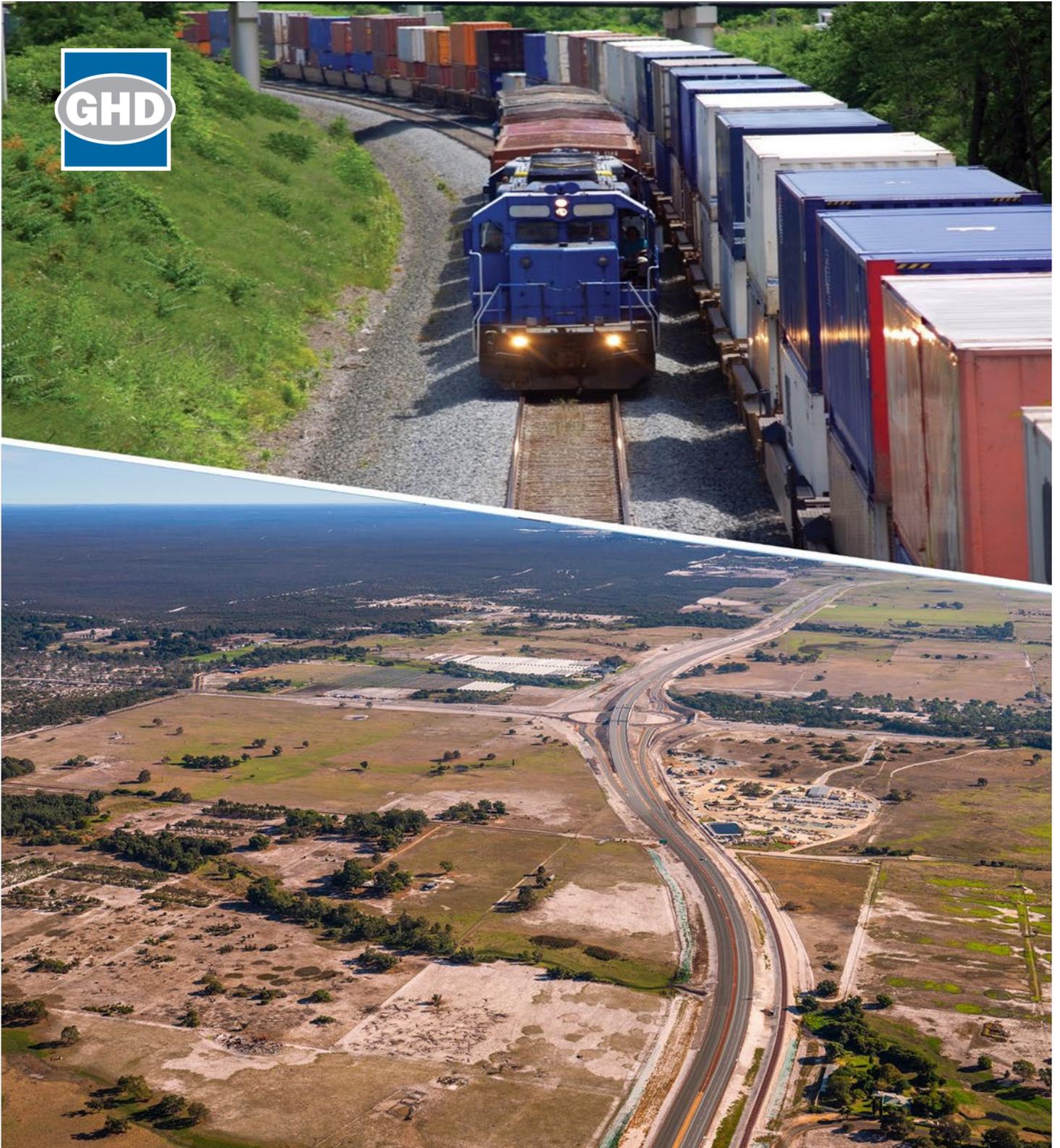


# Appendix E - Strategic Transport Strategy



**Department of Planning, Lands and Heritage**  
Bullsbrook Freight and Industrial Land Use Strategy  
Transport Strategy

October 2021

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Appendix A - RAV Network Configurations

# 1. Summary

## 1.1 Overview

The Western Australian Planning Commission's (WAPC) North-East Sub-regional Planning Framework (March 2018) has identified an area at Bullsbrook as a future strategic industrial precinct to serve Perth's north-east sub-region and to act as a freight hub for the north-east and north-west sub-regions (study area). The area will provide employment opportunities and significant freight efficiencies for goods and commodities passing through the northern part of the Perth metropolitan region.

In considering potential options for industrial development in this area, which is a relatively undeveloped "greenfields" location, there is considerable opportunity to strategically plan for new freight and industrial activity, and to identify and "future proof" the transport infrastructure that will be required for the successful operation of an industrial area.

The development of an industrial area at Bullsbrook is likely to serve as a major employment centre for Perth's rapidly growing north-east sub-region and will likely also attract workers from the north-west sub-region. It is also likely to serve as a logistical hub for consumer products bound for Perth's northern coastal sub-region. Accordingly, excellent transport links will be required within the study area and between Bullsbrook and a wide range of origins and destinations.

Provision of any additional road infrastructure that might make commuting from nearby areas more desirable will likely influence urban development and potentially accelerate vehicle trip generation through the study area. The potential for freight infrastructure to influence (and be impacted by) residential or other urban development should be considered by the planning process.

## 1.2 Intermodal terminal

Intermodal terminals (IMTs), which are also known as "inland ports" or "dry ports", aim to provide a more competitive container freight handling option (than direct road movements from the maritime port) to a specific hinterland<sup>1</sup>. Often, they also host co-located logistics functions (such as points where loads are consolidated or deconsolidated) to provide freight services to a diverse set of users<sup>2</sup>. IMTs invariably attract clusters of industrial and logistics land uses, particularly where surrounding land is low-cost and geographically suited to such uses. This further strengthens their desirability for strategic planners aiming to facilitate economic development in peri-urban regions.

An IMT is proposed adjacent to the west side of the Millendon–Narngulu freight railway, just north of Stock Road. The IMT will be a key facility serving the proposed Bullsbrook industrial area, as well as providing a transport hub for the distribution of commodities from Fremantle and Kwinana, and to concentrate commodities going to those ports.

The presence of an IMT within the study area provides an exceptional opportunity to rationalise freight transport within the Perth metropolitan region, especially by using rail to transport goods and commodities to and from the ports at Fremantle and Kwinana. This would assist in managing many of the externalities and issues associated with the movement of containerised freight through Perth, particularly as the Fremantle inner-harbour and its

---

<sup>1</sup> Roso, Woxenius and Lumsden. 2009. "The dry port concept: connecting container seaports with the hinterland." *Journal of Transport Geography*. <https://doi.org/10.1016/j.jtrangeo.2008.10.008>

<sup>2</sup> Rodrigue, Debrie, Fremont and Gouveral. 2010. "Functions and actors of inland ports: European and North American dynamics." *Journal of Transport Geography*, 18(4), 519-529.

major servicing roads approach their practical capacity limits. Perth's existing container movement routes pass through highly constrained residential areas, conflicting with increasing volumes of commuter and service vehicle traffic. This situation is highly undesirable for both industry and the broader public.

In establishing a new IMT, or inland port, it will be critical that the issues associated with existing freight corridors in Perth (such as close residential populations, poor design characteristics and co-location of freight and commuter traffic) are not repeated.

Ultimately, provision of an IMT at this location will support the government's desire to increase the use of rail rather than road as the preferred freight transport mode. This is supported by the *Westport Port and Environs Strategy Outcomes Report 2020* which identifies the Bullsbrook IMT in a ring of current and future IMTs located on the perimeter of the Perth metropolitan area that will provide critical supply chain linkages to the Fremantle and Kwinana ports.

### 1.3 Recommendations

This report details the transport matters associated with the industrial development at Bullsbrook, and forms part of the strategic planning for the area. It identifies major transport links within the study area (with the IMT at its hub), as well as external road and rail connections. Following on from recent commitments in the major road network within the north east corridor, this report assesses additional road network changes required to support the safe and efficient movement of people and freight to, from and within the study area.

The key recommendations of this report are included in Table 12 and summarised as follows:

- Ultimate construction and upgrade of Stock Road to dual carriageway. This should include grade separation of Stock Road over the railway line and a connection to Great Northern Highway (GNH).
- Create a new north-south spine road through the precinct by extending Sawpit Road northward to connect to Neaves Road. The road would pass by the western side of the proposed IMT and accommodate RAV 7 over size/over mass (OSOM) vehicles (north of Stock Road). This is because the Stock Road/Tonkin Highway interchange does not have sufficient clearance for over size vehicles to travel from Stock Road to the north.
- Realign Neaves-Rutland Roads with a bridge over the railway line so that they provide a direct connection between Tonkin Highway and GNH. The section between GNH and north-south spine road to be designed for RAV 7 and OSOM vehicles.
- Extension of Almeria Parade to the south to connect to the new Lot 300 industrial area.
- Undertake a comprehensive review of all railway level crossings in the study area (private, public, formal, and informal) to identify whether these should be retained, consolidated, closed or grade separated.

### 1.4 Limitations

*This report has been prepared by GHD for the Department of Planning, Lands and Heritage and may only be used and relied on by the Department of Planning, Lands and Heritage for the purpose agreed between GHD and the Department of Planning, Lands and Heritage as set out in this report.*

*GHD otherwise disclaims responsibility to any person other than the Department of Planning, Lands and Heritage arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.*

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

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

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

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

## 2. Introduction and background

### 2.1 Introduction

The Department of Planning, Lands and Heritage (DPLH), on behalf of the WAPC, has engaged GHD to prepare the Bullsbrook Freight and Industrial Land Use Planning Strategy (BFILUPS) for the area shown in Figure 2-1.

The North-East Sub-regional Planning Framework identified Bullsbrook as the location for a strategic industrial area that will provide an alternative to Kwinana for major industry, provide an employment hub for Perth's north-east and north-west corridors, and act as a freight hub for the northern parts of the metropolitan region.

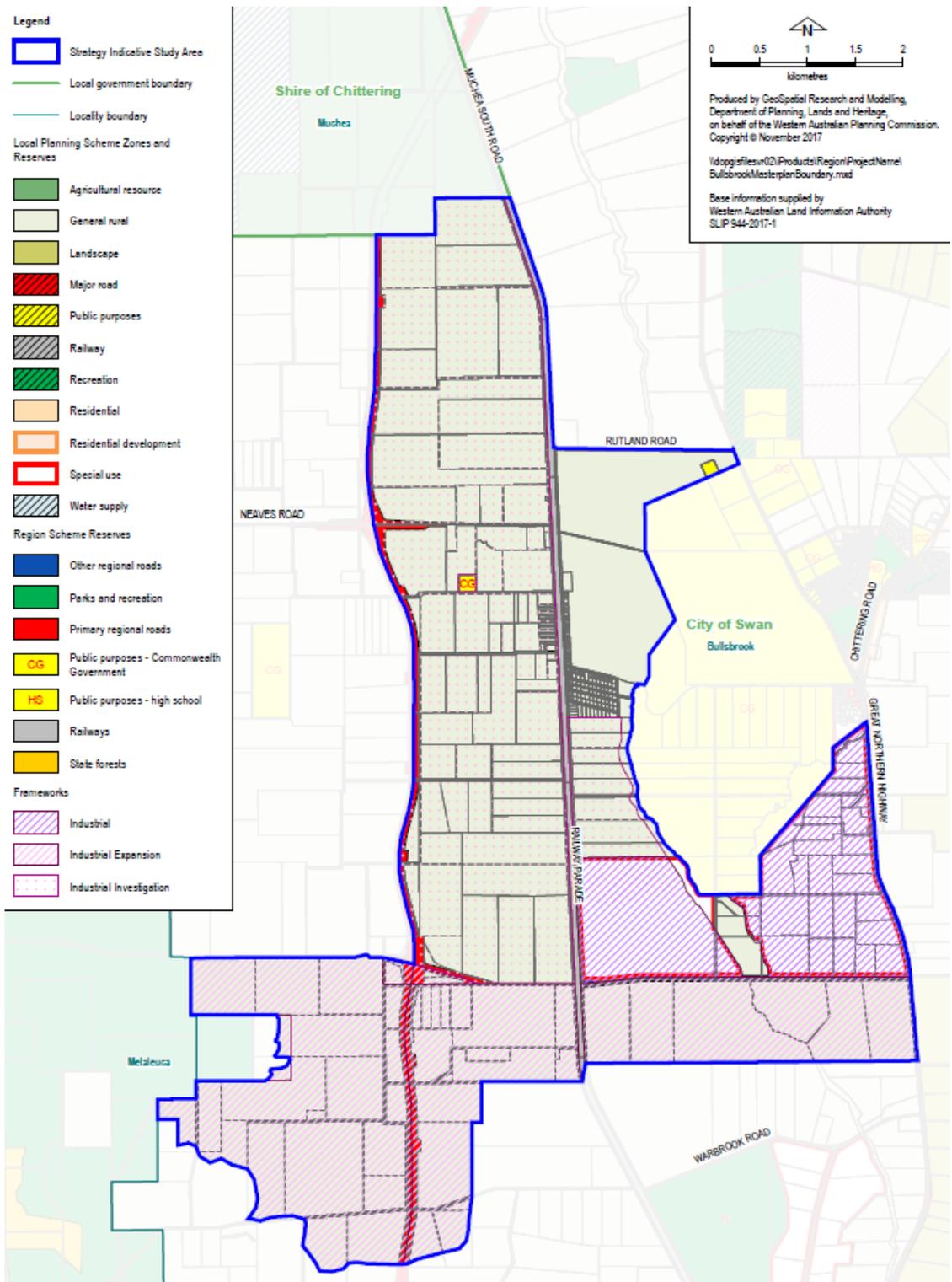
The Department of Transport's (DoT) *Transport @ 3.5 million* plan (2017) proposes the development of an IMT within the Bullsbrook industrial precinct by the time Perth's population reaches 3.5 million. The preferred location for the IMT site is shown in Figure 2-2.

The aim of the BFILUPS is to develop a high-level strategic plan for the Bullsbrook industrial precinct, which will inform future amendments to the Metropolitan Region Scheme (MRS) and the City of Swan local planning scheme. This will facilitate supply of industrial employment land and ensure that the necessary infrastructure requirements are appropriately considered.

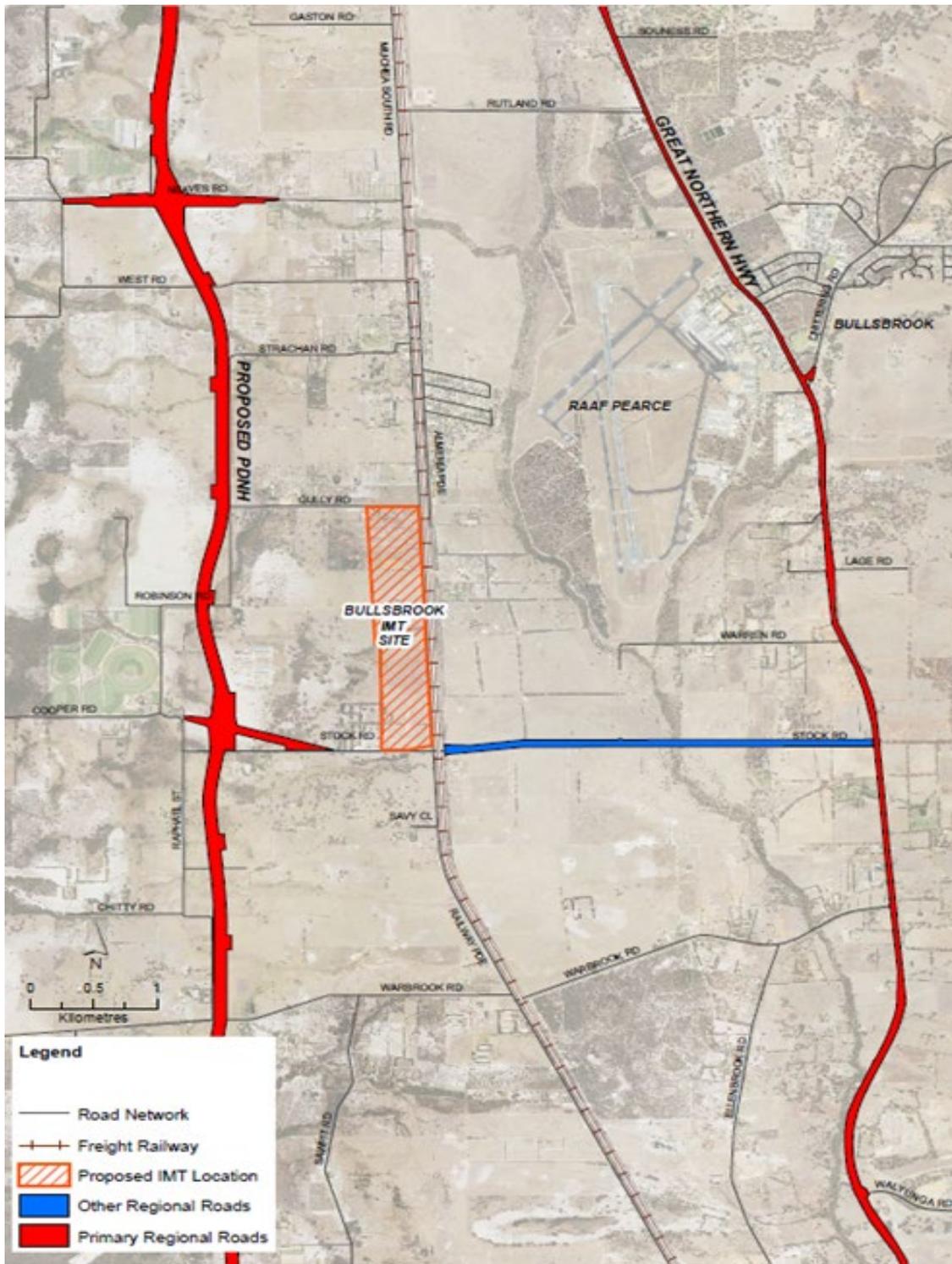
The extension of Tonkin Highway north to Muchea intersects the study area and is likely to catalyse additional investment in land along the corridor.

The proposed IMT will also interface with a number of existing and proposed industrial areas in Perth's north, including the proposed Ellenbrook North urban area, the proposed Muchea employment area, the expanding Wangara Industrial area and a number of emerging industrial areas located in the Neerabup/Pinjar area.

This report outlines the Transport Strategy to support the Land Use Planning Strategy.



**Figure 2-1 Indicative study area**



**Figure 2-2 Preferred location for the Bullsbrook IMT (DoT)**

## 2.2 Transport planning aims

The development of an industrial precinct at Bullsbrook, including an IMT, is consistent with several long-term strategic aims of the State Government, to:

1. Provide a road network that facilitates the safe and efficient movement of freight traffic to and from the Bullsbrook industrial precinct and IMT site, at local, regional, interstate, and international scales. The IMT is proposed to form a key point within international supply chains for containerised goods and a major location where

containerised loads will be broken down into smaller loads bound for individual destinations.

2. Protect major freight corridors from compromising sensitive land uses (particularly housing) and being compromised by those land uses.
3. Avoid, where possible, interaction and congestion associated with commuter movements reducing freight movement efficiency.
4. Reduce pressures on vulnerable parts of Perth's road network caused by logistics transport, particularly those that cannot easily be adapted to cater for freight transport demand.
5. Provide for social and economic opportunities, particularly for local employment and economic development (as per Perth Land Monitor).

It is critical that the implementation of these strategic aims matches the key commercial and operational requirements of industrial tenants and logistics operators to ensure the timely development of private investment in buildings, firms, and localised employment.

Freight and logistics firms often relocate to low-priced and large format land, particularly to escape operating restrictions, localised traffic congestion and conflicts with residential land uses. The establishment of an IMT within the Bullsbrook industrial precinct is likely to catalyse this change, though some initial development of low-cost land is likely now that the extension of Tonkin Highway<sup>3</sup> is complete (and where/when land use planning regulations permit).

Freight operators require the capacity to move goods on a 24/7 basis. As international freight movement has become more rapid and responsive to customer demand, the activities of logistics and distribution centres have increasingly become dependent on the timing of other supply chain activities. It is likely that future trends in freight movement and supply chain management strategies will influence the demands and activity that occurs within the study area, particularly the IMT.

## 2.3 Prior relevant transport planning studies

Several technical studies relevant to the study area and its surrounds have been previously undertaken. These have been reviewed as a major input to the structure planning process.

### **City of Swan Transport Strategy, September 2014<sup>4</sup>**

This report was prepared for the City of Swan and focuses on an integrated transport model including land-use decisions, parking, public transport, road, and pedestrian/cycling infrastructure. The report confirms freight connectivity along strategic corridors and within industrial precincts, Roe Highway, Great Eastern Highway Bypass, Toodyay Road, Great Northern Highway, Gngalara Road and Beechboro Road serving Hazelmere, Bellevue, South Guildford, and Malaga industrial areas.

