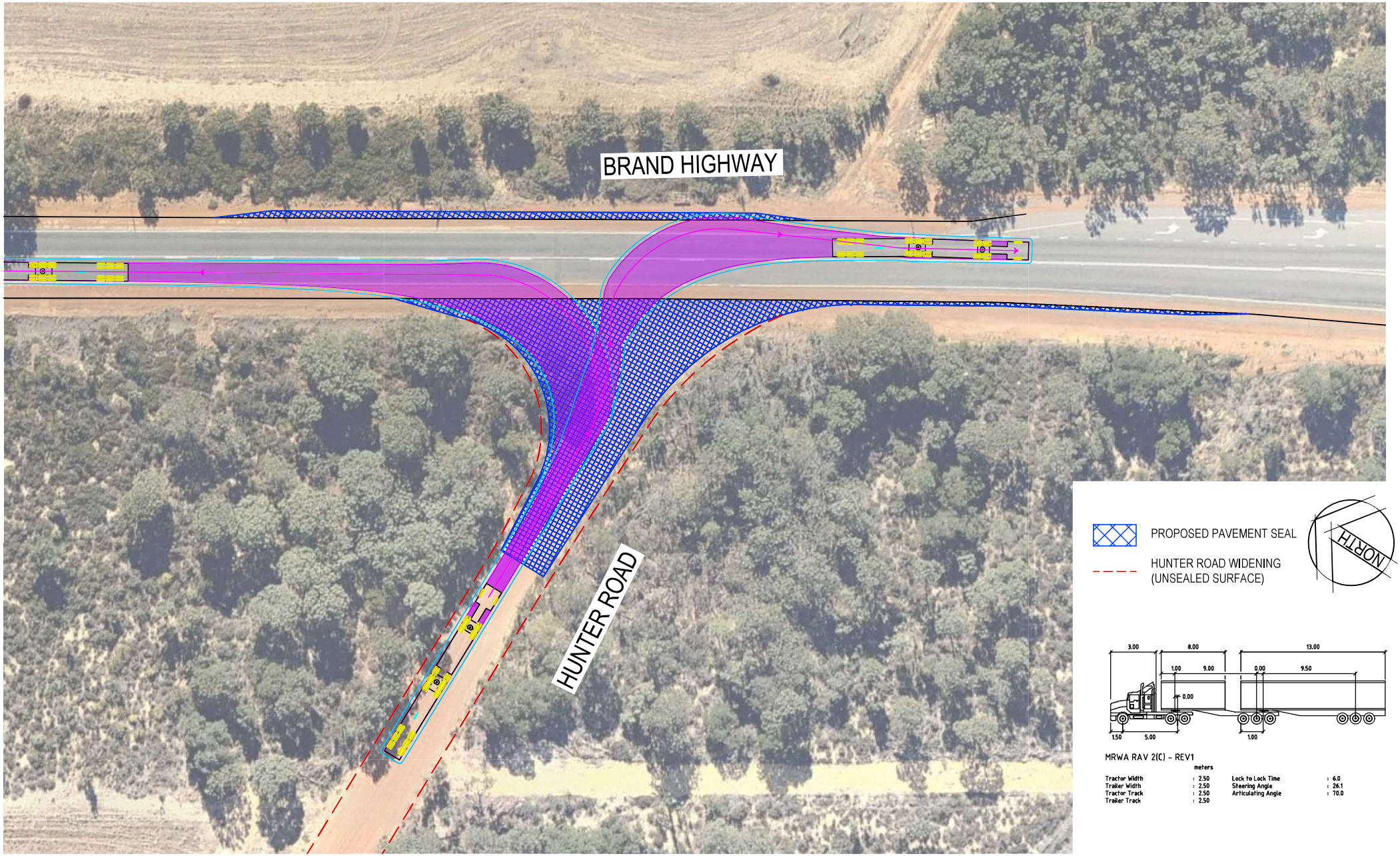
LOT M1254 HUNTER ROAD

27.5m B-DOUBLE SWEPT PATH ENTERING HUNTER ROAD

Date	Scale	Size
14.05.2021	1:500	A3

CW1176500-TR-SK002
Drawing Number

B
Revision



MRWA RAV 2(C) - REV1

	meters		
Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 2.50	Steering Angle	: 26.1
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 2.50		

DATE PLOTTED: 7 July 2021 9:52 AM BY: RAYMOND RAGHNAT
CAD File: K:\Projects\CW1176500_ProTen Western Australia Pty Ltd_Hunter Farm Rd_Traffic Management\05_Technical\Traffic\CAD\CW1176500-Hunter Rd V2.dwg

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PROTEN WA

LOT M1254 HUNTER ROAD

27.5m B-DOUBLE SWEPT PATH

EXITING HUNTER ROAD

Date	Scale	Size
14.05.2021	1:500	A3

CW1176500-TR-SK003
Drawing Number

B
Revision

Lot M1254 Proposed Chicken Farm

APPENDIX C

WAPC CHECKLIST

Item	Provided	Comments / Proposals
Introduction/Background		
name of applicant and consultant	Section 1	
development location and context	Section 1, 2.1	
brief description of development proposal	Section 1	
key issues	Section 1	
Background information	Section 1	
Existing situation		
existing site uses (if any)	Section 2.1	
existing parking and demand (if appropriate)	N/A	
existing access arrangements	Section 3.2	
existing site traffic	N/A	
surrounding land uses	Section 2.1	
surrounding road network	Section 2.3	
traffic management on frontage roads	Section 2.3	
traffic flows on surrounding roads (usually am and pm peak hours)	Section 2.4	
traffic flows at major intersections (usually am and pm peak hours)	N/A	
operation of surrounding intersections	N/A	
existing pedestrian/cycle networks	Section 2.6	
existing public transport services surrounding the development	Section 2.7	
Crash data	Section 2.8	
Development proposal		
regional context	Section 2.1	
proposed land uses	Section 3.1	
table of land uses and quantities	Section 3.1	
access arrangements	Section 3.2	
parking provision	Section 3.3	
end of trip facilities	N/A	
any specific issues	N/A	
road network	Section 4.1	
intersection layouts and controls	Section 4.1	
pedestrian/cycle networks and crossing facilities	Section 4.3	

Item	Provided	Comments / Proposals
public transport services	Section 4.4	
Integration with surrounding area		
surrounding major attractors/generators	Section 5.1	
committed developments and transport proposals	Section 4.1, 5.2	
proposed changes to land uses within 1200 metres	Section 5.2	
travel desire lines from development to these attractors/generators	N/A	
adequacy of existing transport networks	Section 6.3, 6.4	
deficiencies in existing transport networks	N/A	
remedial measures to address deficiencies	N/A	
Analysis of transport networks		
assessment years	N/A	
time periods	N/A	
development generated traffic	Section 6.1	
distribution of generated traffic	Section 6.2	
parking supply & demand	N/A	
base and "with development" traffic flows	N/A	
analysis of development accesses	N/A	
impact on surrounding roads	Section 6.3	
impact on intersections	Section 6.3	
impact on neighbouring areas	Section 6.3	
traffic noise and vibration	N/A	
road safety	Section 2.8	
public transport access	N/A	
pedestrian access / amenity	N/A	
cycle access / amenity	N/A	
analysis of pedestrian / cycle networks	N/A	
safe walk/cycle to school (for residential and school site developments only)	N/A	
Traffic management plan (where appropriate)	N/A	

About Cardno

Cardno is a professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

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Attachment D

Intersection Design Brand Highway (H004) and Hunter Road (5070173)

AMENDMENTS

NO.	DESCRIPTION	DATE APPROVED
0	ISSUED FOR CONSTRUCTION	RA 15.12.2022
D	ISSUED FOR 100% DESIGN REVIEW	RA 19.10.2022
C	ISSUED FOR 85% DESIGN REVIEW	RA 02.09.2022
B	ISSUED FOR 15% DESIGN REVIEW	RA 22.07.2022
A	ISSUED FOR 15% DESIGN REVIEW	RA 20.05.2022

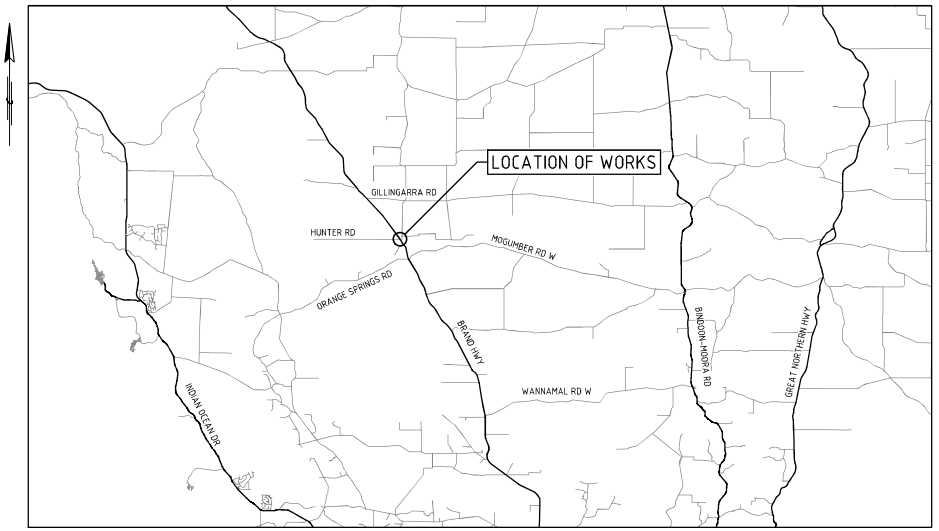
CONTRACT No. CW1200271
ROAD CONSTRUCTION
BRAND HIGHWAY H004

INTERSECTION DESIGN
BRAND HIGHWAY (H004) AND HUNTER ROAD (5070173)
SLK 77.30 TO SLK 77.50
(504) SHIRE OF DANDARAGAN

DRAWINGS - ROADWORKS

INTERSECTION DESIGN
BRAND HWIGHWAY (H004)
AND HUNTER ROAD (5070173)

SLK 77.30 TO SLK 77.50
(504) SHIRE OF DANDARAGAN



LOCALITY PLAN
NOT TO SCALE

DRAWING INDEX

GENERAL DRAWINGS

202214-0354	COVER PAGE	
202214-0355	LOCALITY PLAN & DRAWING INDEX	
202214-0356	GENERAL NOTES	

EARTHWORKS LAYOUT PLAN

202214-0357	EARTHWORKS LAYOUT PLAN	

EXISTING SERVICES PLAN

202214-0358	DEMOLITION / LOCATION PLAN	

PLAN & PROFILES DRAWINGS

202214-0359	MC01 PLAN AND PROFILE	SHEET 1 OF 2
202214-0360	MC02 PLAN AND PROFILE	SHEET 2 OF 2

INTERSECTION DRAWINGS

202214-0361	EXTENT OF PAVEMENT & SURFACING PLAN	
202214-0362	INTERSECTION LAYOUT PLAN	

CROSS SECTION DRAWINGS

202214-0363	CROSS SECTIONS	SHEET 1 OF 4
202214-0364	CROSS SECTIONS	SHEET 2 OF 4
202214-0365	CROSS SECTIONS	SHEET 3 OF 4
202214-0366	CROSS SECTIONS	SHEET 4 OF 4

DRAINAGE DRAWINGS

202214-0367	DRAINAGE LAYOUT PLAN	

TYPICAL DRAWINGS

202214-0368	TYPICAL DETAILS	
202214-0369	DETAILED CROSS SECTIONS	

LINEMARKING AND SIGNAGE

202214-0370	LINEMARKING & SIGNAGE LAYOUT PLAN	

TURNING MOVEMENTS

202214-0371	TURNING MOVEMENTS	SHEET 1 OF 2
202214-0372	TURNING MOVEMENTS	SHEET 2 OF 2

STANDARD DRAWINGS

201331-0007	HAZARD MARKERS - CULVERT WIDTH MARKERS / CULVERT POST
201331-032	PAVEMENT SERIES - TYPICAL DETAILS GRANULAR TRAVERSE JOINTS
201631-0083	PAVEMENT SERIES - TYPICAL TIE IN DETAILS (GRANULAR PAVEMENT) LONGITUDINAL CONSTRUCTION JOINTS (ASPHALT WEARING COURSE)
201331-035	WEARING COURSE SERIES - TYPICAL DETAILS OGA/DGA TRANSVERSE JOINTS
201331-038	WEARING COURSE SERIES - TYPICAL DETAILS LONGITUDINAL JOINTS
1930-0666	PRECAST SMALL BOX CULVERT UNITS
200131-0062	BEDDING AND BACKFILL DETAILS
201131-0064	CONSTRUCTION DETAILS FOR BASE SLABS, APRONS SLABS WINGWALLS, HEADWALLS - SHEET NO 1
201131-0065	CONSTRUCTION DETAILS FOR BASE SLABS, APRONS SLABS WINGWALLS, HEADWALLS - SHEET NO 2
201131-0066	CONSTRUCTION DETAILS FOR BASE SLABS, APRONS SLABS WINGWALLS, HEADWALLS - SHEET NO 3
202031-0107	PAVEMENT MARKINGS AND RRPMs AT TYPE "BA" AND TYPE "AUR" INTERSECTIONS
201131-0040	LONGITUDINAL EDGE LINE WITH ADJACENT AUDIO-TACTILE RIBS FOR ROADS WITH SEALED SHOULDERS ≥1.0m
201631-0054	TRANSITION FROM 120mm EDGE LINE TO 150mm EDGE LINE WITH ADJACENT AUDIO-TACTILE RIBS
9931-0198	PAVEMENT MARKING LINE TYPES
200431-002	STOP AND GIVE WAY LINES
201031-0004	SPLITTER ISLAND ON TERMINATING ROAD - LINE MARKING AND RRPM'S FOR ISLAND 3.0m WIDE AND POSTED SPEED 70km/h
201031-0026	RAISED PAVEMENT MARKERS - GENERAL APPLICATION
201031-0027	RAISED PAVEMENT MARKERS - GENERAL APPLICATIONS - FREEWAYS, HIGHWAYS, MAIN ROADS AND ARTERIAL ROADS IN RURAL AND OUTER METROPOLITAN
8820-0257	TYPICAL MOUNTING FOR SINGLE SIDED & BACK TO BACK SIGNS
9020-0693	TYPICAL MOUNTING DETAIL, SINGLE SIDE & BACK TO BACK SIGNS
9020-0316	TYPICAL SIGN BRACKET
8720-0762	LOCATION DETAIL FOR TWO AND THREE POST SIGNS
9548-106	LOCATION DETAILS FOR SINGLE POST SIGNS
9648-176	FIXING AND INSTALLATION DETAILS FOR SINGLE HAZARD MARKERS
9748-0438	FIXING AND INSTALLATION DETAILS FOR ONE WAY ARROW DIRECTION SIGN & TWO WAY ARROW DIRECTION SIGN
200831-0015	HAZARD BOARD SIGN LOCATIONS
201331-0007	CULVERT WIDTH MARKERS/CULVERT
8720-0657	POSTS FOR UNBRACED SIGNS: COMMON LENGTHS USED
9220-0180	UNBRACED SIGN BLANKS, BOLTS HOLE LOCATION
8820-0354	ALUMINIUM EXTRUSION FOR THE REAR OF ROAD SIGNS
200831-0017	HORIZONTAL JOINT FOR BRACED SIGNS
201431-0032	TYPICAL ASSEMBLY OF MULTI PIECE SIGN - ON-SITE VERTICAL JOINTS
9331-0376	KERB TYPES
9831-5497	OFF-ROAD DRAINAGE TYPICAL PLAN
9831-5498	OFF-ROAD DRAINAGE CROSS SECTIONS
200331-0182	PAVEMENT MARKINGS AND RRPM's AT TYPE "BA" AND TYPE "AUR" INTERSECTIONS

FOR CONSTRUCTION

SCALES A1

No.	DESCRIPTION	APPROVED & DATE
1	UPDATED STANDARD DRAWING LIST	RA 21.04.2023
0	ISSUED FOR CONSTRUCTION	RA 15.12.2022
D	ISSUED FOR 100% DESIGN REVIEW	RA 19.10.2022
C	ISSUED FOR 85% DESIGN REVIEW	RA 02.09.2022
B	ISSUED FOR 15% DESIGN REVIEW	RA 22.07.2022
A	ISSUED FOR 15% DESIGN REVIEW	RA 20.05.2022

AMENDMENTS

ProTen

METADATA	
GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

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BRAND HWY INTERSECTION DESIGN
BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
LOCALITY PLAN & DRAWING INDEX

LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN

MRWA DRAWING NUMBER
202214-0355-1

EARTHWORKS LAYOUT PLAN NOTES:

1. GENERAL

1.1. ALL WORK TO BE COMPLETED TO THE APPROVAL OF MAIN ROADS WA
1.1. THE CONTRACTOR SHALL LIMIT THE MOVEMENT OF EQUIPMENT AND MANPOWER TO THE MINIMUM AREA NECESSARY AND PROTECT ALL VEGETATION ON SITE UNLESS OTHERWISE APPROVED BY SUPERINTENDENT.
1.2. THE CONSTRUCTION OF THE WORKS SHALL BE TO THE APPROVAL OF THE MAIN ROADS WA.
1.3. NO WORKS SHALL BE UNDERTAKEN WITHOUT MAIN ROADS WA'S APPROVAL OF TRAFFIC MANAGEMENT PLAN AND "AUTHORISATION TO UNDERTAKE WORKS IN ROAD RESERVE".
1.4. ALL DRAWINGS TO BE READ IN CONJUNCTION WITH MAIN ROADS WA'S STANDARD DRAWINGS AND SPECIFICATIONS.

2. EARTHWORKS

2.1. ALL LEVELS IN METRES TO AHD.
2.2. HORIZONTAL DATUM IS LCG94.
2.3. EXISTING FEATURES AND LEVELS AS SUPPLIED BY HARLEY DYKSTRA
2.4. ALL DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE SPECIFICATION AND SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED BY THE SUPERINTENDENT. ANY DISCREPANCY SHALL BE REFERRED TO THE SUPERINTENDENT FOR DECISION BEFORE PROCEEDING WITH THE WORK.
2.5. ALL LEVELS & SET OUT SHALL BE LOCATED FROM BENCH MARKS ESTABLISHED BY A LICENSED SURVEYOR.
2.6. ALL DESIGN CONTOURS SHOWN REFER TO TOP OF FINISHED SURFACE.
2.7. UNSUITABLE MATERIAL TO BE REMOVED TO STOCKPILE OFFSITE. STOCKPILE LOCATION SUBJECT TO THE APPROVAL OF THE SUPERINTENDENT.
2.8. REMNANT VEGETATION TO BE PEGGED BY CONTRACTOR. NO CLEARING TO OCCUR UNTIL SUCH STAGE AS THE PROPOSED EXTENTS, TO BE REMOVED, IS APPROVED BY THE SUPERINTENDENT.
2.9. THIS PLAN SHALL BE READ IN CONJUNCTION WITH THE ROAD PROFILE DRAWINGS, AS SHOWN ON THE PROJECT DRAWINGS FOR ROAD DESIGN LEVELS AND CROSSFALLS.
2.10. PLACING OF FILL SHALL NOT COMMENCE UNTIL SUPERINTENDENT AND PROJECT GEOTECHNICAL ENGINEER HAS INSPECTED THE WORKS.
2.11. THE CONTRACTOR SHALL MAKE APPROPRIATE ALLOWANCE IN THE TENDER TO ENGAGE THE PROJECT GEOTECHNICAL ENGINEER OR ANY APPROVED ALTERNATIVE GEOTECHNICAL ENGINEER TO VISIT THE SITE DURING EARTHWORK ACTIVITIES AS REQUIRED AND PROVIDE THE NECESSARY CERTIFICATION UPON COMPLETION OF EARTHWORKS.
2.12. THE CONTRACTOR SHALL MAKE THEIR OWN DETERMINATION OF CUT TO FILL QUANTITIES. EARTHWORKS MODELS CAN BE PROVIDED FOR INFORMATION IF REQUIRED.
2.13. EXTENT OF EARTHWORKS SHALL BE AS SHOWN BY DESIGN CONTOURS AS SPECIFIED ON THIS PLAN.
2.14. THE CONTRACTOR SHALL ALLOW FOR ROAD BOX-OUT WHEN FORMING EARTHWORKS WHICH ARE NOT INDICATED BY THE DESIGN CONTOURS ON THIS DRAWING. REFER TO ROAD PLAN & PROFILE DRAWINGS FOR WIDTH AND CROSSFALL.
2.15. WHERE THERE IS NO DESIGN LEVELS SHOWN ALONG A ROAD RESERVE BOUNDARY, THE CONTRACTOR SHALL GRADE EVENLY FROM THE PROPOSED VERGE LEVELS TO NATURAL SURFACE, NOT EXCEEDING 1 IN 3 SLOPE U.O.N.
2.16. THE CONTRACTOR SHALL PROOF COMPACT TO 600mm DEPTH -
i) ALL FILL AREAS PRIOR TO PLACING OF FILL.
ii) ALL CUT AREAS AFTER COMPLETION OF CUT, BUT PRIOR TO PLACING TOPSOIL.
2.17. CHARACTERISTIC DRY BACK OF UNBOUND LAYERS OF SUBGRADE SHALL BE 85% OF THE SUBGRADES OPTIMUM MOISTURE CONTENT MODIFIED
2.18. COMPACTION SHALL BE NOT LESS THAN 95% MMDD (U.N.O.).
2.19. FILL SHALL BE CLEAN GRANULAR MATERIAL AND PLACED IN LAYERS NOT EXCEEDING 300mm COMPACTED THICKNESS TO 95% MMDD (U.N.O.). FILL SHALL BE GRADED EVENLY BETWEEN DESIGN LEVELS SHOWN. LOCALIZED MOUNDS AND TRENCHES SHALL BE GRADED LEVEL.
2.20. THE CONTRACTOR SHALL ALLOW FOR REMOVAL AND RESPREADING OF TOP SOIL ON THE VERGE, INCLUDING REMOVAL OF EXCESS TOP SOIL OFF SITE.
2.21. DESIGN MODELS (AutoCAD) ARE AVAILABLE FOR ACCURATE LOCATIONS OF DESIGN CONTOURS.
2.22. BATTERS TO EXISTING LEVELS SHALL NOT EXCEED 1 IN 3 SLOPE GENERALLY..
2.23. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ARRANGING DILAPIDATION REPORTS FOR ALL EXISTING BUILDINGS WITHIN THE VICINITY OF THE SITE OF WORKS WHICH COULD BE AFFECTED BY THE EARTHWORK ACTIVITIES PRIOR TO COMMENCEMENT OF WORKS ON SITE.
2.24. THE CONTRACTOR SHALL HAVE SUFFICIENT WATER CARTS ON SITE SUCH THAT ONE WATER CART IS IN OPERATION AT ALL TIMES.
2.25. THE CONTRACTOR SHALL BE RESPONSIBLE TO SUBMIT 'AS-CONSTRUCTED' INFORMATION (DIGITAL/HARDCOPY) IN AN ACCEPTABLE FORMAT FOR SUBMISSION TO THE MAIN ROADS WA (REFER SPECIFICATION).
2.26. THE CONTRACTOR SHALL MAKE APPROPRIATE ALLOWANCES IN THEIR TENDER TO COMPLY WITH THE DUST MANAGEMENT REPORT AND THE MAIN ROADS WA'S DUST MANAGEMENT REQUIREMENTS.
2.27. THE CONTRACTOR SHALL MAKE APPROPRIATE ALLOWANCES IN THEIR TENDER TO REGULARLY SWEEP THE ROADS FRONTING THE WORKS UNTIL COMPLETION.
2.28. THE CONTRACTOR SHALL BE RESPONSIBLE TO STABILIZE THE SITE DAILY OR AS REQUIRED BY ADDING THE STABILIZING LIQUID TO THE WATER CART AT THE END OF EACH DAYS WORK.
2.29. THE CONTRACTOR SHALL BE RESPONSIBLE TO HYDROMULCH THE SITE AFTER COMPLETION OF THE WORKS.
2.30. ALL EXISTING VEGETATION HIGHLIGHTED FOR RETENTION TO BE FENCED OFF AND PROTECTED AT ALL TIMES.
2.31. VEGETATION HIGHLIGHTED FOR REMOVAL TO BE PROTECTED UNTIL APPROVAL IN WRITING IS RECEIVED FROM THE SUPERINTENDENT OF WORKS.
2.32. CONTRACTOR TO SEEK APPROVAL IN WRITING FROM THE SUPERINTENDENT PRIOR TO WORKS ON PRIVATE PROPERTY.
2.33. EXISTING PROPERTY DRIVEWAYS TO BE PROTECTED. LOT OWNERS TO BE PROVIDED 24 HOUR ACCESS TO BRAND HWY & HUNTER RD FOR DURATION OF WORKS.
2.34. FENCING TO PROPERTIES IN THE VICINITY OF THE WORKS AREA TO BE PROTECTED. DAMAGED AND REMOVED FENCING TO BE REINSTALLED TO THE APPROVAL OF THE SUPERINTENDENT
2.35. CONTRACTOR TO RECONSTRUCT/ REINSTATE FENCING IMPACTED BY THE WORKS. FINISH AND MATERIALS TO SUIT EXISTING.
2.36. TEMPORARY FENCING TO BE PROVIDED UNTIL FINAL FENCING IS IN PLACE.
2.37. THE CONTRACTOR SHALL NOT UNDERTAKE WORKS WITHIN PRIVATE PROPERTY, WITHOUT THE EXPRESSED CONSENT OF THE PROPERTY OWNER & PRINCIPLE.
2.38. CONTRACTOR TO CONFIRM TIE-IN LEVELS & LENGTHS FOR DRIVEWAYS.

