



# APPENDIX 3

DVC - ASSESSMENT OF INTERSECTION REQUIREMENTS FOR  
PROPOSED STRUCTURE PLAN



ROWE GROUP

October 2014

Final

Assessment of Intersection Requirements for Proposed  
Structure Plan – Lots 15 & 17 Brand Highway, Rudds  
Gully

Prepared For:

Australian Mineral Investors Pty Ltd

Report



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# 1. INTRODUCTION

## 1.1 BACKGROUND

Australian Mineral Investors Pty Ltd has commissioned Donald Veal Consultants to undertake the concept design for proposed accesses onto the Brand Highway from Lots 15 and 17 Brand Highway, Rudds Gully. This concept design is to be submitted to the relevant authorities for formal approval.

The proposed development site is situated on the east side of Brand Highway, north of its intersection with Rudds Gully Road. The subject site is situated some 2 kms south of the Wandina town site as shown in **Figure 1.1**.



**Figure 1.1: Locality Plan**

Source: Google Earth

The existing lots are undeveloped and have no formalised access from Brand Highway. We understand that the Structure Plan over these Lots is currently being progressed. The Structure Plan for the location is shown in **Appendix A**.

Main Roads Western Australia (MRWA) have advised in their letter dated 19<sup>th</sup> November 2012 (attached in **Appendix B**) of their concerns over sight line inadequacy at the proposed access locations onto Brand Highway. Alternative locations for the accesses which provide 300m sight lines to the north and south are required.

Furthermore, MRWA advised of the southbound overtaking provision for vehicles to overtake slower vehicles on the way out of the built up area of Wandina. It is observed that on approach from the north to Lot 15, there exists overtaking provision on Brand Highway southbound. On approach from the south to Lot 17, there exists overtaking provision on Brand Highway northbound. The designs of the new accesses are to ensure minimal impact to existing over taking provisions, at least until the proposed North-South Highway is realised.

## 1.2 SCOPE OF WORKS

The scope of works:

- Forecast traffic at the site;
- Ascertain intersection layout;
  - with reference to Austroads Guidelines Part 4A;
  - ensuring adequate sight lines of 300m are obtained; and
  - ensuring overtaking provisions are preserved.
- Assess the adequacy of the layout using forecast traffic volumes and proposed intersection layout.

This report provides details of the works undertaken to arrive at the concept layout of the new accesses onto Brand Highway, which are shown as **Figure 3.1 and 3.2** in section 3.

## 2. TRAFFIC VOLUMES

### 2.1 EXISTING TRAFFIC VOLUMES

Short term traffic counts were conducted by MRWA (attached in **Appendix C**) at a location north of Rudds Gully Road for period between 27<sup>th</sup> of August 2011 and 2<sup>nd</sup> September 2011. The Monday to Friday average indicates around 4,100 vehicles per day (vpd).

The Traffic Digest sourced from MRWA has provided annual average daily traffic counts (AADT) on Brand Highway south of Glendinning Road for years 2005/06 and 2008/09 and south of Greenough River Road for years 2006/07 and 2007/08. The volumes from MRWA Traffic Digest are used to establish compound annual growth and average percentage of heavy vehicles. These are summarised in **Table 2.1**. Details of MRWA's Traffic Digest are also shown in **Appendix C**.

The likelihood is that traffic volumes will continue to grow before alternative route options are available.

| Location                | Year    | AADT 1-7 | Growth p.a. | HV     |
|-------------------------|---------|----------|-------------|--------|
| S of Glendinning Rd     | 2005/06 | 8 020    |             | 6.5%   |
|                         | 2008/09 | 9 040    | 4.10%       | 7.4%   |
| S of Greenough River Rd | 2006/07 | 3 260    |             | 15.7%  |
|                         | 2007/08 | 3 300    | 1.22%       | 16.2%  |
| Average Annual Growth   |         |          | 2.66%       |        |
| Average HV              |         |          |             | 11.45% |

**Table 2.1: Traffic volumes on Brand Highway**

Source: MRWA

### 2.2 DEVELOPMENT TRAFFIC

Traffic volumes generated by the proposed developments were obtained from *Lot 15 & 17 Brand Highway, Rudds Gully City of Geraldton Proposed Structure Plan Traffic Assessment Report* dated 14 February 2012 and prepared by Transcore Pty Ltd. That report presented two scenarios:

- Interim Scenario (full development of Lots 15 and 17 with their respective accesses onto Brand Highway with no direct internal road links between Lots 15 and 17 through Lot 16); and
- Ultimate Scenario (full development of Lot 16 and its integration into Lot 15 and 17 road network).

For the purpose of this report we have used modelled turning volumes for the Interim Scenario, as at this stage Lot 16 will not be developed. It is assumed that the AM or PM peak hours contain approximately 10% of the proposed daily traffic volumes.

Traffic distribution at both accesses was based on the assumption that the majority of traffic would be heading to/from the north - major work attractor and tidal traffic flow. This results in the following traffic distribution:

- AM peak hour
  - Outbound traffic 80/20 split northbound/southbound;
  - Inbound traffic 20/80 split southbound/northbound;
  - Inbound/outbound split 10/90
- Conversely in the PM peak hour
  - Inbound traffic 80/20 split southbound/northbound;
  - Outbound traffic 20/80 split northbound/southbound;
  - Inbound/outbound split 90/10

Peak hour volumes on Brand Highway were based on the latest traffic counts conducted by MRWA outlined in section 2.1. The percentage of heavy vehicles is 11.45%. Monday peak volumes (which were the highest) were used in the analysis, that is:

- AM peak volumes 202 vph northbound and 184 vph southbound; and
- PM peak volumes 209 vph northbound and 204 vph southbound.

To estimate forecast volumes, the above was then projected ten years ahead based on current growth rates of 2.66% per annum. Beyond this ten year period, the majority of traffic is assumed to be directed onto the new North-South Highway, east of the site.

The resulting peak hour turning volumes for the proposed accesses to Lot 15 and 17 are shown in **Figure 2.1** and **Figure 2.2**, respectively.

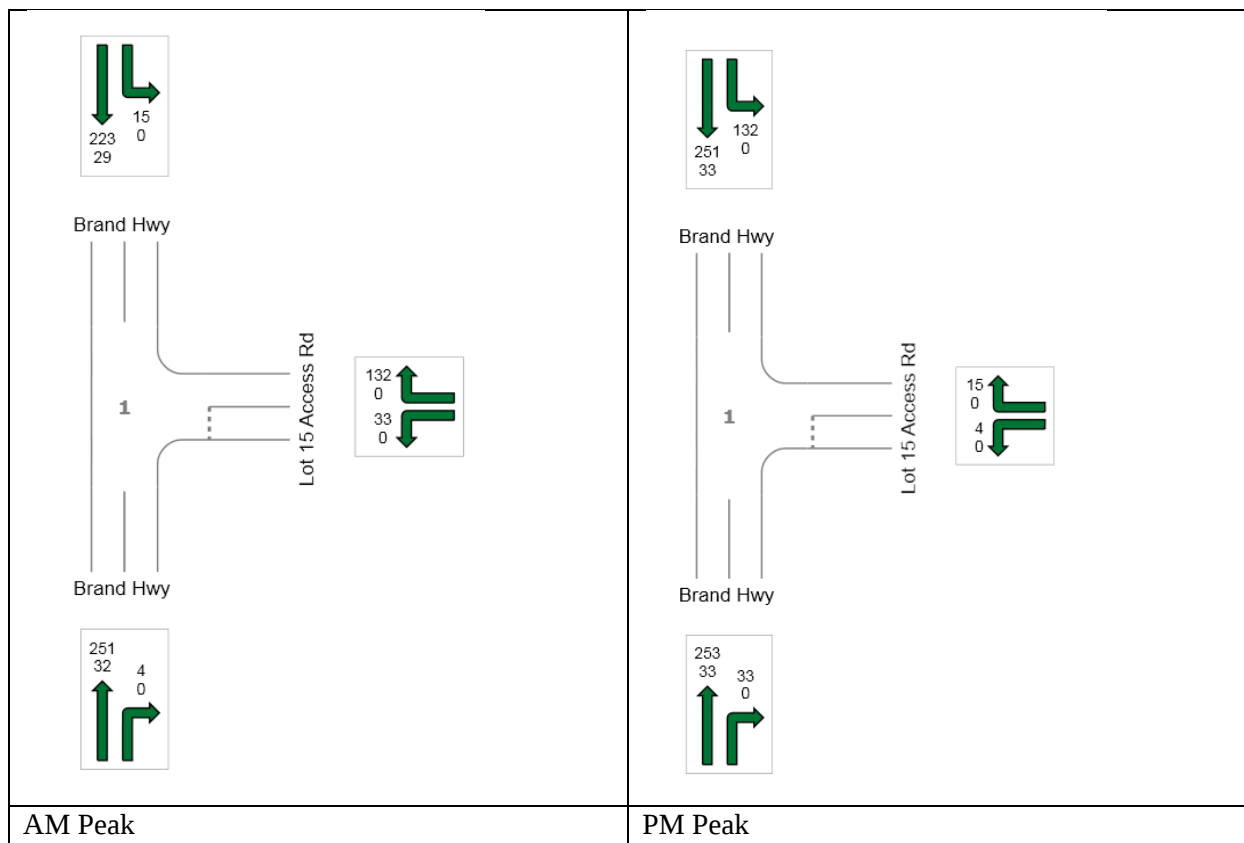


Figure 2.1: Turning volumes for Lot 15

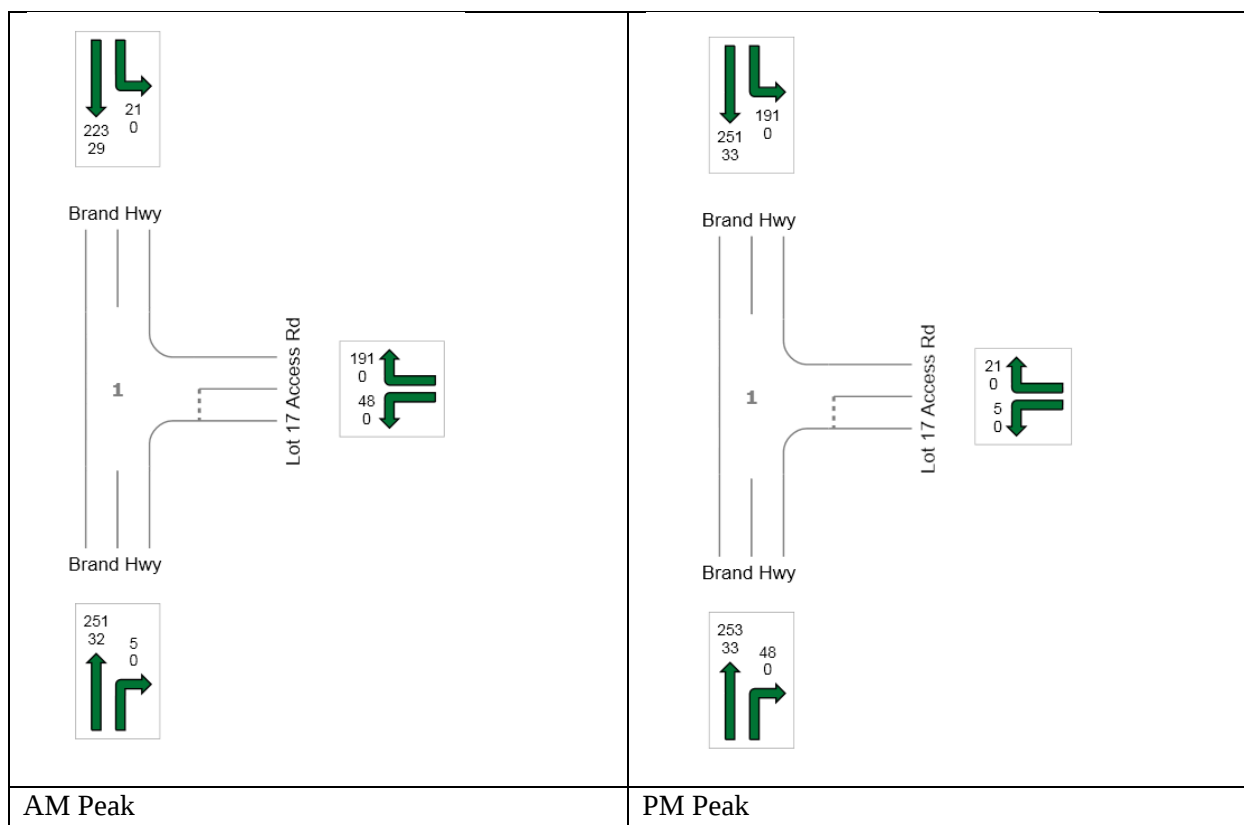


Figure 2.2: Turning volumes for Lot 17

### 3. CONCEPT DESIGN OF ACCESSES

#### 3.1 CONSULTATION WITH MRWA

Brand Highway is managed by MRWA and is classified as a Primary Distributor under MRWA's Road Hierarchy Classification. This classification is applied to roads that *"Provide for major regional and inter-regional traffic movement and carry large volumes of generally fast moving traffic. Some are strategic freight routes and all are State Roads."* (MRWA).