Future road freight is primarily expected to follow the major highways within the City of Swan, with the most noticeable change being the construction of the Tonkin Highway extension. Tonkin Highway will see a sizeable volume of freight vehicle use in preference to Great Northern Highway (GNH), although some freight vehicles are likely to remain on GNH as this is the only major regional north-south freight route that allows for "high and wide" freight vehicles (i.e., up to 10 metres high and 10 metres wide).

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<sup>3</sup> The extension of Tonkin Highway from Reid Highway to Muchea has been variously referred to as "Perth Darwin National Highway", "PDNH", "NorthLink" and "Swan Valley Bypass".

<sup>4</sup> <https://www.swan.wa.gov.au/Your-Council/About-us/Projects-initiatives/Our-plans-strategies/Transport-Strategy>

The report notes that changes to Neaves/Rutland Roads may require duplication works and realignment of the eastern portion (east of Railway Parade) to provide better connectivity with GNH (Figure 2-3). While the pre-eminence of Tonkin Highway may serve to reduce traffic along this section of Neaves Road in the longer term, the overall function and usage of the eastern portion of Neaves Road will be greatly affected by the decision and timing of any realignment.

Main Roads WA has indicated that Neaves Road west of Tonkin Highway has the possibility of becoming a Primary Regional Road in the future.



**Figure 2-3: Neaves/Rutland Roads (in yellow) definition (City of Swan Transport Strategy)**

The report further notes that Stock Road will ultimately form a major link between the PDNH and GNH, in addition to being the primary access to the South Bullsbrook Industrial Estate (Northern Gateway) and the Bullsbrook residential development. This additional traffic is likely to necessitate an upgrade of the GNH/Stock Road intersection, as well as grade separation of the existing Stock Road rail crossing.

The report makes the following recommendations in relation to Bullsbrook:

- Investigate timing of Stock Road intersection treatments as a result of regional road upgrades and development.
- Undertake rail crossing upgrade study for the Stock Road rail crossing.

## **Bullsbrook Intermodal Terminal Planning Report 2016**

In October 2016, a planning report was prepared for DoT for the proposed Bullsbrook IMT<sup>5</sup>. The report provides information to support a MRS amendment to reserve land for the IMT on the west side of the railway (north of Stock Road). It also includes a preliminary design concept plan showing a future layout of the IMT, along with possible road and rail connections.

The report identifies that, in addition to the proposed IMT, the Bullsbrook corridor is likely to host significant industrial and logistical land uses, which will benefit from access to the IMT, as well as the PDNH.

Prior reports focusing on the Bullsbrook IMT were summarised in the *Planning Report*, and are listed below:

- Worley Parsons (2012), South Bullsbrook/North Ellenbrook Intermodal Terminal – Site Options and Servicing Requirements Assessment
- Neil Matthews Consulting (2014), Metropolitan Intermodal Network Development Assessment
- Laurie Piggott Consulting (2014), Bullsbrook IMT Preliminary Design Advice
- Department of Transport (2015), South Bullsbrook Intermodal Terminal site Investigation Report
- Beyond Rail Solutions (2015), Proposed IMT at Bullsbrook – Location Assessment

## **Metropolitan Region Scheme Amendments 1323/41, 1324/41, 1325/41 Amendments in the Bullsbrook Urban Precinct (South, Central, North) Amendment Report WAPC (March 2018)<sup>6</sup>**

This report, prepared by the WAPC, details the proposed amendments to facilitate planning for the Bullsbrook area. It includes the following commentary regarding regional roads in the locality:

*“Main Roads WA acknowledges that the Perth-Darwin National Highway will attract and divert some freight traffic away from Great Northern Highway. However, Great Northern Highway will remain a major freight route and distributor road from these precincts. It is likely that Great Northern Highway will need to be upgraded through the Bullsbrook area in order to cater for the proposed increased traffic volumes. Future planning work for this has not yet commenced. Access to the Perth-Darwin National Highway will be via Stock Road to the south or via Rutland Road to Neaves Road to the north. These roads will need to be upgraded to highway standard or possibly four lane dual carriageways”.*

This report raises the connection of Stock Road to the Tonkin Highway extension (Perth Darwin National Highway) as an important element of structure planning. The report sets out that prior to the rezoning of the land, confirmation is required on the upgrading requirements to support the proposed scale of development.

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<sup>5</sup> GHD (2016), *Bullsbrook Intermodal Terminal Planning Report*

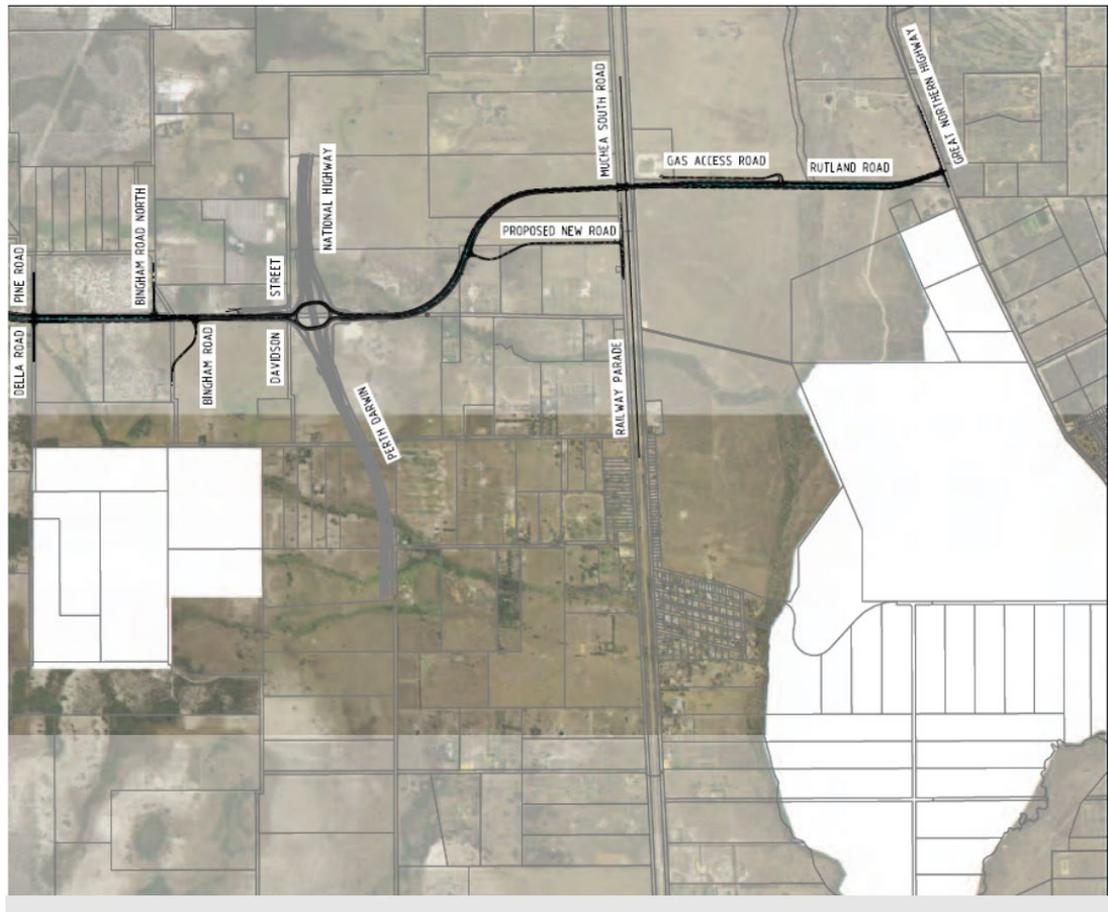
<sup>6</sup> Available at:

[https://www.planning.wa.gov.au/dop\\_pub\\_pdf/Amendments\\_in\\_the\\_Bullsbrook\\_Urban\\_Precinct\\_South\\_Central\\_North.pdf](https://www.planning.wa.gov.au/dop_pub_pdf/Amendments_in_the_Bullsbrook_Urban_Precinct_South_Central_North.pdf)

## Neaves/Rutland Roads

In 2016, DPLH commissioned the Neaves Rutland Other Regional Road Study to develop a regional road reserve from GNH to the boundary of the City of Swan, generally following the existing Neaves Road and Rutland Road reserves<sup>7</sup>. A reference group consisting of key government and corporate stakeholders was convened to guide the study process.

A proposed connection of Neaves Road with Rutland Road and GNH, with a connection to Railway Parade was developed through the study, as shown in Figure 2-4<sup>8</sup>.



**Figure 2-4 Proposed Neaves/Rutland road connection/realignment (DPLH)**

<sup>7</sup> Worley Parsons (2016), *Neaves Rutland Other Regional Road Study – Final Planning Report*

<sup>8</sup> Note this figure does not include the proposed north-south spine road.

## 3. Existing planning framework

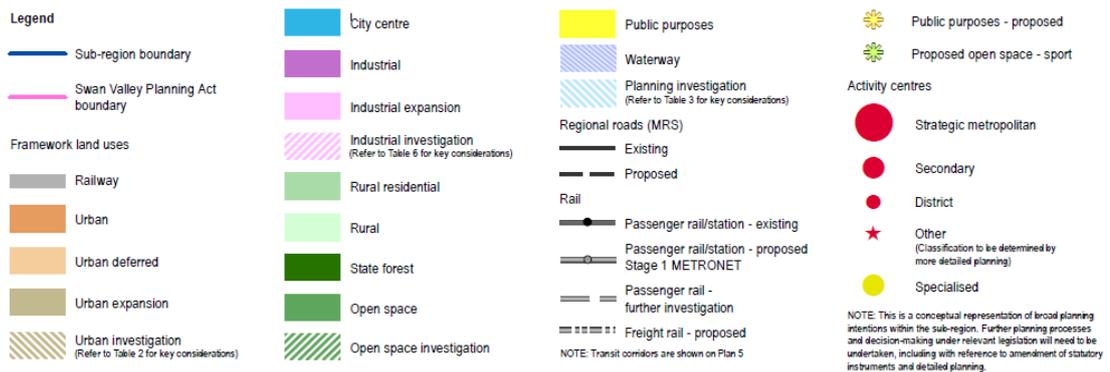
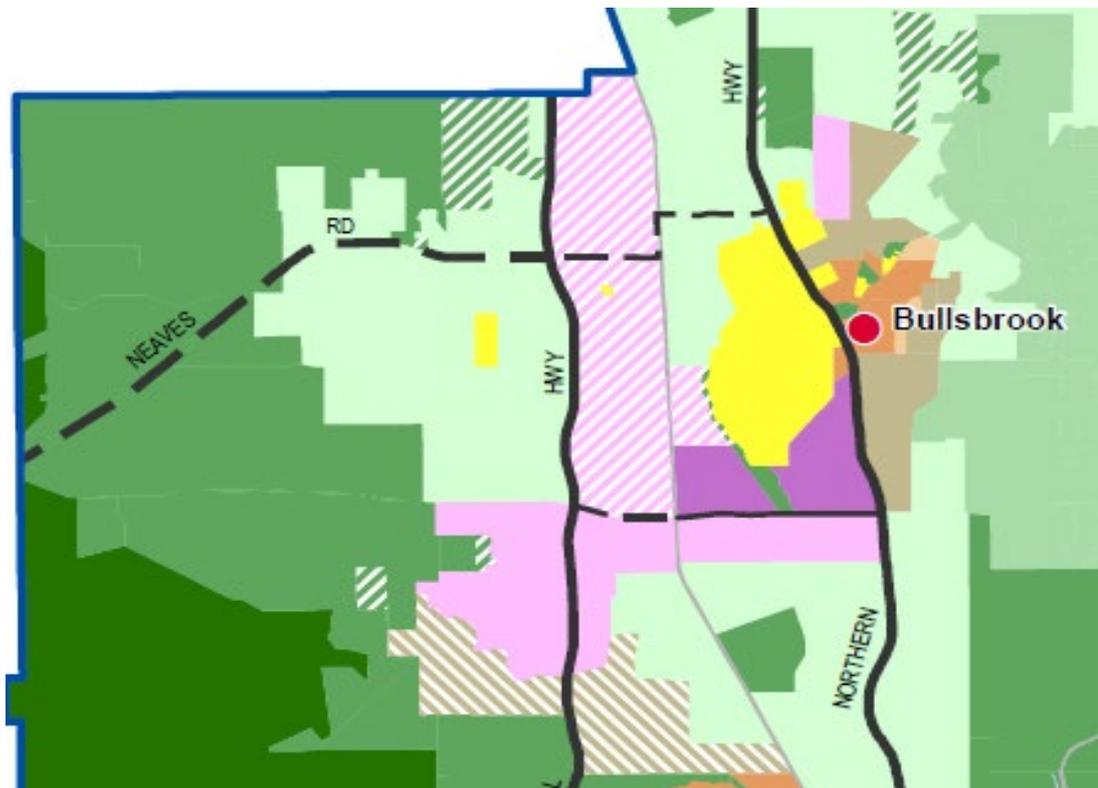
### 3.1 North-East Sub-regional Planning Framework

The North-East Sub-regional Planning Framework<sup>9</sup> (NESRPF) comprises the City of Swan and the Shires of Mundaring and Kalamunda, covering an area of 2,010 square kilometres. It aims to establish a long-term integrated planning framework to guide future growth across the sub-region. This includes consideration of where future residential and employment areas will be located; what community and social infrastructure will be required; integrated use of existing infrastructure; protection of important environmental assets and critical services; and staging and sequencing of future development.

The NESRPF recognises the need for an intermodal freight terminal at South Bullsbrook and identifies land surrounding the terminal as 'Industrial', 'Industrial Investigation' and 'Industrial Expansion', as shown in Figure 3-1.

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<sup>9</sup> Department of Planning, Lands and Heritage, March 2018



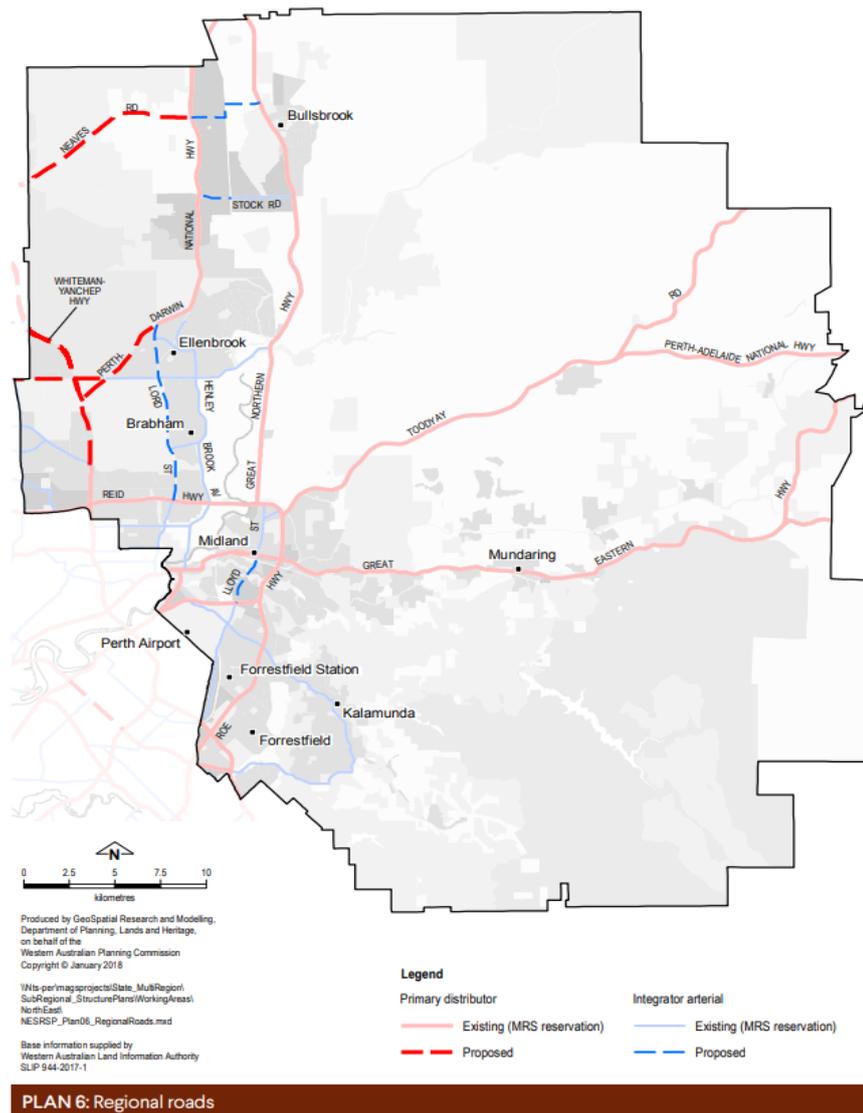
**Figure 3-1 NESRPF (Plan 1)**

The NESRPF includes identification of new and upgraded primary distributor and integrator arterial roads within the study area as described below and shown in Figure 3-2.

**Perth Darwin National Highway** - A new Primary Distributor connecting Tonkin Highway with GNH at Muchea to improve freight transport and general traffic capacity through the northern part of the sub region diverting some traffic from GNH, West Swan Road and Lord Street.

**Neaves Road** – An important east-west link that connects the North-West sub region to the North-East sub-region. It provides access to PDNH, the Bullsbrook employment node, the planned Bullsbrook IMT, and the Muchea Industrial Park.

network in this area and the potential impacts on the Gngangara Priority 1 Water Protection Area, adjacent bushland, and other environmental attributes.



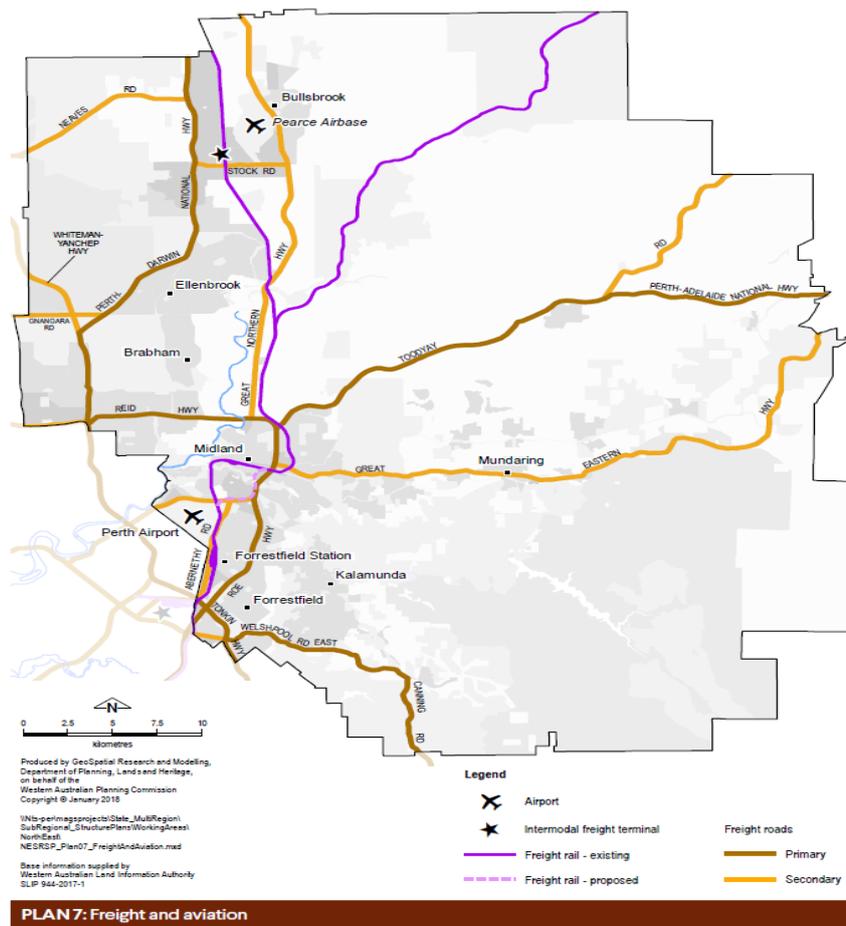
**Figure 3-2 2050 North east region regional roads (NESRPF March 2018)**

### 3.1.1 Freight

The NESRPF forecasts the volume of freight movement on the regional road and rail networks to increase substantially by 2050. This increase will be centred on interstate road and rail routes, particularly those servicing port facilities and connecting with intermodal terminals located at Kewdale, Hope Valley/Wattleup (Latitude 32), Bullsbrook and Mundijong. Overall, the proportion of freight on rail is expected to increase<sup>10</sup>.

Figure 3-3 shows the 2050 freight network as reflected in the NESRPF. Tonkin Highway/PDNH is identified as the primary freight route north-east of Perth, with GNH becoming a secondary route. Stock Road is required to connect the two with Neaves Road providing the connector to other routes to the west.