EXISTING SERVICES & TERRAIN PLAN NOTES:

1. SERVICES

1.1. THE CONTRACTOR SHALL UNDERTAKE A DIAL BEFORE YOU DIG AND PHYSICALLY LOCATE EXISTING SERVICES IN ORDER TO ENSURE THERE IS NO CONFLICT WITH THE PROPOSED CIVIL WORKS. IN THE EVENT OF THE INTERFERENCE WITH CIVIL WORKS THE CONTRACTOR SHALL BE RESPONSIBLE TO ADVISE THE SUPERINTENDENT IMMEDIATELY AND SEEK DIRECTION. THE CONTRACTOR SHALL MAKE APPROPRIATE ALLOWANCE IN THE TENDER.
1.2. THE CONTRACTOR SHALL LIASE WITH SERVICE PROVIDER TO RAISE, LOWER OR REPLACE EXISTING MANHOLES TO MATCH VERGE GRADE AS DEEMED NECESSARY. THE CONTRACTOR SHALL MAKE APPROPRIATE ALLOWANCE IN THE TENDER.
1.3. ANY DAMAGE TO EXISTING SERVICES SHALL BE NOTIFIED AND RECTIFIED BY THE SERVICE AUTHORITY, ALL COSTS SHALL BE BORNE BY THE CONTRACTOR.
1.4. ALL DRAWINGS TO BE READ IN CONJUNCTION WITH MAIN ROADS WA'S STANDARD DRAWINGS

ROAD LAYOUT PLAN NOTES:

1. GENERAL

1.4. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWINGS LISTED ON THE COVER AND THE SPECIFICATION.
1.5. THE CONTRACTOR SHALL LIMIT THE MOVEMENT OF EQUIPMENT AND MANPOWER TO THE MINIMUM AREA NECESSARY AND PROTECT ALL VEGETATION ON SITE.
1.6. ALL DRAWINGS TO BE READ IN CONJUNCTION WITH MAIN ROADS WA STANDARD DRAWINGS.
1.7. ALL DIMENSIONS ARE IN METRES.
1.8. CONTRACTOR TO LIAISE WITH ATCO GAS FOR ANY WORKS OCCOURING WITHIN 15m OF HIGH PRESSURE GAS MAINS IN ACCORDANCE WITH AGA-08M-PR24.

2. ROADWORKS

2.1. ALL KERBS SHALL BE KEYED MOUNTABLE TYPE A-2(40) KERB UNLESS OTHERWISE SHOWN.
2.2. PAVEMENT WIDTH SHALL BE AS SHOWN ON THE DRAWING AND SHALL BE MEASURED BETWEEN KERBS.
2.3. ALL ROAD VERGES SHALL BE STABILISED WITH 75mm OF TOPSOIL THE SUPERINTENDENT WILL INSTRUCT THE CONTRACTOR TO HYDROMULCH THE VERGES IF REQUIRED.
2.4. THE CONTRACTOR SHALL INSTALL REGULATORY SIGNS AND LINE MARKINGS IN CONJUNCTION WITH THE WORKS.
2.5. CONTRACTOR SHALL ALLOW SMOOTH CONNECTION INTO EXISTING KERB & PAVEMENT LEVELS FOR ALL CONNECTING ROADS. EXISTING TO BE SAWCUT WHERE REQUIRED.
2.6. CONTRACTOR IS TO ENSURE THAT THERE IS NO ROAD BASE, COMPACTED SUBGRADE, COMPACTED SAND OR MORTAR BASE PRESENT IN LANDSCAPING AREAS.
2.7. CHARACTERISTIC DRY BACK OF UNBOUND LAYERS OF SUBBASE AND BASECOURSE SHALL RESPECTIVELY BE 85% AND 70% OF THE SUBGRADES OPTIMUM MOISTURE CONTENT MODIFIED.
2.8. SUBBASE AND BASECOURSE SHALL BE COMPACTED TO 96%MMDD AND 98%MMDD RESPECTIVELY.

3. SERVICE INSTALLATION

3.1. THE CONTRACTOR SHALL SUPPLY AND INSTALL UNDERGROUND POWER DUCTS IN THE LOCATIONS TO BE ADVISED.
3.2. THE CONTRACTOR SHALL LIAISE WITH TELSTRA AND NBN Co. FOR TIMELY INSTALLATION OF ANY ROAD CROSSINGS.
3.3. THE CONTRACTOR SHALL LIAISE WITH ATCO GAS FOR TIMELY INSTALLATION OF ANY ROAD CROSSINGS.
3.4. ANY DAMAGE TO EXISTING SERVICES SHALL BE NOTIFIED AND RECTIFIED BY THE SERVICE AUTHORITY ALL COSTS SHALL BE BORNE BY THE CONTRACTOR.
3.5. THE CONTRACTOR SHALL BE RESPONSIBLE TO PROTECT ALL OF THE MONITORING BORES AND THE IRRIGATION BORES AT ALL TIMES. ANY DAMAGE DONE TO THE MONITORING BORES OR THE IRRIGATION BORES WILL BE RECTIFIED BY THE CONTRACTOR AT NO COST TO THE PRINCIPAL.

4. KERBING AND MEDIAN CONCRETE

4.1. CONCRETE KERBING SHALL CONFORM TO MAIN ROADS SPECIFICATION 407
4.2. MEDIAN CONCRETE SHALL CONFORM TO MAIN ROADS SPECIFICATION 901.
4.3. MEDIAN CONCRETE CONTRACTION / EXPANSION JOINTS SHALL ALIGN WITH KERB CONTRACTION / EXPANSION JOINTS.

DRAINAGE LAYOUT PLAN NOTES:

4. DRAINAGE

4.1. PIPE SIZES IN MILLIMETRES, DISTANCES AND LEVELS IN METRES.
4.2. ALL DRAINAGE PIPES SHALL BE CLASS 2 RCP (U.N.O.).
4.3. ALL PIPES SHALL BE LAID WITH AT LEAST H2 BEDDING SUPPORT AS DESCRIBED IN AS 3725.
4.4. MINIMUM COVER TO ANY PIPE TO BE 0.6m. MINIMUM CLEARANCE TO OTHER SERVICES AS NOTED.
4.5. CONTRACTOR TO LIAISE WITH RELEVANT AUTHORITIES WHEN NEAR EXISTING SERVICES. REPORT ANY DISCREPANCIES.
4.6. ALL PIPE DISTANCES ARE MEASURED BETWEEN CENTRE OF PIT LINERS.
4.7. FOR DRAINAGE DETAILS REFER TO DRAWING CW1014500-CI-501.
4.8. ALL WORKS SHALL BE CARRIED OUT TO THE REQUIREMENTS OF THE MAIN ROADS WA, WHERE THEIR REQUIREMENT ARE IN CONFLICT WITH WHAT IS SHOWN ON THE DRAWINGS, THE CONTRACTOR SHALL OBTAIN DIRECTION FROM THE SUPERINTENDENT PRIOR TO PROCEEDING WITH THE CONSTRUCTION.
4.9. THE CONTRACTOR SHALL COMPLY WITH LOCAL AUTHORITY CONDITIONS WITH REGARD TO SAND-DRIFT, STABILISATION AND THE REQUIREMENT OF WATER CARTS TO MINIMISE DUST BLOW TO NEIGHBOURING PROPERTIES.
4.10. ALL LEVELS SHALL BE BASED ON BENCHMARKS AS SUPPLIED BY A LICENSED SURVEYOR.
4.11. CONTRACTOR SHALL LOCATE ALL EXISTING SERVICES, PRIOR TO WORKS COMMENCING AND PROTECT FOR THE DURATION OF THE WORKS. ANY DAMAGE TO SERVICES IS THE RESPONSIBILITY OF THE CONTRACTOR TO REPAIR IN ACCORDANCE WITH THAT SERVICE AUTHORITY REQUIREMENTS. ANY DETAILS OF EXISTING SERVICES SHOWN ON THE DRAWINGS ARE INDICATIVE ONLY.
4.12. EARTHWORKS SHALL BE COMPLETED PRIOR TO THE LAYING OF PIPES.
4.13. ALL GRATED GULLY PITS WITHIN TRAFFICABLE PAVEMENT AREAS AND CYCLEWAYS SHALL HAVE CYCLE-SAFE GRATING.
4.14. JUNCTION PIT LID LEVELS IN VERGES - SHALL BE FLUSH WITH FINAL VERGE GRADING TO ENSURE FLUSH FINISH WITH POSSIBLE FOOTPATHS AND FUTURE TURF AREAS.
4.15. CONTRACTOR SHALL CONTACT SUPERINTENDENT PRIOR CONSTRUCTION, WHEN AN INCORRECT INVERT LEVEL OR GRADE IS FOUND. (INVERT LEVELS OVER-RIDE GRADES GIVEN)
4.16. GENERALLY PIPES SHALL BE LAID OBVERT TO OBVERT WITH 20mm FALL THROUGH PITS U.O.N PIPE LENGTHS ARE FROM CENTRE OF LINERS.
4.17. JUNCTION PITS AND SIDE ENTRY PITS SHALL BE LOCATED AS SPECIFIED ON THESE PLANS TO MINIMISE CONFLICT WITH OTHER SERVICES AND FUTURE CROSSOVERS.
4.18. THE CONTRACTOR SHALL REFER TO THE RELEVANT SEWER DESIGN DRAWINGS FOR THE DETAILS OF LOCATION
4.19. DRAINAGE PIPES SHALL BE PILED AND KEELED WHERE THEY CROSS ABOVE SEWER LINES. THE PILE AND KEEL DETAIL SHALL BE AS ADOPTED BY THE WATER CORPORATION STANDARD
4.20. BACKFILL SHALL BE PLACED AND COMPACTED IN LIFTS NOT EXCEEDING 300mm. CONTRACTOR SHALL NOTIFY SUPERINTENDENT PRIOR TO COMMENCING NEXT LIFT. ALL COMPACTION MUST BE TO 95% MMDD.
4.21. THE CONTRACTOR SHALL VERIFY EXISTING PIPE LEVEL AND EXTEND NEW PIPE AT EXISTING GRADE.
4.22. ALL PIPES UNDER ROAD PAVEMENT SHALL HAVE CEMENT STABILISED BACKFILL IN ACCORDANCE WITH MRWA SPECIFICATIONS.
4.23. THE CONTRACTOR SHALL BE RESPONSIBLE TO SUBMIT 'AS-CONSTRUCTED' INFORMATION FOR STORMWATER DRAINAGE (DIGITAL/HARDCOPY) IN AN ACCEPTABLE FORMAT FOR SUBMISSION TO THE MAIN ROADS WA (REFER SPECIFICATION).
4.24. CONTRACTOR TO REINSTATE EXISTING PAVEMENT AFTER INSTALLATION OF STORMWATER PITS AND PIPE NETWORK.
4.25. PLACEMENT OF ALL BATTER DRAINS TO BE CONFIRMED ON SITE WITH MAIN ROADS WA PRIOR TO CONSTRUCTION.
4.26. ALL DRAWINGS TO BE READ IN CONJUNCTION WITH MAIN ROADS WA STANDARD DRAWINGS.

LINEMARKING & SIGNAGE NOTES:

1. LINEMARKING

1.1. ALL LINEMARKINGS TO BE "4 YEAR LIFE" MATERIAL FOR ARTERIAL ROADS
1.2. ALL LINEMARKINGS TO BE APPLIED WITH GLASS BEADS.
1.3. EXISTING LINEMARKING TO BE REMOVED BY GRINDING IN ACCORDANCE WITH MAIN ROADS SPECIFICATION 604.36.03. THE METHOD OF REMOVAL SHALL BE CONFIRMED WITH THE SUPERINTENDENT BEFORE CONDUCTING THE WORKS.
1.4. ALL EXISTING SIGNS PROPOSED TO REMAIN SHALL BE REPLACED LIKE FOR LIKE DUE TO THEIR AGE
1.5. THE CONTRACTOR SHALL ALLOW FOR THE REMOVAL OF EXISTING LINEMARKING.
1.6. THE CONTRACTOR SHALL ALLOW FOR FINAL SWEEPING OF THE ROADS AND APPLY SPOT MARKING.
1.7. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH MAIN ROADS WA STANDARD DRAWINGS.
1.8. THE CONTRACTOR SHALL ALLOW FOR THE INSTALLATION OF ALL LINEMARKING DENOTED AS "BY OTHERS".
1.9. ALL ARROWS AND DIAGONAL AND TRANSVERSE LINE MARKINGS TO BE THERMOPLASTIC.
1.10. LINEMARKING TO BE SET OUT FOR MRWA INSPECTION PRIOR TO INSTALLATION.
1.11. LINEMARKING WORKS SHALL BE IN ACCORDANCE WITH MAIN ROADS SPECIFICATION 604

2. SIGNAGE NOTES

2.1 ALL EXISTING SIGNS PROPOSED TO REMAIN SHALL BE REPLACED LIKE FOR LIKE DUE TO THEIR AGE AND CONDITION.
2.2 ALL SIGNS SHALL BE IN ACCORDANCE WITH MAIN ROADS SPECIFICATIONS 601 AND STANDARD DRAWINGS.
2.3 ALL GUIDEPOSTS SHALL BE IN ACCORDANCE WITH MAIN ROADS SPECIFICATION 602

FOR CONSTRUCTION

SCALES: A1

No.	DESCRIPTION	APPROVED & DATE
0	ISSUED FOR CONSTRUCTION	RA 15.12.2022
D	ISSUED FOR 100% DESIGN REVIEW	RA 19.10.2022
C	ISSUED FOR 85% DESIGN REVIEW	RA 02.09.2022
B	ISSUED FOR 15% DESIGN REVIEW	RA 22.07.2022
A	ISSUED FOR 15% DESIGN REVIEW	RA 20.05.2022

AMENDMENTS

ProTen

METADATA	
GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

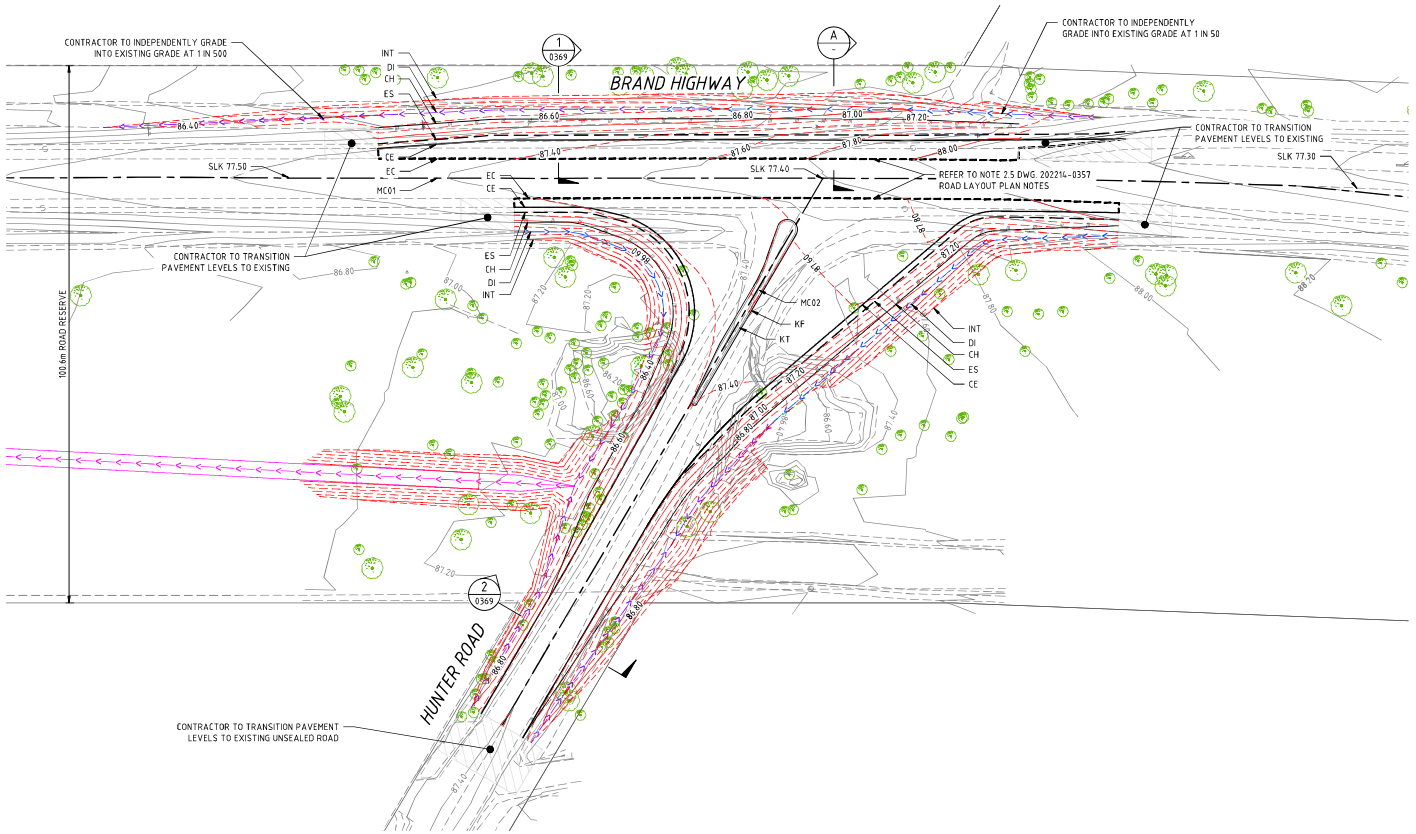
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BRAND HWY INTERSECTION DESIGN
BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
GENERAL NOTES
LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN
MRWA DRAWING NUMBER
202214-0356-0



