Loch Street Station Precinct Structure Plan

Prepared for the Town of Claremont by Stacey Towne Town Planner in consultation with PLANNING CONTEXT and mackay urbandesign

June 2017

Endorsement page

This Structure Plan is prepared under the deemed provisions of the *Planning and Development (Local Planning Schemes) Regulations 2015.*

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON: ……

Signed for and on behalf of the Western Australian Planning Commission:

_____

an officer of the Commission duly authorised by the Commission pursuant to section 16 of the Planning and Development Act 2005 for that purpose, in the presence of:

_____ Witness

_____ Date

_____ Date of Expiry

Table of amendments to Structure Plan

Amendment No.	Summary of the Amendment	Amendment Type	Date approved by the WAPC

Executive summary

With the assistance of planning consultancies Planning Context and Mackay Urbandesign, the Town of Claremont and town planner Stacey Towne have prepared a Local Structure Plan for the land within its Town boundaries that is within approximately 400 metres from the Loch Street railway station. This is part of the general area identified as a station precinct in the draft *Perth and Peel @ 3.5 million* with potential to accommodate additional residential development.

The Western Australian Planning Commission (WAPC) has required the preparation of a Structure Plan for the Loch Street Station Precinct and environs for the purposes of orderly and proper planning. The Structure Plan is to facilitate the development of land in consideration of the objectives of the WAPC's draft Central Sub-Regional Planning Framework and the impacts of traffic generation within and surrounding the area of the Structure Plan.

The land within the Structure Plan area has already been developed and it is therefore intended that this Structure Plan will:

- *Identify land development opportunities and constraints for higher density development;*
- *Identify existing key potential sites for redevelopment that are of significance together with land that may have potential for future consolidation and redevelopment;*
- *Present models of how development could best be accommodated for varying lot parcels; and*
- *Demonstrate how the proposed density development concept could be implemented through the Town of Claremont's local planning tools and mechanisms.*

The Structure Plan is summarised in **Table 1 – Executive Summary** below. It will inform amendments to *Town Planning Scheme No. 3*, development of Local Development Plans, development of Local Planning Policy and amendments to existing Local Planning Policy. A set of Design Guidelines are proposed to be adopted as a Local Planning Policy to support this Structure Plan to ensure a high quality built form that complements the character of the area.

Table 1 – Executive Summary

Item	Data	Structure Plan Ref (Section no.)
Total area covered by the Structure Plan	Approximately 22 Hectares (including railway and road reserves)	Structure Plan Map
Area of each land use proposed: • Residential • Mixed Use (Local Centre) • Mixed Use (Showgrounds)	Approximately: 12 ha 0.5 ha 1.2 ha	Structure Plan Map
Estimated number of dwellings	658 dwellings - 200 single/group - 458 apartments	Part Two: Section 8.2 and 8.3
Estimated residential site density	60 Dwellings per site hectares (based on developable land of 10.95ha)	Part Two: Section 8.2
Estimated population	1,278 based on: - 2.27 persons per single/grouped dwelling; plus - 1.8 persons per multiple dwelling	
Estimated commercial floor space	- 1,225m^2 NLA	Part Two: Section 8.1
Estimated area given over to Local Parks	Nil - (existing reserves plus formalisation of existing Mofflin Park)	

Town of Claremont

Part One: Implementation

Loch Street Station Precinct Structure Plan

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Part One: Implementation

1. Structure Plan Area

The Structure Plan map is shown in **Plan 1 – Loch Street Station Precinct Structure Plan** and includes:

- residential density;
- mixed use sites;
- building setbacks required as a buffer to high voltage powerlines on Ashton Avenue;
- proposed zoning/reservation changes;
- sites requiring an approved Local Development Plan (LDP) prior to development;
- movement networks; and
- open space.

2. Sub-precincts

The Structure Plan area has been divided into eight Sub-precincts of similar or common function, density and/or desired urban form and are shown in **Plan 2 – Loch Street Station Precinct Structure Plan Sub-Precincts**.

The Sub-precincts are named as follows:

1. Second Avenue
2. Alfred Road/Ashton Avenue
3. Ashton Avenue Commercial
4. Ashton Avenue East
5. Showgrounds
6. Ashton Triangle
7. Gugeri Street
8. College Road

3. Operation

The date the Structure Plan comes into effect is the date the Structure Plan is approved by the Western Australian Planning Commission (WAPC).

4. Staging

The Structure Plan area is already developed and servicing is available. Modifications are required to the intersections of Ashton Avenue and Alfred Road, Ashton Avenue, Gugeri Street and Chancellor Street, Chancellor Street and Loch Street, and Loch Street, Gugeri Street and Railway Road prior to 2031. All of these intersections (except Loch Street, Gugeri Street and Railway Road) will require road widening to facilitate additional and lengthened lanes. Intersection modifications and land acquisitions in accordance with the provisions of the *Public Works Act 1902* will be undertaken by the Town prior to 2031. Therefore, there are no major barriers to development occurring in any particular order or stage.

The Structure Plan generally allows for the independent development of lots. Development is not expected to occur at the same time and allows for the incremental implementation of Structure Plan outcomes.

For those sites designated as requiring a Local Development Plan (LDP) within the Structure Plan, no development should take place until a relevant LDP has been approved.

5. Subdivision and development requirements

Subdivision and development of land within the Structure Plan area must comply with all usual planning requirements, including Town of Claremont *Town Planning Scheme No. 3* (TPS3) any Local Planning Policy and/or LDP adopted by the Town of Claremont.

In the absence of any provisions in a Local Planning Policy or LDP, residential development shall be in accordance with the Residential Design Codes of Western Australia (R Codes) as amended from time to time.

It is intended that some development requirements within the Structure Plan will vary from current TPS3, R Codes and Local Planning Policy provisions and standards (e.g. - building height and maximum 5% variation to plot ratio). These matters will be addressed through amendments to TPS3 and adoption/amendment to Local Planning Policies.

It is acknowledged that development of the Royal Agricultural Society of Western Australia (RAS) Showgrounds land and land owned by the Department of Communities (former Housing Authority of Western Australia) within the Structure Plan area is not subject to the requirements of TPS3, however, it is subject to the requirements of the Metropolitan Region Scheme. It is noted that traffic studies commissioned by the Town as part of a review of the Structure Plan to address submissions raised during the public consultation period has identified that traffic modelling for the advertised Structure Plan development yields will not accommodate estimated traffic volumes in the locality. Accordingly unless a major intersection/roundabout is constructed over the railway reserve at the Ashton Avenue bridge (or at Loch Street), the advertised RAS proposals and the Department of Communities development cannot be accommodated.

5.1 Zones and Reserves

The Structure Plan outlines the Zones and Reserves desired within the Structure Plan Area. These may not yet be reflected in TPS3 and amendments may be required accordingly.

The Zones and Reserves shown in TPS3 are the zones and reserves that apply to the Structure Plan area.

Residential Zone

The Structure Plan does not propose changes to any of the existing Residential zoning within the Structure Plan area, other than in relation to the associated density codings. Much of the land within the Structure Plan area is appropriately zoned Residential under TPS3 to support residential development of all dwelling types. A number of commercial type uses may also be permitted within the Residential zone.

Local Centre Zone

The Structure Plan does not propose change to the existing Local Centre zoning within the Structure Plan area.

The Local Centre zone which applies to a portion of the land on the western side of Ashton Avenue under TPS3 also supports residential development (Dwelling - self-contained is an AA use) above ground level.

Local Reserves – Recreation and Local Road Reserve

Part of the Local Road reserve on the corner of Mofflin Avenue and Stubbs Terrace has been developed and is used as a local park. The Structure Plan recognises this land as public open space, and proposes to formalise these arrangements by depicting it as proposed Local Reserves – Recreation.

An amendment to TPS3 will be required to reflect this formal modification. In addition, arrangements may need to be made to satisfy requirements of the *Land Administration Act 1997* (e.g. possible road closure and creation of a separate lot reserve).

5.2 Height

The proposed acceptable maximum building heights and/or storeys within the Structure Plan area are depicted on **Plan 3 – Height**. In some instances, these are significantly different to what TPS3 generally allows.

For the Residential zone, Clause 40(3) of TPS3 requires a maximum height of 6.6m. Clause 40(5)(a), however, allows for increase in height under "special circumstances". Design Guidelines prepared as a Local Planning Policy will need to be developed and adopted to refer to the heights proposed by the Structure Plan as a way of acknowledging these "special circumstances". In addition, heights proposed by the Structure Plan can be incorporated into any required LDP and therefore recognised as "special circumstances".

Amendments will also be required to existing Local Planning Policy LV123 - Retention of Residential Character to recognise the new heights allowances within parts of the Structure Plan area.

For the Local Centre zone, Clause 40(6) of TPS3 requires a maximum height of 6m. In this instance, the height proposed by the Structure Plan can be incorporated into the required LDPs. An amendment to TPS3 will also be required to allow for height variations in "special circumstances" in a similar manner to the residential height variances under Clause 40(5)(a).

The preferred heights within the Structure Plan are summarised in Table 2 – Heights as follows:

Table 2 - Heights

Sub-precinct	Maximum No. of Storeys	Comment
1. Second Avenue	2 (no change)	Entire Sub-precinct
2. Alfred Road/Ashton Avenue	2 (no change)	Entire Sub-precinct
3. Ashton Avenue Commercial	3	Entire Sub-precinct
4. Ashton Avenue East	2	Entire Sub-precinct
5. Showgrounds	(no change)	Entire Sub-precinct
6. Ashton Triangle	Nil (no change)	Entire Sub-precinct
7. Gugeri Street	5	Corner of Gugeri and Loch Streets
	3	Corner Gugeri and Chancellor Streets
	3	Balance of Sub-precinct
8. College Road	2 (no change)	Entire Sub-precinct

These height requirements are to be further refined to better inform built form expectations through the development and adoption of Design Guidelines (as Local Planning Policies) and LDPs and to ensure adjoining and adjacent properties with lesser height requirements are not adversely impacted.

5.3 Commercial Floorspace

No additional sites are proposed for retail use, therefore shopping floorspace is not expected to significantly alter from what currently exists within most of the Structure Plan area.

Commercial development within the RAS Showgrounds Sub-precinct, however, has been mooted and is subject to State Government approvals outside of this Structure Plan process. The advertised

Structure Plan reflected the RAS development aspirations for the site under their proposed Management Plan, modified under this Structure Plan to incorporate residential development on the top two storeys as a desirable design outcome. As a result of concerns raised by the RAS as part of the consultation process for the Structure Plan, together with traffic forecasting to address traffic congestion concerns, the proposals depicted on the RAS landholding has been removed from the Structure Plan. On this basis it is noted that the traffic forecasting undertaken as part of the review exercise only accommodates existing traffic generation from the existing RAS activities on site. In considering the approval of the proposed RAS Management Plan (or any other approval for development on this land), the WAPC is requested to be cognisant of the implications that any additional development on the RAS showgrounds (where access is attained from Ashton Avenue particularly) on traffic congestion in the locality - unless measures can be undertaken to alleviate the traffic congestion as part of those developments.

5.4 Heritage Features

There are no heritage listed sites or places within the Structure Plan area, although it is recognised that the RAS Showgrounds is a Heritage Area under the Town's Heritage List.

5.5 Separation Areas

A 132kV High Voltage power line is located on Ashton Avenue and Australian Standard AS7000.2010 Table 3.8 (for clearances of structures to power lines) applies to nearby development. To address this matter, the Structure Plan shows a building setback line requiring development on properties on the eastern side of Ashton Avenue to be set back 6 metres from the street alignment and 8 metres from the centre of the power lines (as required by Western Power).

5.7 Interface with adjoining land

The land within the Structure Plan area is separated from adjoining land in most instances by street alignments providing significant physical separation and limited impacts. The exception to this is the western sides of Sub-precinct 3 – Ashton Avenue Commercial and Sub-precinct 2 – Ashton Avenue/Alfred Road which abut Residential R30 land, and other sub-precincts where density codings vary.

To reduce any impacts on adjoining land and to ensure residential amenity is not compromised, this Structure Plan is to be supported by Design Guidelines adopted as Local Planning Policy and LDPs which are to provide design controls for such matters as (including but not limited to) building height, setbacks, vehicular access and parking.

These measures will also address potential interface issues between land uses and/or varying development forms within the Structure Plan area (e.g. development adjacent to the railway line; and development adjacent to Sub-precinct 1 – Second Avenue).

5.8 Public Open Space

The Structure Plan proposes to rationalise public open space by formalising an increase in public open space at the corner of Mofflin Avenue and Stubbs Terrace.

The advertised proposal to commensurately reduce the size of the Local Recreation Reserve within the Ashton Triangle Sub-precinct while improving its functionality and use has been removed from the Structure Plan due to land title concerns raised by the RAS during consultation, in addition to measures undertaken to reduce development yield within the Precinct to address traffic congestion concerns.

The overall amount of local recreation reservation within the Structure Plan area does not change, although it is recognised that the RAS Showgrounds Management Plan may potentially provide some

additional informal open space on the west side of Ashton Avenue opposite its intersection with Mofflin Avenue and the Ashton Triangle Sub-precinct.

6. Land use and permissibility

Land Use Permissibility within the Structure Plan Area shall be in accordance with the corresponding Zone or Reserve under TPS3.

7. Residential density

7.1 Density Targets

The draft Central Sub-regional Planning Framework sets a high-level target for the spatial distribution of the infill housing target across the Central sub-region. For the Town of Claremont, the infill housing target is 1,300 (975 dwellings in urban consolidation areas and incremental growth of 325 dwellings outside urban consolidation areas).

The Town of Claremont's residential growth target of 1300 dwellings is more than accommodated by proposals contained in the existing and proposed studies and developments, including the *North East Precinct Structure Plan* –Claremont on the Park development (up to 1000 dwellings – 370 more than the original estimate of 630 dwellings) and the *Stirling Highway Local Development Plan* which proposes increased densities under the "Staged" scenario with additional "Designated Landmark" sites located at the intersections of Airlie Street (Amana), the north-western corner of Stirling Road and Dean Street (St Louis Estate Retirement Village) and yielding over 1200 dwellings.

The planning imperative with regard to the Loch Street Station Precinct is to assist this growth within a sustainable traffic movement network, while at the same time providing opportunity for urban renewal and improvement of facilities in the Precinct to improve overall living standards for existing and future residents.

7.2 Proposed Residential Density

Residential densities proposed within the Structure Plan Area are depicted in **Plan 1 – Loch Street Station Precinct Structure Plan**. In some instances, these differ significantly from existing density codes provided within TPS3 and amendments to TPS3 will be required.

Residential densities vary throughout the Structure Plan area and include R25, R30, R40, R60 and R80 and are detailed by Sub-precinct as follows:

Sub-precinct	R Code
1. Second Avenue	R25 (no change)
2. Alfred Road/ Ashton Avenue	R30 (some change from R25)
3. Ashton Avenue Commercial	R60 (change from R25)
4. Ashton Avenue East	R40 (change from R25)
5. Showgrounds	Nil (no change)
6. Ashton Triangle	Nil (no change)

7. Gugeri Street	R60 (except existing R80 and corner of Loch Street and Gugeri Road) (change from R20 and Special Zone)
8. College Road	R40 (change from R20)

The Structure Plan requires a number of properties to be amalgamated/consolidated in order to achieve development at the densities proposed within Sub-precincts 7 (Gugeri Street) and 8 (College Road).

8. Local Development Plans

Implementation of this Structure Plan requires variation to a number of current TPS3 requirements and LDPs are required in order to provide for specific development form applicable to designated Structure Plan sites.

LDPs are to be prepared in accordance with Clause 48 of the Deemed Provisions of the *Planning and Development (Local Planning Schemes) Regulations 2015* to inform applications for subdivision and development of:

a) a group of four or more green title lots in separate ownership and where landowners are having difficulty in coordinating development and require Council intervention to assist development; and
b) the sites indicated on **Plan 1 – Loch Street Station Precinct Structure Plan**.

LDPs are to include as follows:

- Building envelopes including ground floor and upper floor setbacks, maximum building height, boundary wall location, length and height, and other side and rear setbacks.
- Orientation and design of built form and major openings to achieve passive surveillance of the street and or Public Open Space.
- Vehicle access points and parking including garage/carport location and on-street parking provision.

In addition, the following issues and principles are to be addressed:

LDP	Issues and Principles to be addressed
A. Sub-precinct 3 – Ashton Avenue Commercial	Possible shared access and parking; maintaining adequate separation distance from adjoining residential properties; building height variation to TPS3; nil setbacks to Ashton Avenue frontage; provision of awnings; street parking and landscaping treatments.
B. Sub-precinct 7 – Gugeri Street (optional for land already included within another LDP)	Decrease in number of access points to Gugeri Street; minimum lot size and frontages; improved pedestrian access to and along Gugeri Street; no vehicular access to Gugeri Street from corner development sites and access separation from the intersection of Gugeri and Loch Streets and Gugeri and Chancellor Streets.

9. Local Planning Policy

Local Planning Policy in the form of Design Guidelines will be adopted for development within the Structure Plan area.

New Local Planning Policy is required to be developed and adopted to recognise the approved Structure Plan as a "special circumstance" under TPS3 Clause 40 (5)(a) and also for the Local Shopping zone. This will allow for variation to the height provisions of TPS3 to be in accordance with the maximum heights proposed by the Structure Plan for development within the Residential and Local Shopping zones (once TPS3 is amended for the Local Shopping zone).

Local Planning Policy LV123 Retention of Residential Character will require amendments to recognise the new heights within parts of the Structure Plan area and formally remove the present (and commonly varied requirement in Sub-precinct 1) requirement which limits the second storeys to 50% of the ground floor area located in the middle third of the dwelling and for the dwellings to appear as singe storey from the street frontage.

10. Other requirements

10.1 Infrastructure upgrades

Other than upgrades at intersections of Ashton Avenue and Alfred Road, Ashton Avenue, Gugeri Street and Chancellor Street, Chancellor Street and Loch Street, and Loch Street, Gugeri Street and Railway Road, no infrastructure upgrades are proposed to be required to support development within the Structure Plan area which can be readily serviced through the extension of existing services in the vicinity (noting also the exception of upgrades to the Ashton Avenue railway bridge currently being undertaken).

10.2 Developer contributions

The Structure Plan area is not subject to any developer contributions under the Scheme.

If infrastructure upgrades are required, funding from developers through normal subdivision and development requirements may be necessary, however a formal Development Contribution Plan is not proposed for development within this Structure Plan area.

Intersection upgrades identified under the modified Structure Plan (following consultation) will be undertaken by the Town over a period of time (up until 2031), funded by Council with assistance from the State and Federal Government (as deemed appropriate).

11. Additional information

Prior to the lodgement of a Development Application in the Structure Plan area, the following plans/reports may be required as applicable, to the satisfaction of the relevant authority:

Additional information	Approval Stage	Consultation Required
An acoustic assessment/noise management plan demonstrating noise mitigation strategies	Development Application	Town of Claremont
Risk analysis – contaminated sites on corner of Gugeri Street and Loch Street and Restricted Site	Development Application	Town of Claremont and Department of Environment and Regulation

It is noted that a detailed acoustic assessment may be required as a condition of Development Approval demonstrating mitigation measures, construction standards and implementation strategies.

This will be required prior to lodgement of a Building Permit, or occupation of a development if a Building Permit is not required.

Plan 1 –- Loch Street Station Precinct Structure Plan

Plan 2 – Loch Street Station Precinct Structure Plan Sub-precincts

Sub-precincts

1. **Second Avenue**
2. **Alfred Road/Ashton Avenue**
3. **Ashton Avenue Commercial**
4. **Ashton Avenue East**
5. **Showgrounds**
6. **Ashton Triangle**
7. **Gugeri Street**
8. **College Road**

Plan 3 – Loch Street Station Precinct Structure Plan Building Height

Town of Claremont

Part Two: Explanatory Report

Loch Street Station Precinct Structure Plan

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Part Two: Explanatory Report

1. Planning background

1.1 Introduction and purpose

A Structure Plan provides a basis for zoning (including residential density) and subdivision of land. Schedule 2, Part 4, Clause 15 of the *Planning and Development (Local Planning Schemes) Regulations 2015* (LPS Regs) allows for the preparation of a Structure Plan in a number of circumstances.

This local Structure Plan has been prepared for the Loch Street Station Precinct by planning consultants for the Town of Claremont for the purposes of orderly and proper planning, as directed by the Western Australian Planning Commission (WAPC) on 13 December 2016.

The purpose of the Loch Street Station Precinct Structure Plan is generally to formalise the intent of Recommendation 10 of the *Town of Claremont Housing Capacity Study* (adopted 2013).

Loch Street Station Precinct Structure Plan

Purpose:

Within approximately 400 metres of the Loch Street Railway Station, the local Structure Plan proposes to:

- Identify land development opportunities and constraints for higher density development;
- Identify existing key potential sites for redevelopment that are of significance together with land that may have potential for future consolidation and redevelopment;
- Present models of how development could best be accommodated for varying lot parcels;
- Demonstrate how the proposed density development concept could be implemented through the Town of Claremont's local planning tools and mechanisms.

The Structure Plan deals with residential density, building heights, subdivision, and the coordination of infrastructure on a small neighbourhood scale. It is intended to guide (not determine) built form, and consideration is given to the capability of future and existing lots with increased densities being developed for their intended use in accordance with the provisions of *Town Planning Scheme No. 3* (TPS3) and the Residential Design Codes (R Codes).

Detailed development standards, variations to the requirements of the R Codes and guidelines on built form are required for specific sites within the Structure Plan area. These are to be achieved through local planning mechanisms additional to this Structure Plan, such as amendments to TPS3, Local Planning Policy (including Design Guidelines) and Local Development Plans (LDPs).

The Loch Street Station Precinct Structure Plan is divided into eight Sub-precincts (as shown in **Plan 2** in Part One of this document):

1. Second Avenue
2. Alfred Road/Ashton Avenue
3. Ashton Avenue East
4. Ashton Avenue Commercial
5. Showgrounds
6. Ashton Triangle
7. Gugeri Street
8. College Road.

The Sub-precincts identify areas of similar or common function, density and/or desired urban form. Sites within each Sub-precinct either relate to each other in some way or have common issues and planning principles. Identifying sub-precincts assists in spatially defining areas for further planning

measures such as LDPs and Local Planning Policy, including Design Guidelines and restrictions on the application of discretion relative to plot ratio.

1.2 Land description

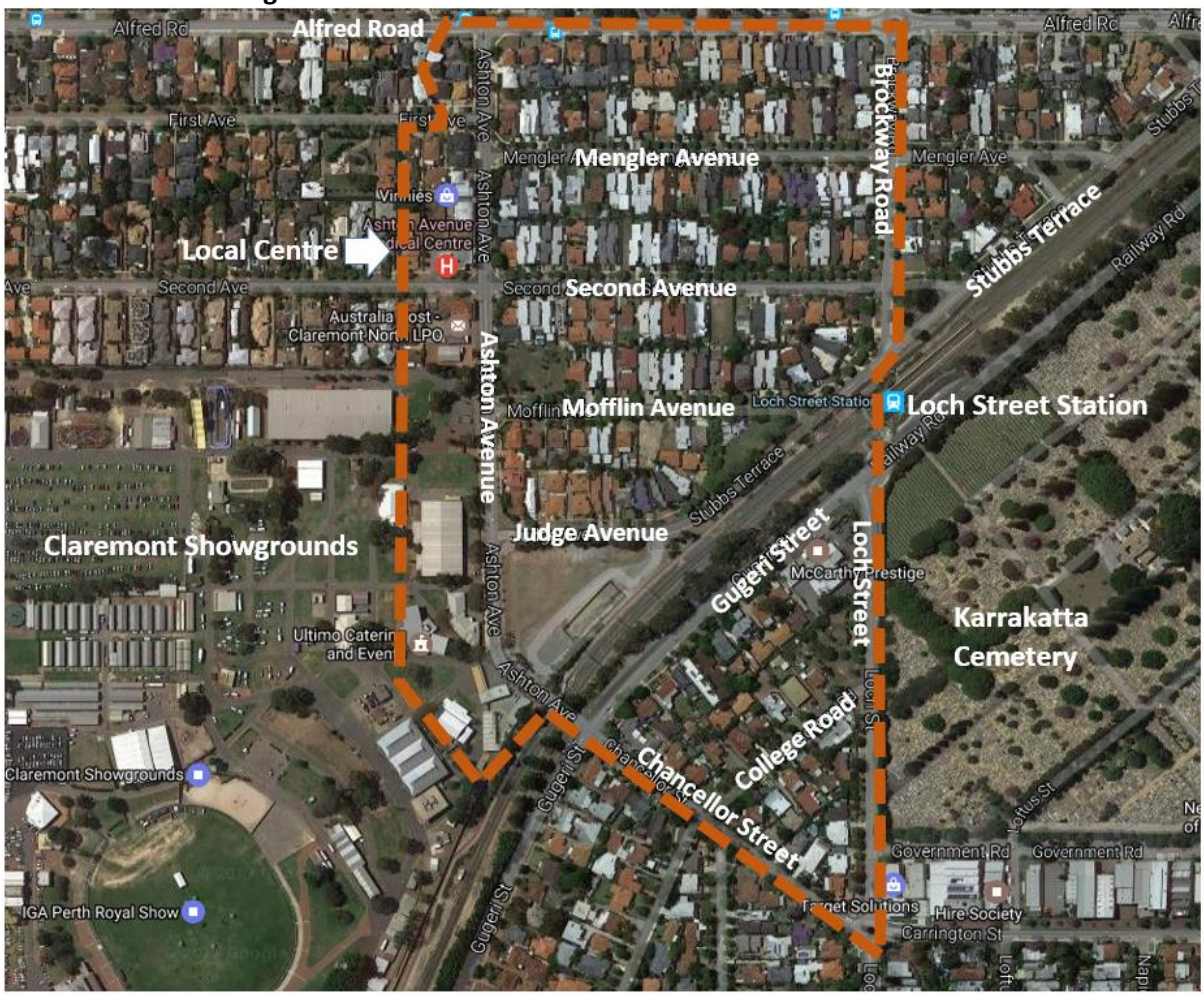
1.2.1 Location

The Loch Street Station Precinct Structure Plan area is located less than two kilometres east of the Claremont CBD (Claremont Quarter) and less than ten kilometres south-west of the Perth CBD.

The Structure Plan area includes land within an approximately 400 metre radius of the Loch Street railway station within the confines of the Town of Claremont. The land within a 400 metre radius of the station that is not located within the Town of Claremont, comprises of the Karrakatta Cemetery (south east of the railway line) and single residential development (north east of the railway line). These areas are located within the City of Nedlands and do not form part of this Structure Plan.

The Structure Plan area is located on both the northern and southern sides of the Perth to Fremantle railway line and is generally bound by Loch Street and Brockway Road to the east; Alfred Road to the north; a strip of land immediately west of Ashton Avenue to the west (including a portion of the Claremont Royal Agricultural Society (RAS) Showgrounds); and Chancellor Street to the south west as shown in **Figure 2.1 – Loch Street Station Precinct Structure Plan Area.**

Figure 2.1 - Loch Street Station Precinct Structure Plan Area



1.2.2 Area and current land use

The Structure Plan area encompasses a fully developed suburban area and comprises approximately 370 properties characterised by predominantly single residences and grouped dwelling development, with the following exceptions:

- A small local shopping strip including a medical centre is located on the western side of Ashton Avenue and to the south of this the eastern edge of the RAS Showgrounds.
- A triangular shaped local park (0.18 hectares) exists near the corner of Mofflin Avenue and Stubbs Terrace (within the road reservation and therefore not formally recognised under TPS3) and another local park is located just to the west of the Structure Plan area in First Avenue (0.23 hectares). Both are landscaped and have play equipment.
- Another triangular shaped site bound by Judge and Ashton Avenues and Stubbs Terrace (Sub-precinct 6 Ashton Triangle) is depicted as Local Reserves - Recreation under TPS3 which is undeveloped and cleared, with the exception of a row of shade trees along the verge area of Judge Avenue. This land is used for informal car parking during the Perth Royal Show. Although this land is depicted as Local reserves – Recreation and Local Road Reserve in TPS3, the land use does not particularly reflect these functions and presents an opportunity for improvement. A portion of the adjoining section of Stubbs Terrace (unconstructed) road reserve is currently fenced and being used as a temporary storage for the Town of Claremont depot.
- Two properties near the corner of Gugeri and Loch Streets are currently used for non-conforming commercial purposes including a paint and panel business (122 Gugeri Street) and an equipment hire business (124 Gugeri Street). 122 Gugeri Street is part of a site that was recently rezoned and is capable of being developed for Residential R80 purposes. 124 Gugeri Street is also recognised as a contaminated site due to past land use activities.

1.2.3 Surrounding land use

Context and site analysis plan detail the site's relationship to the immediate area as shown in **Figures 2.2 – Context Analysis Plan and 2.3 – Site Analysis Plan.**

Figure 2.2 - Context Analysis Plan

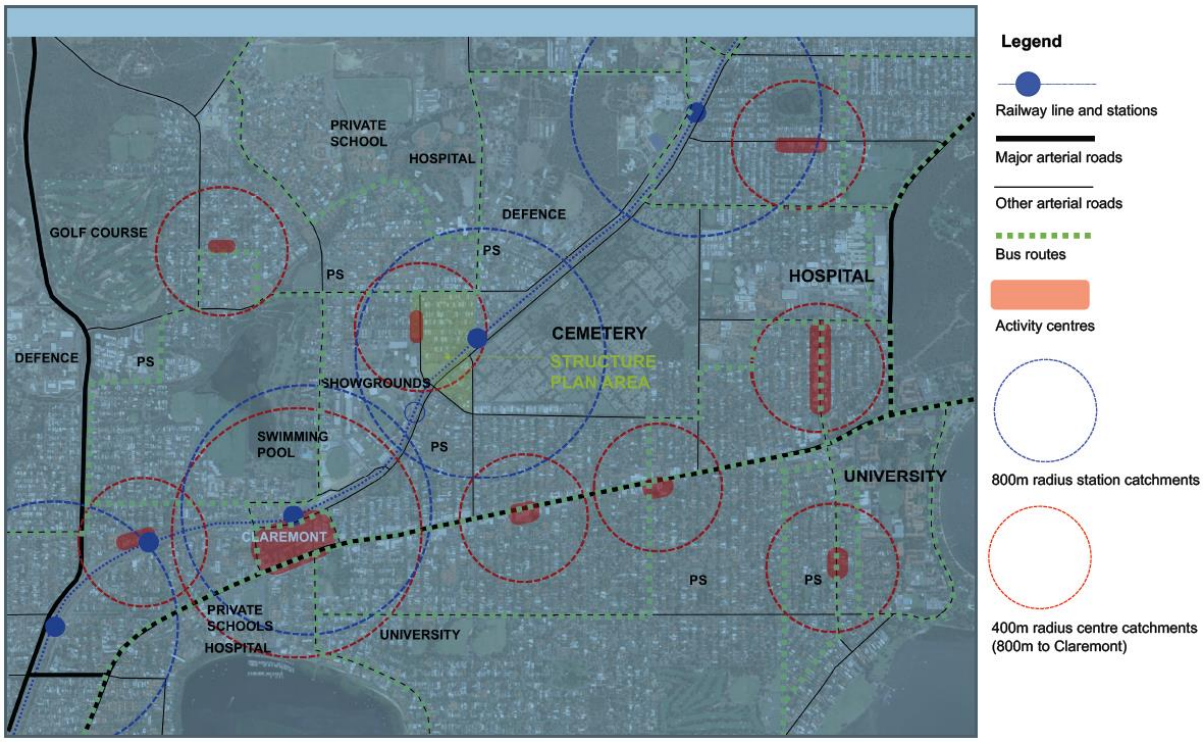
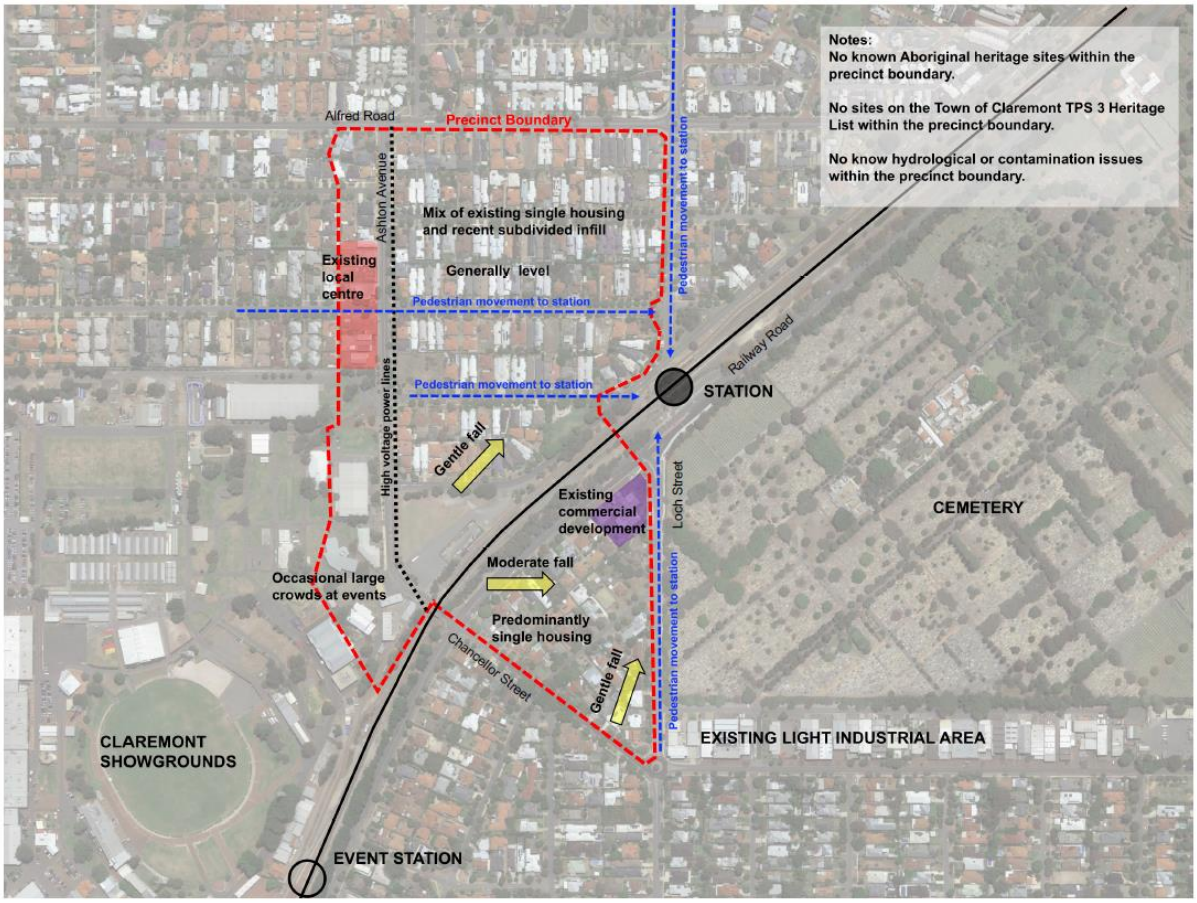


Figure 2.3 – Site Analysis Plan



Land to the west of (and not included within) the Structure Plan area includes:

- R30 coded land - Land to the west of the properties that front Ashton Avenue in Sub-precinct 2 – Alfred Road/Ashton Avenue and Sub-precinct 3 – Ashton Avenue Commercial are zoned Residential with a density code of R30. These properties are not included within the Structure Plan area as they generally exceed the 400 metre radius from the train station.
- North East Precinct - Further west, development and construction works for the North East Precinct are ongoing producing a range of medium to high density housing options surrounding the Claremont Oval. It will ultimately include approximately 1000 residential apartments and townhouse lots, together with about 1,360m^2 of retail floor space and 4,000m^2 of commercial floor space as part of an integrated mixed use development within the precinct.

Land to the east of (and not included within) the Structure Plan area includes:

- Well established single residential development (north east of the railway line) located within the City of Nedlands.
- The Karrakatta Cemetery (south east of the railway line) located within the City of Nedlands.

1.2.4 Land ownership

As the land has been subdivided and developed over many years, there are multiple landowners of the properties within the Structure Plan area, including some public as well as private ownership.

Owners of some of the more significant potential development sites include:

- Housing Authority of Western Australia - 11 Ashton Avenue (Lot 200) (part of Sub-precinct 4 – Ashton Avenue East).
- Royal Agricultural Society of Western Australia - Freehold Lot 2, Lot 3765, Lot 3, Lot 3282 and Lot 2266; and Crown Grant in Trust Lot 4782 ; (part of Sub-precinct 6 – Ashton Triangle).
- Royal Agricultural Society of Western Australia – Crown Grant in Trust Lot 1797; and Freehold Lot 3282 (Closed Road), Lot 2266 and Lot 2267 (part of Sub-precinct 5 – Showgrounds).

2 Planning framework

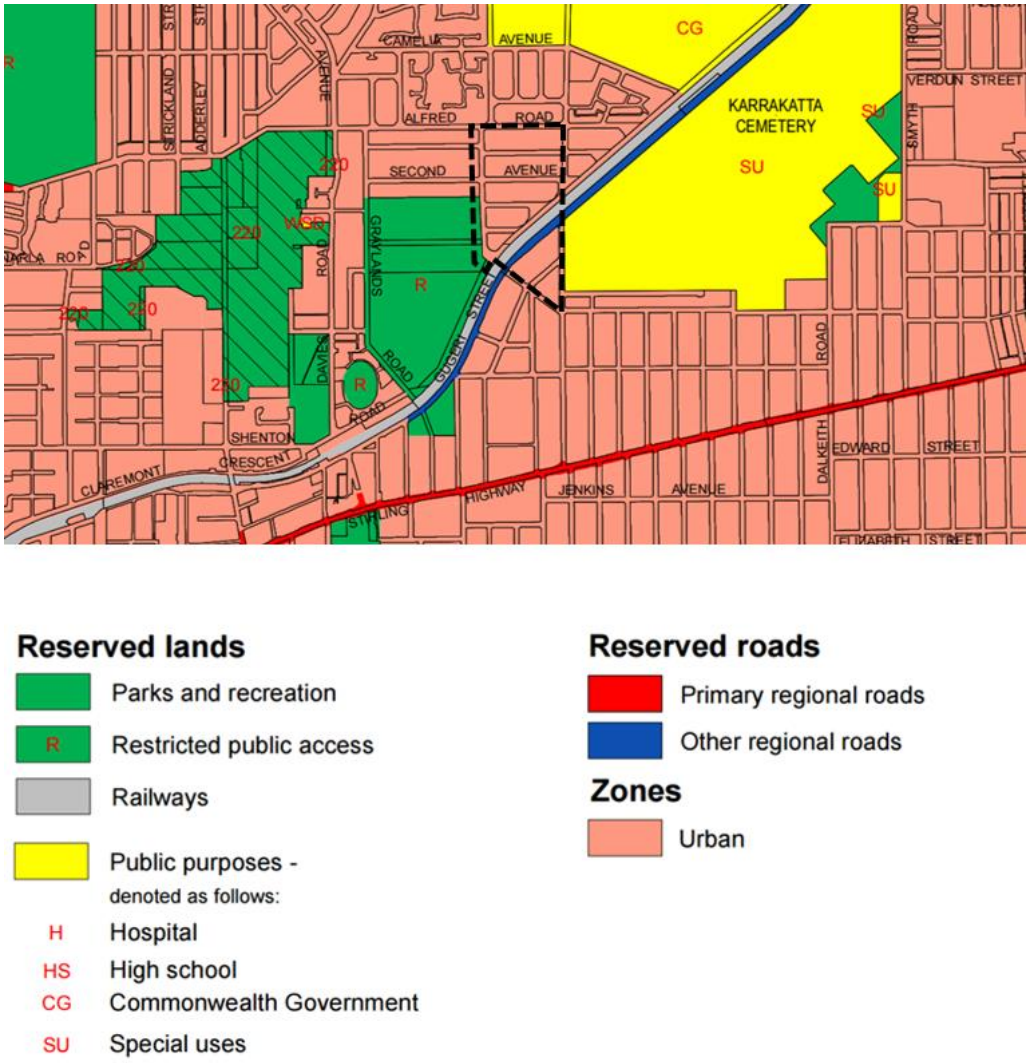
2.1 Zoning and reservations

2.1.1 Metropolitan Region Scheme

The land within the Structure Plan area is predominantly zoned Urban under the *Metropolitan Region Scheme* (MRS) with the exception of the Railway Reserve (Perth to Fremantle Railway Line); Important Region Road Reserve (Gugeri Street) and Regional Parks and Recreation (Claremont Showgrounds) as shown in **Figure 2.4.**

The Structure Plan is generally consistent with the provisions of the MRS. No changes are required to the MRS to accommodate the Structure Plan, with the exception of possible changes to the Parks and Recreation Reserve over the RAS Showgrounds. Any development within the showgrounds site will be subject to State level planning requirements, which may include a Management Plan, Local Development Plan and an amendment to the MRS.

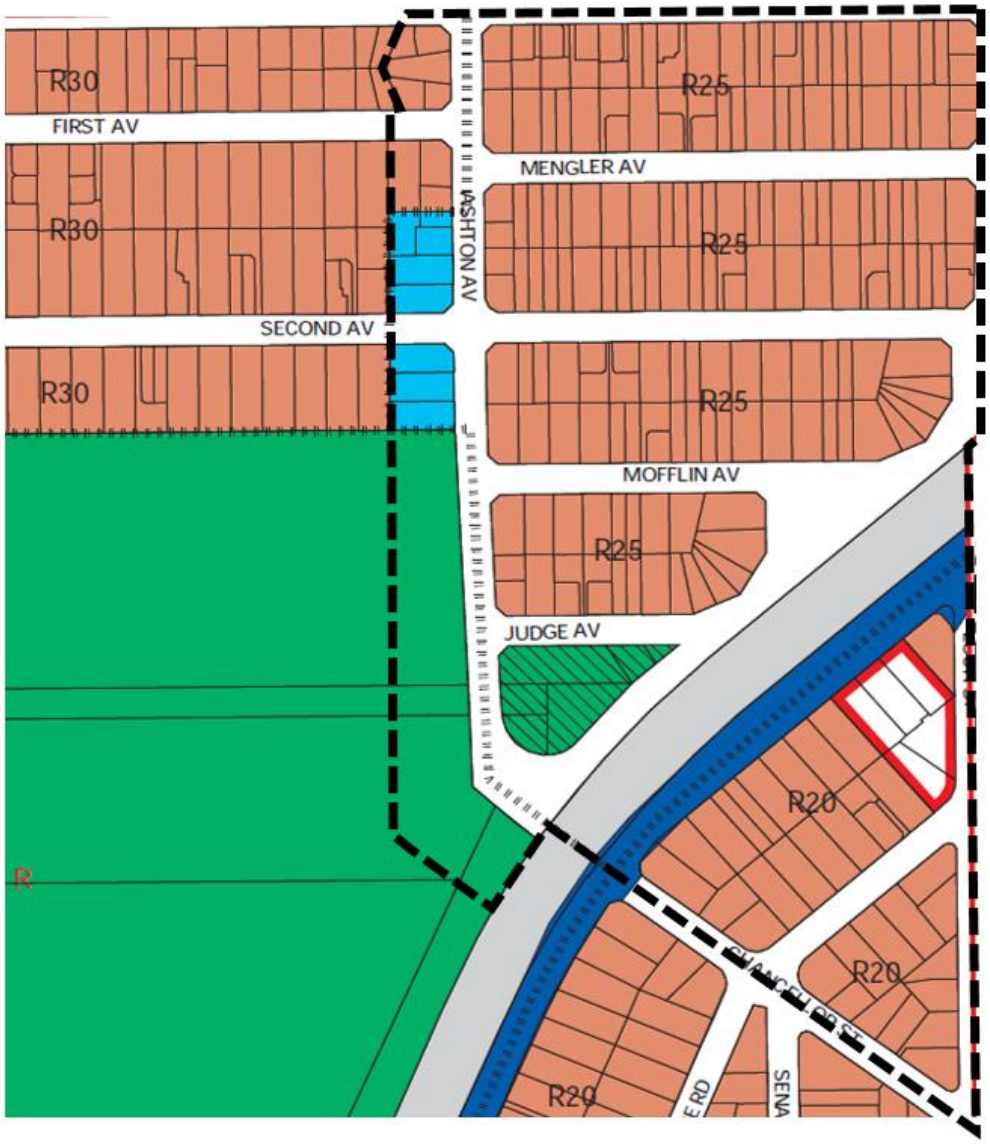
Figure 2.4 - Metropolitan Region Scheme Zones and Reservations



2.1.2 Town Planning Scheme No. 3

The zoning and applicable R Codes within the Structure Plan area under TPS 3 are shown in **Figure 2.5**.

Figure 2.5 – TPS3 Zoning and R Codes



Residential R20

The area south of the railway line bound by Gugeri Street, Chancellor Street and Loch Street is within Sub-precinct 7 - Gugeri Street and Sub-precinct 8 – College Road. Most of the land within this area is zoned Residential with a density code of R20.

The following development requirements apply to R20 land under State Planning Policy 3.1 - Residential Design Codes (SPP 3.1) (R Codes):

R20 Code	Minimum site area per dwelling m^2	Minimum lot area/rear battle-axe m^2	Minimum frontage	Open space min total of site	Open Space Min outdoor living m^2	Primary setback	Secondary setback
Single house & grouped dwelling	Min 350 Av 450	450	10m	50%	30	6m	1.5m
Multiple dwelling	350	-	-	50%	-	6m	1.5m

The predominant lot size in this vicinity is approximately $1000m^2$, however, about one third of the lots vary between approximately 500 – $700m^2$. Under current density provisions, one additional dwelling unit per property could be achieved and this is restricted only to those larger properties with an area of $900m^2$ or more.

Residential R25

Much of the land north of the railway line is zoned Residential with a density code of R25. The R25 code is confined within the boundaries of Judge Avenue, Ashton Avenue, Alfred Road and Brockway Road.

All of the land within the Sub-Precinct 1 – Second Avenue is Residential R25. Some of the Residential R25 land is also located on the eastern side of Ashton Avenue in Sub-Precinct 2 – Alfred Road/Ashton Avenue and Sub-precinct 4 – Ashton Avenue East.

The following development requirements apply to R25 land under the R Codes:

R25 Code	Minimum site area per dwelling m^2	Minimum lot area/rear battle-axe m^2	Minimum frontage	Open space min total of site	Open Space Min outdoor living m^2	Primary setback	Secondary setback
Single house & grouped dwelling	Min 300 Av 350	425	8m	50%	30	6m	1.5m
Multiple dwelling	350	-	-	50%	-	6m	1.5m

Much of this area has been subdivided and developed to its full capacity with the majority of lots in the mid 300 – $400m^2$ range. Under current density provisions, a minimum lot size of $700m^2$ is required for further subdivision into two lots and/or development of two dwellings.

Only about 12% of the properties within this Residential R25 area are $700m^2$ or more and available for further subdivision – most of the lower sized lots in the area have already been subdivided in accordance with the R Code requirements. This has resulted in a significantly modified urban form

containing older style battle-axe development for two dwellings and more recent side by side two dwelling development on each of the original housing lots.

Residential R30

A small number of properties (8) fronting/near Ashton Avenue, but north of the shopping strip, are zoned Residential with a density code of R30. These properties make up part of Sub-precinct 2 – Alfred Road/Ashton Avenue.

The following development requirements apply to R30 land under the R Codes:

R30 Code	Minimum site area per dwelling m^2	Minimum lot area/rear battle-axe m^2	Minimum frontage	Open space min total of site	Open Space Min outdoor living m^2	Primary setback	Secondary setback
Single house & grouped dwelling	Min 260 Av 300	420	8m	45%	24	4m	1.5m
Multiple dwelling*	300	-	-	45%	-	4m	1.5m

The predominant lot size in this vicinity is approximately 300m^2 and further subdivision and/or development of additional dwellings is not possible.

Special Zone – Restricted Use

Set amongst the R20 coded land to the south of the railway are Lots 4, 22 and 25 Gugeri Street, Lot 26 Loch Street and Lot 20 College Road which are zoned Special Zone – Restricted Use with a density code of R80 (resulting from Amendment No. 113 to TPS3).

In accordance with the requirements of TPS3, a Detailed Area Plan (DAP) was approved to accompany the new zoning. The DAP proposes to minimise impacts on the adjacent residential properties to the west and to College Road by designing buildings to 'step down' to these boundaries. Traffic impacts will be minimised by locating all vehicle access from Loch Street.

The DAP allows for residential development with the following characteristics (whilst all other development standards are to be as per TPS3 and the R Codes):

- A density of R80 with a plot ratio of 1:1 or up to 5000m^2 of floorspace (allows for 40-60 new dwellings);
- A three storey/12.5m height maximum development along Gugeri Street;
- Two storey development along College Road to fit with the existing streetscape;
- A 'Development Frontage' area where buildings are required to be constructed facing the street to maximise passive surveillance and presentation to the street;
- Two storey development at a maximum 6.6m wall height along the western boundary, to address overlooking, overshadowing and the effects of building bulk on the adjacent single-residential lots;
- Potential nil setback to the property to the north-east, currently used as a commercial garden equipment hire centre;
- Car parking for the site accessed from Loch Street (underground car parking is presumed);
- High pedestrian amenity with pedestrian access points on Gugeri Street and Loch Street with all ground-floor units facing the street having separate private access; and
- Variations may be considered in accordance with the Local Planning Policy provisions of TPS3.

The Detailed Area Plan and zoning of this property is likely to deliver a similar built form to adjacent properties along Gugeri Street as provided for by this Structure Plan, and associated Local Planning

Policy (Design Guideline and LDPs. Consideration should be given to normalising this property with the planning controls for the adjacent lots when Council initiates an amendment to TPS3 to implement the Structure Plan.

Local Centre

A strip of seven lots north of the showgrounds along the west side of Ashton Avenue are zoned Local Centre. These are within Sub-Precinct 3 – Ashton Avenue Commercial.

Under TPS3, Dwelling (Self-contained) is a use that may be approved by Council subject to a number of requirements and circumstances (discussed in greater detail further in this report). A density code of R25 exists over this Local Centre zone, requiring a minimum site area of 350m^2 for multiple dwellings.

Two of these properties are in the mid 400m^2 range, whilst the remaining are in the mid 700m^2 range.

Local Reserve – Recreation and Local Road Reserve

A small, roughly triangular piece of land immediately north of the railway line on the corner of Judge and Ashton Avenues is a local reserve for recreation. This land is within Sub-Precinct 6 – Ashton Triangle.

The reserve is made up of six lots (Lot 2, Lot 3765, Lot 3, Lot 3282, Lot 2266 and Lot 4782) with a combined area of approximately 5,175m^2. These are freehold lots owned by the RAS, with the exception of Lot 4782 which is a Crown Grant held in Trust by the RAS. Immediately adjoining this to the south is an unconstructed Local Road reserve (Stubbs Terrace) that is vested in the Town of Claremont and partly used as a temporary storage depot and car parking (Refer to **Figure 2.6**.)

Figure 2.6 – Ashton Triangle

Note: Sub-precinct 6 – Ashton Triangle has been modified to remove the portion of Stubbs Terrace in consideration of the reduced capacity to develop the RAS lots to the North – in response to concerns raised by the RAS during the submission period.

Local Road Reserve

A small section of Local Road Reserve near the corner of Mofflin Avenue and Stubbs Terrace has been developed and is used as a small local park (Refer to **Figure 2.7**). This land is within Sub-precinct 1 – Second Avenue.

Figure 2.7 – Mofflin (Road) Reserve

2.2 Regional and Sub-regional Structure Plans

In May 2015, the WAPC released for public discussion the draft *Perth and Peel@3.5 million* suite of documents that addresses where future homes and jobs should be located to support a population of 3.5 million by 2050; important environmental assets can be protected; how to best utilise existing and proposed infrastructure; and appropriate areas for greater infill development and residential density.

The suite includes four draft sub-regional planning frameworks for Central, North-West, North-East and South Metropolitan Peel. Once finalised, the frameworks will become sub-regional Structure Plans and will be used by State agencies and local governments to guide residential and industrial development, and supporting infrastructure.

The frameworks identify where growth in the medium to long term should occur and is made up of five distinct elements of urban consolidation: activity centres, corridors, station precincts, industrial centres and the green network.

The Town of Claremont is located within the Central Sub-regional Planning Framework.

Station Precincts

Station precincts are defined areas surrounding train stations and major bus interchanges with the potential to accommodate transit oriented development (TOD) but which are not identified as activity centres.

One of the ten urban consolidation principles applied in the preparation of the frameworks includes:

> *Where appropriate, focus development in and around station precincts (train stations or major bus interchanges) and promote these precincts as attractive places to live and work by optimising proximity to public transport while ensuring minimal impact on the operational efficiency of the regional transport network.*

Nominal areas of 400 metres in diameter around 15 train stations on the Fremantle, Midland and Armadale rail lines and around Bull Creek Station on the Mandurah rail line have been identified for urban consolidation within the Central sub-region. These are stations that are not already located within an activity centre and, of relevance to the Town of Claremont, station precincts have been identified around Loch Street and Swanbourne railway stations[1].

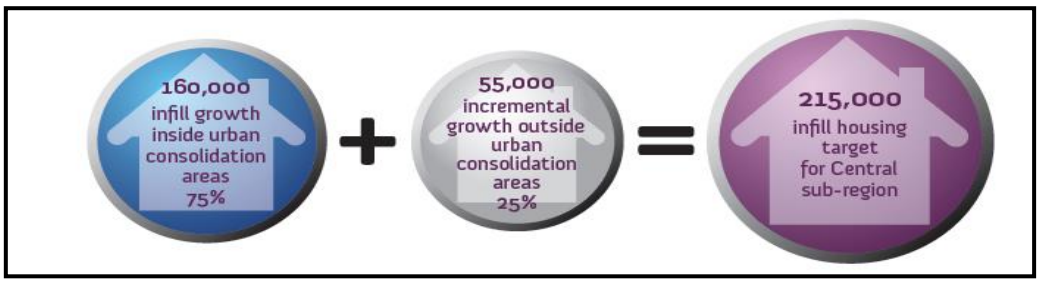
The aim is to create a high-amenity urban environment that also maintains or enhances a station's transport function within the broader transit network. TODs aim to:

- promote and facilitate public transport use;
- capitalise on the investment made in public transport infrastructure;
- encourage spatial development patterns that make it easier to both operate and access public transport;
- create transit stations as destinations;
- ensure development of complementary land uses around transit stations; and
- establish high levels of amenity, safety and permeability of the urban form.

Infill targets

Directions 2031 and Beyond sets an infill target (proportion of the total amount of additional dwellings) of 47 per cent for the Perth and Peel regions. When applied to a population of 3.5 million by 2050 this equates to approximately 380,000 new dwellings, of which approximately 215,000 are expected to be delivered in the Central sub-region (the balance of 165,000 expected in the outer sub-regions of Perth and Peel).

The majority of all new infill residential development, approximately 75 per cent (160,000 dwellings), is proposed to occur within the identified urban consolidation areas of activity centres, corridors and station precincts, with 25 per cent (55,000 dwellings) occurring as a result of incremental infill growth in existing built up areas within traditional suburban streets.



Source: Draft Perth and Peel @3.5million

The framework sets a high-level target for the spatial distribution of the infill housing target across the Central sub-region. For the Town of Claremont, the infill housing target is 1,300 (975 dwellings in urban consolidation areas and 325 dwellings in incremental growth areas outside urban consolidation areas).

[1] This Structure Plan addresses development opportunities around the Loch Street Station. The Town of Claremont is also undertaking a planning study on the land surrounding the Swanbourne Station

Role of Local Government

The framework states that Local Government has an important role in its implementation. In preparing, reviewing or amending local planning strategies and schemes, Local Governments are expected to align with the allocated infill housing targets and reflect the intent expressed in the Central Sub-regional Planning Framework as it relates to corridors, station precincts, industrial and activity centres.

The framework proposes that there are a number of measures, statutory mechanisms and provisions available to local government to enable urban consolidation to be realised including: local planning policies, scheme provisions, incentives, density bonuses, up-coding, split-coding, special control or development areas, and minimum densities.

The framework will inform the preparation, review or amendment of the local planning strategies of each local government within the Central sub-region. This will require a refinement of local strategies to explicitly address the urban consolidation areas set out in the framework for each local government area:

- taking into consideration the nature and significance of local suburb characteristics;
- targeting urban consolidation areas for the development of higher residential and employment densities (where appropriate);
- considering additional or alternative urban consolidation areas outside of those identified in the framework such as locations having a high level of accessibility or amenity; and
- determining the relevant measures or suitable provisions that could be adopted to implement and activate the urban consolidation areas.

This local Structure Plan will assist in complying with expectations outlined in the framework. While the Town of Claremont's residential growth targets are more than accommodated by proposals contained in the existing and proposed studies, the planning imperative with regard to Loch Street Station precinct is to assist this growth, while at the same time providing opportunity for urban renewal and improvement of facilities in the precinct to improve overall living standards for existing and future residents.

2.3 Planning strategies

Local Planning Strategy – Clearly Claremont

The Town of Claremont's Local Planning Strategy 2010 – 2025, *Clearly Claremont,* was endorsed by the WAPC on 8 February 2011.

Five desired outcomes have been identified to guide future decisions about land use and planning in the Town of Claremont as follows:

- Natural and Built Environmental Sustainability
- Effective and Responsive Land Use and Zoning
- Economic and Community Benefits
- A Resilient Town
- A Safe and Engaged Community

The Local Planning Strategy focuses on five different areas of application to translate the desired outcomes into actionable solutions:

- Living in Claremont – focuses on providing more housing choice, having better places to live in and supplying safe, accessible and attractive public services.

- Working in Claremont – focuses on ensuring a prosperous locality with strong and diverse economic activity.
- Enjoying Claremont – focuses on providing different opportunities to enjoy the locality through its shopping, culture, sport, tourism and open spaces.
- Connecting Claremont – focuses on connecting residents, businesses and visitors by improving the accessibility of the Town.
- Cross-cutting policies – focuses on issues (such as protecting heritage and sustainability) that require action across many areas of the Town and should be integrated throughout the entire Council operation.

The strategy's position statement with regard to Living in Claremont is as follows:

L1 The Town supports the efficient use of housing through intergenerational, adaptive reuse, and ancillary housing designs and initiatives.
L2 The Town will support a mix of housing sizes and types, taking into account the requirements of different groups of people.
L3 The Town will require that every major development contributes to active, healthy communities through appropriate design and function.
L4 The Town will support state and federal government initiatives that provide more affordable housing.
L5 The Town supports initiatives and developments that provide safe, accessible and attractive services for the community.

The Local Planning Strategy is scheduled to be reviewed in the next financial year.

Housing Capacity Study
In November 2012, the Town of Claremont adopted its *Housing Capacity Study* to identify constraints and opportunities relating to the housing targets included in Directions 2031 Draft Central Metropolitan Perth Sub-Regional Strategy (CMPSS), which was to inform the review of the Town of Claremont's Local Planning Strategy, *Clearly Claremont*.

Recommendation 10 of the *Housing Capacity Study* concerning the Loch Street Transit Oriented Development (TOD) area provides for the Town to:

1. Support and progress the drafting of a Local Planning Scheme Amendment to apply an appropriate zoning and higher residential density code to suitable land identified as having development potential within 400m of the Loch Street Station;
2. Develop a set of draft statutory and policy planning tools to control redevelopment, reduce streetscape amenity impacts and protect the amenities of lower density surrounding properties; and
3. Give special consideration to the development of key landmark sites on the corner of Railway Road and Loch Street (currently R80) and the vacant land between Ashton Avenue and the railway line (possible future R80). Note: The vacant land referred to in the *Housing Capacity Study* between Ashton Avenue and the railway line did not include the Department of Communities property at the corner of Ashton Avenue and Mofflin Avenue, previously contained three single dwellings which were demolished during the time in which the *Housing Capacity Study* was prepared.

Since the adoption of the *Housing Capacity Study*, planning for the key landmark site on the corner of Gugeri and Loch Streets has occurred and a residential density code of R80 exists over the land to allow for 40-60 new dwellings, in place of four existing dwellings and three vacant/non-residential lots.

The Claremont *Housing Capacity Study* recognises the need for policies and guidelines to be developed to protect the amenity of existing and future development and that these should be developed in conjunction with any scheme amendment process.

The Structure Plan addresses the intent of Recommendation 10 of the *Housing Capacity Study* to include the following:

- Identify land development opportunities and constraints for higher density development;
- Identify existing key potential sites for redevelopment that are of significance together with land that may have potential for future consolidation and redevelopment;
- Present models of how development could best be accommodated for varying lot parcels; and
- Demonstrate how the proposed density development concept could be implemented through the Town of Claremont's planning measures.

2.4 Planning policies

2.4.1 WAPC/Department of Planning

SPP 3 – Urban Growth and Settlement

State Planning Policy 3 – Urban Growth and Settlement (SPP 3) is a broad based policy that applies to all development within the State.

The main policy measures that relate to this Structure Plan include creating sustainable communities, managing urban growth in Metropolitan Perth, planning for liveable neighbourhoods and coordination of services and infrastructure. The Structure Plan aims to fulfil the objectives of this policy by building on the existing community infrastructure and providing for a variety of housing whilst recognising the relevant economic, environmental and community needs and values. Sustainable development is promoted particularly in terms of reduced demands on private travel modes.

SPP 3.1 – Residential Design Codes

State Planning Policy 3.1 - Residential Design Codes (R Codes) applies to residential development in Western Australia. Clause 26 of TPS3 requires the development of land for residential purposes to conform to the provisions of the R Codes, unless otherwise provided for in the Scheme.

The R25, R30, R40, R60 and R80 density codes identified by the Structure Plan will be implemented generally in accordance with the R Codes once necessary amendments to TPS3 are implemented. Future subdivision/amalgamation and residential development across the Structure Plan area is also to comply with the requirements of the accompanying Local Planning Policy (including Design Guidelines) and LDPs (where required) and these may seek to vary some R Code provisions.

SPP 3.6 – Development Contributions for Infrastructure

State Planning Policy 3.6 – Development Contributions for Infrastructure (SPP 3.6) outlines the relevant considerations and principles for developer contributions for infrastructure, and the preparation of Development Contribution Plans.

Engineering advice received in the preparation of the Structure Plan confirms that the current infrastructure servicing capacity can service the resultant development yield identified in this Structure Plan and that no development contributions are sought for development within the Structure Plan area.

SPP 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning

State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning (SPP 5.4) addresses transport noise from within major transport corridors and its impact on sensitive land uses. The Policy aims to promote a system in which sustainable land use and transport are mutually compatible and its objectives include protecting people from unreasonable noise impacts; protecting major transport corridors from urban encroachment; and encouraging best practice design and construction standards.

This Policy does not have retrospective powers over existing transport infrastructure or existing urban development. Notwithstanding this, the Structure Plan promotes transport noise assessment and appropriate mitigation as part of development on identified sites within the Structure Plan area by identifying this as an issue/principle to be addressed for specified LDPs.

DC 1.6 - Planning to Support Transit Use and Transit Oriented Development

The State level Planning Policy most relevant to this Structure Plan is Development Control Policy 1.6 - Planning to Support Transit Use and Transit Oriented Development (DC 1.6). This Policy seeks to encourage transport use by integrating land use and public transport infrastructure. DC 1.6 seeks to ensure the optimal use of land within transit oriented precincts supporting the intentions of *Directions 2031 and Beyond*.

A transit-oriented development (TOD) is typically a mixed-use residential and commercial area with strong access to public transport. A TOD neighbourhood typically has a centre with a transit station or stop (train station, metro station, tram stop, or bus stop), surrounded by relatively high-density development with progressively lower-density development spreading outward from the centre. TODs generally are located within a radius of 400 to 800 metres from a transit stop such as a railway station.

The WAPC promotes the increase of residential density within walking catchments of activity centres, activity corridors and public transport nodes such as railway stations. Subject to having regard to the local government's character and heritage studies, residential development at a minimum of 25 dwellings per hectare within 800m of railway stations is encouraged, and substantially higher for those sites that have the advantage of close proximity to railway stations.

The basic TOD philosophy involves *'concentrating urban development around stations in order to support transit use, and developing transit systems to connect existing and planned concentrations of development'*. TODs encourage the use of, and access to, local transit, thus providing an alternative to automobile usage. The benefits of such being an increase in usage and fare revenues, and subsequent channelling of that revenue back into the transport system.

Importantly the benefits of TODs are also from a sustainability point of view. Not only is rail one of the most energy efficient modes of transport, but land fill developments have proven to be far more energy efficient than fringe developments. Finally, although sometimes hard to measure, there are the social benefits of TODs, which claim higher levels of social interaction and sense of community.

Based on information provided by the Department of Transport there are 69 major nodes on Perth's Rail network. The actual number of TOD projects are much more limited with some 20 existing or planned. Because of existing land use constraints around the Loch Street Station and its close proximity to Claremont Station, it cannot be seen as a fully functioning TOD. It can however make a viable contribution to urban consolidation around the railway station and should assist in retaining the Station as a viable operation for the State government.

DC 5.1 – Regional Roads (Vehicular Access)

Development Control Policy 5.1 - Regional Roads (Vehicular Access (DC 1.6) sets out the principles to be applied when considering proposals for vehicle access to or from developments abutting regional roads. The Policy objectives include ensuring that vehicle access to regional roads and the type of abutting developments is controlled and conforms with sound town planning principles as well as minimising the number of junctions or driveways to improve traffic flow and safety on all regional roads.

The access control requirements of this Policy apply to Primary and District Distributors, which includes all categories of regional roads designated in the MRS. In general, the Policy seeks to minimise the creation of new driveways on regional roads and rationalise existing access arrangements. Where alternative access is or could be made available from side or rear streets or from rights of carriageway, no access shall be permitted to the regional road unless special circumstances apply. Arrangements whereby adjoining owners enter into cross-easement agreements to provide reciprocal rights of access across adjacent lots may be required as a means of rationalising access to the regional road.

Where access is permitted, conditions may be imposed prescribing the location and width of the junction or driveway to ensure adequate visibility and to provide for the safe and convenient movement of vehicles both entering and leaving the traffic stream.

As Gugeri Street is an Important Regional Road within the MRS, this Policy applies to development on land abutting this road frontage. The Structure Plan has taken this into account and provides for redevelopment that will reduce the number of access points needed to Gugeri Street and specifies the requirement of LDPs for sites abutting Gugeri Street to further address such matters as crossover location and pairing of development sites to reduce the number of crossovers directly fronting Gugeri Street. Consideration should be given in the development of LDPs for the properties fronting Gugeri Street for the inclusion of common Rights of Carriageway (ROCW) servicing common access from Chancellor Street and College Road (or Loch Street) to further reduce the impact of multiple driveways accessing Gugeri Street.

Structure Plan Framework Guidelines

The WAPC's *Structure Plan Framework 2015* constitutes the manner and form in which a Structure Plan and Activity Centre Plan is to be prepared, pursuant to the *Planning and Development (Local Planning Schemes) Regulations 2015.* The Structure Plan has been prepared in accordance with these guidelines.

2.4.2 Town of Claremont

The Town of Claremont has adopted a number of Policies that relate to residential development that could have some significance regarding future development within the Structure Plan area.

Council Policy Retention of Residential Character LV123

The objectives of this Policy are:

- To ensure that new two storey, single residential development, and second storey additions/alterations to existing single dwellings, is compatible with the character, form and scale of existing residential development in the locality, and harmonises with the existing streetscape; and
- To encourage creative design solutions of quality that meets the standards of this Policy, and which enhance the character of existing single residential areas.

To protect existing residential areas of predominantly (nominally greater than 50 per cent) single storey in character, new development or alterations/extensions to existing development are to have a comparable scale and proportion to surrounding development in the immediate locality as viewed from the street, unless it can be demonstrated that the surrounding development is not desirable or representative.

Building bulk is to be generally distributed to ensure that a proposed two storey dwelling, or second storey additions/alterations to an existing dwelling, will not have an overpowering impact on neighbours and the streetscape. A single house of two storeys is to be designed so as to appear as a predominantly single storey house when viewed from the primary street verge immediately in front of the development site.

The Structure Plan area comprises of a mix of single and two storey properties and proposes heights for some sites greater than two storeys. Alternative planning measures to address amenity and streetscape issues are proposed through Local Planning Policy (including Design Guidelines and restrictions on the use of discretion when proposing plot ratio variations) and LDPs.

Policy LV123 will require amendment to acknowledge two storey development within the Structure Plan area, and in some instances greater than two storeys, by excluding the land within the Structure Plan area from the requirements of the Policy.

Council Policy Residential Amenity LV129
The objectives of this Policy are:

- To ensure that when new residential development is proposed, due consideration is given to the preservation of reasonable amenity for occupiers of adjoining properties and the surrounding area.
- To provide guidance in the consideration of amenity impacts arising from proposals seeking a Building Permit without the submission of a Planning Application due to exemptions for development provided for under clause 25 of TPS3.
- To ensure development does not impact on local amenity in terms of roof reflectivity or overlooking from large windows to non-habitable rooms which may otherwise comply with the deemed-to-comply provisions of the R Codes.

This Policy will continue to apply through the Structure Plan area without amendment.

However, additional Local Planning Policy (Design Guidelines) and LDPs will ensure that existing single residential development areas are not adversely impacted. These matters will be fully addressed and reflected in new/revised Local planning Policies and LDPs.

Local Planning Policy 2/2015 and Council Policy Retention of Heritage Place, Heritage Areas and Heritage Precincts LV124
The objectives of this Policy are:

- To conserve and enhance the heritage significance of heritage places, areas and precincts within the Town of Claremont.
- To provide design and development guidance to ensure that development does not adversely affect the heritage significance of heritage places, areas or precincts.
- To ensure that heritage places, areas and precincts are developed in a manner that ensures their long-term use and viability.
- To ensure that heritage significance is given due consideration in the planning decision making process.

- To provide guidance to landowners and the community about the planning processes for heritage identification and protection in the Town of Claremont.
- To encourage the conservation of heritage places, areas and precincts through the provision of planning and financial incentives.
- To protect the heritage characteristics of streetscapes within the locality and where possible accommodate modern development trends.

There are currently no heritage listed buildings or sites within the Structure Plan area, other than within the RAS Showgrounds.

2.5 Other approvals and decisions

2.5.1 Royal Agricultural Showgrounds

The Claremont Showgrounds has been identified as a site of State significance. The Showgrounds has been managed by the RAS since 1904. The RAS is an independent, not for profit organisation.

In mid-2014, the RAS released a Concept Plan for the renewal of the Showgrounds (development of design and use options overseen by consultants Hames Sharley) to be developed over 15 to 20 years. The Concept Plan has evolved to a Management Plan (not currently for publication) which incorporates a number of new facilities and site upgrading to support agricultural exhibition and year round education. The plan also shows opportunity for a centre of excellence with modern offices, with other possible uses including short stay apartments, exhibition space or parking along the eastern edge of site near Ashton Avenue. To the east of Ashton Avenue, the Concept Plan suggests new residential development for the local recreation reserve triangle (this land is also owned by the RAS).

The Management Plan depicts the land that is included in the Structure Plan as 'East Gate Commercial Precinct 10'. This comprises of 0.5 hectares which is earmarked for two main building blocks along Ashton Avenue. The northern block includes a six level building (maximum height 22 metres) comprising of exhibition/pavilions on the ground floor with commercial space above. The southern block includes a four level building refurbishment of existing asset services with exhibition/pavilions on the ground floor and commercial/mixed use space above.