<sup>10</sup> See BITRE 2009, p. 9 ([https://bitre.gov.au/publications/2009/files/is\\_034.pdf](https://bitre.gov.au/publications/2009/files/is_034.pdf)) and Freight @ 3.5 Million, DoT 2015



**Figure 3-3 2050 North east region freight network (NESRPF March 2018)**

The proposed Bullsbrook IMT will have an important role in the freight network having rail connections to Fremantle Port and the proposed Kwinana Outer Harbour, as well as to regions north of Perth. Rail and road access to the potential IMT requires detailed planning and protection from encroachment by incompatible development and is an important consideration when identifying locations for infill housing development. State Planning Policy 5.4 provides clear guidance on mitigating conflicts between sensitive land uses and freight transport corridors. Similarly, the design, construction, upgrade, and operation of the infrastructure within these corridors should seek to minimise impacts on surrounding land uses.

### 3.2 South Bullsbrook Industrial Precinct Local Structure Plan No 1 (WAPC) January 2015

This document identifies the following:

- Warren Road is subject to a 5-metre road widening on the south side.
- Direct access to Stock Road and GNH is not permitted without prior approval of Main Roads WA and/or the WAPC.

- Traffic signals are proposed at the Stock Road/GNH intersection<sup>11</sup>.
- Left in/out is proposed at the Warren Road/GNH junction.

### **3.3 South Bullsbrook Local Structure Plan No 2 (WAPC) February 2016**

This document identifies the following:

- Stock Road is classified as an Other Regional Road and is subject to a 20-metre road widening to the north of the existing reserve, to be ceded at subdivision stage.
- Direct lot access to Stock Road is not permitted without the prior approval of Main Roads WA and/or the WAPC.
- The existing intersection of Almeria Parade and Stock Road is to be formally closed at the time of subdivision of the land adjacent.

### **3.4 Bullsbrook Freight and Industrial Land Use Planning Strategy**

The proposed Strategy Plan for the Bullsbrook Freight and Industrial Area is shown in Figure 3-4.

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<sup>11</sup> This is not the current planning for Stock Road/GNH - a roundabout is recommended for the intersection.



## 4. Existing transport network

### 4.1 Active transport

The primary road routes within the study area do not contain any adjacent walking or cycling paths, however the road reserves are all wide enough for them to be installed. Almost all roads in the area are sealed two-lane carriageways with marginal or no sealed shoulders.

The only existing active transport infrastructure within the study area is limited to a small section of footpath on Almeria Parade adjacent the residential area east of the railway.

The Bullsbrook townsite has a reasonable path network within and surrounding it, however the City of Swan considers Bullsbrook as a separate townsite, which is too far to be connected to other urban locations to the south via active transport infrastructure. Accordingly, the City of Swan's Transport Strategy (2014)<sup>12</sup> does not propose any active transport infrastructure for the area. In addition, there are no plans to provide east-west path connections to the PSP on the eastern side of Tonkin Highway.

Surveys/counts have not been undertaken; however, it is likely that walking and cycling volumes outside Bullsbrook and the small town site (approximately 360 people in 140 dwellings) near Turner Road would be low, owing to long distances and absence of suitable infrastructure.

### 4.2 Public transport

The Strategy area is served by one Transperth bus service (Route 311), shown in Figure 4-1.

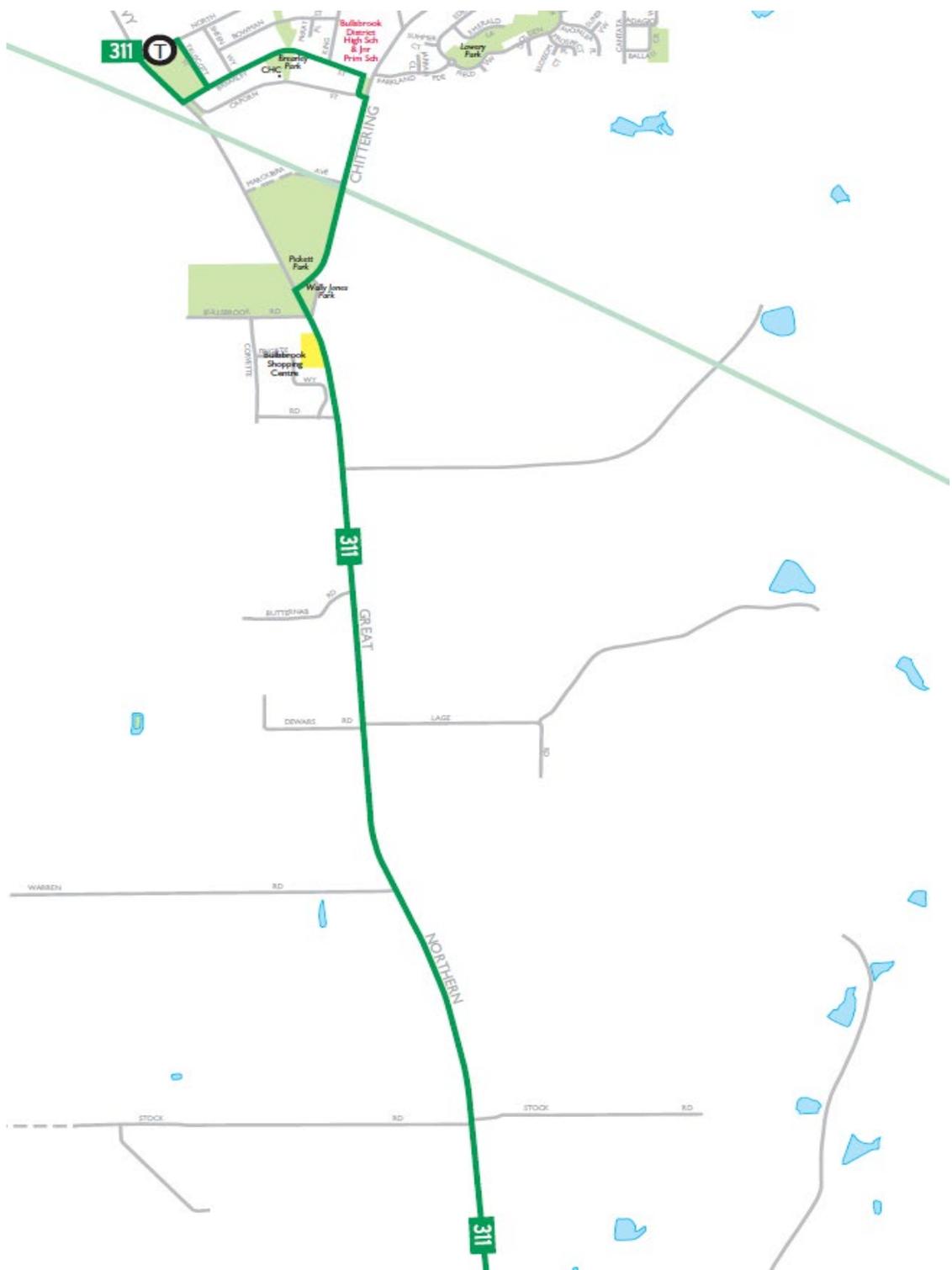
The route operates between Bullsbrook and Midland Station, with three services between 7.00 am and 8.00 am on weekdays. The return journey in the afternoon peak from Midland Station to Bullsbrook has only one service (which departs Midland Station at 5.49 pm). This bus service is not directly connected to other major activity centres.

Previously, between approximately 1993 and 2015, this route extended beyond Bullsbrook to also service the Muchea town site<sup>13</sup>.

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<sup>12</sup> <https://www.swan.wa.gov.au/Your-Council/About-us/Projects-initiatives/Our-plans-strategies/Transport-Strategy>

<sup>13</sup> The Advocate. 2015. Bus Service Changes. <https://www.pressreader.com/australia/the-advocate-perth/20150304/281496454744066>



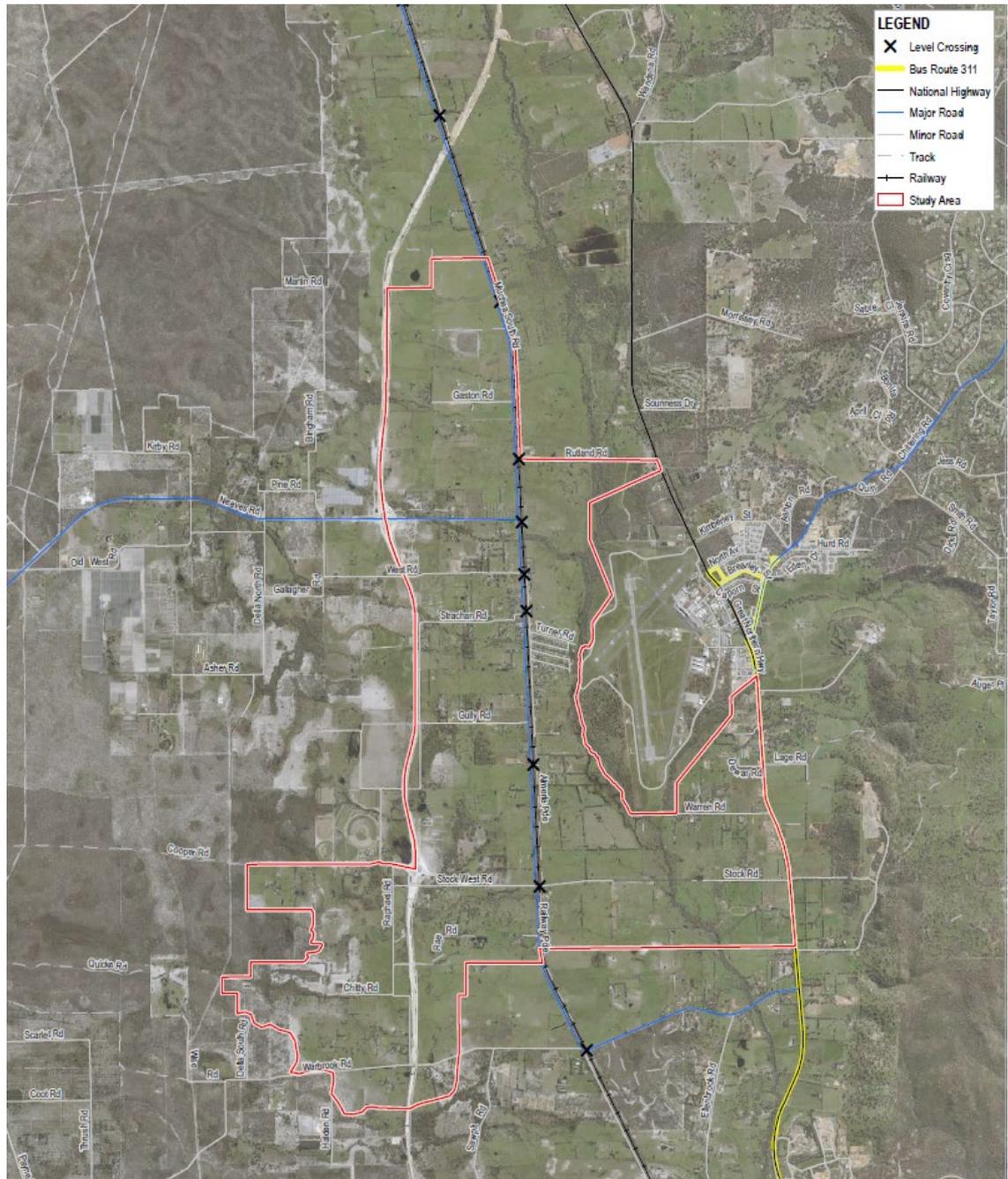
**Figure 4-1 Existing bus service - Route 311 (Transperth)**

### 4.3 Rail

The Millendon Junction – Narngulu narrow gauge railway runs through the centre of the study area and is the sole rail link (Figure 4-2). The line is used for freight purposes only, i.e. no passenger rail services.

## 4.4 Roads

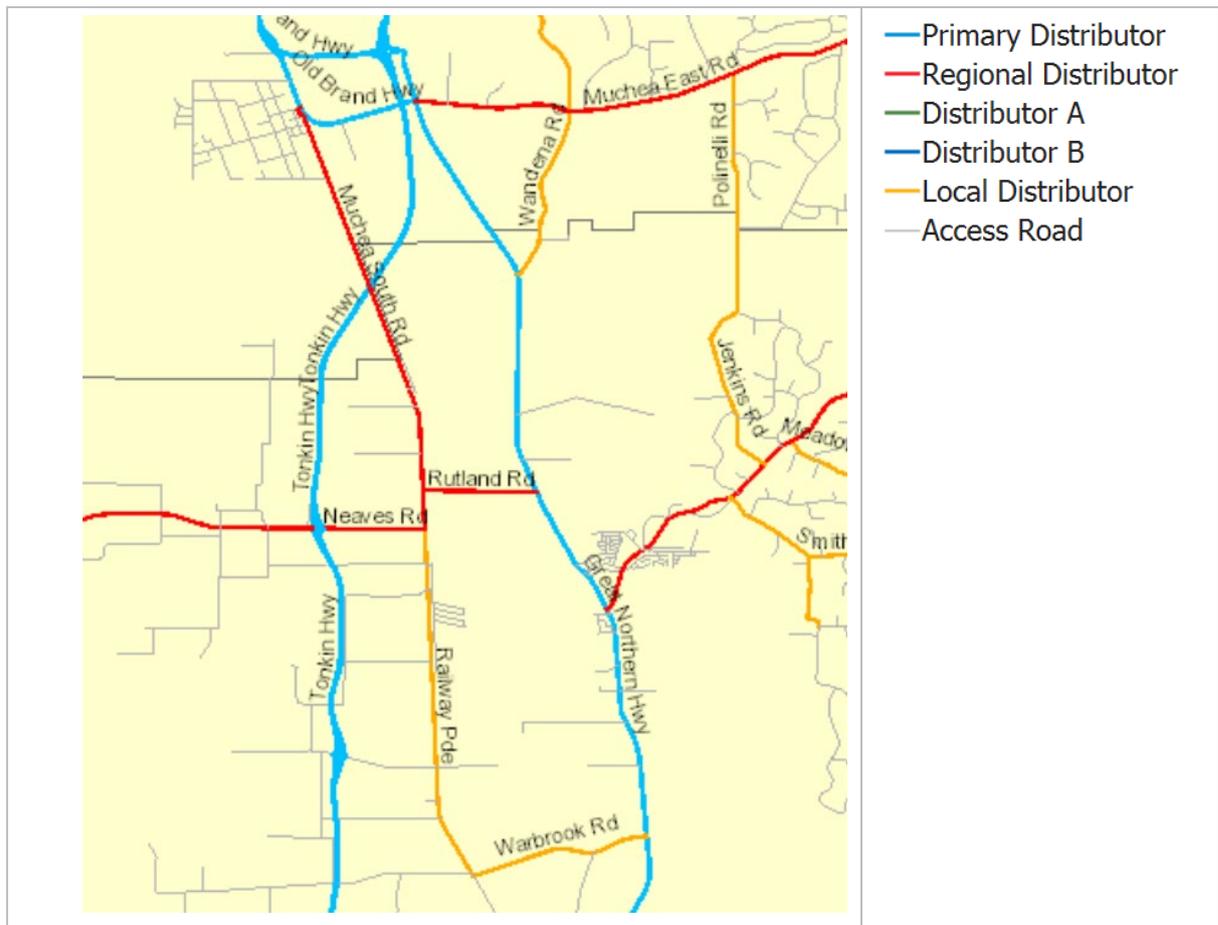
Given the predominantly rural nature of existing land use within the study area, the road network is sparse with few major routes passing by or through it (Figure 4-2). Tonkin Highway and GNH are the primary north-south roads within proximity of the Strategy area. Railway Parade, transecting the Strategy area, is a secondary north-south road. Secondary east-west routes include Warbrook Road in the south and Neaves and Rutland Roads in the north, however none of the connections provide a direct connection across the railway.



**Figure 4-2 Existing transport network**

#### 4.4.1 Road hierarchy

Figure 4-3 shows the existing road classification/hierarchy within and surrounding the study area.



**Figure 4-3 Road hierarchy within & surrounding the study area (MRWA)**

Table 1 shows the classification and controlling authority of roads within and surrounding the study area.

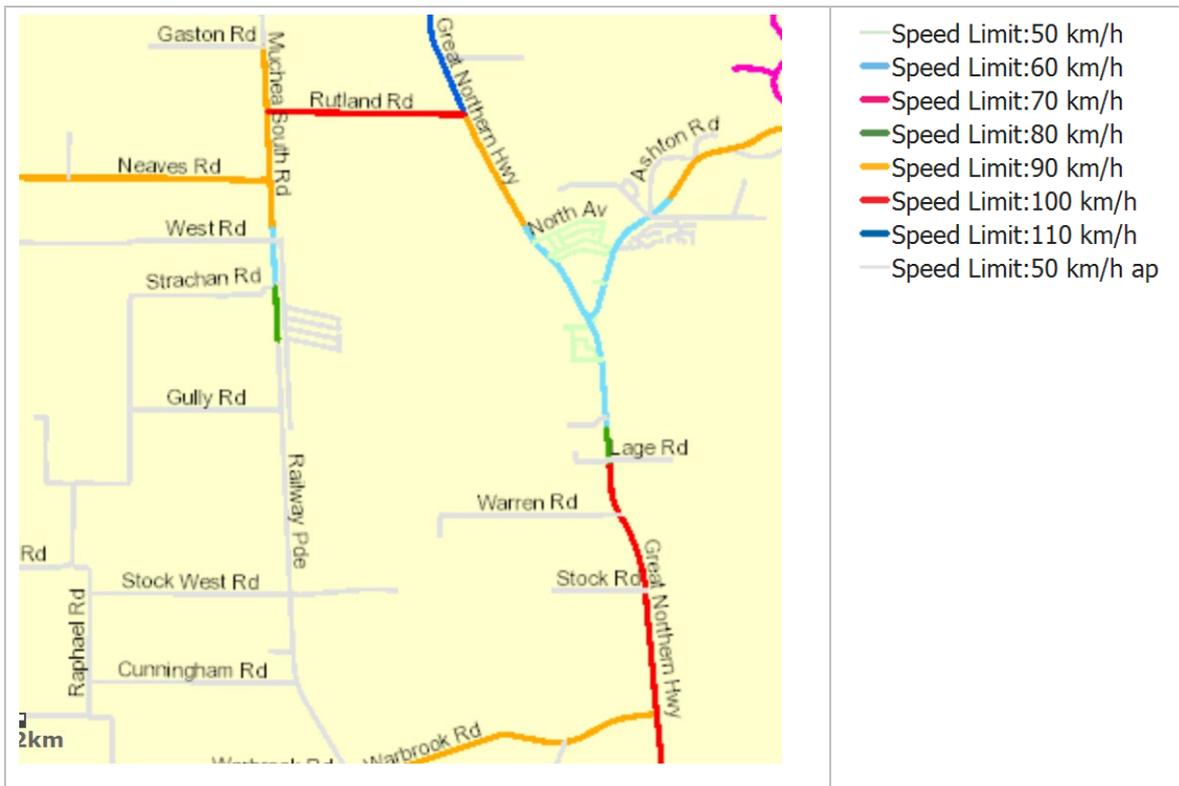
**Table 1 Road classifications and controlling authority**

Road	Classification	Controlling authority
Stock Road	Access Road	City of Swan
Railway Parade	Local Distributor	City of Swan
Neaves Road	Regional Distributor	City of Swan
Rutland Road	Regional Distributor	City of Swan
Muchea South Road	Regional Distributor	City of Swan
Great Northern Highway	Primary Distributor	Main Roads WA
Perth Darwin National Highway	Primary Distributor	Main Roads WA

#### 4.4.2 Speed limits

As shown in Figure 4-4, access roads surrounding the site generally have a speed limit of 50 kilometres per hour (km/h). GNH has a speed limit approaching Bullsbrook town site of 100 km/h (south) and 110 km/h (north). It is 60 km/h through the town site.

Railway Parade is 50 km/h through the southern portion of the study area, rising to 90 km/h in the north, as it becomes Muchea South Road. Neaves and Rutland Roads are 90 km/h and 100 km/h respectively, whilst Warbrook Road is 90 km/h.



