Floreat
Precinct Structure Plan



April 2026

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Endorsement

This Precinct Structure Plan is prepared under the provisions of the Town of Cambridge Local Planning Scheme No.1, *Planning and Development (Local Planning Schemes) Regulations 2015* (as amended) and State Planning Policy 7.2–Precinct Design.

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

18 AUGUST 2026

Date

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



an officer of the Commission duly authorised by the Commission pursuant to section 24 of the *Planning and Development Act 2005* for that purpose, in the presence of:

Anne Woodin

Witness

24 AUGUST 2026

Date

24 AUGUST 2036

Date of Expiry

Amendment No.	Summary of Amendment	Amendment Type	Date Approved

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Executive Summary

The Floreat Forum Precinct holds a unique place in the identity and day to day life of Floreat and surrounding neighbourhoods. Developed as Perth's first internalised mall in the early 1960s, the Forum represented the transition and growth of Perth as a modern city.

Today, the Forum still holds a special place within the community.

Strategically located between the river and the sea, surrounded by the lush Garden Suburb character of Floreat and well connected via east-west movement networks, the site also offers unrivalled amenity that can be utilised to help reposition the precinct for renewal.

This potential is underlined by the Town of Cambridge's aspirations within the endorsed Local Planning Strategy, which identifies the Forum site and the surrounding 'residential frame' as a key precinct for medium-high density mixed-use redevelopment. This includes the target to deliver 1250 new dwellings to provide housing for changing demographics and population growth, and further expansion of commercial floorspace over time.

This strategy to direct growth within defined activity centres was in direct response to the community's desire to maintain the unique garden suburb setting and character across the wider Floreat area.

This Precinct Structure Plan seeks to unlock this potential. It provides a framework that will allow the Floreat Forum to transition from a mall-based activity centre to a truly mixed-use centre.

It has been developed by a best-in-class multi-disciplinary team, in collaboration with key stakeholders, over a thorough two-year process, driven by the following project vision:

"Floreat Forum Precinct will become the heart of the Floreat community. It will transform into a truly mixed-use precinct, providing new public spaces and connections, a broad range of activated uses and diverse living options supported by commercial, retail and entertainment uses"

Importantly, the PSP also recognises the complexity of redeveloping a functioning retail centre with agreed long-term leases, pushing development to the outer edge of the precinct to allow the ongoing evolution of the centre, whilst delivering the strategic intent of the planning framework.

The PSP is considered to represent a best practice approach to transitioning single function centres to a mixed-use community led activity centre, and it will allow the precinct to continue to evolve and deliver economic, social and community benefits well into the future.

Item	Data	Structure Plan Ref (section no.)
Total area covered by the structure plan	approximately 9.98 hectares	Part 2, Section 2.3
Area of each land use proposed: • Mixed Use • Retail • Residential • Short Stay	Concept plan over Central Core Precinct accommodates approximately: • 221,941sqm Gross total floorspace; • 22,319sqm NLA of commercial floorspace; • 77,426sqm NLA residential floorspace.	Part 3, Section 6
Estimated number of dwellings	Precinct Core 650 – 950 Transition 250 – 300	Part 3, Section 6
Estimated population	1,980 – 2,750 people (based on 2.2 persons per dwelling)	Part 3, Section 6
Estimated commercial floor space	22,000 – 28,000 gross lettable area	Part 3, Section 6



Part 1 - Implementation

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1. Precinct Plan Area

The Floreat Precinct Structure Plan (PSP) applies to the land contained within the inner edge of the line denoting the PSP area boundary on Figure 1, reflecting the Activity Centre boundary within the endorsed Town of Cambridge Local Planning Strategy.

The PSP area is located within the Town of Cambridge and is generally bound by The Boulevard to the north, Hornsey Road to the east, Oceanic Drive to the south and Howtree Place to the west. The Floreat Forum component is the focus of change to accommodate identified residential and commercial growth. The adjoining 'residential frame' allows for the appropriate transition to adjoining lower density suburban context.

The controls apply to Lot 100 (No. 5) Howtree Place, Floreat and Lot 101 (Cambridge Library), The Boulevard, Floreat which is the site of Floreat Forum shopping centre. The PSP also applies to Lots 352 – 355, 357-360, 362 Floreat Avenue, Floreat; Lots 137-139, 289-294 & 347-351 Hornsey Road, Floreat; Lots 136, 363, 365-366 & 367-370 Newry Street, Floreat; and Lot 1-2,140-141 & 4403 Oceanic Drive, Floreat being the precinct frame area.



Figure 1 - Precinct Plan Boundary

2. Objectives

This PSP is guided by the following core objectives:



Create connections and destinations

Enhance existing open space within the precinct and deliver new publicly accessible spaces and connections to improve public amenity, which link to adjacent neighbourhood and district parklands.



Activate streets and public spaces

Encourage diversification of land uses to support the precinct, enhance walkability and legibility and activate ground floor edges on key external streets, including the consolidation of service areas and access points, pedestrian walkways through the site and new public plazas.



Enhance greenery

Protect existing trees, create new public accessible spaces collocated with deep soil and provide generous landscaping of surrounding streets, local parks and new communal private space.



Deliver density well

Facilitate development of high amenity, medium-high density residential dwellings to achieve the targets outlined within the Town of Cambridge Local Planning Strategy, whilst providing a sensible transition to surrounding residential land uses.



Maintain public access

Allow for the continued operation of retail and service businesses as primary centre activities while progressively implementing redevelopment and improvements.

3. Operation

The PSP has been prepared in accordance with:

A) The WAPC's State Planning Policy 4.2 (Activity Centres for Perth & Peel) which identifies the precinct area as a District Centre, and outlines the requirement for the preparation of an Activity Centre Plan to guide subdivision and development of land within the centre;

B) The WAPC's Planning Manual – Guidance for Structure Plans (August 2023);

C) State Planning Policy 7.2: Precinct Design

The plan is in effect from the date stated on the cover [date decision letter is distributed to the applicant] and for a period of 10 years [or for any other period approved by the WAPC]. Upon adoption, the PSP will act as a due regard document, requiring assessing bodies to give this document regard in respect to subsequent development and subdivision applications within the Precinct area.

4. Staging

The development will be staged in a logical manner consistent with individual landowner aspirations and market conditions.

Within the Centre Core, staging may consider the operation of key retail and commercial uses where this benefits broader precinct development and the community. Staging will ensure ongoing permeability throughout the precinct for pedestrians. Arrangements for the new east-west connection should be secured at the earliest stages of redevelopment.

Floreat PSP Indicative Staging

Stage	Centre Core Development Sites Reference	Public Benefit Delivered	Potential Infrastructure Upgrades
Stage 01	Northern Retail	• D Deliver low speed, pedestrian priority main street connecting Howtree Place to Floreat Avenue. • Deliver Northern Entry Plaza with an approximate area of 1,500sqm. • New retail and outdoor dining amenity. • Improved screening and interface to northern portion of Howtree Place. • North-south pedestrian connection depicted on Figure 3 - Urban Structure and Movement.	• New intersection onto Howtree place to allow access for one-way main street. • Improved streetscape outcome to northern portion of Howtree Place. • New roundabout on Floreat Avenue to facilitate egress.
Stage 02	Building D Building C	• Deliver new public space of approximately 850sqm, providing new deep soil and an entry statement to the precinct from The Boulevard. • Main street connecting Howtree Place and Floreat Avenue (if not delivered in earlier stage).	• Incremental streetscape improvements within the Frame Precinct such as street trees on Newry Street and Hornsey Road. • Potential signalisation of Floreat Avenue / The Boulevard intersection subject to passing traffic movement growth and detailed modelling at Development Application stage.
Stage 03	Building E	• Activation and streetscape improvements to Floreat Avenue • New retail amenity including introduction of additional mini-major and reconfigured basement car parking. • Improved screening and streetscape to southern portion of Howtree Place. • North-south pedestrian connection depicted on Figure 3 – Urban Structure and Movement (if not delivered in earlier stage).	• New roundabout southern portion of Howtree Place. • Improved streetscape to southern portion of Howtree Place.
Stage 04	Building F	• Deliver new southern entry plaza of approximately 480sqm, east-west pedestrian connectivity between Floreat Avenue and Howtree Place and improved interface to southern parkland	• Streetscape enhancements to Floreat Avenue. • Upgrades to southern park interface
Stage 05	Building A Building B Building G	• 10% deep soil area provided for each residential building, communal activated mobility deck and final activation of one-way main street.	• Upgrades to northern portion of Floreat Avenue.

5. Sub-precincts

The Floreat Precinct consists of 3 sub-precincts as identified on Plan 1. Each precinct has the following core objectives:

5.1 Centre Core

The Centre Core precinct should be:

A) The primary activity core for Floreat including the operating Floreat Forum Shopping Centre.

B) An activated place with diverse land uses that bring people together throughout the day and night, including retail, leisure, residential living, commercial office, and build-to-rent.

C) A high amenity place with seamless east-west and north-south connections and publicly accessible spaces.

D) The location for concentrated high-density, landmark residential development acknowledging the need to accommodate the majority of neighbourhood residential growth.

E) Well landscaped with generous shade, green spaces and improved streetscapes.

F) A connected space offering exceptional walkability and accessibility for all modes of transport and service vehicles.

G) Complimentary to an enhanced Floreat Avenue streetscape, adjacent Centre Transition built form, and established ground level variations.

5.2 Centre Transition

The Centre Transition precinct should be:

A) A medium scale, primarily residential area whilst providing ancillary space for cafes, offices and other services.

B) An attractive and high-quality built form area that responds to the Centre Core and enhanced Floreat Avenue streetscapes.

C) A safe space for pedestrians, cyclists and public transport users accessing the Centre Core.

D) Designed to encourage interaction between neighbours and the street.

E) Shady and green throughout to enhance the garden suburb character.

5.3 Residential Transition

The Residential Transition precinct should be:

A) A low-medium scale residential area, which respects its lower density residential context to the east.

B) Attractive and high-quality built form with residential character and scale.

C) Designed to encourage interaction between neighbours and the street.

D) Shady and green throughout to enhance the garden suburb character.

6. Subdivision and Development Requirements

6.1 Subdivision Requirements

A) Within the Centre Core, subdivision of land is to create logical development sites that are generally consistent with the PSP objectives and sub-precinct outcomes.

B) Subdivision should not isolate, fragment or otherwise compromise land arrangement of the proposed access, landscaping and public space outcomes. Subdivision that isolates land identified for access, landscaping or public space will not generally be supported without arrangements for construction, management and ongoing access being in place. Easements or other mechanisms to secure public access may be required as a condition of subdivision approval.

C) At the time of subdivision for development sites within the Centre Core precinct, a public access easement is to be provided allowing for continued public access to accessible plazas, pedestrian access ways, shared spaces and car-parking / mobility infrastructure.

D) Within the Centre Transition Precinct and Residential Transition Precinct, further subdivision of land should only be supported where it facilitates the built form and density objectives of this PSP. Amalgamation of lots to support consolidated, high-quality redevelopment may be considered.

6.2 General Development Requirements

A) Development is to generally accord with the heights, indicative building footprints and locations outlined within Section 6.

B) Development proposals should include provision of key access, landscaping and public spaces identified in this PSP and tree retention and deep soil areas proposed in the associated Landscaping Plan, and generally in accordance with Table 1

C) Development proposals incorporating substantial redevelopment of the existing shopping centre footprint, including residential development proposals outside of Building E, shall be accompanied by:

i. A Landscaping Plan (or Amended Landscaping Plan);

ii. Amended Transport Impact Assessment;

iii. Economic, Retail & Market Assessment

iv. Design strategies to improve Howtree Place and Floreat Avenue interfaces; and

v. Investigation of additional east-west pedestrian connection/s across the Centre Core.

D) Development proposals in the Centre Core may be exempt from B) above provided that:

i. The proposal has no residential component;

ii. The proposal does not increase NLA by more than 500m2; and

iii. If the proposal impacts loading arrangements, parking arrangements, or building facades, design details are provided to improve the interface with Floreat Avenue and/or Howtree Place commensurate with the scale and location of the development and consistent with the PSP objectives.

E) Where this PSP is inconsistent with the Town of Cambridge's Local Planning Scheme, the Scheme shall prevail.

F) Where this PSP is inconsistent with the Residential Design Codes of Western Australia, Local Planning Policy, Master Plan or Design Guidelines, this PSP shall prevail.

G) In conformity with Clause 1.2.2 and Clause 1.2.3 of the Residential Design Codes Volume 2 – Apartments (R-Codes, Vol. 2), this PSP contains provisions that amend or replace:

- Acceptable Outcomes set out in Part 2 of the R-Codes Volume 2; and
- Acceptable Outcomes set out in Part 4 of the R-Codes Volume 2.

H) The provisions provided within this PSP detail specific Acceptable Outcomes of the R-Codes, Vol.2 that have been amended or replaced by this PSP. Refer to Section 6 for the summary of amendments and/or replacements. For the remaining elements which are not addressed by this PSP, Vol.2 of the R-Codes shall remain applicable.

I) Variations to the Development Controls of this PSP may be approved through a Development Application, provided that the subject development achieves the objectives of this PSP and the relevant objectives and principles of Vol.2 (as applicable).

6.3 Urban Ecology and Public Realm

6.3.1 Objectives

A) Landscaping, including deep soil areas and tree canopy, contributes to the leafy character of Floreat and enhance the overall amenity consistent with the current and future character of the locality.

B) Site planning maximises retention of existing healthy trees and protects the viability of adjacent trees.

C) All open spaces within privately owned land shall incorporate high quality landscaping which responds to the architecture of the building and the landscaping of the adjacent public realm.

D) Development will maximise physical and visual interaction between buildings and pedestrians at the street level and above.

E) Sustainable initiatives will be integrated into the design, construction and management of new buildings and open spaces to minimise the environmental impact of new development.

F) Buildings will address and activate the street, pedestrian access ways and open space contributing to a sense of place and the creation of a vibrant, diverse, inviting and safe urban environment.

G) Services / servicing required for the function of the retail centre and new building are designed and located in a manner that ensures they meet changing needs over time, do not negatively impact on the architectural design of the building or the amenity of the subject area by being fully integrated into the design and screened from public view (where possible).

6.3.2 Acceptable Outcomes

A) General

- Create new publicly accessible spaces, private open spaces and activated frontages generally in accordance with Figure 2.

B) Southern Public Square

- Create a publicly accessible space designed as a key entry point into the shopping precinct and connection point to the adjacent residential frame. The space will be a minimum site area of 500sqm, be a multi-purpose space co-located with deep soil and be activated by surrounding ground floor land uses;

C) Northern Public Square

- Create a publicly accessible space designed as the primary new public square for the centre core. The space will be a minimum site area of 3,500sqm (including alfresco, lawn, shared street and terrace), be designed as civic area offering flexible event space, a main entrance to the shopping mall, and provide seamless connections through to the Boulevard and along the new shared main street zone.

D). Active Frontages

- Generally active frontages will have nil-setbacks to the public realm and continuous or significant glazing, maximising the physical and visual connection between buildings and pedestrians at the street level. Operable windows and al-fresco dining and other internal uses will spill onto the street to activate the public realm. Shops, cafes, restaurants or other social uses are preferred at the ground level, with high density residential or office above the street level.

E) Urban residential frontages

- Will provide for a range of residential and commercial land uses at appropriate setbacks designed to maintain physical and visual connection between buildings and pedestrians at the street level.

F) Residential transition frontages

- Will provide for residential land uses consistent with the controls relevant to SPP 7.3 Vol.2. Residential Transition Frontages provide a residential character interface to the street and public realm, to provide a sensitive built form transition between the Centre Core and Centre Transition precincts and adjacent low-density residential development.

G) Screened service frontages

- The location of service areas are essential to the ongoing function and viability of the retail asset. Attractive screening and/or landscaping will be provided to servicing areas to maintain public amenity, enhance streetscape quality and separate pedestrian movement from servicing areas.

H) Deep soil

- Deep soil areas in accordance with SPP 7.3 should generally be provided for all major residential development sites.

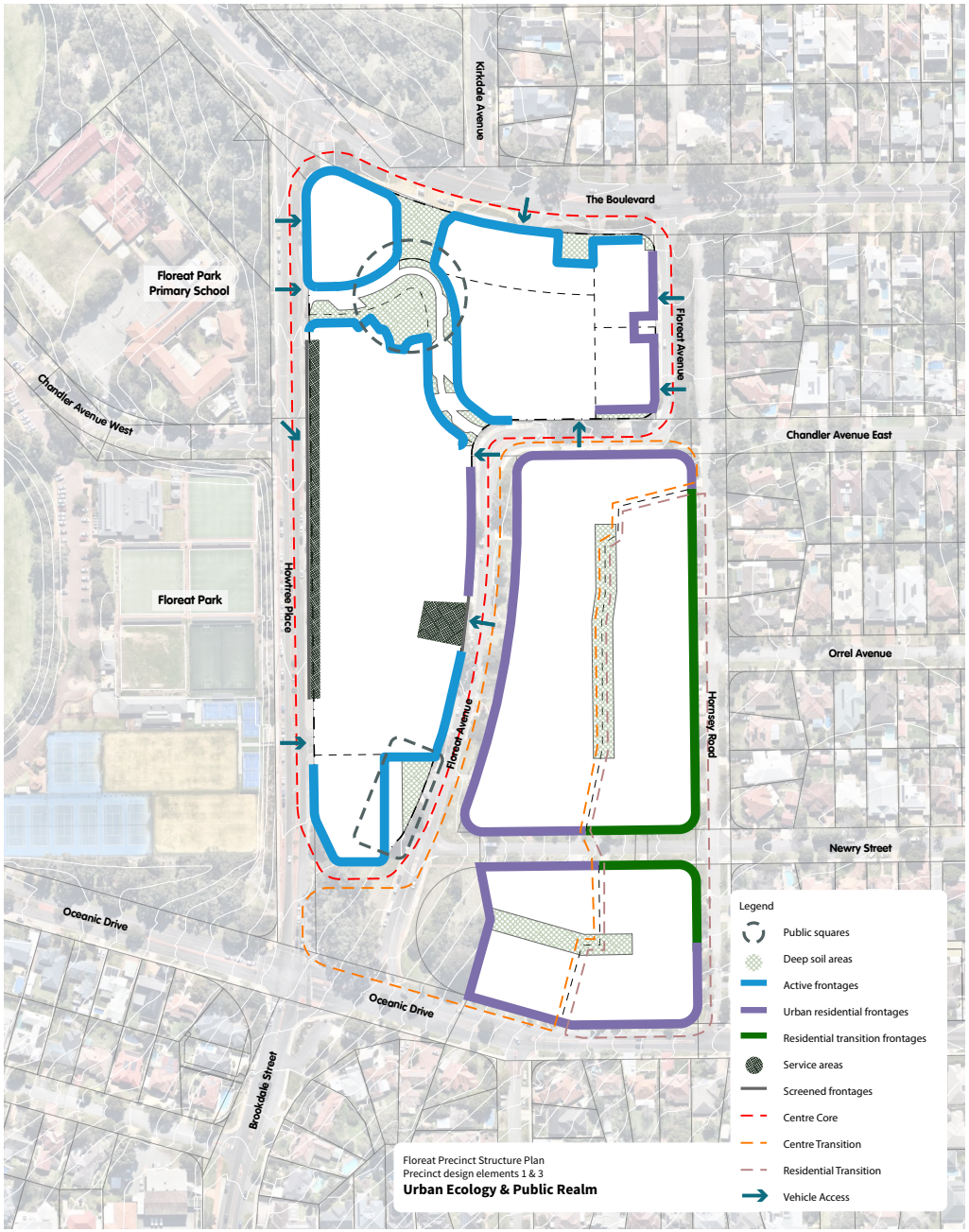

Figure 2 - Urban Ecology and Public Realm

6.4 Urban Structure and Movement

6.4.1 Objectives

- Pedestrian amenity will be prioritised throughout the precinct, with improvements in overall east west and north south connectivity, streetscape design and activation.
- Cycle infrastructure, bicycle parking and end of trip facilities will be integrated into new development and the public realm, in areas that are easily accessible and convenient.
- Public Transport infrastructure and connectivity should be improved over time, recognizing the increasing residential density and population of the precinct, in partnership with State Government agencies.
- New retail development / redevelopment of the retail centre will seek to reduce car parking through reciprocal rates, whilst ensuring provision of sufficient parking to accommodate the anticipated requirements.
- The design, location and number of car parking bays and vehicle access points will minimise any negative impact on the quality of the architectural design, amenity and street outcome.

6.4.2 Acceptable Outcomes

A) General

- Deliver the movement network and urban structure elements generally in accordance with Figure 3.

B) Shared Street

- Provide for a pedestrian-priority, urban street connecting Floreat Avenue to Howtree Place contained within private land ownership. The street will provide for pedestrian and bicycle movement in both directions while vehicle movement will be permitted in one direction (from Howtree Place to Floreat Avenue). Flexible on street parking areas are to be provided within the reserve to support adjacent activated uses.

C) Pedestrian access way (south)

- Provide for east-west pedestrian connectivity that integrates with the Southern Public Square and facilitates movement from Floreat Avenue to Howtree Place and beyond to the community facilities to the west.

D) Car-Parking

- Commercial parking is to be provided at a minimum reciprocal rate of 3-4 bays per 100sqm NLA.
- Car parking quantities for permanent residential land uses are to be provided in accordance with the ratios and maximums set out in R-Codes Vol 2.
- Car parking is to be generally provided within basement structure, above ground level, or appropriately sleeved with activated uses that provide a streetscape interface consistent with the PSP objectives.

E) Vehicle access points

- Vehicle access points are to be generally provided in accordance with the locations shown on Figure 3. The access points should be designed to minimise impact on the public realm and pedestrian amenity and be positioned away from intersections with clear sightlines.

F) Neighbourhood connector (Floreat Avenue)

- Neighbourhood Connector (Floreat Avenue) is encouraged to be upgraded as a high amenity connection and entry point to the Precinct. The design should include generous shared paths, on street car parking and street tree planting and one lane of traffic in each direction.

G) Urban Boulevard (Howtree Place)

- Urban Boulevard (Howtree Place) is encouraged to be upgraded as a high amenity street that balances the need for pedestrian connectivity with retail site servicing requirements. The design should include improved landscaping, design features to facilitate safe pedestrian crossings, a southern roundabout to slow traffic, generous shared paths, on-street car-parking and one lane of traffic in each direction.

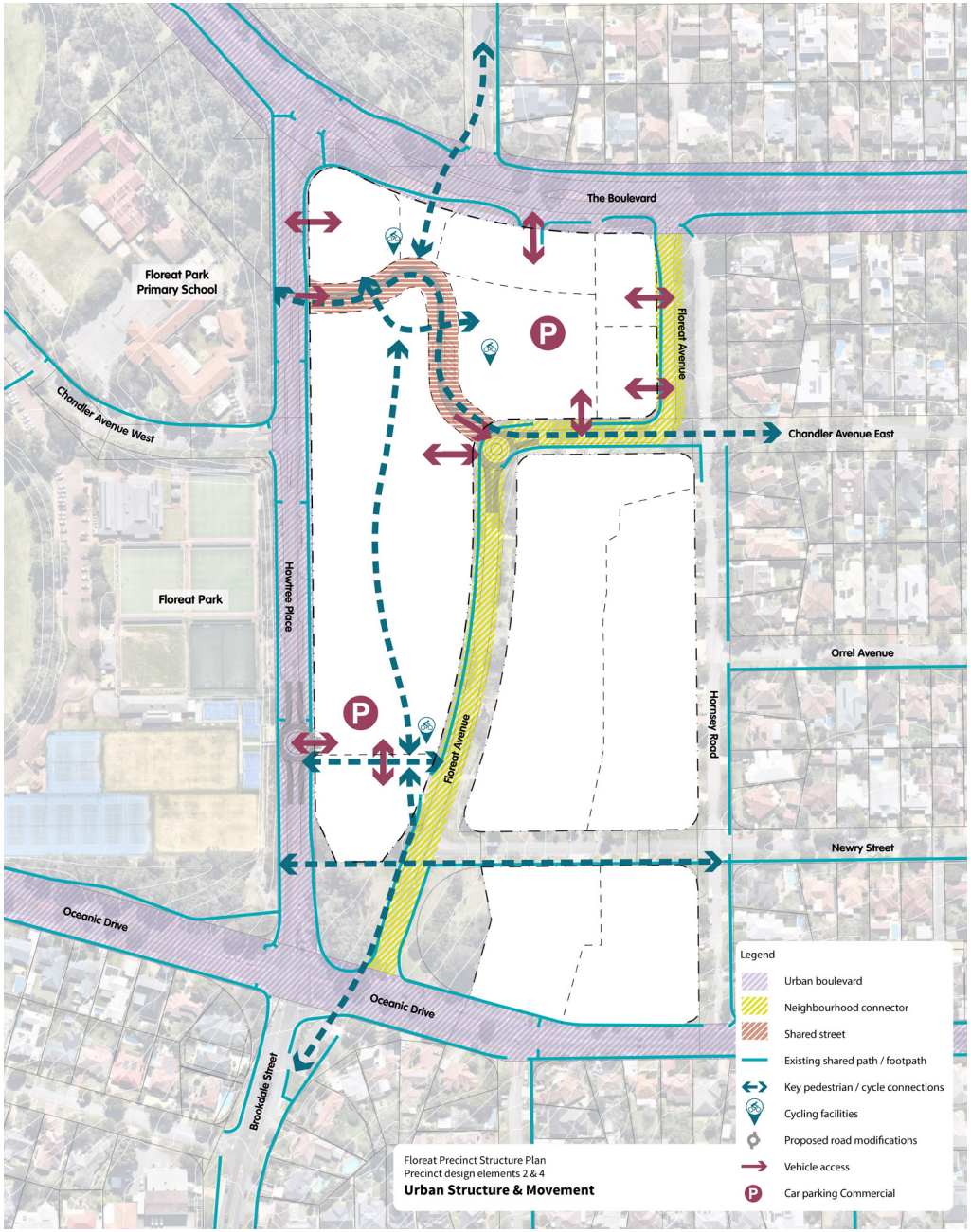

Figure 3 - Urban Structure and Movement

6.5 Land Use and Built Form

6.5.1 Objectives

A) New residential development provides high quality, medium-high density housing choice to the local community and delivers on the residential dwelling target identified in the endorsed Town of Cambridge Local Planning Strategy.

B) Podiums are to provide a human scale element and support activation of adjoining streets and public spaces.

C) Tower elements should maximise outlook, sunlight and cross ventilation and minimise overshadowing of residential properties and key public spaces.

D) Landmark buildings should be positioned on the north-west and south-west development sites of the Centre Core Precinct and be designed to make a lasting contribution to the streetscape, public realm and architectural quality of the area.

E) Buildings will reflect local character through the integration of meaningful interpretation that utilises materials and landscaping in a sensitive manner. A sensitive transition to adjoining low scale residential areas should be provided.

F) Buildings should provide a contemporary architectural response with active edges at ground level and an articulated facade above ground level.

G) High quality materials and finishes will be incorporated into building and landscape designs, contributing to a high standard of design and to the overall place quality of Floreat.

H) Buildings in the Centre Transition sub-precinct shall contribute to the enhanced Floreat Avenue streetscape and provide an appropriate transition from the Centre Core to the "garden suburb" qualities of development to the east.

I) Buildings in the Residential Transition shall complement the established "garden suburb" character of existing development to the east while providing for a more intense, transitional residential development format



Figure 4 - Land Use and Built Form

6.5.2 Acceptable Outcomes

Centre Core (Floreat Forum)

Element	Control	
Preferred Land Uses	**Ground Floor**	Restaurant/café, Shop, Fast Food Outlet, Market, Amusement Parlour, Office, Bulky Goods Showroom, Consulting Rooms, Medical Centre, Recreation - Private, Child Care Premises
	Above Ground Floor	Multiple Dwellings, Office, Tourist and Visitor Accommodation, Cinema/theatre

The following provisions are variations to the Acceptable Outcomes of Parts 2 and 3 of the Residential Design Codes Volume 2, Apartments.	
Plot Ratio	Plot ratio is not applicable to any development
Building Height	**Podium:** Minimum 2 storeys **Upper levels:** Maximum 8 storeys above ground level
Street Setbacks	**Podium:** Nil setback permitted to all boundaries **Upper levels:** Nil Setback permitted to Floreat Avenue. Nil setback permitted to all other boundaries, subject to Building Separation provision.
Building Separation	Minimum tower separation of 12m
Vehicle and service access	Personal and service vehicle access should be separated wherever possible and located generally in accordance with Figure 5
Facade Design	All facades to the East-West connection to provide weather protection for pedestrians, and to Floreat Avenue as appropriate

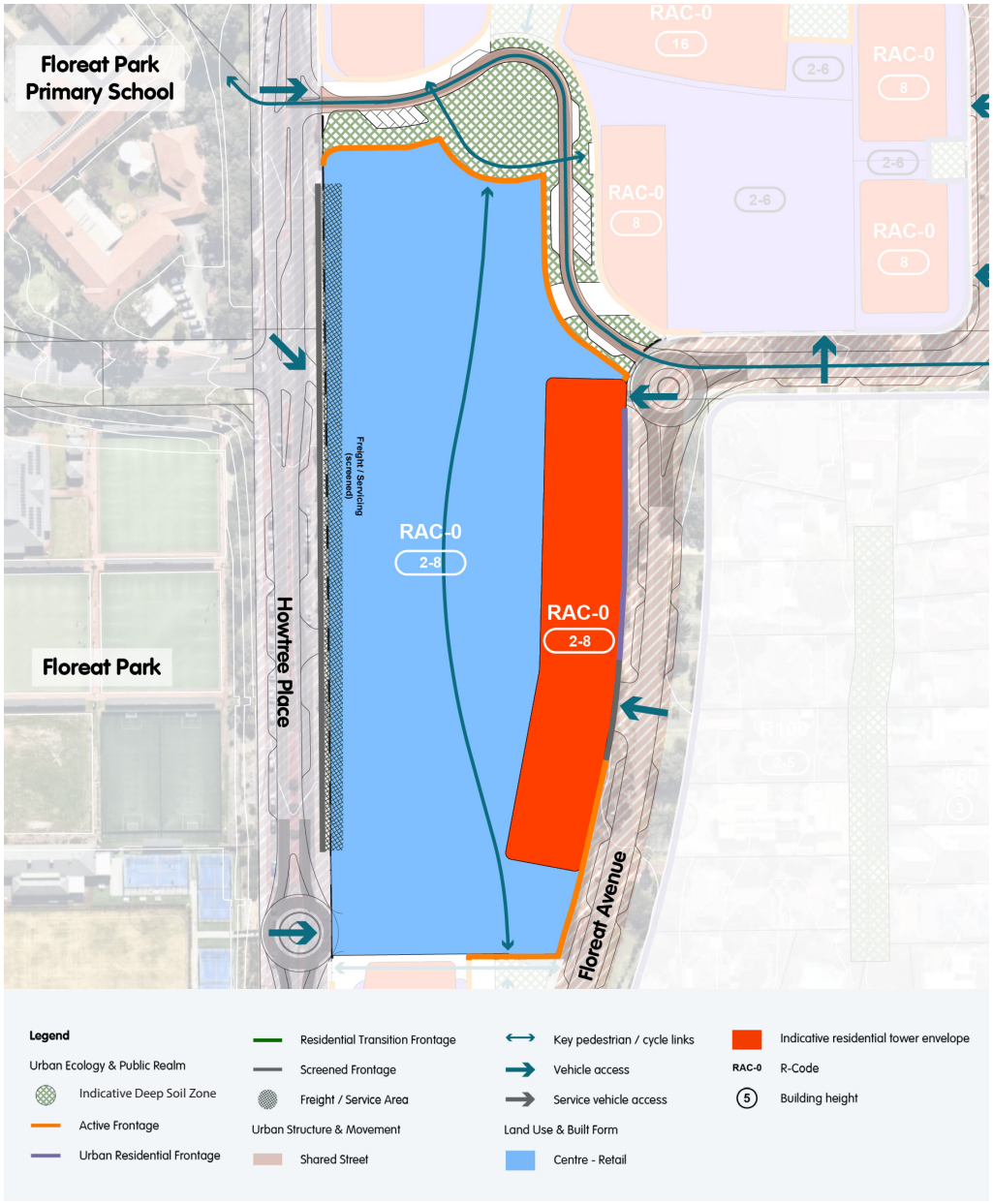

Figure 5 - Centre Core (Floreat Forum)

Development Site A

Element	Control	
Preferred Land Uses	**Ground Floor**	Restaurant/café, Shop, Fast Food Outlet, Market, Amusement Parlour, Office
	Above Ground Floor	Multiple Dwelling, Office

The following provisions are variations to the Acceptable Outcomes of Parts 2 and 3 of the Residential Design Codes Volume 2, Apartments.

Plot Ratio	Plot ratio is not applicable to any development
Building Height	**Podium**: Minimum 2 storey and maximum 6 storey height range. **Tower:** Maximum 20 storeys above ground level.
Street Setbacks	**Podium:** Nil setback permitted to all boundaries **Tower:**: Minimum 3m setback to The Boulevard and Howtree Place. Nil setback permitted to Shared Street
Vehicle and service access	Personal and service vehicle access should be separated wherever possible and located generally in accordance with Figure 6
Facade Design	All facades to the East-West connection to provide weather protection for pedestrians, and to Floreat Avenue as appropriate

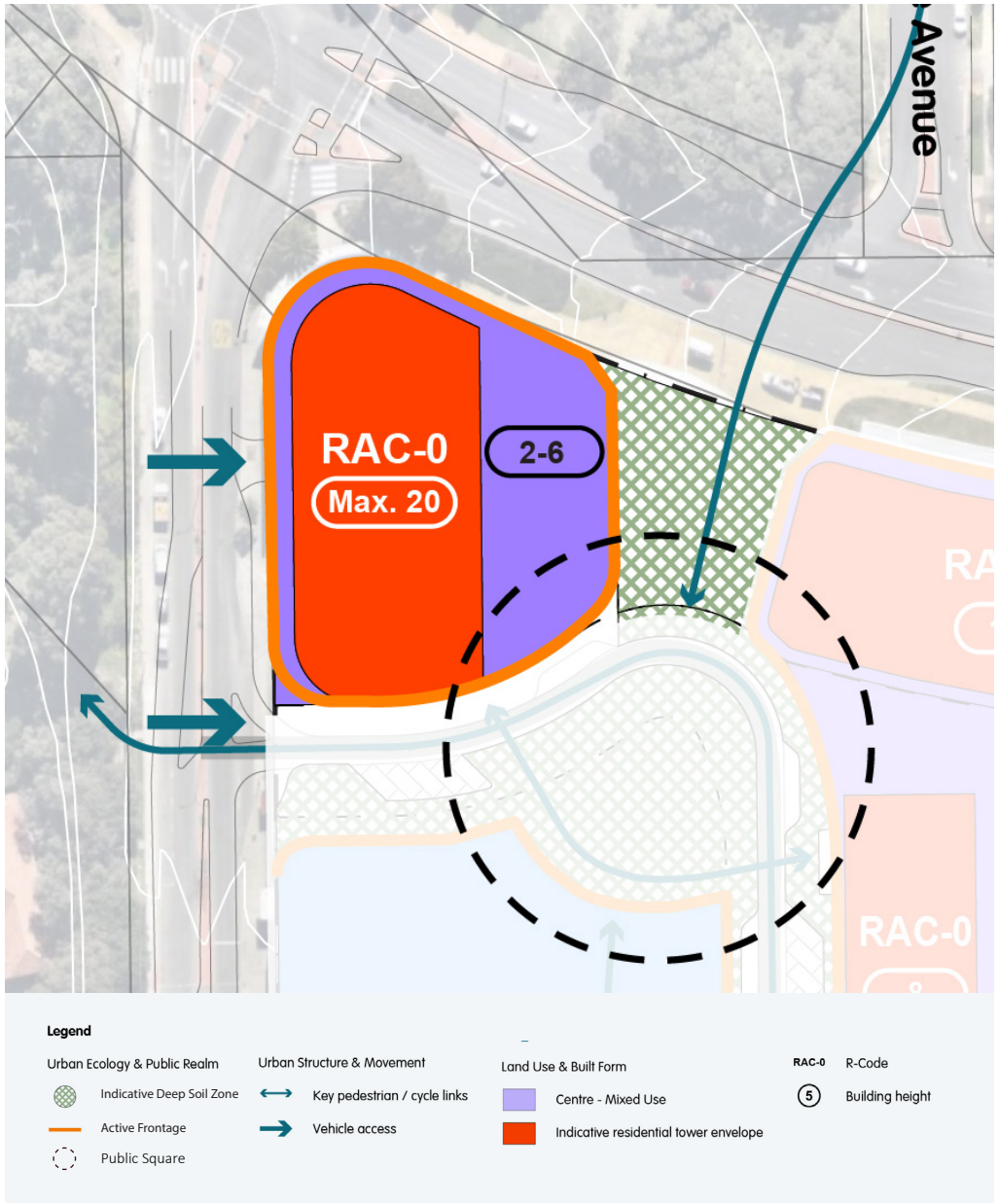

Figure 6 - Development Site A Controls

Development Site B

Element	Control	
Preferred Land Uses	**Ground Floor**	Restaurant/café, Shop, Fast Food Outlet, Market, Amusement Parlour, Office
	Above Ground Floor	Multiple Dwelling, Office
The following provisions are variations to the Acceptable Outcomes of Parts 2 and 3 of the Residential Design Codes Volume 2, Apartments.		
Plot Ratio	Plot ratio is not applicable to any development	
Building Height	**Podium:** Minimum 2 storey and maximum 6 storey height range. **Tower:** Maximum 18 storeys above ground level	
Street Setbacks	**Podium:** Nil setback permitted to Howtree Place and POS (south) subject to provision of adequate Deep Soil Zone. Setback to Floreat Avenue subject to provision of adequate Deep Soil Zone, and the provision of the public square. **Tower:** Nil setback permitted to Howtree Place and POS (south). Min 3m setback to Floreat Avenue.	
Side & Rear Setbacks	Minimum 7m setback for podium to northern site boundary to allow for through pedestrian link. Tower cantilever permitted.	

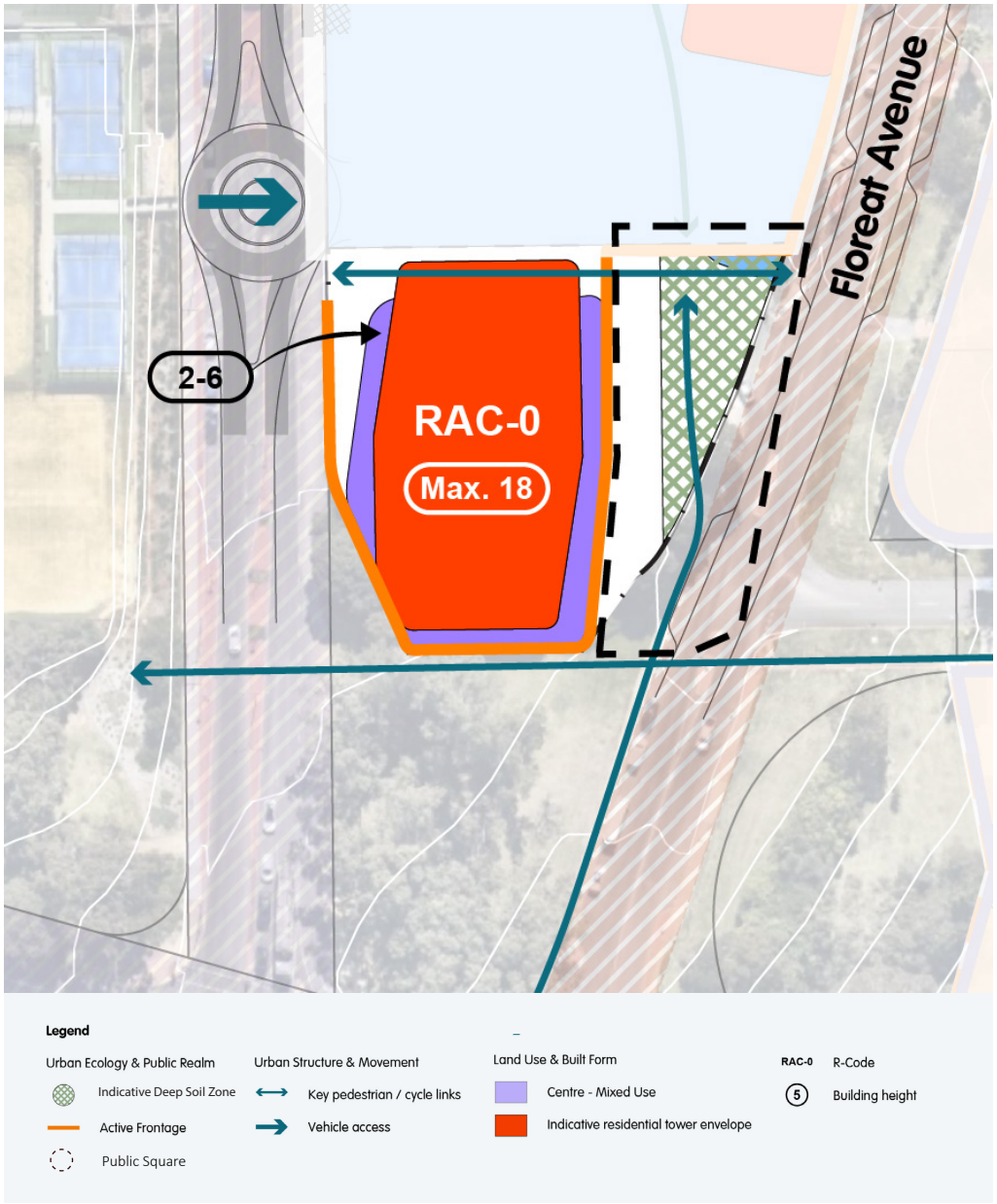

Figure 7 - Development Site B Controls

Development Site C/D

Element	Control	
Preferred Land Uses	**Ground Floor**	Restaurant/café, Shop, Fast Food Outlet, Market, Amusement Parlour, Office
	Above Ground Floor	Multiple Dwelling, Office, Residential Care Facility

The following provisions are variations to the Acceptable Outcomes of Parts 2 and 3 of the Residential Design Codes Volume 2, Apartments.

Plot Ratio	Plot ratio is not applicable to any development
Building Height	**Podium** Minimum 2 storey and maximum 6 storey height range. **Tower:** Maximum 16 storeys above ground level and generally in accordance with Plan 2.
Street Setbacks	**Podium:** Nil setback permitted to The Boulevard, Floreat Avenue and the Shared Street, subject to provision of adequate Deep Soil Zones. **Tower:** Min. 3m setback to The Boulevard. Min 6m setback to Floreat Avenue (east), 4m to Floreat Avenue (south). Nil setback permitted to Shared Street.
Side & Rear Setbacks	No side and rear setbacks apply, subject to provision of adequate Deep Soil Zones and Building Separation.
Facade Design	All facades to the East-West connection to provide weather protection for pedestrians, and to Floreat Avenue as appropriate

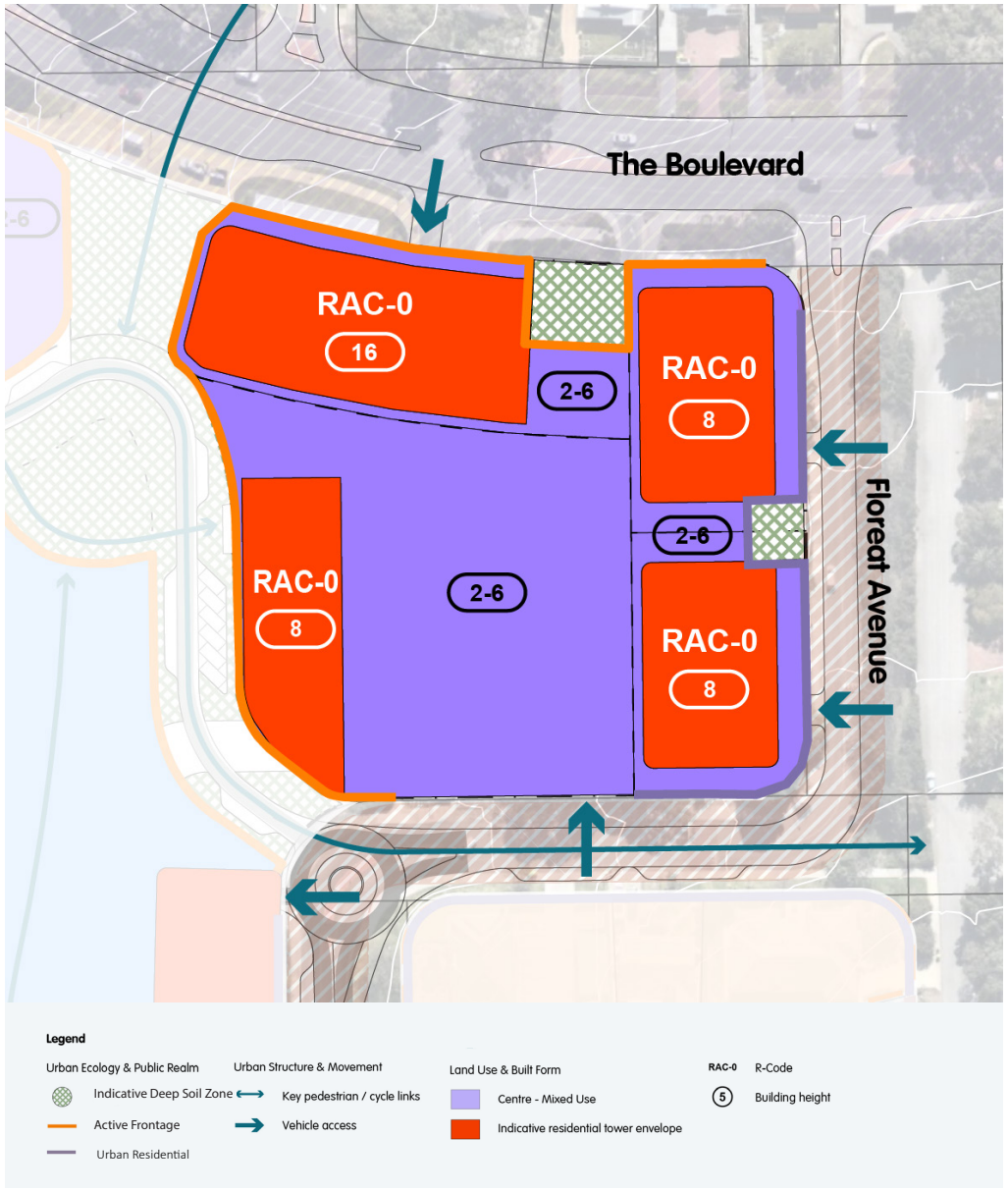

Figure 8 - Development Site C/D Controls

6.5.3 Centre Transition Zone

Overview

The Centre Transition Zone is intended to provide multiple-dwellings in line with the requirements of the R-100 density coding, under the Residential Design Codes Volume 2, Apartments.

Controls

Element	Control	
Preferred Land Uses	**Ground Floor**	Multiple Dwellings, Restaurant/café, Office
	Above Ground Floor	Multiple Dwellings

The following provisions are variations to the Acceptable Outcomes of Parts 2 and 3 of the Residential Design Codes Volume 2, Apartments.	
Building Height	Minimum two storeys and maximum five storeys.
Street Setbacks	Car-parking, including for non-residential uses, is not located within the primary street setback; and where car parking is located at ground level behind the street setback it is designed to integrate with landscaping and the building façade.
Side & Rear Setbacks	**Rear setback:** 6m (providing deep soil provision and tree retention, where appropriate).
Landscaping	**Site Area**: 10% deep soil area **Rear Setback Area**: 60% soft landscaping

6.5.4 Residential Transition Zone

Overview

The Residential Transition Zone is intended to provide multiple-dwellings in line with the requirements of the R-60 density coding, under State Planning Policy 7.3 – Residential Design Codes Volume 2, Apartments.

Controls

Element	Control	
Preferred Land Uses	**Ground Floor**	Multiple Dwellings, Grouped Dwellings
	Above Ground Floor	Multiple Dwellings

The following provisions are variations to the Acceptable Outcomes of Parts 2 and 3 of the Residential Design Codes Volume 2, Apartments.	
Building Height	Maximum 3 storeys
Primary Setback	6m, and 3m behind the main building line for a third storey.
Side & Rear Setbacks	**Rear setback:** 6m
Frontages	**Minimum Frontage:** 12m
Landscaping	**Site Area:** 10% deep soil area **Primary Street Setback Area:** Minimum 50% soft landscaping

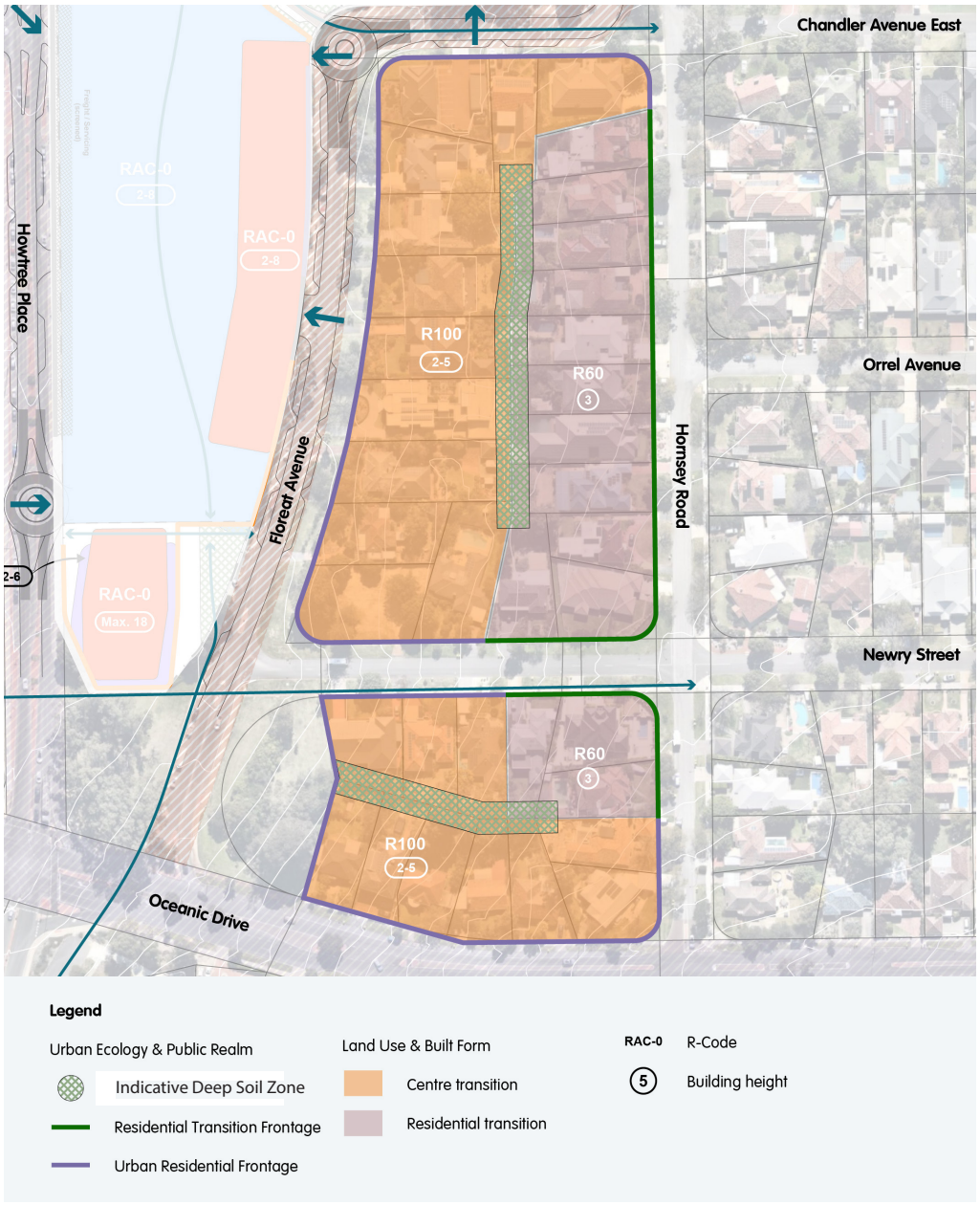

Figure 9 - Centre Transition Zone

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1. Introduction

The Floreat Precinct holds a unique place in the identity and day to day life of Floreat and surrounding neighbourhoods.

Developed as Perth's first internalised mall in the early 1960s, the Forum represented the transition and growth of Perth as a modern city. It was laid out, together with the adjacent open spaces, as a community heart for the Floreat area, and included civic meeting places, pedestrian colonnades and entry plazas.

The Forum has developed uniquely over time to service the local community, with a strong focus on independent retail and fresh food. Subsequent expansions and redevelopments of the centre have however created a precinct that has significant potential to diversify its offering.

Strategically located between the river and the sea, surrounded by the lush Garden Suburb character of Floreat and well connected via east-west movement networks, the site offers unrivalled amenity that can be utilised to help reposition the precinct for renewal.

This potential is underlined by the Town of Cambridge's aspirations within the endorsed Local Planning Strategy, which identifies the Forum site and the surrounding 'residential frame' as a key site of mixed-use redevelopment. This includes the aspiration to deliver 1250 new dwellings to provide housing for changing demographics and population growth, and further expansion over time of commercial floorspace.

This Precinct Structure Plan seeks to unlock this potential. It provides a high-level framework that will allow the Floreat Forum to transition from a mall-based activity centre to a truly mixed-use centre. It aims to deliver better amenity through the delivery of new public spaces, more 'communal uses' that bring the community together and a broader mix of activity drivers, including the potential for residential, build to rent, short stay and office accommodation to creating a diverse and thriving precinct.

Noting the uniqueness of the Floreat area as a Garden Suburb, the PSP also provides a blueprint to deliver greener spaces through the Floreat precinct, integrating the site within its broader context.

The PSP is considered to represent a best practice approach to transitioning single function centres to a mixed-use community led activity centre, and it will allow the precinct to continue to evolve and deliver economic, social and community benefits well into the future.



1.1 Place Context

The broader Floreat Neighbourhood has a unique and defining character that has developed over time.

The social and design qualities that are embedded within this character have been used in the proposed concept plan that supports the PSP, with the intent to help to re-establish Floreat as the centre of the community.



1906

Limekilns estate closed

Quarrying of the area from the mid-1800's to early 1900's. Perth City Council purchased the "Limekilns" Estate in 1917.



1925

The Boulevard

New road was constructed linking the city to the seaside.



1934

Floreat Park Estate

The opening of the boulevard created demand for housing, with the release and marketing of Number 1 estate.



1936

Thousand Acre Park

Set aside and reserved, creating the foundation of the Garden suburb.



1962

British Empire and Commonwealth Games

Undertaken largely on endowment lands, was part of the broader internationalisation and modernist movement of Perth with several prominent architectural buildings.



1965

Floreat Forum

WA's first shopping centre.



Paganin House

Modernist classics situated within the neighbourhood.



Today

Today's Character

A garden suburb with a diverse mixture of California bungalow, modernist and modern housing stock in a leafy green environment.

1.2 Creating A New Social Heart

Much has been written about the future of retail, with the ongoing growth in market share of online shopping, the rise of 'click and collect' and the expansion of strategic regional shopping complexes (local examples include Karrinyup and Carousel).

This raises interesting questions for sub-regional centres such as Floreat, particularly being positioned between highly local centres that provide everyday convenience and regional centres that act as broader destination drivers.

Whilst Floreat Forum will continue to offer the important community role as it currently performs, the competition within retail markets means the site must work harder in the future to reposition itself as an important community meeting place. This includes transitioning away from being solely a retail, drive to centre, to a place that also offers living, working, moving and experience.

In practice, this also includes the diversification of retail experiences such as fresh food markets, essential services, independent retail, major supermarkets, curated entertainment and inventive food and beverage.

Collectively these elements will help to transform the centre to a community and social heart, and this philosophy has been a driving narrative through the preparation of the PSP.





Living
Housing location and choice



Working
Flexible spaces for people to meet and work



Moving
Improving walkability and transport diversity



Experience
Allow the community to lead happy and healthy lives

2. Context Analysis

2.1 City Context

Floreat Forum is uniquely positioned approximately 6km west of the Perth CBD, and 4km from the coast. The precinct is connected to the wider city through key east west connection corridors of The Boulevard and Oceanic Drive/ Cambridge Street, which are both classified as District Distributor A streets. These streets also act to frame the precinct, and distinguish it from its immediate context. It is expected that over time it will perform a more prominent role in linking the site to the wider City.

Floreat is Perth's garden suburb, which is typified through large, single residential lots containing significant landscaping, often with mid-century or post-war California bungalow houses. Building on the garden city theme, Floreat is home to a range of local and district level open space reserves. Notably, as per the Town's Local Planning Strategy, 94.9% of dwellings in Floreat are located within 400m of public open space. Significant regional open space network include Bold Park, the coastal foreshore, Perry Lakes Reserve and Lake Monger while active open space reserves including Wembley Golf Course and Floreat Sporting Precinct further contribute to the leafy green setting.

However, despite the significant amenity, lower residential density impacts the provision of services and public transport infrastructure, particularly to Floreat and City Beach.

As an existing shopping centre, Floreat Forum plays an important retail function in Perth's western suburbs, servicing a catchment that ranges from City Beach to Leederville, and from Woodlands to Swanbourne.

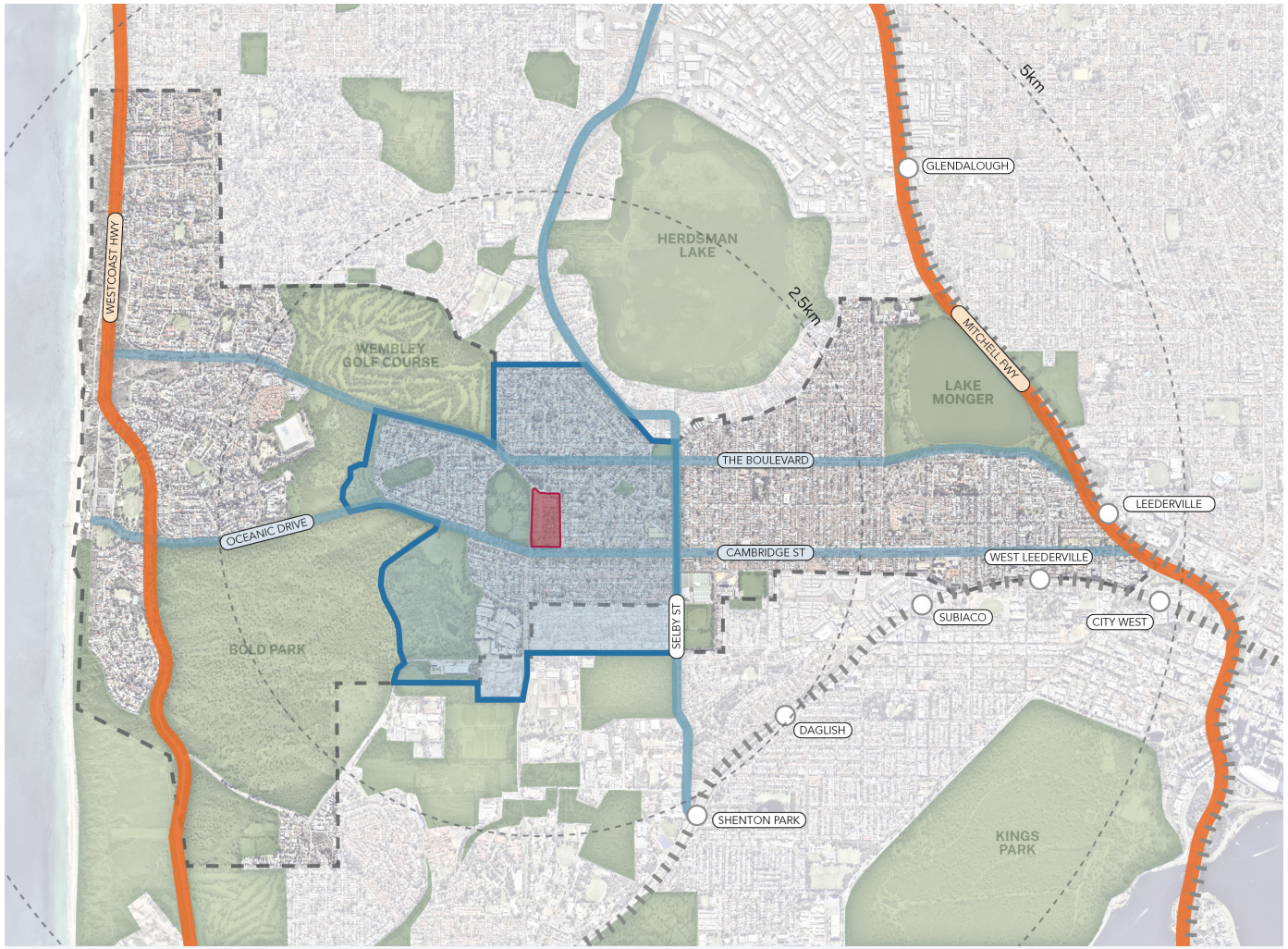


Figure 10 - City Context

2.2 Neighbourhood Context

Within a more immediate context, the Site is surrounded by both local and regional recreation facilities with different functions and character. Floreat Oval and McLean Park provide an immediate access to open space within a 400m walkable catchment. Floreat Forum Primary School is also adjacent to the site.