The land within the "Ashton Triangle" has specifically been excluded from the Management Plan.

Clause 16 of the MRS allows permitted development rights for works on reserved land including land reserved for Parks and Recreation where these are in accordance with a Management Plan endorsed by the WAPC. The status of the Management Plan is unclear and no formal advertising or public notification has been made in this regard, which is a matter for State Government consideration with appropriate recommendation from Council.

This advertised Structure Plan did not support some aspects of the Management Plan proposal and put forward alternatives for land use mix by including residential development, building height limits and open space location to address this. Significantly the Structure Plan made a recommendation to augment the open space in the locality by the provision of informal open space along the western side of Ashton Avenue, together with promotion of development and rationalisation of the Local Reserves-Recreation and associated residential development in the Ashton Triangle Sub-precinct-6. As a result of the submission received from the RAS, the Structure Plan has been modified to remove all aspects of the Management Plan and the Town's proposed modifications. This means that only the existing development has been taken into consideration in the traffic modelling undertaken to establish the revised densities proposed for the Precinct following consideration of submissions, particularly in regard to traffic congestion.

2.5.2 Proposed Development – Department of Communities (former Housing Authority)

At its Ordinary Meeting held on 18 October 2016, Council considered an application from the former Housing Authority proposing 25 three storey multiple dwelling units (four studio apartments, five single bedroom units and 16 two bedroom units) on its property at 11 Ashton Avenue (corner of Mofflin Avenue), Claremont.

The proposed development is not required to obtain development approval under TPS3, however, it is required to be determined by the WAPC pursuant to the MRS. Notwithstanding this, Council has the opportunity to provide a recommendation to the WAPC regarding the proposal.

The proposed development showed ground floor setbacks of 8m to Ashton Avenue and 2.5m to Mofflin Avenue and a building height of 10.4 metres. The site is currently zoned Residential with an R25 coding under TPS3. The proposal did not meet the 'Deemed to Comply' requirements of the R Codes relating to plot ratio, street setbacks, landscaping, driveway access and visitor car parking, or height requirements under TPS3. As the former Housing Authority is exempt from applying for development approval under TPS3, it is not constrained by the current R25 density and other scheme requirements.

The application was advertised for public comment and 53 submissions were received predominantly concerned with the density and the effects on amenity of adjoining properties due to building bulk and height.

Council considered that whilst the development is consistent with the draft strategic directions currently being formulated by the Town for the locality, no appropriate guiding planning tool had been finalised rendering it premature to support the proposed development at this stage.

On this basis Council resolved to advise that the WAPC that it did not support the development at this time. However acknowledging that the WAPC may approve that development on the basis of regional planning objectives, a set of draft approval conditions were forwarded to the WAPC with Council's comments and copies of the submissions received. These conditions included seeking a reduction in height of the development along Mofflin Avenue, reducing the number of dwellings to accord with an R40 development with a maximum 0.6 plot ratio, increasing landscaping along the northern and eastern side boundaries and providing the neighbouring property with a right-of-carriageway access through the site.

The proposed development may be considered a stimulus for future redevelopment of the locality inclusive of the "mini-activity corridor" which could act as a catalyst for regeneration of the local shops and improve facilities and amenities of the area overall.

On 13 December 2016, the WAPC deferred a decision on the proposed development until no later than 30 June 2017 for the following reason:

> *"The subject development is located in a broader locality where comprehensive pre-planning is required, including appropriate consultation with the local government and the community, prior to the current application being determined. Such comprehensive planning will consider residential density, interface issues, traffic management and parking, along with an assessment of infrastructure capacity."*

The WAPC further advised the Town of Claremont, that in accordance with Schedule 2, clause 15(c) of the *Planning and Development (Local Planning Schemes) Regulations 2015*, it considers that a Structure Plan for the Loch Street Station Precinct and environs is required to be prepared and

advertised for the purposes of orderly and proper planning; and that it may be appropriate to identify areas where Local Development Plans will apply in order to guide and coordinate development outcomes for particular sites, to assist in achieving a suitable built form within the locality.

In the course of addressing 76 submissions on the Draft Structure Plan, traffic modelling was required to address concerns raised on traffic congestion associated with the development yields. This modelling was complex and as a result extensions for Council to consider the Structure Plan submissions were granted until 20 February 2018. As a result, the WAPC has deferred consideration of the Department of Communities application on the corner of Ashton Avenue and Mofflin Avenue until April 2018.

It is further noted that as a result of the traffic modelling, reduced densities and heights have been applied throughout the Precinct to reduce the development yields and achieve an acceptable Level of Service at key intersections within the Precinct. In this regard Sub-precinct 4 has been reduced form the formerly advertised R50 with three storey height limitation to R40 with a two storey height limitation. On this basis, the proposed Department of Communities development proposal is clearly inconsistent with Council's approved Structure Plan. Accordingly, Council resolved on 20 February 2018 to advise the WAPC that it remains opposed to the Department of Communities development and recommends that it be refused as it is inconsistent with the Structure Plan supported by Council and it will provide an inappropriate precedent for development within the Precinct if approved (see Appendix 6 – Council Minutes 20 February 2018).

2.6 Pre lodgement consultation

This Structure Plan was drafted as a result of direction from the WAPC.

Implementation of the Structure Plan requires collaboration between the Town of Claremont, various State government departments, service agencies, prospective developers, landowners and business owners.

Preliminary investigations have been made with regard to servicing and infrastructure capacities. Public consultation will occur through the usual statutory processes under the *Planning and Development (Local Planning Schemes) Regulations 2015*, together with subsequent advertising involved with amending TPS3 and adopting Local Planning Policy, should the Town of Claremont resolve to initiate these.

3 Site conditions and constraints

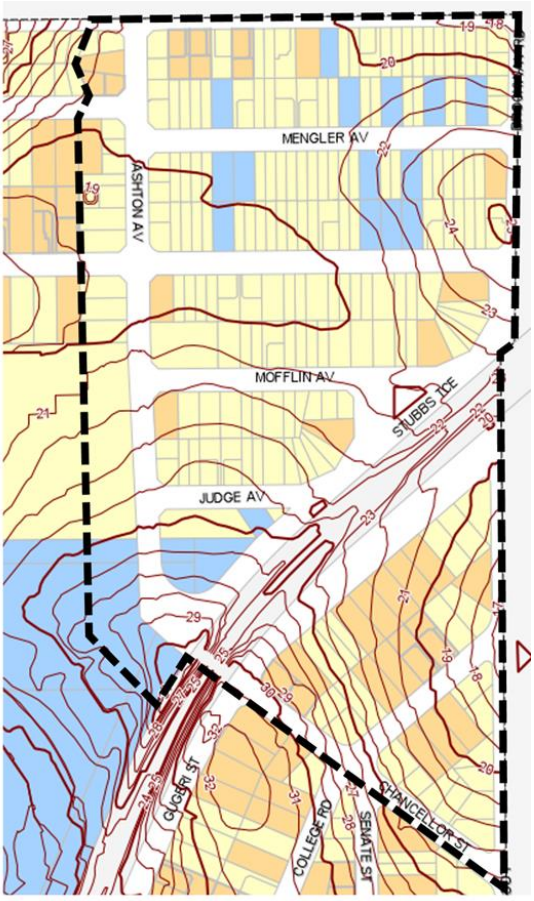
3.1 Biodiversity and natural area assets

The Structure Plan area is a brown field area that has been well established since the early 1900s. Although nearby to Lake Claremont, there are no significant biodiversity or natural area assets in relation to the Structure Plan area that pose a constraint to future development.

3.2 Landform and soils

The Structure Plan area is characterised by properties with a relatively flat landform, however, south of the railway line land slopes downwards from west to east as seen in **Figure 2.8 - Contours**. There are no major issues involving levels that would be a constraint or involve high earthworks costs to enable redevelopment.

Figure 2.8 – Contours



Source: Landgate (2011)

The Structure Plan area is located within the Western Coastal Plain. There are no acid sulphate risks within the Structure Plan area. The land is within an area described within the *Western Suburbs Greening Plan*[2] as an undulating landscape comprising of gentle rolling flat to gently inclined plains and rounded foothills. The soil type is described as:

> *"The area between the dunal landforms and the Swan River consist of Spearwood sands which are divided into Karrakatta soils and Cottesloe sands. The Karrakatta soils are limestone and have deep limestone deposits. The Cottesloe sands on the western side of Karrakatta are brown to yellow on the surface with surface limestone, exposed at several places."*

[2] *Western Suburbs Greening Plan*, March 2002, Ecoscape for Western Suburbs Regional Organisation of Councils.

3.3 Contaminated sites

Contaminated sites mapping from the Department of Environment Regulation website identifies 124 Gugeri Street, Claremont (Lot 1 on Plan 4664) within Sub-precinct 7 – Gugeri Street as having been reported as a known or suspected contaminated site.

Under the *Contaminated Sites Act 2003*, this site has been classified as 'remediated for restricted use'. Total petroleum hydrocarbons and heavy metals were identified in soils at the site and heavy metals were also present in groundwater. This site has historically been used as a service station, a land use that has the potential to cause contamination.

According to the Department of Environment Regulation website, a Risk Assessment has demonstrated that the impacts present on the site do not pose a risk to human health, the environment or any environmental value. A Memorial stating the site's classification has been placed on the Certificate of Title.

Further analysis for individual sites is recommended at development application stage.

3.4 Groundwater

There is no surface water within the Structure Plan area and it is not within a Public Drinking Water Source Area. According to the Department of Water website[3], the Structure Plan area generally has the following characteristics:

Water Quality	Depth
• Groundwater salinity 1000-1500mg/L • Surface geology type - Tamala limestone: Aeolian calcarenite, variably lithified, leached quartz sand/Qpcs • Iron staining risk is low • Suitability for garden bore varies within the Structure Plan area • No know acid sulphate risk	• Depth of ground level to water table approximately 17-20 metres • Base of aquifer approximately 44.5-46 metres.

3.5 Bushfire hazard

Designated bush fire prone areas have been identified by the Fire and Emergency Services Commissioner as being subject, or likely to be subject, to bushfire attack. Additional planning and building requirements may apply to development within these areas and further assessment of the bushfire risk may also be required under the *Planning and Development (Local Planning Schemes) Regulations 2015* and the *Building Code of Australia*.

The designated bush fire prone areas are coloured pink on **Figure 2.9**. It is noted that there are no designated bush fire prone areas within the Structure Plan area and, therefore, no bushfire hazard exists.

It is noted that bush fire prone areas are designated to the west of the Structure Plan area within the Town of Claremont and the City of Nedlands (near Lake Claremont and north of Alfred Road; to the north east north of Samichon Road and west of the railway line within the City of Nedlands; and to the south east on the edge of the Karrakatta Cemetery in the vicinity of Smythe Road and Karella Street in the City of Nedlands.

Figure 2.9 - Designated bush fire prone areas

Source: https://maps.slip.wa.gov.au/landgate/bushfireprone2016/

[1] http://www.water.wa.gov.au/maps-and-data/maps/perth-groundwater-atlas

3.6 Heritage

Clause 8 of the deemed provisions of the *Planning and Development (Local Planning Schemes) Regulations 2015* require local governments to establish and maintain a heritage list to identify places within the Scheme area that are of cultural heritage significance and worthy of built heritage conservation.

The Town of Claremont has adopted a Heritage List under TPS3. There are no statutory heritage listings within the Structure Plan area other than the inclusion of the RAS Showgrounds as a Heritage Area. In addition, there are no registered aboriginal heritage sites listed on the Department of Aboriginal Affairs data base within the Structure Plan area.

As part of the development of the proposed Management Plan for the Claremont Showgrounds, a heritage assessment of the site was undertaken to determine if any elements could qualify as being culturally significant. A number of places were identified as having some cultural significance, however the heritage significance of these buildings needs to be further addressed by the Town in consultation with the RAS.

While no specific buildings are identified, should any future heritage assessment result in identification of heritage listings, the Structure Plan supports the retention, restoration and reuse of these heritage buildings.

3.7 Coast and foreshores

The Structure Plan area lies approximately three and half kilometres east of the coast and approximately two and a half kilometres north of the Swan River. Due to these distances, development in the Structure Plan area will have no effects on the coast or foreshore.

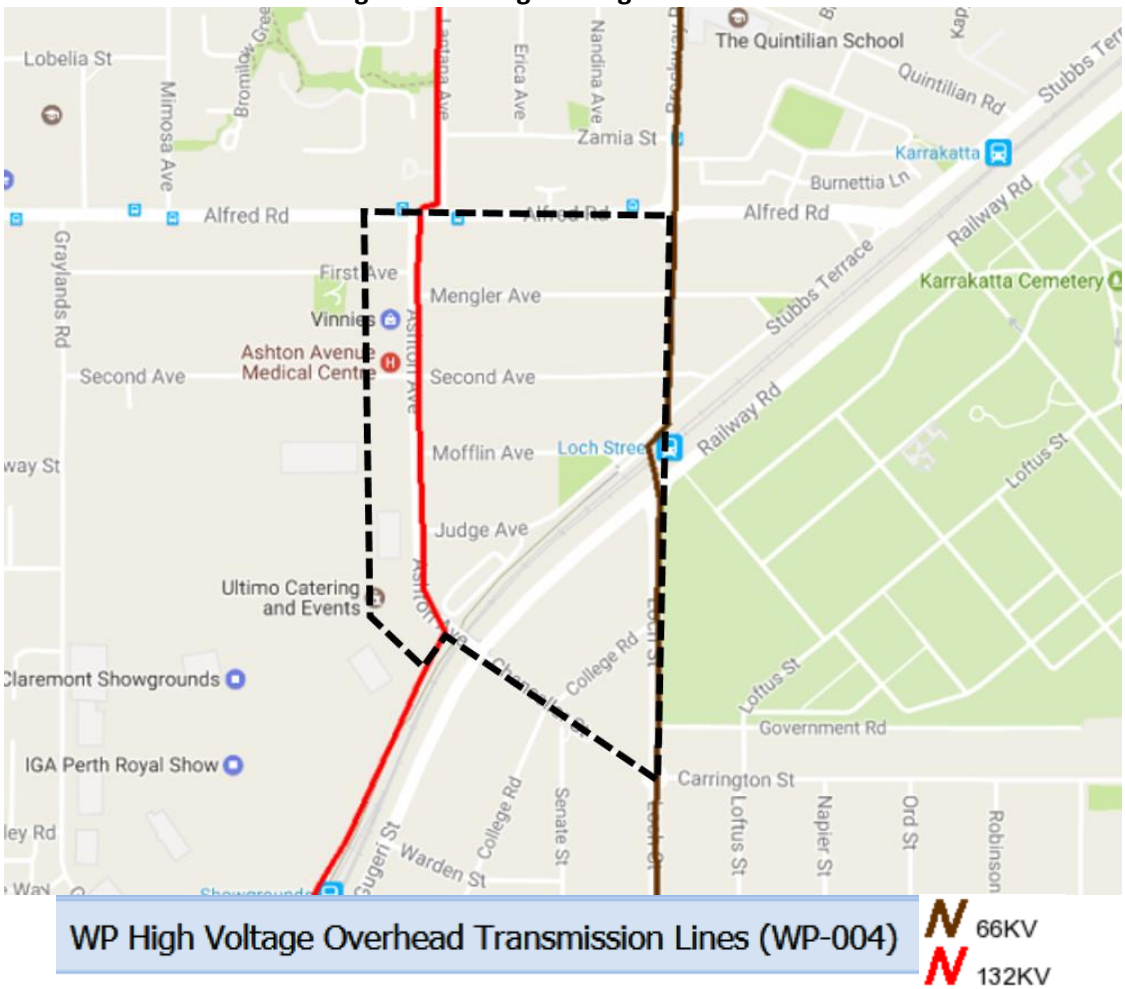
3.8 High Voltage Powerlines

High voltage power lines (132kv) are located along the extent of Ashton Avenue, then parallel to the railway line (on the northern side) within the Structure Plan area as shown in **Figure 2.10**.

Advice from Western Power indicates that if a High Voltage power line Easement is located on property, buildings would need to be setback a minimum of 8 metres from the centreline of the power lines on Ashton Avenue. Australian Standard AS7000.2010 Table 3.8 for clearances of structures to power lines applies to development where an easement does not already exist. Development on the west side of Ashton Avenue is well within this requirement, however development on the east side of Ashton Avenue must be set back a minimum of 6 metres from the street alignment to comply.

The Structure Plan has set a building setback of 6m for properties on the eastern side of Ashton Avenue accordingly and it is also proposed to include reference to this requirement in any required LDP and/or Local Planning Policy (including Design Guidelines).

Figure 2.10 - High Voltage Powerlines



Source: https://www.westernpower.com.au/technical-information/calculators-tools/network-capacity-mapping-tool/

4 Opportunity and Constraint Analysis

Figures 2.11a and 2.11b show general opportunities and constraints relating to the Structure Plan area.

Figure 2.11a – Opportunities and Constraints

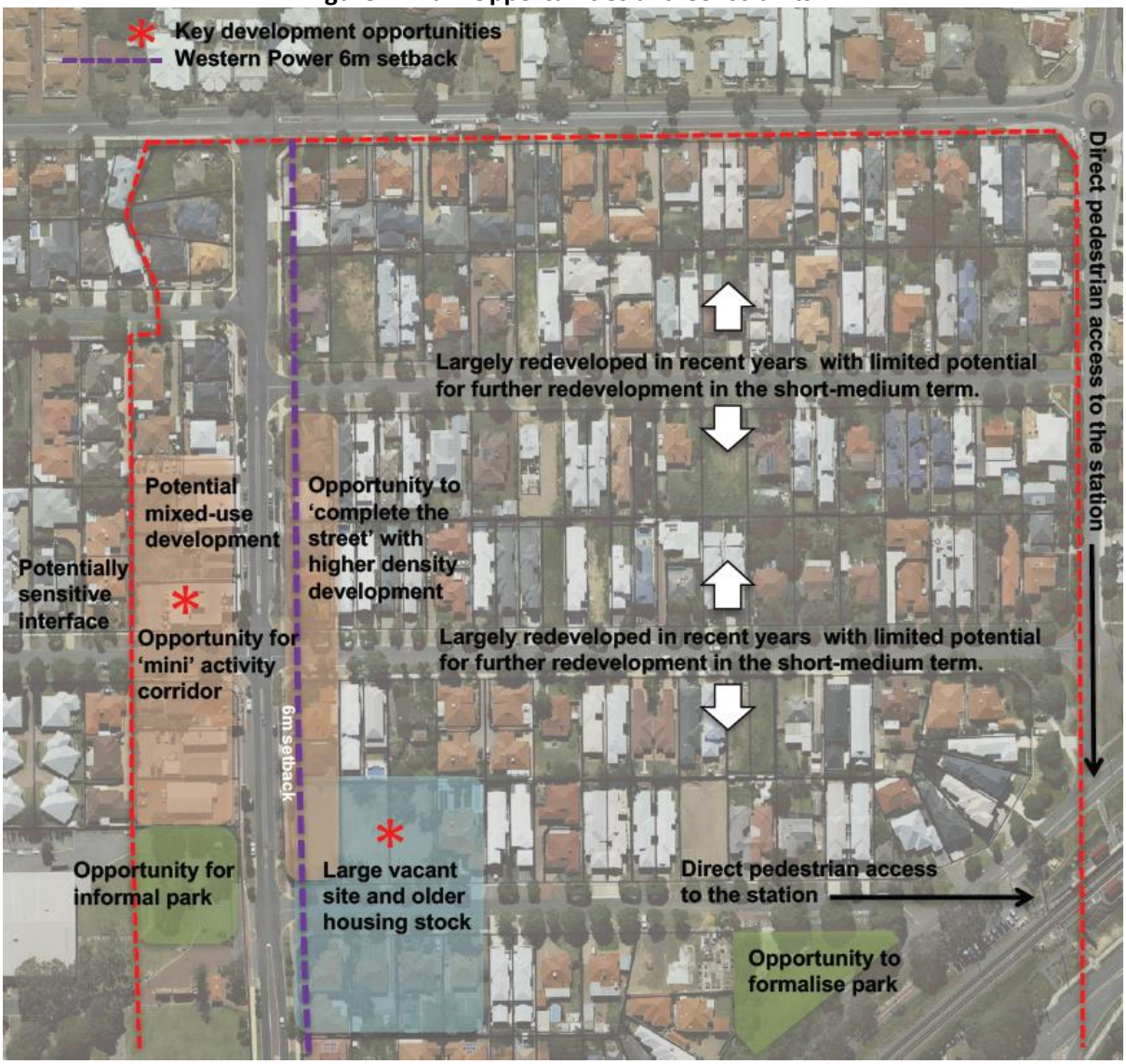
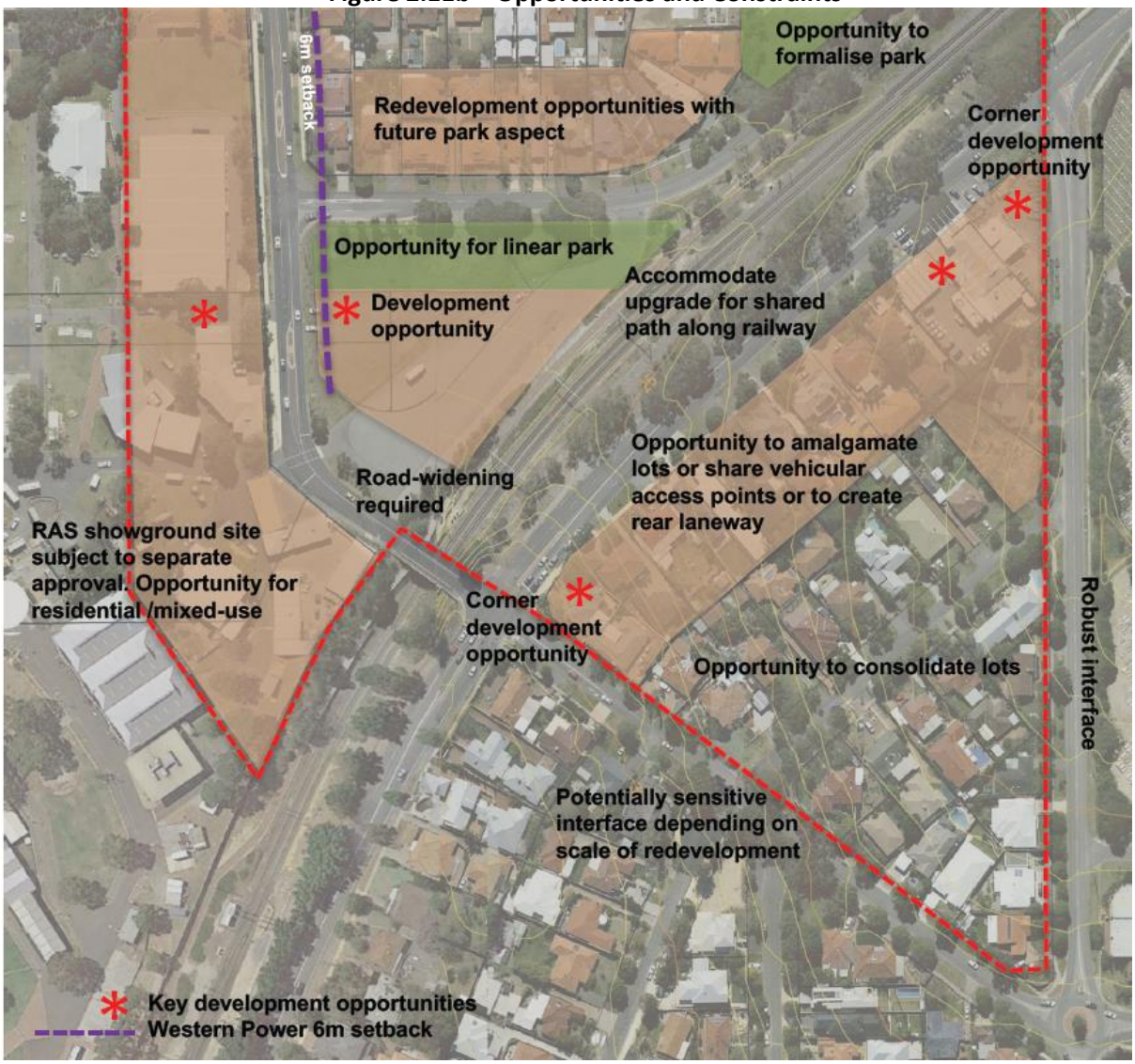


Figure 2.11b – Opportunities and Constraints



An opportunities and constraints analysis was undertaken for the structure Plan area and is summarised in **Appendix 1 – Opportunities and Constraints Analysis**. This looks at lot sizes, use and current density potential together with site characteristics.

Approximately 20 per cent of the properties were found to have a strong likelihood of redevelopment in the short to medium term, without any intervention. These were either vacant, involved commercial businesses or were generally older housing stock of diminishing quality (some with potential for views). Significantly, the remaining 64 per cent of properties had moderate, limited or minimal likelihood of redevelopment.

It is noted that much of the land north of the railway line is basically developed with two houses on most lots, so the area's cohesiveness should be maintained (Sub-precinct 1 – Second Avenue). There are small pockets (for example Mofflin Avenue and Judge Avenue) however, where the land is vacant, the predominant style of dwelling is battle axe duplexes and/or comprises of aging housing stock with close and easy access to Loch Street station which provide an opportunity for redevelopment.

4.2 Key Potential Development Sites

The assessment indicated that significant redevelopment of the overall catchment of the Loch Street Station Precinct Structure Plan area would be highly unlikely in the short to medium term, and possibly even in the longer term. Notwithstanding this, the assessment identified a number of more specific 'hot spots' of potential redevelopment as follows:

- **Local shopping strip along Ashton Avenue (identified as Sub-precinct 3 – Ashton Avenue Commercial)**
  This group of commercial tenancies includes a high number of properties of increasing age and diminishing quality indicating timeliness for redevelopment. In addition, TPS3 allows for development of multiple dwellings above the ground level. This is an opportunity that has yet to be taken up under the R25 density code, however, a higher coding and height allowances would be likely to offer the required incentive for redevelopment.

Ashton Avenue Local Centre

- **11 Ashton Avenue (corner of Mofflin Avenue) and 7 Mofflin Avenue (within Sub-precinct 4 – Ashton Avenue East)**
  Three lots were recently amalgamated to a 2,326m^2 site (Lot 200 – 11 Ashton Avenue). The land is currently vacant and owned by the Department of Communities (former Housing Authority of Western Australia). The property at 7 Mofflin Avenue (approximately 770m^2) accommodates a single residence of satisfactory condition, however, it is over 40 years old. The landowner has expressed an interest in developing this property in conjunction with the adjacent (former) Housing Authority land and it has been included as part of this key potential development site (total combined area of approximately 3,030m^2) but may be developed independently of the Housing Authority site.

  This potential development site is located opposite the small local shopping strip on Ashton Avenue and extends partly along Mofflin Avenue which has direct pedestrian access to the railway station.

- **Showgrounds 'East Gate' fronting Ashton Avenue – (identified as Sub-precinct 5 – Showgrounds)**
  This strip of land along Ashton Avenue has already been identified by the RAS as having potential for development within is future development concept and Management Plan for the Showgrounds. Whilst the RAS Management Plan shows this strip as "pavilions with the opportunity for commercial space, exhibits or education or special events", preference is for mixed uses, including residential development, together with the provision of informal open space links between Ashton Avenue and the Showgrounds.

- **Local Recreation Reserve Triangle (identified as Sub-precinct 6 – Ashton Triangle)**
  Made up of several separate lots, this site is predominantly under the freehold ownership of the RAS and local road reservation under the control of the Town of Claremont. It is not developed or actively used as parkland and the road reserve remains unconstructed. Primarily the land is used for parking during RAS events.

  This site offers opportunity for formal consolidation and aside from not being appropriately zoned, has no major impediments to development given that it is predominantly under single ownership, is vacant and cleared and has no special earthworks requirements. Development of this site could result in a smaller but significantly more functional and attractive public open space to serve higher density residential development and existing residential development in the vicinity. Public open space area in the locality will be augmented and maintained by formally recognising the land used as open space in the Mofflin Avenue/Stubbs Terrace intersection road reserve.

  Although not part of the Showgrounds, the RAS concept plan shows this land as a possibility for it to *"offer the perfect space for a new residential development".* This land has specifically been excluded from the proposed RAS Management Plan, but was addressed under the Draft Structure Plan as a significant opportunity to provide a major residential development in close proximity to the Loch Street Railway Station.

Ashton Triangle

Given the concerns raised by the RAS during consultation on the Draft Structure plan, the separate and independent WAPC approval processes for the RAS Management Plan, and also concerns raised with regard to traffic generation, the land contained in Sub-precinct 6 – Ashton Triangle is no longer viewed as a key potential development site for the purposes of the Structure Plan and has been removed.

- **Land fronting Gugeri Street (within Sub-precinct 7 – Gugeri Street)**
  This land with Gugeri Street frontage includes four key sites: Lot 1 corner of Loch Street (non-conforming commercial use); Lot 11 and 12 corner of Chancellor Street; Lots 4, 22 and 25 Gugeri Street, Lot 26 Loch Street and Lot 20 College Road (recently rezoned to allow residential development at a density of R80); and the balance of the properties that front Gugeri Street.

  This includes a number of larger lots (approximately 1000m^2) with large frontages/widths. With the appropriate density code and some lot boundary changes/consolidation, these sites could support high quality, high density residential development.

  Encouraging combined lot redevelopment sites along Gugeri Street also offers opportunity to reduce the number of vehicular access points to this Important Regional Road and provide alternative access to these properties. No access to new development on the corner sites would be permitted.

- **Land fronting College Road and bound by Loch Street and Chancellor Street (within Sub-precinct 8 – College Road)**
  Opportunity is available to consolidate smaller and/or narrow properties for higher density development on the northern side of College Road. A similar density on the south-eastern side of College Road would allow for incremental increased dwellings without the need to dramatically alter property boundaries.

4.3 Other Considerations/Issues

4.3.1 Gugeri Street

Gugeri Street is reserved as an Important Regional Road under the MRS and vehicular access points are to be minimised.

4.3.2 Railway Line

The Public Transport Authority is likely to require a Section 70A Notification to be provided for all Certificates of Title in close proximity to the railway line to advise potential purchasers that the amenity of the site may be affected by rail noise and vibration.

4.3.3 RAS Showgrounds

Due to the proximity to the RAS Showgrounds, a Section 70A Notification may be required for all Certificates of Title in close proximity to the Showgrounds to advise potential purchasers that the amenity of the site may be affected by noise and other activities of the Showgrounds.

5. Services and Infrastructure

A demand analysis and servicing report have been undertaken by JDSI Consulting Engineers to determine the capabilities of the existing service infrastructure within the Structure Plan area. For further detailed information, refer to **Appendix 2 – Engineering Services Report** attached. (Note: this is also relevant to Section 6 – Transport and Movement).

Summary of capacity to service proposed Structure Plan yields

	Comments
Power	Gradual increase unlikely to trigger developer funded off-site upgrades
Water	Should upgrades be needed to meet increased density the Water Corporation is likely to undertake these as required
Wastewater	Should upgrades be needed to meet increased density the Water Corporation is likely to undertake these as required
Gas	Gradual increase unlikely to trigger developer funded upgrades. Not an essential service
Communications	No constraints determined
Stormwater	New development to retain 1 in 100 year stormwater event on site i.e. no contribution to existing roads drainage system

5.1 Power supply

The existing Western Power electricity network serving the Loch Street Station Precinct Structure Plan area is fed to the north of the railway line from the Shenton Park Zone Substation and to the south from the Nedlands Park Zone Substation.

Load in the northern and southern parts of the Structure Plan area is expected to increase to 7.0 MVA and 2.0 MVA respectively in accordance with the structure plan forecasted yields and the ensuing electrical loadings. These future loadings are comfortably within the Shenton Park Substation capacity, however augmentation of the existing feeder network will likely be required.

As electrical load growth in the Structure Plan area is likely to be organic in nature, network augmentation is expected to be accommodated through Western Power's ongoing expansion programs to meet forecast growth rather than an impost on new development.

Should the requirement for connection of major single point loads in the Structure Plan area arise, however, a network feasibility study by Western Power on a case by case basis is recommended.

5.2 Water Supply

The Water Corporation owns and maintains the water reticulation system within the Structure Plan area. The area is well serviced by the water supply network.

The Water Corporation has indicated that any necessary network reinforcement for water supply infrastructure due to increased demand would likely be undertaken by the Water Corporation, as is typically the case in established areas.

5.3 Wastewater

The Water Corporation owns and maintains the sewerage reticulation system within the structure plan area. The area is well serviced, with reticulation typically running at the rear of the lots.

The northern portion of the Structure Plan area discharges to the Swanbourne Main Wastewater Pump Station and associated gravity mains. Upgrades for these assets have been scheduled into the Water Corporation's Capital Investment Program, indicating upgrade works within the next five years. In consideration of the planned upgrades and the relatively insignificant quantity of wastewater flows

that the subject area contributes to total flows, the Water Corporation has indicated that sewer capacity is unlikely to be an issue.

The capacity of the existing 150mm dia. pipework downstream of the southern sub-precincts is in the order of 5L/s and the ultimate demand for the area is estimated at 3L/s. As this area represents the upstream extremity of this sewer catchment, it is therefore expected that the projected growth will not trigger any requirement to upgrade the pipework immediately downstream of the site. It is noted that sewerage will need to be extended to service Sub-precinct 6 – Ashton Triangle as no servicing currently exists in this location. This would be required through subdivision (amalgamation) processes necessary to facilitate development.

The Water Corporation has provided current planning information for this catchment showing the long term pump rate will be at approximately 66% of the capacity of the pump station. The additional flows from this development area represent an increase in the order of 2.5L/s, pushing the utilisation of the pump station to approximately 90% of its capacity. The Water Corporation has confirmed that there appears to be sufficient capacity on the system to accommodate the proposed Structure Plan development. There may be need for minor upgrades but these will be assessed at the appropriate time, once more detail has been provided.

It is also noted that there are sewer lines on some of the properties in the Structure Plan area and due consideration should be given to this at development stages.

5.4 Gas

The existing gas network within the structure plan area is operated by ATCO gas and comprises various sized Medium Low Pressure gas mains.

Confirmation of any network reinforcement will be required by ATCO gas. Should the increased demand within the precinct be gradual there is unlikely to be any upgrading cost for a single developer.

5.6 Telecommunications

Dial-Before-You-Dig information indicates the Structure Plan area is currently serviced by various telecommunications providers including Telstra, NBN, Vocus and Optus. Whilst most properties are currently serviced via Telstra, new developments would have the opportunity to connect to the NBN network which has currently been rolled out to the western boundary of the Structure Plan area with a fixed line service.

An increase in yields would not appear to pose any constraints given the existing networks can be upgraded to suit, it is also expected that the existing NBN network on the adjacent land will continue to roll out across the Structure Plan area as part of NBN's brown field roll-out and/or new development requirements.

5.7 Stormwater Drainage

The existing road drainage comprises small disconnected pit and pipe networks and isolated soakwells and is currently at capacity.

The Cemetery Board have requested to have the Loch Street Sump removed, which is located on the east side of Loch Street opposite College Road. This sump is at the low point of the wider catchment area which incorporates Loch Street to the north and south and west along College Road. Removal of this sump would require replacement by an equivalent storage volume in close vicinity to cater for the existing road drainage. Approval for the removal of the sump from the cemetery site requires ongoing

discussions and negotiations between the Town and the Cemetery Board and consideration of alternative servicing capacity, which has not been identified at this point.

Any increased stormwater requirements created by increased density would need to be catered for within each development site up to the 1 in 100 year event. This will be assessed and/or conditioned during the Development Application stage. A lower stormwater servicing capacity on the development sites will require overflow into the road network and additional land will be required to service this drainage capacity.

It is noted that discharge from one of two main stormwater catchments in the northern part of the Structure Plan area goes into a sump located behind the 'Graylands Deli' on Ashton Avenue. It is essential to maintain this function, however, options could be considered such as to tank and cover as part of any future redevelopment of the Local Centre area (e.g. for parking). This may a consideration for the LDP.

6. Transport and Movement

6.1 Roads and traffic

6.1.1 Initial Traffic Assessment

As part of the Engineering Services report, GTA Consultants has studied the road network traffic data collated around the Loch Street Station Structure Plan precinct and identified the existing theoretical mid-block capacities on the key roads. The traffic generation of the proposed Loch Street Structure Plan was then applied to the road network to determine the high-level traffic impacts. A full copy of the High Level Traffic Assessment Memorandum dated 31 May 2017 is included as **Part 1 of Appendix 3 – Traffic Assessment**.

The traffic analysis initially determined that whilst some of the roads in the Structure Plan area appear to be around their daily capacities, intersection improvements are proposed that will assist in improving the operational capacities.

The existing road network within the Structure Plan area consists of District Distributor A Roads (Ashton Avenue, Alfred Road, Chancellor Street, part of Loch Street), Local Distributor Roads (Stubbs Terrace and Judge Avenue) and local access streets (Mengler Avenue, Second Avenue, Mofflin Avenue and College Road).

Ashton Avenue which connects to Chancellor Street to the south by the railway bridge is the key north-south link in the Loch Street Station Structure Plan area. A section of this road currently exceeds daily volume capacity, whilst another section is at or reaching daily volume capacity.

In the northern part of the Structure Plan area, Alfred Road is a key east-west link and connects to Stubbs Terrace to the east. This road is at or reaching daily volume capacity west of Ashton Avenue, but has remaining daily capacity east-bound.

Judge Avenue and Stubbs Terrace are both Local Distributors and have remaining daily capacity.

In the southern part of the Structure Plan area, Gugeri Street runs east-west and parallel to the railway line and carries the highest traffic in the area. West of Chancellor Street, this road is at or reaching daily capacity, but has remaining daily capacity east-bound.

Chancellor Street provides a link southwards from the Ashton Avenue and Gugeri Street intersection to connect to Loch Street. Loch Street also provides for north–south traffic from Gugeri Street ultimately extending to Stirling Highway. Both of these roads currently exceed daily capacity.

Based on minimal additional dwellings within Sub-precinct 1 – Second Avenue and Sub-precinct 2 – Alfred Road/Ashton Avenue, the Loch Street Station Precinct Structure Plan is expected to ultimately generate some 5,300vpd.

The traffic analysis shows that key roads in the Structure Plan area are already at the limit of their daily capacities based on the constructed road profile (not the Main Roads WA intended function). On this basis, peak hour intersection modelling (LINSIG or SIDRA) for the Structure Plan should be undertaken in the future to confirm the life of the intersections (including those with proposed intersection upgrades) and to identify any other potential bottlenecks.

The results show the highest increase in traffic is expected on Ashton Avenue approaching the bridge at an additional +30% from 9,500vpd to 12,300vpd. It was recommended that the Main Roads WA future upgraded intersection of Ashton Avenue/Chancellor Road/Gugeri Street be monitored by the

Town of Claremont and intersection operational analysis be undertaken under the Structure Plan traffic demands.

Gugeri Street (east of Chancellor Street), and Loch Street are both expected to experience between 12% - 19% increase in traffic. It is recommended that the Gugeri Street/Loch Street future upgraded intersection, the Chancellor Street/Loch Street intersection and the Ashton Avenue/Alfred Road intersection be monitored by the Town of Claremont and intersection operational analysis undertaken under the Structure Plan traffic demands.

Investment into intersection improvements are currently occurring at key intersections in the Loch Street Structure Plan area and these will assist in improving the operational capacities of the intersections. It is recommended these intersections are monitored going forward and further analysis undertaken on an "as needed basis".

The following intersection improvements are currently under design for construction or are currently in construction and are expected to greatly improve the intersection operations:

- Ashton Avenue Bridge - additional lane to enable a dedicated right turn lane and a shared through/left-turn lane (southbound approach to Gugeri Street) as part of a National Black Spot Project by Main Roads WA. (For construction June 2017).
- Ashton Avenue/Gugeri Street intersection – full right turn green phase from Gugeri Street into Chancellor Street, which is then filtered during other times.
- Loch Street/Gugeri Street intersection - a dedicated right turn pocket on Gugeri Street eastbound into Loch Street southbound. (Under construction).
- A new pelican crossing on Railway Parade just east of the Loch Street Station. (Under construction).
- An investigation to a potential roundabout (or alternative upgrade) to Ashton Avenue and Alfred Road intersection, in association with the City of Nedlands, has already commenced.
- The 2008 constructed Karrakatta underpass which is approximately 1.2km east of Loch Street has already alleviated some traffic demands at Ashton Avenue across the railway line. The proposal for a full restriction of right turn from Gugeri Street into Ashton Avenue north during peak times is under discussion.

The Draft Structure Plan recommended that these upgraded intersection layouts continue to be monitored by the Town of Claremont post implementation. Intersection operational analysis should be undertaken in the future to determine the operation and future life of the intersections with the Structure Plan demands.

6.1.2 Supplementary Traffic Studies

Given significant objections raised as part of the submissions received during the public consultation phase for the Structure Plan relating to traffic congestion, further traffic forecasting has been undertaken by GTA Consultants. The results of these studies are detailed in **Part 2 of Appendix 3 – Traffic Assessment** dated 20 February 2018.

In summary, the single most significant concern raised in the consultation submissions was related to traffic congestion. Concerns were raised on the existing congestion levels and the impact of additional development in the area, the need to integrate transport and land use planning and the operation of the Ashton Avenue bridge (and other intersections).

In consideration of concerns over traffic impacts, a review of traffic forecasting for the locality has been undertaken by GTA Consultants. This review identified that a number of density proposals and

development yields proposed in the Draft Structure Plan required reconsideration to reduce the level of congestion in 2031 modelling for the Structure Plan area.

The traffic forecasting uses a Main Roads WA (ROM) model which draws in land use and development yield calculations from the Department of Planning to establish traffic volumes for regional and local traffic. This then calculates the resultant Levels of Service (LOS – A to F) for intersections to determine whether an intersection fails or provides an appropriate LOS with reasonable levels of traffic congestion – a LOS of A-C is considered acceptable.

A reverse engineering exercise was undertaken to establish recommended densities and development yields which could accommodate a reasonable LOS for the intersection. As a result, it is recommended that the proposed densities through the Structure Plan be reduced to accommodate acceptable LOS at this key intersection:

- Removing R80 in Sub-precincts 5 – Showgrounds and 6 – Ashton Triangle (see comments below relative to RAS)
- Removing all new commercial uses from Sub-precinct 5 – Showgrounds (see comments below relative to RAS)
- Reducing density in Sub-precincts 4 – Ashton Avenue East and 8– College Road from R50 to R40 (with a two storey height restriction)
- Reducing density in Sub-precincts 3 – Ashton Avenue Commercial and 7 – Gugeri Street from R80 to R60 (other than the corner of Loch Street and Gugeri Street and the adjoining R80 Special Zone site).

The modelling indicates that most of the intersections in the locality can operate with acceptable LOS, albeit some with further works **required** before 2031 – e.g. a roundabout at the intersection of Ashton Avenue and Alfred Road – requiring potential (if the Structure Plan is approved with these modifications) road widening, widening of the roundabout at the intersection of Chancellor Street and Loch Street – requiring road widening and provision of traffic signals at the intersection of Gugeri Street and Loch Street – not requiring road widening. **Figures 2.12 – 2.13** below.

Figure 2.12 – Potential Road Widening at Ashton Avenue and Alfred Road

Figure 2.13 – Potential Road Widening at Chancellor Street and Loch Street

The LOS forecast for the operation of the pivotal intersection of Ashton Avenue (bridge), Gugeri Street and Chancellor Street without the Structure Plan growth is of significant concern - even with current modifications being undertaken with the reconstruction of the bridge. The traffic modelling indicates that with phasing modifications to the traffic signals and provision of additional and lengthened turning lanes, the LOS for 2031 can be accommodated with road widening. It is noted that the overall LOS for this intersection is C with reduced development as detailed above, however in the PM for traffic turning west off Ashton Avenue into Gugeri Street, an LOS of E is forecast – this is mainly attributed to restrictions on the phasing of the turning movements at the traffic lights. This is considered a reasonable LOS outcome, however the densities and resultant development under the Draft Structure Plan proposals would create an unacceptable LOS at the intersection. Potential road widening proposals for the intersection of Ashton Avenue, Chancellor Street and Gugeri Street are shown in **Figure 2.14** below.

Figure 2.14 – Potential Road Widening at Ashton Avenue, Chancellor Street and Gugeri Street

It is noted that while the current bridge upgrade works in Ashton Avenue will assist by reducing immediate traffic congestion concerns in the area, traffic forecasting for 2031 has identified that a number of additional intersection improvements are required to cater for expected traffic demands with and without the future growth in residential development in the Precinct. The current design for the bridge includes another southbound lane and pedestrian paths either side. Due to the location of transformer services and a major power line transmission pole to the north–west of the bridge, an additional northbound lane has not been included. If an additional northbound lane had been included, additional traffic movement and development may have been accommodated in the locality; however the final designs for the bridge reconstruction were completed well ahead of the recent traffic study findings.

In many ways this is a consequence of the public's perception of and commitment to the use of alternative modes of transport. The existing public transport system is not fully integrated and sophisticated as in other cities (e.g. Melbourne) and accordingly until the system develops to provide cross-linkages to railway stations, the Precinct is expected to maintain a strong preference for private vehicle transport and hence traffic forecasting will reflect these patterns of transport behaviour. To some degree this is a "chicken and egg" scenario, as integrated public transport requires increased densities to support the development of the public transport network. In addition, as time progresses other forms of transport such as an increased dependence on shared vehicle services and opportunities which relate the autonomous vehicle transport (e.g. cars linking to form car trains) may alter travel habits and the assessment of trip generation and traffic flow, may in turn deliver an improved LOS and reduce traffic congestion at key intersections.

Another option would be for the Town to discuss the progression of the Structure Plan with the WAPC and RAS in consideration of the RAS proposals for a Management Plan for the Showgrounds. It is clear from the traffic studies that any additional development of the Showgrounds along the Ashton Avenue frontage (whether under the proposed Management Plan or alternative arrangements) will create additional pressure on the Ashton Avenue, Gugeri Street and Chancellor Street intersection and cause total failure of the road network. Given this and that the WAPC is the approval authority for both the SP and the RAS Management Plan, opportunity may exist for these plans to be integrated and for other options to be developed to improve north-south linkages through the area (e.g. tunnelling of the railway, widening and realigning/construction of a roundabout extending over the railway line at the Ashton Avenue bridge, or construction of a crossing between Loch Street and Brockway Road). All these options involve works well beyond the financial capacity of the Town (but possibly within the scope of a redevelopment plan for the Showgrounds), and also beyond the scope of the Structure Plan. These matters will need to be considered by the WAPC in determination of both the Structure Plan and proposals for the RAS Management Plan.

Whilst acknowledging the scenarios above, until these changes occur it would be inappropriate to recommend progression of the Structure Plan in its draft form. Given that the Town is achieving its WAPC density targets with planned increases in density along Stirling Highway and existing consolidation projects, a reduction in density growth throughout the Precinct under the Structure Plan is not a critical concern for the Town. In addition the reduced densities recommended in the progression of the Structure Plan culminate in reduced heights and resultant improvements in amenity outcomes. An alternative option is for the Structure Plan to be placed on hold until such time as attitudes to modes of travel change generally and traffic forecasting can accurately reflect improvements and an acceptable LOS for the Ashton Avenue, Gugeri Street and Chancellor Street intersection. This change in attitude may result from improved public transport services (involving integrated linkages further afield from the railway line) which increase patronage levels, or the onset of alternative modes of travel (increased reliance on shared/autonomous vehicle use).

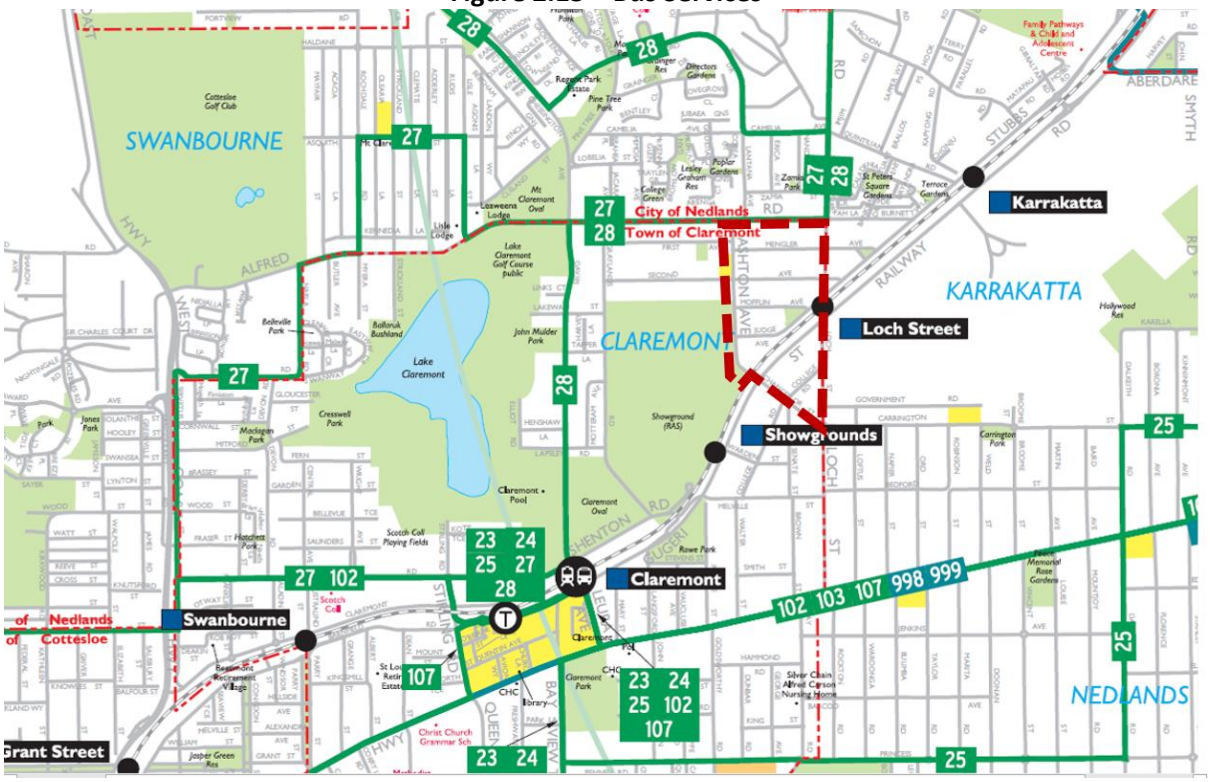
6.2 Public Transport

The TOD concept aims to provide residential accommodation concentrated on activity corridors and around train stations to encourage commuters to use public transport in peak periods and reduce car dependency.

The Loch Street Station is located within approximately 400 metres from any property within the Structure Plan area. It is located on the Perth to Fremantle line with trains generally operating every 15 minutes. From Perth CBD, transfers can be made to access the wider metropolitan region. In addition, the Structure Plan area is also in close proximity to the Karrakatta, Claremont and Showgrounds stations.

No public bus service runs directly through the Structure Plan area, however high frequency bus services run along Stirling Highway which is located between 700m – 1.5 km from dwellings within the Structure Plan area. Another two low frequency local bus services run along the northern boundary of the Structure Plan area, on Alfred Road. Bus services operating within and near the Structure Plan area are shown in **Figure 2.15 – Bus Services**.

Figure 2.15 – Bus Services



Source: http://www.transperth.wa.gov.au/Portals/0/Asset/Documents/Journey%20Planner/Network%20Maps/Map5.pdf

An analysis of the patronage of railway stations throughout the metropolitan passenger rail network has been undertaken by the Public Transport Authority (PTA). Discussions with PTA have indicated that although one of the key state planning strategies is aligned to concentrate on Transport Orientated Development, the Loch Street Station has poor patronage levels and may be considered for closure in the future. Local government studies such as this Structure Plan will be integral in future decision making, as increased density of development around stations will assist in raising patronage levels at the station and assist in preservation of the service. It is important, therefore to confirm with PTA that the future of the Loch Street Station is secured if

the densities proposed by the Structure Plan are delivered during the consultation process and final approval of the Structure Plan.

6.3 Pedestrian Movement and Amenity

Good pedestrian connectivity is provided by the existing local streets within the Structure Plan area and the grid iron street pattern allows for easy and direct access to the Loch Street station. It is noted, however that there are no formal pedestrian crossing points at the station.

Residents on the northern side of the railway need to cross Stubbs Terrace to arrive at the station. As population increases, this situation will need to be monitored with consideration for the need of a formalised pedestrian crossing.

As part of a National Black Spot funded project implemented by the City of Nedlands (with the approval of both Claremont and Nedlands Council) a pedestrian activated signal is to be provided on the Railway Road side of the intersection to assist pedestrians crossing Gugeri Street at this point.

All streets have constructed footpaths, however upgrades will be required as development intensifies Pedestrian access near the corner of Gugeri Street and Loch Street is currently deficient where the (non-conforming use) commercial premises are located. This will require upgrading when the properties are redeveloped.

Pedestrian amenity is also a consideration in the vicinity of the Local Centre. A LDP and Design Guidelines will call for provision of awnings for commercial frontages along Ashton Avenue and secondary street frontages (where located on a corner) to provide a pleasant and comfortable pedestrian environment, allowing for continuous shade and shelter along the footpath.

Examples of poor pedestrian amenity – discontinuous or missing footpaths and blank walls with opportunity for passive surveillance of pedestrians




5.4 Cycling

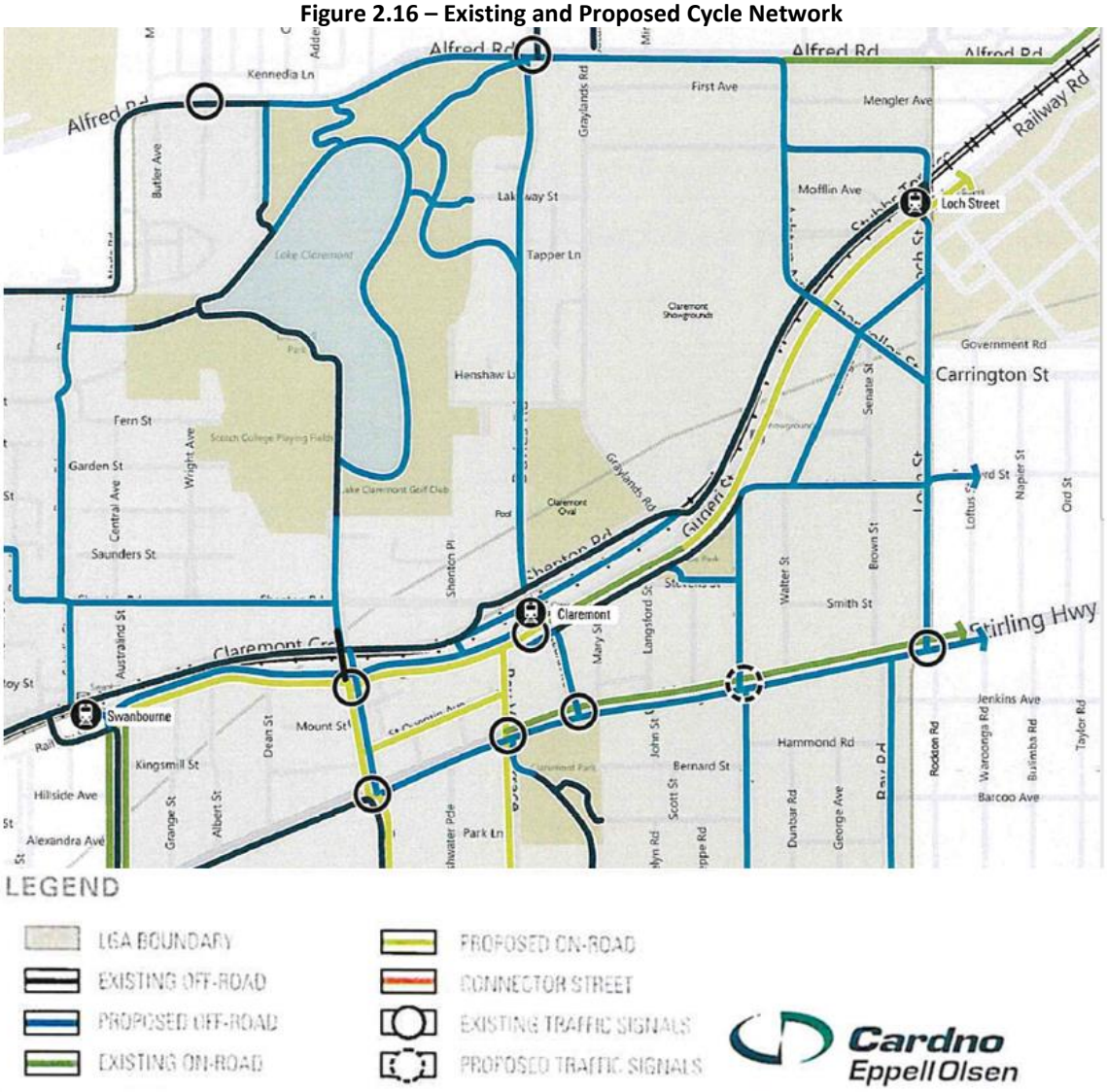
Figure 2.16 shows an extract from the Town of Claremont's Draft Bike Plan map prepared by Cardno Eppell Olsen, which is currently under review.

A principal shared path runs along the northern edge of the railway line providing good cycling access to the west and east across suburbs. A ramp from the principal shared path is currently being upgraded as part of the Ashton Avenue bridge replacement works to link in with Ashton Avenue.

Bicycle lanes/sealed road shoulders are provided along parts of Alfred Road. Intersecting with the principal shared path is an identified Perth Bicycle Network route which provides access to local primary schools and beyond. Brockway Road is part of the Perth Bicycle Network connecting Mt Claremont to the Loch Street Station and the Principal Shared Path, and is suitable for an off road path.

The Draft Bike Plan shows proposed on road paths along Gugeri Street and off road paths along Loch Street, Brockway Road, Second Avenue, Chancellor Street and Ashton Avenue. Improvements within and surrounding the Structure Plan area will be considered as part of the Bike Plan review.

Figure 2.16 – Existing and Proposed Cycle Network



(Note: the "proposed off road" path on the southern side of Stirling Highway between Goldsworthy Road and Loch Street has now been completed)

6.5 Parking

Car parking within the Structure Plan area is generally provided on private property and on local streets. During the time of the Perth Royal Show and other major events at the Claremont Showgrounds, the Ashton Triangle land is used as a major parking area. If this land is developed, additional pressure on the public road network may result, however development of this land should include provisions to accommodate the lost parking within the Showgrounds property as part of the LDP requirements for the site.

At the Loch Street station, the Public Transport Authority provides 13 bays plus parking for persons with disabilities. These are accessed from the southern side of railway lines from Railway Road (extension of Gugeri Street). As it is the intention of the Structure Plan to provide higher density development within walking distance to the train station, additional parking at the station is not required.

Parking for individual developments will be assessed under the R-Codes and TPS3, however some indicative calculations have been made based on the land use and density proposed within the Structure Plan area as shown in **Table 3 – Indicative Parking**.

Table 3- Indicative Parking

	Car bays required
Single and grouped dwellings	400
Multiple dwellings	687
Non-residential (excl. Showgrounds)	49
Non-residential Showgrounds	Nil
Total:	**1,136**

Calculations are based on 1 bay per 25m^2 net leasable area (NLA) for commercial uses at the local centre (1,225 m^2 NLA); 2 bays per single/grouped dwelling; and 1.5 bays per apartment dwelling.

LDPs and Design Guidelines will also require:

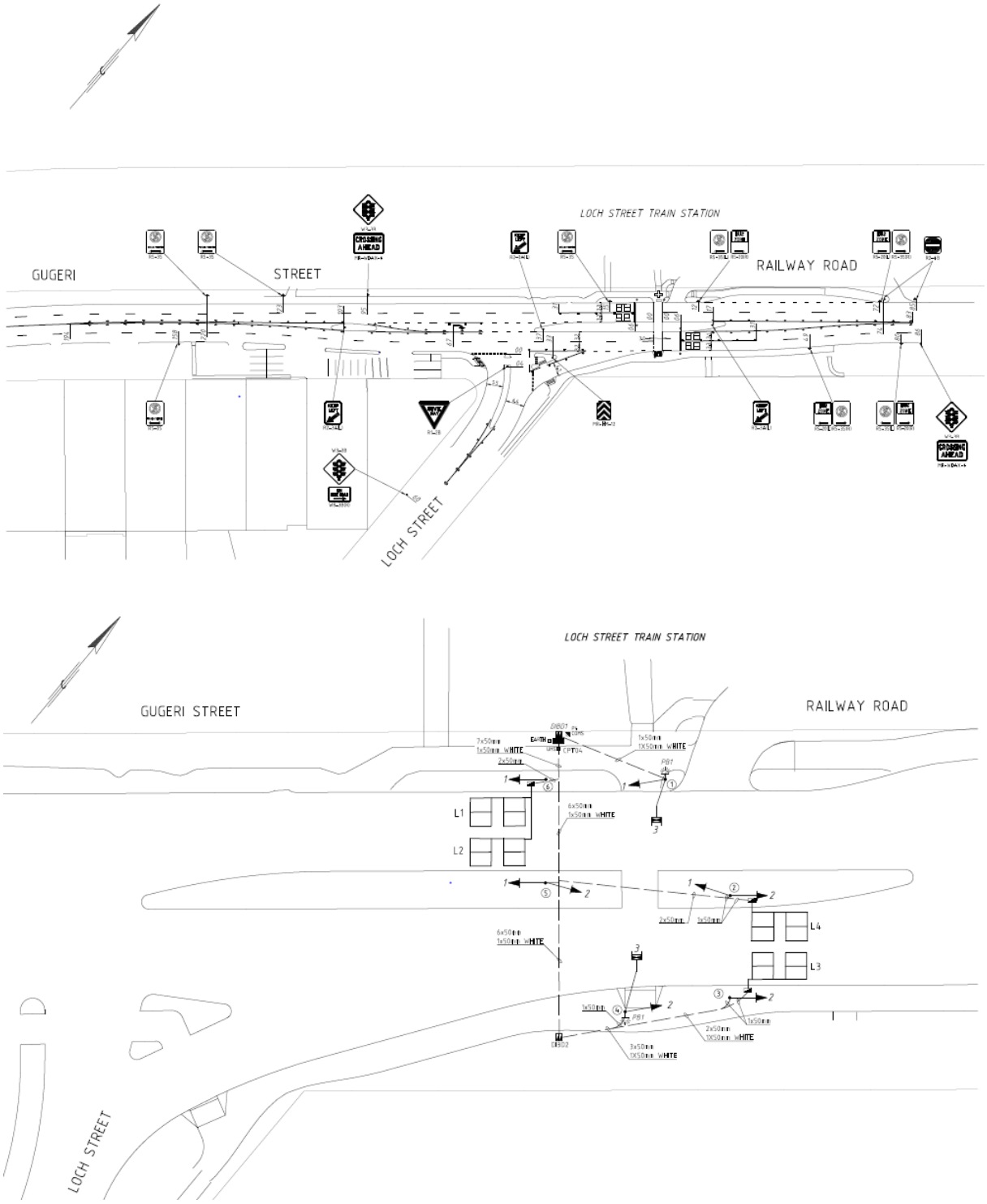
- Car parking for all new development at the key sites at the corner of Ashton and Mofflin Avenues; Ashton Triangle; and the Showgrounds to be integrated within, or located behind, buildings and screened from public view to reduce the visual dominance of parked cars and improve pedestrian amenity.
- Consolidation of car parking at the rear of the commercial buildings to provide a more pedestrian friendly environment and greater amenity along the street frontage.
- Avoiding garage-dominated frontages.

6.6 Scheduled and Recommended Upgrades

6.6.1 Loch/Gugeri/Railway Road intersection upgrade works

Traffic treatment works at the Loch Street – Gugeri Street/Railway Road intersection commenced in May 2017 as shown on **Figure 2.17**. This is a National Black Spot funded project implemented by the City of Nedlands with the approval of both Claremont and Nedlands Council. In addition to the new right turn lane for the traffic turning right from Gugeri Street to Loch Street there will be a pedestrian activated signal on the Railway Road side of the intersection.

Figure 2.17 – As Constructed Intersection Works and Pedestrian Crossing at Gugeri Street, Loch Street and Railway Road

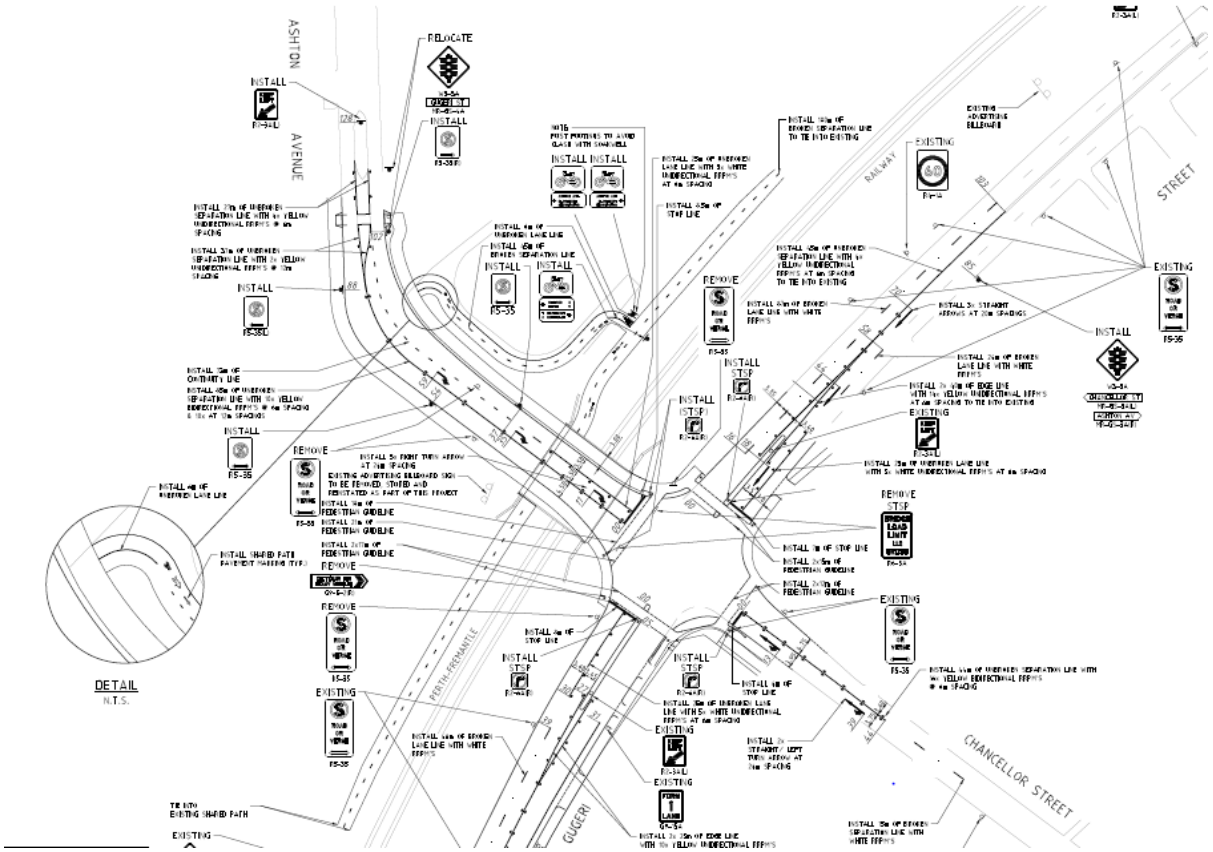


Source: Town of Claremont

6.6.2 Ashton Avenue Rail Bridge

Main Roads Western Australia (MRWA) has undertaking initial repair work at the Ashton Avenue railway bridge and has commenced reconstruction the bridge as shown in **Figure 2.18**. The Town of Claremont has promoted (and Council has resolved to support) a design which will provide for two south-bound traffic lanes including a right turning lane into Gugeri Street, a 3m wide shared path on the north-eastern side and a 2m path on the south-western side.

Figure 2.18 – Under Construction Ashton Avenue Bridge Works and Current Upgrades to Ashton Avenue, Gugeri Street and Chancellor Street Intersection

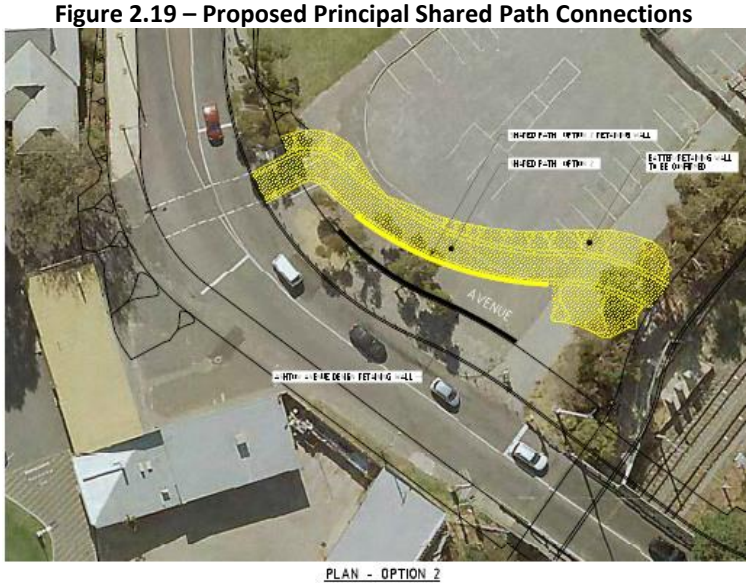


Source: Town of Claremont

6.6.3 Shared Path Ramp Ashton Avenue

A ramp from the principal shared path along the railway line is currently being upgraded as part of the Ashton Avenue bridge replacement works to link in with Ashton Avenue as shown in **Figure 2.19**.

Figure 2.19 – Proposed Principal Shared Path Connections



Source: Town of Claremont

6.6.4 Other Upgrades

It is important in a TOD precinct to ensure and improve pedestrian amenity and convenience due to increased population. It is expected that this can be accommodated by the treatment works to street reserves, which may include: provision of street trees; upgrades to footpaths; and pedestrian signalisation at intersections with traffic lights and additional pedestrian crossing points and refuge islands.

6.7 Transport noise

It is likely that vibration and noise from the passenger trains on the Perth to Fremantle railway will exceed the outdoor noise criteria targets and limits in SPP 5.4 (Road and Rail Transport Noise and Freight Considerations in Land Use Planning) for properties in close proximity to the railway line. This will require further consideration in the development of the Local Planning Policy (Design Guidelines) to provide for building treatments, which will be implemented during the Development Application and Building Permit stages.

In addition, some properties may also be required to place Section 70A notifications on Certificate of Titles to advise prospective purchases of potential for noise impacts from the railway line.

7. Urban Form Principles and Rationale

A number of broad principles were developed based on best practice and sound planning principles to inform the urban form proposed by the Structure Plan. The broad principles and objectives for the Loch Street Precinct Structure Plan are outlined in further detail in **Appendix 4**.

Application of a higher density and corresponding increased height limits generally across the Structure Plan area would be unlikely to achieve significant increases of housing numbers and types in the short to medium term. This is due to much of the area to the north of the railway being well established with housing stock being of more recent construction and good condition, with a multiplicity of private land ownership.