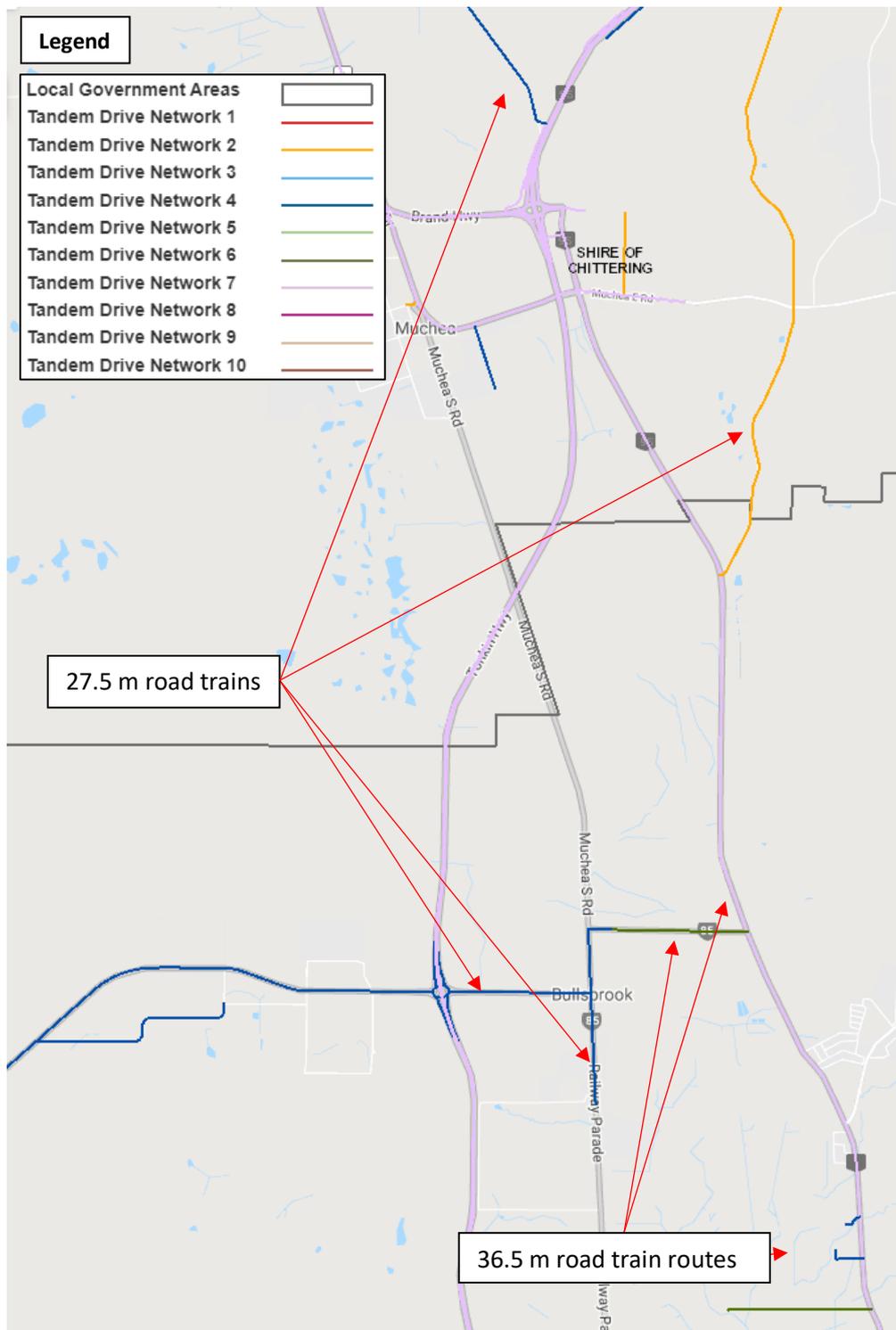
**Figure 4-4 Speed limits in the study area (MRWA)**

#### 4.4.3 Restricted access vehicle network

The restricted access vehicle (RAV) network is shown in Figure 4-5 and includes routes that accommodate B-Doubles and above.

- GNH, Rutland Road, Warren Road – 36.5-metre road train routes.
- Stock Road, part of Railway Parade, Neaves Road – 27.5-metre truck routes.

The existing network for each RAV type within and surrounding the study area is shown in Appendix A.



**Figure 4-5 Existing RAV network within study area (MRWA)**

#### 4.4.4 Over size/over mass network

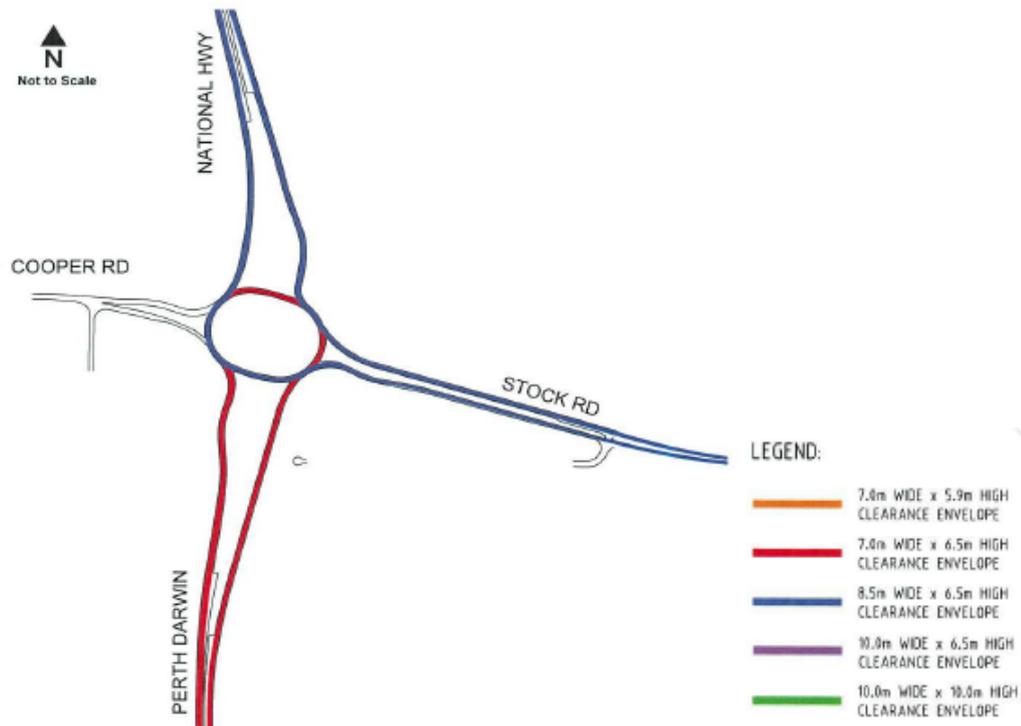
Figure 4-6 shows the existing over size/over mass (OSOM) corridor near the study area. This corridor has a clearance envelope of 10-metres wide by 10-metres high. GNH forms part of OSOM Corridor 3. Main Roads WA does not propose to change the OSOM route along GNH following completion of the Tonkin Highway extension/PDNH.



**Figure 4-6 Existing OSOM corridor (MRWA)**

The Stock Road interchange with Tonkin Highway cannot cater for OSOM vehicles. The interchange can cater for vehicles up to a clearance envelope of 8.5-metres wide by 6.5-metres high (north of Stock Road) and 7.0 metres wide by 6.5 metres high (south of Stock Road), as shown in Figure 4-7.

Stock Road is proposed to have a 10.0 metre by 10.0 metre clearance envelope between the IMT and GNH.



**Figure 4-7 Stock Road and PDNH OSOM clearance envelopes (MRWA)**

#### 4.5 Railway crossings

There are several at grade railway crossings through the project area. The existing at-grade railway crossings at Stock and Rutland Roads will be grade separated under current proposals to upgrade these links. The design of grade separations is expected to accommodate double stacked railway vehicles (height of 7.2 metres). The spans of the bridge crossing at Stock Road must be sized to incorporate approach sidings along the west side of the main railway line.

“Formal” sealed level crossings currently exist near West Road and Strachan Road, providing connectivity to the residential area on the east side of the railway line along Almeria Parade. Several unsealed railway crossings also exist.

The level crossings are likely to remain in the near term, however, it is considered that a comprehensive review of all level crossings in the area should be undertaken to determine whether crossings can be rationalised or removed where practical or deemed necessary.

It is expected that additional crossings may be required as the industrial area develops. Current state government policy is that new level crossings should not be provided, which raises the question of how best to service future industrial sites and the rural-residential enclave east of the railway line.

#### 4.6 Traffic volumes

Table 2 shows the daily traffic volumes on the primary routes within the study area<sup>14</sup>. It shows that heavy vehicles comprise a significant proportion of traffic movements on the primary roads.

<sup>14</sup> Obtained from Main Roads WA’s web site (Traffic Map) in May 2018.

**Table 2 Daily traffic volumes**

Location	Vehicles per day	Year
Great Northern Highway south of Bullsbrook Road	13,870 (23% heavy vehicles)	2015/16
Great Northern Highway north of Warbrook Road	8,231 (15.2% heavy vehicles)	2020/21
Stock Road (west of Great Northern Highway)	38 (21% heavy vehicles)	2014/15
Neaves Road west of Railway Parade	5,562 (20% heavy vehicles)	2020/21
Tonkin Highway North of Stock Road	11,807 (32.8% heavy vehicles)	2020/21
Tonkin Highway North of Neaves Road	8,140 (26.3% heavy vehicles)	2020/21

## 4.7 Crash analysis

The following crash statistics for the primary roads with the study area relate to the period between 1 January 2013 and 31 December 2017. With changed road layouts and traffic patterns following the opening of the Tonkin Highway extension in 2020, patterns are likely to change significantly, requiring further analysis in future.

- **Stock Road/Great Northern Highway intersection** - no reported crashes.
- **Warren Road/Great Northern Highway intersection** - no reported crashes.
- **Rutland Road/Great Northern Highway intersection** - 38 reported crashes in five years (five hospital, eight medical treatment, 20 property damage only (PDO) major and five PDO minor). The collision diagram indicates predominant patterns are rear end collisions in Rutland Road and right-angle collisions involving the right turn out colliding with northbound traffic on GNH. It is apparent that a safety issue exists at this intersection and should be addressed by Main Roads WA and the City of Swan.
- **Rutland Road/Muchea South Road intersection** - Five reported collisions, all PDO major. It is apparent that a safety issue exists at this intersection. It is expected that the crash pattern will alter significantly after the opening of the Tonkin Highway extension.
- **Neaves Road/Railway Road intersection** - 13 reported crashes (two medical, eight PDO major and three PDO minor). The collision diagram indicates predominant patterns are rear end collisions in Neaves Road. It is apparent that a safety issue exists at this intersection. It is expected that traffic patterns (and hence crash patterns) will change significantly following the opening of the Tonkin Highway extension.

Table 3 summarises road section and level crossing crash data

**Table 3 Road section and level crossing crash data**

Road	Section	No of crashes	Crash types
Rutland Road	Full length excluding terminating intersections.	4	3 PDO major, 1 PDO minor. 2 rear end, 1 run off road, 1 reversing in traffic.
Great Northern Highway	Muchea Road to Rutland Road excluding intersections (end)	26	1 Hospital, 2 medical, 19 PDO major, 4 PDO minor. 13 rear end/sideswipe, 6 run off road.
Great Northern Highway	Rutland Road to Chittering Road excluding intersections (end)	12	5 hospital, 1 medical, 3 PDO major, 3 PDO minor. 3 head on, 2 rear end, 4 run off carriageway.
Great Northern Highway	Chittering Road to Stock Road excluding intersections (end)	23	1 fatal, 2 hospital, 4 medical, 14 PDO major, 2 PDO minor. 10 rear end/side swipe, 5 driveway, 4 run off carriageway.
Railway Parade	Neaves Road to Stock Road excluding intersections (end)	5	1 hospital, 2 medical, 1 PDO major, 1 PDO minor. 1 head on, 1 rear end, 2 run off road.
Warbrook Road Rail crossing	-	0	-
Stock Road west	-	0	-
Rutland Road rail crossing	-	0	-
Almeria Parade	-	0	-

## 5. Strategic transport context

### 5.1 The freight and passenger transport task

The development of the Bullsbrook industrial precinct requires the provision of transport linkages, both within the study area and externally. Of particular importance will be the provision of safe and efficient transport links between the proposed IMT and other parts of the study area.

The IMT is proposed as a transit point for containerised cargo arriving at Fremantle Port and/or the proposed future outer harbour at Kwinana for forwarding to the northern parts of the Perth metropolitan area and elsewhere within WA (primarily the Geraldton/Midlands area and the Wheatbelt). It will also be a collection point for container cargo to be forwarded to the ports for export. A further possibility is the inclusion of other rail related activities (marshalling, maintenance, etc.).

The relationship between the Bullsbrook industrial precinct, the IMT and the other proposed industrial/employment nodes (at Muchea, North Ellenbrook, Wangara and Neerabup) must also be considered, as does the potential distribution of employment and customer travel to and from the broader Bullsbrook industrial precinct.

Current planning for the IMT site seeks to facilitate a development that will ultimately cater for throughput of 250,000 TEU<sup>15</sup>/annum. Initial terminal capacity has been estimated as 150,000 TEU/annum. In addition to containerised cargo, it is expected that large volumes of light commercial vehicles and passenger cars (primarily used for commercial purposes) will access the IMT and the wider Bullsbrook industrial precinct on a daily basis.

As a potential major employment centre, the provision of passenger transport to the precinct is a major consideration in the structure-planning process. The significant distance between existing surrounding residential areas and the industrial precinct will be a major factor that is likely to make access by active and public transport challenging and will require careful planning of direct road connections to/from the precinct, particularly across significant barriers such as Tonkin Highway and the freight rail line. However, this distance will be lessened with the development of the Ellenbrook North (west and east) District Structure Plan areas to the south of Warbrook Road (west and east of Tonkin Highway). Development of these areas will bring a significant residential population base (and potential workforce) in proximity to the Bullsbrook industrial precinct which will improve the viability of public transport services.

### 5.2 Integration with surrounding area/network

The Strategy area is located close to several existing and future trip attractors that it must integrate with to ensure its successful development and operation. These are outlined in the following sections.

#### 5.2.1 Muchea industrial area

The Muchea and Bullsbrook industrial areas are expected to complement each other given their different focus. Muchea, approximately 5 km north of the northern end of the structure plan area, is geared towards agricultural industries whilst Bullsbrook is to focus on containerised/break bulk freight.

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<sup>15</sup> A TEU (Twenty-foot Equivalent Unit) is a measure of containerised cargo mass based upon a standard 20-foot international shipping container. Double length (40 foot) containers are also commonly used to ship freight, which equates to two TEUs each.

There is a road train assembly area (RTAA) in Muchea, approximately 14 km north of the proposed Bullsbrook IMT location. As such, a RTAA cannot be located at or adjacent to the IMT.

### **5.2.2 Bullsbrook town centre**

This is presently the nearest urban town centre, approximately 4.5 km north east of the site. Trips between the IMT, industrial precinct and the town centre will likely comprise primarily employee commuter trips. Depending on the ultimate degree of employment located within the IMT precinct, this may eventually become a significant source of traffic. Traffic from Bullsbrook bound for Tonkin Highway is likely to use Stock Road.

### **5.2.3 Ellenbrook urban area**

Ellenbrook (including the growing corridor consisting of Brabham, Dayton, and Bennett Springs), is approximately 5 km south of the site and is a major residential area that is likely to host a significant proportion of the future workforce once the facility becomes functional. It is therefore crucial that north-south connections between the industrial precinct and this area is provided, including GNH and Tonkin Highway.

In addition to the existing Ellenbrook area to the south of Maralla Road, there are also planned residential developments to the immediate north of Maralla Road on the west and east sides of Tonkin Highway (North Ellenbrook West and East District Structure Plan areas). The precinct's interface with these areas should be an important consideration. Both areas should be looked at holistically as there will be a large amount of shared infrastructure, with timings of infrastructure in the industrial area heavily influenced by traffic from the proposed North Ellenbrook residential areas.

### **5.2.4 Neerabup Industrial Area**

While presently small, this area, located approximately 20 km west of the site, is expected to be a major employment area as the North-West Sub-region grows. Freight between the study area and Neerabup is expected to almost entirely be via Neaves Road.

### **5.2.5 Wangara Industrial Area**

Wangara is an established industrial area located 20 km south west of the site. It is expected to continue to grow, particularly near Ocean Reef Road. The East Wanneroo Structure Plan Amendment<sup>16</sup> was finalised and approved in December 2020 and is expected to support further urban development between the Wangara and Neerabup industrial areas. Freight between the study area and Wangara is expected to almost entirely be via Gngangara Road.

### **5.2.6 RAAF Pearce Air Force Base**

The study area partially surrounds the Royal Australian Air Force's (RAAF) Pearce air base. There are several issues to be considered, including:

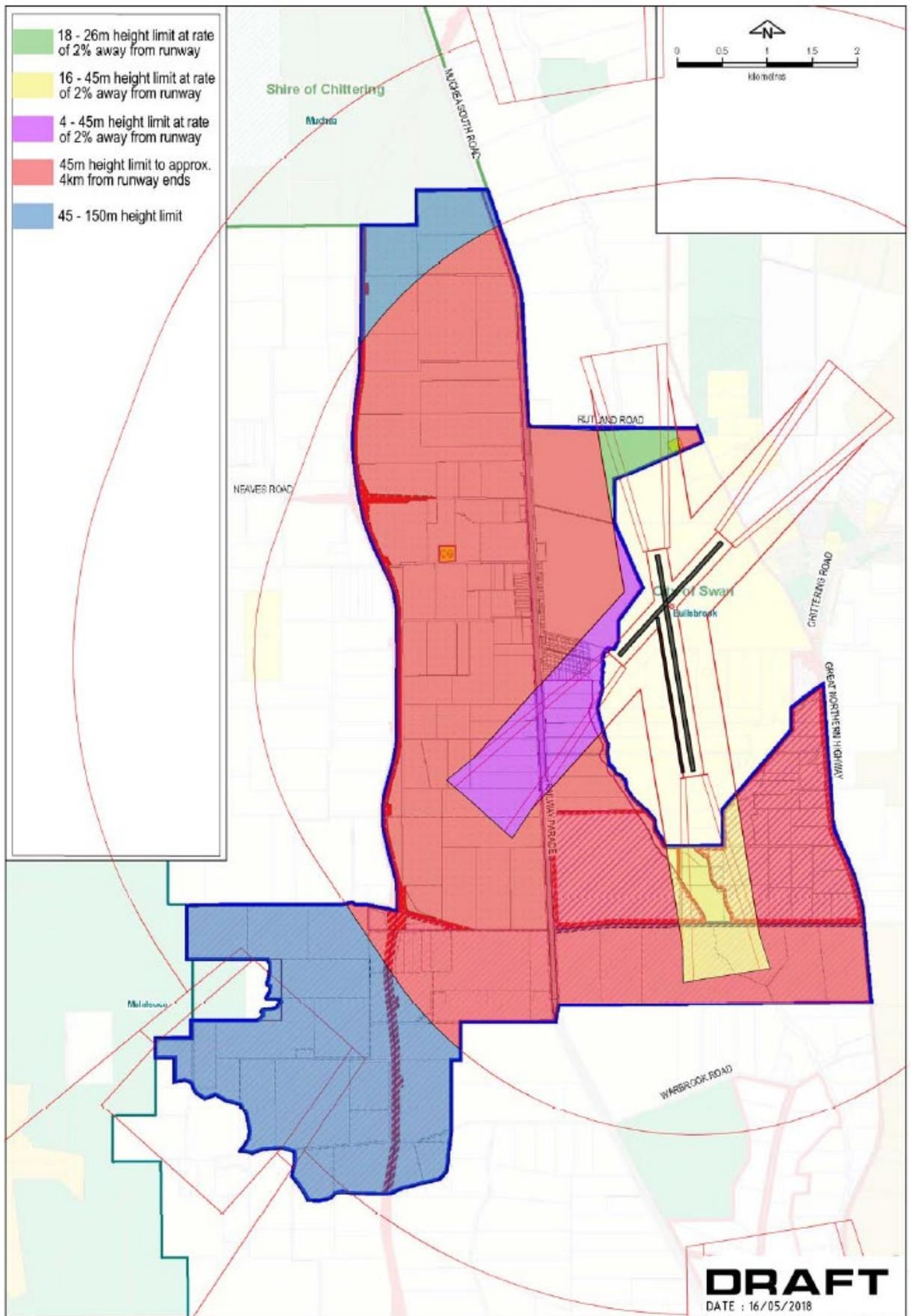
- As an industrial land use, it is not considered a noise sensitive receptor. The Department of Defence (DoD) requests that future land sales include a title condition acknowledging that the air force operates 24/7 and aircraft noise is inevitable.
- Outdoor lighting within six kilometres of the airfield must comply with DoD guidelines to avoid glare from reflective surfaces for pilots. Care should be taken in the IMT

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<sup>16</sup> See <https://www.planning.wa.gov.au/east-wanneroo.aspx>

design stage to ensure this does not occur. This may pose some design and enforcement challenges for hardstand yard lighting, etc.