The location provides the opportunity for significant aspect and views to be leveraged. Views to Bold Park and Perry Lakes Reserve particularly provide a green aspect for future.

The Boulevard and Oceanic Drive, both classified as 'Distributor A' roads Transport and movement corridors separate the site from the surrounding single residential development. Furthermore, Howtree Place provides a clear break between the precinct, and the adjacent public open space and community functions on the west.

Hornsey Road plays a similar role in separating the precinct frame from the surrounding residential development. The treatment of this transition zone is an important consideration of the PSP, to ensure a careful transition from the centre core to the residential character.

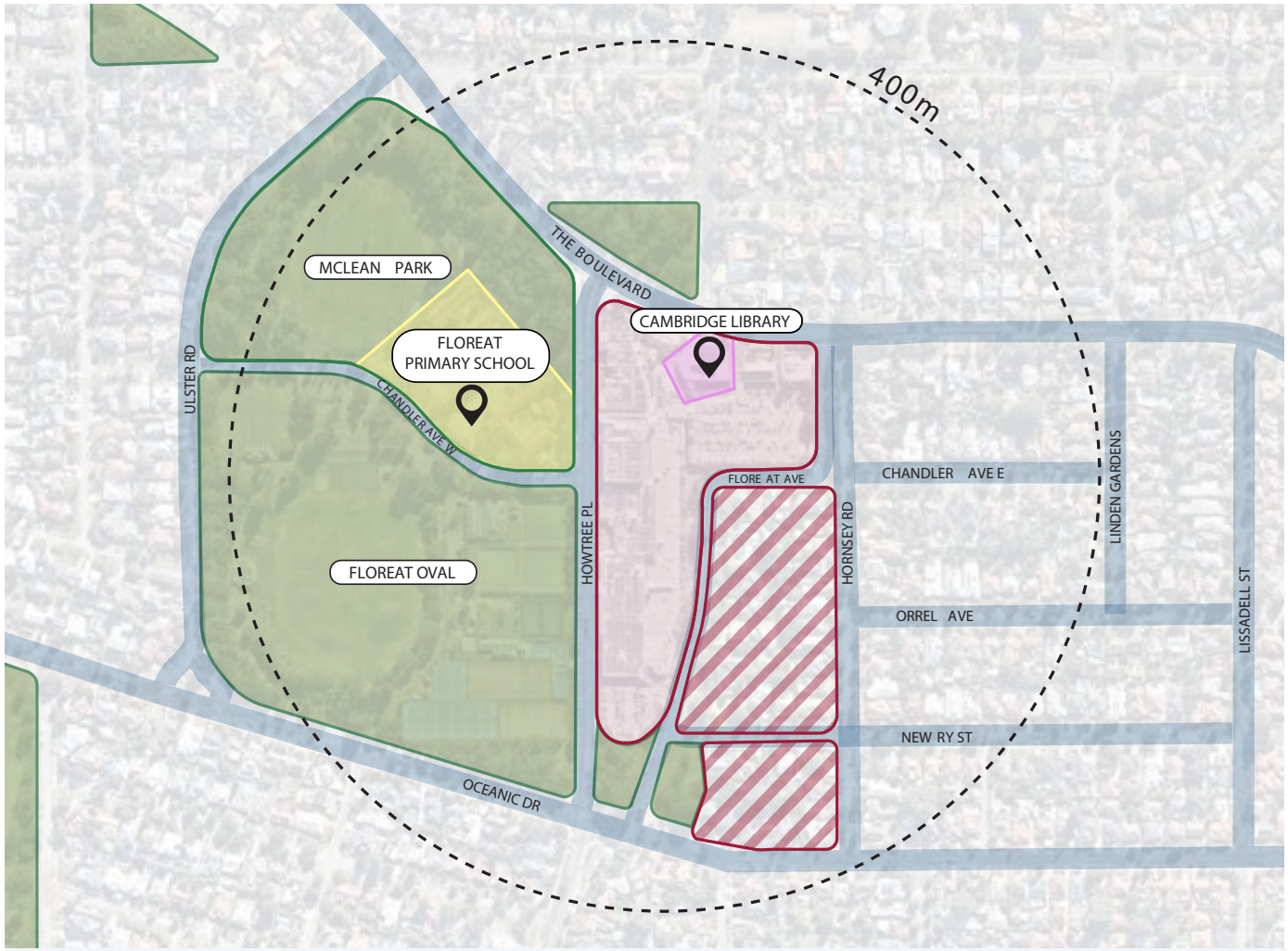


Figure 11 - Neighbourhood Context

2.3 Site Context

Floreat Forum is one of Australia's earliest internal mall-based activity centres that is unique in its mix. It is notable for containing two large supermarket anchors, a large volume of supporting specialty retail and services and the co-location of cafes, restaurants, and food catering services. The centre also includes a Council owned library and other non-retail services.

The centre contains key parking areas in the north and south of the site, with further underground parking under the core of the shopping centre. While the shopping centre is largely internal, the centre has key external community space in the north of the site, with food and beverage tenancies fronting onto the public realm.

Adjacent to the site is an area known as the 'Residential Frame' bounded by Hornsey Road (east), Floreat Avenue (north and east) and Oceanic Drive (south). The area is largely single residential properties with a diverse character, age and condition, as well as a small number of commercial uses such as a Dental Clinic fronting Floreat Avenue.

80+ Speciality Retailers

Medical Services

18,628sqm

Total GLA



2.4 Community Context

An analysis of the socio-economic context of Floreat Forum and the Town of Cambridge has been undertaken to inform the preparation of this PSP. This analysis demonstrates that Floreat generally has higher incomes, lower housing diversity and a higher proportion of families with children. These characteristics are all consistent with the existing character of Floreat as a garden suburb, but do not necessarily cater for groups such as those in their early careers (20's and 30's), and older people.

Notable characteristics include:

Average age and income levels
The average age and income levels are higher than Perth indicating a greater capacity to fund and demand a high-quality retail offer as well as an emerging downsizer market.

Cost of housing
The cost of housing is higher with a level of households that either rent or have a mortgage being relatively lower than Perth. This also indicates a capacity to downsize from detached housing product.

Family composition
The volume of households who are couples with children is relatively high indicating demand for education services and childcare in the municipality.

Notably, the life-stages within Floreat differ to both the Town of Cambridge and Greater Perth. These statistics reflect the family-character of the suburb with a greater representation of school aged children, and older workers and pre-retirees. The inverse of this pattern is an underrepresentation of 'tertiary education and independence' and 'young workforce' groups compared to the Town and Greater Perth.

The housing stock in Floreat is similarly reflective of its design as a garden suburb, displaying a disproportionately higher concentration of large, single residential dwellings compared to the Town of Cambridge, Perth and Western Australia. Notably, there is some growth in high density dwellings, increasing by approximately 200 dwellings between the 2016 and 2021 census years. This growth is shown in developments such as Perry Lakes.

The significant proportion of single residential dwellings, coupled with an aging population with a greater capacity to downsize shows a need to provide greater dwelling diversity to ensure existing residents can age in place, close to existing amenities including shopping, medical and other weekly needs

		Floreat	Town of Cambridge	Perth Metropolitan Area
AGE	Median age	42	41	37
INCOME	Median weekly household income	$3,570	$2,964	$1,815
CHILDREN	Couples with children	48%	53%	46%
DWELLING TYPES	Medium and high-density housing	13.5%	26%	22%
COST OF HOUSING	Households with a mortgage	39.5%	36%	42%
	Median weekly rent	$600	$450	$350
	Households renting	12.6%	21%	27%
ETHNICITY	Non English speaking background	12.6%	19%	24%

	Primary schoolers (5 to 11)	Secondary schoolers (12 to 17)	Older workers and pre-retirees (50 to 59)
Floreat	**10.9%**	**11.3%**	**16.4%**
Town of Cambridge	9.9%	9.4%	14%
Greater Perth	9%	7.4%	12.4%

	Floreat	Cambridge	Perth	WA
Separate house	**89.9%**	73.4%	77.8%	79.7%
Semi-detached house	**2.7%**	11.6%	14.2%	13%
Flat or apartment	**7.5%**	14.8%	7.6%	6.5%

	Floreat	Cambridge	Perth	WA
Studio or 1 bedroom	**0.9%**	6.8%	3.8%	4%
2 bedroom	**9.6%**	15.7%	12.6%	12.6%
3 bedroom	**33.1%**	32%	36.7%	37.5%
4 or more bedroom	**56.1%**	44.9%	45.7%	44.7%

2.5 Governance Context

2.5.1 Perth and Peel @ 3.5 million

In accordance with the Western Australian Planning Commission's Perth and Peel @ 3.5 million framework the Town has a target to plan for the provision of 6,830 additional dwellings by 2050 to support a total Perth metropolitan population of 3.5 million.

A series of urban consolidation and infill precincts have been identified which are intended to accommodate residential development within the Town of Cambridge over the next 20-30 years.

These precincts are identified spatially in Figure 12. Floreat PSP is a critical component of the Town's infill requirements, accounting for 18% of the overall dwelling target.

2.5.2 State Planning Policy 4.2 – Activity Centres for Perth and Peel

Floreat is identified as a District Centre Activity Centre in SPP 4.2 - Activity Centres for Perth and Peel.

District centres have a greater focus on servicing the daily and weekly needs of residents. Their relatively smaller scale and catchment enables them to have a greater local community focus and provide services, facilities and job opportunities that reflect the needs of their catchments. Many district centres also have a specialisation such as tourism or entertainment which serves a wider catchment.

2.5.3 Town of Cambridge Local Planning Strategy

The Town's Local Planning Strategy (the Strategy) sets the vision and strategic planning direction for the Town for the next 10-15 years, and beyond with the goal of having the "best liveable suburbs". The Strategy is guided by a series of eight planning principles that are of importance to the Town and its community. These principles are supported by a series of objectives. Of greatest relevance to Floreat Activity centre are the following themes and objectives:

Housing

- **Housing Growth**: To facilitate growth of residential density in precincts with strong connectivity to local services and facilities.
- **Housing Diversity and Affordability**: To increase the diversity of housing choices throughout the Town to cater for a changing demographic and lifestyle choice.
- **Built Form Response**: To ensure new built form responds to changing needs of the community, and the existing and proposed character within the surrounding area.

Economy and Employment

- **Vibrant Centres**: To support the viability of business activity in strategic centres, knowledge centres and consumer centres.
- **Business Diversity**: To increase the diversity of businesses and services operating throughout the Town to reinforce the resilience of the economy.
- **Business and Employment Growth**: To provide flexibility in land use planning and development to facilitate land use change and mixture that encourages business and employment growth within Activity Centres, Corridors, Neighbourhood and Local Centres.

Community Infrastructure and Facilities

- **Meeting Community Need**: To respond to the changing demographic needs of the Town with community infrastructure designed to meet those needs.
- **Activation of Places**: To encourage activation of places within the Town through integration and delivery of community infrastructure and facilities.

Through a focus on infill development within the key strategic precincts including Floreat Activity Centre, the Town aims to deliver an increased diversity of housing and greater affordability for the existing and future community.

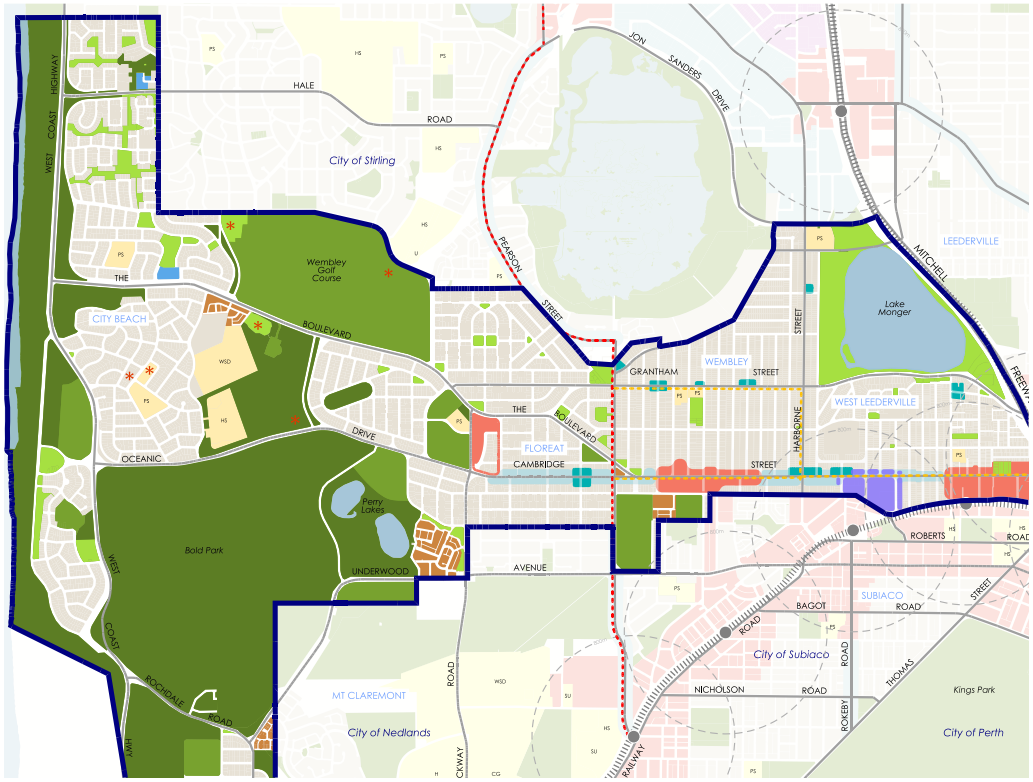
Importantly, the Town expects that Activity Centres such as the Floreat Activity Centre will deliver predominantly apartment-based product either as standalone apartment complexes or as part of mixed use development, with opportunity for townhouse product at the fringes of precincts where they interface with established suburban areas.

Floreat Forum is identified as a key activity centre in the Strategy, and identified as being a key contributor to the Town's infill targets under Perth and Peel @3.5million. The Town's Strategy anticipates that Floreat Activity Centre will provide between 900 and 1,250 additional dwellings by 2050.

The Town's Vision for the Floreat Activity Centre is:

> Floreat Activity Centre will transform into an attractive and vibrant mixed-use precinct with a broad range of residential and commercial/retail uses.
>
> The Floreat Forum Shopping Centre and the Cambridge Library form a key part of the activity centre and will be redeveloped to better interface with the surrounding public streets and open space, accommodating residential development above the commercial/retail area.
>
> Adjacent suburban streets will progressively be redeveloped to provide medium-high density residential between two and five storeys, with density grading down to the existing suburban environment.

The Town also anticipates the introduction of a further 11,000sqm of employment space over time.



LEGEND

- Town Of Cambridge

Urban Consolidation Precincts

- Activity Centres
- Indicative Activity Centre Frame
- Urban Corridor
- Neighbourhood Centres
- Local Centres

Infill Precints

- Suburban Residential Are
- Existing Development Sit
- Potential Future Develop (Subject To Further Inves
- Medical Precinct

- Recreation Space
- Sport Space
- Nature Space
- Public Purpose
- High Priority Public Transport Corridor
- High Frequency Public Transport Corridor
- Distributor Roads
- Railway/Train Station
- 800 Metre Catchment
- Water Bodies

Figure 12 - Town of Cambridge Local Planning Strategy



LEGEND

- Activity Centre Precinct
- Indicative Activity Centre Frame
- Open Space
- School Site
- Existing Bus Stop
- Improvements to public realm required to make precinct more pedestrian friendly
- Important pedestrian linkages which may require improvement
- Key community facility/ school site
- Key local open space area
- Careful consideration of interface required to protect amenity of adjacent suburban areas
- Careful consideration of interface required to create active streets
- Building orientation to take advantage of city/ ocean views

Figure 13 - Floreat Activity Centre - Town of Cambridge Local Planning Strategy

2.5.4 Town of Cambridge Local Planning Scheme

The Town of Cambridge LPS 1 currently assigns a District Centre Zone to the Floreat Activity Centre, with an R12.5 coding for the Residential Frame areas, shown in Figure 14.

The objectives of the District Centre Zoning include the following:

- Provide a community focal point for people, services, employment and leisure that are highly accessible and do not adversely impact on adjoining residential areas.
- Provide for district centres to focus on weekly needs and services for a wider district catchment.
- Provide a broad range of employment opportunities to encourage diversity within the Centre.
- Ensure a mix of commercial and residential development, which provides for activity and accessibility at the street level and supports the provision of public transport and pedestrian links.
- Provide for a wide range of different types of residential accommodation, including high density residential, to meet the diverse needs of the community.

These objectives are considered consistent with the vision and intent of the PSP contained within this document. In addition to the above, major land uses proposed within the PSP are able to be approved under the Zoning Table, allowing development anticipated within this PSP to be considered in more detailed Development Applications.

An exception to this is the residential frame area, which currently has an R-Coding of 12.5. To provide for mixed-use / multiple dwellings in line with the endorse Local Planning Strategy and this PSP, a residential upcoding to R-60 (Residential Transition) and R-100 (Centre Transition) would be required.

Through the preparation of the Town's new Town Planning Scheme No. 3, the Town may wish to consider a rezoning of the area to more clearly align with the Model Provisions. "Centre Zone" is considered the most appropriate zoning, which designates land for future development as a town centre or activity centre and provides a basis for future detailed planning in accordance with the structure planning provisions of the Scheme or the Activity Centres State Planning Policy.

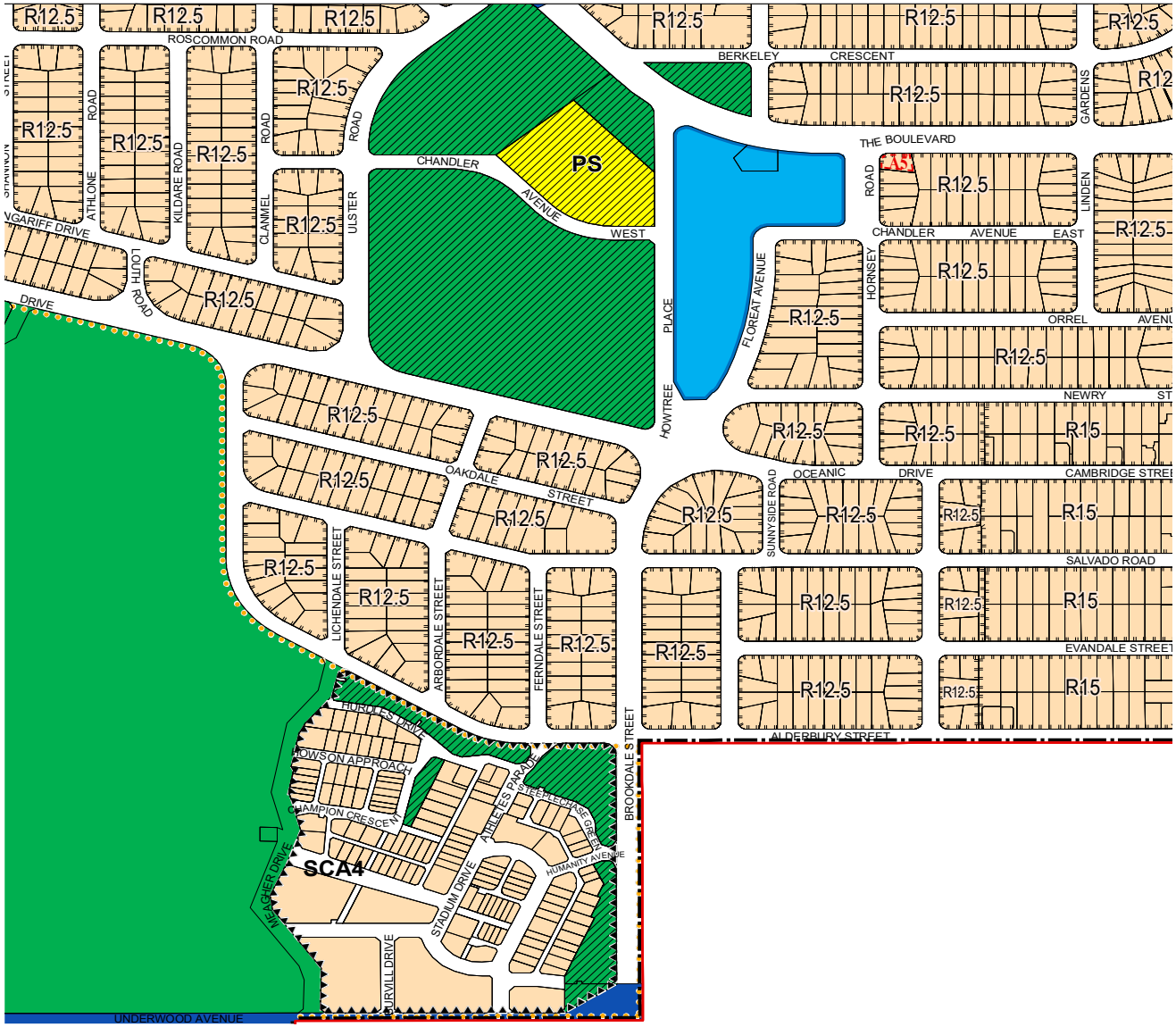


Figure 14 - Existing Town of Cambridge Local Planning Scheme No.1

3. Opportunities and Constraints Analysis

3.1 Environment + Ecological Setting

The Floreat PSP site sits on the Swan Coastal Plan within the Spearwood Dunes geological area. Soils largely consist of the Karrakatta complex, creating an environment where both the Karrakatta and Cottesloe vegetation complex would grow and flourish. The geological, soil and vegetation cluster that would be present on site can be seen within the nearby Bold Park reserve, providing significant landscape aspiration to inform the precinct design.

The precinct area falls from east to west and north to south and has a number of significant 'landmark trees' in and adjacent to the site. Whilst much of the primary site that includes the Floreat Forum is cleared of natural vegetation by virtue of its commercial context, significant existing trees do exist on the edges of the Forum site and within adjacent road reserves. To understand the type and health of these trees, an arboriculture assessment was conducted and integrated with Landscape Design. The report focussed on 33 trees along the eastern boundary of the site.

Generally tree growth has occurred within defined verge or raised bank areas and the report highlighted overall good health of the trees and found them structurally sound. Vegetation also exists within the Residential Frame Area, particularly at the rear of properties, within the road reserve of Floreat Avenue, and within areas of Public Open Space to the south and immediate west.

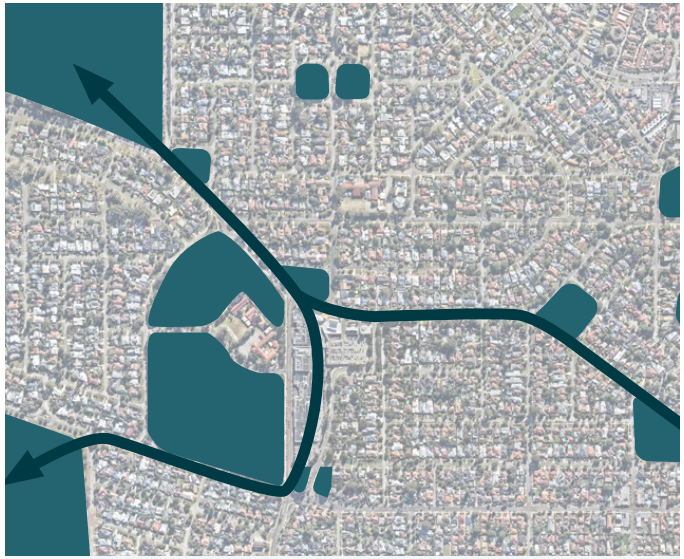
The broader Floreat neighbourhood is defined by significant natural amenity. Within the immediate district context to the Floreat PSP area, significant green spaces and community facilities exist including:

- Mclean Park / Primary School / Floreat Oval / Memorial Park to the immediate west;
- Wembley Gold Complex to the north-west; and
- Perry Lakes Reserve to the south-west.

These significant areas are supported by smaller open spaces and larger road reserves that contain significant mature trees. Collectively, this green amenity provides significant opportunities to connect into, providing green links and fingers through the Floreat PSP area.



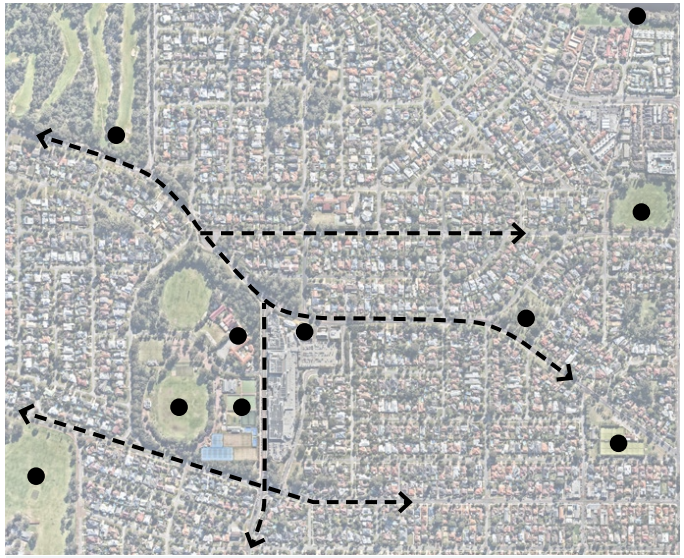
Landmark Trees



Green Spaces



Topography



Community Context

3.2 Cultural Heritage and Significance

The PSP area does not contain any places that have been recognised or registered as Aboriginal Cultural Heritage.

Notwithstanding, it is clear that the site sits within a unique ecological setting and walking trails exist within proximity to the site that recognise and celebrate Whadjuk Noongar significance. These include the 'beach to bush trail' through Perry Lakes and Bold Park, and the Yange Kep Bidi Trail (Wetland Trail) from Lake Mongar, through Perry Lakes and down to Freshwater Bay.

The Floreat Forum site is recognised for its heritage value on the Town of Cambridge's Municipal Inventory (category 4).

Constructed in 1963, the site and its adjacent neighbourhood underwent significant development on the back of the Commonwealth Games at Perry Lakes in 1962. The Forum site was WA's first enclosed American Style shopping mall, and featured a distinctive conical roof structure which covered the shopping precinct.

Importantly, it served as a community focal point by virtue of its use, and had design elements such as public spaces, plazas, stairways and open air spaces that were well utilised by the local community.

Due to ongoing expansion over time, the site has little significance today, but contributes to the understanding of the history of the Town of Cambridge.

The significance of the area as a community precinct is reinforced by other local heritage places to adjacent to the PSP area, including Floreat Primary School, Floreat Oval, and tree planted on the Boulevard linking the city to the coast.

More broadly, the area has rich architectural history within the Floreat neighbourhood and surrounds particularly through the mid-century architectural style, exemplified by the works of Iwan Iwanoff, notably Paganin House and Lifford Road. Together with the garden suburb layout, these aspects are valued by the community as a unique element of the local character.



A community focal point



Perth's first shopping centre development



An integral part of the local community



A legacy of local ownership and community authenticity

3.3 Movement Network

3.3.1 Pedestrian Movement

The Floreat precinct is deemed to be very walkable with a high Walk Score of 87.

Although this site has several pedestrian access points, elements of the pedestrian environment are lacking in amenity due to the presence of unclear and uninviting access points to the Floreat Forum site as well as unpleasant walking experience on surrounding roads including The Boulevard and Howtree Place.

In addition to accommodating high volumes of traffic, both of these streets have inactive frontages, particularly Howtree Place, with the sole access to the Forum located between a bus stop and a loading dock. This presents limited passive surveillance with perceived feelings of discomfort for pedestrians.

3.3.2 Cycling Movement

Floreat Forum currently offers limited bicycle parking and access, which may discourage potential cyclists and likely places more pressure on car parking and surrounding road networks. The Department of Transport's Long-Term Cycling Plan (LTCN) has allocated Howtree Place as a Secondary Cycling Route; sections of The Boulevard (between Howtree and Empire Avenue) as Secondary Cycling Routes; and adjoining streets to the Boulevard are Local Routes. The Town of Cambridge Cycling Strategy mostly aligns with the LTCN, with the exception of The Boulevard which is a Secondary Cycling Route through the precinct area; and Floreat Avenue has been designated as a Local Cycling Route.

As the cycling catchment is quite significant, this has the potential to modal shift and alleviate pressures on parking and adjacent road networks.

3.3.3 Public Transport Accessibility

Considering Floreat Forum is located in an inner-city suburb, access to public transport is relatively poor. This precinct has a low Walk Score rating of 44 for accessibility to public transport. This is due to lack of heavy rail access and infrequent bus services and their lack of connectivity with surrounding suburbs. Floreat Forum has access to four bus routes within a 400 m catchment, with three of them following similar routes. A description of the bus routes is shown in the table below.

With the local population set to increase due to the residential dwellings proposed, there is an opportunity to increase the public transport services in the area including a potential bus connection to nearby heavy rail and other significant destinations. This may reduce car dependency of nearby residents and visitors.

Bus Route	Description	Peak Frequency	Off-Peak Frequency
28	Perth - Claremont Station via HBF Stadium	15 minutes	60 minutes
81	Perth - Wembley via Cambridge Street	25 minutes	No service on Weekends and Public Holidays
82	Perth - Wembley via Cambridge Street	15-20 minutes	60 minutes
83	Perth - Wembley via Cambridge Street	15 minutes	No Service on Weekends and Public Holidays

3.3.4 Vehicle Access and Parking

The PSP area is bound by a number of significant District Distributor A Roads including The Boulevard, Howtree Place and Oceanic Drive. The streets provide significant points of access into the precinct, including:

- Oceanic Drive / Hornsey Road: Full access, unsignalized
- Oceanic Drive / Floreat Avenue: Left in / left out
- Oceanic Drive / Howtree Place: Full access, signalized
- The Boulevard / Howtree Place: Full access, signalized
- The Boulevard / Floreat Avenue: Full access, unsignalized.

Street internal to the area then provide access to the residential properties of the residential frame and the Floreat Forum Site. Three significant car parks currently exist to service the Floreat Forum site, providing approximately 900 parking bays. These include:

- Southern decked car-park accessed via Floreat Avenue;
- Southern semi-basement car-park accessed via Howtree Place; and
- Northern deck car-park accessed via Floreat Avenue Internal slip road, and The Boulevard.

Major servicing and loading associated with the site currently occurs via Howtree Place, including a northern service dock associated with Coles supermarket, a shared central loading dock, and a southern loading dock associated with Woolworths Supermarket. The loading requirements create an inactivated façade to Howtree Place and limit the ability for pedestrian access to the site.

3.4 Economic Market Demand

To understand the land use requirements of the area and how this transition might occur, Hatch undertook a needs assessment across various land use types (Appendix E).

The needs assessment was designed to be compliant with Draft SPP 4.2 – Activity Centres (October 2000), and also considered how to sustain its own demand for additional retail and commercial floorspace driven by greater volumes of residents in the activity centre and a higher local worker population.

To inform the opportunity for supporting land uses including health, wellness, medical, strata office and recreational facilities, Hatch also benchmarked several other mall-based activity centres throughout Perth and other locations in Australia to understand how this mixed-use transition could occur.

The analysis found that an expansion of retail floorspace recommended by 2031 equates to 5,000 sqm of food and grocery retailing including liquor, 2,000 sqm in restaurant & food catering and between 3,000 and 4,000 sqm in non-food retailing including mini majors and retail services. Further expansion opportunity beyond 2031 exists supported by an additional local residential catchment at the subject site.

In addition, the findings concluded that additional land use diversity can potentially be supported in the future such as complementary office / commercial and entertainment focused uses.

An assessment of the residential market opportunity including supporting components such as aged care was also undertaken and confirms that Floreat can play an important role in providing housing diversity for the Floreat / City Beach and wider sub-market. The population is expected to age significantly, and this will drive downsizer activity for those aged 55 to 75 together with demand for aged care accommodation for those aged 75+.

Given the site's significant surrounding amenity and connectivity, the study also confirms Build to Rent and short stay accommodation have the potential to be accommodated on the site in the future.

3.5 Engineering and Servicing

A servicing report has been prepared by Pritchard Francis to review the engineering service requirements for the Floreat Precinct Structure Plan area. The report builds upon the servicing assessment that was undertaken to inform the Town's endorsed Local Planning Strategy, and confirms the following:

- Major existing services are located adjacent to the Precinct Structure Plan Area;
- Network upgrades would be required to service the proposed development, including sewer and electrical supply;
- Network upgrades would be completed via agency network improvements, developer funded improvements or both. This would be subject to the nature of the upgrade and the policies of the relevant service provider;
- Relevant capacity requirements can be met and there are no service capacity issues that prevent the proposed redevelopment from occurring.

A copy of the Engineering Servicing Report is provided as Appendix D.

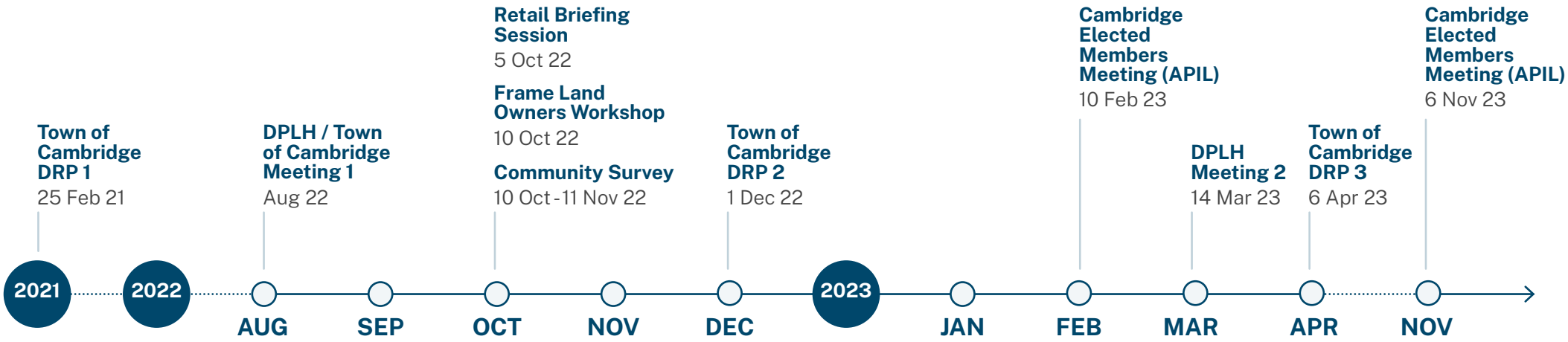
3.6 Opportunities and Constraints Summary

From (Constraint)	To (Opportunity)
Limited, single use retail centre focused on day trade	Become a mixed use activity centre offering a wide variety of community needs to transition to an 18 hour place, including dining, hospitality, entertainment, commercial, healthcare and community / civic uses
Internal / inward focused retail	Break up the site to introduce east-west connections, with a focus on activated spaces and streets. Create new pedestrian entries to the site.
Operating centre with long term lease commitments and operational requirements.	Consider a staged approach to redevelopment that allows for both the staged enhancement of the centre and associated public amenity and the ongoing operational requirements, including car-parking, loading and minimum square metre requirements.
Centre currently reliant on the private car for access	Transition the precinct to one that is walkable and well-connected, including the potential to improve public transport and cycling access to the area and consider new road cross sections.
Current lack of tree canopy within the precinct compared to surrounding green network.	Seek to enhance greenery in the precinct through the retention of trees, consideration of new deep soil and open space, and connections through to greenery to the west
Largely single residential areas adjacent to the site	Opportunity to diversify the housing offer in line with endorsed planning priorities and demographics of the local area, and consider an appropriate transition to adjacent residential uses, particularly within the Residential Frame area.
Significant car parking, access and servicing / loading requirements	Potential to consolidate car parking into basement / mobility hubs and seek to rationalise and consolidate servicing / loading.
Garden city character of the area and relationship with new building typologies to accommodate PSP dwelling target.	Take inspiration from the mid-century style, together with the garden city layout to help create civic meetings places, new pedestrian connections and strong landscape integration.

4. Stakeholder Engagement

The precinct structure plan has been developed working closely with the Town and relevant stakeholders through an ongoing design process over the past 3 years. This has provided meaningful input and resulted in the concept continually evolving and responding to feedback received.

The key components of this engagement are identified below, and expanded upon in the following pages.



4.1 Town of Cambridge Design Review Panel

The concept has been presented to the Town of Cambridge Design Review Panel on three separate occasions. Each subsequent design concept was highly responsive to the feedback received and is summarised below.

DRP 1 | Conceptual Planning



"The panel appreciated early engagements and acknowledged that the presentation was the first step in the development of the plan."

Specific comments includes:

- *"The proposal should reflect the garden suburb characteristics of Floreat and draw on them."*
- *"The parking should not result in the total loss of deep soil"*
- *"Consider the establishment of semi-external spaces"*
- *"Consider the massing within the transition area"*
- *"There is the opportunity for landmark buildings to be situated to the West and bottom of the site."*
- *"The analysis and vision is a good first step for the future redevelopment of the site."*

DRP 2 | Concept Development



"In principle support was given to the proposed PSP concept."

Specific comments included:

- *"Further work to reduce height and taper buildings to reduce overshadowing impacts to adjoining sites is required."*
- *"Consider locating the building bulk and height at the northern and southern ends and less in the eastern area of the precinct and frame."*
- *"Level of consultation response was impressive."*
- *"Preparation of additional sections would assist in understanding the relationship between buildings on and adjoining the site."*
- *"Fundamentally the PSP is about the movement network, overall built form, and interfaces with surrounding environment."*

DRP 3 (Final) | Concept Refinement



"In principle support was given to the proposed PSP concept. The Panel noted that the changes made from DR2 were positive and an on-going improvement. The Panel also noted that whilst the subject of the work was, ultimately, a PSP, a design has to be worked up in sufficient detail to inform a meaningful and workable planning document, and the design has largely reached that point."

Specific comments included:

- *"Further consideration of the landscape treatment along Howtree Place to improve pedestrian amenity."*
- *"Refinement of the tower envelopes to provide a more marked transition in scale from high to low, with additional consideration to reducing the impact of Tower F on residential properties to the south."*
- *"Investigate ways in which the Tower G podium can be activated, eg sleeving and/or the possibility of bringing Tower G 'all the way to the ground' to achieve a better pedestrian experience and ensure activation of the adjoining thoroughfare."*

4.2 Retail and Landowner Briefings

Noting that the precinct boundary includes private landowners within the 'residential frame' precinct and the importance of the forum to existing retail operators and the broader community, a multi layered approach to engagement was undertaken. This included:

Retail Briefing Session | October 2022

A retail briefing was undertaken by APIL Property to explain to existing operators the current process that was being undertaken. In addition, the briefing session was an opportunity to understand current performance issues and gain ideas about how the longer term repositioning of the centre could assist retail operations.

This feedback was used to inform both the short term operations of the retail and the long term vision for what the centre and surrounding precinct could become.

The knowledge provided to the retailers also equipped them to answer questions from customers on the back of broader community consultation initiatives.

Landowner Briefing and Feedback Sessions | October 2022

A landowner session was held at Floreat Forum in October 2022. The session was advertised via a letter drop to all households within the residential frame area and held after hours to ensure maximum attendance.

The session was attended by centre management and members of the APIL property and Hatch teams, and over 30 surrounding landowners. A presentation was provided to the audience, which covered:

- An introduction to the team;
- An overview of the process being undertaken;
- An overview of the Town of Cambridge Local Planning Strategy; and
- An overview of the Precinct Structure Plan Framework and six design principles.

A feedback session with 2 groups of landowners was then facilitated, which included collecting structured feedback on their future ambitions and associated inputs to each key PSP design element. Feedback from the session was used to inform the vision, objectives and design response. In particular, the assignment of residential design codes, building controls and indicative landscape treatments within the residential frame area.

4.3 Community Survey

To inform the future redevelopment of the Floreat Forum precinct, a public survey of visitors, local residents and workers was conducted in October / November 2022.

The survey was structured to explicitly gain information about:

- How people use the centre today;
- What ideas people have to improve the centre; and
- Structured feedback aligned directly to the 6 design principles of the PSP framework.

To market the survey and gain the maximum amount of feedback possible, a number of approaches were undertaken, which included:

- Posters within the Floreat Forum with QR codes to the survey;
- Flyers;
- Educating retailers and encouraging them to raise awareness to the survey;
- An article in the local newspaper;
- The preparation of a website landing page on the Floreat Forum webpage; and
- Social media posts including on the Floreat Forum Facebook and Instagram pages.

The campaign proved to be incredibly successful, with the survey receiving over 500 responses from interested people.

In addition, due to the structuring of the survey around the PSP design principles, community feedback has been captured on introductory pages to each design element. This feedback helped to inform each element objective and demonstrates the team's commitment to understanding community sentiment and using this to inform contemporary redevelopment within the precinct.

Community Feedback - Snapshot Summary

Who we heard from

75% Approximately 75% of respondents living in the Town of Cambridge

65% were parents, either of young children or young families

92% of respondents said they live close by, with 66% visiting multiple times a week

80% of respondents visit by car

What do you love about Floreat Forum?


Community feel


Convenience


Easy to access


Close to home


Diversity of offerings


Outdoor spaces

What is one thing you would like to change about Floreat Forum?

25% Improve the diversity of commercial offerings

17% More dining and entertainment options

16% Improve parking, movement and access

13% Revitalise a tired centre

9% Cater to all age groups and a wider demographics

5% Improve the public realm

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1. Vision

The vision for the site has been informed by significant feedback from all stakeholders, including the Town of Cambridge's intent outlined within the Endorsed Local Planning Strategy to:

"Transform into an attractive and vibrant mixed-use precinct with a broad range of residential and commercial/retail uses."

This vision has been further considered and refined following:

- Significant community feedback through responses received from the survey, landowner briefing and retailer feedback;
- Benchmarking the transition of the precinct to other successful local, national and international exemplars;
- Project team interactive workshops which included representatives of the property owners, managers and a best practice, multidisciplinary team of urban professionals including architects, landscape architects, transport planners, urban designers and town planners;
- Design input and refinement through the design review process.

Through this process the vision for the precinct has been refined to:

Floreat Precinct will become the heart of the Floreat community.

It will provide new high quality public spaces central to the site, more greenery at key entry points, a broader diversity of things to do across the precinct and deliver new ways of living within Floreat.

It will do this in a truly unique way – drawing inspiration from the surrounding garden suburb character, integrating with the existing area, using clean and modern architectural elements, and enhancing the cherished aspects of the neighbourhood.

This vision is demonstrated through key design moves and throughout the design elements for the precinct.



2. Key Design Moves









Reconnect the community

Through the introduction of an activated high street, that loops around key commercial tenancies. The link will provide opportunities for deep soil, a landmark park, playgrounds and public spaces, and provides the amenity to unlock key development sites.



Enhance greenery

Particularly at key entry points to the Floreat PSP area that links the site to its surrounding green network. Carefully consider basement car parking to allow spaces for deep soil and vegetation to flourish.



Activate streets and rooftop space

Creating public amenity adjacent to key spaces, and activating through independent retail, food and beverage tenancies. Future residents are supported to grow a thriving community through green podium and rooftop communal spaces.





Note: Staging indicative only



Deliver density well

Through a nuanced built form strategy that steps buildings up away from neighbouring properties and down toward more residential focussed areas. Amenity of each development site is maximised through the placement of buildings, ensuring sunlight, cross ventilation and views, and that public spaces are protected from overshadowing and wind.



A considered delivery strategy

Allowing the precinct to be developed across five stages, balancing the need to maintain the important operating centre, deliver new public space and amenity, and balance car parking and commercial floorspace constraints.



3. Urban Ecology

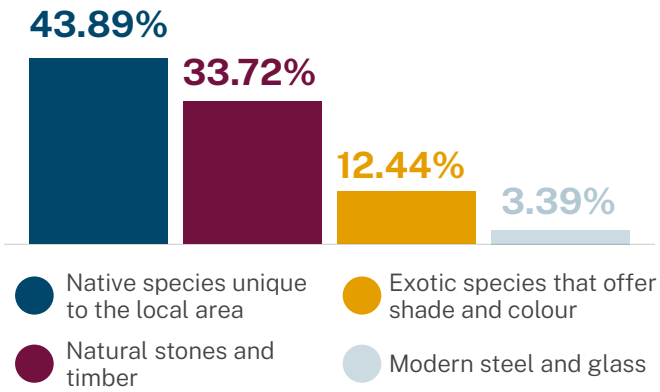
The urban ecology vision for the site is to reintegrate the precinct within its natural setting, delivering new green amenity throughout the area and connecting it to the surrounding neighbourhood.

Buildings, landscape and public spaces will be designed with environmental performance as a primary consideration, including access to daylight, shade, wind protection and microclimate considerations, as well as use of appropriate tree species selection that respond to the surrounding garden suburb setting.

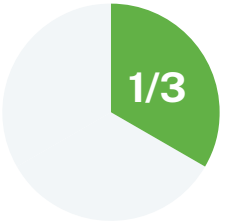
In addition to the natural environment, the Floreat PSP will respond to the heritage and social values of the Floreat precinct, delivering new community infrastructure and public spaces that will help to re-establish its connection at the heart of the community.

Community Feedback

What landscape species and materials should guide the public space design?

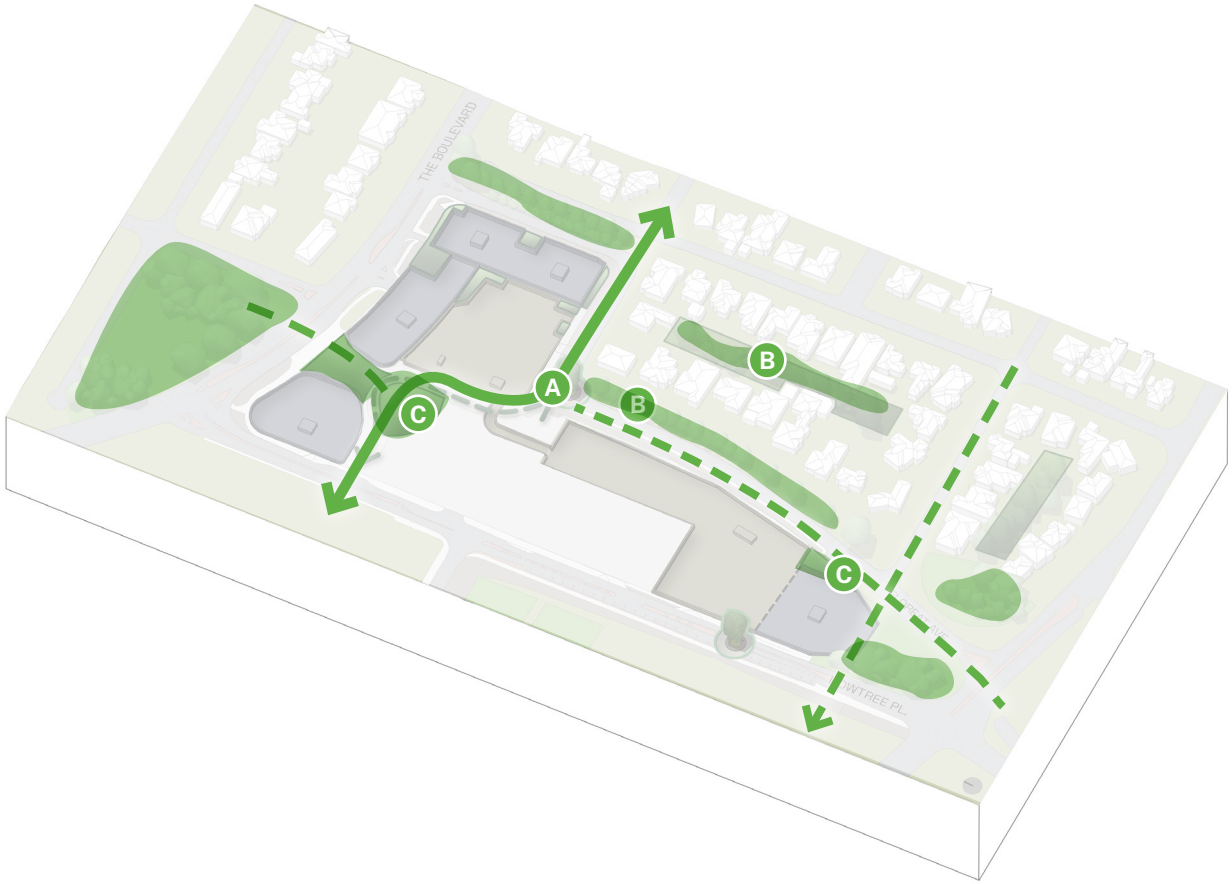


What are the most important potential environmental benefits?



A third of respondents want to see buildings with high sustainability outcomes and reduced energy consumption.











Design Principles

A New Green Connections

New green connections will integrate the site with its surrounding natural amenity, providing new pathways that connect residents to community facilities from east to west, and pedestrian desire lines from the Wembley Golf course to Perry Lakes north and south.

B Retain Mature Trees

Retain mature trees where possible, particularly on the eastern extent of the Floreat Forum site (Floreat Avenue) and at the rear of the 'Residential Frame', whilst improving tree canopy through landscape design throughout the precinct.

C Celebrate Green Civic Space

Celebrate green civic space through the co-location of new public spaces with deep soil areas, leveraging Floreat's Garden suburb character at the Precinct's southern, northern and central landmarks.

3.1 New Green Networks

The assessment of the ecological setting of the site demonstrates the significant potential for new green networks and fingers to be presented through the new precinct design.

Opportunities exist to extend the green street network to break up the precinct area and enhance the existing road reserves through tree planting strategies aligned to the Town of Cambridge's policy setting.

In addition, there are opportunities to reconnect and reorientate the precinct to its significant green amenity that sits adjacent to the area. In particular, new linkages to the community precinct to the west and better interfaces with green spaces to the south and north.

The PSP also seeks to enhance the green network and tree canopy provision within the area, particularly through the creation of new public spaces at key locations, collocated with deep soil. These opportunities have been picked up and addressed within the Landscape Masterplan (Appendix A), Design Principles Report (Appendix C), and Transport Impact Assessment (Appendix B).



3.2 Tree Retention and Canopy

Whilst much of the primary site that includes the Floreat Forum is cleared of natural vegetation by virtue of its commercial context, significant existing trees do exist on the edges of the Forum site and within adjacent road reserves.

Generally tree growth has occurred within defined verge or raised bank areas and the report highlighted overall good health of the trees and found them structurally sound.

The indicative concept plans demonstrate that these trees are capable of being retained, and the principle of retention where possible is embedded within Part One of this PSP. Further design testing will be required at Development Application stage to confirm the ability to retain and protect these trees.

In addition, significant vegetation also occurs within the adjacent 'Residential Frame' area and is a key contributing factor to the overall character of the precinct. Much of the mature vegetation exists at the rear of the frame properties, and a 6 metre rear setback has therefore been incorporated within the intent to retain these trees within private property.

More broadly, adjacent area of public space and road reserve (particularly to the south of the precinct) also contain significant vegetation. With improvements to the amenity and public infrastructure within these spaces, they have the potential to provide additional green amenity to the future community as the population grows.

3.3 Sustainability

In developing the precinct plan, fundamental sustainability principles have been considered and are embedded within the PSP design and delivery strategy. Key elements of the strategy include:

- **Community focus:** Colocation of key daily services and facilities, public space and entertainment uses and living opportunities that collectively improve health and wellbeing outcomes;
- **Landscape and Public Realm Design:** Significant new deep soil areas that are collocated with public spaces, significant improvements in tree canopy, tree retention initiatives and consideration of water sensitive urban design within the landscape masterplan (Appendix A);
- **Sustainable transport:** Initiatives that reduce the reliance on cars, including vastly improved active transport infrastructure and pedestrian priority zones, ability to live and work within the precinct without the need to travel, and future consideration of car-share schemes;
- **Built form massing:** Consideration of new development siting to improve sustainability outcomes including solar passive design, limited over-shadowing and natural ventilation;
- **Economically sustainable:** A considered development strategy that maintains the operational aspects of the centre, and provides redevelopment opportunities that are capable of delivery.
- **Flexibility and adaptability:** A masterplan that provides capacity to evolve in the future through the consideration of staging and aspects such as the mobility hub.

In addition to the above, redevelopment of the centre will provide the opportunity for ongoing use of existing energy production infrastructure (PV solar panels) and recycling systems to benefit the precinct.

As the plan represents a long-term redevelopment over a 15-20 year time horizon, it is considered that the concept of sustainability and design will evolve significantly, including increased use of EV, changing transport patterns and differing community expectations. A detailed sustainability strategy is therefore considered premature and will be rather addressed in individual development applications, in line with the design WA principles.

This will allow aspects such as Green Star accreditation / self-assessment, NABERS Energy and Water Certification and Fitwel communities certification to be appropriately considered and tested in detailed planning. The objective of sustainability is embedded within Part One of the PSP.

3.4 Indicative Deep Soil

The proposed urban structure of the precinct allows for the staged development of key public spaces within the area. These are outlined further in the 'Public Realm' section of this report.

The configuration of parking and building footprints has been carefully designed to allow for each development site to deliver a minimum of 10% deep soil area.

Deep soil areas are primarily located along site edges to act as a green buffer, and key central public spaces to improve the amenity for the community. These locations ensure a significant proportion of the deep soil areas are publicly accessible, and will also contribute towards usable public open space.

RESIDENTIAL LOTS *

LOT	DSA	DSA%
01	386	10.9%
02	636	18.6%
03	754	12.3%
04	478	14.3%

* NOTE

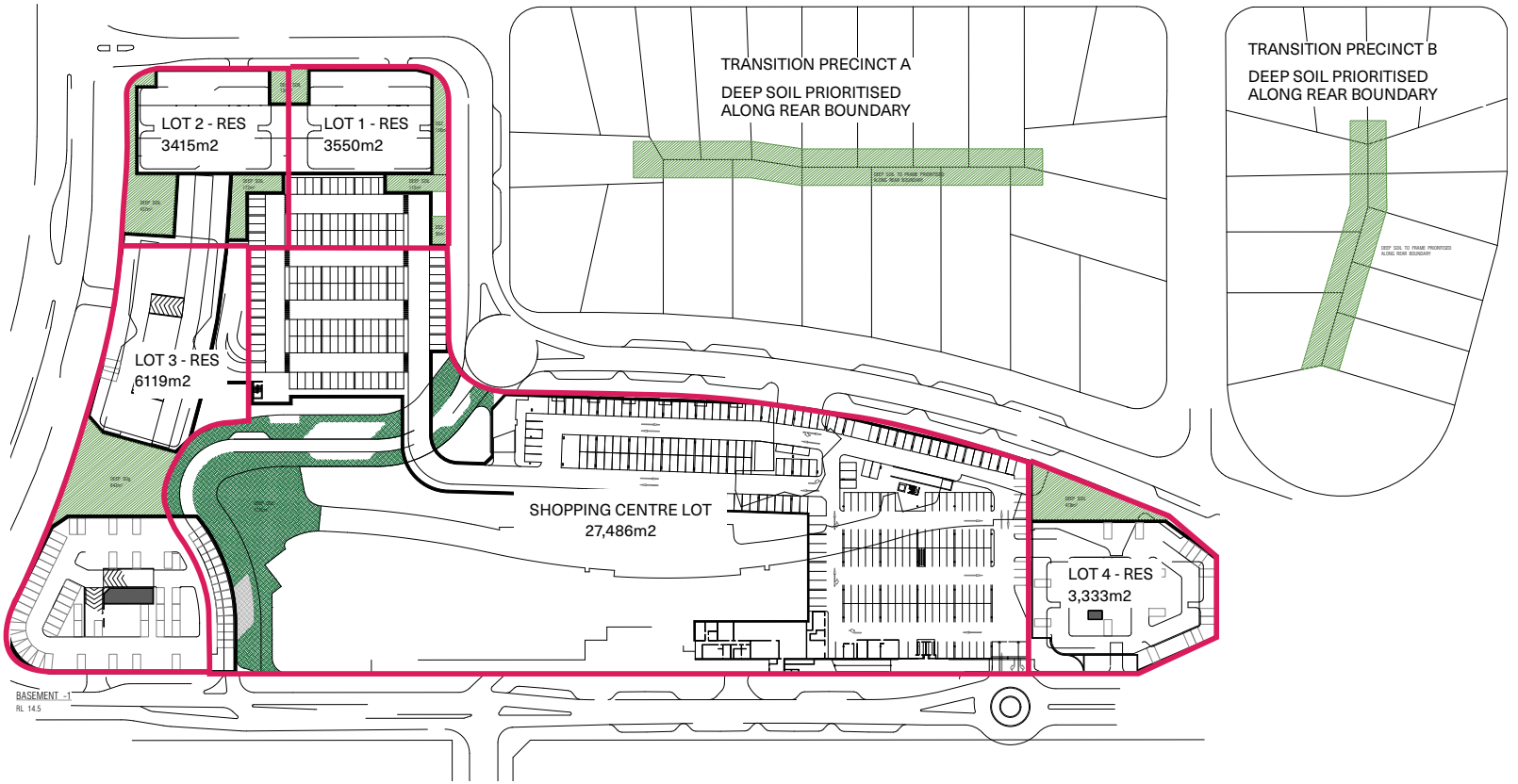
Deep Soil Area within the Residential Lots meet the requirements set out in the Design WA Residential Design Codes SPP 7.3. It includes areas that do not sit over basement or building Structure, are indicative only and subject to detailed design in later phases.