Instead, the general rationale behind the densities and heights proposed focuses on encouraging development and redevelopment in specific locations whilst generally avoiding disruption to the well-established single residential character of much of the balance of the Structure Plan area.

Pockets of high density and increased building height are strategically provided for in areas which face Ashton, Mofflin and Judge Avenues north of the railway line, also along Gugeri Street and reducing in intensity in the remainder of the area south of the railway line.

This rationale and the broad principles are also intended to inform associated subsequent planning controls (including LDPs and Local Planning Policy, including Design Guidelines) that will determine appropriate built form scale, massing and building typology.

8. Proposed Land Use Mix

The Loch Street Station Precinct is a residential focused TOD. The Structure Plan provides primarily for residential land uses with some mixed use commercial floor space (at existing commercial sites) with residential units above.

8.1 Commercial

Ashton Avenue is promoted as a 'mini activity corridor' within this Structure Plan, however, the general Structure Plan area is not earmarked for further substantial commercial development. The main purpose of the Structure Plan is to provide for a wider range of housing types and higher density in opportune and appropriate locations, and from a commercial perspective, provide the impetus for redevelopment of the existing rundown shopping precinct.

The existing shopping centre on Ashton Avenue is a local level shopping centre, comprising of a medical centre and small retail tenancies. This minor commercial centre does not fall within the planning requirements of SPP 4.2 – Activity Centres and employment opportunities are relatively low given the nature and scale of the centre.

The ultimate net commercial floorspace within the existing local centre in this Structure Plan is estimated at 1,225m^2.

8.2 Residential

The Structure Plan encourages higher density development in strategic locations close to Loch Street Station and provides opportunities for greater housing choice. Residential density codes are allocated to the Sub-precincts as shown in **Figure 2.21**.

Figure 2.21 – Residential Density Codes

The residential density is controlled by height and setback requirements as specified within the Design Guidelines and the minimum dwelling size as per the R Codes. The density of development has been tested and refined to ensure it does not result in infrastructure servicing capacity issues. For this reason and to ensure delivery of the built form outcomes prompted by the Structure Plan, a limitation

on plot ratio variation is proposed to be considered for inclusion into LDPs and Local Planning Policy (Design Guidelines and Plot Ratio Restrictions).

The Structure Plan aims to provide for a maximum of 658 dwellings within the area. This will equate to 60 dwellings per gross hectare.

The design of the Structure Plan addresses the potential impact on the surrounding residential locality by providing higher density along both sides of Ashton Avenue and contained within the Showgrounds, Ashton Triangle, part of Mofflin Avenue, Judge Avenue and the triangle of land south of Gugeri Street (including College Road).

8.3 Yield Analysis

Analysis was undertaken to estimate the number of dwellings that could potentially be developed within the Structure Plan area. The yields were assessed by using projected plot ratio floorspace depending on which precinct the site(s) are situated within. The plot ratio used was as per the corresponding R Code requirement (that is 0.7 for R60 and 1.0 for R80).

Table 4 shows the estimated ultimate dwellings yield for each Sub-precinct:

Table 4 – Estimated Dwellings

Residential yield estimate		
Sub-precinct	**Single/grouped dwellings**	**Apartments**
Sub precinct 1: Second Avenue	184	0
Sub precinct 2: Alfred Road/Ashton Avenue	16	0
Sub precinct 3: Ashton Avenue Commercial	0	43
Sub precinct 4: Ashton Avenue East	0	99
Sub precinct 5: Showgrounds	0	Nil
Sub precinct 6: Ashton Triangle	0	Nil
Sub precinct 7: Gugeri Street	0	153
Sub precinct 8: College Road	0	163
Sub Totals	**200**	**458**
Total	**658 dwellings**	

8.4 Public Open Space

Due to the infill nature of future development within the area, no additional public open space (POS) is proposed within the Structure Plan other than acknowledging the capacity of the RAS to provide complementary parcels of informal open space on land fronting Ashton Avenue to provide linkages between the Showgrounds and Structure Plan area.

The Structure Plan, however, aims to formalise an increase in POS at the corner of Mofflin Avenue and Stubbs Terrace.

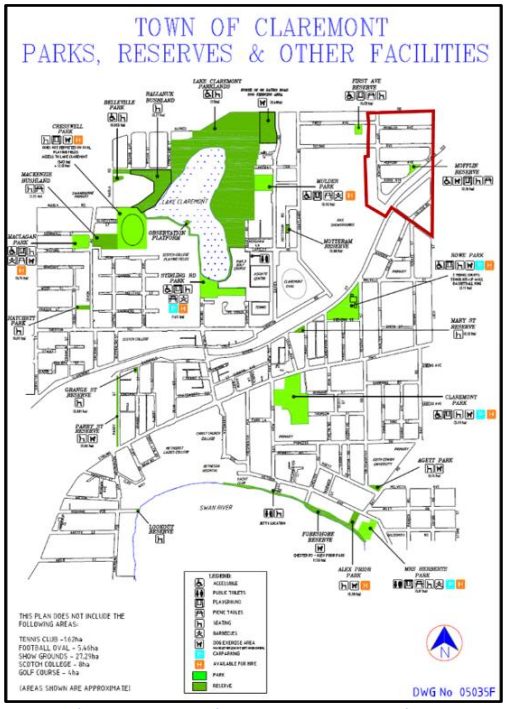
The Town of Claremont is facilitated with a wide range of open space types and functions, including regional, district and local levels of nature, sport and recreation spaces as promoted by the WAPC's *Draft Liveable Neighbourhoods*. Although *Draft Liveable Neighbourhoods* is more relevant to green field development, the principle of access to adequate and functional open space for residents has been a consideration in this Structure Plan.

The Town of Claremont is a relatively compact area comprising of less than five square kilometres. As such, most residents enjoy close proximity and ease of access to these places of open space, which subsequently includes the existing and future residents of the Structure Plan area. For example, dwellings are within approximately:

- 300-400 metres of at least a small or local pocket park, or an area that functions as a small open space (e.g. grassed and landscaped areas at the intersections of Stubbs Terrace and Mofflin Avenue, Second Avenue, Mengler Avenue and Alfred Road – the latter three being within the City of Nedlands).
- 1.5km of neighbourhood parks such as Claremont Park, Rowe Park, Mulder Park and Stirling Road Park.
- Less than 2 km of neighbourhood sports ovals such as Creswell Park and Scotch College Playing Fields.
- 1.5 km of district sport and recreation facilities such as Claremont Oval, Claremont Tennis Courts, Claremont Aquatic Centre, Claremont Par 3 Golf Course and gymnasium, Claremont Bowling Club.
- 1.5km and 2.5km from regional level nature spaces such as Lake Claremont and the Swan River, respectively.
- Immediately adjacent the regional recreation facility of the Claremont Showgrounds.

Figure 2.22 shows the location of the various open spaces within the Town of Claremont boundaries in relation to the Structure Plan area.

Figure 2.22 – Park, Reserves and Other Facilities



Source: http://www.claremont.wa.gov.au/MediaLibrary/TownOfClaremont/Documents/PARKS-RESERVES-FACILITIES.pdf

In addition, just outside of the Town of Claremont boundaries and within reasonably close proximity to the Structure Plan area are further open space facilities including the Mount Claremont Oval, Cottesloe Golf Club and College Park.

8.5 Desired built form

The proposed built form ranges from low density (R25 and R30) to higher density (R50 and R80) with heights from two to six storeys. The following **Table 5 – Built Form** summarises the density, height and land use proposed for each precinct.

Table 5 - Built Form

Sub-precinct	Density Code	Height	Land Use
1. Second Avenue	Low R25	2 storeys	Residential
2. Alfred Road/ Ashton Avenue	Low R30	2 storeys	Residential
3. Ashton Avenue Commercial	High R60	3 storeys	Mixed Commercial/ Residential
4. Ashton Avenue East	Medium R40	2 storeys	Residential
5. Showgrounds	N/A	N/A	Showgrounds
6. Ashton Triangle	N/A	N/A	POS
7. Gugeri Street	High R60 and R80	3-5 storeys	Residential
8. College Road	Medium R60	2 storeys	Residential

Based on the land use mix, densities and heights proposed by the Structure Plan, three dimensional modelling has been developed to depict the indicative built form characteristics desired within the Structure Plan area and are shown as **Figures 2.22, 2.23, 2.24 and 2.25.** Note that Sub-precinct 1 – Second Avenue and Sub-precinct 2 – Alfred road/Ashton Avenue basically remain unchanged.

Figure 2.22 – Building envelope and land use model (Northeast)

Figure 2.23– Building envelope and land use model (Northwest)

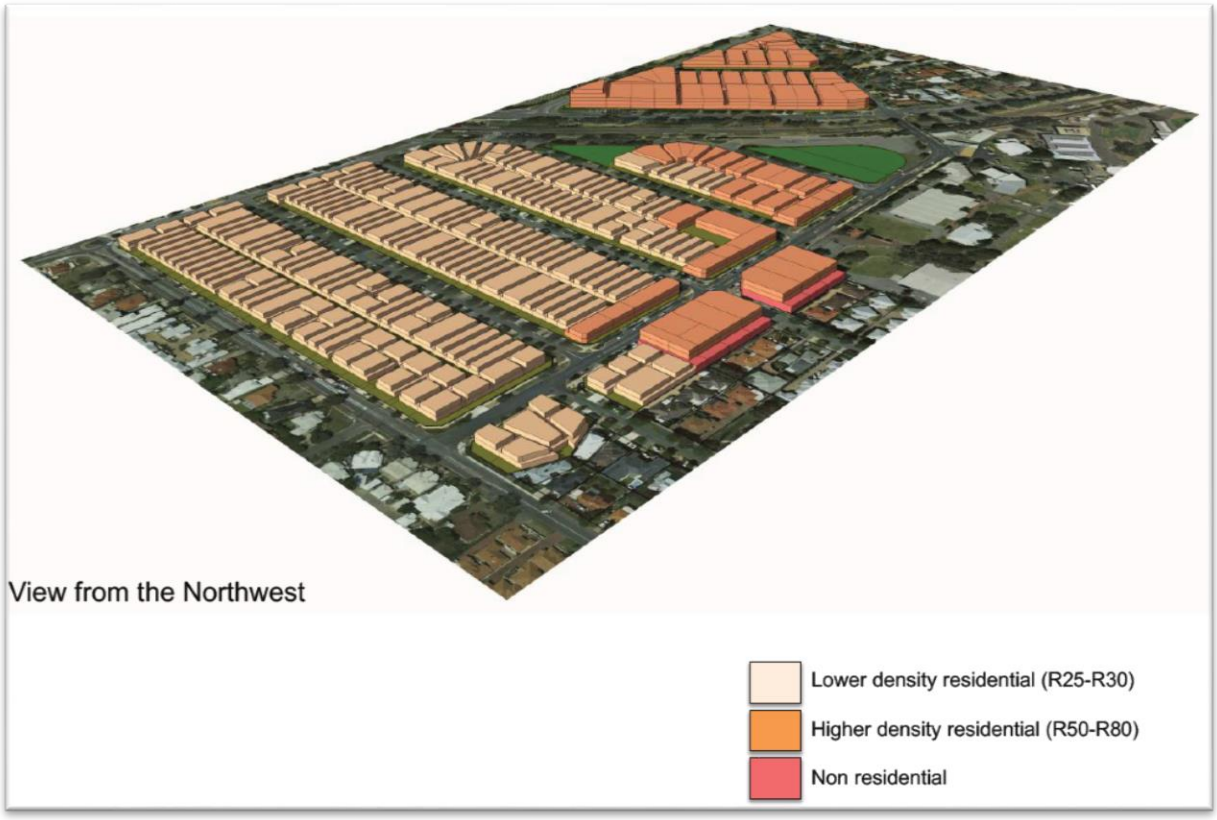


Figure 2.24– Building envelope and land use model (Southwest)

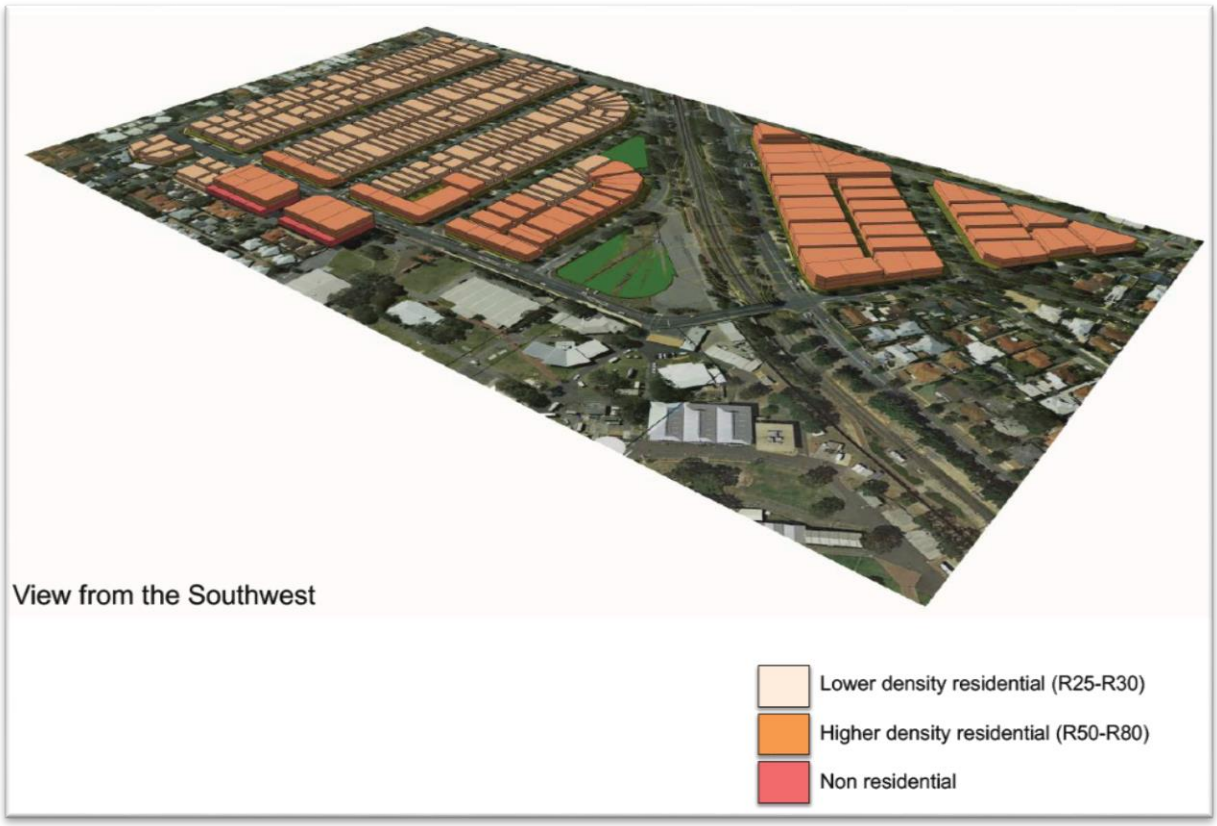
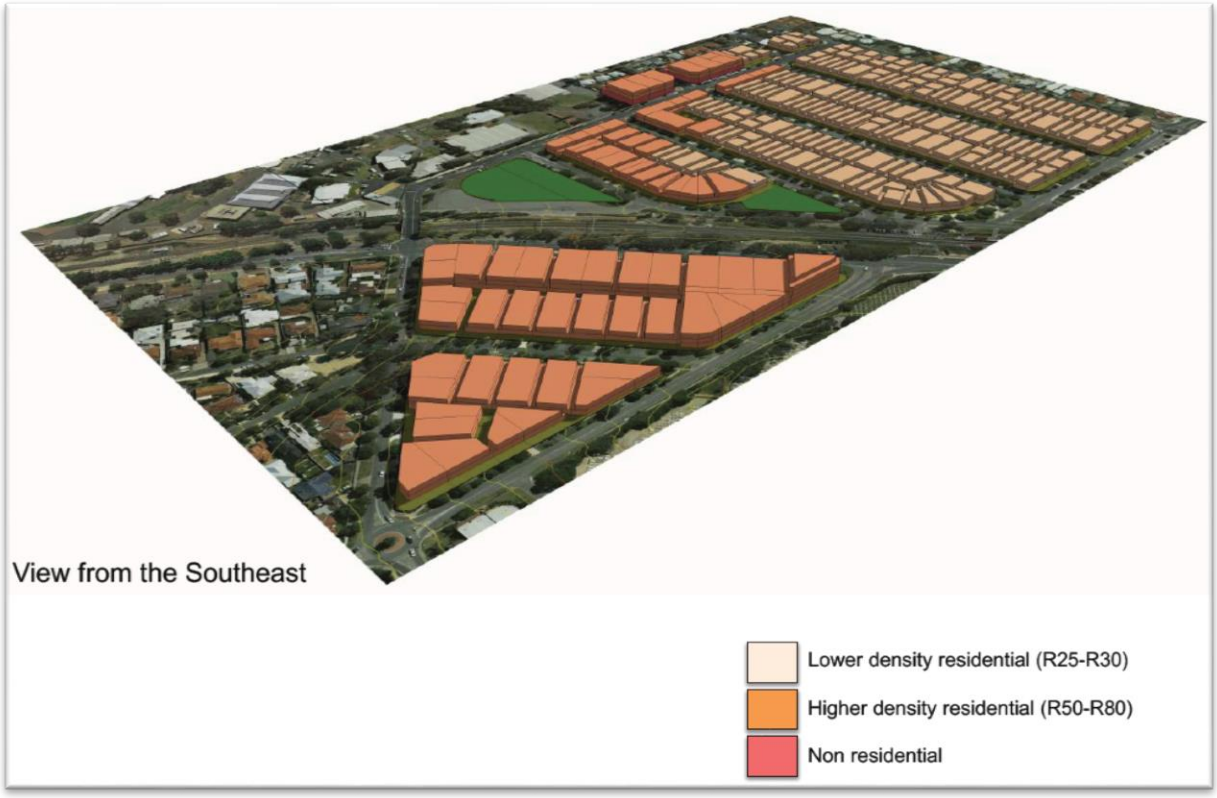


Figure 2.25– Building envelope and land use model (Southeast)



It is proposed that upper storeys of new development will be set back appropriate distances to enable a transition to lower density/lower height areas, to provide visual relief to the adjoining properties or streets, give the perception of lesser building bulk and provide for increased privacy and create a "human interface" with the ground level.

Ground floor commercial tenancies on Ashton Avenue will be orientated towards the street, providing active street frontages and awnings for high pedestrian amenity. Ground floor residential units are also required to address primary and secondary streets, providing visual surveillance.

New buildings on the eastern side of Ashton Avenue will need to provide a 6 metre setback due to the location of High Voltage power lines, however all other residential setbacks are to be set back from the street in accordance with the requirements of the applicable R Code standard. Corner buildings are to address both street frontages.

Development design and form should enhance the streetscape and establish an appropriate transition in scale both within the Structure Plan area and with its surroundings. This is intended to be achieved through the development of the Design Guidelines, and in some instances, LDPs.

The height limits and setback controls within associated Design Guidelines and LDPs (to be completed in accordance with matters listed in Section 8 of Part One) are to ensure there is an appropriate interface between the built form within the Structure Plan area, the public realm and the surrounding areas.

Of particular relevance are the R Code standards applicable to R60 and R80 shown in **Tables 6 and 7**:

Table 6- General R Code Requirements

Multiple dwelling	Maximum Plot Ratio	Open space min total of site	Open Space Min outdoor living	Primary street setback	Secondary street setback	Side setback	Rear setback
R60	0.7	45%	-	2m	2m	Tables 2a and 2b of the R Codes*	Tables 2a and 2b of the R Codes
R80	1.0	refer to Local Structure Plan or LDP	-	2m	2m	Table 5 of the R Codes**	Tables 2a and 2b of the R Codes

***Based on a function of wall length, height and presence of major openings.** It is possible; however, that a wall may have a zero setback where it abuts an existing or simultaneously constructed wall of equal or greater proportions.*
***Depending on the width of the lot (i.e. less than and equal to 14m wide = 3m setback, 15m wide = 3.5m setback, equal to and greater than 16m wide = 4m setback).** It is possible; however, that a wall may have a zero setback where it abuts an existing or simultaneously constructed wall of equal or greater proportions.*

Table 7 - General R Code Height

	R50	R80
Top of external wall	9m	12m
Top of external wall (concealed roof)	10m	13m
Top of pitched roof	12m	15m
Maximum height of wall built up to boundary	3.5m	7
Average	3m	6

Refer to Table 3 of the R Codes for details relating to gable walls, ridges and roof pitches.

In order to achieve the desired built form, some amendments will be required to TPS3 provisions together with variations to some R Code provisions. This is particularly relevant to:

- Plot ratio whereby variations of more than 5 per cent of the R Code requirement is not supported; and
- Height and setback requirements which may be varied to allow greater building height and more stringent upper storey setbacks.

The development of LDPs and new Local Planning Policy (including Design Guidelines), the proposed 5% limitation on plot ratio variations and height restrictions will also assist in achieving these desired outcomes.

It will be necessary to address multiple land tenure issues to achieve a coordinated development approach. Standard lot sizes in the Structure Plan area are generally too small to successfully be developed in isolation and will often be too small to achieve the setback requirements and/or the architectural design requirements set out in the Design Guidelines. The Structure Plan requires setbacks from the upper floors to enable a transition in height across the precinct which could only be practically achieved on large/wide sites.

8.1 Interface between Structure Plan Area and land adjoining

The land within the Structure Plan area is separated from adjoining land in most instances by street alignments providing significant physical separation and limited impacts. There are no neighbour issues along Loch Street with the Karrakatta Cemetery and commercial land use interface and neighbours on the northern side of Alfred Road and eastern side of Brockway Avenue will experience no changes.

Robust interface - Commercial premises and Karrakatta Cemetery (cnr of Gugeri a Loch Street)

Potentially sensitive interfaces may occur at the western side of Sub-precinct 3 – Ashton Avenue Commercial which abuts Residential R30 land; and the western side of Sub-precinct 7 – Gugeri Street and Sub-precinct 8 – College Road which is on the opposite side of Chancellor Road where properties are Residential R20.

To reduce any impacts on adjoining land and to ensure residential amenity is not compromised, this Structure Plan is to be supported by Design Guidelines adopted as Local Planning Policy and LDPs which are to provide design controls for such matters as (including but not limited to) building height, setbacks, vehicular access and parking.

These measures will also address potential interface issues between land uses and/or varying development forms within the Structure Plan area (e.g. development adjacent to the railway line; and development adjacent to Sub-precinct 1 – Second Avenue).

9. Implementation Strategy

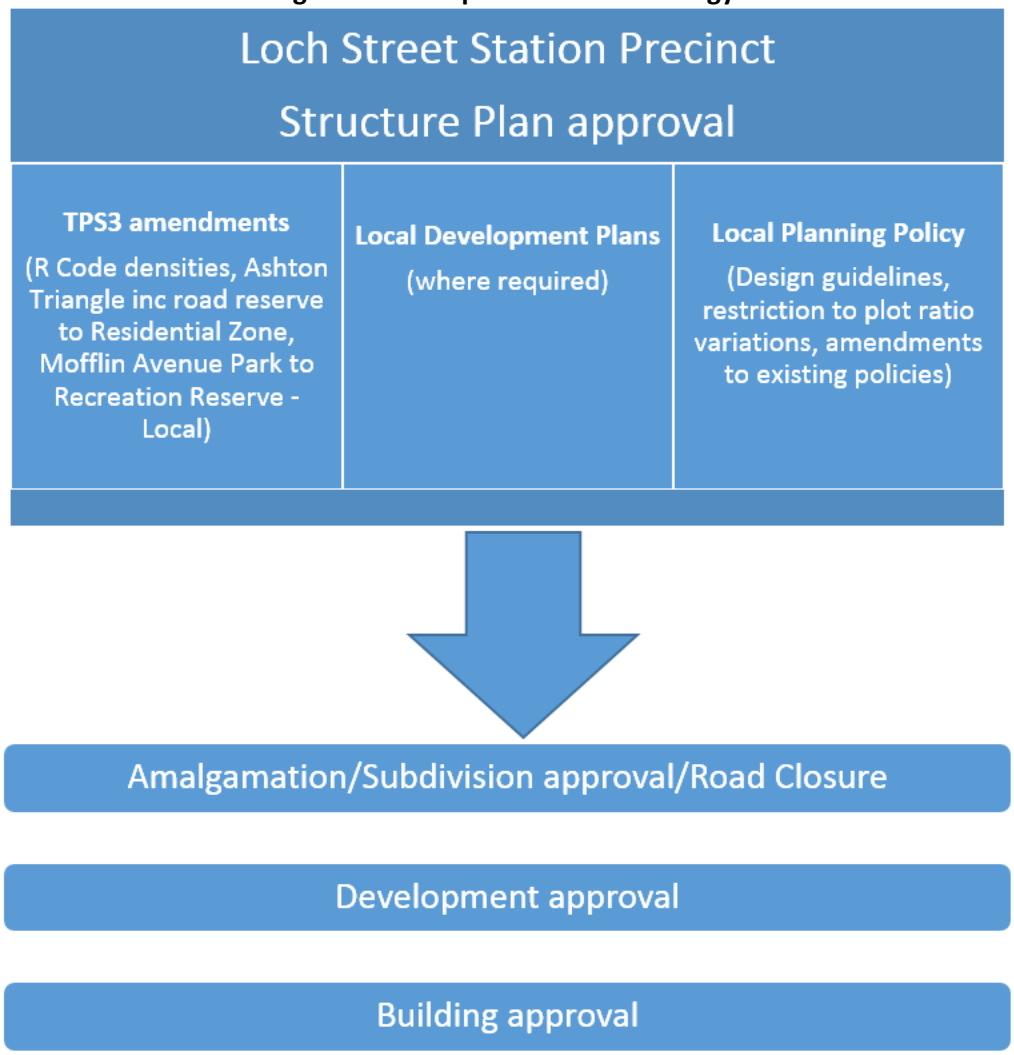
The Loch Street Station Precinct Structure Plan will inform amendments to the TPS3, development of LDPs, development of Local Planning Policy (including Design Guidelines and limitations on Plot Ratio discretion) and amendments to existing Local Planning Policy.

Development within the LDP area required for Gugeri Street will require lots to be of a certain size and frontage and possibly serviced by a ROCW. Rationalising of boundaries is also required for development of the Ashton Triangle LDP together with revisions to road reserves and Public Open Space boundaries. In order to achieve this, some sites will need to be subdivided/amalgamated, and roads will need to be closed.

In most instances Development Approval will be required and all construction will require a Building Permit.

Figure 2.26 - Implementation Strategy indicates what factors are involved to ultimately achieve development as proposed by the Structure Plan. Some approvals may occur concurrently and not all development depends on each stage being completed.

Figure 2.26 - Implementation Strategy



Appendix 5 provides a detailed summary of measures required to implement this Structure Plan.

9.1 TPS3 Amendments

Apart from one R80 coded site, all Residential zoned properties located within the Structure Plan area are coded R20, R25 or R30 (low-medium density) which does not deliver the compact urban form required by the strategic planning framework.

In addition, one of the most significant key potential development sites is currently not appropriately zoned to allow for residential development and requires a road closure and public open space rationalisation.

A small parkland area of local importance is currently developed within a local road reserve at the intersection of Mofflin Avenue and Stubbs Terrace that is not required for road purposes. The current function of this land should be formalised and protected.

For these reasons, scheme amendments are required in addition to the Structure Plan for the purposes of orderly and proper planning and it is intended that the Town of Claremont will initiate these as soon as practicable following approval of the Structure Plan. In addition, action will need to be taken to close the road and consolidate the land.

Amendments to TPS3 are also required in relation to varying height requirements in the Local Centre zone to acknowledge "special circumstances" applying to these properties under the auspice of the Structure Plan.

9.2 LDP Approvals

LDPs for sites as required by the Structure Plan are to be developed in consultation with the Town of Claremont and may progress concurrently with the scheme amendment and Local Planning Policy development processes.

In the event that LDP preparation for approval is delayed, proponents may initiate preparation as informed by the Loch Street Station Precinct Structure Plan and addressing the identified issues and principles, in consultation with the Town of Claremont.

LDPs are to address matters identified in the Structure Plan.

9.3 Local Planning Policy

The Town of Claremont intends to develop Design Guidelines to be adopted as Local Planning Policy as part of this Structure Plan process. It is intended to control the extent of plot ratio discretion under the R Codes through Local Planning Policy and also confirm Policy guidelines to indicate that proposed heights in the Structure Plan provide the necessary "special circumstances" to allow for increased residential heights for a number of sites as depicted in the Structure Plan. Amendments are required to existing Local Planning Policies to recognise increased heights as soon as practicable and may progress concurrently with the Structure Plan approval process.

In the event that Local Planning Policy preparation for approval is delayed, proponents may initiate policy preparation as informed by the Loch Street Station Precinct Structure Plan, in consultation with the Town of Claremont. In addition, where the heights proposed are subject to existing Council Policy and TPS3 considerations, the Structure Plan will form the basis for any necessary discretionary Development Approval considerations in the intervening period.

Technical Appendices

Index

1. **Opportunities and Constraints Analysis**
2. **Engineering Services Report**
3. **Part 1 Traffic Assessment – High Level Traffic Assessment Memorandum**
   Part 2 Traffic Assessment - Supplementary Traffic Assessment
4. **Broad Principles and Objectives**
5. **Implementation Measures**
6. **Council Minutes 20 February 2018**

Appendix 1 - Opportunities and Constraints Analysis

Lot size, Use and Current Density Potential

South of the Railway Line

Residential R20

The triangular shaped area south of the railway line bound by Gugeri Street, Chancellor Street and Loch Street is generally zoned Residential with a density code of R20. The following development requirements apply to R20 land under State Planning Policy 3.1 - Residential Design Codes (SPP 3.1):

R20 Code	Minimum site area per dwelling m^2	Minimum lot area/rear battleaxe m^2	Minimum frontage	Open space min total of site	Primary setback	Secondary setback
Single house and grouped dwelling	Min 350 Av 450	450	10m	50%	6m	1.5m
Multiple dwelling	450	-	-	50%	6m	1.5m

The predominant lot size in this vicinity is approximately $1000m^2$, however, about one third of the lots vary between approximately $500 – 700m^2$. Under current density provisions, one additional dwelling unit per property could be achieved and this is restricted only to those larger properties with an area of $900m^2$ or more.

Special Zone – Restricted Use

Set amongst the R20 coded land is a site on Gugeri Street that was the subject of Amendment No. 113 to TPS3 (Lots 4, 22 and 25 Gugeri Street, Lot 26 Loch Street and Lot 20 College Road) which is now zoned Special Zone – Restricted Use with a density code of R80. This allows for the development of 40-60 new dwellings.

In accordance with the (superseded by the *Planning and Development (Local Planning Schemes) Regulations 2015*) requirements of TPS3, a Detailed Area Plan (DAP) has been approved to accompany the new zoning. The DAP proposes to minimise impacts on the adjacent residential properties to the west and to College Road by designing buildings to 'step down' to these boundaries. Traffic impacts will be minimised by locating all vehicle access from Loch Street.

North of the Railway Line

Residential R25

Much of the land north of the railway line is zoned Residential with a density code of R25. The R25 code is confined within the boundaries of Judge Avenue, Ashton Avenue, Alfred Road and Brockway Road. The following development requirements apply to R25 land under the R Codes:

R25 Code	Minimum site area per dwelling m^2	Minimum lot area/rear battleaxe m^2	Minimum frontage	Open space min total of site	Primary setback	Secondary setback
Single house and grouped dwelling	Min 300 Av 350	420	8m	50%	6m	1.5m
Multiple dwelling	350	-	-	50%	6m	1.5m

Much of this area has been subdivided and developed to its full capacity with the majority of lots in the mid $300 – 400m^2$ range. Under current density provisions, a minimum lot size of $700m^2$ is required for further subdivision into two lots and/or development of two dwellings.

Only about 12 per cent of the properties within this Residential R25 area are 700m^2 or more.

Local Centre R25
A strip of seven lots north of the showgrounds along Ashton Avenue are zoned Local Centre.

Under TPS3, Dwelling (Self-contained) is a use that may be approved by Council subject to a number of requirements and circumstances. A density code of R25 exists over this Local Centre zone, requiring a minimum site area of 350m^2 for multiple dwellings. Two of these properties are in the mid 400m^2 range, whilst the remaining are in the mid 700m^2 range.

Residential R30
A small number of properties (7) fronting Ashton Avenue, but north of the shopping strip, are zoned Residential with a density code of R30. The following development requirements apply to R30 land under R Codes:

R30 Code	Minimum site area per dwelling m^2	Minimum lot area/rear battle-axe m^2	Minimum frontage	Open space min total of site	Open Space Min outdoor living m^2	Primary setback	Secondary setback
Single house & grouped dwelling	Min 260 Av 300	420	8m	45%	24	4m	1.5m
Multiple dwelling*	300	-	-	45%	-	4m	1.5m

The predominant lot size in this vicinity is approximately 300m^2 and further subdivision and/or development of additional dwellings is not possible.

Local Reserve – Recreation and Local Road Reserve
A small, roughly triangular piece of land immediately north of the railway line on the corner of Judge and Ashton Avenues is reserved under TPS3 for Local Reserves - Recreation. The reserve is made up of several lots and is owned by the Royal Agricultural Society of Western Australia. Immediately adjoining this to the south is a Local Road reserve.

The site is undeveloped and cleared, with the exception of a row of shade trees along the verge area of Judge Avenue. This land is used for informal car parking during the Perth Royal Show. Adjacent this site in portion of the (unconstructed) Stubbs Terrace road reserve is currently fenced and being used as a temporary storage for the Town of Claremont depot.

Site Analysis

An on-site assessment was also undertaken to determine the likelihood and timing of redevelopment in the foreseeable future. In addition to statutory controls, a number of additional factors can influence the timing and extent of future development.

Assessment criteria involved a range of factors including lot and building features, ownership and existing development. These elements were considered as being either likely to encourage or present some challenge to redevelopment in the short to medium term as shown in Attachment 1 - Redevelopment Opportunity and Constraint Elements.

Attachment 2A – Summary of Properties and Elements that Apply details the scores allocated for each element (being positive, neutral and negative equating with potential influence on

redevelopment) and then applied to each of the properties within the study area. This attachment summarises the number of properties that displayed the characteristic of each element.

The scores for each of the elements were calculated to reach a total score for each of the study area properties to gain an indication of the likelihood of its redevelopment in the short to medium term, without any intervention. Higher positive scores indicate greater likelihood of redevelopment, whilst lower and negative scores indicate less likelihood of redevelopment, such that a total score of:

>10	=	Strong likelihood of redevelopment
0 – 10	=	Moderate likelihood of redevelopment
-10 - 0	=	Limited likelihood of redevelopment
<-10	=	Minimal likelihood of redevelopment

Attachment 2B – Summary of Properties and Total Redevelopment Potential Scores gives a summary of the number of properties within each of these development potential ranges.

Redevelopment Scores

Of the approximately 200[4] lots within the study area, 38 properties received a score of 10 or above (less than 20per cent). Of these: 13 lots were vacant, nine involved commercial businesses and the remaining 16 lots were generally older housing stock of diminishing quality (some with potential for views). A total of 33 properties were identified as having a moderate likelihood of redevelopment. The remaining 128 properties had limited (115) or minimal (13) likelihood of redevelopment representing some 64per cent of the study area.

Comments

Vacant lots	As expected for an older inner suburb, limited vacant lots (13) are available throughout the Structure Plan area. Some of these lots may have already been built on since the site survey which was undertaken. These scattered singly throughout the Structure Plan area, only allowing for individual lot development (i.e. limited opportunity to amalgamate with other adjacent vacant lots for larger scale redevelopment).
Age and Condition/ Quality	The site survey identified that the Structure Plan area is not characterised by properties "ripe" for redevelopment (aged and poorer quality housing stock) as an overwhelming majority of the housing stock was identified as being good (131) or satisfactory (43), with only 25 as poor. The poorer quality housing stock is scattered throughout, with the exception of the seven commercial tenancies along Ashton Avenue (all being poor in quality). These figures directly relate to the age of the dwellings with most being constructed within the last 20 years (123), with some 36 dwellings being built between 20 – 40 years ago and 40+ years respectively.
Heritage	There are no heritage listings or other heritage issues that affect the Structure Plan area (other than under consideration in the RAS Showgrounds) and this element was not found to be a constraint to development for any of the Structure Plan area properties.
Landform	The study area is characterised by properties with a relatively flat landform. There are no major issues involving levels that would be a constraint or involve high earthworks costs to enable redevelopment. There is limited potential for significant views that would offer any great incentive for higher density development.
Trees	Given that the Structure Plan area is part of a well-established residential community, it would not be surprising to find a number of larger trees within private gardens that could impact on development. However, this does not seem to be the case within the Structure Plan area with only 24 properties accommodating at least one tree of a medium to large scale/size. It may be that a significant number of trees have already been removed due to subdivision and development over recent years.
Institutional /Civic use	There are no public buildings or institutional/civic buildings within the Structure Plan area (other than those contained/proposed to be developed in the RAS Showground). It is noted, however, that one of the lots identified as vacant and having a high redevelopment score, is shown as a local park reserve in the TPS3. Change would be required to remove this land from this reservation and include it within an appropriate zone with a suitable residential density code.

[4] Note that whilst there are actually more than 350 individual properties within the Structure Plan area, the data base only recognises the parent lot where a strata exists, thus the discrepancy in total property figures. However, the general assessment outcome is still considered relevant and useful.

Attachment 1 - Opportunity and Constraint Elements

Element	Opportunity	Constraint
Vacant lot	Reason: A vacant lot has no demolition costs and suggests that development is already anticipated.	
Lot Size	Large lot Reason: Larger lots have a greater capacity to accommodate larger-scaled development. The proportion of land sterilised by setbacks is also reduced. **Possible** Small lot Reason: Depending on the grouping of smaller lots, together with other factors, there could be opportunity for consolidation to a larger site for increased development potential than as individual lots.	Small lot Reason: Smaller lots have less capacity to accommodate larger-scaled development. The proportion of land sterilised by setbacks is also increased.
Number of owners/ Tenants (low)	One or few Reason: Single or minimal ownerships make it easier to achieve owner agreement to redevelop.	Many Reason: Multiple ownerships such as strata-titled properties and multiple commercial tenancies can be more challenging to achieve owner agreement to redevelop.
Business Operations	Reason: No need to relocate (unless property being redeveloped), can be mixed use with units above and benefit from additional population.	Reason: Redevelopment may remove existing services from the local shops while being undertaken.),
Condition of building stock	Poor Reason: Building stock in a poor condition is likely to require a decision to renovate or redevelop, or may suggest an intention to redevelop in the near future.	Good Reason: Building stock in a good condition is unlikely to drive redevelopment in the near future.
Views or potential views from upper levels	Reason: The presence of views (such as to a park) or potential views (such as to the river), significantly increase the sale price of developed accommodation.	
Age of building stock	Older Reason: Older buildings are more likely to be considered as redevelopment opportunities.	Newer Reason: Recent buildings are unlikely to be considered as redevelopment opportunities. **Possible** Older Reason: Older buildings may be more likely to be considered as redevelopment opportunities, however this element needs to be cross referenced with heritage listings/significance which may affect development potential.
Heritage listing/ significance		Reason: heritage listed buildings are likely to be constraining to wholesale or significant redevelopment of a lot.
Significant trees on site		Reason: the presence of significantly sized trees on a lot may be constraining to wholesale redevelopment of the lot.
Site slope	Moderate slope *Reason:* A moderate slope allows for access to grade-separated parking areas.	Steep slope *Reason:* A steeper site generally increases construction costs
Institutional or civic use		*Reason:* An institutional or civic building has a specific purpose and is unlikely to be redeveloped unless it is an outstanding opportunity.

Attachment 2A - Summary of Properties and Elements that apply

Element	Applies	Score per Element	No. of properties
Vacant lot	Yes	10	**13**
	No	0	**186**
Ownership	1	5	**175**
	2-5	-2	**24**
	5-10	-5	**0**
	10	-10	**0**
Business	Yes	5	**9**
	No	0	**190**
Quality	Poor	5	**25**
	Satisfactory	0	**43**
	Good	-5	**131**
Age	<20	-10	**123**
	20-40	-2	**36**
	40+	0	**40**
Trees	Yes	-1 (and -1 per tree)	**24**
	No	0	**175**
Views	Yes	5	**54**
	No	0	**145**
Slope	Flat	0	**181**
	Moderate	2	**16**
	Steep	5	**2**
Institutional/civic Use	Yes	-10	**0**
	No	0	**199**
Heritage list/significance	Yes	-2	**0**
	No	0	**199**

Attachment 2B - Summary of Properties and Total Redevelopment Potential Scores

Total score for all elements	>10 Strong likelihood of redevelopment	0-10 Moderate likelihood of redevelopment	-10-0 Limited likelihood of redevelopment	<-10 Minimal likelihood of redevelopment
No. of properties	**38** **19%**	**33** **17%**	**115** **58%**	**13** **6%**

Appendix 2 – Engineering Services Report

LOCH STREET STATION STRUCTURE PLAN

INTRODUCTION

The purpose of this engineering services report is to identify the existing services and their capacities, calculate the demand of the proposed yields and determine if any service upgrades are required.

The proposed Loch Street Station Structure Plan area comprises two distinct areas which are on the north and south of the station. Refer refigure 1 below.

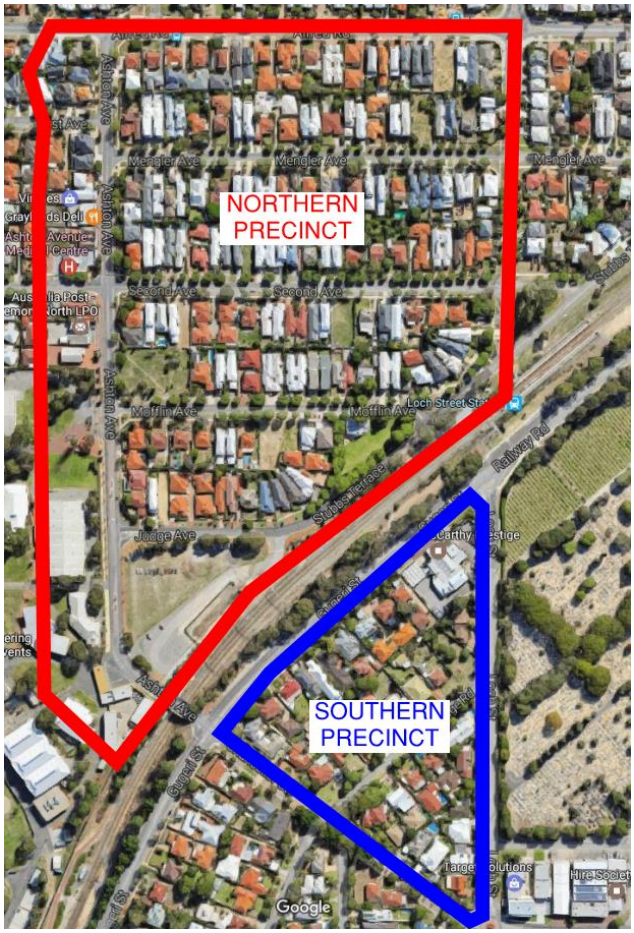


Figure 1: Site location

There are numerous private and government landowners and stakeholders within the Loch Street Station Structure Plan area with most the land already developed in accordance with current planning codes. In writing this report JDSi has assumed that the yield increase across the Structure Plan area will be organic in nature over several years.

EXISTING SERVICES

POWER

The existing Western Power electricity network serving the Loch Street Station Structure Plan precinct comprises an 11,000/415 Volt system to the north of the train station and a 6,600/415 Volt system to the south fed from the Shenton Park and Nedlands Park Zone Substations respectively.

The current loadings in the north and south precincts are estimated to be 1.8 MVA and 0.5 MVA respectively derived by allocating 8.7kVA to each of the 260 existing dwellings. This allocation is consistent with Western Power's Design After Diversity Maximum Demand (DADMD) loadings for dwellings of the quality found in the precinct.

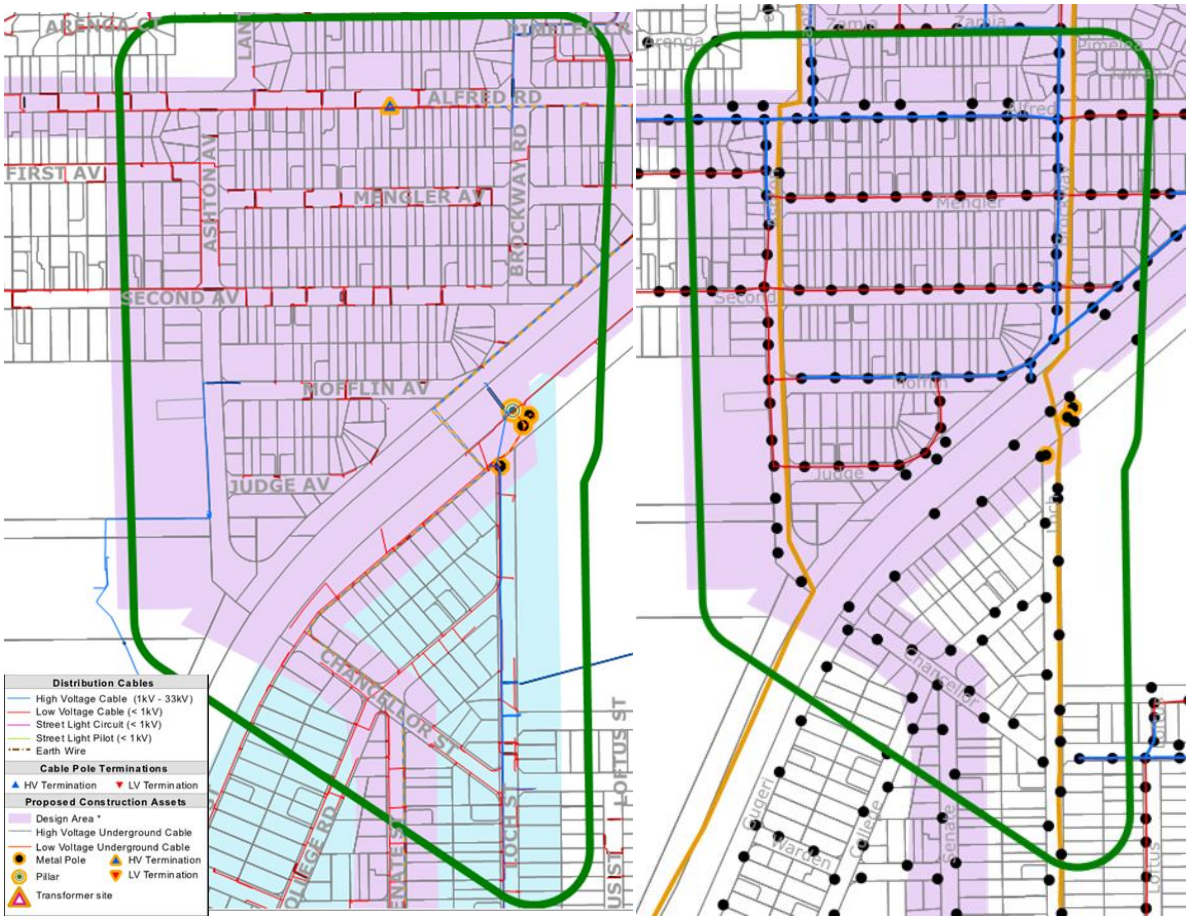


Figure 2: Western Power underground (left) and overhead (right) electrical assets

WATER

The Water Corporation owns and maintains the water reticulation system within the structure plan area. The area is well serviced by the water supply network.

The northern portion of the precinct is generally serviced via 100mm dia. water mains other than a 150mm water main in Alfred Road and a 225mm dia. main in Ashton Road which were predominantly installed in the 1940's.

The southern portion of the precinct is generally serviced via 100mm dia. water mains and a 205mm dia. water main in the southern verge of Gugeri Street. A 760mm dia. steel distribution main also exists in the northern verge of Gugeri Street. The pipework south of the railway was predominantly installed in the 1950's.

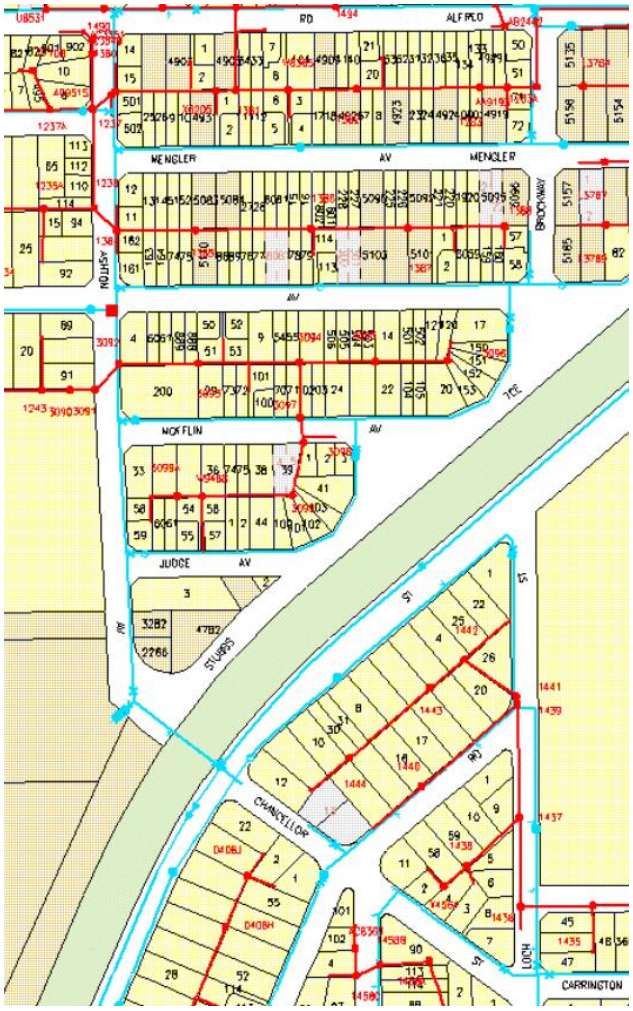


Figure 3: Water Corporation assets.
Blue represents existing water services and red represents existing wastewater services

WASTEWATER

The Water Corporation owns and maintains the sewerage reticulation system within the structure plan area. The area is well serviced, with reticulation typically running at the rear of the lots.

The northern portion of the precinct is serviced via 150mm dia. and 230mm dia. sewers constructed in the 1930's and 1940's which gravitate to a Wastewater Pumping Station west of the precinct.

The southern portion of the precinct is serviced via 150mm dia. sewers constructed in the 1950's which gravitate to the Carrington Street Wastewater Pumping Station (PS020-10). A 150mm Pressure Main then pumps the wastewater to a 230mm dia. gravity main in Bedford Street.

GAS

The existing gas network within the structure plan area is operated by ATCO gas and comprises various sized Medium Low Pressure gas mains.

TELECOMMUNICATIONS

Dial-Before-You-Dig information indicates the structure plan area is currently serviced by via various telecommunications providers including Telstra, NBN, Vocus and Optus. Whilst most properties are currently serviced via Telstra, new developments would have the opportunity to connect to the NBN network which has currently been rolled out to the western boundary of the Structure Plan area with a fixed line service.

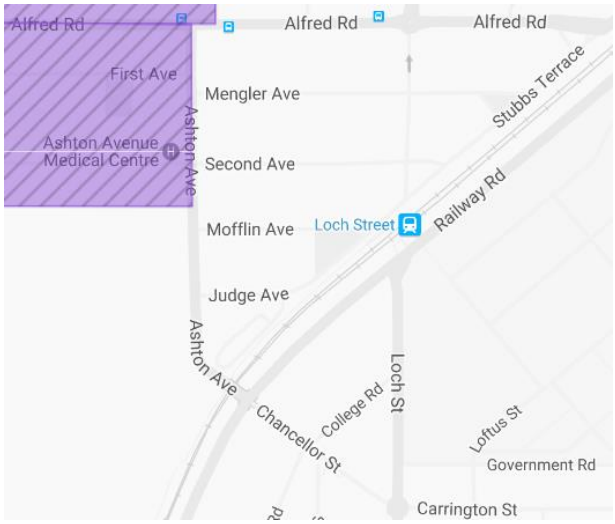


Figure 4: NBN rollout map. The purple hatching represents active services.

STORMWATER

The existing road drainage comprises small disconnected pit and pipe networks and isolated soakwells. The Town of Claremont has advised that the road drainage is at capacity.

The northern portion of the precinct appears to be divided into 2 main stormwater catchments, the most northern of which appears to discharge into a sump located behind 'Graylands Deli' on Ashton Avenue as well as distributed soakwells throughout the catchment. The other main catchment appears to discharge by overland flow into the triangular shaped POS just north of the train station.

The minor catchments further north of the precinct appear to comprise of only pits and pipes with no clear outfall, indicating stormwater disposal by soakage within the pits.

The southern portion of the precinct is split into 2 stormwater catchments, the larger catchment discharges into a fenced sump between Railway Parade and the rail reserve.

A smaller fenced sump near the interaction of Loch Street and College Road captures road runoff from the upstream catchments (south and west of the sump). The sump utilises a retaining structure adjacent to the Karrakatta Cemetery to maximise its storage volume.

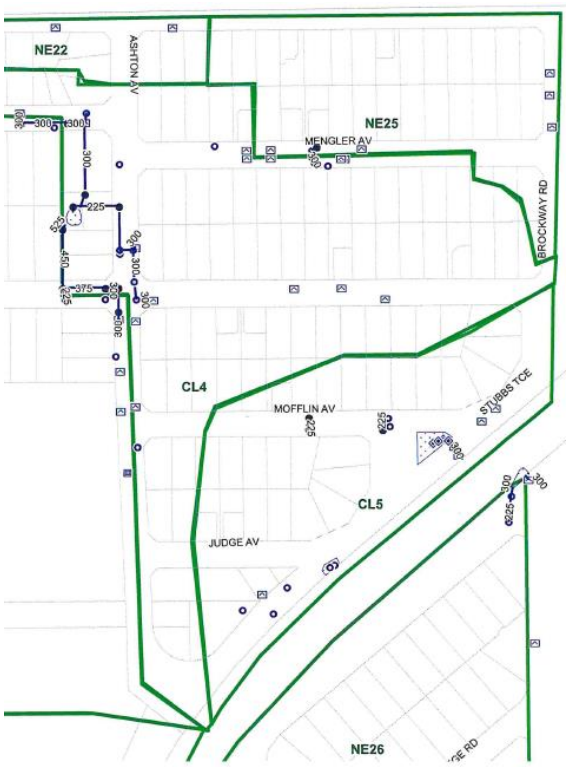


Figure 5: Drainage assets.

ROADS & TRAFFIC

Ashton Avenue which connects to Chancellor Street to the south is the key north-south link in the Loch Street SP precinct and is identified as a District Distributor A road with a speed limit of 50km/hr. The road reserve width is only some 20m though which indicates it is functioning more as a Neighbourhood Connector. Ashton Avenue is carrying between 9,500vpd just north of the bridge to 7,300vpd approaching Alfred Road.

Alfred Road is a key east-west link in the northern SP precinct and connects to Stubbs Terrace to the east. It has a speed limit of 60km/hr and is identified as a District Distributor A. It carries around 6,900vpd west of Ashton Avenue with a road reserve width of some 20m indicating a Neighbourhood Connector function.

Judge Avenue and Stubbs Terrace are Local Distributor roads carrying under 2,000vpd. All other roads in the northern precinct are Access Roads carrying generally under 1,000vpd.

Gugeri Street, running east-west and parallel to the railway line is carrying the highest traffic in the area at around 25,300 vpd (west of Chancellor Street). Gugeri Street has a speed limit of 60km/hr and is identified as a District Distributor

Chancellor Street connects with the Ashton Avenue bridge and is also identified as a District Distributor A road with a speed limit of 50km/hr. It is carrying around 8,500vpd south of the bridge and these volumes continue to Loch Street to the south towards the Stirling Highway.

Loch Street section between Gugeri Street and Chancellor Street is carrying around 4,500vpd and is classified as an Access Street. South of Chancellor Street the existing traffic volumes jump to 8,500vpd and this section to the Stirling Highway is classified as a District Distributor A.

All other roads in the southern precinct are Access Roads carrying generally under 1,000vpd.

SERVICING CAPACITY / CONSTRAINTS

POWER

Western Power's Network Capacity Mapping Tool indicates the current capacity in the north precinct is 10-15 MVA increasing to 25-30MVA in 2018 when the new Shenton Park Zone Substation progressively takes up load as Western Power upgrades feeder powerlines and transfers electricity supply from adjacent redundant substations to this new site.

Capacity in the south precinct is limited in comparison to the north at 5.0 MVA. Capacity increases to 15-20 MVA in 2020 as Western Power progressively converts network voltage in the area and the new Shenton Park 11,000 Volt Zone Substation takes up load from the old Nedlands Park 6,600 Volt Zone Substation.

Load in the north and south precincts is expected to increase to 7.0 MVA and 2.0 MVA respectively in accordance with the structure plan forecasted yields and the ensuing electrical loadings. These future loadings are comfortably within the Shenton Park Substation capacity however augmentation of the existing feeder network will likely be required. As electrical load growth in the precinct is likely to be organic in nature, network augmentation should not be an impost on the development rather a function of Western Power's ongoing expansion programs to meet forecast growth.

Should the requirement for connection of major single point loads in the precinct arise a network feasibility study by Western Power on a case by case basis is recommended.

WATER

The Water Corporation has indicated that any necessary network reinforcement for water supply infrastructure due to increased demand would likely be undertaken by the Corporation as is typically the case in established areas.

WASTEWATER

North

The northern portion of the structure plan area discharges to the Swanbourne Main Wastewater Pump Station and associated gravity mains. Upgrades for these assets have been scheduled into the Water Corporation's Capital Investment Program, indicating upgrade works within the next five years. In consideration of the planned upgrades and the relatively insignificant quantity of wastewater flows that the subject area contributes to total flows, the Water Corporation has indicated that sewer capacity is unlikely to be an issue.

South

The capacity of the existing 150mm dia. pipework downstream of the southern sub-precincts is in the order of 5L/s and the ultimate demand for the area is estimated at 3L/s. As this area represents the upstream extremity of this sewer catchment it is therefore expected that the projected growth will not trigger any requirement to upgrade the pipework immediately downstream of the site. The Water Corporation has provided current planning information for this catchment. The information shows that the long term pump rate will be at approximately 66% of the capacity of the pump station. The additional flows from this development area represent an increase in the order of 2.5L/s, pushing the utilisation of the pump station to approximately 90% of its capacity. The Water Corporation has been sought for additional comment on long term adequacy of the existing infrastructure. However, it is expected that growth in demand would be organic in nature with asset augmentation costs being borne by the Water Corporation.

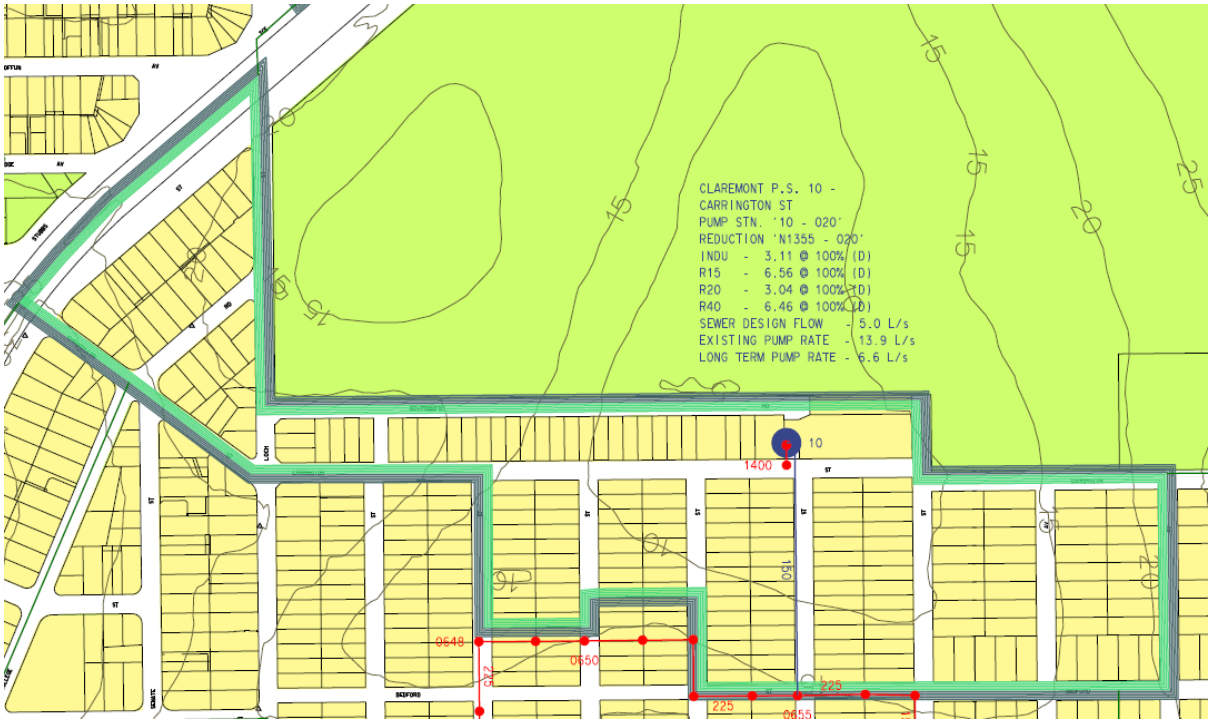


Figure 6: Wastewater catchment.

GAS

Confirmation of any network reinforcement will be required by ATCO gas. Should the increased demand within the precinct be gradual there is unlikely to be any upgrading cost for a single developer.

TELECOMMUNICATIONS

An increase in yields would not appear to pose any constraints given the existing networks can be upgraded to suit, it is also expected that the existing NBN network on the adjacent will continue to roll out across the structure plan area as part of NBN's brown field roll-out and / or new development requirements.

STORMWATER

The only constraint advised by the Town of Claremont is that the Cemetery Board have requested to have the Loch Street Sump removed. This is located on the east side of Loch St opposite college Road. This sump at the low point of the wider catchment area which incorporates Loch Street to the north and south and west along College Road. Removal of this sump would require replacement by an equivalent storage volume in close vicinity to cater for the existing road drainage.

Any increased stormwater requirements created by increased density would need to be catered for within each development site up to the 1 in 100 year event. The Town of Claremont has advised that the road drainage is currently at capacity.

ROAD & TRAFFIC

A traffic analysis was undertaken by GTA Consultants which determined that whilst some of the roads in the Structure Plan area appear to be around their daily capacities, intersection improvements are proposed at both the Gugeri Street/Ashton Avenue signalised intersection and the Gugeri Street/Loch Street priority controlled intersection. Both will assist in improving the operational capacities of the intersections.

It is also noted that the Town of Claremont will monitor these intersections on an as needed basis to determine when further upgrades may be required.

GTA's traffic calculations are based on development adopting 'Transit Orientated Development' design principles with the Town of Claremont to encourage reductions in parking requirements.

Refer to GTA's memorandum (reference no. W128890) for details of the traffic study undertaken.

SUMMARY OF CAPACITY TO SERVICE PROPOSED YIELDS

Sub Precinct	Comments
Power	Gradual increase unlikely to trigger developer funded off-site upgrades.
Water	Should upgrades be needed to meet increased density the Water Corporation is likely to undertake these as required.
Wastewater	Should upgrades be needed to meet increased density the Water Corporation is likely to undertake these as required.
Gas	Gradual increase unlikely to trigger developer funded upgrades. Not an essential service
Communications	No constraints determined.
Stormwater	New development to retain 1 in 100 year stormwater event on site i.e. no contribution to existing roads drainage system.
Roads and Traffic	Road upgrades are proposed which will improve traffic capacities of key intersections.

Appendix 3 – Part 1 Traffic Assessment - High Level Traffic Assessment Memorandum

MEMORANDUM

TO: David Hellmuth (Director, JDSi Engineers)

CC: David Vinicombe (Executive Manager Planning and Development, Town of Claremont)

FROM: Tanya Moran (Director, GTA Consultants Traffic and Transport Engineering)

DATE: 31/5/17

OUR REF: W128890

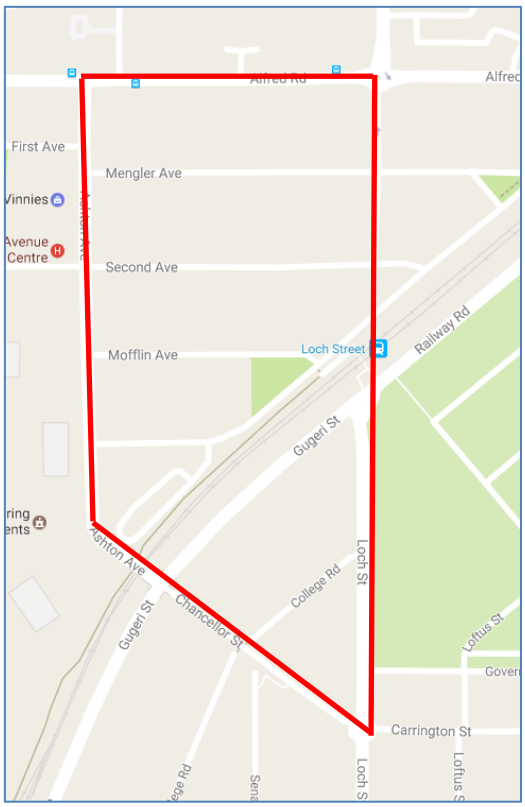
PAGE 1 OF 9 (Appendices pages 10-37)

RE: **Loch Street Structure Plan Precinct – High Level Traffic Assessment**

Dear David,

This Memorandum has been prepared to assist JDSi Engineers and the Town of Claremont, determine the high-level traffic impacts of the proposed Loch Street Structure Plan on the immediate road network. The study area is illustrated in the Figure 1 below.

Figure 1: Study Area, Loch Street, Claremont



This memo documents all available road network traffic data collated to date and presents a theoretical road network capacity assessment (mid-block capacities) with recommendations for further analysis.

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Existing Conditions Data

Daily traffic flows in the study area were collated by the Town of Claremont over a seven-day period within each of the past four years (2013 – 2017) for the roads in the study area. A copy of these road link traffic flows representing Average Weekday Traffic are at **Attachment A**.

GTA also sourced Main Roads WA (MRWA) SCATS data for the signalised intersections of:

- Gugeri Street / Chancellor Street
- Pelican Crossing on Railway Road near Karrakatta Station
- Railway Road / Aberdare Road / Busway.

A copy of these signalised intersection counts are at **Attachment B,** covering a full week from Monday 8th May – Sunday 14th May 2017. It is noted that while this data provides approach volumes on each leg of the signalised intersections, the traffic signals loops at the intersections do not collect turning movement proportions.

MRWA online traffic database was also reviewed for the study area and GTA obtained road link daily volumes for the following locations to further supplement the above data:

- Gugeri Street, just west of Chancellor Street (15 June – 18 June 2016 data)
- Gugeri Street, just west of Loch Street (20 June – 21 June 2016 data)
- Chancellor Street, south of Gugeri Street (17 June – 20 June 2016 data)
- Ashton Avenue, North of Gugeri Street (15 June to 18 June 2016 data).

This data is provided at **Attachment C**.

Summary of Existing Conditions

A summary of the collated traffic data is provided in Table 1.

Table 1: Loch Street Precinct – Summary of Existing Road Link Traffic Data & Capacity (mid-block only)

Road Name (speed)	Count Location	Original Intended Function (source: MRWA Road Info Mapping)	Theoretical Capacity (based on MRWA)	Existing Traffic Volumes (daily, two-way)	Existing Road Profile (assumed theoretical capacity based on road profile [a])	GTA Comment (current capacity based on constructed lanes)
North Precinct						
Ashton Avenue (50km/hr)	north of the bridge	District Distributor A	35,000vpd	9,500vpd	20m; NC function with 2-lanes, median (7,000vpd)	Exceeding daily volume capacity
Ashton Avenue (50km/hr)	approaching Alfred Road	District Distributor A	35,000vpd	7,300vpd	20m; NC function with 2-lanes (7,000vpd)	At or reaching daily volume capacity
Alfred Road (60km/hr)	west of Ashton Avenue	District Distributor A	35,000vpd	6,900vpd	19.4m; NC function with 2-lanes, median (7,000vpd)	At or reaching daily volume capacity
Judge Avenue (50km/hr)	East of Ashton Avenue	Local Distributor	3,000vpd	under 2,000vpd	20m with 2-lanes (3,000vpd)	Has remaining daily capacity
Stubbs Terrace (50km/hr)	West of Mofflin Ave	Local Distributor	3,000vpd	under 2,000vpd	22m with 2-lanes (3,000vpd)	Has remaining daily capacity
South Precinct						
Gugeri Street (60km/h)	West of Chancellor Street	District Distributor A	35,000vpd	25,300vpd	22m with 4-lanes (25,000vpd)	At or reaching daily volume capacity

Road Name (speed)	Count Location	Original Intended Function (source: MRWA Road Info Mapping)	Theoretical Capacity (based on MRWA)	Existing Traffic Volumes (daily, two-way)	Existing Road Profile (assumed theoretical capacity based on road profile [a])	GTA Comment (current capacity based on constructed lanes)
Chancellor Street (50km/hr)	South of Ashton Avenue bridge	District Distributor A	35,000vpd	8,500vpd	19.4m with 2-lanes (3,000vpd)	Exceeding daily volume capacity
Loch Street (50km/hr)	between Gugeri Street and Chancellor Street	Access Street	3,000vpd	4,500vpd	20m with 2-lanes (3,000vpd)	Exceeding daily volume capacity
Loch Street (50km/hr)	South of Chancellor Street	District Distributor A	35,000vpd	8,500vpd	19.4m with 2-lanes (3,000vpd)	Exceeding daily volume capacity

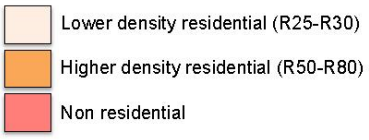
(a) Source: Liveable Neighbourhoods Guidelines, WAPC, January 2009 edition.

All other roads in the precinct are Access Roads carrying generally under 1,000vpd.

Structure Plan Generated Traffic

The Loch Street Structure Plan proposal is depicted in Figure 2. It consists of higher density residential apartments proposed in the triangle precinct (south of Gugeri Street and west of Loch Street) and some commercial land uses and apartments (to the north of Gugeri Street and west of Ashton Avenue). The area south of Alfred Road is generally single dwelling residential which is mostly already developed.

Figure 2: Loch Street SP proposed Building Envelope Precincts and Building Heights



(Source: Town of Claremont, by Mackay Urban Design, May 2017)

The vehicle trip generation rates adopted in this assessment are based on the *WAPC Transport Assessment Guidelines, 2016* and *RMS Guide to Traffic Generating Developments, 2002* and the

GTA Consultants' Trip Generation Database which is an ongoing collaboration of parking and traffic survey data for a wide range of land uses in capital cities around Australia collected between July 1989 and May 2017.

Adopted traffic generation rates are shown in Table 2.

Table 2: Adopted Trip Generation Rates

Proposed Land Use	Assumed lots	Daily Trip Generation Rate	Daily Trips (VPD)
Sub precincts 1 and 2	200 dwellings	8 trips per lot per day	1,600
Sub precincts 3 to 8	1,238 apartments (a)	3 trips per apartment (c)	3,714
Commercial	12,765 sq.m NLA (b) (assume 95% office and 5% shops)	10 trips per 100sq.m GFA (for 12,125sq.m Office)	1,212
		55.5 trips per 100sq.m GFA (for 640sq.m speciality shops)	355
Total			**6,881**

(a) Summary based on Built Form (provided by Town of Claremont, email dated 17/5/17) which provides for the maximum multiple dwelling scenario.