Mr Mark Salt, Network Manager for the Mid West Region provided a copy of design drawings for the section of Brand Highway under consideration. These were used for a preliminary assessment of suitable locations for the two new accesses. The drawings are quite dated (1979) and therefore have not been attached to this report.

On Wednesday 27 March 2013, a site inspection was undertaken by Donald Veal and Naomi Mynott of MRWA. This inspection was undertaken to verify the adequacy of the proposed locations of the accesses and any specifics required for the detailed survey (in addition to the typical requirements).

#### 3.2 SIGHT LINE ADEQUACY

Sight line requirements were taken to be 300m as specified in MRWA's letter dated 19 November 2012. The locations of the accesses were refined subsequent to the detailed survey which was undertaken by HTD Surveyors and Planners on 24 April 2013. With the versatility of the digital data, a number of further locations were investigated - in particular at locations which 'line up' with the access roads within the development site which run perpendicular to Brand Highway.

The resulting proposed access locations to lot 15 and 17 were found to satisfy MRWA's 300m requirements and could satisfactorily be reworked, with adjustments, into the internal road layout of the development. The sight line verifications are shown in **Appendix D**, namely **Dwg DVC-Z303-SK3.01 Rev2** and **Dwg DVC-Z303-SK3.02 Rev1** for the horizontal sight line check for lots 15 and 17 respectively, and **Dwg DVC-Z303-SK4.01 Rev2** and **Dwg DVC-Z303-SK4.02 Rev3** for the vertical sight line check for lots 15 and 17 respectively.

Note that at lot 15, horizontal sight lines to the north are impaired. This will be rectified with modifications to the embankment at detailed design.

#### 3.3 INTERSECTION LAYOUT

The concept intersection layouts were designed in accordance with Austroads Guidelines *Guide to Road Design - Part 4A- Unsignalised and Signalised Intersections*(2009). Reference was also made to MRWA Drawing No. 200131-0083 and 200131-0084. The posted speed limit of the route is 90km/h. In the absence of 85th percentile speed data the design speed was taken to be 100km/h.

For both lots 15 and 17 the Austroads Guidelines Part 4A recommends a rural channelised T-junction (CHR) for the right turn movement. This is based on the forecast volumes in **Figures 2.1** and **2.2** (particularly PM peak volumes) and Figure 4.9 (Warrants for turn treatments on major road at unsignalised intersections, page 46). For both sites, reference was made to Figure 7.7 (page 105) of the Guidelines for the CHR layout with the deceleration length 155m (refer Table 5.2, page 65). Storage requirements are minimal as shown by the SIDRA analysis in section 3.4. Hence, the length of the pocket is purely the deceleration length, which is based on a comfortable stopping rate of  $2.5\text{m/s}^2$  - as opposed to the maximum stopping rate of  $3.5\text{m/s}^2$ . The median is to be painted.

Figure 4.9 also recommends an auxiliary lane for the left turn movements at both accesses. The left turn lane length is governed by the deceleration distance as the queue length is minimal. Using Table 5.2, the deceleration distance from 100km/h to 20km/h is 150m.

For both left and right turn pockets a taper length of 33m has been used (as per Table 5.1 of the Guidelines, page 64).

As per MRWA Drawing No. 200131-0084, a 70 degree high entry angled island is proposed on the access road approach.

The design was further modified to satisfy the City of Greater Geraldton's (CoGG) List of Modifications (provided on 26 May 2014), and in particular the inclusion of pedestrian and cyclist provisions. Mr Mark Atkinson, Manager of Infrastructure and Planning CoGG, provided an indication of the cross section of the access roads, and this is shown below in **Figure 3.1A**.

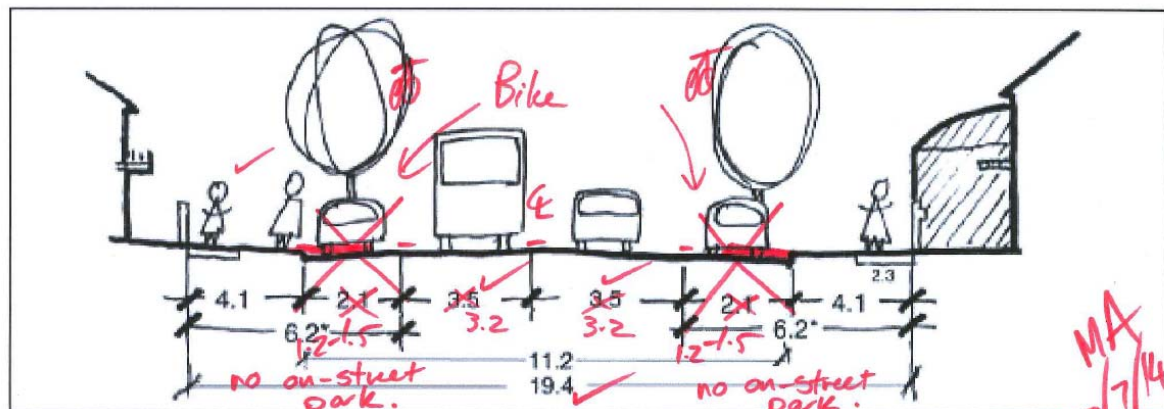


Figure 18: Neighbourhood connector B - 50 km/hr (<3000 vehicles per day).

Figure 3.1A: CoGG Cross section requirements at the access roads

Pedestrian and cyclist facilities provided in each of the concept layouts show:

- 2.5m shared path along the northern fence line of Brand Highway to extent of subject lots;
- 2.3m shared path along one side of the access road;
- Pedestrian crossing facilities at the intersection; and
- 2 x 1.5m on road cycle lanes on the access road with cycle lane on/off ramps.

The resulting concept layouts are included as **Figures 3.1** and **3.2**.

The intersection caters for the design vehicle of a 19m semi-trailer. The swept path of the semi is shown in **Appendix D** as **Dwg DVC-Z303-1.2 Rev2** and **Dwg DVC-Z303-2.2 Rev3**.

### **3.4 SIDRA ANALYSIS**

A capacity analysis of the proposed intersections of Brand Highway with the Access Roads for Lot 15 and Lot 17 were carried out using the SIDRA computer package, to assess the traffic operations with the addition of the development traffic.

SIDRA is an intersection-modelling tool commonly used by traffic engineers for all types of intersection analysis. SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

**Degree of Saturation:** is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for varied traffic flow up to one for saturated flow or capacity.

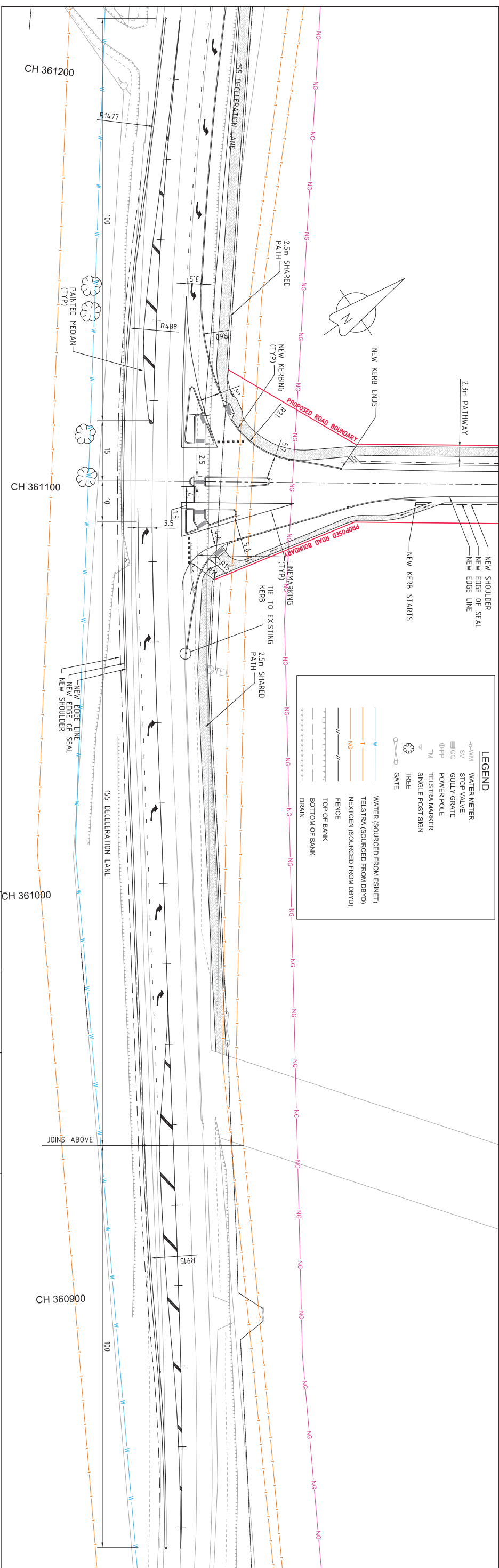
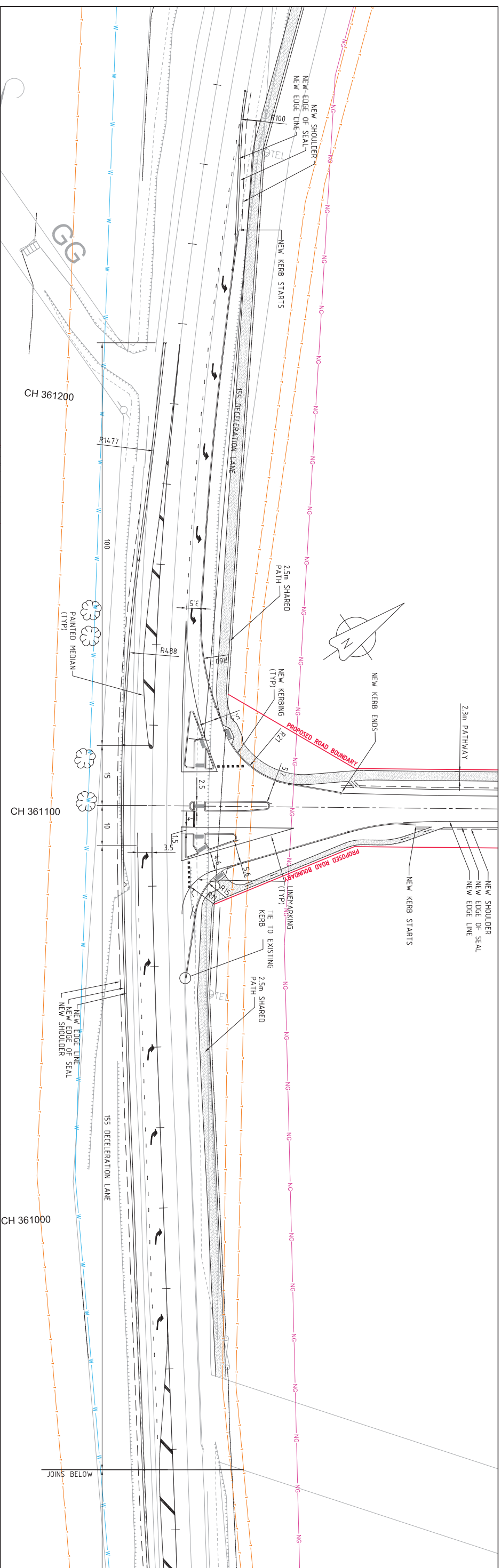
**Level of Service (LOS):** is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of service, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).