SHOPPING CENTRE LOT**

DSA	DSA%
2,398	8.7%

** NOTE

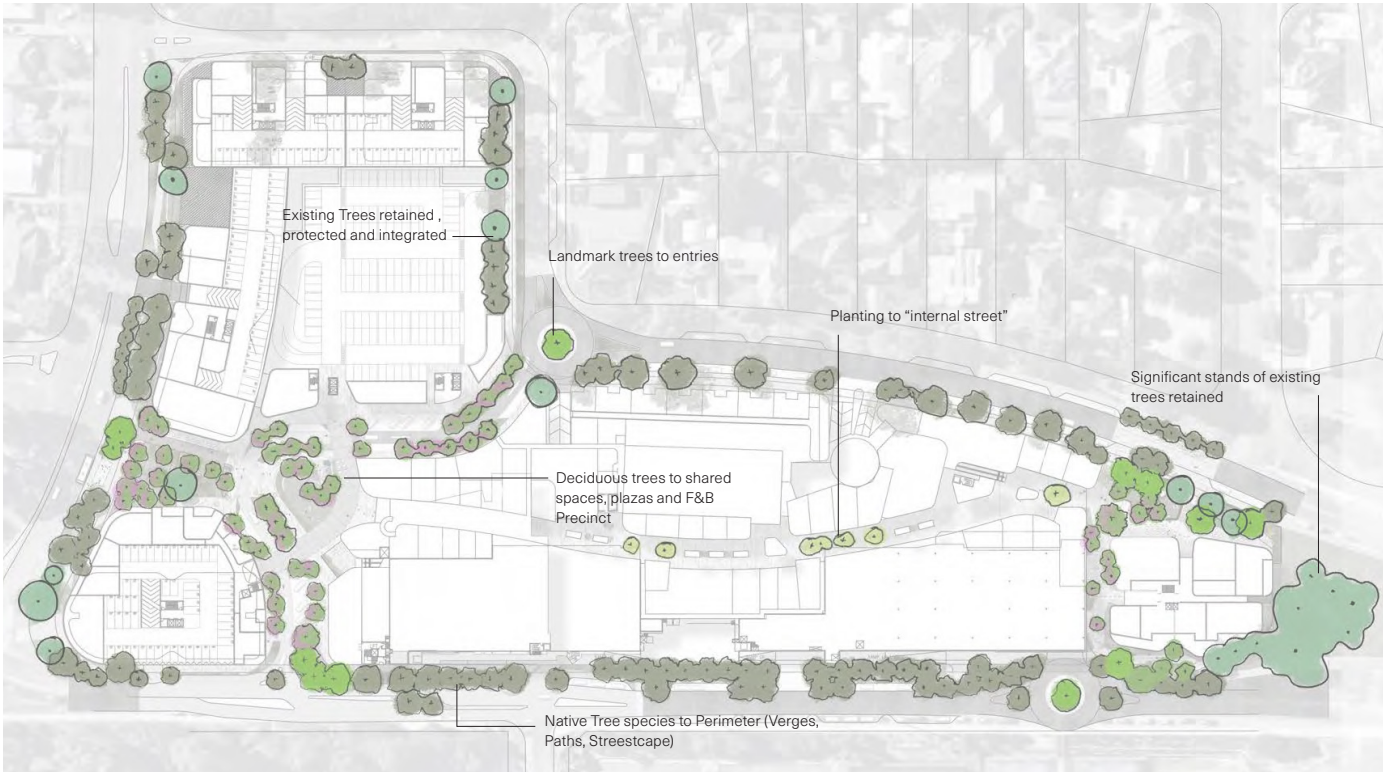
Deep Soil Area within the Shopping Centre Lots includes public realm areas that do not sit over basement or building structure, are indicative only and subject to detailed design in later phases.



3.5 Planting Strategy

Generous planting to the projects verges, paths and open spaces that builds upon the existing mature trees on site will strengthen the garden city character and qualities to the proposed Floreat Forum Structure Plan. Key components include:

- Water Sensitive Urban Design strategies will be adopted to ensure stormwater run-off is minimised and directed to support vegetation within the project;
- Tree cells / structural soil tree trenches are proposed to be used to allow roots access to larger soil volumes and minimise compaction in high traffic areas;
- Existing trees will be retained where possible and proposed trees will be added to maximise canopy coverage and mitigate the urban heat island effect;
- New feature trees will be located on site where significant deep soil is achieved;
- Trees will be appropriately located to support the functions of key spaces and ensure passive solar opportunities are achieved; and
- Increased tree canopy will provide shaded, comfortable connections that encourage and improve walking and cycling to and from the site.









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Part 3 - Design Response 3

4. Urban Structure

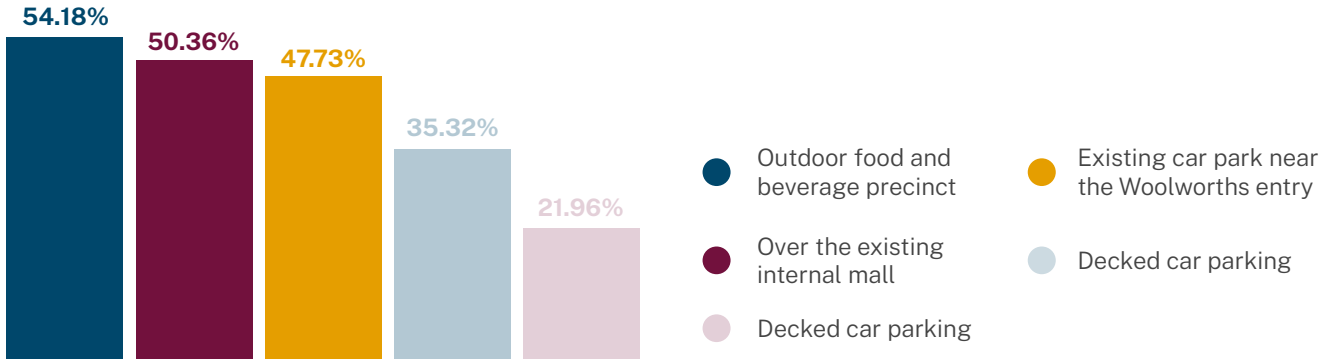
The urban structure proposed within the PSP has been designed to support the intended built form and associated public realm outcomes for the site.

New connections are proposed to break up the site and reintegrate the centre with the surrounding community. The connections provide the basis for a logical urban structure that may form the basis for future subdivision, and new opportunities to activate key areas of public realm.

Critically, the PSP has also been designed with the ongoing function of the commercial operations of the centre that is valued by the community.

Community Feedback

Where are the key places on site for redevelopment?



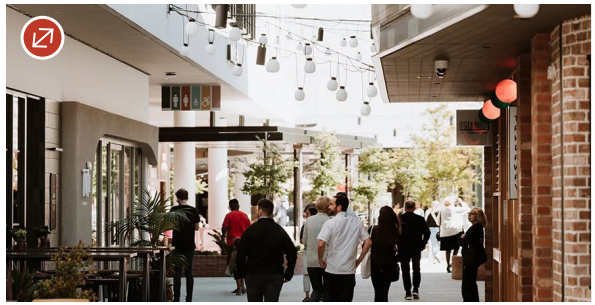


Floreat Precinct Structure Plan 47









Design Principles

Reintegrate inside and outside

To support the activation of newly created public spaces within the precinct.

Deliver on density

By creating a structure that allows for the staged development of the site, and careful transition to existing residential areas.

Prioritise people movement

Through creating a pedestrian-priority connections through the site that are supported by new public space and activated frontages.

4.1 Public Spaces and Pedestrian Connections

The proposed urban structure aims to create new connections and areas of public space that are supported by activated land uses. Anchoring key development sites in the north and south of the precinct, with adjacent open space and deep soil areas provides immediate amenity to key development sites, while leveraging development to deliver public-realm outcomes.

The structure provides for the introduction of a key east-west link in the form of a pedestrian priority street that increases the permeability of the precinct, particularly for pedestrians but also supporting vehicular movement. Further pedestrian movement networks are provided in the southern development site, as well as maintaining north-south pedestrian connection through the existing Forum site. This structure aims to prioritise walking and cycling, with a focus on further integrating the site with the surrounding 400m and 800m catchments, noting the Floreat Primary School and Floreat Reserve as key destinations for the local community which will be more easily accessed through the site.

The structure of the development sites also allows for the staged development of key public spaces within the precinct. These are outlined further in the 'Public Realm' section of this report.

4.2 Staging Strategy

A high-level staging strategy has been established that considers how the precinct may be developed in the future. The strategy is based on the following key principles:

- The delivery of public benefit and improvement in overall amenity within early stages of development;
- The progressive upgrade of supporting infrastructure that enhances access, egress and streetscapes within the precinct;
- Overall market demand and consideration of stages of a suitable size and yield for feasible delivery; and
- The ongoing operation of the shopping centre component as a fundamental daily service for the local community.

Based on current market demand modelling, the redevelopment would take approximately 15-20 years to full build out. At this phase of the planning process, staging remains indicative only and will be subject to market demand and developer intentions.

In relation to the Residential Frame, it should be noted that these lots are in individual private ownership, and timing of their redevelopment and release to market will depend on the appropriate R-Coding of the land and individual land-owner intentions. An assumption of 50 dwellings (or the equivalent of 6 lots redeveloped) per 3 year period has been applied.

The table and figures opposite provide an overview of the staging strategy, together with indicative yields, public benefit delivery and associated future infrastructure upgrades.

4.3 Block Structure

The proposed urban structure, particularly the location of key development sites have been designed to respond to the existing layout and function of the site, while allowing for its future redevelopment in accordance with the PSP. Design testing and review to inform the PSP demonstrates the block structure of the development sites can accommodate significant development while also providing deep soil and open space areas.

Within the residential frame, the existing lots are generally 1000m2 in size or greater. While lots may be amalgamated to deliver the intended built form outcome, the density coding and size of the lots ensure that a multiple-dwelling development outcome is achievable on most lots without amalgamation. The purposeful density coding and existing urban structure will support the intended character and function of the precinct.

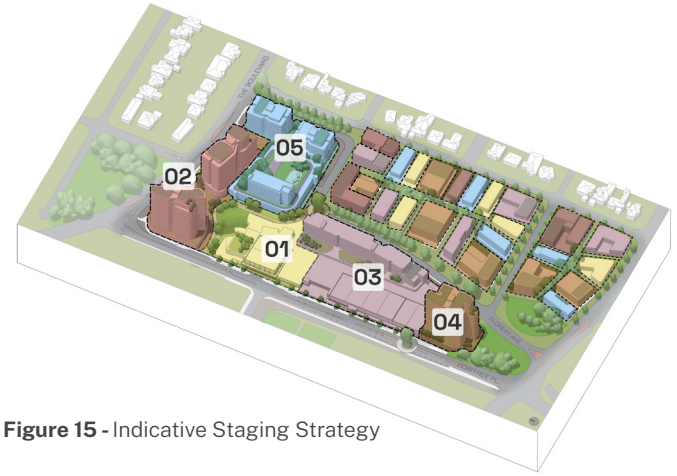


Figure 15 - Indicative Staging Strategy



Figure 16 - Development Site Reference

Floreat PSP Indicative Staging Strategy Summary

Stage	Year	Centre Core Development Sites Reference	Centre Core Dwelling Yield	Centre / Residential Transition Dwelling Yield	Total Dwelling Supply	% Complete	**Public Benefit Delivered**	**Potential Infrastructure Upgrades**
Stage 01	3	Northern Retail	0	50	50	4%	• Deliver low, speed pedestrian priority main street connecting Howtree Place to Floreat Avenue. • Deliver Northern Entry Plaza with an approximate area of 1,500sqm. • New retail and outdoor dining amenity. • Improved screening and interface to northern portion of Howtree Place	• New intersection onto Howtree place to allow access for one-way main street. • Improved streetscape outcome to northern portion of Howtree Place. • New roundabout on Floreat Avenue to facilitate egress.
Stage 02	6	Building D	215	50	315	25%	• Deliver new public space of approximately 850sqm, providing new deep soil and an entry statement to the precinct from The Boulevard.	• Incremental streetscape improvements within the Frame Precinct such as street trees on Newry Street and Hornsey Road. • Potential signalization of Floreat Avenue / The Boulevard intersection subject to passing traffic movement growth and detailed modelling at Development Application stage.
	9	Building C	195	50	560	45%		
Stage 03	12	Building E	195	50	805	65%	• Activation and streetscape improvements to Floreat Avenue • New retail amenity including introduction of additional mini-major and reconfigured basement car parking. • Improved screening and streetscape to southern portion of Howtree Place.	• New roundabout southern portion of Howtree Place • Improved streetscape to southern portion of Howtree Place
Stage 04	15	Building F	170	50	1,025	80%	• Deliver new southern entry plaza of approximately 480sqm, east-west pedestrian connectivity between Floreat Avenue and Howtree Place and improved interface to southern parkland	• Streetscape enhancements to Floreat Avenue. • Upgrades to southern park interface
Stage 05	18	Building A	100	50	1,175	95%	• 10% deep soil area provided for each residential building, communal activated mobility deck and final activation of one-way main street.	• Upgrades to northern portion of Floreat Avenue.
		Building B	75		1,250	100%		
		Building G (short stay)						
Total			**950 dwellings**	**300 dwellings**				

Part 3 - Design Response 3

5. Public Realm

The vision for the public realm treatment is to create a series of unique public realm typologies, centred around a new civic and community heart.

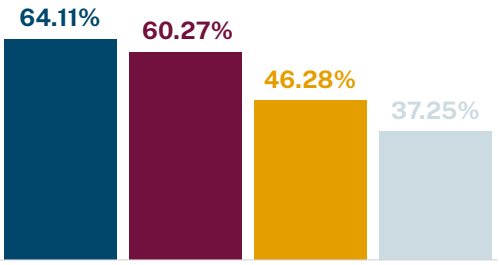
These open spaces will play different roles within the network and work together to offer the community new destinations that are activated throughout the day and night.

Public spaces will prioritise pedestrian movement and provide opportunities to pause, meet and connect to the landscape, reflecting the garden suburb character.

Public spaces will also provide connection between the public and private realm, with tenancies spilling into public areas to create a village atmosphere.

Community Feedback

What elements of the site's history could be drawn on in the design of public spaces?



- The history of the Floreat and City Beach as a garden of suburbs
- Original landscape features, flora and fauna of the area
- The history of Floreat Forum as Perth's first shopping centre
- Whadjuk traditional owner heritage

What would improve the public spaces?

Improved undercover areas outside	57.14%
Tables and seating	55.13%
Seating and facilities within existing malls	51.79%
Improved or additional playgrounds	34.38%
Public art	33.04%
Water fountains	29.46%
Pet facilities	17.41%
Signage	8.71%



Floreat Precinct Structure Plan 51



- A Northern Entry Square
- B Southern Entry Plaza
- C Shared Street
- D Upgraded Parks







Design Principles

Create a new community heart

in the form of new civic and green squares. They will act as a focus point for movement between the commercial, residential and food and beverage uses, and provide the community with a flexible open space for events and gatherings.

Deliver a series of scaled public destinations

To provide people with varied environments that work together to offer the community a different level of activation throughout the day and night.

Activate spaces with variety of uses and landscape treatments

Including the integration of the surrounding garden suburb setting, water sensitive urban design, green verges and playgrounds.

5.1 Landscape Masterplan

A Landscape Concept Masterplan (Appendix A) has been prepared to support the redevelopment of the precinct over time.

The design aims to respond to the scale, form and character of the local context providing a pedestrian scaled upgrade that looks at present and future demographic projections for Floreat.

The key components of the plan include suggested upgrades to key streets throughout the precinct, development of new civic green spaces to support the proposed intensification of the precinct, as well as upgraded / new pocket parks. In addition, the landscape masterplan outlines the intention to retain trees throughout the precinct where possible, and considers the provision of deep soil on key development sites. Please refer to figure 17 for an overview of key features.

5.2 Diverse Public Spaces

Civic and Green Squares

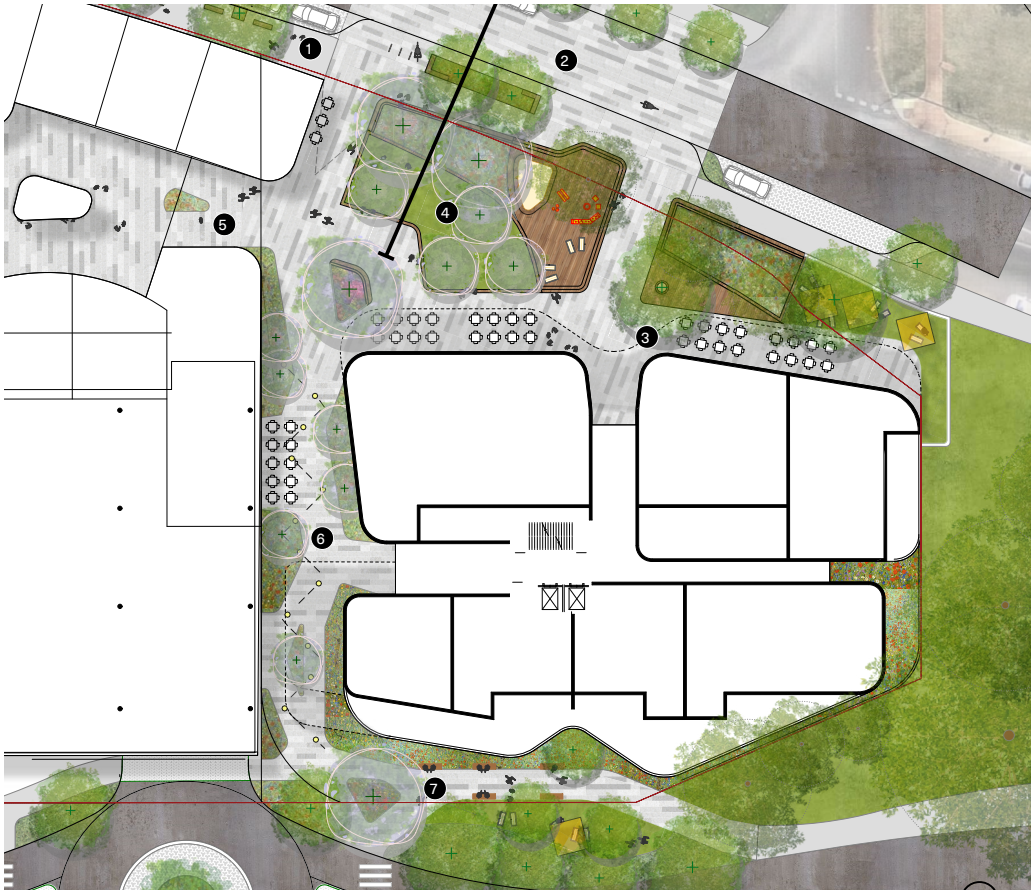
The northern and southern entrance squares provide key public space nodes, bookending the future footprint of the shopping centre with public spaces. These spaces are also co-located with key development sites, offering significant amenity to future residents.

The northern square includes a civic space, providing for community events. The southern square will act as a key connection to the adjacent residential frame of the precinct while also providing amenity to and integrating the southern development site within the precinct.



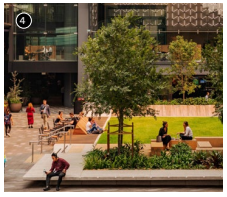
Figure 17 - Landscape Concept Masterplan

1. Upgraded footpath along The Boulevard
2. Landmark roundabout
3. Upgraded verge along Floreat Avenue with parallel parking bays, planting and native trees WSUD blisters and pedestrian footpath
4. South Entry Square with raised pedestrian crossing, connection to existing lawn and feature trees
5. Existing lawn with potential for retail spillout and informal event activation
6. Pocket park along Howtree Place footpath with native trees and planting
7. Activated laneway to South Entry Square
8. Upgraded verge on Howtree Place with WSUD landscape buffer to loading zone, pedestrian footpath, parallel parking and new native tree planting
9. Feature paving treatment anticipating entry to shared zone
10. Main deep soil zone and landscape heart with suspended boardwalk connection between The Boulevard and the new Floreat Forum
11. North Entry Square with feature pedestrian walkway to mall and feature deciduous trees
12. Slow vehicle and pedestrian shared way with feature paving treatment, parking and WSUD garden beds with deciduous street trees



South Entry Square

1. Pedestrian boulevard along Floreat Avenue, with line parking and WSUD landscape blisters
2. Raised pedestrian crossing / Shared Space
3. Residential upper, with Al-fresco and F&B at ground-level
4. Raised timber deck, including shaded lawn area, play space and seating
5. Pedestrian access to internal shopping mall
6. Laneway connection between Howtree Place and Floreat Avenue
7. Pocket park and pedestrian footpath along Howtree Place









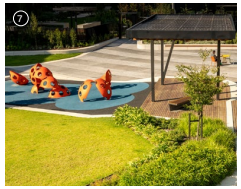


North Entry Square

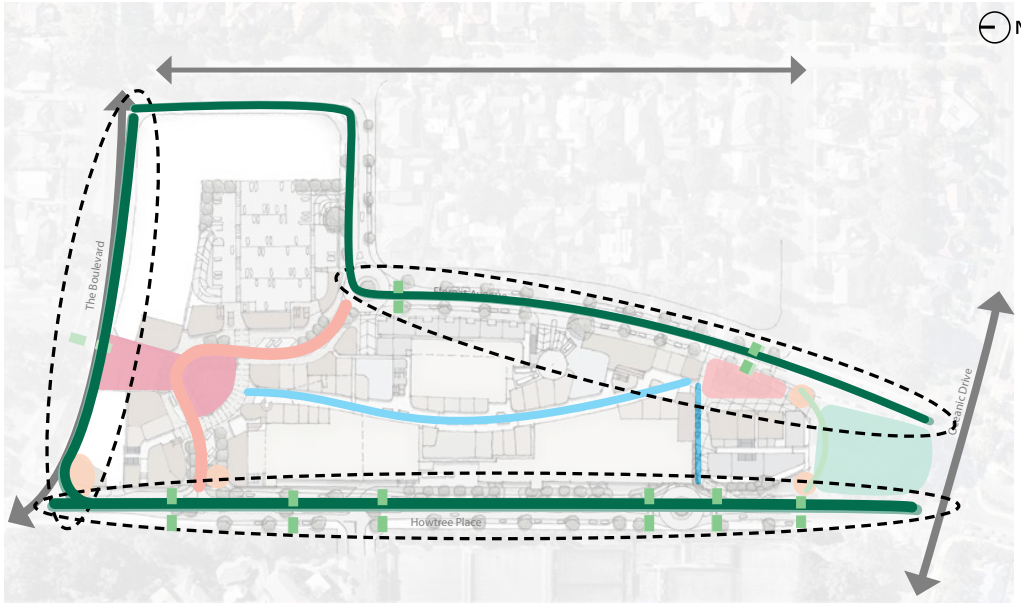
1. Pedestrian footpath along The Boulevard
2. Al-fresco balcony over deep soil area
3. Landscape mound with trees and integrated suspended boardwalk connections from The Boulevard to the new Forum
4. Lawn area around existing tree including informal seating and decking
5. Shared zone, with alternate surface treatment, feature lighting, and one-way slow vehicular circulation
6. Al-fresco dining and F&B
7. Civic square including lawn chill-out zone, seating walls, play space and flexible event space
8. Feature paved pedestrian walkway
9. Main entrance to shopping mall
10. Urban link, connecting Howtree Place to Floreat Avenue with parking and WSUD garden beds with deciduous trees
11. Gateway pocket park, including shaded timber deck, seating and planting
12. Pedestrian footpath along Howtree Place











Green Street

Green streets surround the core of the precinct area and serve to integrate the site within the garden suburb context. The streets will provide opportunity for better active transport opportunities, a number of safe pedestrian crossings to improve connectivity between the core, transitional frame and open space to the west.

Active façades, green verges and water sensitive urban design will ensure these streets are comfortable for pedestrians.

Existing

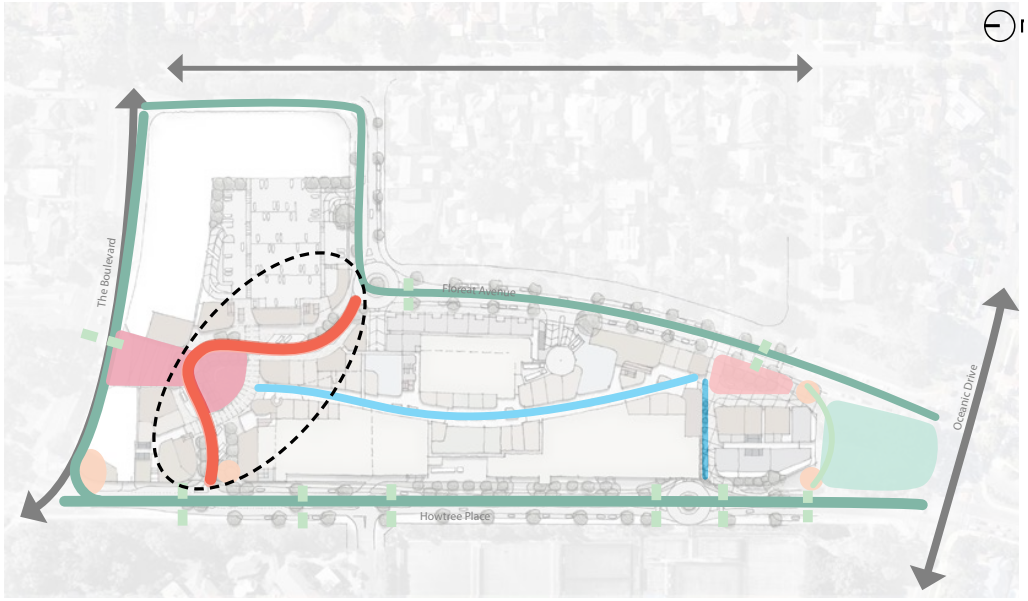




Exemplars







Shared Street

The shared street will prioritise pedestrian movement, linking the transitional frame with the district open space through the site, but also provide a key point for occasional vehicle movement.

Shop frontages will face onto the street with food and beverage tenancies that spill onto the street will create an activated and interesting pedestrian environment.

Existing

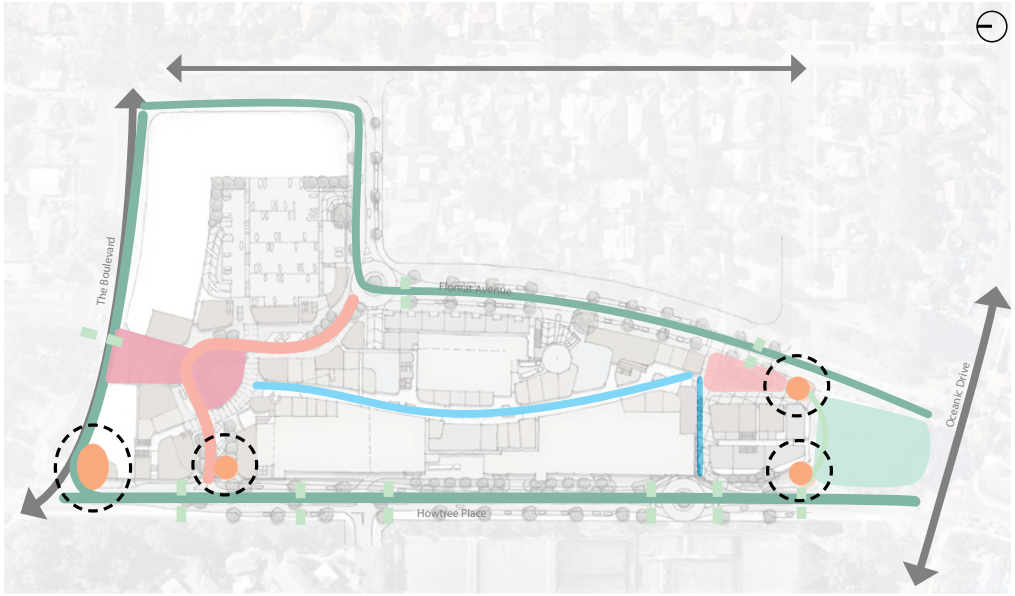


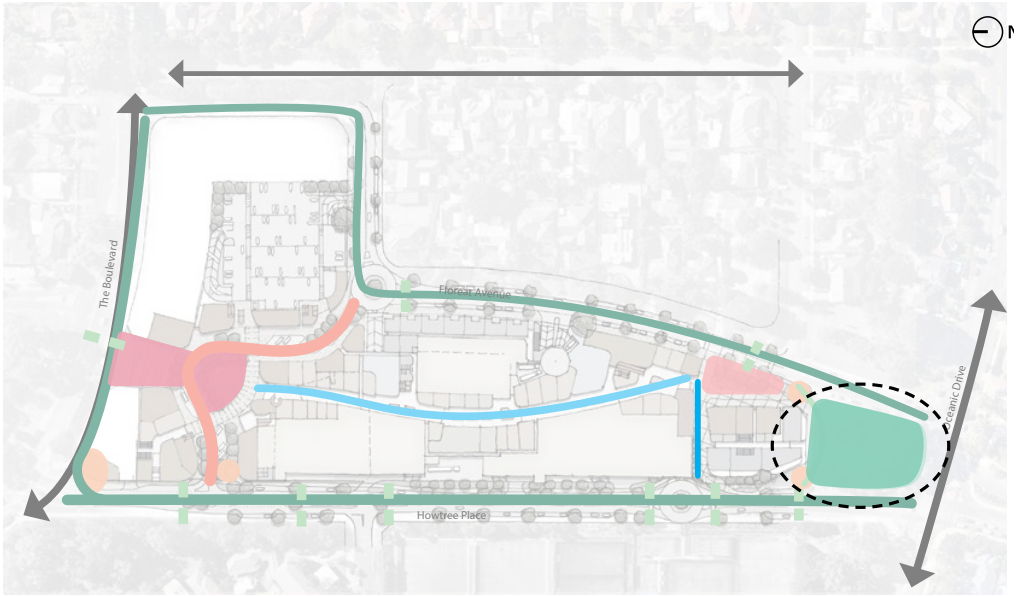
Exemplars











Pocket Park

Pocket parks located throughout the site will provide more intimate public spaces with opportunities for seating and increased landscape outcomes. The location of these spaces will also activate key access points to the site, making for a welcoming pedestrian experience.

Exemplars







Park

The redevelopment of Floreat Forum presents a significant opportunity to leverage the existing, but underutilised park to the south of the site. The park will add to the diversity of the public space available in the precinct, engage with the surrounding green network and the development site immediately to the north.

Exemplars







Part 3 - Design Response 3

6. Movement

The redevelopment of the Floreat precinct aims to improve connectivity to surrounding areas of the site, enhancing pedestrian access and amenity to support more sustainable transport.

The creation of clear movement networks through the site will also improve the pedestrian experience. Key vehicle access points are identified to facilitate access to development sites while the retention / upgrade of public parking will continue to accommodate visitors to the site.

The Transport Impact Assessment (Appendix B) identifies that the proposed development is unlikely to impact the surrounding road network and has the potential to activate this precinct and increase place value. The TIA demonstrates that PSP design has the capacity to accommodate future parking demands, and the road network has sufficient capacity to cater for growth in traffic related to proposed PSP.

Community Feedback

What improvements to transport would increase your use of the centre?

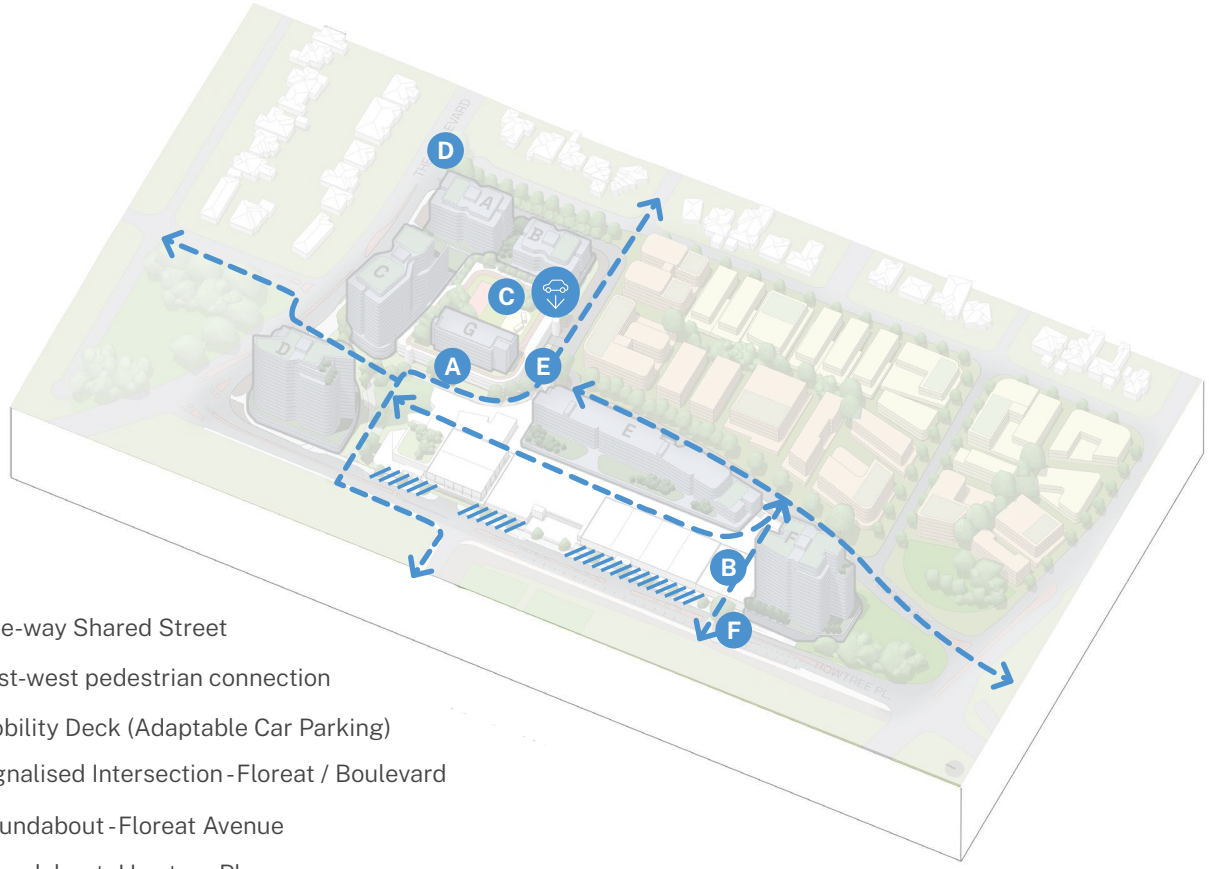
Better footpaths to walk to the centre	44.27%
More car parking	43.37%
Adjustments to the location and design of parking	41.33%
More bike paths, bike racks and end of trip facilities to ride to the centre	40.53%
More bus services to the centre, beach and city	40%
Click and collect facilities	16.27%
Direct to boot facilities	13.33%

Are any improvements needed to the streets around the through the centre?

Better street trees and landscaping	47.13%
More shops facing outside streets	34.93%
More connections through the centre	28.95%
Better public transport links	25.84%
No changes required	25.36%
Improvements to the loading areas on Howtree Place	22.01%
More parking on outside streets	10.05%



Floreat Precinct Structure Plan 57



A One-way Shared Street

B East-west pedestrian connection

C Mobility Deck (Adaptable Car Parking)

D Signalised Intersection - Floreat / Boulevard

E Roundabout - Floreat Avenue

F Roundabout - Howtree Place







Design Principles

Improve walking and cycling and public transport accessibility

To provide greater access to both the immediate context, and to the wider City along The Boulevard and Oceanic Drive.

Improve streetscapes and sleeve loading in appropriate locations

To balance the need for deliveries and servicing with broader precinct improvements

Rightsized car-parking to support reciprocity

Through providing a reduced, reciprocal parking rate for commercial development to minimize parking oversupply.

6.1 Pedestrian Movement

A key priority of the concept plan is to improve the pedestrian amenity of the precinct. This is achieved through enhanced entry points into and improved east-west connections through the Centre Core (Floreat Forum) precinct, as well as proposed incremental improvements to the surrounding streets within the precinct to accommodate pedestrian desire lines.

In regards to key entry point into the Centre Core (Floreat Forum) site, the Boulevard access point has been opened significantly to increase permeability and surveillance. This entry point is collocated with new publicly accessible open space, providing a new destination for the surrounding community. Complimenting this entry point is the maintenance and enhancement of the southern entrance. This is also proposed to be collocated with public space and provides a highly active and inviting space into the core precinct. An internal arcade space then connects through the site completing a strong north-south connection to green spaces and beyond to the surrounding community.

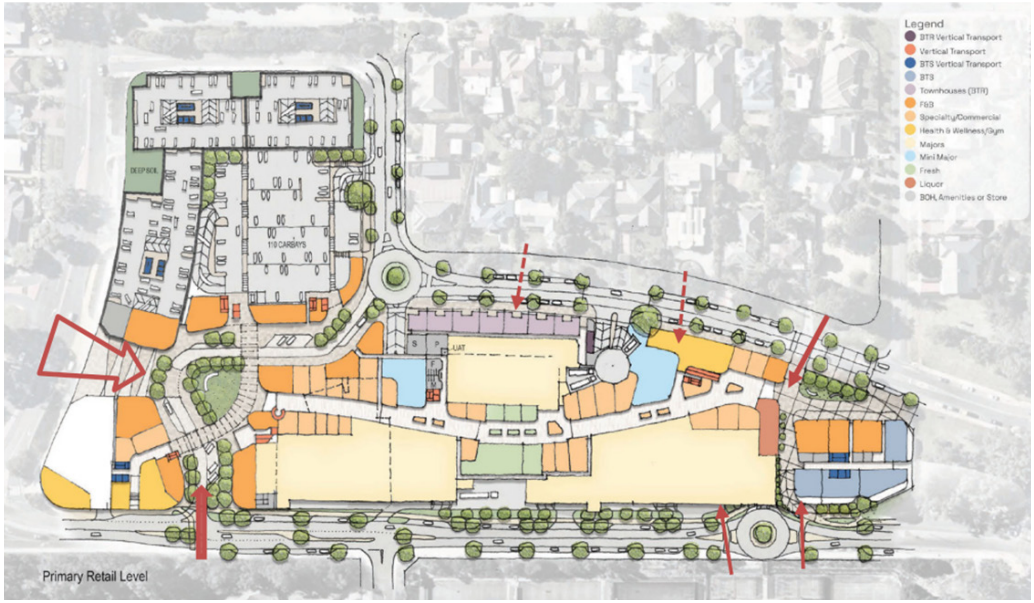
Two new pedestrian thoroughfares are also created to connect the site from East to West. The most significant of these is the key internal main street that provides a direct connection from Floreat Avenue through to Howtree Place. This street is envisaged to be a pedestrian priority space, with low-speed vehicle traffic and highly activated edges. It is proposed to be held in private ownership, with a public access easement granted to the community in perpetuity. A secondary east-west link is also proposed to the rear of the southern development site. This provides a link from Newry Street, through the southern entry plaza, to Howtree Place and the community facilities within Floreat Park.

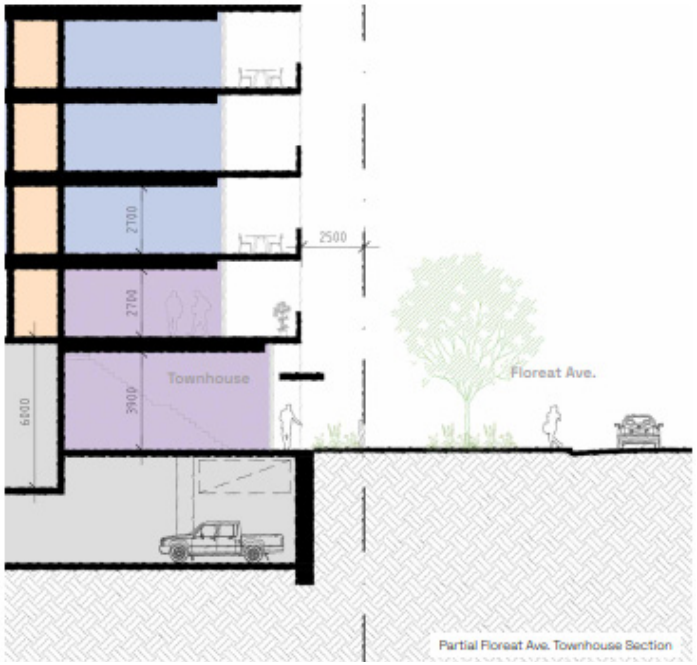
Finally, pedestrian movement is proposed to be enhanced within the precinct through the upgrade of key streets in partnership with the Town of Cambridge. This includes proposed modifications to Howtree Place, providing more generous footpath space and landscape, as well as formalised on-street car parking on both sides of the street and improved streetscapes at key pedestrian access points. In addition, Floreat Avenue is proposed to be upgraded, to again provide improved pedestrian amenity and more formal on-street car parking arrangements.

These upgrades are proposed to be augmented with improved interfaces with key streets and public spaces, particularly through improved built form relationship with the public realm, sleeving car-parking and the placement of activated uses toward the edge of the site.

Other precinct streets, including Newry Street and Hornsey Road are proposed to be retained as per the current treatment, noting their generous reserves widths, landscaping and footpaths. Incremental improvements to landscaping may be considered by the Town of Cambridge

The proposed design clearly enhances the pedestrian amenity of the site, and provided for improved connectivity through new pathways and enhanced entry points across the precinct.





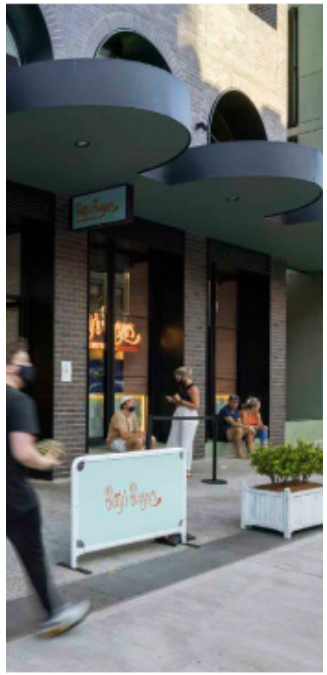


Figure 18 - Activated Ground Plane and Pedestrian Amenity

6.2 Cycling / Micromobility Movement

Floreat Forum currently offers limited bicycle parking and access, which may discourage potential cyclists and likely places more pressure on car parking and surrounding road networks. The Department of Transport's Long-Term Cycling Plan (LTCN) has allocated Howtree Place as a Secondary Cycling Route; sections of The Boulevard (between Howtree and Empire Avenue) as Secondary Cycling Routes; and adjoining streets to the Boulevard are Local Routes. The Town of Cambridge Cycling Strategy mostly aligns with the LTCN, with the exception of The Boulevard which is a Secondary Cycling Route through the precinct area; and Floreat Avenue has been designated as a Local Cycling Route. The upgrading of these routes should be considered as part of broader streetscape upgrades within the Floreat Precinct as soon as possible, to improve access for cyclists and other forms of micromobility to accommodate all ages and abilities.

As the cycling catchment is quite significant, this has the potential to modal shift and alleviate pressures on parking and adjacent road networks.

In relation to bicycle parking, the number of short and long-term bicycle parking bays required to be delivered as part of the redevelopment will depend on the number of dwellings provided through future development. The table below shows the minimum statutory requirements for commercial and residential bicycle parking bays. It is also crucial that end-of-trip facilities are provided along with parking. Under LPP 3.13, for the minimum of 22 long-term commercial car bays a minimum of 2 storage lockers, 3 men's showers and 3 women's showers need to be provided. Parking areas for micro-mobility modes also need to be considered. This can include simple, paved areas for short-term parking through to defined storage for scooters and skateboards.

		Total Bicycle Parking Requirement	
Land Use	**Yield**	**Minimum Long-term Parking** *Employee Resident Spaces*	**Minimum Short-term Parking** *Visitor/Shopper Spaces*
Residential Apartments - Minimum Yield	670 dwellings	335	67
Residential Apartments - Maximum Yield	950 dwellings	475	95
Shopping Centre (all commercial areas)	22,319m^2	22	45

Total Bicycle Parking Requirement for Residential Component	402 - 570
Total Bicycle Parking Requirement for Commercial Component	67
Total Volume of Bicycle Parking Provided by Proponent	TBC at development application.

Figure 19 - Parking Requirements in accordance with regulatory documents

6.3 Public Transport Accessibility

The Floreat Precinct area has relatively limited access to public transport when assessed against other comparable inner-urban precincts. This is due largely to the lack of local heavy rail access, together with low relative population density which limits demand for bus services.

With the local population set to increase due to the residential dwellings proposed, there is an opportunity to increase the public transport services in the area including a potential bus connection to nearby heavy rail and other significant destinations.

The precinct plan incorporates future improvements in bus services through consideration of the location of existing bus stops that can be upgraded and enhanced, as well as the alignment of key pedestrian movement paths and significant publicly accessible meeting spaces. This includes:

- Bus stop located to the North of the site on The Boulevard and the alignment of key north south thoroughfares and improve open space access point;
- Bus stop located on Howtree Plan and the alignment of the one-way main street;
- Bus stops located on Oceanic Drive and the alignment of north-south thoroughfares and the southern entry plaza; and
- Bus stops located on Floreat Avenue and improved activation and streetscape outcomes.

Whilst there are currently no formal plans to provide additional services within the area, it is clear that additional routes and buses can be provided when demand increases. The increased density within this strategic activity centre, together with enhancement to public realm, cycling and pedestrian infrastructure, ensures the PSP is public transport ready and supports increased investment in sustainable transport initiatives over time.

6.4 Vehicular Access and Parking

The access points for vehicles into the precinct remain the same, with the addition of the one-way internal circulation route that runs from Howtree Place to Floreat Avenue.

The TIA provided as Appendix B confirms that the surrounding street network is capable of supporting the proposed development with the following key adjustments:

- A new roundabout at Floreat Avenue to provide for access / egress into the Floreat Forum site, particularly for the introduction of the one-way main street and new loading / car-parking requirements;
- A new Howtree Place roundabout to access into rearranged car-parking under the Floreat Forum Shopping Centre, and as a traffic calming measure to slow vehicles speeds down within the area; and
- Signalisation of the Floreat Avenue / The Boulevard intersection to improve access and egress into the precinct. Timing of this upgrade will be dependent on growth in passing traffic and transport modelling associated with each future development application.

With regards to residential car-parking, preliminary assessment contained in the TIA concludes that the centre can accommodate sufficient car parking for residential component, even if developed according to the highest scenario. This includes up to 1125 passenger car parking bays based on the maximum yield of 950 dwellings in the Centre Core precinct, noting less bays will need to be provided if fewer dwellings are proposed. Additionally, if shared micro-mobility schemes, communal vehicle pools and local shuttle buses are provided, there is scope to reduce the residential car parking requirement.

All residential car parking is proposed to be provided in basement car parking or sleeved within the podiums of buildings. All major development sites have been planned to be 'self-sufficient' in terms of minimum levels of car parking provision.

In regard to commercial parking, the Town of Cambridge's Local Planning Policy 3.13 would typically require 893 parking bays to be provided for commercial purposes under a flat rate of 5 bays per 100m2 which is applied to shopping centres which exceed 1500m2 in size. Noting the size of this centre compared to other district centres in Perth and the future co-location of commercial and residential land uses within the Precinct, a lower parking rate should be considered for the site. Testing contained within the TIA in Appendix B demonstrated that a parking rate of between 3-4 bays per 100sqm of GFA is sufficient for the centre, particularly given the reciprocal nature of anticipated land uses.

Commercial car parking has been considered in the concept planning for the site, and is proposed to be contained under the Floreat Forum site accessed via Howtree Plan, and within the 'Mobility Deck' (an adaptable above ground structure) accessed primarily via Floreat Avenue and The Boulevard.

Parking for delivery and service vehicles is also required to deliver goods and services to residential and commercial land uses. The statutory requirements specify that 18 parking bays should be allocated for these vehicles. Servicing of the retail core precinct is proposed off Howtree Place, with an additional smaller servicing point off Floreat Avenue.

It will be important for the future of this Activity Centre that vehicular parking is not over-provided. Therefore flexibility should be provided for future development applications to avoid undersupply and overuse of parking. The following initiatives may be considered in a reduction of parking rates:

- Commercial operators should offer incentives to people utilising active transport modes;
- Implement micro mobility and/or mobility as a shared service (MaaS) schemes along with increased public transport services;
- As a minimum, residential visitors' parking bays can be used reciprocally with commercial parking; and
- Parking management initiatives including timed parking, pick-up/drop-off zones, etc as outlined within the TIA report.

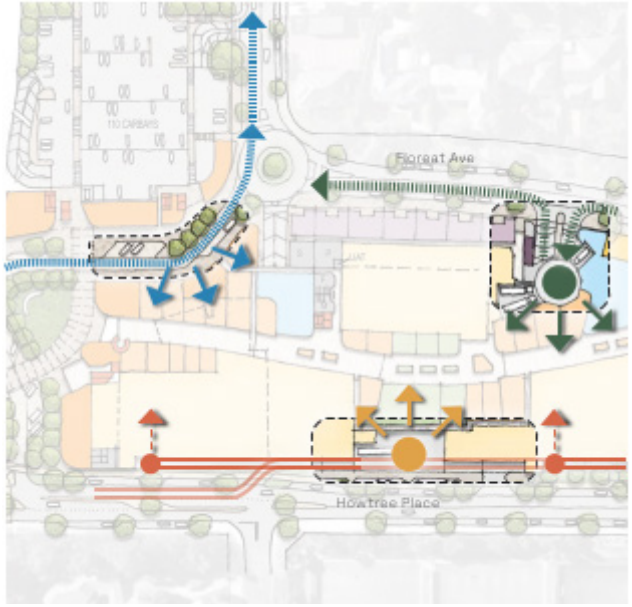


Figure 20 - Site Servicing Strategy

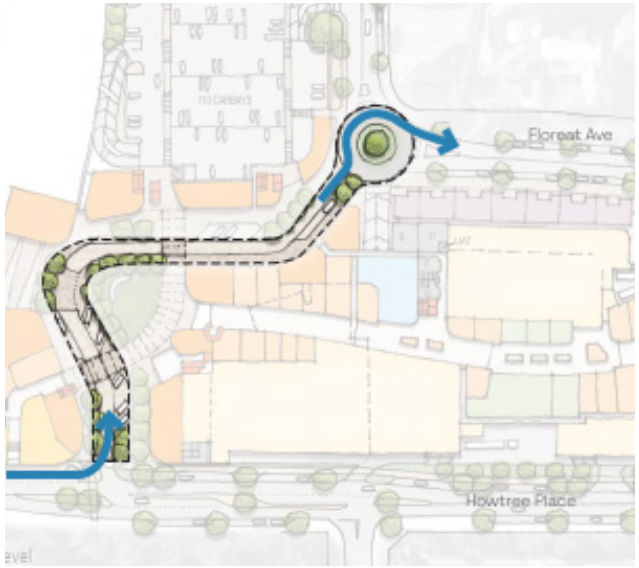
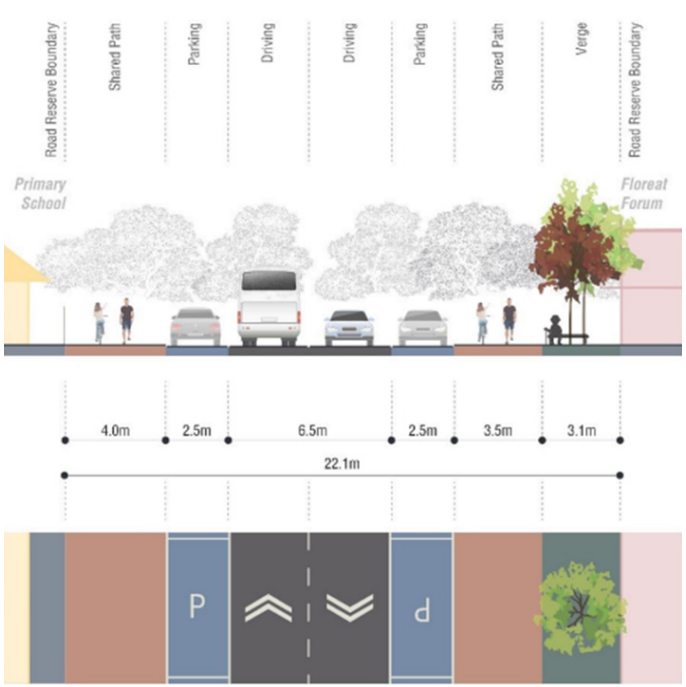


Figure 21 - Internal Main Street

6.5 Road Hierarchy and Cross-Sections

The Boulevard, Howtree Place and Oceanic Drive are designated as Distributor A roads while Floreat Avenue is an Access Road. Indicative cross sections are detailed below.

Howtree Place



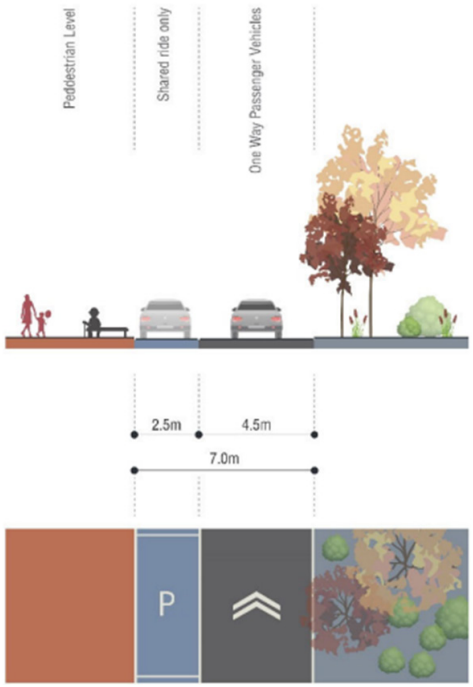
Howtree Place one lane per carriageway along with on-street parking available on both sides of the road reservation. It also proposes 3.5 to 4 metre shared paths on both sides of the road, to provide sufficient space for pedestrians, cyclists, and other modes of micromobility.

Floreat Avenue



Floreat Avenue proposes a similar road configuration, however with slightly less allocated road pavement width for motor vehicles. This is acceptable considering it carries significantly less vehicles than a Distributor A Road.

Internal Road



The proposed internal road travelling through the precinct permits motor vehicles as well as pedestrians/cyclists. The road allocation is one lane, one way only and permits only passenger vehicles. It also has allocation for on-street parking on one side of the road for shared ride only. There is also allocation for two-way pedestrian, cycling and micromobility movement throughout the site.

Part 3 - Design Response 3

7. Land Use

Floreat Forum is a valued community asset that provides key retail and commercial functions servicing the weekly needs of the surrounding community.

While the community value the existing functions, it is clear an opportunity exists to increase and diversify the commercial and community offering, particularly with the Town's vision to increase residential density within the Floreat Activity Centre.

To meet the future needs of the community, the land use vision for the area is to transition the precinct from one that is primarily retail focussed to an area that is genuinely mixed-use – providing opportunities to live, work, play, learn and visit.

Community Feedback

What offerings could be improved?

Restaurants and cafes	73.04%
Fashion	48.53%
Bars	35.54%
Cinema and Entertainment	34.80%
Fresh food	34.07%
Pop up events	20.59%
Supermarket	19.85%
Residential Apartments	19.85%
Aged Care Housing	12.01%
Medical	9.56%
Fitness and Wellness	9.56%
Office, co-working and business services	8.33%

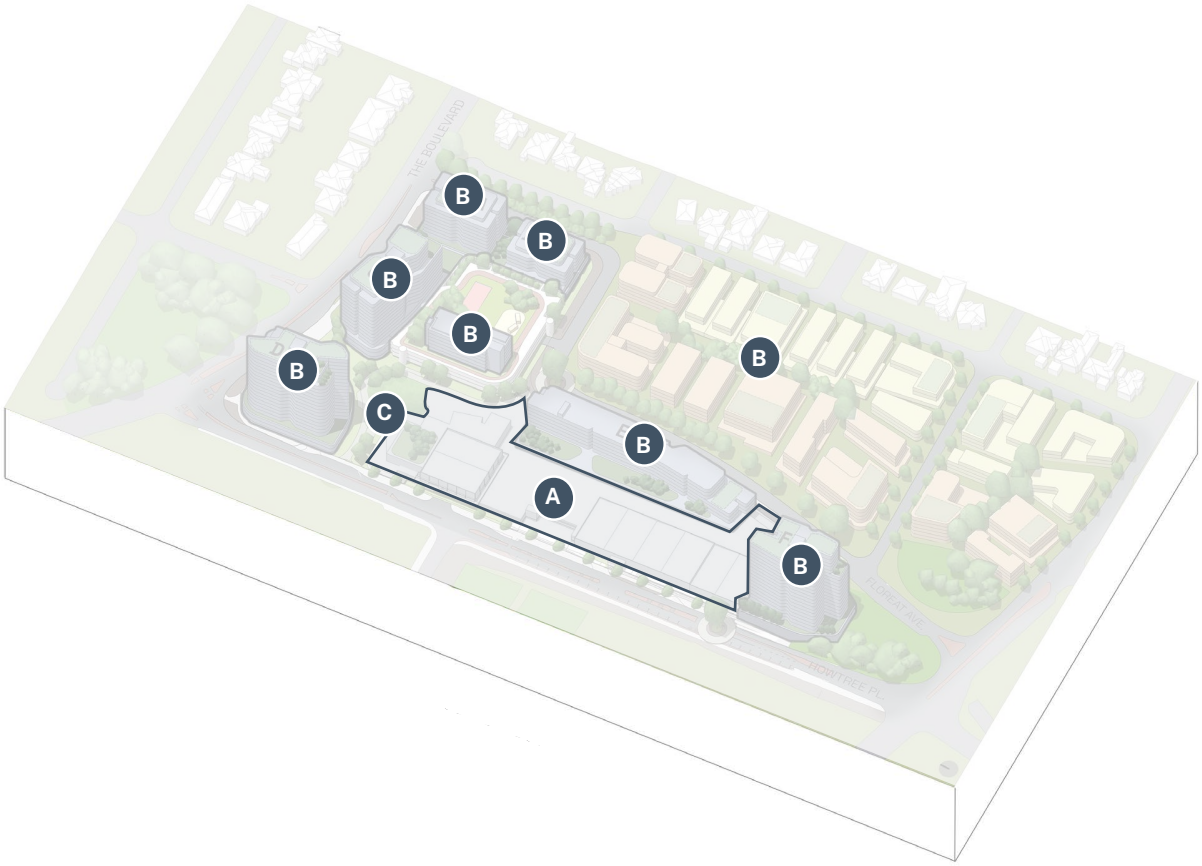
What features and amenities are important?

Landscape spaces and greenery on the building	76.22%
New dining and entertainment options within Floreat Forum	75.41%
Environmental performance of building	58.92%
Health and wellness options within Floreat Forum and adjoining parklands	36.76%
Private resident only gym and pool facilities	28.11%
Views to city	17.84%
Private dining and entertainment areas	15.41%



Floreat Precinct Structure Plan 63

Part 3 - Design Response









Design Principles

A Remain an everyday, convenience destination

but broaden land-uses to become a more mixed use and sustainable precinct, adding entertainment and wellbeing uses to enhanced retail offering.

B Become a living precinct

through new residential, build to rent and short stay accommodation provided on site to make the most of local amenity, aspect and views.

C Curate local retail and food and beverage

offer to create a highly active and desirable destination, and locate these uses to amplify the qualities of new public spaces north, south and centrally within the precinct.

Floreat Precinct Structure Plan 64

Part 3 - Design Response 3

A diverse land use mix for the precinct.

One of the key vision elements of the PSP is to transition the Floreat Forum asset from one that is primarily retail focussed to a facility that is genuinely mixed-use – providing economic, social and community benefits to the wider region.

To understand the land use requirements of the area and how this transition might occur, Hatch undertook a needs assessment across various land use types (Appendix E). The needs assessment was designed to be compliant with Draft SPP 4.2 – Activity Centres (October 2000), and also considered how to sustain its own demand for additional retail and commercial floorspace driven by greater volumes of residents in the activity centre and a higher local worker population.

To inform the opportunity for supporting land uses including health, wellness, medical, strata office and recreational facilities, benchmarking of several other mall-based activity centres throughout Perth and other locations in Australia was also undertaken to understand how this mixed-use transition could occur.

The analysis found that an expansion of retail floorspace recommended by 2031 equates to 5,000 sqm of food and grocery retailing including liquor, 2,000 sqm in restaurant & food catering and between 3,000 and 4,000 sqm in non-food retailing including mini majors and retail services. Further expansion opportunity beyond 2031 exists supported by an additional local residential catchment at the subject site. In addition, the findings concluded that additional land use diversity can potentially be supported in the future such as complementary office / commercial and entertainment focussed uses.

In support of these findings, the concept plan that supports the PSP accommodates an expansion of approximately 5,000sqm, with additional space able to be provided in the future if necessary, particularly through upper level expansion.