(b) For this high-level assessment, GTA has assumed NLA = GFA.

(c) This rate has been based on both the GTA Database for apartments near rail stations and on the RTA Guidelines recorded peak hour rates. It is expected that Town of Claremont will be supportive of Transited Orientated Development (TOD) design principles and look to encourage alternative transport modes and discourage over supply of parking in the Loch Street SP area.

On the basis of the above, some 6,900vpd are expected to be generated as a result of the Loch Street SP land uses. However, based on the information provided by the Town of Claremont it appears that yields within Sub-precincts 1 & 2 will not greatly increase as no apartments are proposed. Therefore, the **'new' trips** likely to be generated to the road network as a result of the SP are in the order of 6,900 – 1,600 = **5,300vpd**.

Structure Plan Distributed Traffic

Distribution of the SP generated traffic to the external precincts have been based on actual traffic volume proportions at the Chancellor Street / Ashton Avenue intersection as this intersection is central to the SP area. These are typically:

- North-west via Alfred Road = 10%
- North-east via Alfred Road = 5%
- West via Gugeri Street = 32%
- East via Gugeri Street = 33%
- South via Chancellor Street and Loch Street = 20%

On the above basis, a high-level traffic distribution exercise was undertaken (refer **Attachment D**) to allocate new SP traffic to the study area road network. Table 3 provides a summary of the existing volumes in comparison to the estimated traffic volumes distributed post structure plan implementation.

Table 3: Structure Plan Distributed Traffic

Road	Count Location	Existing Traffic Volumes (Daily, two-way)	GTA Comment (current mid-block daily capacity based on constructed lanes)	New SP Trips (daily, two-way)	New Traffic Volumes with SP developed (no background growth)	% change (+)	GTA Comment
Ashton Avenue (50km/hr)	north of the bridge	9,500vpd	Exceeding daily volume capacity	+2,820vpd	12,320vpd	30%	**Intersection analysis at Ashton Ave/Chancellor Rd/Gugeri St recommended.** (Note: MRWA parallel investigations).
Ashton Avenue (50km/hr)	approaching Alfred Road	7,300vpd	At or Reaching capacity	+682vpd	7,990vpd	9%	**Intersection analysis at Alfred Rd/Ashton Ave recommended.**
Alfred Road (60km/hr)	west of Ashton Avenue	6,900vpd	At or Reaching capacity	+528vpd	7,430vpd	8%	Ok - Daily capacity only slightly exceeded (7,000vpd to 7,430vpd). **Intersection analysis at Alfred Rd/Ashton Ave recommended.**
Judge Avenue (50km/hr)	East of Ashton Avenue	under 2,000vpd	Has capacity	Nil (assumed all traffic will use Alfred Rd)	2,000vpd	-	Ok.
Stubbs Terrace (50km/hr)	West of Mofflin Ave	under 2,000vpd	Has capacity	Nil (assumed all traffic will use Alfred Rd)	2,000vpd	-	Ok.
Gugeri Street (60km/h)	West of Chancellor Street	25,300vpd	At or Reaching capacity	+1,697vpd	27,000vpd	7%	**Intersection analysis at Ashton Ave/Chancellor Rd/Gugeri St recommended.** (Note: MRWA parallel investigations).

Road	Count Location	Existing Traffic Volumes (Daily, two-way)	GTA Comment (current mid-block daily capacity based on constructed lanes)	New SP Trips (daily, two-way)	New Traffic Volumes with SP developed (no background growth)	% change (+)	GTA Comment
Gugeri Street (60km/h)	East of Chancellor Street	14,385vpd	Has Capacity	+1,946vpd	16,330vpd	13%	Ok. **Intersection analysis at Gugeri St/Loch St recommended.** (Note: ToC's parallel investigations).
Chancellor Street (50km/hr)	South of Ashton Avenue bridge	8,500vpd	exceeding capacity	+600vpd	9,100vpd	7%	**Intersection analysis at Ashton Ave/Chancellor Rd/Gugeri St recommended.** (Note: MRWA parallel investigations).
Loch Street (50km/hr)	between Gugeri Street and Chancellor Street	4,500vpd	exceeding capacity	+840vpd	5,340vpd	19%	**Intersection analysis at Gugeri St/Loch St recommended.** (Note: ToC's parallel investigations).
Loch Street (50km/hr)	South of Chancellor Street	8,500vpd	exceeding capacity	+1,042vpd	9,540vpd	12%	**Intersection analysis at Chancellor St/Loch St recommended.**

Peak Hour Analysis

The above high level assessment considers daily traffic volumes only. Often, in urban areas of mixed land uses daily traffic volumes do not always illustrate the peak hour capacity of intersections. Just because a road exceeds its daily traffic volume does not necessarily means its intersections are congested in the peak periods. At this stage, the Town of Claremont has indicated that it is not necessary to do a peak hour analysis of any intersections since the following intersection improvements are currently under design for construction and are expected to greatly improve the intersection operations:

- Ashton Avenue Bridge - additional lane to enable a dedicated right turn lane and a shared through/left-turn lane (southbound approach to Gugeri Street) as part of a National Black Spot Project by Main Roads WA. For construction June 2017.
- Ashton Avenue / Gugeri Street intersection – full right turn green phase from Gugeri Street into Chancellor Street, which is then filtered during other times.
- Loch Street / Gugeri Street intersection - a dedicated right turn pocket on Gugeri Street eastbound into Loch Street southbound.
- A new pelican crossing on Railway Parade just east of the Loch Street Station.
- An investigation to a potential roundabout (or alternative upgrade) to Ashton Avenue and Alfred Road intersection, in association with the City of Nedlands, has already commenced.
- The 2008 constructed Karakatta underpass which is approximately 1.2km east of Loch Street has already alleviated some traffic demands at Ashton Avenue across the railway line. The proposal for a full restriction of right turn from Gugeri Street into Ashton Avenue north during peak times is under discussion.

It is recommended that these upgraded intersection layouts continue to be monitored by the Town of Claremont post implementation. Intersection operational analysis should be undertaken in the future to determine the operation and future life of the intersections with the SP demands.

Summary

This memorandum documents all road network traffic data collated to date around the Loch Street Structure Plan precinct. It documents the existing theoretical mid-block capacities on the key roads. The traffic generation of the proposed Loch Street Structure Plan is then applied to the road network to determine the high-level traffic impacts.

This traffic analysis has shown that key roads in the study area are already at the limit of their daily capacities based on the constructed road profile (not the Main Roads WA intended function). On this basis, peak hour intersection modelling (LINSIG or SIDRA) for the Structure Plan should be undertaken in the future to confirm the life of the intersections (including those with proposed intersection upgrades as noted in this memorandum) and to identify any other potential bottlenecks.

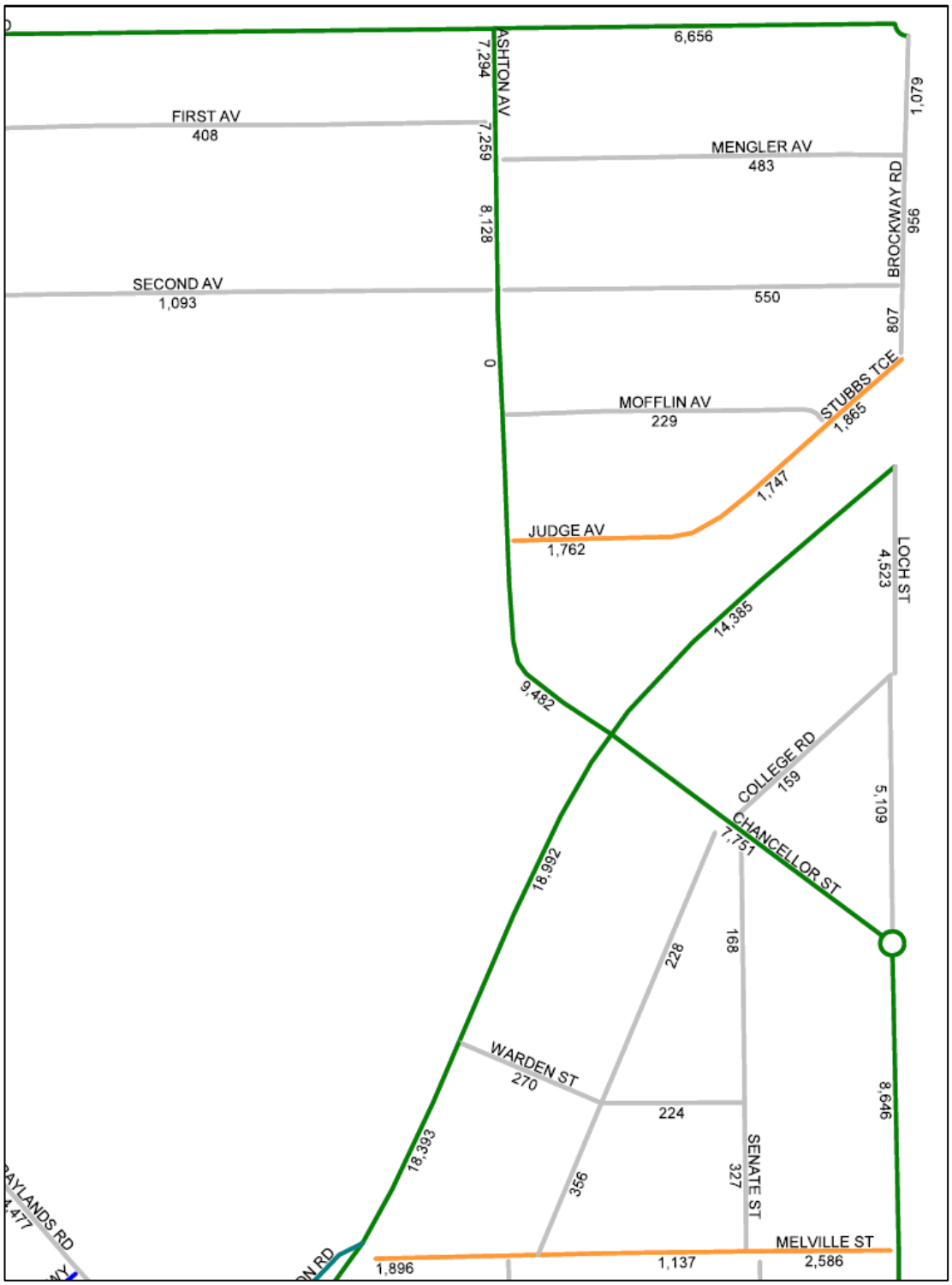
The results show the highest increase in traffic is expected on Ashton Avenue approaching the bridge at an additional +30% from 9,500vpd to 12,300vpd. It is recommended that the Main Roads WA future upgraded intersection of Ashton Avenue/Chancellor Road/Gugeri Street be monitored by the Town of Claremont and intersection operational analysis be undertaken under the Structure Plan traffic demands.

Gugeri Street (east of Chancellor Street), and Loch Street are both expected to experience between 12% - 19% increase in traffic (refer Table 3). It is recommended that the Gugeri Street/Loch Street future upgraded intersection, the Chancellor Street/Loch Street intersection and the Ashton

Avenue/Alfred Road intersection be monitored by the Town of Claremont and intersection operational analysis undertaken under the Structure Plan traffic demands.

Investment into intersection improvements are currently occurring at key intersections in the Loch Street Structure Plan area and these will assist in improving the operational capacities of the intersections. It is recommended these intersections are monitored going forward and further analysis undertaken on an as needed basis at the discretion of the Town of Claremont.

Attachment A:
Town of Claremont's Average Weekday Traffic (2013 – 2017 data)



Attachment B:
SCATS data (May 2017)

Monday 8 May 2017

	Approach	1	1	2	3	4	5	6	7	8	9	
1:00	Approach	1	11	23	23	3	6	12	12	2	1	93
2:00	Approach	1	4	9	9	5	4	4	5	0	0	40
3:00	Approach	1	2	8	8	2	3	8	1	0	0	32
4:00	Approach	1	7	8	8	1	1	3	3	1	1	33
5:00	Approach	1	15	21	21	2	3	9	9	0	0	80
6:00	Approach	1	46	80	80	16	12	62	44	2	2	344
7:00	Approach	1	163	238	238	24	21	204	89	7	6	990
8:00	Approach	1	529	389	389	50	70	548	298	11	12	2296
9:00	Approach	1	719	412	412	82	93	521	310	15	17	2581
10:00	Approach	1	423	329	329	73	105	436	212	17	22	1946
11:00	Approach	1	309	267	267	62	100	356	213	6	8	1588
12:00	Approach	1	380	334	334	79	98	362	203	10	11	1811
13:00	Approach	1	356	369	369	73	117	424	247	8	9	1972
14:00	Approach	1	330	292	292	89	102	398	234	12	14	1763
15:00	Approach	1	314	282	282	103	152	400	262	12	17	1824
16:00	Approach	1	499	380	380	136	168	423	342	14	16	2358
17:00	Approach	1	410	335	335	147	186	455	335	13	15	2231
18:00	Approach	1	400	300	300	147	179	543	423	6	10	2308
19:00	Approach	1	246	209	209	99	125	334	226	12	16	1476
20:00	Approach	1	134	162	162	88	75	209	105	6	6	947
21:00	Approach	1	83	119	119	66	55	134	75	4	6	661
22:00	Approach	1	57	86	86	65	64	142	61	3	5	569
23:00	Approach	1	36	60	60	37	16	58	43	0	0	310
24:00:00	Approach	1	12	34	34	12	22	20	15	0	1	150

AM Peak	2637	7:40	8:40	PM Peak	2358	15:00	16:00	Daily Total	28403

Tuesday 9 May 2017

	Approach	1	1	2	3	4	5	6	7	8	9	
1:00	Approach	1	9	16	16	4	3	8	4	1	1	62
2:00	Approach	1	2	3	3	1	1	6	3	0	0	19
3:00	Approach	1	3	8	8	2	2	3	3	0	0	29
4:00	Approach	1	3	5	5	0	0	3	1	0	0	17
5:00	Approach	1	5	21	21	1	4	8	11	0	0	71
6:00	Approach	1	46	85	85	12	11	60	46	2	2	349
7:00	Approach	1	155	207	207	28	25	235	99	5	5	966
8:00	Approach	1	558	391	391	61	75	520	298	9	10	2313
9:00	Approach	1	772	430	430	78	115	552	322	13	15	2727
10:00	Approach	1	533	383	383	81	100	529	251	15	24	2299
11:00	Approach	1	362	338	338	91	148	403	201	10	17	1908
12:00	Approach	1	351	297	297	85	111	409	223	9	11	1793
13:00	Approach	1	360	347	347	78	119	433	220	8	8	1920
14:00	Approach	1	328	295	295	87	122	403	217	12	14	1773
15:00	Approach	1	342	285	285	118	153	408	274	9	11	1885
16:00	Approach	1	479	352	352	118	180	489	375	18	19	2382
17:00	Approach	1	461	341	341	137	194	491	340	10	14	2329
18:00	Approach	1	451	317	317	127	184	579	475	8	10	2468

19:00	Approach	1	274	254	254	102	131	345	275	7	9	1651
20:00	Approach	1	168	177	177	62	67	214	140	5	6	1016
21:00	Approach	1	112	135	135	46	61	160	104	4	4	761
22:00	Approach	1	71	90	90	42	40	96	76	3	4	512
23:00	Approach	1	75	203	203	25	26	67	32	1	1	633
24:00:00	Approach	1	21	73	73	11	7	26	16	0	1	228

	AM Peak	2766	7:35	8:35	PM Peak	2133	16:55	17:55	Daily Total	30111

Wednesday 10 May 2017

	Approach	1	1	2	3	4	5	6	7	8	9	
1:00	Approach	1	6	18	18	10	5	8	5	1	1	72
2:00	Approach	1	4	5	5	2	5	5	4	0	0	30
3:00	Approach	1	2	7	7	4	0	1	3	2	3	29
4:00	Approach	1	4	8	8	1	1	2	1	1	3	29
5:00	Approach	1	11	21	21	3	3	6	11	0	0	76
6:00	Approach	1	45	66	66	11	18	73	40	3	3	325
7:00	Approach	1	167	236	236	23	19	242	94	7	6	1030
8:00	Approach	1	543	377	377	62	75	539	312	15	16	2316
9:00	Approach	1	798	422	422	84	110	548	314	16	21	2735
10:00	Approach	1	524	372	372	73	102	489	175	12	19	2138
11:00	Approach	1	369	285	285	75	113	414	235	6	12	1794
12:00	Approach	1	355	314	314	86	125	416	267	9	10	1896
13:00	Approach	1	510	364	364	85	140	453	258	10	11	2195
14:00	Approach	1	366	288	288	82	133	411	255	8	11	1842
15:00	Approach	1	359	311	311	99	153	412	252	8	10	1915
16:00	Approach	1	434	323	323	113	151	406	320	18	16	2104
17:00	Approach	1	448	340	340	157	213	488	377	10	13	2386
18:00	Approach	1	463	336	336	122	168	561	449	9	13	2457
19:00	Approach	1	299	286	286	101	145	394	282	9	11	1813
20:00	Approach	1	152	192	192	79	95	193	114	7	8	1032
21:00	Approach	1	123	157	157	51	68	159	102	3	4	824
22:00	Approach	1	92	114	114	57	48	149	83	4	5	666
23:00	Approach	1	47	91	91	23	19	77	52	0	0	400
24:00:00	Approach	1	23	60	60	12	5	35	32	0	1	228

	AM Peak	2762	7:35	8:35	PM Peak	2494	4:55	5:55	Daily Total	30332

Thursday 11 May 2017

	Approach	1	1	2	3	4	5	6	7	8	9	
1:00	Approach	1	12	18	18	5	11	12	9	3	3	91
2:00	Approach	1	6	8	8	1	2	8	5	0	0	38
3:00	Approach	1	4	8	8	1	3	5	8	1	1	39
4:00	Approach	1	4	9	9	4	0	3	2	0	0	31
5:00	Approach	1	4	14	14	3	4	8	9	0	0	56
6:00	Approach	1	46	60	60	9	9	53	36	2	2	277
7:00	Approach	1	180	226	226	22	18	216	107	6	6	1007
8:00	Approach	1	552	398	398	54	63	532	282	11	13	2303
9:00	Approach	1	772	425	425	71	112	520	322	12	17	2676
10:00	Approach	1	522	362	362	76	122	479	252	11	15	2201

11:00	Approach	1	355	314	314	81	113	348	245	6	9	1785
12:00	Approach	1	386	284	284	88	121	393	258	7	9	1830
13:00	Approach	1	422	308	308	81	149	431	243	9	12	1963
14:00	Approach	1	385	317	317	80	126	387	247	8	9	1876
15:00	Approach	1	345	283	283	106	155	386	317	13	16	1904
16:00	Approach	1	459	372	372	116	173	429	372	17	16	2326
17:00	Approach	1	480	353	353	119	200	443	367	9	15	2339
18:00	Approach	1	447	314	314	135	192	577	483	9	11	2482
19:00	Approach	1	356	327	327	90	119	431	309	11	14	1984
20:00	Approach	1	208	192	192	60	79	225	140	6	7	1109
21:00	Approach	1	141	186	186	52	61	159	103	3	3	894
22:00	Approach	1	120	124	124	47	49	157	99	5	5	730
23:00	Approach	1	51	82	82	30	25	79	57	2	2	410
24:00:00	Approach	1	24	57	57	9	13	31	22	0	1	214

	AM Peak	2707	7:45	8:45	PM Peak	2500	4:50	5:50	Daily Total	30565

Friday 12 May 2017

	Approach	1	1	2	3	4	5	6	7	8	9	
1:00	Approach	1	16	26	26	6	9	24	17	3	3	130
2:00	Approach	1	9	16	16	1	1	4	10	2	2	61
3:00	Approach	1	4	6	6	3	3	12	5	1	1	41
4:00	Approach	1	3	9	9	0	2	4	3	1	1	32
5:00	Approach	1	7	8	8	6	4	12	10	0	0	55
6:00	Approach	1	45	56	56	9	18	59	52	3	3	301
7:00	Approach	1	181	227	227	27	17	217	107	6	7	1016
8:00	Approach	1	509	372	372	60	68	515	322	14	16	2248
9:00	Approach	1	728	397	397	68	108	583	340	16	21	2658
10:00	Approach	1	442	351	351	64	117	468	256	10	14	2073
11:00	Approach	1	429	310	310	76	129	416	232	10	10	1922
12:00	Approach	1	411	351	351	91	127	446	276	10	12	2075
13:00	Approach	1	472	367	367	88	154	452	263	9	16	2188
14:00	Approach	1	454	326	326	98	137	425	270	9	11	2056
15:00	Approach	1	379	317	317	106	163	428	336	11	18	2075
16:00	Approach	1	523	366	366	141	201	465	365	17	17	2461
17:00	Approach	1	544	359	359	143	189	484	347	11	13	2449
18:00	Approach	1	556	351	351	139	188	463	365	9	10	2432
19:00	Approach	1	280	247	247	100	111	367	233	9	11	1605
20:00	Approach	1	128	168	168	44	66	190	109	7	5	885
21:00	Approach	1	103	127	127	50	60	185	119	3	4	778
22:00	Approach	1	95	111	111	55	54	354	237	5	6	1028
23:00	Approach	1	107	114	114	29	35	114	102	0	0	615
24:00:00	Approach	1	36	83	83	16	14	62	58	2	2	356

	AM Peak	2674	7:55	8:55	PM Peak	2519	16:45	17:45	Daily Total	31540

Saturday 13 May 2017

	Approach	1	1	2	3	4	5	6	7	8	9	
1:00	Approach	1	31	45	45	6	13	33	42	1	1	217
2:00	Approach	1	7	24	24	1	5	16	15	0	0	92

3:00	Approach	1	9	18	18	7	4	5	10	0	0	71
4:00	Approach	1	3	14	14	0	1	5	8	0	0	45
5:00	Approach	1	7	16	16	4	3	10	9	4	6	75
6:00	Approach	1	22	34	34	7	9	31	31	2	4	174
7:00	Approach	1	60	81	81	15	15	77	55	5	5	394
8:00	Approach	1	135	158	158	56	56	174	102	3	1	843
9:00	Approach	1	275	237	237	76	87	272	191	6	5	1386
10:00	Approach	1	364	291	291	80	108	352	256	4	3	1749
11:00	Approach	1	454	371	371	68	112	440	266	3	5	2090
12:00	Approach	1	491	406	406	80	113	465	278	3	3	2245
13:00	Approach	1	491	388	388	85	140	511	317	3	3	2326
14:00	Approach	1	444	318	318	74	118	445	265	2	3	1987
15:00	Approach	1	394	304	304	78	119	436	276	3	3	1917
16:00	Approach	1	383	323	323	74	102	366	255	4	5	1835
17:00	Approach	1	402	329	329	77	89	322	204	2	2	1756
18:00	Approach	1	345	320	320	65	93	310	177	2	2	1634
19:00	Approach	1	205	226	226	60	71	228	125	3	5	1149
20:00	Approach	1	126	146	146	39	51	155	100	1	2	766
21:00	Approach	1	71	110	110	29	49	117	61	0	0	547
22:00	Approach	1	74	87	87	30	39	108	52	0	0	477
23:00	Approach	1	75	91	91	23	33	88	62	0	0	463
24:00:00	Approach	1	62	85	85	13	22	53	39	1	1	361
			AM Peak	2245	11:00	12:00		PM Peak	2326	12:00	13:00	Daily Total 24599

Sunday 14 May 2017

	Approach	1	1	2	3	4	5	6	7	8	9	
1:00	Approach	1	24	42	42	10	16	36	36	1	1	208
2:00	Approach	1	23	29	29	2	7	18	23	0	0	131
3:00	Approach	1	4	28	28	0	3	13	7	0	0	83
4:00	Approach	1	6	14	14	0	2	7	11	0	0	54
5:00	Approach	1	8	18	18	2	1	10	10	0	0	67
6:00	Approach	1	11	19	19	5	4	16	14	0	0	88
7:00	Approach	1	30	49	49	8	6	52	41	1	1	237
8:00	Approach	1	82	117	117	28	30	110	59	1	3	547
9:00	Approach	1	152	204	204	44	35	211	112	4	4	970
10:00	Approach	1	293	270	270	55	80	328	166	5	4	1471
11:00	Approach	1	359	330	330	65	96	403	230	4	3	1820
12:00	Approach	1	457	378	378	62	126	462	281	6	5	2155
13:00	Approach	1	447	403	403	65	102	439	265	4	5	2133
14:00	Approach	1	362	358	358	63	105	378	213	5	5	1847
15:00	Approach	1	338	384	384	80	100	373	192	4	4	1859
16:00	Approach	1	363	330	330	79	101	349	196	12	10	1770
17:00	Approach	1	271	263	263	62	85	261	152	3	4	1364
18:00	Approach	1	251	286	286	72	82	238	131	2	4	1352
19:00	Approach	1	139	147	147	49	54	161	102	2	3	804
20:00	Approach	1	79	93	93	33	27	111	76	4	4	520
21:00	Approach	1	73	105	105	37	40	108	54	1	1	524
22:00	Approach	1	38	68	68	26	25	71	37	0	0	333
23:00	Approach	1	33	52	52	8	15	34	25	5	5	229

24:00:00	Approach	1	16	29	29	8	16	24	15	0	0	137

	AM Peak	2155	11:00	12:00	PM Peak	2133	12:00	13:00	Daily Total	20703

Monday 8 May 2017

	Approach	1	1	2	3	4	
1:00	Approach	1	13	11	23	10	57
2:00	Approach	1	7	6	10	3	26
3:00	Approach	1	5	6	8	0	19
4:00	Approach	1	7	8	4	3	22
5:00	Approach	1	15	12	19	9	55
6:00	Approach	1	49	41	66	46	202
7:00	Approach	1	179	106	197	86	568
8:00	Approach	1	463	212	425	203	1303
9:00	Approach	1	644	276	465	227	1612
10:00	Approach	1	429	218	387	190	1224
11:00	Approach	1	309	238	353	210	1110
12:00	Approach	1	344	255	374	224	1197
13:00	Approach	1	331	271	402	216	1220
14:00	Approach	1	360	207	403	228	1198
15:00	Approach	1	359	197	429	223	1208
16:00	Approach	1	487	229	527	276	1519
17:00	Approach	1	452	202	487	256	1397
18:00	Approach	1	496	222	583	307	1608
19:00	Approach	1	274	148	381	180	983
20:00	Approach	1	163	84	210	87	544
21:00	Approach	1	106	52	138	57	353
22:00	Approach	1	79	33	114	58	284
23:00	Approach	1	43	26	66	36	171
24:00:00	Approach	1	12	12	23	13	60

	AM Peak	1672	7:45	8:45	PM Peak	1619	5:05	6:05	Daily Total	17940

Tuesday 9 May 2017

	Approach	1	1	2	3	4	
1:00	Approach	1	12	14	6	3	35
2:00	Approach	1	4	2	2	3	11
3:00	Approach	1	2	2	3	3	10
4:00	Approach	1	1	5	7	4	17
5:00	Approach	1	5	10	15	12	42
6:00	Approach	1	55	39	60	47	201
7:00	Approach	1	162	87	188	120	557
8:00	Approach	1	480	247	417	216	1360
9:00	Approach	1	608	327	486	216	1637
10:00	Approach	1	411	270	443	206	1330
11:00	Approach	1	344	262	340	186	1132
12:00	Approach	1	345	223	421	202	1191
13:00	Approach	1	343	284	410	205	1242
14:00	Approach	1	324	250	390	197	1161
15:00	Approach	1	393	236	453	231	1313
16:00	Approach	1	491	215	552	299	1557
17:00	Approach	1	499	237	505	242	1483
18:00	Approach	1	551	249	644	290	1734

19:00	Approach	1	324	158	437	178	1097					
20:00	Approach	1	197	87	242	99	625					
21:00	Approach	1	124	63	180	96	463					
22:00	Approach	1	75	40	114	56	285					
23:00	Approach	1	54	39	85	27	205					
24:00:00	Approach	1	22	11	29	13	75					
	AM Peak		1645	7:50	8:50		PM Peak	1734	5:00	6:00	Daily Total	18763
Wednesday 10 May 2017												
	Approach	1	1	2	3	4						
1:00	Approach	1	11	11	6	8	36					
2:00	Approach	1	3	4	3	6	16					
3:00	Approach	1	1	3	4	1	9					
4:00	Approach	1	4	4	6	2	16					
5:00	Approach	1	13	6	16	16	51					
6:00	Approach	1	65	30	74	50	219					
7:00	Approach	1	164	111	182	103	560					
8:00	Approach	1	483	229	454	206	1372					
9:00	Approach	1	645	305	465	232	1647					
10:00	Approach	1	478	249	381	205	1313					
11:00	Approach	1	419	217	407	258	1301					
12:00	Approach	1	371	221	434	240	1266					
13:00	Approach	1	458	251	427	269	1405					
14:00	Approach	1	381	202	423	265	1271					
15:00	Approach	1	421	192	476	213	1302					
16:00	Approach	1	439	226	496	252	1413					
17:00	Approach	1	512	208	541	286	1547					
18:00	Approach	1	574	244	604	306	1728					
19:00	Approach	1	364	189	484	224	1261					
20:00	Approach	1	200	92	238	96	626					
21:00	Approach	1	144	94	194	86	518					
22:00	Approach	1	114	79	158	79	430					
23:00	Approach	1	62	36	92	41	231					
24:00:00	Approach	1	21	28	52	30	131					
	AM Peak		1703	7:35	8:35		PM Peak	1742	5:10	6:10	Daily Total	19669
Thursday 11 May 2017												
	Approach	1	1	2	3	4						
1:00	Approach	1	16	18	17	13	64					
2:00	Approach	1	5	5	7	5	22					
3:00	Approach	1	4	6	5	7	22					
4:00	Approach	1	4	6	5	4	19					
5:00	Approach	1	7	7	19	10	43					
6:00	Approach	1	50	28	68	46	192					
7:00	Approach	1	187	103	205	113	608					
8:00	Approach	1	514	237	445	214	1410					
9:00	Approach	1	606	317	469	217	1609					
10:00	Approach	1	463	268	416	235	1382					

11:00	Approach	1	375	205	400	209	1189
12:00	Approach	1	394	204	452	244	1294
13:00	Approach	1	403	253	427	232	1315
14:00	Approach	1	398	259	407	226	1290
15:00	Approach	1	427	202	540	244	1413
16:00	Approach	1	525	247	528	287	1587
17:00	Approach	1	536	229	551	289	1605
18:00	Approach	1	557	233	647	321	1758
19:00	Approach	1	386	193	459	225	1263
20:00	Approach	1	228	123	284	126	761
21:00	Approach	1	176	123	195	100	594
22:00	Approach	1	155	86	204	84	529
23:00	Approach	1	72	52	120	50	294
24:00:00	Approach	1	30	32	52	27	141

	AM Peak	1680	7:45	8:45	PM Peak	1761	4:55	5:55	Daily Total	20404	

Friday 12 May 2017

	Approach	1	1	2	3	4	
1:00	Approach	1	22	21	31	21	95
2:00	Approach	1	15	14	16	11	56
3:00	Approach	1	6	6	11	4	27
4:00	Approach	1	0	4	8	2	14
5:00	Approach	1	3	7	19	8	37
6:00	Approach	1	50	29	62	50	191
7:00	Approach	1	193	95	194	110	592
8:00	Approach	1	481	223	424	205	1333
9:00	Approach	1	581	291	506	249	1627
10:00	Approach	1	437	206	376	217	1236
11:00	Approach	1	449	234	437	232	1352
12:00	Approach	1	482	283	480	297	1542
13:00	Approach	1	485	282	492	283	1542
14:00	Approach	1	446	246	483	255	1430
15:00	Approach	1	402	230	488	309	1429
16:00	Approach	1	562	270	542	273	1647
17:00	Approach	1	610	299	534	271	1714
18:00	Approach	1	604	316	540	252	1712
19:00	Approach	1	277	148	386	182	993
20:00	Approach	1	153	82	201	92	528
21:00	Approach	1	117	63	194	82	456
22:00	Approach	1	108	67	342	190	707
23:00	Approach	1	110	70	124	77	381
24:00:00	Approach	1	38	40	77	44	199

	AM Peak	1675	7:50	8:50	PM Peak	1772	4:50	5:50	Daily Total	20840	

Saturday 13 May 2017

	Approach	1	1	2	3	4	
1:00	Approach	1	33	29	42	41	145
2:00	Approach	1	9	14	19	16	58

3:00	Approach	1	9	11	11	7	38					
4:00	Approach	1	3	8	8	11	30					
5:00	Approach	1	7	5	11	10	33					
6:00	Approach	1	28	17	30	20	95					
7:00	Approach	1	65	40	95	64	264					
8:00	Approach	1	199	72	175	101	547					
9:00	Approach	1	337	138	337	184	996					
10:00	Approach	1	426	201	455	271	1353					
11:00	Approach	1	539	272	498	286	1595					
12:00	Approach	1	535	291	506	288	1620					
13:00	Approach	1	538	275	526	296	1635					
14:00	Approach	1	501	275	455	277	1508					
15:00	Approach	1	450	257	524	307	1538					
16:00	Approach	1	461	282	460	239	1442					
17:00	Approach	1	509	238	372	189	1308					
18:00	Approach	1	367	237	317	153	1074					
19:00	Approach	1	211	114	236	111	672					
20:00	Approach	1	139	76	164	77	456					
21:00	Approach	1	92	44	119	49	304					
22:00	Approach	1	80	50	103	32	265					
23:00	Approach	1	80	60	104	46	290					
24:00:00	Approach	1	69	52	72	32	225					
		AM Peak	1657	10:20	11:20	PM Peak	1669	12:20	1:20	Daily Total	17491	

Sunday 14 May 2017

	Approach	1	1	2	3	4	
1:00	Approach	1	24	15	48	36	123
2:00	Approach	1	15	13	25	21	74
3:00	Approach	1	4	14	12	6	36
4:00	Approach	1	5	7	5	9	26
5:00	Approach	1	7	8	9	12	36
6:00	Approach	1	11	13	17	11	52
7:00	Approach	1	30	27	56	36	149
8:00	Approach	1	111	60	108	51	330
9:00	Approach	1	184	122	213	112	631
10:00	Approach	1	315	223	351	191	1080
11:00	Approach	1	397	295	335	232	1259
12:00	Approach	1	501	346	434	320	1601
13:00	Approach	1	474	345	396	312	1527
14:00	Approach	1	404	330	352	245	1331
15:00	Approach	1	438	307	363	217	1325
16:00	Approach	1	413	289	323	209	1234
17:00	Approach	1	316	222	256	138	932
18:00	Approach	1	285	189	239	112	825
19:00	Approach	1	144	89	173	66	472
20:00	Approach	1	87	52	124	52	315
21:00	Approach	1	85	50	104	45	284
22:00	Approach	1	58	36	63	36	193
23:00	Approach	1	40	35	40	19	134

24:00:00	Approach	1	14	17	30	18	79					
		AM Peak	1601	11:00	12:00		PM Peak	1531	12:05	13:05	Daily Total	14048

Monday 8 May 2017

	Approach	1	1	2	3	4	5	6	
1:00	Approach	1	11	15	9	21	9	5	70
2:00	Approach	1	9	5	2	8	3	4	31
3:00	Approach	1	7	7	1	5	1	4	25
4:00	Approach	1	5	7	3	3	2	5	25
5:00	Approach	1	18	15	8	17	7	10	75
6:00	Approach	1	60	36	30	46	38	60	270
7:00	Approach	1	170	119	83	124	84	150	730
8:00	Approach	1	493	196	145	281	147	434	1696
9:00	Approach	1	634	218	232	336	109	506	2035
10:00	Approach	1	384	186	189	247	108	349	1463
11:00	Approach	1	343	173	180	273	123	304	1396
12:00	Approach	1	374	177	221	300	118	291	1481
13:00	Approach	1	382	183	209	325	138	265	1502
14:00	Approach	1	347	183	180	311	139	216	1376
15:00	Approach	1	351	176	215	344	149	278	1513
16:00	Approach	1	513	188	323	449	147	345	1965
17:00	Approach	1	496	157	406	406	143	338	1946
18:00	Approach	1	548	146	404	453	216	270	2037
19:00	Approach	1	256	157	200	292	139	221	1265
20:00	Approach	1	151	93	119	158	63	128	712
21:00	Approach	1	88	67	89	87	53	76	460
22:00	Approach	1	61	47	64	84	46	70	372
23:00	Approach	1	34	38	41	37	30	31	211
24:00:00	Approach	1	14	16	18	19	10	16	93

	AM Peak	2129	7:40	8:40	PM Peak	2079	4:50	5:50	Daily Total 22749

Tuesday 9 May 2017

	Approach	1	1	2	3	4	5	6	
1:00	Approach	1	11	12	10	6	2	9	50
2:00	Approach	1	6	1	4	2	3	2	18
3:00	Approach	1	1	4	1	1	3	3	13
4:00	Approach	1	3	5	2	4	4	2	20
5:00	Approach	1	8	7	7	8	12	15	57
6:00	Approach	1	65	39	40	34	38	60	276
7:00	Approach	1	152	94	74	130	99	165	714
8:00	Approach	1	526	198	130	261	130	475	1720
9:00	Approach	1	645	273	240	294	137	517	2106
10:00	Approach	1	452	212	160	328	130	375	1657
11:00	Approach	1	355	202	188	260	124	298	1427
12:00	Approach	1	359	162	212	301	137	247	1418
13:00	Approach	1	406	191	232	304	137	266	1536
14:00	Approach	1	385	173	204	297	146	256	1461
15:00	Approach	1	399	192	288	337	147	292	1655
16:00	Approach	1	536	162	365	452	170	339	2024
17:00	Approach	1	558	155	439	410	145	324	2031
18:00	Approach	1	599	181	434	498	165	311	2188

19:00	Approach	1	369	136	280	334	157	247	1523				
20:00	Approach	1	179	108	118	151	92	150	798				
21:00	Approach	1	108	91	105	132	81	104	621				
22:00	Approach	1	69	44	56	79	50	62	360				
23:00	Approach	1	42	48	29	65	22	48	254				
24:00:00	Approach	1	23	14	22	17	14	18	108				
	AM Peak		2116	7:40	8:40	PM Peak		2229	4:50	5:50	Daily Total	24035	
Wednesday 10 May 2017													
	Approach	1	1	2	3	4	5	6					
1:00	Approach	1	10	13	12	5	7	2	49				
2:00	Approach	1	4	2	6	1	6	2	21				
3:00	Approach	1	0	3	3	1	2	0	9				
4:00	Approach	1	3	4	3	6	2	1	19				
5:00	Approach	1	16	9	7	15	12	20	79				
6:00	Approach	1	66	38	44	43	44	54	289				
7:00	Approach	1	171	109	96	118	82	153	729				
8:00	Approach	1	541	190	141	302	154	468	1796				
9:00	Approach	1	654	246	222	310	142	548	2122				
10:00	Approach	1	449	220	192	266	112	359	1598				
11:00	Approach	1	389	182	173	301	150	312	1507				
12:00	Approach	1	398	181	194	314	171	307	1565				
13:00	Approach	1	443	194	209	348	189	305	1688				
14:00	Approach	1	367	178	184	325	164	230	1448				
15:00	Approach	1	399	174	248	376	141	301	1639				
16:00	Approach	1	471	174	316	397	153	338	1849				
17:00	Approach	1	519	134	383	470	169	320	1995				
18:00	Approach	1	596	179	404	492	182	313	2166				
19:00	Approach	1	356	159	288	345	160	266	1574				
20:00	Approach	1	172	118	121	158	81	154	804				
21:00	Approach	1	127	119	103	132	78	83	642				
22:00	Approach	1	104	87	94	109	65	72	531				
23:00	Approach	1	49	43	47	66	37	57	299				
24:00:00	Approach	1	20	30	29	48	26	13	166				
	AM Peak		2161	7:35	8:35	PM Peak		2174	4:55	5:55	Daily Total	24584	
Thursday 11 May 2017													
	Approach	1	1	2	3	4	5	6					
12:00 - 1:0	Approach	1	15	20	13	15	13	10	86				
2:00	Approach	1	7	6	7	4	4	4	32				
3:00	Approach	1	1	6	1	2	6	3	19				
4:00	Approach	1	5	8	2	4	5	1	25				
5:00	Approach	1	10	8	3	15	10	14	60				
6:00	Approach	1	51	32	35	37	43	61	259				
7:00	Approach	1	181	109	68	140	101	164	763				
8:00	Approach	1	556	189	148	295	126	454	1768				
9:00	Approach	1	657	263	233	333	130	515	2131				
10:00	Approach	1	464	212	167	308	120	392	1663				

11:00	Approach	1	365	172	183	293	119	287	1419			
12:00	Approach	1	390	160	206	369	134	287	1546			
13:00	Approach	1	406	204	228	318	154	273	1583			
14:00	Approach	1	385	219	182	307	125	249	1467			
15:00	Approach	1	431	170	268	379	160	316	1724			
16:00	Approach	1	570	168	362	475	137	348	2060			
17:00	Approach	1	534	167	421	467	133	330	2052			
18:00	Approach	1	580	118	437	573	159	340	2207			
19:00	Approach	1	414	191	288	368	170	266	1697			
20:00	Approach	1	220	148	124	196	103	146	937			
21:00	Approach	1	169	152	81	149	93	116	760			
22:00	Approach	1	150	110	89	142	73	84	648			
23:00	Approach	1	72	58	47	92	51	53	373			
24:00:00	Approach	1	26	35	27	45	22	16	171			
	AM Peak		2157	7:45	8:45	PM Peak		2234	5:05	6:05	Daily Total	25450
Friday 12 May 2017												
	Approach	1	1	2	3	4	5	6				
1:00	Approach	1	19	29	14	27	17	13	119			
2:00	Approach	1	16	19	5	13	11	14	78			
3:00	Approach	1	10	8	4	7	3	1	33			
4:00	Approach	1	1	4	2	6	2	6	21			
5:00	Approach	1	5	10	4	9	9	9	46			
6:00	Approach	1	50	34	42	48	38	54	266			
7:00	Approach	1	175	125	77	125	88	157	747			
8:00	Approach	1	486	219	140	272	148	450	1715			
9:00	Approach	1	634	235	229	337	147	506	2088			
10:00	Approach	1	440	178	199	276	134	425	1652			
11:00	Approach	1	449	187	183	335	124	311	1589			
12:00	Approach	1	470	205	229	390	123	298	1715			
13:00	Approach	1	465	220	236	374	153	275	1723			
14:00	Approach	1	422	204	209	368	165	257	1625			
15:00	Approach	1	468	169	256	436	156	305	1790			
16:00	Approach	1	586	195	349	461	135	358	2084			
17:00	Approach	1	630	213	356	466	125	342	2132			
18:00	Approach	1	580	261	367	375	157	287	2027			
19:00	Approach	1	302	147	205	301	141	246	1342			
20:00	Approach	1	125	112	97	135	84	134	687			
21:00	Approach	1	99	72	81	132	73	84	541			
22:00	Approach	1	95	78	74	272	147	107	773			
23:00	Approach	1	91	84	51	78	63	47	414			
24:00:00	Approach	1	40	44	36	58	37	32	247			
	AM Peak		2147	7:45	8:45	PM Peak		2168	3:50	4:50	Daily Total	25454
Saturday 13 May 2017												
	Approach	1	1	2	3	4	5	6				
1:00	Approach	1	28	41	22	33	33	19	176			
2:00	Approach	1	11	14	9	18	13	12	77			

3:00	Approach	1	8	13	6	8	5	8	48
4:00	Approach	1	6	6	6	9	10	6	43
5:00	Approach	1	7	7	5	9	10	6	44
6:00	Approach	1	18	23	22	22	19	30	134
7:00	Approach	1	53	46	40	68	69	58	334
8:00	Approach	1	145	100	124	127	82	141	719
9:00	Approach	1	291	136	219	234	123	322	1325
10:00	Approach	1	440	161	233	354	181	394	1763
11:00	Approach	1	521	168	323	415	148	414	1989
12:00	Approach	1	564	157	308	428	165	373	1995
13:00	Approach	1	580	153	287	456	145	426	2047
14:00	Approach	1	525	163	215	412	130	360	1805
15:00	Approach	1	422	189	258	380	172	399	1820
16:00	Approach	1	412	209	217	389	154	285	1666
17:00	Approach	1	433	211	237	293	118	245	1537
18:00	Approach	1	430	222	205	223	107	288	1475
19:00	Approach	1	202	120	153	158	86	215	934
20:00	Approach	1	106	105	88	117	68	115	599
21:00	Approach	1	80	62	63	81	40	75	401
22:00	Approach	1	64	57	67	72	25	54	339
23:00	Approach	1	62	79	64	78	38	53	374
24:00:00	Approach	1	52	58	43	53	29	30	265

	AM Peak	2037	10:10	11:10	PM Peak	2085	12:00	13:00	Daily Total 21909

Sunday 14 May 2017

	Approach	1	1	2	3	4	5	6	
1:00	Approach	1	18	24	26	36	27	20	151
2:00	Approach	1	11	17	13	16	21	20	98
3:00	Approach	1	9	13	6	12	5	6	51
4:00	Approach	1	5	10	7	5	7	4	38
5:00	Approach	1	11	8	5	6	14	6	50
6:00	Approach	1	10	13	3	15	12	12	65
7:00	Approach	1	24	35	17	38	38	35	187
8:00	Approach	1	86	56	75	69	53	100	439
9:00	Approach	1	122	91	92	122	84	187	698
10:00	Approach	1	216	137	151	223	116	260	1103
11:00	Approach	1	277	163	202	239	135	230	1246
12:00	Approach	1	357	196	239	366	168	298	1624
13:00	Approach	1	409	146	232	399	152	327	1665
14:00	Approach	1	319	208	162	294	140	227	1350
15:00	Approach	1	367	206	177	288	124	255	1417
16:00	Approach	1	329	170	229	286	124	242	1380
17:00	Approach	1	264	177	146	186	105	189	1067
18:00	Approach	1	260	174	160	169	85	214	1062
19:00	Approach	1	117	111	110	127	61	166	692
20:00	Approach	1	86	60	75	90	37	75	423
21:00	Approach	1	81	57	77	68	39	66	388
22:00	Approach	1	51	45	43	54	36	53	282
23:00	Approach	1	39	33	22	35	16	28	173

24:00:00	Approach	1	18	15	12	26	14	6	91				
		AM Peak	1624	11:00	12:00		PM Peak	1665	12:00	13:00		Daily Total	15740

Attachment C:
MRWA Traffic Count Data (2016)

SITE 0794

Volume by Hour

20 Jun 2016 to 21 Jun 2016

Gugeri St (1150001)
West of Loch St (SLK 1.67)

Count: Classification Counts

Average Vehicle Volume

Both Directions

Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon - Fri	Mon - Sun
0000	49	38						44	
0100	32	18						25	
0200	23	10						17	
0300	13	11						12	
0400	61	45						53	
0500	157	140						149	
0600	424	414						419	
0700	1069	1119						1094	
0800	1330	1279						1305	
0900	831	918						875	
1000	859	903						881	
1100	930	921						926	
1200	957	1011						984	
1300	881	968						925	
1400	991	1026						1009	
1500	1143	1258						1201	
1600	1128	1185						1157	
1700	1297	1352						1325	
1800	779	883						831	
1900	418	474						446	
2000	309	352						331	
2100	243	273						258	
2200	111	130						121	
2300	51	64						58	
Total	14086	14792						14446	

Peak Statistics

		Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon - Fri	Mon - Sun
AM	1/4 Hour	0815	0745						0815	
	1/4 Hr Vol	364	351						358	
	1 Hour	0730	0745						0745	
	1 Hr Vol	1369	1366						1365	
	1 Hr Fact	.9402	.9729						.9545	
PM	1/4 Hour	1530	1730						1530	
	1/4 Hr Vol	345	353						349	
	1 Hour	1645	1700						1700	
	1 Hr Vol	1307	1352						1325	
	1 Hr Fact	.9582	.9575						.9588	

✈ = Public Holiday

✍ = School Holiday

SITE 0794

Volume by Hour

20 Jun 2016 to 21 Jun 2016

Gugeri St (1150001)
West of Loch St (SLK 1.67)

Count: Classification Counts

Average Vehicle Volume

Directional

Hour	Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun	
	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W
0000	25	24	18	20											22	22		
0100	11	21	7	11											9	16		
0200	12	11	4	6											8	9		
0300	7	6	3	8											5	7		
0400	23	38	18	27											21	33		
0500	66	91	62	78											64	85		
0600	204	220	219	195											212	208		
0700	633	436	657	462											645	449		
0800	816	514	776	503											796	509		
0900	468	363	511	407											490	385		
1000	459	400	438	465											449	433		
1100	431	499	447	474											439	487		
1200	431	526	511	500											471	513		
1300	390	491	461	507											426	499		
1400	479	512	496	530											488	521		
1500	583	560	577	681											580	621		
1600	501	627	539	646											520	637		
1700	588	709	607	745											598	727		
1800	304	475	385	498											345	487		
1900	204	214	204	270											204	242		
2000	153	156	155	197											154	177		
2100	101	142	97	176											99	159		
2200	58	53	62	68											60	61		
2300	20	31	29	35											25	33		
Total	6967	7119	7283	7509											7130	7320		

Peak Statistics

		Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun	
		E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W
AM	1/4 Hour	0815	0800	0830	0745											0815	0745		
	1/4 Hr Vol	225	153	219	162											222	157		
	1 Hour	0800	0730	0745	0745											0745	0730		
	1 Hr Vol	816	574	809	557											804	565		
	1 Hr Fact	.9067	.9379	.9235	.8596											.9074	.8997		
PM	1/4 Hour	1530	1700	1530	1715											1530	1715		
	1/4 Hr Vol	184	197	174	192											179	193		
	1 Hour	1700	1645	1645	1700											1645	1700		
	1 Hr Vol	588	720	624	745											606	727		
	1 Hr Fact	.9545	.9137	.9231	.9701											.9381	.9417		

✈ = Public Holiday

✍ = School Holiday

SITE 0835

Volume by Hour

17 Jun 2016 to 20 Jun 2016

Chancellor St (1150015)
South of Gugeri St (SLK 0.14)

Count: Classification Counts

Average Vehicle Volume

Both Directions

Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon - Fri	Mon - Sun
0000	17				34	54	51	26	39
0100	10				14	29	23	12	19
0200	5				10	13	13	8	10
0300	8				7	7	12	8	9
0400	20				18	14	10	19	16
0500	72				83	57	13	78	56
0600	184				210	77	33	197	126
0700	512				547	281	118	530	365
0800	718				776	508	260	747	566
0900	502				547	599	379	525	507
1000	424				472	630	503	448	507
1100	443				524	650	557	484	544
1200	433				538	632	553	486	539
1300	404				489	594	527	447	504
1400	484				523	565	488	504	515
1500	661				654	543	447	658	576
1600	654				629	547	403	642	558
1700	627				644	560	401	636	558
1800	369				513	426	317	441	406
1900	240				328	259	178	284	251
2000	146				200	170	132	173	162
2100	134				169	150	103	152	139
2200	73				150	132	58	112	103
2300	36				98	105	29	67	67
Total	7176				8177	7602	5608	7684	7142

Peak Statistics

		Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon - Fri	Mon - Sun
AM	1/4 Hour	0815				0830	0945	1130	0815	0845
	1/4 Hr Vol	194				213	183	164	190	150
	1 Hour	0800				0800	0930	1115	0800	0800
	1 Hr Vol	718				776	673	592	747	566
	1 Hr Fact	.9253				.9108	.9194	.9024	.9829	.9465
PM	1/4 Hour	1630				1545	1215	1200	1615	1530
	1/4 Hr Vol	192				169	168	148	174	147
	1 Hour	1545				1530	1200	1200	1545	1500
	1 Hr Vol	676				657	632	553	659	576
	1 Hr Fact	.8802				.9719	.9405	.9341	.9496	.9796

✈ = Public Holiday

✍ = School Holiday

SITE 0835

Volume by Hour

17 Jun 2016 to 20 Jun 2016

Chancellor St (1150015)
South of Gugeri St (SLK 0.14)

Count: Classification Counts

Average Vehicle Volume

Directional

Hour	Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun	
	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
0000	12	5							20	14	35	19	26	25	16	10	23	16
0100	6	4							11	3	20	9	11	12	9	4	12	7
0200	1	4							5	5	6	7	7	6	3	5	5	6
0300	5	3							3	4	4	3	7	5	4	4	5	4
0400	9	11							4	14	6	8	3	7	7	13	6	10
0500	28	44							33	50	22	35	9	4	31	47	23	33
0600	63	121							73	137	35	42	13	20	68	129	46	80
0700	151	361							154	393	136	145	50	68	153	377	123	242
0800	224	494							225	551	206	302	121	139	225	523	194	372
0900	195	307							232	315	309	290	189	190	214	311	231	276
1000	214	210							236	236	316	314	268	235	225	223	259	249
1100	207	236							254	270	315	335	276	281	231	253	263	281
1200	216	217							295	243	278	354	242	311	256	230	258	281
1300	183	221							251	238	249	345	217	310	217	230	225	279
1400	278	206							299	224	233	332	210	278	289	215	255	260
1500	340	321							325	329	263	280	227	220	333	325	289	288
1600	410	244							370	259	266	281	190	213	390	252	309	249
1700	404	223							368	276	214	346	188	213	386	250	294	265
1800	200	169							235	278	176	250	140	177	218	224	188	219
1900	131	109							158	170	116	143	93	85	145	140	125	127
2000	75	71							110	90	76	94	72	60	93	81	83	79
2100	70	64							93	76	74	76	46	57	82	70	71	68
2200	43	30							76	74	69	63	31	27	60	52	55	49
2300	22	14							50	48	58	47	20	9	36	31	38	30
Total	3487	3689							3880	4297	3482	4120	2656	2952	3691	3999	3380	3770

Peak Statistics

		Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun	
		N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
AM	1/4 Hour	1045	0815							1145	0830	0945	0845	1130	1130	1145	0830	1045	0830
	1/4 Hr Vol	68	138							70	158	97	94	76	88	63	134	69	98
	1 Hour	1030	0800							1145	0800	0930	1130	1115	1130	1145	0800	1045	0800
	1 Hr Vol	225	494							304	551	345	362	287	311	262	523	266	372
	1 Hr Fact	.8272	.8949							.8636	.8718	.8892	.9427	.9441	.8835	.8733	.9757	.9708	.9514
PM	1/4 Hour	1630	1530							1615	1530	1400	1700	1200	1300	1630	1530	1615	1530
	1/4 Hr Vol	126	100							98	94	77	106	73	92	112	97	83	82
	1 Hour	1615	1500							1615	1500	1200	1230	1200	1230	1615	1500	1545	1230
	1 Hr Vol	434	321							373	329	278	365	242	336	404	325	318	292
	1 Hr Fact	.8611	.8025							.9515	.875	.9521	.9125	.8288	.913	.9058	.8376	.9607	.9542

✈ = Public Holiday

✍ = School Holiday

SITE 0671

Volume by Hour

15 Jun 2016 to 18 Jun 2016

Gugeri St (1150001)
West of Chancellor St (SLK 1.21)

Count: Classification Counts

Average Vehicle Volume

Both Directions

Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon - Fri	Mon - Sun
0000			33	50	80	145		54	
0100			19	24	51	69		31	
0200			15	19	46	44		27	
0300			23	24	24	27		24	
0400			64	58	48	38		57	
0500			191	182	203	82		192	
0600			617	565	512	274		565	
0700			1457	1433	1405	581		1432	
0800			1642	1682	1596	970		1640	
0900			1244	1189	1263	1251		1232	
1000			1154	1194	1280	1575		1209	
1100			1290	1226	1389	1619		1302	
1200			1312	1378	1529	1767		1406	
1300			1168	1237	1419	1882		1275	
1400			1311	1356	1507	1785		1391	
1500			1535	1629	1631	1427		1598	
1600			1514	1578	1555	1380		1549	
1700			1750	1753	1616	1726		1706	
1800			1220	1285	1168	1000		1224	
1900			698	820	643	545		720	
2000			490	624	412	361		509	
2100			424	505	434	346		454	
2200			235	289	328	339		284	
2300			85	138	230	257		151	
Total			19491	20238	20369	19490		20032	

Peak Statistics

		Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon - Fri	Mon - Sun
AM	1/4 Hour			0800	0800	0745	1130		0745	
	1/4 Hr Vol			458	455	435	426		447	
	1 Hour			0745	0745	0730	1145		0745	
	1 Hr Vol			1725	1734	1665	1712		1707	
	1 Hr Fact			.9416	.9527	.9569	.9145		.9554	
PM	1/4 Hour			1715	1715	1445	1330		1715	
	1/4 Hr Vol			477	453	424	511		451	
	1 Hour			1700	1645	1645	1315		1700	
	1 Hr Vol			1750	1765	1645	1914		1706	
	1 Hr Fact			.9172	.9741	.9722	.9364		.9457	

✈ = Public Holiday

✍ = School Holiday

SITE 0671

Volume by Hour

15 Jun 2016 to 18 Jun 2016

Gugeri St (1150001)
West of Chancellor St (SLK 1.21)

Count: Classification Counts

Average Vehicle Volume

Directional

Hour	Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun	
	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W
0000					14	19	24	26	46	34	82	63			28	26		
0100					10	9	15	9	25	26	29	40			17	15		
0200					8	7	8	11	26	20	14	30			14	13		
0300					13	10	11	13	13	11	11	16			12	11		
0400					32	32	28	30	23	25	17	21			28	29		
0500					88	103	88	94	95	108	32	50			90	102		
0600					336	281	291	274	268	244	129	145			298	266		
0700					888	569	839	594	821	584	288	293			849	582		
0800					992	650	1037	645	903	693	494	476			977	663		
0900					647	597	645	544	643	620	575	676			645	587		
1000					607	547	607	587	682	598	752	823			632	577		
1100					656	634	620	606	691	698	813	806			656	646		
1200					648	664	702	676	732	797	885	882			694	712		
1300					581	587	576	661	730	689	1077	805			629	646		
1400					623	688	634	722	723	784	982	803			660	731		
1500					817	718	841	788	806	825	795	632			821	777		
1600					702	812	799	779	774	781	755	625			758	791		
1700					825	925	814	939	786	830	865	861			808	898		
1800					559	661	594	691	576	592	473	527			576	648		
1900					329	369	417	403	336	307	283	262			361	360		
2000					257	233	314	310	214	198	176	185			262	247		
2100					182	242	271	234	257	177	171	175			237	218		
2200					104	131	136	153	167	161	160	179			136	148		
2300					39	46	73	65	103	127	135	122			72	79		
Total					9957	9534	10384	9854	10440	9929	9993	9497			10260	9772		

Peak Statistics

		Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun	
		E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W
AM	1/4 Hour					0830	0800	0800	0745	0815	0800	1130	1015			0830	0800		
	1/4 Hr Vol					271	199	271	191	245	210	211	219			258	198		
	1 Hour					0745	0730	0745	0730	0730	1145	1145	1115			0745	1145		
	1 Hr Vol					1032	701	1060	693	947	794	862	865			1011	710		
	1 Hr Fact					.952	.8807	.9779	.9071	.9663	.8901	.917	.9485			.9809	.9458		
PM	1/4 Hour					1715	1745	1530	1715	1600	1730	1330	1730			1530	1715		
	1/4 Hr Vol					239	241	239	259	221	226	307	304			225	239		
	1 Hour					1700	1700	1530	1645	1515	1645	1315	1715			1530	1700		
	1 Hr Vol					825	925	870	946	829	851	1135	911			826	898		
	1 Hr Fact					.863	.9595	.91	.9131	.9378	.9414	.9243	.7492			.9178	.9393		

✈ = Public Holiday

✍ = School Holiday

SITE 0030

Volume by Hour

15 Jun 2016 to 18 Jun 2016

Ashton Av (1150006)
North of Gugeri St (SLK 0.14)

Count: Classification Counts

Average Vehicle Volume

Both Directions

Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon - Fri	Mon - Sun
0000			20	21	46	66		29	
0100			10	15	21	34		15	
0200			4	11	12	16		9	
0300			6	4	8	7		6	
0400			30	25	24	12		26	
0500			105	96	102	56		101	
0600			286	282	252	95		273	
0700			666	639	645	313		650	
0800			862	849	891	598		867	
0900			653	636	650	722		646	
1000			555	552	603	855		570	
1100			593	640	655	881		629	
1200			636	634	704	857		658	
1300			608	548	624	819		593	
1400			702	643	750	791		698	
1500			840	844	819	751		834	
1600			834	881	783	782		833	
1700			790	880	809	736		826	
1800			583	618	599	551		600	
1900			385	377	356	345		373	
2000			205	268	244	244		239	
2100			193	203	205	210		200	
2200			107	105	157	177		123	
2300			45	63	115	130		74	
Total			9718	9834	10074	10048		9872	

Peak Statistics

		Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon - Fri	Mon - Sun
AM	1/4 Hour			0845	0815	0830	1115		0830	
	1/4 Hr Vol			228	225	230	236		220	
	1 Hour			0800	0745	0800	1045		0800	
	1 Hr Vol			862	851	891	903		867	
	1 Hr Fact			.9452	.9456	.9685	.9566		.9837	
PM	1/4 Hour			1630	1700	1445	1245		1700	
	1/4 Hr Vol			226	255	223	221		219	
	1 Hour			1445	1615	1515	1215		1630	
	1 Hr Vol			847	934	842	860		852	
	1 Hr Fact			.9669	.9157	.9612	.9729		.9741	

✈ = Public Holiday

✍ = School Holiday

Volume by Hour

15 Jun 2016 to 18 Jun 2016

Ashton Av (1150006)
North of Gugeri St (SLK 0.14)

Count: Classification Counts

Average Vehicle Volume

Directional

Hour	Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun	
	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
0000					13	7	18	3	27	19	48	18			19	10		
0100					7	3	11	4	18	3	24	10			12	3		
0200					2	2	7	4	7	5	8	8			5	4		
0300					4	2	2	2	6	2	5	2			4	2		
0400					13	17	12	13	8	16	8	4			11	15		
0500					45	60	34	62	41	61	24	32			40	61		
0600					109	177	114	168	93	159	47	48			105	168		
0700					200	466	200	439	196	449	164	149			199	451		
0800					281	581	291	558	295	596	273	325			289	578		
0900					265	388	234	402	286	364	363	359			262	385		
1000					256	299	281	271	294	309	434	421			277	293		
1100					292	301	324	316	328	327	514	367			315	315		
1200					324	312	345	289	368	336	422	435			346	312		
1300					313	295	303	245	340	284	430	389			319	275		
1400					343	359	309	334	402	348	430	361			351	347		
1500					484	356	464	380	450	369	414	337			466	368		
1600					526	308	545	336	491	292	398	384			521	312		
1700					489	301	531	349	507	302	341	395			509	317		
1800					350	233	361	257	306	293	260	291			339	261		
1900					189	196	194	183	195	161	160	185			193	180		
2000					102	103	150	118	143	101	101	143			132	107		
2100					113	80	118	85	122	83	100	110			118	83		
2200					63	44	70	35	87	70	79	98			73	50		
2300					26	19	42	21	65	50	78	52			44	30		
Total					4809	4909	4960	4874	5075	4999	5125	4923			4949	4927		

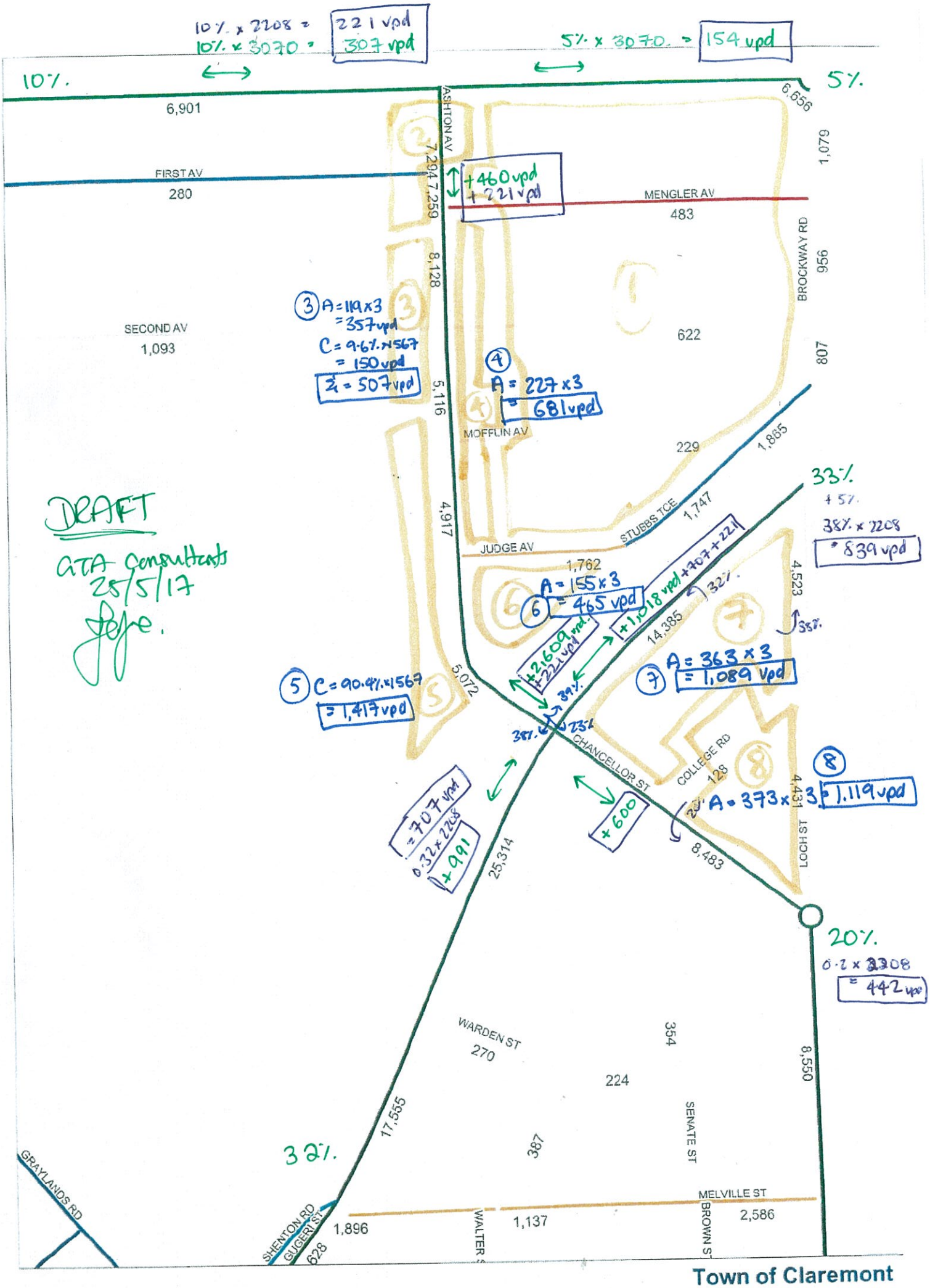
Peak Statistics

		Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun	
		N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
AM	1/4 Hour					0900	0800	1130	0830	0845	0830	1115	1000			1130	0800		
	1/4 Hr Vol					86	164	100	156	87	164	146	115			86	153		
	1 Hour					1145	0800	1130	0745	1145	0745	1045	0945			1130	0745		
	1 Hr Vol					329	581	372	576	366	613	517	426			350	589		
	1 Hr Fact					.9564	.8857	.93	.9231	.8971	.9345	.8853	.9261			.9545	.9603		
PM	1/4 Hour					1630	1445	1630	1700	1730	1530	1600	1715			1630	1445		
	1/4 Hr Vol					150	115	166	109	140	109	122	116			144	102		
	1 Hour					1600	1430	1615	1500	1645	1445	1430	1200			1630	1430		
	1 Hr Vol					526	409	567	380	514	380	437	435			527	380		
	1 Hr Fact					.8767	.8891	.8539	.9314	.9179	.8716	.9338	.9457			.9149	.9314		

✈ = Public Holiday

✍ = School Holiday

Attachment D:
GTA Traffic Distribution and Assignment



Town of Claremont
Loch St Station Traffic Counts

Appendix 3 – Part 2 Traffic Assessment – Supplementary Traffic Assessment

GTAconsultants

Loch Street Structure Plan Precinct Traffic Assessment

Client //	Town of Claremont
Office //	WA
Reference //	W128891
Date //	20/02/2018

Loch Street Structure Plan Precinct

Traffic Assessment

Issue: Final 20/02/2018

Client: Town of Claremont
Reference: W128891
GTA Consultants Office: WA

Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
Final	20/02/18	Final	AQ	TJ	Tim Judd	

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

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Disclaimer

This report, prepared by GTA Consultants, is to undertake a traffic modelling exercise to assess the impact of the proposed Loch Street Structure Plan densification to the immediate road network intersections. The report and analysis on which the outcomes are based have been prepared as per the scope of works prepared by GTA Consultants and approved by the Town of Claremont, including any subsequent agreements.

GTA Consultants has utilised and presumed accurate, information provided by Town of Claremont and/or from other sources in the preparation of this report. GTA Consultants has accepted this information verbatim. If the information is found to be inaccurate or incomplete, then our analysis and reporting conclusions may need to be amended. Likewise, the passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations, and conclusions expressed in this report.

This report has been prepared for the Town of Claremont and was prepared under the provisions of the contract between GTA Consultants and the Town of Claremont. GTA Consultants accepts no liability for any use of this report, analysis and conclusions by anyone other than Town of Claremont.

1. Introduction

1.1 Background and Proposal

GTA Consultants (GTA) has been commissioned by the Town of Claremont (ToC) to undertake a traffic modelling exercise to assess the impact of the proposed Loch Street Structure Plan densification to the immediate road network intersections.

In May 2017, GTA prepared a high-level constraints traffic assessment of the proposed Loch Street Structure Plan on the immediate road network for the purpose of public advertising. Subsequent to this, detailed peak hour intersection modelling was commissioned by ToC to assess the Structure Plan proposal for intersection capacity and efficiency, and to identify any potential traffic movement inadequacies in the future.

The Loch Street Structure Plan area, as shown in Figure 1.1, consists of eight precincts. The plan which was originally provided to GTA in October 2017 proposed residential apartments (zones 7 and 8 south of Gugeri Street and west of Loch Street) and commercial and residential apartments (zones 3, 4, 5, and 6 to the north of Gugeri Street and west of Ashton Avenue). The areas south of Alfred Road and east of Ashton Avenue (zones 1 and 2) are generally single dwelling residential which is mostly already fully developed.

Figure 1.1: Loch Street Structure Plan Proposal

(Source: Town of Claremont, by Mackay Urban Design, May 2017)

1.2 Structure Plan Density Reductions

A reverse engineering exercise was undertaken with ToC to revise the original densities of the Structure Plan area. GTA liaised with the ToC to determine a new set of lot yields within the Structure Plan precincts with the intention to maintain the efficiency and overall performance at the adjacent intersections and not to compromise its adequacy from a capacity point of view. As such, the agreed density reductions were as follows;

- Removing the proposed R80 housing in sub-precincts 6 and 5 entirely.
- Reducing the density in Sub-precincts 4 and 8 to R40.
- Reducing the density in Sub-precincts 3 and 7 to R60 apart from the corner of Gugeri and Loch Streets.
- Removing all the commercial traffic from Sub-precinct 5.