**Average Delay:** is the average of all travel time delays for vehicles passing through the intersection.

**95% Queue:** is the queue length below which 95% of all observed queue lengths fall.

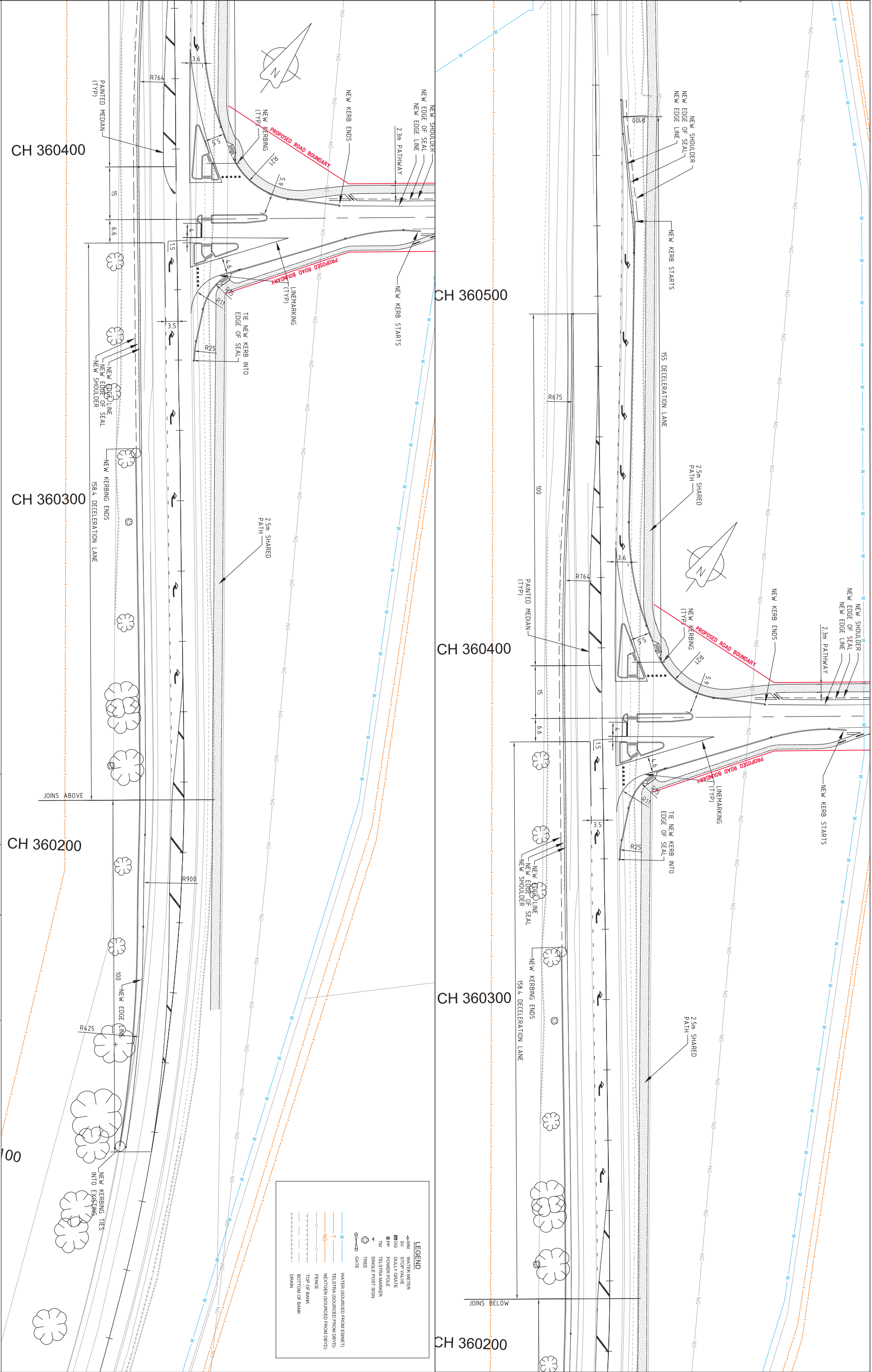
To assess the potential traffic impacts associated with the proposed development we have modelled the peak hours for both Access Roads.

The proposed intersection layouts are shown in **Figure 3.3**.

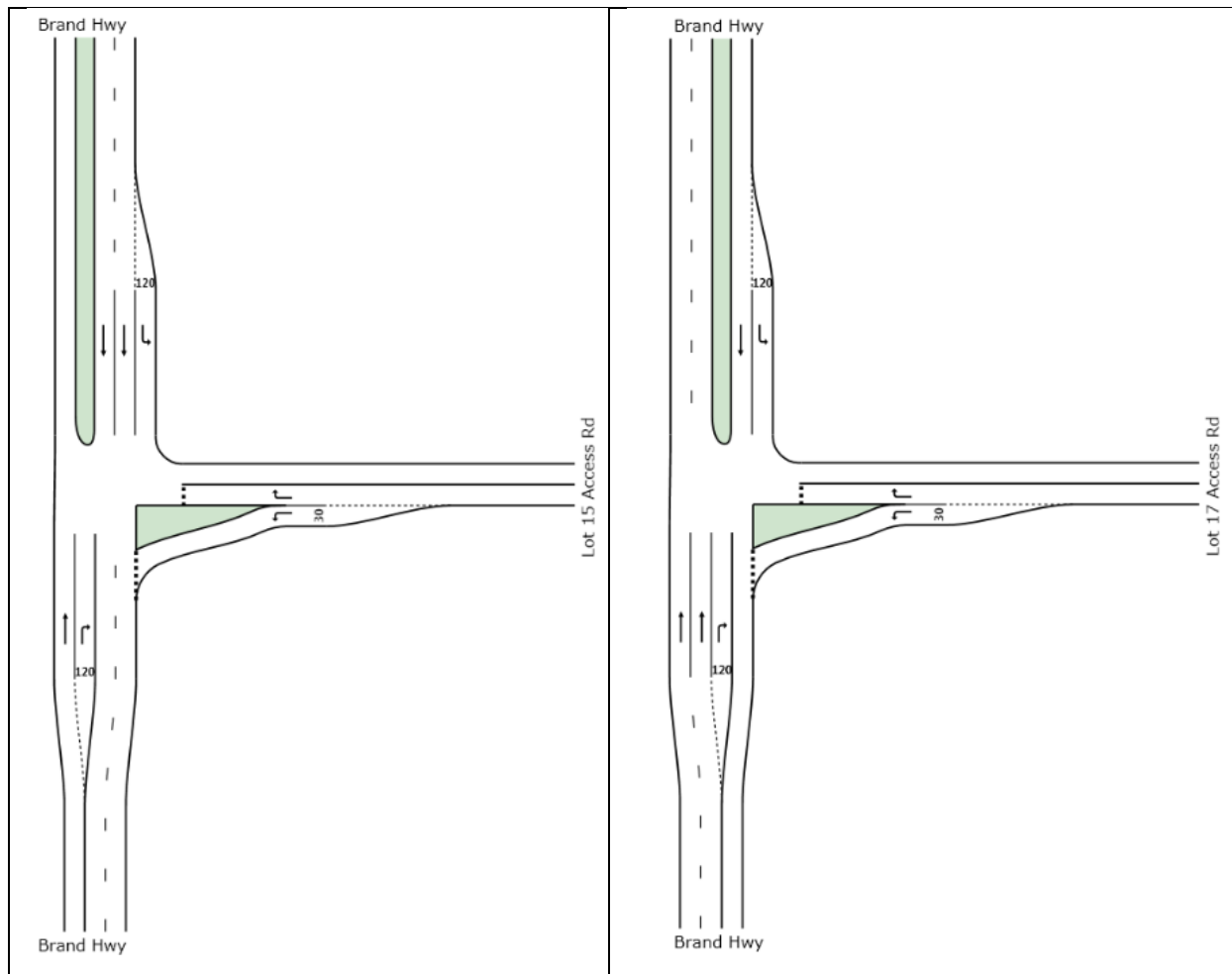


| Project                                | Title                                                                               |
|----------------------------------------|-------------------------------------------------------------------------------------|
| LOT 15 & 17 BRAND HIGHWAY, RUDDS GULLY | FIGURE 3.1: LOT 15 ACCESS CONCEPT LAYOUT (REVISED TO REFLECT CGG COMMENTS 26-05-14) |

|                                                                           |          |             |         |       |                |                   |                |          |
|---------------------------------------------------------------------------|----------|-------------|---------|-------|----------------|-------------------|----------------|----------|
| Client<br><br><b>OWNERS OF LOT 15 &amp; 17 BRAND HIGHWAY, RUDDS GULLY</b> | Approved |             | V Datum | AHD   | Project Number | Drawing File Name | Drawing Number | Revision |
|                                                                           | Scale    | 1:500 AT A1 | H Datum | GCG94 | Z303           | DVC-Z303-1 Rev3   | DVC-Z303-1.1   | 2        |
|                                                                           |          |             |         |       |                |                   |                |          |
|                                                                           |          |             |         |       |                |                   |                |          |



|         |                                                                                     |  |  |  |          |             |          |                                                                                                                          |                          |  |  |                                      |  |                                |  |               |  |
|---------|-------------------------------------------------------------------------------------|--|--|--|----------|-------------|----------|--------------------------------------------------------------------------------------------------------------------------|--------------------------|--|--|--------------------------------------|--|--------------------------------|--|---------------|--|
| Project | LOT 15 & 17 BRAND HIGHWAY, RUDDS GULLY                                              |  |  |  | Designed | GTT         | 16-08-14 | Surveyed                                                                                                                 | HTD SURVEYORS & PLANNERS |  |  |                                      |  |                                |  |               |  |
|         |                                                                                     |  |  |  | Drawn    | GTT         | 16-08-14 |                                                                                                                          |                          |  |  |                                      |  |                                |  |               |  |
|         |                                                                                     |  |  |  | Checked  | DNV         | 18-08-14 | Survey Date                                                                                                              | 24-04-13                 |  |  |                                      |  |                                |  |               |  |
| Title   | FIGURE 3.2: LOT 17 ACCESS CONCEPT LAYOUT (REVISED TO REFLECT CGG COMMENTS 26-05-14) |  |  |  | Approved |             |          | V Datum                                                                                                                  | AHD                      |  |  |                                      |  |                                |  |               |  |
|         |                                                                                     |  |  |  | Scale    | 1:500 AT A1 |          | H Datum                                                                                                                  | GCG94                    |  |  |                                      |  |                                |  |               |  |
|         |                                                                                     |  |  |  |          |             |          |                                                                                                                          |                          |  |  |                                      |  |                                |  |               |  |
| Client  | OWNERS OF LOT 15 & 17 BRAND HIGHWAY, RUDDS GULLY                                    |  |  |  |          |             |          |                                                                                                                          |                          |  |  |                                      |  |                                |  |               |  |
|         |                                                                                     |  |  |  |          |             |          |                                                                                                                          |                          |  |  |                                      |  |                                |  |               |  |
|         |                                                                                     |  |  |  |          |             |          |                                                                                                                          |                          |  |  |                                      |  |                                |  |               |  |
|         |                                                                                     |  |  |  |          |             |          | Donald Veal Consultants<br>6 Burgess Street<br>Midland WA 6056<br>Telephone +61 8 9274 7076<br>Facsimile +61 8 9274 4854 |                          |  |  |                                      |  |                                |  |               |  |
|         |                                                                                     |  |  |  |          |             |          |                                       |                          |  |  |                                      |  |                                |  |               |  |
|         |                                                                                     |  |  |  |          |             |          | Project Number<br>Z303                                                                                                   |                          |  |  | Drawing File Name<br>DVC-Z303-2 Rev3 |  | Drawing Number<br>DVC-Z303-2.1 |  | Revision<br>2 |  |



**Figure 3.3: Proposed Intersection Layouts, Brand Hwy/Access Roads for Lots 15&17**

The forecast traffic flows for the peak hour are shown in **Figures 2.1** and **Figure 2.2**.

