MUCHEA INDUSTRIAL PARK
AMENDMENT 1

LOCAL STRUCTURE PLAN 1
PART TWO: EXPLANATORY REPORT
January 2021

HARVIS

CLE Town Planning + Design

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AMENDMENT 1
LOCAL STRUCTURE PLAN 1

PART TWO: EXPLANATORY REPORT

Prepared by:

CLE Town Planning + Design

PO Box 796
Subiaco WA 6904
08 9382 1233
www.cleplan.com.au

2322Rep124A
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HARVIS CLE Town Planning + Design

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CLIENT / PROJECT MANAGER

Harvis

PROJECT TEAM

Town Planning and Urban Design - CLE Town Planning + Design

Retail Assessment - Shrapnel Urban Planning

Traffic Analysis - WSP

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1.0 PLANNING BACKGROUND

1.1 Introduction and Purpose

Local Structure Plan 1 (LSP 1) for the Muchea Industrial Park (MIP) was approved by the Western Australian Planning Commission (WAPC) on 13 October 2017. LSP 1 is the overarching framework guiding the staged subdivision and development of approximately 150 hectares of industrial land. To date, the WAPC has issued subdivision approvals for the first two stages and development has significantly progressed. BP has constructed one of the largest roadhouses and truck stops in Western Australia and the vision for a strategic employment node in Muchea is being delivered. The proponent, Harvis, has constructed the first stage lots with the majority already sold. The MIP has generated significant momentum and as a result, attracted interest from parties seeking to invest in the MIP and deliver land uses that were not originally anticipated at the time LSP 1 was prepared.

LSP 1 was primarily expected to attract land uses requiring large laydown and storage areas associated with the resources sector. Whilst this is still the case, an opportunity has arisen to further diversify the range of land uses capable of occurring within the MIP in order to enhance the services and amenities available to workers. These services and amenities would also provide for local residents within the primary catchment as well as passing traffic on Tonkin Highway.

Whilst an element of 'shop' and 'retail' offerings has been planned within the broader Muchea Employment Node (MEN) from the outset, it has become apparent that these types of uses will be viable in the shorter-term. To investigate the matter further, Harvis commissioned the preparation of a Retail Needs Assessment (RNA) (refer Appendix 1). The RNA concludes that within the primary catchment of the MIP, there is currently unmet demand for an additional 925m² of shop / retail floor space. By the year 2031, the RNA estimates that unmet demand will increase to approximately 2,045m² of shop / retail floor space based on an expanding workforce population within the MIP combined with population growth within the primary catchment.

Amendment 1 to LSP 1 has been prepared to facilitate development of a local service centre at the entrance to the MIP in response to an identified demand for shop / retail services and other complimentary uses. A 2.1 hectare site has been selected that is anticipated to provide for up to 6,850m² of nett leasable area (NLA). This floor space is planned to accommodate up to 2,650m² of uses such as drive-thru fast food, fuel retail, medical services / consulting rooms, a small supermarket with a liquor offering as well as up to 4,200m² of service-based light industrial uses such as automotive repairs / parts and tyres. The specific site has been determined based on its strong locational attributes, both in the context of Harvis' MIP as well as the broader MEN. These include:

- High-level of exposure to Tonkin Highway enabling the capture of passing trade;
- Easy navigation for vehicles travelling on Tonkin Highway in both directions, with efficient and legible access provided to the site;
- Its location within the first stages of subdivision and development, allowing for delivery of the local service centre in the shorter-term. This will bring services and amenities to the MIP sooner and create additional jobs and investment up-front;

- Synergies with the existing BP Roadhouse on the opposite side of the 'Loop Road' that will combine to create a focal point at the entrance to the MIP, strengthening the node and assisting to define the precinct at the key access point to the broader MEN from Tonkin Highway; and
- It will service an immediate industrial catchment that is being developed as part of the first stages of the MIP. This will maximise the immediate customer base and provide services and amenities within immediate proximity of the first employment uses in the MIP.

This Part 2 - Explanatory Report explains and justifies the amendments to the Part 1 – Implementation Report and the LSP Map. It does not replace the previous Explanatory Report prepared in support the original LSP 1 (September 2017) rather, it forms an addendum and is supplementary to, the previous Explanatory Report and addresses only the proposed amendments.

Amendment 1 to LSP 1 is supported by the necessary technical reports as follows:

- Appendix 1: Retail Needs Assessment (Shrapnel Urban Planning) – demonstrates the need for the local service centre in Muchea and demonstrates the suitability of the proposed location;
- Appendix 2: Traffic Impact Assessment Addendum (WSP) – demonstrates that the anticipated increase in traffic volumes can be suitably accommodated via the planned network of roads and intersections; and
- Appendix 3: Original 2015 Traffic Impact Assessment (GTA Consultants) – provided for information purposes only and to be used as a point of reference when reading the Traffic Impact Assessment Addendum at Appendix 2.

1.2 Planning Framework

1.2.1 Strategic Planning Framework

Muchea Employment Node Structure Plan (August 2011)

Prepared by the WAPC and finalised in 2011, the Muchea Employment Node Structure Plan (MENSP) sets the high-level strategic framework for the planning of an employment node in Muchea. The MENSP has guided previous local scheme amendments and structure plans within the MEN that are in turn, coordinating the subdivision and development of the first stages of the MIP. With specific reference to the purpose of this amendment, the MENSP includes a list of land uses that are planned to occur within the MEN including indicative areas for these uses.

Table 1.1 of the MENSP outlines an indicative 'land use area split' for the MEN to the year 2030 based on a total demand for 596 hectares. The predominant land use typologies anticipated for the MEN were 'primary/rural' at 47% of the total land area, 'storage/distribution' at 24%, 'service industry' at 16% and 'manufacturing/processing/fabrication' at 9.5%. Whilst relatively minor by comparison, the MENSP also made provision for approximately 1.0 hectare of 'shop/retail' and 6.4 hectares of 'other retail' at 1% of the total area. Consistent with the planning for the MEN, this amendment to LSP 1 will provide for approximately 2,650m² of 'shop/retail' and 'other retail' floor space, delivering a range of uses intended to service employees of the MEN as well as local residents and passing trade on Tonkin Highway.

Shire of Chittering Local Planning Strategy (2019)

The Shire of Chittering's Local Planning Strategy (LPS) was finalised in 2019 and serves as the local strategic framework guiding land use planning across the Shire. The LPS was finalised after LSP 1 was approved and as such, includes specific objectives and strategies for LSP 1 as part of the broader MEN.

In terms of planning for industrial land uses, the key objective stated in the LPS is to:

> *"provide for and protect industrial land uses at strategic locations and limit ad-hoc industrial locations throughout the Shire".*

To achieve this objective, the LPS seeks to:

- *Make Muchea Industrial Park a focus for industrial development; and*
- *Promote and cater for a range of compatible uses within industrial zoned land and incorporate design features that address buffers and amenity, including fencing, vegetation buffers, open space and other compatible transition uses."*

With specific reference to the MEN, the LPS identifies the following objectives:

- *Promote industrial development within the Muchea Industrial Park; and*
- *Respect the rural amenity and environmental values in the design and development of the Muchea Industrial Park.*

The second objective listed above has been suitably addressed through the preparation and approval of LSP 1, which identifies those areas of land capable of development and those with environmental values that warrant protection and management within local reserves. As the amendment covers an area previously identified for industrial development, on site environmental values are not a relevant consideration to the proposal.

In order to promote the MEN for industrial development, the LPS outlines the following relevant strategies and actions:

- *Maximise efforts to realise economic flow-on effects generated by State infrastructure projects, including Northlink; and*
- *Direct all future industrial development to the Muchea Industrial Park.*

The proximity of the proposed amendment site to Tonkin Highway (Northlink) is a critical factor in why this location for the local service centre has been chosen. The high-exposure and direct access provided by the MENs only interchange with Tonkin Highway provides an unrivalled opportunity for not only diversifying and enhancing the local amenities available for employees and travellers, it will increase the employment density within the MEN, attract business investment in the shorter-term and serve as a catalyst for further investment and business attraction. This ability for the amendment site to accommodate a local service centre in the short term stems directly from Tonkin Highway, thereby maximising the economic flow-on effects generated by State infrastructure, as strategised by the Shire's LPS.

Further elements of the LPS that support the proposed amendment that aren't specifically related to industrial land uses or the MEN are identified in terms of the more general provision of retail services and the economic opportunity that road infrastructure projects, such as the Tonkin Highway extension, provide. One of the key issues identified at clause 4.5.3 'Key issues summary' of the LPS in relation transport, is to explore the opportunities presented by Northlink (Tonkin Highway extension), whilst acknowledging the challenge that new transport routes present in terms of the Shire's existing retail services not capturing south-bound commuter traffic. The LPS also identified the likely economic impact that the Bindoon Bypass project will have on the Bindoon Townsite, with regional traffic no longer passing through Bindoon.

North-south regional traffic will however, directly pass the MIP as a result of the Tonkin Highway extension. Consistent with the opportunities and challenges identified in the LPS, the proposed local service centre will capitalise on the opportunity afforded by the recent completion of Tonkin Highway and ensure that the retail demand generated by passing trade is not leaked as a result of the Bindoon Bypass, but can still be captured within the Shire of Chittering.

The proposed amendment is consistent with the provisions of the LPS and is a timely response to the recent changes in the regional road network and the ongoing delivery of the MIP by Harvis.

Draft Muchea Industrial Park Structure Plan (October 2020)

Once adopted, the draft Muchea Industrial Park Structure Plan (MIPSP) will supersede the MENSP outlined above. The MIPSP is described as a reviewed and updated version of the MENSP in response to changes to the transport network, updates to the policy framework and the need to review the original economic assumptions that informed the MENSP.

With regards to the distribution of land uses, the MIPSP (similarly to the MENSP) acknowledges that a small proportion of floor space within the overall structure plan area will comprise 'other retail' and 'shop/retail' land uses, totalling approximately 2% of the total floor area within the MIPSP. The proposal to deliver a small proportion of shop/retail and service commercial uses at the main entrance to the MIPSP is therefore consistent with the direction of the draft MIPSP. In terms of distribution, the proposed location within the overall structure plan is considered highly suited given its exposure to Tonkin Highway, ease of access for both estate and regional traffic, its ownership structure and approval status.

The proposed site is covered by an approved subdivision application and is contracted for sale to a reputable and established developer who intends to purchase and develop the site, subject to standard conditions of sale. The delivery timeframe for the project is therefore short-term and will serve to stimulate further activity within the MIPSP and build on the momentum generated thus far.

1.2.2 Statutory Planning Framework

Local Planning Scheme No. 6

Harvis' MIP is zoned 'Industrial Development' under the Shire's Local Planning Scheme No. 6 (LPS 6). The primary objective for the 'Industrial Development' zone is to designate the land for future industrial development and employment creation purposes through the preparation and endorsement of structure plans. The MIP is also covered by the 'Muchea Employment Node Special Control' area which sets out the detailed reporting requirements and matters to be addressed at each stage of the planning process i.e. structure planning, subdivision and development.

Schedule 2 – Zoning Table of LPS 6 confirms that land use permissibility within the zone is to be in accordance with an approved structure plan. In order for a decision maker to assess and determine land uses at the development application stage, the structure plan needs to suitably accommodate the intended land uses through an appropriate zoning designation on the structure plan map.

Clause 4.9 of LPS 6 'Requirements for Industrial Zones and land Uses' will apply to future development proposals within the 'Industrial Development' zone, which includes the proposed local service centre. The most relevant provisions that will need to be addressed at the subsequent development application stage include the requirement to manage pollutants (if any) and on-site wastewater disposal.

Local Structure Plan 1

The proposed local service centre is currently designated 'General Industry' under LSP 1. The majority of land uses that are intended to occur within the local service centre such as 'shop' and 'fast food outlet' are not permitted within the 'General Industry' zone as per Table 2 of LPS 6. In order to provide certainty for future applicants and decision-makers alike, a structure plan amendment that assigns an appropriate zoning is required, as is proposed by this amendment.

Local Planning Policy No. 33 – Muchea Industrial Park Design Guidelines

All future development proposals within the MEN will be required to have due regard to the provisions of the Muchea Industrial Park Design Guidelines (the Guidelines), adopted as a local planning policy by the Shire of Chittering. The Guidelines establish a range of development standards such as building design, setbacks, landscaping and signage that will need to be considered in the preparation and assessment of future development applications.

State Planning Policy 4.1 – State Industrial Buffer Policy (SPP 4.1)

SPP 4.1 seeks to protect the long-term security of industrial land from encroachment by sensitive land uses. As such, SPP 4.1 is not applicable to the proposed LSP amendment as the range of land uses that are provided for within the Special Use Zone are not defined as sensitive land uses. The amendment will provide for employment-generating land uses only and does not propose accommodation of any type. As such, the potential for and need to manage land use conflict is not a consideration for this proposal. Notwithstanding, it is intended that the design response to the sites context within a broader General Industry precinct will respond appropriately, as discussed in further detail under section 3.1 below.

1.2.3 Pre-lodgement Consultation

The following stakeholders and agencies were consulted in the preparation of this amendment:

- The Shire of Chittering; and
- The Department of Planning, Lands and Heritage (DPLH).

No fundamental issues were raised during the pre-lodgement consultation. The DPLH recommended that potential alternative locations be investigated for the local service centre based on traffic and access considerations. The locational attributes that have informed the site selection of the local service centre are discussed in the section 1.1 above and 3.0 below.

2.0 AMENDMENT PROPOSAL

As outlined above, the current LSP 1 Map identifies the proposed local service centre as 'General Industry'. Land use permissibility is therefore in accordance with the 'General Industry' column of the LPS 6 zoning table however, many uses that are intended to occur are not capable of approval within the 'General Industry' zone. The zoning designation on the structure plan map therefore requires amending to provide certainty regarding the intended land use outcomes. The primary purpose of this amendment is therefore to change the zoning designation on the LSP Map for the local service centre, with other minor changes proposed to reflect the more recent subdivision approvals.

As LPS 6 does not have a suitable 'standard' zoning for a local service centre (or similar), an alternative zoning approach is proposed. Specifically, a 'Special Use' zone will be identified on the LSP Map with a corresponding land use table inserted into the Part 1 – Implementation report. The 'Special Use' table prescribes a list of land uses that are suitable and desirable for a local service centre that is proposed on the periphery of an industrial estate and is also adjacent a primary regional road that accommodates significant regional traffic. The 'Special Use' zone provides an opportunity for a more discreet, tailored approach to the land use planning for the site, as compared to a standard zoning approach. At ultimate development, it is expected that the local centre will comprise up to approximately 2,650m² of shop/retail NLA and approximately 4,200m² of service industry-type uses.

In addition to the primary purpose of the amendment i.e. to provide for a local service centre at the entrance to the MIP, there are a number of minor modifications proposed in response to the subdivision design and approval process that has occurred since LSP 1 was approved. These are summarised as follows:

- The east-west road (Canaveral Way) adjacent the northern boundary of the proposed 'Special Use' zone and running parallel to the 'Loop Road' has been straightened to provide a more regular lot shape for the local service centre;
- The small 'Drainage' reserve in the north-west corner of the 'Conservation' reserve and adjacent the 'Loop Road' has been deleted consistent with the approved Urban Water Management Plan;
- 'Plan B – Access Staging Plan' has been deleted in its entirety as it is no longer relevant post-construction of the Tonkin Highway extension and the associated interchange connection with the MIP; and
- The location of Main Roads WA's (MRWA) 'Controlled Access Route' for oversize overmass vehicles has been identified on the western boundary LSP 1 based on MRWA's controlled network which was confirmed as part of the initial subdivision for Stage 1.

The minor modifications listed above do not necessitate changes to the text within the Part 1 – Implementation report, with the changes limited to the LSP Map.

3.0 PLANNING CONSIDERATIONS

The following sections explain and justify the proposed amendment and are limited to the planning matters relevant to the proposed local service centre. Matters that have already been addressed through the preparation of the original Part 2 - Explanatory Report (September 2017) that are not affected by the proposed amendment are not discussed as part this report.

3.1 Local Service Centre – Size and Composition

The amendment proposes to enable development of a 2.1 hectare site as a local service centre providing amenities for workers within the MEN as well as regional traffic travelling along Tonkin Highway and local residents within the catchment. The 2.1 hectare gross site area is estimated to comprise up to 2,650m² of shop/retail floor space and 4,200m² of compatible service-commercial and industry - service businesses at full development.

Development of the local service centre is likely to be staged to match the gradual increase in demand for shop/retail offerings. Whilst the first stage will be delivered in the short-term, future expansion up to the anticipated ultimate floor space amount is likely to occur sequentially based on the following growth factors:

- The increasing size of the MEN workforce over time, which is expected to continue to grow even once the proposed local service centre is built-out;
- The relocation of the Road Train Assembly Area to the MRWA site directly adjacent the MIP;
- An increase in traffic numbers along Tonkin Highway; and
- An increase in the residential population within the primary catchment of the proposed local service centre.

3.1.1 Retail Needs Assessment

An RNA has been prepared by retail consultant Shrapnel Urban Planning and forms Appendix 1 to this report. The key findings of the RNA are summarised as follows:

- Even without development of the MEN and the associated workforce population, there is currently an unmet demand for an additional 925m² of shop/retail floor space within the primary catchment based on the existing resident population;
- To the year 2031, growth of the MEN workforce combined with resident population growth within the primary catchment will create an estimated unmet demand for retail / shop floor space of approximately 2,045m²;
- Demand will continue to increase beyond 2031 as the MEN workforce and local resident population continues to grow such that in the longer-term, additional centres may be warranted within the MEN; and
- The proposed site for the local service centre is the most suitable location within the MIP, given it's high visibility, 'gateway' access into the first stage of development within the MIP, its ability to compliment other uses within the MIP and its ease of access for employees entering and leaving the MIP via the loop road.

Based on the findings of the RNA, a first stage development for approximately 925m² of retail/ shop floor space is considered viable, with additional floor space to accommodate other complimentary service-commercial and industry – service land uses. Whilst the shop/retail floor space technically includes drive-thru fast food uses, it is anticipated that a substantial portion of demand for these uses will be generated by passing trade in addition to the resident and workforce population numbers. As such, it may be feasible that 925m² of shop/ retail floor space is warranted in addition to any drive-thru fast food uses however, this will be at the discretion of the proponent.

3.2 Land Use Permissibility

Table 2 – Special Use Zone within the Part 1 – Implementation report provides a list of permitted land uses for the local service centre that are informed by the following key objectives:

- Provide services and amenities for employees within the MIP and broader MEN and alleviate the need to travel for daily shopping needs and personal services;
- Provide food offerings and a respite destination for drivers / vehicles travelling north-south on the regional road network;
- Provide convenient access to a wide range of retail offerings for north-south regional traffic and capture retail expenditure within Muchea and the Shire of Chittering in order to minimise leakage;
- Encourage and facilitate complementary uses that allow for multi-purpose trips to the centre;
- Allow for land uses that have synergies with, and support the MRWA Road Train Assembly Area (RTAA) and other industrial uses within the MEN;
- Avoid and minimise the potential for land use conflict by not permitting land uses that may be incompatible with industrial uses in close proximity;
- Orientate retail uses that require higher-levels of exposure towards Tonkin Highway and the loop road and provide for industry – service uses further from Tonkin Highway to assist management of the interface with the adjoining General Industry lots; and
- Not permit any sensitive-land uses that have the potential to conflict with the General Industry-zoned land to ensure that industrial uses are not compromised by competing land uses.

3.3 Design Considerations and Interface with Industrial Uses

The detailed design of the proposed local service centre will be undertaken by the future owner of the site. Given the size of the site and the fact that it is covered by an existing subdivision approval, there are no constraining factors that would preclude development of the site as proposed by this amendment. As with all development sites, there are certain attributes that will necessitate a design response and should inform future detailed designs. These are summarised as follows:

- Access to the site is restricted in certain locations based on the outcomes of subdivision approval reference WAPC 155948. These access restrictions will be placed on the title of the proposed 2.1 hectare local service centre lot and are identified on the 'Design Principles Plan' (refer Figure 1). As demonstrated by the Design Principles Plan, the site can comfortably accommodate legible and unfettered access / egress notwithstanding the access restrictions;
- Uses that are expected to benefit most from the high exposure to Tonkin Highway, such as drive-thru fast food and a potential service station, will naturally gravitate to the western boundary. Internal traffic and circulation areas will need to accommodate visitor movement for these uses; and
- The adjoining, undeveloped lots to the east and north will remain zoned 'General Industry' under LSP 1. Whilst the land uses capable of occurring within the proposed Special Use Zone are not 'sensitive land uses' and do not warrant any particular buffer or management response, it is preferable and intended that the shop/retail uses that provide customer amenities such as food, beverage and convenience shopping will avoid orientating towards General Industry zoned land. As depicted on the Design Principles Plan, shop/retail uses should orientate towards the southern boundary where they are visible for wayfinding purposes and will be easily accessible to customers of the BP Roadhouse.

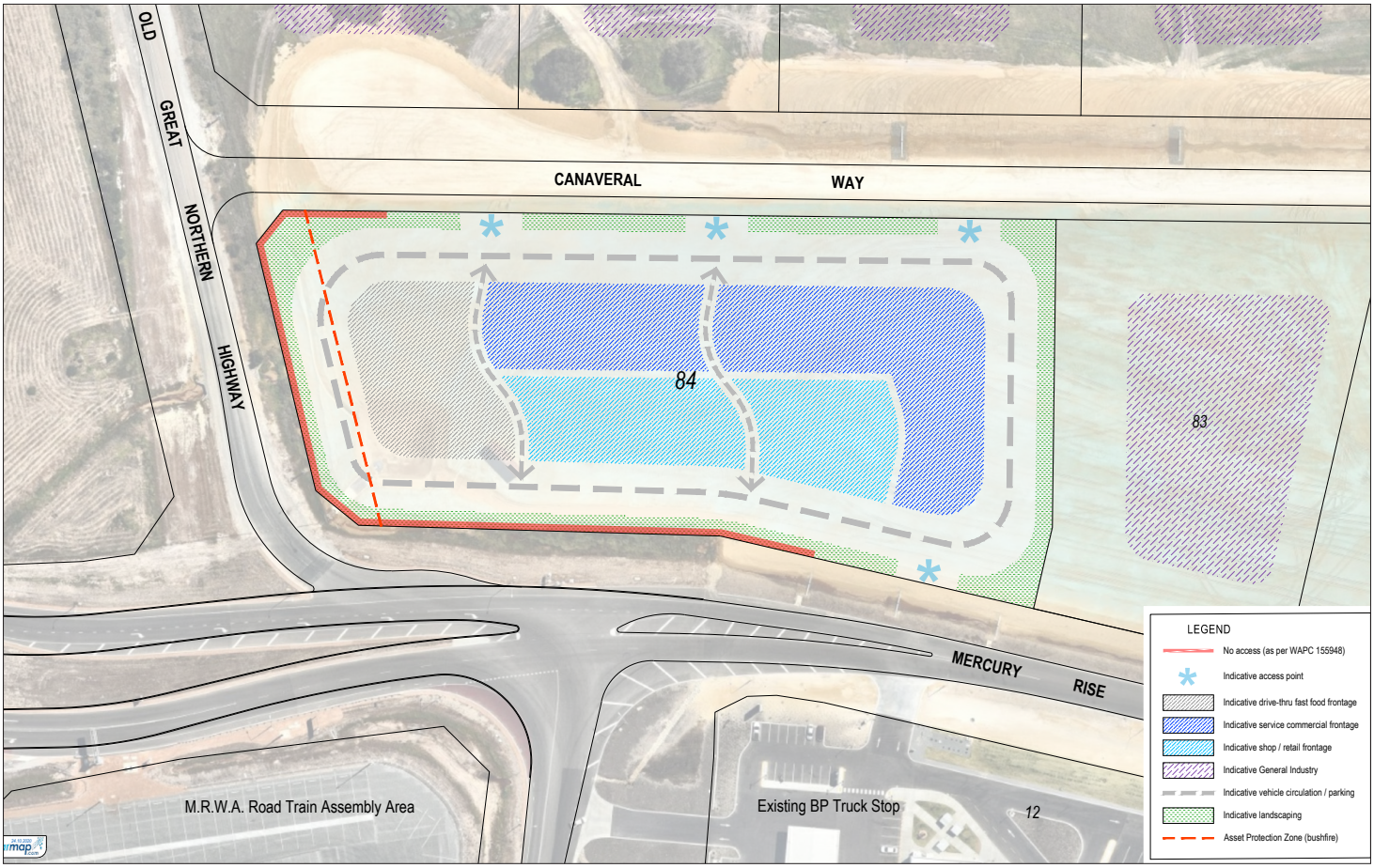

Figure 1 - Design Principles Plan

3.4 Movement Network

An addendum to the original Traffic Impact Assessment (TIA) has been prepared to support the proposed LSP amendment (refer Appendix 2). The primary purpose of the TIA Addendum is to identify any changes in traffic volumes that are expected to result based on the anticipated land uses within the local service centre. This is compared to the traffic volumes modelled under the original TIA based on the anticipated industrial uses (refer Appendix 3 – Original TIA). The TIA Addendum considers other factors not directly related to the purpose of this amendment, such as the opening of Tonkin Highway which was planned, but not constructed, when the original TIA was prepared, as well as other minor changes to the road network that were approved as part of the initial subdivision applications.

The addendum to the TIA confirms that a relatively minor 16% net increase in daily traffic volumes is expected to occur as a result of the proposed local service centre. This is considered a conservative assumption, as the TIA Addendum models 3,150m² of shop / retail floor space by 2031 whereas the RNA and in turn, this LSP Amendment, plan for approximately 2,650m² of shop / retail floor space. Having assessed the ability for the previously planned network of roads and intersections to accommodate this 16% increase in traffic volumes, the TIA Addendum concludes that all roads will function satisfactorily as per their original cross sections and reserve widths detailed in the original TIA. All intersection treatments and geometry as planned and in some cases, constructed, remain suitable and do not require modifications or upgrading as a result of this proposal.

3.4.1 Vehicle Movement and Circulation

For the purpose of the TIA Addendum, it was assumed that all external in-bound traffic will access the local service centre site via a left-in driveway from Mercury Rise. The location of this driveway is capable of achieving the necessary separation distance from the Tonkin Highway interchange established by the conditions of subdivision approval WAPC 155948. Specifically, condition 11 of WAPC 155948 prohibits access to and from Mercury Rise within approximately 145 metres of the western boundary (old Great Northern Highway alignment) of the site. Accordingly, the proposed local service centre has a suitably wide southern frontage (approximately 205 metres) so as to accommodate a Mercury Rise driveway that achieves the necessary separation from the interchange.

Vehicles exiting the local service centre will do so onto Canaveral Way before heading east and then south, back onto Mercury Rise. The TIA Addendum has assessed all intersections based on the increased traffic volumes associated with this movement and determined that they do not require modification or upgrading.

3.4.2 Other Intersections

In addition to the above, the TIA Addendum also considers changes to two MIP intersections that are not related to the local service centre the subject of this amendment. These changes are summarised as follows:

1. The Mercury Rise 'full movement' intersection shown on the LSP Map has been constructed as a 90 degree corner, consistent with its current role providing access to the MIP lots. If and when Mercury Rise is extended to the east by others, further scenario testing will be required to determine whether any additional intersection controls will be required. The TIA addendum however, confirms that the current intersection will function satisfactorily at full development of the MIP.
2. The original LSP (Plan B – Access Staging Plan) proposed a left in / left out (LILO) intersection for the section of GNH that intersects with the Tonkin Highway interchange. Through the subdivision process for Stage 1 of the MIP, MRWA confirmed that this short length of GNH would not be accessible to the public. It was designed and constructed as a restricted access road for 'high wide loads' using GNH. The TIA addendum considers the removal of this intersection and confirms that redistribution of local traffic that may have used this intersection can be accommodated on the broader network without consequence. The LSP 1 Map has been updated to show this restricted access route to provide clarity and certainty for proponents and decision-makers.

3.5 Other considerations

3.5.1 Bushfire

A Bushfire Management Plan (BMP) was prepared and approved as part of the subdivision approval for Stage 1 of the MIP where the proposed local service centre is located. The Bushfire Attack Level (BAL) Contour Plan prepared in association with the BMP identified the western portion of the proposed local service centre is affected by a bushfire hazard (refer Figure 2 – BAL Contour Plan). In order to manage this potential bushfire hazard, the BMP identifies a 13m wide Asset Protection Zone (APZ) where no buildings will be constructed. The APZ can be easily accommodated under the proposed development scenario for the local service centre as the 13m area adjoining the western boundary will be developed for landscaping (low bushfire threat), car parking and vehicle circulation. This design response will effectively manage the potential bushfire threat and bushfire does not constrain development of a local service centre.

3.5.2 Drainage

An Urban Water Management Plan (UWMP) has been prepared and approved over Stage 1 of the MIP which includes the proposed local service centre site. Development of the site as facilitated by this amendment will implement the drainage strategy outlined in the UWMP, specifically:

- A bio retention area within a larger lot detention area will be provided on site to treat and retain minor stormwater events. The location of the lot detention area is expected to coincide with the low-point of the site in the south-west and/or north-west corner(s);
- Major events will be detained within the local detention area to maintain the pre-development flow rates before discharging into the road side conveyance swales constructed as part of subdivisional works; and
- Conveyance swales adjoin the southern and western boundaries of the site and will allow for onsite surface water to be discharged into a western or southern direction, depending on final earthworks and site design.

3.5.3 Environmental Considerations

As previously stated, subdivision approval has been granted for Stage 1 and subdivisional works, including earthworks, have been undertaken in accordance with the approved engineering drawings. All environmental matters have been addressed as part of previous planning processes and the proposed local service centre site is unconstrained by environmental factors.

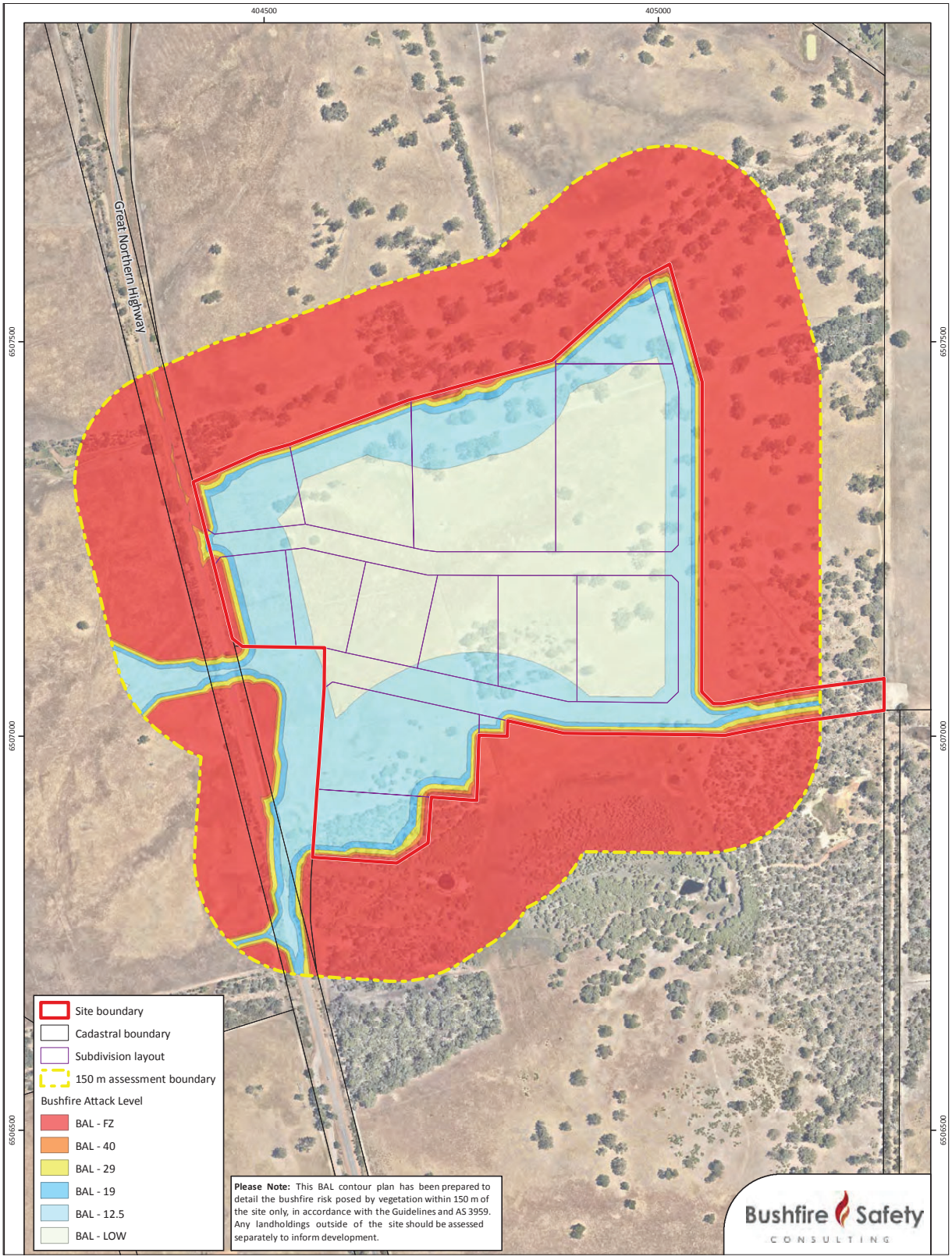

Figure 2 - BAL Contour Plan

Source: Bushfire Safety Consulting

3.5.4 Infrastructure Servicing

A connection to a potable water supply and an underground electricity supply is required through standard subdivision conditions and will be delivered as part of subdivisional works prior to the title for the local service centre being created.