In this context, GTA has utilised the new set of lot yields to undertake a detailed traffic analysis of the operational capacity of key intersections in the vicinity of the Structure Plan area, so as to determine the impact and to test the feasibility of the densification proposal. This report presents the methodology and findings of the traffic modelling exercise of 'base case' and 'future case' scenarios at these key intersections during AM and PM peaks.

1.3 Consultation with ToC

During the preparation of this analysis, a comprehensive consultation exercise was undertaken with ToC to inform the scope and content of this study. GTA liaised with the ToC to discuss the requirements of the project, determine data requirements, and obtain the ToC endorsement for the scope of assessment on the number of intersections to assess, as well as the growth factors to be used for the calculations of the future demand flows.

1.4 References

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

- video and traffic count surveys undertaken by Matrix on Thursday 12 October 2017 between 0700 – 0900 and 1600 – 1800 at the following intersections:
  - Alfred Road / Ashton Avenue priority intersection
  - Alfred Road / Brockway Road roundabout
  - Ashton Avenue / Judge Avenue priority intersection
  - Brockway Road / Stubbs Terrace priority intersection
  - The roundabout on Stubbs Terrace / Nagal Pass
  - Gugeri Street / Ashton Avenue / Chancellor Street traffic signals
  - Gugeri Street / Railway Road / Loch Street priority intersection
  - Gugeri Street Pedestrian Signal Crossing, just east of Loch Street
  - Loch Street / Chancellor Street / Carrington Street roundabout.
- two directional daily link flows were obtained from Main Road WA online traffic database along the roads adjacent to the Structure Plan area
- 2031 ROM24 traffic modelling outputs sourced from Main Road WA (as at October 2017)
- future concept layout plan for Gugeri Street / Ashton Avenue signalised intersection, as provided at Appendix A
- the *WAPC Transport Impact Assessment Guidelines,* August 2016 (WAPC Guidelines)
- traffic count data provided by ToC as referenced in the context of this report

- SCATS data obtained from Main Roads WA online traffic database at the Gugeri Street / Ashton Avenue signalised intersection, and at the Gugeri Street signalised pedestrian crossing to the east of Loch Street
- other documents as referenced in this report.

2. Structure Plan Trip Generation and Distribution

2.1 Trip Generation

The vehicle trip generation rates adopted in this assessment are based on the *WAPC Transport Assessment Guidelines, 2016* and *Trip Generation 7th edition, 2003 - Institute of Transportation Engineers (ITE), Washington, USA*. The adopted trip rates and peak hour traffic generation for each of the Structure Plan sub precincts in addition to the updated set of lot yields within each precinct are shown in Table 2.1.

Table 2.1: Adopted Trip Generation Rates

Sub Precinct	Proposed Land Use (ref: ToC)	Hourly Trip Generation Rate	Source	Total Hourly Trips (veh/hr)	
				AM Peak	PM Peak
Sub precincts 1 and 2	200 dwellings (fully developed)	0.8 trips per hour per dwelling (AM, PM)	WAPC	160	160
Sub precinct 3	43 apartments (61 apartments in the original scheme)	0.51 trips per hour per apartment (AM) 0.62 trips per hour per apartment (PM)	ITE	22	27
	613 sqm GFA Office	2 trips per hour per 100 sqm of GFA (AM, PM)	WAPC	12	12
	612 sqm NLA Shops	1.4 trips per hour per 100 sqm of GFA (AM) 5.6 trips per hour per 100 sqm of GFA (PM)	WAPC/ ITE	9	34
Sub precinct 4	99 apartments (117 apartments in the original scheme)	0.51 trips per hour per apartment (AM) 0.62 trips per hour per apartment (PM)	ITE	49	60
Sub precinct 5	NA (44 apartments in the original scheme)	0.51 trips per hour per apartment (AM) 0.62 trips per hour per apartment (PM)	ITE	-	-
	NA (11,540 sqm GFA Office)	2 trips per hour per 100 sqm of GFA (AM, PM)	WAPC	-	-
Sub precinct 6	NA (80 apartments in the original scheme)	0.51 trips per hour per apartment (AM) 0.62 trips per hour per apartment (PM)	ITE	-	-
Sub precinct 7	153 apartments (187 apartments in the original scheme)	0.51 trips per hour per apartment (AM) 0.62 trips per hour per apartment (PM)	ITE	78	95
Sub precinct 8	163 apartments (192 apartments in the original scheme)	0.51 trips per hour per apartment (AM) 0.62 trips per hour per apartment (PM)	ITE	82	99
Total				**412**	**487**

The above trip generation calculations were based on the following assumptions:

- The land use information outlined in Table 2.1 is based on anticipated Built Form data (spreadsheet provided by ToC, email dated 17/5/17) which provides for a maximum multiple dwelling scenario.
- A reverse engineering exercise was undertaken with ToC to revise and update the land use densities in the Structure Plan area. The aim of this exercise was to ensure that the proposed densification will not compromise the efficiency and overall performance at the adjacent intersections.
- For the purpose of this assessment, GTA has assumed that NLA is equal to GFA providing for a conservative estimate on traffic generation.
- The adopted trip generation rate for shops during the PM peak (5.6 trips per hour per 100sqm of NLA) has been sourced from the ITE Guidelines. The WAPC Guidelines suggest a quarter of that rate during the AM peak, and therefore 1.4 trips per hour per 100sqm of NLA is assumed.
- For the commercial component within sub precinct 3 a 50/50 percentage split has been applied between offices and shops.

2.2 Existing Trips Reductions

Based on the information provided by ToC, the yields within sub precincts 1 and 2 will not greatly increase in the future as no higher density apartments are proposed. As such, the trips from these two precincts have not been included in the 'additional' future traffic totals, as these trips will be already accounted for from the 2017 AM and PM surveys.

It is important to note that relevant trip reductions have also been applied to sub precincts 3, 4, 5, 6, 7 and 8, as the existing traffic demands generated from these existing lots have already been included in the collated 2017 AM and PM surveyed background traffic flows.

On the basis of the above, the **'new trips'** likely to be generated to the road network as a result of the Structure Plan density reductions and removal of existing trips are in the order of **193** trips per hour in the AM peak and **268** trips per hour in the PM peak.

2.3 Trip Distribution and Assignment

Distribution of the Structure Plan generated traffic to the external precincts have been based on actual traffic volume proportions from the October 2017 surveys conducted as part of this study. These are:

- North-west via Alfred Road = 17%
- North-east via Alfred Road = 11%
- West via Gugeri Street = 24%
- East via Gugeri Street = 36%
- South via Chancellor Street and Loch Street = 12%

On the above basis, the total trips calculated in the Trip Generation exercise above were then distributed onto the network using the above distribution proportion in addition to the following assumptions:

- 2021 and 2031 are the future assessment years adopted (as agreed with ToC)
- The Structure Plan traffic is assumed to use the shortest path while being distributed externally
- Zero internal trips are assumed between the assessment zones (allowing for a worst-case scenario for external traffic impacts as a result of the Structure Plan).

3. Traffic Assessment

The following sections set out the approach adopted, the findings and any recommendations.

3.1 Assessment Scenarios

To assess the impact of the proposed Structure Plan on the adjacent intersections, it is appropriate to have consideration to a relevant 'base case' against which to test the proposal impact. It has also been confirmed by ToC that 2017 is the base case and 2021 and 2031 are the forecast assessment years to be adopted in the analysis.

On this basis, and the ToC's confirmation that the ROM forecast data excludes the Loch Street Structure Plan, the following assessment scenarios have been undertaken:

- **Scenario 1** – 'Year 2017' base case – 2017 flows with the existing intersection layouts
- **Scenario 2** – 'Year 2021' interim future scenario – 2021 flows **without** the Structure Plan traffic demands, adopting any already committed geometric intersection upgrades suggested by ToC
- **Scenario 3** – 'Year 2031' future scenario – 2031 flows **without** the Structure Plan traffic demands, adopting any already committed geometric intersection upgrades suggested by ToC
- **Scenario 4** – 'Year 2031' ultimate future scenario – 2031 flows **with** the Structure Plan traffic demands, with mitigation measures as required.

A traffic data collection exercise was undertaken to obtain the 2017 base case flows. Main Roads WA ROM24 traffic modelling demand outputs were obtained and utilised to determine future year traffic demands on the key road links. Further detail on each is provided below.

3.2 Extent of Assessment

The capacity of the following intersections, as agreed with ToC during early consultation, has been considered as part of this traffic assessment:

1. Alfred Road / Ashton Avenue priority intersection
2. Alfred Road / Brockway Road roundabout
3. Ashton Avenue / Judge Avenue priority intersection
4. Brockway Road / Stubbs Terrace priority intersection
5. The roundabout on Stubbs Terrace / Nagal Pass
6. Gugeri Street / Ashton Avenue / Chancellor Street Traffic Signals
7. Gugeri Street / Railway Road / Loch Street priority intersection
8. Gugeri Street Pedestrian Signal Crossing, just east of Loch Street
9. Loch Street / Chancellor Street / Carrington Street roundabout.

During early consultation, ToC provided an upgrade design plan of the Gugeri Street / Ashton Avenue / Chancellor Street signalised intersection, a copy of which is at Appendix A. This design has already been approved and committed for construction. The upgrade layout involves installing a right turn pocket for the right turn movement into Gugeri Street (west), in addition to right turn bans from Chancellor Street into Gugeri Street (east) and from Gugeri Street to Ashton Avenue (north). It was agreed with ToC that this layout would be adopted for the intersection analysis at the year 2017 'Base Case' layout.

Also, for the future year 2021 scenario testing, ToC advised that the Alfred Road / Ashton Avenue priority intersection will include a right turn pocket from Alfred Road (west) into Ashton Avenue (south).

3.3 Assessed Periods

Based on the historical traffic volume data obtained from Main Roads WA online database, and the 2017 Main Roads WA SCATS data, it was determined that the highest daily volumes were typically observed on a Thursday with the morning peak between 0700 – 0900 and the evening peak between 1600 – 1800. In this context, these peak periods were considered within this traffic analysis assessment as the intersection peak periods.

3.4 Traffic Survey

On Thursday 12 October 2017 (first week of the forth school term), peak hour turning count surveys were conducted at the nine intersections. Appendix B shows the detailed results of the peak hour surveys undertaken between 0700 – 0900 and 1600 – 1800, with these flows used as a basis to appraise intersection performance.

It is noted that GTA also referred to the 2017 turning movements sourced from Main Roads WA SCATS data to further confirm the accuracy of the collected survey data during the AM and PM periods at the following locations:

- Gugeri Street / Ashton Avenue / Chancellor Street signalised intersection, and
- Railway Road signalised pedestrian crossing to the east of Loch Street.

Table 3.1 outlines the comparison made at these locations and it indicates a high level of consistency, and therefore accuracy, between the two data sets.

Table 3.1: Survey Data Quality Check

Site	2017 Two Way Hourly SCATS Data (veh/hr)		2017 Two Way Hourly Survey Data (veh/hr)		Difference in AM Peak (veh/hr)	Difference in PM Peak (veh/hr)
	AM	PM	AM	PM		
Gugeri Street (West of Ashton Avenue)	877	671	936	747	+60	+76
Gugeri Street (East (East of Ashton Avenue))	499	735	524	737	+25	+2
Ashton Avenue (North of Gugeri Street)	529	299	518	331	-11	+32
Chancellor Street (South of Gugeri Street)	223	411	246	436	+23	+25
Railway Road (East of Loch Street)	733	966	741	977	+9	+11

3.5 Traffic Growth

As can be seen in Table 3.2, the SCATS data obtained from Main Roads WA online traffic database at the Gugeri Street / Ashton Avenue / Chancellor Street signalised intersection and at the Railway Road signalised pedestrian crossing indicates a 9% AM and PM peak hour percentage of the daily two-way flows.

Table 3.2: Peak Hour Percentage of the Daily Flows

Site	2017 Total Hourly SCATS Data at the intersection (veh/hr)		2017 Daily Flows at the intersection (From SCATS) (vpd)	Peak Hour Percentage (%)	
	AM	PM		AM	PM
Gugeri Street / Ashton Avenue	2,127	2,116	24,542	9%	9%
Gugeri Street signalised pedestrian crossing	1,645	1,674	19,296	9%	9%

These hourly flow percentages were applied to the 2017 two-way hourly flows obtained from the traffic survey to determine the 2017 daily flows.

GTA has undertaken a comprehensive consultation exercise with Main Roads WA to determine the growth factors and the growth percentages to be applied for the agreed future scenarios to be tested (2021 and 2031). Main Road WA provided GTA with the 2016, 2021, and 2031 ROM 24 daily Traffic Volume Diagrams (TVDs), and these ROM 24 outputs were adopted as a basis to determine the growth percentages. To calculate the future traffic volumes, the MRWA recommended methodology to adjust and calibrate the ROM 24 outputs was adopted as follows:

- the actual 2017 video survey counts were adjusted according to the difference between the ROM24 2016 modelled and the actual 2016 ROM24 flows.
- As a result, a new set of adjusted 2017 flows were compared with the 2031 ROM24 flows to calculate the growth percentages.
- These growth percentages were then applied to the actual 2017 video survey counts to forecast the future flows and turning movements to be used in the SIDRA analysis.

This ensures that any differences between the modelled ROM 24 flows and the observed (actual) flows on the field are minimised, which in return confirms that the ultimate modelled volumes for the future analysis years are appropriately adjusted and fit to be used in the SIDRA analysis.

To forecast the future year traffic flows to 2021 and 2031, per annum (compound) growth rates as shown in Table 3.3 below have been applied to the observed 2017 peak hour turning movements.

Table 3.3: Growth Rate Calculations

Location	Annual growth factor (14 years)
Alfred Road	1.1%
Gugeri Street	1.0%
Brockway Road	1.4%
Railway Road	1.0%
Stubbs Terrace*	1.0%
Chancellor Street	4.6%
Ashton Avenue	1.3%
Loch Street	5.3%
Judge Avenue*	1.0%
Carrington Street	1.1%
Nagal Pass	2.2%

*No ROM data is available along Stubbs Terrace and Judge Avenue. During consultation with ToC it was confirmed that growth along this link will be consistent with the anticipated growth on Railway Road, therefore 1.0% is assumed.

It is important to note that growth calculations have accounted for the development generated traffic. As such, any traffic generated from the structure plan as a result of the proposed increased densities was deducted from the 2031 ROM 24 flows to avoid any miscalculations or double counting. It is considered that growth rate estimated outlined in Table 3.3 are reasonable estimates of traffic growth since the ROM data reflects the land use and network assumptions to the year 2021 and 2031 to account for the Perth and Peel @ 3.5million. ROM24 plots are provided at Appendix B.

3.6 Intersection Operation

3.6.1 Methodology

The operation of the key intersections has been assessed using SIDRA Intersection[1] (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 3.4 sets out the thresholds for intersection delays considered to provide an adequate Level of Service (LoS) within the WAPC Guidelines for priority-controlled intersections.

Table 3.4: WAPC Guideline Thresholds for Intersection Adequate 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

SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

- **Degree of Saturation (DoS);** is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for varied traffic flow up to one for saturated flow or capacity.
- **Level of Service (LoS)**; is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of service, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).
- **Average Delay**; is the average of all travel time delays for vehicles through the intersection.
- **95% Queue Length**; is the queue length below which 95% of all observed queue lengths fall.

The SIDRA assessments for the intersections adjacent to the Structure Plan area have been undertaken in 'isolation' and not as a connected network or as a network model. The following sections set out the findings of the SIDRA modelling assessment of the key intersections. The complete set of SIDRA outputs including intersection layouts and movement summary tables are provided at Appendix C. A copy of the .sip files are also provided with this report for the ToC.

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

3.6.2 Alfred Road / Ashton Avenue

The operation of the three-way priority intersection at Alfred Road / Ashton Avenue has been assessed in SIDRA. The results of the 2017 base case 'Scenario 1' assessment indicate that the intersection in its current form is operating acceptably in the 2017 base scenario. During the AM peak hour, analysis results indicate that the right turn movement from Ashton Avenue (south) into Alfred Road (east) is operating with a LOS E and 35 seconds average delay. No issues are noted with the operation of the intersection during the PM Peak period.

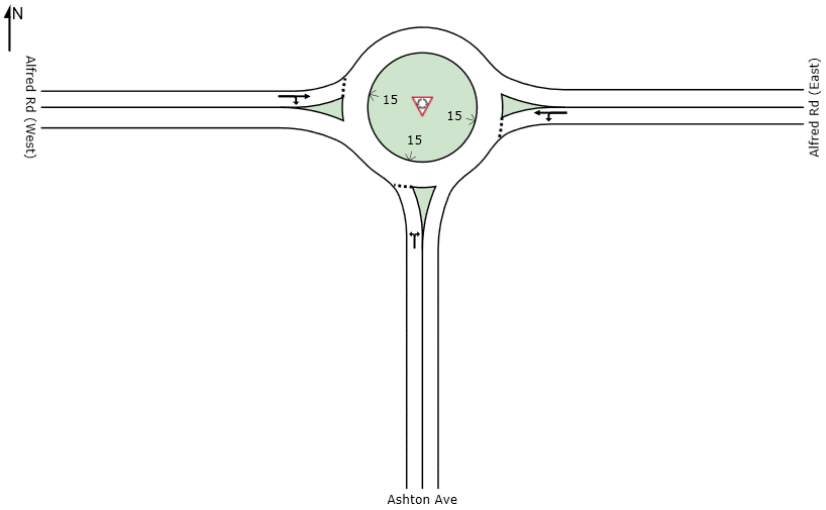
For the future year 2021 scenario testing, the ToC advised that the Alfred Road / Ashton Avenue priority intersection is likely to include a right turn pocket from Alfred Road (west) into Ashton Avenue (south). The 2031 future year without development 'Scenario 3' shows that the performance of the right turn movement from Ashton Avenue (south) into Alfred Road (east) is expected to worsen with an excessive delay of 204 seconds, DoS of 1.018 and a queue length in the order of 47m during the AM peak. This is mainly attributed to the expected increase in the background flows along Ashton Avenue (1.3% growth per annum assumed as outlined in Table 3.3).

A single lane roundabout layout, as shown in Figure 3.1, was tested for the 2031 future year scenarios, and analysis results indicate that the intersection would operate adequately to 2031 (LOS A and B in 2031 AM and PM respectively). Results of the intersection analysis are outlined in Table 3.5.

Table 3.5: SIDRA Results – Alfred Road / Ashton Avenue – Base and Future Scenarios – AM, PM

Assessment Scenario	AM Peak				PM Peak			
	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)
Scenario 1 2017 Base Case	0.620	5.9	51.1 Alfred Road West Approach	NA	0.328	4.9	12.6 Alfred Road West Approach	NA
Scenario 2 2021 Future Case (Without Development)	0.550	4.8	15.0 Ashton Avenue	NA	0.515	5.4	16.6 Ashton Avenue	NA
Scenario 3 2031 Ultimate Future Case (Without Development)	1.108	10.5	47.4 Ashton Avenue	NA	0.881	9.0	37.0 Ashton Avenue	NA
Scenario 4 2031 Ultimate Future Case (With Development and Mitigation Measures	0.760	6.6	86.5 Alfred Road West Approach	A	0.598	6.4	41.8 Alfred Road East Approach	A

Figure 3.1: Alfred Road / Ashton Avenue – Mitigation Future Intersection Layout to 2031



3.6.3 Alfred Road / Brockway Road

The operation of the four-way roundabout at Alfred Road / Brockway Road has been assessed in SIDRA. The results of the assessment indicate that the intersection in its current geometric form is expected to operate acceptably in 2017, 2021 and 2031 and will be able to service the Structure Plan traffic, with no major issues observed in all the tested scenarios. Results of the intersection analysis are outlined in Table 3.6.

Table 3.6: SIDRA Results – Alfred Road / Brockway Road – Base and Future Scenarios – AM, PM

Assessment Scenario	AM Peak				PM Peak			
	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)
Scenario 1 2017 Base Case	0.604	7.6	40.9 Alfred Road West Approach	A	0.354	6.9	17.2 Alfred Road East Approach	A
Scenario 2 2021 Future Case (Without Development)	0.619	7.8	42.7 Alfred Road West Approach	A	0.376	7.0	18.6 Alfred Road East Approach	A
Scenario 3 2031 Ultimate Future Case (Without Development)	0.708	9.4	62.4 Alfred Road West Approach	A	0.443	7.5	23.0 Alfred Road East Approach	A
Scenario 4 2031 Ultimate Future Case (With Development)	0.731	9.7	69.0 Alfred Road West Approach	A	0.449	7.5	23.4 Alfred Road East Approach	A

3.6.4 Ashton Avenue / Judge Avenue

The operation of the three-way priority intersection at Ashton Avenue / Judge Avenue has been assessed in SIDRA. The results of the assessment indicate that the intersection in its current form is operating acceptably in 2017 and would still operate satisfactorily in 2021 and 2031 with the addition of the Structure Plan traffic. No major issues are noted in all the tested scenarios. Results of the intersection analysis are outlined in Table 3.7 below.

Table 3.7: SIDRA Results – Ashton Avenue / Judge Avenue – Base and Future Scenarios – AM, PM

Assessment Scenario	AM Peak				PM Peak			
	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)
Scenario 1 2017 Base Case	0.256	1.5	3.7 Ashton Avenue South Approach	NA	0.202	1.4	3.4 Ashton Avenue South Approach	NA
Scenario 2 2021 Future Case (Without Development)	0.270	1.5	4.0 Ashton Avenue South Approach	NA	0.212	1.4	3.6 Ashton Avenue South Approach	NA
Scenario 3 2031 Ultimate Future Case (Without Development)	0.307	1.6	5.0 Ashton Avenue South Approach	NA	0.242	1.5	4.3 Ashton Avenue South Approach	NA
Scenario 4 2031 Ultimate Future Case (With Development)	0.317	1.6	5.1 Ashton Avenue North Approach	A	0.255	1.7	4.5 Ashton Avenue South Approach	A

3.6.5 Stubbs Terrace / Brockway Road

The operation of the three-way priority intersection at Stubbs Terrace / Brockway Road has been assessed in SIDRA. With the minimal traffic demand carried along Brockway Road and the 1% per annum growth anticipated along Stubbs Terrace to 2031, the results of the assessment indicate that the intersection in its current form is operating acceptably in 2017 and would still operate satisfactorily in 2021 and 2031 and with the addition of the Structure Plan traffic. No major issues are noted in all the tested scenarios. Results of the intersection analysis are outlined in Table 3.8.

Table 3.8: SIDRA Results – Stubbs Terrace / Brockway Road – Base and Future Scenarios – AM, PM

Assessment Scenario	AM Peak				PM Peak			
	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)
Scenario 1 2017 Base Case	0.072	2.3	0.1 Brockway Road North Approach	NA	0.094	2.5	0.1 Stubbs Terrace East Approach	NA
Scenario 2 2021 Future Case (Without Development)	0.075	2.3	0.1 Brockway Road North Approach	NA	0.098	2.5	0.1 Stubbs Terrace East Approach	NA
Scenario 3 2031 Ultimate Future Case (Without Development)	0.083	2.3	0.2 Brockway Road North Approach	NA	0.108	2.5	0.1 Stubbs Terrace East Approach	NA
Scenario 4 2031 Ultimate Future Case (With Development)	0.085	2.3	0.2 Brockway Road North Approach	NA	0.1111	2.5	0.1 Stubbs Terrace East Approach	NA

3.6.6 Stubbs Terrace / Nagal Pass

The operation of the three-way roundabout at Stubbs Terrace / Nagal Pass has been assessed in SIDRA. The results of the 2017 base case 'Scenario 1' and the 2021 and 2031 future years (scenarios 2,3, and 4) indicate that the intersection in its current form is operating acceptably during the 2017 base scenario and would still perform satisfactorily to 2021 and 2031 without the need of any mitigation measures in the short term. Results of the intersection analysis are outlined in Table 3.9.

Table 3.9: SIDRA Results – Stubbs Terrace / Nagal Pass – Base and Future Scenarios – AM, PM

Assessment Scenario	AM Peak				PM Peak			
	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)
Scenario 1 2017 Base Case	0.635	8.6	47.8 Stubbs Terrace West Approach	A	0.485	5.7	31.9 Nagal Pass	A
Scenario 2 2021 Future Case (Without Development)	0.680	9.4	58.0 Stubbs Terrace West Approach	A	0.530	5.8	37.2 Nagal Pass	A
Scenario 3 2031 Ultimate Future Case (Without Development)	0.820	13.1	103.9 Stubbs Terrace West Approach	B	0.660	6.1	57.7 Nagal Pass	A
Scenario 4 2031 Ultimate Case (With Development and Mitigation	0.826	13.3	106.8 Stubbs Terrace West Approach	B	0.675	6.2	59.5 Nagal Pass	A

3.6.7 Gugeri Street / Ashton Avenue / Chancellor Street

The operation of the four-way signalised intersection at Gugeri Street / Ashton Avenue / Chancellor Street has been assessed in SIDRA. The results of the 2017 base case 'Scenario 1' and the 2021 future year 'Scenario 2' indicate that the intersection in its soon to be upgraded form will be operating acceptably during the 2017 base scenario, and would still perform satisfactorily to 2021 without the need of any mitigation measures (LOS B and C during the AM and PM peak periods respectively in year 2021 Scenario 2).

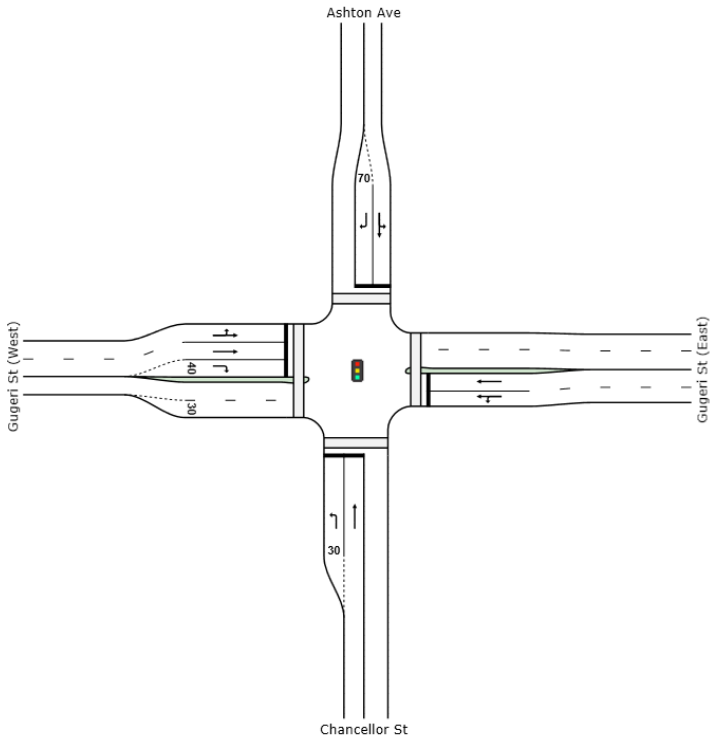
For the future year 2031 without development scenario testing 'Scenario 3', the analysis shows that the DOS, average delay, LOS and 95th percentile queue length results are expected to generally worsen for all movements. The expected deterioration in the intersection performance in the 2031 future year scenario is due to the increase in background traffic demand at the intersection with 1% to 5% per annum growth as per Main Roads WA ROM data applied to the 2017 traffic across the four arms.

An upgraded signalised intersection layout, as shown in Figure 3.2, for 'Scenario 4' was tested, and analysis results indicate that the intersection would operate adequately in 2031 (LOS C during the AM and PM peak periods), with long queue back extending 280m along Chancellor Street, and the right turn movement from Ashton Avenue into Gugeri Street (west) operating at LOS E in the PM peak. Results of the intersection analysis are outlined in Table 3.10, noting that no further widenings could be achieved at the intersection due to space constraints at this location.

Table 3.10: SIDRA Results – Gugeri Street / Ashton Avenue / Chancellor Street – Base and Future Scenarios – AM, PM

Assessment Scenario	AM Peak				PM Peak			
	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)
Scenario 1 2017 Base Case	0.836	18.1	84.2 Gugeri Street East Approach	B	0.825	22.1	146.6 Gugeri Street East Approach	C
Scenario 2 2021 Future Case (Without Development)	0.869	19.2	93.4 Gugeri Street East Approach	B	0.825	22.9	134.7 Gugeri Street East Approach	C
Scenario 3 2031 Ultimate Future Case (Without Development and with Mitigations)	0.921	23.2	114.0 Gugeri Street East Approach	C	0.877	32.2	255.3 Chancellor Street	C
Scenario 4 2031 Ultimate Future Case (With Development and Mitigations)	0.907	23.8	132.2 Gugeri Street East Approach	C	0.893	40.7	284.6 Chancellor Street	C

Figure 3.2: Gugeri Street / Ashton Avenue / Chancellor Street – Mitigated Future Intersection Layout to 2031



3.6.8 Gugeri Street / Railway Road / Loch Street

The operation of the three-way priority intersection at Gugeri Street / Railway Road / Loch Street has been assessed in SIDRA. The results of the 2017 base case 'Scenario 1' assessment indicate that the right turn movement from Loch Street into Railway Road is currently operating at LOS F during the AM and PM peak periods with 95th percentile queues in the order of 550m to 685m and Delays of 1,600 to 1,800 seconds. No major issues are noted however on the east and west approaches during the AM and PM peak periods.

Given the above, for the future years 2021 and 2031 scenarios, performance measures for the right turn movement into Railway Road is expected to further deteriorate (under the current layout), as analysis results indicate a 95th percentile queues exceeding 1km in the AM and PM peak periods along Loch Street in 2031.

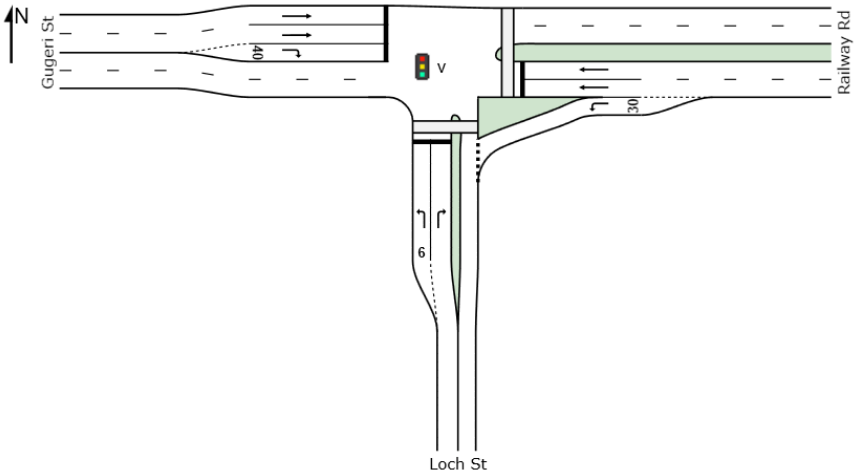
ToC advised that a roundabout layout in this location will be difficult to achieve due to the significant impact on land holdings. On this basis, a signalised intersection layout, as shown in Figure 3.3, was tested for 'Scenario 4', and analysis results indicate that the intersection would operate adequately in 2031 under this layout with 95th percentile queues in the order of 134m extending to the signalised pedestrian crossing to the east of this intersection in 2031 (LOS C in 2031 AM and PM respectively). Results of the intersection analysis are outlined in Table 3.11.

It is noted that the introduction of a signalised intersection at this location could possibly result in the removal of the signalised pedestrian crossing (located 50m to the east) in 2031, as formalised pedestrian crossings will be provided at the proposed signalised intersection.

Table 3.11: SIDRA Results – Gugeri Street / Railway Road / Loch Street – Base and Future Scenarios – AM, PM

Assessment Scenario	AM Peak				PM Peak			
	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)
Scenario 1 2017 Base Case	2.971	216.3	687.5 Loch Street	NA	2.715	158.9	550.5 Loch Street	NA
Scenario 2 2021 Future Case (Without Development)	3.889	364.8	940.1 Loch Street	NA	3.671	285.8	774.2 Loch Street	NA
Scenario 3 2031 Ultimate Future Case (Without Development)	7.797	1252.2	1841.9 Loch Street	NA	7.926	1064.0	1554.9 Loch Street	NA
Scenario 4 2031 Ultimate Future Case (With Development and Mitigations)	0.862	21.7	102.6 Loch Street	C	0.898	24.6	134.3 Railway Road	C

Figure 3.3: Gugeri Street / Railway Road / Loch Street – Mitigated Future Intersection Layout from 2021 to 2031



3.6.9 Railway Road Signalised Pedestrian Crossing

The operation of signalised pedestrian crossing along Railway Road has been assessed in SIDRA. The results of the assessment indicate that the pedestrian crossing is operating acceptably in 2017, and would still operate satisfactorily in 2021 and 2031. It is noted that the 95th percentile queue on the west approach of Railway Road is expected to be in the order of 154m.

The introduction of a signalised intersection at Gugeri Street / Railway Road/ Loch Street intersection as suggested in Section 3.6.8 (to the west of the pedestrian crossing), could possibly result in the removal of the signalised pedestrian crossing in 2031, as formalised pedestrian crossings will be provided at the proposed signalised intersection. Results of the intersection analysis are outlined in Table 3.12.

Table 3.12: SIDRA Results – Railway Road Signalised Pedestrian Crossing – Base and Future Scenarios – AM, PM

Assessment Scenario	AM Peak				PM Peak			
	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)
Scenario 1 2017 Base Case	0.448	5.2	40.5 Railway Road West Approach	A	0.325	1.5	28.5 Railway Road East Approach	A
Scenario 2 2021 Future Case (Without Development)	0.340	4.2	69.9 Railway Road West Approach	A	0.338	1.6	30.2 Railway Road East Approach	A
Scenario 3 2031 Ultimate Future Case (Without Development)	0.396	4.4	86.8 Railway Road West Approach	A	0.349	1.6	45.4 Railway Road East Approach	A
Scenario 4 2031 Ultimate Future Case (With Development)	0.408	4.4	90.6 Railway Road West Approach	A	0.358	1.7	47.1 Railway Road East Approach	A

3.6.10 Loch Street / Chancellor Street / Carrington Street

The operation of the four-way roundabout at Loch Street / Chancellor Street / Carrington Street has been assessed in SIDRA. The results of the 2017 base case 'Scenario 1'and the 2021 future year 'Scenario 2' indicate that the intersection in its current form is operating acceptably during the 2017 base scenario, and would still perform satisfactorily to 2021 without the need of any mitigation measures.

It is important to note here that the intersection upstream at Loch Street / Railway Road is congested in the peak hours for the right turning traffic from Loch Street into Railway Parade, which would queue back to this intersection.

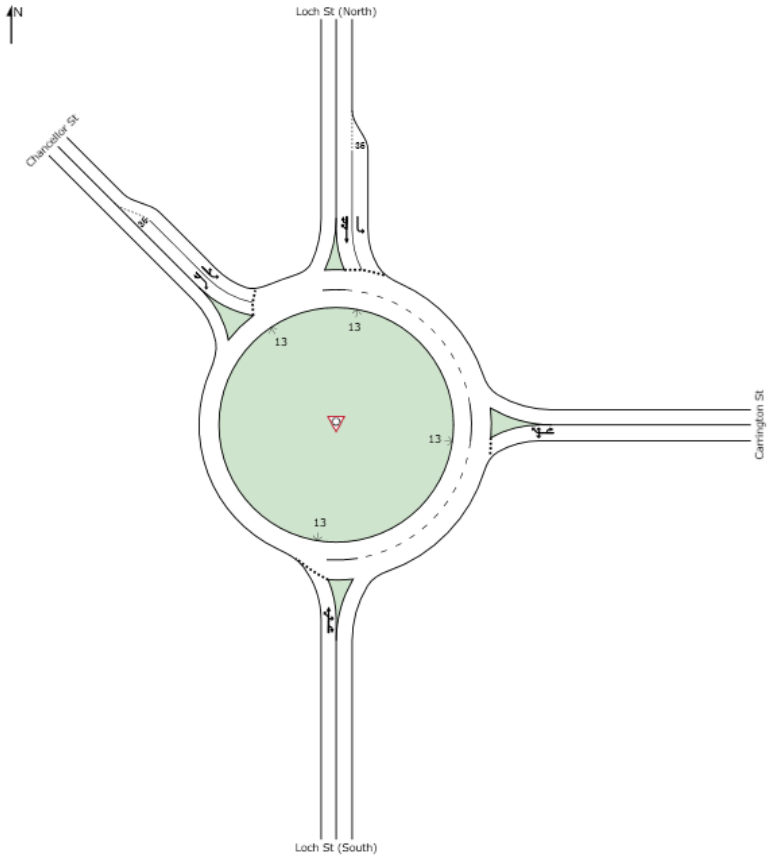
In the 2031 future year without development 'Scenario 3' and with the anticipated increase in background through traffic along Loch Street north and south arms (5.3% growth per annum), Chancellor Street (4.6% growth per annum), Loch Street north approach and Chancellor Street will operate at LOS F during the AM peak period, and Carrington Street will operate at LOS D in the PM peak.

Pocket lanes are suggested as mitigation measures for 'Scenario 4' along Loch Street north and Chancellor Street arms, as shown in Figure 3.4. With these mitigations, analysis results indicate that the intersection would operate adequately to 2031 (LOS B and C in the AM and PM peak periods). Results of the intersection analysis are outlined in Table 3.13.

Table 3.13: SIDRA Results – Loch Street / Chancellor Street / Carrington Street – Base and Future Scenarios – AM, PM

Assessment Scenario	AM Peak				PM Peak			
	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)	DOS (X)	Average Delay (sec)	95th Percentile Queue (m)	LOS (X)
Scenario 1 2017 Base Case	0.541	8.1	33.2 Chancellor Street	A	0.512	7.7	27.1 Carrington Street	A
Scenario 2 2021 Future Case (Without Development)	0.689	105	60.7 Chancellor Street	B	0.580	8.5	36.7 Carrington Street	A
Scenario 3 2031 Ultimate Future Case (Without Development)	1.397	184.4	1348.5 Chancellor Street	F	0.912	22.8	135.3 Carrington Street	C
Scenario 4 2031 Ultimate Future Case (With Development and Mitigations)	0.771	13.8	85.7 Chancellor Street	B	0.942	20.2	142.5 Carrington Street	C

Figure 3.4: Loch Street / Chancellor Street / Carrington Street – Mitigated Future Intersection Layout in 2031



4. Conclusions

GTA Consultants (GTA) has been commissioned by the Town of Claremont (ToC) to undertake a detailed traffic analysis of the operational capacity of key intersections in the vicinity of the Loch Street Structure Plan area, to determine the impact and to test the feasibility of the densification proposal.

A reverse engineering exercise was undertaken with ToC to revise the density of the Structure Plan area, to maintain the efficiency and overall performance at the adjacent intersections and not to compromise its adequacy.

The key findings of this assessment are:

- the Structure Plan 'new' trips to be generated to the road network are in the order of 193 vehicles per hour in the AM peak and 268 vehicles per hour in the PM peak.
- Peak hour turning traffic count surveys were conducted at nine intersections between 0700 – 0900 and 1600 – 1800 on Thursday 12 October 2017 (peak weekday) with these flows used as a basis to appraise the existing intersection's performance.
- Through a comprehensive scoping exercise with the ToC, a future 2021 and 2031 forecast assessment year were adopted for the traffic analysis. The Main Roads WA ROM data and historical traffic growth data along with consultation with ToC informed the future traffic growth rates (%) on key road links.
- The operation of the key intersections has been assessed using SIDRA Intersection (SIDRA) and the WAPC Guidelines as a basis the intersection performance.

<u>Alfred Road / Ashton Avenue:</u>

- The Alfred Road / Ashton Avenue three-way priority intersection is operating acceptably in the 2017 base scenario. GTA notes during the AM peak hour, the right turn movement from Ashton Avenue (south) into Alfred Road (east) is operating at its limit with LOS E and 35 seconds average delay. No issues are noted with the operation of the intersection during the PM peak.
- The ToC had requested GTA to test a potential new right turn pocket from Alfred Road (west) to Ashton Avenue (south) for the 2021 future year. However, due to the ROM data expected increase in the background traffic flows along Ashton Avenue, the intersection is expected to operate unacceptably in 2031 with a 95th percentile queue length of 47m for the right turn from Ashton Avenue (south) into Alfred Road (east), even without adding any traffic generated from the Structure Plan. This movement is expected to experience excessive delays in the order of 204 seconds and DoS of 1.018 during the AM peak, and therefore would not accommodate Structure Plan development.
- A single lane roundabout layout as a mitigation measure was tested and analysis results indicate that a roundabout intersection would operate adequately in 2021 and 2031.

<u>Alfred Road / Brockway Road:</u>

- The four-way roundabout intersection in its current geometric form is expected to operate acceptably in 2017, 2021 and 2031 and accommodate the Structure Plan traffic with no major issues observed in all the tested scenarios.

Ashton Avenue / Judge Avenue:

- The Ashton Avenue / Judge Avenue three-way priority intersection in its current geometric form is expected to operate acceptably in 2017, 2021 and 2031 and accommodate the Structure Plan traffic with no major issues observed in all the tested scenarios.

Stubbs Terrace / Brockway Road:

- The three-way priority intersection in its current form is operating acceptably in 2017 and would still operate satisfactorily in 2021 and 2031 and accommodate the Structure Plan traffic. No major issues are noted in all the tested scenarios.

Stubbs Terrace / Nagal Pass:

- The three-way roundabout in its current form is operating acceptably in 2017, and would still operate satisfactorily in 2021 and 2031 and accommodate the Structure Plan traffic. No major issues are noted in all the tested scenarios.

Gugeri Street / Ashton Avenue / Chancellor Street:

- The Gugeri Street / Ashton Avenue / Chancellor Street four-way signalised intersection in its upgraded form will operate acceptably in 2017 and in 2021.
- For the future year 2031 *without* development scenario, the analysis shows that due to increase of 1% to 4% per annum background traffic growth as per the ROM data on all four arms, the intersection performance is expected to worsen, which is mainly due to the assumed growth in background traffic.
- In light of the above, an upgraded signalised intersection layout was tested for 'Scenario 4' and analysis results indicate that the intersection would operate adequately in 2031 (LOS C during the AM and PM peak periods), with long queue back extending 280m along Chancellor Street, and the right turn movement from Ashton Avenue into Gugeri Street (west) operating at LOS E in the PM peak.
- No further widenings could be achieved at the intersection due to space constraints at this location.

Gugeri Street / Railway Road / Loch Street:

- Gugeri Street / Railway Road / Loch Street three-way priority intersection is operating unacceptably currently in 2017. The results indicate that the right turn movement from Loch Street into Railway Road is operating at LOS F in both peaks with 95th percentile queues in the order of 550m to 685m. No major issues are noted however on the east and west approaches during the AM and PM peak periods.
- ToC advised that a roundabout layout in this location will be difficult to achieve due to the significant impact on land holdings. On this basis, a signalised intersection layout was tested as mitigation and the intersection is expected to operate adequately in 2021 and 2031. The 95th percentile queue of around 134m will extend to the signalised pedestrian crossing to the east of this intersection in 2031.
- It is noted that the introduction of a signalised intersection at this location could result in the removal of the signalised pedestrian crossing (located 50m to the east) in 2031, as formalised pedestrian crossings will be provided at the proposed signalised intersection.

Railway Road Pedestrian Crossing:

- The Railway Road signalised pedestrian crossing is operating acceptably in 2017 and would still operate satisfactorily in 2021 and 2031. It is noted that the 95th percentile queue on the west approach of Railway Road is expected to be in the order of 91m.

- The introduction of a signalised intersection as a mitigation measure at Gugeri Street / Railway Road/ Loch Street intersection (to the west of the of the pedestrian crossing), could result in the removal of the signalised pedestrian crossing in 2031, as formalised pedestrian crossings will be provided at the proposed signalised intersection.

Loch Street / Chancellor Street / Carrington Street:

- Notwithstanding the existing long queue backs noted from the Railway Road / Loch Street intersection upstream, the Loch Street / Chancellor Street / Carrington Street four-way roundabout is operating acceptably in 2017 in isolation and expected to also perform satisfactorily in 2021 without the need of any mitigation measures in the short term.
- In 2031 with the anticipated increase in background through traffic as per the ROM data along Loch Street (5.3% growth per annum) and Chancellor Street (4.6% growth per annum), the Loch Street north approach and Chancellor Street approaches under the current intersection layout will not operate satisfactorily, irrespective of the Structure Plan development.
- A dual lane roundabout is suggested as a mitigation and analysis results indicate that the intersection would operate adequately to 2031.

For all of the above, the mitigation measures are suggested purely from an intersection operation perspective and **does not consider civil and services constraints**. These will need to be further investigated by others if any upgrades are pursued by the ToC.

Appendix A

Concept Design Layout – Gugeri Street / Ashton Avenue / Chancellor Street

INFRASTRUCTURE

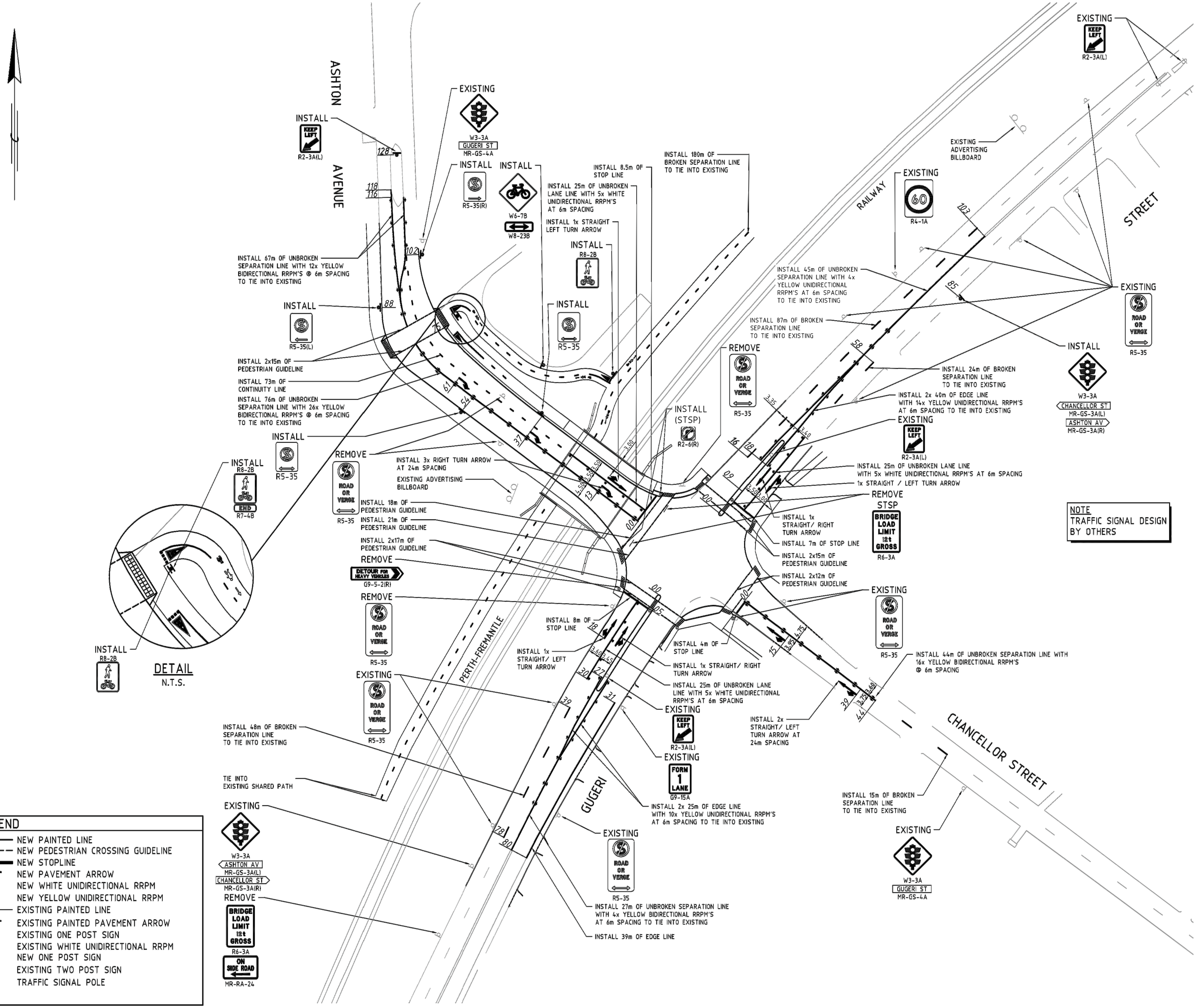
ASHTON AVENUE REPLACEMENT BRIDGE – FINAL DESIGN OF INTERSECTION SIGNAL PHASING AND TURNING MOVEMENTS

DRAFT FINAL – ASHTON AVENUE BRIDGE – SIGN AND LINE MARKING

05 SEPTEMBER 2017

ATTACHMENT 1

PAGES 1



LEGEND

- NEW PAINTED LINE
- NEW PEDESTRIAN CROSSING GUIDELINE
- NEW STOPLINE
- NEW PAVEMENT ARROW
- NEW WHITE UNIDIRECTIONAL RRPM
- NEW YELLOW UNIDIRECTIONAL RRPM
- EXISTING PAINTED LINE
- EXISTING PAINTED PAVEMENT ARROW
- EXISTING ONE POST SIGN
- EXISTING WHITE UNIDIRECTIONAL RRPM
- NEW ONE POST SIGN
- EXISTING TWO POST SIGN
- TRAFFIC SIGNAL POLE

NOTE
TRAFFIC SIGNAL DESIGN BY OTHERS

PLAN
SCALE 1:500

DRAFT FINAL

AMENDMENTS

No.	DESCRIPTION	APPROVED & DATE
A	ISSUED FOR 85% DESIGN REVIEW	JM 19/05/17
B	ISSUED FOR 100% DESIGN REVIEW	

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE MRWA SPECIFICATIONS.
2. PAVEMENT MARKINGS TO BE ADDED/REMOVED AS SHOWN.
3. SIGNS TO BE ADDED/REMOVED/RELOCATED AS SHOWN.
4. RE-USE ALL EXISTING MATERIALS ON SITE WHERE POSSIBLE.
5. ALL EXISTING PAVEMENT MARKINGS TO BE REMOVED BY WET GRINDING.
6. EXISTING SIGNS TO BE RELOCATED IN ACCORDANCE WITH MRWA STD DRG. 9548-106.
7. ALL SIGNS AND LINE MARKING TO BE AS PER MAIN ROADS WA SPECIFICATION 602 SIGNS AND 604 PAVEMENT MARKINGS.

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WARNING
SERVICES AND CADASTRAL BOUNDARY LOCATIONS SHOWN ARE ONLY INDICATIVE AND MUST NOT BE USED FOR EXCAVATION. THE "ONE CALL 1100" SYSTEM SHALL BE USED TO OBTAIN ACCURATE SERVICE LOCATIONS.

METADATA

GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	APR - MAY 2013
MAPPING SURVEY STANDARD:	N/A
DATE OF CAPTURE:	N/A
MAIN ROADS PROJECT ZONE:	PCG94
HEIGHT DATUM:	AHD

GHD
Level 10, 999 Hay Street Perth WA 6004
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DRAWING NUMBER/DOCUMENT ID G:\61\35385\CADD\Drawings\CIVIL

DESIGNED / DRAWN	Y. NI / Y. NI
VERIFIED	
DIRECTOR	

SCALES 1:500

THE GOVERNMENT OF WESTERN AUSTRALIA
mainroads WESTERN AUSTRALIA
METROPOLITAN REGIONAL BRANCH
59 Albany Highway Victoria Park 6100
Telephone (08) 9323 4111 Fax (08) 9323 4430

A1

MRWA FILE NUMBER

APPROVED (MRWA)

ASHTON AVENUE (006)
OVER RAILWAY BRIDGE No. 903A

PAVEMENT MARKING AND MINOR SIGNS

LOCAL AUTHORITY (115) TOWN OF CLAREMONT

MRWA DRAWING NUMBER
201748-2991-B

Appendix B

Traffic Data

2016 ROM24 - Calibration Plot
All Day
Loch Street

BASE MODEL ASSUMPTIONS

LANDUSE: 2016 ROM24 MLUFS Landuse

NETWORK: 2016 ROM24 Base Network

ROM24 Multi-Modal Model V4.40

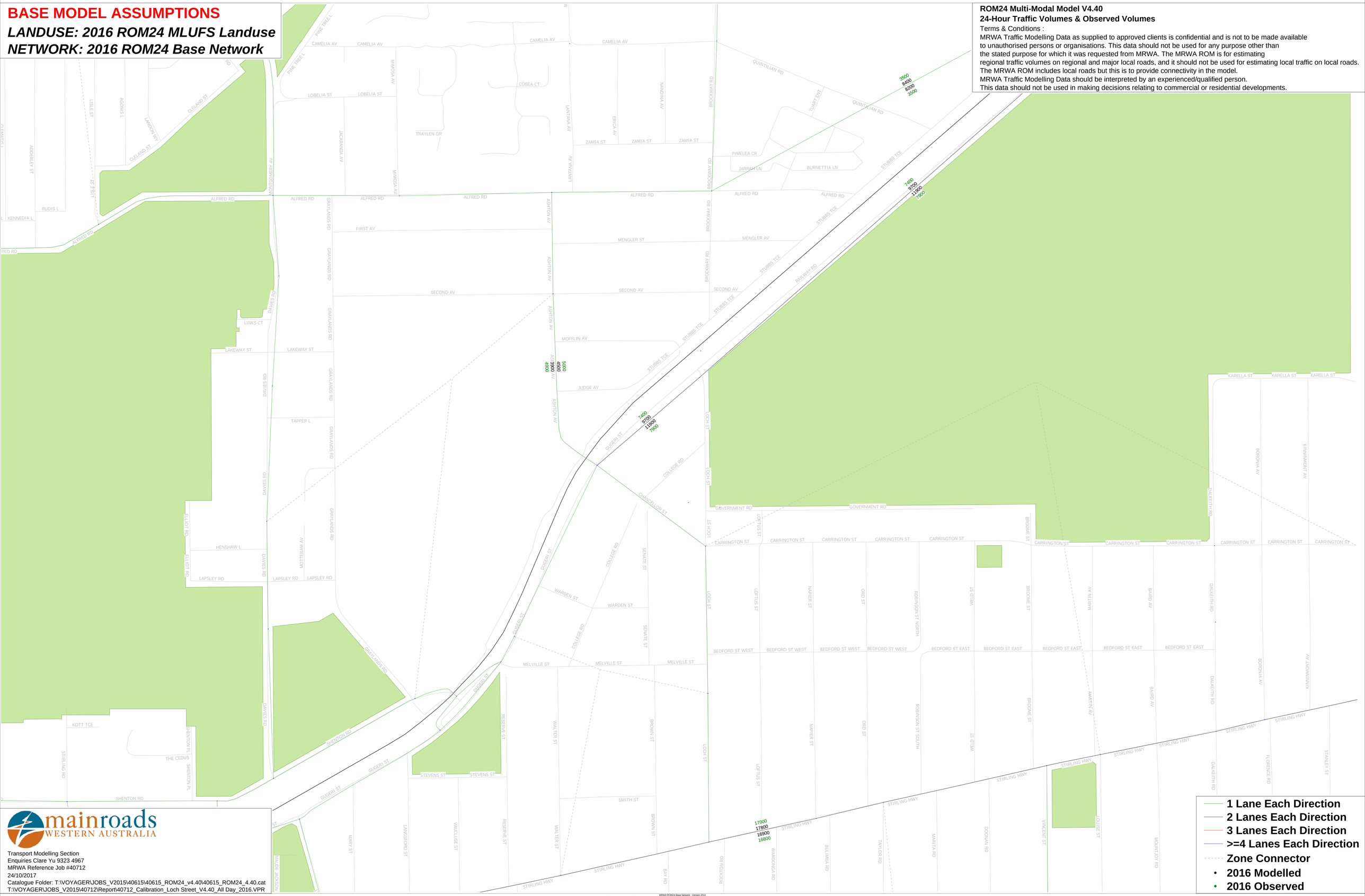
24-Hour Traffic Volumes & Observed Volumes

Terms & Conditions :

MRWA Traffic Modelling Data as supplied to approved clients is confidential and is not to be made available to unauthorised persons or organisations. This data should not be used for any purpose other than the stated purpose for which it was requested from MRWA. The MRWA ROM is for estimating regional traffic volumes on regional and major local roads, and it should not be used for estimating local traffic on local roads. The MRWA ROM includes local roads but this is to provide connectivity in the model.

MRWA Traffic Modelling Data should be interpreted by an experienced/qualified person.

This data should not be used in making decisions relating to commercial or residential developments.



mainroads WESTERN AUSTRALIA

Transport Modelling Section
Enquiries Clare Yu 9323 4967
MRWA Reference Job #40712
24/10/2017
Catalogue Folder: T:\VOYAGER\JOBS_V2015\40615\40615_ROM24_v4.40\40615_ROM24_4.40.cat
T:\VOYAGER\JOBS_V2015\40712\Report\40712_Calibration_Loch Street_V4.40_All Day_2016.VPR

- 1 Lane Each Direction
- 2 Lanes Each Direction
- 3 Lanes Each Direction
- >=4 Lanes Each Direction
- Zone Connector
- 2016 Modelled
- 2016 Observed

2021 ROM24 - Link Volume Plot
ALLDAY
Loch Street

MODEL ASSUMPTIONS

LANDUSE: 2021 ROM24 MLUFS Landuse

NETWORK: 2021 ROM24 Base Network

ROM24 Multi-Modal Model V4.40
24-Hour Traffic Volumes (Factor X 100)

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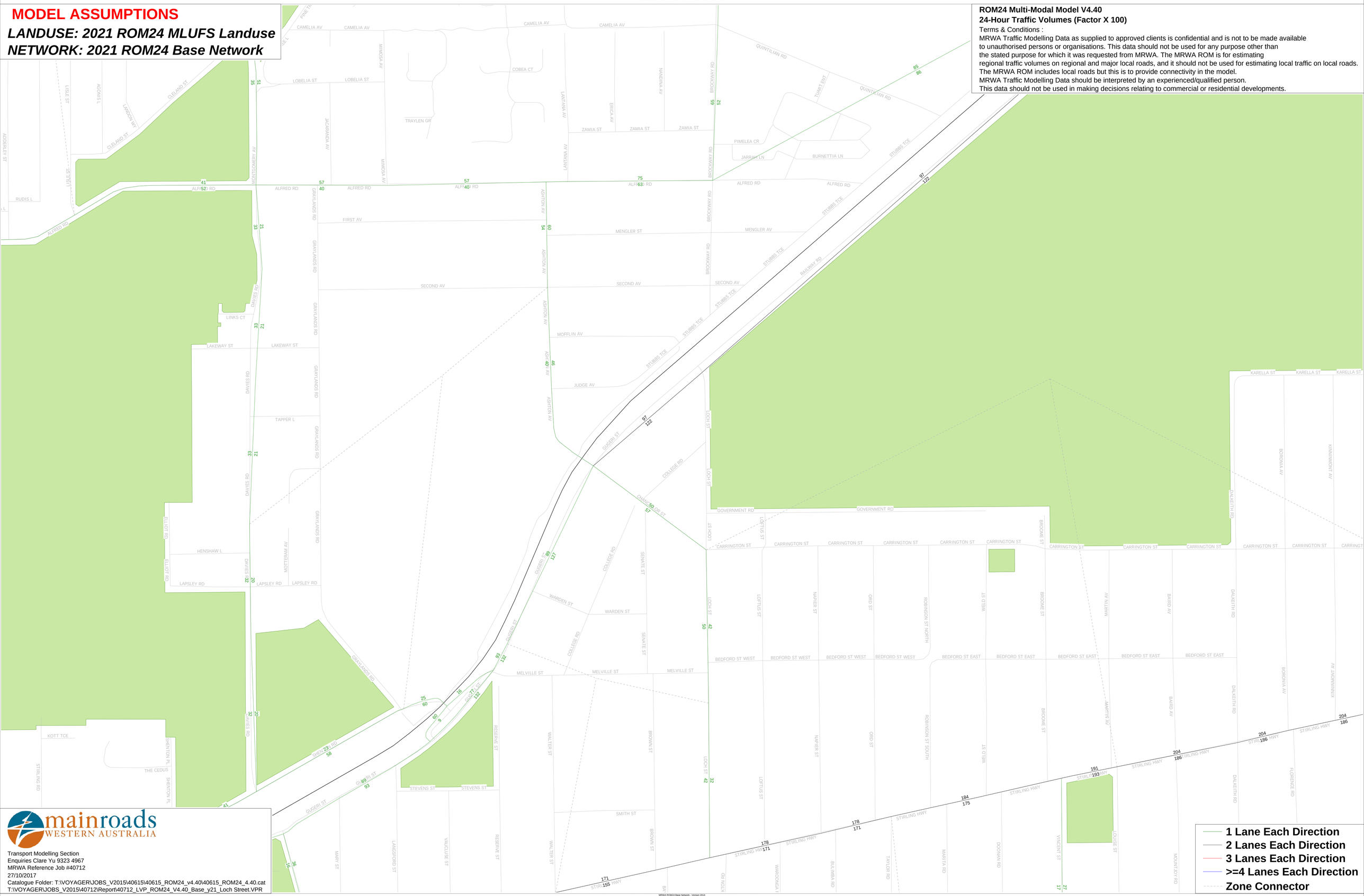

1 Lane Each Direction
2 Lanes Each Direction
3 Lanes Each Direction
>=4 Lanes Each Direction
Zone Connector

mainroads WESTERN AUSTRALIA
Transport Modelling Section
Enquiries Clare Yu 9323 4967

MRWA Reference Job #40712
27/10/2017
Catalogue Folder: T:\VOYAGER\JOBS_V2015\40615\40615_ROM24_v4.40\40615_ROM24_4.40.cat
T:\VOYAGER\JOBS_V2015\40712\Report\40712_LVP_ROM24_V4.40_Base_y21_Loch Street.VPR

2021 ROM24 - Link Volume Plot
AM Peak (7am-9am)
Loch Street

MODEL ASSUMPTIONS

LANDUSE: 2021 ROM24 MLUFS Landuse

NETWORK: 2021 ROM24 Base Network

ROM24 Multi-Modal Model V4.40

AM Peak Hours Traffic Volumes

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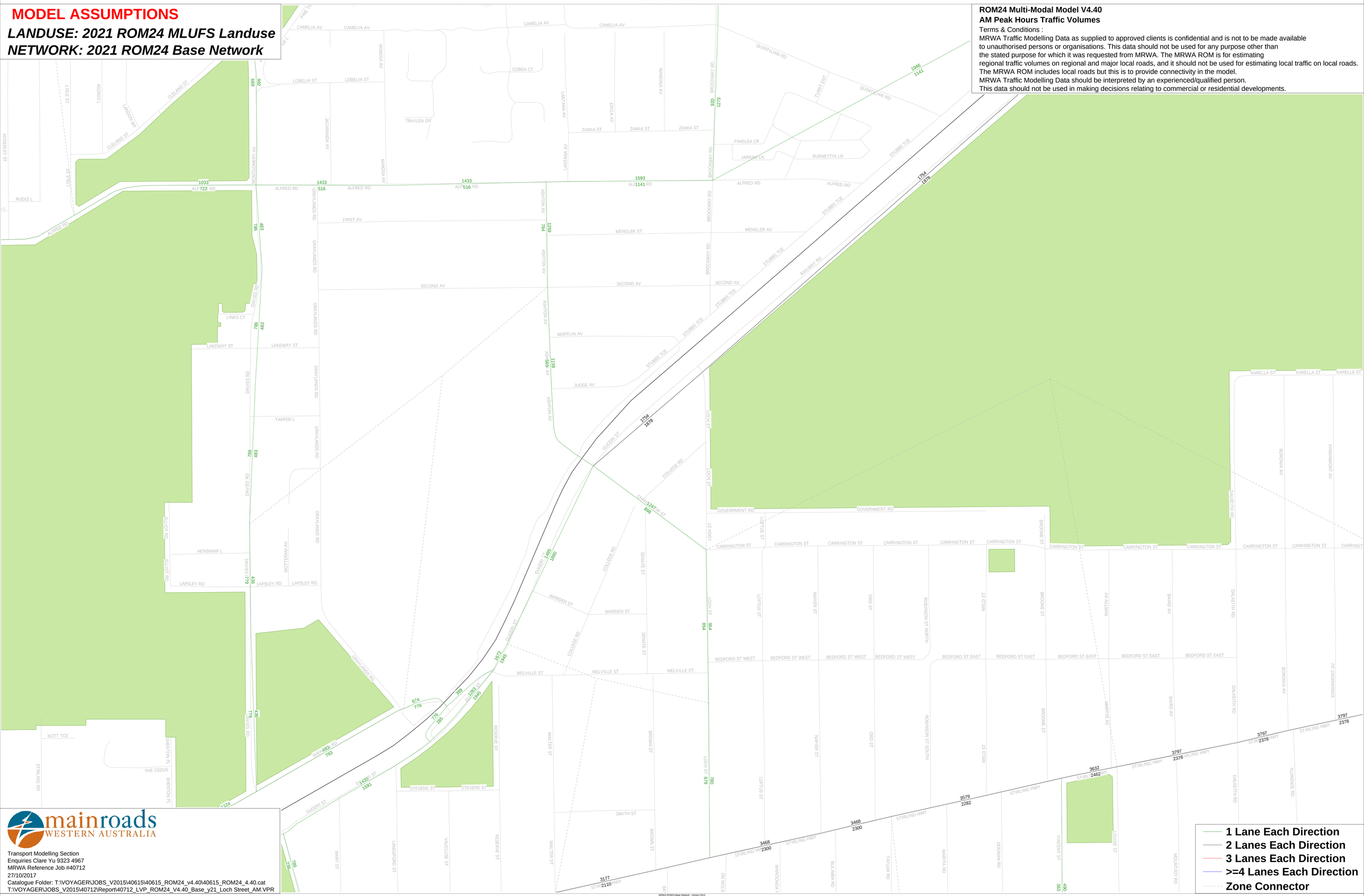

mainroads WESTERN AUSTRALIA

Transport Modelling Section
Enquiries Clare Yu 9323 4967
MRWA Reference Job #40712
27/10/2017
Catalogue Folder: T:\VOYAGER\JOBS_V2015\40615\40615_ROM24_v4.40\40615_ROM24_4.40.cat
T:\VOYAGER\JOBS_V2015\40712\Report\40712_LVP_ROM24_V4.40_Base_y21_Loch Street_AM.VPR

- 1 Lane Each Direction
- 2 Lanes Each Direction
- 3 Lanes Each Direction
- >=4 Lanes Each Direction
- Zone Connector

2021 ROM24 - Link Volume Plot
PM Peak (4pm-6pm)
Loch Street

MODEL ASSUMPTIONS

LANDUSE: 2021 ROM24 MLUFS Landuse

NETWORK: 2021 ROM24 Base Network

ROM24 Multi-Modal Model V4.40

PM Peak Hours Traffic Volumes

Terms & Conditions :

MRWA Traffic Modelling Data as supplied to approved clients is confidential and is not to be made available to unauthorised persons or organisations. This data should not be used for any purpose other than the stated purpose for which it was requested from MRWA. The MRWA ROM is for estimating regional traffic volumes on regional and major local roads, and it should not be used for estimating local traffic on local roads. The MRWA ROM includes local roads but this is to provide connectivity in the model.