Land uses have been arranged on site to create a highly activated ground floor and a diverse mix that:

- draws people to and through the site through centrally located major everyday retail supermarkets;
- Supports speciality retail and fresh food to activate the internal mall;
- Creates food and beverage drawcards to activated ground floor public spaces to the south, north and throughout the internal street;
- Offers a small amount of mixed use potential within the residential transition precinct; and

Together with the creation of public space on the ground floor and broader activity drivers of residential and commercial, the precinct is capable of becoming a highly activated community hub in line with the project vision.

As this PSP is a long term planning framework, the preliminary concept plans assume the relocation of the Town of Cambridge Library to an alternative location offsite. However, sufficient flexibility is also proposed within the plan allowing a portion of redevelopment to occur with the library remaining, or incorporated within a redevelopment site. As the Library site is under Town of Cambridge ownership and control, this will be subject to long-term community infrastructure planning and Council decision making processes.

Floreat Precinct Structure Plan 65



Figure 22 - Ground Floor Concept Plan

A living precinct

In line with the Town of Cambridge's vision for the precinct, residential led land uses are proposed within the precinct to support its intended future function.

An assessment of the residential market opportunity including supporting components such as aged care confirms that Floreat can play an important role in providing housing diversity for the Floreat / City Beach and wider sub-market.

The population is expected to age significantly, and this will drive downsizer activity for those aged 55 to 75 together with demand for aged care accommodation for those aged 75+.

Given the site's significant surrounding amenity and connectivity, the study also confirms Build to Rent and short stay accommodation have the potential to be accommodated on the site in the future.

Residential land uses are positioned throughout the precinct, and have been carefully located to provide an appropriate transition to surrounding lower density housing. They are intended to offer diverse housing options to the community, focussed on the 'missing middle' within the Centre Transition and Residential Transition precinct and high-density apartment living within the Centre Core Precinct (Floreat Forum site), located away from sensitive edges.

The precinct concept supports this policy and market demand, providing mixed-use development sites to deliver between 950-1250 new dwellings.

Supporting this future residential community are local community facilities, particularly within new public spaces and more formal facilities located directly west of the site. The residential apartment buildings will also be provided with semi-private communal facilities in line with policy requirements.

	Yield Density (Apt Nos)		
Building	**Low**	**Mid**	**High**
A	65	75	100
B	45	60	75
C	130	165	195
D	160	180	215
E	140	170	195
F	130	150	170
G	Potential short stay accommodation		
Residential transition	140	160	180
Centre transition precinct	70	90	120
TOTAL	**880**	**1050**	**1250**



A supportive zoning framework

The Town of Cambridge LPS 1 currently assigns a District Centre zone to the Floreat Activity Centre, with an R12.5 coding for the Residential Frame areas. The objectives of the District Centre Zoning include creating a community focus point, providing for weekly needs, ensuring a mix of commercial and residential development and providing for a range of different types of residential accommodation, including high density residential. These objectives are considered consistent with the vision and intent of the PSP. In addition to the above, major land uses proposed within the PSP are able to be approved under the Zoning Table, allowing development anticipated within this PSP to proceed. An exception to this is the residential frame area, which currently has an R-Coding of 12.5, which would not allow for mixed use or multiple dwellings to be development in line with the vision and intent of the PSP.

Through the preparation of the Town's new Town Planning Scheme No. 3, the Town may wish to consider a rezoning of the precinct area. "Centre Zone" is considered the most appropriate zoning for the future use of the site. As outlined in the Model Provisions, this zoning would designate land for future development as a town centre or activity centre and provide a basis for future detailed planning in accordance with the structure planning provisions of the Scheme or the Activity Centres State Planning Policy. Development of the residential frame could be accommodated by the assignment of R-100 and R-60 coding.

This Precinct Structure Plan then provides the supportive statutory framework within Part One to transition the precinct in line with the vision and indicative concept plan.

Key land use controls within the PSP include:

- Upcoding of lots fronting Hornsey Road from Residential 12.5 to Residential R-60, providing the opportunity for high quality multiple dwellings within the precinct;
- Upcoding of lots fronting Floreat Avenue from Residential 12.5 to Residential R-100, again providing the opportunity for high quality multiple dwellings
- Providing a "Centre-Mixed Use" land use within key development sites surrounding the centre to activate podiums and residential RAC-0 indicative tower footprints; and
- Maintaining the "Centre – Retail" component for the core Floreat Forum but noting the need for land use flexibility for the centre to evolve and appropriately activate key areas of public space.



Part 3 - Design Response 3

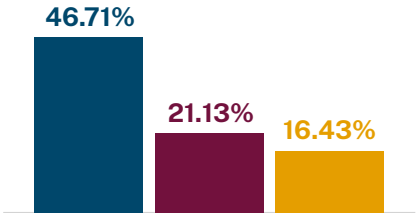
8. Built Form

The built form response aims to provide varied building typologies to suit the specific context of the site with careful consideration for the transition to the surrounding residential context.

At the ground level, fine grain detail and activated frontages will provide visual richness, while the upper levels will be set back and carefully designed to respect the surrounding context. Architecture will provide a contemporary interpretation to the site's context and history, reflecting the mid-century architectural style.

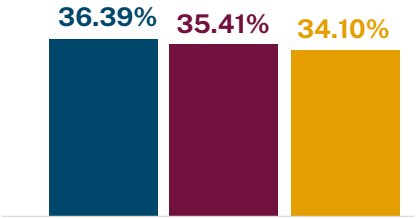
Community Feedback

What style of architecture do you prefer?



- Go for a new modern contemporary style
- Expand in a similar style to the existing buildings
- Go back to the old original building style of Floreat Forum

How would you look to arrange building heights over the site? (Select one or a combination).



- Reduce the retail areas and redevelop at 6 storeys over the entire site
- Improve the retail areas at the existing heights and place 8-12 storey buildings along the northern, eastern and southern edges of the site
- Improve the retail areas at the existing heights, substantially increase the amount of open space and place buildings over 12 storeys at the northern and southern ends only



Floreat Precinct Structure Plan 69

Part 3 - Design Response









Design Principles

A Retain an operating, commercially viable centre

Through acknowledging long-term leases of supermarket operators and pushing new development to the outer edge of the precinct to avoid conflicts with land use, access and lift structures.

B Transition built form to surrounding neighbours

Stepping buildings down to the east within the residential transition precinct to acknowledge the residential outlook and character of the area, progressively moving to taller building elements to the west away from sensitive interfaces.

C Create new landmark development sites

That can be independently and incrementally developed over time and ensure architecture of the highest standard noting the landmark aspects of the envisaged built form.

Floreat Precinct Structure Plan 70

8.1 Transition of built form to surrounding neighbours

Centre Core

A key consideration of the built form strategy has been the layout and functional arrangement of the existing Floreat Forum shopping centre and the associated complexities of redevelopment. Ultimately, this has resulted in the need to maintain the long-term leases for the two major supermarket operators, and the general layout of the broader centre.

The introduction of a gently curved pedestrian connection through the centre has however provided the opportunity for an additional 'major' in line with retail market advice. In addition, it provides the opportunity for reactivation of Floreat Avenue through sleaved uses such as health and wellness, build to rent, and food and beverage. This is driven by an overarching objective to activate key public streets.

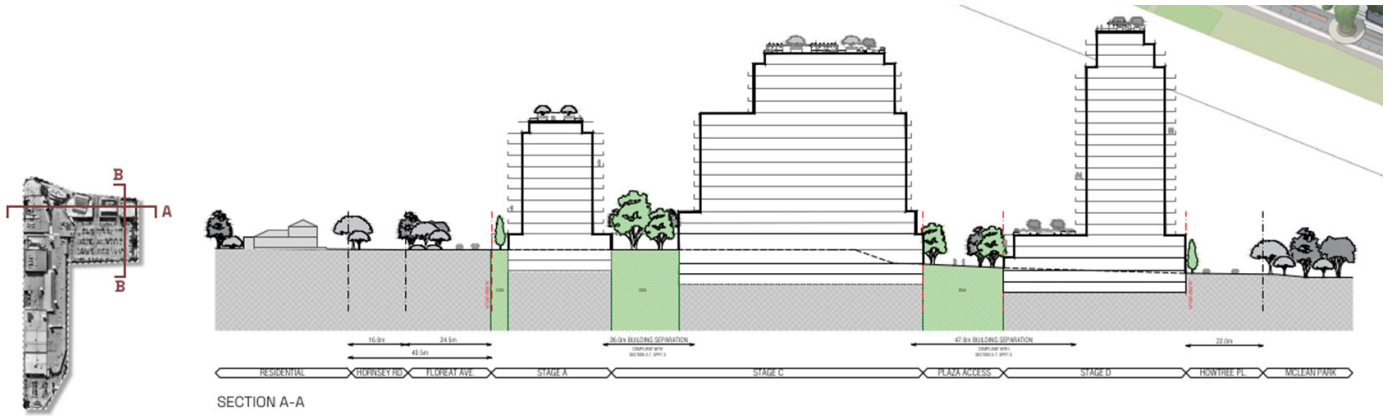
The need to maintain and enhance the operating centre has also influenced the location of major development sites, particularly considering that wholesale demolition, reconfiguration and rebuilding of the centre is not economically, commercially or socially viable. This is demonstrated through built examples across Perth (Karrinyup, Garden City) and Australia (Box Hill, Chadstone etc.) where major development is located around the outer edge of the centres.

Ultimately, this consideration has strongly influenced the location of major development sites within the Floreat PSP area, resulting in a smaller number of taller buildings around the outer edge of the site, that allow for self-sufficient car parking, deep soil and pedestrian access arrangements.

The building height and massing strategy has been carefully considered to balance the potential views of the existing community with the State Government and Town's expectation of additional residential density and commercial floorspace within the activity centre. Greater height is allocated to the North and West of the core precinct, with a transition to reduced height in the east of the core, further transitioning down in scale to the adjacent residential frame.

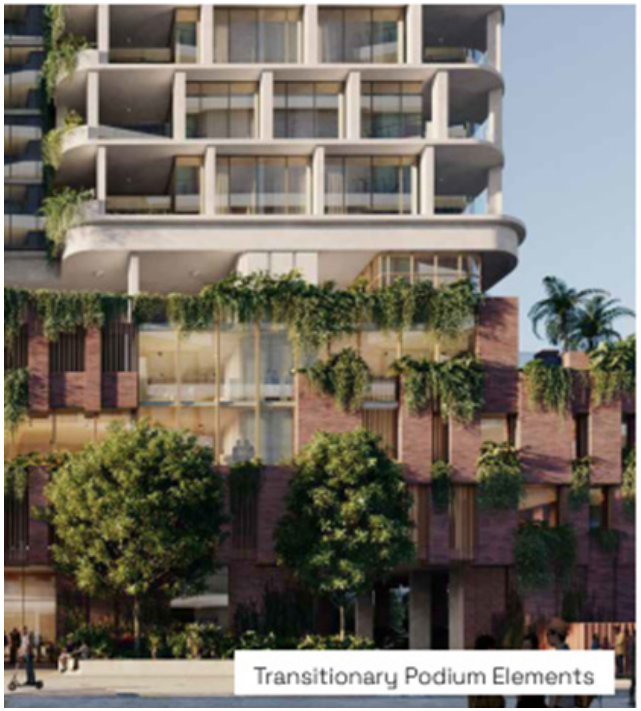
Indicative building footprints, and building heights are designated as part of this PSP. Within the core development area, landmark buildings will be located at the prominent Northern corner and Southern corner, away from sensitive interfaces and adjacent to existing landscaped open space buffers. Tower massing is to be carefully sculpted and set back from podium boundaries to provide good built form outcomes that maximise amenity in the public realm, and mitigate impact to neighbours. Heights are prescribed in Part 1 of this PSP, with landmark development sites ranging from between 16-20 storeys, and other development sites in the core ranging from 7-18 storeys.

Podium levels will range from between 2-5 storeys in height. Podiums will provide active frontages to the public realm as well as opportunities for communal areas and on-structure planting on the podium roof.



SECTION A-A




Transitionary Podium Elements




Transitionary Podium Elements




Sculpted Tower Elements

Transition Precincts

Transition Precincts consists of low-medium rise forms. This tapers up to mid-rise articulated podiums, which negotiate the middle ground between low and high built elements. The transitional zone comprises of two distinct areas: the centre transition precinct and residential transition precinct. These precincts are distinguished by their respective height, which steps down west-east from the Precinct Core to the residential development. The Centre transition precinct will comprise of development of 4-5 storeys at an R100 density, while the residential transition precinct will provide approximately 3 storey development at an R60 density.

Built form testing has been undertaken to consider the resultant development on a single and amalgamated lot within these precincts. The testing confirmed a compliant R-Code arrangement and an efficient building structure for both typologies. An increased 6-metre rear setback has been included to allow for the provision of deep soil, increased setbacks between building forms, and the potential retention of significant trees on site.

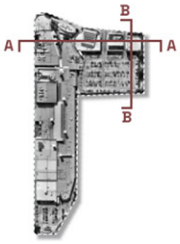




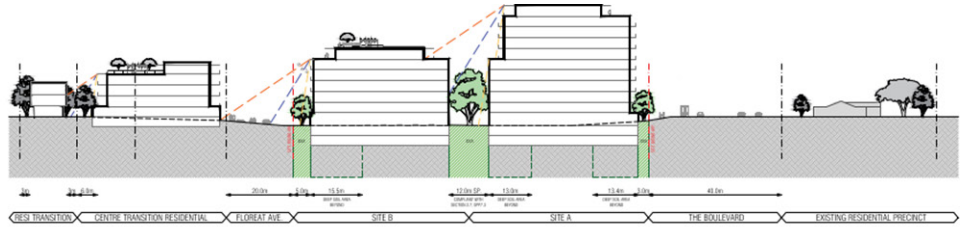








Built Form Transition



SECTION B-B

Building character

The context and character analysis of the broader Floreat area highlighted the rich architectural history of both the site, and Floreat more broadly. This mid-century style together with the garden suburb layout is valued by the community as a unique element of the local character.

With its inception as Perth's first American style mall in the style envisioned by Victor Gruen, and its design and construction in the 1960's, Floreat Forum was originally designed in the mid-century modernist architectural style. These malls were envisioned as walkable, diverse and livable town centre which was pedestrian focused as well as community-oriented, with "garden courts" integrating landscape and built form. Whilst these elements have not always prevailed as malls became more dependant on private vehicles, the original design intent provides guidance on the future redevelopment of Floreat Forum. Key design elements include:

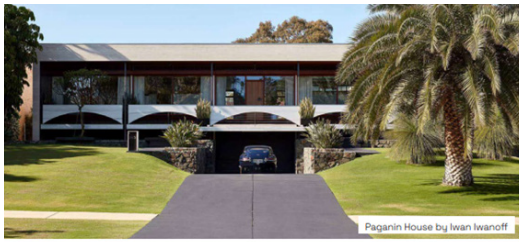
- Civic meeting places
- Pedestrian colonnades
- Importance of landscape integration

More broadly, as the suburbs of City beach and Floreat were being developed, the mid-century architectural style emerged as a prevailing typology. This is exemplified by the works of Iwan Iwanoff, notably Paganin House and Lifford Road.

To imbue future development with a sense of place, and further integrate it within the garden suburb setting future development should look to reflect some of the simple and elegant mid-century architectural form. This may be further developed through design guidelines if considered appropriate by Council.















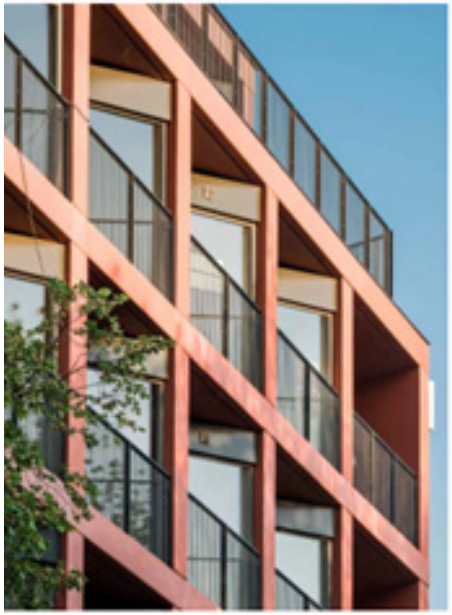


Ground plane design

Given the significant scale of the proposed development, careful consideration of the ground plane should be made as part of future development in accordance with the PSP to provide the best experience for residents, shoppers and visitors to the area. This includes consideration of elements such as:

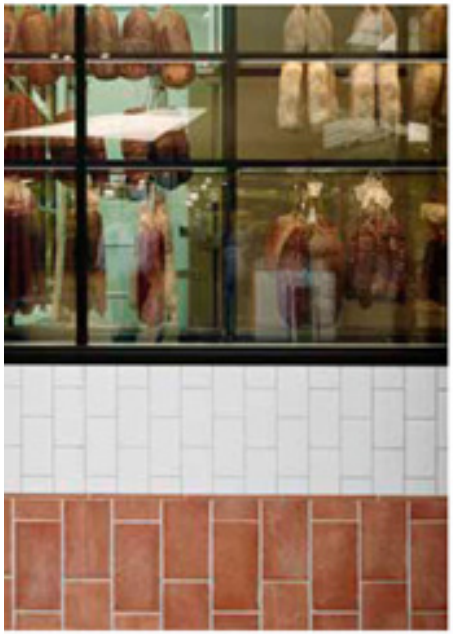
- Activated ground planes;
- Character, materiality and integrated landscaping that link built form to existing Floreat fabric;
- Stall risers and reduced large expanses of commercial glazing;
- Materials that reference the history of Floreat - Mid Century and inter-war bungalows;
- Opportunities for structured landscaping; and
- Simpler materiality at the upper levels.

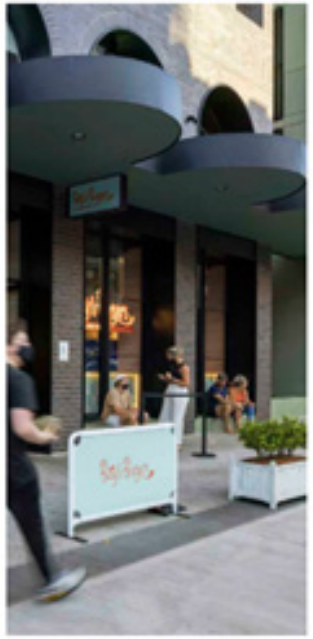
These considerations are matters of more detailed design that should be identified and progressed through the Development Application and design review process.













9. Conclusion

Floreat Forum presents an opportunity to revitalise one of Australia's earliest, 20th century mall-style shopping centres to create a walkable, people-orientated and truly mixed-use centre for the 21st century, adding much-needed diversity of housing opportunities in the Town of Cambridge.

Floreat Forum is highly valued by the community and plays an important role in the day-to-day lives of the residents of the surrounding suburbs. It is unique in its mix of two supermarket retailers and supporting specialty retailers and is a cornerstone of the surrounding civic and community heart of Floreat.

The potential for the precinct is identified in the Town's Local Planning Strategy, which identifies the Forum and surrounding residential frame as a key site for mixed-use development contribution, with an aspirational 1250 dwellings and an expansion of commercial floorspace.

The Floreat Precinct Structure Plan provides a high-level framework to allow Floreat Forum to reach its full potential as a fully mixed-use centre. The PSP is underpinned by key moves of the delivery of key public and community spaces, enhancing green spaces and deep soil areas, delivering key residential density, all while providing a flexible development strategy that will maintain the key functions of the centre that are valued by the community.



Appendix A - Landscape Masterplan (Aspect)

Appendix B - Transport Impact Assessment (KCTT)

Appendix C - Design Principles Report (MJA)

Appendix D - Servicing Report (Pritchard Francis)

Appendix E - Economics, Retail & Market Assessment (Hatch)


APIL
STRATEGIC • ASTUTE • TRUSTED

HATCH
RobertsDay

trm
COLLECTIVE PTY LTD

ASPECT Studios

kctt

Appendix A - Landscape Masterplan (Aspect)

FLOREAT PRECINCT STRUCTURE PLAN

LANDSCAPE & PUBLIC REALM CONCEPT PLAN

APIL
January 2024



ASPECT Studios

Prepared for:
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Perth WA 6000

Prepared by:
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REVISION NO	DATE	DESCRIPTION	PREPARED BY	APPROVED
A	27.06.23	Issue 1	GF	MR
B	19.01.24	Issue 2	GF	MR

ASPECT Studios

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Design WA - Precinct Design Guidelines

The Site

Aspirations

Green Network

Landscape Concept

Existing Trees

Planting Strategy

Deep soil

Tree canopy

Landscape Opportunities on Podim

Introduction

The landscape design for the Floreat Precinct Structure Plan, has been prepared by ASPECT Studios in collaboration with MJA Studio, Trbc Architects, Hatch Roberts Day and KCTT in behalf of APIL.

The PSP is seeking to address the Town of Cambridge activity centre aspirations identified within the Local Planning Strategy for the Floreat Precinct. The area has been identified as one of the key infill growth zones within the Western end of the Town with a target of 1250 dwellings.

The design aims to respond to the scale, form and character of the local context providing a pedestrian scaled upgrade that looks at persent and future demographic projections for Floreat.

As part of the development of the project the design team has undertaken a context analysis reviewing the significant natural and cultural features of the site and it's surrounds. This analysis has provided the foundation for the development of the landscape design and grounded the design in its local context.



Design WA - Precinct Design Guidelines

URBAN / CULTURAL ECOLOGY

Topography, Landscape attributes, landscape ecologies, water
Landscape character,Remnant vegetation, Biodiversity, Landscape corridors

- Green networks
- WSUD
- UHI reduction
- Greening, comfort
- Well-being
- Quality of Life
- Aboriginal Knowledge, concepts and stories of place
- Unique built features and heritage
- Remnant Vegetation
- Ecological communities
- Fauna habitat

URBAN STRUCTURE

A well-considered urban structure will be place-responsive: that is, developed with careful consideration of its physical, cultural and economic context to integrate with the surrounding urban fabric and landscape of the area.

- Response to existing and intended future precinct character
- Landscape spaces - plaza, lane ways, play, greens, recreation, dining precincts, street scape, micro greens
- Way finding and Legibility
- Climatic response
- CPTED, inclusive, accessible, safe

PUBLIC REALM

The public realm should provide a range of well-connected, functional and enriching places, appropriate to the function, scale and character of the precinct.

- Range of public spaces - civic, recreation, nature, sporting, multifunctional
- Community Health and Well-being
- Public space audit
- Multi functional and inclusive
- Year round comfort
- Sense of Place - retain and integrate natural character and identity
- Appropriate and meaningful interpretation of Aboriginal Knowledge and history
- Heritage opportunities
- Urban Tree canopy
- Water wise approaches
- Urban greening / community gardens
- CPTED
- Well proportioned and appropriately scales public spaces and streets
- Enhance relationship between public realm and surrounding land uses and activities (mutual benefit)
- Connectivity and legibility
  Integrate services and utilities








The Site


WEMBLEY
GOLF COMPLEX
Grantham St
BEACH
MCLEAN
PARK
FLOREAT PARK
PRIMARY SCHOOL
B
1
The Boulevard
WINMARLEY
PARK
B
Chandler Ave
Orrel Ave
2
3
B
FLOREAT
OVAL
Newry St
MEMORIAL
PARK
PERTH
Howtree Pl
Floreat Ave
PERRY LAKES
RESERVE
B
Oceanic Dr


1


2


3

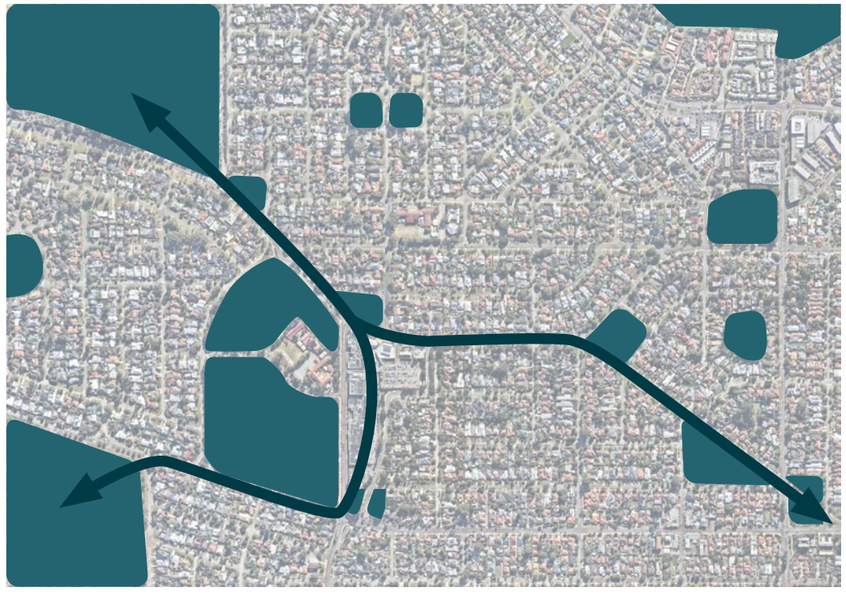
Site Analysis



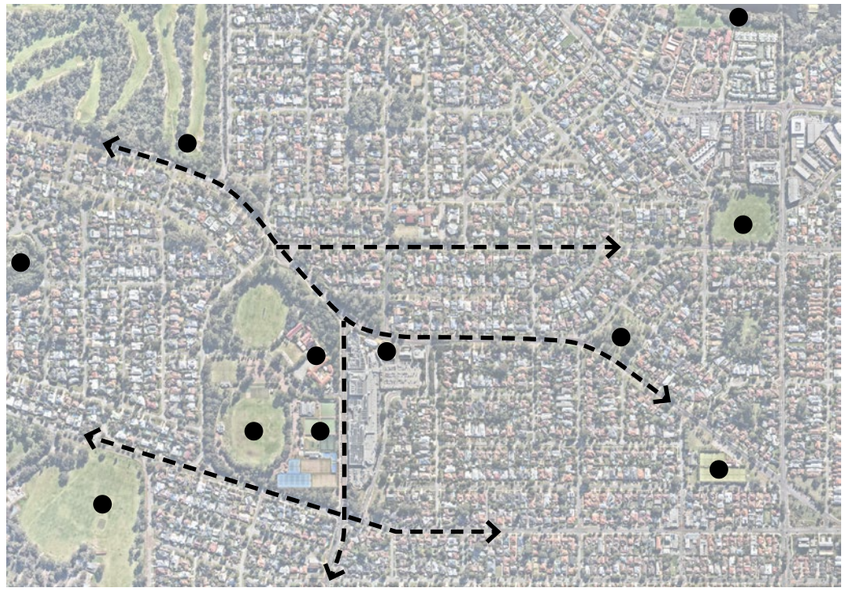
Landmark Trees



Topography



Green Spaces



Community Context

Landscape Opportunities

Connect Communities



Green Links



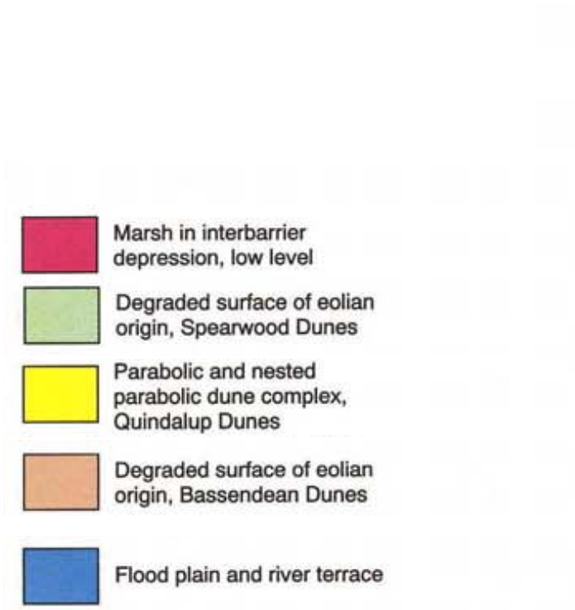
Celebrate the Landscape & Lifestyle



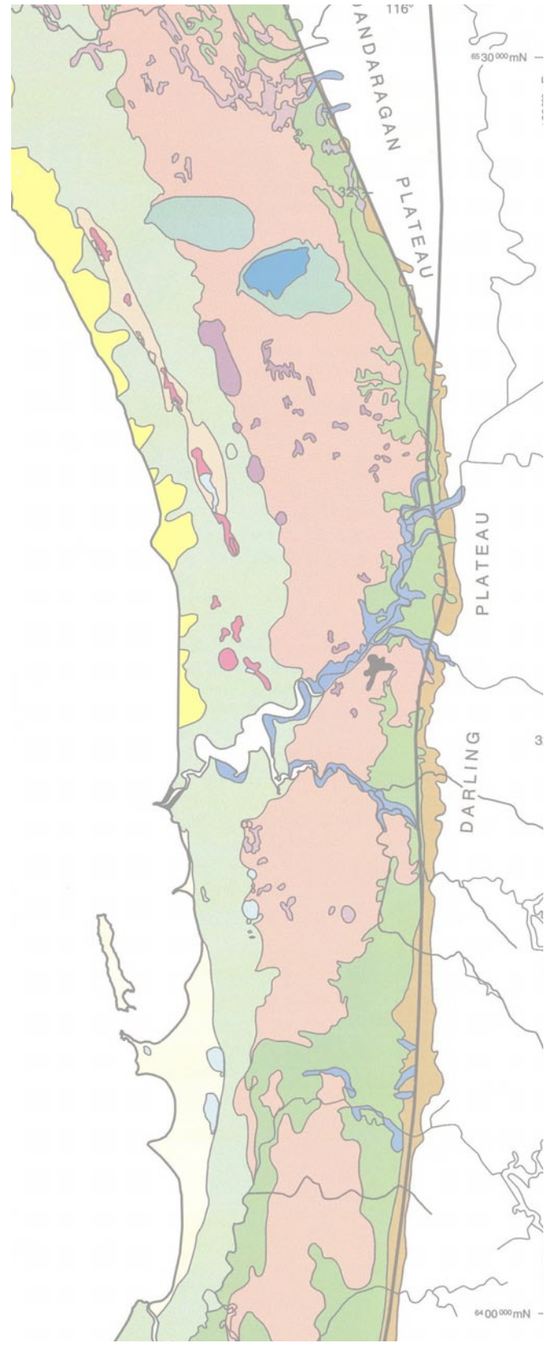
Turn inside Out



Geology - Swan Coastal Plain







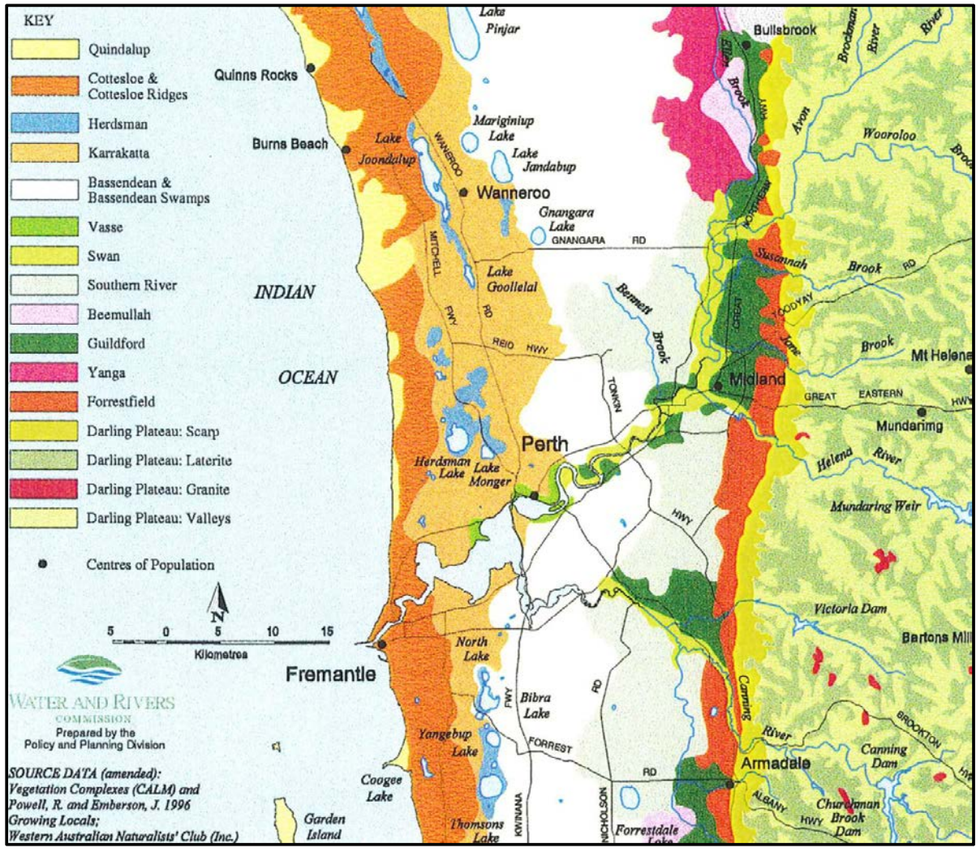
Soil & Vegetation Complexes Types - Swan Coastal Plain

Karrakatta Complex — Predominantly open forest of *Eucalyptus marginata - Eucalyptus calophylla* and woodland of *Eucalyptus marginata - Banksia* species. Found on aeolian deposits of the Swan Coastal Plain.

Cottesloe Complex — Mosaic of woodland of *Eucalyptus gomphocephala* and open forest of *Eucalyptus gomphocephala - Eucalyptus marginata - Eucalyptus calophylla-*, closed heath on the limestone outcrops. The complex is found on the aeolian deposits of the Swan Coastal Plain.

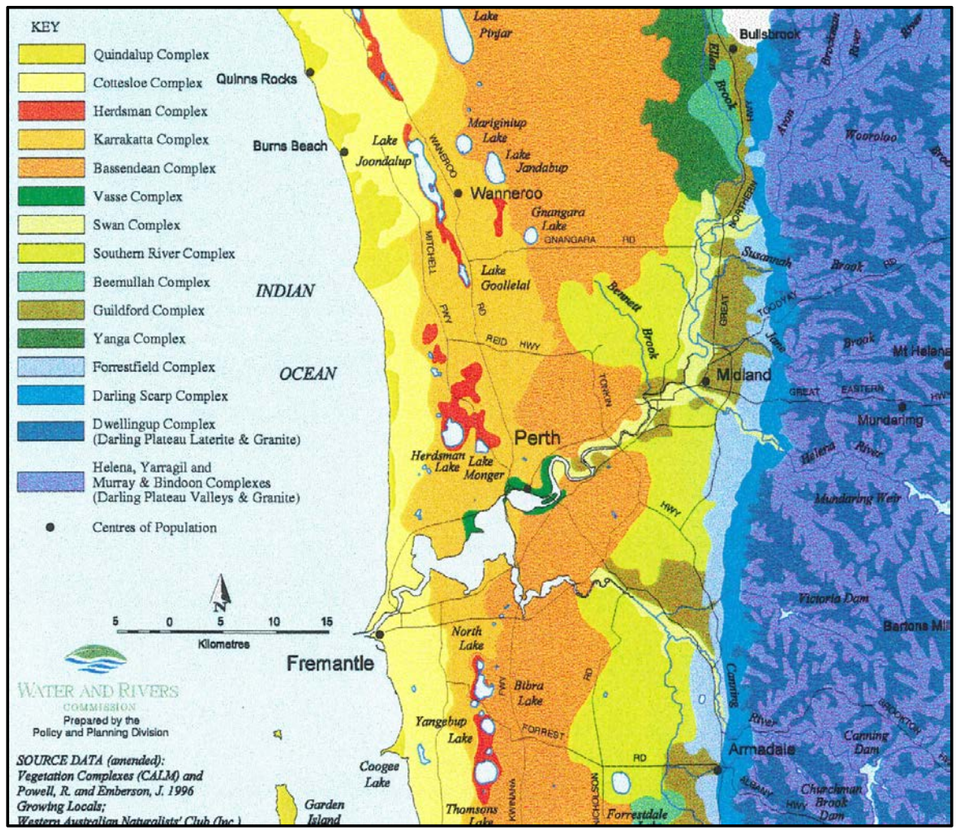
SOIL

Karrakatta Complex



VEGETION

Karrakatta Complex



Soil & Vegetation Complexes Types

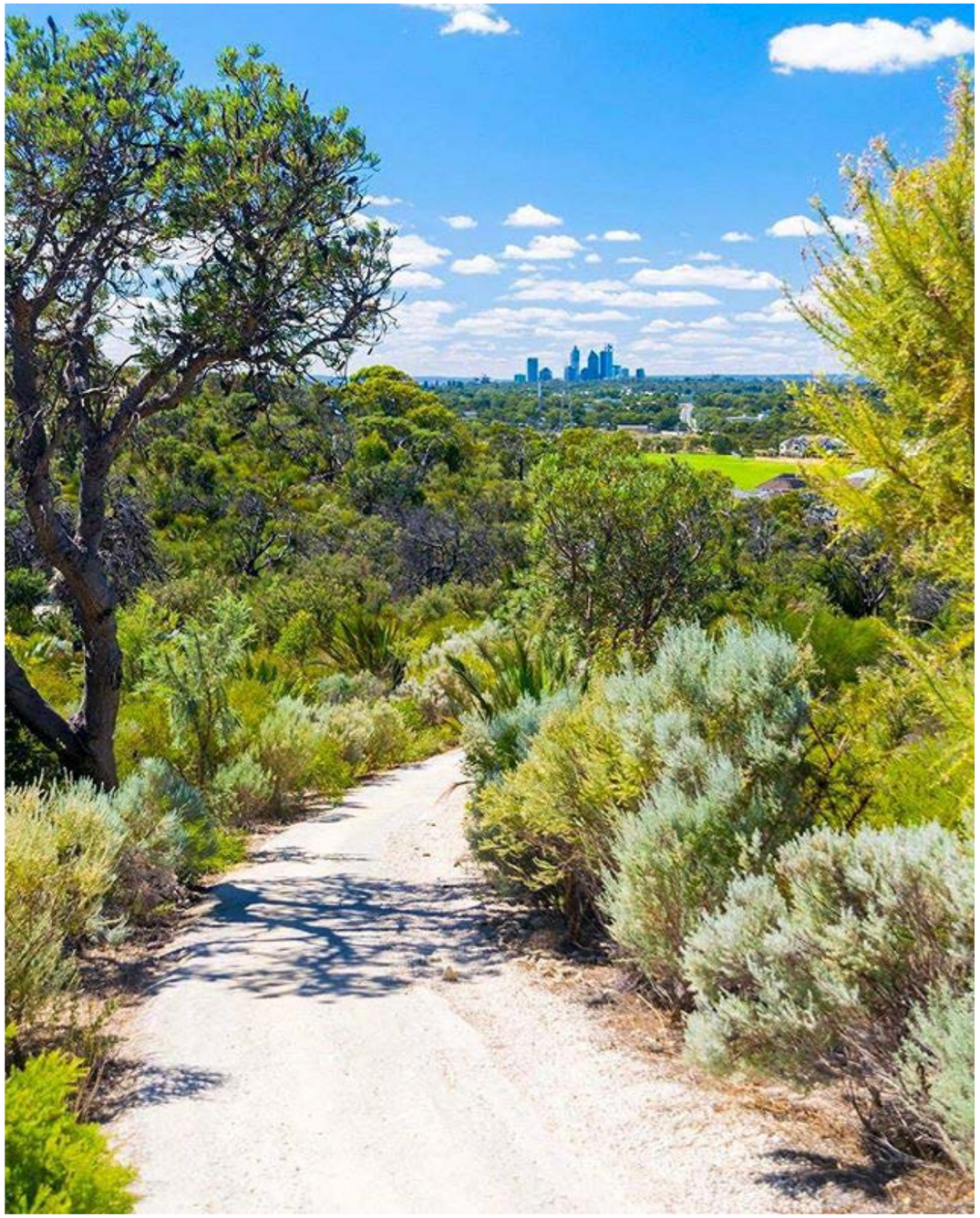
KARRAKATTA VEGETATION COMPLEX

Genus	Species	Common Name	Size	Flowers	Co
Acacia	*cochlearis*	Rigid Wattle	2	Aug-sep	yellow
Acacia	*cyclops*	Red Eyed Wattle	3	Sep-Jan	yellow
Acacia	*pulchella*	Prickly Moses	2	Jun-Oct	yellow
Acacia	*rostellifera*	Summer Scented Wattle	2	Aug-Oct	yellow
Acacia	*saligna*	“Coojong”	6	Aug-Oct	yellow
Acacia	*sessilis*		1	Jul-Oct	yellow
Allocasuarina	*fraseriana*	Common Sheoak	12	May-Nov	
Allocasuarina	*humilis*	Dwarf Sheoak	1.5	May-Nov	
Alyxia	*buxifolia*	Dysentry Bush	1.5	Oct-Nov	white
Anigozanthos	*humilis*	Catspaw	0.5	Aug-Oct	yellow/
Anigozanthos	*manglesii*	Mangles Kangaroo Paw	0.5	Sep-Nov	red/gre
Austrodanthonia	*caespitosa*	Ringed Wallaby Grass	0.5	Oct-Nov	
Austrostipa	*elegantissima*	Feather Spear Grass	2	Aug-Jan	
Banksia	*attenuata*	Candle Banksia	8	Sep-Oct	yellow
Banksa	*dallanneyi*	Couch Honeypot	low	May-Sep	gold
Banksia	*grandis*	Bull Banksia	8	Sep-Dec	yellow
Banksia	*menziesii*	Firewood Banksia	8	Feb-Aug	red
Banksia	*prionotes*	Saw Tooth Banksia	8	Feb-Aug	orange
Banksia	*sessilis*	Parrot Bush	4	May-Nov	yellow
Baumea	*juncea*	Bare Twig-rush	1	Oct-Jan	brown
Baumea	*vaginalis*	Sheath Twig Sedge	1.2	Oct-Nov	brown
Beaufortia	*elegans*	Elegant Beaufortia	1	Nov-Feb	purple
Bossiaea	*eriocarpa*	Common Brown Pea	0.5	Jul-Oct	brown/
Burchardia	*congesta*	Milkmaids	0.5	Aug-Oct	white
Calytrix	*angulata*	Yellow Starflower	1	Sep-Dec	yellow
Calothamnus	*quadrifidus*	One-sided Bottlebrush	2	Aug-Dec	red
Calothamnus	*sanguineus*	Silky Leaved Blood Flower	1	Mar-Nov	red
Conostylis	*aculeata*	Prickly Conostylis	0.5	Sep-Oct	yellow
Conostylis	*candicans*	Grey Cottonheads	0.5	Aug-Sep	yellow
Corymbia	*calophylla*	Marri	35	Jan-May	white
Dianella	*revoluta*	Flax Lily	1	Jun-Aug	orange
Dodonaea	*hackettiana*	Perth Hopbush	4	Jul-Oct	green
Eremophila	*glabra*	Tar Bush	0.5	Jul-Jan	orange
Eucalyptus	*decipiens*	Limestone Marlock	6	Sep-Nov	cream
Eucalyptus	*gomphocephala*	Tuart	40	Jan-Apr	cream
Eucalyptus	*marginata*	Jarrah	30	Sep-Feb	cream
Eucalyptus	*todtiana*	Prickly Bark	10	Feb	cream
Gastrolobium	*capitatum*	Bacon and Eggs	0.5	Jun-Sep	yellow
Gastrolobium	*nervosum*		0.5	Jul-Nov	yell/red
Gompholobium	*aristatum*		0.5	Jul-Dec	yellow
Gompholobium	*confertum*		1	Sep-Dec	yellow
Gompholobium	*scabrum*		0.5	Aug-Sep	purple
Gompholobium	*tomentosum*	Yellow Pea	0.5	Aug-Dec	yellow
Grevillea	*crithmifolia*		1	Jul-sep	white
Haemodorum	*laxum*	Bloodroot	0.5	Nov	black
Haemodorum	*paniculatum*	“Mardja”	0.5	Oct-Dec	yellow
Haemodorum	*spicatum*	“Mardja”	0.5	Nov-Dec	black
Hemiandra	*pungens*	Snake Bush	low	All year	purple
Hypocalymma	*robustum*	Swan River Myrtle	1	Jul-Oct	pink
Isolepis	*cernua*	Nodding Club-rush	0.2	All year	

KARRAKATTA VEGETATION COMPLEX

Genus	Species	Common Name	Size	Flowers	Colour
Jacksonia	*furcellata*	Grey Stinkwood	3	Aug-Mar	yellow
Jacksonia	*sericea*	“Waldjumi”	0.6	Dec-Feb	orange
Jacksonia	*sternbergiana*	Green Stinkwood	3	All year	orange
Kennedia	*prostrata*	Running Postman	low	Jul-Nov	red
Kunzea	*glabrescens*	Spear Wood	3	Sep-Nov	yellow
Laxmannia	*squarrosa*		0.1	Aug-Nov	white
Leptospermum	*spinescens*		1.5	Sep-Nov	white
Lobelia	*alata*	Angled Lobelia	0.3	Mar-Apr	blue
Melaleuca	*preissiana*	“Modong”	10	Nov-Jan	white
Melaleuca	*seriata*		1	Oct-Dec	pink
Melaleuca	*systena*	Coastal Honeymyrtle	1	Sep-Dec	cream
Melaleuca	*thymoides*		1	Sep-Jan	yellow
Melaleuca	*trichophylla*		0.7	Nov-Jan	pink/purple
Muehlenbeckia	*adpressa*	Climbing Lignum	climb	Sep-Dec	yellow/green
Myoporum	*caprarioides*	Slender Myoporum	1.5	All year	white
Neurachne	*alopecuroidea*	Foxtail Mulga Grass	0.5	Aug-Nov	
Opercularia	*vaginata*	Dog Weed	0.3	Aug-Oct	green
Orthrosanthus	*laxus*	Morning Iris	0.5	Aug-Oct	mauve
Patersonia	*occidentalis*	Western Patersonia	0.5	Sep-Dec	purple
Persoonia	*saccatta*	Snottygobble	1.5	Jul-Jan	yellow
Philotheca	*spicata*	Salt and Pepper	0.5	Aug-Sep	mauve
Phyllanthus	*calycinus*	False Boronia	0.3	Jun-Nov	white
Regelia	*inops*		2	Oct-Jan	mauve
Rhagodia	*baccata*	Berry Salt Bush	0.5	Mar-Jun	red
Spyridium	*globulosum*	Basket Bush	3	Jun-Sep	white
Trachymene	*coerulea*	Blue Lace Flower	0.5	Oct-Feb	blue
Villarsia	*albiflora*		1	Sep-Dec	white
Xanthorrhoea	*preissii*	Grass Tree	3	Nov-Jan	white
Xylomeleum	*occidentale*	Woody Pear	8	Dec-Feb	cream

Soil & Vegetation Complexes Types





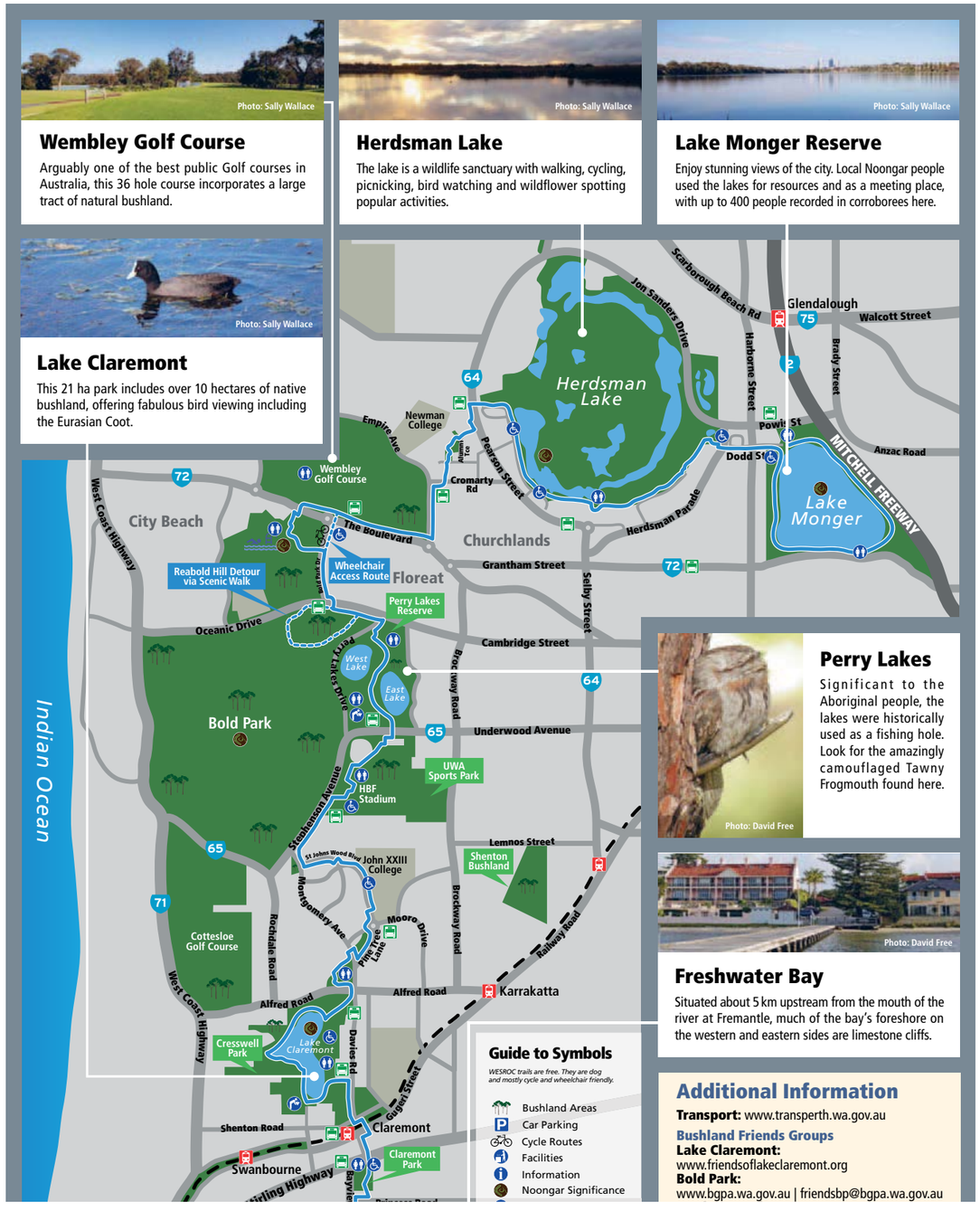


Whadjuk Trail Network - Cultural Significance

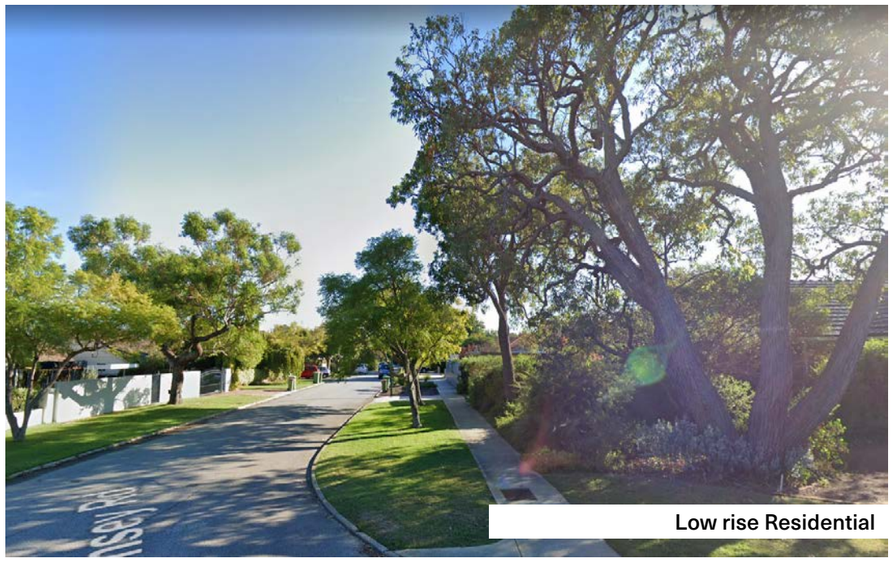
BUSH TO BEACH TRAIL (https://whadjukwalkingtrails.org.au/)



YANGE KEP BIDI TRAIL (WETLAND TRAIL (https://whadjukwalkingtrails.org.au/)



Garden City Character



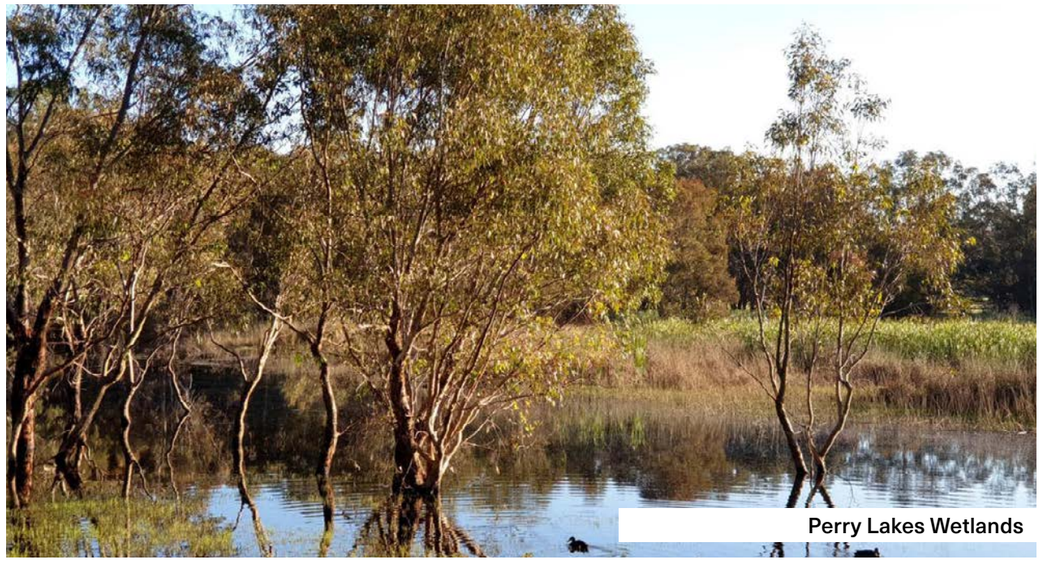
Low rise Residential



High Density



Parklands

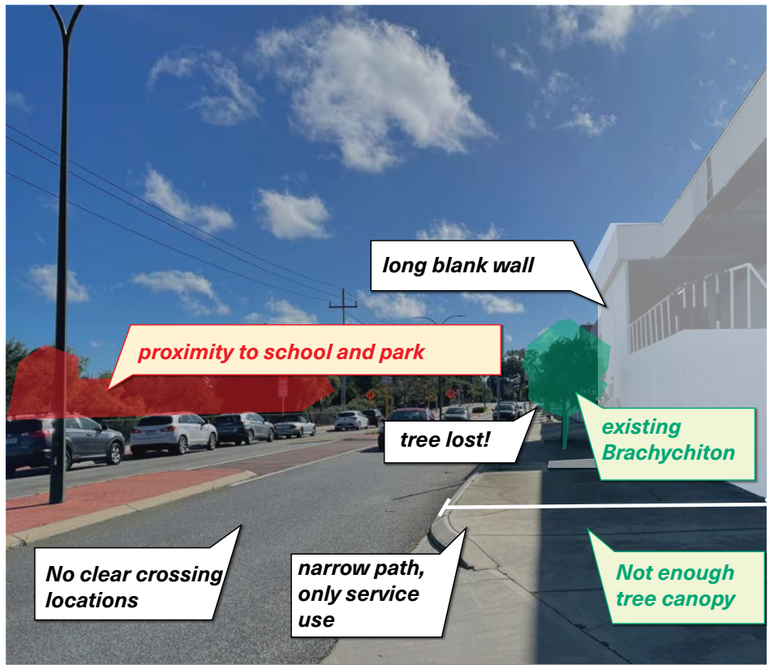


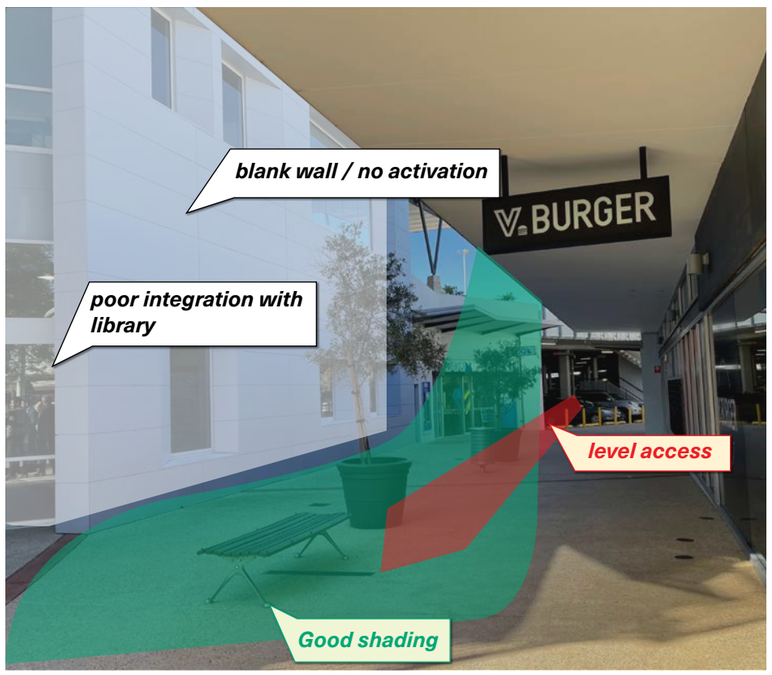
Perry Lakes Wetlands

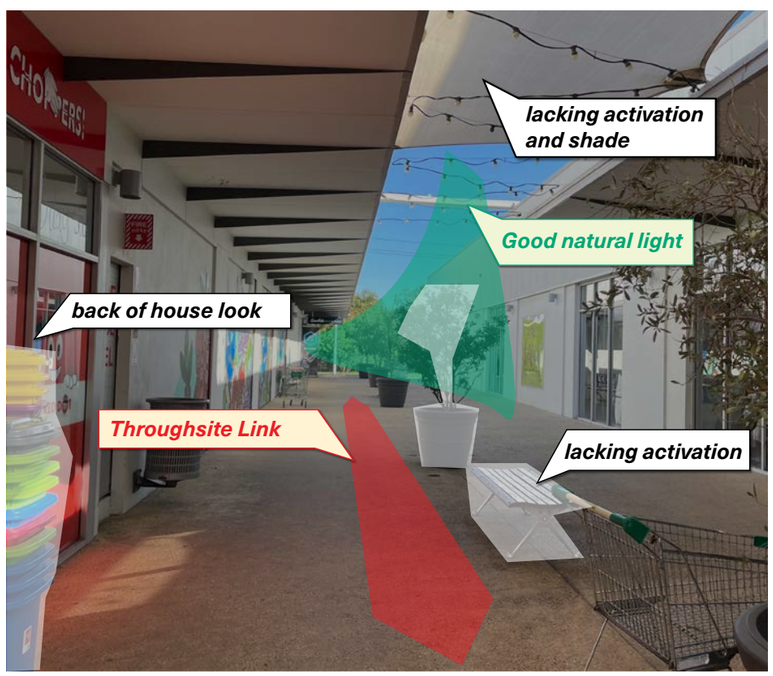
- **established native and exotic trees in wide verge**
- **green architecture**
- **green frame**
- **WSUD and green streets**
- **interpretive opportunities**