EARTHWORKS LAYOUT PLAN

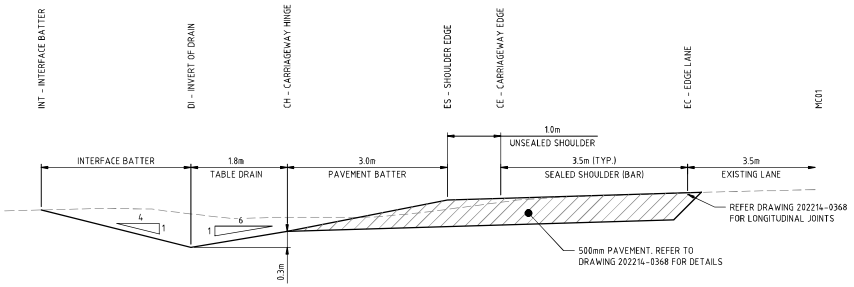
SCALE 1:500

NOTES:

1. REFER TO DWG 202214-0356 FOR NOTES

LEGEND:

- EXISTING CADASTRAL BOUNDARY
- EXISTING CONTOUR (INTERVAL 0.2m)
- PROPOSED CONTOUR (INTERVAL 1.0m)
- PROPOSED CONTOUR (INTERVAL 0.2m)
- ROAD CENTERLINE & REFERENCE STRINGS
- PROPOSED CARRIAGEWAY EDGE
- PROPOSED SHOULDER EDGE
- PROPOSED CARRIAGEWAY HINGE
- TABLE DRAIN (PLUS DIRECTION OF FLOW)
- INDEPENDENT TABLE DRAIN (PLUS DIRECTION OF FLOW)
- TYPE F DRAIN (PLUS DIRECTION OF FLOW)
- CUT BATTER (1:4 U.N.O)
- FILL BATTER (1:4 U.N.O)
- EXISTING CARRIAGEWAY EDGE
- EXISTING TREE



SECTION A (V DRAIN)

SCALE 1:50

Accepted by Main Roads

For definition of Acceptance refer to Acceptance Letter

FOR CONSTRUCTION

SCALES: A1 1:500 1:50

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The Essential First Step

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AMENDMENTS

ProTen

METADATA

GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

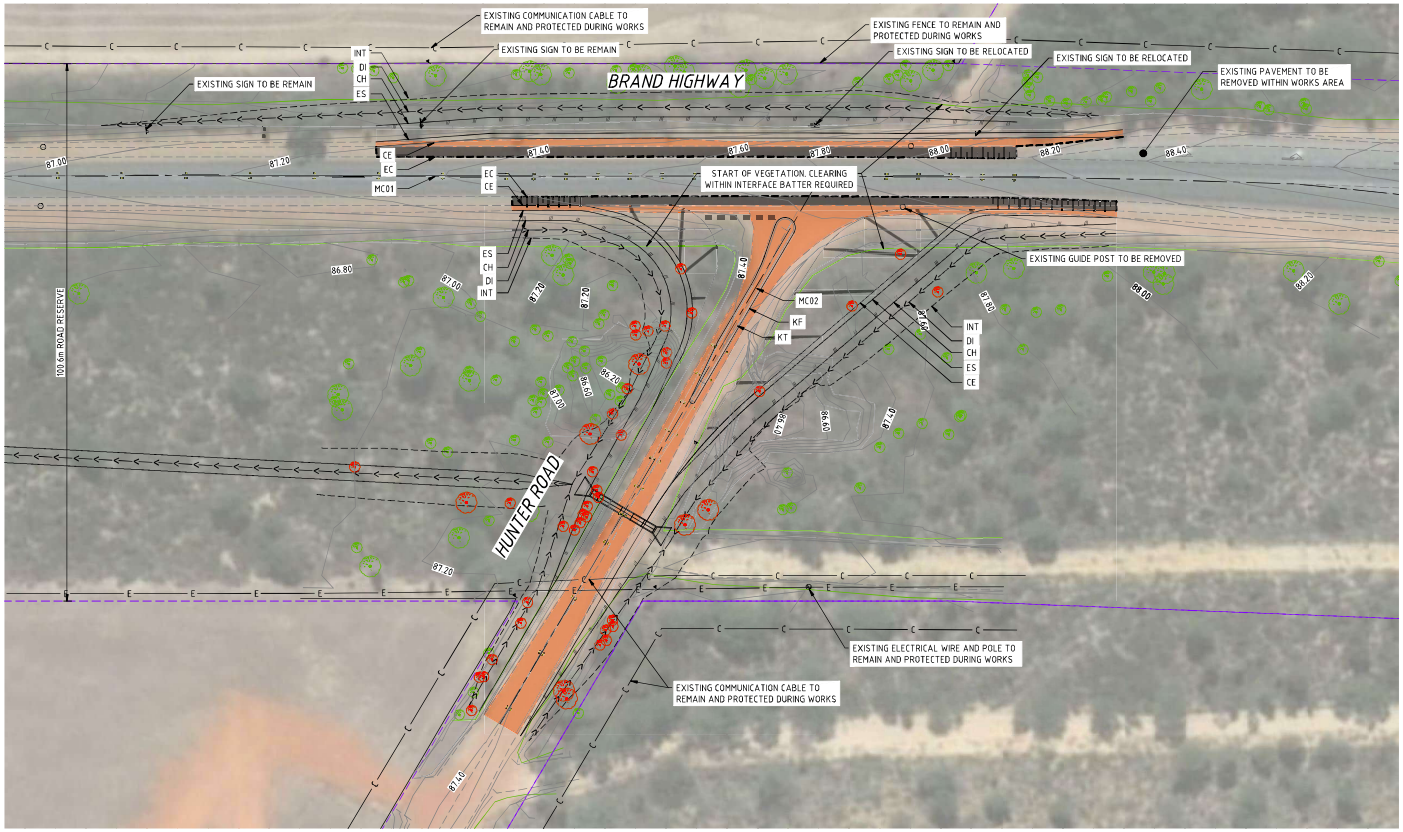
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BRAND HWY INTERSECTION DESIGN
BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
EARTHWORKS LAYOUT PLAN
LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN
MRWA DRAWING NUMBER
202214-0357-0



DEMOLITION / SERVICE LOCATION PLAN

SCALE 1:250

NOTE:

1. REFER TO DWG 202214-0356 FOR GENERAL NOTES

LEGEND:

- EXISTING CADASTRAL BOUNDARY
- EXISTING CONTOUR (INTERVAL 0.2m)
- ROAD CENTERLINE & REFERENCE STRINGS
- PROPOSED CARRIAGEWAY EDGE
- PROPOSED SHOULDER EDGE
- PROPOSED CARRIAGEWAY HINGE
- INVERT OF DRAIN (PLUS DIRECTION OF FLOW)
- INTERFACE BATTER
- EXISTING ROAD
- EXISTING TREE TO BE REMOVED
- EXISTING TREE TO REMAIN
- SEALED PAVEMENT TO BE REMOVED (437m²)
- UNSEALED PAVEMENT TO BE REMOVED (934m²)

SERVICES LEGEND

- C — COMMUNICATION CABLE
- E — ELECTRICAL WIRE

Accepted by Main Roads

For definition of Acceptance refer to Acceptance Letter

FOR CONSTRUCTION

SCALES 1:500 A1

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No.	DESCRIPTION	APPROVED & DATE
1	UPDATED COLOUR OF SERVICES	RA 21.04.2023
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D	ISSUED FOR 100% DESIGN REVIEW	RA 19.10.2022
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B	ISSUED FOR 15% DESIGN REVIEW	RA 22.07.2022
A	ISSUED FOR 15% DESIGN REVIEW	RA 20.05.2022

AMENDMENTS

ProTen

METADATA

GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

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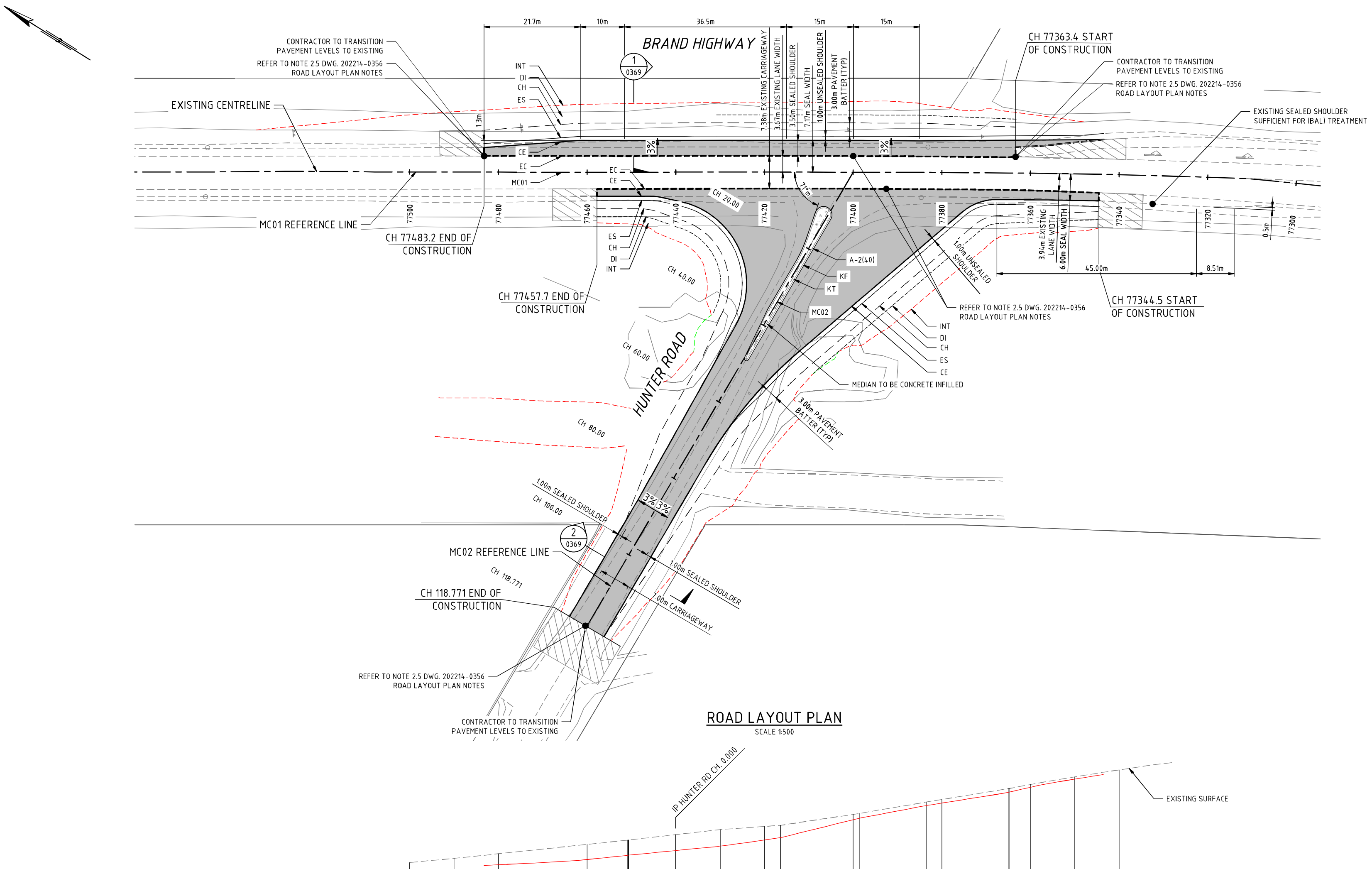
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BRAND HWY INTERSECTION DESIGN

BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
DEMOLITION / LOCATION PLAN

LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN

MRWA DRAWING NUMBER
202214-0358-1



NOTES:

1. REFER TO DWG 202214-0356 FOR NOTES

LEGEND:

	EXISTING CADASTRAL BOUNDARY
	ROAD CENTERLINE & REFERENCE STRING
77360	ROAD CHAINAGE
	PROPOSED CARRIAGEWAY EDGE
	CARRIAGEWAY STRINGS
	EDGE OF UNSEALED SHOULDER
	FORMATION OF DRAIN
	INVERT OF DRAIN
	EXISTING ROAD
	CUT BATTER
	FILL BATTER
3%	PAVEMENT CROSS FALL

PAVEMENT TYPE

	BLACK ASPHALT
	TRANSITION PAVEMENT FROM DESIGN TO EXISTING

DATUM AHD 87.00

PEGGED CL CHAINAGE	PEGGED CL DESIGN	PEGGED CL NATURAL SURFACE	CE DEPTH FROM MC01
77500	87.249	87.249	
77490	87.296	87.296	
77480	87.349	87.349	0.124
77460	87.454	87.454	0.171
77450.928	87.502	87.502	0.171
77450.658	87.503	87.503	0.171
77440	87.564	87.564	0.180
77429.966	87.621	87.621	0.188
77420	87.656	87.656	0.152
77416.355	87.669	87.669	0.139
77400	87.792	87.792	0.061
77398.505	87.804	87.804	0.054
77383.505	87.931	87.931	0.040
77380	87.960	87.960	0.040
77364.824	88.084	88.084	0.041
77360	88.129	88.129	0.031
77350	88.215	88.215	0.025
77340	88.293	88.293	

MC01 PROFILE

VERTICAL SCALE 1:25
HORIZONTAL SCALE 1:500

SCALES 1:500 1:25

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FOR CONSTRUCTION

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No.	DESCRIPTION	APPROVED & DATE
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0	ISSUED FOR CONSTRUCTION	RA 15.12.2022
D	ISSUED FOR 100% DESIGN REVIEW	RA 19.10.2022
C	ISSUED FOR 85% DESIGN REVIEW	RA 02.09.2022
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A	ISSUED FOR 15% DESIGN REVIEW	RA 20.05.2022

AMENDMENTS

ProTen

METADATA

GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

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A1

BRAND HWY INTERSECTION DESIGN

BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
MC01 PLAN AND PROFILE
SHEET 1 OF 2

LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN

MRWA DRAWING NUMBER
202214-0359-1

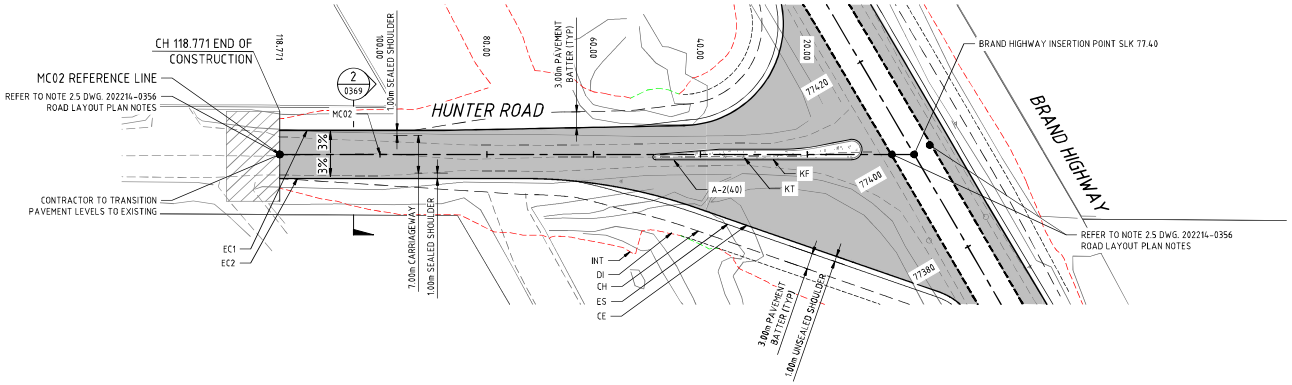
NOTES:

1. REFER TO DWG 202214-0356 FOR NOTES

LEGEND:

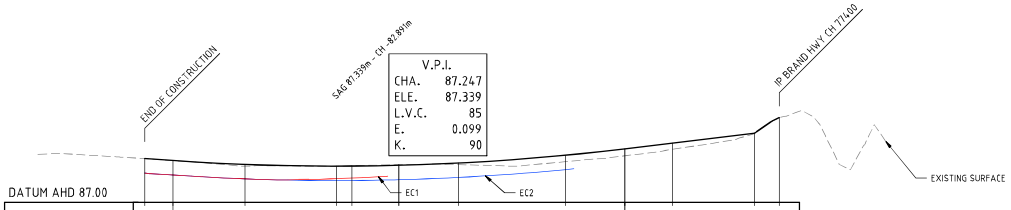
- EXISTING CADASTRAL BOUNDARY
- ROAD CENTERLINE & REFERENCE STRING
- 20.00 ROAD CHAINAGE
- PROPOSED CARRIAGEWAY EDGE
- CARRIAGEWAY STRINGS
- EDGE OF UNSEALED SHOULDER
- FORMATION OF DRAIN
- INVERT OF DRAIN
- EXISTING ROAD
- CUT BATTER
- FILL BATTER
- 3% PAVEMENT CROSS FALL

PAVEMENT TYPE
- BLACK ASPHALT
- TRANSITION PAVEMENT FROM DESIGN TO EXISTING



ROAD LAYOUT PLAN

SCALE 1:500



VERTICAL CURVE K VALUE					VC=85m K=90.0									
VERTICAL GRADE			-0.340%					0.600%						
HORIZ. ALIGNMENT +R = RIGHT TURN -R = LEFT TURN														
EC1 DEPTH FROM MC02	0.135	0.135		0.135	0.135	0.135	0.135		0.135					
EC2 DEPTH FROM MC01	0.135	0.135		0.117	0.112									
PEGGED CL DESIGN	87.409	87.391	87.355	87.339	87.339	87.347	87.368		87.441	87.501	87.554		87.647	87.792
PEGGED CL NATURAL SURFACE	87.409	87.391	87.338	87.338	87.342	87.352	87.354		87.381	87.435	87.496		87.647	87.792
CUT/FILL	0.000	0.000	0.017	0.001	-0.002	-0.006	0.014		0.060	0.066	0.058		0.000	0.000
PEGGED CL CHAINAGE	118.771	113.501	100.000	82.891	80.000	71.196	60.000		40.000	28.891	20.000		4.585	0.000
CROSSFALL	COMMON -3%			RHS -2%			LHS -3% (RHS INTERSECTION)			INTERSECTION				

MC02 PROFILE

VERTICAL SCALE 1:25
HORIZONTAL SCALE 1:500

Accepted by Main Roads

For definition of Acceptance refer to Acceptance Letter

FOR CONSTRUCTION

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0	ISSUED FOR CONSTRUCTION	RA 15.12.2022
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AMENDMENTS

ProTen

METADATA

GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

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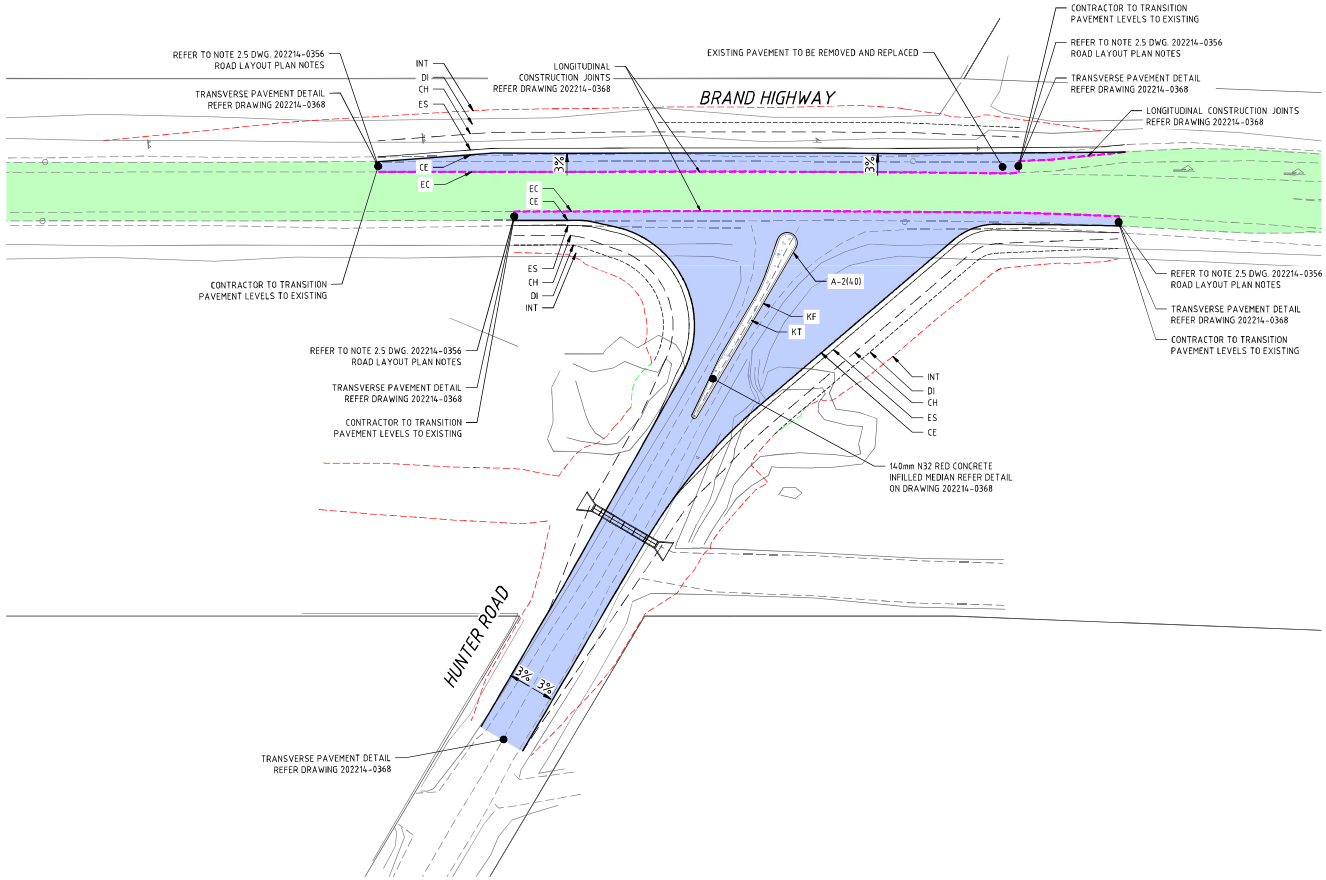
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BRAND HWY INTERSECTION DESIGN

BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
MC02 PLAN AND PROFILE
SHEET 2 OF 2
LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN
MRWA DRAWING NUMBER
202214-0360-1

SCALES 1:25 1:500 A1



EXTENT OF PAVEMENT & SURFACING PLAN

SCALE 1:500

LEGEND:

- EXISTING CADASTRAL BOUNDARY
- JOINT REFERENCE LINE REFER 202214-0368
- PROPOSED CARRIAGEWAY EDGE
- CARRIAGEWAY STRINGS
- EDGE OF UNSEALED SHOULDER
- FORMATION OF DRAIN
- INVERT OF DRAIN
- EXISTING KERB
- CUT BATTER (1:4)
- FILL BATTER (1:4)
- 3% PAVEMENT CROSS FALL

PAVEMENT TYPE

- PROPOSED PAVEMENT
- EXISTING PAVEMENT

NOTES:

1. REFER TO DWG 202214-0356 FOR NOTES
2. REFER TO DWG 202214-0368 FOR PAVEMENT DETAILS
3. MRWA LONGITUDINAL AND TRANSVERSE CONSTRUCTION JOINTS, REFER MRWA STANDARD DRAWINGS 201391-0032-01 & 201631-083
4. CONTRACTOR TO ENSURE A SMOOTH ASPHALT TIE-IN WITH EXISTING

Accepted by Main Roads

For definition of Acceptance refer to Acceptance Letter

FOR CONSTRUCTION

SCALES 1:500 A1

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ProTen

METADATA

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BRAND HWY INTERSECTION DESIGN

BRAND HWY (H004)

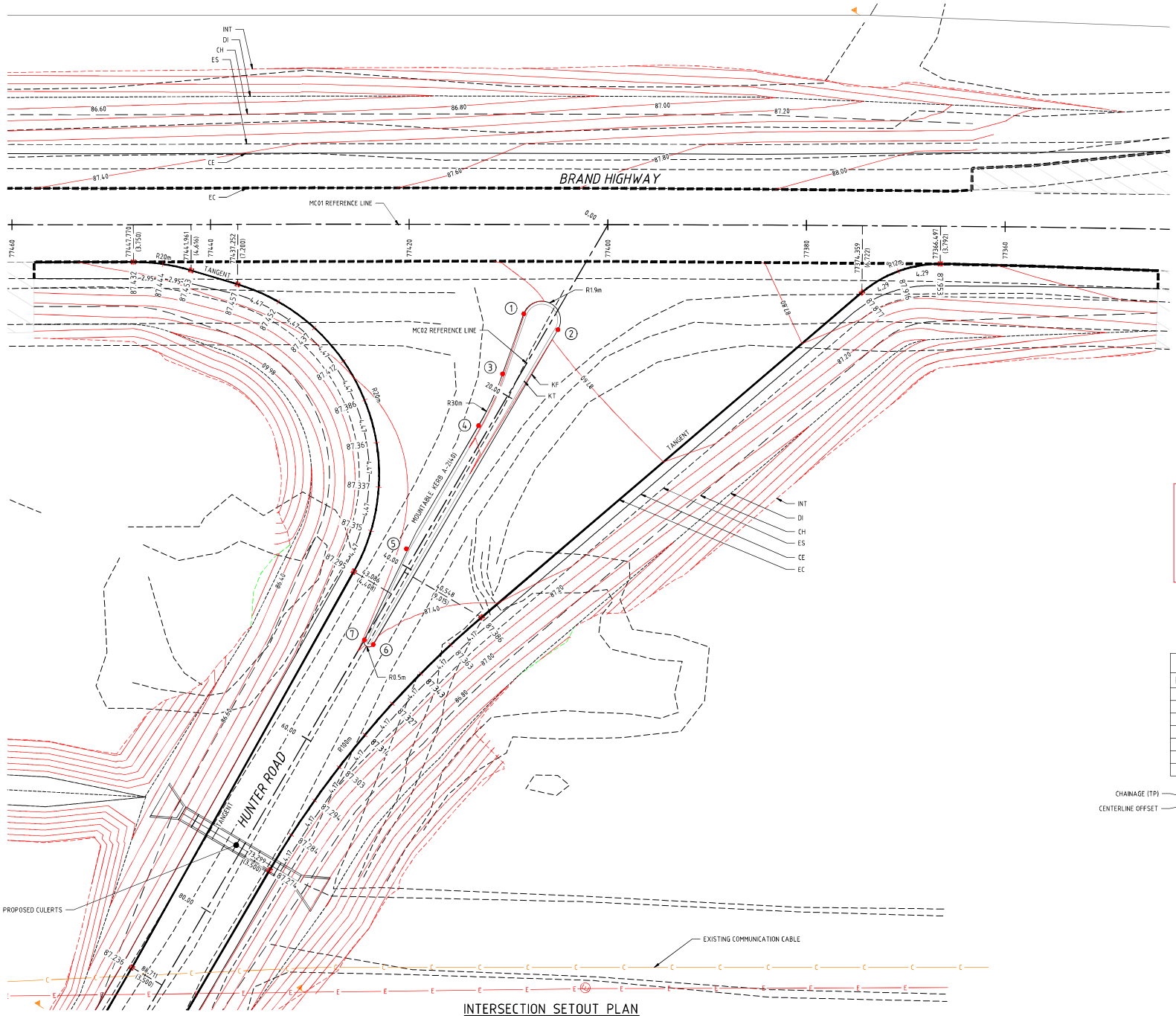
SLK 77.30 TO SLK 77.50

EXTENT OF PAVEMENT & SURFACING PLAN

LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN

MRWA DRAWING NUMBER

202214-0361-0



NOTES:

LEGEND:

- EXISTING CADASTRAL BOUNDARY
- ROAD CENTERLINE
- 77360 CHAINAGE
- PROPOSED EDGE LINE
- EDGE OF SEALED SHOULDER
- EDGE OF SHOULDER
- FORMATION OF DRAIN
- INVERT OF DRAIN
- EXISTING ROAD
- JOINT REFERENCE LINE REFER 202214-0368
- CUT BATTER HINGE
- FILL BATTER TOE
- 87.60 DESIGN CONTOUR (INTERVAL 0.2m)
- CULVERT
- 0.000 ① SETOUT POINT

SERVICES LEGEND

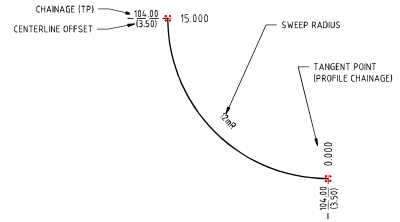
- C COMMUNICATION CABLE
- E ELECTRICAL WIRE

Accepted by Main Roads

For definition of Acceptance refer to Acceptance Letter

SETOUT POINTS

PT No.	EASTING	NORTHING	RL.
1	81743.360	221689.275	87.577
2	81743.829	221685.512	87.607
3	81737.106	221687.877	87.547
4	81731.399	221687.166	87.516
5	81717.031	221686.764	87.422
6	81707.091	221684.486	87.395
7	81707.013	221685.482	87.405



SETOUT DETAIL:

FOR CONSTRUCTION

INTERSECTION SETOUT PLAN

SCALE 1:200

SCALES 1:200 A1

DIAL BEFORE YOU DIG www.1100.com.au The Essential First Step

No.	DESCRIPTION	APPROVED & DATE
	AMENDMENTS	
D	ISSUED FOR CONSTRUCTION	RA 15.12.2022
D	ISSUED FOR 100% DESIGN REVIEW	RA 19.10.2022
C	ISSUED FOR 85% DESIGN REVIEW	RA 02.09.2022
B	ISSUED FOR 15% DESIGN REVIEW	RA 22.07.2022
A	ISSUED FOR 15% DESIGN REVIEW	RA 20.05.2022

ProTen

METADATA

GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

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DESIGNED/DRAWN	A.PEARCE / A.PEARCE
VERIFIED	M.WANSBROUGH
DIRECTOR	R.AKROUSH
APPROVED (MRWA)	
MRWA FILE No.	

mainroads WESTERN AUSTRALIA
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MID WEST-GASCOYNE REGION
Eastward Road Bunbury 6231
Telephone (08) 9956 1200 Fax (08) 9724 5656

BRAND HWY INTERSECTION DESIGN

BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
INTERSECTION LAYOUT PLAN

LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN

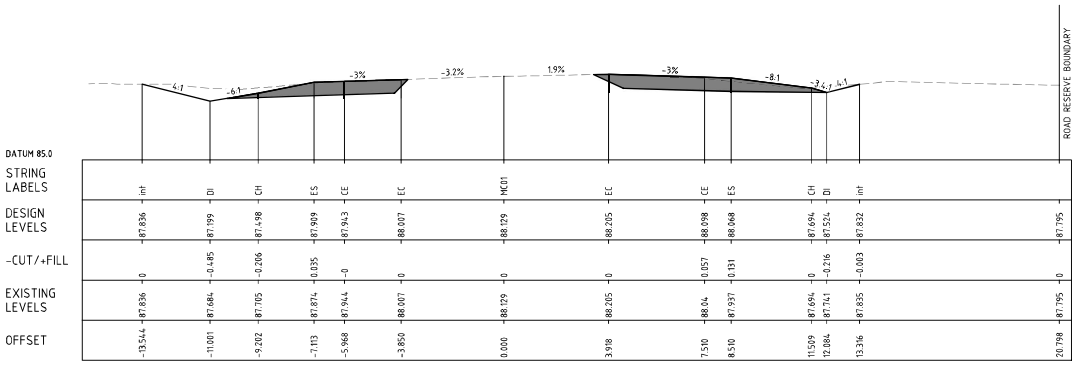
MRWA DRAWING NUMBER
202214-0362-0

LEGEND

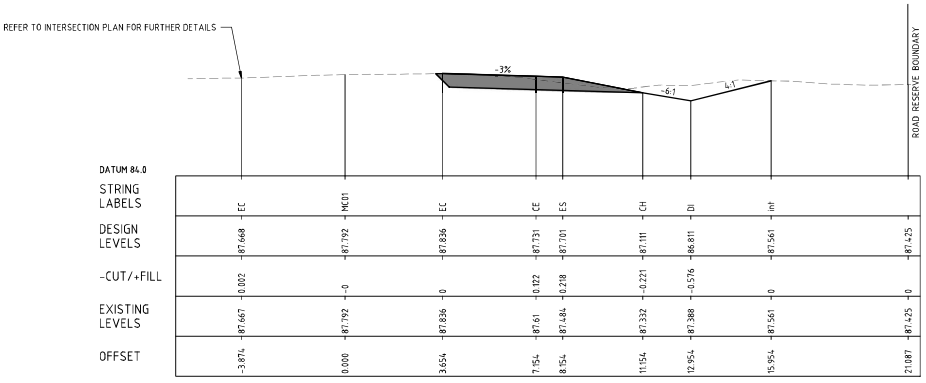
DESIGN SURFACE

EXISTING SURFACE

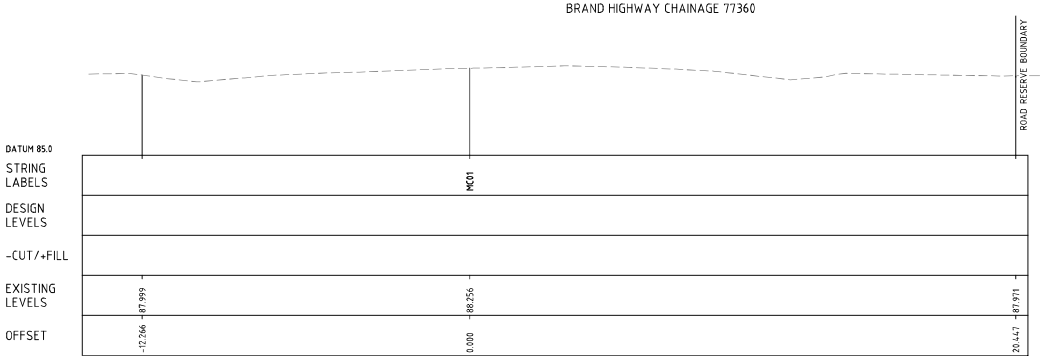
PAVEMENT



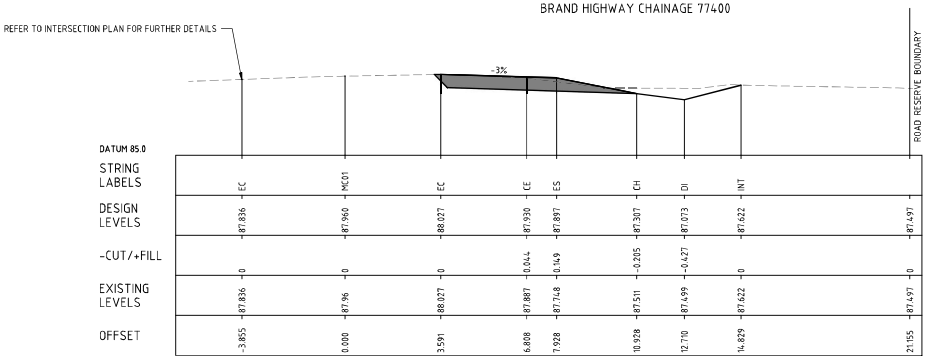
BRAND HIGHWAY CHAINAGE 77360



BRAND HIGHWAY CHAINAGE 77400



BRAND HIGHWAY CHAINAGE 77344.5



BRAND HIGHWAY CHAINAGE 77380

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FOR CONSTRUCTION

DIAL BEFORE YOU DIG www.1100.com.au
The Essential First Step

No.	DESCRIPTION	APPROVED & DATE
	AMENDMENTS	
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C	ISSUED FOR 85% DESIGN REVIEW	RA 02.09.2022
B	ISSUED FOR 15% DESIGN REVIEW	RA 22.07.2022
A	ISSUED FOR 15% DESIGN REVIEW	RA 20.05.2022

ProTen

METADATA

GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

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BRAND HWY INTERSECTION DESIGN

BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
CROSS SECTIONS
SHEET 1 OF 4
LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN
MRWA DRAWING NUMBER
202214-0363-0

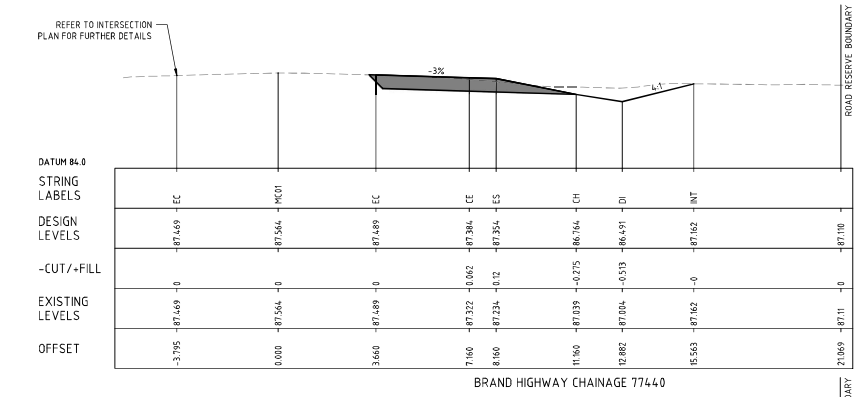
SCALES 1:100 A1

LEGEND

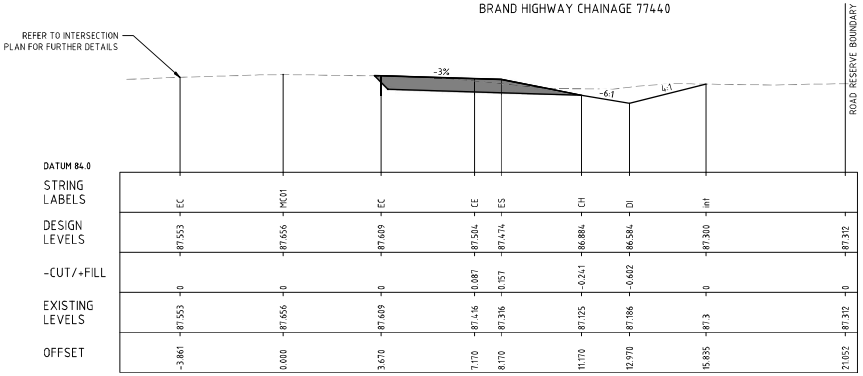
DESIGN SURFACE

EXISTING SURFACE

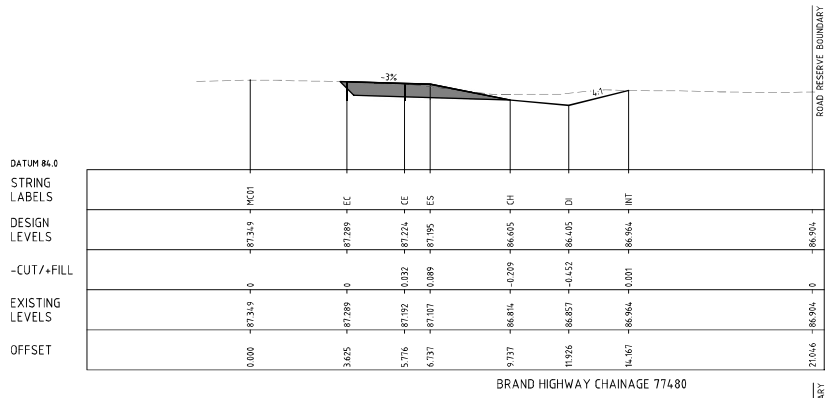
PAVEMENT



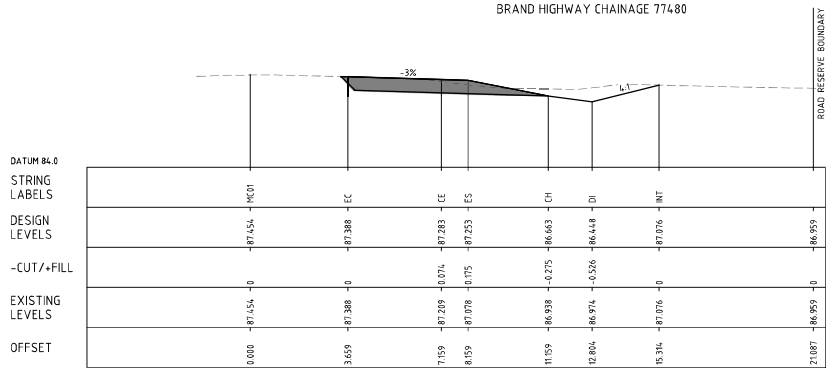
BRAND HIGHWAY CHAINAGE 77440



BRAND HIGHWAY CHAINAGE 77420



BRAND HIGHWAY CHAINAGE 77480



BRAND HIGHWAY CHAINAGE 77460

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FOR CONSTRUCTION

SCALES 1:100 A1

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No.	DESCRIPTION	APPROVED & DATE
0	ISSUED FOR CONSTRUCTION	RA 15.12.2022
D	ISSUED FOR 100% DESIGN REVIEW	RA 19.10.2022
C	ISSUED FOR 85% DESIGN REVIEW	RA 02.09.2022
B	ISSUED FOR 15% DESIGN REVIEW	RA 22.07.2022
A	ISSUED FOR 15% DESIGN REVIEW	RA 20.05.2022

AMENDMENTS

ProTen

METADATA	
GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

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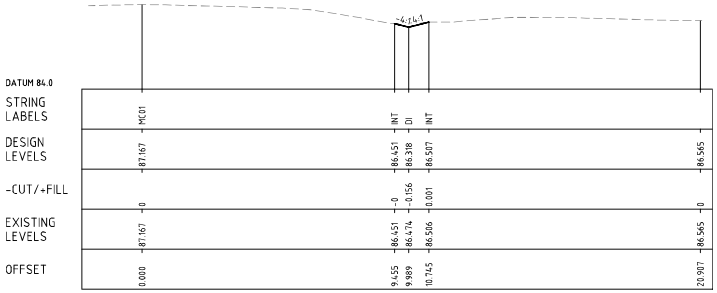
BRAND HWY INTERSECTION DESIGN

BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
CROSS SECTIONS
SHEET 2 OF 4
LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN
MRWA DRAWING NUMBER
202214-0364-0

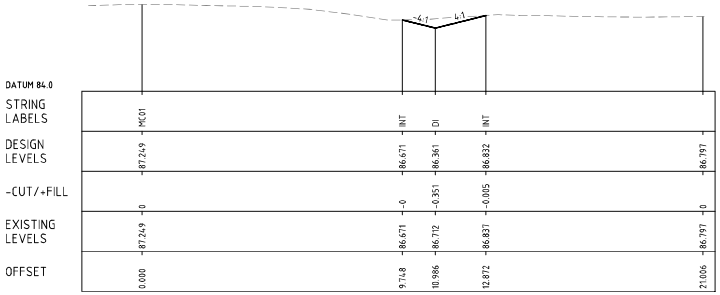
LEGEND

DESIGN SURFACE

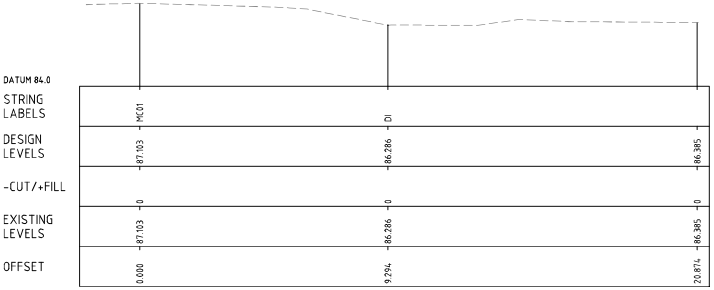
EXISTING SURFACE



BRAND HIGHWAY CHAINAGE 77520



BRAND HIGHWAY CHAINAGE 77500



BRAND HIGHWAY CHAINAGE 77534.695

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FOR CONSTRUCTION

SCALES 1:100 A1

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The Essential First Step

No.	DESCRIPTION	APPROVED & DATE
0	ISSUED FOR CONSTRUCTION	RA 15.12.2022
D	ISSUED FOR 100% DESIGN REVIEW	RA 19.10.2022
C	ISSUED FOR 85% DESIGN REVIEW	RA 02.09.2022
B	ISSUED FOR 15% DESIGN REVIEW	RA 22.07.2022
A	ISSUED FOR 15% DESIGN REVIEW	RA 20.05.2022

AMENDMENTS

ProTen

METADATA	
GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

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DIRECTOR	R.AKROUSH
APPROVED (MRWA)	
MRWA FILE No.	