**Tables 3.1** and **3.2** summarise the results of the analysis of the proposed turning volumes at the intersection of Brand Highway with Access Road for Lot 15 and the intersection of Brand Highway with Access Road for Lot 17, respectively. As can be seen, with the interim scenario forecast traffic volumes for proposed development, the SIDRA analysis indicates that for both intersections all movements operate with acceptable LOS of B or better.

| Movement Performance - Vehicles |        |                       |               |                  |                      |                  |                                   |               |              |                                |                       |
|---------------------------------|--------|-----------------------|---------------|------------------|----------------------|------------------|-----------------------------------|---------------|--------------|--------------------------------|-----------------------|
| Mov ID                          | OD Mov | Demand Total<br>veh/h | Flows HV<br>% | Deg. Satn<br>v/c | Average Delay<br>sec | Level of Service | 95% Back of Queue<br>Vehicles veh | Distance<br>m | Prop. Queued | Effective Stop Rate<br>per veh | Average Speed<br>km/h |
| South: Brand Hwy                |        |                       |               |                  |                      |                  |                                   |               |              |                                |                       |
| 2                               | T1     | 298                   | 11.5          | 0.164            | 0.0                  | LOS A            | 0.0                               | 0.0           | 0.00         | 0.00                           | 89.9                  |
| 3                               | R2     | 4                     | 0.0           | 0.004            | 12.8                 | LOS B            | 0.0                               | 0.1           | 0.36         | 0.65                           | 58.1                  |
| Approach                        |        | 302                   | 11.3          | 0.164            | 0.2                  | NA               | 0.0                               | 0.1           | 0.01         | 0.01                           | 89.5                  |
| East: Lot 15 Access Rd          |        |                       |               |                  |                      |                  |                                   |               |              |                                |                       |
| 4                               | L2     | 35                    | 0.0           | 0.033            | 10.3                 | LOS B            | 0.1                               | 1.0           | 0.41         | 0.64                           | 47.7                  |
| 6                               | R2     | 139                   | 0.0           | 0.230            | 13.3                 | LOS B            | 0.9                               | 6.1           | 0.58         | 0.87                           | 45.9                  |
| Approach                        |        | 174                   | 0.0           | 0.230            | 12.7                 | LOS B            | 0.9                               | 6.1           | 0.54         | 0.82                           | 46.3                  |
| North: Brand Hwy                |        |                       |               |                  |                      |                  |                                   |               |              |                                |                       |
| 7                               | L2     | 16                    | 0.0           | 0.009            | 14.2                 | LOS B            | 0.0                               | 0.0           | 0.00         | 0.78                           | 63.2                  |
| 8                               | T1     | 265                   | 11.5          | 0.073            | 0.0                  | LOS A            | 0.0                               | 0.0           | 0.00         | 0.00                           | 90.0                  |
| Approach                        |        | 281                   | 10.8          | 0.073            | 0.8                  | NA               | 0.0                               | 0.0           | 0.00         | 0.04                           | 88.3                  |
| All Vehicles                    |        | 757                   | 8.5           | 0.230            | 3.3                  | NA               | 0.9                               | 6.1           | 0.13         | 0.21                           | 75.3                  |

Table 3.1A: SIDRA results, AM Peak Hour, Forecast volumes at Lot 15 Access

| Movement Performance - Vehicles |        |                       |               |                  |                      |                  |                                   |               |              |                                |                       |
|---------------------------------|--------|-----------------------|---------------|------------------|----------------------|------------------|-----------------------------------|---------------|--------------|--------------------------------|-----------------------|
| Mov ID                          | OD Mov | Demand Total<br>veh/h | Flows HV<br>% | Deg. Satn<br>v/c | Average Delay<br>sec | Level of Service | 95% Back of Queue<br>Vehicles veh | Distance<br>m | Prop. Queued | Effective Stop Rate<br>per veh | Average Speed<br>km/h |
| South: Brand Hwy                |        |                       |               |                  |                      |                  |                                   |               |              |                                |                       |
| 2                               | T1     | 301                   | 11.5          | 0.166            | 0.0                  | LOS A            | 0.0                               | 0.0           | 0.00         | 0.00                           | 89.9                  |
| 3                               | R2     | 35                    | 0.0           | 0.038            | 13.6                 | LOS B            | 0.1                               | 1.0           | 0.45         | 0.73                           | 57.3                  |
| Approach                        |        | 336                   | 10.3          | 0.166            | 1.4                  | NA               | 0.1                               | 1.0           | 0.05         | 0.08                           | 86.9                  |
| East: Lot 15 Access Rd          |        |                       |               |                  |                      |                  |                                   |               |              |                                |                       |
| 4                               | L2     | 4                     | 0.0           | 0.005            | 10.8                 | LOS B            | 0.0                               | 0.1           | 0.46         | 0.61                           | 47.6                  |
| 6                               | R2     | 16                    | 0.0           | 0.031            | 13.9                 | LOS B            | 0.1                               | 0.7           | 0.58         | 0.81                           | 45.5                  |
| Approach                        |        | 20                    | 0.0           | 0.031            | 13.2                 | LOS B            | 0.1                               | 0.7           | 0.56         | 0.77                           | 45.9                  |
| North: Brand Hwy                |        |                       |               |                  |                      |                  |                                   |               |              |                                |                       |
| 7                               | L2     | 139                   | 0.0           | 0.075            | 14.2                 | LOS B            | 0.0                               | 0.0           | 0.00         | 0.78                           | 63.2                  |
| 8                               | T1     | 299                   | 11.5          | 0.082            | 0.0                  | LOS A            | 0.0                               | 0.0           | 0.00         | 0.00                           | 90.0                  |
| Approach                        |        | 438                   | 7.8           | 0.082            | 4.5                  | NA               | 0.0                               | 0.0           | 0.00         | 0.25                           | 80.6                  |
| All Vehicles                    |        | 794                   | 8.7           | 0.166            | 3.4                  | NA               | 0.1                               | 1.0           | 0.03         | 0.19                           | 81.8                  |

Table 3.1B: SIDRA results, PM Peak Hour, Forecast volumes at Lot 15 Access

| Movement Performance - Vehicles |        |                       |               |                  |                      |                  |                                      |               |              |                                |                       |
|---------------------------------|--------|-----------------------|---------------|------------------|----------------------|------------------|--------------------------------------|---------------|--------------|--------------------------------|-----------------------|
| Mov ID                          | OD Mov | Demand Total<br>veh/h | Flows HV<br>% | Deg. Satn<br>v/c | Average Delay<br>sec | Level of Service | 95% Back of Queue<br>Vehicles<br>veh | Distance<br>m | Prop. Queued | Effective Stop Rate<br>per veh | Average Speed<br>km/h |
| South: Brand Hwy                |        |                       |               |                  |                      |                  |                                      |               |              |                                |                       |
| 2                               | T1     | 298                   | 11.5          | 0.164            | 0.0                  | LOS A            | 0.0                                  | 0.0           | 0.00         | 0.00                           | 89.9                  |
| 3                               | R2     | 5                     | 0.0           | 0.005            | 12.8                 | LOS B            | 0.0                                  | 0.1           | 0.36         | 0.66                           | 58.0                  |
| Approach                        |        | 303                   | 11.3          | 0.164            | 0.3                  | NA               | 0.0                                  | 0.1           | 0.01         | 0.01                           | 89.4                  |
| East: Lot 17 Access Rd          |        |                       |               |                  |                      |                  |                                      |               |              |                                |                       |
| 4                               | L2     | 51                    | 0.0           | 0.048            | 10.4                 | LOS B            | 0.2                                  | 1.5           | 0.41         | 0.65                           | 47.7                  |
| 6                               | R2     | 201                   | 0.0           | 0.334            | 14.3                 | LOS B            | 1.5                                  | 10.7          | 0.61         | 0.93                           | 45.3                  |
| Approach                        |        | 252                   | 0.0           | 0.334            | 13.5                 | LOS B            | 1.5                                  | 10.7          | 0.57         | 0.87                           | 45.7                  |
| North: Brand Hwy                |        |                       |               |                  |                      |                  |                                      |               |              |                                |                       |
| 7                               | L2     | 22                    | 0.0           | 0.012            | 14.2                 | LOS B            | 0.0                                  | 0.0           | 0.00         | 0.78                           | 63.2                  |
| 8                               | T1     | 265                   | 11.5          | 0.073            | 0.0                  | LOS A            | 0.0                                  | 0.0           | 0.00         | 0.00                           | 90.0                  |
| Approach                        |        | 287                   | 10.6          | 0.073            | 1.1                  | NA               | 0.0                                  | 0.0           | 0.00         | 0.06                           | 87.6                  |
| All Vehicles                    |        | 842                   | 7.7           | 0.334            | 4.5                  | NA               | 1.5                                  | 10.7          | 0.17         | 0.28                           | 71.3                  |

Table 3.2A: SIDRA results, AM Peak Hour, Forecast volumes at Lot 17 Access

| Movement Performance - Vehicles |        |                       |               |                  |                      |                  |                                      |               |              |                                |                       |
|---------------------------------|--------|-----------------------|---------------|------------------|----------------------|------------------|--------------------------------------|---------------|--------------|--------------------------------|-----------------------|
| Mov ID                          | OD Mov | Demand Total<br>veh/h | Flows HV<br>% | Deg. Satn<br>v/c | Average Delay<br>sec | Level of Service | 95% Back of Queue<br>Vehicles<br>veh | Distance<br>m | Prop. Queued | Effective Stop Rate<br>per veh | Average Speed<br>km/h |
| South: Brand Hwy                |        |                       |               |                  |                      |                  |                                      |               |              |                                |                       |
| 2                               | T1     | 301                   | 11.5          | 0.083            | 0.0                  | LOS A            | 0.0                                  | 0.0           | 0.00         | 0.00                           | 90.0                  |
| 3                               | R2     | 51                    | 0.0           | 0.060            | 14.2                 | LOS B            | 0.2                                  | 1.6           | 0.50         | 0.78                           | 56.4                  |
| Approach                        |        | 352                   | 9.8           | 0.083            | 2.1                  | NA               | 0.2                                  | 1.6           | 0.07         | 0.11                           | 85.6                  |
| East: Lot 17 Access Rd          |        |                       |               |                  |                      |                  |                                      |               |              |                                |                       |
| 4                               | L2     | 5                     | 0.0           | 0.006            | 11.1                 | LOS B            | 0.0                                  | 0.2           | 0.49         | 0.63                           | 47.5                  |
| 6                               | R2     | 22                    | 0.0           | 0.046            | 14.5                 | LOS B            | 0.2                                  | 1.1           | 0.61         | 0.85                           | 45.1                  |
| Approach                        |        | 27                    | 0.0           | 0.046            | 13.9                 | LOS B            | 0.2                                  | 1.1           | 0.59         | 0.81                           | 45.5                  |
| North: Brand Hwy                |        |                       |               |                  |                      |                  |                                      |               |              |                                |                       |
| 7                               | L2     | 201                   | 0.0           | 0.108            | 14.2                 | LOS B            | 0.0                                  | 0.0           | 0.00         | 0.78                           | 63.2                  |
| 8                               | T1     | 299                   | 11.5          | 0.165            | 0.0                  | LOS A            | 0.0                                  | 0.0           | 0.00         | 0.00                           | 89.9                  |
| Approach                        |        | 500                   | 6.8           | 0.165            | 5.7                  | NA               | 0.0                                  | 0.0           | 0.00         | 0.31                           | 78.3                  |
| All Vehicles                    |        | 879                   | 7.8           | 0.165            | 4.5                  | NA               | 0.2                                  | 1.6           | 0.05         | 0.25                           | 79.5                  |

Table 3.2B: SIDRA results, PM Peak Hour, Forecast volumes at Lot 17 Access

## 4. CONCLUSION

The forecast traffic volume on Brand Highway in the vicinity of the development is expected to increase from its current 4,100 vpd by an average rate of 2.66% before relief is offered by possible network improvements. The likely volume of development traffic for the interim scenario from the sites will be of the order of 184 vph in the peak hours for Lot 15 and some 260 vpd in the peak hours for Lot 17. These levels of traffic on a 90 km/h (design speed 100km/h) road warrant auxiliary lanes for both left and right turn movements as per Austroads Guidelines Part 4A (2009).

**Figures 3.1** and **3.2** show the concept intersection layout designs for Lot 15 and Lot 17, respectively. The concept layouts have been undertaken with reference to Austroads Guidelines Part 4A and the requirements of MRWA's letter dated 19 November 2012. These include sight line requirements and maintaining overtaking provisions on Brand Highway in the vicinity of the development lots. The layouts also address the CoGG's List of Modifications of 26 May 2014, and in particular provisions for pedestrian and cyclist facilities at the intersection. These provisions include shared pathways along Brand Highway and the access roads, pedestrian crossing facilities and on road cycle lanes.

The concept layouts provide safe access to Lots 15 and 17, and acceptable levels of service in terms of operational performance. Accordingly, **Figures 3.1** and **3.2** are therefore submitted to the relevant authorities for approval.

## **APPENDIX A: STRUCTURE PLAN**

urban  
plan | design  
development


## **APPENDIX B: MRWA 19-11-2012 LETTER**



Enquiries: Naomi Mynott on 08 9956 1205  
Our Ref: 05/6718-07  
Your Ref:

19 November 2012

Mr V Baltic  
Traffic & Transport Engineer  
Transcore

**BY EMAIL**

Dear Vladimir

**LOTS 15 & 17 BRAND HIGHWAY, RUDDS GULLY**

Thank you for contacting Main Roads regarding the proposed Structure Plan for lots 15 & 17.