Wastewater treatment will occur on-site using secondary treatment systems with nutrient removal in accordance with the subdivision approval. The site is not within the 'effluent sensitive area' identified on the LSP Map. At 2.1 hectares in area, the local service centre site is suitably sized to allow for onsite treatment to occur. Details and specifications (including irrigation areas) for the treatment of effluent on-site will need to be provided as part of the development application in accordance with clause 6.3.1 of the LSP and the approved UWMP.

APPENDICES

Appendix 1: Retail Needs Assessment

Appendix 2: Traffic Impact Assessment Addendum

Appendix 3: Original Traffic Impact Assessment (2015)

APPENDIX 1

Retail Needs Assessment

Muchea Industrial Park LSP 1 Amendment

Proposed Special Use Zone Retail Needs Assessment

December 2020

SHRAPNEL URBAN PLANNING

Telephone: +61 8 9388-2893 Fax: +61 8 9381-4208 E-mail: t.shrapnel@gmail.com Web: www.shrapnel.com.au

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SUMMARY AND CONCLUSIONS

CLE Town Planning + Design, on behalf of Harvis Capital Pty Ltd is proposing an amendment to the Shire of Chittering's Muchea Industrial Park Local Structure Plan 1, which proposes, amongst other things, to create a 2.1 hectare Special Use zone for the purpose of establishing a commercial services activity centre at the main entrance into the Industrial Park's first stage of development.

It is intended that this facility will evolve into a useful and convenient complement to the Industrial Park, accommodating a range of complementary business, community and retail services. The purpose of this Retail Needs Assessment is to assess the potential for the proposed retail services.

An analysis of the nature and role of existing retail floorspace in the towns within a defined study area indicated that the quantity of Shop/ Retail floorspace provided in the study area is relatively small and provides only a Neighbourhood/ Local level of retail service provision to the local population. Only about 20% of the study area's household retail expenditure potential is spent in the study area.

This is unsurprising given the relatively small population in the study area and its reasonable level of access (for a rural community) to Metropolitan Perth. The study area's retail floorspace provision is, however, unevenly spread in relation to the population, and is particularly poor within the Primary study area component, which is focussed on Muchea.

Accordingly, this assessment finds that there is a compelling rationale for facilitating the development of additional local-serving retail floorspace within the Primary study area, with Muchea itself being the obvious location. The proposed commercial services activity centre Special Use site provides an excellent opportunity for this to occur, while also catering for various other future needs of the businesses and employees that will populate the Industrial Park over coming decades.

After assessing:

- The household retail expending potential of study area households;
- The existing shortfall of available Shop/ Retail floorspace in the Primary study area;
- Study area population and population forecasts; and
- Estimates of the potential retail spending contribution of the future employees in the Industrial Park and Employment Node over time;

it is concluded that:

- There is a current unmet demand for an additional 900 sqm of Shop/ Retail floorspace in the Primary study area;
- Based on a conservative Primary Study Area population forecast and a plausible Industrial Park employment forecast, the demand for Shop/ Retail floorspace in the proposed services centre is estimated to potentially reach 2,640 sqm by 2031, and 3,795 sqm by 2041;
- The employee estimates beyond 2031 apply to the wider Employment Node as a whole , as well as the Industrial Park. Therefore, in the longer term, some or all of the estimated Shop/

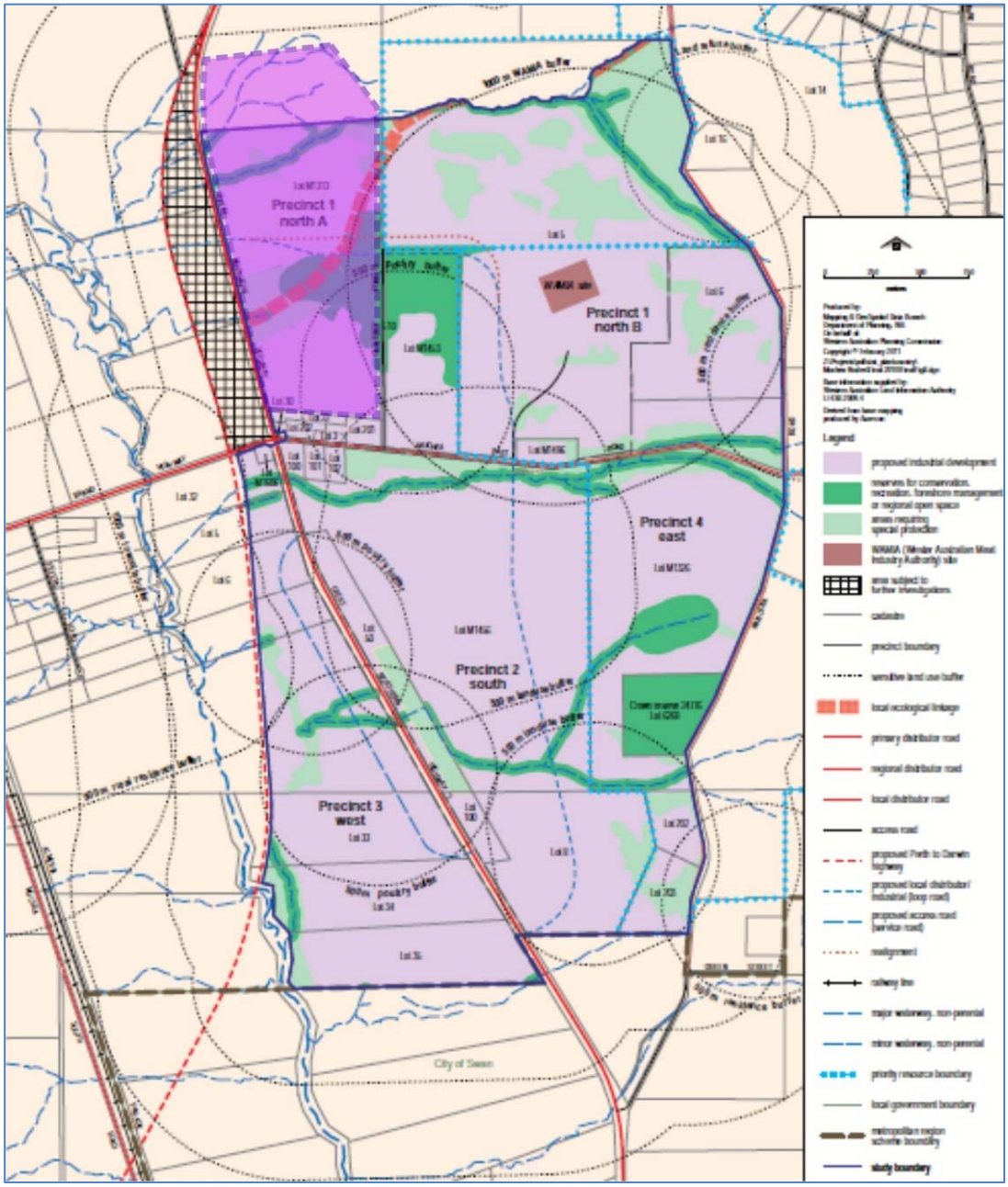
Retail floorspace demand beyond 2031 will probably need to be satisfied within one or more other convenience retail outlets within the wider Employment Node;

- Although there will certainly be some percentage of non-local “passing traffic” that will stop at the proposed services centre and use the available facilities there, at this stage it is not possible to reliably assess the potential extent of this patronage prior to the establishment of at least the first stage of Shop/ Retail development in the Industrial Park;
- Assuming the Shop/ Retail component of the proposed service activity centre settles at 2,500 - 2600 sqm by 2031, it is likely that the overall site area needed for this component would be in the vicinity of 7,000 sqm (due mainly to parking and access requirements), leaving approximately two-thirds (14,000 sqm) of the overall Special Use site area left for the establishment of other potential service activity centre uses.

INTRODUCTION

CLE Town Planning + Design, on behalf of Harvis Capital Pty Ltd is proposing an amendment to the Shire of Chittering's Muchea Industrial Park Local Structure Plan 1. The area the subject of the proposed amendment is a relatively small section (approximately 150 ha) of the much larger Muchea Employment Node. The Employment Node is approximately 1,167 ha in area, some 693 ha of which is destined for future industrial development after allowing for retention of conservation and other protected areas (Figure 1).

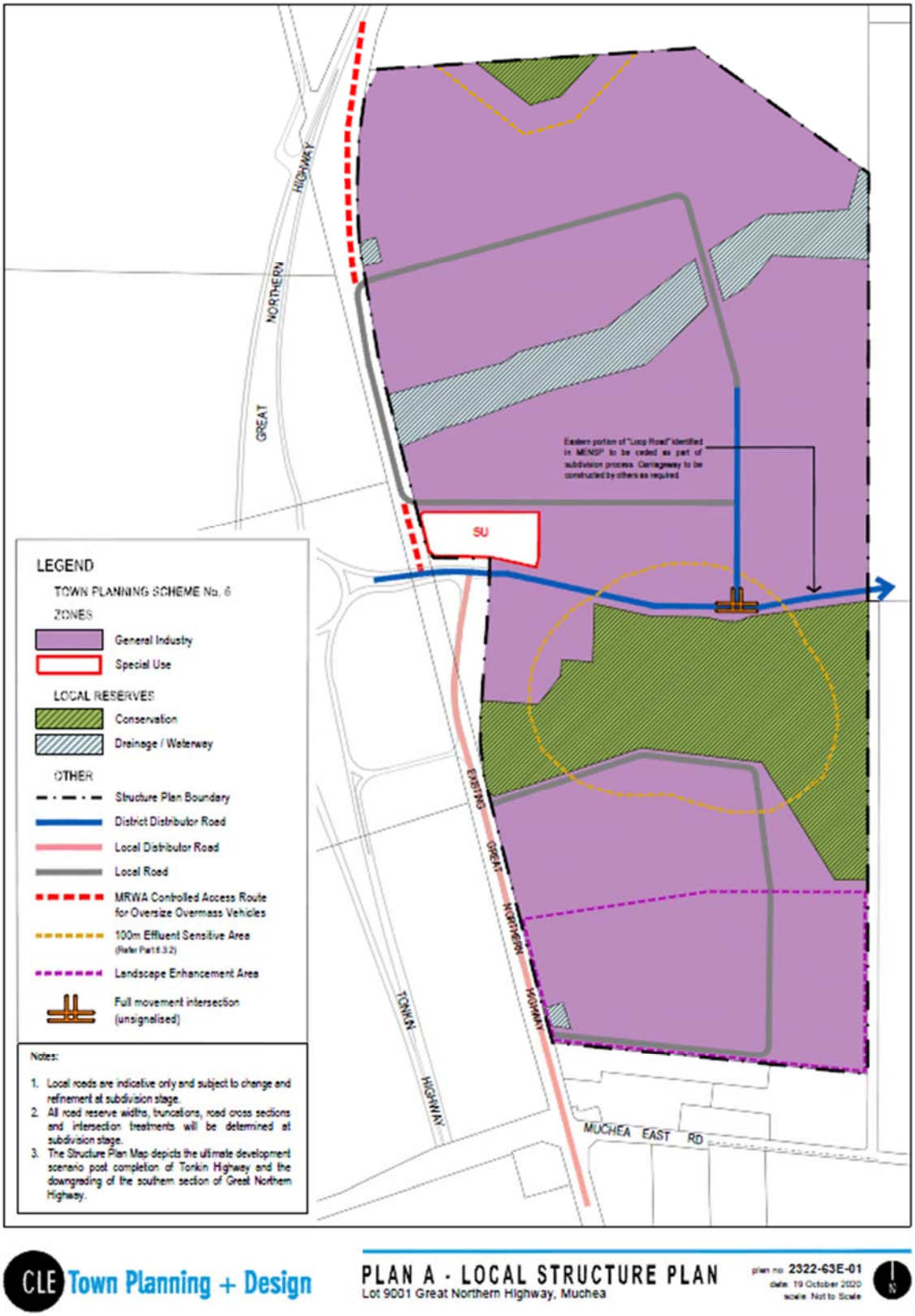
Figure 1 Muchea Industrial Park (darker purple) within the wider Muchea Employment Node context



The amendment to Local Structure Plan 1 proposes, amongst other things, to create a 2.1 hectare Special Use zone for the purpose of establishing a commercial services activity centre at the main

entrance into the Industrial Park's first stage of development (Figure 2). The services activity centre is intended to evolve into a highly useful and convenient complement to the Industrial Park, which will increase its attractiveness to developers and businesses.

Figure 2 Proposed Special Use zone within the Industrial Park context



The location of the Special Use site is considered to be the most appropriate for the proposed services centre given the site's highway visibility and outstanding "gateway" access into the first development stage of the Industrial Park (Figure 3). No other site in the Industrial Park is regarded as suitable for the services centre, given the scope of the potential complementary land uses envisaged and the necessary ease of access for industrial area employees entering and leaving the Industrial Park. Indeed, it was the site's outstanding location that ignited commercial interest in establishing the proposed services centre in the first place.

Figure 3 Special Use site in local context

Rationale for the Special Use Zone

Due to its locational qualities, the proposed Special Use site is unique, and possesses an inherently higher and better land use potential than the other industrial-zoned lots that are to be established throughout the Industrial Park. Comprehensive development of the Industrial Park, which is assured given its location and major transport/ logistics role within WA's economy, could possibly be complete, or close to completion, by 2031[1].

That assessment is supported, not only by the future potential of the Industrial Park as a whole, but on the well-recognised significance of the Muchea Road Train Assembly Area (RTAA) and its location at the confluence of several important transport routes. Fairly rapid development expectations for the Industrial Park are therefore understandable and emphasise the necessity for securing the proposed Special Use site as soon as practicable in order for it not be snapped up early for a use or

[1] Source: Harvis Capital Pty Ltd; 2020.

uses that may, in the longer run, not fully utilise the potential access and economic benefits of this unique site. Some examples of potential uses envisaged for the Special Use site are:

- Specialised and/ or high-tech service businesses that would benefit from the Industrial Park location but require only relatively small premises (e.g. a veterinary supplies centre).
- Vehicle and other machinery parts, service, sales and repair facilities which could serve not only the Industrial Park, but the wider Employment Node as a whole.
- Multi-purpose industry-focussed rentable office/ meeting/ conference facilities.
- A childcare centre for the regular daily use and benefit of Industrial Park employees.
- Various *suitable* light industrial and service commercial uses requiring relatively small sites.
- A range of food, beverage, fast-food, indoor dining and (potentially) other types of retail services (e.g. a small supermarket) established to cater for the convenience needs of:
    - employees working within the Industrial Park's various industries and transport/ logistics operations,
    - local residents within the surrounding district, who are very poorly catered for in this regard at present, and
    - passing travellers.

As will be demonstrated in this report, it is intended that the proposed services activity centre will fulfill several necessary purposes, including provision of much needed additional local/ neighbourhood-level retail services to the local resident population, which is currently lacking in such services. This particular role is one of the reasons the planning framework is proposed to accommodate the services centre within an obviously purposeful Special Use zone which, although it complements the Industrial Park's main purpose, is not part of the "General Industry" zone itself.

Retail Needs Assessment

It is the proposal for retail uses, within the larger suite of other potential services in the Special Use zone, which is the main reason for this Retail Needs Assessment. The potential for some level of retail services provision In the Muchea Employment Node has been envisaged by the WAPC since planning for it commenced more than a decade ago. A retail component is also still envisaged in the WAPC's current (2020) update of its original 2011 Employment Node structure plan.

Until now, however, the previously recognised potential for retail services in the Muchea Employment Node has been expressed in very general terms and has not previously advanced to the point of identifying a specific location for some of the anticipated retail facilities. This report therefore aims to:

- Confirm the potential need and prospects for the provision of an appropriate range of future retail and other service commercial services within the proposed Special Use site.
- Assess the potential scope for, and appropriate timing of such services.

Terminology

The following terms may be used in this report:

Retail in its non-technical, common sense meaning is used frequently in the interests of readability.

Shop/ Retail (SHP) – Planning Land Use Category (PLUC) 5 – specifically refers to one of two Retail categories defined by the WAPC (see SPP 4.2 for details) and includes virtually all retail activities normally found within shopping centres. It *excludes* many of the uses normally referred to as "bulky goods" retail but does include some potentially bulky items such as household appliances.

Other Retail (RET) – Planning Land Use Category (PLUC) 6 – is the other specific Retail category defined in detail by the WAPC. It mostly includes outlets for those retail uses normally referred to as "bulky goods" (e.g. furniture, floor coverings, etc), but also includes hardware. Other Retail precincts often also include one or more fast food outlets, even though these are currently classified as "Shop/ Retail" by the WAPC.

Total Retail specifically refers to Shop/ Retail plus Other Retail.

Net Lettable Area (NLA) in square metres is the unit of measurement for all retail and other commercial floorspace. It includes all internal floorspace except stairs, toilets, lift shafts and motor rooms, escalators, tea rooms and other service areas, lobbies, and areas used for public spaces or thoroughfares[2]. Note that non-public storage areas within large shops (such as supermarkets) are generally not classified by the WAPC as "Shop/ Retail" NLA, but as "Storage" NLA.

Retail Needs Assessment (RNA): The study sometimes required under Clause 6.2.2 of SPP 4.2 to estimate the retail needs and indicative distribution of retail floorspace across the activity centres in a local government area; and to guide the preparation of district and activity centre structure plans.

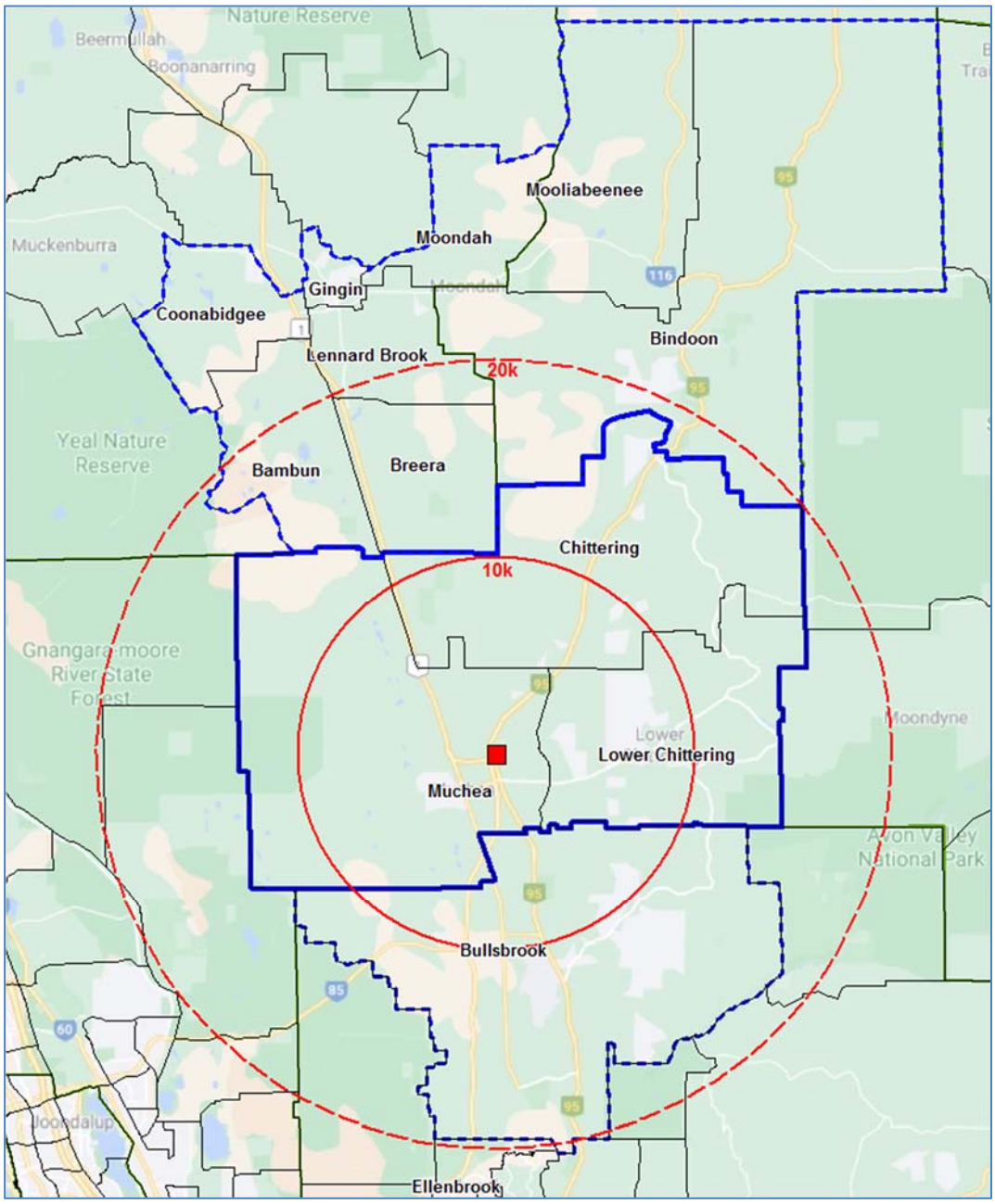
[2] The related term Gross Leasable Area (GLA) includes these things.

RETAIL NEEDS ASSESSMENT

Study Area

The study area defined for the purposes of this assessment is presented in Figure 4. It comprises a "Primary" area (solid blue line) which contains the Muchea, Chittering, and Lower Chittering "State Suburbs", which are the populated rural areas most likely to benefit from any additional retail services at Muchea. Two secondary or "Frame" areas have also been defined – one north of the Primary area and other south (both dashed blue lines).

Figure 4 Defined Study Area showing named State Suburbs



The overall study area is comprised of 12 ABS State Suburbs (names indicated in Figure 4) – three in the Primary area, one in the southern Frame area and the rest in the northern Frame area. The red square in Figure 4 marks the location of the proposed Special Use site at Muchea, while red circles

define the 10 and 20 km radii around the Special Use site. State Suburbs were selected as the most relevant sources of population data for this assessment, being the most useful in area.

Relevant Towns

The towns within the defined study area currently serving most of the local retail needs of the study area population and travellers through the area, are:

- Gingin (about 25km NNW of the SU site)
- Bindoon (about 23km NNE of the SU site)
- Muchea (town site about 2km SW of the SU site)
- Bullsbrook (10km South of the SU site).

The commercial centres within each of these towns were surveyed for the purposes of this assessment and the quantity and quality of retail floorspace estimated. Shop/ Retail (PLUC 5) and Other Retail (PLUC 6) floorspace has been estimated separately.

Gingin Town Centre

Gingin is a small, pleasant town centre located about 3.5 kilometres (by car) to the east of the Brand Highway. It is therefore primarily a local service centre with an independent non-chain supermarket. Estimated retail floorspace in the Gingin town centre is:

- Shop/ Retail: 1,350 sqm;
- Other Retail: 870 sqm;
- Total Retail Floorspace: 2,220 sqm

Bindoon Town Centre

Bindoon town centre, which accommodates the Shire of Chittering offices, is an attractive and well-maintained retail and other commercial services centre which caters for tourists as well as local residents. Amongst other things it contains an IGA supermarket, large hardware outlet and a popular café/ restaurant.

Construction of the extensive Bindoon By-pass is scheduled to start within a few months and will very likely have some negative impact on Bindoon tourist visitation. Current estimated retail floorspace in the Bindoon town centre is:

- Shop/ Retail: 2,500 sqm;
- Other Retail: 1,000 sqm;
- Total Retail Floorspace: 3,500 sqm

Muchea

Muchea, the main focus of this assessment, is a small low-density settlement accommodating a population of 759 persons living within 282 dwellings. Muchea's only Shop/ Retail outlet at the moment is a small IGA store incorporating a post office, with Mobil service station attached. There is also a rural supplies store on the eastern side of the IGA. The new BP service station to the immediate south of the proposed Special Use site now also provides some new Shop/ Retail

floorspace in the form of fast food provisions and a sit-down café/ lunch area. The current estimated overall retail floorspace in Muchea is:

- Shop/ Retail: 600 sqm (includes 200 sqm in new BP service station near RTAA);
- Other Retail: 350 sqm;
- Total Retail Floorspace: 950 sqm.

Bullsbrook

Bullsbrook town centre is about 10 km south of Muchea and is regarded as a somewhat higher-order centre than those in the other study area towns discussed above. While it is larger in some respects than the other town centres, its Shop/ Retail offering is still just that of a relatively small neighbourhood centre. It would therefore serve its well-populated hinterland for mainly neighbourhood/ local needs. Muchea residents would, in all likelihood, also use it more frequently for much of their "local" shopping due to the modest offering in their own local facilities, and Bullsbrook's relative proximity compared to the other study area town centres to the north. The Current estimated retail floorspace in the Bullsbrook town centre is:

- Shop/ Retail: 1,800 sqm;
- Other Retail: 1,600 sqm;
- Total Retail Floorspace: 3,400 sqm.

Summary of existing retail floorspace in study area towns

Table 1 summarises the estimated retail floorspace in each of the towns listed above. The lower section of the table presents an estimate of the approximate annual turnover of the Shop/ Retail and Other Retail components of the floorspace.

Table 1 Retail floorspace in selected towns/ Indicative annual Shop/ Retail turnover estimate (2020)

Retail Floorspace	Gingin	Bindoon	Muchea	Bullsbrook	Total
Shop/ Retail (sqm)	1,350	2,500	600	1,800	6,250
Other Retail (sqm)	870	1,000	350	1,600	3,820
Total Retail (sqm)	2,220	3,500	950	3,400	10,070
At assumed annual turnover per sqm of...					Avge
Shop/ Retail floorspace	$4,000	$6,000	$3,000	$6,000	$5,280
Other Retail floorspace	$2,000	$2,500	$1,500	$2,500	$2,295
Average (total retail)	$3,216	$5,000	$2,447	$4,353	$4,147
Annual retail turnover within the centres would be in the order of...					
Shop/ Retail ($million)	$5.40	$15.00	$1.80	$10.80	$33.00
Other Retail ($million)	$1.74	$2.50	$0.53	$4.00	$8.77
Total turnover/ annum ($million)	$7.14	$17.50	$2.33	$14.80	$41.77

It should be noted in Table 1 that, although the retail floorspace area estimates are considered to be reasonably accurate, the dollar turnover per square metre estimates are based on site observations, on-line searches of asking rents for commercial properties in the study area, plus industry knowledge and experience. The accuracy of these estimates is therefore not guaranteed, but is considered reasonable enough for the purpose of comparing the retail floorspace data in Table 1 to the household spending data discussed in the following section of this report.

The survey of retail floorspace in the towns clearly indicates that the Shop/ Retail component of the available floorspace is very "local" in nature – the equivalent of the numerous local and small neighbourhood centres within the Perth metropolitan context. The quantity of Other Retail floorspace, on the other hand, is more significant than would be found in the average urban local/ neighbourhood centre because of the role that category of floorspace has in serving the numerous practical needs of rural/ agricultural operations in the study area.

Ellenbrook Central

This centre is the closest large centre to the defined study area and is now an easy 20-minute drive from Muchea. It is very busy most of the time. This is due, not only to the patronage of its home district of Ellenbrook and immediate surrounds, but to its advantageous location at the edge of the

large rural hinterland to the north which, now and until a planned district centre in Bullsbrook is eventually constructed, will cater only for small local/ neighbourhood retail floorspace demand.

- Shop/ Retail: 28,501 sqm;
- Other Retail: 30,926 sqm;
- Total Retail Floorspace: 59,427 sqm

(Source WAPC Land Use and Employment Survey ~2016)

Population and Retail Spending

This section assesses the overall spending potential of the study area's population with a view to estimating the proportion of its expenditure likely to occur within the retail floorspace available in the study area's towns, verses elsewhere – i.e. outside the study area, including online. Table 2 presents 2016 household and population data for the study area, including estimates of household and individual retail spending.

Table 2 Population and annual retail spending by study area households (2016)[3]

Data Item	Primary Area	Frame Nth	Frame Sth	Total Study Area
Households	1,428	1,148	1,959	4,535
Persons	3,999	2,628	5,185	11,812
Convenience Shop/ Retail ($M/ annum)	$37.10	$25.34	$50.06	$112.49
Comparison Shop/ Retail ($M/ annum)	$12.33	$7.52	$16.86	$36.71
Total Shop/ Retail Spend ($M/ annum)	*$49.42*	*$32.85*	*$66.92*	*$149.20*
Avge annual Shop/ Retail Spend per household	*$34,610*	*$28,618*	*$34,162*	*$32,900*
Avge annual Shop/ Retail Spend per person	*$12,359*	*$12,502*	*$12,907*	*$12,631*
Total Other Retail Spend ($M/ annum)	*$20.11*	*$12.77*	*$25.24*	*$58.12*
Avge annual Other Retail Spend per household	$14,085	$11,119	$12,887	$12,817
Avge annual Other/ Retail Spend per person	$5,030	$4,857	$4,869	$4,921
Total Retail Spend ($M/ annum)	*$69.54*	*$45.62*	*$92.17*	*$207.32*
Avge annual Total Retail Spend per Household	$48,695	$39,738	$47,049	$45,717
Avge annual Total Spend per Person	$17,388	$17,359	$17,776	$17,552

Sources: Households & Population – ABS; Retail Spending – Market Data Systems (2016)

[3] NOTE: For the purposes of this assessment it is assumed that the 2016 household expenditure estimates presented in Table 2 still apply in 2020.

A comparison between the estimated annual retail spending on ***Shop/ Retail*** goods within the study area's town centres in Table 1 ($33.00 million), and the corresponding total Shop/ Retail spending potential of the study area's households in Table 2 ($149.20 million), indicates that the various towns currently cater for approximately 22% of the population's Shop/ Retail expenditure, (and 20% of its total retail expenditure). Some 80% of the total retail spending potential of the study area population is therefore spent outside the study area within larger centres in metropolitan Perth, and online.

The large "Ellenbrook Central" secondary centre would be one of the major beneficiaries of this situation now that the Tonkin Highway extension has made that centre so accessible to the entire study area – particularly the Primary area. Other well-positioned major centres such as the Joondalup Strategic Metropolitan Centre would also be benefiting from retail expenditure sourced from the study area.

Retail Floorspace Needs (Primary study area)

Current Unmet Demand (2020)

It seems inevitable that the nature and role of the retail floorspace in the study area's towns will, for the foreseeable future, remain at the "small neighbourhood/ local" scale, however, there is definitely scope for the provision of this local retail floorspace to be increased within the ***Primary study area***. The current Shop/ Retail offering within the Primary area is clearly inadequate compared to what is available in the larger town centres in both Frame areas.

The estimated annual retail turnover of $2.33 million in the existing Muchea "centre" (Table 1) is a mere 3.4% of the retail spending potential of Primary area households ($69.54 million). Most of the convenience spending by the Primary area population is therefore occurring in the Frame area town centres – some of it in Bindoon, with the majority of it likely to be in Bullsbrook. The population of the Primary area in 2020 is 4,299 persons, some 33% of the study area's total population, yet its current quantity of retail floorspace (950 sqm) is only 9% of the study area's total retail floorspace.

The ratio of Shop/ Retail floorspace per person in the Primary area is therefore only 0.14 sqm per capita, whereas it averages 0.48 sqm per capita across the entire study area (Primary + Frame areas). This is considerably lower than the 0.53 sqm per capita average generally applicable to local/ neighbourhood centres across the Perth metropolitan region. Furthermore, because of Gingin's location at the periphery of the northern Frame area, if the northern Frame area was extended further north to fully cover Gingin's overall catchment population, then the floorspace per capita ratio figure for this enlarged study area would be even lower than it currently is. It is therefore clear that the overall study area is undersupplied with neighbourhood/ local level Shop/ Retail floorspace, with the Primary area being the worse off.

Accordingly, there is a compelling rationale for facilitating the development of additional local-serving retail floorspace in the Primary area, with Muchea as the obvious location. The proposed commercial service centre Special Use site provides an excellent opportunity for this to occur, while also conveniently serving various other future needs of the businesses and employees that will populate the Industrial Park over coming decades. Seeking to focus establishment of the additional required floorspace on the existing Muchea retail outlet is not appropriate because, since construction of the main highway by-pass, that site is now effectively on a side-road.