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MID WEST-GASCOYNE REGION
Eastward Road Bunbury 6231
Telephone (08) 9956 1200 Fax (08) 9724 5656

BRAND HWY INTERSECTION DESIGN

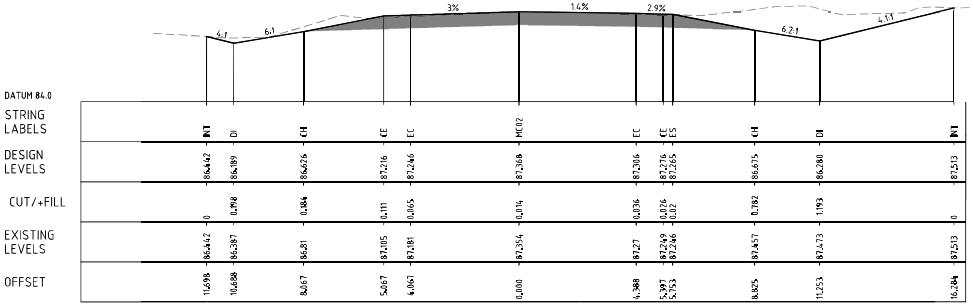
BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
CROSS SECTIONS
SHEET 3 OF 4
LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN
MRWA DRAWING NUMBER
202214-0365-0

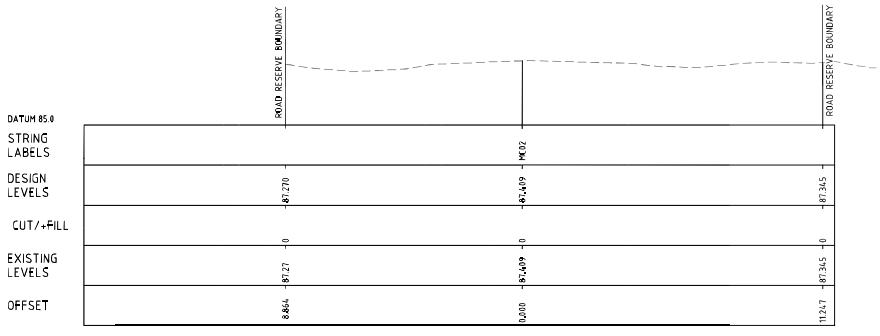
LEGEND

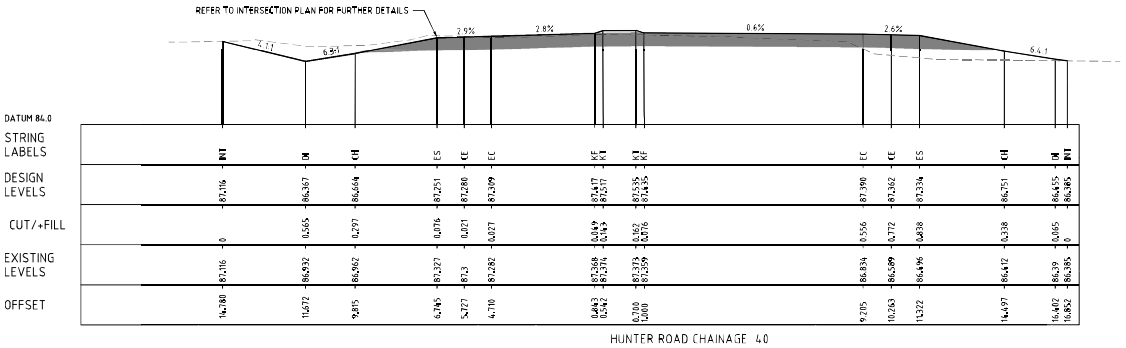
DESIGN SURFACE

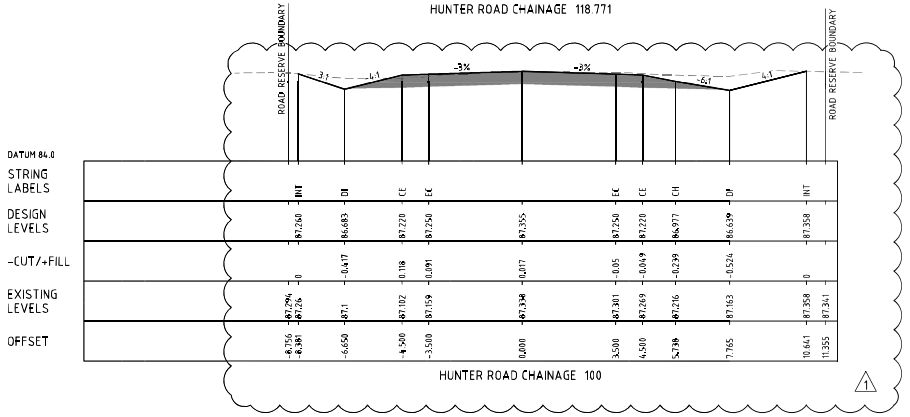
EXISTING SURFACE

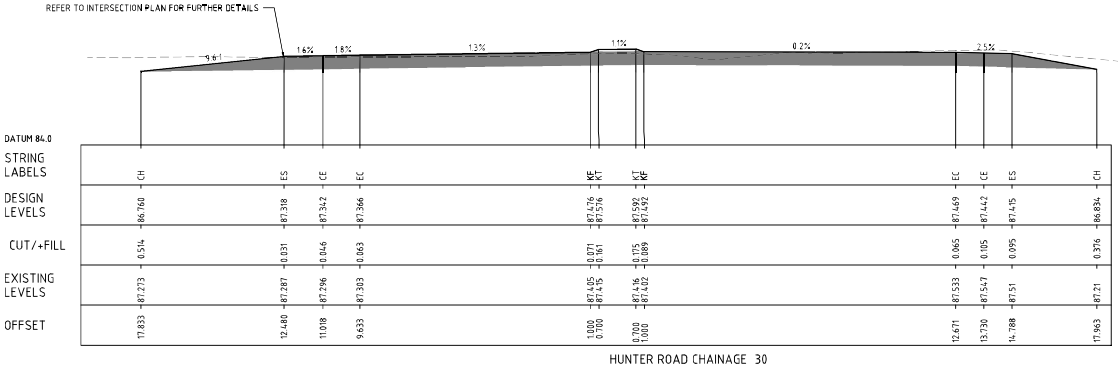
PAVEMENT

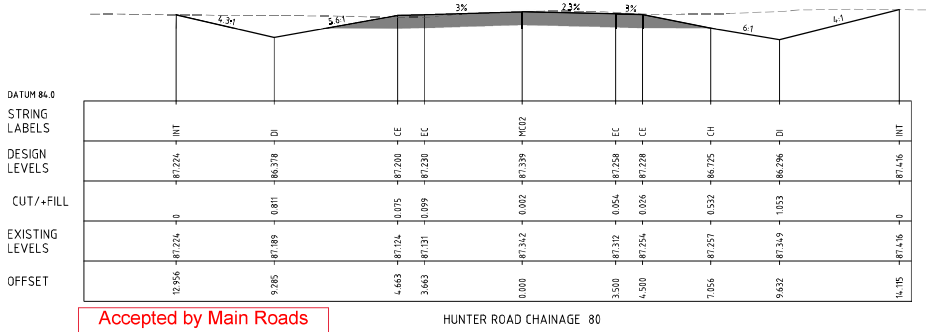












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FOR CONSTRUCTION

DIAL BEFORE YOU DIG www.1100.com.au
The Essential First Step

No.	DESCRIPTION	APPROVED & DATE
1	UPDATED SECTION CHAINAGE 100	RA 21.04.2023
0	ISSUED FOR CONSTRUCTION	RA 15.12.2022
D	ISSUED FOR 100% DESIGN REVIEW	RA 19.10.2022
C	ISSUED FOR 85% DESIGN REVIEW	RA 02.09.2022
B	ISSUED FOR 15% DESIGN REVIEW	RA 22.07.2022
A	ISSUED FOR 15% DESIGN REVIEW	RA 20.05.2022

AMENDMENTS

ProTen

METADATA

GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

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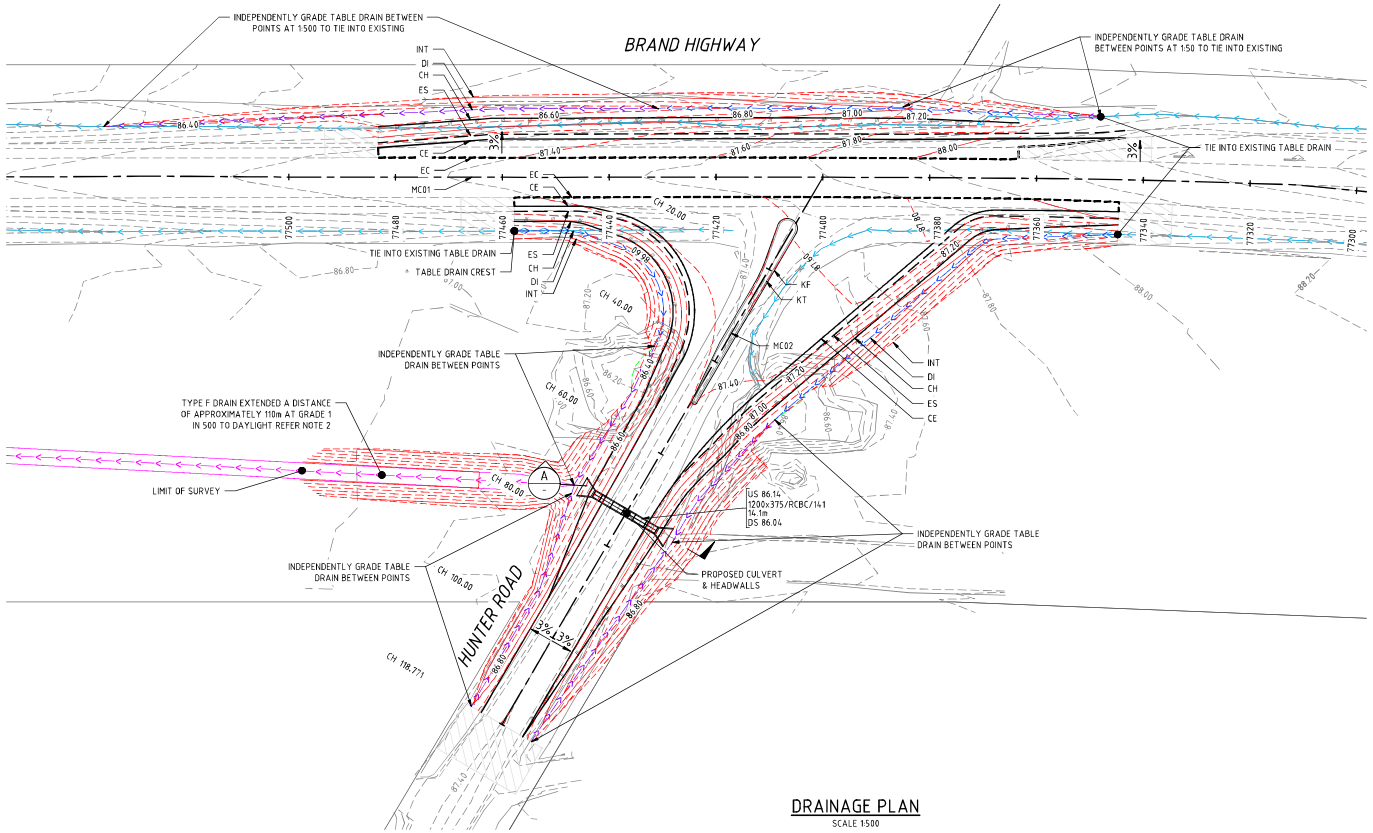
DESIGNED/DRAWN	A.PEARCE / A.PEARCE
VERIFIED	M.WANSBROUGH
DIRECTOR	R.AKROUSH
APPROVED (MRWA)	
MRWA FILE No.	

mainroads WESTERN AUSTRALIA
CENTRAL AND NORTHERN REGIONS DIRECTORATE
MID WEST-GASCOYNE REGION
Eastward Road Bunbury 6231
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BRAND HWY INTERSECTION DESIGN

BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
CROSS SECTIONS
SHEET 4 OF 4
LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN
MRWA DRAWING NUMBER
202214-0366-1

SCALES 1:100 A1



DRAINAGE PLAN
SCALE 1:500

NOTES:

1. REFER TO DWG 202214-0356 FOR NOTES
2. SRTM DATA (1 SECOND CELL DATA) SOURCED FROM https://elevation.fsdf.org.au/ HAS BEEN USED TO ESTIMATE THE REQUIRED LENGTH AND DIRECTION OF THE TYPE F DRAIN TO DAYLIGHT. SUBJECT TO SETOUT AND CONFIRMATION ONSITE DURING CONSTRUCTION

LEGEND:

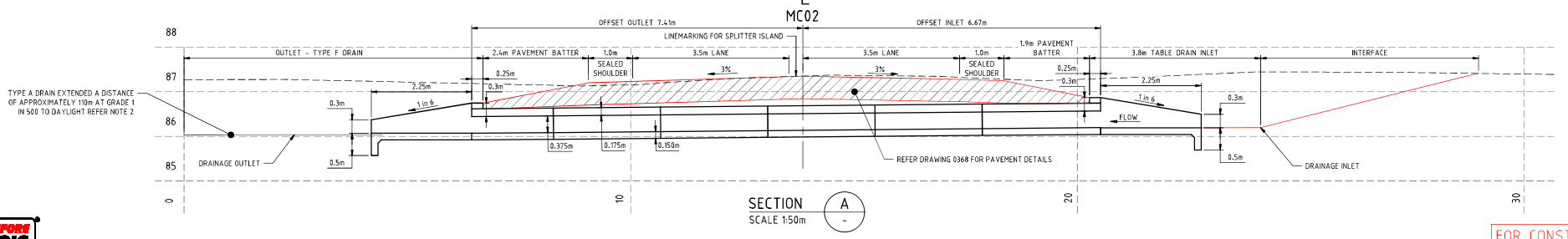
- EXISTING CADASTRAL BOUNDARY
- 8.60 EXISTING CONTOUR (INTERVAL 0.2m)
- 8.00 PROPOSED CONTOUR (INTERVAL 1.0m)
- 8.20 PROPOSED CONTOUR (INTERVAL 0.2m)
- PROPOSED CARRIAGEWAY EDGE
- PROPOSED SHOULDER EDGE
- PROPOSED CARRIAGEWAY HINGE
- TABLE DRAIN (PLUS DIRECTION OF FLOW)
- INDEPENDENT TABLE DRAIN (PLUS DIRECTION OF FLOW)
- TYPE F DRAIN (PLUS DIRECTION OF FLOW)
- EXISTING INVERT OF DRAIN (PLUS DIRECTION OF FLOW)
- CUT BATTER (1:4 U.N.O)
- FILL BATTER (1:4 U.N.O)
- EXISTING ROAD
- US 10.00 / 300x450/RCBC/200 / 10.0m / DS 9.95 — UPSTREAM I.L. / SPAN/HEIGHT/CONDUIT TYPE/GRADE / CONDUIT LENGTH / DOWNSTREAM I.L.

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CULVERT SCHEDULE

STRUCTURE NUMBER	REF. LINE	CHAINAGE	CULVERT R.C.B.C SIZE (WIDTH x HEIGHT mm)	PIPE CLASS	No. OF BARRELS	CULVERT TYPE	SKEW (DEGREES)	INLET SIDE L=LEFT R=RIGHT	INLET OFFSET FROM REFERENCE LINE (m)	INLET INVERT LEVEL (m)	INLET EXTENSION (m)	INLET HEADWALL HEIGHT (m)	INLET APRON LENGTH (m)	INLET REFERENCE POINT EASTING	INLET REFERENCE POINT NORTHING	INLET ROCK PROTECTION	OUTLET SIDE L=LEFT R=RIGHT	OUTLET OFFSET FROM REFERENCE LINE (m)	OUTLET INVERT LEVEL (m)	OUTLET EXTENSION (m)	OUTLET HEADWALL HEIGHT (m)	OUTLET APRON LENGTH (m)	OUTLET REFERENCE POINT EASTING	OUTLET REFERENCE POINT NORTHING	OUTLET ROCK PROTECTION	GROUND CONDITIONS	COMMENTS
C001	MC20	73	1200 X 375	N/A	1	RCBC	0	R	6.67	86.14		0.3	1.0	81682.84	221678.30	NONE	L	7.41	86.04		0.3	1.0	81682.48	221691.79	NONE	NON AGGRESSIVE	NEW CULVERT CONNECTING PROPOSED TABLE DRAIN



SECTION A
SCALE 1:50m

FOR CONSTRUCTION

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No.	DESCRIPTION	APPROVED & DATE
0	ISSUED FOR CONSTRUCTION	RA 15.12.2022
D	ISSUED FOR 100% DESIGN REVIEW	RA 19.10.2022
C	ISSUED FOR 85% DESIGN REVIEW	RA 02.09.2022
B	ISSUED FOR 15% DESIGN REVIEW	RA 22.07.2022
A	ISSUED FOR 15% DESIGN REVIEW	RA 20.05.2022

AMENDMENTS

ProTen

METADATA

GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

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VERIFIED	M.WANSBROUGH
DIRECTOR	R.AKROUSH
APPROVED (MRWA)	
MRWA FILE No.	

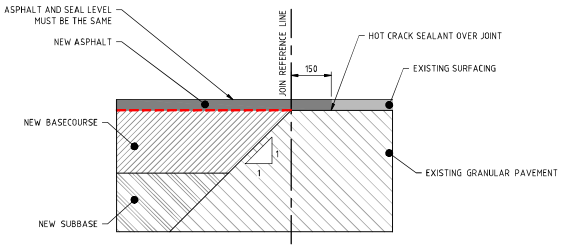
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CENTRAL AND NORTHERN REGIONS DIRECTORATE
MID WEST-GASCOYNE REGION
Eastward Road Bunbury 6231
Telephone (08) 9956 1200 Fax (08) 9724 5656

BRAND HWY INTERSECTION DESIGN

BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
DRAINAGE LAYOUT PLAN

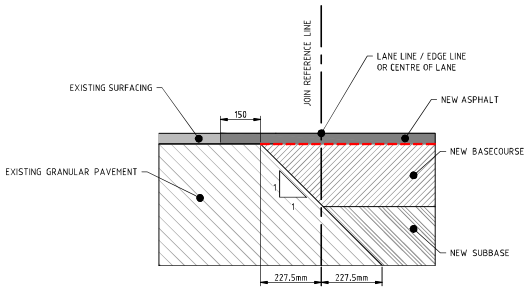
LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN
MRWA DRAWING NUMBER
202214-0367-0

SCALES 1:50 1:500
A1



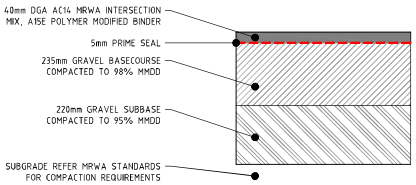
TRANSVERSE CONSTRUCTION JOINT

DENSE GRADE ASPHALT TO SEAL (NEW PAVEMENT)
SCALE 1:10



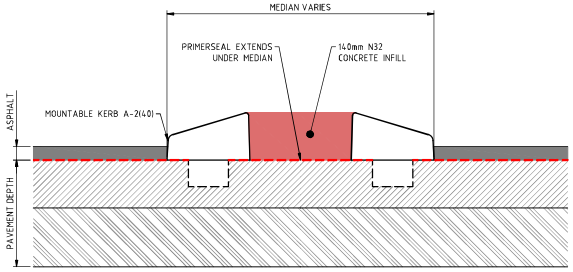
LONGITUDINAL CONSTRUCTION JOINTS

SCALE 1:10



PAVEMENT DETAIL

SCALE 1:10



SPLITTER ISLAND TREATMENT DETAIL

SCALE 1:10

Accepted by Main Roads

For definition of Acceptance refer to Acceptance Letter

FOR CONSTRUCTION

SCALES 1:10 A1

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The Essential First Step

No.	DESCRIPTION	APPROVED & DATE
	AMENDMENTS	
0	ISSUED FOR CONSTRUCTION	RA 15.12.2022
D	ISSUED FOR 100% DESIGN REVIEW	RA 19.10.2022
C	ISSUED FOR 85% DESIGN REVIEW	RA 02.09.2022
B	ISSUED FOR 15% DESIGN REVIEW	RA 22.07.2022
A	ISSUED FOR 15% DESIGN REVIEW	RA 20.05.2022

ProTen

METADATA

GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

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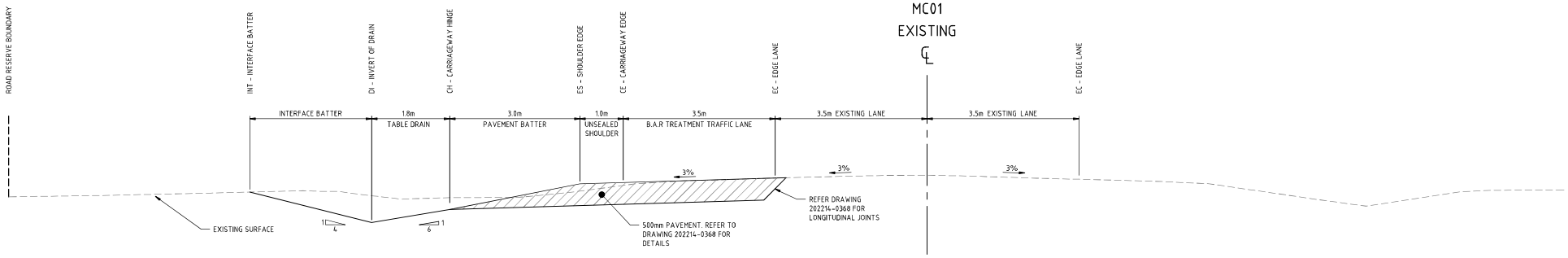
DESIGNED/DRAWN	A.PEARCE / A.PEARCE
VERIFIED	M.WANSBROUGH
DIRECTOR	R.AKROUSH
APPROVED (MRWA)	
MRWA FILE No.	