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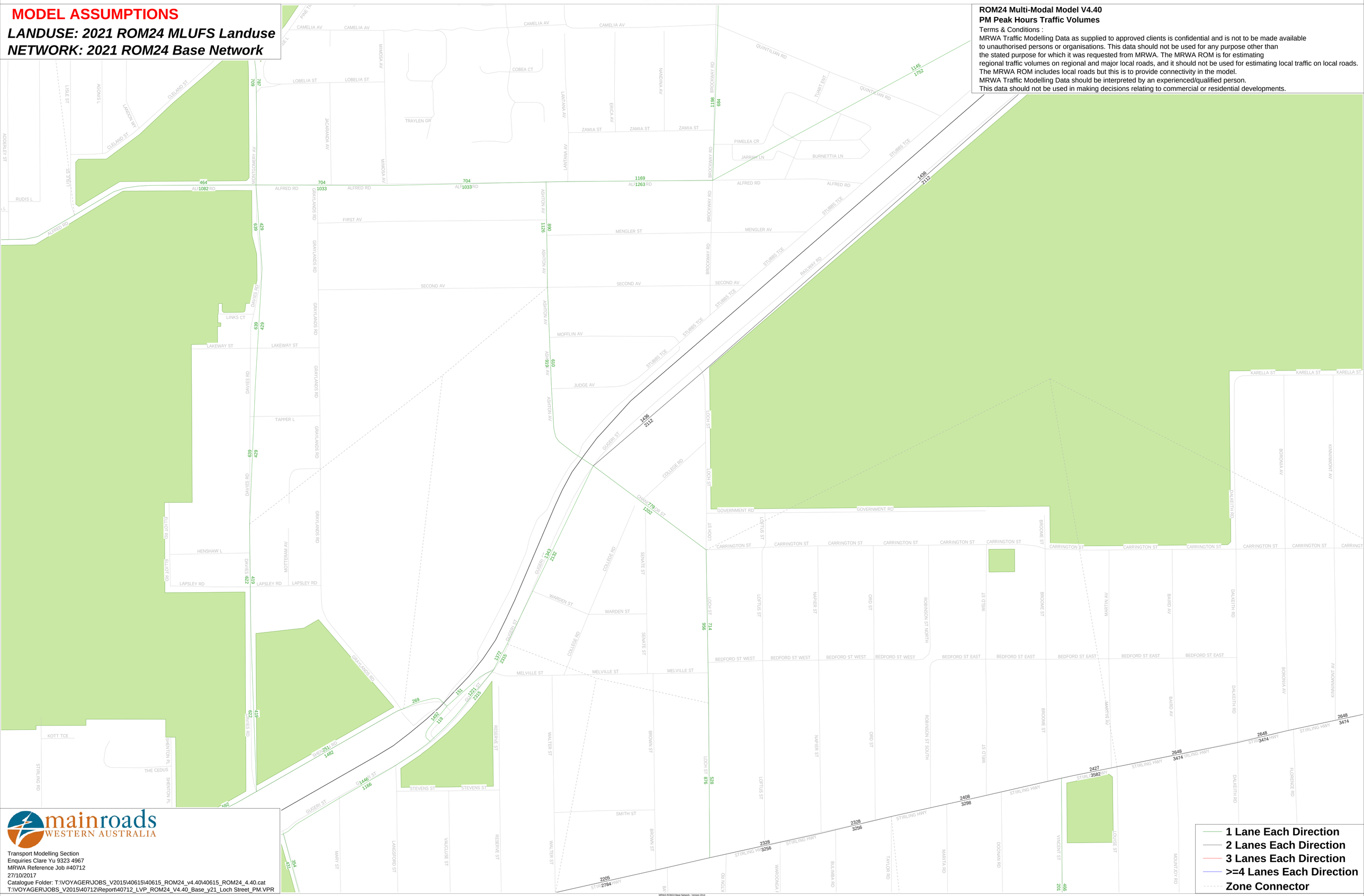

mainroads WESTERN AUSTRALIA

Transport Modelling Section
Enquiries Clare Yu 9323 4967
MRWA Reference Job #40712
27/10/2017
Catalogue Folder: T:\VOYAGER\JOBS_V2015\40615\40615_ROM24_v4.40\40615_ROM24_4.40.cat
T:\VOYAGER\JOBS_V2015\40712\Report\40712_LVP_ROM24_V4.40_Base_y21_Loch Street_PM.VPR

2031 ROM24 - Link Volume Plot
AM Peak (7am-9am)
Loch Street

MODEL ASSUMPTIONS

LANDUSE: 2031 ROM24 MLUFS Landuse

NETWORK: 2031 ROM24 Base Network

ROM24 Multi-Modal Model V4.40

AM Peak Hours Traffic Volumes

Terms & Conditions :

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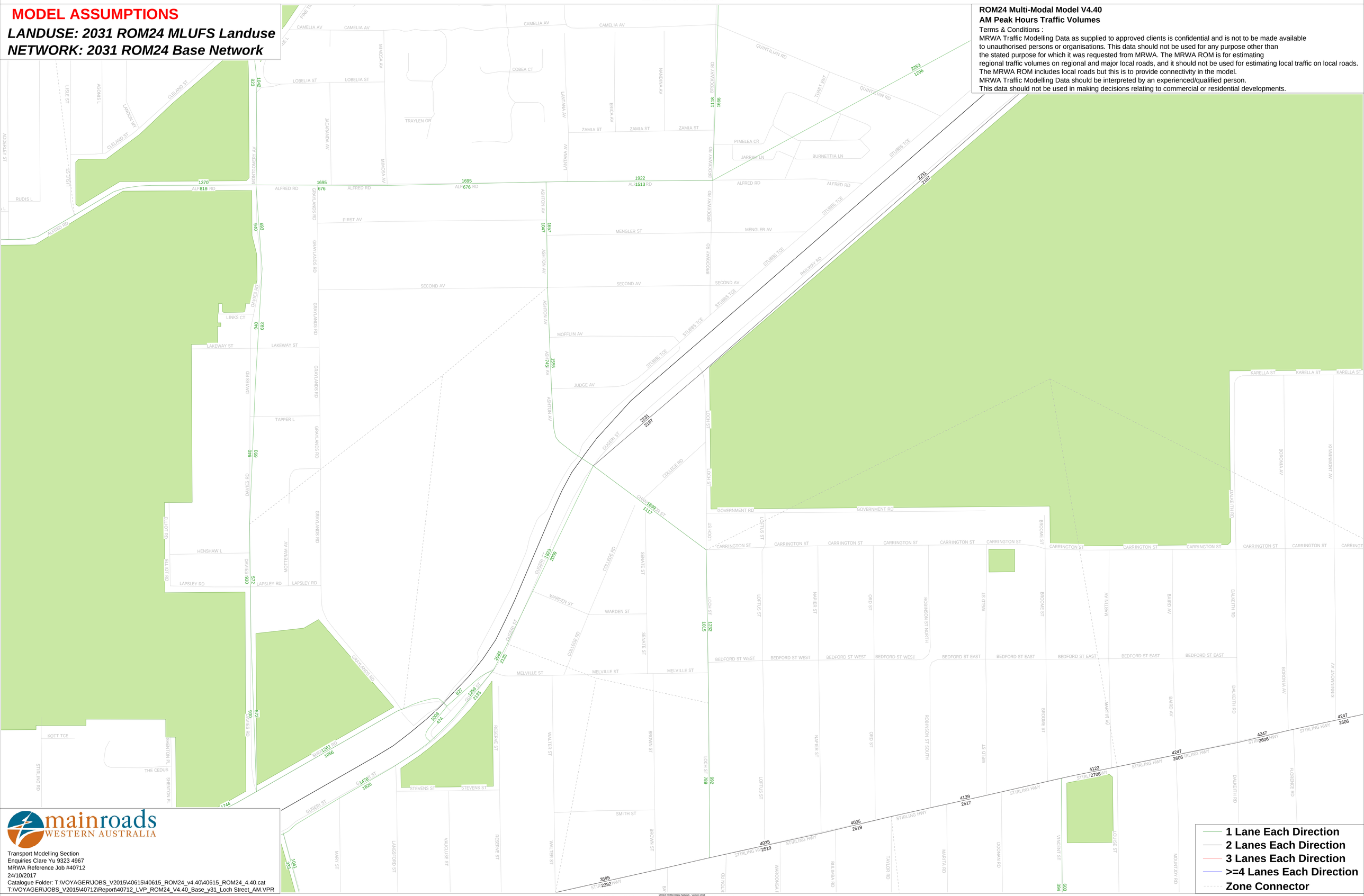

1 Lane Each Direction

2 Lanes Each Direction

3 Lanes Each Direction

>=4 Lanes Each Direction

Zone Connector

Transport Modelling Section
Enquiries Clare Yu 9323 4967
MRWA Reference Job #40712
24/10/2017
Catalogue Folder: T:\VOYAGER\JOBS_V2015\40615\40615_ROM24_v4.40\40615_ROM24_4.40.cat
T:\VOYAGER\JOBS_V2015\40712\Report\40712_LVP_ROM24_V4.40_Base_y31_Loch Street_AM.VPR

2031 ROM24 - Link Volume Plot
PM Peak (4pm-6pm)
Loch Street

MODEL ASSUMPTIONS

LANDUSE: 2031 ROM24 MLUFS Landuse

NETWORK: 2031 ROM24 Base Network

ROM24 Multi-Modal Model V4.40

PM Peak Hours Traffic Volumes

Terms & Conditions :

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mainroads WESTERN AUSTRALIA

Transport Modelling Section
Enquiries Clare Yu 9323 4967

MRWA Reference Job #40712

24/10/2017

Catalogue Folder: T:\VOYAGER\JOBS_V2015\40615\40615_ROM24_v4.40\40615_ROM24_4.40.cat

T:\VOYAGER\JOBS_V2015\40712\Report\40712_LVP_ROM24_V4.40_Base_y31_Loch Street_PM.VPR

- 1 Lane Each Direction
- 2 Lanes Each Direction
- 3 Lanes Each Direction
- >=4 Lanes Each Direction
- Zone Connector

2031 ROM24 - Link Volume Plot
ALLDAY
Loch Street

MODEL ASSUMPTIONS

LANDUSE: 2031 ROM24 MLUFS Landuse

NETWORK: 2031 ROM24 Base Network

ROM24 Multi-Modal Model V4.40
24-Hour Traffic Volumes (Factor X 100)

Terms & Conditions :
MRWA Traffic Modelling Data as supplied to approved clients is confidential and is not to be made available to unauthorised persons or organisations. This data should not be used for any purpose other than the stated purpose for which it was requested from MRWA. The MRWA ROM is for estimating regional traffic volumes on regional and major local roads, and it should not be used for estimating local traffic on local roads. The MRWA ROM includes local roads but this is to provide connectivity in the model.
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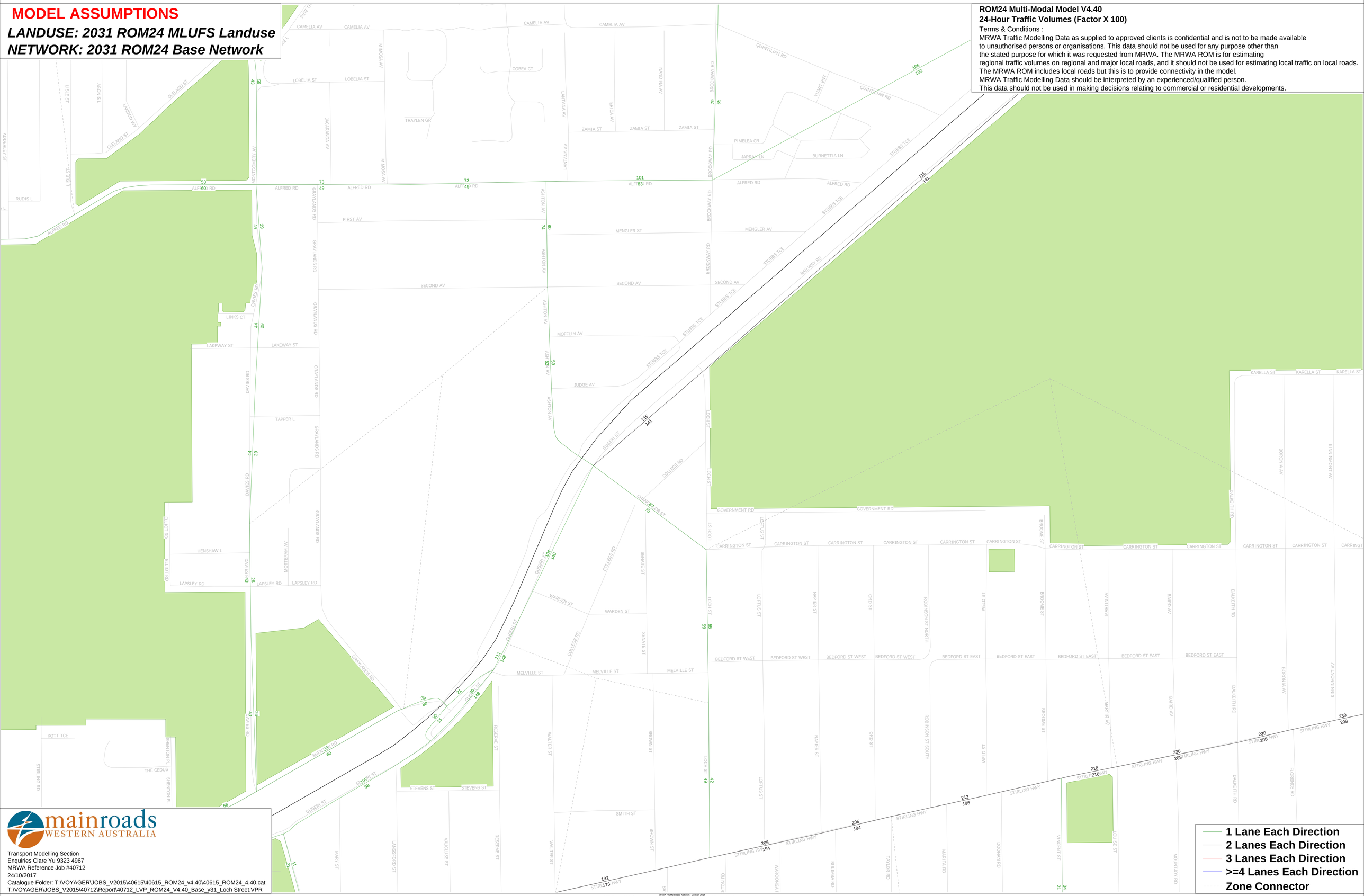


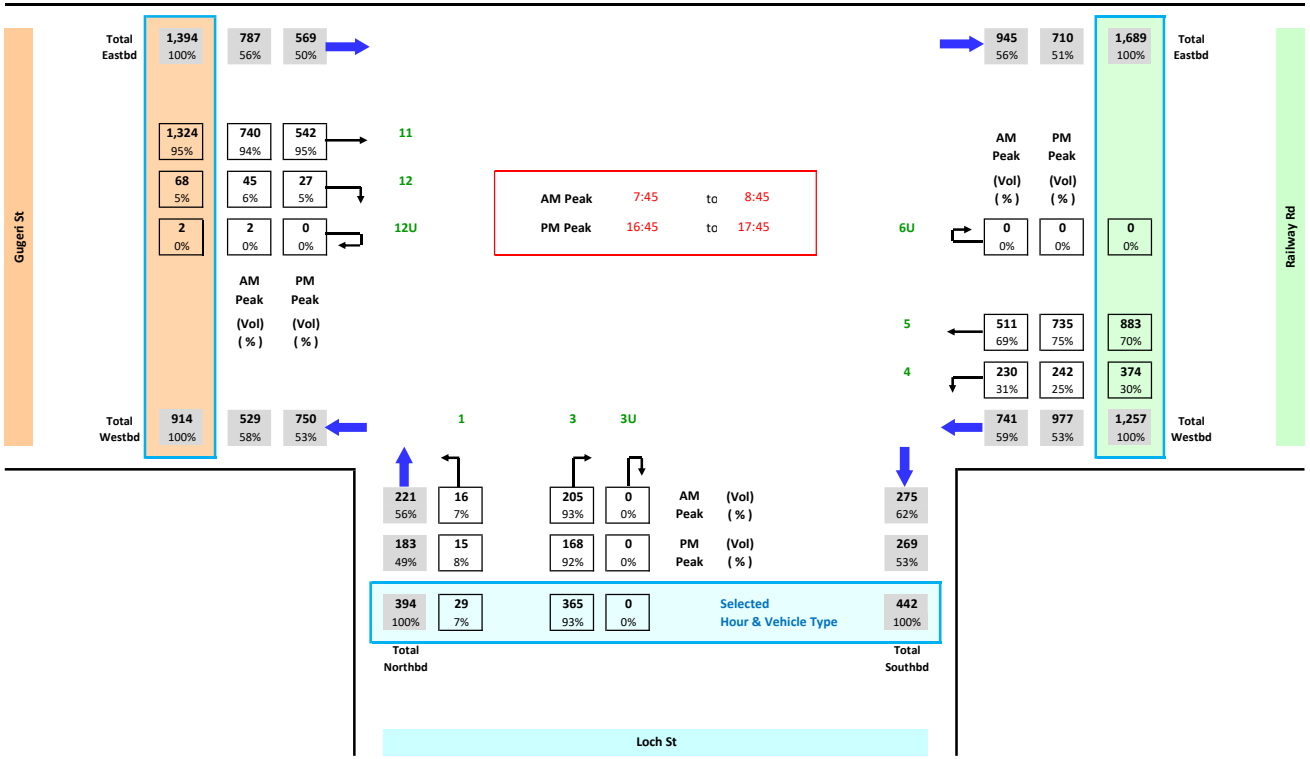
mainroads WESTERN AUSTRALIA
Transport Modelling Section
Enquiries Clare Yu 9323 4967
MRWA Reference Job #40712
24/10/2017
Catalogue Folder: T:\VOYAGER\JOBS_V2015\40615\40615_ROM24_v4.40\40615_ROM24_4.40.cat
T:\VOYAGER\JOBS_V2015\40712\Report\40712_LVP_ROM24_V4.40_Base_y31_Loch Street.VPR

Job No. : W198
Client : GTA
Suburb : Claremont
Location : 2. Gugeri St / Loch St / Railway Rd

Day/Date : Thursday, 12th October 2017
Weather : Fine
Description : Classified Intersection Count
: Intersection Diagram

MATRIX Traffic and Transport Data

Hour Starting	Vehicle Type
AM Totals	All Vehicles



Job No. : W198
Client : GTA
Suburb : Claremont
Location : 3. Railway Rd ped crossing

Day/Date : Thursday, 12th October 2017
Weather : Fine
Description : Mid-block Count
: Intersection Diagram

Hour Starting	Vehicle Type
AM Totals	All Vehicles

Railway Rd

AM Peak	7:45	to	8:45
PM Peak	16:00	to	17:00

N

Westbound

NB	**AM Peak**	**35**	**49**
	PM Peak	**11**	

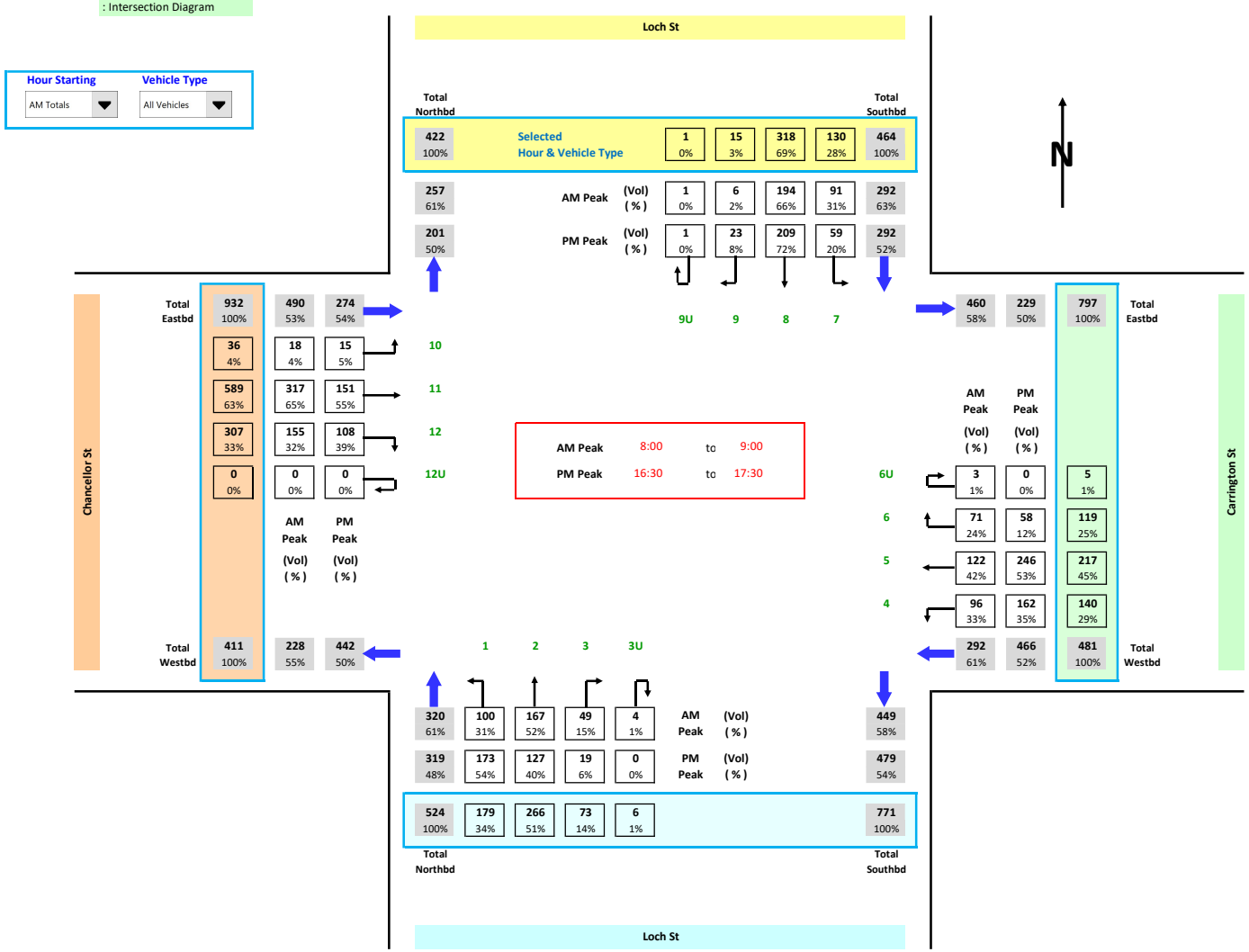
SB	**AM Peak**	**24**	**38**
	PM Peak	**11**	

Eastbound

Job No. : W198
Client : GTA
Suburb : Claremont
Location : 4. Loch St / Chancellor St / Carrington St

Day/Date : Thursday, 12th October 2017
Weather : Fine
Description : Classified Intersection Count
: Intersection Diagram

MATRIX Traffic and Transport Data

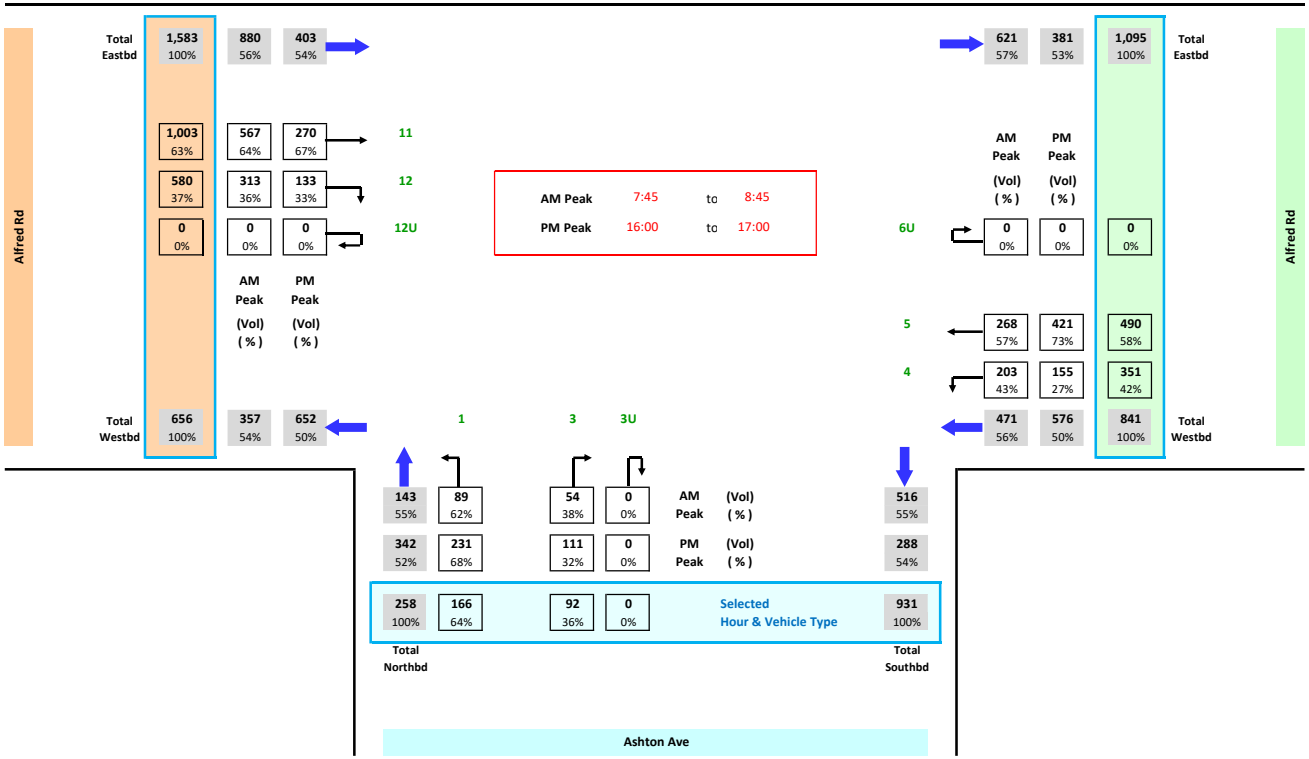


Job No. : W198
Client : GTA
Suburb : Claremont
Location : 5. Alfred Rd / Ashton Ave

Day/Date : Thursday, 12th October 2017
Weather : Fine
Description : Classified Intersection Count
: Intersection Diagram

MATRIX Traffic and Transport Data

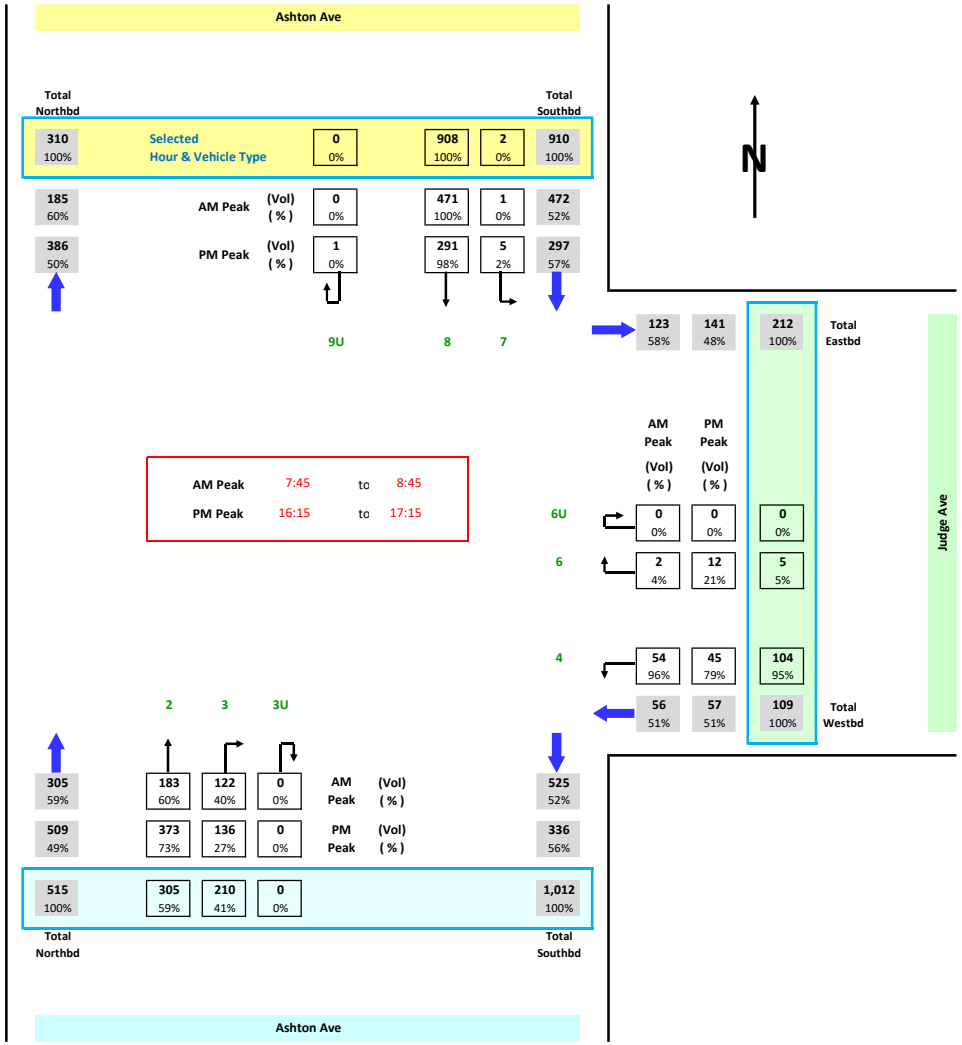
Hour Starting	Vehicle Type
AM Totals	All Vehicles



Job No. : W198
Client : GTA
Suburb : Claremont
Location : 6. Ashton Ave / Judge Ave

Day/Date : Thursday, 12th October 2017
Weather : Fine
Description : Classified Intersection Count
: Intersection Diagram

Hour Starting	Vehicle Type
AM Totals	All Vehicles

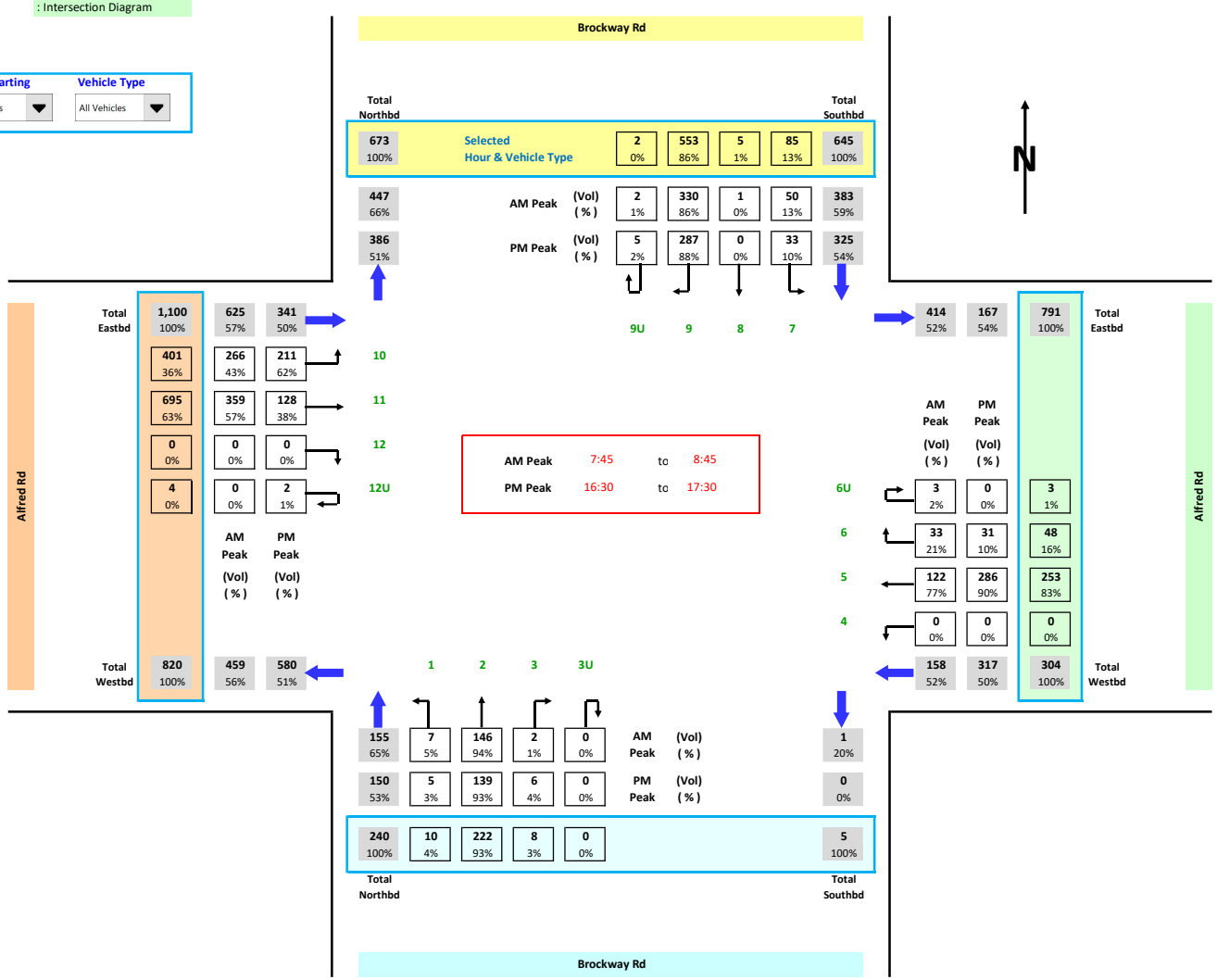


Job No. : W198
Client : GTA
Suburb : Claremont
Location : 7. Alfred Rd / Brockway Rd

Day/Date : Thursday, 12th October 2017
Weather : Fine
Description : Classified Intersection Count
: Intersection Diagram

MATRIX Traffic and Transport Data

Hour Starting: AM Totals
Vehicle Type: All Vehicles

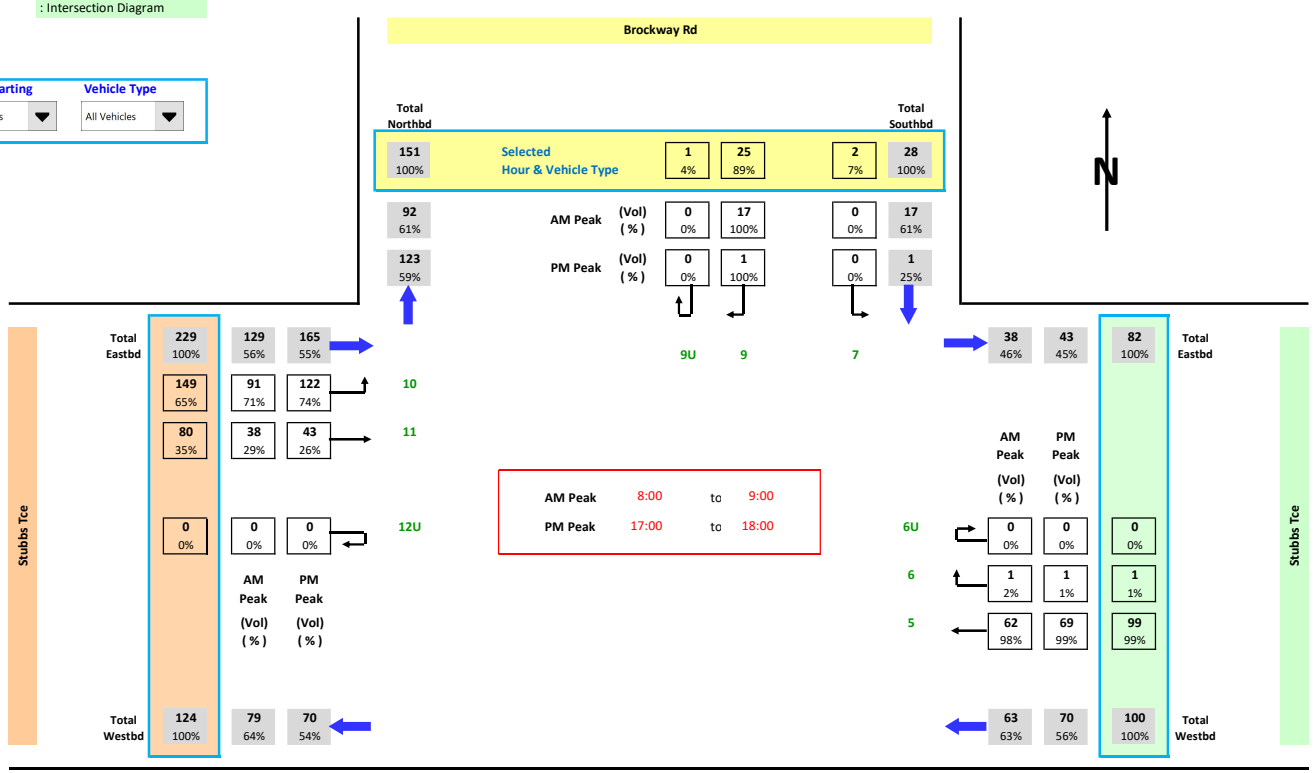


Job No. : W198
Client : GTA
Suburb : Claremont
Location : 8. Brockway Rd / Stubbs Tce

Day/Date : Thursday, 12th October 2017
Weather : Fine
Description : Classified Intersection Count
: Intersection Diagram

MATRIX Traffic and Transport Data

Hour Starting AM Totals
Vehicle Type All Vehicles

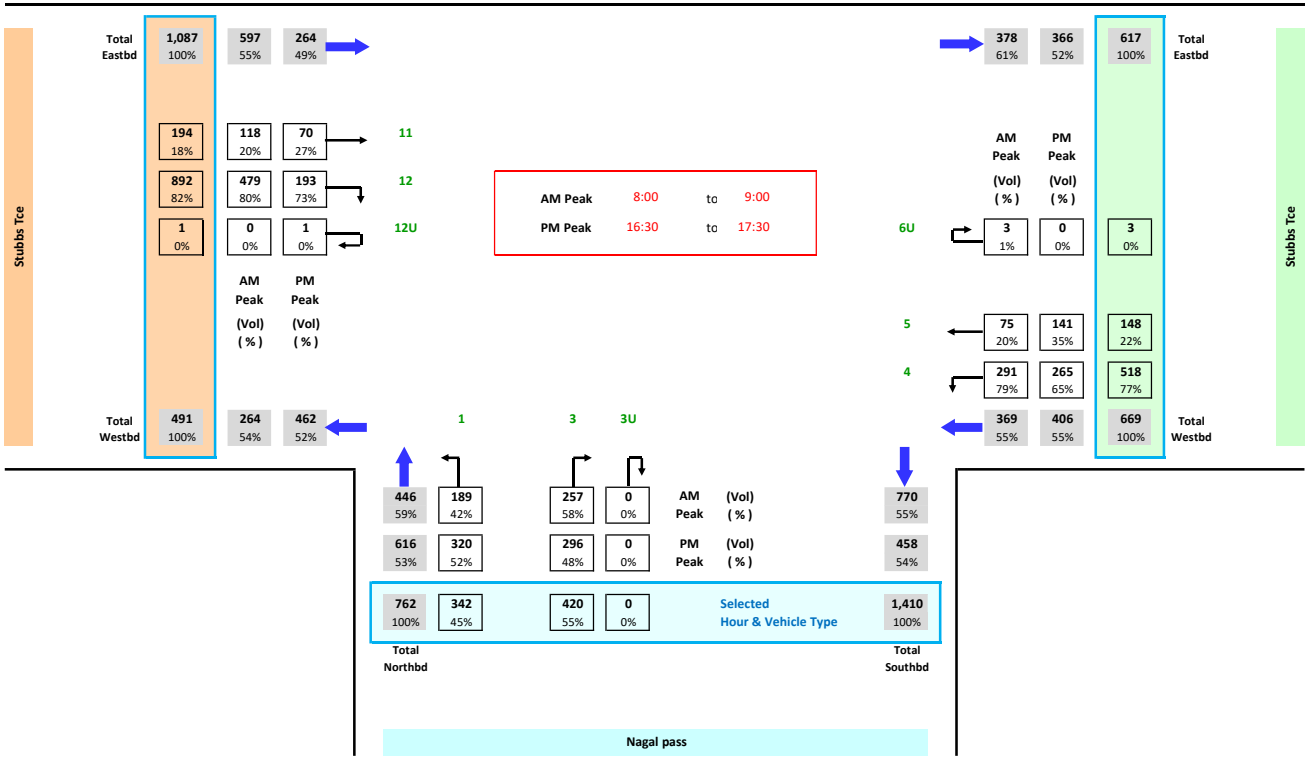


Job No. : W198
Client : GTA
Suburb : Claremont
Location : 9. Stubbs Tce / Nagal pass

Day/Date : Thursday, 12th October 2017
Weather : Fine
Description : Classified Intersection Count
: Intersection Diagram

MATRIX Traffic and Transport Data

Hour Starting AM Totals
Vehicle Type All Vehicles



Appendix C

SIDRA Outputs (PDF and .sip files)

MOVEMENT SUMMARY

Site: [S1 - Ashton Ave/Chancellor St/Gugeri St - AM Peak - 2017]

Signals - Fixed Time Isolated Cycle Time = 50 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Chancellor St											
1	L2	28	4.0	0.533	23.3	LOS C	5.6	40.1	0.92	0.77	41.5
2	T1	224	2.0	0.533	18.7	LOS B	5.6	40.1	0.92	0.77	39.6
Approach		253	2.2	0.533	19.2	LOS B	5.6	40.1	0.92	0.77	39.8
East: Gugeri St (East)											
4	L2	6	0.0	0.196	20.8	LOS C	2.0	14.2	0.80	0.64	43.9
5	T1	535	3.0	0.809	21.5	LOS C	11.7	84.2	0.96	0.92	44.3
Approach		541	3.0	0.809	21.5	LOS C	11.7	84.2	0.95	0.92	44.3
North: Ashton Ave											
7	L2	9	11.0	0.836	30.3	LOS C	11.0	77.9	1.00	1.05	38.4
8	T1	382	1.0	0.836	25.7	LOS C	11.0	77.9	1.00	1.05	37.0
9	R2	154	3.0	0.671	29.6	LOS C	4.0	28.8	1.00	0.87	37.1
Approach		545	1.7	0.836	26.8	LOS C	11.0	77.9	1.00	1.00	37.0
West: Gugeri St (West)											
10	L2	95	2.0	0.650	15.1	LOS B	11.8	84.2	0.78	0.71	46.8
11	T1	783	2.0	0.650	9.9	LOS A	11.8	84.2	0.82	0.74	50.8
12	R2	107	1.0	0.650	16.3	LOS B	5.2	36.6	0.93	0.81	45.5
Approach		985	1.9	0.650	11.1	LOS B	11.8	84.2	0.83	0.74	49.8
All Vehicles		2324	2.1	0.836	18.1	LOS B	11.8	84.2	0.91	0.85	43.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	17.7	LOS B	0.1	0.1	0.84	0.84
P2	East Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
P3	North Full Crossing	53	10.9	LOS B	0.0	0.0	0.66	0.66
P4	West Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
All Pedestrians		211	16.8	LOS B			0.82	0.82

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Chancellor St.sip7

MOVEMENT SUMMARY

Site: [S1 - Gugeri St/Railway Rd/Loch St - PM Peak - 2017]

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
South: Loch St											
10	L2	16	0.0	0.015	5.4	LOS A	0.1	0.4	0.30	0.53	49.0
12	R2	177	1.0	2.715	1628.4	LOS F	78.0	550.5	1.00	3.81	1.1
Approach		193	0.9	2.715	1495.4	LOS F	78.0	550.5	0.94	3.54	1.3
East: Railway Rd											
1	L2	255	0.0	0.283	3.0	LOS A	1.4	9.7	0.10	0.27	48.7
2	T1	774	0.0	0.283	0.0	LOS A	1.4	9.7	0.03	0.08	59.0
Approach		1028	0.0	0.283	0.8	NA	1.4	9.7	0.05	0.13	56.0
West: Gugeri St											
8	T1	571	1.0	0.148	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
9	R2	28	0.0	0.048	10.2	LOS B	0.2	1.2	0.60	0.79	46.9
Approach		599	1.0	0.148	0.5	NA	0.2	1.2	0.03	0.04	58.6
All Vehicles		1820	0.4	2.715	158.9	NA	78.0	550.5	0.14	0.46	10.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S2 - Gugeri St/Railway Rd/Loch St - AM Peak - 2021 (Without Dev)]

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
South: Loch St											
10	L2	19	7.0	0.017	5.1	LOS A	0.1	0.4	0.19	0.51	49.0
12	R2	265	1.0	3.889	2674.5	LOS F	133.2	940.1	1.00	4.40	0.7
Approach		284	1.4	3.889	2496.5	LOS F	133.2	940.1	0.95	4.14	0.8
East: Railway Rd											
1	L2	252	3.0	0.234	3.1	LOS A	1.2	8.3	0.14	0.33	48.0
2	T1	571	3.0	0.234	0.0	LOS A	1.2	8.3	0.03	0.08	59.0
Approach		822	3.0	0.234	1.0	NA	1.2	8.3	0.07	0.15	55.1
West: Gugeri St											
8	T1	776	2.0	0.203	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
9	R2	47	0.0	0.062	8.5	LOS A	0.2	1.6	0.53	0.73	47.9
Approach		823	1.9	0.203	0.5	NA	0.2	1.6	0.03	0.04	58.4
All Vehicles		1929	2.3	3.889	368.4	NA	133.2	940.1	0.18	0.69	4.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S2 - Gugeri St/Railway Rd/Loch St - PM Peak - 2021 (Without Dev)]

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
South: Loch St											
10	L2	19	0.0	0.018	5.5	LOS A	0.1	0.4	0.31	0.54	49.0
12	R2	218	1.0	3.671	2491.6	LOS F	109.7	774.2	1.00	3.95	0.8
Approach		237	0.9	3.671	2292.7	LOS F	109.7	774.2	0.94	3.68	0.9
East: Railway Rd											
1	L2	265	0.0	0.294	3.0	LOS A	1.5	10.2	0.10	0.27	48.7
2	T1	805	0.0	0.294	0.0	LOS A	1.5	10.2	0.03	0.08	59.0
Approach		1071	0.0	0.294	0.8	NA	1.5	10.2	0.05	0.13	56.0
West: Gugeri St											
8	T1	568	1.0	0.147	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
9	R2	28	0.0	0.051	10.5	LOS B	0.2	1.3	0.62	0.81	46.7
Approach		597	1.0	0.147	0.5	NA	0.2	1.3	0.03	0.04	58.5
All Vehicles		1904	0.4	3.671	285.8	NA	109.7	774.2	0.15	0.54	6.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S3 - Gugeri St/Railway Rd/Loch St - AM Peak - 2031 (Without Dev)]

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
South: Loch St											
10	L2	33	7.0	0.029	5.2	LOS A	0.1	0.7	0.21	0.52	49.0
12	R2	444	1.0	7.797	6198.1	LOS F	260.9	1841.9	1.00	4.37	0.3
Approach		477	1.4	7.797	5774.3	LOS F	260.9	1841.9	0.95	4.11	0.3
East: Railway Rd											
1	L2	278	3.0	0.258	3.1	LOS A	1.3	9.4	0.14	0.33	48.0
2	T1	631	3.0	0.258	0.0	LOS A	1.3	9.4	0.03	0.08	59.0
Approach		908	3.0	0.258	1.0	NA	1.3	9.4	0.07	0.15	55.1
West: Gugeri St											
8	T1	768	2.0	0.201	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
9	R2	46	0.0	0.066	9.0	LOS A	0.2	1.7	0.55	0.75	47.6
Approach		815	1.9	0.201	0.5	NA	0.2	1.7	0.03	0.04	58.4
All Vehicles		2200	2.2	7.797	1252.2	NA	260.9	1841.9	0.24	0.97	1.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S3 - Gugeri St/Railway Rd/Loch St - PM Peak - 2031 (Without Dev)]

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
South: Loch St											
10	L2	33	0.0	0.032	5.6	LOS A	0.1	0.8	0.33	0.56	48.9
12	R2	364	1.0	7.926	6333.9	LOS F	220.2	1554.9	1.00	3.78	0.3
Approach		397	0.9	7.926	5813.5	LOS F	220.2	1554.9	0.95	3.52	0.4
East: Railway Rd											
1	L2	293	0.0	0.325	3.1	LOS A	1.7	11.7	0.10	0.27	48.6
2	T1	889	0.0	0.325	0.0	LOS A	1.7	11.7	0.03	0.08	59.0
Approach		1182	0.0	0.325	0.8	NA	1.7	11.7	0.05	0.13	56.0
West: Gugeri St											
8	T1	562	1.0	0.146	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
9	R2	28	0.0	0.058	11.6	LOS B	0.2	1.4	0.67	0.86	46.0
Approach		591	1.0	0.146	0.6	NA	0.2	1.4	0.03	0.04	58.4
All Vehicles		2169	0.4	7.926	1064.0	NA	220.2	1554.9	0.21	0.72	1.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: v [S4 - Gugeri St/Railway Rd/Loch St - AM Peak - 2031 (With Dev + Mitigations)]

Signals - Fixed Time Isolated Cycle Time = 60 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: Loch St											
10	L2	38	7.0	0.040	11.3	LOS B	0.5	3.8	0.48	0.64	45.5
12	R2	472	1.0	0.817	29.4	LOS C	14.5	102.6	0.95	0.95	37.1
Approach		509	1.4	0.817	28.1	LOS C	14.5	102.6	0.92	0.93	37.7
East: Railway Rd											
1	L2	283	3.0	0.206	6.9	LOS A	1.4	10.1	0.31	0.64	49.6
2	T1	635	3.0	0.862	32.7	LOS C	12.1	87.2	0.99	1.04	39.0
Approach		918	3.0	0.862	24.7	LOS C	12.1	87.2	0.78	0.92	41.8
West: Gugeri St											
8	T1	778	2.0	0.469	13.2	LOS B	8.2	58.5	0.76	0.65	49.3
9	R2	53	0.0	0.288	34.6	LOS C	1.5	10.8	0.96	0.74	35.7
Approach		831	1.9	0.469	14.6	LOS B	8.2	58.5	0.77	0.66	48.1
All Vehicles		2258	2.2	0.862	21.7	LOS C	14.5	102.6	0.81	0.83	42.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians							
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90
P1	East Full Crossing	53	22.6	LOS C	0.1	0.1	0.87	0.87
All Pedestrians		105	23.5	LOS C			0.89	0.89

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: v [S4 - Gugeri St/Railway Rd/Loch St - PM Peak - 2031 (With Dev + Mitigations)]

Signals - Fixed Time Isolated Cycle Time = 60 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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Loch St											
10	L2	38	0.0	0.044	13.9	LOS B	0.6	4.2	0.57	0.66	44.2
12	R2	380	1.0	0.887	39.0	LOS D	13.6	96.1	1.00	1.07	33.9
Approach		418	0.9	0.887	36.7	LOS D	13.6	96.1	0.96	1.03	34.6
East: Railway Rd											
1	L2	308	0.0	0.220	6.9	LOS A	1.5	10.8	0.31	0.64	49.6
2	T1	904	0.0	0.898	34.4	LOS C	19.2	134.3	0.97	1.11	38.3
Approach		1213	0.0	0.898	27.4	LOS C	19.2	134.3	0.80	0.99	40.7
West: Gugeri St											
8	T1	573	1.0	0.288	8.9	LOS A	4.8	33.7	0.60	0.51	52.3
9	R2	49	0.0	0.271	34.5	LOS C	1.4	10.1	0.96	0.73	35.7
Approach		622	0.9	0.288	10.9	LOS B	4.8	33.7	0.63	0.53	50.5
All Vehicles		2253	0.4	0.898	24.6	LOS C	19.2	134.3	0.79	0.87	41.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	20.9	LOS C	0.1	0.1	0.84	0.84
P1	East Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90
All Pedestrians		105	22.6	LOS C			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: [S1 - Ped Crossing - Railway Rd - AM Peak - 2017]

Pedestrian Crossing (Signals) - Fixed Time Isolated Cycle Time = 40 seconds (Optimum Cycle Time - Minimum Delay)

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: Railway Rd (East)											
8	T1	791	3.0	0.361	5.0	LOS A	4.2	30.5	0.57	0.49	51.8
Approach		791	3.0	0.361	5.0	LOS A	4.2	30.5	0.57	0.49	51.8
West: Railway Rd (West)											
2	T1	995	2.0	0.448	5.4	LOS A	5.7	40.5	0.61	0.53	51.4
Approach		995	2.0	0.448	5.4	LOS A	5.7	40.5	0.61	0.53	51.4
All Vehicles		1785	2.4	0.448	5.2	LOS A	5.7	40.5	0.59	0.52	51.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	West Full Crossing	49	14.5	LOS B	0.0	0.0	0.85	0.85
All Pedestrians		49	14.5	LOS B			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: [S1 - Ped Crossing - Railway Rd - PM Peak - 2017]

Pedestrian Crossing (Signals) - Fixed Time Isolated Cycle Time = 65 seconds (Optimum Cycle Time - Minimum Delay)

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: Railway Rd (East)											
8	T1	1028	0.0	0.325	1.6	LOS A	4.1	28.5	0.27	0.24	57.1
Approach		1028	0.0	0.325	1.6	LOS A	4.1	28.5	0.27	0.24	57.1
West: Railway Rd (West)											
2	T1	747	1.0	0.236	1.5	LOS A	2.7	18.9	0.24	0.21	57.4
Approach		747	1.0	0.236	1.5	LOS A	2.7	18.9	0.24	0.21	57.4
All Vehicles		1776	0.4	0.325	1.5	LOS A	4.1	28.5	0.26	0.23	57.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	West Full Crossing	13	26.8	LOS C	0.0	0.0	0.91	0.91
All Pedestrians		13	26.8	LOS C			0.91	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: [S2 - Ped Crossing - Railway Rd - AM Peak - 2021 (Without Dev)]

Pedestrian Crossing (Signals) - Fixed Time Isolated Cycle Time = 140 seconds (Optimum Cycle Time - Minimum Delay)

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: Railway Rd (East)											
8	T1	822	3.0	0.272	4.0	LOS A	7.2	52.0	0.28	0.25	53.3
Approach		822	3.0	0.272	4.0	LOS A	7.2	52.0	0.28	0.25	53.3
West: Railway Rd (West)											
2	T1	1041	2.0	0.340	4.3	LOS A	9.8	69.9	0.31	0.28	52.9
Approach		1041	2.0	0.340	4.3	LOS A	9.8	69.9	0.31	0.28	52.9
All Vehicles		1863	2.4	0.340	4.2	LOS A	9.8	69.9	0.30	0.27	53.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	West Full Crossing	49	64.3	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		49	64.3	LOS F			0.96	0.96

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: [S1 - Ashton Ave/Chancellor St/Gugeri St - PM Peak - 2017]

Signals - Fixed Time Isolated Cycle Time = 70 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Chancellor St											
1	L2	58	0.0	0.825	35.9	LOS D	16.5	115.2	1.00	1.01	36.3
2	T1	391	0.0	0.825	31.3	LOS C	16.5	115.2	1.00	1.01	34.8
Approach		448	0.0	0.825	31.9	LOS C	16.5	115.2	1.00	1.01	35.0
East: Gugeri St (East)											
4	L2	4	0.0	0.196	21.0	LOS C	3.3	23.1	0.70	0.57	43.9
5	T1	755	0.0	0.808	23.0	LOS C	20.9	146.6	0.91	0.87	43.5
Approach		759	0.0	0.808	23.0	LOS C	20.9	146.6	0.91	0.87	43.5
North: Ashton Ave											
7	L2	8	0.0	0.457	27.9	LOS C	7.1	49.7	0.88	0.73	39.6
8	T1	236	0.0	0.457	23.3	LOS C	7.1	49.7	0.88	0.73	37.9
9	R2	104	0.0	0.809	45.7	LOS D	4.1	28.5	1.00	0.94	31.9
Approach		348	0.0	0.809	30.1	LOS C	7.1	49.7	0.92	0.80	35.9
West: Gugeri St (West)											
10	L2	143	3.0	0.473	15.6	LOS B	10.5	74.2	0.65	0.63	46.1
11	T1	598	1.0	0.473	10.6	LOS B	10.5	74.2	0.72	0.66	50.2
12	R2	45	2.0	0.473	17.2	LOS B	5.1	36.1	0.84	0.72	45.5
Approach		786	1.4	0.473	11.9	LOS B	10.5	74.2	0.71	0.66	49.1
All Vehicles		2342	0.5	0.825	22.1	LOS C	20.9	146.6	0.86	0.81	41.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	17.2	LOS B	0.1	0.1	0.70	0.70
P2	East Full Crossing	53	27.5	LOS C	0.1	0.1	0.89	0.89
P3	North Full Crossing	53	11.5	LOS B	0.1	0.1	0.57	0.57
P4	West Full Crossing	53	28.4	LOS C	0.1	0.1	0.90	0.90
All Pedestrians		211	21.1	LOS C			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Chancellor St.sip7

MOVEMENT SUMMARY

Site: [S2 - Ped Crossing - Railway Rd - PM Peak - 2021 (Without Dev)]

Pedestrian Crossing (Signals) - Fixed Time Isolated Cycle Time = 65 seconds (Optimum Cycle Time - Minimum Delay)

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: Railway Rd (East)											
8	T1	1071	0.0	0.338	1.6	LOS A	4.3	30.2	0.27	0.24	57.1
Approach		1071	0.0	0.338	1.6	LOS A	4.3	30.2	0.27	0.24	57.1
West: Railway Rd (West)											
2	T1	785	1.0	0.248	1.5	LOS A	2.9	20.2	0.25	0.22	57.3
Approach		785	1.0	0.248	1.5	LOS A	2.9	20.2	0.25	0.22	57.3
All Vehicles		1856	0.4	0.338	1.6	LOS A	4.3	30.2	0.26	0.23	57.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	West Full Crossing	13	26.8	LOS C	0.0	0.0	0.91	0.91
All Pedestrians		13	26.8	LOS C			0.91	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: [S3 - Ped Crossing - Railway Rd - AM Peak - 2031 (Without Dev)]

Pedestrian Crossing (Signals) - Fixed Time Isolated Cycle Time = 140 seconds (Optimum Cycle Time - Minimum Delay)

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: Railway Rd (East)											
8	T1	908	3.0	0.301	4.1	LOS A	8.2	59.2	0.29	0.26	53.1
Approach		908	3.0	0.301	4.1	LOS A	8.2	59.2	0.29	0.26	53.1
West: Railway Rd (West)											
2	T1	1213	2.0	0.396	4.6	LOS A	12.2	86.8	0.33	0.30	52.4
Approach		1213	2.0	0.396	4.6	LOS A	12.2	86.8	0.33	0.30	52.4
All Vehicles		2121	2.4	0.396	4.4	LOS A	12.2	86.8	0.31	0.28	52.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	West Full Crossing	49	64.3	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		49	64.3	LOS F			0.96	0.96

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: [S3 - Ped Crossing - Railway Rd - PM Peak - 2031 (Without Dev)]

Pedestrian Crossing (Signals) - Fixed Time Isolated Cycle Time = 125 seconds (Optimum Cycle Time - Minimum Delay)

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: Railway Rd (East)											
8	T1	1182	0.0	0.349	1.5	LOS A	6.5	45.4	0.20	0.18	57.2
Approach		1182	0.0	0.349	1.5	LOS A	6.5	45.4	0.20	0.18	57.2
West: Railway Rd (West)											
2	T1	927	1.0	0.274	1.4	LOS A	4.6	32.7	0.18	0.16	57.5
Approach		927	1.0	0.274	1.4	LOS A	4.6	32.7	0.18	0.16	57.5
All Vehicles		2109	0.4	0.349	1.5	LOS A	6.5	45.4	0.19	0.17	57.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	West Full Crossing	13	56.7	LOS E	0.0	0.0	0.95	0.95
All Pedestrians		13	56.7	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: [S4 - Ped Crossing - Railway Rd - AM Peak - 2031 (With Dev)]

Pedestrian Crossing (Signals) - Fixed Time Isolated Cycle Time = 140 seconds (Optimum Cycle Time - Minimum Delay)

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: Railway Rd (East)											
8	T1	918	3.0	0.304	4.1	LOS A	8.4	60.0	0.29	0.26	53.1
Approach		918	3.0	0.304	4.1	LOS A	8.4	60.0	0.29	0.26	53.1
West: Railway Rd (West)											
2	T1	1248	2.0	0.408	4.6	LOS A	12.7	90.6	0.33	0.30	52.4
Approach		1248	2.0	0.408	4.6	LOS A	12.7	90.6	0.33	0.30	52.4
All Vehicles		2166	2.4	0.408	4.4	LOS A	12.7	90.6	0.32	0.29	52.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	West Full Crossing	49	64.3	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		49	64.3	LOS F			0.96	0.96

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: [S4 - Ped Crossing - Railway Rd - PM Peak - 2031 (With Dev)]

Pedestrian Crossing (Signals) - Fixed Time Isolated Cycle Time = 125 seconds (Optimum Cycle Time - Minimum Delay)

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: Railway Rd (East)											
8	T1	1213	0.0	0.358	1.6	LOS A	6.7	47.1	0.20	0.18	57.2
Approach		1213	0.0	0.358	1.6	LOS A	6.7	47.1	0.20	0.18	57.2
West: Railway Rd (West)											
2	T1	953	1.0	0.281	1.4	LOS A	4.8	33.9	0.18	0.16	57.4
Approach		953	1.0	0.281	1.4	LOS A	4.8	33.9	0.18	0.16	57.4
All Vehicles		2165	0.4	0.358	1.5	LOS A	6.7	47.1	0.19	0.18	57.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	West Full Crossing	13	56.7	LOS E	0.0	0.0	0.95	0.95
All Pedestrians		13	56.7	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: [S1 - Chancellor St/Loch St/Carrington St - AM Peak - 2017]

Roundabout

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: Loch St (South)											
1a	L1	105	4.0	0.328	5.7	LOS A	2.2	16.1	0.52	0.60	52.9
2	T1	182	4.0	0.328	6.1	LOS A	2.2	16.1	0.52	0.60	44.9
12	R2	52	0.0	0.328	9.7	LOS A	2.2	16.1	0.52	0.60	53.0
12u	U	4	0.0	0.328	11.4	LOS B	2.2	16.1	0.52	0.60	53.7
Approach		343	3.3	0.328	6.6	LOS A	2.2	16.1	0.52	0.60	48.3
East: Carrington St											
1	L2	101	1.0	0.335	6.6	LOS A	2.1	15.0	0.62	0.74	42.4
6a	R1	128	1.0	0.335	9.6	LOS A	2.1	15.0	0.62	0.74	50.4
6	R2	75	0.0	0.335	10.4	LOS B	2.1	15.0	0.62	0.74	43.3
3u	U	3	0.0	0.335	12.1	LOS B	2.1	15.0	0.62	0.74	51.3
Approach		307	0.7	0.335	8.8	LOS A	2.1	15.0	0.62	0.74	45.8
North: Loch St (North)											
7	L2	96	1.0	0.410	7.7	LOS A	2.8	20.4	0.78	0.81	49.3
8	T1	202	5.0	0.410	8.0	LOS A	2.8	20.4	0.78	0.81	50.1
9b	R3	6	0.0	0.410	12.3	LOS B	2.8	20.4	0.78	0.81	50.3
9u	U	1	0.0	0.410	13.1	LOS B	2.8	20.4	0.78	0.81	50.6
Approach		305	3.6	0.410	8.0	LOS A	2.8	20.4	0.78	0.81	49.8
NorthWest: Chancellor St											
27b	L3	19	0.0	0.541	8.2	LOS A	4.7	33.2	0.75	0.75	51.2
27a	L1	327	0.0	0.541	7.6	LOS A	4.7	33.2	0.75	0.75	52.1
29a	R1	161	3.0	0.541	11.0	LOS B	4.7	33.2	0.75	0.75	51.6
29u	U	1	0.0	0.541	13.5	LOS B	4.7	33.2	0.75	0.75	52.7
Approach		508	1.0	0.541	8.7	LOS A	4.7	33.2	0.75	0.75	51.9
All Vehicles		1464	2.0	0.541	8.1	LOS A	4.7	33.2	0.68	0.72	49.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S1 - Chancellor St/Loch St/Carrington St - PM Peak - 2017]

Roundabout

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: Loch St (South)											
1a	L1	182	0.0	0.377	6.6	LOS A	2.6	18.4	0.65	0.69	52.8
2	T1	144	1.0	0.377	7.0	LOS A	2.6	18.4	0.65	0.69	44.7
12	R2	20	0.0	0.377	10.7	LOS B	2.6	18.4	0.65	0.69	52.9
12u	U	1	0.0	0.377	12.5	LOS B	2.6	18.4	0.65	0.69	53.5
Approach		347	0.4	0.377	7.1	LOS A	2.6	18.4	0.65	0.69	49.1
East: Carrington St											
1	L2	169	0.0	0.512	7.1	LOS A	3.9	27.1	0.70	0.77	42.2
6a	R1	254	0.0	0.512	10.0	LOS B	3.9	27.1	0.70	0.77	50.1
6	R2	61	2.0	0.512	11.0	LOS B	3.9	27.1	0.70	0.77	43.1
3u	U	1	0.0	0.512	12.6	LOS B	3.9	27.1	0.70	0.77	51.0
Approach		485	0.3	0.512	9.1	LOS A	3.9	27.1	0.70	0.77	46.1
North: Loch St (North)											
7	L2	62	0.0	0.314	5.9	LOS A	2.0	14.1	0.56	0.63	50.9
8	T1	220	2.0	0.314	6.0	LOS A	2.0	14.1	0.56	0.63	51.8
9b	R3	24	0.0	0.314	10.5	LOS B	2.0	14.1	0.56	0.63	51.9
9u	U	1	0.0	0.314	11.4	LOS B	2.0	14.1	0.56	0.63	52.2
Approach		307	1.4	0.314	6.4	LOS A	2.0	14.1	0.56	0.63	51.6
NorthWest: Chancellor St											
27b	L3	16	0.0	0.287	6.5	LOS A	2.0	14.1	0.55	0.63	51.9
27a	L1	159	1.0	0.287	6.0	LOS A	2.0	14.1	0.55	0.63	52.8
29a	R1	114	1.0	0.287	9.2	LOS A	2.0	14.1	0.55	0.63	52.5
29u	U	1	0.0	0.287	11.8	LOS B	2.0	14.1	0.55	0.63	53.5
Approach		289	0.9	0.287	7.3	LOS A	2.0	14.1	0.55	0.63	52.7
All Vehicles		1429	0.7	0.512	7.7	LOS A	3.9	27.1	0.63	0.69	49.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S2 - Chancellor St/Loch St/Carrington St - AM Peak - 2021 (Without Dev)]

Roundabout

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: Loch St (South)											
1a	L1	129	4.0	0.404	5.9	LOS A	3.0	21.6	0.57	0.62	52.7
2	T1	224	4.0	0.404	6.2	LOS A	3.0	21.6	0.57	0.62	44.7
12	R2	63	0.0	0.404	9.8	LOS A	3.0	21.6	0.57	0.62	52.8
12u	U	5	0.0	0.404	11.6	LOS B	3.0	21.6	0.57	0.62	53.5
Approach		422	3.4	0.404	6.7	LOS A	3.0	21.6	0.57	0.62	48.2
East: Carrington St											
1	L2	105	1.0	0.379	7.3	LOS A	2.5	17.7	0.70	0.79	42.1
6a	R1	134	1.0	0.379	10.2	LOS B	2.5	17.7	0.70	0.79	49.9
6	R2	78	0.0	0.379	11.1	LOS B	2.5	17.7	0.70	0.79	43.0
3u	U	3	0.0	0.379	12.8	LOS B	2.5	17.7	0.70	0.79	50.8
Approach		320	0.7	0.379	9.5	LOS A	2.5	17.7	0.70	0.79	45.4
North: Loch St (North)											
7	L2	118	1.0	0.585	12.0	LOS B	5.5	39.6	0.93	1.04	46.6
8	T1	248	5.0	0.585	12.2	LOS B	5.5	39.6	0.93	1.04	47.3
9b	R3	7	0.0	0.585	16.5	LOS B	5.5	39.6	0.93	1.04	47.5
9u	U	1	0.0	0.585	17.3	LOS B	5.5	39.6	0.93	1.04	47.8
Approach		375	3.6	0.585	12.3	LOS B	5.5	39.6	0.93	1.04	47.1
NorthWest: Chancellor St											
27b	L3	23	0.0	0.689	12.0	LOS B	8.6	60.7	0.90	0.94	48.6
27a	L1	392	0.0	0.689	11.5	LOS B	8.6	60.7	0.90	0.94	49.4
29a	R1	193	3.0	0.689	14.8	LOS B	8.6	60.7	0.90	0.94	49.0
29u	U	1	0.0	0.689	17.3	LOS B	8.6	60.7	0.90	0.94	49.9
Approach		608	0.9	0.689	12.6	LOS B	8.6	60.7	0.90	0.94	49.2
All Vehicles		1725	2.1	0.689	10.5	LOS B	8.6	60.7	0.79	0.85	47.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S2 - Chancellor St/Loch St/Carrington St - PM Peak - 2021 (Without Dev)]

Roundabout

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: Loch St (South)											
1a	L1	224	0.0	0.474	7.0	LOS A	3.6	25.3	0.73	0.73	52.6
2	T1	177	1.0	0.474	7.4	LOS A	3.6	25.3	0.73	0.73	44.5
12	R2	24	0.0	0.474	11.1	LOS B	3.6	25.3	0.73	0.73	52.6
12u	U	1	0.0	0.474	12.9	LOS B	3.6	25.3	0.73	0.73	53.2
Approach		426	0.4	0.474	7.4	LOS A	3.6	25.3	0.73	0.73	48.9
East: Carrington St											
1	L2	177	0.0	0.580	9.0	LOS A	5.2	36.7	0.79	0.88	41.3
6a	R1	265	0.0	0.580	11.9	LOS B	5.2	36.7	0.79	0.88	48.8
6	R2	64	2.0	0.580	12.9	LOS B	5.2	36.7	0.79	0.88	42.1
3u	U	1	0.0	0.580	14.5	LOS B	5.2	36.7	0.79	0.88	49.7
Approach		507	0.3	0.580	11.0	LOS B	5.2	36.7	0.79	0.88	45.1
North: Loch St (North)											
7	L2	77	0.0	0.409	6.5	LOS A	2.8	20.0	0.66	0.70	50.6
8	T1	271	2.0	0.409	6.6	LOS A	2.8	20.0	0.66	0.70	51.4
9b	R3	29	0.0	0.409	11.1	LOS B	2.8	20.0	0.66	0.70	51.5
9u	U	1	0.0	0.409	12.0	LOS B	2.8	20.0	0.66	0.70	51.8
Approach		378	1.4	0.409	7.0	LOS A	2.8	20.0	0.66	0.70	51.3
NorthWest: Chancellor St											
27b	L3	19	0.0	0.359	7.0	LOS A	2.7	18.8	0.63	0.67	51.7
27a	L1	191	1.0	0.359	6.5	LOS A	2.7	18.8	0.63	0.67	52.5
29a	R1	136	1.0	0.359	9.7	LOS A	2.7	18.8	0.63	0.67	52.2
29u	U	1	0.0	0.359	12.3	LOS B	2.7	18.8	0.63	0.67	53.2
Approach		346	0.9	0.359	7.8	LOS A	2.7	18.8	0.63	0.67	52.4
All Vehicles		1658	0.7	0.580	8.5	LOS A	5.2	36.7	0.71	0.76	48.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S3 - Chancellor St/Loch St/Carrington St - AM Peak - 2031 (Without Dev)]

Roundabout

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: Loch St (South)											
1a	L1	217	4.0	0.684	7.9	LOS A	8.1	58.1	0.82	0.75	51.7
2	T1	375	4.0	0.684	8.3	LOS A	8.1	58.1	0.82	0.75	44.0
12	R2	106	0.0	0.684	11.8	LOS B	8.1	58.1	0.82	0.75	51.8
12u	U	8	0.0	0.684	13.6	LOS B	8.1	58.1	0.82	0.75	52.5
Approach		706	3.4	0.684	8.8	LOS A	8.1	58.1	0.82	0.75	47.3
East: Carrington St											
1	L2	118	1.0	0.496	9.9	LOS A	4.0	28.1	0.84	0.93	40.9
6a	R1	149	1.0	0.496	12.8	LOS B	4.0	28.1	0.84	0.93	48.2
6	R2	87	0.0	0.496	13.6	LOS B	4.0	28.1	0.84	0.93	41.7
3u	U	3	0.0	0.496	15.4	LOS B	4.0	28.1	0.84	0.93	49.1
Approach		358	0.7	0.496	12.1	LOS B	4.0	28.1	0.84	0.93	44.0
North: Loch St (North)											
7	L2	198	1.0	1.163	181.5	LOS F	75.3	543.5	1.00	3.84	14.8
8	T1	417	5.0	1.163	181.8	LOS F	75.3	543.5	1.00	3.84	14.9
9b	R3	13	0.0	1.163	186.0	LOS F	75.3	543.5	1.00	3.84	14.9
9u	U	2	0.0	1.163	186.8	LOS F	75.3	543.5	1.00	3.84	14.9
Approach		629	3.6	1.163	181.8	LOS F	75.3	543.5	1.00	3.84	14.8
NorthWest: Chancellor St											
27b	L3	36	0.0	1.397	380.2	LOS F	191.1	1348.5	1.00	6.29	8.3
27a	L1	615	0.0	1.397	379.7	LOS F	191.1	1348.5	1.00	6.29	8.3
29a	R1	302	3.0	1.397	383.1	LOS F	191.1	1348.5	1.00	6.29	8.3
29u	U	1	0.0	1.397	385.5	LOS F	191.1	1348.5	1.00	6.29	8.3
Approach		954	1.0	1.397	380.8	LOS F	191.1	1348.5	1.00	6.29	8.3
All Vehicles		2647	2.2	1.397	184.4	LOS F	191.1	1348.5	0.93	3.51	14.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S2 - Ashton Ave/Chancellor St/Gugeri St - AM Peak - 2021 (Without Dev)]

Signals - Fixed Time Isolated Cycle Time = 50 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Chancellor St											
1	L2	34	4.0	0.588	22.8	LOS C	6.7	48.0	0.92	0.78	41.7
2	T1	268	2.0	0.588	18.2	LOS B	6.7	48.0	0.92	0.78	39.8
Approach		302	2.2	0.588	18.7	LOS B	6.7	48.0	0.92	0.78	40.0
East: Gugeri St (East)											
4	L2	7	0.0	0.211	21.7	LOS C	2.0	14.6	0.82	0.65	43.4
5	T1	533	3.0	0.869	25.6	LOS C	13.0	93.4	0.97	1.01	42.2
Approach		540	3.0	0.869	25.6	LOS C	13.0	93.4	0.97	1.00	42.2
North: Ashton Ave											
7	L2	9	11.0	0.811	28.3	LOS C	11.1	78.6	1.00	1.01	39.3
8	T1	402	1.0	0.811	23.6	LOS C	11.1	78.6	1.00	1.01	37.8
9	R2	162	3.0	0.727	30.6	LOS C	4.4	31.3	1.00	0.92	36.7
Approach		574	1.7	0.811	25.7	LOS C	11.1	78.6	1.00	0.99	37.5
West: Gugeri St (West)											
10	L2	87	2.0	0.631	15.6	LOS B	11.1	79.3	0.78	0.71	46.6
11	T1	725	2.0	0.631	10.3	LOS B	11.1	79.3	0.83	0.74	50.5
12	R2	99	1.0	0.631	16.7	LOS B	4.7	33.7	0.94	0.80	45.3
Approach		912	1.9	0.631	11.5	LOS B	11.1	79.3	0.83	0.74	49.5
All Vehicles		2327	2.1	0.869	19.2	LOS B	13.0	93.4	0.92	0.87	43.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	18.5	LOS B	0.1	0.1	0.86	0.86
P2	East Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
P3	North Full Crossing	53	11.6	LOS B	0.1	0.1	0.68	0.68
P4	West Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
All Pedestrians		211	17.2	LOS B			0.83	0.83