Accounting for these factors it is considered reasonable that, for local retail floorspace planning purposes, a Shop/ Retail floorspace per capita ratio of .35 sqm be applied within the Primary area itself. This ratio strikes a reasonable and practicable balance point between the ratio for the study area as a whole, and the inappropriately low ratio currently applying to the Primary area component of the study area.

Applying the .35 sqm per capita ratio to the current Primary area population (4,299 in 2020), results in an estimate of 1,505 sqm of Shop/ Retail floorspace in Muchea instead of the existing 600 sqm[4]. This floorspace would be generating annual Shop/ Retail turnover of between $4.5 million and $6.0 million, depending on the quality of the floorspace[5], thus putting it on a par with the estimated performance of Gingin town centre. It would also be saving local residents much travel time. Therefore, taking account of the approximately 200 sqm of retail space now provided within the BP Service Station, it is concluded that ***there is currently (2020) an unmet demand for 905 sqm of Shop/ Retail floorspace within the Primary area***.

Population Forecasts

As the Primary area population increases over time, as it is forecast to do, the demand for additional retail floorspace will also increase. Previous population counts and forecasts for the defined study area are presented in Table 3.

Table 3 Study Area population and forecasts 2011-2041

State Suburb	2011	2016	2021	2026	2031	2036	2041
	<<< ABS Census		Forecast >>>				
Primary Area***							
Muchea	1,018	968	1,054	1,130	1,215	1,300	1,390
Chittering	503	911	1,003	1,078	1,146	1,226	1,312
Lower Chittering	1,558	2,120	2,317	2,470	2,643	2,828	3,026
Total	3,079	3,999	4,374	4,678	5,004	5,354	5,728
Northern Frame							
Coonabidgee	110	124	130	137	147	157	167
Bambun	45	50	53	55	59	63	67
Gingin	743	852	895	944	1,009	1,077	1,149
Lennard Brook	184	194	204	215	230	245	262
Breera	35	37	39	41	44	47	50
Moondah	30	31	33	34	37	39	42
Mooliabeenee	140	157	171	182	194	207	221
Bindoon	1,063	1,183	1,289	1,374	1,464	1,562	1,666
Total	2,350	2,628	2,812	2,983	3,184	3,397	3,625
Southern Frame							
Bullsbrook	4,326	5,185	6,100	6,985	7,975	8,509	9,079
Total	4,326	5,185	6,100	6,985	7,975	8,509	9,079
Total Study Area	9,755	11,812	13,287	14,646	16,163	17,260	18,432

*** Note: Between 2011-2016 population figures in the sub-areas were affected by various boundary changes

Sources: ABS Census; WA Tomorrow (WAPC); SHRAPNEL URBAN PLANNING

[4] Includes the 200 sqm now available in the new BP service station.

[5] The assumed annual turnover per sqm of the existing Muchea floorspace ($3,000) is due to its poor quality.

As indicated in Table 3, forecast population growth between 2016 and 2041 is highest in the southern Frame area (75%), second-highest in the Primary area (43%) and lowest in the Northern Frame area (38%). The numeric population increase in the Primary area between 2020 and 2041 is forecast to be 1,429 persons[6]. Applying the .35 sqm per capita standard to this anticipated population growth, results in an estimated additional future requirement for some ***500 sqm of Shop/ Retail floorspace by 2041***.

Potential Demand from Employees

In addition to the current unsatisfied residential household demand for retail floorspace in the Primary area, and the additional demand that will result from local area population growth over the next couple of decades, there will also be considerable future demand in the short, medium and longer-terms, resulting from industrial businesses establishing in the Industrial Park and (later) the Employment Node as a whole. It is currently envisaged that development of the Industrial Park alone could generate a requirement for some 1100-1200 employees within it by 2030[7]. Also, the WAPC has very recently expressed the view that employment within the fully developed Employment Node as a whole could eventually reach some 2,500 in the longer term[8].

Employees of the Industrial Park and the Employment Node will find it very convenient to have Shop/ Retail facilities provided at the main access road to their place of employment. This will apply particularly to fast food outlets for lunches, etc, and, potentially, to a small supermarket such as an IGA, which would very conveniently facilitate necessary domestic-purpose shopping after work, prior to the (in many cases long) drive home. The timesaving and convenience this would offer over time would be very significant and provide an obvious additional benefit to employees working in the Industrial Park and wider Employment Node. Such convenience benefits would also apply on a more occasional basis for the purchasing of other goods that may, over time, be offered in both Shop/ Retail and Other Retail outlets as they develop.

Potential Employee Expenditure

In order to estimate the potential retail expenditure of Industrial Park and Employment Node employees over time, the following conservative ***assumptions*** have been made:

- An average of $1,550 per annum spent on lunches by individual employees (source: ING Direct research; 2017); with 60% of Industrial Park/ Employment Node employees buying their lunch and 40% bringing it from home (conservatively modified downwards from a 70%/ 30% estimate by McCrindle Research Pty Ltd 2020);
- An Average WA household grocery spend per week of $240 (source: ABS/ Budget Direct; 2020); with 25% of Industrial Park/ Employment Node employees' weekly household food/ groceries being purchased within the Special Use zone, on the way home after work;
- An average additional overall weekly spend of $10 by 50% of employees;
- An average annual Shop/ Retail floorspace turnover of $6,000 per sqm within the services centre Shop/ Retail component.

[6] Primary area persons: Base 4,299 (2020); then + 75 (2020-21) + 1,354 persons (2021-41)
[7] Sources: Harvis Capital P/L (Industrial Park development estimates and related employment research 2020); Economic and Employment Lands Strategy, April 2012; WAPC Land Use and Employment Survey 2015-2017.
[8] Draft Muchea Employment Node Structure Plan; WAPC 2020

The results of this combination of assumptions are presented in Table 4.

Table 4: Estimate of Shop/ Retail floorspace demand by Industrial Park/ Employment Node employees 2021-2041

Item	Spend/ Empl.	% Spent	Year:	2021	2026	2031	2036	2041
	per annum	in IP/ EN	Employees:	30	630	1,240	1,880	2,500
Lunches	$1,550	60%		$28	$586	$1,153	$1,748	$2,325
HH Groceries	$12,480	25%		$94	$1,966	$3,869	$5,866	$7,800
Other Spend	$520	50%		$8	$164	$322	$489	$650
Total Estimated Spend $(Thousands)				$129	$2,715	$5,344	$8,103	$10,775
Assumed Ann. Turnover/ sqm of Shop/ Retail floorspace				$6,000				
Employees Shop/ Retail floorspace demand (sqm)				22	453	891	1,350	1,796

As indicated in Table 4 Shop/ Retail floorspace demand generated by employees could equal approximately 450 sqm by 2026, almost 900 sqm by 2031 and potentially up to 1,800 sqm by 2041.

Total Potential Shop/ Retail Floorspace Demand

The three Shop/ Retail floorspace demand drivers described in the previous three pages and Table 4 have been combined into one consolidated estimate (Table 5) and are summarised as (numbers rounded to nearest 5 sqm):

- Primary Study area current shortfall based on household demand: 905 sqm
- Future demand from forecast population growth 2020 – 2041 (500 sqm);
- Expenditure by employees 2021-2041 (20 sqm – 1,795 sqm).

Table 5: Existing and future demand for Shop/ Retail floorspace (figures are in sqm NLA and rounded to the nearest 5 sqm)

Demand Components	2021	2026	2031	2036	2041
Existing Muchea service station/ shop	400		Ind. Park only	+ to Ult. Empl.Node Employment	
(assume relocation of existing shop to SU site)		400	400	400	400
BP Service Station	200	200	200	200	200
Current (sqm NLA)	600	600	600	600	600
Additional Shop/ Retail Floorspace Demand 2021 - 2041 (sqm NLA)					
Primary Area Residents	905	1,030	1,155	1,280	1,405
From Employees	20	455	890	1,350	1,795
From Passing Traffic	-	-	-	-	-
Total Shop/ Retail Demand (sqm NLA)	1,525	2,085	2,645	3,230	3,800

Key points to note in Table 5:

- This assessment indicates that in 2021 there will be a demand for 1,525 sqm of Shop/ Retail floorspace in the Primary study area and a supply of only 600 sqm. There will therefore be an unmet demand for an additional 920 sqm of Shop/ Retail floorspace in 2021.
- Based on the population and employment forecasts, and related assumptions, Shop/ Retail floorspace demand could potentially reach 2,645 sqm in the Industrial Park by 2031, and 3,800 sqm in the Employment Node as a whole by 2041.
- The Shop/ Retail floorspace estimates beyond 2031 apply to the wider Employment Node as a whole (not just the Industrial Park component). In the longer term some of this additional

retail floorspace demand will probably need to be satisfied within one or more other small retail outlets located within the wider Employment Node.

- An assumption has been made that the existing Muchea shop business would, in due course, be relocated to the future Special Use zone. Whether or not this actually occurs is considered irrelevant to the estimates in Table 5 as it is likely that most of the spending currently occurring at the existing store would be quickly diverted to any new retail facilities of a similar genre in the Industrial Park, thus still satisfying the demand estimated in Table 5.

Passing non-local Traffic

The benefits to retail centres/ outlets of vehicular "passing traffic" are generally accepted as a truism yet such benefits are in fact significantly over-estimated. All successful retail outlets require a suitable, highly visible, location and this, most of the time, involves a sufficient amount of overall "busyness", including vehicular traffic. However, to be considered as a potential source of additional retail business, estimates of "passing traffic" must of course exclude any such traffic which is transporting local people past the centre who already regularly use the centre. Assessing "non-local" passing traffic therefore generally requires detailed technical surveys.

The new BP service station at Muchea is well placed as a stop for motorists to refuel and refresh before entering Perth after (say) a four-hour drive from Geraldton, or a seven-hour drive from Meekatharra. It is also likely that some percentage of that patronage will take the opportunity to dine at an appropriate facility in the retail component of the Special Use site opposite the service station. There are also the numerous trucks that are already stopping at the RTAA, but these don't count as "passing traffic" because the RTAA is their specific destination and the drivers count as employees. In relation to the Special Use site and proposed retail facilities, it is therefore concluded that:

- There will certainly be ***some percentage of non-local "passing traffic"*** that will stop at the proposed services centre and use the available facilities there, thus contributing to the demand for the facilities provided in the services activity centre.
- At this stage, however, it is not possible to reliably assess the potential extent of this patronage prior to the establishment of at least the first stage of the proposed development, which will then start to reveal the attractiveness of the facility to passing non-local travellers – i.e. those with no other specific business or interest in the service centre other than stopping to refuel and refresh.

Site Area

Assuming the Shop/ Retail component of the proposed service activity centre settles at (say) 2,500 sqm by 2036, it is likely that the site area needed for this particular component would be in the vicinity of 7,000 sqm (due mainly to parking and access requirements) leaving approximately two-thirds (14,000 sqm) of the overall Special Use site area left for the establishment of other potential service activity centre uses such as those potential examples listed on Page 4 of this report.

APPENDIX 2

Traffic Impact Assessment Addendum

Design
for a better
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HARVIS

MUCHEA INDUSTRIAL PARK

TRANSPORT ASSESSMENT ADDENDUM

DECEMBER 2020

CONFIDENTIAL

Question today
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Create for the future

Muchea Industrial Park
Transport Assessment Addendum

Harvis

WSP
Level 5, 503 Murray Street
Perth WA 6000
PO Box 7181
Cloisters Square WA 6850

Tel: +61 8 9489 9700
Fax: +61 8 9489 9777
wsp.com

REV	DATE	DETAILS
A	10/12/20	Draft for client review
B	18/12/20	Final

	NAME	DATE	SIGNATURE
Prepared by:	Lachlan Piper	10/12/20	
Reviewed by:	Leigh Dawson	17/12/20	
Approved by:	Mark Fowler	18/12/20	

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1 INTRODUCTION

1.1 CONTEXT

This Addendum provides an update to the *Lot 102, Muchea Local Structure Plan Transport Assessment Issue C* report dated 21/12/15 prepared by GTA consultants (the original report), in relation to the proposed Local Structure Plan LSP, at the now named Muchea Industrial Park.

The Addendum is provided to account for an update to the LSP land and transport network assumptions, updating only sections of the original report impacted by the changes, as such this Addendum should be read in conjunction with the original report.

The changes accounted for in this Addendum include:

- Access arrangements to the LSP, including a change already approved as part of the original LSP approval process
- A revision to both the proposed land uses
- The external transport network is also revised, with the completion of the Northlink project in April 2020 extending the Tonkin Highway from Morley to Muchea.

The revised assessment follows the same methodology as utilised in the initial assessment where practical. This Addendum is therefore structured as follows following this Section:

Table 1.1 Addendum Structure and Content

ORIGINAL REPORT CHAPTER	UPADTED IN THIS ADDENDUM	EXTENT OF UPDATE
2. Existing Situation	Yes	Existing transport networks and traffic volumes updated to reflect opening of Northlink.
3. Development Proposal	Yes	Updated to reflect revised proposal including land uses and access.
4. Traffic Impact Assessment	Yes	Net change trip generation completed for revised proposal.
5. Conclusion	Yes	Updated to reflect analysis now being undertaken.

2 EXISTING SITUATION

2.1 LSP AREA USE AND LOCATION

There are no changes required to this section, please refer to the original report.

2.2 EXISTING TRANSPORT NETWORKS

WALKING AND CYCLING

There are no changes required to this section, please refer to the original report.

PUBLIC TRANSPORT

There are no changes required to this section, please refer to the original report.

VEHICULAR ACCESS

There are no changes required to this section other than to note Northlink is now operational and Great Northern Highway (south of Brand Highway) carries significantly less traffic than previously. Please refer to the original report.

2.3 EXISTING TRAFFIC VOLUMES

INTERSECTION VOLUMES

In addition to the turning movement count data included in the original report, WSP obtained SCATS traffic volume data for the Great Northern Highway / Brand Highway / Muchea East Road signalised intersection from MRWA to inform this addendum.

Data was obtained for the week of 22-29 September 2020. The analysis identified the following peak hours:

- AM Peak Hour (Tuesday 22nd September 2020): 7:30am to 8:30am
- PM Peak Hour (Friday 25th September 2020): 4:15pm to 5:15pm.

This demonstrates a slight change in the AM peak hour, which has moved forward by 30 minutes. The PM peak remains the same as identified in the original report.

The 2020 AM and PM peak hour volumes are shown in Figure 2.1 and Figure 2.2.

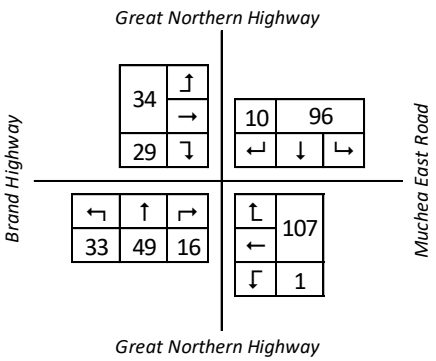


Figure 2.1: AM Peak Hour Volumes (from SCATS data)

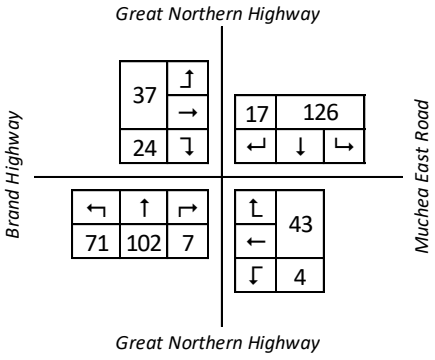


Figure 2.2: PM Peak Hour Volumes (from SCATS data)

Demands at this intersection have changed since 2013 due to the opening of Northlink. Comparing the two sets of turning count data from 2013 and 2020 illustrates that:

- In the AM peak there is a reduction in traffic on most approaches, with an increase in traffic on the east approach (with an additional 67 movements). Overall AM Peak hour movements at the intersection decrease by 220 vehicles.
- The PM peak has decreased in traffic on the south and west approaches, and smaller increases in traffic on the north and east approaches. Overall traffic is decreased by 139 vehicles in the PM peak.

Overall it is considered that the 2013 conditions provide a conservative basis for existing conditions volumes. Since the original analysis determined the intersection has acceptable operation, re-analysis lesser volumes is not required. While there is a change in overall traffic patterns, the opening of Northlink results in a reduction in traffic on the Great Northern Highway at this intersection.

LINK VOLUMES

Link count information on the road network around the LSP was previously collated for 2014. This is tabulated below with comparative, more recent information.

Table 2.1 Link count information, original report

ROAD NAME	LOCATION	ORIGINAL REPORT AVERAGE TWO-WAY WEEKDAY VOLUME (DATE)	UPDATED AVERAGE TWO-WAY WEEKDAY VOLUME (DATE)
Great Northern Highway	North of Muchea East Road	4,309 (2014) 32% Heavy vehicle	3,064 (2020/21) 20% Heavy vehicle
Great Northern Highway	North of Wandena Road (south of Muchea East Road)	7,155 (2014) 22% Heavy vehicle	2,309 (2020/21) 27% Heavy vehicle
Brand Highway	West of Great Northern Highway	4,245 (2014) 22% Heavy vehicle	1,592 (2020/21) 23% Heavy vehicle
Muchea East Road	East of Great Northern Highway	961 (2014) 22% Heavy vehicle	794 (2018/19) 19% Heavy vehicle

It is acknowledged that the link count information collected as part of the original report is now not directly comparable to the current situation with the opening of Northlink, and the reconfigured road network.

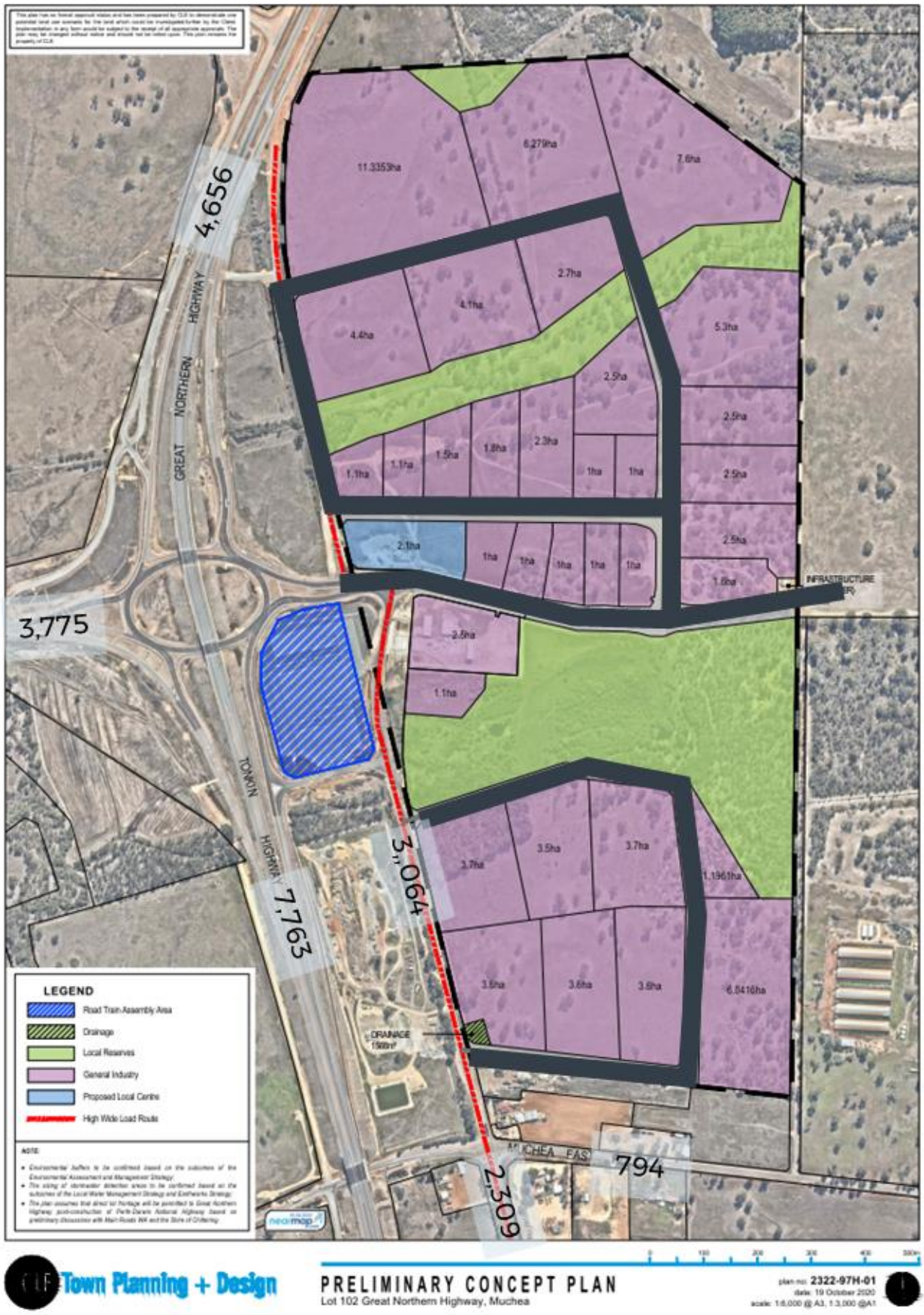
As such, to provide further context, the above has been elaborated upon to document more relevant information as provided in Table 2.2.

Table 2.2 Updated link count information

ROAD NAME	LOCATION	YEAR	AVERAGE TWO-WAY WEEKDAY VOLUME
Tonkin Highway (Northlink)	North of Neaves Road	2020/21	7,763 28% Heavy vehicle
Brand Highway	West of Tonkin Highway	2020/21	3,775 38% Heavy vehicle
Great Northern Highway	North of Brand Highway	2020/21	4,656 33% Heavy vehicle

These external traffic volumes are represented in Figure 2.3.

Figure 2.3 External Traffic Volumes (2020)



To provide context to the future year traffic generation for the LSP area, 2031 external traffic volumes have also been considered. An in-depth desktop research exercise was undertaken to obtain 2031 traffic flow information, but there was limited meaningful information available. As an alternate approach, a 3% per annum growth rate has been applied to Tonkin Highway, Brand Highway and Great Northern Highway (north of Brand Highway) to provide an estimate of what future volumes could be.

Table 2.3 2031 External Traffic Estimates

ROAD NAME	LOCATION	AVERAGE 2020 TWO-WAY WEEKDAY VOLUME	AVERAGE 2031 TWO-WAY WEEKDAY VOLUME
Tonkin Highway (Northlink)	North of Neaves Road	7,763	10,746
Brand Highway	West of Tonkin Highway	3,775	5,225
Great Northern Highway	North of Brand Highway	4,656	6,445

3 DEVELOPMENT PROPOSAL

3.1 CONTEXT

There are no changes required to this section, refer to the original report.

3.2 DEVELOPMENT PROPOSAL

The reference to the Interim Proposal in the original report is no longer relevant, and did not transpire in any case.

The LSP is to ultimately incorporate the land uses detailed in Table 3.1, and compared with those proposed in the original report.

Table 3.1 Development proposal

LAND USE	ORIGINAL REPORT		UPDATE	
	NUMBER OF LOTS	LAND AREA (HA)	NUMBER OF LOTS	LAND AREA (HA)
Transport & Logistics	6	57.6	7	31.5
Manufacturing / Processing	4	22	7	21.4
Services	5	8	3	3.2
Retail / Service Commercial	1	7.5	1	2.1
Engineering & Mechanical	2	3.9	8	14.8
Truckwash	1	1.0	1	1.0
Laydown / Auctioneer / Saleyards	3	10.9	5	21.7
Hire	1	3.6	1	3.6
Service Station	1	2.5	2	3.5
TOTAL	**24**	**110.8**	**35**	**102.7**

As demonstrated, the proposed land uses remain the same, with a different mix now proposed. The overall land area being utilised for lots has reduced by 8.1 hectares.

LSP PROPOSAL ACCESS AND ROAD NETWORK

The proposed layout of the ultimate LSP road network is shown in Figure 3.1. As compared to the original report, 'Intersection A' no longer provides direct access to the development. Intersection A will continue to provide access for High-Wide-Loads to the Great Northern Highway (north), however this falls outside the traffic generation and impact assessment considered in this analysis as it is not part of the LSP proposal.

It was determined during the original approval process that Intersection A would not be utilised for access to the LSP area at the instruction of Main Roads WA. The traffic analysis was not changed in the original report however to reflect this change. The subsequent impact of the prior decision to remove Intersection A, upon the revised performance of Intersection B, is taken into account within this proposal

As part of the revised proposal, it is also intended to account for the existing first stage subdivision approval (WAPC 155948) underpinning the recently constructed Mercury Rise (Road 1) and adjoining lots. This proposal will reflect the

provision of one-way driveway entries (left-in) to the LSP area from Mercury Rise via those dual-frontage lots positioned between Mercury Rise (Road 1) and Canaveral Way (Road 5), as permitted under the existing subdivision approval. Note, the Mercury Rise road reserve does not commence until the easting of the north-west corner of Lot 12 (BP Site), and as such the minimum requisite driveway separation from Main Roads WA's Tonkin Highway interchange is observed by the proposed local service centre maintaining access from Mercury Rise, whilst managing the aforementioned MRWA decision to remove Intersection A.

This means that all traffic generation related to the land uses to the north of Mercury Rise (Road 1) will now use 'Intersection B' or the driveway accesses.

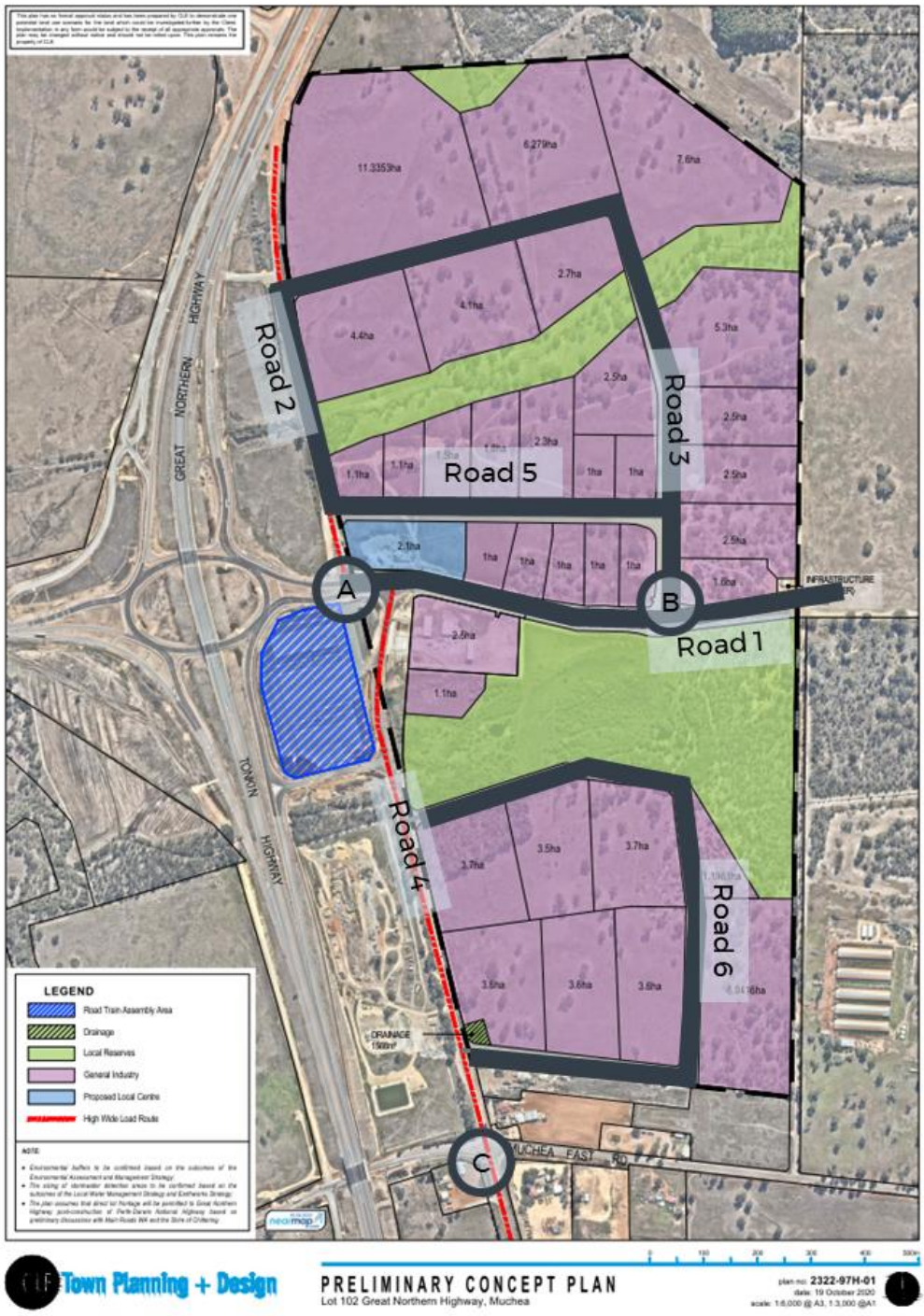


Figure 3.1 Updated Master Plan Road Network and Key Intersections

4 TRAFFIC IMPACT ASSESSMENT

4.1 ASSESSMENT SCENARIOS

The reference to the Interim Proposal in the original report is no longer relevant, and did not transpire.

Consistent with the previous analysis, 2031 has been taken to be the ultimate design horizon at which full development is assumed.

4.2 ASSUMPTIONS

MUCHEA EMPLOYMENT NODE BACKGROUND TRAFFIC

There are no changes required to this section, please refer to the original report.

PROPOSED LAND USES WITHIN THE LSP

Table 4.1 provides an update of the individual land areas and floor areas within each lot to inform the revised traffic generation for the LSP.

Table 4.1 Adopted Land Area and Building Area Proportion Estimates

LAND USE	LAND AREA (HA)	% BUILDING AREA FOR LAND USE	GLFA FOR TRAFFIC ESTIMATES (SQ.M)
Transport & Logistics	31.5	15%	47,175
Manufacturing / Processing	21.4	45%	96,345
Services	3.2	64%	20,224
Retail / Service Commercial	2.1	35%	7,350
Engineering & Mechanical	14.8	40%	59,240
Truckwash	1.0	40%	4,000
Laydown / Auctioneer / Saleyards	21.7	22%	47,762
Hire	3.6	30%	10,800
Service Station	3.5	N/A	N/A
TOTAL	**102.7**	**-**	**292,896**

*Service station traffic estimates not based on floor area but on passing traffic volumes, as per original report.

Note the “Retail / Service Commercial” land use consists of the following:

- 600sqm supermarket
- 650sqm fast food (two outlets)
- 1,900sqm non-food retail
- 4,200sqm service commercial.

TRIP GENERATION RATE

A key change to the LSP proposal is the inclusion of the retail / service commercial land use offering consolidated at one location in the land immediately north-east of the Brand Highway / Northlink roundabout, as highlighted blue in Figure 4.1.

Figure 4.1 Proposed retail / service commercial lot

This lot will include a range of uses including fast food, supermarket, and a mix of non-food retail and service commercial offerings. As such, the previously adopted trip generation methodology has been modified to include these land uses. Trip rates for these land uses have been taken from the WAPC '*Transport Impact Assessment'* and *Institute of Transportation Engineers (ITE) Trip Generation* guidelines.

Table 4.2 provides the updated set of trip generation rates utilised for the analysis. Daily volumes have been derived by multiplying the AM and PM peak values by 4, which is comparable to the peak to daily factor applied for the original report.

In determining trip rates, it is acknowledged that the proposed site will not generate the same level of traffic for the same land uses as in a fully urbanised environment within Perth Metropolitan area. In addition, a number of the patrons to the retail / service commercial offering will be those already travelling to and from the LSP area. Some discounts have therefore been applied in line with *Institute of Transportation Engineers (ITE) Trip Generation* guidelines, including:

- a 56% trip rate discount for fast-food outlets accounting for pass-by trips, linked trips and the remote location
- a 50% discount to the service commercial land uses accounting for linked trips and the remote location
- any non-burger fast food type outlets will not be operational in the AM peak.

Note that no reduction has been made to the supermarket land use as it is assumed the scale of the supermarket itself will be such that it self-limits the trip generation and will not lead to an overestimate.

Table 4.2 Vehicle trip rates

LAND USE	AM PEAK			PM PEAK			DAILY		
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
Service / Light Industry per 100sqm GFA	0.41	0.05	0.46	0.17	0.34	0.51	4	4	8
Food retail (supermarket) per 100sqm GFA	2	0.5	2.5	5.0	5.0	10.0	25	25	50
Non-food retail (service commercial) per 100sqm GFA	0.5	0.13	0.63	1	1	2	5	5	10
Fast Food (non-burger) per 100sqm GFA	0	0	0	6.6	6.6	13.2	26	26	52
Fast Food (burger) per 100sqm GFA	4.4	4.4	8.8	6.6	6.6	13.2	44	44	88

The development considered in the original report included a service station on a 2.5ha lot. Trips to this lot were derived based on the amount of traffic passing on the road network. A second service station is now proposed in the LSP, with a 1ha lot. Trips to the 1ha site have been pro-rated from the total trip generation of the 2.5ha site based on the lot size and the trip generation utilised in the previous analysis, as detailed in Table 4.3.