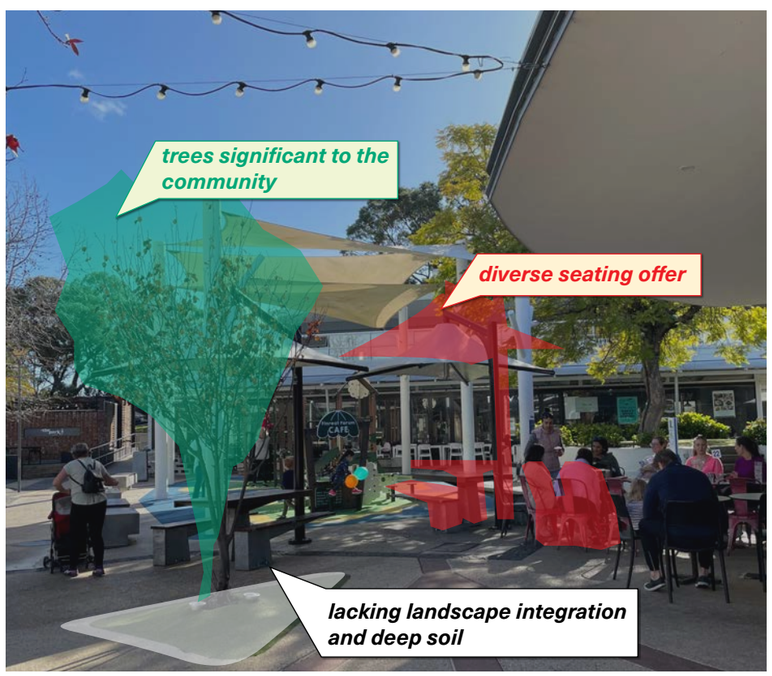
Site Appreciation











Past VS Present

1960s



- A Community Focal Point
- Served many generations



- Perth's first shopping Centre Development



- An integral part of the local community



- A legacy of local ownership and community authenticity

Today



- An inwardly focused development that does not integrate with its surrounding context



- Architecture lacking character and integration with landscape



- Missing a way finding strategy to support identity and legibility



- Open space framework does not adequately support a thriving entertainment and dining precinct

Aspirations_Health / Wellbeing & Lifestyle









Aspirations_Living Streets





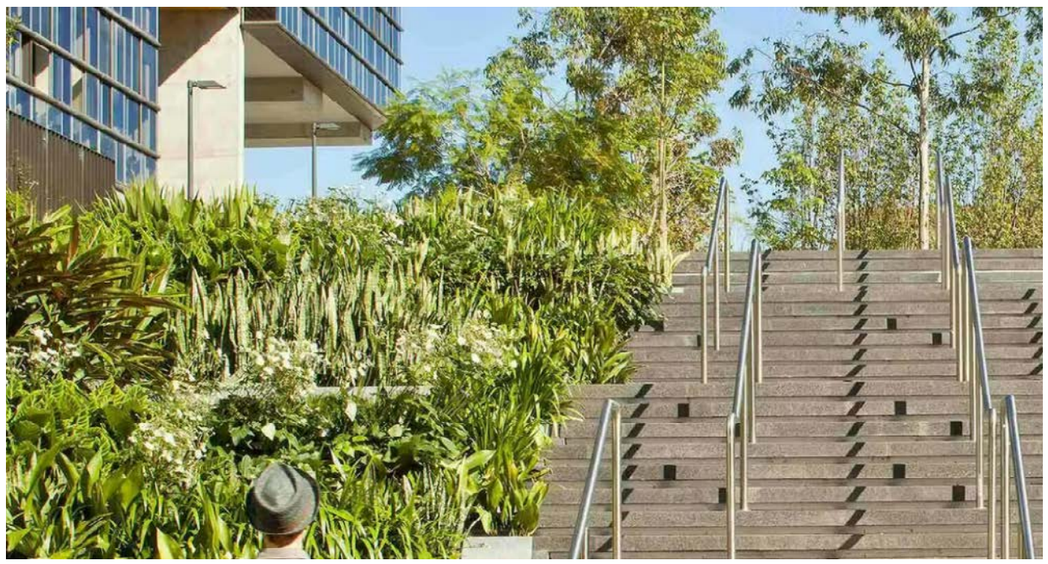




- **improved walkability and cycling network**
- **reduce urban heat island effect**
- **facade permeability**
- **WSUD and increased canopy cover**
- **biodiversity**

Aspirations_Living Architecture









- **biophilia**
- **biodiversity**
- **aesthetics**
- **integrated landscape**

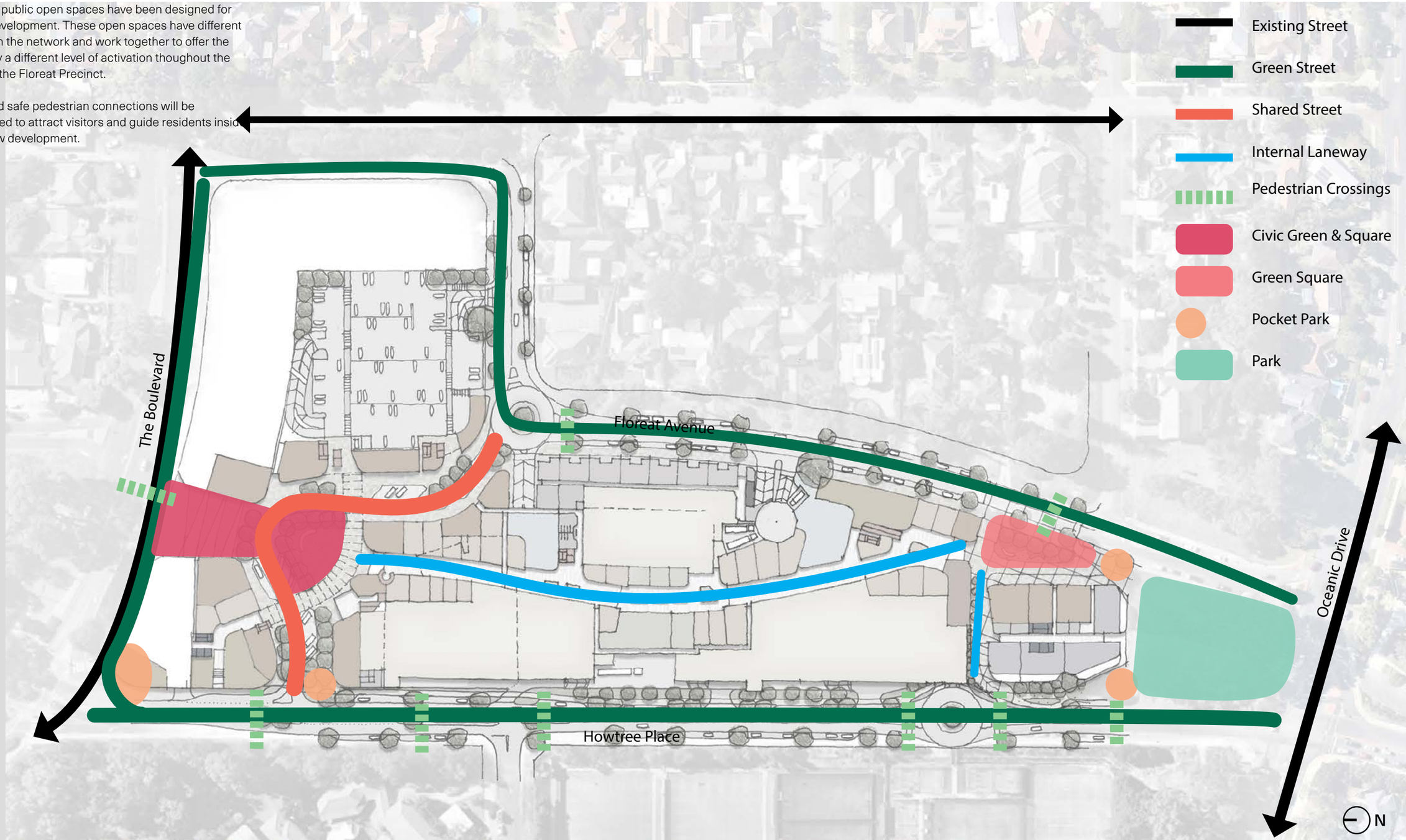
Green Network



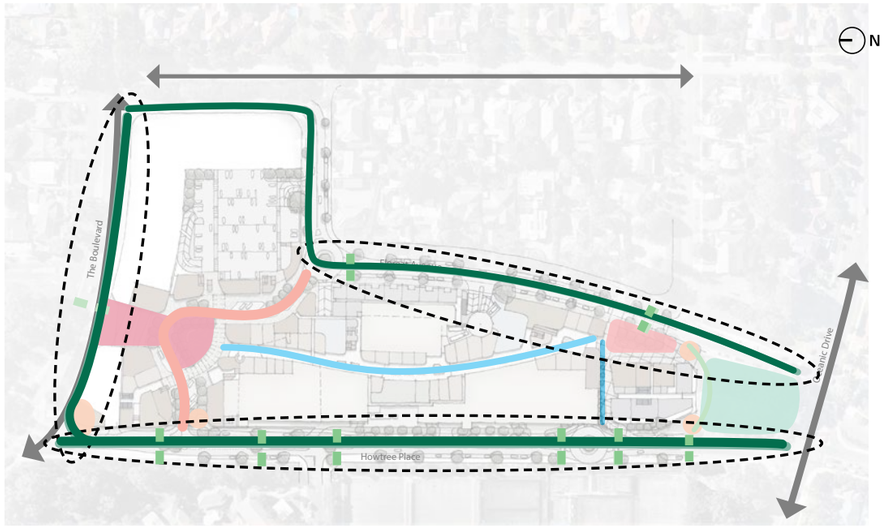
Open Space Framework - Ground

A series of public open spaces have been designed for the new development. These open spaces have different roles within the network and work together to offer the community a different level of activation thoughout the day within the Floreat Precinct.

Legible and safe pedestrian connections will be implemented to attract visitors and guide residents inside out the new development.



Green Street

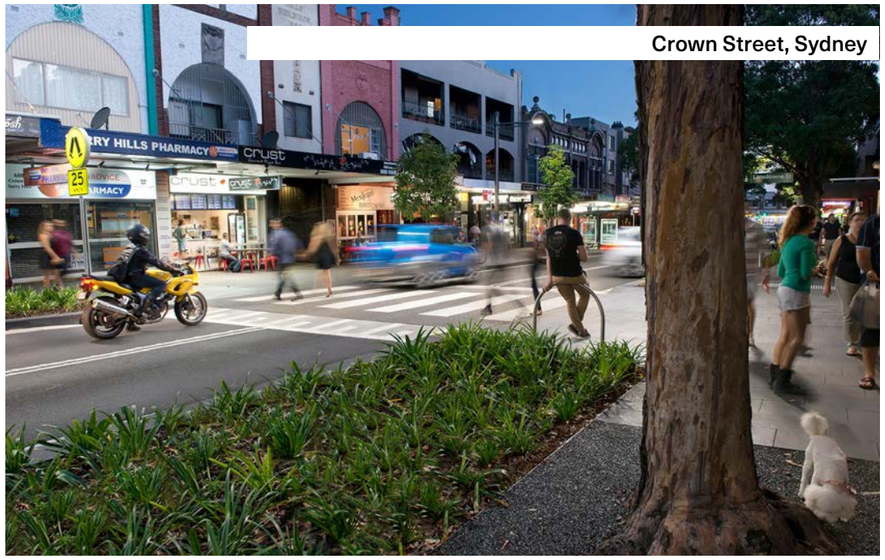


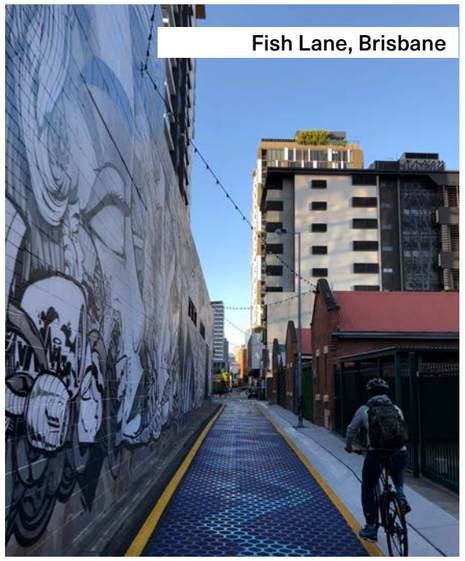
Existing condition








Crown Street, Sydney

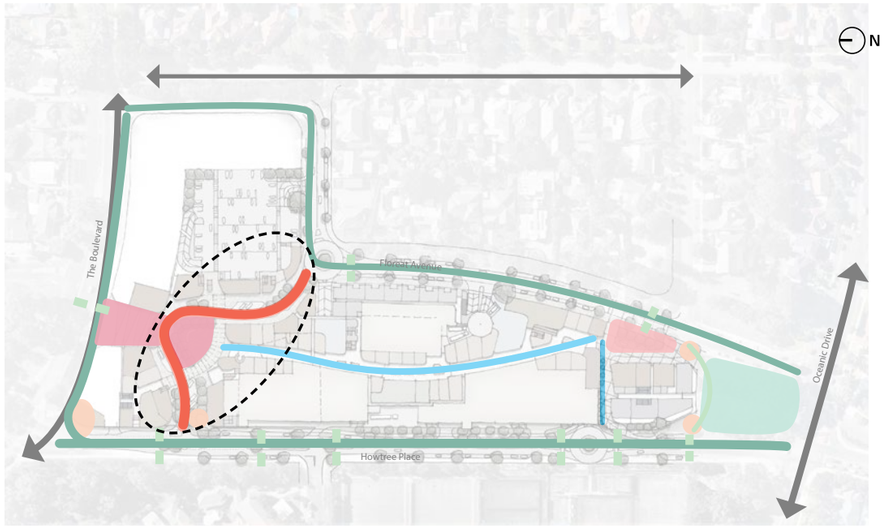

Fish Lane, Brisbane


Barangaroo, Sydney



- **active transport opportunities**
- **safe pedestrian crossing**
- **facade activation**
- **WSUD and increased canopy cover**
- **green verges & biodiversity**

Shared Street



Existing condition




South Eveleigh Precinct, Sydney

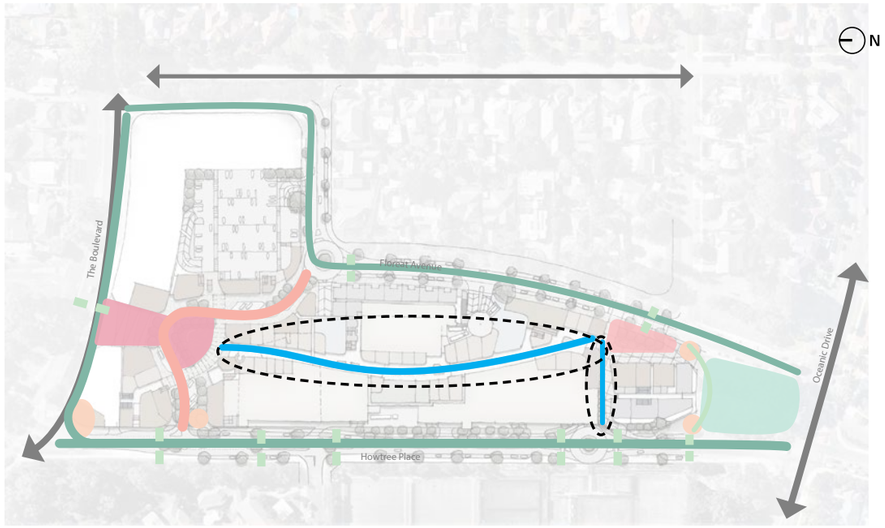

James Street, Brisbane



Steam Mill Lane, Sydney

- **F&B spillout**
- **active day & night**
- **safe and comfortable pedestrian environment**
- **natural and artificial shade**
- **slow vehicle access & pedestrian priority**

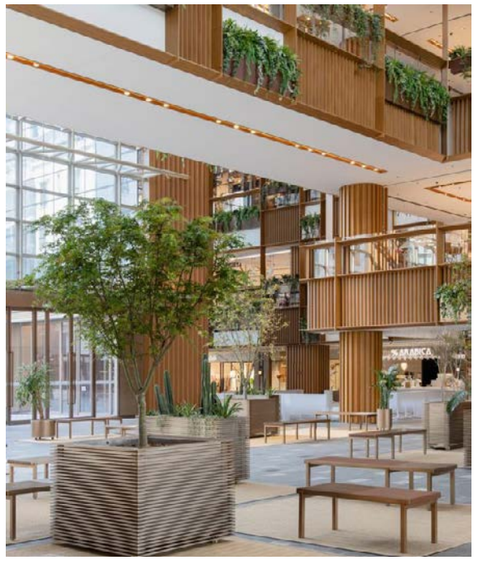
Internal Laneway



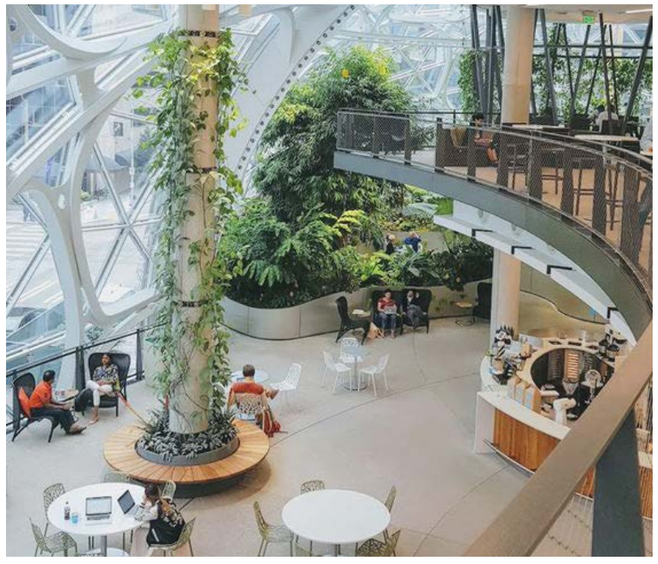
Existing condition





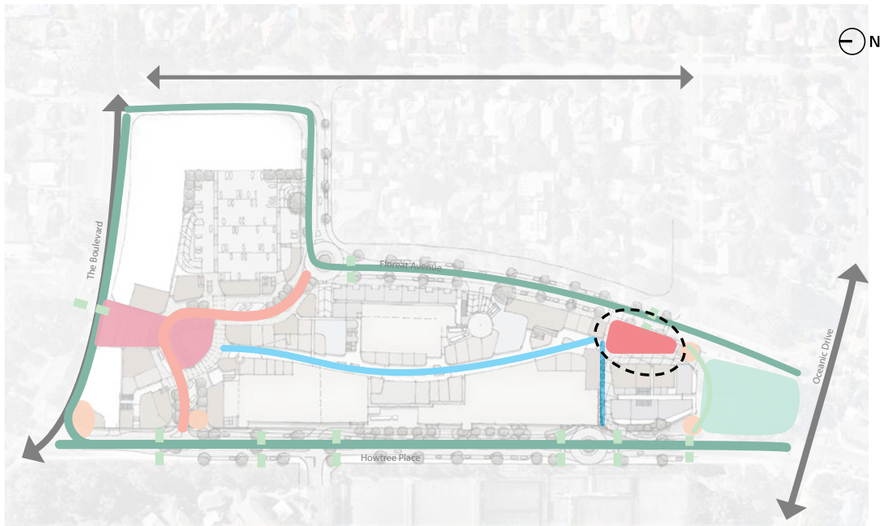


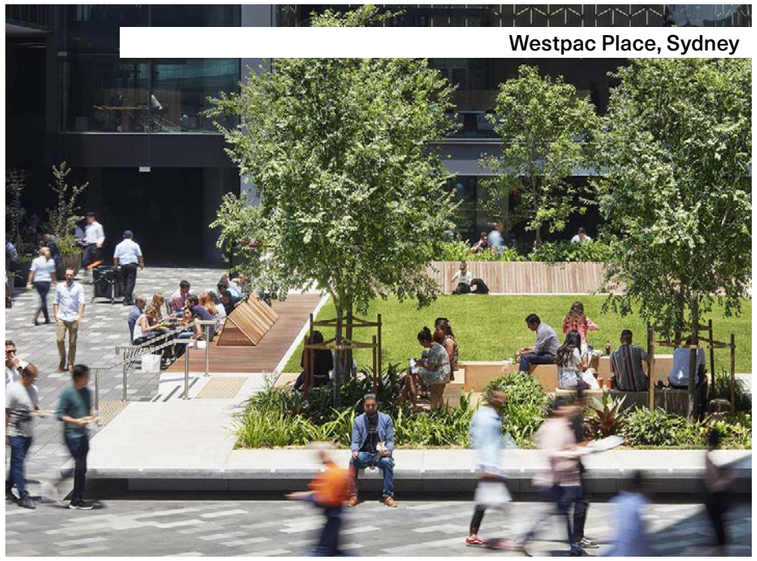


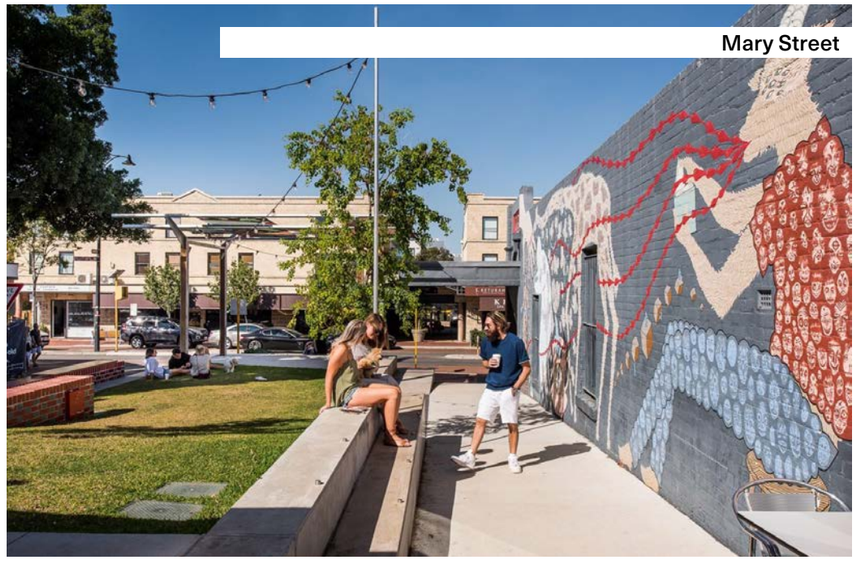


- **landscape to soften architecture**
- **natural light access**
- **indoor / outdoor quality**
- **habitable circulation space**

Green Square



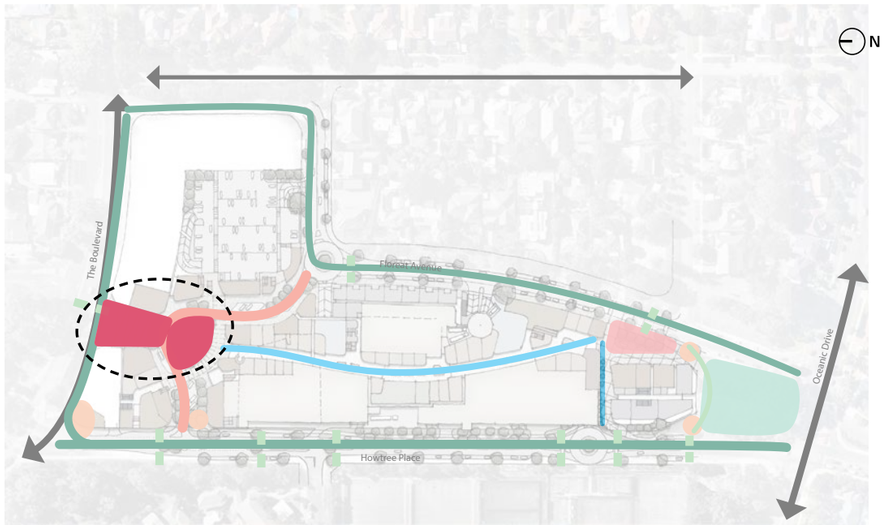

Westpac Place, Sydney


Mary Street


James Street, Brisbane

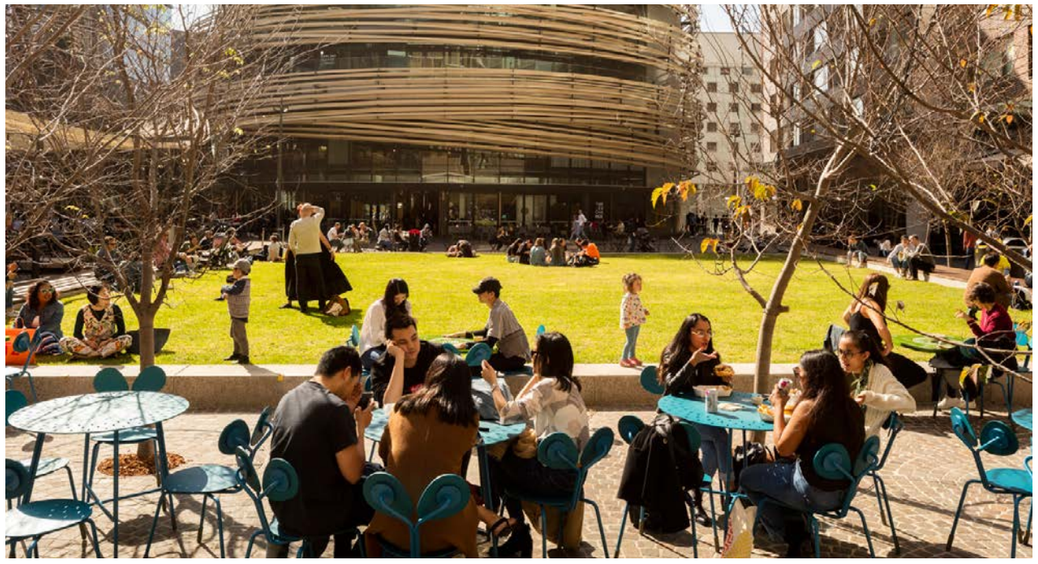
- **formal & informal dwelling**
- **active day & night / community event**
- **sense of place**
- **safe pedestrian environment for everyone**
- **meaningful place for true deep soil**

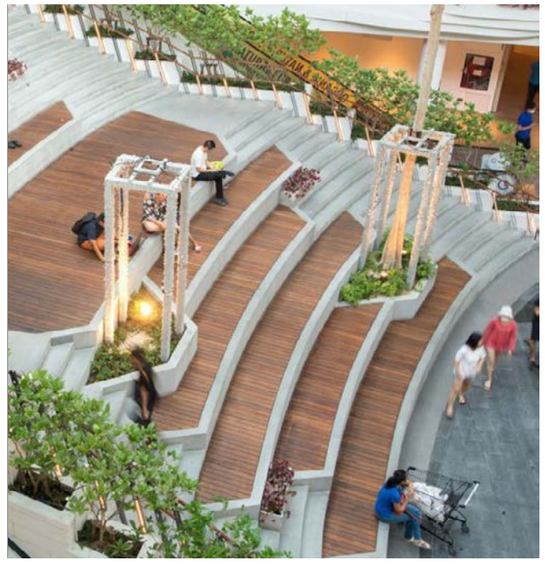
Civic Green & Square



Existing square 1900SQM



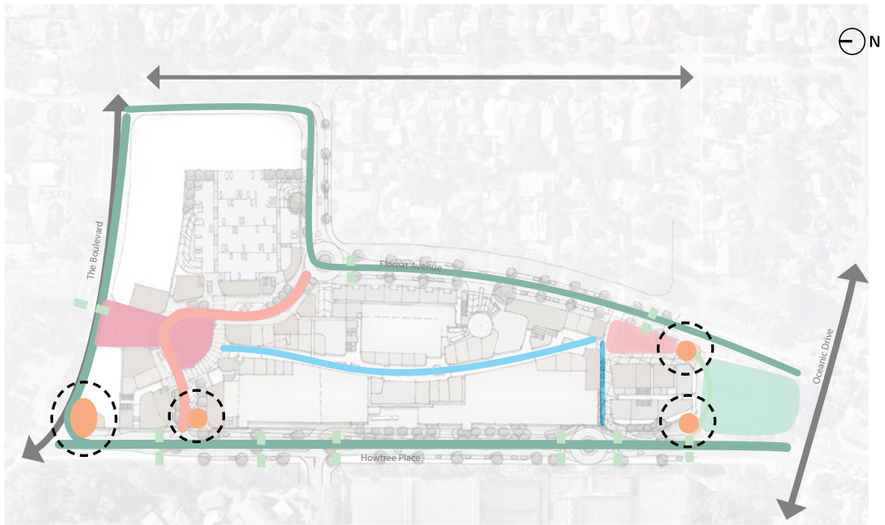






- **seating opportunity**
- **visually attractive from a distance**
- **safe pedestrian refuge**
- **landscape opportunity**
- **enhancing amenity & activating access points**

Pocket Park



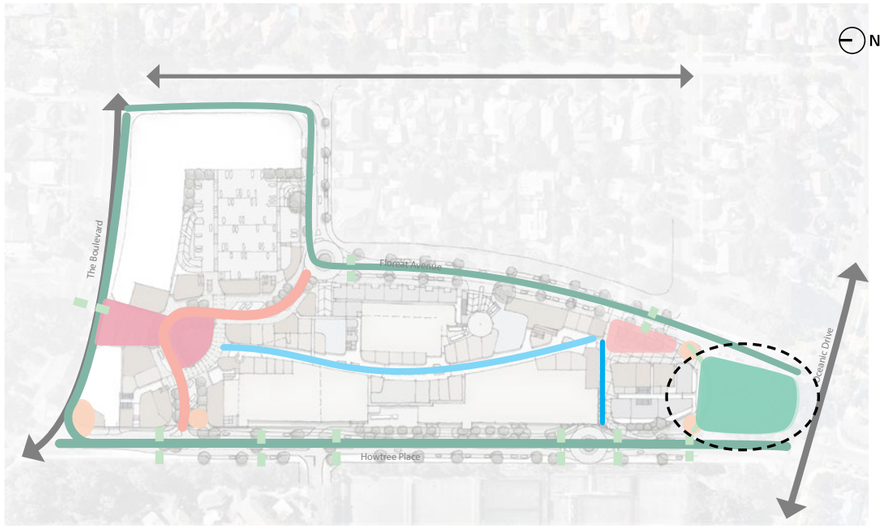

SLR pocket parks, Sydney


MacArthur Place, Sydney


One Darling Island, Sydney

- **seating opportunity**
- **visually attractive from a distance**
- **safe pedestrian refuge**
- **landscape opportunity**
- **enhancing amenity & activating access points**

Park









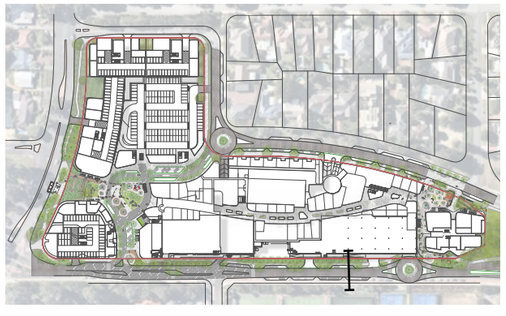
- **engaging with existing park and green network**
- **open ground floor and building spillout**
- **benefit from established vegetation**
- **diversified public space offer**
- **opportunity to include existing trees in canopy cover calculations**

Concept Landscape Plan

1. Upgraded footpath along The Boulevard
2. Landmark roundabout
3. Upgraded verge along Floreat Avenue with parallel parking bays, planting and native trees WSUD blisters and pedestrian footpath
4. South Entry Square with raised pedestrian crossing, connection to existing lawn and feature trees
5. Existing lawn with potential for retail spillout and informal event activation
6. Pocket park along Howtree Place footpath with native trees and planting
7. Activated laneway to South Entry Square
8. Upgraded verge on Howtree Place with WSUD landscape buffer to loading zone, pedestrian footpath, parallel parking and new native tree planting
9. Feature paving treatment anticipating entry to shared zone
10. Main deep soil zone and landscape heart with suspended boardwalk connection between The Boulevard and the new Floreat Precinct
11. North Entry Square with feature pedestrian walkway to mall and feature deciduous trees
12. Slow vehicle and pedestrian shared way with feature paving treatment, parking and WSUD garden beds with deciduous street trees



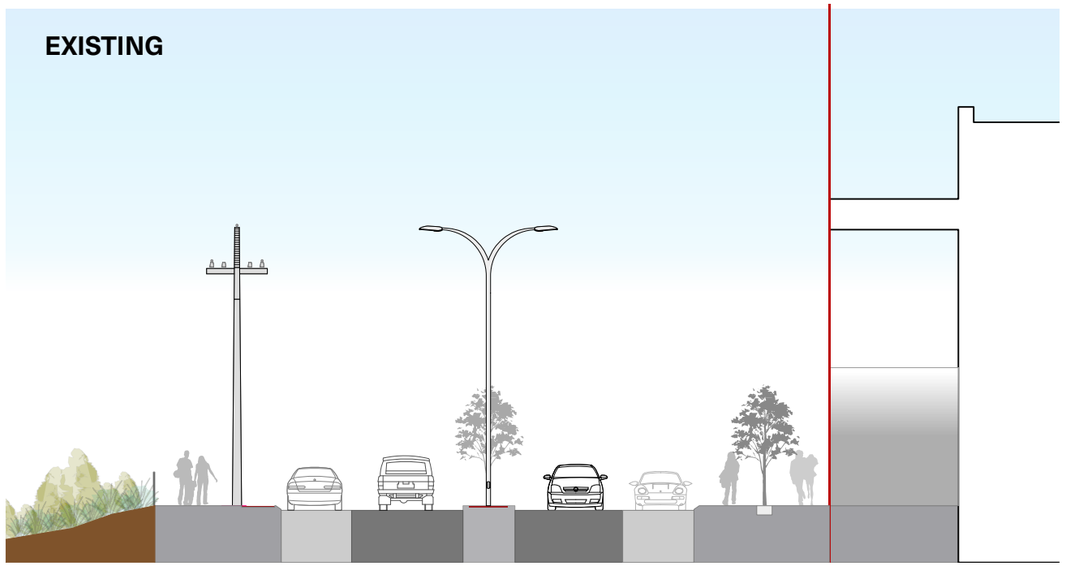
Indicative Street Sections

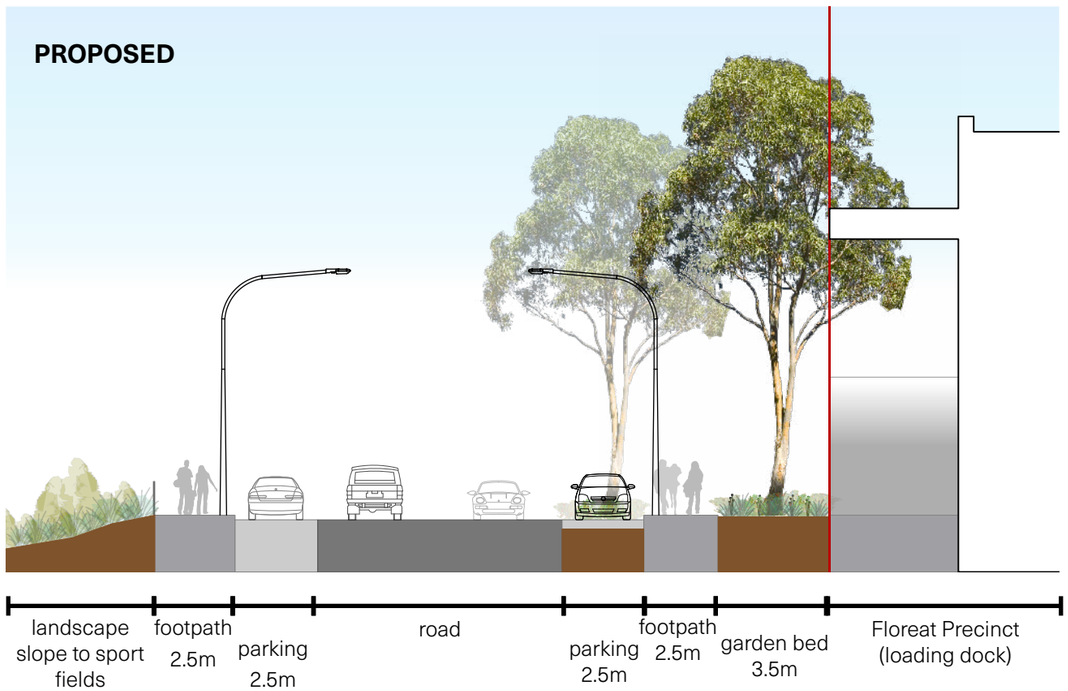


Howtree Place

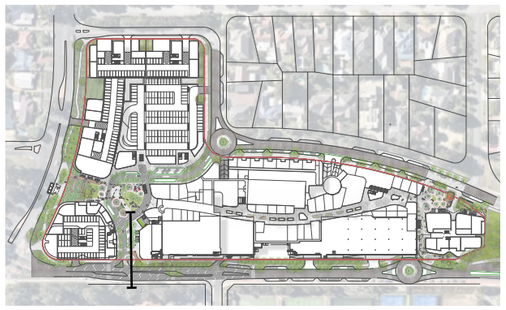
Howtree Place will retain it's primary vehicle character, but a series of improvements will help making this street more pedestrian friendly. In addition to the new roundabouts, a change in paving material towards the Forum main square and the greening of the footpath wlll increase safety for all pedestrians.

Large native trees within WSUD garden beds will help shading the street, pocket parks will invite visitors in entering the precinct wherever the built facade presents an opening.

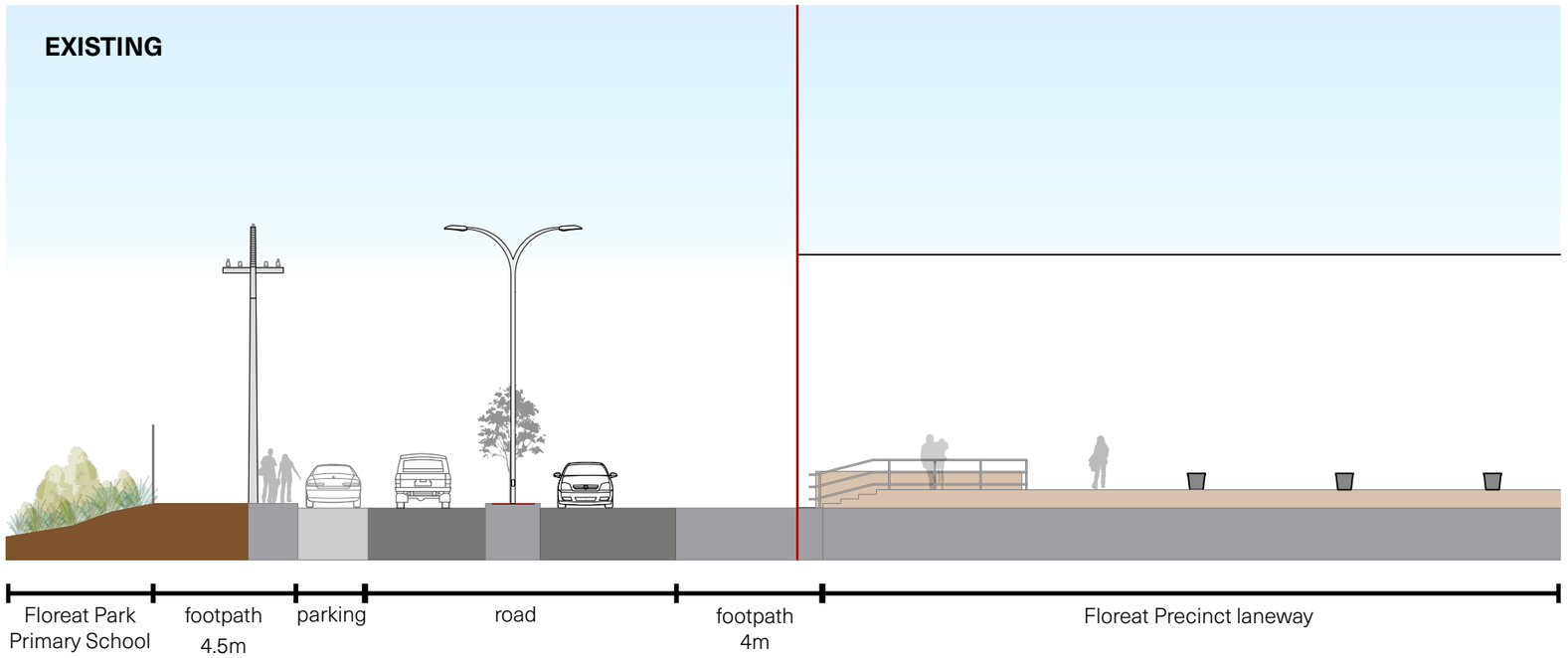


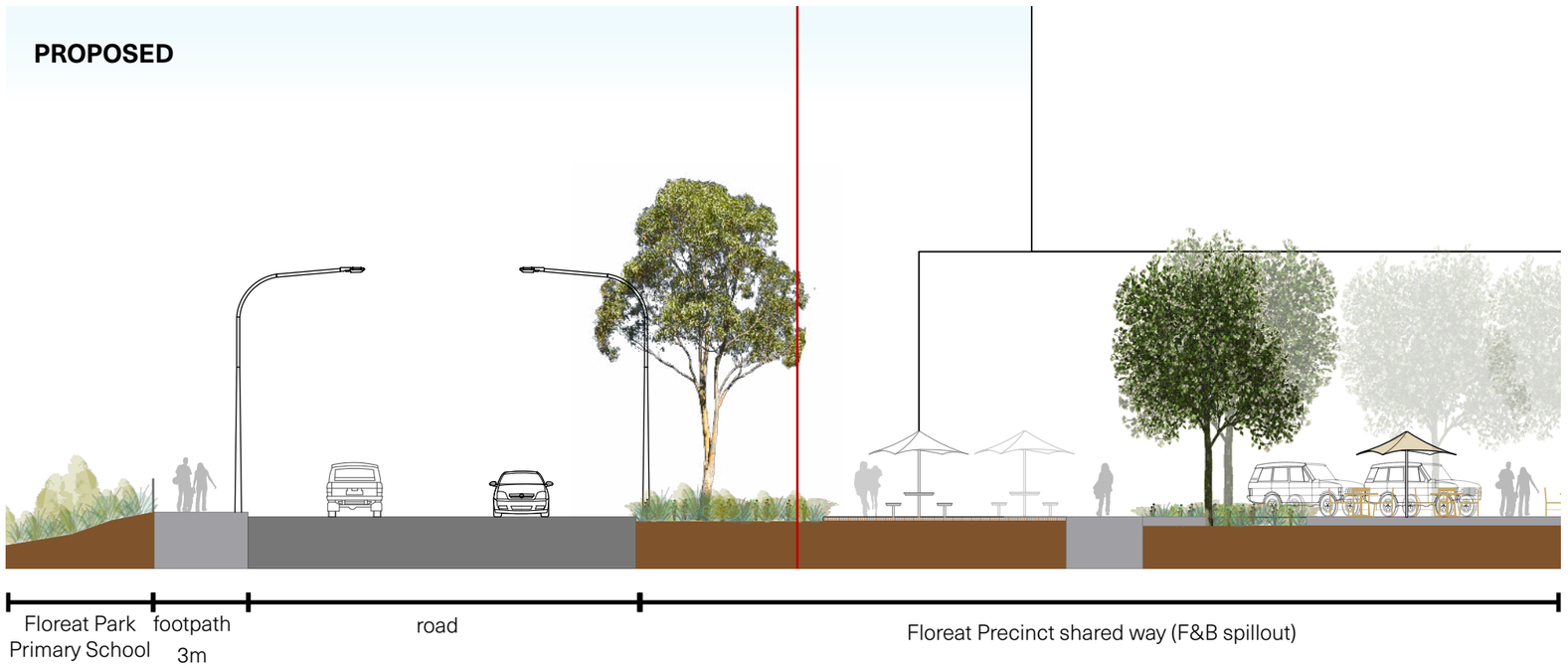


Indicative Street Sections



Howtree Place





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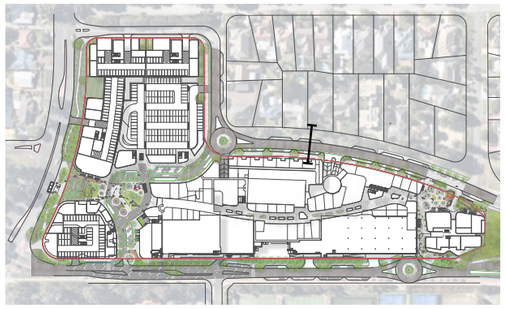
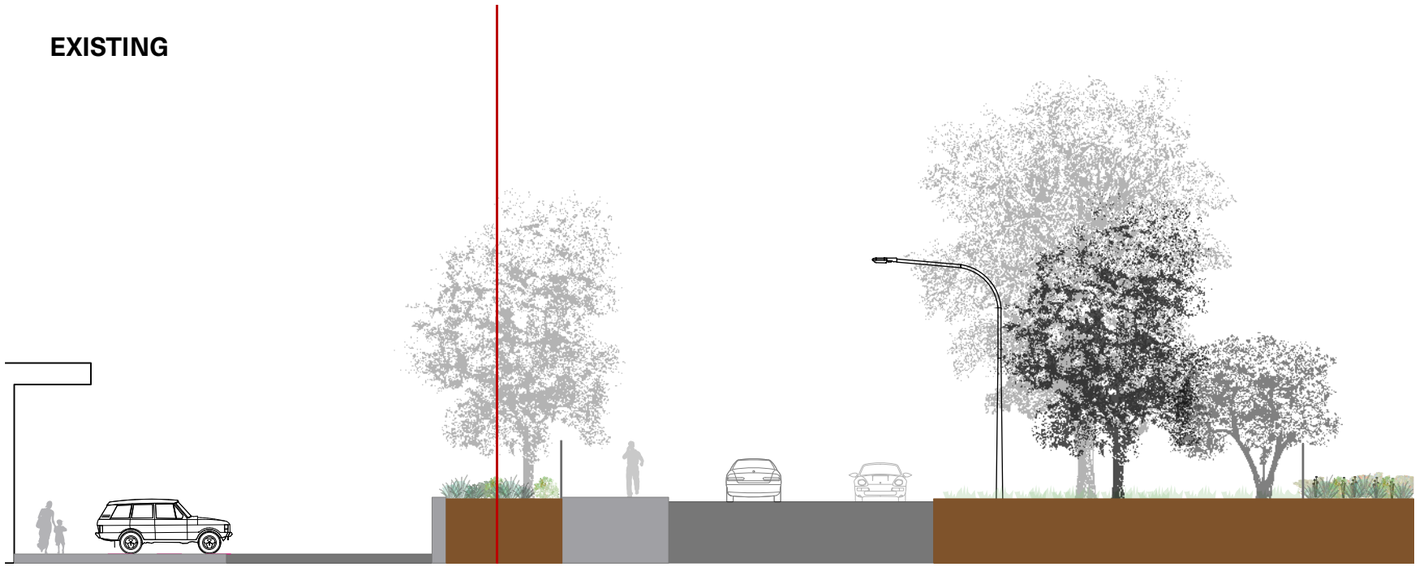


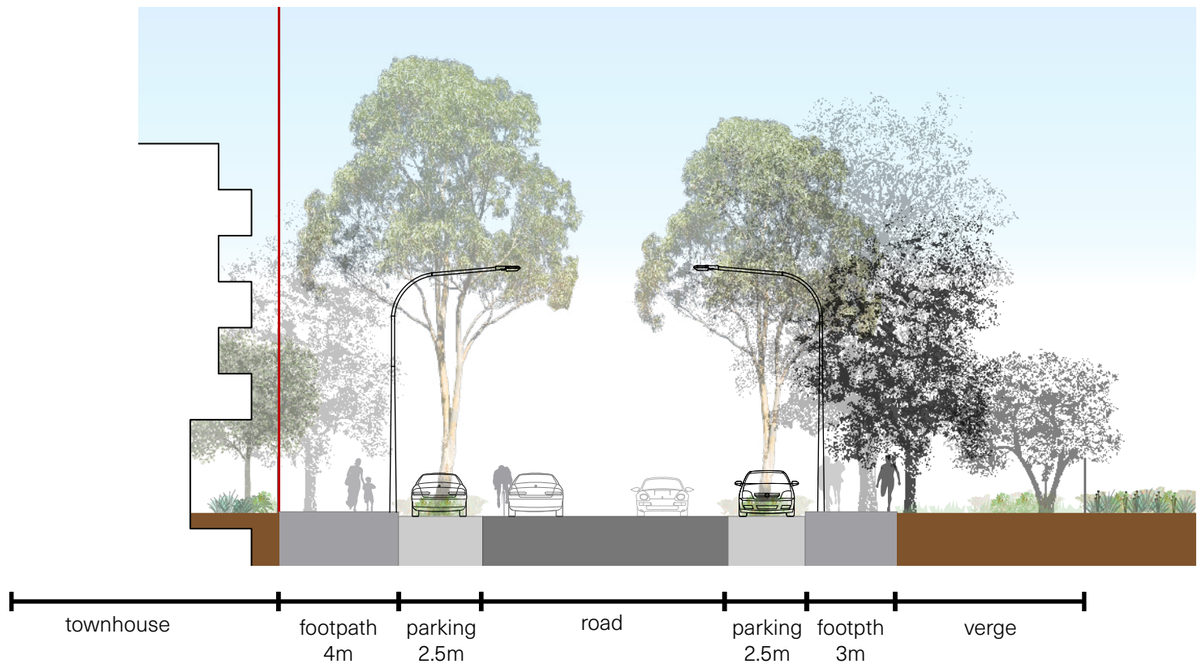
Floreat Avenue

The upgraded streetscape aims to create a safe and inviting pedestrian boulevard, where the retained existing trees together with new WSUD garden beds will soften parking and roads separating them from people movement.

EXISTING

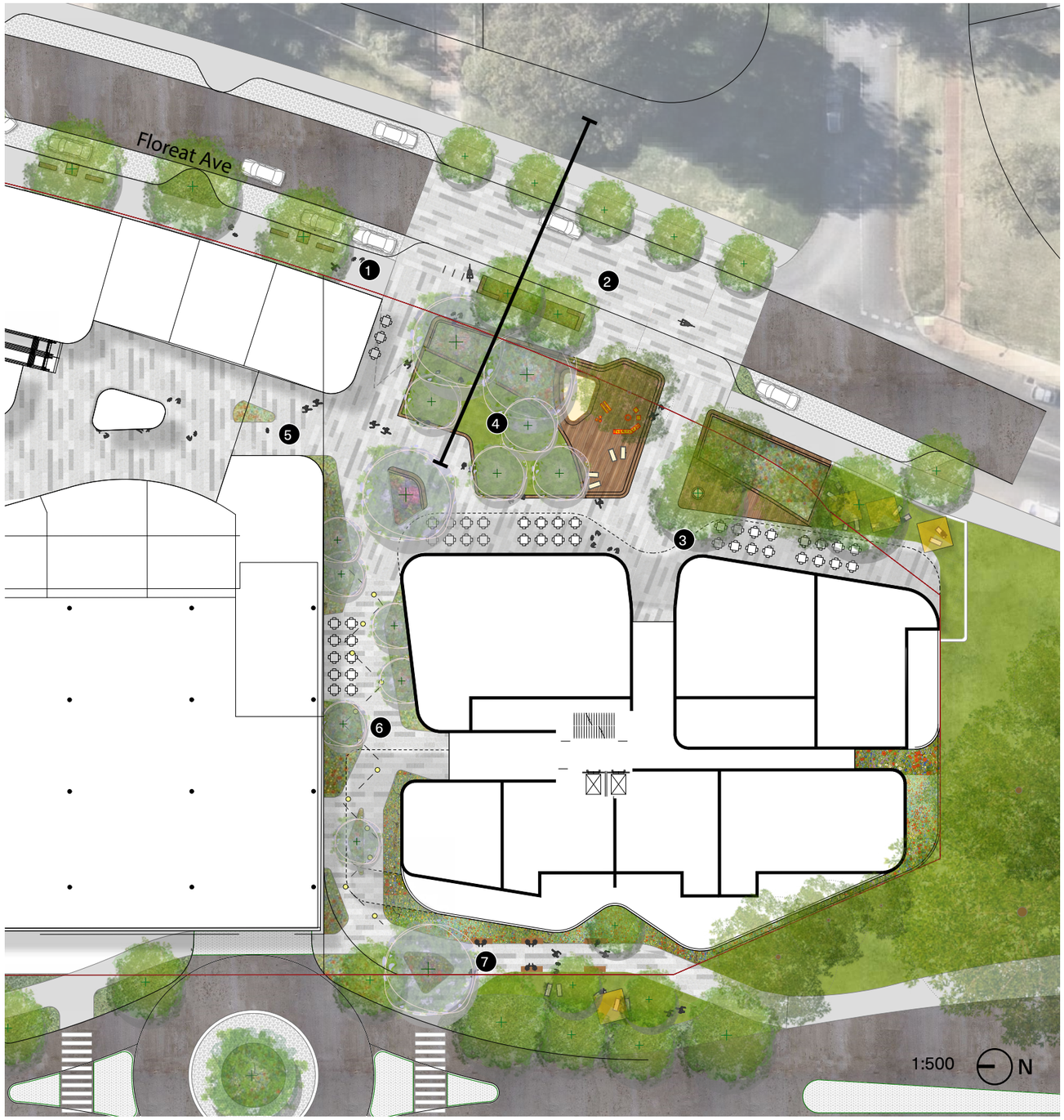


PROPOSED



Indicative South Entry Square

1. Pedestrian boulevard along Floreat Avenue, with line parking and WSUD landscape blisters
2. Raised pedestrian crossing / Shared Space
3. Residential upper, with Al-fresco and F&B at ground-level
4. Raised timber deck, including shaded lawn area, play space and seating
5. Pedestrian access to internal shopping mall
6. Laneway connection between Howtree Place and Floreat Avenue
7. Pocket park and pedestrian footpath along Howtree Place







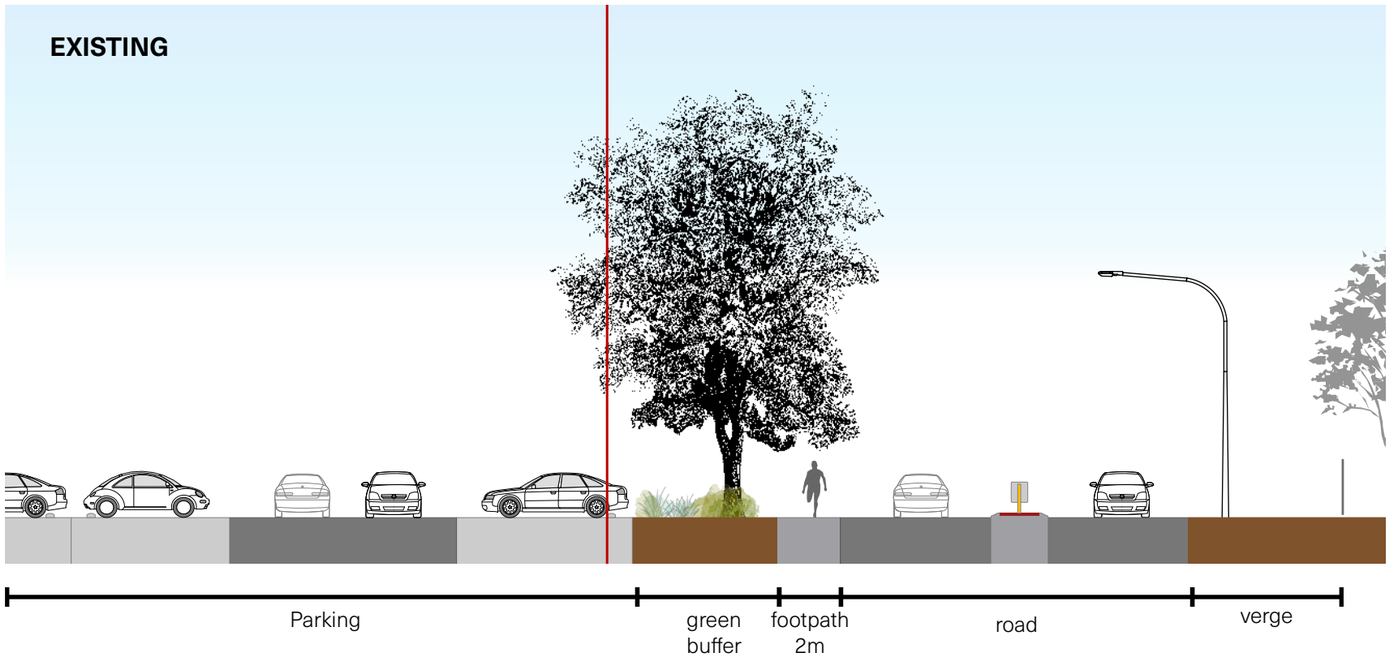


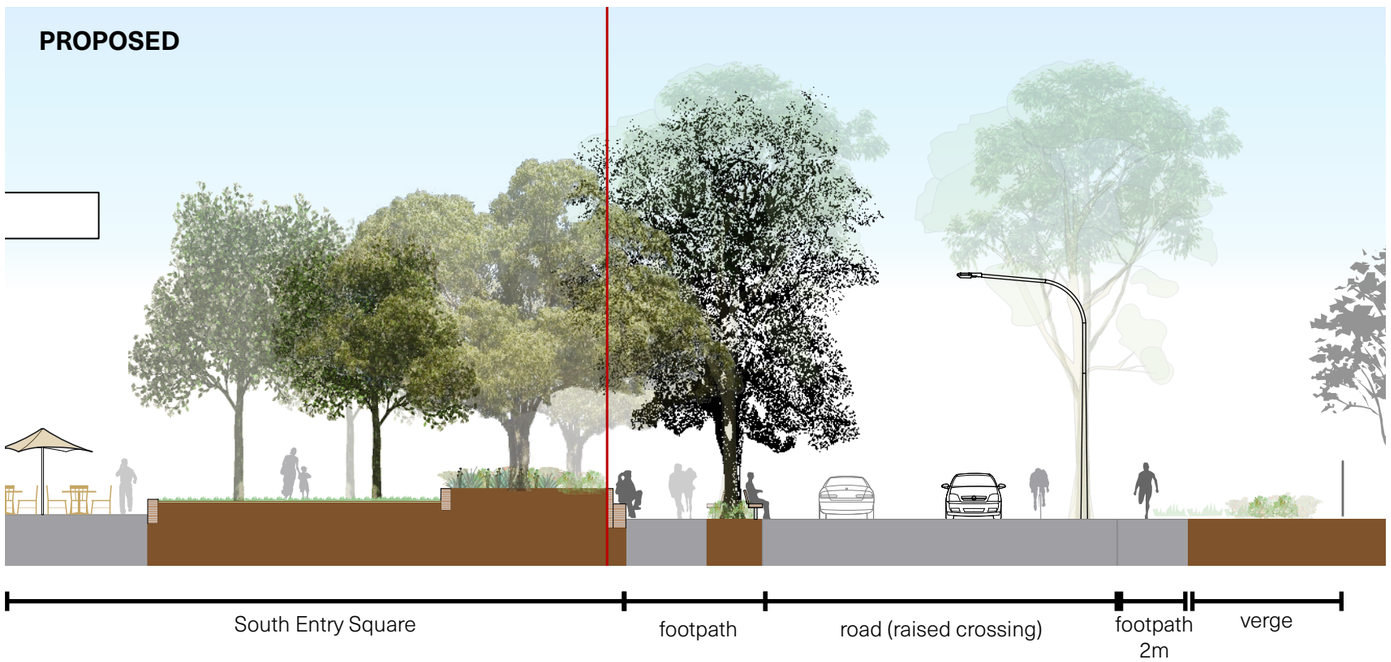






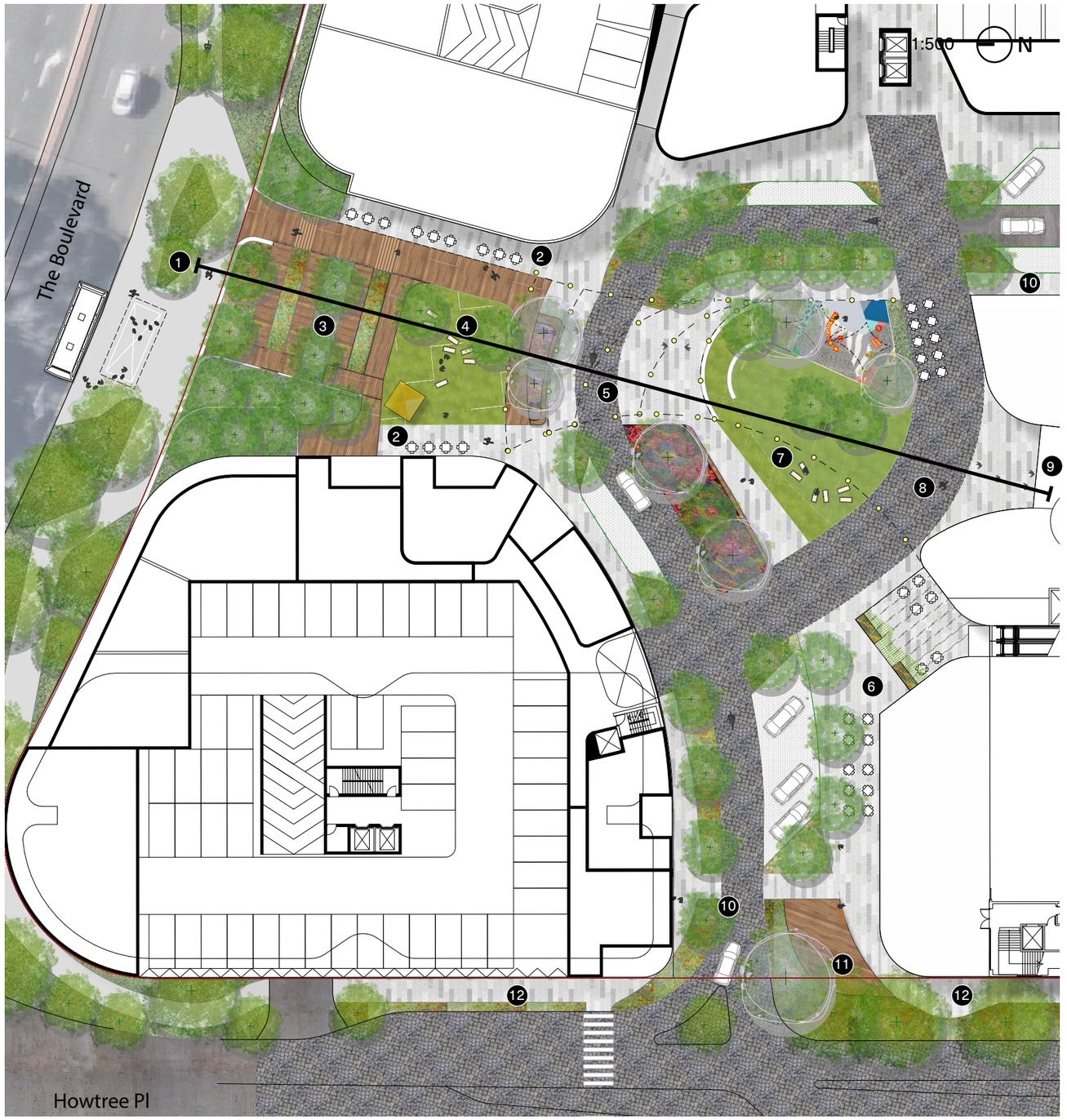
Indicative Street Sections



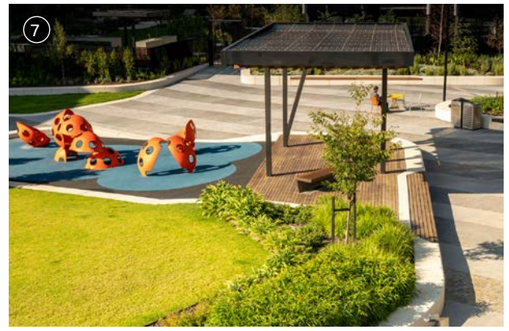


North Entry Square

1. Pedestrian footpath along The Boulevard
2. Al-fresco balcony over deep soil area
3. Landscape mound with trees and integrated suspended boardwalk connections from The Boulevard to the new Forum
4. Lawn area around existing tree including informal seating and decking
5. Shared zone, with alternate surface treatment, feature lighting, and one-way slow vehicular circulation
6. Al-fresco dining and F&B
7. Civic square including lawn chill-out zone, seating walls, play space and flexible event space
8. Feature paved pedestrian walkway
9. Main entrance to shopping mall
10. Urban link, connecting Howtree Place to Floreat Avenue with parking and WSUD garden beds with deciduous trees
11. Gateway pocket park, including shaded timber deck, seating and planting
12. Pedestrian footpath along Howtree Place