- Activities leading to an increased likelihood of bird strike by aircraft should be avoided.
- DoD requests that development does not prejudice existing utility services for RAAF Base Pearce.
- The site is within a 15-kilometre radius of the base and will require DoD approval for any structures that may pose a hazard to aircraft – this includes height limitations (Figure 5-1). The only structures at the IMT that may be affected would be lighting towers, which would be addressed at the detailed design stage. Other structures throughout the industrial precinct will need to be assessed against the height restrictions as part of the development application process.
- The DoD has plans to extend the runways at Pearce Airbase (the timing has not yet been determined as at the date of this report). Accordingly, clearance/ height requirements should be re-checked at subsequent stages of the project.
- The base is likely to attract very specific and potentially atypical traffic patterns. In the very long term, this site could attract significant freight flows if the site is used for civil aviation, or increased defence aerospace industry.



**Figure 5-1 Pearce Airbase – height restrictions (DoD)**

## 6. Proposed transport networks

### 6.1 Internal network

The proposed primary transport network within the study area at full development is shown in Figure 6-1.

#### 6.1.1 Rail

The existing narrow-gauge Millendon–Narngulu freight railway, which runs north-south through the middle of the study area, will remain the sole external rail link and will have a spur to connect to the IMT. The IMT site has been sized to accommodate 650-metre trains, with provision for extension to 900-metre trains in future, if necessary<sup>17</sup>. The spacing of internal sidings and turnouts has been designed to allow upgrade to dual gauge if warranted in future. The approach siding will extend from just north of Warbrook Road to Stock Road, which is just sufficient to accommodate an 1800-metre interstate train, which would then be broken into 900-metre rakes for shunting into the IMT. The siding will be located within the existing railway reserve and positioned to allow future duplication of the main line, should this ever prove necessary.

Trains to/from the north would initially use the southern approach siding by way of a crossover. If demand grows in the future, the IMT layout must be flexible enough to allow for a direct approach from the north.

It is anticipated that train control within the proposed IMT and its approach sidings will be under the control of the terminal operator. The exact arrangements for demarcation of control will be determined closer to the time of construction. They will reflect the ownership/management of the terminal and main line at that time, together with any changes in signalling technology between now and then.

Provision has been made in the planning of the IMT to accommodate 1800-metre standard gauge trains in future, however it is expected that the existing narrow-gauge line will be the only rail freight service in the short to medium term. For interstate trains to access the IMT, considerable infrastructure upgrades would be required, including reconstruction of the existing line from Millendon to Bullsbrook as dual gauge, with consequent upgrades to bridges and culverts, signals, and other such infrastructure. Conversion of the Millendon Junction to a triangle arrangement would allow direct access to the upgraded line but is likely to be strongly resisted on social impact grounds.

Operational changes would also be necessary for interstate trains to access the IMT. This might include provision of a siding south of Millendon, where trains could be reversed. Alternatively, trains could be re-routed to Forrestfield/Kewdale and back, however this is less efficient.

The potential construction of a standard gauge link to give rail access to the eastern states is complex and will require additional studies beyond the scope of this Strategy.

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<sup>17</sup> The IMT masterplan study (GHD 2016) noted that the primary market for the Bullsbrook IMT would be container (and some break-bulk) commodities coming over the wharves at Fremantle and Kwinana, for distribution to Perth's north-west and north-east corridors, and areas north of Perth. For this purpose, the 650-metre port shuttle was adopted as the design train.



### **6.1.2 Active transport**

Because of the low density and relatively large distances involved in a strategic industrial estate, demand for pedestrian and cycle infrastructure and facilities will be generally limited, however there will be some variation between precincts. For example, precincts designated for service industrial will accommodate more intensive land use with a larger workforce, which would therefore justify a more comprehensive cycle/pathway network that should be sufficiently provided for.

There is a north-south Principal Shared Path on the east side of Tonkin Highway. Provision for shared path connectivity should be provided for in the designs of the major east-west connectors of Maralla Road, Warbrook Road, Stock/Cooper Road, Neaves-Rutland Road, and the connector road for the potential mid-block interchange with Tonkin Highway between Maralla and Warbrook Roads.

Provision should also be made in the proposed north-south spine road/Sawpit Road and along GNH as far north as Rutland Road, particularly as the residential cells to the east of GNH develop. Elsewhere, road reserves should be wide enough to accommodate generous shoulders suitable for cycling to provide a “last mile” connection from the primary routes.

The provision of paths will support the introduction of bus services once development has substantially occurred as it will allow pedestrians to easily access the stops.

### **6.1.3 Public transport**

Transperth has advised that no additional public transport routes are planned for the area in the short term. In the longer term, the extensive residential developments east of GNH and south of Warbrook Road (Ellenbrook North), along with the delivery of new jobs within the Bullsbrook industrial precinct, will likely drive demand for increased bus services to/from the industrial area, particularly from those without a driver’s licence or access to a personal vehicle (e.g., young people/ apprentices). The extent to which services may be extended into the study area, along with their frequencies, remains to be determined as it is very much dependant on the availability of funding for any new or extended routes. However, the low density/very large lot nature of strategic industrial sites tends to complicate the provision of public transport, particularly at high frequencies. Accordingly, a small number of direct routes at a reasonable frequency (e.g., 20 minutes in the peaks) across the precinct will likely form the basis of the ultimate configuration of the network.

The local distribution and intensity of jobs will depend on the specific location of firms within the study area. This will, in turn, partly determine the demand for public transport routes through the precinct. Accordingly, it is recommended that Transperth undertake bus network planning following the substantial completion of the subdivision and land development process.

It is likely that some local bus routes to and from Bullsbrook town centre would traverse the industrial precinct and provide onward connectivity with the Ellenbrook town centre and the future rail station in Ellenbrook.

### **6.1.4 Roads**

The future primary road network within the strategy area is shown in Figure 6-1. It includes three north-south links (the Tonkin Highway extension, a new central spine road/realigned Railway Parade and a duplicated GNH along the eastern boundary) and two east-west links (Stock/Cooper Roads and Rutland/Neaves Roads).

Primary roads through the precinct must accommodate 36.5-metre vehicles. These assemblies (rated up to RAV 7), may transport up to four TEUs in one set of trailers. This will necessitate road engineering to incorporate relevant swept path geometry, acceleration and deceleration provision, and other key design elements.

Changes to the road network within the structure plan area will be driven by several factors, including:

- The completion of Tonkin Highway (2020).
- Traffic generated by new industries and subdivision within the Strategy area.
- Provision for an IMT on the west side of the railway line.
- External traffic generators, such as the rapidly growing residential areas at Bullsbrook east of GNH and in the future urban areas to the immediate south of the Strategy area (North Ellenbrook East and West).

Stock Road is considered the link that should be delivered as a priority to provide a connection between Tonkin and Great Northern Highways and to facilitate development of Lot 300 on the north side of Stock Road.

Other links will likely be required/delivered as the land that is currently zoned for industrial use is developed. The proposed north-south spine road is considered an important link (primarily between Stock and Neaves-Rutland Roads), however as the land through which it runs is not yet zoned for industrial use, it is unlikely to be delivered in the immediate future.

The following roads are already, or will likely become, controlled access roads as the Strategy area develops:

- Tonkin Highway
- Great Northern Highway
- Stock Road
- Neaves/Rutland Roads
- North-south spine road
- Cooper Road (west of Tonkin Highway)

All other roads will likely permit direct property access.

The following section describes the expected/recommended configuration of each major access road.

### **Tonkin Highway**

The southern section of the Tonkin Highway extension (from Guildford Road to The Promenade in Ellenbrook) was completed in 2019, with the northern section to Muchea completed in April 2020. Tonkin Highway forms the main north-south road along the western edge of the Strategy area and is forecast to carry approximately 34,000 vehicles per day by 2051<sup>18</sup>.

Interchanges within the Strategy area include those at Stock/Cooper Roads and Neaves/Rutland Roads. No further interchanges are currently planned by Main Roads WA within the Strategy area; however, an additional interchange is being considered approximately midway between Warbrook and Maralla Roads.

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<sup>18</sup> ROM 2021.

The northern section of the Tonkin Highway extension has been constructed as a dual carriageway to Muchea. As a result of construction, this section has four lanes and takes most of the heavy traffic away from GNH. These works were completed in April 2020 and included:

- Dual carriageway to Muchea
- Interchanges at Stock Road, Neaves Road and Brand Highway
- Deviation at Brand Highway
- Flyover bridges at Muchea South Road, railways and Ellenbrook

Tonkin Highway south of the Brand Highway interchange only accommodates 36.5-metre vehicles. Accordingly, triple road trains (53.5 metres) cannot directly access the IMT, they must break down at the road train assembly area at Muchea (north east of the Brand Highway interchange) before proceeding south to the IMT and/or into the metropolitan area. It is therefore recommended that the proposed internal spine road be designed for RAV 7 and OSOM.

### **Great Northern Highway**

With the completion of the Tonkin Highway extension and the construction of the proposed north-south spine road, 2051 traffic volumes on GNH (just south of Stock Road) are forecast to be around 65,000 vpd and around 20% heavy vehicles and 15,800 vpd north of Stock Road (27-42% heavy vehicles).

Minor upgrades will be required at existing and/or new intersections created by the development of the industrial land on the western side of GNH between Warbrook Road and Brig Way. Duplication of the southern approach to the Bullsbrook town site is being considered by Main Roads WA, but there is currently no funding commitment. In addition, changes to the intersection with Stock Road will be required to support increased traffic volumes at this location as well as its inclusion in the RAV network.

### **Stock Road**

Stock Road must provide a connection between Tonkin Highway and GNH and be grade separated from the railway. As part of this upgrade, the current stagger between Stock Road East and Stock Road West should be remedied. In addition, a significant proportion of Stock Road East requires construction as it is currently a dirt track. The connection should be upgraded/constructed as a four-lane dual carriageway to coincide with the development of Lot 300 on the north side of Stock Road. Consideration should also be given as to its appropriate classification, i.e., an ORR or a PRR.

A connection to this standard would provide an opportunity to alter the RAV network, as shown in Figure 6-2, to include Stock Road and Tonkin Highway (north of Stock Road). Main Roads WA has advised that GNH would need to remain as a HWL/OSOM route as the Stock Road interchange with Tonkin Highway does not cater for the largest of HWL/OSOM loads (10 m x 10 m)<sup>19</sup>. Whilst the section of Stock Road west of the proposed IMT site will not provide a 10 m x 10 m clearance, there is potential to design and construct the section of Stock Road<sup>20</sup> between GNH and the intersection with the north-south spine road to provide such clearance.

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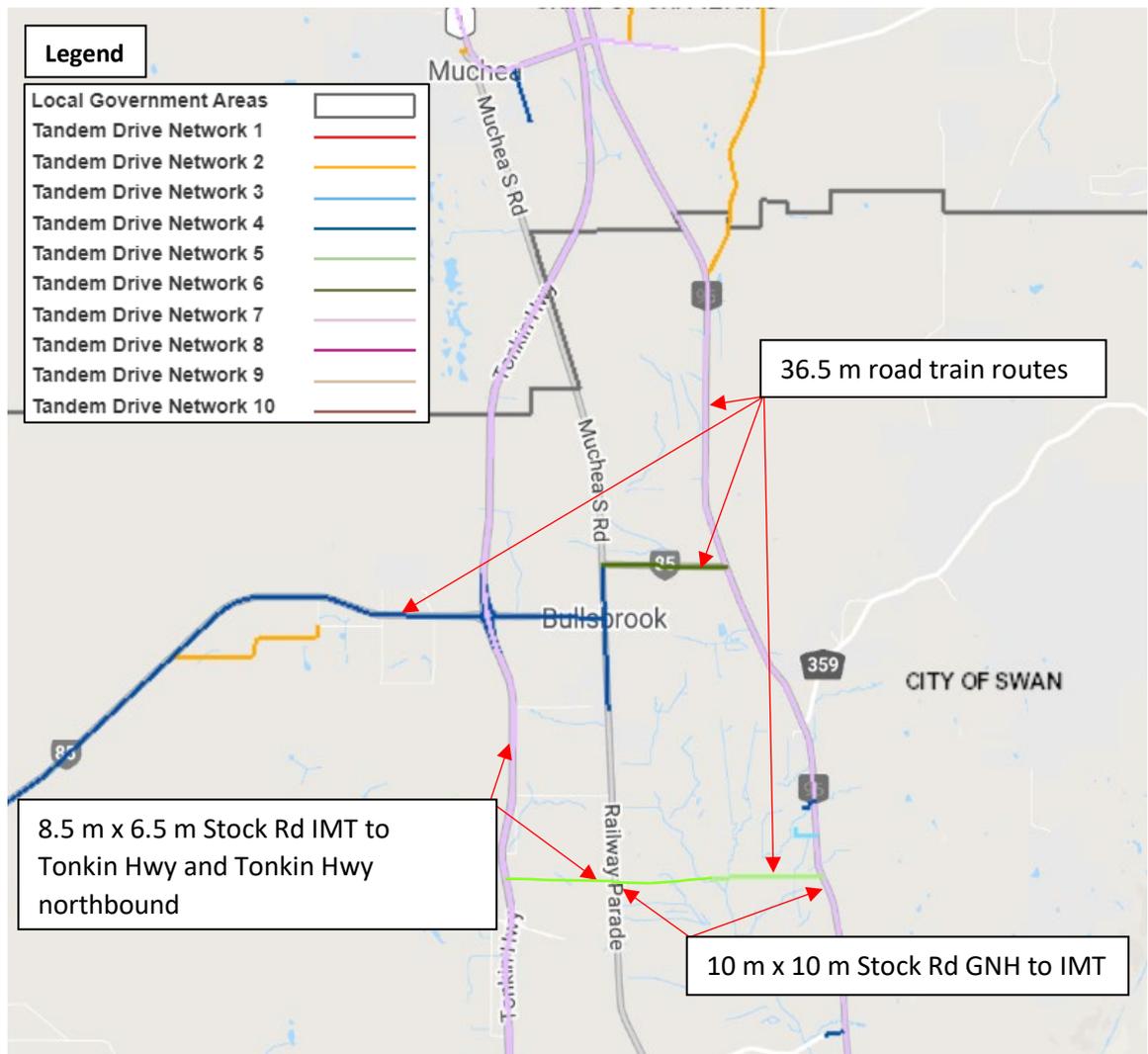
<sup>19</sup> As mentioned in the previous section, stakeholders expressed a strong preference for all HWL/OSOM traffic to be diverted along Stock Road to an alternative route and therefore off GNH and away from the Bullsbrook town site.

<sup>20</sup> With interstate transport operators expected to access the IMT, it is suggested that Stock Road be renamed to Cooper Road for its entire length to avoid confusion with Stock Road south of Perth, which shares the National Route 1 designation with GNH.

## **Cooper Road**

There is potential for Cooper Road to be extended west in the longer-term to provide a westward connection to the wider regional road network, particularly if an alternative to Neaves Road becomes desired.

The NESRPF recognises the potential longer-term opportunity to provide an additional and more direct east-west road connection between the North-West Subregion and the North Ellenbrook/Bullsbrook industrial centre utilising the Cooper Road reserve alignment. This would connect directly to Stock Road (East) at Tonkin Highway, potentially form part of the future freight network and enhance access to the planned Bullsbrook IMT and Bullsbrook/North Ellenbrook and South Bullsbrook employment nodes.

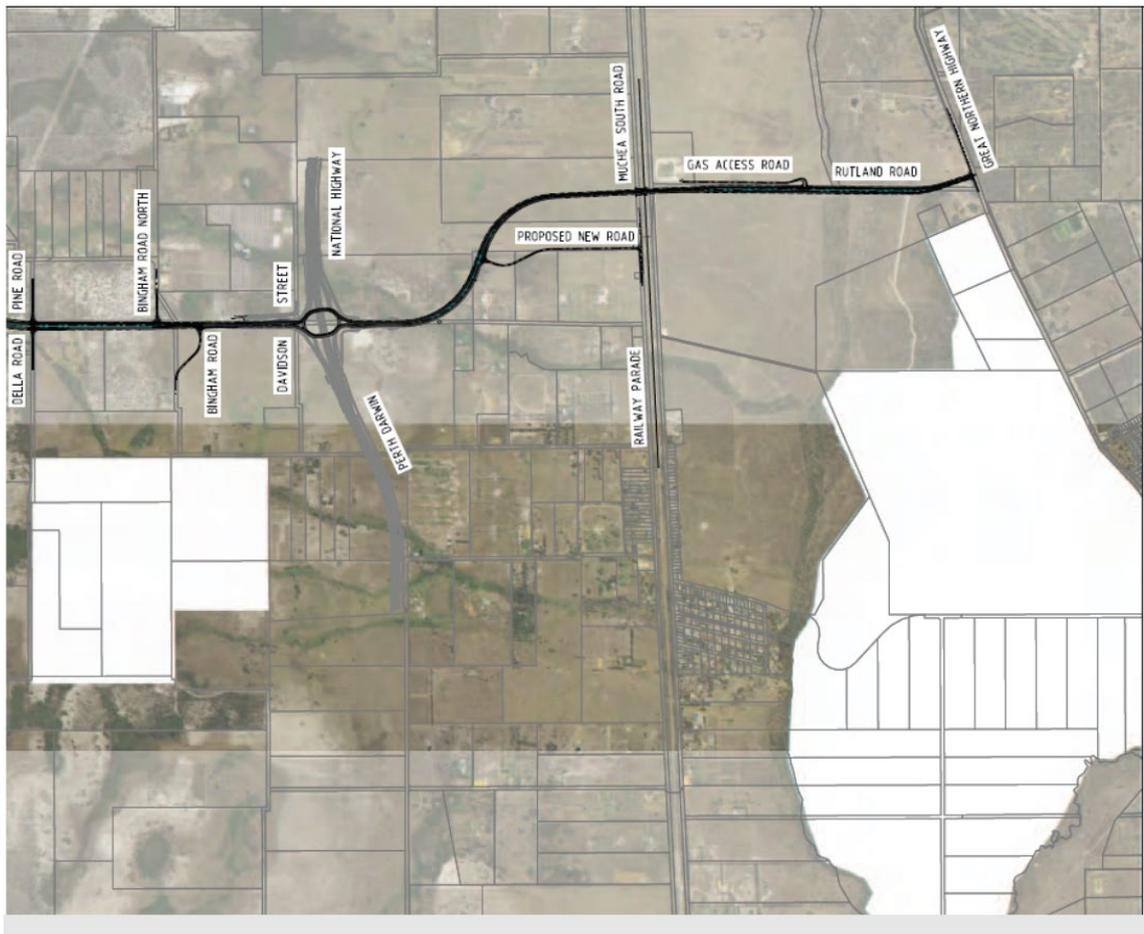


**Figure 6-2 Suggested RAV and OSOM network after upgrade of Stock Road**

### Neaves-Rutland Road

Neaves Road provides a major east-west route linking Perth’s north east and north west corridors and is forecast to carry approximately 35,200 vehicles per day by 2051<sup>21</sup>. In the *NESRPF*, Neaves Road (west of Tonkin Highway) is identified as a Secondary Freight Route. It is proposed to be connected with Rutland Road and thereby to GNH, including an overpass of the freight rail line and a connection to Railway Parade, as shown in Figure 6-3. This will provide a connection between Mitchell Freeway in the west to Tonkin Highway and GNH in the east. Accordingly, this route should be developed to cater for OSOM vehicles.

<sup>21</sup> ROM 2021.



**Figure 6-3 Proposed Neaves-Rutland Road connection (DPLH)**

The proposed north-south spine road would also connect to the realigned Neaves-Rutland Road approximately mid way between Tonkin Highway and Railway Parade (connection not shown in Figure 6-3).

The DPLH has identified that there may be potential protected flora species present on the proposed alignment for the new/duplicated Rutland Road. This needs to be further investigated and a suitable solution found to protect this connection.

Neaves Road will be a PRR west of Tonkin Highway and an ORR east of Tonkin Highway.

#### **Railway Parade/spine road**

A previous study<sup>22</sup> considered options for the treatment of Railway Parade and recommended that it be realigned west of the proposed IMT, with a four-way intersection with Stock Road about mid-way between the railway and Tonkin Highway. This would create a new north-south road midway between Tonkin Highway and the rail line (see Figure 6-1). The spine road is recommended to continue south of Stock Road to connect to the existing Sawpit Road, terminating at Maralla Road. The spine road would provide the following benefits:

- Elimination of the need for a level crossing where trains enter and exit the IMT.
- Retention of north-south connectivity, together with a convenient connection between Stock Road and Railway Parade.

<sup>22</sup> GHD. 2016. *Bullsbrook IMT Planning Study*

- Provision of a frontage road along the west side of the IMT to create a safe and efficient entry and exit for trucks servicing the IMT.
- Facilitate the development of the IMT and complementary surrounding industry.

The location of the intersection of the proposed north-south spine road with Stock Road is tied to the required separation distances from the railway line and Tonkin Highway, as well as the desire to align the road to the west of the City of Swan's waste facility site. This would place the intersection approximately 800 m from Tonkin Highway and 850 m from the railway line. A signalised intersection will need to be examined based on forecast traffic volumes, including the potential for grade separation in the future should it be required.