Table 4.3 Vehicle trip rates – Service stations

LAND USE	AM PEAK			PM PEAK			DAILY		
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
2.5ha service station	39	39	78	29	29	58	365	365	730
1.0ha service station	15.6	15.6	31.2	11.6	11.6	23.2	146	146	292

TRIP GENERATION ZONES

There are no changes required to this section, please refer to the original report.

4.3 TRAFFIC GENERATION

Traffic generated for the LSP proposal in each zone (as defined in the original report, and adopted in this analysis as shown in Figure 4.2) are detailed in Table 4.4. These are derived from the previously documented land uses and trip rates.

Figure 4.2 Original report trip generation zones (extracted from Original Report)

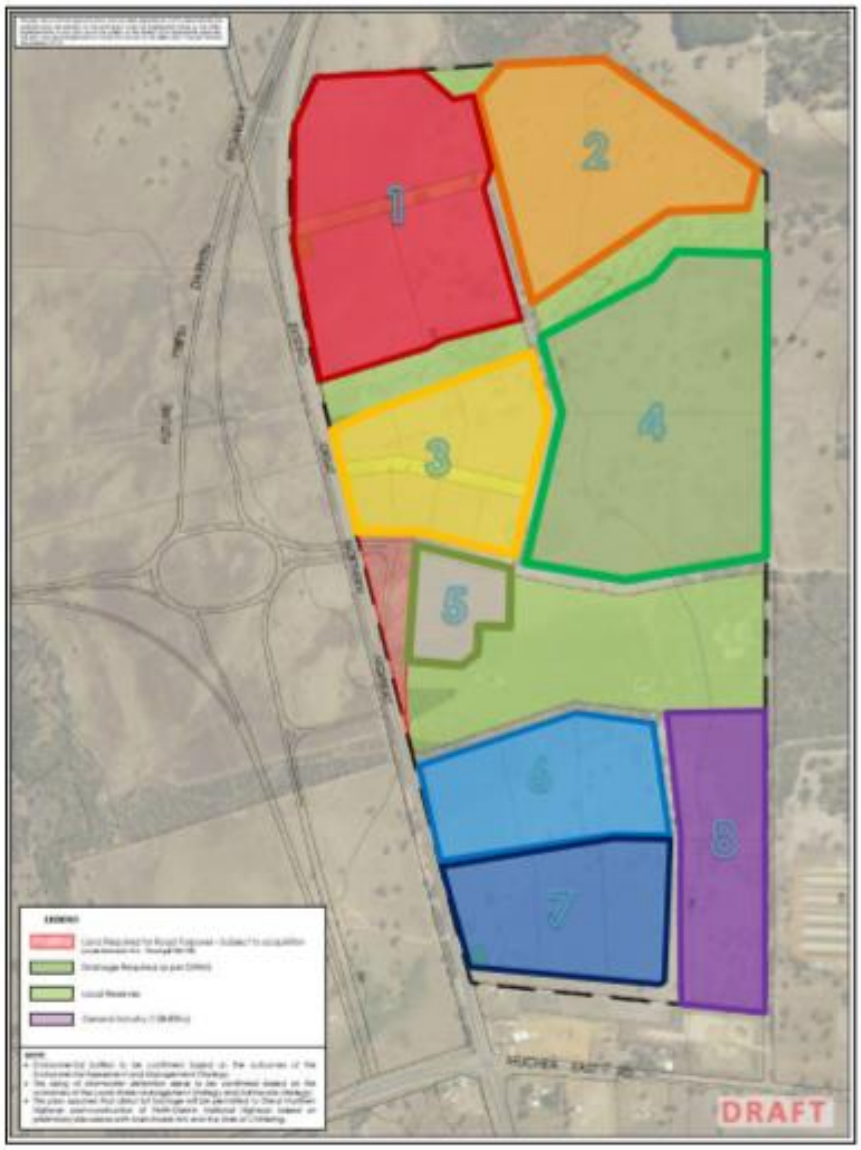


Table 4.4 Estimated Total Traffic Generation for LSP Proposal

TRIP GENERATION ZONE	AM PEAK TRIPS (TO+FROM)	PM PEAK TRIPS (TO+FROM)	DAILY TRIPS (TO+FROM)
Zone 1	318	352	2762
Zone 2	96	106	834
Zone 3	415	628	1389
Zone 4	157	175	4323
Zone 5	98	81	1369
Zone 6	87	97	908
Zone 7	182	202	758

TRIP GENERATION ZONE	AM PEAK TRIPS (TO+FROM)	PM PEAK TRIPS (TO+FROM)	DAILY TRIPS (TO+FROM)
Zone 8	149	165	1584
TOTAL	**1,502**	**1,805**	**13,833**

Table 4.5 demonstrates a comparison between traffic generated for the proposed land uses and the original report.

Table 4.5 Trip generation comparison

	AM PEAK TRIPS (TO+FROM)	PM PEAK TRIPS (TO+FROM)	DAILY TRIPS (TO+FROM)
Original Report	1,384	1,516	11,973
Revised Proposal	1,502	1,805	13,833
Net Change	118	289	1,860
Net Change %	9%	19%	16%

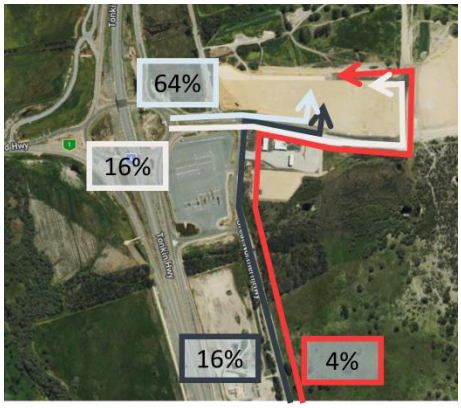
4.4 DISTRIBUTION AND ASSIGNMENT

Building on the assumptions previously developed, access to the site is as follows

- For all zones except Zone 5, 80% of traffic approaches from the Tonkin Highway / Great Northern Highway interchange, with the remaining 20% of traffic approaching/departing from the Great Northern Highway (south)
- For Zone 5, all trips are to/from the Tonkin Highway / Great Northern Highway interchange
- 80% of trips accessing Zone 3 will access the lots directly from Road 1 (Mercury Rise), with the remainder accessing the lots via 'Intersection B' and Road 5 (Canaveral Way). However right turn egress onto Mercury Rise may not be possible from these lots, so 100% of the egress is assumed via Canaveral Way and 'Intersection B'
- Trips travelling to Zones 6-8 from the Tonkin Highway / Great Northern Highway interchange travel via Mercury Rise
- 40% of trips departing Zones 6-8 travel to Tonkin Highway southbound via the Road Train Assembly Area access road.

These assumptions are summarised in Table 4.6.

Table 4.6 Trip distribution paths

TRIP GENERATION ZONE	DISTRIBUITION TO ZONE	DISTRIBUITION FROM ZONE
Zone 1, 2, 4		
Zone 3		
Zone 5		
Zone 6, 7, 8		

Assigning the traffic generation from Table 4.4 to the distribution paths from Table 4.6 results in development traffic generation for the key intersections as detailed in Figure 4.3 in the AM peak and Figure 4.4 for the PM peak.

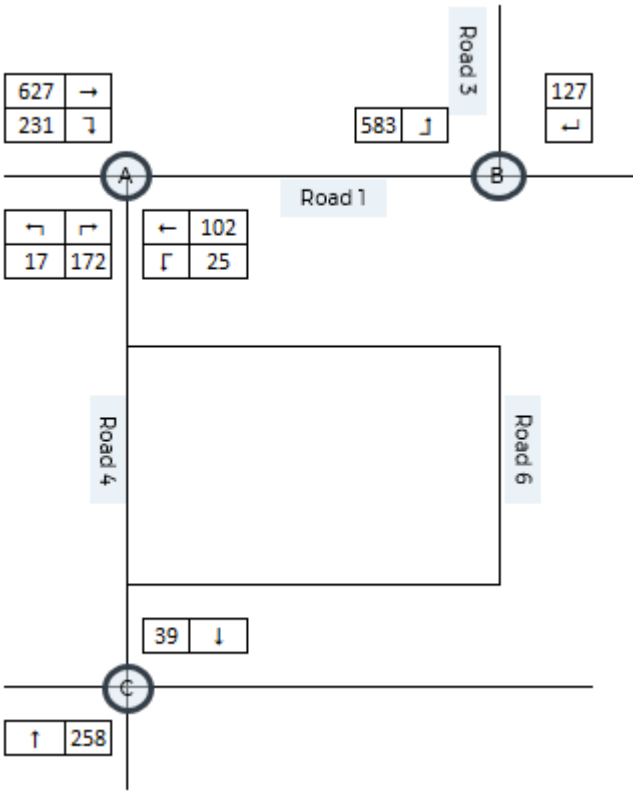


Figure 4.3: AM Peak development traffic

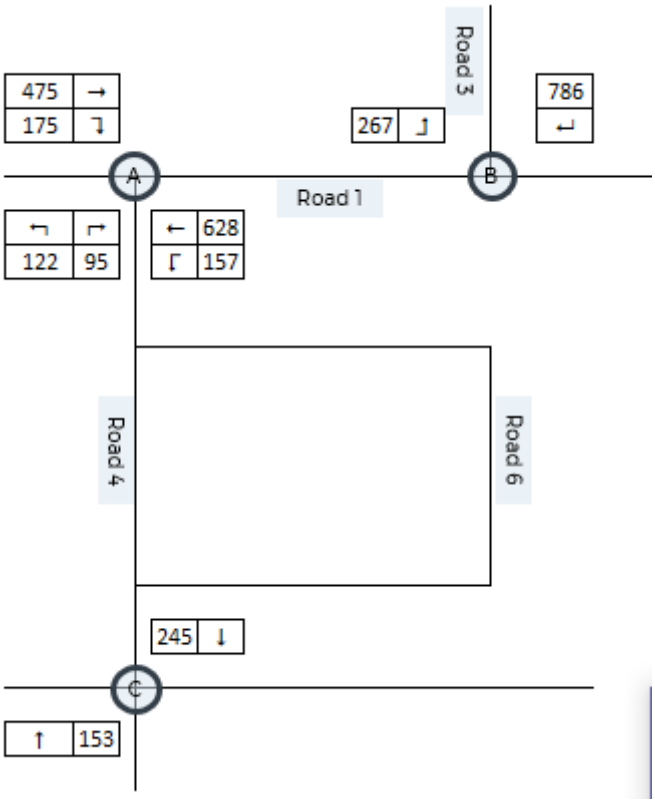


Figure 4.4: PM Peak development traffic

4.5 TRAFFIC IMPACT ASSESSMENT

The original report considered three key intersection for traffic impact. These are set out below, with commentary provided for each in the context of the new proposal.

INTERSECTION A

Intersection A is no longer intended to be utilised as proposed in the original report, and access to it will be restricted for High-Wide-Load movements only. As such, it no longer needs to be considered, since it is not actually utilised for general traffic. The restricted movements at this intersection do not cause any other traffic changes than to consolidate LSP traffic to Intersection B, and as such no adverse impacts are caused by this change.

INTERSECTION B

In the original report it was assumed that Intersection B would be constructed and operate as a priority controlled intersection, even though it was not anticipated any demand will be travelling beyond the intersection on Mercury Rise (Road 1). When tested for capacity as a priority intersection in the original report, it was also assumed Mercury Rise would be single carriageway in its ultimate form.

As part of the commencement of development at the LSP it was agreed to not construct an intersection at this location, and instead create a continuous road into the LSP area. This means no vehicles need to stop to give-way and Intersection B will not actually be an intersection until such time that Mercury Rise needs to be constructed further to the east to

accommodate future access to the Muchea Employment Node Structure Plan area. In its current form therefore, there will be no operational issues at Intersection B.

In the future when Mercury Rise is constructed further east, it is intended to be done so as a dual carriageway.. As per the original approved LSP, the impact of future development and resultant traffic volumes on Mercury Rise not associated with this LSP would need to be determined by way of an operational assessment, with any upgrades required triggered by other development and not the LSP.

INTERSECTION C

Since the opening of Northlink, traffic volumes at this intersection have reduced significantly, particularly for heavy vehicles. The original report showed this intersection to operate with acceptable limits, given the majority of traffic (and any increases as a result of the revised proposal) travel to / from Northlink, it is considered this intersection will continue to operate within acceptable limits.

4.6 ROAD HIERARCHY AND CROSS-SECTIONS

The revised trip generation estimates have been distributed throughout the LSP area to generate daily traffic volumes on each of the proposed roads.

Figure 4.4 demonstrates the traffic volumes by road on a daily basis.

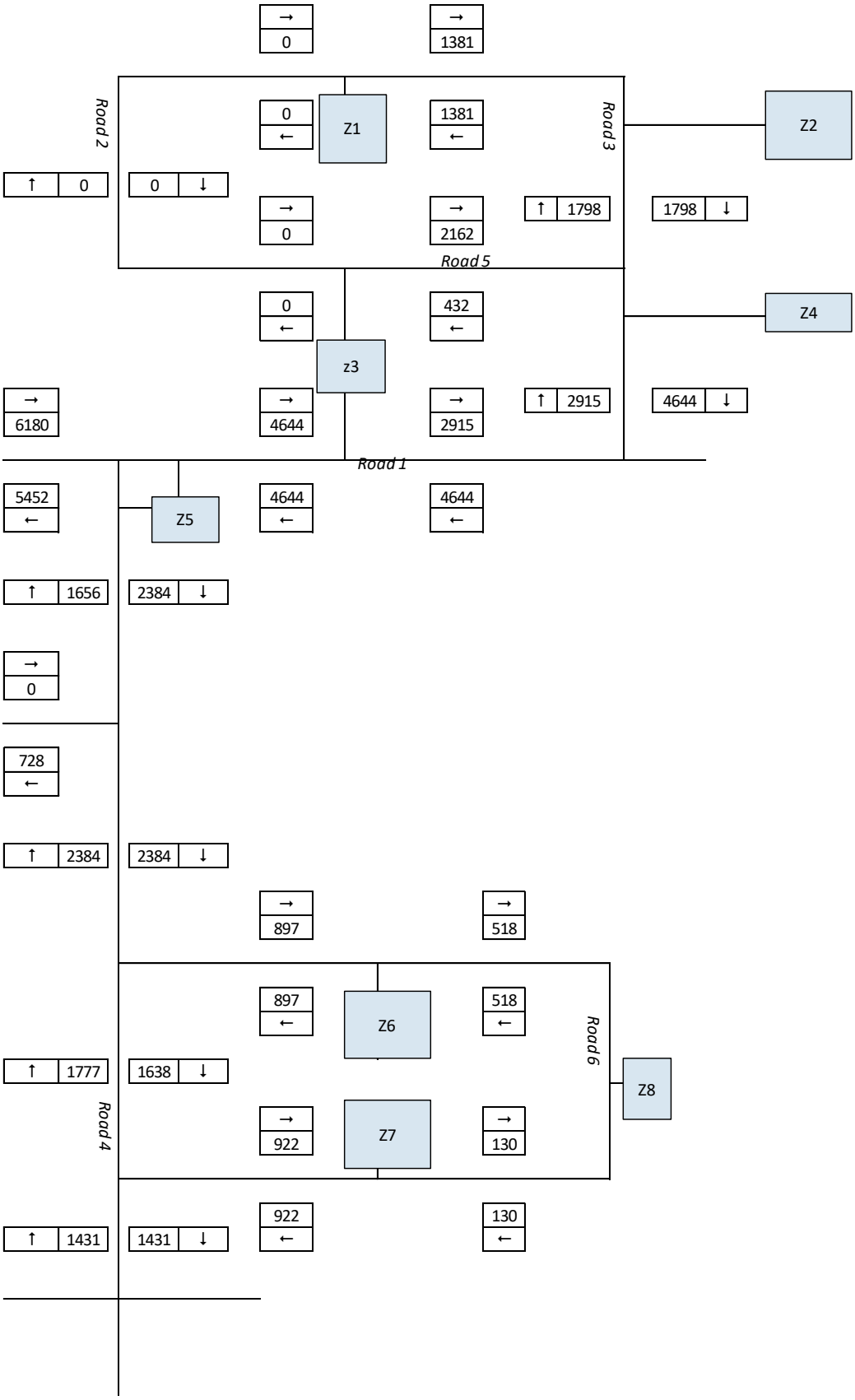


Figure 4.5: Daily traffic generation (at 2031)

These volumes are summarised over the proposed LSP layout in Figure 4.6, and provided alongside external traffic volumes in Figure 4.7.

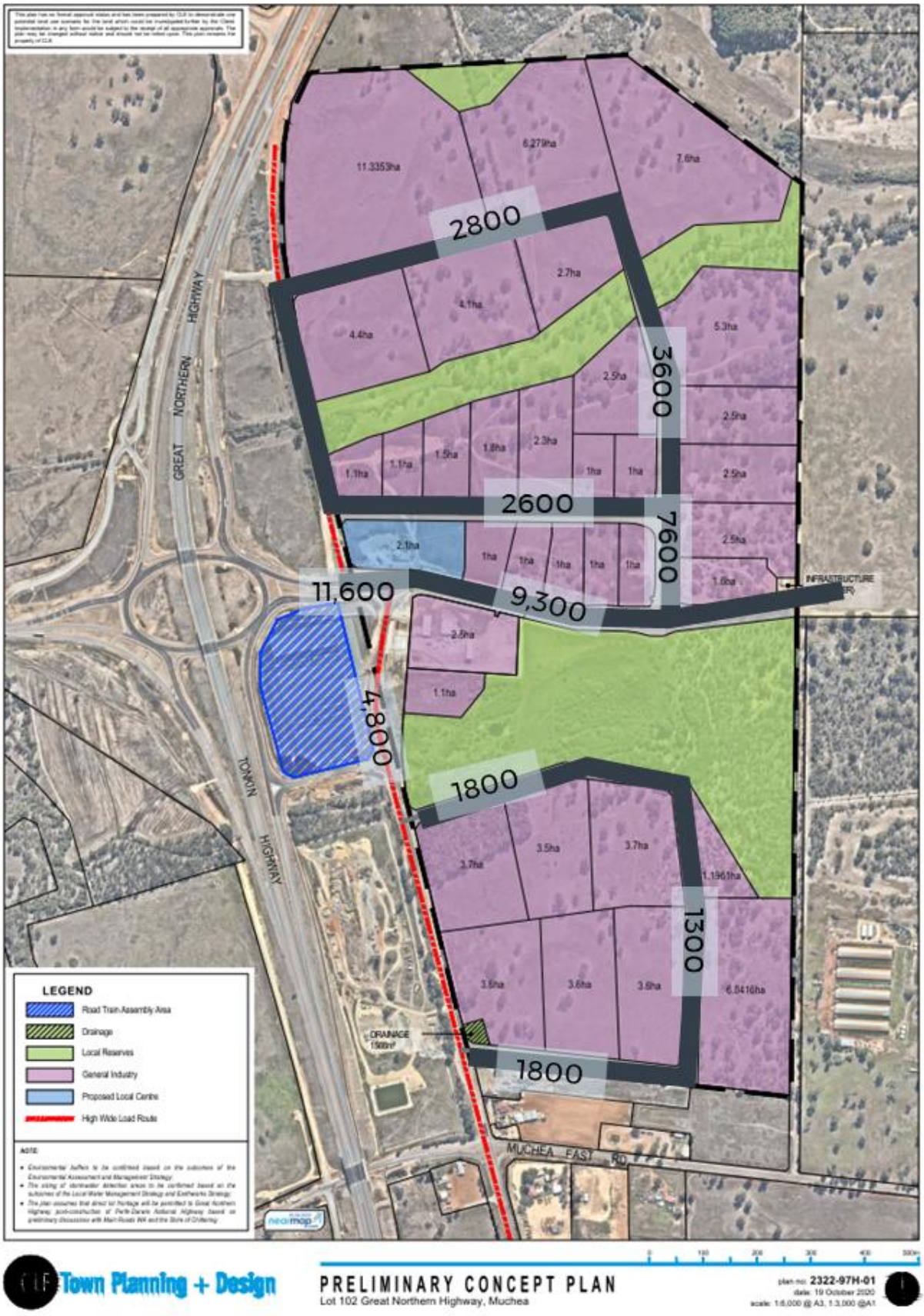


Figure 4.6: Daily Volumes on Key Roads in LSP at full build out (2031)

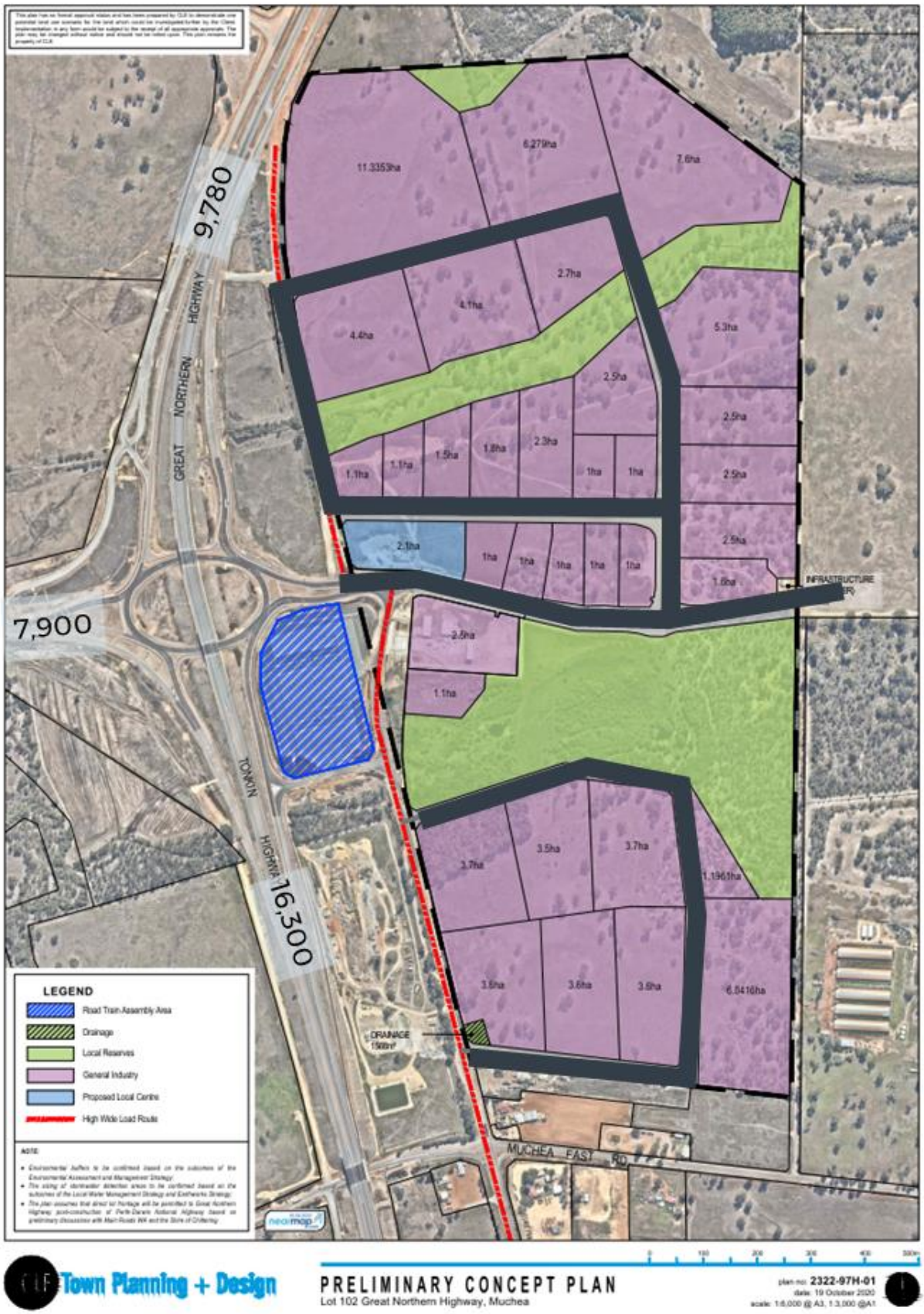


Figure 4.7 2031 External and LSP Traffic Flows (estimated)

These volumes are comparable to those in the original report, and as such no changes to the proposed road hierarchy are required.

Similarly, the revised proposal will not materially change the vehicle types accessing the LSP area, given this and the limited change in daily traffic volumes, no changes are required to the previously proposed cross-sections.

5 CONCLUSION

WSP have prepared this Addendum to update and supplement the original Transport Assessment prepared as part of the original application for the now approved Local Structure Plan (LSP) at Muchea Industrial Park.

The Addendum revisited all areas of the original report, and provided updates where required.

Key changes to the development proposal assessed include:

- Access arrangements to the LSP, including a change already approved as part of the original LSP approval process
- A revision to both the proposed land uses
- The external transport network is also revised, with the completion of the Northlink project in April 2020 extending the Tonkin Highway from Morley to Muchea.

It was determined that the revised proposal will result in some additional traffic generation from the LSP area, as per the Table 5.1.

Table 5.1 Trip Generation Comparison

	AM PEAK TRIPS (TO+FROM)	PM PEAK TRIPS (TO+FROM)	DAILY TRIPS (TO+FROM)
Original Report	1,384	1,516	11,973
Revised Proposal	1,502	1,805	13,833
Net Change	118	289	1,860
Net Change %	9%	19%	16%

Despite the increase in traffic it was concluded the outcomes of the previous assessment were still relevant in terms of:

- Intersection capacity, mainly due to changes in the operation and permitted intersection use
- Road hierarchy
- Road cross-section.

APPENDIX 3

Original Traffic Impact Assessment (2015)

Lot 102, Muchea

Local Structure Plan

Transport Assessment

Issue: C 21/12/15

Client: Sirona Capital
Reference: 16P1004000
GTA Consultants Office: WA

Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
C	21/12/15	Final	Lucas Stewart	Mark Fowler Tanya Moran	Tanya Moran	

GTAconsultants
Melbourne | Sydney | Brisbane
Canberra | Adelaide | Perth
Gold Coast | Townsville

GTAconsultants

Lot 102, Muchea
Local Structure Plan
Transport Assessment

Client //	Sirona Capital
Office //	WA
Reference //	16P1004000
Date //	21/12/15

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1. Introduction

1.1 Background & Proposal

A Local Structure Plan (LSP) is being prepared for a proposed industrial development at Lot 102, Muchea, in the Shire of Chittering. The planning proposal incorporates some 149 hectares of land incorporating primarily general industry land uses. GTA Consultants (GTA) has been commissioned by Sirona Capital to prepare a Transport Assessment (TA) to support the LSP.

This report details the methodology and findings of the TA, which was prepared in line with the guidelines set out in the Western Australian Planning Commission publication '*Transport Assessment Guidelines for Development*' (WAPC Guidelines) and takes account of the Shire of Chittering (SoC) planning policies. This TA considers the sites integration with the existing transport networks including walking, cycling, public transport and vehicular travel and considers the potential impact of the proposed development on these, including consideration of the following:

i existing traffic conditions proximate to the site
ii future (non-development related) transport network upgrades proposed in the region
iii the high-level assessment of the adequacy of the proposed internal road network layout and intersection configuration
iv the traffic generating characteristics of the proposal
v the anticipated impact of the proposal on the surrounding road network.

1.2 References

In preparing this report, reference has been made to the following:

- an inspection of the site undertaken by GTA on 21st October 2015
- Shire of Chittering *Town Planning Scheme No. 6*
- the Western Australian Planning Commission (WAPC) *Transport Assessment Guidelines for Developments*, dated August 2006
- *Traffic Impact Assessment for Hardstand for DA* report prepared by GHD, dated February 2014
- *South Bullsbrook Industrial Precinct – Transport Assessment and Staging Report* prepared by Arup, dated 03 September 2014
- traffic count data provided by MRWA as referenced in the context of this report
- NorthLink WA presentation by Rob Arnott (Senior Project Director) to Engineers Australia on Thursday 17th September 2015
- LSP layout plans prepared by CLE as provided at Appendix A
- other documents as referenced in this report.

1.3 Scoping Discussion

The scope of this TA, including the technical parameters, was discussed and agreed during scoping discussions with SoC, Main Roads WA (MRWA) Wheatbelt regional office and the MRWA Metro region/NorthLink WA project team. Correspondence and Technical Notes associated with these discussions are provided at Appendix B.

2. Existing Situation

2.1 LSP Area Use and Location

The LSP covers a 149 ha area in Muchea East, as shown in Figure 2.1. Muchea East is located approximately 45km north of Perth. The LSP area has a frontage of approximately 1.9km to Great Northern Highway and a small frontage to Gulliente Road on the eastern boundary of the area.

Figure 2.1: LSP Area and its Existing Environs

(Base Image Source: Nearmap)

The land in and surrounding the LSP area is predominantly agricultural, with some local light and general industry uses.

2.2 Existing Transport Networks

Walking and Cycling

There are no specific pedestrian or cycle infrastructure present within a reasonable distance (by each mode) of the LSP area.

Given the rural nature of the LSP area and the long distances to nearest residencies (in excess of 3km to Muchea and Lower Chittering), it is anticipated that walking demand will be negligible from the LSP area to other walking generators outside of the LSP.

Any cyclists in the area local to the LSP currently travel on the established road networks.

The proposed walking and cycling infrastructure within the LSP is discussed in Section 3.2 – Development Proposal.

Public Transport

Public transport bus services currently operate on Great Northern Highway in the form of long distance regional services. No bus stops currently exist on Great Northern Highway along the LSP frontage.

As identified in the *Muchea Employment Node Structure Plan*, the land uses proposed for the area mean feasible provision of public transport services is difficult to achieve. Notwithstanding this, if the provision of services is deemed necessary in the future there exists an opportunity to provide a bus stop on the upgraded section of the Perth Darwin National Highway (Northlink WA) for existing bus services which operate on this route, adjacent to the site. It is likely that any bus stop on NorthLink WA would cater for the already operating regional services as opposed to any new local services, which may not be sustainable from a demand perspective in the short to medium term.

Vehicular Access

The existing primary vehicle access routes for the LSP are highlighted in Figure 2.1 and discussed below.

Great Northern Highway

The Great Northern Highway is under the control of MRWA and classified as a Primary Distributor in the MRWA Road Hierarchy. The Great Northern Highway is listed as a Network 7 Restricted Access Vehicle (RAV) road for its entire 230km length between Perth and Wubin, including its length proximate to the subject site.

The Great Northern Highway plays a strategic role in the movement of freight between Perth and northern WA. It is a two-lane, two-way undivided road set with a generally 9m wide carriageway set within a 40m (or greater) wide road reserve (approx.) as it passes the LSP area. It has a 110km/h posted north of the Brand Highway intersection as it passes the site, with this speed limit dropping to 80km/h through the intersection.

The Great Northern Highway is currently subject to an upgrade programme which will enable the movement of Network 10 RAV vehicles to travel on the route from north of the Brand Highway.

Brand Highway

The Brand Highway is under the control of MRWA and classified as a Primary Distributor in the MRWA Road Hierarchy. The Brand Highway is listed as a Network 7 RAV road for its entire length between Perth and south of Geraldton, including the section through the Muchea townsite.

The Brand Highway is a two-lane, two-way undivided road with a 9m wide carriageway set within a 30m wide road reserve (approx). It has a 110km/h posted speed limit to the north of Muchea, with this speed limit dropping to 80km/h through Muchea and on its approach to the intersection at the Great Northern Highway.

Muchea East Road

Muchea East Road is under the control of the Shire of Chittering and classified as a Regional Distributor in the MRWA Road Hierarchy. It is listed as a Network 7 RAV road for approximately 1.2km of its length immediately east of the Great Northern Highway.

Muchea East Road is a two-lane two-way undivided road with an 8m wide carriageway set within a 20m wide road reserve (approx). It has a 100km/h posted speed limit to the east of the Great Northern Highway, slowing to 80km/h on the approach to the intersection.

Gulliente Road

Gulliente Road is under the control of the Shire of Chittering and classified as an Access Road in the MRWA Road Hierarchy. It is listed as a Network 2 RAV road with conditions that a written approval from the Shire of Chittering permitting the use of this road must be carried by drivers and produced on demand. For the first 310m from Muchea East Road, Gulliente Road is sealed but is narrow at approximately 6.5m to 7m wide, beyond this it becomes an unsealed access track.

Gulliente Road is a two-lane two-way undivided road set within a 20m wide road reserve (approx). There is no posted speed limit on Gulliente Road, with a default 50km/h speed limit therefore applying.

2.3 Existing Traffic Volumes

In order to inform the assessment of the impact of the LSP on the existing road network in the area, a number of sources have been exhausted to collate traffic data information, as set out below.