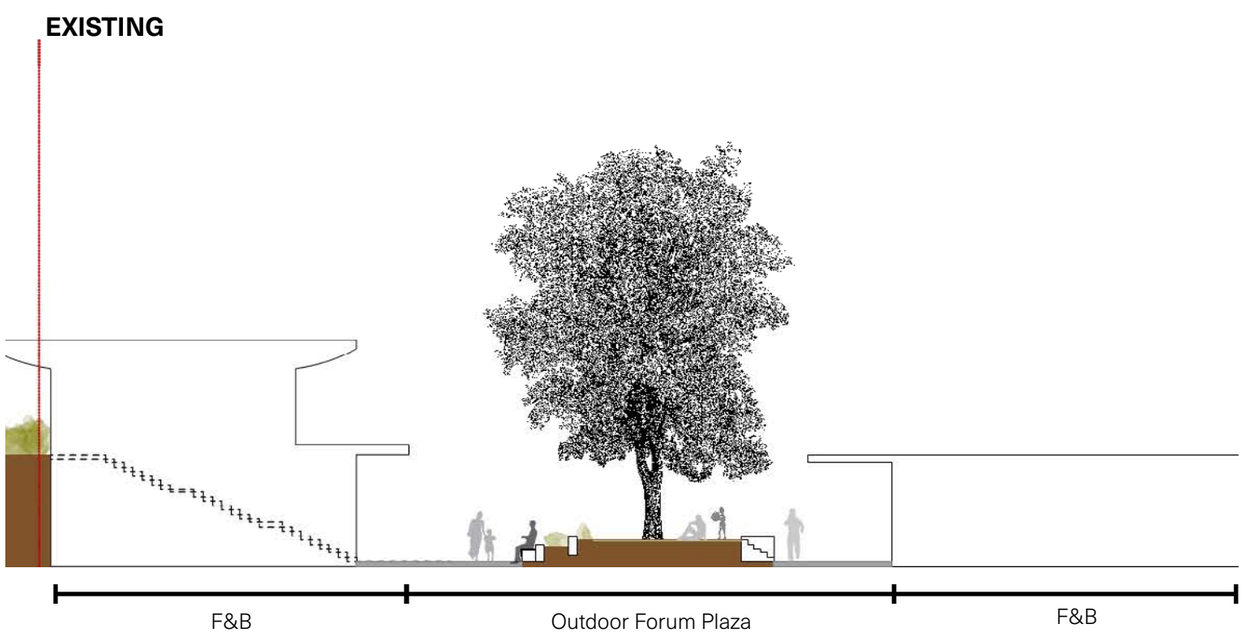


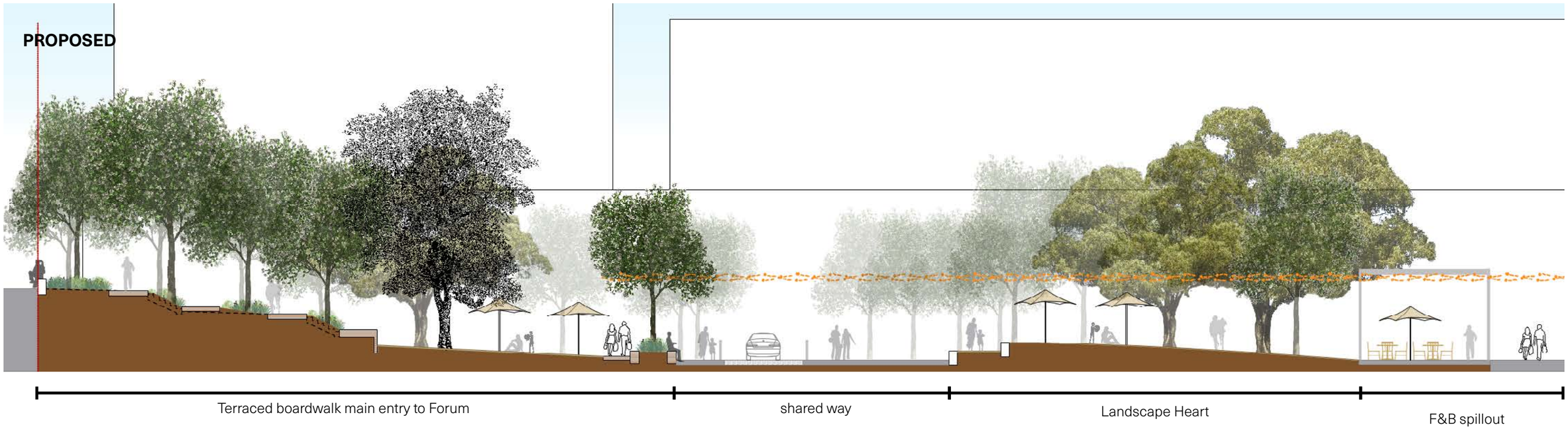




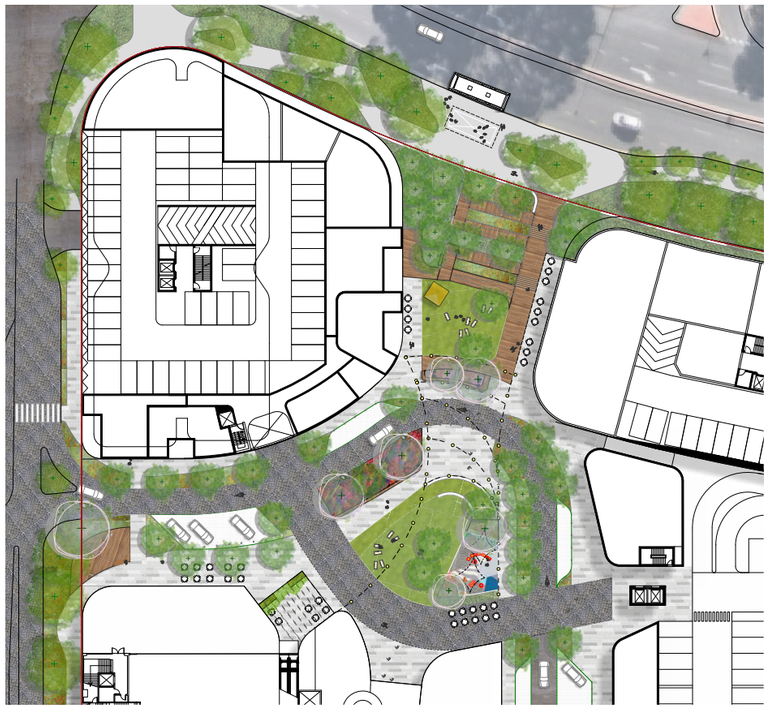


Indicative Street Section





North Entry Square_scale comparison



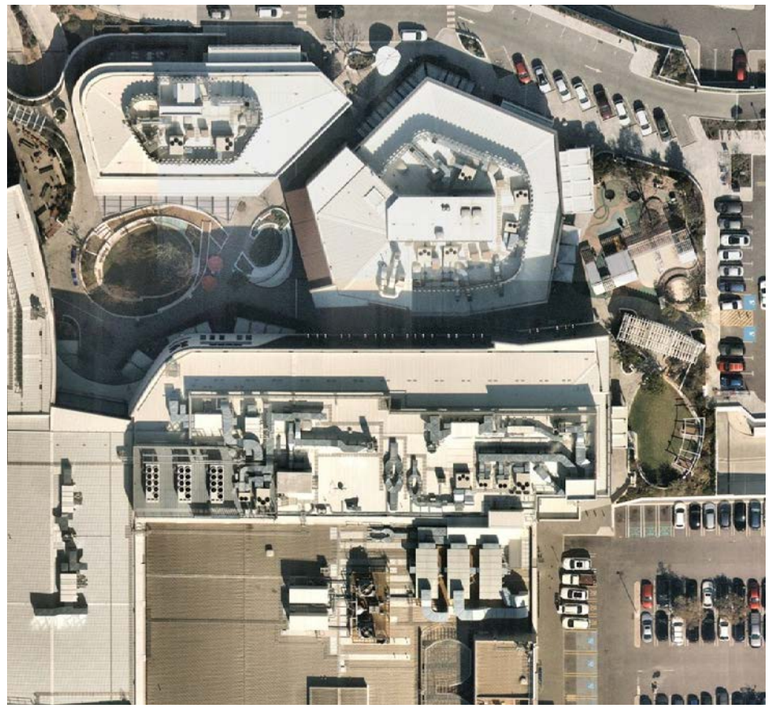
Civic Green & Square
AREA: 4000 sqm

ALFRESCO	1266 sqm
LAWN	630 sqm
SHARED LANE	1680 sqm
TERRACES	640 sqm



Existing Condition
AREA: 1780 sqm

ALFRESCO	655sqm
PLAY	92.5 sqm
LAWN	74.8 sqm
CIRCULATION	216 sqm



Karrinyup Shopping Centre
AREA: 2660 sqm

ALFRESCO	1000 sqm
PLAY	640 sqm
LAWN	580 sqm + 280 sqm
LANEWAY	205 sqm

Landscape Landmarks







- **sculptural landscape elements**
- **feature trees along streets and at key locations**
- **pedestrian amenity at key points**
- **custom furniture and fixtures integrating landscape**

Existing Trees

An arboricultural assessment of the existing trees on site was conducted to evaluate the status of trees on site and minimise the impact of the proposed development, retaining existing canopy cover where possible.

The arboricultural report focused on 33 trees along the Eastern boundary and within the existing plaza, which are more likely to be impacted by a future development of the site.

Generally tree growth has occurred within defined verge or raised bank areas, making those edges become the boundary of their Structural Root Zone, future design will need to take into account this information.

Results of the assessment highlighted an overall good status of the trees both structurally and health wise.

Recommendation of the arborist is to try and keep existing trees and their current conditions as much as possible to minimise impact on their structural integrity and vitality and therefore affect canopy cover and garden city character of the Floreat Precinct.



























Tree Retention and Removal

The plan below shows the location of the existing trees that are within or directly adjacent to the site. An arborist assessment has been undertaken on the trees numbered in the plan below.

Objective of the PSP is to retain worthy trees on site wherever possible. The testing that has been done confirms that this is possible in the future, but will be subject to further design testing at Development Application stage.

Tree 4: Arborist Assessment:
Eucalyptus camaldulensis - Mature Tree, Good Condition, growing close to sewer pit which is beginning to cause distortiion. Modify pit or remove tree.

Tree 5:Arborist Assessment:
Eucalyptus camaldulensis - Semi Mature, Good Condition

TREES ASSESSED BY ARBORIST	33
Trees likely to be removed	2
Trees to be retained, protected & integrated (subject to detailed assessment and guidance by qualified arborist in future design phases)	31

OTHER TREES (NOT ASSESSED)

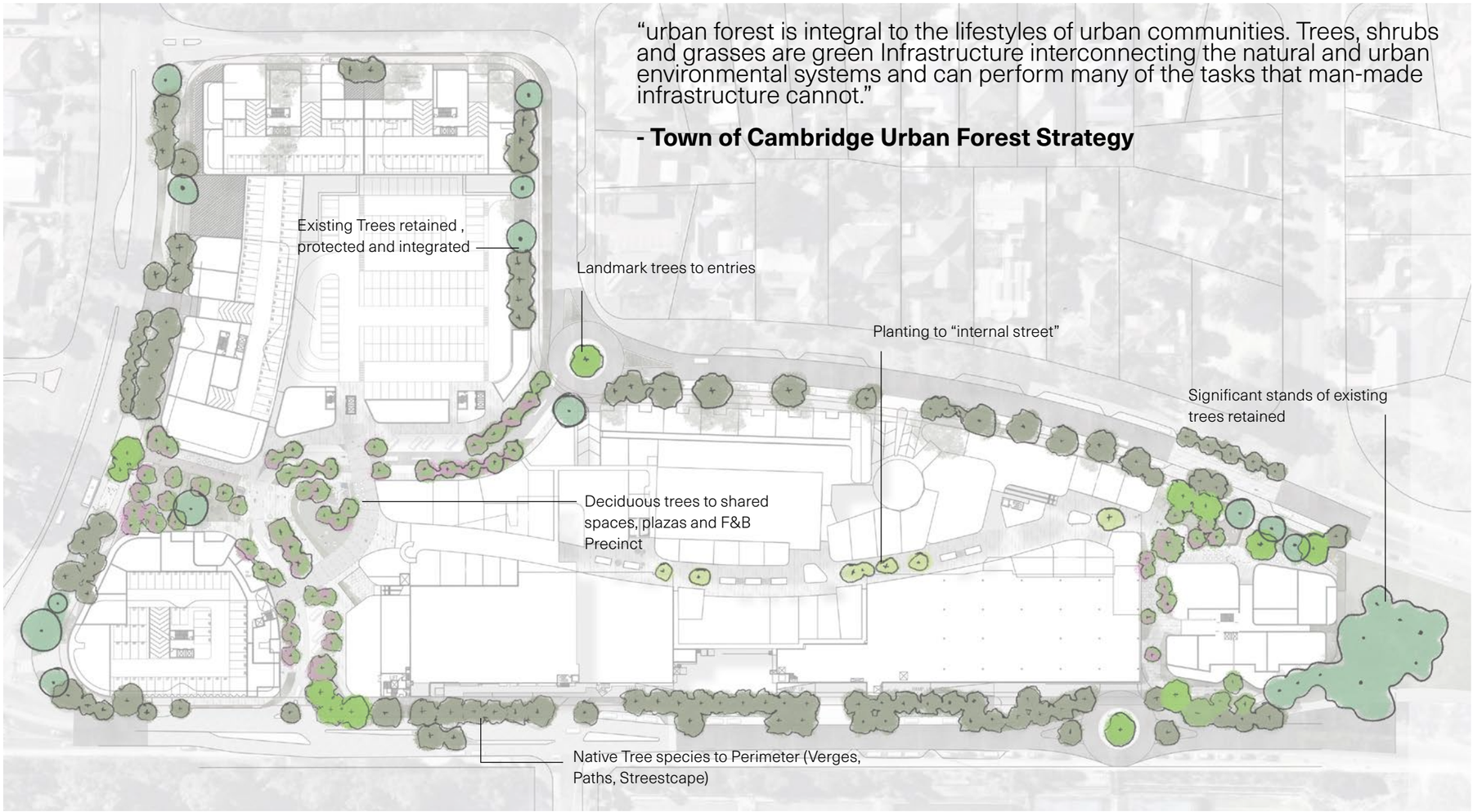
Trees retained, protected & integrated



Planting Strategy_Ground

Generous planting to the projects verges, paths and open spaces that builds opon the existing mature trees on site will strengthen the Garden City character and qualities to the proposed Floreat Precinct Structure Plan.

- Water Sensitive Urban Design strategies will be adopted to ensure stormwater run-off is minimised and directed to support vegetation witin the project;
- Tree cells / structural soil tree trenches are proposed to be used to allow roots access to larger soil volumes and minimise compaction in high traffic areas;
- Existing trees will be retained where possible and proposed trees will be added to maximise canopy coverage and mitigate theurban heat island effect;
- New feature trees will be located on site where significant deep soil is achieved;
- Trees will be appropriately located to support the functions of key spaces and ensure passive solar opportunities are achieved;
- Increased Tree Canopy will provide shaded, comfortable connections that encourage and improve walking and cycling to and from the site.











Tree Planting Strategy

Proposed trees have been selected from the Town of Cambridge "Urban Forest Strategy".

Street Trees will be large native evergreen, aiming to create a continuous canopy along pedestrian pathways around the Floreat Precinct.

Within the precinct deciduous trees will ensure sunlight access during winter and provide shade during summer and feature trees will mark gateways and core locations.

The podium selection counts a mix of evergreen and deciduous trees (located according to shading conditions) which require smaller soil volumes to grow and keep a small canopy.

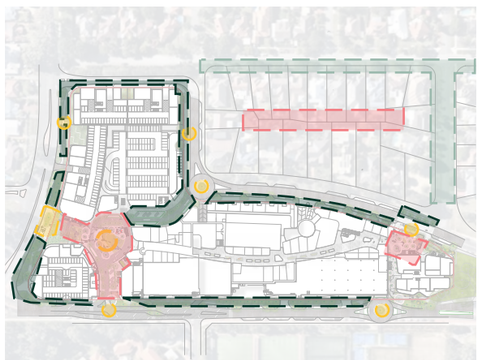
LARGE NATIVE STREET TREES

NATIVE - MEDIUM

FEATURE TREES

DECIDUOUS TREES

TREES FOR PODIUM AMENITY SPACES











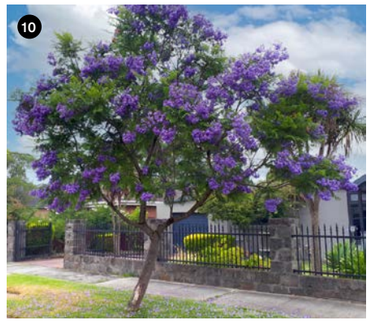
























Indicative Tree species list

- *Acmena smithii*
- *Agonis flexuosa (1)*
- *Angophora costata (2)*
- *Araucaria columnaris*
- *Araucaria heterophylla (3)*
- *Brachychiton populneus (4)*
- *Corymbia ficifolia (5)*
- *Corymbia maculata (6)*
- *Delonix regia (7)*
- *Erythrina indica*
- *Eucalyptus leucoxylon*
- *Eucalyptus sideroxylon "Rosea" (8)*
- *Ficus hillii*
- *Fraxinus griffithii (9)*
- *Jacaranda mimosifolia (10)*
- *Melaleuca lanceolata (11)*
- *Melaleuca quinquenervia*
- *Metrosiderosexcelsa*
- *Phoenix canariensis (12)*
- *Platanus orientalis digitata*
- *Sapium sebiferum (13)*
- *Tipuana tipu (14)*
- *Tristaniopsis laurina (15)*
- *Ulmus parvifolia*
- *Gleditsia tricanthos "Shademaster"*
- *Liquidamber styraciflua*
- *Lagerstroemia indica*
- *Olea Europaea*

Deep Soil

RESIDENTIAL LOTS *

LOT	DSA	DSA%
01	386	10.9%
02	636	18.6%
03	754	12.3%
04	478	14.3%

* NOTE

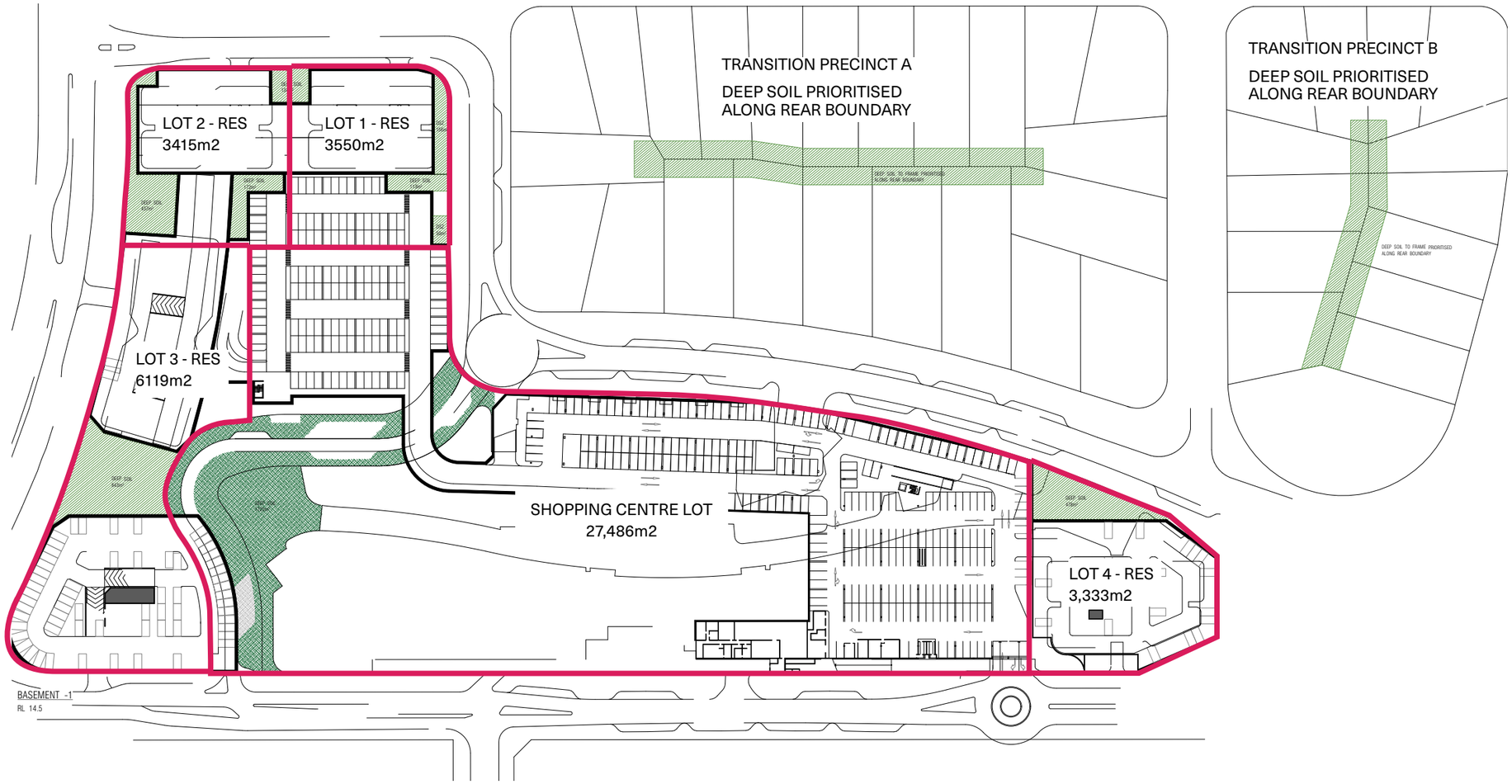
Deep Soil Area within the Residential Lots meet the requirements set out in the Design WA Residential Design Codes SPP 7.3. It includes areas that do not sit over basement or building Structure, are indicative only and subject to detailed design in later phases.

SHOPPING CENTRE LOT**

DSA	DSA%
2,398	8.7%

** NOTE

Deep Soil Area within the Shopping Centre Lots includes public realm areas that do not sit over basement or building structure, are indicative only and subject to detailed design in later phases.



Tree Canopy Cover

Together with retention of existing trees canopy, we aim to add as many new trees as possible to complement the Garden City character, provide shade amenity, contribute to biodiversity and contrast heat island effect.

The proposed design estimates location of the below quantities of trees with the Lot Boundaries.

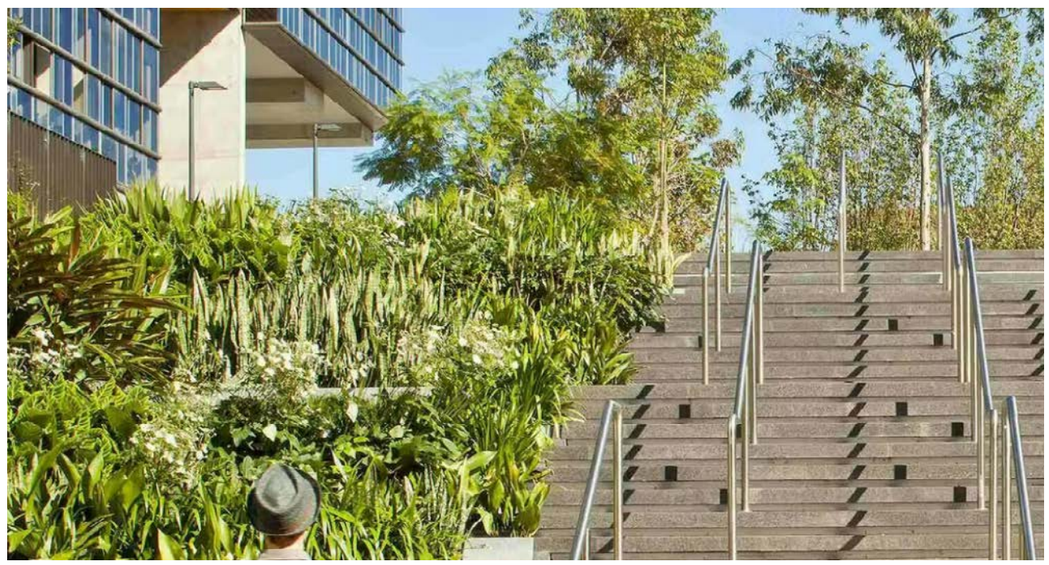
Large trees - Existing	**15**
Medium trees	**25**
Small trees	**40**



N

Landscape Opportunities on Podium









- **filled with natural light**
- **offset energy consumption**
- **contrasting urban heat island effect**

Landscape Opportunities on Podium









- **green and comfortable asset for residents and/or visitors**
- **contributing to biodiversity**

Planting Strategy_Podium

The planting strategy for the podium provides generous planted zones for private shared use through an arrangement of outdoor spaces, a mix of fixed and flexible furniture, active recreation areas, and spaces that offer a more quiet place.

Planting will feature a range of evergreen lush species with the opportunity to include edibles where sun exposure will allow for commuity gardens to be hosted.

Trees will be small sized and deciduous where sun access is not continuous otherwise native evergreen will be preferred.

Generous soil volumes (in raised planters or integrated slab set down zones) will be allowed anywhere a tree will be proposed on podium to ensure suitable growing conditions.

Rooftop space is envisioned to be optimized by being used as a green roof or bio-solar roof. Green roofs will provide habitats which encourage biodiversity, while Bio-solar roofs will integrate solar power and green roofs increasing PV panels efficiency and creating a 'habitat mosaic' which allows a wider variety of vegetation to flourish and, in turn, attract birds and insects.



* Axonometric created by MJA architects. Refer to Architect report for most up to date massing and podium layout.

ASPECT Studios

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1 - SUMMARY

An arboricultural survey was conducted along the Floreat Avenue Border of Floreat Forum on behalf of Apical Group. The report will conclude that all assessed trees maintain good condition overall and are providing significant amenity value for the area, with the majority exhibiting both good vitality and good structural condition.

All assessed trees are located in small groups within defined verge or raised bank areas. These areas are expected to contain the combined structural and functional root mass of the group, with minimal root development extending outside of this. As such these areas, rather than the calculated Tree Protection Zone (TPZ) figures, would provide a more accurate description of actual root development and should therefore be used to define any required tree protection areas.

The report will recommend these planting areas are retained in their current form with minimal disturbance or alterations. Any excavation within these areas has a high likelihood of impacting both structural integrity and vitality of the trees and should therefore be avoided or minimised as much as possible. Any required works within the areas should be undertaken in accordance with AS 4970:2009 "*Protection of Trees on Development Sites*" and will require confirmation with, and on site supervision by, a suitably qualified project arborist to ensure works will not negatively impact the trees.

In addition to minor fence distortion the report will note two trees currently growing in close proximity to substantial infrastructure (sewer access pit and carpark ramp wall). Although no significant impact or damage was observed at this point the likelihood of this is expected to increase as the trees continue to develop in size. Depending on proposed designs substantial consideration and accommodations may be required in order to preserve the trees for the long term. Alternatively if this infrastructure is to be retained and cannot be altered the removal of the trees and planting of replacements at more suitable locations is recommended in both cases

2 - INTRODUCTION

2.1 Apil Group has requested an arboricultural survey and assessment of all trees greater than 5m in height running along the eastern Floreat Avenue Border, along with a single Jacaranda within the Forum open area. The trees were inspected from ground level in calm and overcast conditions on the 7th and 8th of April 2023. A total of thirty-three (33) trees were documented and added to the Tree Plotter mapping software. The gathered information is displayed in map and table format within Section 3 of the report and can also be accessed directly through the web based portal with the following login information:

TREE PLOTTER
Website: https://au.pg-cloud.com/ClassicTS/
Username: Floreat Forum
Password: floreatforum

2.2 The following map indicates the site layout, location and ID number and of trees assessed.



FIG.1 Displays assessed tree locations and identification numbers – image via Tree Plotter

3 - OBSERVATIONS

3.1 Tree details and measurements are displayed within the following table;

Tree ID #	Botanical Name	Tree Height [m]	Age Class	Vitality	Structural Condition	DBH [cm]	DGL [cm]	TPZ [m]	SRZ [m]	Comments	Recommended works
1	*Jacaranda mimosifolia*	9	Mature	Good	Good	41	46	4.92	2.39	Raised soil/planter level. Artificial turf over rootzone	Remove artificial turf, lower soil level to original height
2	*Eucalyptus leucoxylon*	7	Semi-Mature	Good	Good	28	36	3.36	2.15		
3	*Angophora costata*	12	Mature	Fair	Good	48	50	5.76	2.47		
4	*Eucalyptus camaldulensis*	13	Mature	Good	Good	45	65	5.4	2.76	Growing close to sewer pit and beginning to cause distortion	Clear foliage from building roof. Modify pit or remove tree
5	*Eucalyptus camaldulensis*	11	Semi-Mature	Good	Good	30	34	3.6	2.1		Clear foliage from building roof. Remove low branch over carpark
6	*Angophora costata*	13	Mature	Good	Good	47	54	5.64	2.55		Clear foliage from building roof
7	*Angophora costata*	12	Semi-Mature	Good	Good	33	41	3.96	2.28		Clear foliage from building roof
8	*Corymbia citriodora*	13	Mature	Good	Good	42	52	5.04	2.51		Clear low foliage from sign and walkway
9	*Eucalyptus grandis*	14	Mature	Fair	Fair	44	55	5.28	2.57	Stem in contact with parking ramp	Modify ramp or remove tree
10	*Angophora costata*	8	Semi-Mature	Good	Good	35	40	4.2	2.25		
11	*Angophora costata*	9	Semi-Mature	Good	Good	34	37	4.08	2.18		
12	*Angophora costata*	12	Mature	Good	Good	39	44	4.68	2.34		
13	*Angophora costata*	12	Mature	Good	Good	39	44	4.68	2.34		
14	*Angophora costata*	11	Mature	Good	Good	50	55	6	2.57		Crown lift foliage over footpath
15	*Corymbia citriodora*	13	Mature	Fair	Good	38	45	4.56	2.37		
16	*Angophora costata*	8	Semi-Mature	Good	Good	28	34	3.36	2.1		
17	*Angophora costata*	8	Semi-Mature	Good	Good	30	36	3.6	2.15		
18	*Angophora costata*	9	Mature	Good	Good	41	46	4.92	2.39		Crown lift foliage over footpath
19	*Corymbia citriodora*	13	Mature	Good	Good	37	44	4.44	2.34		

20	*Eucalyptus camaldulensis*	11	Mature	Good	Good	47	57	5.64	2.61	Causing some distortion to fence	Modify/replace fence panel
21	*Eucalyptus caesia*	6	Mature	Good	Fair	16	18	2	1.61		
22	*Araucaria heterophylla*	21	Mature	Fair	Good	60	64	7.2	2.74		
23	*Corymbia ficifolia*	7	Mature	Good	Good	34	39	4.08	2.23		
24	*Ficus obliqua*	8	Mature	Good	Good	57	57	6.84	2.61		Crown lift over vehicle lane
25	*Ficus rubiginosa*	10	Mature	Good	Good	74	97	8.88	3.27	Stem growing into fence	Modify fence to move further from stem. Crown lift over vehicle lane
26	*Corymbia citriodora*	21	Mature	Good	Good	91	103	10.92	3.35		
27	*Liquidambar styraciflua*	6	Semi-Mature	Fair	Fair	41	41	4.92	2.28		
28	*Podocarpus elatus*	11	Mature	Good	Good	40	42	4.8	2.3		
29	*Araucaria columnaris*	18	Mature	Good	Fair	56	58	6.72	2.63	Co-dominant main stem, bifurcates at 9m	
30	*Jacaranda mimosifolia*	6	Semi-Mature	Good	Good	16	18	2	1.61		
31	*Angophora costata*	11	Mature	Good	Good	50	55	6	2.57		Clear low foliage from sign and walkway
32	*Angophora costata*	10	Mature	Good	Good	46	46	5.52	2.39		Crown lift foliage to clear parking bays
33	*Angophora costata*	10	Mature	Good	Good	38	43	4.56	2.32		Crown lift foliage to clear parking bays

Legend:

DBH: Diameter at Breast Height (measured at 1.4m unless otherwise stated).
DGL: Diameter at Ground Level (measured at ground level, above any root flare).
TPZ: Tree Protection Zone (calculated as a radius from the centre of the stem).
SRZ: Structural Root Zone (calculated as a radius from the centre of the stem).

4 – DISCUSSION

4.1 Lining the eastern Border of the Floreat Forum complex the assessed trees provide significant amenity value to the area. All trees are located with semi-naturalised groups in defined vegetation areas such as raised banks or verges.

4.2 All assed trees maintain good condition overall with the majority displaying good structural condition and high vitality. No significant decline, major retained deadwood or structural defects of concern were noted throughout the assessment group. Recommended remedial works are minimal consisting principally of foliage pruning to increase clearance from signs, footpath and buildings, and minor fence modification works to increase clearance from two tree stems.



IMG 1 – Tree 20 – causing moderate fence distortion



IMG 2- Tree 8, foliage blocking sign

4.3 Tree 1 creates a highly prominent feature within the centre of the shopping complex. The tree is located within a raised planting bed which has been surfaced with artificial turf to allow pedestrian movement around the tree. Inspection found minimal root fair development suggesting the soil level around the stem has been raised above the natural grade before the entire area was covered in artificial turf. Artificial surfaces such as this commonly have restrictive permeability which is likely impacting gaseous and water exchange within the soil profile below. The raised level may also encourage development of girdling roots or expose the lower stem to pathogen colonisation, causing decline and potential death of the tree in the long term. It is unclear what material is directly below the artificial turf but careful lowering of the soil level back to the original grade via non-destructive methods such as hand digging or air spading is recommended. Replacement of the artificial turf with mulch or similar permeable layer is also recommended to maintain the current high vitality of the tree and promote healthy development.



IMG 3 – Tree 1, located within raised area



IMG 4 – Note artificial turf and lack of root flair, suggesting soil level increase around the stem

4.4 Two trees were found to be growing in close proximity to surrounding infrastructure. These were Tree 4 growing beside a sewer access pit and Tree 9 growing adpressed against the lower carpark ramp wall. Both trees are large specimens that maintain good condition overall and are providing reasonable amenity value. Impact to the infrastructure appears minimal at this stage however the likelihood of damage is expected to increase as these large species continue to apply new stem and root growth around the areas. Based on current proximity the trees are likely using the infrastructure for structural support, removal or significant modification of this infrastructure therefore does not look possible without compromising the structural integrity of the trees. It is unclear of the degree of proposed development within these areas and how that relates to the trees but should retention be desired careful consideration regarding how to modify the ramp or decommission the sewer pit will be required. Alternatively if this infrastructure is required to be preserved removal of the trees and replacement at more suitable locations is recommended.



IMG 5 – Tree 4, growing beside sewer pit



IMG 6 – Tree 9, stem adpressed against ramp wall

5 – TREE PROTECTION

5.1 Tree 1 – This individual specimen is located within a central raised planting bed with additional planting and seating areas built into the sides. In this case all significant root mass is likely to be contained within this planting area, within minimal development extending out into the surrounding soil. As such the exterior boundary of the raised planting are should be nominated as the Tree Protection Zone, rather than the calculated figure. As this tree is within the centre of the site it is likely to require the most substantial protection to maintain it in its current high value form. In line with AS4970 a suitable barrier such as temporary fencing panels should be erected around the walls of the planting bed to protect from direct mechanical damage and to prevent the storage of equipment or materials within its root zone, all of which are likely to impact the tree to some degree. Any reticulation or irrigation currently supplied to this area should also be maintained throughout the length of the project. As root development within the area is likely to be dense due to the compact size of the planting bed any form of major excavation or disturbance is likely to damage substantial root mass, significantly impacting both vitality and structural integrity. As such this should be prevented where possible. Modification to the external planting bed itself may be achievable but any proposed designs will require review by a consultant arborist to determine their feasibility.



IMG 7 – Tree 1, the exterior of the planting bed should be used as the nominated TPZ area. No significant excavation or modifications permitted within.

5.2 The remaining trees within the site are all located within well-defined verges or raised bank areas. In a similar form to Tree 1 these areas are likely to contain all significant structural and absorptive root mass of the trees distributed asymmetrically throughout, with minimal root mass extending out into the rest of the site. As such it is recommended the perimeter of these areas are used as combined Tree Protection Zones for the subject trees rather than the calculated individual figures, which in these instances are likely to not provide an accurate description of root development. Protection of these trees should take the form of temporary fencing at the borders of these areas to protect from direct mechanical damage and to prevent storage of equipment or materials within the root zones. Fencing around raised areas may not be necessary, although protection of the canopy from large machinery may still be required.

Any excavations within these areas is likely to cause significant impact the trees and as such this should be prevented or minimised where possible. Any works within these areas will require prior confirmation by the project arborist, and direct supervision while they are being undertaken.



IMG 8 – low bank area containing multiple trees



IMG 9 – Raised area, may not require protective fencing

6 – RECOMMENDATIONS

6.1 Engage a suitably qualified consultant arboriculturist (AQA Level 5 or above) as a nominated project arborist. This role will provide guidance and advice at the design stage, ensure tree protection is installed correctly and remains adequate during the works, monitor tree condition during the project, and will supervise any works within the TPZs.

6.2 Any and all works around subject trees should be considerate of, and in accordance with, AS 4970:2009 "*Protection of Trees on Development Sites*".

6.3 Tree 1 –

- 6.3.1 Erect protective fencing around entire raised planting bed before development works.
- 6.3.2 Maintain any current reticulation the tree is receiving throughout the project.
- 6.3.3 Avoid significant modification or excavation within planting bed.
- 6.3.4 Any works within the area should be confirmed with project arborist at the design stage and undertaken under direct supervision.

6.4 Trees 2-33 –

- 6.4.1 Consider bank/verge planting areas as combined TPZs for each group.
- 6.4.2 Erect protective fencing around these areas before development works.
- 6.4.3 Prevent or minimise significant excavation or modification to these areas.
- 6.4.4 Any works within the area should be confirmed with project arborist at the design stage and undertaken under direct supervision.

6.5 Tree1 – Lower soil directly around the stem or throughout the whole planting bed back to original grade using non-destructive excavation methods such as careful hand digging or air spading. Replace artificial turf with mulch or similar permeable surface.

6.6 Trees 4+9 - Determine design and service requirements of the infrastructure around the trees. Depending on outcome either modify/decommission infrastructure to retain the trees, or remove and replant at more suitable locations.

6.7 Trees 20+25 - Modify sections of fencing to increase clearance from tree stems

6.8 Conduct various small remedial pruning works to increase foliage clearances from signs, footpaths and building rooves, as detailed within Table 3.1

Jack Payne – April 2023

Literature cited

Council of Standards Australia. (2009, August 26). Australian Standard®Protection of trees on development sites AS4970 - 2009. Australia.

Liability and Limitation

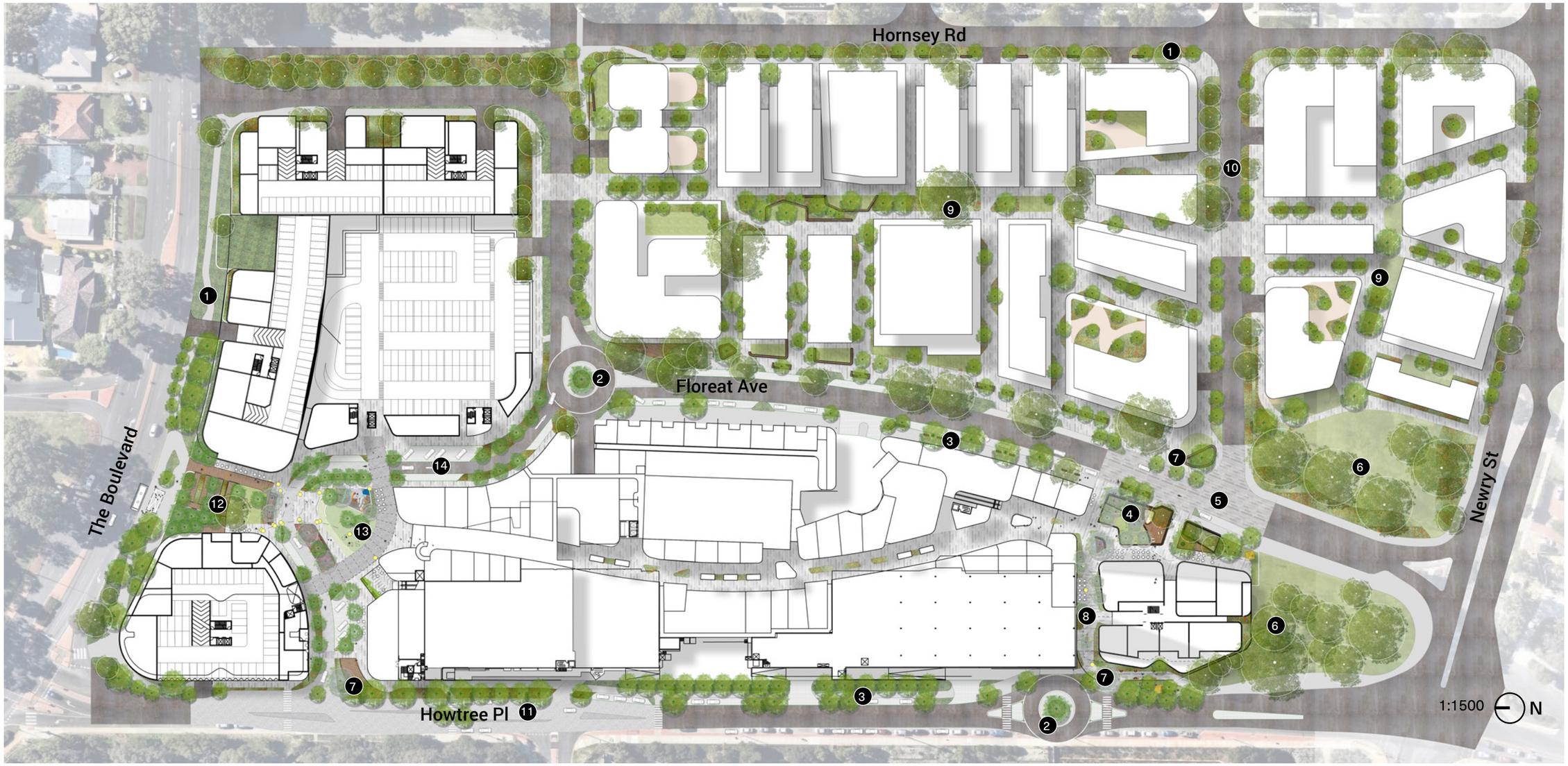
Tree risk inspections are based on reasonably practicable assessment methods. Every condition that could possibly lead to a stem or tree failure cannot be expected to be detected. Trees may fail from a range of singular or cumulative reasons, some of which are not yet fully understood. Recommendations following inspections may or may not be accepted by clients.

Assessment tools are variable and unless otherwise stated inspections are undertaken at ground level based on the permissible access granted. Inspection of underground portions is limited and potential reasons for failure are not always available for consideration. CTS cannot guarantee against tree or limb failure.

It is not possible to make a tree "safe" rather they can be managed to reduce the potential risk of harm to acceptable levels, should the consultant feel this is necessary. Recommendations in this report are based on qualifications, experience, knowledge and the use of assessment tools deemed necessary for the individual inspection.

The report is to be considered in full and sections are not to be selected for legal consideration without advice and approval from CTS.
No portion of this report may be forwarded without the expressed permission of the author.

Concept Landscape Plan



1. Upgraded verge with existing trees and planting and pedestrian footpath
2. Landmark roundabout
3. Upgraded verge along with parallel parking bays, planting and native trees WSUD blisters and pedestrian footpath
4. South Entry Square
5. Raised pedestrian crossing and shared zone, connecting public parks to Southern Square and Transition Precinct A & B
6. Existing lawn with potential for retail spillout and informal event activation
7. Pocket park with native trees and planting
8. Activated laneway to South Entry Square
9. Transition Precinct Deep Soil zone with significant existing trees and proposed residential communal amenity area.
10. New slow road separating Transition Precincts A and B with pedestrian footpath and planted verge.
11. Feature paving treatment anticipating entry to shared zone
12. Main deep soil zone and landscape heart with suspended boardwalk connection between The Boulevard and the new Floreat Precinct
13. North Entry Square with feature pedestrian walkway to mall and feature deciduous trees
14. Slow vehicle and pedestrian shared way with feature paving treatment, parking and WSUD garden beds with deciduous street trees

Appendix B - Transport Impact Assessment (KCTT)

TRANSPORT IMPACT ASSESSMENT

Floreat Precinct

Structure Plan

April 2024

Preliminary Assessment - Rev E

kctt

PART OF Premise

HISTORY AND STATUS OF THE DOCUMENT

Revision	Date issued	Reviewed by	Approved by	Date approved	Revision type
PA - Rev A	29.06.2023	MK	MK	29.06.2023	Issued for Review
PA - Rev B	21.12.2023	MK	MK	21.12.2023	Amended in Accordance with the Received Comments
PA - Rev C	19.01.2024	MK	MK	19.01.2024	Report Finalised in Accordance with the Received Comments
PA - Rev D	5.04.2024	MK	MK	5.04.2024	Amended in Accordance with the Received Comments
PA - Rev E	23.04.2024	MK	MK	23.04.2024	Amended in Accordance with the Received Comments

DISTRIBUTION OF COPIES

Revision	Date of issue	Quantity	Issued to
PA - Rev A	29.06.2023	1 (PDF)	YG (APIL), AC, DW (Hatch), CD (MJA Architects)
PA - Rev B	21.12.2023	1 (PDF)	YG (APIL), AC, DW (Hatch), CD (MJA Architects)
PA - Rev C	19.01.2024	1 (PDF)	YG (APIL), AC, DW (Hatch), CD (MJA Architects)
PA - Rev D	5.04.2024	1 (PDF)	YG (APIL), AC, DW (Hatch), CD (MJA Architects)
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Appendices

Appendix 1 - The layout of the proposed development
Appendix 2 - Transport Planning and Traffic Plans
Appendix 3 - Traffic Modelling Report
Appendix 4 - Matrices
Appendix 5 - Cycle Length Calculations

1. Executive Summary

Site Context

- The subject site includes Floreat Forum and the adjacent Residential Frame. It is designated as a District Centre under SPP 4.2 (Activity Centres for Perth and Peel). It is the oldest shopping centre of its kind in Western Australia.
- The site is bound by The Boulevard, Howtree Place, Floreat Avenue, Hornsey Road and Oceanic Drive and is exposed to high volumes of passing traffic.
- At present, the levels across the site vary greatly, and as a result, some of pedestrian access points are not readily accessible or visible.
- The Floreat Forum site currently features approximately 900 parking bays distributed across three main parking areas.
- At present, the centre activity is focused inward; therefore, the street frontages are not active nor too attractive for pedestrians and bicyclists.
- The Precinct Structure Plan aims to guide the future development of the Centre and Residential Frame as it is one of the key locations in the Town of Cambridge for urban infill required to meet population targets.
- Several development options were examined; however, this report focuses on the option anticipating approximately 22,319m^2 of commercial space, 950 dwellings on the Floreat Forum site, and approximately 300 dwellings in the residential frame. These yields are consistent with the Endorsed Town of Cambridge Local Planning Strategy.
- The development will occur in logical key stages over an anticipated 5-year development horizon. This will however be subject to market demand, as well as individual landowner intentions within the Residential Frame. For the purposes of this report and assessment, a 2041 full build out horizon year has been assumed.

Technical Findings

- If developed to the scale discussed, the subject site will generate an additional 1,846 VPD, 521 VPH in the AM and 508 VPH in the PM peak. This is deemed high impact under WAPC guidelines.
- The network can cater to this traffic, provided some minor enhancements are undertaken. Both existing signalised intersections will need phasing optimisation, while the Floreat Avenue/ The Boulevard intersection will need to be signalised.
- It is likely the cycle enhancement will be required regardless of the development progressing due to the growth in passing traffic on these high-order roads.
- Based on current modelling the signalisation of Floreat Avenue/ The Boulevard intersection may be required approximately at 20% build out, with timing to be reassessed at time of development application when yields and growth in passing traffic are known.
- The plan proposes streetscape enhancements to Floreat Avenue and Howtree Place, creating a more pedestrian-friendly environment. Each street will feature a roundabout as a traffic management and road safety measure.
- Further to this, the Precinct Structure Plan anticipates internal, non-gazetted, shared streets which will only permit vehicular traffic in one direction (Howtree Place to Floreat Avenue).

Relationship with Policies

- Based on the current regulations, the Precinct Structure Plan has a cumulative requirement for approximately 893 commercial and 1,294 residential parking bays. The Precinct Structure Plan generally allows sufficient place to accommodate this requirement; however, further design development must guard against the over-provision of vehicular parking as induced demand may be detrimental to place value.
- In addition, both residential and commercial components of the development trigger cumulative requirement for the provision of 153 motorcycle/scooter / gopher parking bays.
- Building Code of Australia ACROD Provision – the proposed development will require a minimum of 14 ACROD parking bays. These should be conveniently located in the vicinity of pedestrian access points to the shopping centre.
- While no policy stipulates the provision of parking for seniors and parents with prams, it is a good practice to provide each type of parking at a rate of 4-5% of total parking.
- If the development aims for Green Star rating, fuel-efficient and electric vehicle parking should be provided at a stipulated rate.
- The proposed development would need to provide 625 bicycle parking bays for residents and 125 parking bays for residential visitors within both Floreat Forum Residential and Residential Frame. If designated storage rooms have sufficient space, they can be used as bicycle parking for residents. These should be provided pro rata to the number of dwellings in each development.
- The commercial component of the development must provide 22 long-term bicycle parking bays with appropriate end-of-trip facilities and a minimum of 45 bicycle parking bays for patrons. Although no policy stipulates this, parking for other micro mobility vehicles should be considered in the design development.
- The statutory requirements specify a total of 23 parking bays to be set aside for delivery vehicles and waste collection vehicles. We believe that a coherent design can provide appropriate parking areas for these vehicles and that greater reciprocities can be found.

Conclusion

- In summary, the Precinct Structure Plan anticipates approximately 950 dwellings within the Floreat Forum and an additional 300 dwellings within the Residential Frame. A total of 22,319m^2 commercial space is expected to be provided. The staging will take place over a 15-year period, for the purposes of this report and assessment, a 2041 full build out horizon year.
- The Precinct Structure Plan envisages streetscape enhancements and the provision of additional non-gazetted connection through the site. Preliminary modelling shows that the surrounding network can cater to the additional traffic and traffic growth provided that some minor enhancements are implemented.
- At the time of development applications for individual sites, all efforts should be made to promote active transport over standard vehicular transport. This can be done through the provision of residential micro-mobility share schemes, communal vehicle pools, local bus shuttles etc.
- While the Precinct Structure Plan allows sufficient space to cater to the statutory parking requirements, this option should not be fully exercised in further design development as in principle it contradicts the design intent of the entire Precinct Structure Plan. The appropriate rate of commercial carparking supply should be between 3-4 carparking bays per 100m^2 GFA for this type of development.
- In summary, KCTT believe that the proposed development is not likely to negatively impact the surrounding road network but has the potential to create an active and lively location with high place value.

2. Transport Impact Assessment

2.1 Introduction

APIL engaged KCTT to participate in a team delivering the Precinct Structure Plan for future development of Floreat Activity Centre.

This report will focus on the anticipated transport impact of the proposed development but will also discuss impact mitigation strategies and place value enhancement strategies through the creation of a coherent movement network.

The report aims to assess where sufficient information is available at this stage, and guidance for the portions of the project that will be developed in future.

2.2 Location

Street Number	5
Road Name	Howtree Place
Suburb	Floreat
Description of Site	

Floreat Activity Centre is bound by The Boulevard, Howtree Place, Oceanic Drive and Hornsey Road.
The Floreat Forum site enjoys vehicular access from The Boulevard, Floreat Avenue and Howtree Place with loading docks for two anchor tenants (Coles and Woolworths) being on Howtree Place. Although current physical form of Floreat Forum has limited interactivity to the street fronts, the pedestrian access points are located on all surrounding streets.
The Residential Frame features low density residential dwellings with direct vehicular access to Floreat Avenue, Hornsey Road and Newry Street.

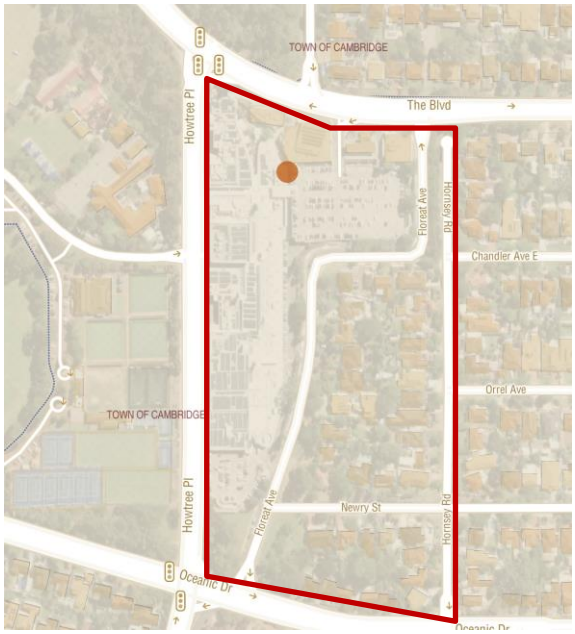


Figure 1 - Subject Site

The Subject Site is classified as a District Centre under SPP 4.2 (Activity Centres for Perth and Peel) and is one of two District Centres located within the Town of Cambridge. As the Town of Cambridge does not feature centres of higher order at present, the subject site represents an important public life node.

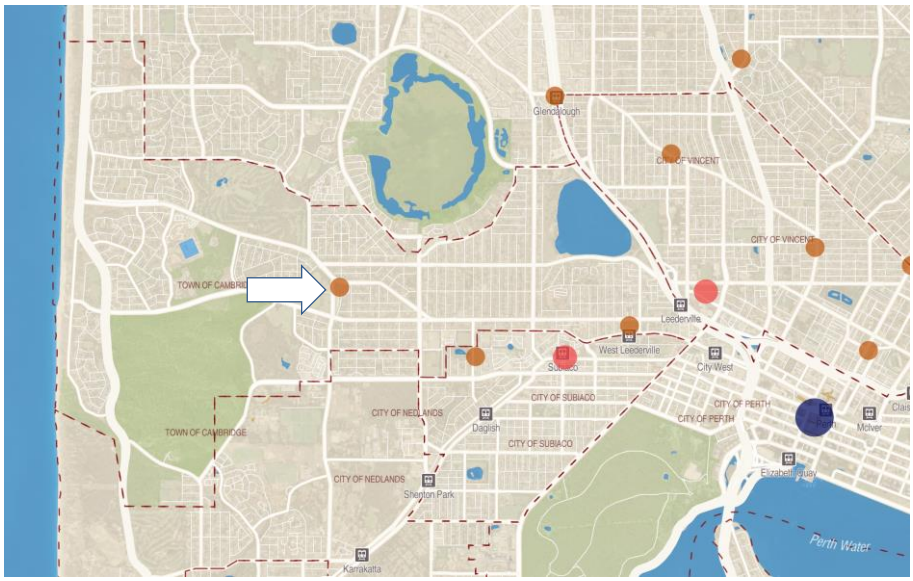


Figure 2 - Spatial distribution of centres recognised by SPP 4.2

Floreat Activity Centre is easily accessible from most of inner-city suburbs. The figure below illustrates basic accessibility (not accounting for particular retail or service attraction) for pedestrians, bicyclists and drivers.