The Stock Road intersection is recommended to provide a 10 m x 10 m clearance to prevent OSOM vehicles from having to travel along GNH through the Bullsbrook townsite. The redirection of heavy vehicles away from the Bullsbrook town centre is strongly supported by the local community and all stakeholders.

The intersection with Warbrook Road is recommended to be designed to restrict/prevent the movement of industrial traffic south of Warbrook Road (through the proposed North Ellenbrook residential area). This is particularly important due to the attraction of a proposed interchange on Tonkin Highway approximately halfway between Warbrook and Maralla Roads which industrial traffic may seek to use as an alternative to the Stock Road interchange (see section 6.2.2).

### **IMT internal network**

The IMT internal network has been discussed in detail in GHD (2016)<sup>23</sup>.

The IMT will require two access points to the road network, both of which will be on the realigned Railway Parade/Spine Road. It is noted that a direct connection from the IMT to Stock Road is undesirable due to potential congestion, and practical difficulties resulting from the gradient of the planned Stock Road grade separation over the railway line. Final alignments are not yet confirmed.

### **Proposed speed limits and road hierarchy (functional classification)**

The current 100 km/h speed limit on GNH through South Bullsbrook (i.e., between Stock Road and Butternab Road) is likely to reduce when activity intensification in the area warrants the change. Traffic speeds will also be influenced by upgrades to intersections, including the signalisation of Stock Road/GNH.

Proposed speed limits and the proposed internal road hierarchy/functional classification in the Strategy area, can be seen in Figure 6-4.

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<sup>23</sup> GHD, 2016, *Bullsbrook IMT Masterplan*



## Primary road reservation widths and cross-sections

Proposed road reservation widths for each of the primary roads within the Strategy area are shown in Table 4:

**Table 4 Primary road reservation widths and cross sections**

Road	Section	Classification	RAV status	Indicative reserve width	Cross section
Stock Road	GNH to Tonkin Highway	Primary Distributor	RAV 7 & OSOM (Spine Road to GNH)	60.0 m	Two carriageways, each with <ul style="list-style-type: none"> <li>• 2 x 3.5 m traffic lanes</li> <li>• 3.0 m outside shoulder</li> <li>• 1.0 m median shoulder</li> </ul> 6.0 m median 3.0 m off-road cycleway 10.0 m vertical clearance (GNH to Spine Road)
Cooper Road	Tonkin Highway to west of study area	Regional Distributor	RAV 7	40.0 m	Single carriageway <ul style="list-style-type: none"> <li>• 2 x 3.5 m traffic lanes</li> <li>• 2.0 m shoulders</li> </ul>
Neaves Road	Tonkin Highway to rail line	Primary Distributor	RAV 7, OSOM	50.0 m	Two carriageways, each with <ul style="list-style-type: none"> <li>• 2 x 3.5 m traffic lanes</li> <li>• 3.0 m outside shoulder</li> <li>• 1.0 m median shoulder</li> </ul> 6.0 m median 3.0 m off-road cycleway 10.0 m vertical clearance (GNH to Spine Road)
Rutland Road	All	Primary Distributor	RAV 7, OSOM		Variable depends on local features. Focus on intersection treatments in the short to medium term.
GNH	Warbrook Road to Brig Way	Primary Distributor	RAV 7 Remains OSOM	Variable, mostly per existing	Variable depends on local features. Focus on intersection treatments in the short to medium term.
Muchea South Road	Rutland Road to north of study area	Regional Distributor	RAV 4	40.0 m	Single carriageway <ul style="list-style-type: none"> <li>• 2 x 3.5 m traffic lanes</li> <li>• 2.0 m shoulders</li> </ul>

Road	Section	Classification	RAV status	Indicative reserve width	Cross section
Spine Road	All	Regional Distributor	RAV 7 & OSOM	40.0 m	Two carriageways, each with <ul style="list-style-type: none"> <li>• 2 x 3.5 m traffic lanes</li> <li>• 2.0 m outside shoulder</li> <li>• 1.0 m median shoulder</li> <li>6.0 m median</li> </ul>

### 6.1.5 Level crossings

In the short term, the two existing formal level crossings of the railway at Strachan and West Roads that provide access to/from the existing rural-residential area on the east side of the railway will remain given the low frequency of train and vehicle movements across these crossings. There is potential for an increased level of control to be implemented at the crossings if deemed necessary (i.e., boom gates). In the long term, a comprehensive study is required to investigate the future treatment of level crossings in the area.

Should alternatives to level crossings be required, options include:

1. Extend Almeria Parade south to join with future internal roads within the industrial area to the immediate north east of the future Stock Road/railway line flyover.
2. Provide a grade separated crossing of the railway near the residential area. Potential locations include approximately 350 metres south of Deanhead Street or near Gully Road. A bridge would need to be sufficiently high to accommodate double stacked railway wagons and this may be difficult to achieve due to RAAF height restrictions. An underpass may also prove difficult due to the high-water table.

Option 1 is the most cost-effective option and is therefore the most recommended option to be delivered should the existing level crossings be removed at some point in the future. However, a second connection is necessary for both connectivity and emergency egress. Accordingly, option 2 is recommended to be investigated.

### 6.1.6 Traffic generation from study area – 2041+

Traffic generation from the Strategy area in 2041+ has been estimated based on the Main Roads WA ROM 24 data<sup>24</sup>. Forecast daily traffic volumes for 2041 network and ultimate land use are shown in Table 5.

**Table 5 Forecast traffic generation from study area**

ROM Zone	Vehicles per day (ultimate development)
1461	31,900
1460	34,400
1451	1000

<sup>24</sup> Title: ROM24 2041 Scenario - Link Volume Plot for Bullsbrook Freight and Industrial Development, All Day – Y41LU Y41NET Bullsbrook\_R6 with Trip Adjustment2

ROM Zone	Vehicles per day (ultimate development)
1459	21,700
1458	22,500
1453	18,300
1452	16,000
1454	14,100
1455	13,100
1456	35,200
<b>Total</b>	<b>208,200</b>

### 6.1.7 Analysis of internal transport network

A review has been undertaken of the forecast traffic volumes using Main Roads WA ROM24 output for the 2041+ network and ultimate land use<sup>25</sup>. The ROM output includes Link Volume Plot (LVP) and Select-Link Plot (SLP) for the Bullsbrook study (model run/iteration #6). The latest updates include:

- Trip generation by the IMT is based on the information provided by the DoT (these are different to employment trips)
- Road network changes to replicate the proposed North Ellenbrook East and West District Structure Plans
- Final intersection treatments along Stock Road
- Two IMTs have been assumed in Zones 1458 and 1453 with approximately 3500 - 4000 additional vehicular trips (pcu) manually assigned to these two zones
- Assumed IMT capacity of 250,000 TEUs per annum for both terminals.

*Austrroads Guide to Traffic Management Part 3* indicates mid-block capacities for urban roads (Table 6 and Table 7 refer).

<sup>25</sup> DPLH advised of a minor discrepancy in the ROM. Approximately, 8,600 trips/day between Zones 546 and 548 use GNH as minor roads are not modelled in ROM. It is acknowledged therefore that forecast volumes on GNH are likely to be inflated in the vicinity of Zones 546 and 548.

**Table 6 Typical mid-block capacities for urban roads with interrupted flows (Austroads)**

Type of lane	One-way mid-block capacity (pc/h)
<b>Median or inner lane</b>	
Divided road	1000
Undivided road	900
<b>Middle lane (of a 3 lane carriageway)</b>	
Divided road	900
Undivided road	1000
<b>Kerb lane</b>	
Adjacent to parking lane	900
Occasional parked vehicles	600
Clearway conditions	900

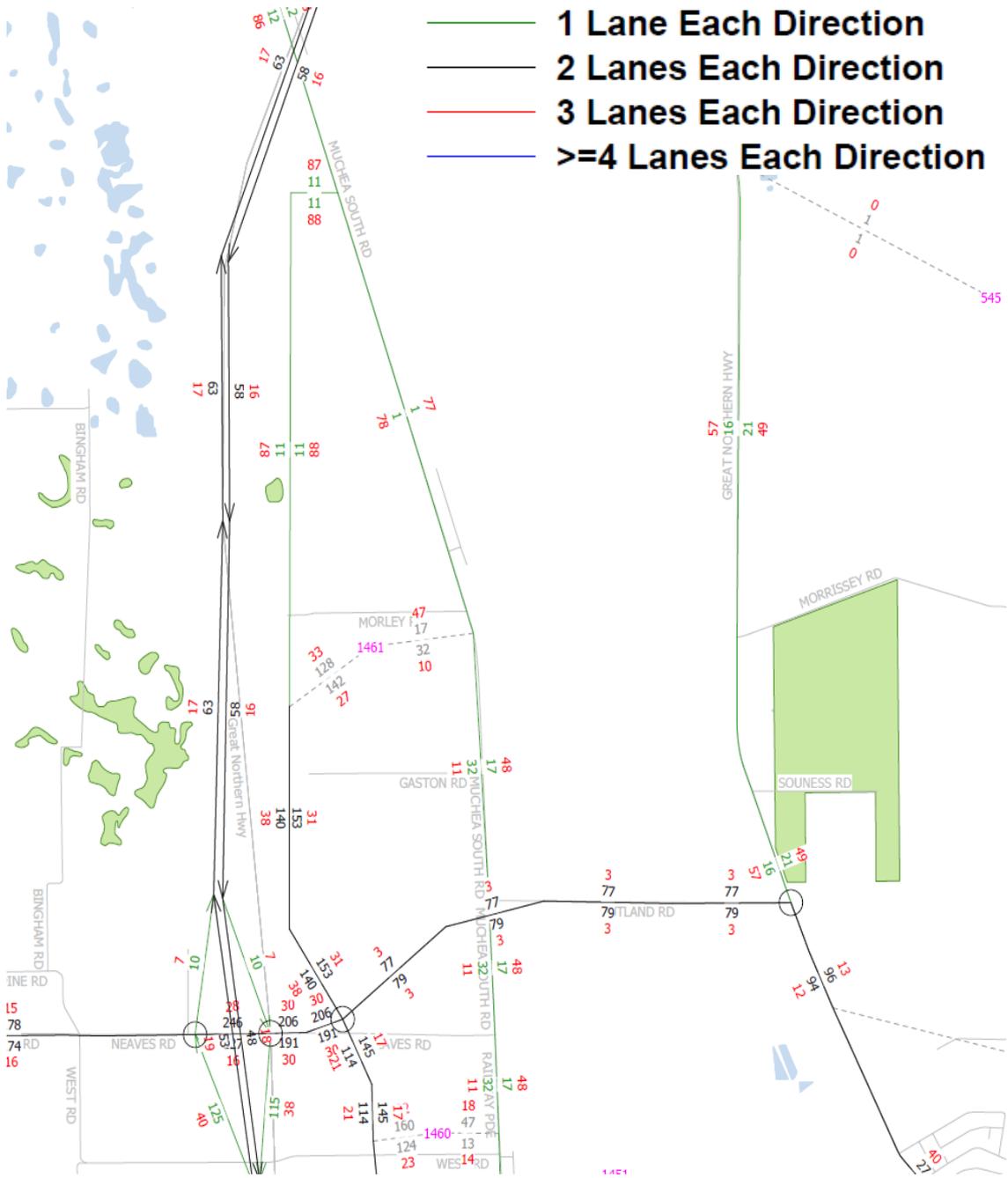
**Table 7 Road Capacities Road Reserves Review**

Road Type	Capacity
<b>Regional Roads</b>	
<i>Freeway (100km/h)</i>	
4 lanes	60,000
6 lanes	90,000
8 lanes	120,000
<i>Suburban Highways (80km/h) / Expressways</i>	
4 lanes	54,400
6 lanes	81,600
8 lanes	108,800
<b>Urban Arterials</b>	
4 lanes undivided	29,000
4 lanes divided	38,000
6 lanes divided	58,000
<b>District Roads</b>	
2 lanes	12,000
4 lane undivided	14,000
4 lane divided (no parking)	30,000
4 lane divided (minimal frontage access)	38,000
6 lane divided (no parking)	46,000
6 lane divided (minimal frontage access)	58,000

Assuming mid-block capacities from Table 7 are 10% of daily capacity, then the following theoretical capacity applies to single and dual carriageways within the study area:

- Single carriageway one lane in each direction: 12,000 vehicles per day (vpd) (600 vehicles per hour x 2 x 10) - 18,000 vpd (900 vph x 2 x 10)
- Dual carriageway two lanes in each direction: 38,000 vpd (1000 vph + 900 vph x 2 x 10)

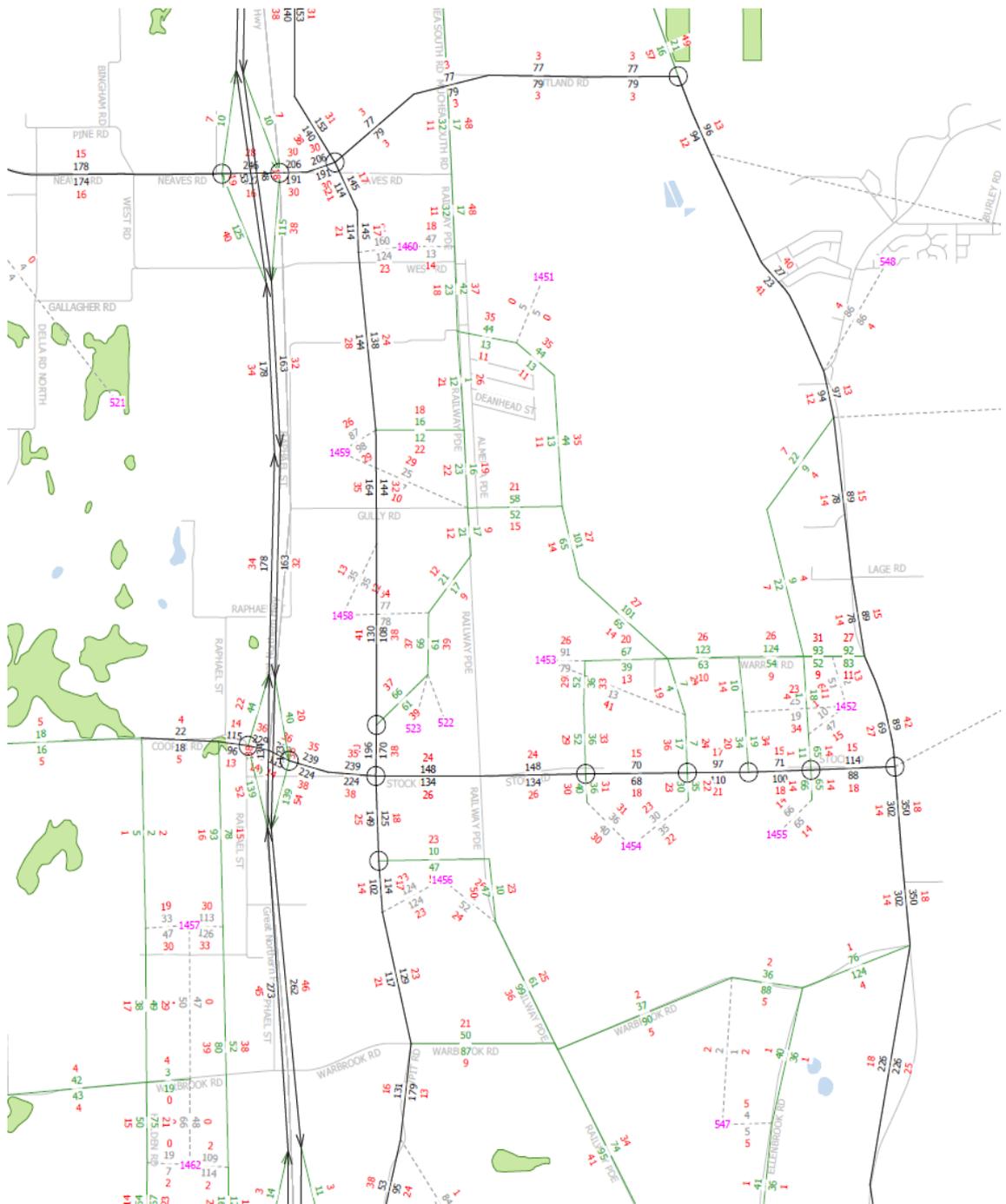
The study area is broken down into separable portions for ease of comment (northern section followed by central sections). An extract of the ROM is included for each section and a legend showing road cross sections is as follows:



**Figure 6-5 ROM Plot 2041+ Network at ultimate development (northern section)**

Comparison of traffic volumes at 2041+ with capacity on the roads proposed as single carriageway in the northern section (Figure 6-5) indicates no issues (single carriageway capacity 12,000-18,000 vpd).

Comparison of traffic volumes with capacity on the roads proposed as dual carriageway indicates no issues (dual carriageway capacity 38,000 vpd). The section of Rutland Road between the proposed Spine Road and the Tonkin Highway ramp will need consideration of intersection geometry at each traffic signal. A check using Highway Capacity Software indicates three lanes in each direction are required.



**Figure 6-6 ROM Plot 2041+ Network ultimate development (central section)**

Comparison of traffic volumes at 2041+ with capacity on the roads proposed as single carriageway in the central section (Figure 6-6) indicate no issues (single carriageway capacity 12,000-18,000 vpd).

Comparison of traffic volumes with capacity on the roads proposed as dual carriageway indicate no issues (dual carriageway capacity 38,000 vpd), with the exception of Stock Road between Tonkin Highway and the proposed north-south spine road (46,300 vpd forecast), which may require three lanes in each direction, not two as indicated on the ROM plot. A review using Highway Capacity software indicates three lanes in each direction is required to achieve a LoS of D.

GNH is proposed as a dual carriageway with two lanes in each direction. Forecast daily volumes of 60,500 vpd on GNH just south of Stock Road are above LoS C capacity (54,400 vpd from Road Reserves Review Table 7) but below the practical capacity of the road.

As traffic volumes approach full development levels, intersection treatments at Warbrook Road/GNH and Warren Road/GNH will require major upgrade, e.g., roundabout/signals. Warbrook Road provides an important road in the network with forecast volumes to 20,000 vpd indicating this road should remain open to serve the development with access across the rail line.

The capacity for a freeway with two lanes in each direction, is 60,000 vpd at a level of service of C (Table 7). The forecast traffic volume on Tonkin Highway (north of Warbrook Road) on full development is 53,500 vpd, which indicates adequate capacity on Tonkin Highway. It is noted however that daily volumes south of a proposed new interchange at Ellenbrook North (East/West) are 92,400 vpd indicating ultimate upgrade of Tonkin Highway is likely to be required to three lanes in each direction.

The intersection requirements on the major internal roads will need to be determined by detailed analysis, however based on the forecast traffic volumes, traffic signals or roundabouts will likely be required (Table 8).

**Table 8 Likely intersection requirements**

Intersection	Forecast traffic volumes vpd	Intersection treatment
Rutland Road	~20,000	
• GNH	~19,000	Roundabout/Signals
• Muehea South Road	~5,000	Flyover
• Spine Road	>25,000	Roundabout/Signals
Stock Road	~30,000	
• GNH	>65,000	Roundabout/Signals
• Spine Road	>36,000	Roundabout/Signals

*Austrroads Guide to Traffic Management Part 6 Intersections, Interchanges and Crossings* indicates the suitability of traffic control to different road types based on operational and Safe Systems objectives as shown in Table 9.

**Table 9 Suitability of traffic control to different road types based on operational and Safe Systems objectives**

Road type	Primary arterial	Secondary arterial	Collector and local crossing road	Local street
<b>Roundabouts</b>				
Primary arterial	A	A	X	X
Secondary arterial	A	A	A	X
Collector & local crossing road	X	A	A	O
Local street	X	X	O	O
<b>Traffic signals</b>				
Primary arterial	O	O	O	X
Secondary arterial	O	O	O	X
Collector & local crossing road	O	O	X	X
Local street	X	X	X	X
<b>Stop signs or give way signs</b>				
Primary arterial urban/(rural)	X/(X)	X/(O)	A	A
Secondary arterial urban/(rural)	X/(O)	X/(O)	A	A
Collector & local crossing road	A	A	A	A
Local street	A	A	A	A

*A = Most likely to be an appropriate treatment*

*O = May be an appropriate treatment*

*X = Usually an inappropriate treatment.*

## 6.2 External transport network

The external transport network will link the Bullsbrook industrial precinct with origins and destinations throughout Western Australia and beyond. The key links are as listed in Table 10.