Intersection Volumes

Manual Turning Movement Counts

Turning movement counts were recorded at the following intersections on Tuesday 19 November 2013:

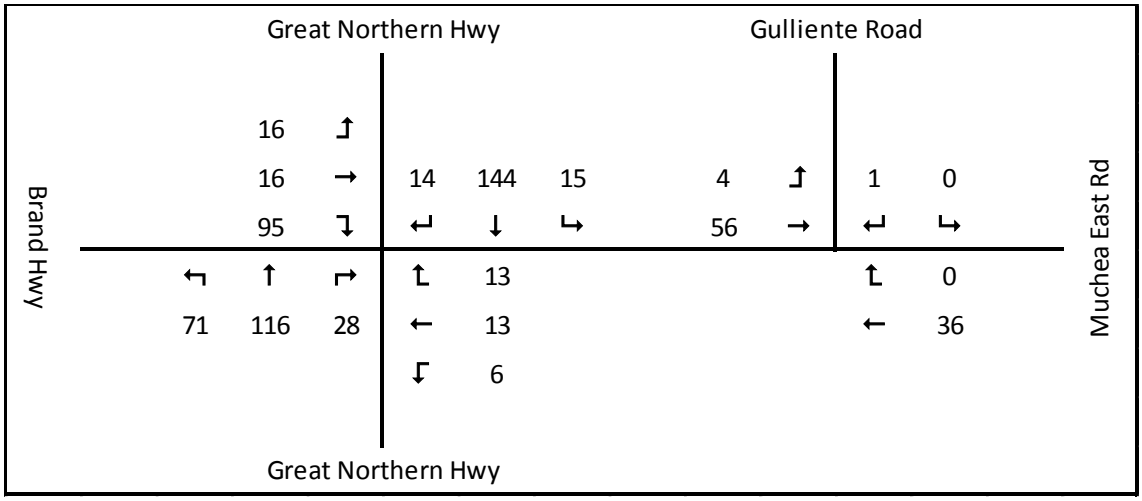
- Great Northern Highway / Brand Highway / Muchea East Road
- Muchea East Road / Gulliente Road.

The turning movement count data identified the following peak hours:

- Great Northern Highway / Brand Highway / Muchea East Road
  - AM Peak Hour: 7:00am to 8:00am
  - PM Peak Hour: 4:15pm to 5:15pm
- Muchea East Road / Gulliente Road
  - AM Peak Hour: 7:15am to 8:15am
  - PM Peak Hour: 4:45pm to 5:45pm.

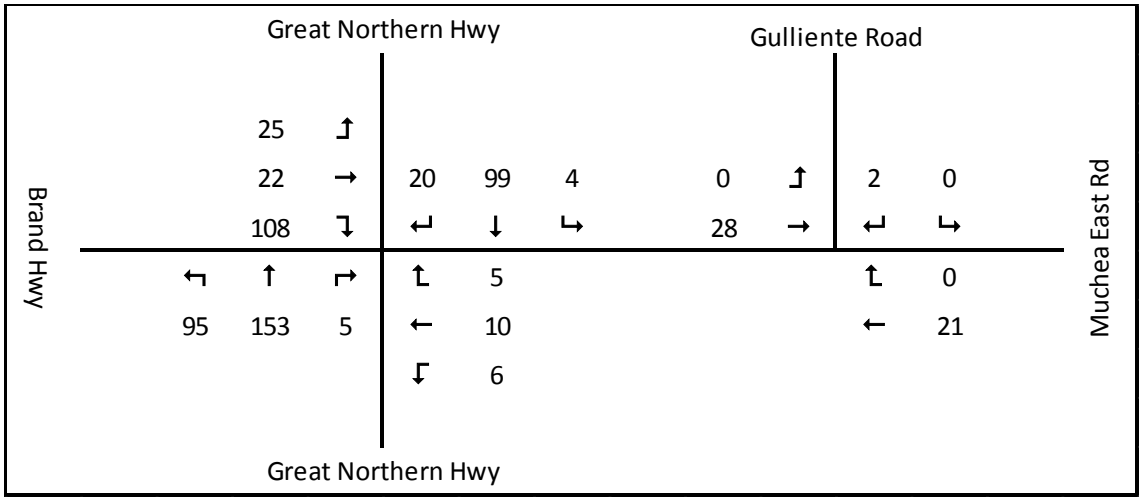
The AM and PM peak hour traffic volumes as identified in these counts are shown in Figure 2.2 and Figure 2.3.

Figure 2.2: AM Peak Hour Turning Movement Volumes (from 2013 counts)



Source: Muchea *Traffic Impact Assessment for Hardstand for DA,* GHD, dated February 2014

Figure 2.3: PM Peak Hour Turning Movement Volumes (from 2013 counts)



Source: Muchea *Traffic Impact Assessment for Hardstand for DA,* GHD, dated February 2014

MRWA SCATS Traffic Volume Data

In addition to the previous turning movement count data, GTA obtained SCATS traffic volume data for the Great Northern Highway / Brand Highway / Muchea East Road signalised intersection from MRWA. Data was obtained for the week of 12-18 October 2015, with the volumes from the Tuesday (13 October) extracted to compare directly to the turning movement count data detailed above. The analysis identified the following peak hours:

- AM Peak Hour: 7:00am to 8:00am
- PM Peak Hour: 4:15pm to 5:15pm.

The AM and PM peak hour volumes are shown in Figure 2.4 and Figure 2.5.

Figure 2.4: AM Peak Hour Volumes (from SCATS data)

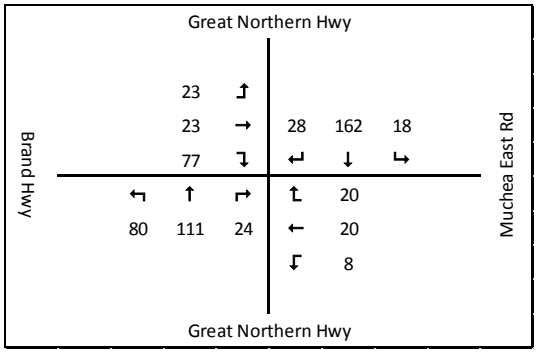
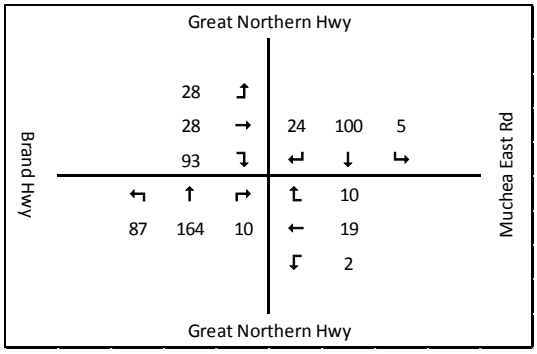


Figure 2.5: PM Peak Hour Volumes (from SCATS data)



Comparing the two sets of turning count data from 2013 and 2015 illustrates that traffic at the intersection has largely remained at similar volumes over the two year period.

Link Volumes

In addition to the intersection volume data as detailed above, daily traffic volume data was obtained from MRWA for the Great Northern Highway, Brand Highway, and Muchea East Road. This data is presented in Table 2.1.

Table 2.1: Existing Traffic Volumes on Key Roads

Road Name	Location of Count	Year of Count	Average Two-Way Weekday Volume (% Heavy Vehicles)	Data Source
Great Northern Highway	North of Muchea East Road	2014	4,309 (32.6%)	MRWA
Great Northern Highway	North of Wandena Road (south of Muchea East Road)	2014	7,155 (30.7%)	MRWA
Brand Highway	West of Great Northern Highway	2014	4,245 (22.5%)	MRWA
Muchea East Road	East of Great Northern Highway	2014	961 (22.0%)	MRWA

3. Development Proposal

3.1 Context

The subject site is located adjacent to the Great Northern Highway, and just north of the Brand Highway. These routes will be the subject to significant changes in the near future as a result of the NorthLink WA project that is currently being delivered by MRWA. The NorthLink WA project involves the two key elements of:

- Southern Section: Tonkin Highway grade separations
- Perth Darwin National Highway: a 37km link between the Southern Section and Great Northern Highway / Brand Highway in Muchea.

A key element of the Perth Darwin National Highway is the delivery of a large-scale interchange between Great Northern Highway and Brand Highway, which will be located adjacent to the LSP area. The delivery of this is yet unconfirmed but it is understood there is a desire to deliver the project in its entirety by the end of 2019[1].

In coordination with the NorthLink WA project, the Great Northern Highway – Muchea to Wubin Stage 2 Upgrade project is also currently being delivered by MRWA. The intent of this project is to improve safety and efficiency on the highway between Muchea and Wubin and also upgrade the road to a standard that allows the movement of RAV 10 from the current RAV 7. RAV classes allow the movement of vehicles of particular dimensions and weight on specific routes. The RAV 10 classification would terminate at Muchea and so at this location vehicles would be required to 'de-couple' and convert into smaller RAV 7 vehicles for travel south into Perth or north via the Brand Highway. In order to enable this, MRWA propose to construct a Road Train Assembly Area (RTAA) directly adjacent to the LSP which is accessed directly from the Perth Darwin National Highway.

3.2 Development Proposal

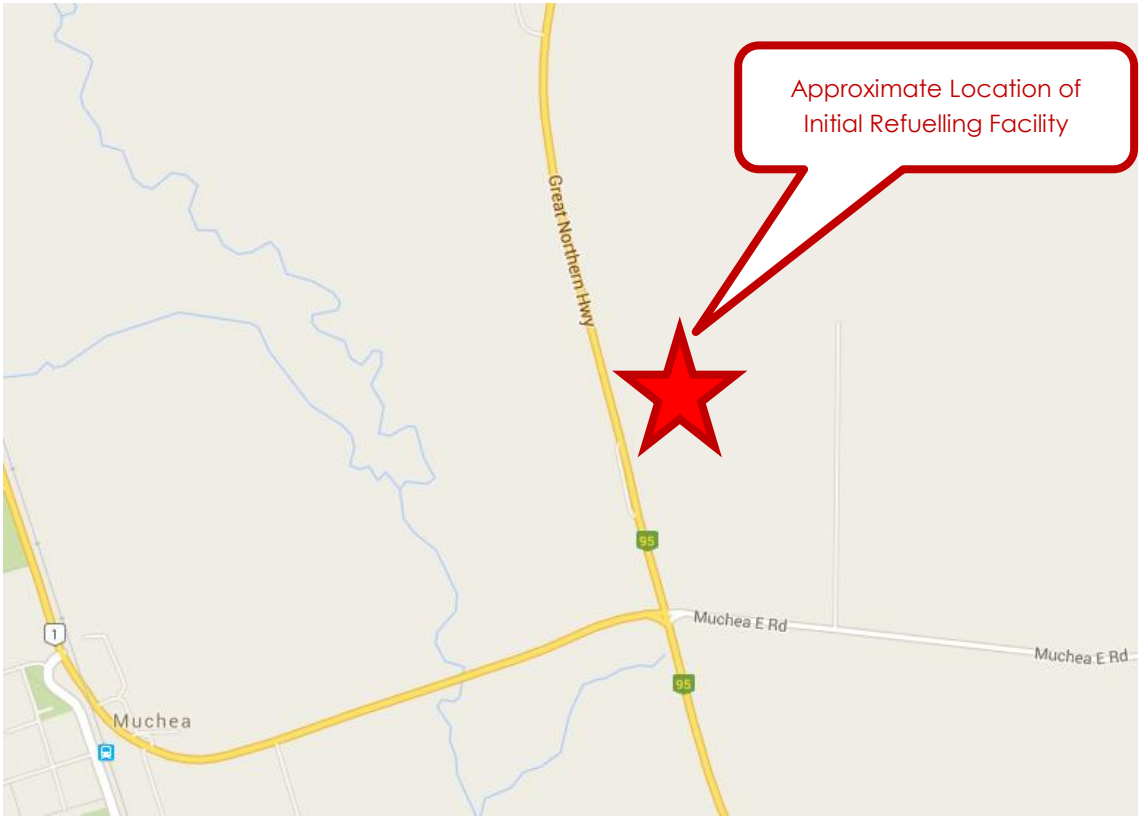
As a result of the major infrastructure works in the area, it is proposed to defer the opening of the LSP proposals until the NorthLink WA infrastructure upgrades are complete. In the meantime, it is proposed to provide an interim development scenario which will allow the operation of an unmanned fuel station. Further information on the interim and LSP proposals are provided below.

Interim Proposal

It is proposed to operate an unmanned re-fuelling facility within the LSP area prior to the implementation of the LSP proposals. The re-fuelling facility will be located on the Great Northern Highway frontage of the LSP area, as conceptually shown in Figure 3.1.

[1] NorthLink WA presentation by Rob Arnott (Senior Project Director) to Engineers Australia on Thursday 17th September 2015.

Figure 3.1: Proposed Interim Proposal Location



Interim Proposal Access

The re-fuelling facility will be accessed via a formal intersection which caters for the vehicles which are expected to use it. The exact location has yet to be determined but will be identified once MRWA proposals for this interchange is finalised.

This arrangement has been discussed with the MRWA Wheatbelt region (refer the scoping discussions provided at Appendix B). MRWA has acknowledged that any investment in this access will ultimately be made abortive works through the delivery of NorthLink WA and so a pragmatic approach will be taken when considering the type and form of the intersection. Notwithstanding this, the intersection should maintain (and improve, if possible) safety on this section of road.

The existing alignment of Great Northern Highway as it passes the LSP area is typically straight and flat, such that an access solution can be easily determined which will satisfy safety and capacity requirements. The exact location and form of the intersection will be determined during a Development Application process for the re-fuelling facility.

LSP Proposal

The LSP is to ultimately incorporate the following land uses as detailed in Table 3.1.

Table 3.1: Development Proposal

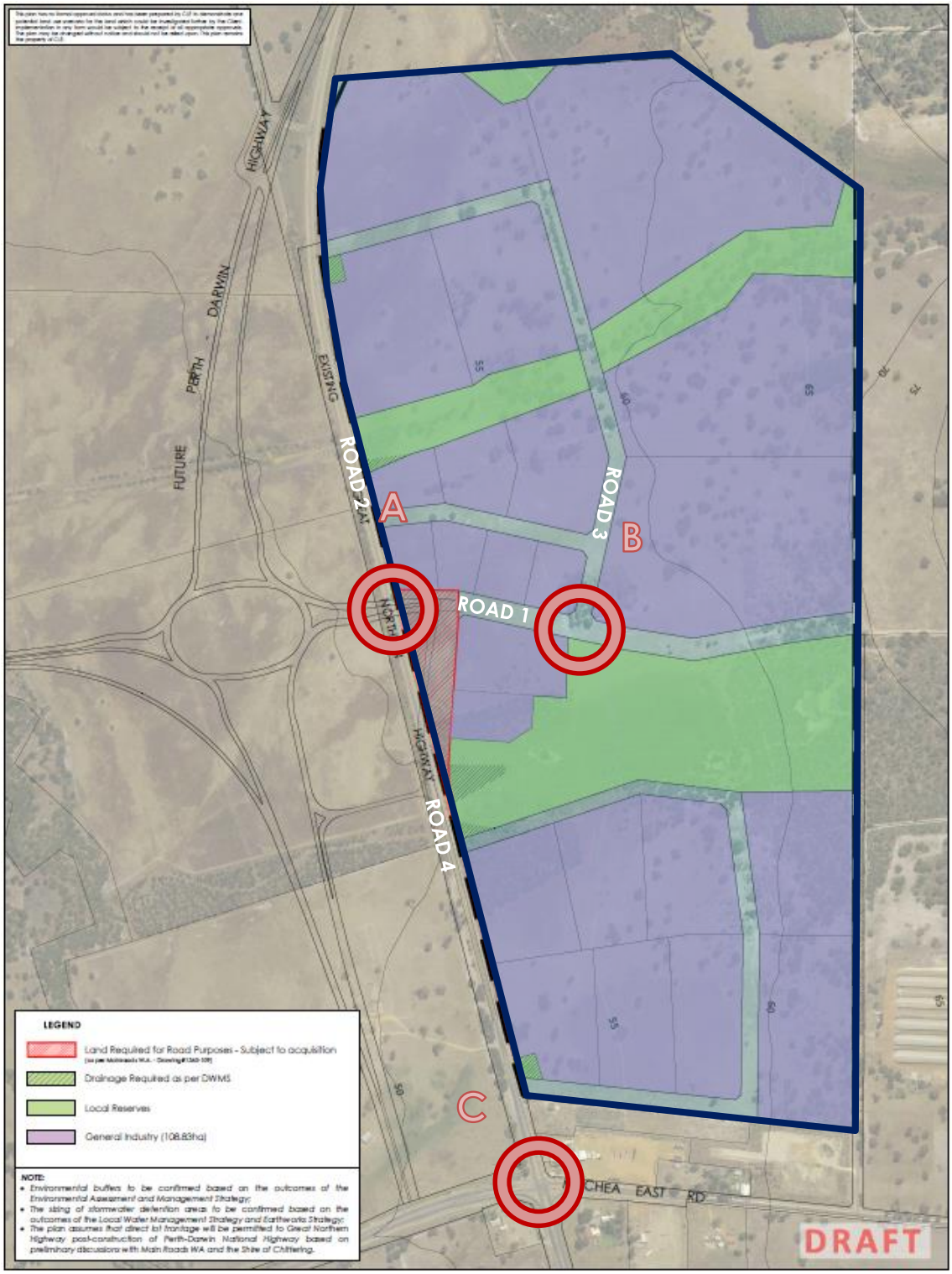
Land Use	Number of Lots	Total Ha
Transport & Logistics	6	57.6
Manufacturing/Processing	4	22.8
Services	5	7.5
Retail	1	1.0
Engineering & Mechanical	2	3.9
Truckwash	1	1.0
Service station	1	2.5
Laydown/Auctioneer/Saleyards	3	10.9
Hire	1	3.6
TOTAL	**24**	**110.8**

These land uses will be spread throughout the LSP area, with all prospective land users seeing great benefit from being provided with immediate access to the strategic road network, and so it is likely the end users may operate some regional distribution from the LSP area also.

LSP Proposal Access and Road Network

The anticipated layout of the ultimate LSP road network is shown in Figure 3.2. Primary access will be gained to the LSP area from the NorthLink WA interchange, with secondary access from the existing Great Northern Highway (and in turn Muchea East Road) with driveway access to individual lots provided throughout the LSP area. The internal road network and intersections will be developed to consider the wider aims of the *Muchea Employment Node Structure Plan* and the ability to accommodate access to particular lots by large, heavy vehicles.

Figure 3.2: Proposed Ultimate Structure Plan Concept, Road Network and Key Intersections



Primary Access – Road 1

The layout of the primary access to the LSP (Road 1) is largely dictated by the NorthLink WA project and their interchange design. The current layout, as proposed, is shown in Figure 3.2. As such, Road 1 is subject to further refinement as the NorthLink WA layout and RTAA proposals are finalised.

In the *Muchea Employment Node Structure Plan (2011)*, Road 1 is depicted as a 'loop road' as illustrated in Figure 3.3. The loop road runs through the LSP area from the Great Northern Highway and ultimately heads south east. Delivery for the construction of this 'loop road' beyond the LSP area will be subject to further development of the *Muchea Employment Node Structure Plan*.

Figure 3.3: Muchea Employment Node Transport Network

Secondary Access – Road 4

It is expected that the existing Great Northern Highway will be downgraded and handed over to SoC to maintain and operate (refer Appendix B scoping discussions). The LSP proposes to use this route for secondary access to the LSP area, via the existing Muchea East Road intersection (Intersection C). No physical changes are proposed to Road 4, other than those proposed as part of NorthLink WA. The majority of demand to and from the LSP area will be generated via NorthLink WA and so the volume of vehicles using Road 4 will be relatively low.

Internal Road Network (including Roads 2 & 3)

The internal road network will largely be focussed around Road 1 from the NorthLink WA interchange. The development of the internal road network will be dependent upon the development staging and vehicular access requirements.

Walking and Cycling

Walking and cycling will play limited roles within the LSP area. As such, the network of internal roads as described above, provides for a legible traffic hierarchy and will assist off road pedestrian and cyclist movements. Generally, a shared path along one side of the internal roads would reasonably serve the needs of the occasional walking and cycling demand.

4. Traffic Impact Assessment

4.1 Assessment Scenarios

Two key scenarios have been determined for consideration as part of this assessment, in line with the development proposals set out in Section 3.2.

Interim Proposal (2016)

Given likely planning and construction timeframes, it is expected that the proposed re-fuelling facility would be operational by the end of 2016. As such, this has been assumed to be the base year for the interim proposal traffic impact assessment. A 2% per annum traffic growth rate has been applied to determine the 2016 base volumes from existing volumes, on the basis of historic traffic growth identified on Great Northern Highway as it passes the site.

LSP Proposal (2031)

The LSP Proposal scenario assumes that the entire subject site is fully developed, and that the proposed NorthLink WA road upgrades (including future intersections and interchanges) are all complete and operational.

In this scenario, the re-fuelling facility delivered as part of the Interim Proposal will be removed from the site and replaced as a full roadside service station (with convenience store and associated facilities) in a location proximate to the proposed RTAA.

In accordance with MRWA traffic modelling for the NorthLink WA project, 2031 has been taken to be the ultimate design horizon at which full development is assumed.

4.2 Assumptions

Muchea Employment Node (Background Traffic)

All land beyond the LSP to the east is currently zoned 'Agricultural Resource' and at the time of writing this report, there are no known scheme amendments proposed within the *Muchea Employment Node Structure Plan* area to rezone land to facilitate industrial development. Further, the project team is not aware of any proposed developments that will generate additional traffic on the road network, specifically on the loop road (Road 1).

Assumption 1: On the basis of the above, it would be reasonable to assume that at LSP's full development around 2031, there would be no or very little traffic demand accessing the loop road through the LSP area from the east.

There is therefore no requirement, for the purposes of operating the LSP area, to provide any road link to the east of 'Intersection B'. This means that the intersection does not need to be an intersection as there is no real purpose for the road to the east for the operations of the LSP.

Assuming an eastern approach to form 'Intersection B' is constructed, it will initially be adequate to provide a priority controlled intersection. The intersection operational assessment detailed in Section 4.5 demonstrates a priority control will have some surplus traffic capacity during peak periods.

Sensitivity tests have also been run by GTA, which indicate that the intersection could accommodate additional traffic to/from the east in the event that further development does occur prior to around 2031. It is however noted that the extent of development to the east, and its subsequent traffic generation on Road 1 would impact the performance of this intersection into the future, and as such the operations of this should be assessed by other Applicants at the time of any proposal being considered on the land parcels to the east.

Assumption 2: 'Intersection B' is constructed as a priority controlled intersection to assist the loop road proposal in the *Muchea Employment Node Structure Plan*, even though there is no requirement to provide a road link to the east of 'Intersection B' for the purposes of operating the LSP area.

Proposed Land Uses within LSP

In order to accurately estimate the traffic generation of the individual specialised industrial land uses within the LSP, GTA was provided with data by Sirona Capital of their other similar industrial estates. The data provided breakdowns of the individual land areas and floor areas within the estates, thus providing ratios of total land area to Gross Leasable Floor Area (GLFA). The ratios were then used to derive the expected traffic generation for the LSP.

Based upon the information provided by Sirona Capital, the following assumptions with respect to individual uses and floor area ratios were adopted in GTA's analysis, as detailed in Table 4.1.

Table 4.1: Land Area and Building Area Proportion Estimates as adopted in GTA's analysis

Specific Land Use	Land Area (ha)	% of building area for land use	GLFA for Traffic Estimates (sq.m)
Transport & Logistics	57.6	15%	86,400
Manufacturing / Processing	22.8	45%	99,750
Services	7.5	64%	47,760
Retail	1.0	66%	6,600
Engineering & Mechanical	3.9	40%	15,600
Truckwash	1.0	40%	4,000
Laydown / Auctioneer / Saleyards	10.9	20-25%	23,650
Hire	3.6	30%	10,800
Service Station	2.5	N/A - refer note [1]	N/A - refer note [1]
Total	**110.8 ha**	**-**	**294,560 sq.m**

[1] Service station traffic estimates not based on floor area but on passing traffic volumes. Further details provided in Table 4.6.

Assumption 3: GTA's traffic generation has been based on the GLFA of each specific land use proposed within the LSP. The GLFA has been derived from other existing industrial estates. On average, the percentage of building area to land area in the LSP is about 27%, which is considered appropriate for general industry.

Trip Generation Rate

In determining trip generation for the LSP, consideration was given to other similar Transport Assessments prepared for similar developments on behalf of Sirona Capital, most notably the *South Bullsbrook Industrial Precinct – Transport Assessment and Staging Report* prepared by Arup in 2014. The trip generation rates for the AM and PM peak periods, as used and agreed by approving agencies are presented in Table 4.2.

Table 4.2: Traffic Generation Rates for LSP Proposal

Land Use	Trip Generation Rate	
	AM Peak Hour	PM Peak Hour
Service/Light Industry	0.46 trips / 100sq.m GLA	0.51 trips / 100sq.m GLA

With respect to determining an appropriate ***daily*** trip generation rate, reference has been made to the NSW RMS (formerly RTA) *Guide to Traffic Generating Developments*, which specifies a traffic generation rate for 'warehouse' use of **4 trips / 100sq.m** floor area over a typical weekday.

This rate was adopted within this analysis given the 'warehouse' use described in the Guide, and the proposed mixed of industrial-based uses within the LSP are directly comparable. It is also noted that the warehouse rate specified in the Guide for peak hour traffic generation is 0.5 trips / 100sq.m floor area, which correlates to the peak hour traffic generation rates adopted in the *South Bullsbrook Industrial Precinct – Transport Assessment and Staging Report* and subsequently also used for this assessment.

To further support this daily rate, GTA has compiled the following summary of relevant trip generation rates from a number of sources around Australia and New Zealand. These include:

- NSW Roads and Maritime Services (RMS) *Guide to Traffic Generating Developments*
- Queensland Department of Transport and Main Roads (TMR) *Road Planning and Design Manual*
- New Zealand Trips and Parking Database Bureau (NZTPDB) *Trips Database Bureau Database* (TDB Database) entries for Australia
- GTA's Generation Database of trip generation from a range of land uses across Australia, including surveys of six industrial sites in Victoria
- *Ipswich Car Parking Rates Benchmarking Study – Business Park Traffic Generation Rates* comprehensive study prepared by GTA for Ipswich City Council for an industrial site in Carole Park, Queensland.

The peak hour and daily trip generation rates for industrial land uses as specified in these data sources are summarised in Table 4.3.

Table 4.3: Summary of Trip Generation Rates

Data Source	Data Origin	Specified Land Use Category	Peak Hour Trip Generation Rate (trips / 100sq.m floor area)	Daily Trip Generation Rate (trips / 100sq.m floor area)
NSW RMS	New South Wales	Warehouse	0.5 trips / hour	4 trips / day
		Factory	1 trip / hour	5 trips / day
Qld TMR	Queensland	Factory	-	4-5 trips / day
NZTPDB	Erskine Park, New South Wales	Industrial Park	0.15-0.16 trips / hour	1.89 trips / day
	Eastern Creek, New South Wales	Industrial Park	0.19-0.20 trips / hour	2.31 trips / day
	Port Stephens, New South Wales	Industrial Park	0.32-0.39 trips / hour	3.78 trips / day
GTA Database (derived from our own Traffic Surveys)	Victoria	3 industrial parks, 2 factories and 1 distribution centre	0.5 trips / hour	4.5 trips / day
	Carole Park, Queensland	Industrial Park	0.3 trips / hour	3.7 trips / day
Average of All Data Sources			**0.44 trips / hour**	**3.8 trips / day**

The data indicates that **average peak hour** trip generation of these industrial sites is in the order of **0.44 vehicle trips / 100sq.m** per hour. This concludes that the adopted rates of 0.46 and 0.51 vehicle trips / 100sq.m floor area are sufficiently conservative in estimating the traffic generated by the proposed LSP.

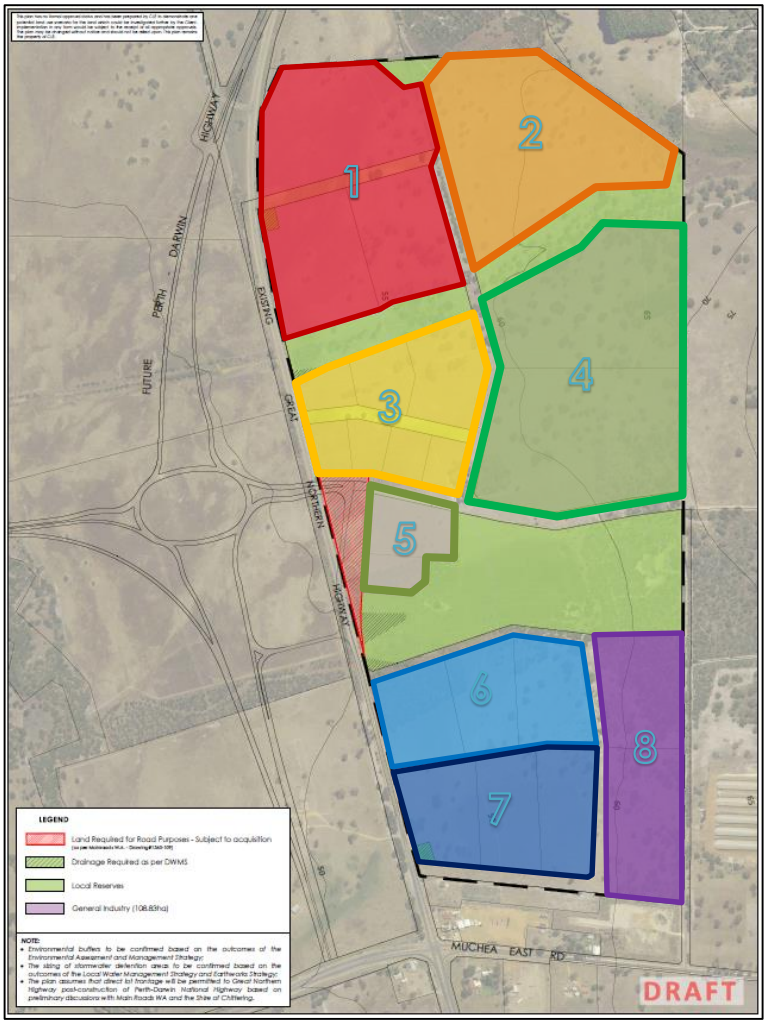
With respect to **daily rates**, Table 4.3 indicates that a trip generation rate of **4 vehicle trips / 100sq.m** per day is consistent with the NSW RMS rate for 'warehouses', the lower end of the Queensland TMR rate for 'factories', and is greater than a number of empirical data sources obtained through GTA's surveys. Accordingly, this rate is considered to be appropriate and provide for a sufficiently conservative estimate of traffic generated by the proposed LSP.

Assumption 4: A daily trip generation rate of 4 trips / 100sq.m GLFA has been used for the LSP Proposal.

Trip Generation Zones

To accurately represent localised traffic generation and distribution, the LSP has been divided into eight trip generation 'zones'. These zones represent a portion of the total traffic generated by the LSP and each have their own distribution across the local road network. These zones are shown in Figure 4.1.

Figure 4.1: Trip Generation Zones



4.3 Traffic Generation

The traffic generating characteristics of each scenario are considered in the following sections.

Interim Proposal (2016)

Given that the re-fuelling facility is to be an unmanned development providing only fuel with no ancillary on-site uses, it is expected that trips to the site would be almost exclusively drop-in trips (i.e. trips already on the road network). As such, traffic generation for the interim proposal has been estimated based on a proportion of passing vehicles on the Great Northern Highway.

Information provided by the potential service station operator for the interim development proposal suggests the following with respect to anticipated drop-in traffic proportions:

- 3% of passing light vehicles will drop-in at the re-fuelling facility
- 5% of passing heavy vehicles will drop-in at the re-fuelling facility
- 7% of passing road trains will drop-in at the re-fuelling facility.

It is noted that these rates provide for the number of vehicles passing the site that drop-in to the re-fuelling facility, each of which would generate one inbound and one outbound movement. The definition of road trains in the above respect is RAV 10 vehicles, and as they are not permitted to

travel on the existing Great Northern Highway they have been excluded in the Interim Proposal scenario.

The drop-in trip proportions for light and heavy vehicles have been adopted as the basis for traffic generation assumptions of the proposed re-fuelling facility. It is noted that these traffic generation assumptions in Table 4.4 apply to service stations with convenience stores, and as such are to be considered a conservative estimate of traffic generation for the proposed unmanned re-fuelling facility.

With this conservative estimate in mind, the total anticipated traffic generation for the Interim Proposal is provided in Table 4.4.