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MID WEST-GASCOYNE REGION
Eastward Road
Telephone (08) 9956 1200
Bunbury 6231
Fax (08) 9724 5656

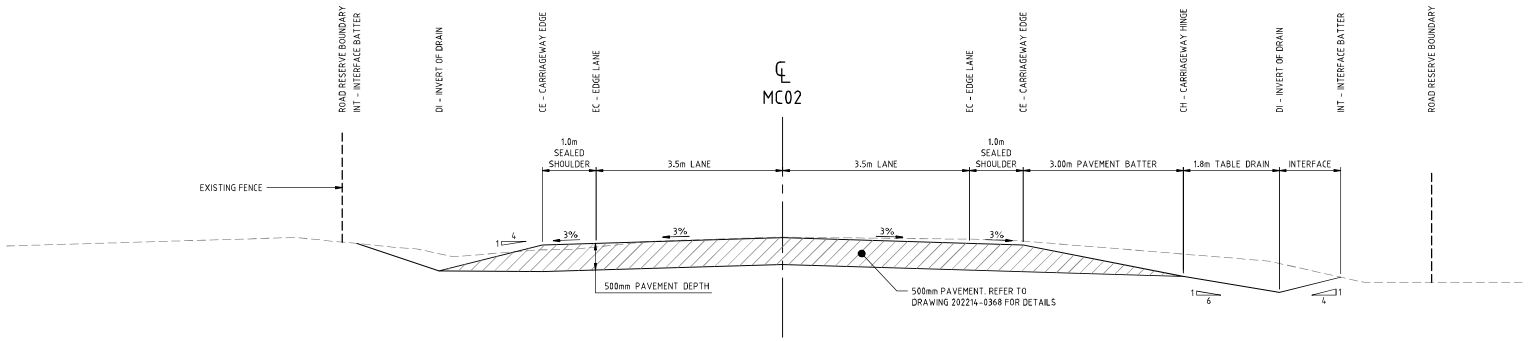
BRAND HWY INTERSECTION DESIGN

BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
TYPICAL DETAILS

LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN
MRWA DRAWING NUMBER
202214-0368-0



SECTION 1
SCALE 1:50m
0357



SECTION 2
SCALE 1:50m
0357

Accepted by Main Roads

For definition of Acceptance refer to Acceptance Letter

FOR CONSTRUCTION

SCALES 1:50 A1

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No.	DESCRIPTION	APPROVED & DATE
0	ISSUED FOR CONSTRUCTION	RA 15.12.2022
D	ISSUED FOR 100% DESIGN REVIEW	RA 19.10.2022
C	ISSUED FOR 85% DESIGN REVIEW	RA 02.09.2022
B	ISSUED FOR 15% DESIGN REVIEW	RA 22.07.2022
A	ISSUED FOR 15% DESIGN REVIEW	RA 20.05.2022

AMENDMENTS

ProTen

METADATA

GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

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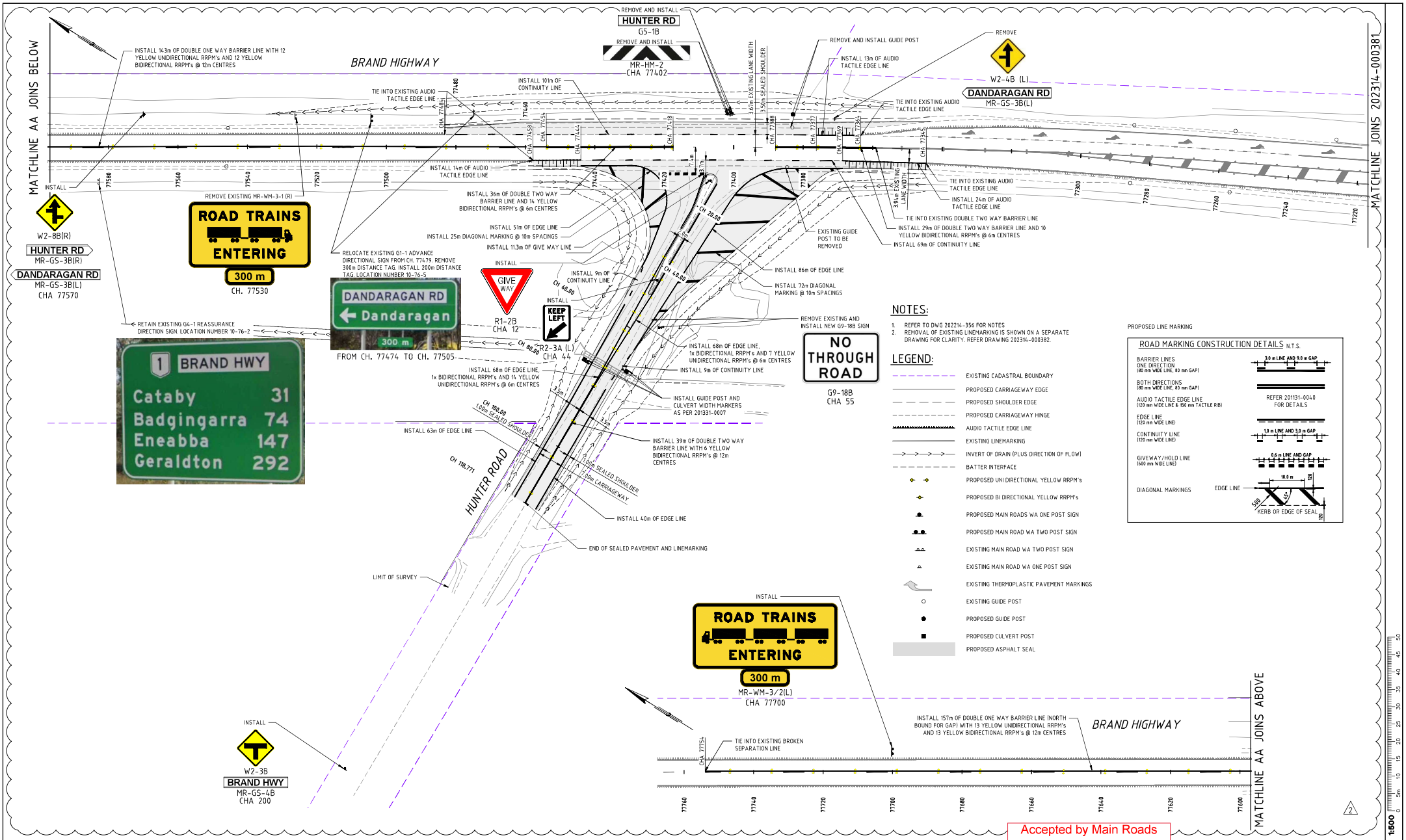
DESIGNED/DRAWN	A.PEARCE / A.PEARCE
VERIFIED	M.WANSBROUGH
DIRECTOR	R.AKROUSH
APPROVED (MRWA)	
MRWA FILE No.	

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BRAND HWY INTERSECTION DESIGN

BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
DETAILED CROSS SECTIONS

LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN
MRWA DRAWING NUMBER
202214-0369-0



LINEMARKING LAYOUT PLAN

SCALE 1:500

Accepted by Main Roads

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FOR CONSTRUCTION

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No.	DESCRIPTION	APPROVED & DATE
2	MAIN ROADS AMMENDMENTS ADDED	RA 21.04.2023
1	MAIN ROADS AMMENDMENTS ADDED	RA 24.02.2023
0	ISSUED FOR CONSTRUCTION	RA 15.12.2022

AMENDMENTS

ProTen

METADATA

GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

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BRAND HWY INTERSECTION DESIGN

BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
LINEMARKING & SIGNAGE LAYOUT PLAN
SHEET 1 OF 2

LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN

MRWA DRAWING NUMBER
202214-0370-2

SCALES 1:500 A1

NOTES:

1. REFER TO DWG 202214-356 FOR NOTES
2. REMOVAL OF EXISTING LINEMARKING IS SHOWN ON A SEPARATE DRAWING FOR CLARITY. REFER DRAWING 202314-000382.

LEGEND:

- EXISTING CADASTRAL BOUNDARY
- PROPOSED CARRIAGEWAY EDGE
- PROPOSED SHOULDER EDGE
- PROPOSED CARRIAGEWAY HINGE
- AUDIO TACTILE EDGE LINE
- EXISTING LINEMARKING
- INVERT OF DRAIN (PLUS DIRECTION OF FLOW)
- BATTER INTERFACE
- PROPOSED UNI DIRECTIONAL YELLOW RRPM's
- PROPOSED BI DIRECTIONAL YELLOW RRPM's
- PROPOSED MAIN ROADS WA ONE POST SIGN
- PROPOSED MAIN ROAD WA TWO POST SIGN
- EXISTING MAIN ROAD WA TWO POST SIGN
- EXISTING MAIN ROAD WA ONE POST SIGN
- EXISTING THERMOPLASTIC PAVEMENT MARKINGS
- EXISTING GUIDE POST
- PROPOSED GUIDE POST
- PROPOSED CULVERT POST
- PROPOSED ASPHALT SEAL

PROPOSED LINE MARKING

ROAD MARKING CONSTRUCTION DETAILS N.T.S.

BARRIER LINES ONE DIRECTION (80 mm WIDE LINE, 80 mm GAP) — 3.0 m LINE AND 9.0 m GAP

BOTH DIRECTIONS (80 mm WIDE LINE, 80 mm GAP)

AUDIO TACTILE EDGE LINE (120 mm WIDE LINE & 150 mm TACTILE RIB) — REFER 201131-0040 FOR DETAILS

EDGE LINE (120 mm WIDE LINE)

CONTINUITY LINE (120 mm WIDE LINE) — 1.0 m LINE AND 3.0 m GAP

GIVEWAY/HOLD LINE (600 mm WIDE LINE) — 0.6 m LINE AND GAP

DIAGONAL MARKINGS — EDGE LINE — 10.0 m, 12%, 45°, 500, 120, KERB OR EDGE OF SEAL



RETAIN EXISTING

EXISTING CHA. 77050

DANDARAGAN ROAD

BRAND HIGHWAY

MATCHLINE JOINS 202214-0370

REMOVE

W2-4B (R)

DANDARAGAN RD

MR-GS-3B(R)

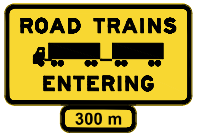
REMOVE AND INSTALL



G7-6-1A MR-SMAX-5(L)

EXISTING CHA. 76990

REMOVE EXISTING MR-WM-3-1 (L)



MATCHLINE JOINS BELOW

77200 77180 77160 77140 77120 77100 77080 77060 77040 77020 77000 76980 76960 76940 76920 76900 76880

RETAIN EXISTING



G2-1
LOCATION NO 004-08

G2-2
LOCATION NO 10-76-4

CHA 77170

REMOVE AND INSTALL



G7-6-1A MR-SMAX-5(L)
EXISTING CHA. 76830

RETAIN EXISTING



EXISTING CHA. 76800
LOCATION NO 10-76-14

BRAND HIGHWAY

MATCHLINE JOINS ABOVE

76860 76840 76820 76800 76780

RELOCATE EXISTING G1-1 ADVANCE DIRECTION SIGN AND MR-VID-7(R) SCENIC DRIVE INTERSECTION DIRECTION SIGN FROM CH 77000. REMOVE 200m DISTANCE TAG AND INSTALL 400m DISTANCE TAG. LOCATION NUMBER 10-76-1



EXISTING CHA. 77000
TO CHA. 76780

INSTALL

W2-8B(R)

DANDARAGAN RD

MR-GS-3B(R)

HUNTER RD

MR-GS-3B(L)

CHA 76950

INSTALL



MR-WM-3/2(L)

CHA 76870

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LINEMARKING LAYOUT PLAN

SCALE 1:500

Accepted by Main Roads

For definition of Acceptance refer to Acceptance Letter

FOR CONSTRUCTION

SCALES 1:500 A1

No.	DESCRIPTION	APPROVED & DATE
1	MAIN ROADS AMMENDMENTS ADDED	RA 21.04.2023
0	ISSUED FOR CONSTRUCTION	RA 24.02.2023

AMENDMENTS

ProTen

METADATA

GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

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DIRECTOR	R.AKROUSH
APPROVED (MRWA)	
MRWA FILE No.	

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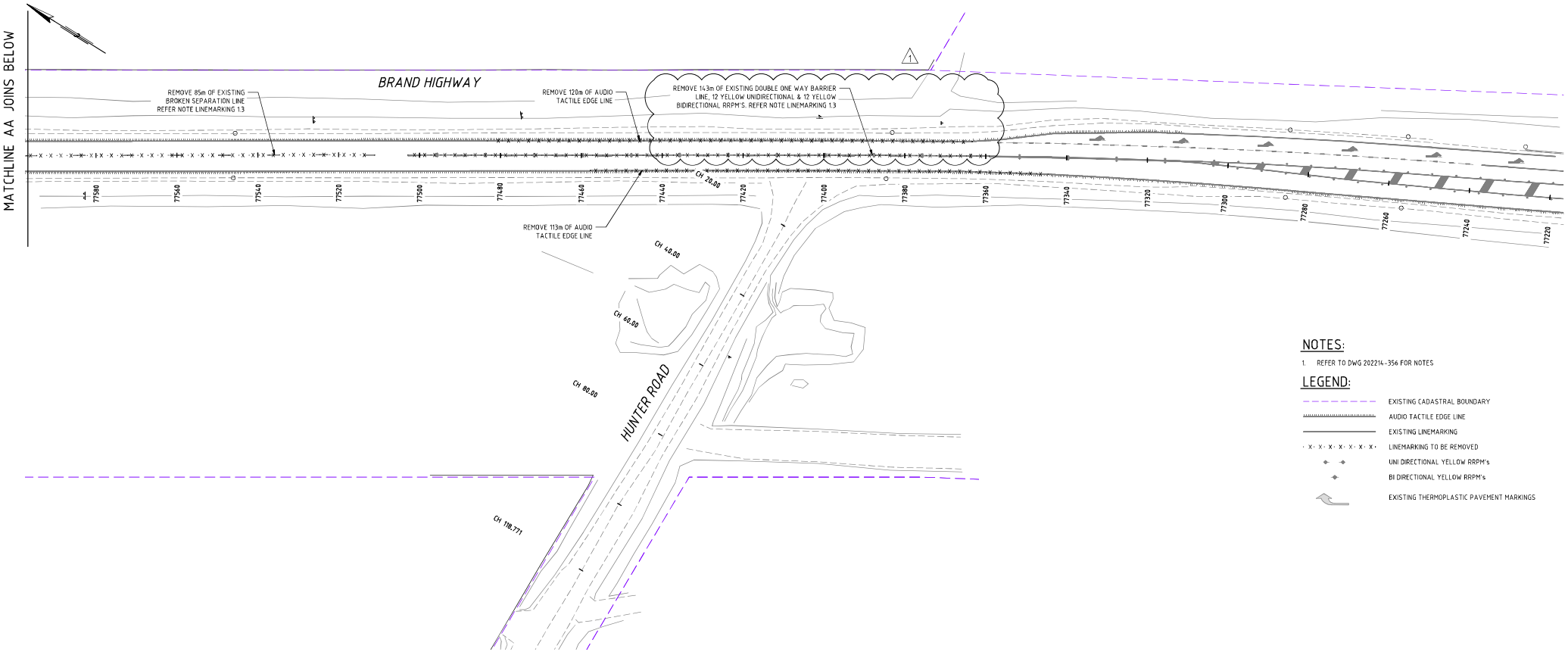
BRAND HWY INTERSECTION DESIGN

BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
LINEMARKING & SIGNAGE LAYOUT PLAN
SHEET 2 OF 2

LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN

MRWA DRAWING NUMBER

202314-000381-0

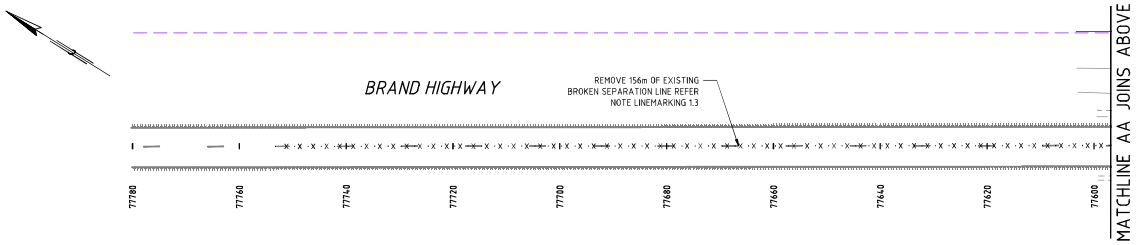


NOTES:

1. REFER TO DWG 202214-356 FOR NOTES

LEGEND:

- EXISTING CADASTRAL BOUNDARY
- AUDIO TACTILE EDGE LINE
- EXISTING LINEMARKING
- LINEMARKING TO BE REMOVED
- UNI DIRECTIONAL YELLOW RRPM's
- BI DIRECTIONAL YELLOW RRPM's
- EXISTING THERMOPLASTIC PAVEMENT MARKINGS



EXISTING LINEMARKING REMOVAL

SCALE 1:500

SCALES 1:500

A1

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No.	DESCRIPTION	APPROVED & DATE
1	MAIN ROADS AMMENDMENTS ADDED	RA 21.04.2023
0	ISSUED FOR CONSTRUCTION	RA 24.02.2023

AMENDMENTS

ProTen

METADATA

GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

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VERIFIED	M.WANSBROUGH
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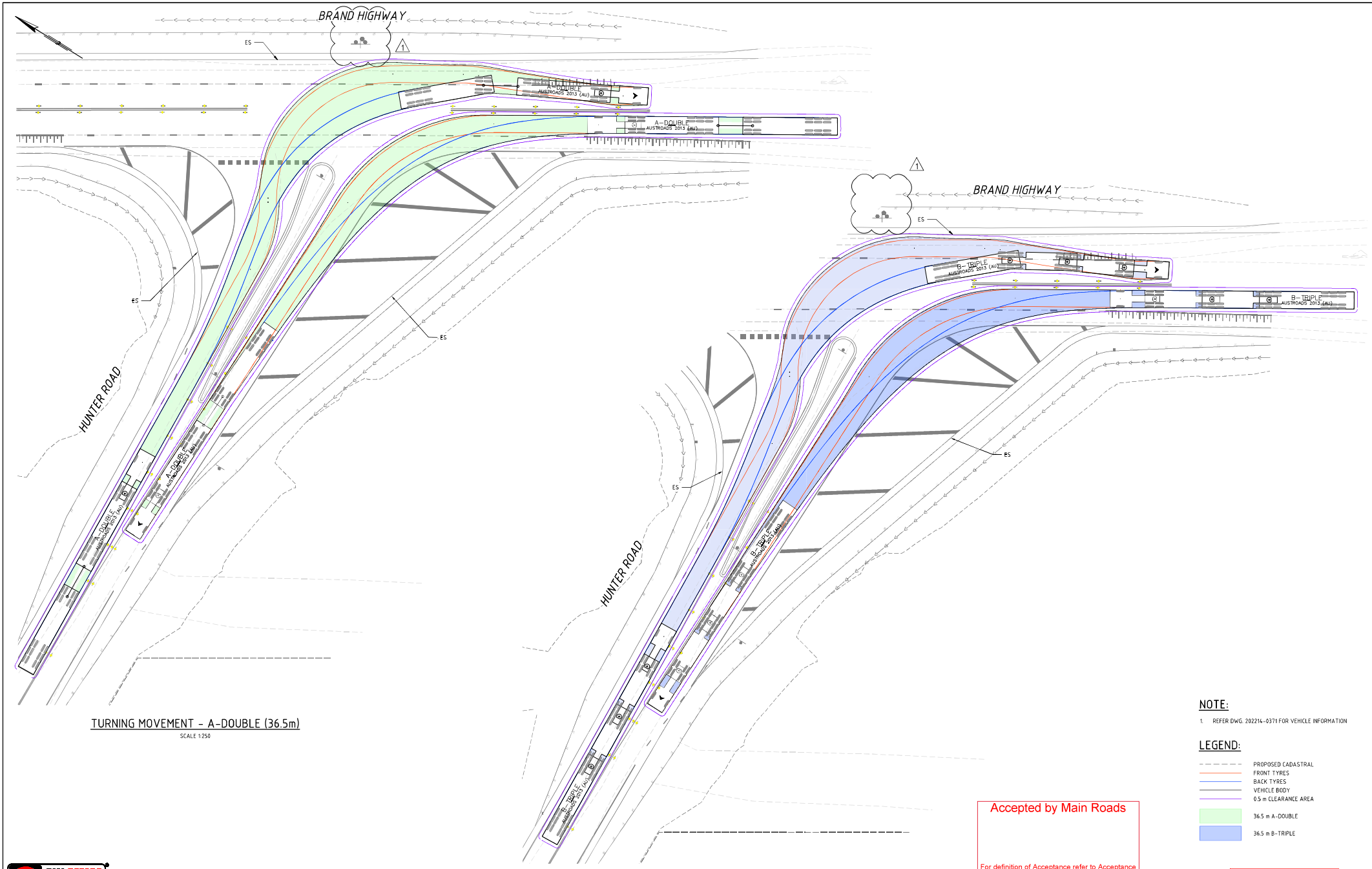
BRAND HWY INTERSECTION DESIGN

BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
EXISTING LINEMARKING REMOVAL
SHEET 1 OF 1

LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN

MRWA DRAWING NUMBER

202314-000382-0



TURNING MOVEMENT - A-DOUBLE (36.5m)

SCALE 1:250

TURNING MOVEMENT - B-TRIPLE (36.5m)

SCALE 1:250

NOTE:

1. REFER DWG. 202214-0371 FOR VEHICLE INFORMATION

LEGEND:

- PROPOSED CADASTRAL
- FRONT TYRES
- BACK TYRES
- VEHICLE BODY
- 0.5 m CLEARANCE AREA
- 36.5 m A-DOUBLE
- 36.5 m B-TRIPLE

Accepted by Main Roads

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FOR CONSTRUCTION

SCALES 1:250 A1

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The Essential First Step

No.	DESCRIPTION	APPROVED & DATE
1	UPDATED SIGN	RA 21.04.2023
0	ISSUED FOR CONSTRUCTION	RA 15.12.2022
D	ISSUED FOR 100% DESIGN REVIEW	RA 19.10.2022
C	ISSUED FOR 85% DESIGN REVIEW	RA 02.09.2022
B	ISSUED FOR 15% DESIGN REVIEW	RA 22.07.2022
A	ISSUED FOR 15% DESIGN REVIEW	RA 20.05.2022

AMENDMENTS

ProTen

METADATA

GROUND SURVEY STANDARD:	67-08-43
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MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
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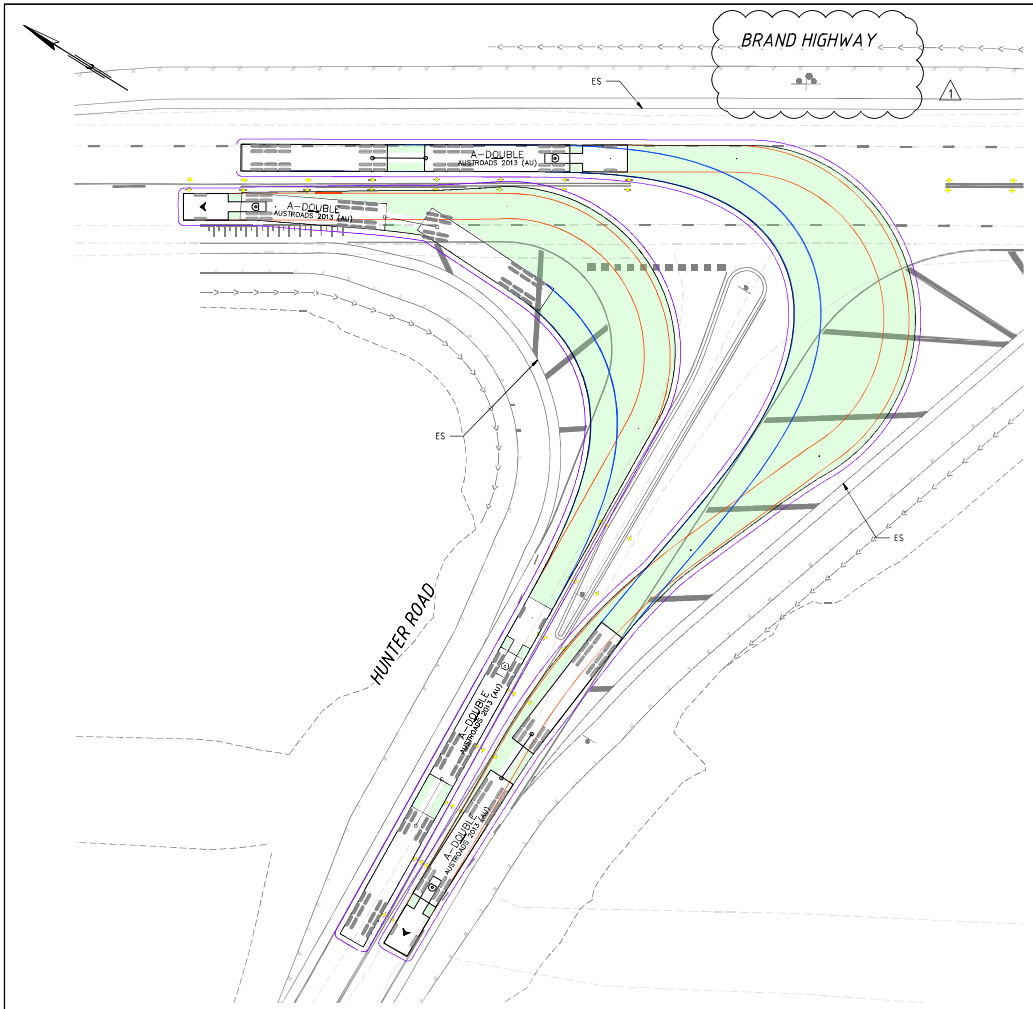
DESIGNED/DRAWN	A.PEARCE / A.PEARCE
VERIFIED	M.WANSBROUGH
DIRECTOR	R.AKROUSH
APPROVED (MRWA)	
MRWA FILE No.	

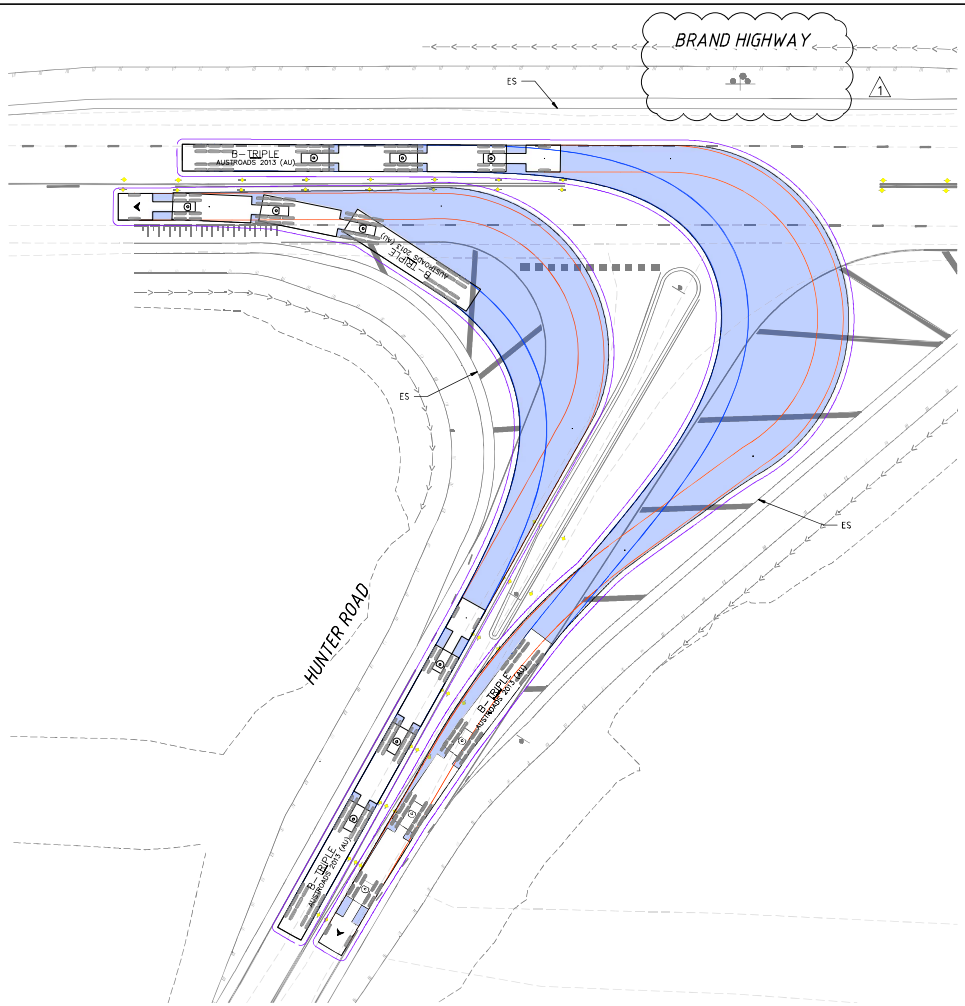
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MID WEST-GASCOYNE REGION
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BRAND HWY INTERSECTION DESIGN

BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
TURNING MOVEMENTS
SHEET 1 OF 2
LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN

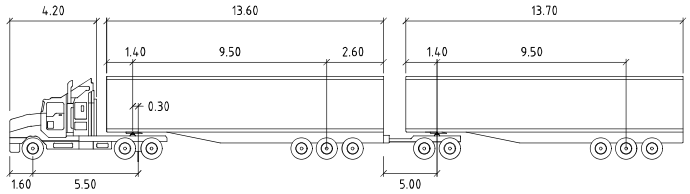
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202214-0371-1





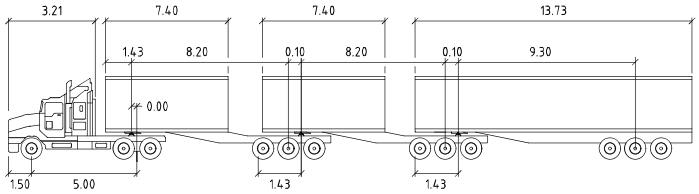
TURNING MOVEMENT - A-DOUBLE (36.5m)

SCALE 1:250



TURNING MOVEMENT - B-TRIPLE (36.5m)

SCALE 1:250



LEGEND:

- PROPOSED CADASTRAL
- FRONT TYRES
- BACK TYRES
- VEHICLE BODY
- 0.5 CLEARANCE AREA
- 36.5m A-DOUBLE
- 36.5m B-TRIPLE

A-DOUBLE

	meters		
Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 2.50	Steering Angle	: 23.4
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 2.50		

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B-TRIPLE

	meters		
Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 2.50	Steering Angle	: 21.2
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 2.50		

FOR CONSTRUCTION

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No.	DESCRIPTION	APPROVED & DATE
1	UPDATED SIGN	RA 21.04.2023
0	ISSUED FOR CONSTRUCTION	RA 15.12.2022
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C	ISSUED FOR 85% DESIGN REVIEW	RA 02.09.2022
B	ISSUED FOR 15% DESIGN REVIEW	RA 22.07.2022
A	ISSUED FOR 15% DESIGN REVIEW	RA 20.05.2022

AMENDMENTS

ProTen

METADATA

GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	07/04/2022
MAPPING SURVEY STANDARD:	NA
DATE OF CAPTURE:	NA
MAIN ROADS PROJECT ZONE:	LCG94
HEIGHT DATUM:	AHD

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APPROVED (MRWA)	
MRWA FILE No.	

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BRAND HWY INTERSECTION DESIGN

BRAND HWY (H004)
SLK 77.30 TO SLK 77.50
TURNING MOVEMENTS
SHEET 2 OF 2
LOCAL AUTHORITY (504) SHIRE OF DANDARAGAN

MRWA DRAWING NUMBER
202214-0372-1

SCALES 1:250 (0 5m 10 15 20 25)
A1

Attachment E

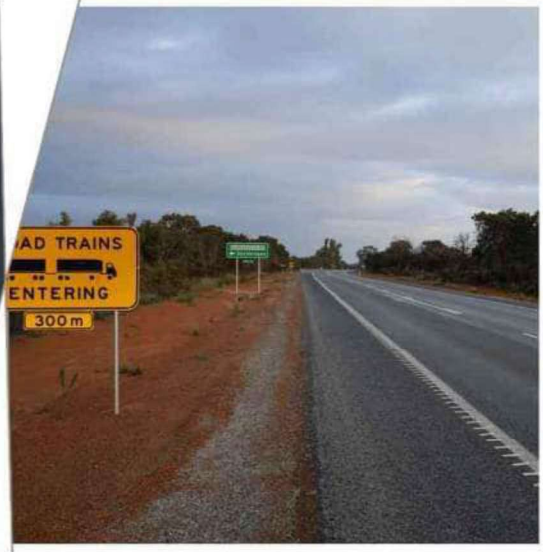
100% Design Report Brand Highway (H004) and Hunter Road (5070173) Intersection Upgrade

100% Design Report

Brand Highway (H004) and Hunter Road (5070173) Intersection Upgrade SLK 77.30 – SLK 77.50

Shire of Dandaragan

CW1200271



Prepared for

ProTen Western Australia Pty Ltd

19 October 2022

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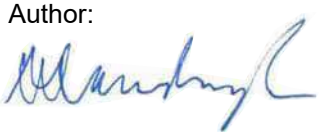
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Document Information

Prepared for	ProTen Western Australia Pty Ltd
Project Name	Brand Highway (H004) and Hunter Road (5070173) Intersection Upgrade SLK 77.30 – SLK 77.50
File Reference	CW1200271-CI-RP-001
Job Reference	CW1200271
Date	19 October 2022
Revision	B

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Effective Date 19/10/2022

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Date Approved 19/10/2022

Document History

Version	Date	Description of Revision	Prepared by	Reviewed by
A	2/09/2022	85% Design Report	M. Wansbrough	R. Akroush
B	19/10/2022	Minor amendments for Section 4.3.2, 4.3.3 and Appendix A Section 6.3	M. Wansbrough	R. Akroush

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Table of Contents

1	Introduction		1
2	Background		2
	2.1	Topography	2
	2.2	Road Reserve	2
	2.3	Traffic Assessment and Forecast	2
	2.4	Crash History	2
	2.5	Survey	2
	2.6	Cadastral	3
	2.7	Services	3
	2.8	Geotechnical	3
	2.9	Environmental	3
3	Design Standards		5
4	Design		7
	4.1	Road Design	7
	4.2	Pavement Structure and Surfacing Design	7
	4.3	Drainage Design	8
	4.4	Signage and Linemarking	10
	4.5	Road Safety Audits	10
	4.6	Safety in Design	10
5	Recommendations		11
6	Conclusion		11

Appendices

Appendix A Transport Impact Assessment

Appendix B Survey

Appendix C DBYD Diagrams

Appendix D Geotech Investigation and PAvement Design TEch Memo

Appendix E Drainage Calculations

Appendix F Safety in Design Register

Appendix G Road Safety Audit

Appendix H DAP Application Determination

Tables

Table 3-1 Key Design Parameters 6
Table 4-1 Catchment Areas Contributing to Culvert 9

Figures

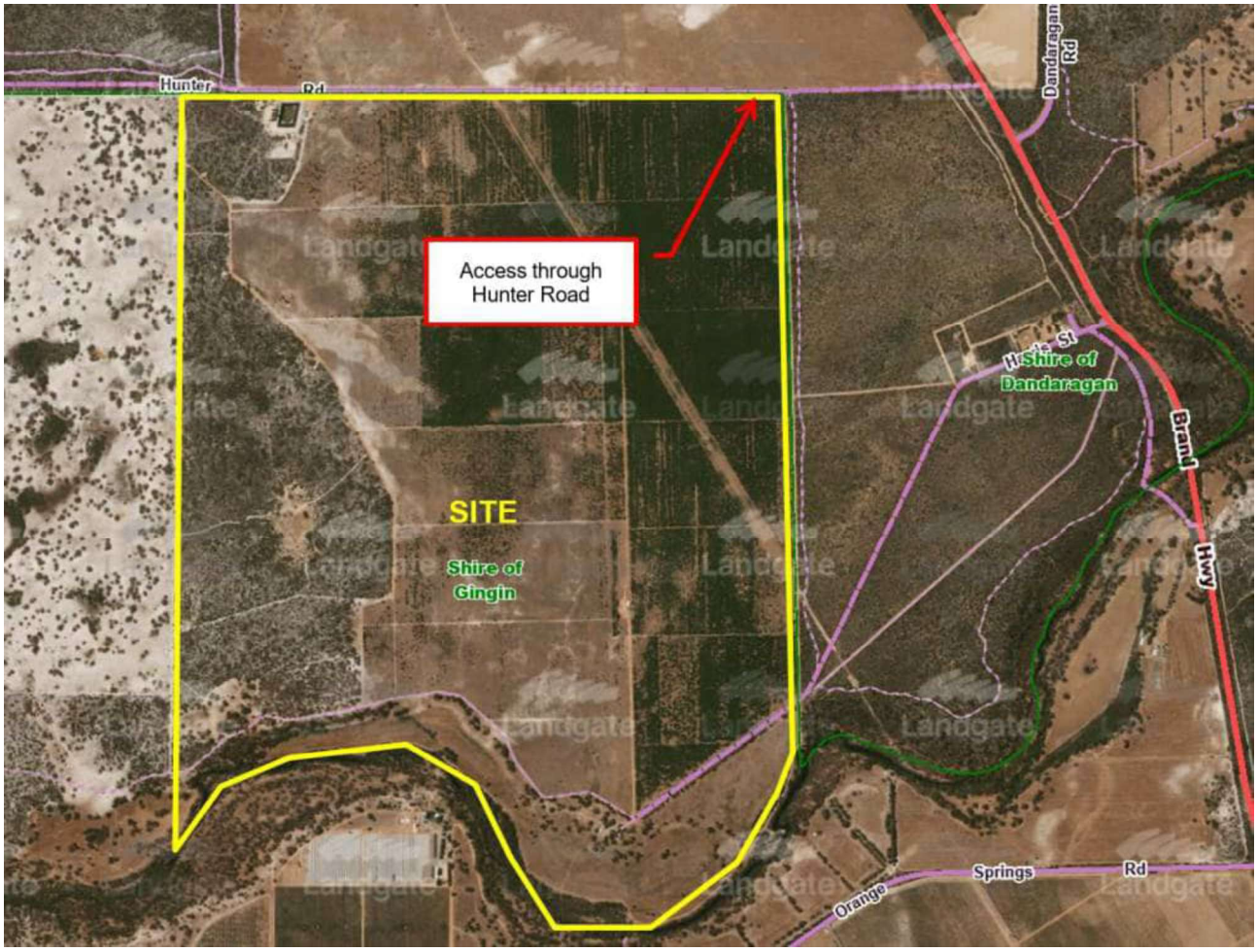
Figure 1-1 Location of Approved Chicken Farm Site 1
Figure 2-1 Topography 2
Figure 2-2 Desktop Threatened Ecological Communities Mapping 4
Figure 2-3 Desktop Threatened Ecological Communities Mapping 4
Figure 2-4 Desktop Mapping of Aboriginal Heritage Sites 4
Figure 4-1 External Contours Around the Site 9
Figure 4-2 Basin 2 Estimated Gross Catchment 10

1 Introduction

Cardno was commissioned by ProTen to prepare a detailed design for the intersection upgrade of Brand Highway (H004) and Hunter Road (5070173) to accommodate vehicles up to an A-Double (36.5m) which will be required to access a proposed Chicken Farm located at Lot M1254 Hunter Road, Orange Springs WA 6507 in the Shire of Gingin.

Development approval was granted by the Regional Joint Development Assessment Panel (Regional JDAP) for 2 farms, Farm 1 containing 6 sheds and Farm 2 containing 8 sheds, for a total of 14 chicken sheds within the same Site. A new DA is being pursued which proposes an additional 2 sheds for Farm 1 and an additional farm (Farm 3) containing 8 chicken sheds within the same Site for a total of 24 chicken sheds (8 sheds on each farm).

Figure 1-1 Location of Approved Chicken Farm Site



2 Background

2.1 Topography

The site is flat, gently grading sloping 0.5% from South-East to North-west. There is a crest along Brand Highway approximately 400m south of the intersection, and there is a sag approximately 330m north of the intersection. Figure 2-1 below illustrates this using contours sourced from ELVIS.

Figure 2-1 Topography



2.2 Road Reserve

The design fits within existing road reserve. At this location, Brand Hwy existing road reserve width is 100.6m, and the Hunter Road existing road reserve width is 20.1m.

2.3 Traffic Assessment and Forecast

A Transport Impact Assessment for the proposed development has been prepared and is included as Appendix A.

2.4 Crash History

The Transport Impact Assessment included as Appendix A contains a summary of the crash history.

2.5 Survey

Survey data was provided by Harley Dykstra. A copy of the survey is included in Appendix B. Key features are summarised below:

- Type of survey is detailed field pickup.
- Date of survey is 7/04/2022

- Grid coordinate system is LCG94
- Level datum is AHD with connection made to RRM H4-323 via digital level survey methods.

2.6 Cadastral

Cadastral boundaries are based on those shown by the survey, which were not verified or marked at the time of survey but are derived from the SCDB 04 2022. They are estimated to be accurate ± 0.25m.

2.7 Services

The survey plan shows underground services based on service authorities' records obtained from 'Dial Before You Dig' or similar sources. Only surface features (i.e., overhead power pole) were surveyed. Cardno also completed a search for 'Dial Before You Dig' to confirm the information shown:

- Nextgen – Fibre optic cable identified on the East side of Brand Hwy. Diagram contained within Appendix C.
- Telstra Services – Cables have been identified along the West side of Brand Hwy and Hunter Rd.
- Western Power – High Voltage (1 Phase) overhead power lines along the western boundary of Brand Hwy.

Cardno recommend ProTen investigate further to confirm that all vehicles that will be accessing the site will be crossing this power line with adequate clearance.

The Western Power Clearance Advice 'Working near overhead and underground electric lines' is one of four safety code of practices developed to provide guidance for electrical safety duties and standards required under the Occupational Safety and Health Regulations 1996 reg. 3.64.