**Table 10 External transport links**

Origin / Destination	Mode	Comments
Bullsbrook residential area	Road	via Stock Road and Rutland Road
Regional areas north and south of Perth	Road	via Tonkin Highway and GNH
	Rail	via Millendon – Narngulu freight railway
Muceha industrial area	Road	via Tonkin Highway and GNH, with a minor contribution via Muceha South Road
North-west corridor	Road	via Neaves Road or Tonkin Highway / Gnangara Road. There may be a need to consider an additional route via Cooper Road in future
Perth CBD	Road	via Tonkin Highway
Perth Airport	Road	via Tonkin Highway
Fremantle and Kwinana	Road	via Tonkin Highway
	Rail	via Millendon–Narngulu freight railway
Kewdale & Forrestfield Canning Vale	Road	via Tonkin Highway
	Rail	via Millendon–Narngulu freight railway
Eastern States	Road	via Tonkin Highway and/or GNH to Roe Highway
	Rail	via Millendon–Narngulu freight railway with connection to standard gauge line at Millendon or Kewdale

### 6.2.1 Rail network

The Millendon–Narngulu freight railway provides direct connections to Fremantle, Kwinana, Geraldton, and various points through the northern wheatbelt. It is expected that rail freight into and out of the precinct will travel via the proposed IMT on the western side of the railway line.

Initially, any trains to/from the north of Bullsbrook will use the southern approach siding, entering and leaving it via a crossover at the north end of the siding. The terminal has been designed to allow retrofitting of a direct entry/exit to the north, should this ever be required by a change in demand. In addition, it is also likely that electrification of the rail network and the introduction of autonomous trains will see most freight travel on rail rather than road. This possibility is not precluded by this plan.

For interstate rail traffic to access the Bullsbrook IMT, this would require substantial network changes and upgrades. In particular:

- Upgrading of the railway between Millendon Junction and Bullsbrook to dual gauge, with higher axle capacities. This will likely necessitate that one or more bridges or culverts be reconstructed.
- Provision would need to be made to accommodate 1800-metre trains in the southern approach siding, with internal sidings being capable of expansion to 900 metres, thus allowing an interstate train to be accommodated in two rakes.
- Turnouts and sidings within the terminal would need to be spaced to allow future upgrade to dual gauge if necessary.

Following the above, the design of all rail corridors should allow for standard gauge conversion in the future. Additionally, any new grade separations should allow for future double-stacked rolling stock.

## **6.2.2 Road network**

The NESRPF and the *Perth and Peel @ 3.5 Million Transport Network* both include an overview of the anticipated road freight network in the north-east and north-west corridors (Figure 3-3).

The key external roads affected by the industrial precinct and IMT will be:

- Great Northern Highway
- Tonkin Highway
- Neaves Road and Gnangara Road
- Muchea South Road
- North-south spine road
- Railway Parade
- Maralla Road

### **Great Northern Highway**

GNH will remain as an important transport route, though most freight traffic will be reallocated to Tonkin Highway. It is expected that truck traffic to and from the Eastern States would continue to use the more direct route via GNH unless regulatory controls were instituted. The largest HWL and OSOM vehicles are proposed to be directed to the new north-south Spine Road, bypassing the Bullsbrook town centre. GNH is expected to be duplicated at some point in the future, which will replace the intermittent overtaking provisions south of the Bullsbrook townsite.

### **Tonkin Highway extension**

The Tonkin Highway extension between Reid Highway and Muchea was completed in mid-2020. It has become the primary north-south road to/from the study area, particularly for industrial/freight traffic coming from within the Perth metropolitan area.

### **Neaves Road and Gnangara Road**

Neaves Road and Gnangara Road are the primary east-west links between the north-west and north-east corridors. Traffic to/from the northern part of the north-west corridor (i.e., Pinjar and Neerabup industrial areas and adjacent residential areas) would likely use Neaves Road as the main connector. Traffic to/from Wangara and surrounding areas is more likely to use Tonkin Highway and Gnangara Road.

### **Muchea South Road**

Although it currently forms an important link between Neaves Road and Brand Highway, the Muchea South Road lost this regional traffic once the Tonkin Highway extension opened. Muchea South Road will still carry some north-south traffic and will service those parts of the industrial precinct north of Neaves Road.

### **North-south spine road**

A new north-south spine road would be developed that extends Sawpit Road northward to Neaves Road. It would be designed to accommodate RAV 7 and OSOM access between Stock Road and Neaves Road, with restrictions on industrial traffic through movement south of Warbrook Road.

### **Railway Parade**

With the opening of the Tonkin Highway extension and the construction of a north-south spine road, Railway Parade would no longer provide the primary north-south route west of the railway line. It would be realigned to the south of Stock Road and to the north of the IMT.

### **Future east-west link road**

Connectivity to/from the west could potentially become an issue over the longer term. Currently, Gngangara and Neaves Roads are the only two east-west connections with the Bullsbrook Industrial precinct and these two connections are 18 km apart (Gngangara Road is 11 km to the south and Neaves Road connects to the precinct's northern boundary). Accordingly, an additional east-west road connection between the North-West Sub-region (the future Whiteman – Yanchep Highway) and the Bullsbrook industrial centre may be required as a lack of direct connectivity to/from the west may reduce the efficiency of transport operations in the precinct and impede workforce access.

Several roads have been considered for this connection, including Cooper Road, Warbrook Road and Maralla Road.

As mentioned in section 7.1.4, the NESRPF recognises the potential longer-term opportunity to provide an additional and more direct east-west road connection between the North-West Subregion and the North Ellenbrook/Bullsbrook industrial centre utilising the Cooper Road reserve alignment. Future investigations to determine the feasibility of this road connection will need to include consideration of efficiency benefits for the broader regional transport network in this area and the potential impacts on the Gngangara Priority 1 Water Protection Area, adjacent bushland, and other environmental attributes.

Warbrook Road was considered; however Main Roads WA considers an interchange at this location to be too close to Stock Road (2.35 km south). Maralla Road was also considered as a potential alignment but was also discarded due to environmental constraints.

Another possible option is for an interchange to be built at Tonkin Highway, approximately mid-block between Warbrook and Maralla Roads, however this interchange is likely to service the North Ellenbrook urban cells only with a potential connection from this to a future east-west link still to be determined.

## **6.2.3 Analysis of external transport networks**

Forecast traffic volumes for the 2041 network and ultimate land use are summarised in Table 11 together with commentary.

**Table 11 Forecast traffic volumes 2041 network and ultimate volumes**

Road	Carriageway	Capacity vpd <sup>26</sup>	Forecast vpd	Comment
Great Northern Highway				
• North of Stock Road	Two lanes in each direction	54,400	24-25,000	No capacity issues anticipated
• South of Stock Road	Two lanes in each direction	54,400	<65,000	Forecast daily volumes above LoS C capacity but below practical capacity of road.
Tonkin Highway				
• North of Stock Road	Two lanes in each direction	60,000	35,000	No capacity issues anticipated
• South of Stock Road	Two lanes in each direction	60,000	56,000	No capacity issues anticipated

As indicated in Table 8, major intersections are likely to require traffic signals and roundabouts, specifically Rutland Road/GNH and Stock Road/GNH. Future dual carriageway of GNH will require channelization at unsignalised intersections to include right and left turn pockets.

### 6.3 Constraints to delivery of the transport network

There are several challenges/constraints that will need to be overcome to deliver an effective transport network for the Bullsbrook Industrial Area. These are summarised in the following sections.

#### 6.3.1 Environmental<sup>27</sup>

- Gngangara Priority 1 Water Protection Area lies to the west of the precinct.
- Proximity of Conservation Category Wetlands.
- High water table through much of the precinct.
- Height restrictions posed by the air base may restrict bridge heights/locations.

#### 6.3.2 Funding

- Cost to build transport infrastructure and who pays/delivers?
- Developer contribution plans will be required.

<sup>26</sup> Road reserves review

<sup>27</sup> Refer to Bullsbrook Freight and Industrial Land Use Planning Strategy Environmental Study (GHD 2021) for further information

### **6.3.3 Timing and intensity of development<sup>28</sup>**

- How many jobs will the precinct create, when will they be created and where within the precinct will most of them be located? These will determine the nature, form and staging of the transport network, including the potential for frequent public transport services and the need to cater for active transport.

### **6.3.4 Geographic separation and connectivity**

- The distance between the precinct and other activity centres makes it difficult to provide extensive connectivity, as well as encourage a high proportion of access by active transport. However, this will be addressed to some degree by the development of two urban cells to the south of Warbrook Road (Ellenbrook North (West and East) District Structure Plan areas).

### **6.3.5 Stock Road / Tonkin Highway interchange**

- The Stock Road/Tonkin Highway interchange cannot accommodate the largest of vehicles (up to 53.5 m in length and a 10 m x 10 m clearance requirement). This constraint means that the development of a north-south spine road between Stock and Neaves Roads that is able to accommodate RAV 7 and OSOM vehicles is essential in order to prevent these large vehicles from having to travel along GNH and through the Bullsbrook town site.

### **6.3.6 Social**

- Impact of new transport links on private land/property.

## **6.4 Opportunities for delivery of the transport network**

### **6.4.1 Heavy vehicles**

- Delivery of Stock Road connecting to GNH, north-south spine road from Stock Road to Neaves Road and a realigned Neaves-Rutland Road, each with capacity to accommodate a 10 m x 10 m clearance, would allow RAV 7 and OSOM vehicles to access the proposed IMT and will provide a significant reduction in the number of heavy vehicles going through the Bullsbrook town centre.

### **6.4.2 Safety**

- Grade separation from the railway line will improve safety.

### **6.4.3 Connectivity**

- Increased intensity of development will improve the ability to provide transport links to, from and through the precinct, particularly east-west.
- An increased population base in the Bullsbrook area and Ellenbrook North will increase demand on the transport network.
- Improved transport links will allow for travel to the area from current low self-contained employment areas.

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<sup>28</sup> Refer to Bullsbrook Land Use Strategy (GHD 2021) and the Bullsbrook Freight and Industrial Market Needs Assessment (Macroplan 2020) for information on likely land development and staging

## 7. Summary & Recommendations

### 7.1 Summary

Regional and sub-regional planning for the Perth metropolitan region has identified a long-term requirement for an industrial precinct to be developed at South Bullsbrook, in Perth's north-east corridor. The industrial precinct is to include an intermodal freight terminal as its focal point, with much of the surrounding industrial precinct featuring services and industries complimentary to the IMT.

Previous studies have confirmed that the preferred location for the IMT is west of the Millendon Junction – Narngulu railway, north of Stock Road. A planning control area (No 115) has been established over a site stretching approximately 2,000 metres from Stock Road to Gully Road.

The IMT will primarily serve as a distribution point for containerised freight from Fremantle inner and outer harbours into Perth's north-east and north-west corridors, and regional areas north of Perth. Initial terminal capacity has been estimated as 150,000 TEU/annum, growing ultimately to 250,000 TEU/annum.

The Bullsbrook Freight and Industrial Land Use Planning Strategy area is forecast to generate 208,200 vpd onto the surrounding road network upon full development. Road access to the IMT will be via a new north-south spine road to the west of the site. The new spine road will connect to an upgraded Stock Road, which will be the major link east to GNH and west to Tonkin Highway.

### 7.2 Recommendations

Several recommendations have been developed to give effect to the transport strategy for the Bullsbrook industrial precinct. These are summarised in Table 12.

**Table 12: Recommendations**

Number	Item	Recommended action	Stakeholders	Timeframes
1	Stock Road	<ul style="list-style-type: none"> <li>- Priority for development/construction.</li> <li>- Regional road (status to be determined).</li> <li>- Include it as a RAV 7 route.</li> <li>- Upgrade to dual carriageway and extend it eastward to connect Tonkin Highway with GNH.</li> <li>- Will likely require three lanes between Tonkin Highway and the spine road post 2041.</li> <li>- Once proposed development in the area that will generate additional freight train movements and/or traffic volumes is known, undertake an ALCAM<sup>29</sup> assessment to determine need for grade separation over the railway.</li> <li>- Consider renaming it to Cooper Road to avoid confusion with Stock Road south of Perth.</li> <li>- Section between IMT and GNH to accommodate OSOM vehicles.</li> </ul>	MRWA, DPLH, City of Swan, PTA	<p>Prior to establishment of IMT.</p> <p>When proposed development is known that will generate additional freight train movements and/or traffic volumes that will create a safety issue without separation.</p>
2	Railway Parade	<ul style="list-style-type: none"> <li>- Realign the section south of Stock Road to connect to future spine road (due to grade separation of Stock Road over rail and construction of IMT).</li> <li>- Realign the section north of the IMT so that it aligns with connectivity requirements of the IMT.</li> </ul>	City of Swan, DPLH	<p>Upon development of the IMT and/or the development of the land south of Stock Road (west of the railway).</p> <p>When Stock Road is grade separated over the railway.</p>

<sup>29</sup> Australian Level Crossing Assessment Model

Number	Item	Recommended action	Stakeholders	Timeframes
3	North-south spine road	<ul style="list-style-type: none"> <li>- Construct a restricted link from the northern end of Sawpit Road to Neaves Road.</li> <li>- The intersection with Warbrook Road should restrict through movements south of Warbrook Road to prevent/discourage industrial traffic movement through residential area to access PDNH at the proposed new interchange located between Warbrook and Maralla Roads.</li> <li>- Intersection with Stock Road to be approximately midway between Tonkin Highway and railway line (west side of City of Swan recycling centre).</li> <li>- Section between Stock and Neaves Roads to accommodate RAV 7 and OSOM access.</li> </ul>	City of Swan, DPLH	<p>Prior to establishment of IMT.</p> <p>Upon subdivision of the industrial area north of Warbrook Road.</p> <p>Restriction on through access south of Warbrook Road should be implemented at the time of subdivision of the North Ellenbrook (East and West) District Structure Plan areas.</p>
4	Neaves Road	<ul style="list-style-type: none"> <li>- Realign, duplicate, and connect with Rutland Road and GNH with a grade separation over the railway line.</li> <li>- Potential to reclassify realigned route to Primary Regional Road status.</li> <li>- To accommodate RAV 7 and OSOM access.</li> </ul>	MRWA, City of Swan, DPLH	<p>Prior to establishment of IMT.</p> <p>As development of Neerabup and Bullsbrook industrial areas occurs.</p>
5	Great Northern Highway	<ul style="list-style-type: none"> <li>- Minor upgrades will be required at new intersections created by the industrial precinct.</li> <li>- Consider duplication of some sections, particularly the southern approach to the Bullsbrook townsite.</li> </ul>	MRWA, City of Swan, DPLH	Upon development of industrial lots fronting GNH.

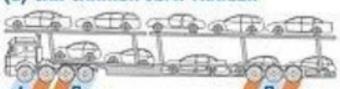
Number	Item	Recommended action	Stakeholders	Timeframes
6	Almeria Parade (north of Stock Road)	<ul style="list-style-type: none"> <li>- Consider alignment of Almeria Parade and extend south to connect to Stock Road and the future industrial area at Lot 300.</li> </ul>	City of Swan, DPLH	<p>Upon development of Lot 300.</p> <p>Upon extension of Stock Road to the east.</p>
7	Planning process	<ul style="list-style-type: none"> <li>- To consider the potential for freight transport infrastructure to influence (and be impacted by) residential or other incompatible urban development.</li> <li>- Several parcels of land may have frontage access to only one road with limited alternatives. Each “cell” within the industrial area will be required to have at least two access routes to different destinations to allow for evacuation and access by emergency services.</li> <li>- Access roads to the south west corner of the strategy area will be required for efficiency and convenience and to provide an interface between the industrial land and the proposed residential extension from the south.</li> <li>- Transport infrastructure planning for the industrial precinct to consider restrictions posed by RAAF Base Pearce.</li> </ul>	Planning agencies, DPLH	Structure planning phase
8	Railway crossings	<ul style="list-style-type: none"> <li>- Undertake a comprehensive study into level crossings of the railway within and immediately surrounding the study area.</li> <li>- Perform ALCAM assessments as required.</li> <li>- Design of any grade-separated crossings of the railway should accommodate double stacked railway wagons (height of 7.2 metres).</li> </ul>	City of Swan, MRWA, PTA, Rail operator, DPLH	<p>Prior to establishment of the IMT.</p> <p>Grade separation to be assessed once proposed development is known that will generate additional freight train movements/and or traffic volumes which</p>

Number	Item	Recommended action	Stakeholders	Timeframes
				may create safety issues.
9	Road design	<ul style="list-style-type: none"> <li>- New roads must accommodate 36.5-metre road trains, i.e., road engineering to incorporate relevant swept path geometry, acceleration and deceleration provision, and other key design elements.</li> <li>- Design and posted speeds <i>within</i> the industrial precinct must reflect safe system principles. Lower posted speeds are also likely to reduce the differential between light and heavy vehicle travel speeds, thereby reducing unsafe overtaking due to driver frustration.</li> </ul>	City of Swan, MRWA, DPLH	Design phase.
10	Bus services	<ul style="list-style-type: none"> <li>- Undertake bus network planning. The focus should be on the major north-south spines of GNH and Railway Parade/Spine Road to link residential with employment and service precincts.</li> <li>- Provide safe pedestrian crossing facilities near stops (particularly near signalised intersections).</li> </ul>	Transperth/PTA, City of Swan, MRWA, DPLH	Following substantial completion of the subdivision and land development process.
11	Active transport infrastructure	<ul style="list-style-type: none"> <li>- Provide off-road paths along the primary routes to cater for walking and cycling. Routes include: GNH as far north as Rutland Road, Stock/Cooper Road, Neaves/Rutland Road, Maralla Road, Warbrook Road, Railway Parade, the connector road for the potential mid-block interchange with Tonkin Highway between Maralla and Warbrook Roads, and the proposed north-south spine road/Sawpit Road.</li> <li>- Elsewhere, road reserves should be wide enough to accommodate generous shoulders suitable for cycling to provide a “last mile” connection from the primary routes.</li> <li>- Requirement for the provision of end of trip facilities to be included in development approvals for the industrial sites.</li> </ul>	MRWA, City of Swan, Department of Transport, DPLH	Design phase of new roads.

Number	Item	Recommended action	Stakeholders	Timeframes
12	Railway line	<ul style="list-style-type: none"> <li>- Should Bullsbrook become a destination for interstate rail traffic, substantial network changes and upgrades would be required, including:               <ul style="list-style-type: none"> <li>o Upgrading of the railway between Millendon Junction and Bullsbrook to dual gauge, with higher axle capacities. This will likely necessitate that one or more bridges or culverts be reconstructed.</li> <li>o Provision to accommodate 1800-metre trains in the southern approach siding, with internal sidings being capable of expansion to 900 metres.</li> <li>o Turnouts and sidings within the terminal would need to be spaced to allow future upgrade to dual gauge if necessary.</li> <li>o The design of all rail corridors should allow for standard gauge conversion. Any new grade separations should allow for future double-stacked rolling stock.</li> <li>o Trains to/from the north would initially use the southern approach siding by way of a crossover. If demand grows in the future, the IMT layout must be flexible enough to allow for a direct approach from the north.</li> </ul> </li> </ul>	PTA, Railway Operator, DPLH	Once determination is made to route interstate rail to/from the Bullsbrook IMT.