Table 4.4: Estimated Traffic Generation for Interim Proposal

Land Use	Period	Passing LVs (2016)	Passing HVs (2016)	LV Drop-Ins	HV Drop-Ins	Total Drop-Ins
Service Station	AM Peak	258	111	8 vehicles (16 vehicle movements)	6 vehicles (12 vehicle movements)	14 vehicles **(28 vehicle movements)**
	PM Peak	236	101	7 vehicles (14 vehicle movements)	5 vehicles (10 vehicle movements)	12 vehicles **(24 vehicle movements)**
	Daily	3,200	1,371	96 vehicles (192 vehicle movements)	69 vehicles (138 vehicle movements)	165 vehicles **(330 vehicle movements)**

Table 4.4 indicates that the Interim Proposal is expected to generate some 28 and 24 vehicle movements in and out of the site in the AM and PM peak hours respectively, with some 330 vehicle movements in and out of the site over a typical day.

LSP Proposal (2031)

The trip generation rates have been applied to the trip generation "zones" developed by GTA over the LSP area.

The traffic generated in the morning and evening peak periods are set out below in Table 4.5.

Table 4.5: Traffic Generation for LSP Proposal

Trip Generation Zone	AM Peak Hour		PM Peak Hour	
	Arrivals	Departures	Arrivals	Departures
1	273	30	114	222
2	172	19	72	140
3	258	29	108	210
4	84	9	35	68
5	See below			
6	85	9	36	69
7	104	12	44	85
8	195	22	82	159

With respect to the proposed ultimate service station (Trip Generation Zone 5), estimates of its traffic generation have been assumed to be proportional to the anticipated scale of future passing volumes on Northlink WA around 2031 (as provided by MRWA in their email attached at Appendix B). These proportions and resultant traffic generation estimates are detailed in Table 4.6.

Table 4.6: Estimated Service Station Traffic Generation for LSP Proposal

Land Use	Period	Passing Traffic Volumes	Drop-In Proportions of Passing Vehicles	Trip Generation Estimate
Service Station	AM Peak	1,075 vehicles / hour	3% of light vehicles 5% of heavy vehicles 7% of road trains	39 trips / hour
	PM Peak	800 vehicles / hour		29 trips / hour
	Daily	10,000 vehicles / day		365 trips / day

On this basis, the estimated traffic generation associated with the total LSP proposal is detailed in Table 4.7.

Table 4.7: Estimated Total Traffic Generation for LSP Proposal

Trip Generation Zone	Assumed GLFA (sq.m)	Trip Generation Rate			Trip Generation Estimate		
		AM Peak	PM Peak	Daily	AM Peak (trips/hour)	PM Peak (trips/hour)	Daily (trips/day)
1	66,000	0.46 trips / 100sq.m GLA	0.51 trips / 100sq.m GLA	4 trips / 100sq.m GLA	304	337	2,640
2	41.550				191	212	1,662
3	62,360				287	318	2,494
4	20,250				93	103	810
5	N/A (5.4 ha site)	As per above plus Table 4.6 for service station component			82	72	655
6	20,500	0.46 trips / 100sq.m GLA	0.51 trips / 100sq.m GLA	4 trips / 100sq.m GLA	94	105	820
7	25,200				116	129	1,008
8	47,100				217	240	1,884
Total					**1,384**	**1,516**	**11,973**

Table 4.7 indicates that the proposal is expected to generate in the order of 1,400 vehicle movements in the AM peak, 1,500 vehicle movements in the PM peak and a total of 12,000 vehicle movements per typical weekday.

4.4 Distribution and Assignment

Interim Proposal (2016)

Given that the development traffic is expected to be entirely drop-in based in the Interim Proposal, directional distributions would correlate with existing traffic flows on the Great Northern Highway. As such, the following directional distributions have been assumed:

- AM Peak:
  - 60% of development traffic travels southbound (i.e. enters from the north and leaves to the south)
  - 40% of development traffic travels northbound (i.e. enters from the south and leaves to the north).
- PM Peak:
  - 40% of development traffic travels southbound (i.e. enters from the north and leaves to the south)
  - 60% of development traffic travels northbound (i.e. enters from the south and leaves to the north).

As noted above, the traffic generated by the re-fuelling facility is expected to be entirely drop-in based (i.e. trips already on the road network), and as such is not expected to have a net impact on traffic volumes at adjacent intersections.

On this basis, the anticipated traffic generation for the Interim Proposal is shown in Figure 4.2 and Figure 4.3.

Figure 4.2: AM Peak Hour Interim Traffic Generation

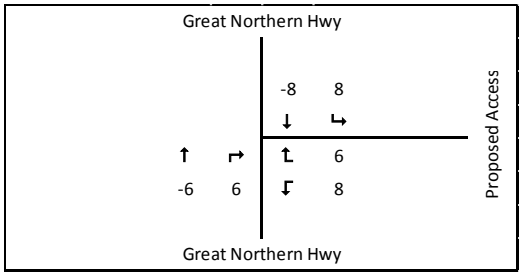
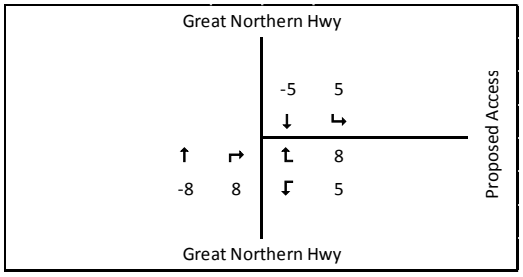


Figure 4.3: PM Peak Hour Interim Traffic Generation



LSP Proposal (2031)

Noting the future layout of the road network with Northlink WA rerouting the Great Northern and Brand Highways, and the future interchange with the east-west road through the LSP area, it is expected that the vast majority of traffic would utilise this major interchange in accessing the LSP area. In the case of the proposed service station, all traffic to this site is assumed to be drop-in trips from the new highway alignment.

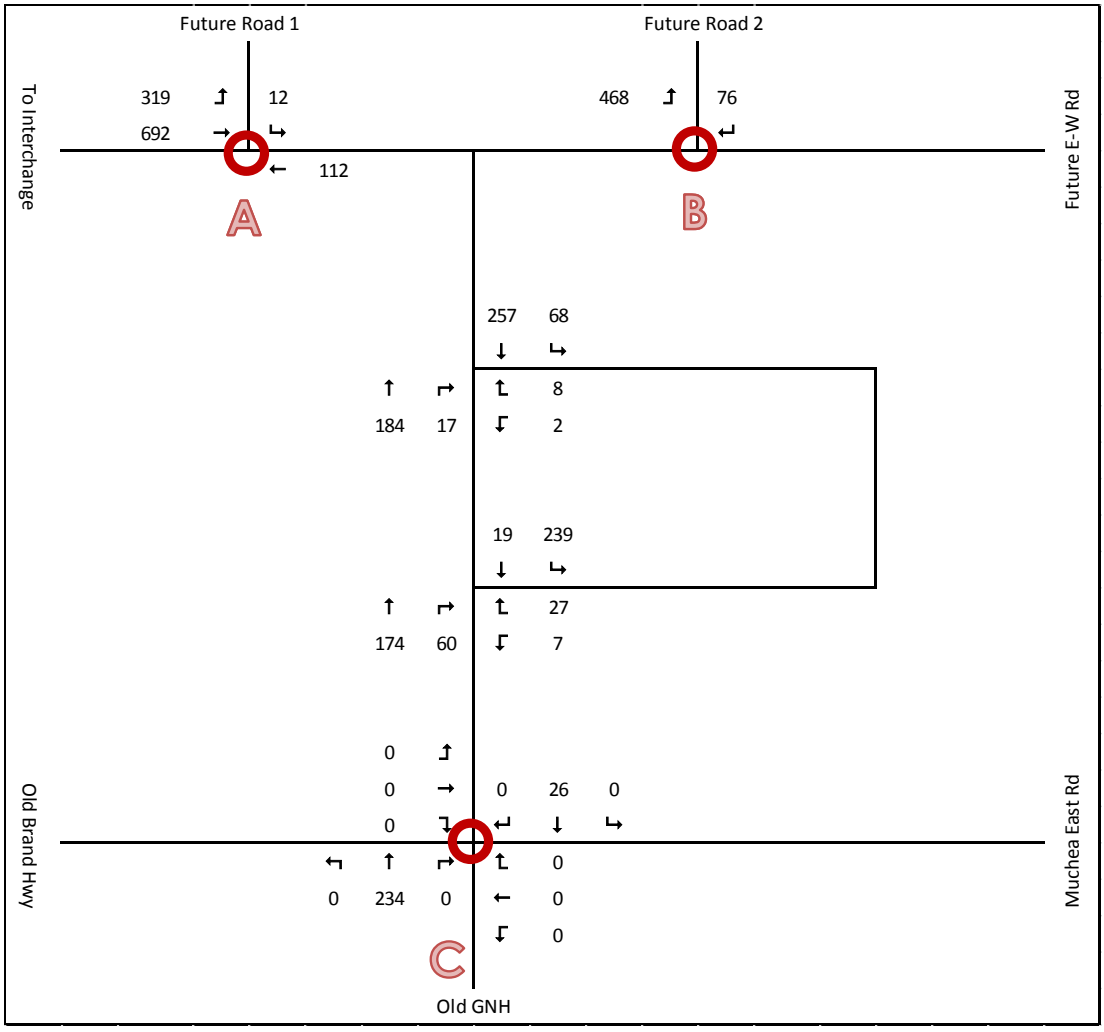
As such, the following assumptions with respect to traffic distribution have been made:

- All Trip Generation Zones except Zone 5 (service station):
  - 80% of traffic travels to/from the LSP area via Northlink WA and the east-west road
  - 20% travels to/from the south via the existing Great Northern Highway
- Trip Generation Zone 5:
  - 100% of traffic travels to/from the site via Northlink WA and the east-west road.

The individual turning movements at intersections internal to the LSP have been assumed in accordance with the location of the Trip Generation Zones, the internal road network layout, and the turning movements permitted at each intersection (i.e. left-in / left-out movements versus full turning movements).

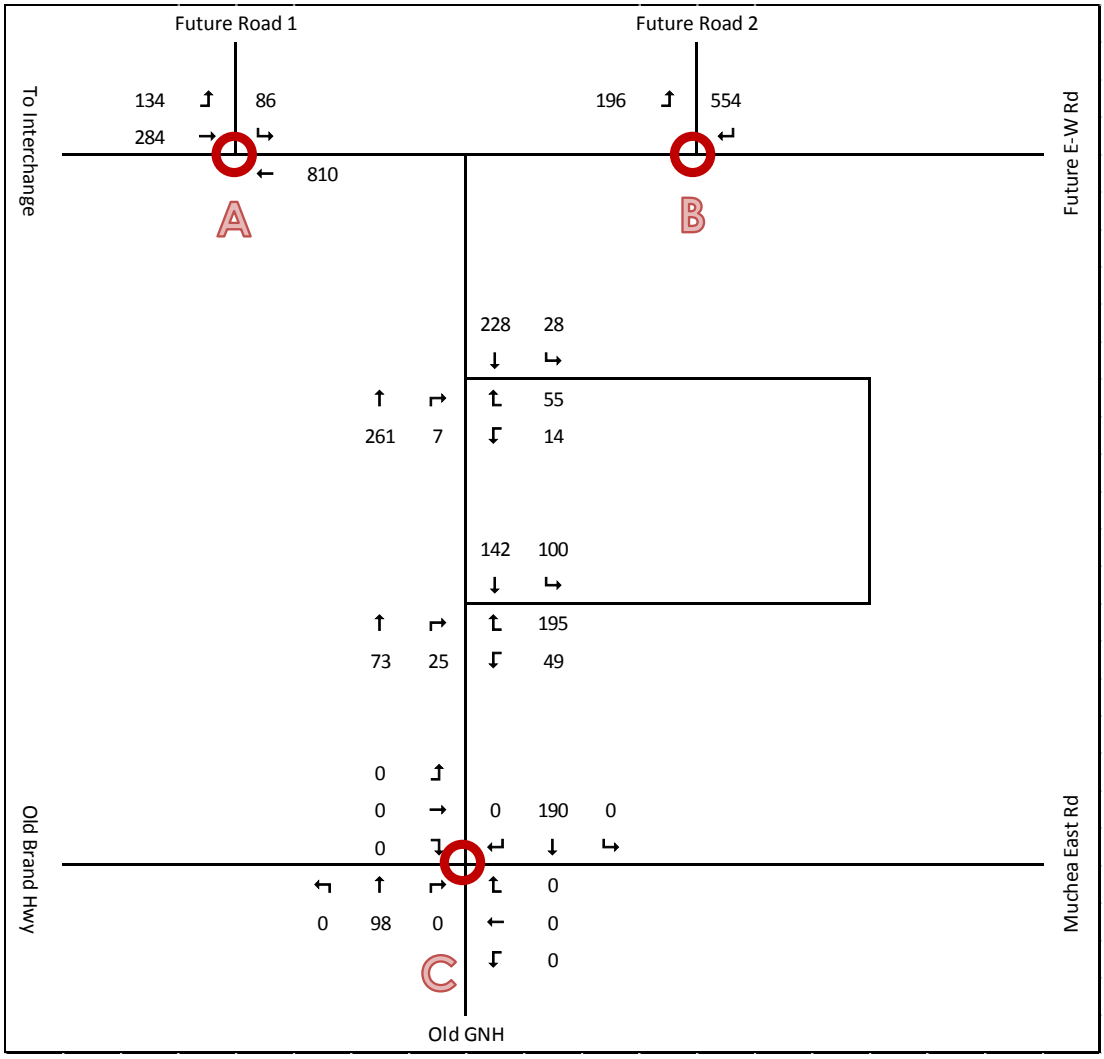
Based on these estimates and assumptions, the turning movements generated at the individual intersections within the LSP area during the AM and PM peak hours are shown in Figure 4.4 and Figure 4.5, respectively.

Figure 4.4: AM Peak Hour LSP Ultimate Traffic Generation



= Intersection Locations as per Figure 4.6

Figure 4.5: PM Peak Hour LSP Ultimate Traffic Generation



= Intersection Locations as per Figure 4.6

4.5 Traffic Impact Assessment

The traffic impact assessment approach and the results of each assessment scenario are considered in the following sections.

Methodology

The operation of the key intersections has been assessed using SIDRA Intersection[2] (SIDRA), a computer based modelling package which calculates intersection performance.

As detailed in the WAPC Guidelines, the critical measure of intersection performance is average delay per vehicle. Table 4.8 sets out the thresholds for intersection delays considered to provide an adequate Level of Service (LoS) within the WAPC Guidelines for priority-controlled and signalised intersections.

[2] Program used under licence from Akcelik & Associates Pty Ltd

Table 4.8: WAPC Guideline Thresholds for Intersection Operations

Delay Component	Priority-Controlled Intersection Threshold	Signalised Intersection Threshold
Average delay for all vehicles passing through the intersection	<35 seconds*	<55 seconds
Average delay for any individual vehicle, pedestrian or cyclist movement	<45 seconds	<65 seconds

* Only applicable to non-priority legs of intersection due to zero delays associated with priority movements

The following sections set out findings of SIDRA assessments of the key intersections within and proximate to the subject site for each proposal scenario.

Interim Proposal (2016)

The operation of an access to the proposed re-fuelling facility on the existing Great Northern Highway has been assessed in SIDRA for the 2016 design year. Detailed results of this expected operation are provided at Appendix C of this report.

The results of the assessment indicate that this intersection arrangement is expected to operate acceptably, with all delays well within acceptable limits.

LSP Proposal (2031)

In preparing this assessment, the following intersections have been assessed in SIDRA for the 2031 design horizon at ultimate development:

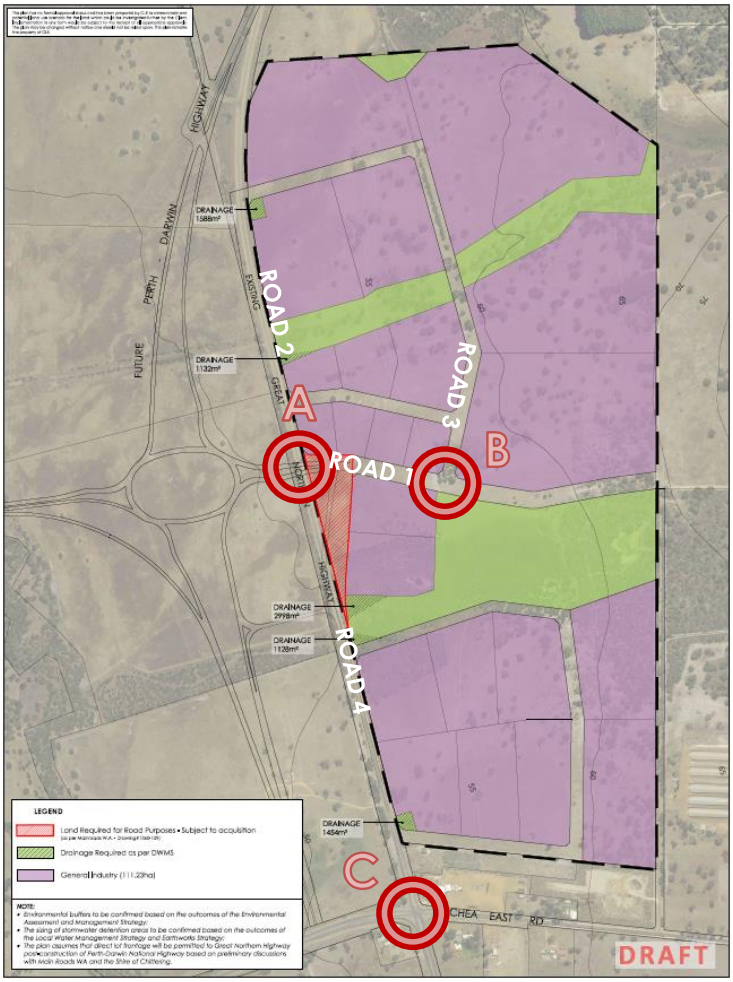
Intersection A: Road 1 / Road 2 (left-in / left-out intersection)

Intersection B: Road 1 / Road 3 (unsignalised full turning movement T-intersection)

Intersection C: Existing Great Northern Highway / Existing Brand Highway / Muchea East Road (signalised four-way intersection).

The locations of these intersections within the LSP are shown in Figure 4.6.

Figure 4.6: Intersections Assessed in Ultimate Scenario



The operations of each of these intersections are discussed below, with detailed SIDRA outputs provided at Appendix C.

Intersection A (Left-in / Left-out)

The results of the assessment indicate that 'Intersection A' is expected to operate within acceptable limits in the ultimate design horizon. Average delays of the northern approach do not exceed 9 seconds in either peak period, with a Level of Service A on all approaches.

Intersection B (unsignalised full turning movement T-intersection)

The operations 'Intersection B' have been modelled as a T-intersection, despite the fact that no traffic is expected to the east of this intersection at LSP's full development. Notwithstanding, the operational assessment indicates that delays remain within acceptable limits, with an average delay of 33 seconds expected during the PM peak hour.

As per the discussions earlier in this chapter, this assessment does not incorporate any traffic travelling further to the east, given that no development is currently planned to the east of the site at the time of writing this report. However, should this change, the impact of future development would need to be determined by way of an operational assessment, with any upgrades required triggered by other development and not the LSP.

Intersection C (Great Northern Highway / Brand Highway / Muchea East Road)

The operations of 'Intersection C' have been considered. The opening of Northlink WA will see both the Great Northern and Brand Highways rerouted away from this intersection to the new interchange, which will significantly reduce the traffic volumes at this existing signalised intersection in the ultimate design horizon.

As such, with the additional traffic generated by the LSP, the intersection is expected to operate within acceptable limits in the 2031 design year. All average delays remain below the 55 second threshold specified by WAPC as acceptable for signalised intersections. The detailed SIDRA outputs are provided at Appendix C.

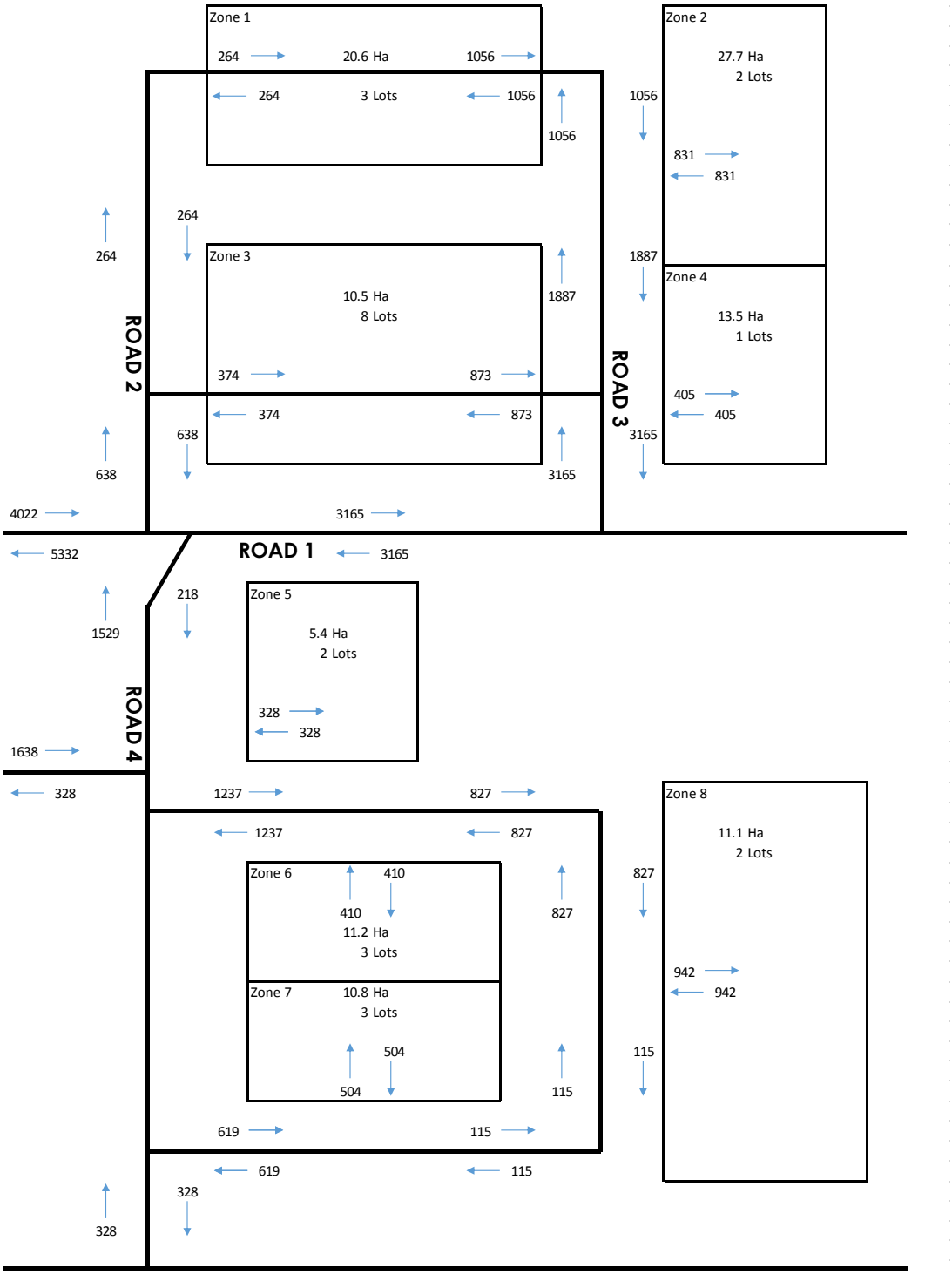
The intersection separation distance to the LSP's most southern intersection on the Great Northern Highway has also been checked. Currently, it is proposed that the two intersections are 150m (approx.) apart. The SoC's *Local Planning Policy No. 16 – Roads and Drainage* does not specify junction separation distances, however, the current *Liveable Neighbourhoods* has been referred which indicates the junction spacing (centreline to centreline) should be a minimum 40m for Neighbourhood Connectors / Local Distributors. As such, and having regard for the estimated traffic queue back from 'Intersection C' under the Northlink WA operating scenario, the proposed 150m junction spacing is adequate.

4.6 Road Hierarchy and Cross-Sections

The road hierarchy within the LSP area has been determined from the trip generation exercise which examined the daily vehicular activity at each of the lots within the LSP area. Individual lots were grouped to create trip generation "zones" and traffic assigned across the internal road network.

Figure 4.7 provides a summary of the distributed traffic through the proposed road network.

Figure 4.7: LSP Ultimate Daily Flows – simplified (vehicles per day)



The daily traffic volumes presented in Figure 4.7 indicate the following:

- Road 1 connecting the LSP area to the proposed Northlink WA interchange will be designated as a District Distributor A road, expected to carry around 9,400 vehicles per day upon full development. This is proposed to be a 40m wide road reserve, as discussed further in this section.

- Road 2 will be a District Distributor B type, based on the expected 6,300 vehicles per day upon full development. However, as the road runs through land use cells instead of between cells, the road could be downgraded in classification to a Local Distributor to match its actual function. The forecast 6,300 vehicles per day is a highly conservative estimate for Structure Planning purposes and the proposed 30m wide road reserve with a single carriageway will be sufficient to cater for the 'worst-case' link volume expected on this section.
- Road 4, the retired section of the Great Northern Highway south of the main east-west link will be designated as a Local Distributor, as it provides a link to access roads, expected to carry around 1,700 vehicles per day upon full development.
- The remaining internal roads within the LSP area fall within the daily volume limits and function for Access Roads, expected to carry below 3,000 vehicles per day upon full development.

The road hierarchy glossary of terms is provided in Table 4.9, the proposed road hierarchy is shown in Figure 4.8, and the 2031 daily link volumes (two-way) in Figure 4.9.

Table 4.9: Glossary of Road Hierarchy Terms

***Liveable Neighbourhoods* Street Types**	**Conventional Road Hierarchy (from the *Metropolitan Functional Road Hierarchy*, Main Roads 1997)**
Primary Distributors. Those arterial routes that are highly connective, with service roads wherever possible, and limited intersections. They are often signal-controlled. Indicative maximum traffic capacity is 35,000 vpd for four lanes and 50,000 vpd for six lanes.	**Primary Distributors.** These provide for major regional and inter-regional traffic movement and carry large volumes of generally fast moving traffic. Some are strategic freight routes and all are National or State roads.
District Distributor Integrator 'A'. An arterial route that has frequent connections to local streets and development frontage along its length, it typically has service roads with on-street parking for mixed use, with direct vehicle access limited where there are no service roads. Indicative maximum traffic capacity is 35,000 vpd.	**District Distributor A.** These carry traffic between industrial, commercial and residential areas and generally connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining property.
District Distributor Integrator 'B'. An arterial route that has frequent connections to local streets and development frontage along its length, it typically has one clear lane for each direction with on-street parking. Indicative maximum traffic capacity is 20,000 vpd.	**District Distributor B.** These perform a similar function to type A district distributors but with reduced capacity due to flow restrictions from access to and roadside parking alongside adjoining property. These are often older roads with a traffic demand in excess of that originally intended. District Distributor A and B roads run between land use cells and generally not through them, forming a grid which would ideally space them around 1.5 kilometres apart.
Neighbourhood Connectors. These are local streets that provide the lower order sub-arterial network that services and links neighbourhoods and towns. They spread local traffic loads, act as a bus route, have a predominantly residential frontage, have frequent connection points to local streets, and are typically traffic calmed to limit noise and facilitate pedestrian use.	**Local Distributors.** Carry traffic within a cell and link District Distributors at the boundary to access roads. The route of the Local Distributor discourages through traffic so that the cell formed by the grid of District Distributors only carries traffic belonging to or serving the area. These roads should accommodate buses but discourage trucks.
Access Streets. Streets providing predominantly residential access where the local environment is dominant, traffic speeds and volumes are low, and pedestrian and cycle movements are facilitated.	**Access Roads.** Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. These roads are bicycle and pedestrian friendly.

Source: Liveable Neighbourhoods (2000) http://www.planning.wa.gov.au/dop_pub_pdf/LNTMG.pdf

Figure 4.8: Proposed LSP Road Hierarchy

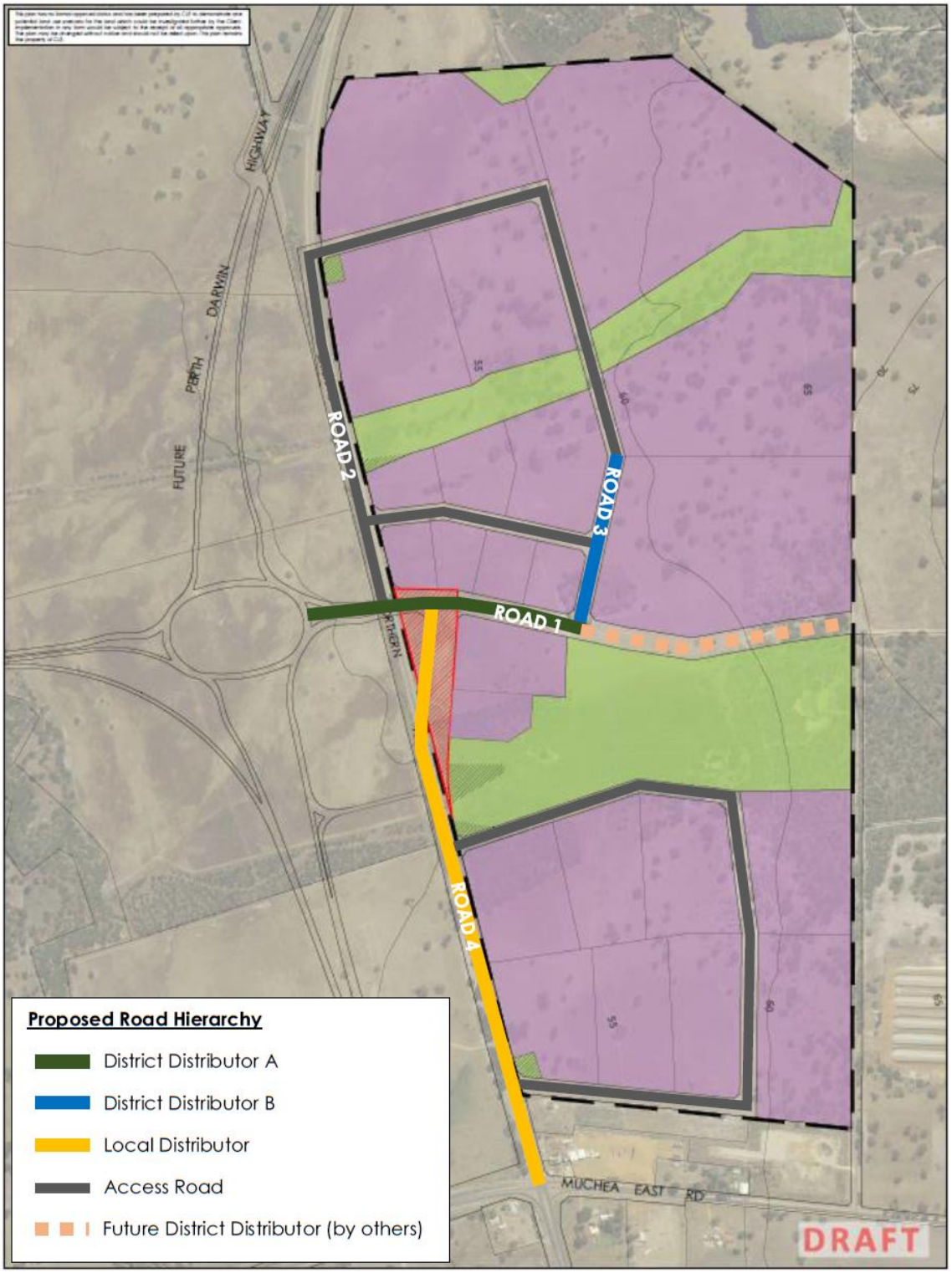
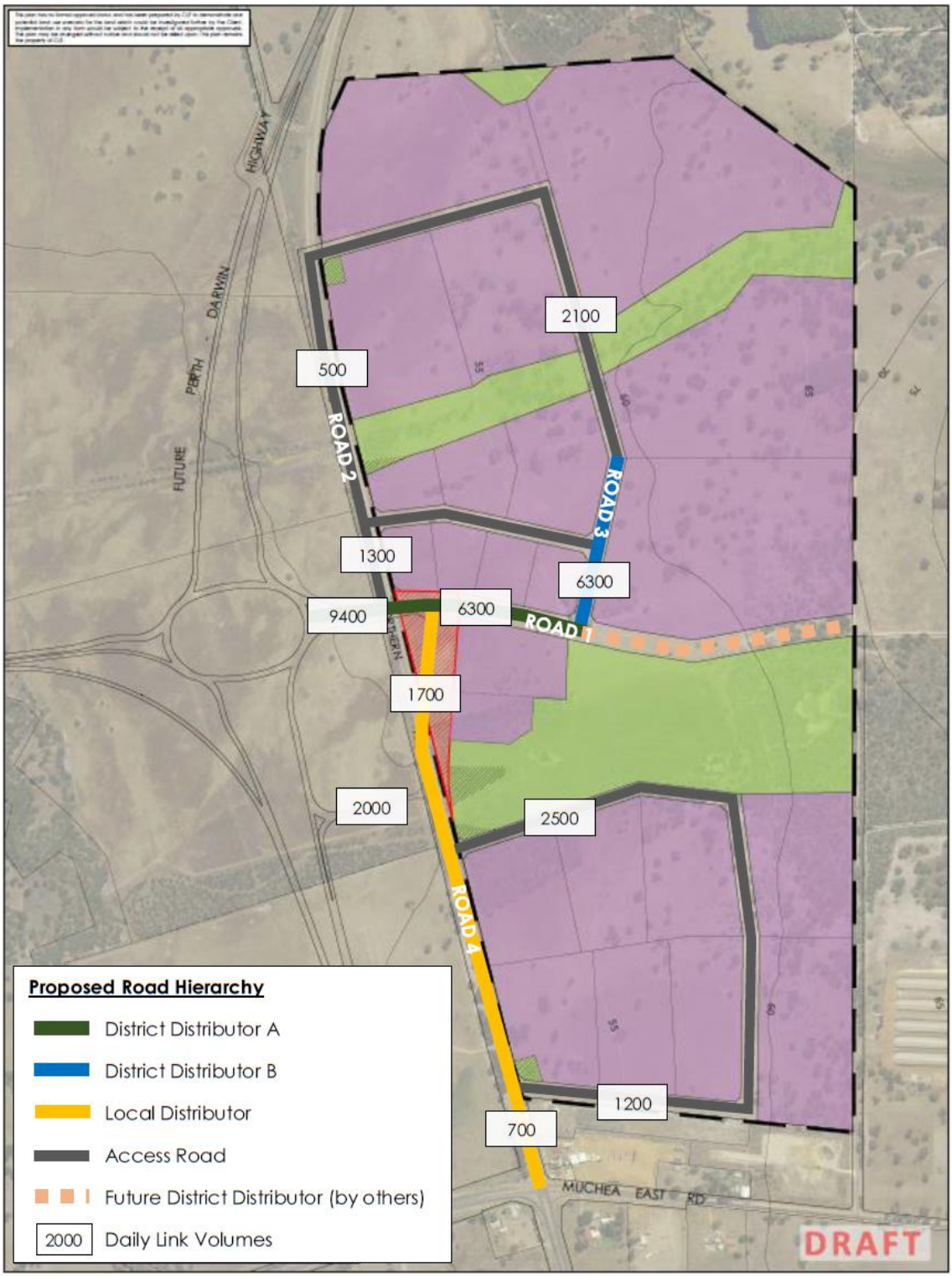


Figure 4.9: Daily Volumes on Key Roads in 2031



As the internal road network is developed within the LSP, it is crucial to determine what size of vehicles may use different areas of the development to inform the cross-sections and intersection layouts. Since the majority of vehicles expected to use the LSP will be large and require large areas to turn around to negotiate intersections, consideration should be given to grouping land

uses by vehicles sizes which would allow the larger intersections to be applied only in specific areas of the LSP.