In conjunction with the Western Power Clearance Advice, it specifies various exclusion zones required by law when energised (live) overhead electrical lines are present.

- 0.5 meters of a live insulated overhead powerline or aerial bundled conductor line of a voltage of not more than 1,000 volts.
- 1.0 meter of a live uninsulated overhead powerline of a voltage of not more than 1,000 volts.
- 3.0 meters of a live overhead powerline whether insulated or not, of a voltage exceeding 1,000 volts but not more than 33,000 volts, or
- 6.0 meters of a live overhead powerline whether insulated or not, of a voltage exceeding 33,000 volts.

2.8 Geotechnical

A technical memorandum regarding the Geotechnical Field Investigation and pavement design is provided as Appendix D.

2.9 Environmental

A review of desktop mapping indicates that the site falls within a Threatened Ecological Communities site. It is recommended that ProTen seek further advice from the Department of Biodiversity, Conservation and Attractions through their planning team.

Figure 2-2 Desktop Threatened Ecological Communities Mapping

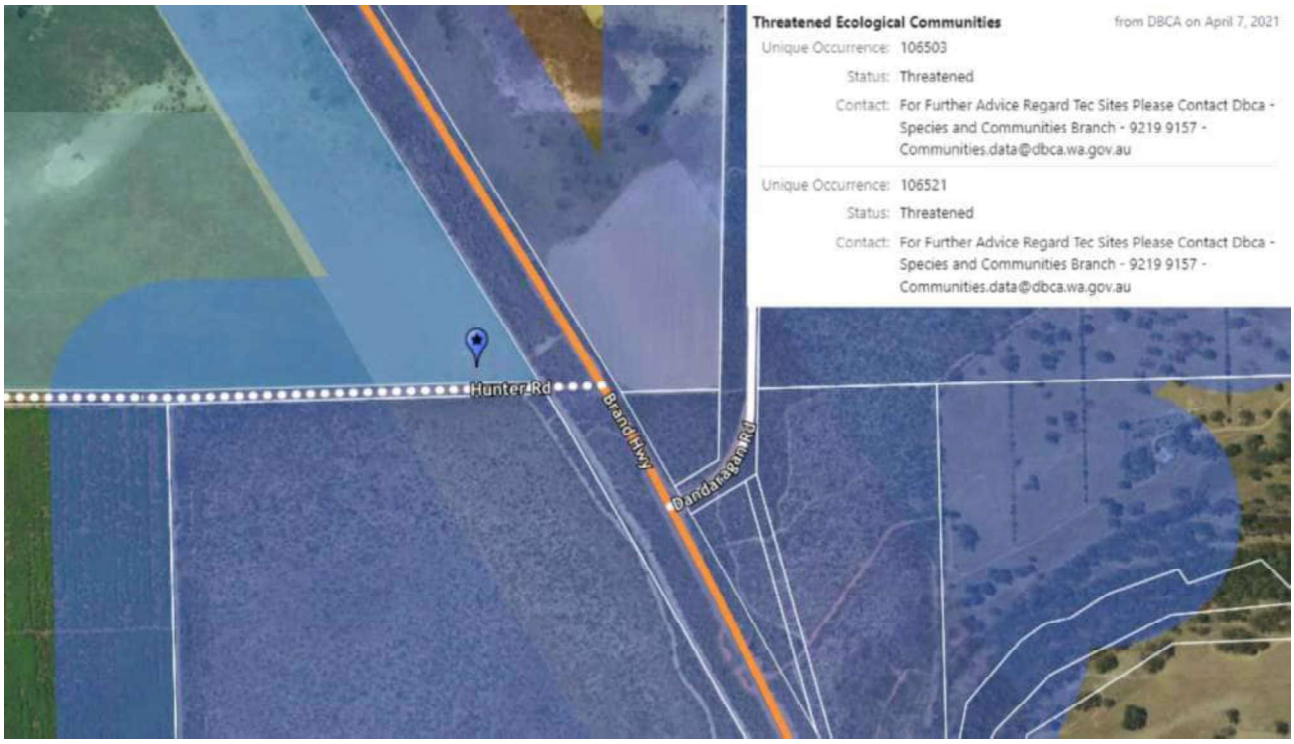
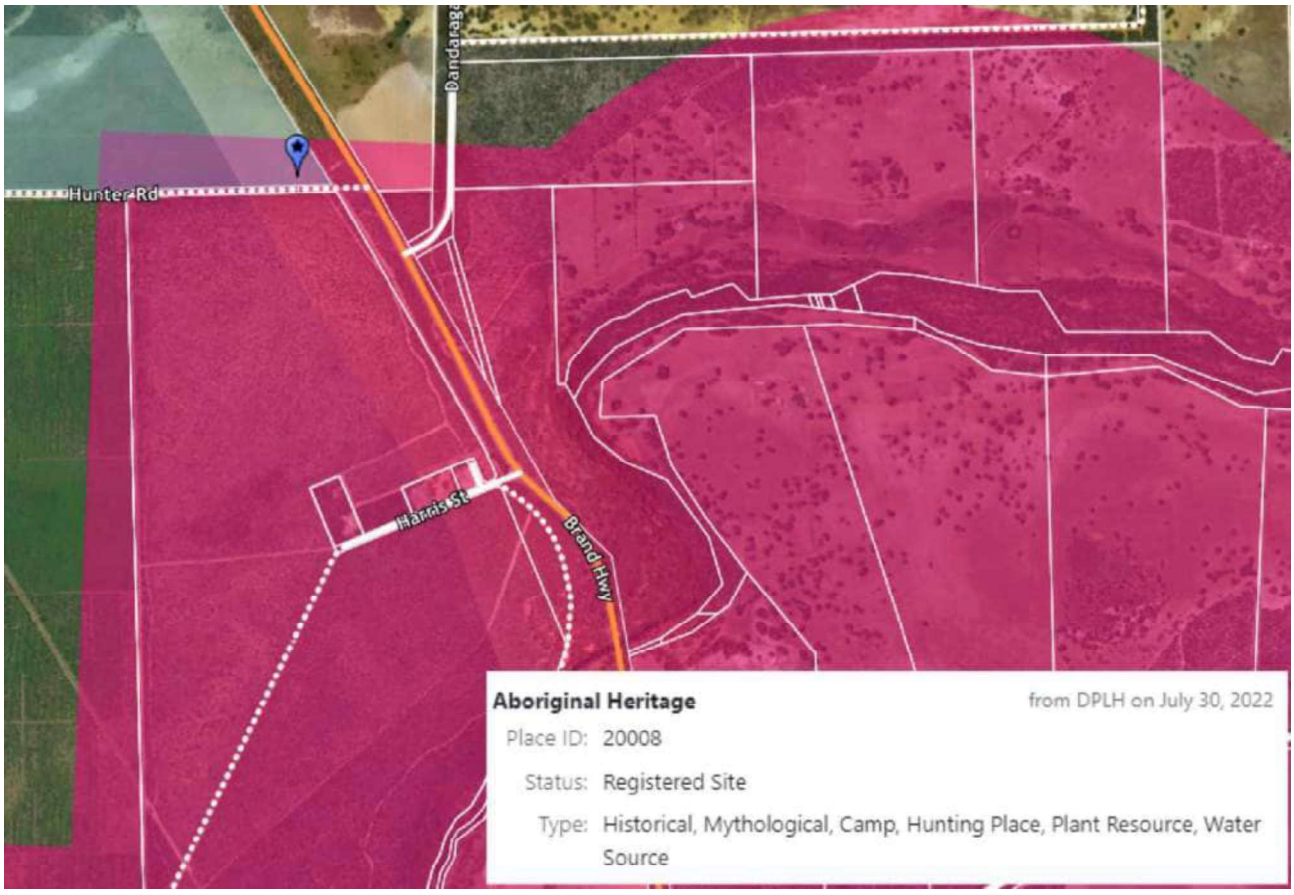


Figure 2-3 Desktop Threatened Ecological Communities Mapping

A review of desktop mapping indicates that the site falls within the fringes of an Aboriginal Heritage registered site. It is recommended that ProTen seek further advice from the Department of Planning, Lands and Heritage through their planning team.

Figure 2-4 Desktop Mapping of Aboriginal Heritage Sites



3 Design Standards

The design has been prepared in accordance with Austroads Guide to Road Design including Main Roads WA supplements:

Road Design Standards

- Main Roads WA Supplements to Austroads Guide to Road Design
- Austroads Guide to Road Design Part 1 – 6
- Main Roads WA Horizontal Curve Tables
- Main Roads WA Standard Drawings

Drainage Design Standards

- Main Roads' Standard drawings
- Main Roads' Supplements to Austroads' Guide to Road Design Parts 5, 5A and 5B
- Austroads' Guide to Road Design -· Parts 5, 5A and 5B

Pavement Design Standards

- Austroads Guide to Pavement Technology Part 2: Pavement Structural Design.
- Main Roads Western Australia Engineering Road Note 9: Procedure for the Design of Road Pavements.

Cardno adopted desirable parameters from the standards for design. Key design parameters are tabulated on the following page.

Table 3-1 Key Design Parameters

Criteria	Brand Hwy	Hunter Rd	Comment
General			
Design Speed (km/hr)	120	120	Existing posted speed plus 10km/hr. This section of Hunter Rd is not built-up, the rural default speed applies.
Cross Section			
Lane width (m)	3.5	3.5m	Existing lane width on Brand Hwy is maintained.
Shoulder width (m)	1.0m sealed	1.0m sealed	Additional seal widening on Brand Hwy for BAR and BAL treatment.
Crossfall	3%	3%	
Pavement Batter	1:6	1:6	
Table drain foreslope	1:6	1:6	
Table drain backslope	1:4	1:4	
Fill Batter	1:6	1:6	
Horizontal Geometry			
Design Vehicle	B-Triple (36.5m)	B-Triple (36.5m)	While ProTen has advised that the proposed chicken farm must be capable of accepting A-Double Road trains (36.5m, 75T), Main Roads has advised that B-Triple must be adopted as it is the worst performing vehicle on the Brand Hwy (RAV 7) network.
Vertical Geometry			
Min. K for sag curve	N/A	51	Brand Hwy traffic lanes unchanged.
Min. grade	N/A	0.3%	Roads are unkerbed. Brand Hwy traffic lanes unchanged.
Sight Distance			
Coefficient of Deceleration	0.36 (Cars) 0.28 (Truck)	0.36 (Cars) 0.28 (Truck)	'Truck' for this design is a Type 1 Road Train
SSD	241m (cars) 286m (truck)	241m (cars) 286m (truck)	
ASD	241m (cars) 286m (truck)	241m (cars) 286m (truck)	
SISD	341m (cars) 385m (truck)	341m (cars) 385m (truck)	
Drainage			
Design Storm (minor)	10%AEP	10%AEP	Table Drain Conveyance
Design Storm (major)	1%AEP	1%AEP	Resizing of existing basins.
Design Storm for TWL to not exceed Subgrade level	20%AEP	20%AEP	
Minimum Saturated Field Permeability	5m/day	5m/day	Based on Geotechnical Field investigation
Pavement			
Design CBR	10%	10%	Based on Geotechnical Field investigation

4 Design

4.1 Road Design

4.1.1 Software

The design has been modelled using 12D and drafted using AutoCAD.

4.1.2 Cross Section

The existing road reserve width is adequate such that desirable values for cross-section parameters could be adopted. Typical cross sections are provided within the design drawings.

4.1.3 Horizontal Alignment

The horizontal alignment of Brand Hwy and Hunter Rd is unchanged.

4.1.4 Vertical Alignment

The vertical alignment of Brand Hwy is unchanged.

The vertical alignment of Hunter Rd is similar to existing with maximum depth of fill of 80mm. A K value of 90 was adopted for design, and a minimum vertical grade of 0.34% was adopted, noting this road is unkerbed.

4.1.5 Tie-In Sections

At the limit of works, Hunter Road will transition from the proposed sealed pavement to the existing unsealed pavement. The lane and shoulder width at the tie-in point matches existing therefore there should not be difficulties tying in.

For the pavement widening on Brandy Hwy, the design shoulders tie-into existing shoulders, therefore there should not be difficulties tying in.

4.1.6 Intersections, Roundabouts and Interchanges

A turn warrant assessment has been undertaken a part of the TIA that was prepared for the proposed Chicken Farm (refer Appendix A). The results showed that a Basic Left-Turn (BAL) treatment and a Basic Right-Turn (BAR) treatment would be required for the forecast 2032 traffic volumes.

Brand Highway currently permits RAV 7 vehicles, however Hunter Road does not. In accordance with the previous DA approval conditions, a RAV 7 permit application for Hunter Road is being progressed with Main Roads WA.

As part of the design drawings, Cardno has provided turning swept paths diagrams for;

- 36.5m B-Triple, which is the worst performing vehicle on the RAV 7 network; and
- 36.5m A-Double, which ProTen has advised will be the largest vehicle proposed to access the proposed Chicken Farm.

The intersection has been designed such that the design vehicle does not cross the centreline of the Hunter Road.

Hunter Road currently intersects Brand Highway at an angle of 60°. Austroads Guide to Road Design Part 4A suggests that roadways should meet at an angle not less than 70° to accommodate users who have difficulty turning their head and neck, and for older drivers. The splitter island has been shaped to guide users to pull up to the give way line at an angle of 70° to Brand Hwy. This measure has been implemented rather than realigning Hunter Road's approach to the intersection which would require substantial clearing of vegetation.

4.2 Pavement Structure and Surfacing Design

A separate technical memorandum regarding the Geotechnical Investigation and pavement design is provided as Appendix D. A summary is provided below:

- There are two vehicle count locations available on MRWA Traffic Map. One is 1.5km to the north of the proposed intersection (Brand Highway north of Dandaragan Road) and another approximately 3.8km south of the intersection (Brand Highway south of Mogumber Road West). For the purposes of this pavement design, the details from the Mogumber Road West location have been used as they have a

higher overall traffic count and historical count details. In addition, it is assumed that on average ten A-Double vehicles per day will access the Hunter Road.

- Design life of 40 years is required.
- A CBR of 10% has been adopted for design based on laboratory test results and other considerations noted within the technical memorandum.
- Design Equivalent Standard Axle load of 4.4 x 10^8 were calculating for Brand Highway plus the additional A-Double traffic, and accounting for tight intersection turns.
- The Austroads Method as applied in AUSTROADS 2012 Guide to Pavement Technology Part 2: Pavement Structural Design and MRWA Engineering Road Note 9 was used as the recognised method for the design of granular pavements with thin asphalt surfacing.
- Based on the above, the design pavement as follows and applies to both Hunter Road and the widening of Brand Highway.
  - 40mm DGA AC14 MRWA intersection mix, A15E Polymer Modified Binder
  - Prime seal
  - 235mm of basecourse
  - 220mm sub-base.
- Pavement Construction Recommendations are outlined in Section 7.4 of the Appendix D.

4.3 Drainage Design

4.3.1 Design Data

The following information and data have been used for the drainage design:

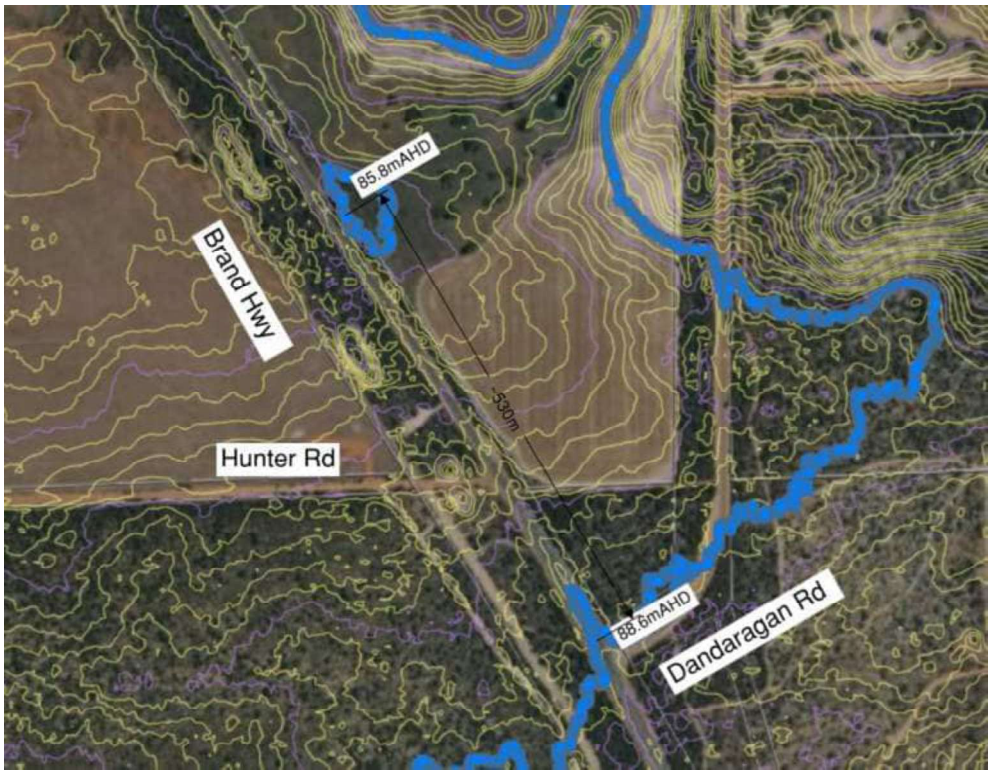
- IFD Data sourced from the Bureau of Meteorology and on 30th August 2022.
- Feature survey (ref 23250-01A) provided by the Client and prepared by Harley Dykstra
- SRTM data (5m DEM cell data) sourced from https://elevation.fsdf.org.au/ on 13th June 2022 for the purposes of understanding the external catchment beyond the extents of feature survey noted above.

4.3.2 Existing Drainage System

On the western side of Brand Hwy, the tables drains within the design area discharge into two existing basins either side of Hunter Rd.

On the eastern side of Brand Hwy, the table drain currently conveys road runoff from the intersection with Dandaragan Rd to a low point approximately 530m north as shown in Figure 4-1 below.

Figure 4-1 External Contours Around the Site



4.3.3 Proposed Drainage

The proposed design is unkerbed and utilises table drains with foreslope 1:6 and backslope 1:4. Table drains depths along Brand Hwy on approach to tie-ins are restricted by the flat layout of the highway. Proposed table drains have been set 300mm below subgrade surface and independently grade on approach to the shallower tie-in points with inverts are generally at or slightly below subgrade surface.

Table drains along Hunter Rd have their inverts set 300mm below subgrade surface as recommended in Austroads Guide to Road Design Part 3.

The 15% design proposed to re-configure the existing basin either side of Hunter Rd to contain the 1%AEP. Following design review Main Roads indicated their preference to instead have a culvert crossing Hunter Rd discharging via a Type F drain to the north. The design has been updated accordingly.

The upstream catchment for this culvert extends beyond the limits of the feature survey and so Lidar data was used to estimate the gross area of the catchment by running CatchmentSIM in AutoCAD – refer screenshot as Figure 4-2 below. Aerial imagery was used to estimate the impervious area of Brand Highway pavement within this catchment, as follows:

Table 4-1 Catchment Areas Contributing to Culvert

Surface Type	Catchment Area (m^2)	Runoff Coefficient (m^2)	Contributing Area (m^2)
Impervious	3,056	0.9	2,750
Pervious	7,294	0.2	1,458

The required flow for the 10%AEP was calculated to be 54.6L/s using rational method calculations. Culvert sizing was completed using HY-8 software. The results are provided as Appendix E.

The minimum concrete box culvert size, 1200x375 (span x height) is proposed. It has sufficient capacity to convey the 10%AEP storm event. The pavement is set with 500mm cover so that the top of culvert is at the subgrade surface at the outer edge of pavement at the upstream end. The culvert has been provided with a slope of 1:200.

Figure 4-2 Basin 2 Estimated Gross Catchment



4.4 Signage and Linemarking

Linemarking along Brand Hwy is to modify and replace as shown to accommodate linemarking required for the intersection. Redundant linemarking shall be remove and replaced with new lines for the extent reflected by the design drawing.

Existing signs along Brand Hwy are to remain and be relocated lateral to accommodate pavement widening as reflected by the design drawing.

4.5 Road Safety Audits

A Road Safety Audit will be conducted on the 85% design. Recommendations will be incorporated in the 100% design.

4.6 Safety in Design

A Safety in Design Register is provided within Appendix F. The register considers project specific factors and does not include generic considerations such as safe work practices and other common place practices.

5 Recommendations

To summarise Cardno's recommendations noted within this report:

- It is recommended that ProTen investigate further to confirm that all vehicles that will be accessing the site will be able to cross the overhead power line with adequate clearance in accordance with Western Power's requirements.
- A review of desktop mapping indicates that the site falls within a Threatened Ecological Communities site. It is recommended that ProTen seek further advice from the Department of Biodiversity, Conservation and Attractions through their planning team.
- A review of desktop mapping indicates that the site falls within the fringes of an Aboriginal Heritage registered site. It is recommended that ProTen seek further advice from the Department of Planning, Lands and Heritage through their planning team.
- Refer to the Geotechnical Investigation Memorandum (Appendix D) for pavement construction recommendations.

6 Conclusion

Cardno has provided an intersection design which meets the clients' requirements for a 36.5m A-Double to access the proposed Chicken Farm, and also satisfies Main Roads HVS requirements for it to accommodate a 36.5m B-Triple which is the worst performing vehicle on the RAV 7 network, which applies to Brand Hwy. 15% review comments have been addressed for the 85% design. In parallel with Main Roads review of the 85% design, a Road Safety Audit will be completed. Comments from Main Road's review, as well as recommendations from the Road Safety Audit will be completed for the 100% design.

A Bill of Quantities will also be prepared based on the 85% design and provided to ProTen separately.