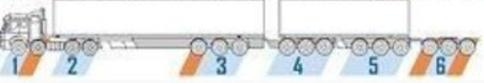
# Appendices

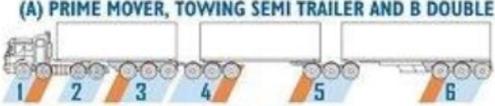
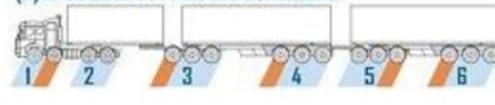
# Appendix A - RAV Network Configurations

Category & RAV Network	Vehicle Description and Configuration	Length (m)	Max Mass (T)	Axle
	<p>(A) PRIME MOVER, SEMI TRAILER TOWING A PIG TRAILER</p>  <p>(B) PRIME MOVER TOWING SEMI TRAILER</p>  <p>(C) B-DOUBLE</p>  <p>(D) SHORT B TRIPLE</p>  <p>(E) CAR CARRIER SEMI TRAILER</p> 	<p>(A) ≤27.5</p> <p>(B) ≤20</p> <p>(C) ≤27.5</p> <p>(D) ≤27.5</p> <p>(E) ≤25</p>	<p>65.5</p> <p>47.5</p> <p>67.5</p> <p>87.5</p> <p>42.5</p>	<p>4</p> <p>3</p> <p>4</p> <p>5</p> <p>3</p>
	<p>(A) PRIME MOVER, SEMI TRAILER TOWING A DOG TRAILER</p> 	<p>≤27.5</p>	<p>84</p>	<p>5</p>

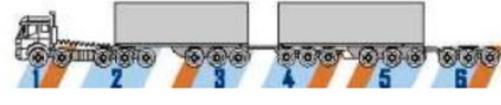
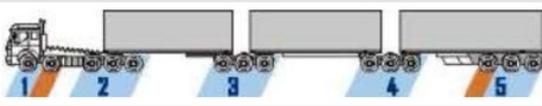
	<p>(A) PRIME MOVER, SEMI TRAILER TOWING 6 AXLE DOG TRAILER</p> 	$\leq 27.5$	87.5	5

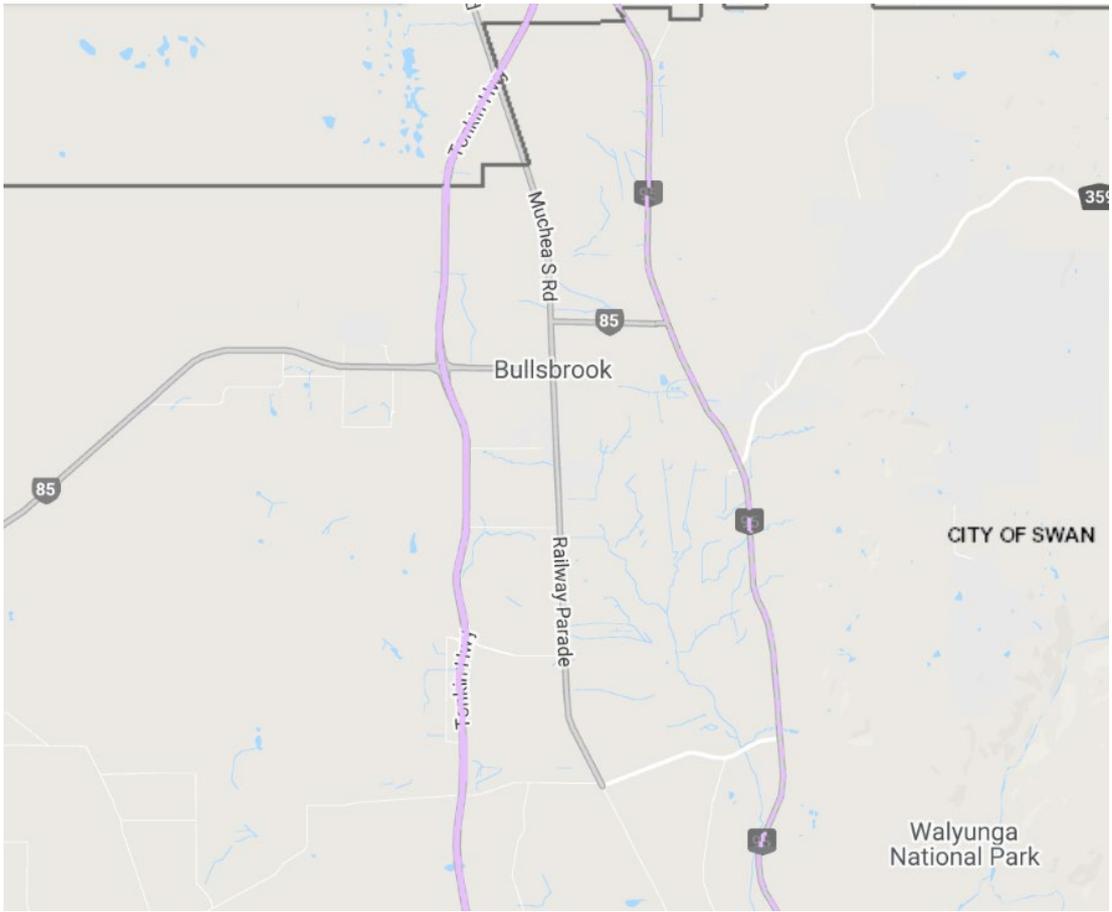
	<p>(A) PRIME MOVER, SEMI TRAILER TOWING A DOG TRAILER</p> 	(A) $>27.5,$ $\leq 36.5$	84	5
	<p>(B) PRIME MOVER, SEMI TRAILER TOWING A DOG TRAILER AND CONVERTER DOLLY</p> 	(B) $>27.5,$ $\leq 36.5$	84+d	6
	<p>(C) B-DOUBLE TOWING A CONVERTER DOLLY</p> 	(C) $>27.5,$ $\leq 36.5$	67.5+d	5
	<p>(D) B-TRIPLE</p> 	(D) $>27.5,$ $\leq 36.5$	84	5

	<p>(A) PRIME MOVER, SEMI TRAILER TOWING 6 AXLE DOG TRAILER</p> 	(A) $>27.5,$ $\leq 36.5$	87.5	5
	<p>(B) B-TRIPLE</p> 	(B) $>27.5,$ $\leq 36.5$	87.5	5
	<p>(C) PRIME MOVER SEMI TRAILER TOWING A 6 AXLE TRAILER &amp; CONVERTER DOLLY</p> 	(C) $>27.5,$ $\leq 36.5$	87.5+d	6

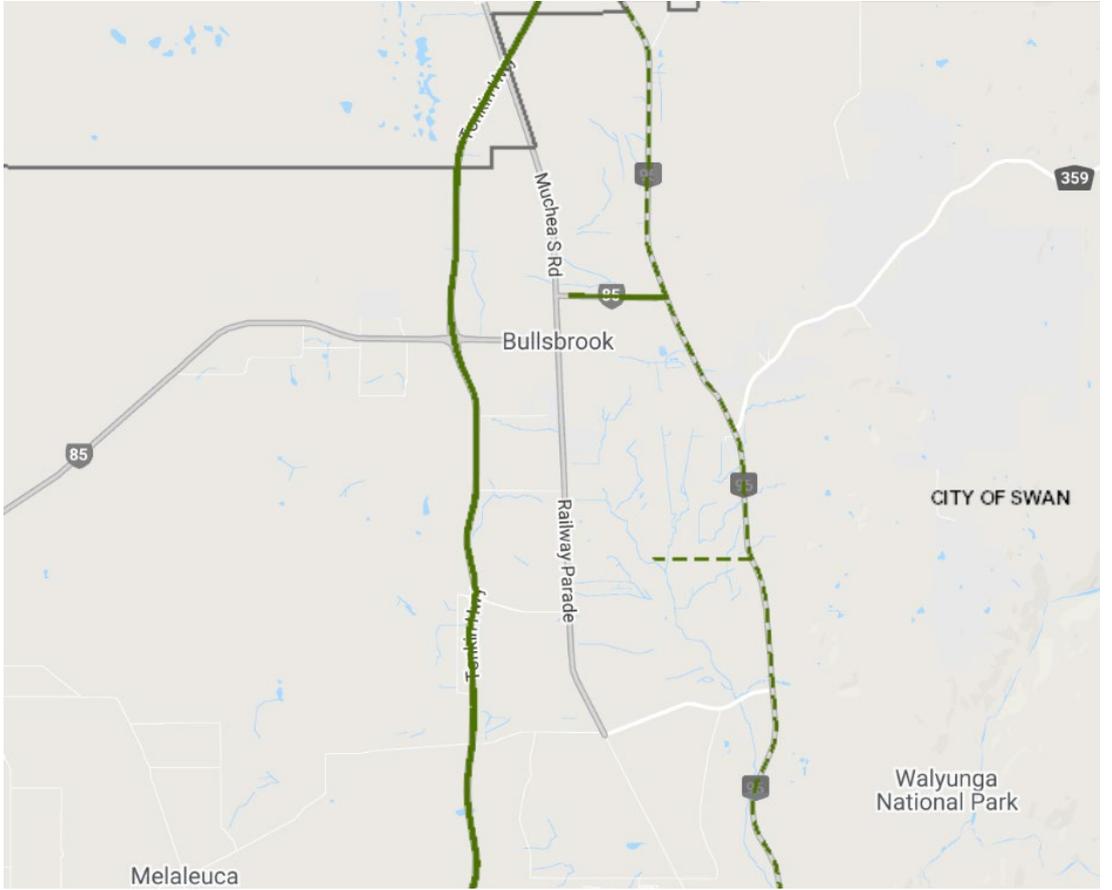
		(A) >27.5, ≤36.5	107.5	6
		(B) >27.5, ≤36.5	107.5	6

GNH is also approved for Tri Drive 4 combinations.

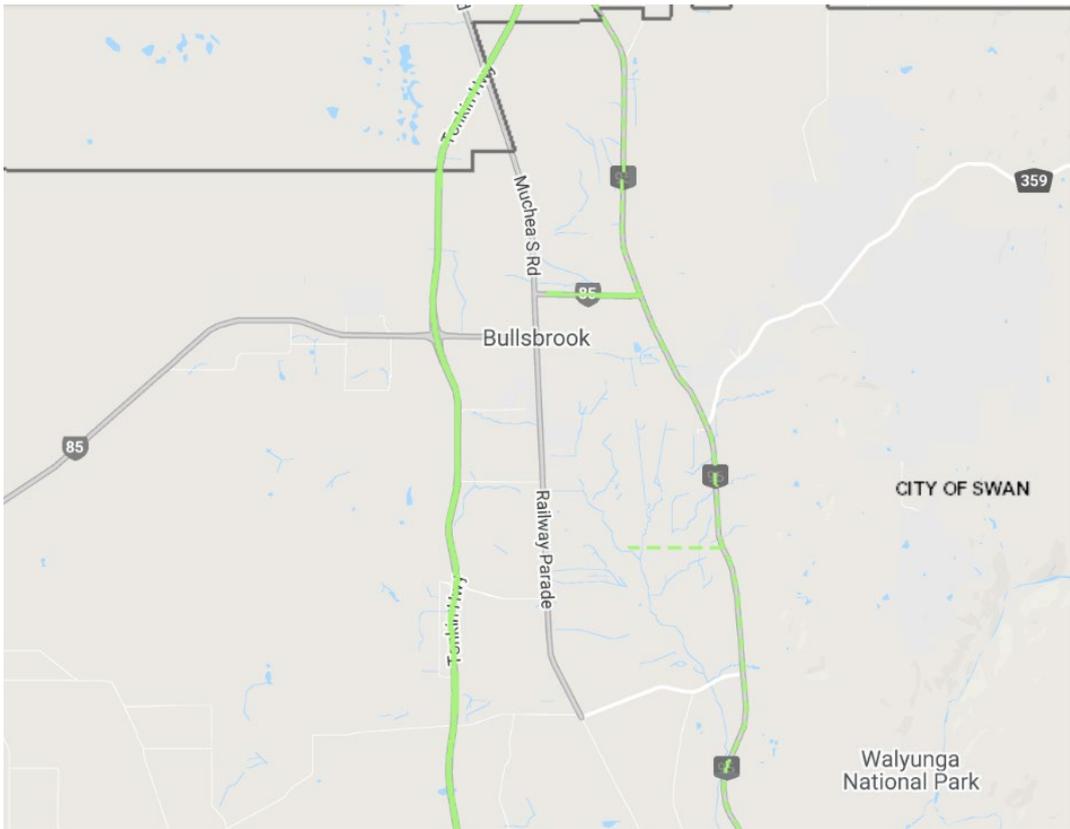
4	Vehicles not exceeding 36.5 m			
4(A)	Prime Mover, semi trailer & dog trailer		36.5	91
4(B)	Prime Mover, semi trailer & dog trailer towing a 2 or 3 axle converter dolly		36.5	91
4(C)	B Double towing a 2 or 3 axle converter dolly		36.5	71
4 (D)	B-Triple		36.5	91
4(E)	Prime Mover and semi trailer towing a B Double		36.5	111
4(F)	B-double towing a dog trailer		36.5	111



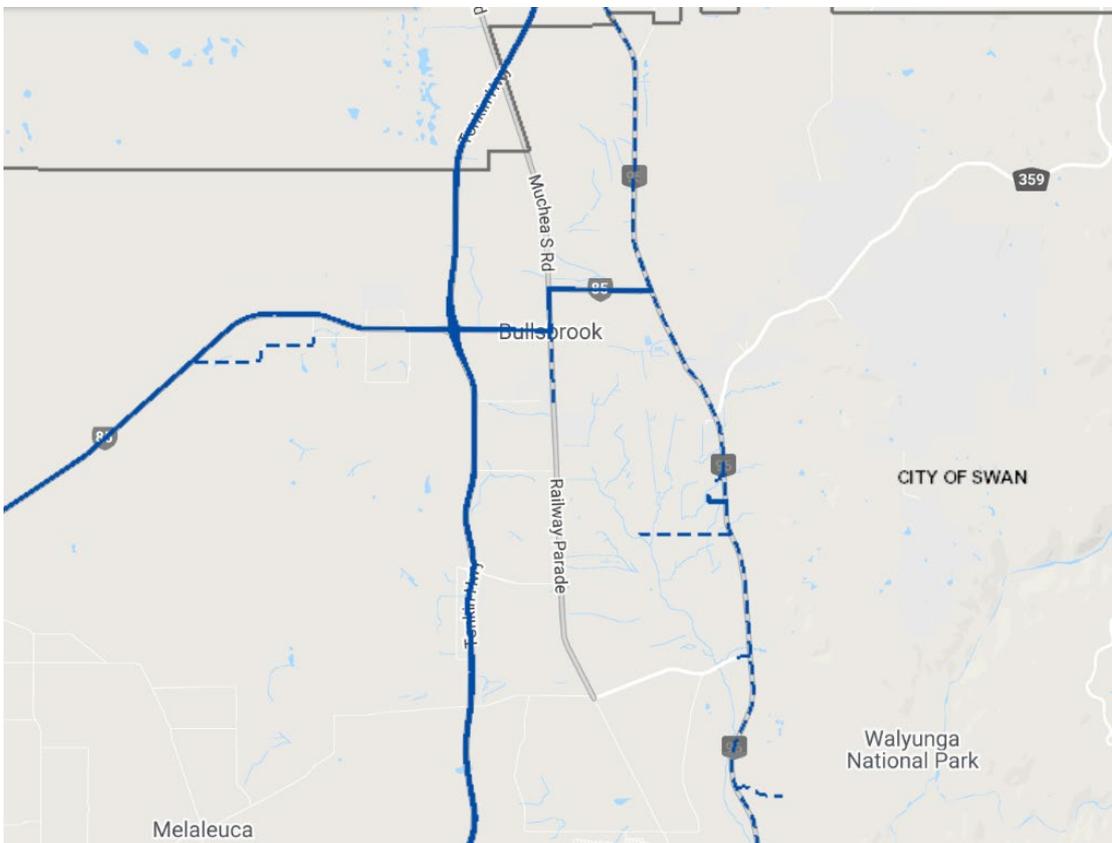
Network 7 RAV route (pink)



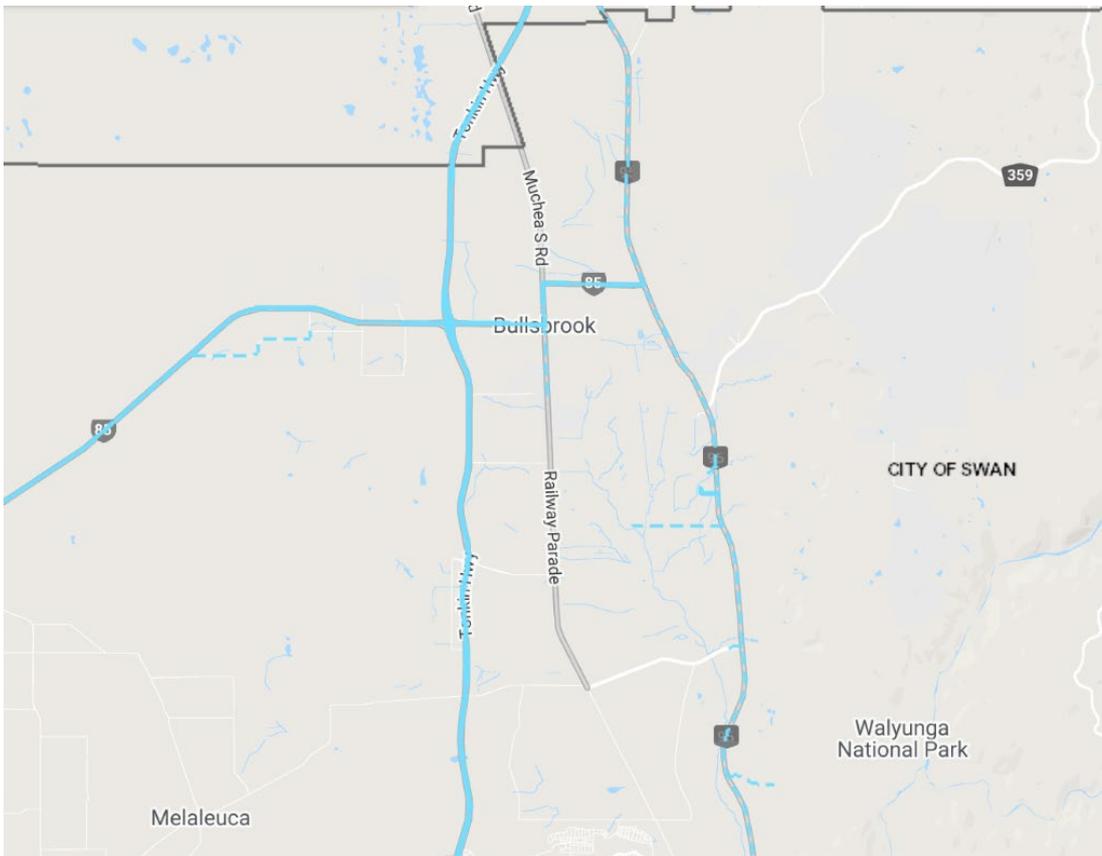
Network 6 RAV route (green)



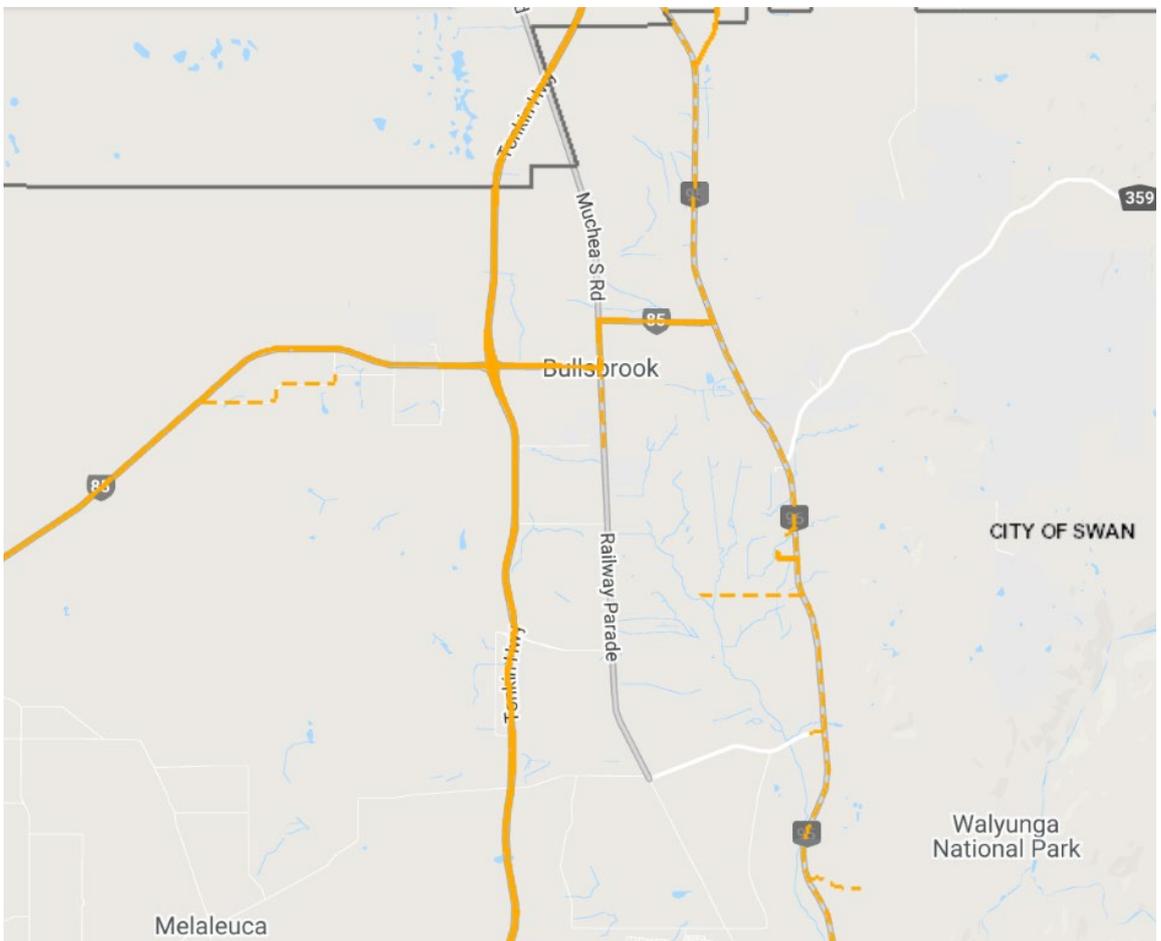
Network 5 RAV route (light green)



Network 4 RAV route (blue)



Network 3 RAV route (light blue)



Network 2 RAV route (orange)

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Level 10

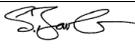
999 Hay Street

T: 61 8 6222 8222 F: 61 8 6222 8555 E: [permail@ghd.com](mailto:permail@ghd.com)

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		Name	Signature	Name	Signature	Date
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