In order to determine the appropriate road reserves for each of the roads within the LSP area, reference has also been made to the *Muchea Employment Node Structure Plan*, which correlates the main east-west road within the LSP as the 'loop road'. This is proposed to be a 40m wide road reserve, designed with provision for future use as a High Wide Load route and/or dualling.

The proposed LSP road reserve widths have also been cross-checked with the SoC's *Local Planning Policy No. 16 – Roads and Drainage*. This policy provides the following guidance with respect to road reserve widths for urban areas:

- Important Through Roads: 40m road reserve width
- Other Roads: 20m road reserve width.

Applying these requirements to the proposed LSP road network layout, it is considered that Road 4 and Road 1 would constitute 'important through roads' as per SoC's definition, given the distribution role they provide to the LSP area and beyond. These roads would therefore require a minimum reserve width of 40m.

The existing Great Northern Highway is set within a road reserve of 40m or greater, and as such meets the minimum requirement.

The Great Northern Highway is also a key Over Size Over Mass (OSOM) load route. In this respect, the design of the RTAA and access to it will need to allow access by these vehicles. OSOM routes typically apply a 10m x 10m clearance envelope to allow passage of these vehicles, and this will need to be considered when designing the internal roads.

The indicative cross-section for a 40m road reserve has been prepared as shown in Figure 4.10. This cross-section proposes a single carriageway road initially, with a 10m wide pavement and a combined 9.5m wide bench, swale and verge. This reserve width gives provision for future duallling when the traffic volumes warrant it in the longer term.

The remaining roads proposed within the LSP would be classed as 'other roads' and therefore require a minimum reserve width of 20m as per SoC's requirements. A width of 30m has been proposed for the 'other roads' to accommodate necessary swales and verge widths as shown in Figure 4.11.

On the above basis, the proposed road reserves are expected to be suitable to service the LSP and accord with the *Muchea Employment Node Structure Plan* and the SoC's design requirements.

Figure 4.10: Proposed East-West Road Cross-Section – 40m wide Road Reserve with Roadside Drain

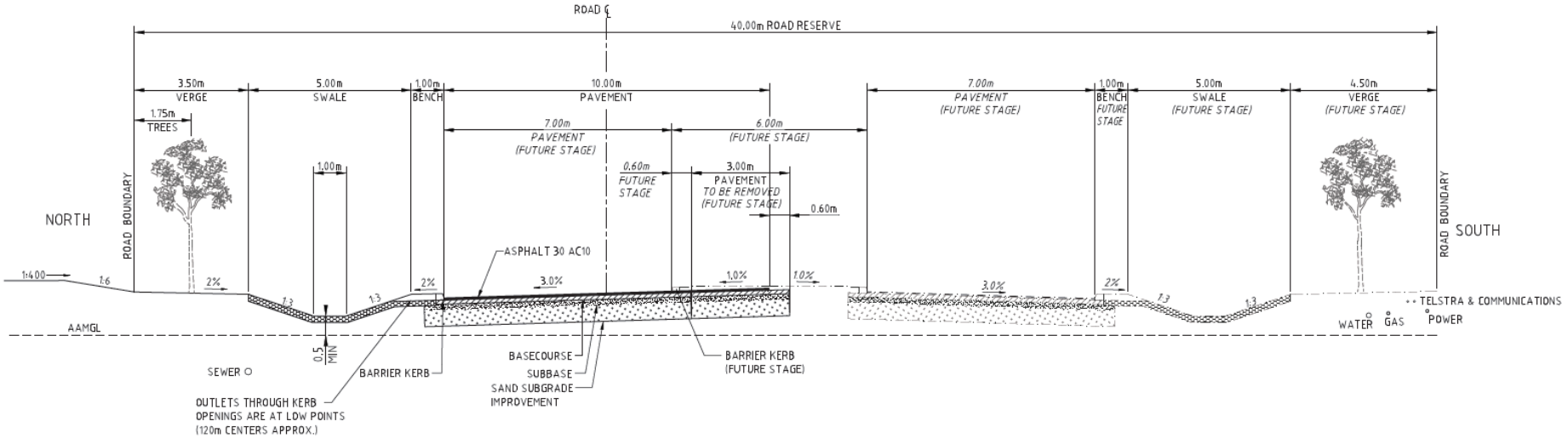
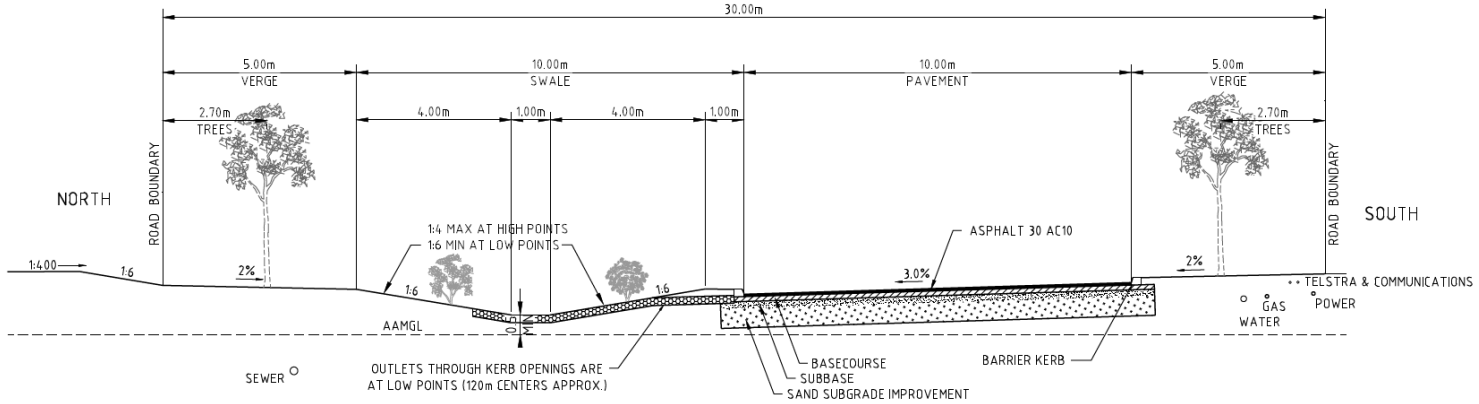


Figure 4.11: Proposed Other Roads Cross-Section – 30m wide Road Reserve with Roadside Drain



Source: Cossill & Webley (2015)

5. Conclusion

Based on the analysis and discussions presented within this report, the following conclusions are made:

i The Muchea East LSP is to include some 149 hectares of land with predominantly general industry uses.

ii Access is to be facilitated by the proposed Perth Darwin National Highway (Northlink WA), a new east-west road (Road 1) and the existing Great Northern Highway.

- Road 1 is the primary access to the LSP and its layout is largely dictated by the NorthLink WA project and their interchange design.
- The internal road network will largely be focussed around Road 1. The development of the internal road network will be dependent upon the development staging and vehicular access requirements.
- It is expected that the existing Great Northern Highway will be downgraded and handed over to Shire of Chittering to maintain and operate when Northlink WA is operational. The LSP proposes to use the Great Northern Highway (Road 4) for secondary access to the LSP area, via the existing Muchea East Road intersection. No physical changes are proposed to Road 4, other than those proposed as part of NorthLink WA. The majority of demand to and from the LSP area will be generated via NorthLink WA and so the level of vehicles utilising Road 4 will be relatively low.

iii As a result of the major infrastructure works in the area, it is proposed to develop the LSP in two key stages, an Interim Proposal (around 2016) and an LSP Proposal (full development, around 2031):

- The Interim Proposal is to operate an unmanned re-fuelling facility within the LSP area prior to the implementation of the LSP land use proposals. The re-fuelling facility will be located on the Great Northern Highway frontage of the LSP area. The existing alignment of Great Northern Highway as it passes the LSP area is typically straight and flat, such that an access solution can be easily determined which can satisfy safety and capacity requirements. The exact location and form of the intersection will be determined during a Development Application process for the re-fuelling facility.
- The LSP Proposal contains various land uses ranging from Transport and Logistics to Saleyards (refer Figure 4.1) and will be spread throughout the LSP area. All prospective land users will see great benefit from being provided with immediate access to the strategic road network via Northlink WA.

iv The proposed road hierarchy within the LSP is consistent with Main Roads WA's road hierarchy requirements for the anticipated daily traffic volumes at full development. The daily traffic volumes as presented in this report indicate:

- Road 1, connecting the LSP area to the Northlink WA interchange will be designated as a District Distributor A road, expected to carry around 9,400 vehicles per day upon full development. This is proposed to be a 40m wide road reserve, designed with provision for future use as a High Wide Load route and/or dualling.
- Road 3, connecting to Road 1 will be a District Distributor B type, based on the expected 6,300 vehicles per day upon full development. As the road runs through land use cells instead of between cells, the road could be downgraded in classification to a Local Distributor to match its actual function. The forecast 6,300 vehicles per day is a highly conservative estimate for Structure Planning purposes and the proposed 30m

wide road reserve with a single carriageway will be sufficient to cater for the traffic volumes expected on this section.

- Road 4, the retired section of the Great Northern Highway will be designated as a Local Distributor, as it provides a link to Access Roads and is expected to carry around 1,700 vehicles per day upon full development just south of Road 1.
- The remaining internal roads within the LSP area fall within the daily volume limits and meet the function for Access Roads, expected to carry below 3,000 vehicles per day upon full development.

v The proposed road reserve widths have been designed consistent with the *Muchea Employment Node Structure Plan* and the Shire of Chittering's design requirements and policies.

vi Walking and cycling will play limited roles within the LSP area. As such, the network of internal roads provide for a legible traffic hierarchy and will assist off road pedestrian and cyclist movements. Generally, a shared path along one side of the internal roads would reasonably serve the needs of the occasional walking and cycling demand.

vii The land uses proposed in the LSP mean feasible provision of public transport services is difficult to achieve. Notwithstanding, an opportunity to provide a bus stop on the upgraded section of Northlink WA adjacent the LSP exists as part of a wider operating regional service.

viii The existing Great Northern Highway is a key Over Size Over Mass (OSOM) load route. As such, the design of Main Road's Road Train Assembly Area and the access to it will need to allow for OSOM vehicles. OSOM routes typically apply a 10m x 10m clearance envelope to allow passage of these vehicles, and this will need to be considered at the next stages of designing the internal roads.

ix The Interim Proposal (refuelling facility, 2016) is expected to generate some 28 and 24 vehicle movements in and out of the site in the AM and PM peak hours respectively, with some 330 vehicle movements in and out of the site over a typical day.

x The LSP Proposal (full development, around 2031) is expected to generate in the order of 1,400 vehicle movements in the AM peak, 1,500 vehicle movements in the PM peak and some 12,000 vehicle movements per typical weekday.

xi The operational assessments conclude that the key internal intersections within the proposed LSP are expected to operate within acceptable limits as per the WAPC guidelines upon full development. Findings for the key intersections (refer Figure 4.6) are:

- Intersection A: The proposed left-in / left-out intersection is expected to operate within acceptable limits in the ultimate design horizon. Average delays of the northern approach do not exceed 9 seconds in either peak period, with a Level of Service A on all approaches.
- Intersection B: The operations of the eastern access road intersection have been modelled as a T-intersection, despite the fact that no traffic is expected to/from the east at full development. Notwithstanding, the operational assessment indicates that delays remain within acceptable limits, with an average delay of 33 seconds expected during the PM peak hour.
- Intersection C: The operations of the existing signalised intersection on the current Great Northern Highway / Brand Highway / Muchea East Road intersection have been considered. The opening of Northlink WA will see both the Great Northern and Brand Highways rerouted away from this intersection to the new interchange, which will significantly reduce the traffic volumes at this existing signalised intersection in the ultimate scenario. With the additional traffic generated by the LSP, the intersection is expected to operate within acceptable limits in the 2031 design year. All average

delays remain below the 55 second threshold specified by WAPC as acceptable for signalised intersections.

- The separation distance of 'Intersection C' to the LSP's most southern proposed intersection on the Great Northern Highway has also been checked. Currently, it is proposed the two intersections are 150m (approx.) apart. Based on the downgraded future function of the Great Northern Highway and having regard for the estimated traffic queue back under the Northlink WA operating scenario, the proposed 150m junction spacing is expected to be adequate.

Appendix A

Proposed Local Structure Plan

This plan has no formal approval status and has been prepared by CLE to demonstrate one potential land use scenario for the land which could be investigated further by the Client. Implementation in any form would be subject to the receipt of all appropriate approvals. The plan may be changed without notice and should not be relied upon. This plan remains the property of CLE.

PERTH - DARWIN HIGHWAY

FUTURE GREAT NORTHERN HIGHWAY

EXISTING GREAT NORTHERN HIGHWAY

MUCHEA EAST RD

50 55 60 65 70 75

LEGEND

- Land Required for Road Purposes - Subject to acquisition (as per Mainroads W.A. - Drawing#1360-109)
- Drainage Required as per DWMS
- Local Reserves
- General Industry (108.83ha)

NOTE:

- *Environmental buffers to be confirmed based on the outcomes of the Environmental Assessment and Management Strategy;*
- *The sizing of stormwater detention areas to be confirmed based on the outcomes of the Local Water Management Strategy and Earthworks Strategy;*
- *The plan assumes that direct lot frontage will be permitted to Great Northern Highway post-construction of Perth-Darwin National Highway based on preliminary discussions with Main Roads WA and the Shire of Chittering.*

DRAFT

0 100 200 300 400 500m

PRELIMINARY CONCEPT PLAN

Lot 102 Great Northern Highway, Muchea
Shire of Chittering

plan no: 2322-56H-01
scale: 1:6000@A3, 1:3000@A1
date: 16.12.2015

CLE TOWN PLANNING + DESIGN

Appendix B

Scoping Correspondence with Authorities

Meeting Minutes

Job No:	16P1004000	**GTA Rep:**	Mark Fowler	**Date:**	21/10/15
Job Name:	Lot 102, Muchea			**Time:**	1030
Client:	Sirona Capital			**Location:**	Bindoon
Purpose:	Transport Assessment Scoping				

Attendees:	BS - Bronwyn Southee (Shire of Chittering) DM - Daniel Martinovich (CLE)	TM - Tanya Moran (GTA) MF - Mark Fowler (GTA)
Distribution:	All Attendees, Sirona Capital	

Item		Action
1	**Introductions**	
	• BS advised that Jim Garrett from the Shire of Chittering will review the more technical elements of the DA	Note
2	**Brief Project Overview by CLE**	
	• DM provided a run through of project to date • BS advised a mostly new council is on board, and is unsure as to how the proposal as a whole will be received • DM / BS agreed it would be prudent to carry out a briefing session with the councillors. DM / BS to confirm format and timing	DM / BS
3	**Transport Assessment approach**	
	• GTA explained development will be considered in stages which have yet to be finalised, but are likely to be: ***Initial*** *– unmanned fuel station, accessed from existing GNH* ***Interim*** *– full service station with some accompanying uses and some light industrial, accessed from existing GNH* ***Ultimate*** *– full LSP area operational, accessed primarily from Northlink* • TA will be prepared in line with WAPC guidelines, adopting trip rates used by Sirona Capital on other similar projects • Access from existing GNH has been discussed and agreed with MRWA Northam, these will have limited impact on Shire roads. Assessment will be undertaken using SIDRA and existing traffic flow information in GNH • Ultimate access arrangements will be imposed by Northlink project. Demands will be extracted and adopted from MRWA Northlink traffic model and local SCATS information from Muchea East Road signalised intersection. Intersections agreed to be considered include main internal intersections on spine road, Muchea East Road signals and Muchea East Road / Guiliente Road intersection • BS confirmed that there are other development happening in the area local to the LSP, but none are significant enough to be considered within the initial, interim or ultimate assessments for traffic impact	

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44 St Georges Terrace
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t// +618 6316 4634

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Item		Action
4	**Consultation and work to date**	
	• GTA have been in frequent discussions with MRWA Northam office for the initial and interim scenarios and with the Northlink Project for the ultimate scenario	
	• All assumptions to be made in the analysis will be documented and agreed with relevant parties before proceeding with analysis	GTA
5	**RAV networks**	
	• GTA understand GNH will be upgraded to RAV 10 network for current RAV 7. RAV 10 network will only allow access to and from Road Train Assembly Area (RTAA) and GNH north of the site	
	• All other roads are understood to remain RAV 7	
	• The RAV network within the development site will be determined on the basis of commercial needs and advised to Shire, This information will also be included within the Transport Assessment	GTA
	• BS to speak to Jim Garrett to determine Shire intentions with RAV networks in the area	BS
	• Shire will process any necessary RAV network applications once the DA is approved before the roads are constructed	BS
6	**Access scenarios and locations (including GNH ownership)**	
	• BS advised that existing GNH will be brought up to an appropriate standard and then handed over to the Shire once Northlink and GNH upgrades are complete	
	• On this basis, the extent of the existing GNH identified for re-use in the LSP should be identified	CLE
	• Given it will be a Shire road, BS confirmed driveway access will be permitted from old GNH alignment	
	• BS will discuss intended speed limit for GNH with Jim Garrett and advise	BS
7	**Any other business**	
	• All roads within the LSP area are to designed and built in accordance with the requirements set out in the Employment Node Structure Plan	Note
8	**Close**	

MEMORANDUM

TO: Main Roads Western Australia(MRWA) / Shire of Chittering

CC: Sirona Capital / CLE

FROM: GTA Consultants

DATE: 23/10/2015

OUR REF: 16P1004000

PAGE 1 OF 2

RE: **Lot 102, Muchea – Traffic and Transport Assumptions for Local Structure Plan (LSP)**

GTA Consultants (GTA) has prepared this Memorandum to set out the technical parameters of the Transport Assessment for the LSP that have been discussed with MRWA and Shire of Chittering.

As previously communicated, the development will likely be staged as follows:

- **Initial** – unmanned fuel station, accessed from existing GNH
- **Interim** – full service station with some accompanying uses and some light industrial, accessed from existing GNH
- **Ultimate** – full Structure Plan area operational, accessed primarily from Northlink.

N/A as of 11/12/15

The assumptions are set out in Attachment 1, and are proposed to be adopted within the Transport Assessment for the LSP where appropriate.

It is respectfully requested that MRWA and Shire of Chittering confirm their respective acceptance of the assumptions herein by Wednesday 28th October 2015. This will enable the commencement of the Transport Assessment for the LSP reporting, and ensure project timelines are adhered to.

In light of this, if there are any items you would like to discuss in more detail, or require more clarity please contact me directly.

Yours sincerely

GTA CONSULTANTS

Mark Fowler

Senior Consultant

melbourne
sydney
brisbane
canberra
adelaide
gold coast
townsville
perth

Level 27,
44 St Georges Terrace
PERTH WA 6000
t// +618 6316 4634

www.gta.com.au

Attachment 1 – Traffic and Transport Assumptions for LSP

Item	Assumption detail	Agreements to date
Initial and interim vehicular access form	Gained via CHR / AUL intersection on existing Great Northern Highway.	Principle of this access agreed with **MRWA**, detailed design of layout to be determined post LSP approval.
Ultimate vehicular access arrangements	Primary access gained via a new interchange delivered as part of Northlink. Secondary access gained via an AUL / AUR intersection on Muchea East Road at Guiliente Road. Driveways will also be provided on the existing GNH alignment, once retired by Northlink.	Principle of these arrangements agreed with **MRWA** and **Shire of Chittering**, detailed design of secondary accesses and driveways to be determined post LSP approval.
External traffic demands for initial and interim capacity assessments	Traffic flow data extracted from MRWA IRIS database and SCATS will be adopted with growth factors applied where appropriate.	Discussed and agreed with **MRWA** and **Shire of Chittering** that: • Data is appropriate for use • Growth factors to be determined using historic local flows.
Traffic demands for ultimate scenario assessment	Traffic flow data will originate from available Northlink traffic modelling. Any local traffic data not provided can be extrapolated between existing flows and modelled flows.	Agreed as an appropriate approach with **MRWA** and **Shire of Chittering**.
Initial and Interim traffic distribution	A different distribution will be applied to heavy and light vehicles accessing the Structure Plan area due to differing origins and destinations. Overall distribution will be based upon weighting of existing traffic flows on GNH, Brand Highway and Muchea East Road recorded in traffic data discussed above.	Agreed as an appropriate approach with **MRWA** and **Shire of Chittering**.
Ultimate traffic distribution	Traffic distribution data will originate from available Northlink traffic modelling. Any local distribution not provided can be extrapolated between existing flows and modelled flows.	Agreed as an appropriate approach with **MRWA** and **Shire of Chittering**.
Initial and Interim peak hours	Peak hours will be identified from existing traffic flows on GNH, Brand Highway and Muchea East Road recorded in traffic data discussed above.	Agreed as an appropriate approach with **MRWA** and **Shire of Chittering**.
Ultimate peak hours	Peak hour data will originate from available Northlink traffic modelling.	Agreed as an appropriate approach with **MRWA** and **Shire of Chittering**.
Initial and interim vehicle trip rates and heavy vehicle proportions	Initial scenario will not generate new trips, rather trips will be diverted from vehicles already travelling on GNH. Interim scenario trip rates have been extracted from other similar Sirona Capital projects. Trip rates adopted are as follows: **Component** / **AM** / **PM** Servo: 7% of road trains on GNH; 5% of heavy vehicles on GNH; 3% of light vehicles on GNH Light Industrial: 0.46 / 0.51	Initial scenario discussed and agreed with **MRWA** and **Shire of Chittering**. **Interim scenario rates require agreement from MRWA and Shire of Chittering.**
Ultimate vehicle trip rates and heavy vehicle proportions	Trip generation for the ultimate scenario will be inherent in the Northlink modelling. A logic check against the above rates will be undertaken.	**Approach to be agreed by MRWA and Shire of Chittering**
Over-size vehicle envelope	A 10m x 10m envelope is necessary on roads accessing the Road Train Assembly Area (RTAA) to facilitate access by Over-size vehicles	Agreed with **MRWA** as appropriate.

N/A

Agreed for GTA to make interpretation of the scale of traffic volumes in 2031. Refer MRWA email attached (4/11/15).

From: MCKIRDY Justin (NPDM/A) <justin.mckirdy@mainroads.wa.gov.au>
Sent: Wednesday, 4 November 2015 6:07 PM
To: Tanya Moran
Cc: Mark Fowler; Cameron Leckey; nmatthew@urbsol.com.au
Subject: RE: Northlink Forecast Traffic Volumes - Muchea near RTAA
Attachments: 04112015142755-0001.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Tanya,

Have a good break.

I have tried a few times to find some relevant information. Today I have tracked down some figures which is the best I can do at this time. As discussed, these are very indicative numbers and are provided for information purposes only – they should not be relied upon for anything other than understanding the anticipated scale of traffic volume using the proposed intersection of PDNH/Brand Hwy/GNH around 2031. They should certainly not be used for making any commercial investment decisions.

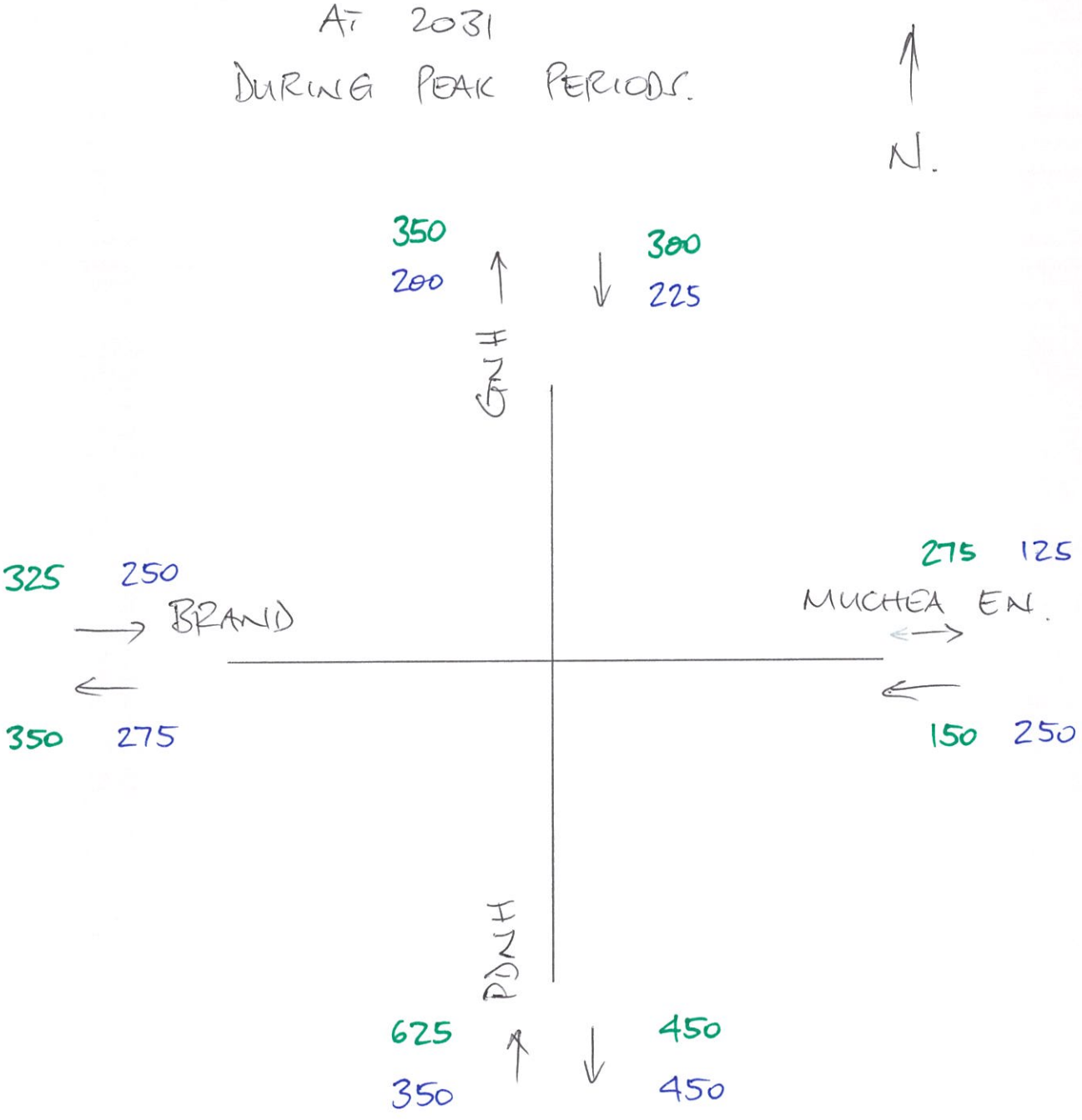
Please note that the figures are peak period figures only. Clearly they rely on some assumed land use within the Muchea Employment node – which your team are likely to be better placed to estimate. I have also spoken to Nigel about the modelling in this area and he advised that there are certainly some assignment issues in the area when considering the daily outputs. He has done some reassignment for these peak volumes to account for some of those problems identified. I can't provide turning volumes but can advise that the predominant movements in and out of MEN are anticipated to be to and from the west and south, at approximately equal measure.

I trust this assists.

Regards

Justin

APPROXIMATE ESTIMATED TRAFFIC VOLUMES AT 2031 DURING PEAK PERIODS.