While we would rather see the area develop with lot 116 & 117 coming forward first with the previously approved location for an intersection, in the interest of promoting development in the area we are willing to consider options for alternative intersection and access arrangements between the highway and the proposal site/area until such a time as lots 116/117 come forward. It will be for CGG to appraise the value of approving Structure Plans for lots that could be isolated (e.g. lot 17).

Notwithstanding the above, Main Roads WA has significant concerns over the proposed locations of the intersections, largely due to sight distances to/from the site not being compliant with guidelines set out in Austroads (in particular Guide to Road Design Parts 4 & 4A) and the MRWA accompaniment to those guidelines. Given that MRWA does not object to the principle of the site coming forward, we would be prepared to discuss alternative access solutions for the site.

The northern intersection was only ever approved on a temporary basis as an access for a single residential lot due to sight lines insufficient for an intersection. This situation has not changed since our first comments were made. The southern intersection also has limited sight distance to the south, which is obscured by a small crest in the road to the south.

Northern Access: On the current alignment of the highway, it is not considered that there are any positions along the boundary of lot 15 that would provide satisfactory sight distance. Possible solutions could include amending land levels within lot 15 to improve visibility or altering the alignment of the highway to allow improved sight lines. If the proponent is able to submit details demonstrating that there is in fact a location that could provide sufficient sight distance on either the current or a different alignment we would be prepared to review our position.

Southern Access: Our concern with the location of the proposed southern access is potentially more simple to resolve. It is considered that a point approximately 200m south of the existing proposed location (at the top of the crest) would enable clear sight lines for over 300m in both north and south directions which would be acceptable. Future connectivity across the Brand Highway could then be based around the revised intersection locations.

There are also some concerns about the overtaking lane that is currently located along the length of the site. For southbound vehicles, this lane allows vehicles to overtake slower moving vehicles on the way out of the built up area and this is a consideration in the traffic movements. Designs would have to accommodate or manage the traffic appropriately. Particularly prior to the development of the North-South highway, adequate overtaking opportunities must be maintained to allow vehicles to overtake slower moving vehicles.

We would therefore recommend that the plans are reviewed to reflect the above comments. We would be happy to discuss this further, please contact Naomi Mynott on 08 9956 1205 or email [naomi.mynott@mainroads.wa.gov.au](mailto:naomi.mynott@mainroads.wa.gov.au).

Yours sincerely



Bernie Miller  
REGIONAL MANAGER MID WEST REGION

CC: Murray Connell, City of Greater Geraldton

## **APPENDIX C: MRWA VOLUMES**

## Weekly Volume by Hour

Traffic Flow: **Both Directions**Road Name: **Brand Hwy (H004)**Site No: **18169**Location Description: **N of Rudds Gully Rd (SLK 359.63)**Date Range: **27 Aug 2011 to 02 Sep 2011**Count Type: **Classification Counts**

| Average Vehicle Volume |      |      |      |      |     |      |      |           |           |
|------------------------|------|------|------|------|-----|------|------|-----------|-----------|
| Hour                   | Mon  | Tue  | Wed  | Thu  | Fri | Sat  | Sun  | Mon - Fri | Mon - Sun |
| 0000                   | 13   | 18   | 28   | 23   |     | 40   | 37   | 21        | 27        |
| 0100                   | 10   | 13   | 13   | 21   |     | 21   | 19   | 14        | 16        |
| 0200                   | 4    | 6    | 14   | 21   |     | 23   | 13   | 11        | 14        |
| 0300                   | 16   | 25   | 19   | 17   |     | 19   | 15   | 19        | 19        |
| 0400                   | 26   | 25   | 23   | 25   |     | 14   | 11   | 25        | 21        |
| 0500                   | 69   | 58   | 76   | 80   |     | 53   | 34   | 71        | 62        |
| 0600                   | 186  | 153  | 173  | 188  |     | 107  | 80   | 175       | 148       |
| 0700                   | 272  | 272  | 263  | 269  |     | 154  | 119  | 269       | 225       |
| 0800                   | 340  | 344  | 358  | 355  |     | 321  | 239  | 349       | 326       |
| 0900                   | 349  | 317  | 302  | 275  |     | 366  | 323  | 311       | 322       |
| 1000                   | 327  | 320  | 250  | 209  |     | 398  | 347  | 277       | 309       |
| 1100                   | 319  | 276  | 293  | 208  |     | 400  | 418  | 274       | 319       |
| 1200                   | 338  | 282  | 300  | 159  |     | 379  | 398  | 270       | 309       |
| 1300                   | 291  | 288  | 272  | 154  |     | 350  | 382  | 251       | 290       |
| 1400                   | 326  | 302  | 250  | 240  |     | 380  | 277  | 280       | 296       |
| 1500                   | 328  | 337  | 245  | 194  |     | 320  | 363  | 276       | 298       |
| 1600                   | 387  | 371  | 292  | 242  |     | 309  | 360  | 323       | 327       |
| 1700                   | 334  | 298  | 317  | 267  |     | 230  | 284  | 304       | 288       |
| 1800                   | 195  | 206  | 220  | 193  |     | 172  | 198  | 204       | 197       |
| 1900                   | 112  | 108  | 121  | 112  |     | 133  | 127  | 113       | 119       |
| 2000                   | 50   | 79   | 80   | 78   |     | 69   | 55   | 72        | 69        |
| 2100                   | 60   | 71   | 67   | 80   |     | 59   | 60   | 70        | 66        |
| 2200                   | 51   | 56   | 33   | 43   |     | 51   | 29   | 46        | 44        |
| 2300                   | 29   | 50   | 34   | 34   |     | 39   | 24   | 37        | 35        |
| Total                  | 4432 | 4275 | 4043 | 3487 |     | 4407 | 4212 | 4062      | 4146      |

| Peak Statistics |            |       |       |       |       |       |       |           |           |
|-----------------|------------|-------|-------|-------|-------|-------|-------|-----------|-----------|
|                 | Mon        | Tue   | Wed   | Thu   | Fri   | Sat   | Sun   | Mon - Fri | Mon - Sun |
| AM              | 1/4 Hour   | 0930  | 0830  | 0815  | 0815  | 1115  | 1045  | 0815      | 0900      |
|                 | 1/4 Hr Vol | 97    | 96    | 101   | 108   | 116   | 123   | 93        | 85        |
|                 | 1/2 Hour   | 0930  | 1015  | 0800  | 0815  | 1100  | 1115  | 0815      | 0845      |
|                 | 1/2 Hr Vol | 185   | 178   | 191   | 194   | 226   | 222   | 181       | 168       |
|                 | 1 Hour     | 0845  | 0745  | 0800  | 0815  | 1030  | 1045  | 0815      | 0815      |
|                 | 1 Hr Vol   | 357   | 348   | 358   | 365   | 427   | 439   | 351       | 332       |
|                 | 1 Hr Fact  | .9201 | .9063 | .8861 | .8449 | .9203 | .8923 | .9435     | .9803     |
|                 | 2 Hour     | 0745  | 0730  | 0745  | 0730  | 0945  | 1045  | 0730      | 0800      |
| PM              | 2 Hr Vol   | 689   | 679   | 660   | 668   | 804   | 846   | 669       | 648       |
|                 | 1/4 Hour   | 1530  | 1630  | 1615  | 1745  | 1430  | 1230  | 1615      | 1615      |
|                 | 1/4 Hr Vol | 108   | 109   | 98    | 85    | 110   | 118   | 89        | 87        |
|                 | 1/2 Hour   | 1645  | 1615  | 1615  | 1600  | 1430  | 1315  | 1615      | 1600      |
|                 | 1/2 Hr Vol | 198   | 199   | 185   | 151   | 200   | 218   | 171       | 171       |
|                 | 1 Hour     | 1600  | 1545  | 1615  | 1715  | 1345  | 1230  | 1600      | 1600      |
|                 | 1 Hr Vol   | 387   | 372   | 324   | 271   | 380   | 428   | 323       | 327       |
|                 | 1 Hr Fact  | .9579 | .8532 | .8265 | .7971 | .8636 | .9068 | .9099     | .9433     |
| Peak            | 2 Hour     | 1515  | 1500  | 1545  | 1600  | 1245  | 1200  | 1530      | 1530      |
|                 | 2 Hr Vol   | 758   | 708   | 615   | 509   | 745   | 780   | 631       | 640       |
| Peak            | 12 Hour    | 0630  | 0630  | 0645  | 0630  | 0730  | 0730  | 0630      | 0645      |
|                 | 12 Hr Vol  | 3840  | 3633  | 3371  | 2795  | 3794  | 3741  | 3410      | 3513      |

## Weekly Volume by Hour

Traffic Flow: **Directional** Road Name: **Brand Hwy (H004)**  
 Site No: **18169** Location Description: **N of Rudds Gully Rd (SLK 359.63)**  
 Date Range: **27 Aug 2011 to 02 Sep 2011** Count Type: **Classification Counts**

| Average Vehicle Volume |      |      |      |      |      |      |      |      |     |   |      |      |      |      |           |      |           |      |
|------------------------|------|------|------|------|------|------|------|------|-----|---|------|------|------|------|-----------|------|-----------|------|
| Hour                   | Mon  |      | Tue  |      | Wed  |      | Thu  |      | Fri |   | Sat  |      | Sun  |      | Mon - Fri |      | Mon - Sun |      |
|                        | N    | S    | N    | S    | N    | S    | N    | S    | N   | S | N    | S    | N    | S    | N         | S    | N         | S    |
| 0000                   | 7    | 6    | 6    | 12   | 16   | 12   | 10   | 13   |     |   | 26   | 14   | 16   | 21   | 10        | 11   | 14        | 13   |
| 0100                   | 7    | 3    | 6    | 7    | 9    | 4    | 9    | 12   |     |   | 13   | 8    | 10   | 9    | 8         | 7    | 9         | 7    |
| 0200                   | 2    | 2    | 3    | 3    | 8    | 6    | 14   | 7    |     |   | 11   | 12   | 8    | 5    | 7         | 5    | 8         | 6    |
| 0300                   | 3    | 13   | 6    | 19   | 6    | 13   | 4    | 13   |     |   | 8    | 11   | 8    | 7    | 5         | 15   | 6         | 13   |
| 0400                   | 8    | 18   | 5    | 20   | 7    | 16   | 7    | 18   |     |   | 3    | 11   | 3    | 8    | 7         | 18   | 6         | 15   |
| 0500                   | 22   | 47   | 14   | 44   | 28   | 48   | 24   | 56   |     |   | 21   | 32   | 14   | 20   | 22        | 49   | 21        | 41   |
| 0600                   | 64   | 122  | 61   | 92   | 55   | 118  | 62   | 126  |     |   | 36   | 71   | 27   | 53   | 61        | 115  | 51        | 97   |
| 0700                   | 141  | 131  | 150  | 122  | 146  | 117  | 131  | 138  |     |   | 56   | 98   | 34   | 85   | 142       | 127  | 110       | 115  |
| 0800                   | 206  | 134  | 185  | 159  | 223  | 135  | 213  | 142  |     |   | 147  | 174  | 92   | 147  | 207       | 143  | 178       | 149  |
| 0900                   | 165  | 184  | 157  | 160  | 151  | 151  | 183  | 92   |     |   | 178  | 188  | 123  | 200  | 164       | 147  | 160       | 163  |
| 1000                   | 158  | 169  | 148  | 172  | 104  | 146  | 157  | 52   |     |   | 198  | 200  | 117  | 230  | 142       | 135  | 147       | 162  |
| 1100                   | 153  | 166  | 133  | 143  | 142  | 151  | 162  | 46   |     |   | 175  | 225  | 186  | 232  | 148       | 127  | 159       | 161  |
| 1200                   | 154  | 184  | 133  | 149  | 140  | 160  | 134  | 25   |     |   | 143  | 236  | 159  | 239  | 140       | 130  | 144       | 166  |
| 1300                   | 146  | 145  | 125  | 163  | 139  | 133  | 130  | 24   |     |   | 151  | 199  | 191  | 191  | 135       | 116  | 147       | 143  |
| 1400                   | 147  | 179  | 145  | 157  | 175  | 75   | 179  | 61   |     |   | 182  | 198  | 171  | 106  | 162       | 118  | 167       | 129  |
| 1500                   | 173  | 155  | 167  | 170  | 172  | 73   | 148  | 46   |     |   | 164  | 156  | 205  | 158  | 165       | 111  | 172       | 126  |
| 1600                   | 202  | 185  | 174  | 197  | 139  | 153  | 158  | 84   |     |   | 162  | 147  | 211  | 149  | 168       | 155  | 174       | 153  |
| 1700                   | 146  | 188  | 139  | 159  | 135  | 182  | 156  | 111  |     |   | 133  | 97   | 185  | 99   | 144       | 160  | 149       | 139  |
| 1800                   | 105  | 90   | 104  | 102  | 109  | 111  | 111  | 82   |     |   | 107  | 65   | 130  | 68   | 107       | 96   | 111       | 86   |
| 1900                   | 62   | 50   | 57   | 51   | 68   | 53   | 64   | 48   |     |   | 84   | 49   | 83   | 44   | 63        | 51   | 70        | 49   |
| 2000                   | 21   | 29   | 44   | 35   | 45   | 35   | 32   | 46   |     |   | 27   | 42   | 37   | 18   | 36        | 36   | 34        | 34   |
| 2100                   | 37   | 23   | 35   | 36   | 27   | 40   | 36   | 44   |     |   | 33   | 26   | 39   | 21   | 34        | 36   | 35        | 32   |
| 2200                   | 29   | 22   | 34   | 22   | 17   | 16   | 31   | 12   |     |   | 27   | 24   | 20   | 9    | 26        | 18   | 26        | 18   |
| 2300                   | 20   | 9    | 36   | 14   | 27   | 7    | 24   | 10   |     |   | 20   | 19   | 17   | 7    | 27        | 10   | 24        | 11   |
| Total                  | 2178 | 2254 | 2067 | 2208 | 2088 | 1955 | 2179 | 1308 |     |   | 2105 | 2302 | 2086 | 2126 | 2132      | 1936 | 2122      | 2028 |