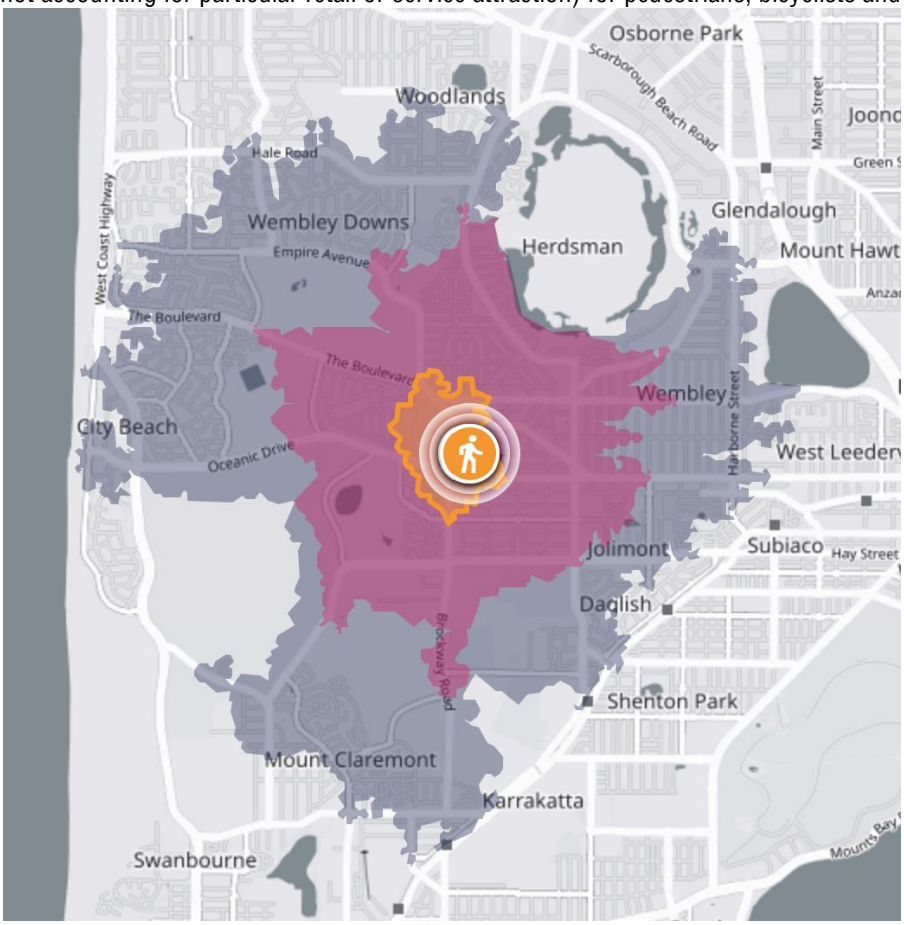


Figure 3 - Floreat Activity Centre 10-minute catchment (walking, cycling and personal vehicle)

2.3 Land Uses

Are there any existing Land Uses	YES
If YES, Nominate:	The subject site is Floreat Forum, shopping centre and adjoining residential precinct bound by Hornsey Road. At present, the site features just over 17,000m^2 of commercial space and some public amenities (such as library and a park). The residential precinct contains approximately 37 dwellings.

Proposed Land Uses

The proposal is in an early stage of planning and will be subject to change. Preliminary assessment is based on the land uses and yields as follows:

Floreat Forum Residential	Floreat Forum Commercial	Residential Frame
Min 670 dwellings	22,319m^2 commercial NLA	120 dwellings - Residential Transition Zone
Max 950 dwellings		180 dwellings - Centre Transition Zone.
including aged care accommodation		

Are the proposed land uses complementary with the surrounding land-uses?	YES

Local Planning Policy 2.3: Precinct P3: Floreat states the following development standards within District Centre Zone (Floreat Forum):

‘ ’ Residential density shall comply with the Residential Design Codes site area requirements for R40.”

Additionally, the following Statement of intent is contained within the mentioned document:
‘ ’Floreat Forum will remain the key commercial and community focus for the area. A range of district shopping and community facilities will continue to be accommodated. Expansion of existing development and any new development will, however, be subject to careful control to ensure that it will not impinge unduly on the amenity of adjacent residential properties. Expansion of the Floreat Tavern, in particular, will not be permitted if it will result in an increase in patronage.

Any new development should be of a height and scale similar to the existing development within the area and compatible with adjacent residential development and reserves. Setbacks for new development will be as determined by the Council having regard to the nature and scale of development proposed, the existing streetscape and the adjacent land uses. As a general rule buildings should be well set back from streets which are also fronted by dwellings. Adequate car parking, screened from the street, must be provided on-site to ensure that vehicles do not encroach into adjacent residential streets.‘ ’

Precinct Structure Plan, as shown in the figure below is aiming to fulfill density targets set by Town of Cambridge’s Planning Strategy.

The development will occur in logical key stages over an anticipated 15 year development horizon as shown indicatively in the table below. This will however be subject to market demand, as well as individual landowner intentions within the Residential Frame. For the purposes of this report and assessment, a 2041 full build out horizon year has been assumed.



Figure 4 - Precinct Concept Plan

Stage	Year	Residential Development Site Stage – Floreat Forum	Floreat Forum Yield	Frame Area Yield	Total residential Supply	% complete
Stage One – Northern Retail	2026	N/A	N/A	50 dwellings (6 lots)	50	4%
Stage Two – Northern Residential	2029	Building D	215	50 dwellings	315	25%
	2032	Building C	195	50	560	45%
Stage Three – Southern Retail	2035	Building E	195	50	805	65%
Stage Four – Residential	2038	Building F	170	50	1,025	80%
Stage Five – Residential and Short Stay	2041	Building A	100	50	1,175	95%
		Building B	75		1,250	100%
		Building G (short stay)				
Total			**950 dwellings**	**300 dwellings**		

2.4 Local Road Network Information

How many roads front the subject site?	6

Name of Roads Fronting Subject Site / Road Classification and Description:

Road Name	**The Boulevard**
Number of Lanes	two way, one lane each direction, undivided
Road Reservation Width	App. 40m
Road Pavement Width	2 x app. 8m
Classification	Distributor A
Speed Limit	60kph
Bus Route	YES
If YES Nominate Bus Routes	No 82
On-street parking	NO

Road Name	**Howtree Place**
Number of Lanes	two way, one lane per direction, divided
Road Reservation Width	App. 22m
Road Pavement Width	2 x app. 6m
Classification	Distributor A
Speed Limit	60kph
Bus Route	NO
If YES Nominate Bus Routes	-
On-street parking	YES

Road Name	**Oceanic Drive**
Number of Lanes	two way, two lanes per direction, divided
Road Reservation Width	App. 30m
Road Pavement Width	2 x app.6m
Classification	Distributor A
Speed Limit	60kph
Bus Route	YES
If YES Nominate Bus Routes	81
On-street parking	YES

Road Name	**Floreat Avenue**
Number of Lanes	two way, one lane each direction, undivided
Road Reservation Width	App. 26m
Road Pavement Width	App.8m
Classification	Access Road
Speed Limit	50kph or State Limit
Bus Route	NO
If YES Nominate Bus Routes	-
On-street parking	YES

Road Name	**Newry Street**
Number of Lanes	two way, one lane (no linemarking), undivided
Road Reservation Width	20.0m
Road Pavement Width	7.2m
Classification	Access Road
Speed Limit	50kph
Bus Route	NO
On-street parking	YES
Road Name	**Hornsey Road**
Number of Lanes	two way, one lane (no linemarking), undivided
Road Reservation Width	20.0m
Road Pavement Width	7.2m
Classification	Access Road
Speed Limit	50kph
Bus Route	NO
On-street parking	YES

2.5 Traffic Volumes

Road Name	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)		Heavy Vehicle %	Date of Traffic Count	*If older than 3 years multiply with a growth rate*
			AM Peak Time - AM Peak VPH	PM Peak Time - PM Peak VPH	*If HV count is Not Available, are HV likely to be in higher volumes than generally expected?*		
Howtree Place	South of The Boulevard (SLK 0.49)	9,091	11:45–689	16:30–883	5.4	2019 /2020	–
	South of The Boulevard **	9,506	09:00–973	16:00–941	n/a	Feb 2022	–
	North of the Oceanic Drive**	9,496	09:00–962	16:00–882	n/a	Feb 2022	–
The Boulevard	East of Howtree Place (SLK 1.04)	12,664	08:00–1,334	16:30–1,234	1.9	2020 /2021	–
	East of Howtree Place **	14,728	09:00–1,480	16:00–1,287	n/a	Feb 2022	–
	West of Howtree Place **	17,996	09:00–1,830	16:00–1,568	n/a	Feb 2022	–
	East of Grantham Street (SLK 1.60)	20,171	08:00–1,975	16:30–1,933	4.5	2020 /2021	–
	East of Empire Avenue (SLK 1.78)	24,089	07:45–2,468	16:45–2,316	4.3v	2019 /2020	–
	West of Empire Avenue (SLK 2.48)	12,081	07:45–1,182	1,182–1,130	7.4	2019 /2020	–
	West of Bold Park Drive (SLK 3.28)	14,827	07:45–1,488	16:45–1,349	4.7	2021 /2022	–
Grantham Street	East of The Boulevard (SLK 2.77)	7,909	08:00–686	16:45–716	7.3	2019 /2020	–

Road Name	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)		Heavy Vehicle %	Date of Traffic Count	*If older than 3 years multiply with a growth rate*
			AM Peak Time - AM Peak VPH	PM Peak Time - PM Peak VPH	*If HV count is Not Available, are HV likely to be in higher volumes than generally expected?*		
Empire Avenue	North of The Boulevard (SLK 0.27)	14,177	07:45–1,517	16:45–1,500	3.9	2019 /2020	–
Oceanic Drive	West of Brookdale Street (SLK 3.40)	11,007	07:45–1,069	16:45–1,013	5.3	2020 /2021	–
	West of Brookdale Street**	11,976	09:00–1,261	16:00–979	n/a	Feb 2022	–
	East of Brookdale Street (SLK 3.56)	10,003	08:00–963	16:30–896	5.8	2018 /2019	–
	East of Brookdale Street**	10,732	09:00–966	16:00–853	n/a	Feb 2022	–
Brookdale Street	South of Oceanic Drive (SLK 0.49)	13,485	08:00–1,375	15:15–1,297	4.8	2020 /2021	–
	South of Oceanic Drive**	12,199	09:00–1,286	16:00–1,143	n/a	Feb 2022	–

Note - The Town of Cambridge does not have traffic data available on Intramaps. The request for available traffic data information is sent to the Town of Cambridge, via email on 29th of July 2022, however, by the time of writing this Report response was not received.

Note**- These traffic volumes have been derived from SCATS data obtained through Main Roads for the intersection of The Boulevard and Howtree Place. Although SCATS should not be used as a sole source of data it is a good tool to verify fluctuations in flow.

2.6 Vehicular Crash Information

Is Crash Data Available on Main Roads WA?	YES
Nominate important survey locations:	
Location 1	The Boulevard (SLK 1.23 – 1.47)
Location 2	Howtree Place (SLK 0.00 – 0.50)
Location 3	Floreat Avenue (SLK 0.00 – 0.56)
Location 4	Intersection of The Boulevard & Howtree Place
Location 5	Intersection of The Boulevard & Floreat Avenue
Location 6	Intersection of Howtree Place & Oceanic Drive
Location 7	Intersection of Floreat Avenue & Oceanic Drive
Location 8	Intersection of Floreat Avenue & Newry Street – no crashes
Location 9	Intersection of Howtree Place & Chandler Avenue West – no crashes

Period of crash data collection	01/01/2019 - 31/12/2023

Road Name	SLK	Road Hierarchy	Speed Limit	Crash Statistics			
				No of KSI Crashes	No of Medical Attention Crashes	No of PDO Major Crashes	No of PDO Minor Crashes
The Boulevard	1.23 – 1.47	Distributor A	60kph	0	1	3	1

MR Nature	Right Angle	Sideswipe Same Dirn	Hit Pedestrian
Count	2	2	1
No of MVKT Travelled at Location	App.18,000 VPD * 365 * 5 years *0.24 km =7.88 MVKT		
KSI Crash Rate	0 KSI crashes/MVKT		
All Crash Rate	5 crashes / 7.88 MVKT =0.63 crashes/MVKT		
Comparison with Crash Density and Crash Rate Statistics	All Crash rate of 0.63 crashes/MVKT is significantly higher than the network average of 0.37 crashes / MVKT.		

Howtree Place	0.00 – 0.50	Distributor A	60kph	0	0	2	3

MR Nature	Rear End	Sideswipe Same Dirn
Count	2	3
No of MVKT Travelled at Location	App.9,500 VPD * 365 * 5 years *0.50 km =8.67 MVKT	
KSI Crash Rate	0 KSI crashes/MVKT	
All Crash Rate	5 crashes / 8.67 MVKT =0.58 crashes/MVKT	
Comparison with Crash Density and Crash Rate Statistics	All Crash rate of 0.58crashes/MVKT is significantly higher than the network average of 0.37 crashes / MVKT.	

Floreat Avenue	0.00 – 0.56	Access Road	50kph or State Limit	1	0	1	1

MR Nature	Hit object	Right angle
Count	1	2
No of MVKT Travelled at Location	Assumed1,000 VPD * 365 * 5 years *0.56 km = 1.02 MVKT	
KSI Crash Rate	0 KSI crashes/MVKT	
All Crash Rate	3 crashes / 1.02 MVKT = 2.94 crashes/MVKT	
Comparison with Crash Density and Crash Rate Statistics	All Crash rate of 3.91 crashes/MVKT is significantly higher than the network average of 1.98 crashes / MVKT.	

Intersection Name	Road Hierarchy	Speed Limit	Crash Statistics			
			No of KSI Crashes	No of Medical Attention Crashes	No of PDO Major Crashes	No of PDO Minor Crashes
The Boulevard & Howtree Place	Distributor A / Distributor A	60kph / 60kph	0	0	3	0
MR Nature	Rear End		Sideswipe Same Dirn			
Count	2		1			
No of MVKT Travelled at Location	App.27,500 VPD * 365 * 5 years * 0.3 km = 15.06 MVKT					
KSI Crash Rate	0 KSI crashes/MVKT					
All Crash Rate	3 crashes / 15.06 MVKT = 0.19 crashes/MVKT					
Comparison with Crash Density and Crash Rate Statistics	All Crash rate of 0.19 crashes/MVKT is lower than the network average of 0.85 crashes / MVKT.					
The Boulevard & Floreat Avenue	Distributor A / Access Road	60kph / 50kph or State Limit	0	0	1	1
MR Nature	Right angle					
Count	2					
No of MVKT Travelled at Location	Assumed 15,000 VPD * 365 * 5 years * 0.3km = 8.21MVKT					
KSI Crash Rate	0 KSI crashes/MVKT					
All Crash Rate	2 crashes /8.21 MVKT = 0.24 crashes/MVKT					
Comparison with Crash Density and Crash Rate Statistics	All Crash rate of 0.24 crashes/MVKT is lower than the network average of 0.85 crashes / MVKT.					
Howtree Place & Oceanic Drive	Distributor A/ Distributor A	60kph/ 60kph	0	3	2	0
MR Nature	Rear End		Right Turn Thru			
Count	3		2			
No of MVKT Travelled at Location	App.20,000 VPD * 365 * 5 years * 0.4 km = 14.6 MVKT					
KSI Crash Rate	0 KSI crashes/MVKT					
All Crash Rate	5 crashes / 14.6 MVKT = 0.34 crashes/MVKT					
Comparison with Crash Density and Crash Rate Statistics	All Crash rate of 0.34 crashes/MVKT is lower than the network average of 0.85 crashes / MVKT.					
Floreat Avenue & Oceanic Drive	Access Road / Distributor A	50kph or State Limit / 60kph	0	1	1	0
MR Nature	Rear End		Sideswipe Same Dirn			
Count	1		1			
No of MVKT Travelled at Location	Assumed 11,500 VPD * 365 * 5 years *0.3 km = 6.30MVKT					
KSI Crash Rate	0 KSI crashes/MVKT					
All Crash Rate	2 crashes / 6.30 MVKT =0.32 crashes/MVKT					
Comparison with Crash Density and Crash Rate Statistics	All Crash rate of 0.32 crashes/MVKT is lower than the network average of 0.85 crashes / MVKT.					

The following tables shows crash rates and crash densities in Perth Metropolitan area on local roads and state roads for the period from 2017 to 2022, as obtained from Main Roads WA on the 31st May 2022 by email request:

Crash Density and Crash Rate on Metropolitan Local Roads Network only

	All Crashes		Serious Injury Crashes (Fatal+Hospital)	
	Average Annual Crash Density (All Crashes/KM)	Average Annual Crash Rate (All Crashes/MVKT)	Average Annual Crash Density (Ser. Inj. Crashes/KM)	Average Annual Crash Rate (Ser. Inj. Crashes/MVKT)
Metro Local Roads - Midblock	2.51	0.95	0.12	0.05
Metro Local Roads - All	5.23	1.98	0.24	0.09

Note: Based on 5-years data for the period 2017 to 2021.

Crash Density and Crash Rate on Metropolitan State Roads Network only

	All Crashes		Serious Injury Crashes (Fatal+Hospital)	
	Average Annual Crash Density (All Crashes/KM)	Average Annual Crash Rate (All Crashes/MVKT)	Average Annual Crash Density (Ser. Inj. Crashes/KM)	Average Annual Crash Rate (Ser. Inj. Crashes/MVKT)
Metro State Roads - Midblock	20.12	0.37	0.89	0.02
Metro State Roads - All	46.28	0.85	1.80	0.03

Note: Based on 5-years data for the period 2017 to 2021.

In order to identify black spots being the locations noted for a high incidence of crashes involving death and injury, it is important to conduct the crash criteria analysis as shown in the table below. If the below crash criteria are met, there is a way to measure the cost-effectiveness of the proposed treatment. It is called BCR and it ensures that the black spot exhibits a significant number of crashes that are correctable by infrastructure treatment.

Table 3.1: Crash criteria for the State Black Spot Program

Crash Criteria	Highways and Main Roads		Local Roads	
	Metro	Rural	Metro	Rural
Intersection or Mid-block or Short road section (< 3 km)	10 crashes over 5 years	3 crashes over 5 years	5 crashes over 5 years	3 crashes over 5 years
Road length (≥ 3km)	Average of 3 Crashes per km over 5 years	Average of 1 crash per km over 5 years	Average of 2 Crashes per km over 5 years	Average of 1 crash per km over 5 years
Benefit-cost ratio (BCR)	1			

(Main Roads/ WALGA 2004)

A any of the analysed roads nor intersections have no KSI crashes over 5 years period, none of them qualify as Black Spot Locations.

2.7 Floreat Forum Patron Surveys

Were patron surveys provided?	YES
If YES, provide the details:	

KCTT received pedestrian foot traffic surveys from the proponent. Data was collected from the existing automatic counters in the centre. Weekly breakdown (as shown in the table below) provided the insight on key directions of pedestrian traffic through the centre. Not surprisingly, pedestrians mostly come from the direction of the largest car parking areas.

Date	East Entrance	South Entrance	Car Park Entrance	Woolworths Entrance	North Car Park Lift	North Car Park	Boulevard South Ramp	Howtree Place	Boulevard North Stairs	Selected Period Total
11/10/21	706	1,979	1,440	332	4,287	621	124	942	96	**10,527**
12/10/21	654	1,875	1,172	390	4,082	596	132	862	112	**9,875**
13/10/21	644	1,852	1,043	386	3,747	660	135	732	118	**9,317**
14/10/21	768	1,851	1,208	478	4,209	780	144	780	104	**10,322**
15/10/21	726	1,826	1,268	610	3,952	814	157	750	148	**10,251**
16/10/21	692	1,895	1,390	549	4,320	786	150	688	132	**10,602**
17/10/21	478	1,222	729	324	2,942	535	144	613	90	**7,077**
TOTAL	**4,668**	**12,500**	**8,250**	**3,069**	**27,539**	**4,792**	**986**	**5,367**	**800**	**67,971**
%	6.87%	18.39%	12.14%	4.52%	40.52%	7.05%	1.45%	7.90%	1.18%	

The figure below represents the spatial distribution of pedestrian traffic in the centre. Most pedestrians (over 40%) come from the direction of the northern car park. While it is impossible to ascertain the exact method of transportation at arrival, it is safe to assume that most pedestrians coming from the direction of the northern carpark arrived in a vehicle.

Similar conclusions can be made for pedestrians arriving from the south and east, while pedestrians arriving from the direction of The Boulevarde (via ramp or stairs) and Howtree Place are most likely arriving on foot, on bicycle or via public transport.

Based on the available information, it is reasonable to assume that approximately 10-15% patrons arrive to the centre on foot, on bicycle (or other micro mobility device) or via public transport.

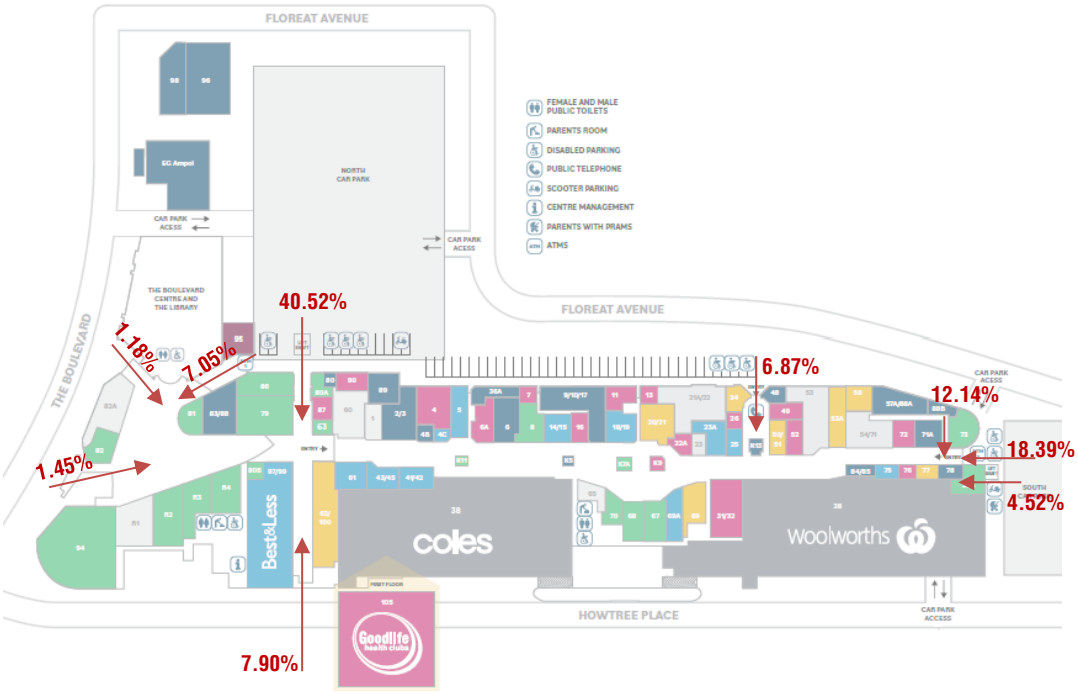


Figure 5 - Spatial distribution of pedestrian traffic

Hourly breakdown in foot traffic was used to determine the most appropriate times for traffic survey. The breakdown was available for only one week. As expected, the traffic is the highest on Saturday in the morning peak. Although this particular data set showed unusually high traffic on Monday morning, the traffic survey focused on more traditional peak trading days – Thursday, Friday and Saturday. Internet search confirmed that Monday 11/10/21 was the first day of school term 3 for 2021, and traditionally the first Mondays in many schools are pupil-free days.

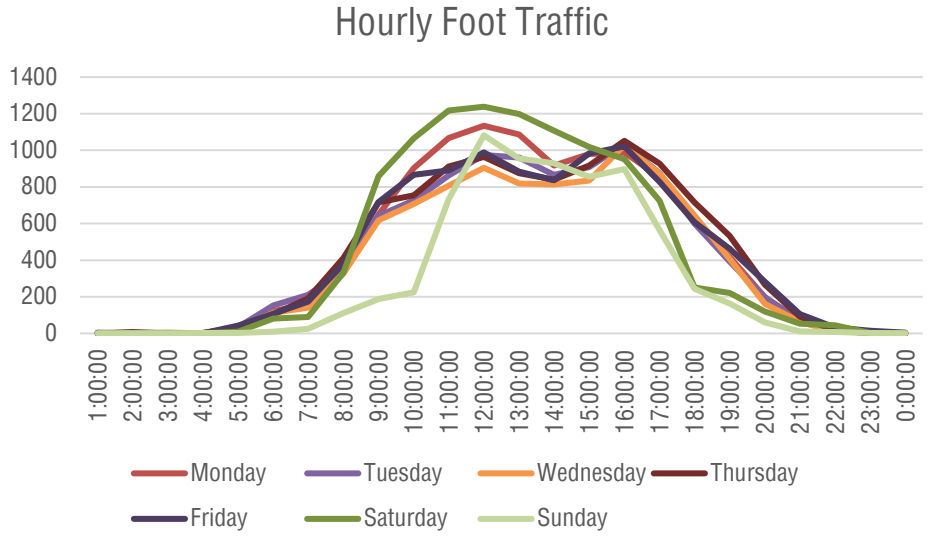


Figure 6 - Hourly foot traffic

Given that the retail core has such pronounced peak operation on Saturday in period 11:00-13:00, all of the modelling will be focused on this time period.

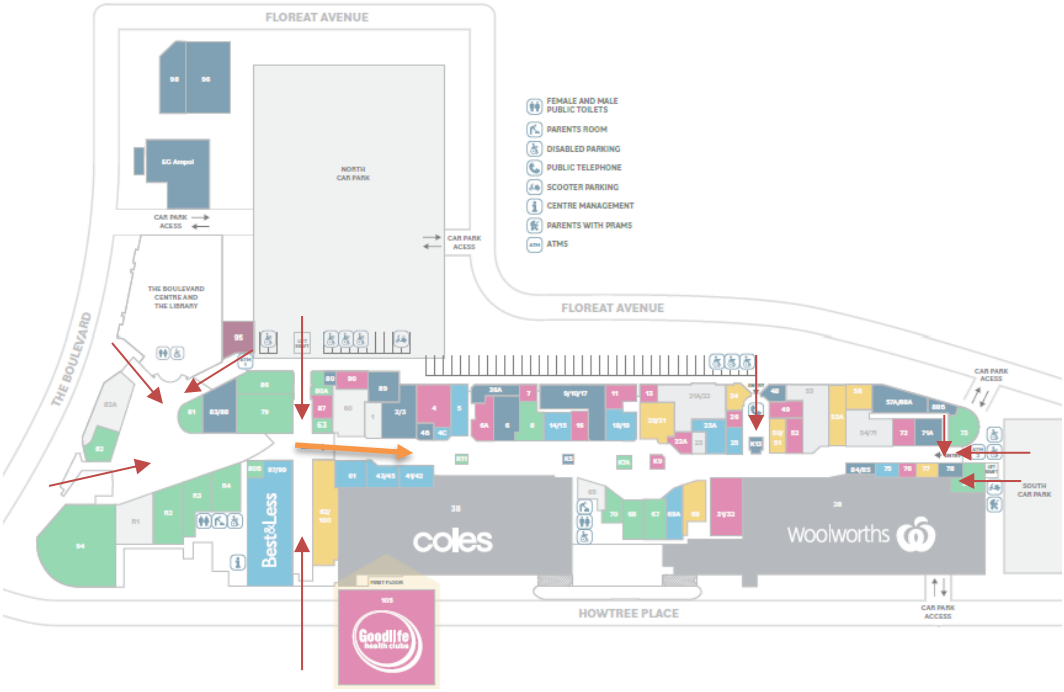
2.8 Pedestrian Infrastructure

Describe existing local pedestrian infrastructure within a 400m radius of the site:

Classification	Road Name
" Other Shared Path (Shared by Pedestrians and Cyclists)"	The Boulevard, Howtree Place, Chandler Avenue West, Oceanic Drive
" Walking Trail"	Newry Street, Brookdale Street
Pedestrian Path	All roads surrounding the subject development site have a pedestrian path on one or both sides of the road reservation.

Does the site have existing pedestrian facilities	YES
What is the Walk Score Rating?	
87 Very Walkable. Most errands can be accomplished on foot.	

The Floreat Forum has several key pedestrian access points as shown in the figure below. Based on the available patron surveys, the most patrons access centre from the direction of the northern carpark. It is impossible to ascertain the exact proportion of patrons who did not use personal vehicle to arrive to the centre, but alternative transportation mode.



Access points on The Boulevard can be deemed solely pedestrian / bicyclist access points. The Boulevard carries high vehicular traffic volumes; however, despite generously sized shared paths, it does not make a pleasant walking environment for pedestrians therefore only 2.5% of patrons arrive via The Boulevard access points.



Figure 7 - The Boulevard approach to the Centre.

As per the Figure above, pedestrian access points from The Boulevard are not obvious; therefore, pedestrians not familiar with the area may not even be aware of these access points.

The main access point to the Centre or the exact trajectory of the pedestrian access are not readily visible. While meandering pedestrian access can contribute to the sense of discovery, ramp access in particular in fact is more likely to cause feelings of discomfort due to confined space and restricted lines of visibility.



Figure 8 - Pedestrian access via stairs from The Boulevard.



Figure 9 – Ramp access (pedestrian and micromobility devices) from The Boulevard.

Along Howtree Place, the Centre interfaces educational facilities. It is reasonable to assume that a significant portion of the patronage accessing the Centre via Howtree Place pedestrian access is derived from this catchment. However, similarly to The Boulevard access points, the access on Howtree Place is not very inviting to pedestrians, and not obvious to pedestrians who are new to the area.

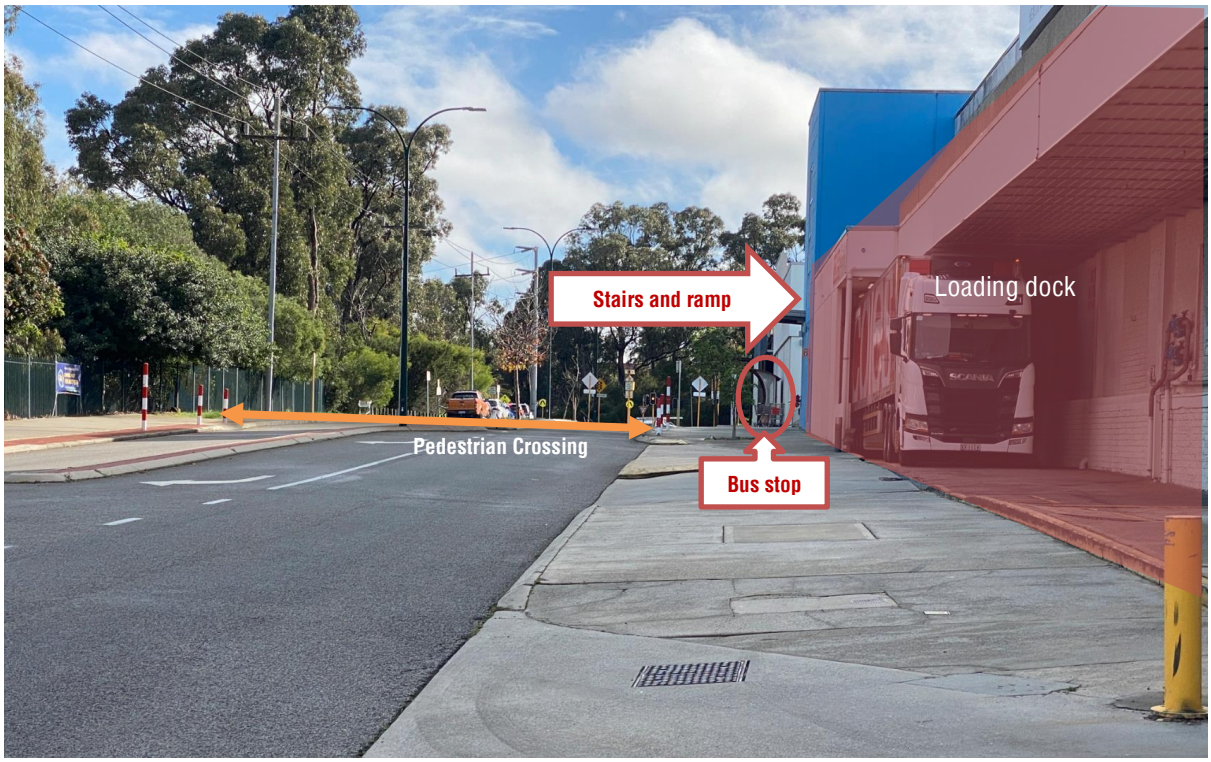


Figure 10 - Howtree Place stairs and ramp access.

The access is located between loading docks and a bus stop. Inactive frontages do not offer passive surveillance and the obscurity of the access is not very inviting to pedestrians.

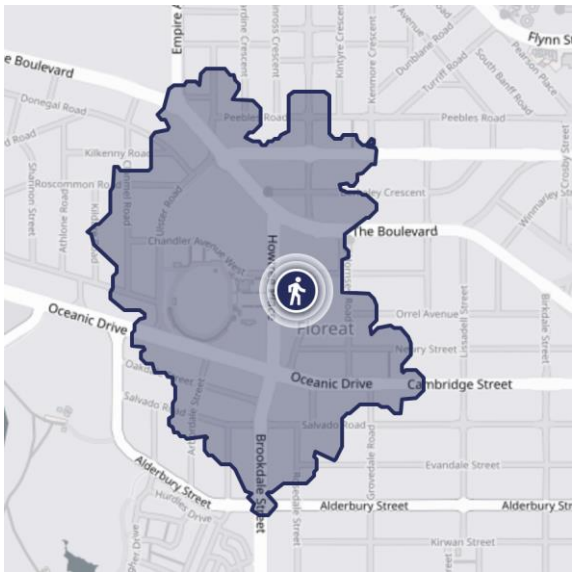


Figure 11 – 10-minute walking catchment from FF

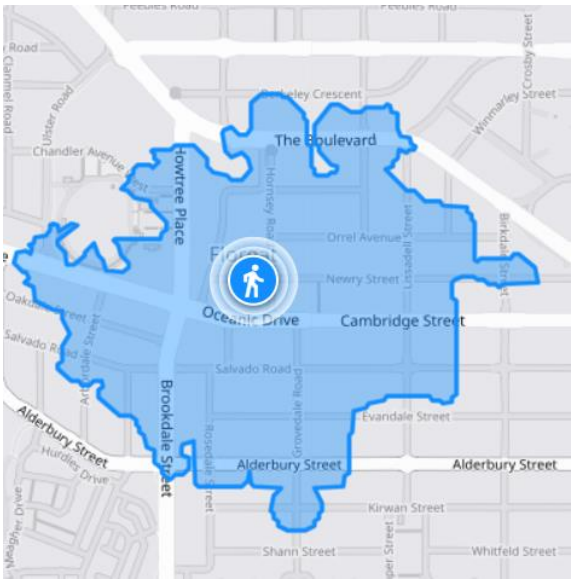


Figure 12 – 10-minute walking catchment from Residential Frame

Roads abutting the Floreat Forum carry high volumes of traffic and effectively act as barriers to fluid pedestrian movement. As per figure above, much of the walkable catchment comprises non-residential land use; however, educational land use is deemed quite complementary. Introduction of additional residential land use within the centre and densification of the residential frame will increase the number of patrons who are able to walk to the Activity Centre.



Figure 13 - Pedestrian path on Hornsey Road on the eastern side of the road reservation



Figure 14 - Pedestrian path on Newry Street on the southern side of the road reservation

Hornsey Road south of Chandler Avenue features a pedestrian path (approximately 1.5m wide) on eastern side of the road reservation and offers pedestrian connectivity to Floreat Avenue, Oceanic Drive and The Boulevard. Newry Street features similarly sized footpath on the southern side of the road reservation connecting Floreat Avenue and Hornsey Road. As the residential frame is redeveloped, the footpaths should be expanded to cater to the contemporary standards.

Proposed Layout and Improvements of Pedestrian Movement

The proposed layout clearly improves pedestrian accessibility to the Floreat Forum. The Boulevard access is opened and restructured so it caters for all ages and abilities while providing appropriate level of surveillance. Howtree Place access is expanded to a visible and inviting link. While this accessway is not closed to personal vehicles, other link users are clearly prioritised which is conveyed via low-speed limits and materialisation.

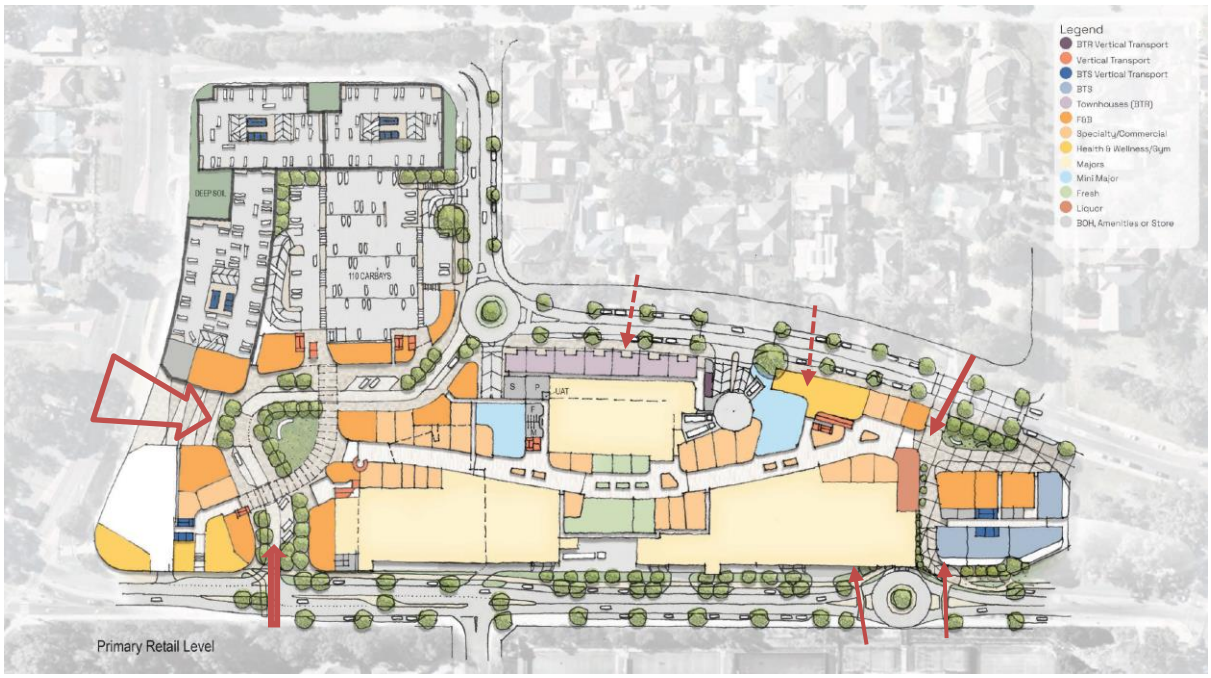


Figure 15 – Floreat Forum - pedestrian access

The design proposal looks to create more pedestrian friendly atmosphere on Howtree Place, introducing shade trees and reconfiguring the carriageway so it is easier to cross.

Considering the densification of residential frame, pedestrian access to Floreat Forum from Floreat Avenue gains importance. The proposal introduces drastically improved access to the southern portion of the Centre; however, in design refinement, other crossing points can be established.

Pedestrian movement through the Floreat Forum and the Residential frame should be key axis of the next design stage. Pedestrian experience within the activity centre, including the trajectory from the parking areas to the centre in many ways are important factor of commercial success.

2.9 Cyclist Infrastructure

Are there any PBN Routes within an 800m radius of the subject site?	YES
If YES, describe:	

Classification	Road Name
" High Quality Shared Path"	The Boulevard, Alderbury Street, Oceanic Drive, Underwood Avenue
" Other Shared Path (Shared by Pedestrians and Cyclists)"	The Boulevard, Howtree Place, Chandler Avenue West, Oceanic Drive
" Good Road Riding Environment"	Kinkdale Avenue, Berkeley Crescent, Newry Street, Oceanic Drive, Cambridge Street. Glengaritt Drive, Donegal Road, Salvado Road
" Perth Bicycle Network - Continuous Signed Routes"	Ulster Road, The Boulevard, Peebles Road, Arbordale Street
" Bicycle Lanes or Sealed Shoulder Either Side"	Brookdale Street

Are there any PBN Routes within a 400m radius of the subject site?	YES
If YES, describe:	

Classification	Road Name
" Other Shared Path (Shared by Pedestrians and Cyclists)"	The Boulevard, Howtree Place, Chandler Avenue West, Oceanic Drive
" Good Road Riding Environment"	Kinkdale Avenue, Berkeley Crescent, Newry Street, Oceanic Drive, Cambridge Street, Glengaritt Drive, Donegal Road, Salvado Road
" Perth Bicycle Network - Continuous Signed Routes"	Ulster Road, The Boulevard, Peebles Road, Arbordale Street
" Bicycle Lanes or Sealed Shoulder Either Side"	Brookdale Street

Does the site have existing cyclist facilities?	YES
Does the site propose to improve cyclist facilities?	YES
If YES, describe the measures proposed.	

The precinct currently offers limited parking for bicycles, and during the site visit bicycles parked against urban furniture were sighted. This clearly demonstrates there is a demand and willingness to bicycle to the centre, but prospective bicyclists may be discouraged by lack of parking and uncomfortable access points. It is presumed that the current residents of the residential frame store their bicycles in their respective dwellings.

Pedestrian crossings at the signalised intersections quite obviously were not designed with bicyclists in mind.



Figure 16 - Howtree Place pedestrian access - centre patrons parking and securing bicycle against the rail.

KCTT additional comment:

State Cycling Strategy designates sections of The Boulevard (between Howtree Place and Empire Avenue) as Secondary Cycling routes while adjoining sections of The Boulevard are designated as Local Routes. Howtree Place is a part of the Secondary Cycling Route.

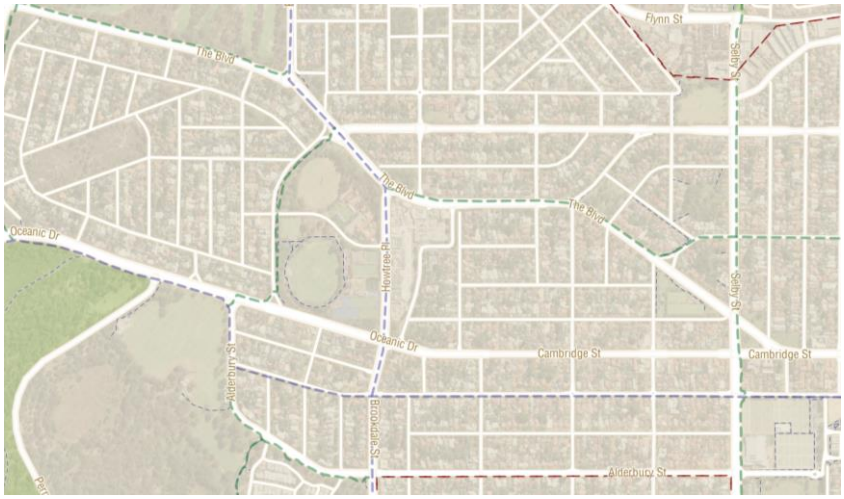


Figure 17 - State Cycling Strategy

Western Australian Cycling Network Hierarchy:

1. **Primary Routes (red routes)** - Primary routes are high-demand corridors connecting major regional destinations. They form the spine of the cycle network and are often located adjacent to major roads, rail corridors, rivers and ocean foreshores. Primary routes are vital to all sorts of bike riding, including medium or long-distance commuting/utility, recreational, training and tourism trips.
2. **Secondary Routes (blue routes)** - Secondary routes have a moderate level of demand, providing connectivity between primary routes and major activity centres such as shopping precincts, industrial areas or major health, education, sporting and civic facilities. Secondary routes support many commuting and utility type trips, but are used by all bike riders, including children and novice riders.
3. **Local Routes (green routes)** - Local routes experience a lower level of demand than primary and secondary routes, but provide critical access to higher-order routes, local amenities and recreational spaces. Predominantly located in local residential areas, local routes often support the start or end of each trip, and as such need to cater for the needs of users of all ages and abilities.

Town of Cambridge Cycling Strategy generally corresponds with the State Cycling Strategy, with a localised exception where The Boulevard is designated as a Secondary Cycling Route between West Coast Highway and Ruslip Street while Floreat Avenue is designated as a Local Cycling Route.

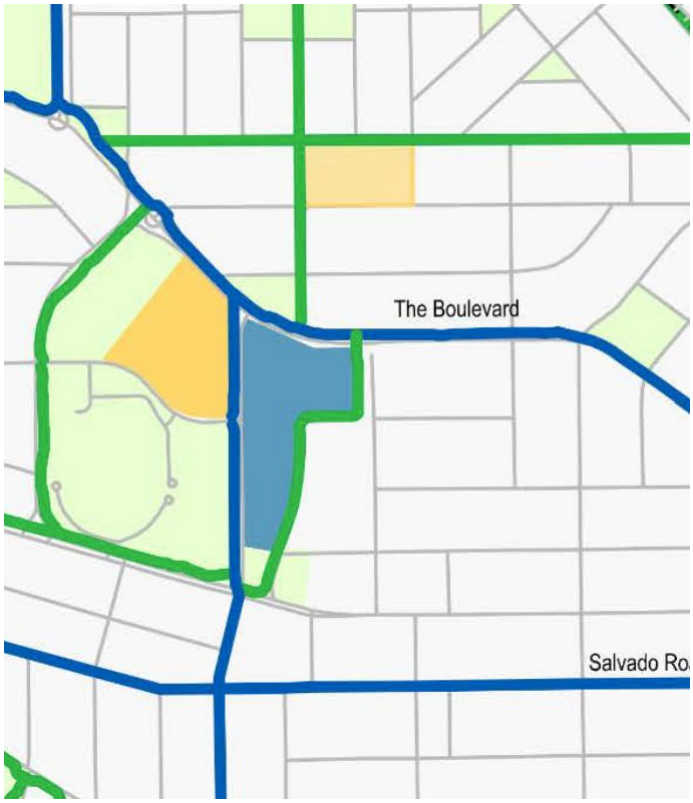


Figure 18 - Town of Cambridge Cycling Strategy

Although Howtree Place is identified as a Secondary Cycling route, it is acknowledged that cycling lanes cannot be implemented in the section of the road interfacing Floreat Forum, but a shared path will connect to The Boulevard.

While the Strategy does not stipulate a timeframe for these upgrades (long term), this should be considered as soon as reasonable to enable equitable access to the Centre for bicyclists and micro mobility travellers of all ages and abilities. Creating the habit from the commencement is more efficient than running behaviour change programs at a later stage.

As per figure below, bicycling catchment is sizeable, and if the mode shift was successful, this would significantly alleviate pressures on the network and parking.



Figure 19 - 10-minute cycling distance

2.10 Provisions for Micromobility Vehicles

Micromobility (or Micromobility Vehicles) refers to a range of small, lightweight vehicles operating at speeds typically below 25 km/h and driven by users personally, which may or may not be battery assisted. Therefore, this broad term encompasses bicycles, e-scooters, e-bicycles, cargo bicycles, skateboards, roller skates, mobility assisting vehicles etc.

Given the intent of the proposed development, further design development should consider the requirements of micromobility vehicles on key shared paths and accessways, and provide a design outcome that is suitable for all ages and all abilities.

Some key points to be considered in further design development are as follows:

a) **Appropriate width of circulation spaces (paths and other spaces not dedicated to play, rest and high-skill-level recreational activities)**

The figure below shows components of bikeable width, as recommended by NACTO. Although this figure pertains to one-directional bikeway, we believe that the consideration is appropriate. NACTO recommends the approach below for bikeways, which must accommodate commuter and recreational traffic. Recommended NACTO ***bikeable width*** for two-way paths, located away from busy thoroughfares, is 2.8m-3.4m for paths where a cargo bike can be expected. While bicyclists are not expected to cruise and must travel at lower speeds, wider paths would accommodate variety of pedestrians visiting the centre.

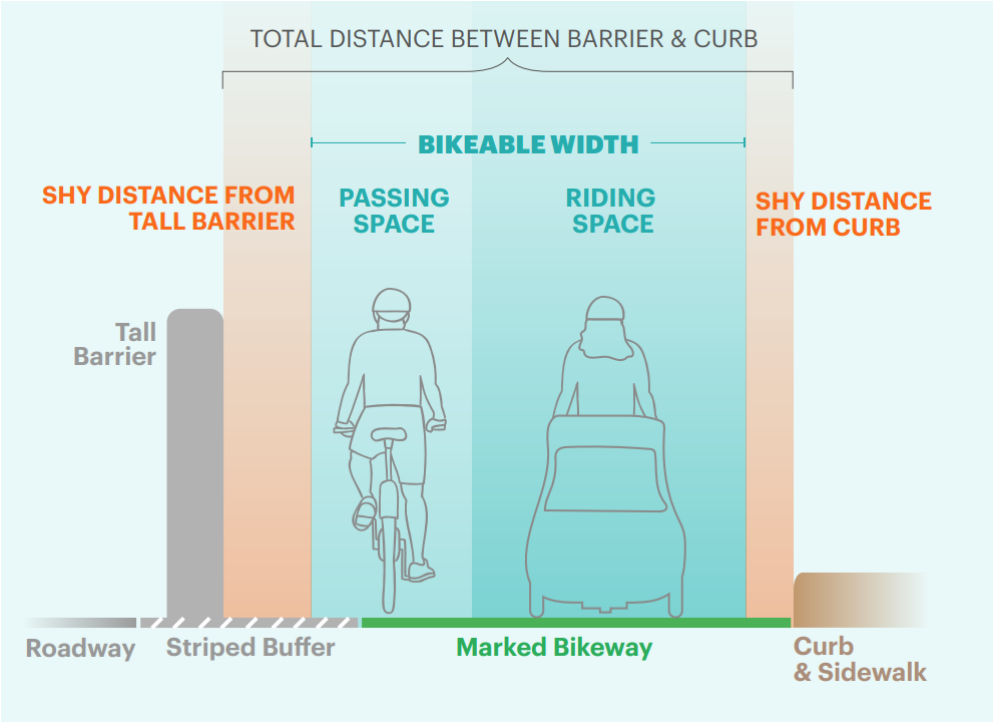


Figure 20 - Considerations for bikeway (source: NACTO)

In addition to the bikeable width, ***shy distance*** (distance from a vertical obstacle deemed unrideable) must be considered as well. Shy distance depends on the side barrier and can range from 0.2m to 0.6m.

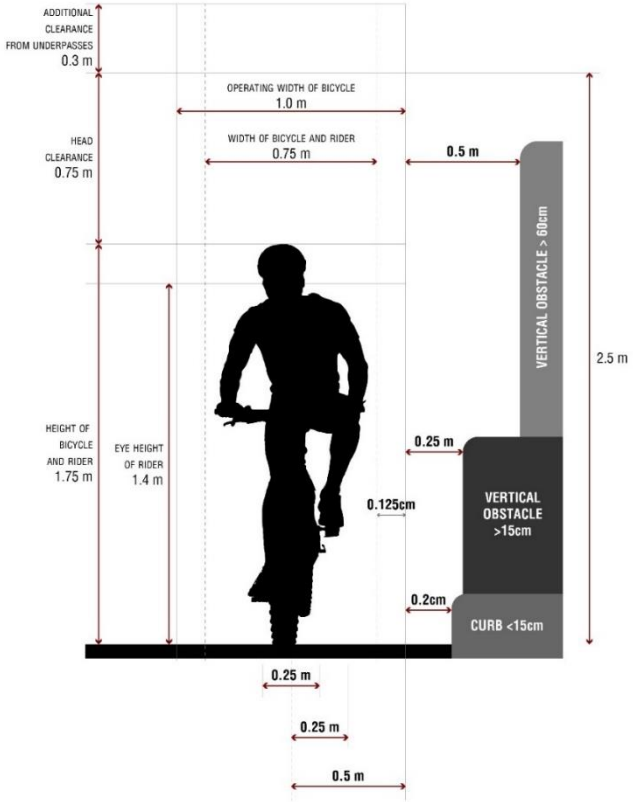


Figure 21 - Vertical clearances and bike-rider operating envelope (NACTO and DoT WA)

Department of Transport WA echoes these guidelines and provides clear guidance on vertical clearances, which should be observed when designing paths travelling under structures and vegetation.

Based on the information above, minimum shared path width should be from 3.2m to 4.0m, depending on the type of vertical obstacles adjacent to the path.

NACTO guidelines align fairly well to the recommendations of Austroads Guide to Road Design, Part 6A: Paths for Walking and Cycling, as shown in the figure below.

Table 5.3: Shared path widths

	Suggested path width (m)		
	Local access path	**Regional path[3]**	**Recreational path**
Desirable minimum width	2.5	3.0	3.5
Minimum width – typical maximum	2.0[1] – 3.0[2]	2.5[1] – 4.0[2]	3.0[1] – 4.0[2]

Figure 22 - Austroads recommendations on the width of shared paths (source: GtRD6A)

b) Path gradients and connections to the external network

Although there is a general recommendation that paths should not be steeper than 5%, AS1428 recommends that 2.5% should not be exceeded to ensure that the paths are accessible to all users (if the terrain permits).

Connections to the external network, appropriate ramps and crossings should be designed and constructed not to feature abrupt grade changes. Vehicles such as scooters and skateboards have small, dense wheels and low ground clearances; therefore, abrupt grade changes and uneven surfaces can jolt the rider of a device.

c) Parking/charging spaces

Parking areas should be placed in the vicinity of rest and play areas, and in vicinity of pedestrian entrance points. While bicycle parking is the first form of parking for micromobility vehicles that comes in mind, parking areas for scooters and skateboards should be considered. These can be simple wide, paved areas where riders can store their devices while resting. Alternatively, devices are likely to be left on the path, creating obstructions for other visitors.

With the rise of battery-powered and electric devices, it would be prudent to consider locations for device charging, should space allow it.

d) Shared micro-mobility schemes

Potential micro-mobility share schemes can be considered given a significant residential component in this development. The residents can be offered access to shared pool of electric bicycles, scooters or other devices. Charging / docking stations should be strategically placed and easily accessible to the residents.

2.11 Bicycle Parking

Local Government	Town of Cambridge
Reference Document Utilised	Local Planning Policy 3.13: Parking State Planning Policy 7.3 Residential Design Codes Volume 2 - Apartments (Gazetted on 1 September 2023)

Description of Parking Requirements in accordance with the Scheme:

Local Planning Policy 3.13: Parking

Shop:

Short-stay: if in a District Centre zone, 1 space/500 m2 NFA

Long-stay: if in a District Centre zone, 1 space/1,000 m2 NFA

State Planning Policy 7.3 Residential Design Codes Volume 2 – Apartments

- *Resident – 0.5 space per dwelling*
- *Visitor – 1 space per 10 dwellings*

Parking Requirements in accordance with regulatory documents

Land Use	Yield	Total Bicycle Parking requirement	
		Minimum Long-term Parking Employee/Resident Spaces	Minimum Short-term Parking Visitor/Shopper spaces
Floreat Forum Residential Minimum Yield	670 dwellings	335	67
Floreat Forum Residential Maximum Yield	950 dwellings	475	95
Floreat Forum Commercial	22,319 m^2	22	45
Residential Frame	300 dwellings	150	30
	TOTAL	**507 - 647**	**142 - 170**

Commentary

The exact volume of parking for bicycles will be confirmed in the next design stage. The table above provides guidance on the basic statutory requirements.

Residential bicycle parking represents a major component of the requirement. Residents may be able to store their bicycles in their respective storerooms. Should the proponent provide a shared (electric) bicycle scheme, the requirement for private storage may be reduced.

Current statutory requirements oblige the proponent to provide a minimum of 45 bicycle parking spaces for commercial visitors. While there is no statutory requirement for parking space for cargo bicycles or tricycles, these should be considered as they enable a wider range of visitors to the Centre. It also enables patrons living in relative vicinity to effectively complete their weekly shopping.

Bicycle parking can be provided in addition to the minimum statutory requirements to encourage patrons to use active transportation modes. Bicycle parking stations should be distributed throughout the centre in vicinity of pedestrian access points.



Figure 23 - Dublin – Cargo bike parking

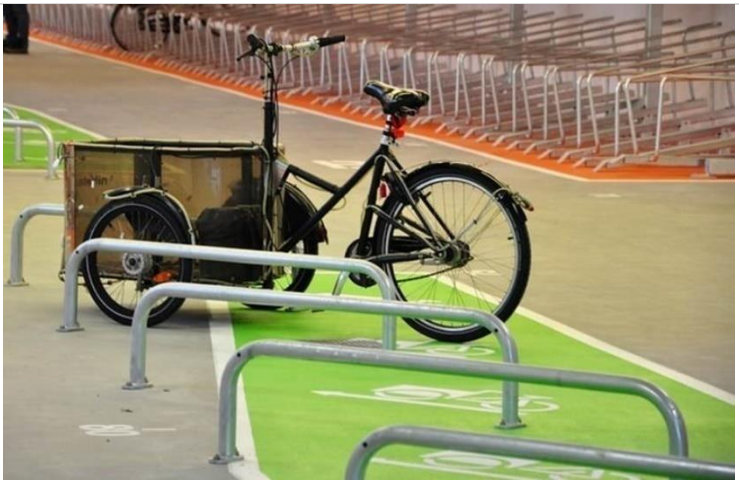


Figure 24 - Malmo - Cargo bike parking

The Centre will need to provide a minimum of 22 long term bicycle parking bays for employees. According to the Local Planning Policy 3.13, 22 long tern bicycle parking bays would require the following end-of-trip facilities:

- Minimum 20 storage lockers.
- 3 men's showers.
- 3 women's showers.

Apart from statutory provisions for bicycles, parking areas should be considered for other micro-mobility devices such as scooters, skateboards, gophers etc.

The residential frame is expected to be delivered within the medium density framework as low-medium rise residential buildings. It is anticipated that each building will provide bicycle storage in accordance with the appropriate policies.

Considerate design providing convenient and safe access, storage and charging locations for e-bikes can strongly encourage modal shift.

2.12 Public Transport Accessibility

How many bus routes are within 400 metres of the subject site?		Four (4)	
How many rail routes are within 800 metres of the subject site?		None	
Bus Route	Description	Peak Frequency	Off-Peak Frequency
28 D	Perth - Claremont Station via HBF Stadium *Deviates off peak via Floreat Forum*	*no service*	1 hour
81 D, H, S	Perth – Wembley via Cambridge Street *Deviates off peak via Floreat Forum*	*no service*	
82	Perth – Wembley via Cambridge Street	15-20 minutes	1 hour
83 B, C,D	Perth – Wembley via Cambridge Street *Deviates off peak via Floreat Forum*	*no service*	1 hour

Walk Score Rating for Accessibility to Public Transport

44 | Some Transit. A few nearby public transportation options.

Although the Centre is situated in an inner-city council, the connection via public transport is not very strong. As per the image below, public transport catchment is quite limited.

There is an opportunity for the proponent to consider running shuttle buses connecting the Centre to nearest railway stations or other significant destinations. This option would reduce car dependency of residents and shopping centre patrons.