AM

PM

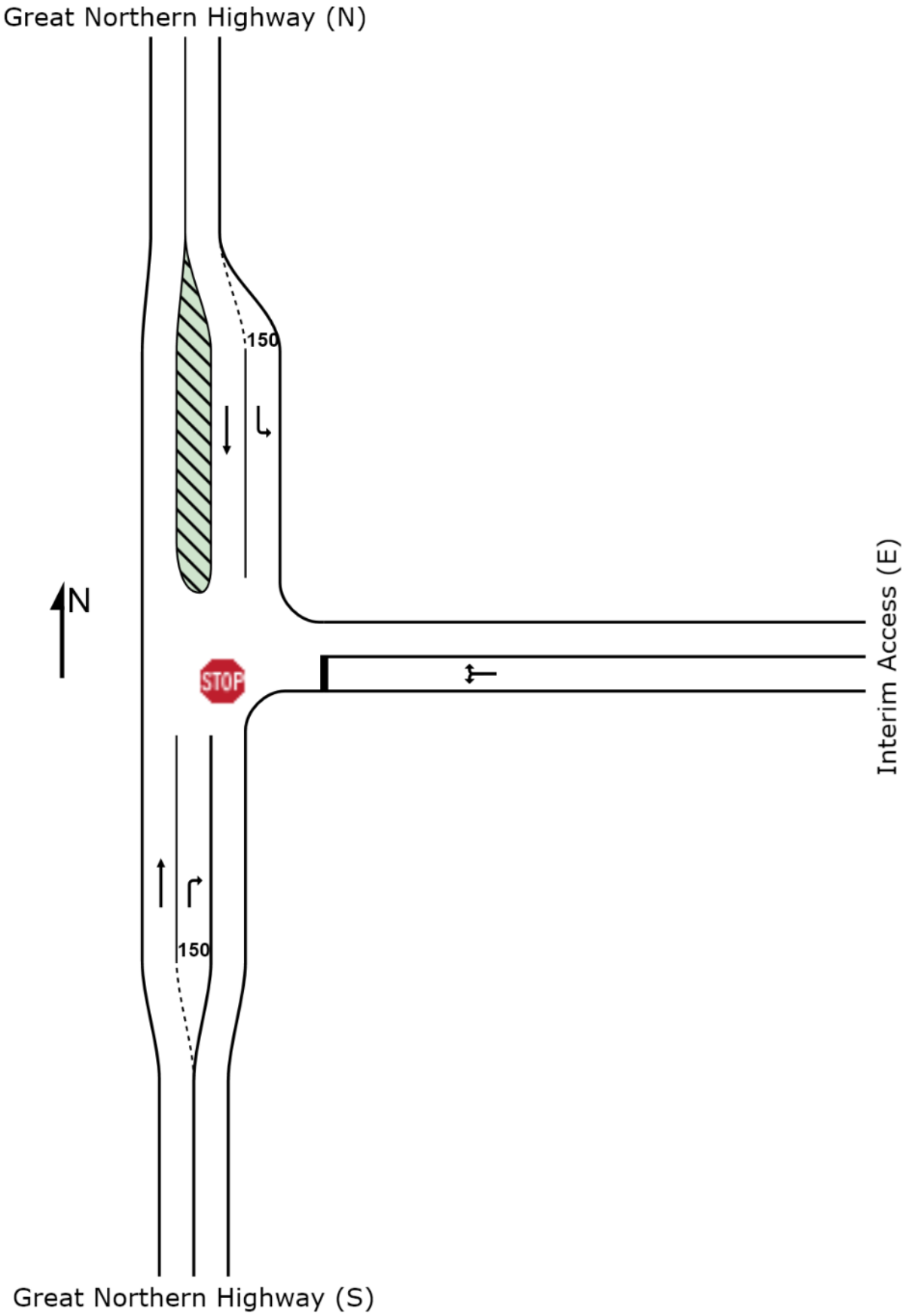
Appendix C

SIDRA Outputs

SITE LAYOUT

Site: 2018 AM

Interim Service Station Access
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 2016 AM

Interim Service Station Access
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Great Northern Highway (S)											
2	T1	159	32.0	0.097	0.0	LOS A	0.0	0.0	0.00	0.00	99.9
3	R2	6	50.0	0.008	10.4	LOS A	0.0	0.3	0.36	0.64	31.5
Approach		165	32.7	0.097	0.4	NA	0.0	0.3	0.01	0.02	92.3
East: Interim Access (E)											
4	L2	8	50.0	0.030	7.3	LOS A	0.1	1.0	0.47	0.96	27.0
6	R2	6	50.0	0.030	12.2	LOS A	0.1	1.0	0.47	0.96	27.0
Approach		15	50.0	0.030	9.4	LOS A	0.1	1.0	0.47	0.96	27.0
North: Great Northern Highway (N)											
7	L2	8	50.0	0.006	9.2	LOS A	0.0	0.0	0.00	0.66	59.3
8	T1	215	32.0	0.132	0.0	LOS A	0.0	0.0	0.00	0.00	99.9
Approach		223	32.7	0.132	0.4	NA	0.0	0.0	0.00	0.03	97.4
All Vehicles		403	33.3	0.132	0.7	NA	0.1	1.0	0.02	0.06	87.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2016 PM

Interim Service Station Access
Stop (Two-Way)

Movement Performance - Vehicles

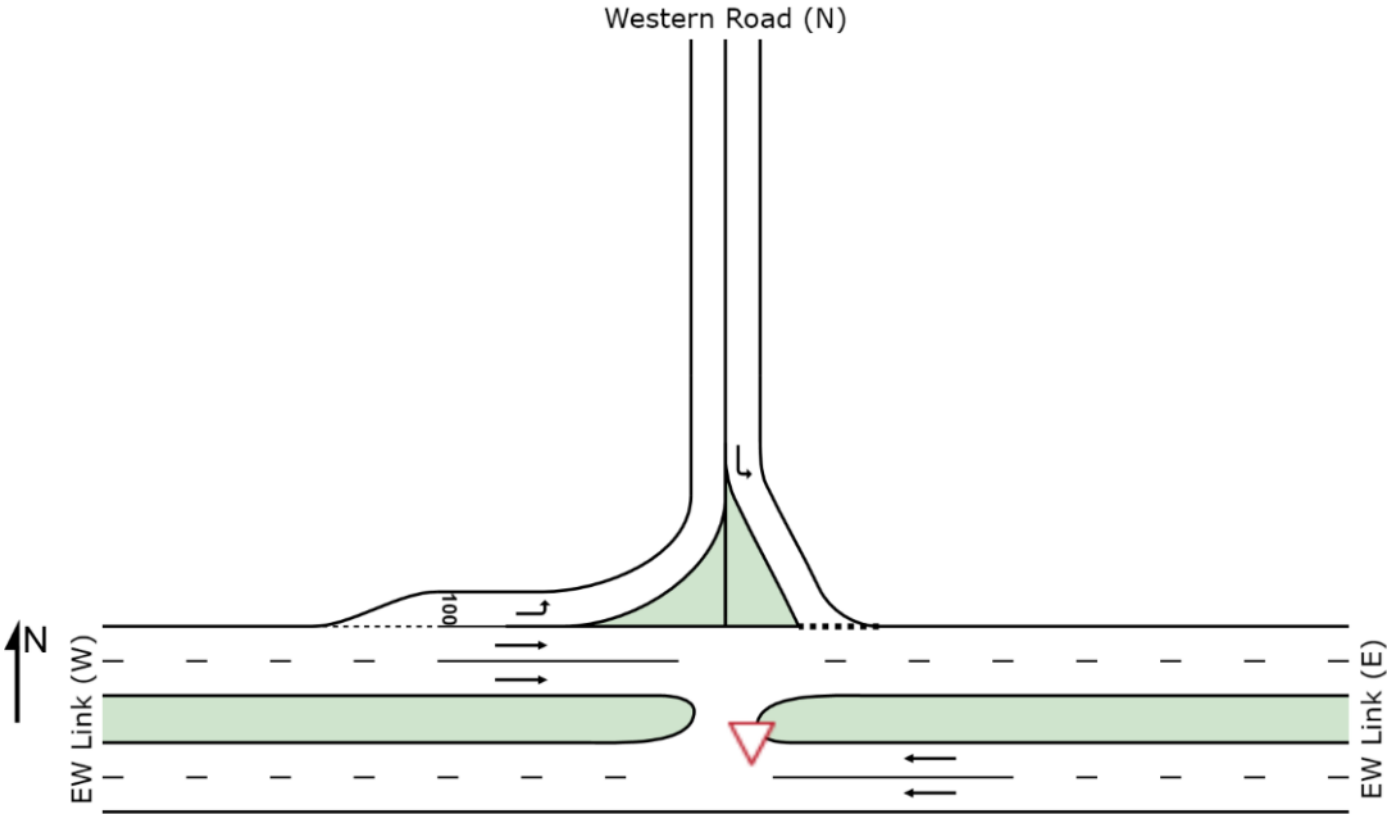
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Great Northern Highway (S)											
2	T1	208	32.0	0.128	0.0	LOS A	0.0	0.0	0.00	0.00	99.9
3	R2	8	50.0	0.009	9.7	LOS A	0.0	0.3	0.28	0.62	31.7
Approach		217	32.7	0.128	0.4	NA	0.0	0.3	0.01	0.02	92.2
East: Interim Access (E)											
4	L2	5	50.0	0.028	6.4	LOS A	0.1	1.0	0.43	0.97	27.0
6	R2	8	50.0	0.028	11.4	LOS A	0.1	1.0	0.43	0.97	27.0
Approach		14	50.0	0.028	9.5	LOS A	0.1	1.0	0.43	0.97	27.0
North: Great Northern Highway (N)											
7	L2	5	50.0	0.004	9.2	LOS A	0.0	0.0	0.00	0.66	59.3
8	T1	134	32.0	0.082	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		139	32.7	0.082	0.4	NA	0.0	0.0	0.00	0.03	97.4
All Vehicles		369	33.3	0.128	0.7	NA	0.1	1.0	0.02	0.06	86.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: Site1 - Western LILO Int - 2031 AM

EW Link / Western (LILO) Road
Giveway / Yield (Two-Way)



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Project: P:\16P1000-1099\16P1004000 - Muchea LSP - Industrial\Modelling\151204sid-16P1004000_EWLink_Intersections.sip6

MOVEMENT SUMMARY

Site: Site1 - Western LILO Int - 2031 AM

EW Link / Western (LILO) Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: EW Link (E)											
5	T1	118	35.0	0.037	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		118	35.0	0.037	0.0	NA	0.0	0.0	0.00	0.00	60.0
North: Western Road (N)											
7	L2	13	35.0	0.019	8.8	LOS A	0.1	0.6	0.47	0.63	50.9
Approach		13	35.0	0.019	8.8	LOS A	0.1	0.6	0.47	0.63	50.9
West: EW Link (W)											
10	L2	336	35.0	0.226	6.0	LOS A	0.0	0.0	0.00	0.51	53.7
11	T1	728	35.0	0.229	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		1064	35.0	0.229	1.9	NA	0.0	0.0	0.00	0.16	57.8
All Vehicles		1195	35.0	0.229	1.8	NA	0.1	0.6	0.00	0.15	57.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: Site1 - Western LILO Int - 2031 PM

EW Link / Western (LILO) Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

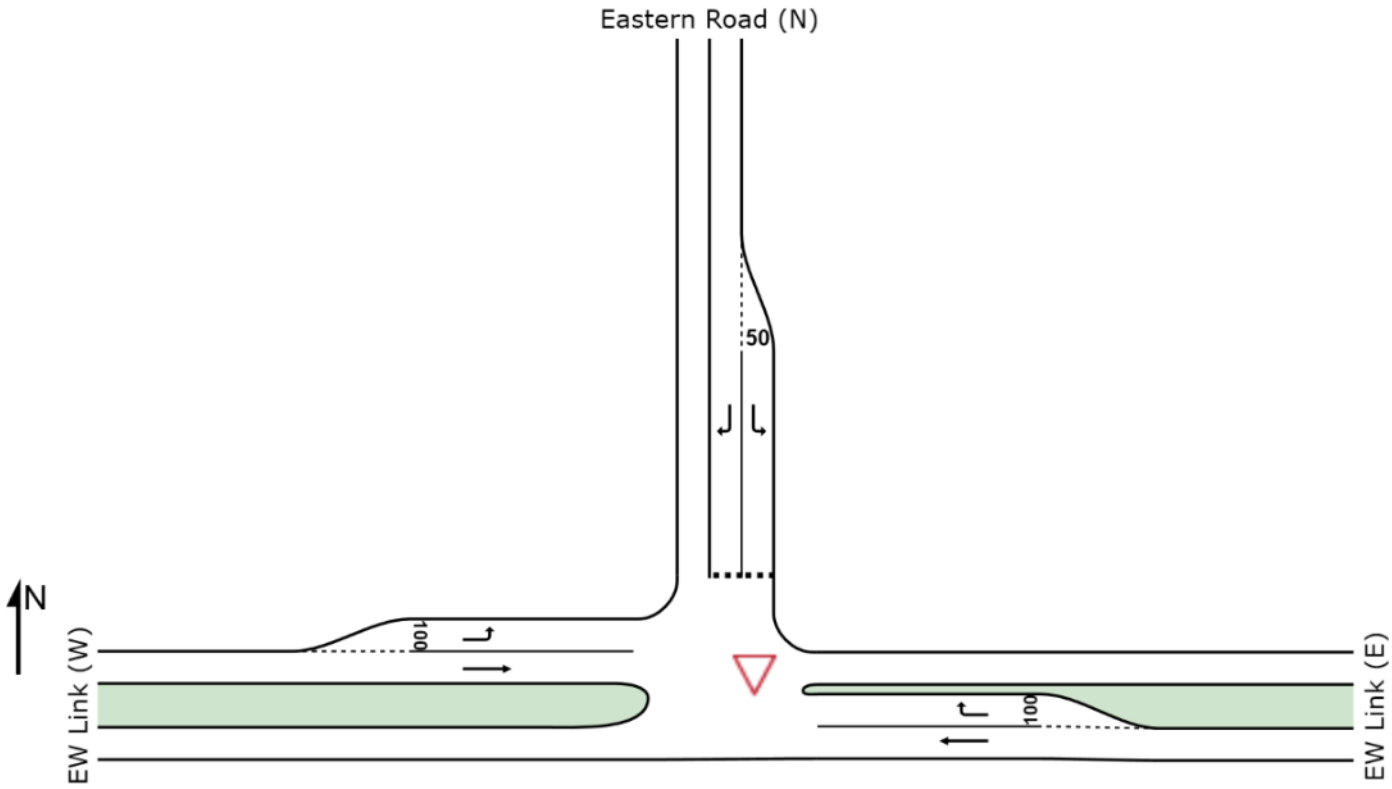
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: EW Link (E)											
5	T1	853	35.0	0.268	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		853	35.0	0.268	0.0	NA	0.0	0.0	0.00	0.00	59.9
North: Western Road (N)											
7	L2	91	35.0	0.097	7.0	LOS A	0.4	3.3	0.30	0.56	51.9
Approach		91	35.0	0.097	7.0	LOS A	0.4	3.3	0.30	0.56	51.9
West: EW Link (W)											
10	L2	141	35.0	0.095	6.0	LOS A	0.0	0.0	0.00	0.51	53.7
11	T1	299	35.0	0.094	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		440	35.0	0.095	1.9	NA	0.0	0.0	0.00	0.16	57.8
All Vehicles		1383	35.0	0.268	1.1	NA	0.4	3.3	0.02	0.09	58.6

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: Site2 - Eastern Int 2031 AM

EW Link / Eastern Road
Giveway / Yield (Two-Way)



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Project: P:\16P1000-1099\16P1004000 - Muchea LSP - Industrial\Modelling\151204sid-16P1004000_EWLink_Intersections.sip6

MOVEMENT SUMMARY

Site: Site2 - Eastern Int 2031 AM

EW Link / Eastern Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: EW Link (E)											
5	T1	1	35.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	1	35.0	0.002	10.2	LOS A	0.0	0.1	0.56	0.62	48.9
Approach		2	35.0	0.002	5.1	NA	0.0	0.1	0.28	0.31	53.9
North: Eastern Road (N)											
7	L2	1	35.0	0.001	6.0	LOS A	0.0	0.0	0.01	0.56	52.1
9	R2	80	35.0	0.135	9.2	LOS A	0.5	4.8	0.48	0.70	49.6
Approach		81	35.0	0.135	9.2	LOS A	0.5	4.8	0.47	0.70	49.6
West: EW Link (W)											
10	L2	493	35.0	0.331	6.0	LOS A	0.0	0.0	0.00	0.57	52.1
11	T1	1	35.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		494	35.0	0.331	6.0	NA	0.0	0.0	0.00	0.57	52.1
All Vehicles		577	35.0	0.331	6.4	NA	0.5	4.8	0.07	0.59	51.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: Site2 - Eastern Int 2031 PM

EW Link / Eastern Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

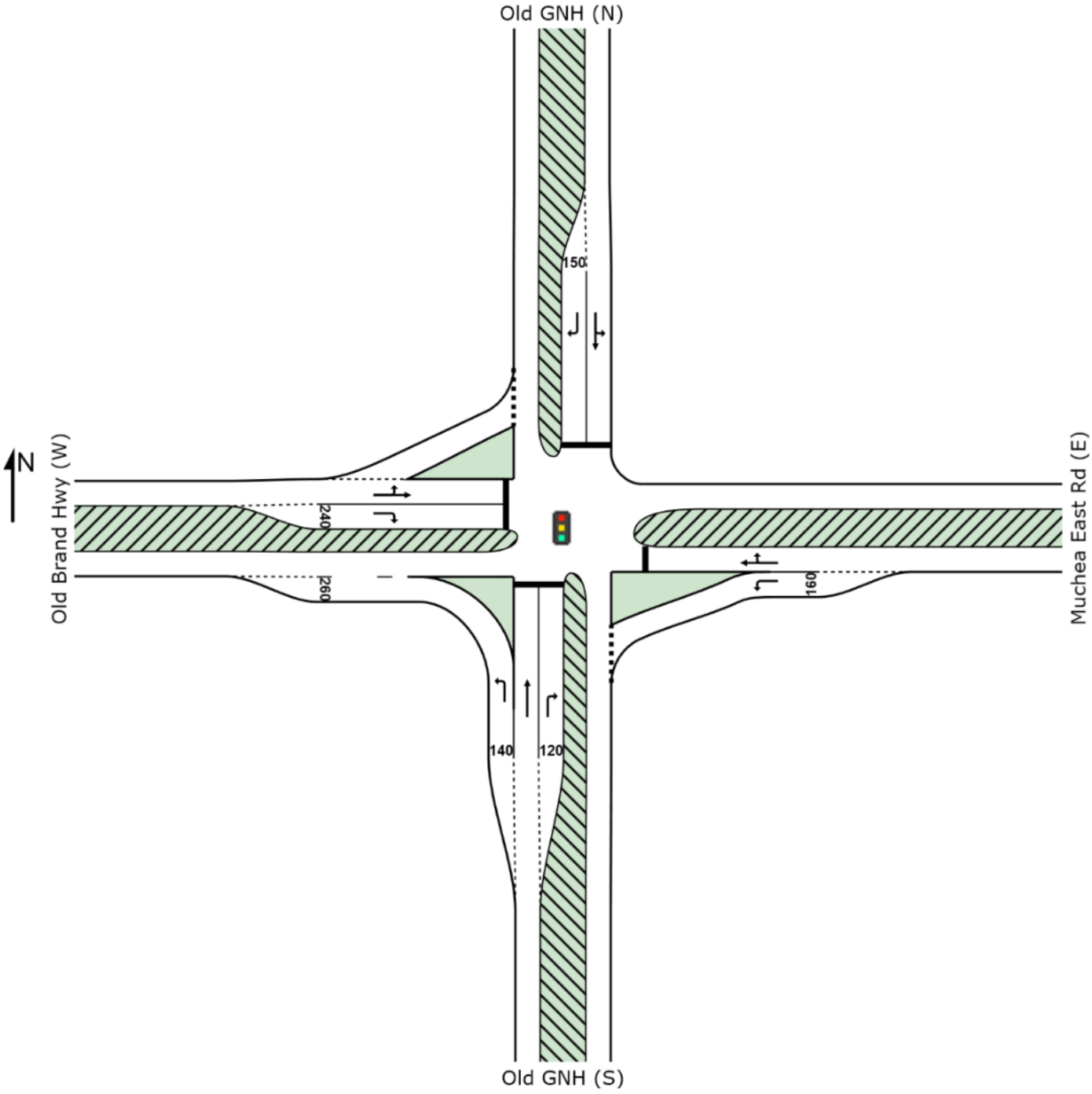
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: EW Link (E)											
5	T1	1	35.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	1	35.0	0.001	7.2	LOS A	0.0	0.0	0.36	0.53	50.9
Approach		2	35.0	0.001	3.6	NA	0.0	0.0	0.18	0.27	55.1
North: Eastern Road (N)											
7	L2	1	35.0	0.001	6.0	LOS A	0.0	0.0	0.01	0.56	52.1
9	R2	583	35.0	0.750	12.8	LOS A	13.5	123.3	0.68	0.79	47.3
Approach		584	35.0	0.750	12.8	LOS A	13.5	123.3	0.68	0.79	47.3
West: EW Link (W)											
10	L2	206	35.0	0.139	6.0	LOS A	0.0	0.0	0.00	0.57	52.1
11	T1	1	35.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		207	35.0	0.139	5.9	NA	0.0	0.0	0.00	0.57	52.2
All Vehicles		794	35.0	0.750	11.0	NA	13.5	123.3	0.50	0.73	48.5

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 2031 AM With Dev

GNH / Brand / Muchea E Signals
Signals - Fixed Time Isolated



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Project: P:\16P1000-1099\16P1004000 - Muchea LSP - Industrial\Modelling\151209sid-16P1004000_GNH_Brand_MucheaE.sip6

MOVEMENT SUMMARY

Site: 2031 AM With Dev

GNH / Brand / Muchea E Signals
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Old GNH (S)											
1	L2	52	33.0	0.034	8.1	LOS A	0.0	0.0	0.00	0.58	57.1
2	T1	318	33.0	0.689	28.8	LOS C	11.6	103.9	0.95	0.83	49.1
3	R2	16	33.0	0.070	26.1	LOS B	0.4	3.4	0.89	0.69	43.2
Approach		385	33.0	0.689	25.9	LOS B	11.6	103.9	0.82	0.79	49.8
East: Muchea East Rd (E)											
4	L2	17	25.0	0.014	9.1	LOS A	0.1	0.9	0.25	0.63	57.0
5	T1	41	25.0	0.449	38.1	LOS C	3.2	27.1	0.98	0.76	41.9
6	R2	41	25.0	0.449	45.3	LOS D	3.2	27.1	0.98	0.76	37.2
Approach		99	25.0	0.449	36.2	LOS C	3.2	27.1	0.85	0.74	41.6
North: Old GNH (N)											
7	L2	12	15.0	0.381	25.4	LOS B	3.6	28.5	0.90	0.72	50.7
8	T1	132	15.0	0.381	18.2	LOS B	3.6	28.5	0.90	0.72	56.7
9	R2	18	15.0	0.071	23.9	LOS B	0.3	2.6	0.89	0.69	47.3
Approach		161	15.0	0.381	19.4	LOS B	3.6	28.5	0.90	0.72	55.0
West: Old Brand Hwy (W)											
10	L2	15	34.0	0.183	30.1	LOS C	0.8	7.2	0.94	0.70	43.7
11	T1	15	34.0	0.183	22.2	LOS B	0.8	7.2	0.94	0.70	51.2
12	R2	49	34.0	0.441	49.5	LOS D	2.0	18.3	0.99	0.75	34.1
Approach		79	34.0	0.441	40.7	LOS C	2.0	18.3	0.97	0.73	38.0
All Vehicles		724	28.0	0.689	27.5	LOS B	11.6	103.9	0.86	0.76	47.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

PHASING SUMMARY

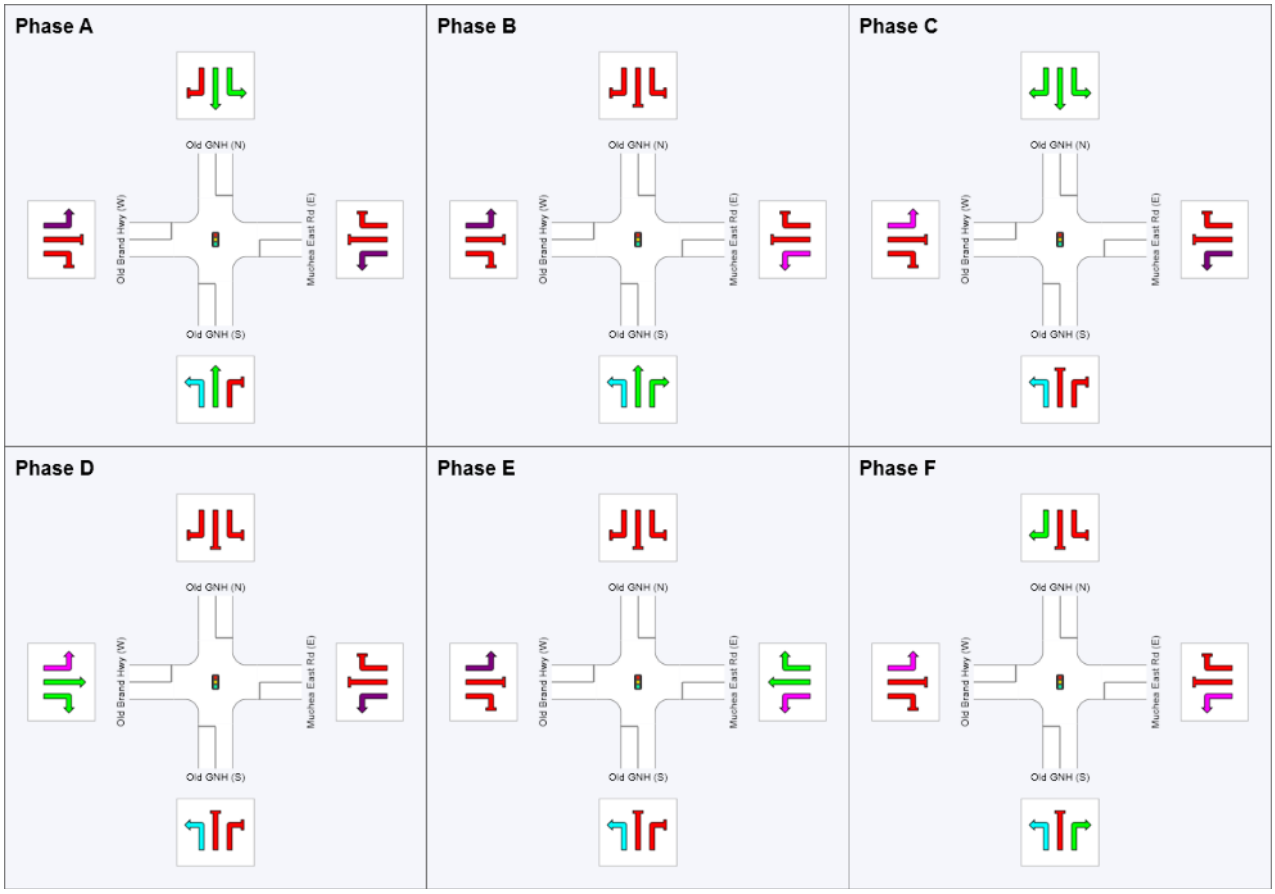
Site: 2031 AM With Dev

GNH / Brand / Muchea E Signals
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Practical Cycle Time)

Phase times determined by the program
Sequence: MRWA Phasing
Movement Class: All Movement Classes
Input Sequence: A, B, C, D, E, F
Output Sequence: A, B, C, D, E, F

Phase Timing Results

Phase	A	B	C	D	E	F
Reference Phase	Yes	No	No	No	No	No
Phase Change Time (sec)	0	17	29	41	53	68
Green Time (sec)	11	6	6	6	9	6
Yellow Time (sec)	4	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2	2
Phase Time (sec)	17	12	12	12	15	12
Phase Split	21 %	15 %	15 %	15 %	19 %	15 %



MOVEMENT SUMMARY

Site: 2031 PM With Dev

GNH / Brand / Muchea E Signals
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Old GNH (S)											
1	L2	57	33.0	0.038	8.1	LOS A	0.0	0.0	0.00	0.58	57.1
2	T1	211	33.0	0.403	23.0	LOS B	6.5	58.4	0.82	0.69	53.2
3	R2	6	33.0	0.028	25.0	LOS B	0.1	1.2	0.88	0.66	43.8
Approach		274	33.0	0.403	19.9	LOS B	6.5	58.4	0.65	0.67	53.7
East: Muchea East Rd (E)											
4	L2	4	25.0	0.004	10.3	LOS A	0.0	0.3	0.32	0.62	55.9
5	T1	41	25.0	0.495	41.7	LOS C	2.5	21.2	1.00	0.75	40.8
6	R2	20	25.0	0.495	49.0	LOS D	2.5	21.2	1.00	0.75	36.3
Approach		65	25.0	0.495	41.9	LOS C	2.5	21.2	0.96	0.75	40.0
North: Old GNH (N)											
7	L2	3	15.0	0.605	24.7	LOS B	6.8	53.6	0.93	0.78	51.6
8	T1	265	15.0	0.605	17.5	LOS B	6.8	53.6	0.93	0.78	57.8
9	R2	16	15.0	0.063	24.1	LOS B	0.3	2.5	0.88	0.69	47.2
Approach		284	15.0	0.605	17.9	LOS B	6.8	53.6	0.93	0.77	57.0
West: Old Brand Hwy (W)											
10	L2	18	34.0	0.223	33.8	LOS C	1.1	10.0	0.94	0.71	41.8
11	T1	18	34.0	0.223	26.0	LOS B	1.1	10.0	0.94	0.71	48.6
12	R2	61	34.0	0.545	50.1	LOS D	2.5	23.0	1.00	0.77	33.9
Approach		97	34.0	0.545	42.7	LOS D	2.5	23.0	0.98	0.75	37.3
All Vehicles		720	25.3	0.605	24.2	LOS B	6.8	58.4	0.83	0.73	50.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

PHASING SUMMARY

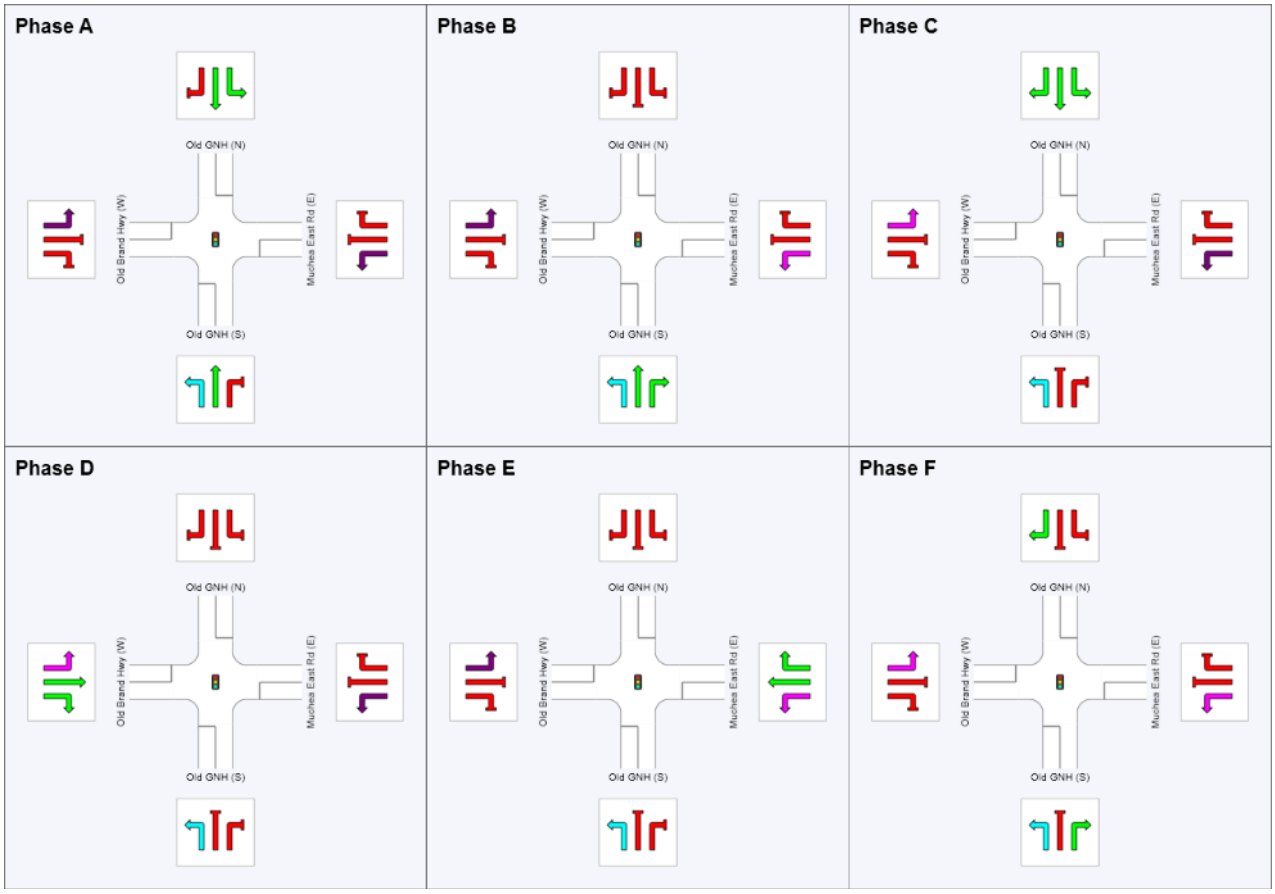
Site: 2031 PM With Dev

GNH / Brand / Muchea E Signals
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Practical Cycle Time)

Phase times determined by the program
Sequence: MRWA Phasing
Movement Class: All Movement Classes
Input Sequence: A, B, C, D, E, F
Output Sequence: A, B, C, D, E, F

Phase Timing Results

Phase	A	B	C	D	E	F
Reference Phase	Yes	No	No	No	No	No
Phase Change Time (sec)	0	20	32	44	56	68
Green Time (sec)	14	6	6	6	6	6
Yellow Time (sec)	4	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2	2
Phase Time (sec)	20	12	12	12	12	12
Phase Split	25 %	15 %	15 %	15 %	15 %	15 %



Melbourne

A Level 25, 55 Collins Street
PO Box 24055
MELBOURNE VIC 3000
P +613 9851 9600
E melbourne@gta.com.au

Brisbane

A Level 4, 283 Elizabeth Street
BRISBANE QLD 4000
GPO Box 115
BRISBANE QLD 4001
P +617 3113 5000
E brisbane@gta.com.au

Adelaide

A Suite 4, Level 1, 136 The Parade
PO Box 3421
NORWOOD SA 5067
P +618 8334 3600
E adelaide@gta.com.au

Townsville

A Level 1, 25 Sturt Street
PO Box 1064
TOWNSVILLE QLD 4810
P +617 4722 2765
E townsville@gta.com.au

Sydney

A Level 6, 15 Help Street
CHATSWOOD NSW 2067
PO Box 5254
WEST CHATSWOOD NSW 1515
P +612 8448 1800
E sydney@gta.com.au

Canberra

A Tower A, Level 5,
7 London Circuit
Canberra ACT 2600
P +612 6243 4826
E canberra@gta.com.au

Gold Coast

A Level 9, Corporate Centre 2
Box 37, 1 Corporate Court
BUNDALL QLD 4217
P +617 5510 4800
F +617 5510 4814
E goldcoast@gta.com.au

Perth

A Level 27, 44 St Georges Terrace
PERTH WA 6000
P +618 6361 4634
E perth@gta.com.au