|      |            | Peak Statistics |       |       |       |       |       |       |       |     |   |       |       |       |       |           |       |           |       |
|------|------------|-----------------|-------|-------|-------|-------|-------|-------|-------|-----|---|-------|-------|-------|-------|-----------|-------|-----------|-------|
|      |            | Mon             |       | Tue   |       | Wed   |       | Thu   |       | Fri |   | Sat   |       | Sun   |       | Mon - Fri |       | Mon - Sun |       |
|      |            | N               | S     | N     | S     | N     | S     | N     | S     | N   | S | N     | S     | N     | S     | N         | S     | N         | S     |
| AM   | 1/4 Hour   | 0800            | 1130  | 0800  | 1045  | 0815  | 1030  | 0815  | 0645  |     |   | 1045  | 1115  | 1130  | 1045  | 0815      | 0645  | 0815      | 1045  |
|      | 1/4 Hr Vol | 55              | 50    | 56    | 47    | 71    | 42    | 69    | 42    |     |   | 55    | 66    | 51    | 85    | 58        | 44    | 48        | 46    |
|      | 1/2 Hour   | 0745            | 0930  | 0745  | 1030  | 0800  | 1030  | 0800  | 0630  |     |   | 1030  | 1100  | 1130  | 1045  | 0800      | 0845  | 0815      | 1045  |
|      | 1/2 Hr Vol | 108             | 94    | 111   | 91    | 127   | 81    | 123   | 81    |     |   | 103   | 131   | 100   | 138   | 113       | 84    | 93        | 87    |
|      | 1 Hour     | 0745            | 0900  | 0745  | 1015  | 0745  | 1145  | 0745  | 0815  |     |   | 1000  | 1030  | 1100  | 1045  | 0745      | 0830  | 0800      | 1045  |
|      | 1 Hr Vol   | 207             | 184   | 209   | 173   | 226   | 164   | 213   | 160   |     |   | 198   | 229   | 186   | 264   | 214       | 158   | 178       | 169   |
|      | 1 Hr Fact  | .9409           | .9583 | .933  | .9202 | .7958 | .8913 | .7717 | .9756 |     |   | .9    | .8674 | .9118 | .7765 | .9224     | .9405 | .9368     | .9152 |
|      | 2 Hour     | 0745            | 0900  | 0730  | 0900  | 0715  | 1045  | 0745  | 0715  |     |   | 0930  | 1100  | 1145  | 1045  | 0745      | 0730  | 0800      | 1045  |
|      | 2 Hr Vol   | 384             | 353   | 375   | 332   | 390   | 315   | 396   | 291   |     |   | 380   | 461   | 364   | 491   | 382       | 291   | 337       | 330   |
|      |            |                 |       |       |       |       |       |       |       |     |   |       |       |       |       |           |       |           |       |
| PM   | 1/4 Hour   | 1600            | 1715  | 1630  | 1630  | 1445  | 1615  | 1445  | 1745  |     |   | 1400  | 1245  | 1600  | 1245  | 1445      | 1715  | 1445      | 1230  |
|      | 1/4 Hr Vol | 60              | 55    | 55    | 54    | 56    | 49    | 52    | 49    |     |   | 53    | 67    | 71    | 65    | 48        | 45    | 48        | 43    |
|      | 1/2 Hour   | 1600            | 1700  | 1630  | 1615  | 1445  | 1615  | 1430  | 1730  |     |   | 1430  | 1230  | 1545  | 1230  | 1600      | 1615  | 1545      | 1230  |
|      | 1/2 Hr Vol | 108             | 106   | 95    | 105   | 105   | 95    | 96    | 77    |     |   | 92    | 122   | 122   | 127   | 91        | 83    | 92        | 86    |
|      | 1 Hour     | 1515            | 1630  | 1545  | 1600  | 1445  | 1700  | 1400  | 1715  |     |   | 1400  | 1200  | 1515  | 1215  | 1530      | 1700  | 1530      | 1200  |
|      | 1 Hr Vol   | 209             | 204   | 182   | 197   | 185   | 182   | 179   | 130   |     |   | 182   | 236   | 222   | 245   | 179       | 160   | 182       | 166   |
|      | 1 Hr Fact  | .8708           | .9273 | .8273 | .912  | .8259 | .9479 | .8606 | .6633 |     |   | .8585 | .8606 | .7817 | .9423 | .9572     | .8939 | .9613     | .9651 |
|      | 2 Hour     | 1515            | 1530  | 1445  | 1530  | 1445  | 1615  | 1430  | 1715  |     |   | 1400  | 1200  | 1515  | 1200  | 1445      | 1600  | 1445      | 1200  |
|      | 2 Hr Vol   | 398             | 376   | 348   | 370   | 349   | 340   | 340   | 202   |     |   | 346   | 435   | 422   | 430   | 345       | 315   | 355       | 308   |
|      |            |                 |       |       |       |       |       |       |       |     |   |       |       |       |       |           |       |           |       |
| Peak | 12 Hour    | 0645            | 0615  | 0700  | 0630  | 0715  | 0615  | 0700  | 0615  |     |   | 0730  | 0600  | 0745  | 0645  | 0700      | 0615  | 0730      | 0630  |
|      | 12 Hr Vol  | 1897            | 1954  | 1790  | 1883  | 1777  | 1607  | 1862  | 953   |     |   | 1824  | 1989  | 1854  | 1913  | 1823      | 1595  | 1819      | 1712  |



## Report Sample

Years with this symbol cannot be adjusted to remove the effect of seasonal variation. The volumes reported are from samples taken over a short period and may not represent typical behaviour.

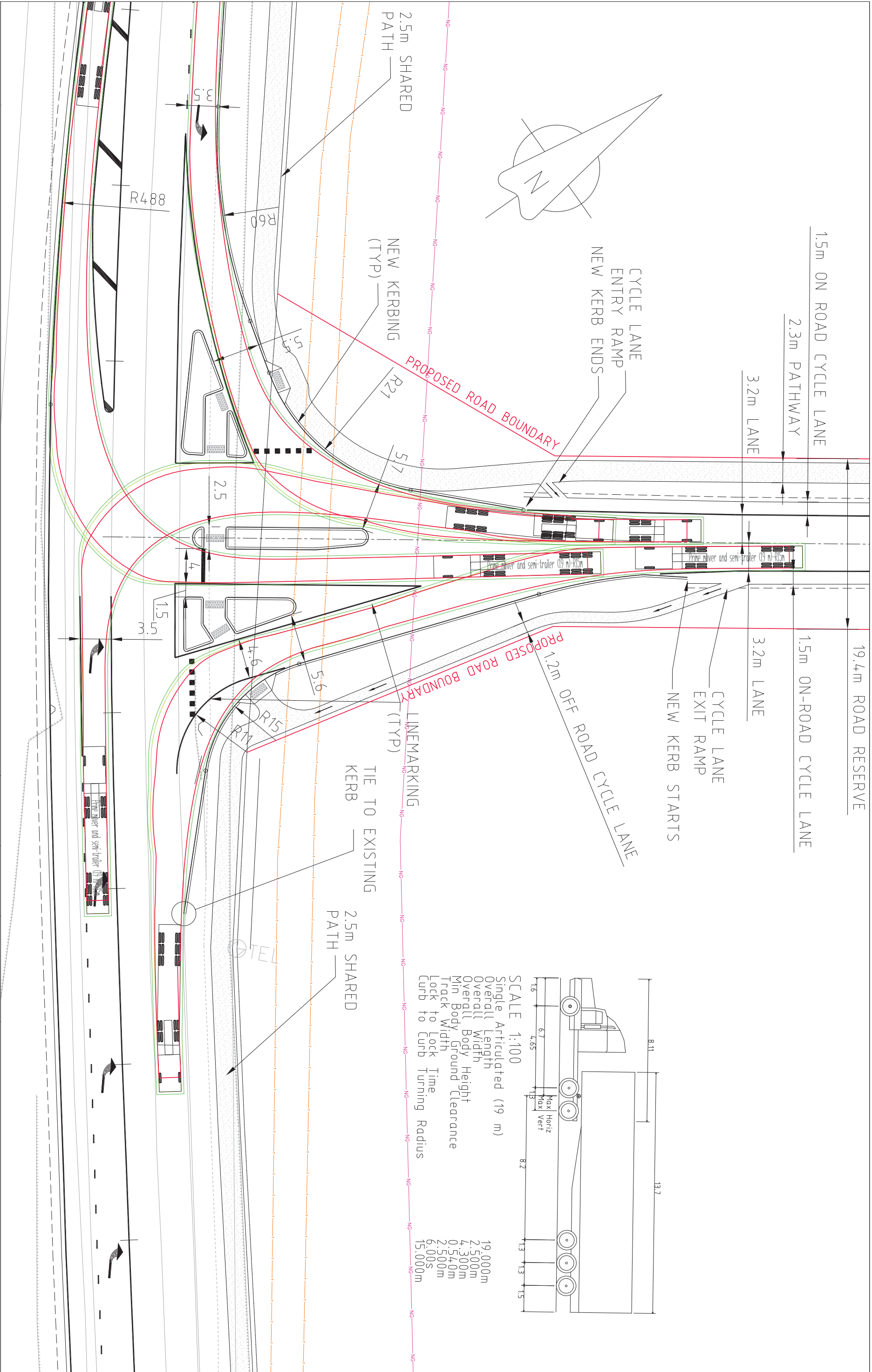
Network Performance Sites (NPS) provide continuous monitoring, 24 hours a day, 7 days a week.

Classification counts record the composition of the traffic and the percentage of heavy vehicles is shown on the report where a count of this type has been used.

The traffic volumes can be calculated to represent the average number of vehicles on a weekday (Monday to Friday, M-F) or daily (Monday to Sunday, M-S).