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Gugeri St-Ashton Ave-Chancellor St.sip7

MOVEMENT SUMMARY

Site: [S3 - Chancellor St/Loch St/Carrington St - PM Peak - 2031 (Without Dev)]

Roundabout

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: Loch St (South)											
1a	L1	375	0.0	0.839	16.7	LOS B	15.0	105.3	1.00	1.14	46.5
2	T1	297	1.0	0.839	17.1	LOS B	15.0	105.3	1.00	1.14	40.1
12	R2	41	0.0	0.839	20.8	LOS C	15.0	105.3	1.00	1.14	46.5
12u	U	1	0.0	0.839	22.5	LOS C	15.0	105.3	1.00	1.14	47.0
Approach		714	0.4	0.839	17.1	LOS B	15.0	105.3	1.00	1.14	43.6
East: Carrington St											
1	L2	198	0.0	0.912	36.0	LOS D	19.3	135.3	1.00	1.60	31.7
6a	R1	296	0.0	0.912	38.9	LOS D	19.3	135.3	1.00	1.60	36.0
6	R2	72	2.0	0.912	39.9	LOS D	19.3	135.3	1.00	1.60	32.2
3u	U	1	0.0	0.912	41.5	LOS D	19.3	135.3	1.00	1.60	36.4
Approach		566	0.3	0.912	38.0	LOS D	19.3	135.3	1.00	1.60	33.9
North: Loch St (North)											
7	L2	128	0.0	0.875	23.1	LOS C	16.4	116.4	1.00	1.37	41.4
8	T1	454	2.0	0.875	23.3	LOS C	16.4	116.4	1.00	1.37	42.0
9b	R3	49	0.0	0.875	27.8	LOS C	16.4	116.4	1.00	1.37	42.1
9u	U	2	0.0	0.875	28.6	LOS C	16.4	116.4	1.00	1.37	42.3
Approach		634	1.4	0.875	23.7	LOS C	16.4	116.4	1.00	1.37	41.9
NorthWest: Chancellor St											
27b	L3	29	0.0	0.673	12.4	LOS B	8.2	57.6	0.94	0.97	48.2
27a	L1	298	1.0	0.673	11.9	LOS B	8.2	57.6	0.94	0.97	48.9
29a	R1	214	1.0	0.673	15.1	LOS B	8.2	57.6	0.94	0.97	48.6
29u	U	1	0.0	0.673	17.7	LOS B	8.2	57.6	0.94	0.97	49.5
Approach		542	0.9	0.673	13.2	LOS B	8.2	57.6	0.94	0.97	48.8
All Vehicles		2456	0.8	0.912	22.8	LOS C	19.3	135.3	0.99	1.27	41.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S4 - Chancellor St/Loch St/Carrington St - AM Peak - 2031 (With Dev + Mitigations)]

Roundabout

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: Loch St (South)											
1a	L1	217	4.0	0.753	9.1	LOS A	9.5	68.5	0.85	0.83	51.1
2	T1	375	4.0	0.753	9.5	LOS A	9.5	68.5	0.85	0.83	43.5
12	R2	106	0.0	0.753	13.0	LOS B	9.5	68.5	0.85	0.83	51.2
12u	U	8	0.0	0.753	14.8	LOS B	9.5	68.5	0.85	0.83	51.8
Approach		706	3.4	0.753	9.9	LOS A	9.5	68.5	0.85	0.83	46.8
East: Carrington St											
1	L2	118	1.0	0.625	14.4	LOS B	5.4	38.2	0.90	1.08	38.9
6a	R1	149	1.0	0.625	17.3	LOS B	5.4	38.2	0.90	1.08	45.5
6	R2	87	0.0	0.625	18.1	LOS B	5.4	38.2	0.90	1.08	39.7
3u	U	3	0.0	0.625	19.8	LOS B	5.4	38.2	0.90	1.08	46.3
Approach		358	0.7	0.625	16.6	LOS B	5.4	38.2	0.90	1.08	41.7
North: Loch St (North)											
7	L2	198	1.0	0.443	9.4	LOS A	2.4	17.1	0.81	0.95	41.7
8	T1	417	5.0	0.731	14.0	LOS B	6.2	45.0	0.93	1.11	48.5
9b	R3	13	0.0	0.731	18.4	LOS B	6.2	45.0	0.93	1.11	48.6
9u	U	2	0.0	0.731	19.3	LOS B	6.2	45.0	0.93	1.11	48.9
Approach		629	3.6	0.731	12.7	LOS B	6.2	45.0	0.89	1.06	46.1
NorthWest: Chancellor St											
27b	L3	36	0.0	0.771	17.5	LOS B	12.2	85.7	1.00	1.15	45.8
27a	L1	615	0.0	0.771	16.7	LOS B	12.2	85.7	1.00	1.15	46.7
29a	R1	302	3.0	0.496	15.0	LOS B	4.2	30.0	0.89	0.97	47.5
29u	U	1	0.0	0.496	17.5	LOS B	4.2	30.0	0.89	0.97	48.4
Approach		954	1.0	0.771	16.2	LOS B	12.2	85.7	0.97	1.09	46.9
All Vehicles		2647	2.2	0.771	13.8	LOS B	12.2	85.7	0.91	1.01	45.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S4 - Chancellor St/Loch St/Carrington St - PM Peak - 2031 (With Dev + Mitigations)]

Roundabout

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: Loch St (South)											
1a	L1	375	0.0	0.920	23.1	LOS C	19.8	139.4	1.00	1.34	43.0
2	T1	297	1.0	0.920	23.5	LOS C	19.8	139.4	1.00	1.34	37.5
12	R2	41	0.0	0.920	27.1	LOS C	19.8	139.4	1.00	1.34	43.0
12u	U	1	0.0	0.920	28.9	LOS C	19.8	139.4	1.00	1.34	43.5
Approach		714	0.4	0.920	23.5	LOS C	19.8	139.4	1.00	1.34	40.6
East: Carrington St											
1	L2	198	0.0	0.942	38.8	LOS D	20.3	142.5	1.00	1.69	30.9
6a	R1	296	0.0	0.942	41.8	LOS D	20.3	142.5	1.00	1.69	35.0
6	R2	72	2.0	0.942	42.8	LOS D	20.3	142.5	1.00	1.69	31.4
3u	U	1	0.0	0.942	44.4	LOS D	20.3	142.5	1.00	1.69	35.4
Approach		566	0.3	0.942	40.9	LOS D	20.3	142.5	1.00	1.69	33.0
North: Loch St (North)											
7	L2	128	0.0	0.256	7.0	LOS A	1.1	7.5	0.62	0.78	42.9
8	T1	454	2.0	0.569	8.0	LOS A	3.9	27.9	0.71	0.88	52.3
9b	R3	49	0.0	0.569	12.6	LOS B	3.9	27.9	0.71	0.88	52.4
9u	U	2	0.0	0.569	13.4	LOS B	3.9	27.9	0.71	0.88	52.7
Approach		634	1.4	0.569	8.2	LOS A	3.9	27.9	0.69	0.86	50.1
NorthWest: Chancellor St											
27b	L3	29	0.0	0.332	7.6	LOS A	2.6	18.2	0.73	0.70	51.9
27a	L1	298	1.0	0.332	6.8	LOS A	2.6	18.2	0.73	0.70	52.9
29a	R1	214	1.0	0.264	10.5	LOS B	1.9	13.1	0.71	0.76	50.5
29u	U	1	0.0	0.264	13.2	LOS B	1.9	13.1	0.71	0.76	51.4
Approach		542	0.9	0.332	8.3	LOS A	2.6	18.2	0.72	0.72	51.9
All Vehicles		2456	0.8	0.942	20.2	LOS C	20.3	142.5	0.86	1.16	42.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S1 - Alfred Rd/Ashton Ave - AM Peak - 2017]

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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Ashton Ave											
10	L2	94	2.0	0.089	8.1	LOS A	0.4	2.5	0.39	0.88	37.2
12	R2	57	6.0	0.390	35.2	LOS E	1.2	9.1	0.92	1.07	29.2
Approach		151	3.5	0.390	18.3	LOS C	1.2	9.1	0.59	0.95	33.7
East: Alfred Rd (East)											
1	L2	214	3.0	0.265	4.6	LOS A	0.0	0.0	0.00	0.23	48.1
2	T1	282	6.0	0.265	0.0	LOS A	0.0	0.0	0.00	0.23	48.6
Approach		496	4.7	0.265	2.0	NA	0.0	0.0	0.00	0.23	48.4
West: Alfred Rd (West)											
8	T1	596	3.0	0.620	3.7	LOS A	7.2	51.1	0.62	0.35	46.2
9	R2	325	1.0	0.620	10.0	LOS A	7.2	51.1	0.62	0.35	41.6
Approach		921	2.3	0.620	5.9	NA	7.2	51.1	0.62	0.35	44.5
All Vehicles		1567	3.2	0.620	5.9	NA	7.2	51.1	0.42	0.37	44.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S1 - Alfred Rd/Ashton Ave - PM Peak - 2017]

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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Ashton Ave											
10	L2	242	0.0	0.274	9.4	LOS A	1.2	8.3	0.54	0.96	36.8
12	R2	117	2.0	0.328	16.8	LOS C	1.2	8.7	0.77	1.07	34.1
Approach		359	0.7	0.328	11.8	LOS B	1.2	8.7	0.61	1.00	35.9
East: Alfred Rd (East)											
1	L2	163	1.0	0.315	4.6	LOS A	0.0	0.0	0.00	0.15	48.6
2	T1	442	2.0	0.315	0.0	LOS A	0.0	0.0	0.00	0.15	49.1
Approach		605	1.7	0.315	1.3	NA	0.0	0.0	0.00	0.15	49.0
West: Alfred Rd (West)											
8	T1	282	3.0	0.298	2.2	LOS A	1.8	12.6	0.48	0.26	47.2
9	R2	140	0.0	0.298	8.2	LOS A	1.8	12.6	0.48	0.26	42.4
Approach		422	2.0	0.298	4.2	NA	1.8	12.6	0.48	0.26	45.5
All Vehicles		1386	1.5	0.328	4.9	NA	1.8	12.6	0.31	0.40	43.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S2 - Alfred Rd/Ashton Ave - AM Peak - 2021 (Without Dev)]

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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Ashton Ave											
10	L2	99	2.0	0.095	8.1	LOS A	0.4	2.7	0.40	0.89	37.2
12	R2	60	6.0	0.550	57.0	LOS F	2.0	15.0	0.95	1.12	24.8
Approach		159	3.5	0.550	26.6	LOS D	2.0	15.0	0.61	0.98	31.3
East: Alfred Rd (East)											
1	L2	223	3.0	0.277	4.6	LOS A	0.0	0.0	0.00	0.23	48.1
2	T1	295	6.0	0.277	0.0	LOS A	0.0	0.0	0.00	0.23	48.6
Approach		518	4.7	0.277	2.0	NA	0.0	0.0	0.00	0.23	48.4
West: Alfred Rd (West)											
8	T1	622	3.0	0.324	0.0	LOS A	0.0	0.0	0.00	0.00	49.9
9	R2	340	1.0	0.329	7.5	LOS A	1.8	12.5	0.60	0.81	40.8
Approach		962	2.3	0.329	2.7	NA	1.8	12.5	0.21	0.28	46.3
All Vehicles		1639	3.2	0.550	4.8	NA	2.0	15.0	0.18	0.34	44.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S2 - Alfred Rd/Ashton Ave - PM Peak - 2021 (Without Dev)]

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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Ashton Ave											
10	L2	255	0.0	0.296	9.7	LOS A	1.4	9.5	0.55	0.99	36.7
12	R2	123	2.0	0.515	28.3	LOS D	2.3	16.6	0.88	1.16	30.8
Approach		378	0.7	0.515	15.8	LOS C	2.3	16.6	0.66	1.04	34.6
East: Alfred Rd (East)											
1	L2	171	1.0	0.329	4.6	LOS A	0.0	0.0	0.00	0.15	48.6
2	T1	462	2.0	0.329	0.0	LOS A	0.0	0.0	0.00	0.15	49.1
Approach		633	1.7	0.329	1.3	NA	0.0	0.0	0.00	0.15	49.0
West: Alfred Rd (West)											
8	T1	295	3.0	0.153	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
9	R2	146	0.0	0.163	7.6	LOS A	0.7	4.8	0.59	0.77	40.8
Approach		441	2.0	0.163	2.5	NA	0.7	4.8	0.20	0.26	46.5
All Vehicles		1452	1.5	0.515	5.4	NA	2.3	16.6	0.23	0.41	43.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S3 - Alfred Rd/Ashton Ave - AM Peak - 2031 (Without Dev)]

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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Ashton Ave											
10	L2	113	2.0	0.113	8.4	LOS A	0.4	3.2	0.42	0.90	37.1
12	R2	68	6.0	1.018	203.5	LOS F	6.4	47.4	1.00	1.69	12.4
Approach		181	3.5	1.018	82.1	LOS F	6.4	47.4	0.64	1.19	21.2
East: Alfred Rd (East)											
1	L2	249	3.0	0.309	4.6	LOS A	0.0	0.0	0.00	0.23	48.1
2	T1	328	6.0	0.309	0.0	LOS A	0.0	0.0	0.00	0.23	48.6
Approach		578	4.7	0.309	2.0	NA	0.0	0.0	0.00	0.23	48.4
West: Alfred Rd (West)											
8	T1	695	3.0	0.361	0.0	LOS A	0.0	0.0	0.00	0.00	49.9
9	R2	379	1.0	0.398	8.6	LOS A	2.4	16.8	0.64	0.91	40.4
Approach		1074	2.3	0.398	3.1	NA	2.4	16.8	0.23	0.32	46.1
All Vehicles		1833	3.2	1.018	10.5	NA	6.4	47.4	0.20	0.38	41.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S3 - Alfred Rd/Ashton Ave - PM Peak - 2031 (Without Dev)]

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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Ashton Ave											
10	L2	291	0.0	0.364	10.7	LOS B	1.9	13.2	0.60	1.07	36.4
12	R2	140	2.0	0.881	66.0	LOS F	5.2	37.0	0.95	1.61	23.4
Approach		431	0.7	0.881	28.7	LOS D	5.2	37.0	0.71	1.24	30.8
East: Alfred Rd (East)											
1	L2	191	1.0	0.367	4.6	LOS A	0.0	0.0	0.00	0.15	48.6
2	T1	516	2.0	0.367	0.0	LOS A	0.0	0.0	0.00	0.15	49.1
Approach		706	1.7	0.367	1.3	NA	0.0	0.0	0.00	0.15	49.0
West: Alfred Rd (West)											
8	T1	328	3.0	0.171	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
9	R2	163	0.0	0.203	8.3	LOS A	0.8	5.9	0.63	0.83	40.5
Approach		492	2.0	0.203	2.8	NA	0.8	5.9	0.21	0.27	46.4
All Vehicles		1628	1.5	0.881	9.0	NA	5.2	37.0	0.25	0.47	41.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: v [S4 - Alfred Rd/Ashton Ave - AM Peak - 2031 (With Dev + Mitigations)]

Roundabout

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: Ashton Ave											
10	L2	132	2.0	0.228	4.2	LOS A	1.6	11.5	0.64	0.62	37.9
12	R2	81	6.0	0.228	7.9	LOS A	1.6	11.5	0.64	0.62	38.9
Approach		213	3.5	0.228	5.6	LOS A	1.6	11.5	0.64	0.62	38.3
East: Alfred Rd (East)											
1	L2	254	3.0	0.631	8.4	LOS A	6.8	49.8	0.86	0.86	40.7
2	T1	328	6.0	0.631	8.6	LOS A	6.8	49.8	0.86	0.86	45.6
Approach		582	4.7	0.631	8.5	LOS A	6.8	49.8	0.86	0.86	43.4
West: Alfred Rd (West)											
8	T1	695	3.0	0.760	4.4	LOS A	12.1	86.5	0.65	0.49	46.1
9	R2	385	1.0	0.760	8.4	LOS A	12.1	86.5	0.65	0.49	42.3
Approach		1080	2.3	0.760	5.8	LOS A	12.1	86.5	0.65	0.49	44.7
All Vehicles		1875	3.2	0.760	6.6	LOS A	12.1	86.5	0.72	0.62	43.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S2 - Ashton Ave/Chancellor St/Gugeri St - PM Peak - 2021 (Without Dev)]

Signals - Fixed Time Isolated Cycle Time = 70 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Chancellor St											
1	L2	69	0.0	0.816	32.6	LOS C	19.0	133.2	0.98	0.98	37.6
2	T1	467	0.0	0.816	28.0	LOS C	19.0	133.2	0.98	0.98	36.0
Approach		537	0.0	0.816	28.6	LOS C	19.0	133.2	0.98	0.98	36.2
East: Gugeri St (East)											
4	L2	4	0.0	0.200	23.9	LOS C	3.1	21.9	0.76	0.61	42.4
5	T1	656	0.0	0.825	26.8	LOS C	19.2	134.7	0.94	0.91	41.6
Approach		660	0.0	0.825	26.8	LOS C	19.2	134.7	0.94	0.91	41.7
North: Ashton Ave											
7	L2	8	0.0	0.397	24.4	LOS C	6.9	48.1	0.82	0.69	41.2
8	T1	248	0.0	0.397	19.8	LOS B	6.9	48.1	0.82	0.69	39.3
9	R2	88	0.0	0.617	41.5	LOS D	3.2	22.6	1.00	0.82	33.1
Approach		345	0.0	0.617	25.5	LOS C	6.9	48.1	0.87	0.72	37.5
West: Gugeri St (West)											
10	L2	133	3.0	0.483	18.0	LOS B	10.5	74.7	0.71	0.67	44.7
11	T1	554	1.0	0.483	12.8	LOS B	10.5	74.7	0.77	0.69	48.7
12	R2	42	2.0	0.483	18.9	LOS B	5.4	38.3	0.87	0.73	44.6
Approach		728	1.4	0.483	14.1	LOS B	10.5	74.7	0.76	0.69	47.7
All Vehicles		2271	0.5	0.825	22.9	LOS C	19.2	134.7	0.88	0.83	41.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	20.1	LOS C	0.1	0.1	0.76	0.76
P2	East Full Crossing	53	24.1	LOS C	0.1	0.1	0.83	0.83
P3	North Full Crossing	53	13.9	LOS B	0.1	0.1	0.63	0.63
P4	West Full Crossing	53	24.9	LOS C	0.1	0.1	0.84	0.84
All Pedestrians		211	20.7	LOS C			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Gugeri St-Ashton Ave-Chancellor St.sip7

MOVEMENT SUMMARY

Site: [S4 - Alfred Rd/Ashton Ave - PM Peak - 2031 (With Dev + Mitigations)]

Roundabout

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: Ashton Ave											
10	L2	302	0.0	0.560	8.1	LOS A	5.4	38.2	0.89	0.93	36.6
12	R2	148	2.0	0.560	11.8	LOS B	5.4	38.2	0.89	0.93	37.5
Approach		451	0.7	0.560	9.3	LOS A	5.4	38.2	0.89	0.93	36.9
East: Alfred Rd (East)											
1	L2	205	1.0	0.598	4.9	LOS A	5.9	41.8	0.65	0.57	41.6
2	T1	516	2.0	0.598	5.0	LOS A	5.9	41.8	0.65	0.57	46.8
Approach		721	1.7	0.598	5.0	LOS A	5.9	41.8	0.65	0.57	45.2
West: Alfred Rd (West)											
8	T1	328	3.0	0.423	4.4	LOS A	3.7	26.6	0.53	0.54	46.5
9	R2	188	0.0	0.423	8.3	LOS A	3.7	26.6	0.53	0.54	42.5
Approach		517	1.9	0.423	5.8	LOS A	3.7	26.6	0.53	0.54	45.0
All Vehicles		1688	1.5	0.598	6.4	LOS A	5.9	41.8	0.68	0.66	42.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: v [S1 - Ashton Ave/Judge Ave - AM Peak - 2017]

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
South: Ashton Ave (South)											
8	T1	193	3.0	0.100	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
9	R2	128	2.0	0.120	6.7	LOS A	0.5	3.7	0.52	0.69	45.1
Approach		321	2.6	0.120	2.7	NA	0.5	3.7	0.21	0.28	47.9
East: Judge Ave											
10	L2	57	0.0	0.057	6.5	LOS A	0.2	1.5	0.47	0.65	45.5
12	R2	2	0.0	0.005	11.5	LOS B	0.0	0.1	0.66	0.71	42.4
Approach		59	0.0	0.057	6.7	LOS A	0.2	1.5	0.48	0.65	45.4
North: Ashton Ave (North)											
1	L2	1	0.0	0.256	4.6	LOS A	0.0	0.0	0.00	0.00	49.5
2	T1	492	2.0	0.256	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		493	2.0	0.256	0.0	NA	0.0	0.0	0.00	0.00	50.0
All Vehicles		873	2.1	0.256	1.5	NA	0.5	3.7	0.11	0.15	48.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: v [S1 - Ashton Ave/Judge Ave - PM Peak - 2017]

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
South: Ashton Ave (South)											
8	T1	393	1.0	0.202	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
9	R2	143	0.0	0.107	5.7	LOS A	0.5	3.4	0.41	0.59	45.5
Approach		536	0.7	0.202	1.5	NA	0.5	3.4	0.11	0.16	48.7
East: Judge Ave											
10	L2	47	0.0	0.038	5.6	LOS A	0.1	1.0	0.36	0.56	45.8
12	R2	13	0.0	0.031	11.9	LOS B	0.1	0.8	0.67	0.81	42.2
Approach		60	0.0	0.038	6.9	LOS A	0.1	1.0	0.43	0.61	45.0
North: Ashton Ave (North)											
1	L2	5	0.0	0.161	4.6	LOS A	0.0	0.0	0.00	0.01	49.4
2	T1	306	1.0	0.161	0.0	LOS A	0.0	0.0	0.00	0.01	49.9
Approach		312	1.0	0.161	0.1	NA	0.0	0.0	0.00	0.01	49.9
All Vehicles		907	0.8	0.202	1.4	NA	0.5	3.4	0.09	0.14	48.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: v [S2 - Ashton Ave/Judge Ave - AM Peak - 2021 (Without Dev)]

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
South: Ashton Ave (South)											
8	T1	203	3.0	0.106	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
9	R2	135	2.0	0.131	6.9	LOS A	0.6	4.0	0.53	0.71	45.0
Approach		338	2.6	0.131	2.7	NA	0.6	4.0	0.21	0.28	47.9
East: Judge Ave											
10	L2	59	0.0	0.061	6.6	LOS A	0.2	1.6	0.49	0.66	45.4
12	R2	2	0.0	0.006	12.2	LOS B	0.0	0.1	0.68	0.73	42.1
Approach		61	0.0	0.061	6.8	LOS A	0.2	1.6	0.49	0.67	45.3
North: Ashton Ave (North)											
1	L2	1	0.0	0.270	4.6	LOS A	0.0	0.0	0.00	0.00	49.5
2	T1	518	2.0	0.270	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		519	2.0	0.270	0.0	NA	0.0	0.0	0.00	0.00	50.0
All Vehicles		918	2.1	0.270	1.5	NA	0.6	4.0	0.11	0.15	48.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: v [S2 - Ashton Ave/Judge Ave - PM Peak - 2021 (Without Dev)]

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
South: Ashton Ave (South)											
8	T1	414	1.0	0.212	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
9	R2	151	0.0	0.114	5.8	LOS A	0.5	3.6	0.42	0.60	45.4
Approach		564	0.7	0.212	1.6	NA	0.5	3.6	0.11	0.16	48.7
East: Judge Ave											
10	L2	49	0.0	0.041	5.6	LOS A	0.2	1.1	0.37	0.57	45.7
12	R2	13	0.0	0.033	12.6	LOS B	0.1	0.8	0.69	0.84	41.9
Approach		62	0.0	0.041	7.0	LOS A	0.2	1.1	0.44	0.62	44.9
North: Ashton Ave (North)											
1	L2	5	0.0	0.169	4.6	LOS A	0.0	0.0	0.00	0.01	49.4
2	T1	322	1.0	0.169	0.0	LOS A	0.0	0.0	0.00	0.01	49.9
Approach		327	1.0	0.169	0.1	NA	0.0	0.0	0.00	0.01	49.9
All Vehicles		954	0.8	0.212	1.4	NA	0.5	3.6	0.09	0.14	48.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: v [S3 - Ashton Ave/Judge Ave - AM Peak - 2031 (Without Dev)]

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
South: Ashton Ave (South)											
8	T1	231	3.0	0.120	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
9	R2	154	2.0	0.164	7.4	LOS A	0.7	5.0	0.58	0.76	44.7
Approach		384	2.6	0.164	3.0	NA	0.7	5.0	0.23	0.30	47.7
East: Judge Ave											
10	L2	65	0.0	0.074	7.1	LOS A	0.3	1.9	0.52	0.71	45.2
12	R2	2	0.0	0.007	14.4	LOS B	0.0	0.2	0.74	0.78	41.0
Approach		67	0.0	0.074	7.4	LOS A	0.3	1.9	0.53	0.71	45.0
North: Ashton Ave (North)											
1	L2	1	0.0	0.307	4.6	LOS A	0.0	0.0	0.00	0.00	49.5
2	T1	589	2.0	0.307	0.0	LOS A	0.0	0.0	0.00	0.00	49.9
Approach		591	2.0	0.307	0.0	NA	0.0	0.0	0.00	0.00	49.9
All Vehicles		1042	2.1	0.307	1.6	NA	0.7	5.0	0.12	0.16	48.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: v [S3 - Ashton Ave/Judge Ave - PM Peak - 2031 (Without Dev)]

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
South: Ashton Ave (South)											
8	T1	471	1.0	0.242	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
9	R2	172	0.0	0.137	6.0	LOS A	0.6	4.3	0.45	0.63	45.4
Approach		642	0.7	0.242	1.6	NA	0.6	4.3	0.12	0.17	48.6
East: Judge Ave											
10	L2	55	0.0	0.047	5.8	LOS A	0.2	1.3	0.40	0.59	45.7
12	R2	15	0.0	0.048	15.0	LOS C	0.2	1.1	0.75	0.89	40.7
Approach		69	0.0	0.048	7.8	LOS A	0.2	1.3	0.48	0.65	44.5
North: Ashton Ave (North)											
1	L2	6	0.0	0.193	4.6	LOS A	0.0	0.0	0.00	0.01	49.4
2	T1	367	1.0	0.193	0.0	LOS A	0.0	0.0	0.00	0.01	49.9
Approach		374	1.0	0.193	0.1	NA	0.0	0.0	0.00	0.01	49.9
All Vehicles		1085	0.8	0.242	1.5	NA	0.6	4.3	0.10	0.14	48.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: v [S4 - Ashton Ave/Judge Ave - AM Peak - 2031 (With Dev + no mitigations)]

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
South: Ashton Ave (South)											
8	T1	259	3.0	0.135	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
9	R2	154	2.0	0.168	7.6	LOS A	0.7	5.1	0.58	0.77	44.6
Approach		413	2.6	0.168	2.8	NA	0.7	5.1	0.22	0.29	47.8
East: Judge Ave											
10	L2	65	0.0	0.075	7.2	LOS A	0.3	1.9	0.53	0.71	45.1
12	R2	3	0.0	0.011	15.5	LOS C	0.0	0.3	0.76	0.83	40.5
Approach		68	0.0	0.075	7.6	LOS A	0.3	1.9	0.54	0.72	44.9
North: Ashton Ave (North)											
1	L2	6	0.0	0.317	4.6	LOS A	0.0	0.0	0.00	0.01	49.4
2	T1	603	2.0	0.317	0.0	LOS A	0.0	0.0	0.00	0.01	49.9
Approach		609	2.0	0.317	0.1	NA	0.0	0.0	0.00	0.01	49.9
All Vehicles		1091	2.1	0.317	1.6	NA	0.7	5.1	0.12	0.16	48.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: v [S4 - Ashton Ave/Judge Ave - PM Peak - 2031 (With Dev + no mitigations)]

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
South: Ashton Ave (South)											
8	T1	496	1.0	0.255	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
9	R2	172	0.0	0.144	6.2	LOS A	0.6	4.5	0.48	0.66	45.3
Approach		667	0.7	0.255	1.6	NA	0.6	4.5	0.12	0.17	48.7
East: Judge Ave											
10	L2	56	0.0	0.050	6.0	LOS A	0.2	1.3	0.42	0.61	45.6
12	R2	27	0.0	0.099	16.8	LOS C	0.3	2.3	0.79	0.91	40.0
Approach		83	0.0	0.099	9.5	LOS A	0.3	2.3	0.54	0.70	43.6
North: Ashton Ave (North)											
1	L2	13	0.0	0.215	4.6	LOS A	0.0	0.0	0.00	0.02	49.4
2	T1	403	1.0	0.215	0.0	LOS A	0.0	0.0	0.00	0.02	49.9
Approach		416	1.0	0.215	0.2	NA	0.0	0.0	0.00	0.02	49.9
All Vehicles		1166	0.8	0.255	1.7	NA	0.6	4.5	0.11	0.15	48.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S1 - Alfred Rd/Brockway Rd - AM Peak - 2017]

Roundabout

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: Brockway Rd (South)											
10	L2	7	14.0	0.210	8.5	LOS A	1.3	9.2	0.68	0.73	51.1
2	T1	152	2.0	0.210	8.2	LOS A	1.3	9.2	0.68	0.73	44.3
12	R2	2	0.0	0.210	11.6	LOS B	1.3	9.2	0.68	0.73	52.2
Approach		161	2.5	0.210	8.3	LOS A	1.3	9.2	0.68	0.73	44.7
East: Alfred Rd (East)											
2	T1	128	3.0	0.196	7.3	LOS A	1.3	9.2	0.63	0.68	52.2
6	R2	35	6.0	0.196	10.8	LOS B	1.3	9.2	0.63	0.68	44.2
3u	U	3	0.0	0.196	12.3	LOS B	1.3	9.2	0.63	0.68	52.6
Approach		166	3.6	0.196	8.1	LOS A	1.3	9.2	0.63	0.68	50.3
North: Brockway Rd (North)											
7	L2	53	0.0	0.482	6.0	LOS A	3.7	26.9	0.75	0.80	42.1
9	R2	347	6.0	0.482	9.2	LOS A	3.7	26.9	0.75	0.80	42.3
9u	U	2	0.0	0.482	10.3	LOS B	3.7	26.9	0.75	0.80	42.9
Approach		402	5.2	0.482	8.8	LOS A	3.7	26.9	0.75	0.80	42.3
West: Alfred Rd (West)											
10	L2	280	3.0	0.604	6.4	LOS A	5.7	40.9	0.67	0.63	43.8
8	T1	395	2.0	0.604	6.6	LOS A	5.7	40.9	0.67	0.63	52.9
9u	U	1	0.0	0.604	11.7	LOS B	5.7	40.9	0.67	0.63	53.2
Approach		676	2.4	0.604	6.5	LOS A	5.7	40.9	0.67	0.63	48.7
All Vehicles		1405	3.4	0.604	7.6	LOS A	5.7	40.9	0.69	0.69	46.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S3 - Ashton Ave/Chancellor St/Gugeri St - AM Peak - 2031 (Without Dev)]

Signals - Fixed Time Isolated Cycle Time = 65 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Chancellor St											
1	L2	54	4.0	0.051	11.2	LOS B	0.7	5.4	0.46	0.64	45.6
2	T1	421	2.0	0.573	17.0	LOS B	10.6	75.3	0.83	0.72	40.6
Approach		475	2.2	0.573	16.4	LOS B	10.6	75.3	0.79	0.71	41.1
East: Gugeri St (East)											
4	L2	6	0.0	0.223	27.1	LOS C	2.7	19.2	0.84	0.67	40.8
5	T1	527	3.0	0.905	35.7	LOS D	17.3	124.1	0.97	1.05	37.8
Approach		534	3.0	0.905	35.6	LOS D	17.3	124.1	0.97	1.04	37.8
North: Ashton Ave											
7	L2	12	11.0	0.625	22.4	LOS C	12.3	86.8	0.87	0.76	41.9
8	T1	458	1.0	0.625	17.7	LOS B	12.3	86.8	0.87	0.76	40.2
9	R2	184	3.0	0.921	51.1	LOS D	7.8	55.9	1.00	1.18	30.6
Approach		654	1.7	0.921	27.2	LOS C	12.3	86.8	0.90	0.88	37.0
West: Gugeri St (West)											
10	L2	73	2.0	0.402	19.4	LOS B	7.4	52.6	0.73	0.66	44.2
11	T1	599	2.0	0.402	13.8	LOS B	7.4	52.8	0.73	0.64	48.6
12	R2	82	1.0	0.280	21.8	LOS C	1.7	11.9	0.93	0.74	41.0
Approach		754	1.9	0.402	15.2	LOS B	7.4	52.8	0.76	0.66	47.2
All Vehicles		2416	2.2	0.921	23.2	LOS C	17.3	124.1	0.85	0.81	40.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	26.8	LOS C	0.1	0.1	0.91	0.91
P2	East Full Crossing	53	20.1	LOS C	0.1	0.1	0.79	0.79
P3	North Full Crossing	53	16.3	LOS B	0.1	0.1	0.71	0.71
P4	West Full Crossing	53	26.8	LOS C	0.1	0.1	0.91	0.91
All Pedestrians		211	22.5	LOS C			0.83	0.83

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Gugeri St-Ashton Ave-Chancellor St.sip7

MOVEMENT SUMMARY

Site: [S1 - Alfred Rd/Brockway Rd - PM Peak - 2017]

Roundabout

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: Brockway Rd (South)											
10	L2	5	0.0	0.216	9.0	LOS A	1.3	9.2	0.72	0.77	50.8
2	T1	142	2.0	0.216	9.3	LOS A	1.3	9.2	0.72	0.77	43.7
12	R2	6	0.0	0.216	12.6	LOS B	1.3	9.2	0.72	0.77	51.4
Approach		154	1.8	0.216	9.4	LOS A	1.3	9.2	0.72	0.77	44.2
East: Alfred Rd (East)											
2	T1	300	0.0	0.354	7.2	LOS A	2.5	17.2	0.63	0.67	52.6
6	R2	31	0.0	0.354	10.6	LOS B	2.5	17.2	0.63	0.67	44.4
3u	U	1	0.0	0.354	12.3	LOS B	2.5	17.2	0.63	0.67	52.9
Approach		332	0.0	0.354	7.6	LOS A	2.5	17.2	0.63	0.67	51.7
North: Brockway Rd (North)											
7	L2	35	0.0	0.295	3.4	LOS A	2.0	14.0	0.41	0.58	43.2
9	R2	302	3.0	0.295	6.5	LOS A	2.0	14.0	0.41	0.58	43.5
9u	U	5	0.0	0.295	7.8	LOS A	2.0	14.0	0.41	0.58	44.0
Approach		342	2.6	0.295	6.2	LOS A	2.0	14.0	0.41	0.58	43.5
West: Alfred Rd (West)											
10	L2	222	2.0	0.328	5.8	LOS A	2.3	16.3	0.49	0.58	44.3
8	T1	133	2.0	0.328	6.0	LOS A	2.3	16.3	0.49	0.58	53.7
9u	U	2	0.0	0.328	11.1	LOS B	2.3	16.3	0.49	0.58	54.0
Approach		357	2.0	0.328	5.9	LOS A	2.3	16.3	0.49	0.58	47.4
All Vehicles		1184	1.6	0.354	6.9	LOS A	2.5	17.2	0.54	0.63	46.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S2 - Alfred Rd/Brockway Rd - AM Peak - 2021 (Without Dev)]

Roundabout

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: Brockway Rd (South)											
10	L2	7	14.0	0.225	8.8	LOS A	1.4	9.9	0.71	0.75	50.9
2	T1	158	2.0	0.225	8.5	LOS A	1.4	9.9	0.71	0.75	44.2
12	R2	2	0.0	0.225	11.8	LOS B	1.4	9.9	0.71	0.75	52.0
Approach		167	2.5	0.225	8.6	LOS A	1.4	9.9	0.71	0.75	44.5
East: Alfred Rd (East)											
2	T1	134	3.0	0.209	7.5	LOS A	1.4	9.8	0.65	0.69	52.1
6	R2	36	6.0	0.209	11.0	LOS B	1.4	9.8	0.65	0.69	44.1
3u	U	3	0.0	0.209	12.5	LOS B	1.4	9.8	0.65	0.69	52.5
Approach		173	3.6	0.209	8.3	LOS A	1.4	9.8	0.65	0.69	50.3
North: Brockway Rd (North)											
7	L2	56	0.0	0.510	6.3	LOS A	4.1	30.2	0.77	0.82	42.0
9	R2	367	6.0	0.510	9.5	LOS A	4.1	30.2	0.77	0.82	42.2
9u	U	2	0.0	0.510	10.6	LOS B	4.1	30.2	0.77	0.82	42.7
Approach		425	5.2	0.510	9.1	LOS A	4.1	30.2	0.77	0.82	42.2
West: Alfred Rd (West)											
10	L2	293	3.0	0.619	6.6	LOS A	6.0	42.7	0.69	0.64	43.8
8	T1	393	2.0	0.619	6.7	LOS A	6.0	42.7	0.69	0.64	52.8
9u	U	1	0.0	0.619	11.8	LOS B	6.0	42.7	0.69	0.64	53.2
Approach		686	2.4	0.619	6.7	LOS A	6.0	42.7	0.69	0.64	48.6
All Vehicles		1452	3.4	0.619	7.8	LOS A	6.0	42.7	0.71	0.71	46.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S2 - Alfred Rd/Brockway Rd - PM Peak - 2021 (Without Dev)]

Roundabout

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: Brockway Rd (South)											
10	L2	5	0.0	0.230	9.3	LOS A	1.4	10.0	0.74	0.79	50.6
2	T1	147	2.0	0.230	9.6	LOS A	1.4	10.0	0.74	0.79	43.5
12	R2	6	0.0	0.230	12.9	LOS B	1.4	10.0	0.74	0.79	51.1
Approach		159	1.9	0.230	9.7	LOS A	1.4	10.0	0.74	0.79	44.0
East: Alfred Rd (East)											
2	T1	314	0.0	0.376	7.4	LOS A	2.7	18.6	0.65	0.69	52.5
6	R2	32	0.0	0.376	10.8	LOS B	2.7	18.6	0.65	0.69	44.4
3u	U	1	0.0	0.376	12.5	LOS B	2.7	18.6	0.65	0.69	52.8
Approach		346	0.0	0.376	7.8	LOS A	2.7	18.6	0.65	0.69	51.6
North: Brockway Rd (North)											
7	L2	37	0.0	0.314	3.5	LOS A	2.1	15.2	0.43	0.58	43.2
9	R2	319	3.0	0.314	6.6	LOS A	2.1	15.2	0.43	0.58	43.5
9u	U	5	0.0	0.314	7.8	LOS A	2.1	15.2	0.43	0.58	44.0
Approach		361	2.7	0.314	6.3	LOS A	2.1	15.2	0.43	0.58	43.5
West: Alfred Rd (West)											
10	L2	232	2.0	0.346	5.9	LOS A	2.5	17.5	0.51	0.59	44.3
8	T1	140	2.0	0.346	6.1	LOS A	2.5	17.5	0.51	0.59	53.6
9u	U	2	0.0	0.346	11.1	LOS B	2.5	17.5	0.51	0.59	53.9
Approach		374	2.0	0.346	6.0	LOS A	2.5	17.5	0.51	0.59	47.4
All Vehicles		1240	1.6	0.376	7.0	LOS A	2.7	18.6	0.56	0.64	46.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S3 - Alfred Rd/Brockway Rd - AM Peak - 2031 (Without Dev)]

Roundabout

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: Brockway Rd (South)											
10	L2	8	14.0	0.275	9.7	LOS A	1.8	12.8	0.78	0.80	50.3
2	T1	175	2.0	0.275	9.3	LOS A	1.8	12.8	0.78	0.80	43.7
12	R2	2	0.0	0.275	12.6	LOS B	1.8	12.8	0.78	0.80	51.4
Approach		185	2.5	0.275	9.4	LOS A	1.8	12.8	0.78	0.80	44.1
East: Alfred Rd (East)											
2	T1	149	3.0	0.251	8.0	LOS A	1.7	12.4	0.72	0.74	51.9
6	R2	40	6.0	0.251	11.6	LOS B	1.7	12.4	0.72	0.74	43.9
3u	U	3	0.0	0.251	13.0	LOS B	1.7	12.4	0.72	0.74	52.2
Approach		193	3.6	0.251	8.8	LOS A	1.7	12.4	0.72	0.74	50.0
North: Brockway Rd (North)											
7	L2	64	0.0	0.624	8.7	LOS A	6.4	46.6	0.88	0.96	40.8
9	R2	422	6.0	0.624	12.0	LOS B	6.4	46.6	0.88	0.96	41.1
9u	U	3	0.0	0.624	13.0	LOS B	6.4	46.6	0.88	0.96	41.6
Approach		489	5.2	0.624	11.6	LOS B	6.4	46.6	0.88	0.96	41.0
West: Alfred Rd (West)											
10	L2	326	3.0	0.708	8.1	LOS A	8.7	62.4	0.81	0.72	43.4
8	T1	438	2.0	0.708	8.3	LOS A	8.7	62.4	0.81	0.72	52.2
9u	U	1	0.0	0.708	13.3	LOS B	8.7	62.4	0.81	0.72	52.6
Approach		765	2.4	0.708	8.2	LOS A	8.7	62.4	0.81	0.72	48.0
All Vehicles		1633	3.4	0.708	9.4	LOS A	8.7	62.4	0.81	0.80	45.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S3 - Alfred Rd/Brockway Rd - PM Peak - 2031 (Without Dev)]

Roundabout

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: Brockway Rd (South)											
10	L2	6	0.0	0.283	10.5	LOS B	1.8	12.9	0.81	0.85	49.7
2	T1	163	2.0	0.283	10.8	LOS B	1.8	12.9	0.81	0.85	42.9
12	R2	7	0.0	0.283	14.1	LOS B	1.8	12.9	0.81	0.85	50.3
Approach		177	1.8	0.283	10.9	LOS B	1.8	12.9	0.81	0.85	43.4
East: Alfred Rd (East)											
2	T1	349	0.0	0.443	8.1	LOS A	3.3	23.0	0.73	0.74	52.2
6	R2	36	0.0	0.443	11.5	LOS B	3.3	23.0	0.73	0.74	44.1
3u	U	1	0.0	0.443	13.2	LOS B	3.3	23.0	0.73	0.74	52.5
Approach		386	0.0	0.443	8.4	LOS A	3.3	23.0	0.73	0.74	51.3
North: Brockway Rd (North)											
7	L2	42	0.0	0.369	3.7	LOS A	2.7	19.0	0.48	0.60	43.1
9	R2	367	3.0	0.369	6.8	LOS A	2.7	19.0	0.48	0.60	43.5
9u	U	8	0.0	0.369	8.0	LOS A	2.7	19.0	0.48	0.60	43.9
Approach		418	2.6	0.369	6.5	LOS A	2.7	19.0	0.48	0.60	43.4
West: Alfred Rd (West)											
10	L2	259	2.0	0.395	6.2	LOS A	2.9	21.0	0.56	0.62	44.2
8	T1	155	2.0	0.395	6.4	LOS A	2.9	21.0	0.56	0.62	53.4
9u	U	2	0.0	0.395	11.4	LOS B	2.9	21.0	0.56	0.62	53.8
Approach		416	2.0	0.395	6.3	LOS A	2.9	21.0	0.56	0.62	47.2
All Vehicles		1397	1.6	0.443	7.5	LOS A	3.3	23.0	0.61	0.68	46.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S4 - Alfred Rd/Brockway Rd - AM Peak - 2031 (With Dev)]

Roundabout

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: Brockway Rd (South)											
10	L2	8	14.0	0.281	9.8	LOS A	1.8	13.1	0.78	0.81	50.3
2	T1	178	2.0	0.281	9.4	LOS A	1.8	13.1	0.78	0.81	43.7
12	R2	2	0.0	0.281	12.7	LOS B	1.8	13.1	0.78	0.81	51.4
Approach		188	2.5	0.281	9.4	LOS A	1.8	13.1	0.78	0.81	44.0
East: Alfred Rd (East)											
2	T1	149	3.0	0.253	8.0	LOS A	1.7	12.4	0.72	0.74	51.8
6	R2	40	6.0	0.253	11.6	LOS B	1.7	12.4	0.72	0.74	43.9
3u	U	3	0.0	0.253	13.0	LOS B	1.7	12.4	0.72	0.74	52.2
Approach		193	3.6	0.253	8.9	LOS A	1.7	12.4	0.72	0.74	50.0
North: Brockway Rd (North)											
7	L2	64	0.0	0.631	8.8	LOS A	6.5	47.8	0.89	0.97	40.8
9	R2	426	6.0	0.631	12.1	LOS B	6.5	47.8	0.89	0.97	41.0
9u	U	2	0.0	0.631	13.2	LOS B	6.5	47.8	0.89	0.97	41.5
Approach		493	5.2	0.631	11.7	LOS B	6.5	47.8	0.89	0.97	41.0
West: Alfred Rd (West)											
10	L2	349	3.0	0.731	8.6	LOS A	9.6	69.0	0.84	0.74	43.2
8	T1	438	2.0	0.731	8.7	LOS A	9.6	69.0	0.84	0.74	52.0
9u	U	1	0.0	0.731	13.8	LOS B	9.6	69.0	0.84	0.74	52.4
Approach		788	2.4	0.731	8.6	LOS A	9.6	69.0	0.84	0.74	47.7
All Vehicles		1662	3.4	0.731	9.7	LOS A	9.6	69.0	0.83	0.82	45.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S4 - Alfred Rd/Brockway Rd - PM Peak - 2031 (With Dev)]

Roundabout

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: Brockway Rd (South)											
10	L2	6	0.0	0.288	10.7	LOS B	1.8	13.1	0.81	0.85	49.6
2	T1	163	2.0	0.288	11.0	LOS B	1.8	13.1	0.81	0.85	42.8
12	R2	7	0.0	0.288	14.3	LOS B	1.8	13.1	0.81	0.85	50.2
Approach		177	1.8	0.288	11.1	LOS B	1.8	13.1	0.81	0.85	43.3
East: Alfred Rd (East)											
2	T1	349	0.0	0.449	8.2	LOS A	3.3	23.4	0.74	0.75	52.1
6	R2	36	0.0	0.449	11.6	LOS B	3.3	23.4	0.74	0.75	44.1
3u	U	1	0.0	0.449	13.3	LOS B	3.3	23.4	0.74	0.75	52.4
Approach		386	0.0	0.449	8.5	LOS A	3.3	23.4	0.74	0.75	51.3
North: Brockway Rd (North)											
7	L2	42	0.0	0.381	3.7	LOS A	2.8	19.9	0.48	0.60	43.1
9	R2	382	3.0	0.381	6.8	LOS A	2.8	19.9	0.48	0.60	43.4
9u	U	8	0.0	0.381	8.0	LOS A	2.8	19.9	0.48	0.60	43.9
Approach		433	2.6	0.381	6.5	LOS A	2.8	19.9	0.48	0.60	43.4
West: Alfred Rd (West)											
10	L2	267	2.0	0.402	6.2	LOS A	3.0	21.5	0.57	0.62	44.2
8	T1	155	2.0	0.402	6.4	LOS A	3.0	21.5	0.57	0.62	53.4
9u	U	1	0.0	0.402	11.4	LOS B	3.0	21.5	0.57	0.62	53.8
Approach		423	2.0	0.402	6.3	LOS A	3.0	21.5	0.57	0.62	47.2
All Vehicles		1419	1.6	0.449	7.5	LOS A	3.3	23.4	0.62	0.68	46.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S1 - Brockway Rd/Stubbs Tc - AM Peak - 2017]

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: Stubbs Tc (East)											
8	T1	65	0.0	0.034	0.0	LOS A	0.0	0.0	0.01	0.01	49.9
9	R2	1	0.0	0.034	5.0	LOS A	0.0	0.0	0.01	0.01	49.3
Approach		66	0.0	0.034	0.1	NA	0.0	0.0	0.01	0.01	49.9
North: Brockway Rd											
10	L2	1	0.0	0.001	4.7	LOS A	0.0	0.0	0.11	0.49	46.4
12	R2	7	0.0	0.007	5.1	LOS A	0.0	0.1	0.22	0.52	45.8
Approach		8	0.0	0.007	5.0	LOS A	0.0	0.1	0.20	0.52	45.9
West: Stubbs Tc (West)											
1	L2	95	4.0	0.072	4.6	LOS A	0.0	0.0	0.00	0.38	47.4
2	T1	40	0.0	0.072	0.0	LOS A	0.0	0.0	0.00	0.38	47.9
Approach		135	2.8	0.072	3.2	NA	0.0	0.0	0.00	0.38	47.6
All Vehicles		209	1.8	0.072	2.3	NA	0.0	0.1	0.01	0.27	48.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S1 - Brockway Rd/Stubbs Tc - PM Peak - 2017]

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: Stubbs Tc (East)											
8	T1	73	0.0	0.037	0.0	LOS A	0.0	0.1	0.01	0.01	49.9
9	R2	1	0.0	0.037	5.1	LOS A	0.0	0.1	0.01	0.01	49.3
Approach		74	0.0	0.037	0.1	NA	0.0	0.1	0.01	0.01	49.9
North: Brockway Rd											
10	L2	1	0.0	0.001	4.7	LOS A	0.0	0.0	0.11	0.49	46.4
12	R2	1	0.0	0.001	5.1	LOS A	0.0	0.0	0.24	0.51	45.8
Approach		2	0.0	0.001	4.9	LOS A	0.0	0.0	0.18	0.50	46.1
West: Stubbs Tc (West)											
1	L2	128	7.0	0.094	4.6	LOS A	0.0	0.0	0.00	0.39	47.3
2	T1	45	0.0	0.094	0.0	LOS A	0.0	0.0	0.00	0.39	47.8
Approach		174	5.2	0.094	3.4	NA	0.0	0.0	0.00	0.39	47.4
All Vehicles		249	3.6	0.094	2.5	NA	0.0	0.1	0.00	0.28	48.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S2 - Brockway Rd/Stubbs Tc - AM Peak - 2021 (Without Dev)]

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: Stubbs Tc (East)											
8	T1	68	0.0	0.035	0.0	LOS A	0.0	0.0	0.01	0.01	49.9
9	R2	1	0.0	0.035	5.0	LOS A	0.0	0.0	0.01	0.01	49.3
Approach		69	0.0	0.035	0.1	NA	0.0	0.0	0.01	0.01	49.9
North: Brockway Rd											
10	L2	1	0.0	0.001	4.7	LOS A	0.0	0.0	0.11	0.49	46.4
12	R2	7	0.0	0.007	5.1	LOS A	0.0	0.1	0.22	0.52	45.8
Approach		8	0.0	0.007	5.0	LOS A	0.0	0.1	0.21	0.52	45.9
West: Stubbs Tc (West)											
1	L2	99	4.0	0.075	4.6	LOS A	0.0	0.0	0.00	0.38	47.4
2	T1	42	0.0	0.075	0.0	LOS A	0.0	0.0	0.00	0.38	47.9
Approach		141	2.8	0.075	3.2	NA	0.0	0.0	0.00	0.38	47.6
All Vehicles		219	1.8	0.075	2.3	NA	0.0	0.1	0.01	0.26	48.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S3 - Ashton Ave/Chancellor St/Gugeri St - PM Peak - 2031 (Without Dev)]

Signals - Fixed Time Isolated Cycle Time = 105 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Chancellor St											
1	L2	108	0.0	0.097	14.8	LOS B	2.4	16.9	0.47	0.66	43.7
2	T1	733	0.0	0.873	33.9	LOS C	36.5	255.3	0.90	0.92	34.2
Approach		841	0.0	0.873	31.5	LOS C	36.5	255.3	0.85	0.89	35.2
East: Gugeri St (East)											
4	L2	4	0.0	0.216	34.7	LOS C	4.8	33.6	0.78	0.64	37.7
5	T1	648	0.0	0.877	43.6	LOS D	29.6	206.9	0.96	0.96	35.0
Approach		653	0.0	0.877	43.5	LOS D	29.6	206.9	0.96	0.95	35.0
North: Ashton Ave											
7	L2	11	0.0	0.319	23.2	LOS C	9.3	65.0	0.67	0.58	41.7
8	T1	282	0.0	0.319	18.7	LOS B	9.3	65.0	0.67	0.58	39.8
9	R2	101	0.0	0.676	53.6	LOS D	5.4	37.6	0.99	0.88	30.0
Approach		394	0.0	0.676	27.8	LOS C	9.3	65.0	0.75	0.66	36.8
West: Gugeri St (West)											
10	L2	109	3.0	0.349	27.7	LOS C	9.7	69.0	0.72	0.68	39.7
11	T1	457	1.0	0.349	22.2	LOS C	9.9	69.7	0.73	0.64	43.6
12	R2	35	2.0	0.178	32.2	LOS C	1.1	8.0	0.94	0.72	36.7
Approach		601	1.4	0.349	23.8	LOS C	9.9	69.7	0.74	0.65	42.4
All Vehicles		2488	0.3	0.877	32.2	LOS C	36.5	255.3	0.83	0.81	36.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	32.9	LOS D	0.1	0.1	0.79	0.79
P2	East Full Crossing	53	21.4	LOS C	0.1	0.1	0.64	0.64
P3	North Full Crossing	53	23.4	LOS C	0.1	0.1	0.67	0.67
P4	West Full Crossing	53	46.8	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		211	31.1	LOS D			0.76	0.76

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Gugeri St-Ashton Ave-Chancellor St.sip7

MOVEMENT SUMMARY

Site: [S2 - Brockway Rd/Stubbs Tc - PM Peak - 2021 (Without Dev)]

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: Stubbs Tc (East)											
8	T1	76	0.0	0.039	0.0	LOS A	0.0	0.1	0.01	0.01	49.9
9	R2	1	0.0	0.039	5.1	LOS A	0.0	0.1	0.01	0.01	49.3
Approach		77	0.0	0.039	0.1	NA	0.0	0.1	0.01	0.01	49.9
North: Brockway Rd											
10	L2	1	0.0	0.001	4.7	LOS A	0.0	0.0	0.12	0.49	46.3
12	R2	1	0.0	0.001	5.2	LOS A	0.0	0.0	0.25	0.51	45.7
Approach		2	0.0	0.001	4.9	LOS A	0.0	0.0	0.18	0.50	46.0
West: Stubbs Tc (West)											
1	L2	134	7.0	0.098	4.6	LOS A	0.0	0.0	0.00	0.39	47.3
2	T1	47	0.0	0.098	0.0	LOS A	0.0	0.0	0.00	0.39	47.8
Approach		181	5.2	0.098	3.4	NA	0.0	0.0	0.00	0.39	47.4
All Vehicles		260	3.6	0.098	2.4	NA	0.0	0.1	0.00	0.28	48.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S3 - Brockway Rd/Stubbs Tc - AM Peak - 2031 (Without Dev)]

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: Stubbs Tc (East)											
8	T1	75	0.0	0.038	0.0	LOS A	0.0	0.1	0.01	0.01	49.9
9	R2	1	0.0	0.038	5.0	LOS A	0.0	0.1	0.01	0.01	49.3
Approach		76	0.0	0.038	0.1	NA	0.0	0.1	0.01	0.01	49.9
North: Brockway Rd											
10	L2	1	0.0	0.001	4.7	LOS A	0.0	0.0	0.12	0.49	46.4
12	R2	8	0.0	0.008	5.1	LOS A	0.0	0.2	0.24	0.53	45.8
Approach		9	0.0	0.008	5.1	LOS A	0.0	0.2	0.22	0.52	45.8
West: Stubbs Tc (West)											
1	L2	108	4.0	0.083	4.6	LOS A	0.0	0.0	0.00	0.37	47.4
2	T1	46	0.0	0.083	0.0	LOS A	0.0	0.0	0.00	0.37	47.9
Approach		155	2.8	0.083	3.2	NA	0.0	0.0	0.00	0.37	47.6
All Vehicles		240	1.8	0.083	2.3	NA	0.0	0.2	0.01	0.26	48.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S3 - Brockway Rd/Stubbs Tc - PM Peak - 2031 (Without Dev)]

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: Stubbs Tc (East)											
8	T1	83	0.0	0.043	0.0	LOS A	0.0	0.1	0.01	0.01	49.9
9	R2	1	0.0	0.043	5.2	LOS A	0.0	0.1	0.01	0.01	49.3
Approach		84	0.0	0.043	0.1	NA	0.0	0.1	0.01	0.01	49.9
North: Brockway Rd											
10	L2	1	0.0	0.001	4.7	LOS A	0.0	0.0	0.12	0.49	46.3
12	R2	1	0.0	0.001	5.2	LOS A	0.0	0.0	0.26	0.51	45.7
Approach		2	0.0	0.001	5.0	LOS A	0.0	0.0	0.19	0.50	46.0
West: Stubbs Tc (West)											
1	L2	147	7.0	0.108	4.6	LOS A	0.0	0.0	0.00	0.39	47.3
2	T1	52	0.0	0.108	0.0	LOS A	0.0	0.0	0.00	0.39	47.8
Approach		199	5.2	0.108	3.4	NA	0.0	0.0	0.00	0.39	47.4
All Vehicles		285	3.6	0.108	2.5	NA	0.0	0.1	0.00	0.28	48.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S4 - Brockway Rd/Stubbs Tc - AM Peak - 2031 (With Dev)]

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: Stubbs Tc (East)											
8	T1	76	0.0	0.039	0.0	LOS A	0.0	0.1	0.01	0.01	49.9
9	R2	1	0.0	0.039	5.0	LOS A	0.0	0.1	0.01	0.01	49.3
Approach		77	0.0	0.039	0.1	NA	0.0	0.1	0.01	0.01	49.9
North: Brockway Rd											
10	L2	1	0.0	0.001	4.7	LOS A	0.0	0.0	0.12	0.49	46.3
12	R2	8	0.0	0.008	5.2	LOS A	0.0	0.2	0.24	0.53	45.8
Approach		9	0.0	0.008	5.1	LOS A	0.0	0.2	0.23	0.52	45.8
West: Stubbs Tc (West)											
1	L2	108	4.0	0.085	4.6	LOS A	0.0	0.0	0.00	0.36	47.5
2	T1	52	0.0	0.085	0.0	LOS A	0.0	0.0	0.00	0.36	48.0
Approach		160	2.7	0.085	3.1	NA	0.0	0.0	0.00	0.36	47.6
All Vehicles		246	1.8	0.085	2.2	NA	0.0	0.2	0.01	0.26	48.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S4 - Brockway Rd/Stubbs Tc - PM Peak - 2031 (With Dev)]

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: Stubbs Tc (East)											
8	T1	97	0.0	0.050	0.0	LOS A	0.0	0.1	0.01	0.01	49.9
9	R2	1	0.0	0.050	5.2	LOS A	0.0	0.1	0.01	0.01	49.3
Approach		98	0.0	0.050	0.1	NA	0.0	0.1	0.01	0.01	49.9
North: Brockway Rd											
10	L2	1	0.0	0.001	4.7	LOS A	0.0	0.0	0.13	0.49	46.3
12	R2	3	0.0	0.003	5.3	LOS A	0.0	0.1	0.27	0.53	45.7
Approach		4	0.0	0.003	5.2	LOS A	0.0	0.1	0.24	0.52	45.8
West: Stubbs Tc (West)											
1	L2	147	7.0	0.111	4.6	LOS A	0.0	0.0	0.00	0.38	47.3
2	T1	58	0.0	0.111	0.0	LOS A	0.0	0.0	0.00	0.38	47.9
Approach		205	5.0	0.111	3.3	NA	0.0	0.0	0.00	0.38	47.5
All Vehicles		307	3.4	0.111	2.3	NA	0.0	0.1	0.01	0.26	48.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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: [S1 - Stubbs Tc/Nagal Pass - AM Peak - 2017]

Roundabout

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: Nagal Pass											
10	L2	197	2.0	0.370	2.8	LOS A	3.2	22.5	0.39	0.57	49.8
12	R2	269	2.0	0.370	6.1	LOS A	3.2	22.5	0.39	0.57	50.7
12u	U	1	0.0	0.370	7.7	LOS A	3.2	22.5	0.39	0.57	24.8
Approach		467	2.0	0.370	4.7	LOS A	3.2	22.5	0.39	0.57	50.3
East: Stubbs Tc (East)											
1	L2	306	2.0	0.542	10.1	LOS B	4.9	35.0	0.87	0.93	39.8
2	T1	79	4.0	0.542	10.2	LOS B	4.9	35.0	0.87	0.93	47.8
3u	U	3	33.0	0.542	16.7	LOS B	4.9	35.0	0.87	0.93	46.9
Approach		388	2.7	0.542	10.2	LOS B	4.9	35.0	0.87	0.93	42.1
West: Stubbs Tc (West)											
8	T1	124	2.0	0.635	7.9	LOS A	6.8	47.8	0.79	0.78	47.5
9	R2	503	1.0	0.635	11.2	LOS B	6.8	47.8	0.79	0.78	39.3
9u	U	1	0.0	0.635	12.7	LOS B	6.8	47.8	0.79	0.78	47.8
Approach		628	1.2	0.635	10.6	LOS B	6.8	47.8	0.79	0.78	41.6
All Vehicles		1484	1.8	0.635	8.6	LOS A	6.8	47.8	0.68	0.75	43.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S1 - Stubbs Tc/Nagal Pass - PM Peak - 2017]

Roundabout

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: Nagal Pass											
10	L2	332	1.0	0.485	2.8	LOS A	4.5	31.9	0.40	0.55	50.2
12	R2	312	0.0	0.485	6.1	LOS A	4.5	31.9	0.40	0.55	51.2
12u	U	1	0.0	0.485	7.8	LOS A	4.5	31.9	0.40	0.55	25.1
Approach		644	0.5	0.485	4.4	LOS A	4.5	31.9	0.40	0.55	50.7
East: Stubbs Tc (East)											
1	L2	301	1.0	0.362	5.4	LOS A	2.7	18.9	0.55	0.59	43.5
2	T1	76	0.0	0.362	5.4	LOS A	2.7	18.9	0.55	0.59	50.6
3u	U	2	0.0	0.362	10.3	LOS B	2.7	18.9	0.55	0.59	50.8
Approach		379	0.8	0.362	5.4	LOS A	2.7	18.9	0.55	0.59	45.6
West: Stubbs Tc (West)											
8	T1	74	0.0	0.304	6.4	LOS A	2.0	14.4	0.62	0.71	48.9
9	R2	202	1.0	0.304	9.8	LOS A	2.0	14.4	0.62	0.71	41.0
9u	U	1	0.0	0.304	11.3	LOS B	2.0	14.4	0.62	0.71	49.1
Approach		277	0.7	0.304	8.9	LOS A	2.0	14.4	0.62	0.71	43.8
All Vehicles		1300	0.6	0.485	5.7	LOS A	4.5	31.9	0.49	0.60	47.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S2 - Stubbs Tc/Nagal Pass - AM Peak - 2021 (Without Dev)]

Roundabout

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: Nagal Pass											
10	L2	215	2.0	0.404	2.8	LOS A	3.6	25.7	0.41	0.57	49.7
12	R2	294	2.0	0.404	6.2	LOS A	3.6	25.7	0.41	0.57	50.6
12u	U	1	0.0	0.404	7.8	LOS A	3.6	25.7	0.41	0.57	24.7
Approach		509	2.0	0.404	4.8	LOS A	3.6	25.7	0.41	0.57	50.2
East: Stubbs Tc (East)											
1	L2	319	2.0	0.583	11.2	LOS B	5.7	40.5	0.91	0.98	38.9
2	T1	82	4.0	0.583	11.2	LOS B	5.7	40.5	0.91	0.98	47.1
3u	U	3	33.0	0.583	17.8	LOS B	5.7	40.5	0.91	0.98	46.2
Approach		404	2.6	0.583	11.2	LOS B	5.7	40.5	0.91	0.98	41.3
West: Stubbs Tc (West)											
8	T1	129	2.0	0.680	9.3	LOS A	8.2	58.0	0.85	0.84	46.7
9	R2	523	1.0	0.680	12.6	LOS B	8.2	58.0	0.85	0.84	38.3
9u	U	1	0.0	0.680	14.1	LOS B	8.2	58.0	0.85	0.84	47.0
Approach		654	1.2	0.680	11.9	LOS B	8.2	58.0	0.85	0.84	40.6
All Vehicles		1567	1.8	0.680	9.4	LOS A	8.2	58.0	0.72	0.79	43.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S2 - Stubbs Tc/Nagal Pass - PM Peak - 2021 (Without Dev)]

Roundabout

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: Nagal Pass											
10	L2	362	1.0	0.530	2.9	LOS A	5.3	37.2	0.43	0.55	50.1
12	R2	340	0.0	0.530	6.2	LOS A	5.3	37.2	0.43	0.55	51.1
12u	U	1	0.0	0.530	7.9	LOS A	5.3	37.2	0.43	0.55	24.9
Approach		703	0.5	0.530	4.5	LOS A	5.3	37.2	0.43	0.55	50.6
East: Stubbs Tc (East)											
1	L2	314	1.0	0.381	5.5	LOS A	2.9	20.3	0.57	0.60	43.4
2	T1	79	0.0	0.381	5.5	LOS A	2.9	20.3	0.57	0.60	50.6
3u	U	2	0.0	0.381	10.4	LOS B	2.9	20.3	0.57	0.60	50.8
Approach		395	0.8	0.381	5.5	LOS A	2.9	20.3	0.57	0.60	45.5
West: Stubbs Tc (West)											
8	T1	77	0.0	0.326	6.7	LOS A	2.2	15.7	0.65	0.73	48.7
9	R2	211	1.0	0.326	10.1	LOS B	2.2	15.7	0.65	0.73	40.8
9u	U	1	0.0	0.326	11.6	LOS B	2.2	15.7	0.65	0.73	48.9
Approach		288	0.7	0.326	9.2	LOS A	2.2	15.7	0.65	0.73	43.7
All Vehicles		1386	0.6	0.530	5.8	LOS A	5.3	37.2	0.52	0.60	47.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S3 - Stubbs Tc/Nagal Pass - AM Peak - 2031 (Without Dev)]

Roundabout

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: Nagal Pass											
10	L2	267	2.0	0.505	3.0	LOS A	5.2	36.9	0.49	0.57	49.5
12	R2	365	2.0	0.505	6.3	LOS A	5.2	36.9	0.49	0.57	50.4
12u	U	1	0.0	0.505	8.0	LOS A	5.2	36.9	0.49	0.57	24.3
Approach		634	2.0	0.505	4.9	LOS A	5.2	36.9	0.49	0.57	50.0
East: Stubbs Tc (East)											
1	L2	352	2.0	0.709	15.8	LOS B	8.5	61.1	1.00	1.15	35.7
2	T1	91	4.0	0.709	15.8	LOS B	8.5	61.1	1.00	1.15	44.4
3u	U	3	33.0	0.709	22.7	LOS C	8.5	61.1	1.00	1.15	43.7
Approach		445	2.6	0.709	15.8	LOS B	8.5	61.1	1.00	1.15	38.2
West: Stubbs Tc (West)											
8	T1	143	2.0	0.820	16.0	LOS B	14.7	103.9	1.00	1.10	43.1
9	R2	578	1.0	0.820	19.3	LOS B	14.7	103.9	1.00	1.10	34.0
9u	U	1	0.0	0.820	20.8	LOS C	14.7	103.9	1.00	1.10	43.3
Approach		722	1.2	0.820	18.7	LOS B	14.7	103.9	1.00	1.10	36.4
All Vehicles		1801	1.8	0.820	13.1	LOS B	14.7	103.9	0.82	0.93	40.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S4 - Ashton Ave/Chancellor St/Gugeri St - AM Peak - 2031 (With Dev + Mitigations)]

Signals - Fixed Time Isolated Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Chancellor St											
1	L2	67	4.0	0.063	11.7	LOS B	1.0	7.3	0.47	0.65	45.3
2	T1	449	2.0	0.600	17.7	LOS B	12.0	85.6	0.83	0.72	40.3
Approach		517	2.3	0.600	16.9	LOS B	12.0	85.6	0.78	0.71	40.9
East: Gugeri St (East)											
4	L2	14	0.0	0.220	28.0	LOS C	2.9	20.8	0.83	0.67	40.2
5	T1	536	3.0	0.892	36.0	LOS D	18.4	132.2	0.97	1.03	37.7
Approach		549	2.9	0.892	35.8	LOS D	18.4	132.2	0.97	1.02	37.7
North: Ashton Ave											
7	L2	17	11.0	0.616	22.9	LOS C	13.2	93.5	0.85	0.75	41.7
8	T1	463	1.0	0.616	18.2	LOS B	13.2	93.5	0.85	0.75	40.0
9	R2	187	3.0	0.907	51.9	LOS D	8.3	59.8	1.00	1.16	30.4
Approach		667	1.8	0.907	27.8	LOS C	13.2	93.5	0.89	0.86	36.8
West: Gugeri St (West)											
10	L2	73	2.0	0.407	20.6	LOS C	8.0	57.2	0.74	0.67	43.6
11	T1	603	2.0	0.407	15.0	LOS B	8.1	57.4	0.74	0.65	47.8
12	R2	85	1.0	0.319	23.5	LOS C	1.9	13.4	0.95	0.75	40.3
Approach		761	1.9	0.407	16.5	LOS B	8.1	57.4	0.76	0.66	46.4
All Vehicles		2495	2.2	0.907	23.8	LOS C	18.4	132.2	0.85	0.80	40.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	27.5	LOS C	0.1	0.1	0.89	0.89
P2	East Full Crossing	53	20.1	LOS C	0.1	0.1	0.76	0.76
P3	North Full Crossing	53	17.2	LOS B	0.1	0.1	0.70	0.70
P4	West Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
All Pedestrians		211	23.5	LOS C			0.82	0.82

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Gugeri St-Ashton Ave-Chancellor St.sip7

MOVEMENT SUMMARY

Site: [S3 - Stubbs Tc/Nagal Pass - PM Peak - 2031 (Without Dev)]

Roundabout

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: Nagal Pass											
10	L2	449	1.0	0.660	3.2	LOS A	8.2	57.7	0.56	0.56	49.8
12	R2	422	0.0	0.660	6.5	LOS A	8.2	57.7	0.56	0.56	50.7
12u	U	1	0.0	0.660	8.2	LOS A	8.2	57.7	0.56	0.56	24.3
Approach		873	0.5	0.660	4.8	LOS A	8.2	57.7	0.56	0.56	50.2
East: Stubbs Tc (East)											
1	L2	346	1.0	0.433	5.8	LOS A	3.5	24.3	0.63	0.63	43.2
2	T1	87	0.0	0.433	5.8	LOS A	3.5	24.3	0.63	0.63	50.4
3u	U	2	0.0	0.433	10.7	LOS B	3.5	24.3	0.63	0.63	50.6
Approach		436	0.8	0.433	5.8	LOS A	3.5	24.3	0.63	0.63	45.3
West: Stubbs Tc (West)											
8	T1	84	0.0	0.395	7.6	LOS A	2.8	20.1	0.75	0.79	48.2
9	R2	233	1.0	0.395	11.0	LOS B	2.8	20.1	0.75	0.79	40.1
9u	U	1	0.0	0.395	12.5	LOS B	2.8	20.1	0.75	0.79	48.4
Approach		318	0.7	0.395	10.1	LOS B	2.8	20.1	0.75	0.79	43.0
All Vehicles		1626	0.6	0.660	6.1	LOS A	8.2	57.7	0.62	0.62	47.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S3 - Stubbs Tc/Nagal Pass - AM Peak - 2031 (With Dev)]

Roundabout

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: Nagal Pass											
10	L2	267	2.0	0.506	3.0	LOS A	5.2	36.9	0.50	0.57	49.5
12	R2	365	2.0	0.506	6.3	LOS A	5.2	36.9	0.50	0.57	50.4
12u	U	1	0.0	0.506	8.0	LOS A	5.2	36.9	0.50	0.57	24.3
Approach		634	2.0	0.506	5.0	LOS A	5.2	36.9	0.50	0.57	50.0
East: Stubbs Tc (East)											
1	L2	352	2.0	0.710	15.8	LOS B	8.6	61.5	1.00	1.16	35.6
2	T1	92	4.0	0.710	15.9	LOS B	8.6	61.5	1.00	1.16	44.4
3u	U	3	33.0	0.710	22.7	LOS C	8.6	61.5	1.00	1.16	43.7
Approach		446	2.6	0.710	15.9	LOS B	8.6	61.5	1.00	1.16	38.2
West: Stubbs Tc (West)											
8	T1	148	2.0	0.826	16.3	LOS B	15.1	106.8	1.00	1.11	42.9
9	R2	578	1.0	0.826	19.7	LOS B	15.1	106.8	1.00	1.11	33.8
9u	U	1	0.0	0.826	21.2	LOS C	15.1	106.8	1.00	1.11	43.1
Approach		727	1.2	0.826	19.0	LOS B	15.1	106.8	1.00	1.11	36.3
All Vehicles		1807	1.8	0.826	13.3	LOS B	15.1	106.8	0.82	0.93	40.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S3 - Stubbs Tc/Nagal Pass - PM Peak - 2031 (With Dev)]

Roundabout

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: Nagal Pass											
10	L2	449	1.0	0.675	3.4	LOS A	8.5	59.5	0.61	0.57	49.6
12	R2	422	0.0	0.675	6.7	LOS A	8.5	59.5	0.61	0.57	50.6
12u	U	1	0.0	0.675	8.4	LOS A	8.5	59.5	0.61	0.57	24.1
Approach		873	0.5	0.675	5.0	LOS A	8.5	59.5	0.61	0.57	50.1
East: Stubbs Tc (East)											
1	L2	346	1.0	0.445	5.9	LOS A	3.6	25.3	0.64	0.64	43.3
2	T1	100	0.0	0.445	5.8	LOS A	3.6	25.3	0.64	0.64	50.4
3u	U	2	0.0	0.445	10.7	LOS B	3.6	25.3	0.64	0.64	50.7
Approach		448	0.8	0.445	5.9	LOS A	3.6	25.3	0.64	0.64	45.6
West: Stubbs Tc (West)											
8	T1	91	0.0	0.405	7.6	LOS A	3.0	20.9	0.76	0.79	48.3
9	R2	233	1.0	0.405	11.0	LOS B	3.0	20.9	0.76	0.79	40.2
9u	U	1	0.0	0.405	12.6	LOS B	3.0	20.9	0.76	0.79	48.4
Approach		324	0.7	0.405	10.1	LOS B	3.0	20.9	0.76	0.79	43.2
All Vehicles		1645	0.6	0.675	6.2	LOS A	8.5	59.5	0.65	0.63	47.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
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.
Roundabout Capacity Model: SIDRA Standard.
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: [S4 - Ashton Ave/Chancellor St/Gugeri St - PM Peak - 2031 (With Dev + Mitigations)]

Signals - Fixed Time Isolated Cycle Time = 110 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Chancellor St											
1	L2	117	0.0	0.105	15.3	LOS B	2.7	19.1	0.47	0.66	43.4
2	T1	753	0.0	0.892	37.9	LOS D	40.7	284.6	0.91	0.95	33.0
Approach		869	0.0	0.892	34.8	LOS C	40.7	284.6	0.85	0.91	34.1
East: Gugeri St (East)											
4	L2	21	0.0	0.220	35.7	LOS D	5.1	36.0	0.78	0.66	37.0
5	T1	653	0.0	0.893	47.5	LOS D	32.8	229.5	0.96	0.99	33.7
Approach		674	0.0	0.893	47.2	LOS D	32.8	229.5	0.96	0.98	33.8
North: Ashton Ave											
7	L2	31	0.0	0.353	24.1	LOS C	11.0	76.9	0.68	0.60	41.2
8	T1	297	0.0	0.353	19.5	LOS B	11.0	76.9	0.68	0.60	39.3
9	R2	105	0.0	0.740	59.0	LOS E	6.1	42.6	1.00	0.92	28.7
Approach		433	0.0	0.740	29.4	LOS C	11.0	76.9	0.75	0.68	36.2
West: Gugeri St (West)											
10	L2	118	0.0	0.379	29.1	LOS C	11.3	79.4	0.74	0.69	39.2
11	T1	474	0.0	0.379	23.4	LOS C	11.3	79.4	0.73	0.65	42.9
12	R2	44	0.0	0.238	34.0	LOS C	1.5	10.6	0.95	0.73	36.1
Approach		636	0.0	0.379	25.2	LOS C	11.3	79.4	0.75	0.66	41.7
All Vehicles		2612	0.0	0.893	34.8	LOS C	40.7	284.6	0.84	0.83	35.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	33.7	LOS D	0.1	0.1	0.78	0.78
P2	East Full Crossing	53	21.7	LOS C	0.1	0.1	0.63	0.63
P3	North Full Crossing	53	24.3	LOS C	0.1	0.1	0.67	0.67
P4	West Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	32.2	LOS D			0.76	0.76

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Gugeri St-Ashton Ave-Chancellor St.sip7

MOVEMENT SUMMARY

Site: [S1 - Gugeri St/Railway Rd/Loch St - AM Peak - 2017]

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
South: Loch St											
10	L2	16	7.0	0.014	5.1	LOS A	0.0	0.3	0.19	0.51	49.1
12	R2	216	1.0	2.971	1846.9	LOS F	97.4	687.5	1.00	4.23	1.0
Approach		232	1.4	2.971	1721.3	LOS F	97.4	687.5	0.94	3.98	1.2
East: Railway Rd											
1	L2	242	3.0	0.225	3.1	LOS A	1.1	7.9	0.14	0.33	48.0
2	T1	548	3.0	0.225	0.0	LOS A	1.1	7.9	0.03	0.08	59.0
Approach		791	3.0	0.225	1.0	NA	1.1	7.9	0.06	0.15	55.1
West: Gugeri St											
8	T1	779	2.0	0.203	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
9	R2	47	0.0	0.060	8.4	LOS A	0.2	1.6	0.52	0.71	48.0
Approach		826	1.9	0.203	0.5	NA	0.2	1.6	0.03	0.04	58.4
All Vehicles		1848	2.3	2.971	216.3	NA	97.4	687.5	0.16	0.58	7.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

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Appendix 4 – Broad Principles and Objectives

Mixed use

- Encourage incorporation of a residential land use component above the future business development proposed within on the RAS Showground site within the Structure Plan area.
- Provide for residential development above redeveloped commercial premises within the existing Local Centre on Ashton Avenue.
- In the absence of any current commercial strategy recommendations to the contrary, limit commercial land use to existing sites.
- Ensure amenity impacts on adjoining non-commercial properties are minimised.