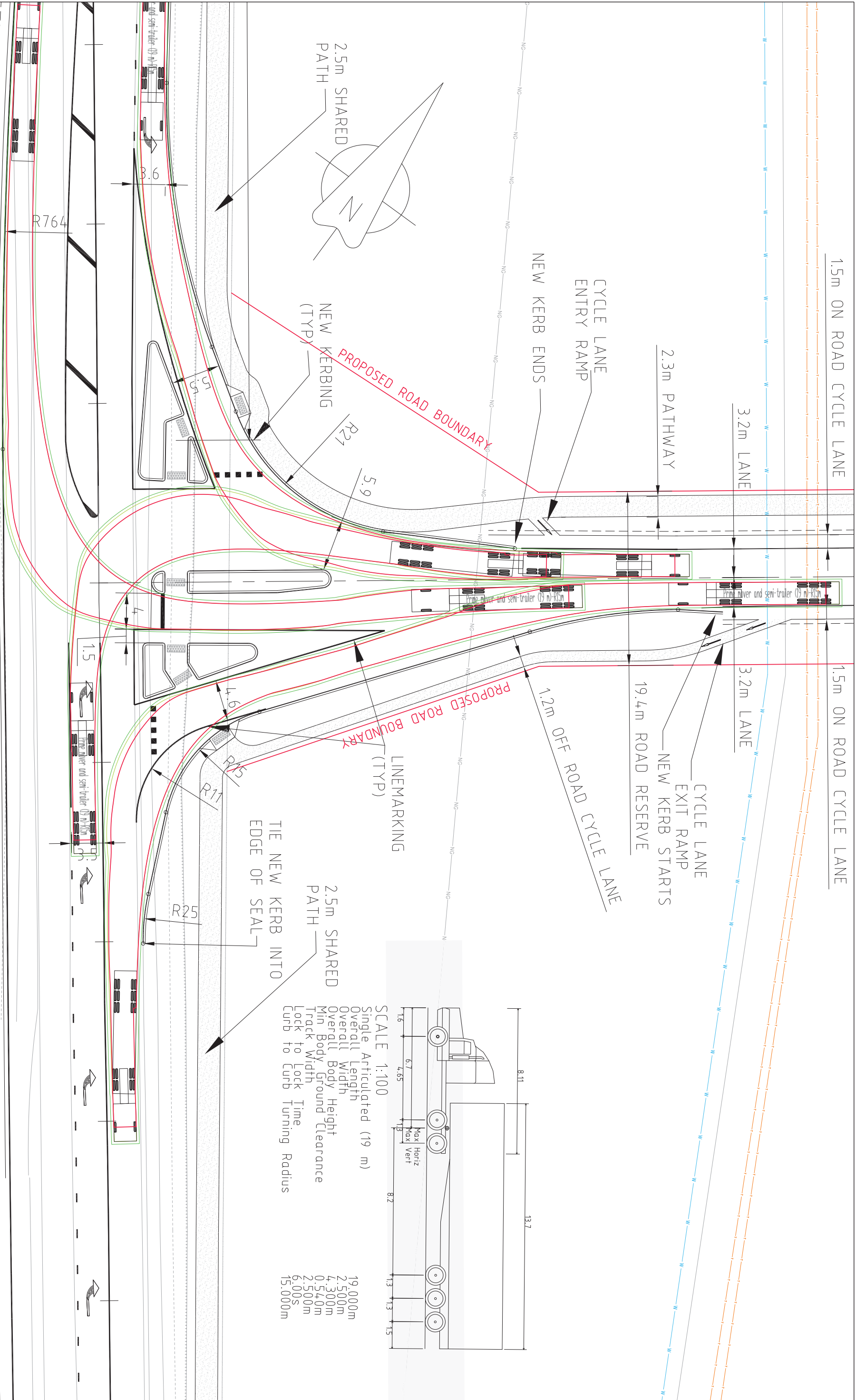
| Greater Geraldton                               |                               |         |         |         |         |         |         |      |                   |
|-------------------------------------------------|-------------------------------|---------|---------|---------|---------|---------|---------|------|-------------------|
| Road Name                                       | Location                      | 2003/04 | 2004/05 | 2005/06 | 2006/07 | 2007/08 | 2008/09 |      |                   |
| <b>A</b>                                        |                               |         |         |         |         |         |         |      |                   |
| Anderson St                                     | S of Webberton Rd             | 2 430   | 6.5     |         | 3 210   | 7.3     | 3 740   | 7.4  |                   |
| <b>B</b>                                        |                               |         |         |         |         |         |         |      |                   |
| Brand Hwy                                       | S of Devlin Pool Rd           | 2 200   | 15.3    |         | 2 180   | 21.6    | 2 610   | 18.0 | 3 280 15.1        |
|                                                 | S of Greenough River Rd       |         |         |         | 3 260   | 15.7    | 3 300   | 16.2 |                   |
|                                                 | S of Glendinning Rd           |         |         | 8 020   | 6.5     |         |         |      | 9 040 7.4         |
|                                                 | N of Glendinning Rd           |         |         | 5 380   | 8.4     |         |         |      |                   |
|                                                 | N of Olive St                 |         |         |         |         |         |         |      | 12 590 6.3        |
| Brand Hwy Off Ramp to North West Coastal Hwy NB | E of Brand Hwy                |         |         |         | 2 870   | 8.5     |         |      |                   |
| <b>C</b>                                        |                               |         |         |         |         |         |         |      |                   |
| Carnarvon Mullewa Rd                            | N of Nubbaroo Rd              | 260     | 490     |         |         |         |         |      |                   |
| Cathedral Av                                    | S of Maitland St              |         |         |         |         |         |         |      | 7 330 3.2         |
|                                                 | N of Shenton St               |         |         |         | 6 780   | 2.7     |         |      |                   |
| Chapman Valley Rd                               | E of North West Coastal Hwy   |         | 8 200   | 3.1     |         |         |         |      |                   |
| <b>D</b>                                        |                               |         |         |         |         |         |         |      |                   |
| Deepdale Rd                                     | S of Geraldton Mt Magnet Rd   |         |         |         | 380     | 39.5    |         |      |                   |
| <b>E</b>                                        |                               |         |         |         |         |         |         |      |                   |
| Edward Rd                                       | S of Davies Rd                |         |         |         |         |         |         |      | 5 070 16.7        |
|                                                 | N of Goulds Rd                |         |         |         | 2 630   | 18.4    | 2 090   | 19.8 |                   |
|                                                 | N of Rudds Gully Rd           |         |         |         | 230     | 32.2    |         |      |                   |
|                                                 | N of Boctenal Rd              |         |         |         |         |         | 1 200   | 18.9 | 1 250 25.1        |
|                                                 | N of Levett Rd                |         |         |         | 950     | 17.6    |         |      |                   |
| <b>F</b>                                        |                               |         |         |         |         |         |         |      |                   |
| Flores Rd                                       | N of Eastward Rd              |         |         |         |         |         |         |      | 4 670 12.2        |
| <b>G</b>                                        |                               |         |         |         |         |         |         |      |                   |
| Geraldton Mt Magnet Rd                          | E of Moonyoonooka Narngulu Rd |         |         |         | 1 190   | 19.7    | 1 340   | 26.3 | 1 870 28.4        |
|                                                 | E of Glengarry Rd             | 870     | 890     |         |         |         |         |      |                   |
|                                                 | E of Yanget Rd                | 650     | 33.5    |         | 630     | 30.2    | 590     | 30.2 | 610 29.0 720 34.5 |
|                                                 | W of Mingenew Mullewa Rd      |         |         |         | 480     | 30.8    |         |      | 580 37.9          |
|                                                 | W of Callaghan Rd             |         |         | 430     | 19.0    |         |         |      |                   |
|                                                 | W of Warren Rd                |         |         | 450     | 17.1    |         |         |      |                   |
|                                                 | E of Mullewa Wubin Rd         | NPS     | 220     | 210     |         | 270     | 47.8    |      | 410 52.0          |
| Glenview St                                     | N of Acacia St                |         |         |         |         |         |         |      | 4 250 3.5         |
| Goulds Rd                                       | N of Rudds Gully Rd           |         |         |         |         |         | 700     | 21.1 |                   |
|                                                 | S of Edward Rd                |         |         |         | 2 310   | 23.8    | 2 380   | 21.0 |                   |
| Grey St                                         | E of Jose St                  |         |         |         | 630     | 13.9    |         |      |                   |
| <b>H</b>                                        |                               |         |         |         |         |         |         |      |                   |
| Highbury St                                     | W of Cue Wy                   |         |         |         |         |         |         |      | 3 460 4.1         |
| Horwood Rd                                      | W of Flores Rd                |         |         |         |         |         |         |      | 8 370 11.9        |
| <b>J</b>                                        |                               |         |         |         |         |         |         |      |                   |
| Jenark Rd                                       | N of Baghdad Ct               |         |         |         | 2 200   | 11.0    |         |      |                   |
| John Willcock Link                              | W of Gregory St               |         |         |         |         |         |         |      | 2 680 20.7        |
| John Willcock Link EB off to Brand Hwy          | W of Cathedral Av             |         |         |         |         |         | 640     | 6.6  |                   |

## **APPENDIX D: SUPPORTING DWGS TO CONCEPT**

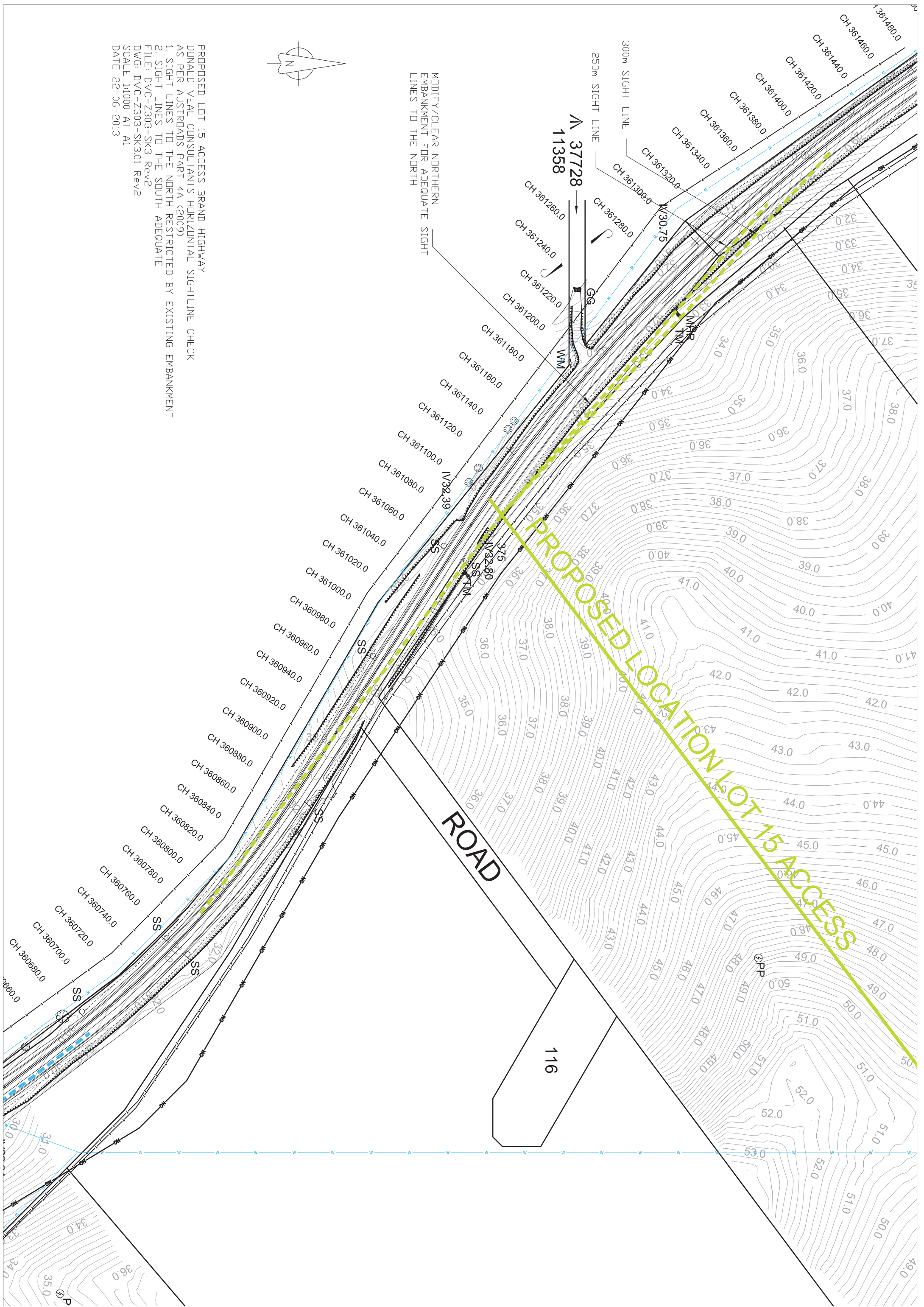


|                                                                                                                          |                                                  |                   |          |                |                          |
|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|-------------------|----------|----------------|--------------------------|
| Project                                                                                                                  | LOT 15 & 17 BRAND HIGHWAY, RUDDS GULLY           |                   |          |                |                          |
|                                                                                                                          | Designed                                         | GTT               | 16-08-14 | Surveyed       | HTD SURVEYORS & PLANNERS |
| Title                                                                                                                    | Drawn                                            | GTT               | 16-08-14 |                |                          |
|                                                                                                                          | Checked                                          | DNV               | 18-08-14 | Survey Date    | 24-04-13                 |
|                                                                                                                          | Approved                                         |                   |          | V Datum        | AHD                      |
| Client                                                                                                                   | Scale                                            | 1:200 AT A1       |          | H Datum        | GCG94                    |
|                                                                                                                          | OWNERS OF LOT 15 & 17 BRAND HIGHWAY, RUDDS GULLY |                   |          |                |                          |
| Donald Veal Consultants<br>6 Burgess Street<br>Midland WA 6056<br>Telephone +61 8 9274 7076<br>Facsimile +61 8 9274 4854 |                                                  |                   |          |                |                          |
|                                       |                                                  |                   |          |                |                          |
| Project Number                                                                                                           |                                                  | Drawing File Name |          | Drawing Number |                          |
| Z303                                                                                                                     |                                                  | DVC-Z303-1 Rev3   |          | DVC-Z303-1.2   |                          |
|                                                                                                                          |                                                  |                   |          | Revision       |                          |
|                                                                                                                          |                                                  |                   |          | 2              |                          |



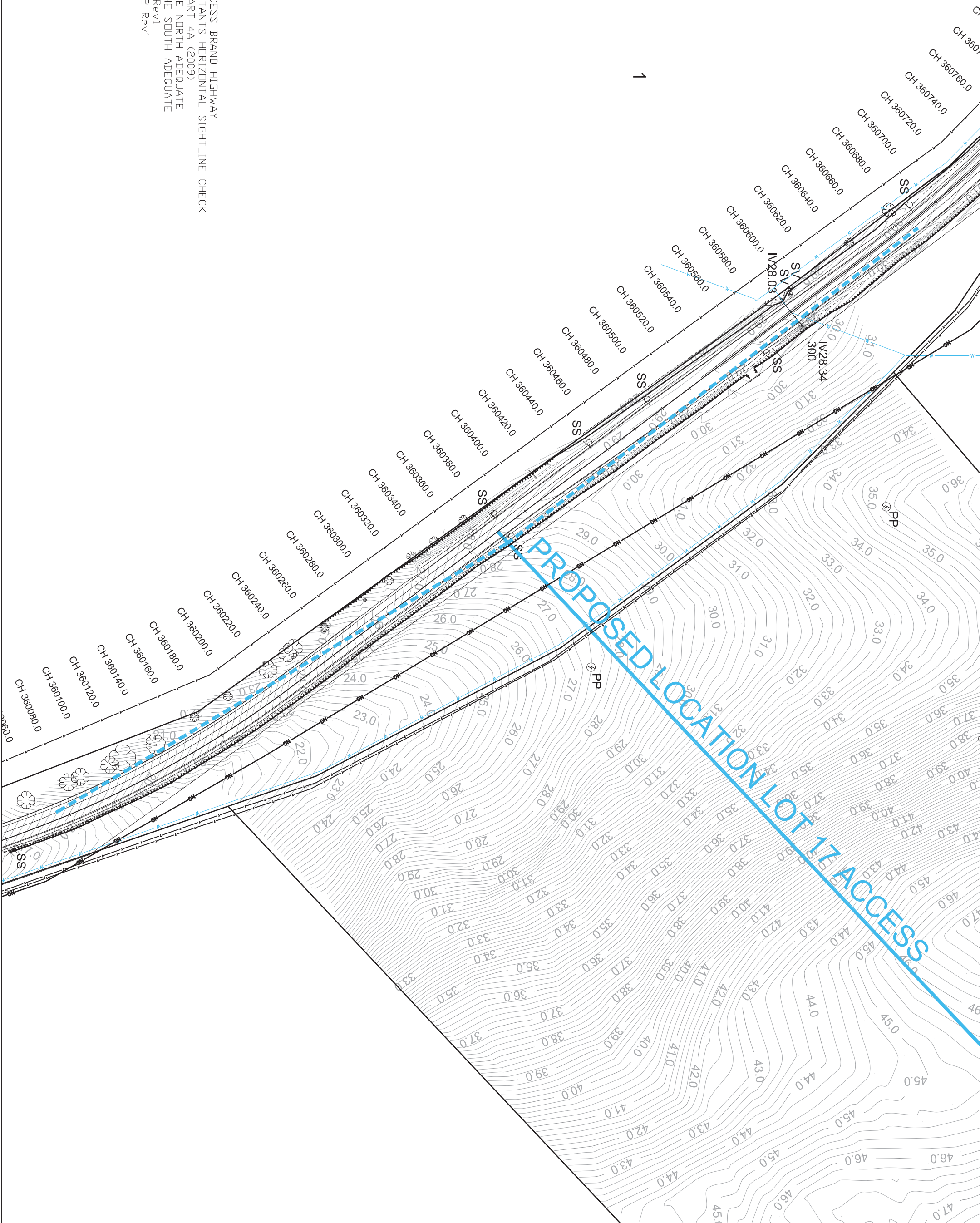
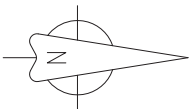


|         |                                                                                                  |  |  |  |          |     |             |                                         |                                                                                                                          |                                                                                     |                                      |                                |               |
|---------|--------------------------------------------------------------------------------------------------|--|--|--|----------|-----|-------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------|--------------------------------|---------------|
| Project | LOT 15 & 17 BRAND HIGHWAY, RUDDS GULLY                                                           |  |  |  | Designed | GTT | 16-08-14    | Surveyed<br>HTD SURVEYORS<br>& PLANNERS | Donald Veal Consultants<br>6 Burgess Street<br>Midland WA 6056<br>Telephone +61 8 9274 7076<br>Facsimile +61 8 9274 4854 |  |                                      |                                |               |
|         |                                                                                                  |  |  |  | Drawn    | GTT | 16-08-14    |                                         |                                                                                                                          |                                                                                     |                                      |                                |               |
|         | LOT 17 ACCESS CONCEPT LAYOUT WITH SWEPT PATH 19m SEMI (REVISED TO REFLECT CGG COMMENTS 26-05-14) |  |  |  | Checked  | DNV | 18-08-14    |                                         |                                                                                                                          |                                                                                     | Survey<br>Date                       | 24-04-13                       |               |
| Client  | OWNERS OF LOT 15 & 17 BRAND HIGHWAY, RUDDS GULLY                                                 |  |  |  | Approved |     | V Datum     |                                         | AHD                                                                                                                      | Project Number<br>Z303                                                              | Drawing File Name<br>DVC-Z303-2 Rev3 | Drawing Number<br>DVC-Z303-2.2 | Revision<br>3 |
|         |                                                                                                  |  |  |  |          |     |             |                                         |                                                                                                                          |                                                                                     |                                      |                                |               |
|         |                                                                                                  |  |  |  | Scale    |     | 1:200 AT A1 |                                         | H Datum                                                                                                                  |                                                                                     |                                      |                                |               |

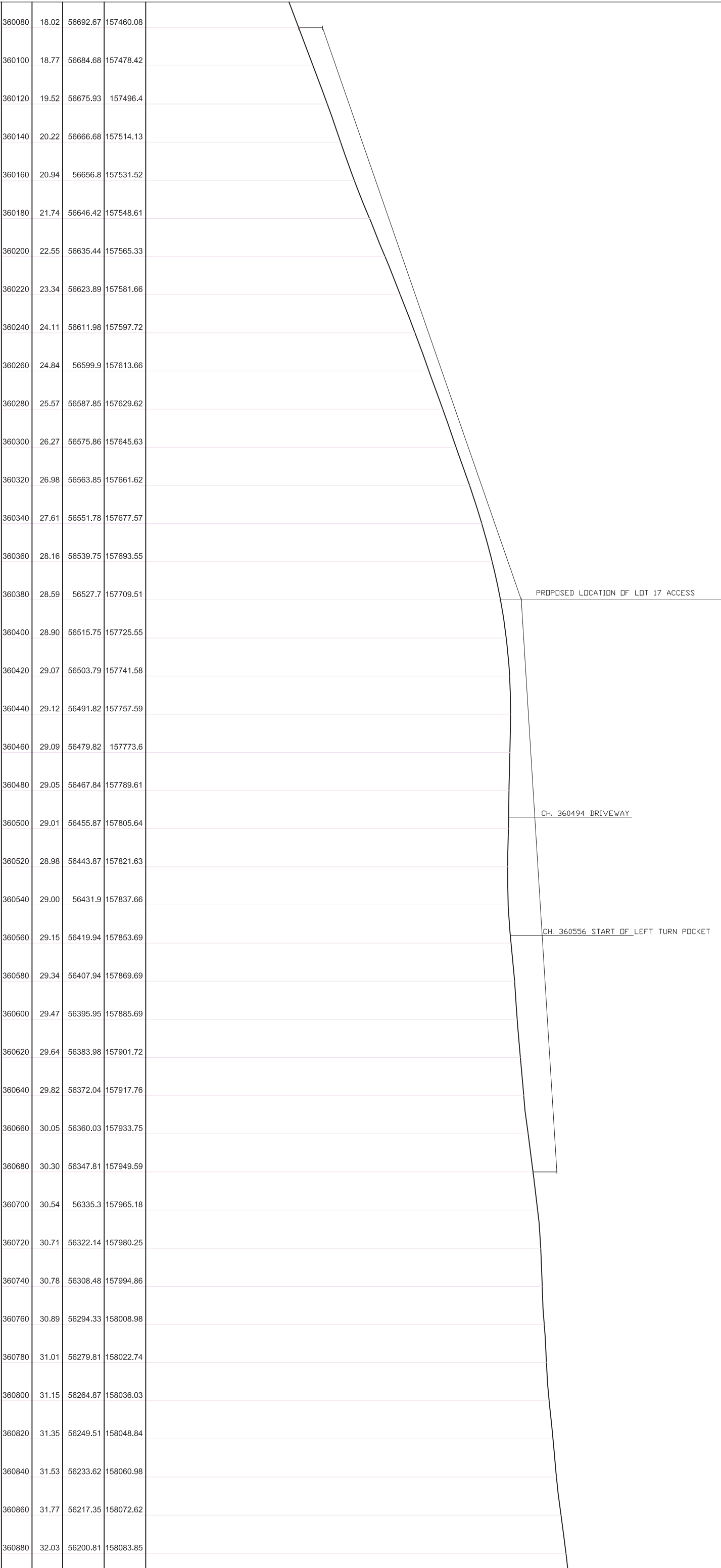


PROPOSED LOT 15 ACCESS BRAND HIGHWAY  
DONALD VEAL CONSULTANTS HORIZONTAL SIGHTLINE CHECK  
AS PER AUSTRALAS PART 4A (2009)  
1. SIGHT LINES TO THE NORTH RESTRICTED BY EXISTING EMBANKMENT  
2. SIGHT LINES TO THE SOUTH ADEQUATE  
FILE: DVC-Z303-SK3 Rev2  
DWG: DVC-Z303-SK3.01 Rev2  
SCALE 1:1000 AT A1  
DATE 22-06-2013

PROPOSED LOT 17 ACCESS BRAND HIGHWAY  
DONALD VEAL CONSULTANTS HORIZONTAL SIGHTLINE CHECK  
AS PER AUSTRADADS PART 4A (2009)  
1. SIGHT LINES TO THE NORTH ADEQUATE  
2. SIGHT LINES TO THE SOUTH ADEQUATE  
FILE: DVC-Z303-SK3 Rev1  
DWG: DVC-Z303-SK3.02 Rev1  
SCALE 1:1000 AT A1  
DATE 10-05-2013







PROPOSED LOT 117 ACCESS BRAND HIGHWAY  
DONALD VEAL CONSULTANTS VERTICAL SIGHTLINE CHECK  
AS PER AUSTRADADS PART 4A (2009)  
1. SIGHT LINES TO THE NORTH ADEQUATE  
2. SIGHT LINES TO THE SOUTH ADEQUATE  
FILE: DVC-Z303-SK4 Rev3  
DWG: DVC-Z303-SK4.02 Rev3  
DATE: 22-06-2013

0

01/06/13

ORIGINAL

DWG

REVISIONS

00

20

40

60

ALL DISTANCES ARE IN METRES

SUBMITTED BY:

SW/DF

DRAWN BY:

DWG

CHECKED BY:

DWG

APPROVED BY:

APRIL 2013

01/06/13

01/06/13

01/06/13

AREA FILE: 762

CONT. INTVAL

V DATUM: AHD

H DATUM: GCG84

FIELD BK:

**HILL, THOMPSON & DELFOS**  
SURVEYORS & PLANNERS  
PO Box 820, GERALDTON WA 6531  
PHONE: (08) 9921 3111 FAX: (08) 9921 8072

CLIENT:

AUSTRALIAN MINERAL INVESTORS Pty Ltd

BRAND HIGHWAY

ROAD CENTRELINE PROFILE SLK 359900 - 361675

BRAND HWY, RUDDS GULLY - CITY OF GREATER GERALDTON

SCALE 1 : 1000

ALL DISTANCES IN METRES

SIZE

A0

PRINT No.

17613PL1-2-0