Public Areas

- Ensure that public and private open space is functional, usable and secure.
- Encourage provision of a small public 'town square' or informal open space on the Claremont Showgrounds redevelopment site conjoining the local shopping centre area and providing a vista from Mofflin Avenue to link the Showgrounds to the Structure Plan area.
- Orientation of development and building design to encourage passive surveillance.
- Discourage expansive blank walls, decreasing the potential for graffiti.

Density

- As incentive to redevelop increase residential density:
    - At key sites where consolidated or individual land parcels are large enough to accommodate substantial development.
    - To create a 'mini activity corridor' effect along Ashton Avenue.
    - To provide a contiguous density (or similar) between identified key development sites where suitable.
    - To provide a transitional density between higher and lower density where suitable.
    - To encourage site redevelopment and residential development above commercial tenancies along Ashton Avenue.
    - Where individual lot sizes are generally capable of accommodating high quality development of increased density (for example of suitable size, configuration and width) or where an increase in the density will encourage consolidation of lots to achieve suitability.
- Ensure that the chosen density code matches the desired built form, encourages a variety of housing types with access to alternative modes of transport and respects/is sensitive to existing residential character.
- Retain current density where properties have already been developed to their capacity, are of reasonably low age and high quality, and an area of recognisable character has been established, specifically in the vicinity of Alfred Road, Mengler Avenue and parts of Judge and Mofflin Avenues.
- Provide for redevelopment of consolidated areas of vacant and older housing stock closer to the Loch Street Station along Gugeri Street, Ashton Avenue, Mofflin Avenue and Judge Avenue.
- Allow for increased residential density for properties along Gugeri Street where access from an alternative local street; or for properties that consolidate to achieve lots of suitable size, configuration and width to accommodate high quality development and subsequently result in reduction of the number of vehicle access points along Gugeri Street.
- Avoid small, narrow lots of poor development amenity.

Access and parking

- Provide for a 'High Street' or mainstreet streetscape by reducing the number or prohibiting from the commercial premises onto Ashton Avenue. Vehicular access to be from an easement or shared access agreement where available, or from a local street (other than Ashton Avenue) if an easement or shared access agreement is not/cannot be made available.
- Consolidate car parking at the rear of the commercial buildings to provide a more pedestrian friendly environment and greater amenity along the street frontage.
- The main pedestrian access to the commercial tenancies for visitors should be directly from the street in order to maintain legibility for pedestrians, with secondary access to the rear parking areas.
- Encourage the provision of awnings for commercial frontages along Ashton Avenue and secondary street frontages (where located on a corner) to provide a pleasant and comfortable pedestrian environment allowing for continuous shade and shelter along the footpath.
- Encourage alternative access for higher density development fronting Gugeri Street where possible and reduce the number of access points to Gugeri Street for new higher density development.
- Provide for high pedestrian amenity with pedestrian access points on Gugeri Street and Loch Street with all ground-floor units facing the street having separate private access.
- Provide for pedestrian and cycle linkages throughout the Structure Plan area, particularly accessing the Loch Street station.
- Car parking for all new development at the key sites at the corner of Ashton and Mofflin Avenues; Ashton Triangle; and the Showgrounds should be integrated within, or located behind, buildings and screened from public view to reduce the visual dominance of parked cars and improve pedestrian amenity.
- Avoid garages dominating frontages.

Heights and Setbacks

- Provide for increased heights to encourage higher density development at the key development sites.
- Provide for increased height at the local shopping centre sites as incentive to redevelop.
- Protect the current amenity of properties already developed to their maximum potential by retaining existing development characteristics (such as lot size, plot ratio, setbacks, heights) or providing for complementary development that does not negatively impact on development by way of overshadowing, loss of privacy, bulk and scale through appropriate transitional height and setback requirements.
- Building heights should be progressively reduced in proximity to existing dwellings within the existing and unchanged R25 and R30 density code areas and those with a lesser height limit to provide an appropriate transition in scale along the adjacent residential streets.
- Require a nil setback to Ashton Avenue for ground level commercial development within the Local Centre zone.

Building amenity

- Buildings should provide frontage to all adjacent streets with the use of windows to habitable rooms, as well as windows and doors to commercial activities to activate streets and provide opportunities for passive surveillance.
- Buildings should articulate street corners with a distinctive architectural element to aid legibility.
- Apartments with openings only to Gugeri Street and the railway line should be avoided to provide healthier natural ventilation options away from a busy road and railway line.
- Apartments with openings that have only a southern aspect should be avoided to enable access to winter sun for all residents.

- Apartments should have a principal outlook to an adjacent street or park, or to a garden or a landscaped courtyard within the development boundary to provide an acceptable level of resident amenity.

Fencing

- Street fencing in front of ground level residential dwelling units should not exceed 1.2m in height and provide for visual permeability to achieve a reasonable balance between resident privacy and opportunities for passive surveillance.

Services

- Service areas and service equipment should be located out of sight from the adjacent public domain to avoid diminishing the quality of the streetscape, especially for pedestrians.

Appendix 5 – Implementation Measures

Changes Required to Implement Structure Plan

Zoning

Sub-precinct	Zoning/Reservation		Planning mechanism required to implement
	Current TPS3	Proposed	
1. Second Avenue	Residential **Unzoned road reserve**	Residential **Local Reserves - Recreation**	No change **Amendment to TPS3**
2. Alfred Road/Ashton Avenue	Residential	Residential	No change
3. Ashton Avenue Commercial	Local Centre	Local Centre	No change
4. Ashton Avenue East	Residential	Residential	No change
5. Showgrounds	MRS Parks & Recreation	MRS Parks & Recreation	NA (advisory only)
6. Ashton Triangle	Local reserve – Recreation	Local reserve – Recreation	No change
7. Gugeri Street	Residential **Special Zone - Restricted Use**	Residential **Residential (possible)**	No change **Amendment to TPS3 (possible)**
8. College Road	Residential	Residential	No change

Comment: Amendments to TPS3 required:

- Sub-precinct 1 - Second Avenue to formally recognise existing open space at intersection of Mofflin Avenue and Stubbs Terrace; and
- Sub-precinct 7 – Gugeri Street to rezone the Special Zone as Residential.

Density

Sub-precinct	R Code		Planning mechanism required to implement
	Current TPS3	Proposed	
1. Second Avenue	R25	R25	No change
2. Alfred Road/ Ashton Avenue	R30 **R25**	R30 **R30**	No change **Properties on east side of Ashton Avenue - Amendment to TPS3**
3. Ashton Avenue Commercial	**R25**	**R60**	**Amendment to TPS3**
4. Ashton Avenue East	**R25**	**R40**	**Amendment to TPS3**
5. Showgrounds	NA	NA	No change
6. Ashton Triangle	NA	NA	No change
7. Gugeri Street	**R20** **R80 (DAP)**	**R60** **R80**	**Amendment to TPS3** **Special Zone - Amendment to TPS3 if part of amendment to rezone the land to Residential**

8. College Road	**R20**	**R40**	**Amendment to TPS3**

Comment: Density changes are required for all sub-precincts with the exception of Sub-precinct 1 – Second Avenue. Amendment to TPS3 is required. Should the restricted Zoned land in Sub-precinct 7 – Gugeri Street be subject to an amendment to TPS3 to rezone the land to Residential, then the amendment should also include a density code of R80 over the land.

Building Height

Sub-precinct	Indicative Height in Storeys			Planning mechanism required to implement
	Current TPS3	Proposed	R Codes*	
1. Second Avenue	2	2	2	No change
2. Alfred Road/ Ashton Avenue	2	2	2	No change
3. Ashton Avenue Commercial	**2**	**3**	**4**	**Amendment to TPS3 required to include a provision similar to Clause 40(5) to allow for increased heights as "special circumstances" (e.g. Structure Plan or LDP) in the Local Centre zone**
4. Ashton Avenue East	**2**	**2**	**3**	**Variations to TPS3 requirement under Clause 40.(5) guided by Structure Plan and new Local Planning Policy and Design Guidelines**
5. Showgrounds	NA	NA	NA	No change to TPS3
6. Ashton Triangle	NA	NA	NA	No change to TPS3
7. Gugeri Street	**2**	**5**	**4**	**Cnr Loch and Gugeri Streets - LDP required which will also address the Design Principles of the R-Codes**
	2	**3**	**4**	**Fronting Gugeri Street (corner sites) – LDP required which will also address the Design Principles of the R-Codes**
	3 (DAP)	**3**	**4 (4 at R80)**	**Currently Special Zone - LDP required to implement Structure Plan (noting that the current DAP provides for alternative independent development)**
	2	**3**	**4**	**Cnr Chancellor and Gugeri Streets - LDP required which will also address the Design Principles of the R-Codes.**
8. College Road	**2**	**2**	**3**	No change to TPS3 **Variation to TPS3 requirement under Clause 40(5) guided by new Local Planning Policy and Design Guidelines.**
***Storeys estimated @ one storey = 3m wall height (not incl. roof)**				

Comment:

- A combination of LDPs, Local Planning Policy and Design Guidelines are required. These documents together with the Structure Plan and amendment to TPS3 will address statutory considerations for height

variations as a "special circumstance" under cl.40 for the Residential and Local Centre zones. Design Guidelines will also address setbacks of upper storeys to take into account privacy and building bulk etc. relative to adjoining properties with a lower density code and height restriction.

- Of note, Amendment to TPS3 is required for building height >6m in the Local Centre zone. Inclusion of a provision to allow height to be increased under "special circumstances".
- Proposed heights are commensurate with R Codes for the densities proposed (based on one storey = 3m wall height) except for:
    - Much of Sub-precinct 7 Gugeri Street (excluding corner site) which is proposed to be one storey less than the R Code requirement.
    - A site in Sub-precinct 7 Gugeri Street, on the corner of Gugeri Street and Loch Street proposed to be one additional storey higher than the R Code requirement.
    - Much of Sub-precincts 4 Ashton Avenue East and 8 College Road Street which are proposed to be one storey less than the R Code requirement.
    - Sub-precinct 3 Aston Avenue Commercial which is proposed to be one storey less than the R Code requirement.

These variations to the R Code height requirements may be allowed consideration of the Design Principles subject to them meeting cl.6.1.2 Height requirements of the R Codes.

Primary/Secondary Street Setbacks

Sub-precinct	Current TPS3	Proposed	Planning mechanism required to implement
1. Second Avenue	6m/1.5m	6m/1.5m	No change
2. Alfred Road/ Ashton Avenue	4m/1.5m 6m/1.5m (Note 6m Western Power setback)	4m/1.5m 6m/1.5m (including Western Power setback)	West of Ashton - No change East of Ashton –TPS3 amendment to increase density to R30 would normally allow for a 4m setback. Local Planning Policy and notation on Structure Plan should enable 6m setback requirement instead.
3. Ashton Avenue Commercial	Nil	Nil	No change
4. Ashton Avenue East	6m/1.5m (Note 6m Western Power setback)	6m/2m (including Western Power setback)	R40 density would normally allow for a 2m setback. Local Planning Policy and notation on Structure Plan should enable 6m setback requirement instead.
5. Showgrounds	NA	NA	NA
6. Ashton Triangle	NA	NA	NA
7. Gugeri Street	6m/1.5m 2m/2m (DAP)	2m/2m 2m/2m	TPS3 amendment to increase density to R60 will allow for a 2m setback to all streets. This may be further changed by LDP which is required. Special Zone – no change
8. College Road	6m/1.5m	2m/2m	TPS3 amendment to increase density to R40 will allow for a 2m setback to all streets.

Comment: Street setbacks remain largely the same, however they alter as a result of density changes to be implemented through an amendment to TPS3, commensurate with the R Code setback requirements for each density coding. Further to the R-Code street setback requirements, the Western Power setback requirements for the High Voltage power lines on the eastern side of Ashton Avenue (6 metres) have been recognised and will apply to the Structure Plan. Note that setbacks for Sub-precinct 5 - Showgrounds is yet to be determined and this will be subject to an LDP.

Side/Rear Setbacks

Sub-precinct	Current	Proposed	Planning mechanism required to implement
1. Second Avenue	Tables 2a and 2b of the R Codes*	Tables 2a and 2b of the R Codes*	No change
2. Alfred Road/ Ashton Avenue	Tables 2a and 2b of the R Codes*	Tables 2a and 2b of the R Codes*	No change
3. Ashton Avenue Commercial	Tables 2a and 2b of the R Codes* Cl. 37A(1) – 6m ground and first floors	Table 5 of the R Codes**/ Tables 2a and 2b of the R Codes* Cl. 37A(1) – 6m ground floor	No change (Residential component. TPS amendment to increase density to R60 will provide for this) No change (Commercial component. Multiple dwelling setbacks not subject to cl.37A(1))
4. Ashton Avenue East	**Tables 2a and 2b of the R Codes***	**Tables 2a and 2b of the R Codes*/ Tables 2a and 2b of the R Codes Structure plan provides for greater setback to adjoining residential properties of a lower R-Coding**	**Structure Plan and Design Guidelines**
5. Showgrounds	NA	NA	NA
6. Ashton Triangle	NA	NA	NA
7. Gugeri Street	**Tables 2a and 2b of the R Codes* DAP requirement for Special Zone**	**Table 5 of the R Codes**/ Tables 2a and 2b of the R Codes***	**TPS3 amendment to increase density to R60 and R80 will provide for this. LDP also required.**
8. College Road	Tables 2a and 2b of the R Codes*	Tables 2a and 2b of the R Codes*/ Tables 2a and 2b of the R Codes	TPS3 amendment to increase density to R40 will provide for this.

***Based on a function of wall length, height and presence of major openings.** It is possible; however, that a wall may have a zero setback where it abuts an existing or simultaneously constructed wall of equal or greater proportions.*
***Depending on the width of the lot (i.e. less than and equal to 14m wide = 3m setback, 15m wide = 3.5m setback, equal to and greater than 16m wide = 4m setback).** It is possible; however, that a wall may have a zero setback where it abuts an existing or simultaneously constructed wall of equal or greater proportions.*

Comment:
Side and rear setbacks are currently subject to the requirements of the R Codes. These will alter throughout the Structure Plan area as a result of density changes to be implemented through an amendment to TPS3,

commensurate with the R Code. For Sub-precinct 4 – Ashton East, the Structure Plan and Design Guidelines will require increased setbacks for properties adjoining land of a lesser density/height allowance.

Plot ratio

Comment: Design Guidelines and/or other Local Planning Policy is to restrict variation of plot ratio requirements to no more than 5 per cent for R40, R60 and R80 coded land.

Appendix 6 – Council Minutes 20 February 2018

13.4 PLANNING AND DEVELOPMENT

13.4.1 LOCH STREET RAILWAY STATION PRECINCT STRUCTURE PLAN

THIS REPORT IS PRESENTED AS AMENDED ON 20 FEBRUARY 2018.

File Ref:	**LND/00081**
Attachments – Public	**Draft Loch Street Station Precinct Structure Plan (Attachment 1)**
	Submission Schedule (Attachment 2)
	Loch Street Structure Plan Precinct Traffic Assessment - GTA Consultants ~~13~~20 /02/18 (Attachment 3)
	Loch Street Precinct Structure Plan Map (Attachment 4)
	Potential Road Widening Plan for Ashton Avenue and Alfred Road (Attachment 5)
	Potential Road Widening Plan for Chancellor Street and Loch Street (Attachment 6)
	Potential Road Widening Plan for Ashton Avenue, Gugeri Street and Chancellor Street (Attachment 7)
	Loch Street Precinct – Sub-precincts and Building Heights Plan (Attachment 8)
	Submission Plan (Attachment 9)
Attachments – Restricted	**Submissions (R-Attachment 1)**
Responsible Officer:	**David Vinicombe** **Executive Manager Planning and Development**
Author:	**David Vinicombe** **Executive Manager Planning and Development**
Proposed Meeting Date:	**20 February 2018**

Purpose

Council is required to consider the 76 submissions received on the Draft Loch Street Station Precinct Structure Plan (SP) and make recommendation to the Western Australian Planning Commission (WAPC) on its progression. In considering the submissions received, Council is also required to consider details contained in a revised Traffic Assessment undertaken for the SP Precinct. The SP, if approved by the WAPC, will form the basis of amendments to Town Planning Scheme No. 3 (TPS3), and the creation/review of supporting Local Planning Policies (LP Policies) and Local Development Plans (LDP) to guide future development in the locality.

Summary

- Council's Housing Capacity Study (2013) made a number of recommendations to guide residential development in the Town inclusive of retaining existing density codings to protect the existing housing form with exception of strategic property; and to study the potential for increased density within 400m of Loch Street Station with a potential R20/R40 split coding.
- Planning Context prepared a Draft Study into Planning for Increased Residential Density within the Loch Street Transit Oriented Development (TOD) in June 2015.
- In October 2016, Council considered an application for the Housing Authority (now Department of Communities) to develop 25 three storey multiple dwellings at 11 Ashton Avenue (cnr Mofflin Avenue). The application was considered premature and it was recommended that the WAPC refuse the proposal in the absence of comprehensive and advertised strategic planning for the area.
- The WAPC resolved on 13 December 2016 to defer a decision until 30 June 2017 to allow comprehensive planning and public consultation of a Structure Plan in accordance with the *Planning and Development (Local Planning Schemes) Regulations 2015* (LPS Regs). Public consultation of the Draft Sp was conducted in June/July 2017.
- Concerns raised during the consultation period for the Draft SP include traffic congestion, density, height, parking, Public Open Space (POS), heat island impacts, streetscape amenity, consultation processes, infrastructure service stress, Department of Communities development proposals, impacts on property valuation, noise, overshadowing, privacy, health and safety, setbacks, access, 132kV power lines, impacts on the Royal Agriculture Society (RAS) Showgrounds relative to respecting the site's State significance, conflicts with the proposed Management Plan for the Showgrounds, Crown Grant Title restrictions, POS, buffer distances, residential use, height restrictions, access, non-conforming uses and compensation.
- Support was raised for the SP, particularly relative to the potential for redevelopment of the shopping strip in Ashton Avenue and retention of the Loch Street railway station.
- A number of requests were made for the increase in density codings proposed and for the SP area to be enlarged to cover an 800m radius from the railway station.
- In reviewing the submissions the major concerns raised by the majority of responses related to existing and future traffic congestion. This required a major review of traffic forecasting in the locality. To allow these investigations, the WAPC has since advised that the SP should be submitted for approval by no later than 20 February 2018. The Department of Planning (DoP) has also advised that it will defer determination of the Department of Communities application for development at 11 Ashton Avenue until April 2018 to allow for the SP to be finalised and considered by the WAPC.
- The SP is a high level strategic document which proposes to balance the existing built form with increased densities to encourage redevelopment of the

area, improve facilities by redevelopment of the shops and maintain services in the locality such as the Railway Station.

- If approved, the SP will inform amendments to TPS3, new and revised LP Policies (including Design Guidelines- DGs) and LDPs to guide development in the locality.
- Concerns raised with regard to traffic congestion have been reviewed and revised traffic modelling for the locality undertaken. A reverse engineering exercise was undertaken to establish recommended densities and development yields which could be accommodated with a reasonable level of service for the intersections.
- The modelling indicates that most of the intersections in the locality can operate with acceptable levels of service (some with further works required before 2031 – e.g. a roundabout at the intersection of Ashton Avenue and Alfred Road – requiring road widening, traffic signals at the intersection of Gugeri Street and Loch Street, widening of the roundabout at the intersection of Chancellor Street and Loch Street – requiring road widening and additional road widening for extended and additional turning lanes at the intersection of Ashton Avenue, Gugeri Street and Chancellor Street – requiring road widening).
- Levels of service forecast for the operation of the pivotal intersection of Ashton Avenue (bridge), Gugeri Street and Chancellor Street are of significant concern, even with current modifications being undertaken with the reconstruction of the bridge.
- The traffic modelling indicates that with additional road widening and provision of improved turning lanes, the level of service for 2031 can be accommodated; however the densities and resultant development under the Draft SP proposals would create an unacceptable level of service at the intersection.
- As a result, it is recommended that the proposed densities through the SP be reduced.
- Revised densities recommended in this report result in commensurate reductions in height, and consequently address the concerns raised in this regard and relative matters regarding privacy and overshadowing.
- The traffic impact forecasts do not support increasing densities within the Precinct or enlarging the SP area. It is recommended that the SP be modified to reduce density proposals throughout.
- Proposals for the RAS are to be removed from the SP and future plans for the site determined by the WAPC in consideration of their Management Plan. Critically, the traffic forecasting for the locality cannot support traffic movement in Ashton Avenue beyond the revised densities proposed under the SP. WAPC will need to consider this in determining both the SP and the RAS Management Plan.
- On this basis it is also recommended that Council reaffirm its objection to the Department of Communities development at the intersection of Ashton Avenue and Mofflin Avenue as it is inconsistent with the recommended SP modifications.

- An alternative option is for the SP to be placed on hold until such time as attitudes to modes of travel change generally and traffic forecasting can accurately reflect improvements to the level of service of the Ashton Avenue, Gugeri Street and Chancellor Street intersection. This change may result from improved public transport services (involving integrated linkages further afield from the railway line) which increase patronage levels, or the onset of alternative modes of travel (increased reliance on shared/autonomous vehicle use).
- WAPC may also consider another option in determining the future of the RAS Showgrounds (whether as part of the Management Proposals for the RAS or alternative development options) by improving north south linkages through the area by tunnelling of the railway, widening and realigning (or reconstruction of a roundabout) at the Ashton Avenue bridge, or adding another crossing between Loch Street and Brockway Road. These options are beyond the scope of this study and will need to be considered by the WAPC in determination of both the SP and proposals for the RAS.

Past Resolutions

In November 2012, Council adopted the Housing Capacity Study to identify constraints and opportunities relating to the housing targets including Directions 2031 (and beyond) and the Draft Central Metropolitan Perth Sub-Regional Strategy.

Ordinary Council Meeting 20 November 2012, Resolution No. 221/12 includes the following pertinent extracts:

That Council resolve as follows:

1. *To adopt the Draft Housing Capacity Study 2012 for the Town of Claremont for inclusion in the review of the Town of Claremont's Local Planning Strategy 2010 – 2025, Clearly Claremont.*
2. *The Town of Claremont work toward implementing the 12 recommendations contained in the Housing Capacity Study 2012 as follows:*

   2.5 Council seek to maintain at least the current level of family suitable detached housing and maintain low density areas of Claremont (R20 and R30 Codings) with the only exceptions being the considering of the rezoning of land around railway stations for medium density development and other strategically placed redevelopments.

   2.10 Council:

   - *Undertake a study of the potential for rezoning of the land within 400m of the Loch Street Station with a potential R20/R40 spilt coding as part of its considerations in the Minister for Planning's Section 76 direction for the Town to initiate an amendment to Town Planning Scheme 3 to provide for R80 development on Lots 4, 22 and 25 Gugeri Street, Lot 26 Loch Street and Lot 20 College Road.*
   - *Develop policies and guidelines in order to protect the amenity of existing and future development; and*

2.11 Council notes that the Royal Agricultural Society Showgrounds could at some stage potentially accommodate a greater diversity of uses including residential development and agree that any future development of Showgrounds for uses not related to its current Parks and Recreation purposes should only be considered following the preparation and endorsement of an agreed Master Plan covering the long term development of the land. The Master Plan would be the basis for considering any proposals to rezone all or part of the Showgrounds.

Ordinary Council Meeting 18 October 2016, Resolution No. 163/126 includes the following pertinent extracts with regard to the proposed Housing Authority application at Lot 200 (11) Ashton Avenue:

THAT Council:

1. *Advise the Western Australian Planning Commission that although the proposed development does not meet current Town Planning Scheme No. 3, Council policy and Residential Design Code requirements, it does meet the Town's strategic directions for the locality contained in the draft LDP. However these directions have not been consulted with the public and as a result there has been significant [public concern raised against the development. Accordingly, while consistent with the draft LDP, it is considered premature to approve the development until such time as the LDP for the Loch Street Station Precinct is consulted with the public and adopted by Council with due regard to submissions made by the local community. On this basis Council does not support the proposed development and recommends the Western Australian Planning Commission refuse to grant development approval for a proposed 25 three storey multiple dwellings at Lot 200 (11) Ashton Avenue, Claremont.*

Ordinary Council Meeting 27 June 2017, Resolution No. 100/17 includes the following pertinent extracts:

That Council:

a) Advertise for public comment the Draft Loch Street Station Precinct Structure Plan for a period of 28 days pursuant to Part 4, clause 18 of the Planning and Development (Local Planning Schemes) Regulations 2015.

b) On conclusion of public consultation, any submissions are to be referred to Council for consideration together with any proposed modifications to the Draft Loch Street Station Precinct Structure Plan to address the comments made.

Ordinary Council Meeting 5 September 2017, Resolution No. 135/17 resolved as follows:

That Council notifies Main Roads WA of its support for the proposed final movement and phasing design for the Ashton Avenue/Gugeri Street/Chancellor Street signalised intersection as detailed below:

1. Vehicles travelling east on Gugeri Street have green signals for all movements including a right turn green arrow (short phase only);

2. *Vehicles travelling in both directions on Gugeri Street have green signals with through left permitted in both directions. Filter right turns onto Chancellor Street are permitted. No right turns from Gugeri Street onto Ashton Avenue;*
3. *Vehicles travelling south on Ashton Avenue have green signals for all movements including a right turn arrow;*
4. *Vehicles travelling from both Chancellor Street and Ashton Avenue have green signals for through and left turn. Filter right turns from Ashton Avenue are permitted. No right turns from Chancellor Street onto Gugeri Street.*
5. *When any traffic signal phasing is activated, pedestrians get a leading green light in whichever direction they are crossing. MRWA will also include additional flashing amber lamps when the pedestrian crossing has been activated to increase awareness that turning vehicles are to give way to the crossing pedestrians.*

Background

State Government Direction

The State Government has prepared a number of strategies to promote a balance between urban growth on the fringe and consolidation within the existing urban fabric of the metropolitan area. In recent times a number of strategic directional documents have been prepared, inclusive of Directions 2031(and Beyond), Draft Central Metropolitan Perth Sub-Regional Strategy (CMPSS), Directions 2031 (and Beyond) - 2014 Report Card and Perth and Peel @ 3.5 Million (draft). The expectation is that local government (Town of Claremont included) will take positive action to support this direction.

Most recently, Perth and Peel @ 3.5 Million (draft) proposes that the Town to accommodate 1300 additional dwellings in the Town by 2050. This target appears to include the Directions 2031 Report Card target of 760 dwellings, but is less than the original target of 2200 contained in the Directions 2031 and Beyond / CMPSS proposals.

Discussions with the Department of Planning officers when finalising the Housing Strategy for the Town indicated that the base (before Directions 2031 / CMPSS) calculation included 630 dwellings in the North East Precinct (NEP). It is envisaged that with increased development yields (22-25%) at the NEP, up to 1000 dwellings may be accommodated within that development alone (370 dwellings more than the base 630 dwellings). It is therefore estimated that the revised future growth target for the Town of 1300, will consist of 370 in the NEP and 930 elsewhere.

The future growth targets for the Town will be primarily achieved at the NEP and along Stirling Highway in accordance with proposals contained in the Stirling Highway Local Development Plan (LDP - adopted by Council on 5 July 2016) and other strategic locations such as surrounding Swanbourne Station. It is noted that amendments to TPS3 consistent with the Stirling Highway LDP are likely to provide for over 1200 additional in the short-medium term, and ultimately 1530 additional dwellings when development west of the Town centre is taken into consideration. These strategic plans (plus the additional development expected from the NEP) will more than comfortably accommodate dwelling targets set for the Town by the WAPC well beyond

2050, and possibly into the next century. Accordingly, the planning imperative set for the Loch Street Station Precinct SP is to assist this growth, while at the same time providing opportunity for urban renewal and improvement of facilities in the Precinct to improve overall living standards for existing and future residents.

Draft Study into Planning for Increased Residential Density within the Loch Street TOD

The initial draft Study dated June 2015 proposed an LDP for the study area. The Study was not formally published for public comment as its contents were not fully fleshed out and ready for public consideration. A preliminary assessment indicated a lack of significant potential redevelopment sites within the study area; however a number of "hot spots" were identified as key sites for potential redevelopment. These included the Ashton Avenue shopping strip, the Department of Communities (former Housing Authority) site, the Local Reserves – Recreation site at the intersection of Judge Avenue and Ashton Avenue (owned by the Royal Agricultural Society - RAS), the RAS Showgrounds and the existing R80 Special Zone adjacent the intersection of Gugeri Street and Loch Street. The preparation of an LDP requires WAPC approval. The WAPC directive to elevate the proposed LDP into a SP has effectively superseded the initial LDP proposals. As the SP is to be approved by the WAPC, and the intent was elevated to achieve an effective TOD plan, an increased density coding spread was required above initial proposals contemplated under the LDP

Draft Loch Street Station Precinct Structure Plan (Attachment 1)

The objectives of the Draft SP are to:

- Identify land development opportunities and constraints for higher density development.
- Identify existing key potential sites for redevelopment that are of significance together with land that may have potential for future consolidation and redevelopment.
- Present models of how development could best be accommodated for varying lot parcels.
- Demonstrate how the proposed density development concept could be implemented through the Town of Claremont's local planning tools and mechanisms.

The planning imperatives for the SP are to:

- Assist the Town in achieving its residential density targets of 1300 additional dwellings (already catered for in the NEP and along Stirling Highway - plus Swanbourne Station).
- Provide opportunity for urban renewal, improvement of facilities in the precinct and ensure retention of Loch Street Railway Station.

A number of opportunities and constraints were initially identified in the Draft SP:

- Protect most of the existing R25 housing stock north of the railway line.

- Encourage redevelopment of the shopping strip and higher density development at the "urban scale" (up to 3-4 storeys) either side of Ashton Avenue "mini" activity corridor.
- Take advantage of larger vacant sites and older housing stock to encourage higher density redevelopment closer to the railway station.
- Recognise the 132kV power line setback along the eastern side of Ashton Avenue.
- Formalising the Local Reserves – Recreation status of Mofflin Park under TPS3.
- Recognising the proposed RAS Management Plan as being subject to separate approval processes, together with the promotion of mixed use residential development and informal open spaces/town squares on the RAS Ashton Avenue Street frontage to improve integration of the RAS land with the Structure Plan area.
- Acknowledge the RAS land ownership of Local Reserves – Recreation land in the Ashton Triangle Sub-precinct and rationalise open space and road closures to create a key development site.
- Acknowledge the R80 Special Zone site adjacent the intersection of Loch and Gugeri Streets and infill surrounding lots along Gugeri Street with an R80 coding with shared access points or rear laneway access.
- Promote higher level corner lot developments at the intersections of Loch and Chancellor Streets with Gugeri Street.

The Draft SP Map proposed a range of increased densities focussing on lots closer to the Loch Street Railway Station in Ashton Avenue, Mofflin Avenue, Judge Avenue, Gugeri Street, Loch Street, Chancellor Street and College Road. The existing built form of the bulk of the R25 area north of the railway line was proposed to be retained and protected. The SP Map also recognised the 132kV power line setback along Ashton Avenue and key sites where LDPs would be required.

Building heights were largely restricted to three storeys along the major roads, with exceptions being mixed use sites at four storeys (to encourage redevelopment of shops and residential development on RAS land), key development sites with heights up to five or six storeys. Large areas of existing single dwellings were restricted to two storeys.

Using the proposed density and height restrictions, built form modelling was developed to determine development yields. Sub-precincts 1 and 2 primarily provide for continuation of existing development form and are estimated to yield 200 dwellings. The remaining Sub-precincts were expected to yield 681 new multiple dwellings.

The increase in development yield was considered to encourage redevelopment of the existing shops and assist in ensuring the maintenance of the Loch Street railway station.

It was also important to ensure that the current infrastructure servicing capacity of the area is maintained and not extended by the density proposals. Any additional servicing requirements would place pressure on the current infrastructure and require preparation of a Development Contribution Plan to facilitate cost sharing.

Consultation

The Draft Loch Street Station Precinct SP was advertised for public comment in accordance with the LPS Regs for a maximum period of 28 days. Advertising included written notification to all affected landowners/residents in the area bounded by Alfred Road, Brockway Road, Loch Street, Melville Street, Gugeri Street and Graylands Road, plus letters to various affected Government bodies. A Notice was published in the Public Notices section of the Post newspaper and on the Town's website, requesting comments up until 28 July 2017.

A total of 76 submissions were received during (and following) the consultation period. Nine submissions fully supported the proposed SP, 45 objected and 22 offered conditional support/objection.

Concerns raised during the consultation period for the Draft SP include traffic congestion (40), density (31), height (16), parking (13), POS (12), heat island impacts (8), streetscape amenity (8), consultation processes (6), infrastructure service stress (8) and other matters (23) including the Department of Communities development proposals, impacts on property valuation, noise, overshadowing, privacy, setbacks, access, 132kV power lines, impacts on drainage at Karrakatta Cemetery and impacts on the RAS showgrounds relative to the SP not respecting the site's State significance, conflicts with the proposed Management Plan for the Showgrounds, Crown Grant Title restrictions on use, POS, buffer distances, residential use, height restrictions, access, non-conforming uses and compensation.

Support was raised for the SP, particularly relative to the potential for redevelopment of the shopping strip in Ashton Avenue and retention of the Loch Street railway station.

A number of requests were made for the increase in density codings proposed and for the SP area to be enlarged to cover an 800m radius from the railway station.

Details on these submissions (R-Attachment 1) and responses are included in the Submission Schedule (Attachment 2), and are also summarised and responded to in the discussion below.

In addition to the above, the Town sought comments from servicing authorities and formal submissions were received from ATCO Gas, Western Power, the Department of Education, Water Corporation and main Roads WA, all supporting the Draft SP. It is noted however that Main Roads WA have made comments on both future scenarios for regional traffic flow in the locality (and beyond) and also concerning the operational capacity of intersections in the Precinct. The comments made in this regard are consistent with concerns on traffic congestion detailed below and have relevance in the progression of the SP and the densities proposed. It is noted that no formal comment was received from the public Transport Authority, although a number of discussions were held between officers from the Town and the Authority in regard to the SP and long term retention of the Loch Street railway station.

Discussion

The following summarises the matters raised in the submissions and provides responses and recommended modifications to the SP where appropriate.

Traffic Considerations

The single most significant concern raised was traffic congestion. Concerns related to existing congestion levels and the impact of additional development in the area, the need to integrate transport and land use planning and the operation of the Ashton Avenue bridge (and other intersections).

In consideration of concerns over traffic impacts, a review of traffic forecasting for the locality has been undertaken by GTA Consultants (*amended* Attachment 3). This review identified that a number of density proposals and development yields proposed in the Draft SP required reconsideration to reduce the level of congestion in 2031 modelling for the SP area.

The traffic forecasting uses a Main Roads WA (ROM) model which draws in land use and development yield calculations from the Department of Planning to establish traffic volumes for regional and local traffic. This then calculates the resultant Levels of Service (LOS – A to F) for intersections to determine whether an intersection fails or provides an appropriate LOS with reasonable levels of traffic congestion – a LOS of A-C is considered acceptable.

A reverse engineering exercise was undertaken to establish recommended densities and development yields which could accommodate a reasonable LOS for the intersection. As a result, it is recommended that the proposed densities through the SP be reduced to accommodate acceptable LOS at this key intersection (as depicted on the revised Structure Plan Map – *amended* Attachment 4):

- Removing R80 in Sub-precincts 5 – Showgrounds and 6 – Ashton Triangle (see comments below relative to RAS)

- Removing all commercial uses from Sub-precinct 5 – Showgrounds (see comments below relative to RAS)

    - Reducing density in Sub-precincts 4 – Ashton Avenue East and 8 – College Road from R50 to ~~R30~~R40

- Reducing density in Sub-precincts 3 – Ashton Avenue Commercial and 7 – Gugeri Street from R80 to R60 (other than the corner of Loch Street and Gugeri Street and the adjoining R80 Special Zone site).

The modelling indicates that most of the intersections in the locality can operate with acceptable LOS, albeit some with further works required before 2031 – e.g. a roundabout at the intersection of Ashton Avenue and Alfred Road – requiring potential (if the SP is approved with these modifications) road widening (Attachment 5), widening of the roundabout at the intersection of Chancellor Street and Loch Street – requiring road widening (Attachment 6) and provision of traffic signals at the intersection of Gugeri Street and Loch Street – not requiring road widening.

The LOS forecast for the operation of the pivotal intersection of Ashton Avenue (bridge), Gugeri Street and Chancellor Street without the SP growth is of significant concern - even with current modifications being undertaken with the reconstruction of the bridge. The traffic modelling indicates that with phasing modifications to the traffic signals and provision of additional and lengthened turning lanes, the LOS for 2031 can be accommodated with road widening (Attachment 7). It is noted that the overall LOS for this intersection is C with reduced development as detailed above, however in the PM for traffic turning west off Ashton Avenue into Gugeri Street, an LOS of E is forecast – this is mainly attributed to restrictions on the phasing of the turning movements at the traffic lights. This is considered a reasonable LOS outcome, however the densities and resultant development under the Draft SP proposals would create an unacceptable LOS at the intersection.

It is noted that while the current bridge upgrade works in Ashton Avenue will assist by reducing immediate traffic congestion concerns in the area, traffic forecasting for 2031 has identified that a number of additional intersection improvements are required to cater for expected traffic demands with and without the future growth in residential development in the Precinct. The current design for the bridge includes another southbound lane and pedestrian paths either side. Due to the location of transformer services and a major power line transmission pole to the north–west of the bridge, an additional northbound lane has not been included. If an additional northbound lane had been included, additional traffic movement and development may have been accommodated in the locality; however the final designs for the bridge reconstruction were completed well ahead of the recent traffic study findings.

An alternative option is for the SP to be placed on hold until such time as attitudes to modes of travel change generally and traffic forecasting can accurately reflect improvements and an acceptable LOS for the Ashton Avenue, Gugeri Street and Chancellor Street intersection. This change in attitude may result from improved public transport services (involving integrated linkages further afield from the railway line) which increase patronage levels, or the onset of alternative modes of travel (increased reliance on shared/autonomous vehicle use).

WAPC may also consider another option in determining the future of the RAS Showgrounds (whether as part of the Management Proposals for the RAS or alternative development options) by improving north south linkages through the area by tunnelling of the railway, widening and realigning (or reconstruction of a roundabout) at the Ashton Avenue bridge, or adding another crossing between Loch Street and Brockway Road. These options are beyond the scope of this study and will need to be considered by the WAPC in determination of both the SP and proposals for the RAS.

Density and Area of Structure Plan

A number of concerns were raised with regard to the density proposals; many seeking reductions and a few seeking increases to reflect a variety of locational attributes and transitional densities between higher and lower densities either side. A few respondents also sought an increase in the SP area to accommodate an expanded TOD 800m from the Loch Street railway station. The increases in area and density comments sought to provide further justification for the long term retention of the railway station, further impetus for the redevelopment of the shopping strip in Ashton

Avenue with associated place making and support for strategic direction from the WAPC to consolidate land use and densities to create a fully functioning TOD.

Revised recommendations for increases in density through the Precinct take into account the physical limitations of the area in terms of existing and well established land uses, as well as the forecast impacts of increased density on traffic flow. An increase of densities or expansion of the Loch Street railway station TOD is not appropriate given that the traffic forecasting for 2031 does not support the growth envisaged under the initial Draft SP proposals and the SP can only responsibly support lesser density increases as now recommended.

The recommended revisions to density proposals in the Precinct to address traffic congestion concerns will still yield a total of ~~653~~ 658 dwellings (including ~~453~~ 458 new multiple dwellings). While this is reduced from the initial estimates of 881 dwellings (including 681 multiple dwellings), the densities proposed will still provide for additional population growth in the locality to assist the Town achieving its density targets and in the retention of the railway station and redevelopment of Ashton Avenue shopping strip.

Based on the initial recommended density increases in the SP, the population of the area was estimated to grow to ~~1,675~~ 1,684 persons (based on 2.27 persons per single/grouped dwelling plus 1.8 persons per multiple dwelling). Given the reductions in density proposed through the Precinct it is estimated that the population of the Precinct will grow to 1269 persons (406 person reduction on initial estimates – approx. 25% reduction).

While the growth estimates above are reduced as a result of the revisions to densities recommended under the SP, they are all that the area can currently effectively manage (albeit with further intersection improvement to be applied). Unless traffic management in the locality can be improved to assist movement across the railway line (as detailed above) the recommended density reductions are all that the SP can responsibly achieve.

It is noted that although the Town has sought assurances through the SP processes from the Public Transport Authority that the Loch Street railway station will remain open, these assurances have not been forthcoming as the Authority needs to take into account a number of locational and operational (including political) factors in the future to confirm the long term retention of the station.

Height

Concerns were raised with regard to the impact of proposed heights under the Draft SP. Primarily the concerns related to building bulk, overshadowing and privacy matters relative to the proposals for four storey development in Sub-precinct 3 – Ashton Avenue Commercial, three storeys in Sub-precinct 4 – Ashton Avenue East, four storeys in Sub-precinct 5 – Showgrounds, six storeys in Sub-precinct 6 – Ashton Triangle, and four and five storeys at the corners of Gugeri Street with Loch Street and Chancellor Street (respectively) in Sub-precinct 7 – Gugeri Street. One submission sought an increase in height from two storeys to three storeys in Sub-precinct 8 – College Road to better reflect built form outcomes for the proposed R50 coding.

Commensurate with the review of traffic matters and the resultant recommendation to reduce the densities throughout the Precinct, proposed heights within the revised density Sub-precincts may be reduced to provide relative heights for each of the Sub-precincts as follows (as shown on Sub-precincts and Building Heights Plan – Attachment 8):

- Sub-precinct 3 – Ashton Avenue Commercial to be reduced from four storeys to three storeys
- Sub-precinct 4 – Ashton Avenue East to be reduced from four storeys to two storeys
- Sub-precinct 5 – Showgrounds deleted entirely (see comments below relative to RAS)
- Sub-precinct 6 – Ashton Triangle deleted entirely (see comments below relative to RAS)
- Sub-precinct 7 – Gugeri Street at the corner of Gugeri Street Chancellor Street reduced from four storeys to three storeys.

It is noted that the five storeys proposed for the corner of Loch Street and Gugeri Street in Sub-precinct 7 – Gugeri Street is recommended for retention to enforce the dominant corner entry statement for the eastern gateway to the Precinct along Gugeri Street/Railway Road. Also heights in Sub-precinct 8 – College Road are not proposed to be increased (as requested) as the proposed density for this Sub-precinct is recommended to be reduced from R50 to ~~R30~~ R40 (above) and the two storey height proposal is consistent with the R30 density coding.

The existing shopping strip along Ashton Avenue in Sub-precinct 3 – Ashton Avenue Commercial is widely regarded as being 'tired' and in need of regeneration. The revised proposals R60 (from the proposed R80 and existing R25) and modified height to three storeys (from the proposed four storeys and existing two storeys) will continue to provide economic incentive to encourage redevelopment of the local centre to improve the overall level of commercial service and amenity of the area.

Parking

Concerns related to the provision of sufficient parking (and association with traffic congestion) for both residential and commercial uses, provision of less parking to promote the TOD and location of parking for the commercial strip of shops.

Parking is to be provided for all re-development in accordance with the provisions of the Residential Design Codes (RDC) and TPS3. Commensurate with the review of traffic matters and the recommendation to reduce the density of a number of the Sub-precincts, relative reductions in dwelling yield (initially estimated at 881 including 681 multiple dwellings, and now proposed to be reduced to ~~653~~ 658 including ~~453~~ 458 multiple dwellings - approximately 370 at present) will reduce the number of vehicles and parking bays associated with the development of the Precinct.

The RDC requirements for parking provision within 800m of a railway station on a high frequency route are reduced to encourage public transport use. Unfortunately as public transport is not fully and comprehensively linked throughout the metropolitan

area, its level of service is not the same as other cities such as Melbourne. While attitudes towards public transport and service levels will improve over time, at this point compliance with the RDC parking requirements is necessary.

Parking for the shopping strip in Sub-precinct 3 – Ashton Avenue Commercial is proposed to be located at the rear of the properties with access provided via rights of carriageways to common access points. It is proposed that this be enforced as a development expectation through the LDP prepared for the Local Centre.

Public Open Space

Support is provided for the proposal to formalise the POS at Mofflin Park (modified to retain road frontage and access to an adjoining property). Additional POS is also requested to accommodate the population growth attributed to the SP.

Quality open space in the immediate locality is limited to Mofflin Park, which is currently a road reserve. The SP proposes to formalise this open space as Public POS to protect it over the longer term. The existing POS located in Sub-precinct 6 - Ashton Triangle is in a diminished state and used regularly for parking associated with the activities of the RAS. The land is also controlled by the RAS in accordance with its Crown Grant title restrictions on land use (see specific comment on this below). Given the objection to the SP by the RAS (see below), it is proposed to retain the current status of the POS in Sub-precinct 6 – Ashton Triangle.

Modification to the Mofflin Avenue Park is recommended to retain the access to the adjoining property at 3 Stubbs Terrace.

Consistent with the proposal to remove the density proposals relating the RAS land in Sub-precinct 6 – Ashton Triangle, it is recommended the POS in this Sub-precinct be modified to retain its current designation.

Provision of additional POS is not proposed in Sub-precincts 7- Gugeri Street and 8 – College Road. This would require significant funding and resumption of large parcels of land (existing residential properties), which is beyond the immediate scope of the SP.

Environmental Concerns

A number of submissions raised concern over environmental impacts resulting from the intensity of proposed development under the SP. These impacts include the creation of ‘heat islands’, excessive noise, overshadowing, privacy, and health and safety. A number of submissions called for the undergrounding of the 132kV power line running along the eastern side of Ashton Avenue.

The reduced densities proposed as a result of traffic congestion concerns, together with reduced heights and development yields will result in reduced building bulk and opportunity to reduce the impacts of the built environment and creation of ‘heat islands’. In addition reduced heights resulting from the reduced built form provide consequential reductions to overshadowing and improvements to privacy outcomes.

Health impacts of the 132 kV power line are for the consideration of Western Power. The cost of undergrounding this section of power line has been estimated at $3 million, which is a considerable (and prohibitive) cost to be absorbed by the impacted landowners (and also by all benefiting owners in the SP Precinct if proposed and included in a Development Contribution Plan). Western Power has indicated it does not support the undergrounding of High Voltage Transmission lines due to cost and technical reasons.

Consultation Processes

Concerns were raised that the processes used for the SP preparation and consultation did not sufficiently engage with the public and that opportunities were lost as a result of not ascertaining property owners' aspirations for development.

There are a number of methods to conduct effective community consultation and the Town has specifically complied with its legislative requirements set by the *Planning and Development (Local Planning Schemes) Regulations 2015* due to the initial tight timeline set by the WAPC to prepare the SP and commence consultation by 30 June 2017.

The consultation period did however draw out a variety of comments from members of the community which can be relied upon to measure the depth of concerns regarding the Draft SP. As indicated, these range from submissions of support including requests for additional density proposals and expansion of the Precinct, to submissions of concern regarding the densities and heights proposed and impacts on residential amenity and traffic volumes and flow in the locality. The Town has worked through these submissions with the view of addressing the issues raised (concerns and opportunities) and proposes to refine the SP to respond to the comments received. A further workshop or public engagement in this context is not supported as it is unlikely to assist the SP process further at this stage.

It is noted that the Town has attempted to achieve a balance on these matters in the knowledge that any proposals for increased density and building height was likely to draw adverse comments as clearly evident from the number of concerns raised during a public consultation period for a Housing Authority (now Department of Communities) application for multiple dwellings on the corner of Ashton Avenue and Mofflin Avenue which significantly exceeded the current R25 density for the property.

Infrastructure Services

Concerns were raised that the existing services in the area (particularly water supply and internet services) are not capable of meeting servicing requirements and need to be upgraded.

While the Engineering Services Report (Appendix 2) of the SP identifies that service provision and planned improvements will accommodate the growth proposed in the Draft SP, the recommended lower density increases now proposed to address concerns over traffic congestion will further improve the long term servicing capacity within the area. It is noted however that recent issues with reduce water pressure has resulted from Water Authority initiatives to preserve existing (and aging) pipe work prior to the replacement and upgrade program currently rolling out through the

metropolitan area. Internet service provision is a Federal Government issue in terms level of service.

Royal Agricultural Society Showgrounds

A submission (including support documents from town planning and legal consultants appointed by the RAS) has raised significant objection to the SP. The submission raises concern over the level of Council engagement with the RAS in preparation of the Draft SP, the validity of the SP and that the SP does not respect the site's State significance, conflicts with a proposed Management Plan for the Showgrounds and related WAPC approval processes. Concerns are also raised about proposals to restrict the height of development along Ashton Avenue and addition of residential development to the perimeter of the site fronting Ashton Avenue. Other concerns were raised with regard to the proposed residential development in Sub-precinct 6 – Ashton Triangle relative to Crown Grant Title restrictions, buffer distances, access, non-conforming uses and compensation matters.

The Town was aware from previous discussions and engagements with the RAS of its development aspirations through their proposed Management Plan. This Management Plan has not been publically advertised at this point and is subject to approval by the WAPC (most likely following formal consultation).

Built form outcomes contained in the proposed Management Plan were reflected in the Draft SP, modified to reduce height proposals to a maximum of four storeys along Ashton Avenue to be relative to Draft SP proposals in Sub-precincts 3 and 4 of four and three storeys (respectively).

The Draft SP included aspirations of the Town that the RAS Management Plan provide upper level residential accommodation and a proposal for a significant residential development site in Sub-precinct 6 – POS land under control of the RAS and subject of discussions between the RAS and the Town a number of years ago relative to potential development for residential purposes.

Preliminary comments on the RAS Management Plan to consultants for the RAS during the preparation of the draft Management Plan clearly expressed the Town's view that residential development sleaving the RAS site was desirable as a measure to ensure amenity impacts from the site (e.g. noise) was self-regulated.

Noting that the aspirations of the Town and RAS come from different perspectives, the common element is that the WAPC is the responsible authority to approve both the SP and the RAS Management Plan. Accordingly, differences between the two will ultimately be reconciled through the WAPC approval process, once advertising of the Management Plan is undertaken to establish wider community views on the RAS proposal.

Given the concerns raised by the RAS relative to Crown Grant Title restriction which prevents use of their properties for uses not associated with the showgrounds (together with the recommendation that residential development densities be increased at lesser levels under the SP to address traffic congestion concerns), proposals for residential development in Sub-precincts 5 - Showgrounds) and 6 -

Ashton Triangle are recommended to be removed from the SP. In addition, the traffic forecasting undertaken for 2031 required the removal of all additional development on the Ashton Road frontage, and accordingly all proposals contained in the SP relative to the RAS Showgrounds are now recommended to be removed from the SP.

The Draft SP reflects access proposals from Ashton Avenue to the showgrounds and does not aim to alter this.

The validity of the SP will be the subject of WAPC consideration. The SP itself only aimed to modify aspirations of the RAS with regard to the Ashton Avenue frontage and did not seek to make any further comment on other matters pertaining to the RAS Management Plan, accordingly acknowledging the status of the site as a whole and respectful to the WAPC approval responsibilities.

The RAS Showgrounds has a history of allowing for/conducting events which are considered by the Town to not have strong associations with the initial intent of the Showgrounds and these activities have over the years raised significant amenity issues and tension between the RAS, the Town and nearby residents. It is the Town's view that these activities are inappropriate in the residential environment in which they sit and that any future redevelopment facilitated under the proposed Management Plan (or any other proposal for the site) must deliver improved amenity outcomes for the residents of the Town. While buffer distances required under State Planning Policy No 4.1 State Industrial Buffer (SPP 4.1) may place a legal obligation with regard to buffer distances being provided off-site, given the above existing circumstances, this is not a practical solution. The Town's view is that any buffer distances should be applied within the site itself, or that the uses be regulated to reduce their amenity impacts. This matter will need to be deliberated on by the WAPC in consideration of both the RAS Management Plan and the SP.

Legal advice received by the Town indicates that the SP itself would not give rise to the possibility of an injurious affection claim. Given that it is now recommended that all SP proposals impacting on the RAS showgrounds be removed, concerns in regard to non-conforming use and compensation for injurious affect fall away.

As indicated above, proposals for the RAS are to be determined by the WAPC in consideration of their Management Plan. Critically, the traffic forecasting for the locality cannot support traffic movement in Ashton Avenue beyond the revised densities proposed under the SP. WAPC will need to consider this in determining both the SP and the RAS Management Plan.

Other Matters

A range of other matters were raised in the submissions, including concerns over the Department of Communities development proposals, impacts on drainage at Karrakatta Cemetery and impacts of the SP proposals on property valuation.

With regard to the proposed Department of Communities development, commensurate with the review of traffic matters and the recommendation to reduce the density of a number of the Sub-precincts (including Sub-precinct 4 Ashton Avenue East down to R30), a relative recommendation to reduce the height in the Sub-precinct to two storeys is made to correlate with the revised density proposals. As the proposed

height (and density) of the development is inconsistent with the recommended proposals to reduce height and density and the adjacent height restrictions, it is recommended that Council advise the WAPC that is remains opposed to the Department of Communities development proposal in consideration of the revised SP proposals taking into account traffic congestion concerns.

With regard to the Metropolitan Cemetery Board's concerns over drainage at Karrakatta Cemetery, the Town is currently liaising with the Cemetery Board to establish options for and costs of relocating the sump to an alternate location within the cemetery grounds.

While the valuation of property adjacent to increased density development is not recognised as relevant planning matter, it should be noted that improvements in the amenity of the area, such as those resulting from the redevelopment of the Ashton Avenue shopping strip and the delivery of improved POS will provide a positive impact on property valuations. In the longer term, the retention of the Loch Street railway station will also have a positive amenity and property valuation outcome.

Financial and Staff Implications

Planning Context prepared an initial draft for the then proposed LDP as a cost of $68,500. At the instruction of the WAPC, the conversion of the draft LDP to a SP, together with Engineering and traffic studies has cost the Town a further $40,300 to date. Final engineering studies and drafting for conclusion of the report to take into account modifications resulting from this report will require a further $5,000 (approx.) the total cost of this project has therefore been in the order of $113,800.

The Loch Street Station Precinct SP will provide a strategic direction for Council to consider amendments to TPS3 together with LP Policies (new and reviewed) to guide development through DGs and LDPs for specific development sites. While the detailed amendment and associated LDP and LP Policies, together with consideration of development applications which may result will require considerable staff resourcing, larger development applications will ultimately be determined by the Metropolitan West Joint Development Assessment Panel (JDAP) on recommendation from and behalf of Council.

Once land has been developed, the final yield will assist Council's rates revenue and the development of community facilities for the betterment of all residents in the Town and the surrounding localities. These funds will provide the capital for the Town to undertake any road widening, intersection modifications and place making activities at the Ashton Avenue Local Centre shopping strip and the Precinct as a whole.

Policy and Statutory Implications

Parts 4 of Schedule 2 in the LPS Regs identify procedures for the preparation and adoption of SPs.

A SP may be prepared if the WAPC considers it is required for the purposes of orderly and proper planning and requires final approval from the WAPC. A SP is required to set out the key attributes and constraints of an area (including topographic features), the planning context for the area, major land uses and zonings/reserves proposed,

estimates of the future number of lots in the area, population impacts coordination of transport and infrastructure services and staging of development.

Following WAPC approval of the SP, the Town is able to amend its current Town Planning Scheme under section 75 of the *Planning and Development Act 2005*. Scheme amendments are required to be undertaken in accordance with the LPS Regs. The LPS Regs replace the previous *Town Planning Regulations 1967*.

A Local Planning Policy must be adopted in accordance with Part 2 of Schedule 2 of the LPS Regs, which includes provisions that override Council's previous requirements under TPS3 cl.82.

An LDP must be adopted in accordance with Part 6 of Schedule 2 of the LPS Regs, and also in accordance with any provisions contained in TPS3 and not covered by the LPS Regs.

Urgency

The WAPC has deferred consideration of the Department of Communities application to allow the Town to prepare and advertise the Draft SP in accordance the LPS Regs. The allocated timeline for the preparation and advertising of the Draft SP was tight and an unexpected financial burden on the Town. The WAPC granted extensions to the consideration period for submissions to allow for the traffic impacts of the Draft SP to be fully studied. Accordingly, Council is now required to make a recommendation on the progression of the SP at this Council meeting.

Conclusion

In consideration of the objections raised, particularly, with regard to existing and future traffic congestion, traffic modelling for 2031 identifies that the existing road network (including improvements currently being undertaken) will need to be augmented to achieve a reasonable level of intersection performance at the main intersection of Gugeri Street, Chancellor Street and Ashton Avenue for traffic generated from existing planned growth. With further modifications relating to road widening and provision of additional turning lanes at the intersection, the traffic forecasting predicts an acceptable LOS can accommodate a reduction in density growth under the SP. Other intersections will also require upgrading in terms of construction and road widening requirements – intersections of Ashton Avenue and Alfred Road, Chancellor Street and Loch Street, and Ashton Avenue, Gugeri Street and Chancellor Street.

In many ways this is a consequence of the public's perception of and commitment to the use of alternative modes of transport. The existing public transport system is not fully integrated and sophisticated as in other cities (e.g. Melbourne) and accordingly until the system develops to provide cross-linkages to railway stations, the Precinct is expected to maintain a strong preference for private vehicle transport and hence traffic forecasting will reflect these patterns of transport behaviour. To some degree this is a "chicken and egg" scenario, as integrated public transport requires increased densities to support the development of the public transport network. In addition, as time progresses other forms of transport such as an increased dependence on shared vehicle services and opportunities which relate the autonomous vehicle transport (e.g. cars linking to form car trains) may alter travel habits and the assessment of trip

generation and traffic flow, may in turn deliver an improved LOS and reduce traffic congestion at key intersections.

Whilst acknowledging the scenarios above, until these changes occur it would be inappropriate to recommend progression of the SP in its draft form. Given that the Town is achieving its WAPC density targets with planned increases in density along Stirling Highway and existing consolidation projects, a reduction in density growth throughout the Precinct under the SP is not a critical concern for the Town. In addition the reduced densities recommended in the progression of the SP culminate in reduced heights and resultant improvements in amenity outcomes.
An alternative recommendation for the SP is that be placed on hold until such time as attitudes to modes of travel change generally and traffic forecasting can accurately reflect improvements and an acceptable levels of service for the Ashton Avenue, Gugeri Street and Chancellor Street intersection.

Another option would be for the Town to discuss the progression of the SP with the WAPC and RAS in consideration of the RAS proposals for a Management Plan for the Showgrounds. It is clear from the traffic studies that any additional development of the Showgrounds along the Ashton Avenue frontage (whether under the proposed Management Plan or alternative arrangements) will create additional pressure on the Ashton Avenue, Gugeri Street and Chancellor Street intersection and cause total failure of the road network. Given this and that the WAPC is the approval authority for both the SP and the RAS Management Plan, opportunity may exist for these plans to be integrated and for other options to be developed to improve north-south linkages through the area (e.g. tunnelling of the railway, widening and realigning/construction of a roundabout extending over the railway line at the Ashton Avenue bridge, or construction of a crossing between Loch Street and Brockway Road). All these options involve works well beyond the financial capacity of the Town (but possibly within the scope of a redevelopment plan for the Showgrounds), and also beyond the scope of the SP. These matters will need to be considered by the WAPC in determination of both the SP and proposals for the RAS Management Plan.

At this point of time however, it is appropriate to recommend changes to the SP to address the concerns raised with regard to traffic congestion, density, height and resultant amenity impacts as detailed in this report. Accordingly it is also appropriate for Council to reaffirm its objection to the proposed Department of Communities development at the intersection of Ashton Avenue and Mofflin Avenue as the proposed development is inconsistent with the recommended modifications to the SP.

Voting Requirements

Simple majority decision of Council required.

Officer Recommendation

Moved Cr Mews, seconded Cr Haynes

THAT Council:

a) Recommend that the Western Australian Planning Commission approve the Loch Street Station Precinct Structure Plan with modifications detailed below and consistent with the revised Structure Plan Map and Building Heights Plan to reduce the impact of future development on key intersections within the Precinct as follows:

1. **Removing R80 in Sub-precincts 5 – Showgrounds and 6 – Ashton Triangle.**
2. **Removing all commercial uses from Sub-precinct 5 – Showgrounds.**
3. **Reducing density in Sub-precincts 4 – Ashton Avenue East and 8 – College Road from R50 to ~~R30~~R40.**
4. **Reducing density in Sub-precincts 3 – Ashton Avenue Commercial and 7 – Gugeri Street from R80 to R60 (other than the corner of Loch Street and Gugeri Street and the adjoining R80 Special Zone site).**
5. **Reducing the building heights proposed for Sub-precinct 3 – Ashton Avenue Commercial from four storeys to three storeys.**
6. **Reducing the building heights proposed for Sub-precinct 4 – Ashton Avenue East from four storeys to two storeys.**
7. **Removing the building heights proposed for Sub-precinct 5 – Showgrounds entirely.**
8. **Removing the building heights proposed for Sub-precinct 6 – Ashton Triangle entirely.**
9. **Reducing the building heights proposed for Sub-precinct 7 – Gugeri Street at the corner of Gugeri Street Chancellor Street from four storeys to three storeys.**
10. **Modification to the proposed Mofflin Avenue Park Public Open Space area to retain the access to the adjoining property at 3 Stubbs Terrace.**
11. **Retaining the current Town Planning Scheme No. 3 designation of Public Open Space on the Royal Agricultural Society land in Sub-precinct 6 – Ashton Triangle.**

12. Include Road Widening Plans for the intersections of Ashton Avenue and Alfred Road, Chancellor Street and Loch Street, and Ashton Avenue, Gugeri Street and Chancellor Street.

13. Include the Loch Street Structure Plan Precinct Traffic Assessment - GTA Consultants ~~13~~20/02/18 in Appendix 2 and references to this Traffic Assessment in the Loch Street Station Precinct Structure Plan where required.

14. Include any consequential changes to the Structure Plan reflecting 1-13 above.

b) As an alternative to the above, the Western Australian Planning Commission may wish to defer finalisation of the Loch Street Station Precinct Structure Plan until such time as traffic modelling for the Precinct can take into account improved patronage levels of public transport, alternative modes of transport, or major intersection upgrades to improve accessibility across the railway line and deliver acceptable levels of service to the key intersections within the Precinct. Further an opportunity may exist for the Western Australian Planning Commission to liaise with the Royal Agricultural Society of WA to determine whether development options for the Claremont Showgrounds have the capacity to facilitate improvements to the road network to address systemic failures in traffic movement within the Town of Claremont.

c) Council advise those who made submissions on the Draft Loch Street Station Precinct Structure Plan of the above and of the responses provided to each submission in the Submission Schedule.

d) Council advise property owners of land subject to potential road widening at the intersections of Ashton Avenue and Alfred Road, Ashton Avenue, Gugeri Street and Chancellor Street, and Chancellor Street and Loch Street of the above and that Council may require road widening from their property in accordance with the *Public Works Act 1902* (for which compensation will be paid) at a future date should the Structure Plan be approved with these road widening requirements.

e) Advise the Western Australian Planning Commission that it remains opposed to the proposed Department of Communities Development at the intersection of Ashton Avenue and Mofflin Avenue and recommend that the development be refused as it is inconsistent with the final Structure Plan supported by Council and will provide an inappropriate precedent for development within the Precinct if approved.

CARRIED(11/18)
(NO DISSENT)

On completion of this Item, the Mayor returned to Item 7 on the Agenda.