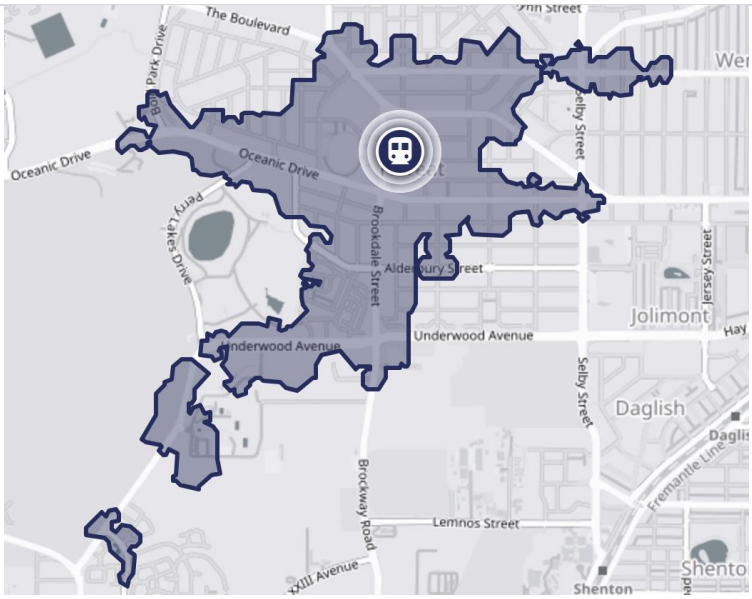


Figure 25 - Effective catchment for 10-minute ride on public transport

PTA plans in the vicinity of the subject site

" There are no short to medium term structural changes to the network proposed at this stage. The centre is presently served by the Route 82 bus service full time with off peak deviations on the 28, 81 and 83 services. There is unlikely to be any frequency improvements on existing services in the short to medium term.

Long term it is proposed that Route 28 will operate Subiaco to Claremont (opposed to Perth to Claremont), but this is unlikely to have any measurable impact on centre access and it wouldn't change our position on deviating to the centre. These changes are long term and subject to resources, terminus / layover upgrades and community consultation."

Public transport provision in the area should be adapted and enhanced based on demand. As the site intensifies over time, improvements could be anticipated in public transport services to better serve the needs of the community and support increased usage.

2.13 Vehicular Parking (Motorcycle and Scooter Parking)

Local Government	Town of Cambridge
Local Government Document Utilised	Local Planning Policy 3.13: Parking State Planning Policy 7.3 Residential Design Codes Volume 2 - Apartments (Gazetted on 1 September 2023)

Description of Parking Requirements in accordance with Scheme:

Local Planning Policy 3.13: Parking

Shop – 1 space per 20m² NFA

State Planning Policy 7.3 Residential Design Codes Volume 2 – Apartments

Location A: within 800m walkable catchment of a train station and/or 250m of a transit stop (bus or light rail) of a high-frequency route and/or within the defined boundaries of an activity centre:

- *1-bedroom dwellings – 0.75 bay per dwelling*
- *2+ bedroom dwellings – 1 bay per dwelling*
- *Visitor - 1 bay per four dwellings up to 12 dwellings; 1 bay per eight dwellings for the 13th dwelling and above*

Calculation of Parking

Land Use	Requirements	Yield	Total Parking
Floreat Forum Residential – 1-bedroom dwellings	*0.75 bay per dwelling*	20% of total 950 = 190	143
Floreat Forum Residential – 2+ bedroom dwellings	*1 bay per dwelling*	80% of total 950 = 760	760
Residential Frame – 1-bedroom dwellings	*0.75 bay per dwelling*	20% of total 300 = 60	45
Residential Frame – 2+ bedroom dwellings	*1 bay per dwelling*	80% of total 300 = 240	240
Residential – Visitors	*1 bay / 4 dwellings up to 12 dwellings;* *1 bay / 8 dwellings for the 13th dwelling and above*	1,250	158
Floreat Forum Commercial	*1 space per 20m² NFA*	22,319m² (80% = 17,855m²)	893
		Total Car Parking Requirement for Residential	**1,346**
		Total Car Parking Requirement for Commercial	**893**

2.13.1 Residential Car Parking

The proposed concept plan shows underground/within podium levels parking for both residential and commercial land use. Parking sectors for residents and visitors within the Centre site will be physically separated and further analysed in next design stages.

The preliminary assessment was conducted for the maximum yield (950 dwellings) within the Floreat Forum site. Should the proponent go with the minimum viable residential development (670 dwellings) the residential parking requirement would be reduced to 723 parking bays within the Floreat Forum for a total of 1,121 residential parking bays (inclusive of Residential Frame). Both scenarios assume additional 300 dwellings in the Residential Frame.

According to SPP 7.3 Vol 2 (apartments), residential developments with more than 20 dwellings, should provide motorcycle/scooter bays at a rate of 1 m/s bay per 10 car parking bays. For each 5 motorcycle/scooter bays, car parking provision can be reduced by 1 car parking bay. The table below shows motorcycle/scooter parking requirements and the resulting adjusted car parking requirement.

Scenario	Dwelling Yield	Nominal Car Parking	Motorcycle / Scooter Parking	Adjusted Car Parking
Floreat Forum Residential Minimum Yield	670	723	72	709
Floreat Forum Residential Maximum Yield	950	1,023	102	1,003
Residential Frame	300	324	33	291

Although the preliminary assessment assumes that approximately 20% of the dwellings have one bedroom or less, it is safe to assume that the centre can accommodate sufficient car parking for residential component, even if developed according to the highest scenario.

Given the structure of current land ownership, residential frame is likely to be developed in a series of independent developments that may contain less than 20 dwellings. As described below, each individual development in the residential frame will provide parking on premises in accordance with State Planning Policy 7.3 or an equivalent at the time of Development Application.

There should be a reasonable level of reciprocity in demand between commercial and residential use. Specific parking bays for residential visitors should be designated, allowing for reciprocal use by commercial visitors, enhancing the efficiency of parking allocation and avoiding overprovision.

Should the proponent provide shared micro-mobility schemes, communal vehicle pools and local shuttle buses, the requirement for the car parking will be further reduced.

2.13.2 Commercial Car Parking

According to the Town of Cambridge's Local Planning Policy 3.13, the proposed development will require 893 car parking bays for the commercial component. The LPP 3.13 requires a flat rate of 5 bays per 100m^2 to be applied to all shopping centres exceeding 1,500m^2 in area. In our opinion, the rate can be deemed too high as this is a standard rate for the provision of parking for major supermarket chain centres. Given that a shopping centre of this size and stature will have a variety of shops, it is reasonable that a lower flat parking rate is considered. From our previous experience in work with the City of Stirling, the parking provision for district centres tends to be 3-4 parking bays per 100m^2 of Gross Floor Area.

Parking Requirement	Yield	Nominal Car Parking	Motorcycle / Scooter Parking
5/100m^2 NLA	17,855m^2	893	18
4/100m^2 GFA	22,319m^2	893	18
3/100m^2 GFA	22,319m^2	700	14

Commercial parking component will attract a requirement for motorcycle/scooter/gopher parking at 2% rate. As per table above, the commercial component of the development would require 14-18 motorcycle/scooter/gopher parking bays. In addition to this, parking for seniors and parents with prams should be considered. While there is no prescribed requirement to provide these or a prescribed provision ratio, good practice would be to provide at

least 4-5% of bays as each category. These types of bays should be located near pedestrian access points and offer a step-free path to the centre.

2.13.3 Parking Management Strategy

The Precinct Structure Plan is expected to allow for sufficient space for car parking areas to be developed for the highest yield of residential development. Based on the current regulations, the Precinct Structure Plan has a cumulative requirement for approximately 893 commercial and 1,294 residential parking bays. Once the design is further developed, a comprehensive Parking Management Plan should be prepared.

A Parking Management Strategy is an essential part of the development process for projects that involve parking facilities or changes to existing parking infrastructure. The PMS should be prepared during the Development Application stage and beyond, as it provides a comprehensive plan for the design, implementation, and ongoing management of parking spaces. PMS can help ensure efficient use of parking spaces, promote sustainable transportation options, and minimise negative impacts on surrounding areas.

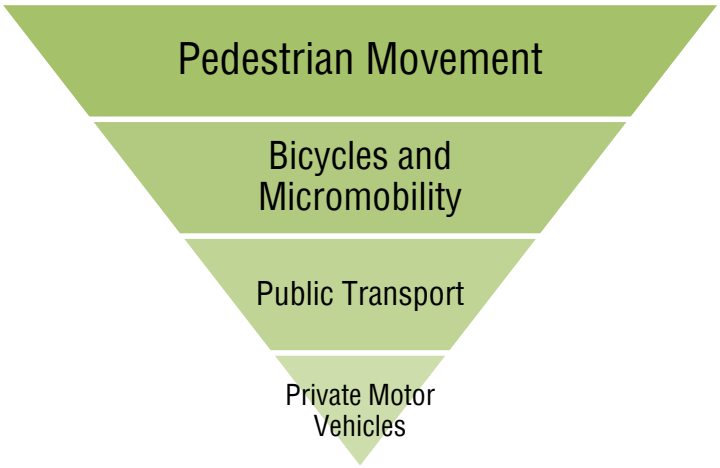
Key aspects that should be covered in a Parking Management Strategy are the following:

- Assessment of parking needs
- Parking layout and design
- Parking allocation and management
- Transportation demand management
- Impact on surrounding area
- Monitoring and enforcement
- Stakeholder engagement
- Plan for future changes in parking demand and trends.

Once the plans are sufficiently developed, a more precise Parking Management Plan should be developed, clearly defining the intent and appropriate use of parking in the precinct.

2.13.3.1 Guide for the Floreat Activity Centre PMS

Further development of the Master Plan area should follow movement hierarchy below:



In further development of the project, all care should be taken to avoid overprovision of vehicular parking. Therefore, the following initiatives and principles should be considered:

Zoning and Allocation

There should be a reasonable level of reciprocity in demand between commercial and residential use. Parking areas should be distinctly separated for residential and commercial use for long term parking; however, short term parking reciprocal usage should be encouraged during peak demand hours, as in general commercial land use and residential land use tend to have complementary peak periods that rarely overlap.

Specific parking bays for residential visitors should be designated, allowing for reciprocal use by commercial visitors, enhancing the efficiency of parking allocation and avoiding overprovision.

Each future individual development in the residential frame should be self-contained parking-wise. It is anticipated that each residential building will provide parking per State Planning Policy 7.3 (or equivalent at the Development Application lodgement).

Parking Policies

Implementing time-limited visitors parking is crucial to ensure turnover and prioritise short-term visits, thus preventing long-term occupancy and facilitating accessibility for shoppers and visitors to the shopping precinct. Furthermore, it reduces the opportunities for abuses of space.

By enforcing time limits, the turnover of parking spaces is increased, allowing more individuals to utilise the limited on-street parking resources effectively. Additionally, reserving on-street parking in the centre specifically for ride-share services or pick-up/drop-off purposes further optimises kerbside space usage.

This measure promotes efficient flow of traffic and enhances convenience for passengers being picked up or dropped off, reducing congestion and improving overall traffic management in the precinct. By strategically allocating on-street parking for these purposes, the shopping precinct can enhance the overall parking experience for visitors while promoting efficient use of kerbside space.

Any parking allowing dwell times longer than 30 minutes within the centre should be provided in underground areas or the mobility deck above ground, maintaining surface aesthetics and minimising congestion.

Specific parking restrictions can be developed once the more detailed plans of the centre are available; however, preliminary suggestion is as follows:

- Parking on central, one-way, roadway should be restricted to a maximum of 15 minutes during the peak demand, with a potential for increase outside of peak demand hours. Preference should be given to drop-off/pick up facilities and taxis and other rideshare services; however, extended dwell times should be prohibited even for these services.
- Parking along Floreat Avenue should be limited to a maximum of one hour during the commercial peak demand with more flexibility allowed after hours to accommodate residential visitors.
- Parking on Howtree Place should be restricted to a maximum of 15 minutes in period 08:00-09:00 and 14:30-15:30 to accommodate adjoining educational facility and associated pick up and drop off times. During commercial peak demand parking should be limited to one hour, with more flexibility allowed after hours.
- Parking on Newbry Street (between Floreat Avenue and Hornsey Street) and on Hornsey Street should be limited to a maximum of two hours during standard working hours with more flexibility allowed outside of these hours.

- Underground commercial parking in the centre should feature a variety of time-limited spaces ranging between 30minutes, 90 minutes and 3 hours. Employees parking should be physically delineated from visitors parking.
- All residential long term parking should be physically segregated from short term parking and contained within the associated residential building, for practical and safety reasons.

Technology Integration

Parking guidance systems and mobile apps should be utilised to encourage efficient parking and inform users about available spaces, with an emphasis on highlighting the convenience of alternative transportation options.

Introduction of paid parking should be considered a viable option for both – on street parking and commercial off-street parking.

Transportation Alternatives and Incentives

Collaborating with commercial operators to offer incentives for patrons using active transport modes is essential in reducing the reliance on private vehicles within the precinct. By working together, commercial operators can introduce initiatives such as discounts, rewards, or special promotions for customers who choose to walk, cycle, or use public transportation to reach the precinct.

These incentives not only encourage sustainable commuting practices but also contribute to reducing traffic congestion and environmental impact associated with private vehicle use. Furthermore, advocating for the implementation of local micro-mobility share schemes and shuttle buses enhances accessibility and provides convenient alternatives to driving.

Promoting initiatives like bike-sharing programs or shuttle services connecting nearby residential areas to the precinct, contributes to providing viable transportation options that are efficient, cost-effective, and eco-friendly.

This collaborative approach between commercial operators and local authorities fosters a culture of sustainability and mobility diversity, ultimately improving the overall accessibility and liveability of the precinct.

Community Engagement and Education

Conducting educational campaigns to inform residents and shoppers about parking regulations, alternative transportation options, and the benefits of reducing vehicular traffic plays a vital role in promoting sustainable transportation practices within the shopping precinct. However, it is always much simpler to establish desired behaviours from the inception than to manage behaviour change. While behaviour change may be inevitable due to change and evolution of the precinct, established behaviour should be as close to desired as possible.

Through these campaigns, residents and shoppers can gain awareness of parking policies, such as time limits and designated areas, encouraging compliance and reducing parking violations. Additionally, educating individuals about alternative transportation modes, such as walking, cycling, or using public transit, highlights the convenience and environmental benefits of choosing sustainable options over private vehicle use.

Furthermore, establishing feedback mechanisms to gather input from the community ensures that the parking management strategy remains responsive to evolving needs and preferences. Feedback can be provided through surveys, community meetings, or online platforms, where stakeholders can voice their concerns, suggest improvements, and provide insights into parking challenges and opportunities.

This two-way communication nurtures community engagement and collaboration, enabling the parking management team to make data-driven decisions and adjust strategies accordingly to better serve the needs of residents, shoppers, and visitors alike.

2.14 ACROD Parking

Class of Building	Class 6
Does this building class require specific provision of ACROD Parking?	YES Shopping centres require ACROD spaces. Residential apartments generally do not require ACROD Spaces unless they provide accessible units.
Reference Document Utilised	Building Code of Australia
Description of Parking Requirements:	
Class 6 — (a) Up to 1000 carparking spaces - 1 space for every 50 carparking spaces or part thereof. (b) for each additional 100 carparking spaces or part thereof in excess of 1000 carparking spaces. - 1 space.	

Parking Requirement in accordance with regulatory documents

Land Use	Requirements	Yield	Total Parking
Floreat Precinct	*1 space for every 50 carparking spaces or part thereof*	700 commercial bays anticipated	14
		Total Volume of ACROD Parking Required	**14**

Justification
This is a preliminary Precinct Structure Plan approval stage. 14 ACROD bays would be required for the anticipated number of commercial parking spaces. If the residential component includes any accessible units, ACROD parking bays should be provided for those units as well.

2.15 Delivery and Service Vehicles

Guideline Document used as reference	NSW RTA Guide to Traffic Generating Developments
Requirements	
Commercial premises (> 20,000m2 GFA) - 5 + 1 space per 8,000m2 over 20,000m2	
Residential flat buildings (> 200 flats or home Units) - 4 + 1 per 100 units over 200 plus 1 space per 1,000 m2 of public area set aside for bar, tavern, lounge and restaurant	

Parking Requirement in accordance with regulatory documents

Land Use	Minimum Requirements	Yield	Total Parking
Floreat Forum Commercial	*5 + 1 space per 8,000m2 over 20,000m2*	22,319m2	6
Floreat Forum Residential	*4 + 1 per 100 units over 200 plus 1 space per 1,000 m2 of public area set aside for bar, tavern, lounge and restaurant*	670-950 dwellings	9-12
Residential frame		300 dwellings	5
	Total Volume of Service and Delivery Parking Required		20-23

Justification
While the nominal requirement is 20-23 parking bays for delivery and service vehicles, practically, this may not be required if loading docks are placed strategically to be shared between various tenants. Waste collection facilities for the residential component should be designed to allow waste collection within the circulation aisle, and the vehicle does not require a dedicated parking bay.
Service and delivery areas in mixed-use zones need to be carefully designed to accommodate the varying needs of residential and commercial tenants, as well as customers and visitors, while maintaining efficient operations and safety. Typically, service and delivery occur in the following areas: **Designated Loading Docks** These areas should be strategically located, often at the back or sides of buildings, to serve multiple tenants while minimising visibility and noise impact on residents and customers. They should be designed for efficient loading and unloading of goods and supplies. **Service Corridors** These corridors connect loading docks to individual commercial spaces, allowing goods to be transported without affecting public areas or residential zones. **Back of House Areas** For commercial tenants, deliveries often occur at the back of stores or restaurants, where goods can be stored and processed away from customer areas. **Waste Management Areas** Waste collection points are typically placed in designated service areas, with access routes for collection vehicles that avoid busy pedestrian zones. **Underground or Enclosed Facilities** In dense urban settings such as the subject activity centre, underground or enclosed delivery and service facilities may be used to optimise space and reduce street-level congestion. While it is understandable that timing deliveries in a complex system such as this one may be very challenging, the deliveries should occur as much as possible outside of peak demand hours.

2.16 Calculation of Development Generated / Attracted Trips

What are the likely hours of operation?	Not applicable for residential land uses Shopping Centre: 08:00 – 21:00 Weekdays: 08:00 – 17:00 Saturday; 11:00 – 17:00 Sunday
What are the likely peak hours of operation?	08:00 – 09:00 and 17:00 – 18:00 on Weekdays; 11:00 – 12:00 and 12:00 – 13:00 on Weekends
Do the development generated peaks coincide with existing road network peaks?	YES Partially both peak times
Guideline Document Used	**NSW Roads and Maritime Services; Report for High Density Residential Trip Generation Surveys; Survey Data Analysis Report (28 September 2012)**
Rates from the above document:	***Residential*** *– For Metropolitan developments, the surveyed trip rates showed a range from 0.18 - 0.32 vehicle trips per hour in the Saturday peak hour. KCTT have decided for a conservative approach of 0.3 vph to assess the worst-case scenario.* *The same surveyed rate shows a maximum of 2 vehicle trips per day per unit. Same as above, KCTT have used this maximum rate to assess the worst-case scenario.*

Guideline Document Used	**NSW RTA Guide to Traffic Generating Developments (October 2022) and;** **NSW RTA Guide to Traffic Generating Developments – Updated Traffic Surveys (August 2013)**
Rates from the above document:	***Shopping Centres (10,000 – 20,000m²)*** *- 78 vehicular trips per day; 7 VPH in Saturday Peak hours* ***Shopping Centres (20,000 – 30,000m²)*** *- 63 vehicular trips per day; 7 VPH in Saturday Peak hours* ***Dwelling houses*** *Daily vehicle trips = 9.0 per dwelling* *Adjusted daily weekend rate = 5.0 per dwelling.* *Weekday peak hour vehicle trips = 0.85 per dwelling.* *Adjusted peak hour weekend rate = 0.5 per dwelling.*

The survey has shown that 11:00-13:00 was the peak period of Saturday 03/09/2022, KCTT have used adjusted PM peak rate for both peak hours for commercial land use.
Preliminary analysis showed that the cumulative development peak traffic attraction/generation is likely to occur on Saturdays, coinciding with the shopping centre operating peak times.
For the PM peak – survey has shown that PM peak is 92% of the AM peak. Therefore, the PM Peak rate was multiplied with 0.92.
Adjusted rate:
AM peak – 7 vehicular trips per hour
PM peak – 6.44 vehicular trips per hour
KCTT has used 0.3 vehicular trips per hour for residential land use, since the stipulated 0.8 vehicular trips per hour is given for workdays.

Existing Traffic Calculation

Land Use Type	Rate above	Yield	Daily Traffic Generation	Peak Hour Traffic Generation	
				AM	PM
Floreat Forum	*Daily – 78 VPD per 100m²* *AM – 7.5 VPH per 100m²* *PM - 6.9 VPH per 100m²*	18,628m²	14,529	1,397	1,285
Residential Frame	*Daily – 5 VPD / dwelling* *Peak - 0.5 VPH / dwelling*	37 dwellings	185	19	19
		Total (A):	**14,714**	**1,416**	**1,304**

Future Traffic Calculation

Land Use Type	Rate above	Yield	Daily Traffic Generation	Peak Hour Traffic Generation	
				AM	PM
Floreat Forum Residential	*Daily – 2 VPD / apartment* *Peak - 0.3 VPH / apartment*	950 dwellings	1,900	285	285
Floreat Forum Commercial	*Daily – 63 VPD / 100m²* *AM - 7 VPH / 100m²* *PM - 6.44 VPH / 100m²*	22,319m²	14,060	1,562	1,437
Residential Frame	*Daily – 2 VPD / apartment* *Peak - 0.3 VPH / apartment*	300 dwellings	600	90	90
		Total (B):	**16,560**	**1,937**	**1,812**
		Total Additional Traffic (B-A)	**1,846**	**521**	**508**

Justification	
Although a certain level of reciprocity can be expected between the commercial and residential use, the impact was assessed without any further reduction to provide a degree of conservativism and certainty. As discussed previously, the vehicular traffic generation/attraction can be reduced by encouraging active transportation modes.	
What is the total impact of the new proposed development?	The total additional impact of the development is 1,846 VPD, 521 VPH in the AM and 508 VPH in the PM peak. This is considered high impact to the surrounding road network.

2.17 Impact on the Surrounding Road Network and Key Intersections

2.17.1 Modelling Results and Anticipated Impact

KCTT provided the assessments for 2041 as a horizon year. Details of modelling results can be found in Appendix 3 of the report. This section will generally only provide summary of findings.

The table below outlines the traffic volumes tested and the anticipated impact on the road network. Traffic growth of 2% per annum was applied to all passing traffic (trips not originating nor terminating in the study area).

Land Use	Main Model	
Floreat Forum Commercial	22,319m^2 GFA	
Floreat Forum Residential	950 apartments	
Residential Frame	300 apartments	
Total Traffic Expected from the Floreat Activity Centre	AM	PM
	1,937	1,812

The modelling found that the only required modifications of the external network geometry are:

- The proposed roundabouts (one on Howtree Place and one on Floreat Avenue)
- The proposed signalisation of Floreat Avenue / The Boulevard intersection
- The proposed one-way laneway connecting Howtree Place and Floreat Avenue, which is in accordance with the concept Floreat Precinct Structure Plans.

As expected, in 2041, adjustments of Cycle and Phase times on existing signalised intersections are required to meet the expected changes in traffic volumes. Approximately 20% - 25% increase in Cycle length is expected on existing signalised intersections ie. approximately 80s cycle length for both intersections.

At the signalised Intersection of Oceanic Drive / Howtree Place / Brookdale Street it is proposed that approaches from Howtree Place and Brookdale Street run in different phases rather than the existing one phase operation. Increased traffic volumes at the intersection reduce available gaps for turning right when these movements run in the same phase with opposite direction through movements.

The Nodes LOS shown in the below section show that all intersections will perform at a satisfactory level in 2041 (Ranging in LOS A – LOS D).

The most significant anticipated change to the intersection operations is the addition of full movement signals at the Floreat Avenue / The Boulevard intersection.

This intersection is a full movement give-way T-intersection in the existing scenario. However, given the high increase in The Boulevard through movements, the intersection cannot operate at a satisfactory level in the future. Sensitivity testing showed that the service at this intersection, particularly Floreat Avenue approach, is likely to deteriorate to the cusp of the Level of Service F in 2029-2030, with assumed 2% annual growth. There are three main options to improve Level of Service at these intersections and these are:

1. Restrict Manoeuvring from Floreat Avenue (close Right Out turn) – While appealing, this option is not viable for densifying area as removal of turning movements at this intersection is likely to cause redistribution of traffic and create unfavourable conditions on other intersections.
2. Roundabout – spatial constraints would not allow for a compliant roundabout at this location.
3. Signalised intersection – this option would allow retention of all turning movements and would not adversely affect distribution of traffic in the precinct.

As the location of access points in the structure plan are mostly defined, the performance of the intersections is unlikely to change significantly. However, it ultimately will depend on the final layout and distribution of parking areas, as well as on actual construction timeline.

2.17.2 Upgrade Requirements to Analysed Intersections

Intersection	Level of Upgrade Required
Howtree Place - The Boulevard	No upgrade required
Howtree Place - Brookdale Street - Oceanic Drive	Minimal – phases and cycle adjustment Adjustments of Cycle and Phase times on Signalised intersections are required to meet the expected changes in traffic volumes. Approximately 20% - 25% increase in Cycle length is expected to be required (to approximately 80 seconds).
Floreat Avenue - Oceanic Drive	No upgrade required
Floreat Avenue - The Boulevard	Significant - proposed signalised intersection Modelling confirmed that the upgrade is required. A signalised intersection is proposed, given the spatial limitations for a potential roundabout. The sensitivity analysis has shown that the LOS E, high delays and long queues start appearing after 10-12 years of compound traffic decrease. This means that the expected timeframe of upgrade should be between 2029-2031. It should be noted that the mentioned years are only used as a reference to the assumed commencement year. A more accurate prediction could be shown through the expected percentages of passing traffic growth/development completion: When the passing traffic increases 15%-20% on top of the current values and when the Structure Plan Precinct is developed to approximately 15%-20%, the delays and queues at the Floreat Avenue approach would trigger the requirement for upgrading the subject intersection. It should be noted that the exact timeline for the upgrade should be reassessed regularly throughout the individual development stages to determine the appropriate year.
The Boulevard – Floreat Forum Access	Minimal – phases and cycle adjustment Adjustments of Cycle and Phase times on Signalised intersections are required to meet the expected changes in traffic volumes. Approximately 20% - 25% increase in Cycle length is expected to be required.

2.17.3 Upgrade Requirements and Traffic Management on Frontage Roads

The Precinct Structure Plan proposes enhancements to Howtree Place and Floreat Avenue which are discussed below. The increase in traffic on Hornsey and Newry is well within the capacity (3,000 VPD) for each street – anticipated traffic is expected to be approximately 50-60% of the nominal capacity. Therefore, no changes to Newry Street or Hornsey Road are proposed.

The goal of carriageway reconfiguration is to create pedestrian friendly streetscapes, notwithstanding there is anticipated growth in vehicular traffic. Proposed roundabout on Howtree Place will help manage traffic in and out of the proposed development and will also ensure that the traffic on Howtree Place keeps operating speed at a reasonable level. Similarly, a roundabout is proposed on Floreat Avenue. This intervention is likely to enhance the safety of the road, in particular around the existing bend.Both existing roads are proposed reconfigured to allow for more generous shared paths on both sides of the road reservation and to encourage alternative transportation modes.

Reducing possible opportunities for anti-social behaviour on priority-controlled intersections will enhance safety. Therefore, the following methods should be considered: -

- Smaller kerb radii – kerb radius should be 6 metres wherever possible; the visual narrowing of the intersection drives the road users to reduce the operating speed limit;
- Paved / Raised intersections – this should be considered on longer stretches of road; it provides a strong visual cue for the road users because the change in the tactile surface signals the requirement for caution and reduction of the operating speed. This type of traffic management can also help define the visual identity of the future place.
- Slow Points / Blisters – this should be considered on longer stretches of the road and could be particularly beneficial in approaches to school zones; this type of traffic management method can be combined with the retention of selected existing vegetation;
- Pedestrian Crossings – pedestrian crossings should be positioned to offer unobstructed sight distances to the pedestrians preparing to cross. Pedestrians should be clearly visible to the drivers in the oncoming traffic. Pedestrian crossings should have pram ramps, creating a safer road environment for vulnerable road users.
- Cyclist / Pedestrian priority – where a shared path crosses an Access Street, priority should be given to pedestrian and cycling traffic. Similarly, where a Safe Active Street intersects with an Access Street, priority should be given to the traffic on Safe Active Street.

Howtree Place remains crucial pedestrian link as it features managed pedestrian crossings servicing the primary school. In further development all options for speed reduction on Howtree Place and Floreat Avenue should be explored.

The Precinct Structure Plan proposes an internal link between Howtree Place and Floreat Avenue. The link was envisaged as a shared connection where pedestrian and micro-mobility traffic is prioritized. Vehicular traffic is permitted in one direction (Howtree Place to Floreat Avenue). The link will feature some at grade parking generally aimed for pick up and drop off function only. The link will not be a gazetted road; therefore, the speed limit should not exceed 10km/h.

Access points to the underground garages should be positioned away from intersections, with clear sightlines and clearly prioritising pedestrians.

2.18 Design Considerations for Developing the Design (Vehicular Access and Parking)

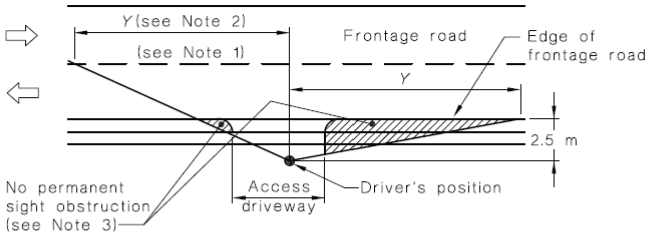
2.18.1 Road Safety

Are sight distances adequate at proposed intersections?	YES*

Justification

The proposal does not seek to introduce new gazetted intersections; however, a number of crossovers will likely have to be designed to an intersection standard. The design would have to ensure that the sight distances are adequate for the vehicles leaving the Centre.

The figure below shows minimum sight distances required at access driveways on various frontage roads. As of writing this email, minimum SSD values cannot be relied upon in Western Australia.



Frontage road speed (Note 4) km/h	Distance (*Y*) along frontage road m		
	Access driveways other than domestic (Note 5)		Domestic property access (Note 6)
	Desirable 5 s gap	Minimum SSD	
40	55	35	30
50	69	45	40
60	83	65	55
70	97	85	70
80	111	105	95
90	125	130	Use values from 2nd and 3rd columns
100	139	160	
110	153	190	

Road safety internal to the development:

Road safety internally to the development is to be addressed once more detailed plans are available. The proponent will prepare a Parking Management Plan addressing all aspects of internal movement safety. To enhance safety, following principles should be observed when designing internal movement networks:

- Pedestrian movement should always take priority. Pedestrian paths should be clearly delineated and where intersecting vehicular movement paths should be prioritised through signage and line marking.
- Intersecting aisles should afford appropriate sight distances and where possible columns and parking bays should be positioned not to restrict sight distances.
- Vehicular speed should not exceed 8km/h internally to the development.
- Parking for seniors and parents with prams should be located in vicinity of pedestrian entrances to the centre.
- ACROD bays should be located in vicinity of pedestrian entrances and connected to the entry points via a clearly visible, step-free path.
- Bicycle and scooter bays should be located so they do not reduce effective footpath width.
- Trolley bays in the commercial component should be distributed throughout parking and placed so it is convenient for shoppers to return the trollies. Trollies which are stored properly reduce risks of injury, accident or damage.
- Parking bays, ramps and circulating aisles should be designed to a minimum AS2890.01 standard, and should feature wheel-stops where interfacing pedestrian circulation.

2.18.2 Car Parking Design

Are there relevant standards to be observed?	YES

Justification

Parking areas should be designed to a minimum of AS2890.01 standard.

Parking Class

Parking areas for residential component can be classified as Class 1 and Class 1a for residents, while parking for residential visitors can be classified as Class 2. Parking areas for commercial component should be classified as follows:

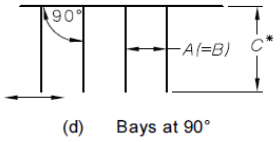
- Class 1 and 1a – employees.
- Class 2 – visitors parking, where the intended length of stay is 2-4 hours.
- Class 3 and 3a – high turnover parking.

Parking for seniors and parents with prams should be regarded as class 3/3a parking.

ACROD bays should be designed in accordance with AS2890.06 standard.

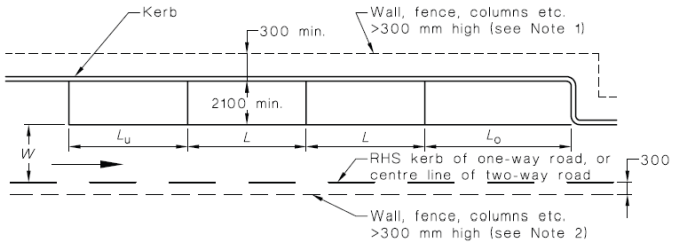
Parking Bay Dimensions

It is anticipated that most of the car parking bays will be perpendicular or parallel. The figures below show an extract from AS2890.01 detailing minimal required dimensions for both options.



(d) Bays at 90°

User class (Note 1)	A (Note 3)	B	C_1	C_2	C_3	Aisle width (Note 4)
1	2.4	2.4	5.4	4.8	5.4	6.2
1A	2.4	2.4	5.4	4.8	5.4	5.8
2	2.5	2.5	5.4	4.8	5.4	5.8
3	2.6	2.6	5.4	4.8	5.4	5.8
3A	2.6	2.6	5.4	4.8	5.4	6.6
3A	2.7	2.7	5.4	4.8	5.4	6.2
4	(See Note 5)					



metres

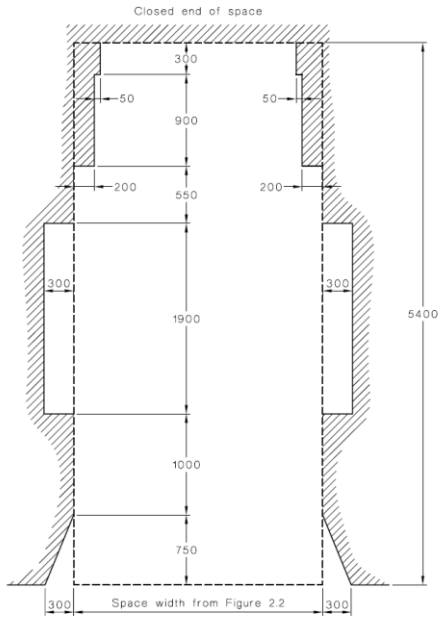
Aisle width (one-way), W	Space length, L	Space length obstructed end spaces, L_o	Space length unobstructed end spaces, L_u (Note 4)
3.0	6.3	6.6	5.4
3.3	6.1	6.4	5.4
3.6	5.9	6.2	5.4

Commercial Vehicles

Loading docks and parking areas for commercial vehicles should be designed in accordance with AS2890.02, and primarily in line with the largest vehicle that is to use loading dock and access point.

Columns

Columns in the underground parking areas should be positioned so they do not obstruct sight lines in aisles where turning manoeuvring is required. If a buffer zone between column and parking bay cannot be incorporated, columns should be distributed per following diagram:



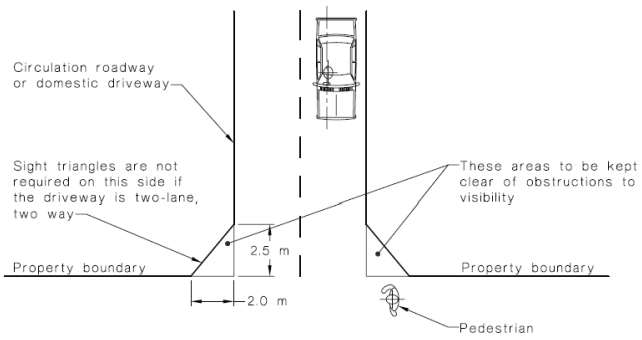
NOTE: The design envelope provides for structural elements to be clear of all four side doors.

DIMENSIONS IN MILLIMETRES

FIGURE 5.2 DESIGN ENVELOPE AROUND PARKED VEHICLE TO BE KEPT CLEAR OF COLUMNS, WALLS AND OBSTRUCTIONS

Pedestrian Sight Lines

Safety of pedestrians in parking areas should be of utmost importance. While the figure below illustrates sight distances required at property entry points, similar requirements should be observed internally to the parking area, in particular where designated pedestrian paths intersect aisles intended for primarily vehicular circulation.



DIMENSIONS IN METRES

FIGURE 3.3 MINIMUM SIGHT LINES FOR PEDESTRIAN SAFETY

Other Considerations

Blind parking aisles (where the aisle terminates with untrafficable obstacle) should be extended by a minimum of 1m beyond the edge of the last parking bay. This extension enables safe reversing manoeuvre.

If a blind aisle has six (6) or more perpendicular bays (or is of an equivalent length) and is accessible by general public (bays are not assigned to residents or employees), a reversing bay is required.

Any circulating aisles that approach 100m in length without intersection aisles require speed cushions or similar speed reduction devices to ensure that the operating vehicular speeds are kept at a minimum.

2.18.3 Ramps, Gradients and Vertical Clearances.

Are there relevant standards to be observed?	YES
Justification	

Ramps internal to the development should be designed to a minimum of AS2890.01 standard, if catering only to passenger vehicles. If a ramp is catering to commercial vehicles, AS2890.02 standard should be observed.

Maximum gradient for a ramp servicing passenger vehicles is 20%. The maximum gradient length must not exceed 20m. If the transition between the gradients is larger than 12.5%, transitional gradients must be provided to avoid vehicles scraping. The length of transitions must not be lesser than 2m. Ramps servicing commercial vehicles should not exceed grade of 16.67%.

At any vehicular queuing point, 6m of maximum 1/20 gradient should be allowed to ensure that the vehicles have appropriate sight distances.

Minimum vertical clearance for standard vehicular parking and circulation aisles servicing standard vehicular parking is 2.2m. Minimum vertical clearance for ACROD parking bays and circulating areas servicing ACROD bays should be 2.3m. Vertical clearances for commercial and service vehicles will vary depending on the typical design vehicle.

2.18.4 Vehicle Crossover Requirements

Are vehicle crossovers required onto existing road networks?	YES
How many existing crossovers?	7
How many proposed crossovers?	TBC
If there are greater numbers of new crossovers, than existing, provide justification:	
It is expected that the access points will be consolidated, so that the number of crossovers will remain the same.	
How close are proposed crossovers to existing intersections?	All currently known crossovers are located in accordance with AS2890.01, figure 3.1 (as shown below). All crossovers which are to be introduced in design refinement phase should be positioned in line with the figure.
Does this meet existing standards?	YES
Justification	
Parking areas will be disaggregated and accessible via various crossovers. All residential and commercial parking will be located underground/within podium levels, while some on-street parking should be time limited and/or dedicated to ride-share services. According to AS/NZS 2890.1:2004 Parking facilities Part 1: Off-street car parking the user class of the access points is likely to vary from 1-4 depending on the final design and distribution of parking.	

Residential car parking is Class 1 or Class 1A, while commercial parking can vary from Class 1 and 1a for employees, through Class 2 for visitors parking to Class 3 and 3a for high turnover parking.

TABLE 3.1

SELECTION OF ACCESS FACILITY CATEGORY

Class of parking facility (see Table 1.1)	Frontage road type	Access facility category				
		Number of parking spaces (Note 1)				
		<25	25 to 100	101 to 300	301 to 600	>600
1,1A	Arterial	1	2	3	4	5
	Local	1	1	2	3	4
2	Arterial	2	2	3	4	5
	Local	1	2	3	4	4
3,3A	Arterial	2	3	4	4	5
	Local	1	2	3	4	4

NOTES:

1 When a car park has multiple access points, each access should be designed for the number of parking spaces effectively served by that access.

2 This Table does not imply that certain types of development are necessarily suitable for location on any particular frontage road type. In particular, access to arterial roads should be limited as far as practicable, and in some circumstances it may be preferable to allow left-turn-only movements into and out of the access driveway.

Therefore, the following requirements from AS/NZS 2890.1:2004 Parking facilities Part 1: Off-street car parking apply:

*"(a) **Driveway Categories 1 and 2**: At unsignalized intersections of sub-arterial, collector or local streets with each other or with an arterial road, access driveways in Categories 1 and 2 (see Table 3.1) shall not be located in the sections of kerb shown by heavy lines in Figure 3.1. **This requirement shall not apply to accesses to domestic driveways in the kerb section opposite the entering road at any intersection including signalized intersections.***

Furthermore, it shall not apply to any access driveway serving a property which would otherwise be denied access due to the physical impossibility of meeting the requirement.

At signalized intersections, the minimum distance from the intersection, measured from the property boundary along both legs, shall be increased as necessary to locate access driveways beyond the influence of normal queue lengths at the intersections. If this is not practicable, it may be necessary to provide-

(i) an arrangement which confines traffic to turning left when either entering or leaving the car park;

(ii) a signalized driveway with signals coordinated with the intersection signals; or

(iii) other traffic management means of providing for safe and efficient operation of the driveway."

*' '(b) **Driveway Categories 3 and 4** Driveways in categories 3 and 4 (see Table 3.1) shall not be located—*

(i) on arterial roads unless entrances and exits are designed and constructed as intersection treatments catering adequately for all projected traffic flows;

(ii) closer to intersections than permitted for Category 1 and 2 driveways (see Item (a));

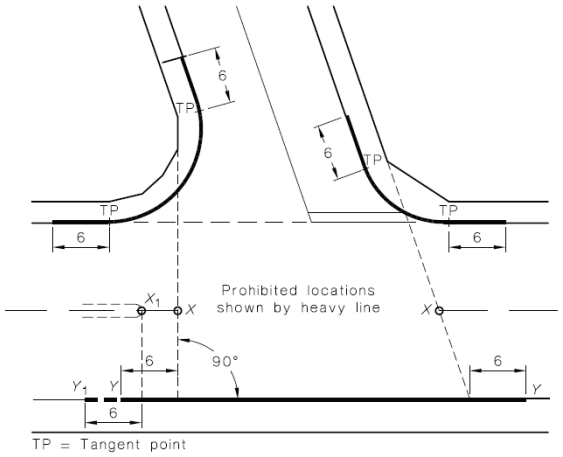
(iii) opposite other developments generating a large amount of traffic, unless all projected traffic flows are provided for in a properly designed and constructed intersection treatment, including the installation of signals if necessary;

(iv) where there is a heavy and constant pedestrian movement along the footpath, unless this can be adequately catered for by some form of positive control, e.g. traffic signals;

(v) where right turning traffic entering the facility would obstruct through traffic; or

(vi) where traffic using the driveways will interfere or block the operations of bus stops, taxi ranks, loading zones or pedestrian crossings.

Entry for left turning vehicles into driveways in Categories 3 and 4 should be gained by the first vehicular driveway reached, and by using the kerbside lane. "



NOTES:

1 Accesses to domestic driveways are excluded from the prohibition in respect of the kerb section marked *Y*-*Y* (see Clause 3.2.3(a)).

2 The points marked X_1 and *X* are respectively at the median end on a divided road and at the intersection of the main road centre-line and the extensions of the side road property lines shown as dotted lines, on an undivided road. On a divided road, dimension *Y*-*Y* extends to Point Y_1.

DIMENSIONS IN METRES

FIGURE 3.1 PROHIBITED LOCATIONS OF ACCESS DRIVEWAYS

In addition to the AS2890.01, relevant crossover policies of the Town of Cambridge should be observed. Curent policy (CP 106) stpiulates that the crossover:

- Must be installed a minimum 1.5m from the face of a tree;
- Must not exceed 6m in width in Floreat.

Once the design is finalised and the distribution of parking is known, crossover design will be developed. It is almost certain that some, if not all crossovers will exceed the stipulated width.

Are auxiliary lanes warranted?	NO*
Justification	
At this stage of the project it is not reasonable to assess slip lane warrants. Once the development plans are further progressed, this assessment can be made.	

2.18.5 Healthy Streets Considerations

Roadways in the Master Plan need to be “fit for human consumption”, meaning they need to be stimulating and safe for active transport (pedestrians, cyclists, micro-mobility users). Overreliance on motorised transport, in particular personal vehicles, has resulted in grotesque growth in obesity and related illnesses to the extent that has become a global public health issue. With more than 50% of global population living in cities, and the percentage constantly increasing, it is of paramount importance to create urban environments that will be as healthy as possible and promote appropriate levels of physical activity on a daily level. With this purpose, the Healthy Streets system was developed comprising 10 key indicators that can be used to assess existing and proposed streets and to guide public realm development. While at a more detailed stage, a full assessment can be undertaken, at this high level of planning, the following elements of the indicators should be considered:

1. Everyone feels welcome

Streets must be welcoming places for everyone to walk, cycle, spend time and engage with other people. Paths should aim to have a clear 1.5m width, free of obstacles (such as advertising signs, street furniture, alfresco area, display stalls etc). This width allows two people to walk side by side and converse, a person moving in a wheelchair to bypass another pedestrian or parent with a pram to walk holding another child by the hand.

2. People choose to walk and cycle

Attractive public realm favours walking and bicycling over motorised transport as this in turn reduces air and noise pollution while it is very beneficial for social cohesion and stimulating for the local economy. Furthermore, the combination of land uses should be conducive to active transport – a number of attractive locations in bikeable/walkable distance will make walking and bicycling more attractive and convenient than travel with passenger vehicles. The precinct would benefit from low operating speeds (30km/h or less) and convenient and abundant bicycle parking.

3. Easy to cross

Pedestrian crossings connect the precinct and make it accessible to all visitors; therefore, pedestrian crossings should be located on pedestrian desire lines and be step-free. The width of the crossing should accommodate movement groups of pedestrians, micro-mobility riders and persons with impaired mobility. Minor crossings should be minimum 4m wide, while larger crossings (for example in front of the shopping centre) should be minimum 6m wide.

4. Shade and shelter

Shade and shelter encourage pedestrians to use the public realm regardless of weather conditions. Awnings, colonnades, bus shelters are some of the examples of shade and shelter that can be considered further in the design; however, the primary consideration should be given to mature vegetation.

5. Places to stop and rest

Regular opportunities to stop and rest are essential to some of the pedestrians, particularly elderly people and people with impaired mobility. Such places should be equipped with street furniture allowing rest and recuperation (such as benches, seats, water fountains etc.). This type of street furniture can be designed to visually enhance the public realm. Furthermore, these spaces allow residents and regular visitors to have brief interactions with each other, creating and solidifying social connections.

6. Clean air

The first step in reducing pollution and maintaining appropriate air quality is discouraging people from using motor vehicles for short trips. A public realm that is conducive to walking, cycling and use of micromobility devices will automatically discourage excessive use of passenger vehicles. Access to heavy vehicles should be limited to delivery vehicles only.



7. Not too noisy

Noise from motor vehicles can seriously impact residents' and visitors' physical and mental health. Restriction of speed limit and vehicular movements will greatly contribute

to keeping the noise at acceptable levels. Heavy vehicle access should be restricted to delivery, service and emergency vehicles.

8. People feel safe

In addition to the safety aspects discussed above, pedestrians and cyclists must be safe from collisions with moving passenger vehicles. The threshold speed where the survivability of vulnerable road users (pedestrians, cyclists, micro-mobility users) rapidly declines in collision with motor vehicles is 30km/h. It is advisable to keep the speed of motor vehicles at 30km/h or below on carriageways. Operating speed in shared areas should be restricted to 10km/h or below.

9. Things to see and do

Street environment should be visually appealing and stimulating for pedestrians. While presence of public art and various amenities are important, stimulating street environment firstly comprises active frontages offering variety of experiences and attracting wide range of patrons.

10. People feel relaxed

Well-proportioned and well-maintained spaces tend to make people feel less anxious and unsafe. Such places are seen as attractive by others, and genuinely attract people as visitors and patrons. People want to be where other people are, and where they feel comfortable spending time.

2.19 Road Cross-Section Requirements

Does this development propose the construction of new roads?	YES*

The proposed Precinct Structure Plan will introduce an internal circulation lane in lieu of current access point on Howtree Place. This circulation lane will not be gazetted; and it will be open for pedestrian, bicycling and micro mobility traffic in both directions while vehicular traffic will be permitted only in one direction (from Howtree Place to Floreat Avenue).

The plan also proposes some enhancements on Howtree Place and Floreat Avenue to enhance streetscape and create urban atmosphere conducive to pedestrian and bicycling traffic.

The diagrams below provide general guidance on carriageway configurations.

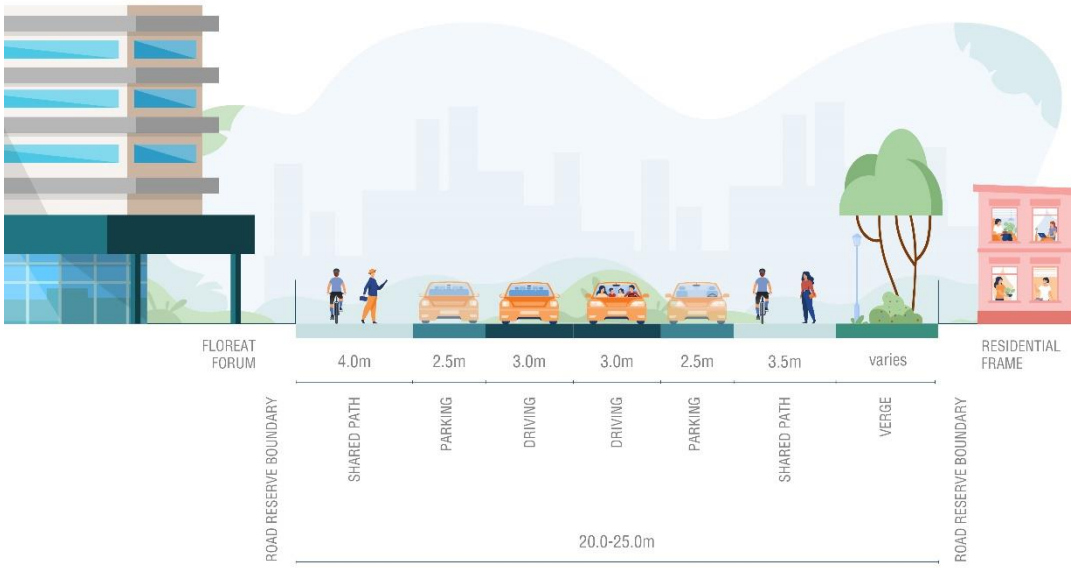
Road Name	**Howtree Place**
Proposed Number of Lanes	One lane per direction
Proposed Road Reservation Width	22.1m
Proposed Road Pavement Width	6.5m
Proposed Pedestrian / Cyclist / Shared Path Width	3.5m shared path on the Floreat Forum side and 4.0m shared path on the Primary School side
Proposed On-street parking	YES - 2.5m on both sides of the road reservation

Provide graphics of the proposed internal road cross section within the Structure Plan Area



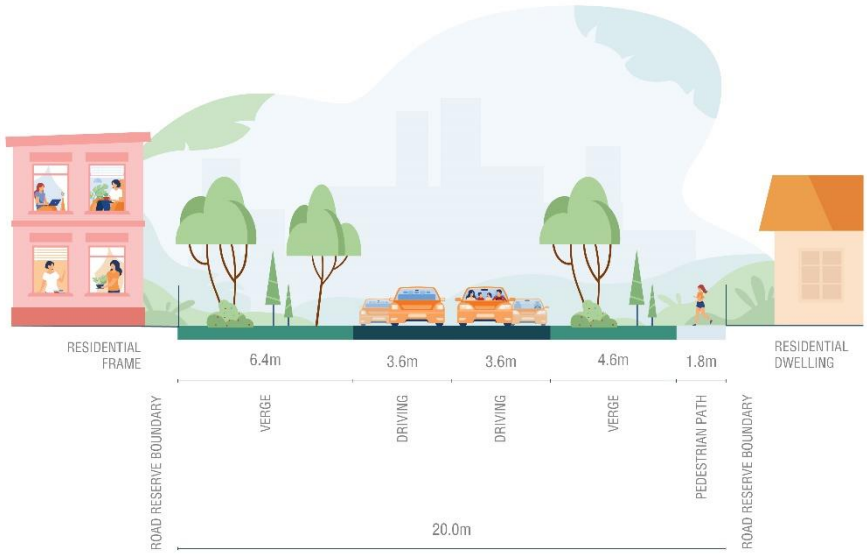
Road Name	Floreat Avenue
Proposed Number of Lanes	One lane per direction
Proposed Road Reservation Width	20.0 – 25.0m
Proposed Road Pavement Width	6.0m
Proposed Pedestrian / Cyclist / Shared Path Width	3.5m shared path on the Residential Frame side and 4.0m shared path on the Floreat Forum side
Proposed On-street parking	YES - 2.5m on both sides of the road reservation

Provide graphics of the proposed internal road cross section within the Structure Plan Area



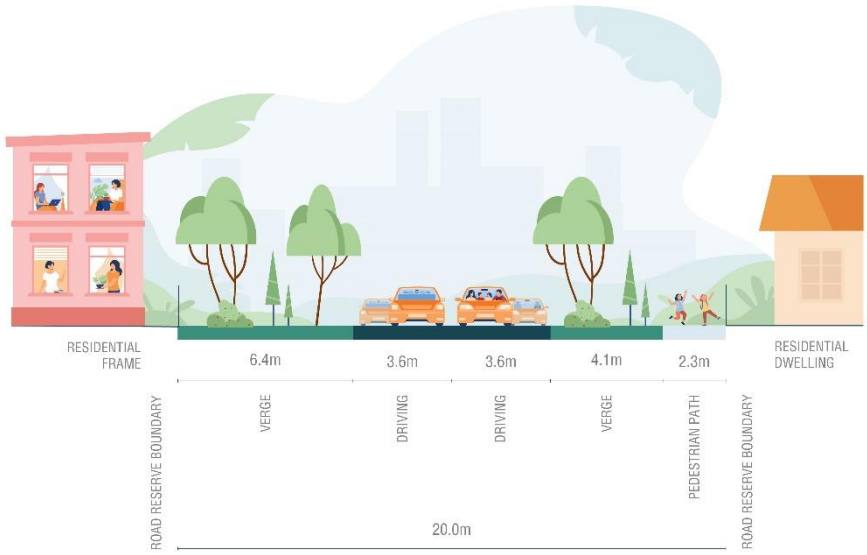
Road Name	**Newry Street** (as per existing treatment)
Proposed Number of Lanes	One lane per direction
Proposed Road Reservation Width	20.0m
Proposed Road Pavement Width	7.2m
Proposed Pedestrian / Cyclist / Shared Path Width	1.8m pedestrian path on the existing residential dwellings side
Proposed On-street parking	YES – informal on street parking

Provide graphics of the proposed internal road cross section within the Structure Plan Area



Road Name	**Hornsey Road** (as per existing treatment)
Proposed Number of Lanes	One lane per direction
Proposed Road Reservation Width	20.0m
Proposed Road Pavement Width	7.2m
Proposed Pedestrian / Cyclist / Shared Path Width	2.3m pedestrian path on the existing residential dwellings side
Proposed On-street parking	YES – informal on street parking

Provide graphics of the proposed internal road cross section within the Structure Plan Area



Road Name	**Internal circulation** (not gazzeted)
Proposed Number of Lanes	one lane, one way - passenger vehicles only
Proposed Road Pavement Width	4.5m
Proposed Pedestrian / Cyclist / Shared Path Width	varies
Proposed On-street parking	YES – 2.5m for shared ride only

Provide graphics of the proposed internal road cross section within the Structure Plan Area



2.20 Site-Specific Issues and Proposed Remedial Measures

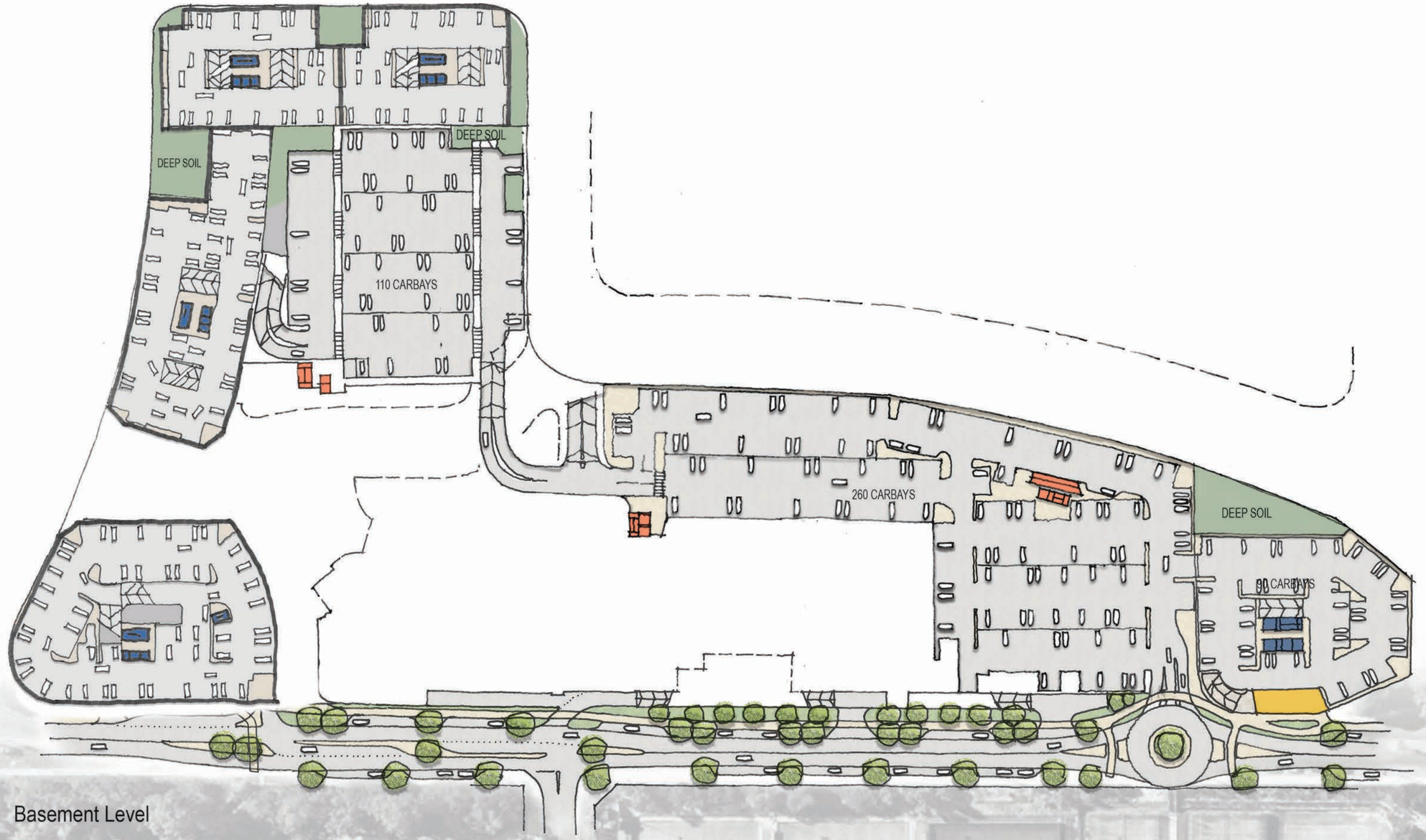
How many site-specific issues need to be discussed?	2
Site-Specific Issue No 1	**Traffic Impact**
Remedial Measure / Response	Based on the current plans, by 2041 the Centre will generate an additional 1,846 VPD, 521 VPH in the AM and 508 VPH in the PM peak. According to WAPC guidelines, this is deemed high impact on the network. Based on the analysis, the network has sufficient capacity to cater to this development and the passing traffic growth provided some minor enhancements. Both signalised intersections will require optimisation to continue performing to a satisfying level, while the intersection of Floreat Avenue and The Boulevard will require signalisation.
Site-Specific Issue No 2	**Parking Requirements**
Remedial Measure / Response	Although the final plans are yet to be developed, the provisional cumulative parking requirement for the proposed development is 2,187 parking bays (no reciprocity accounted for). Current Precinct Structure Plan allows sufficient parking to cater for this cumulative requirement; however, for place value, further design development should guard against overprovision of vehicular parking. The proponent should consider providing residential micro-mobility share schemes and incentives for employees and patrons of the shopping centre for using active modes of transport.

2.21 Technical Literature Used

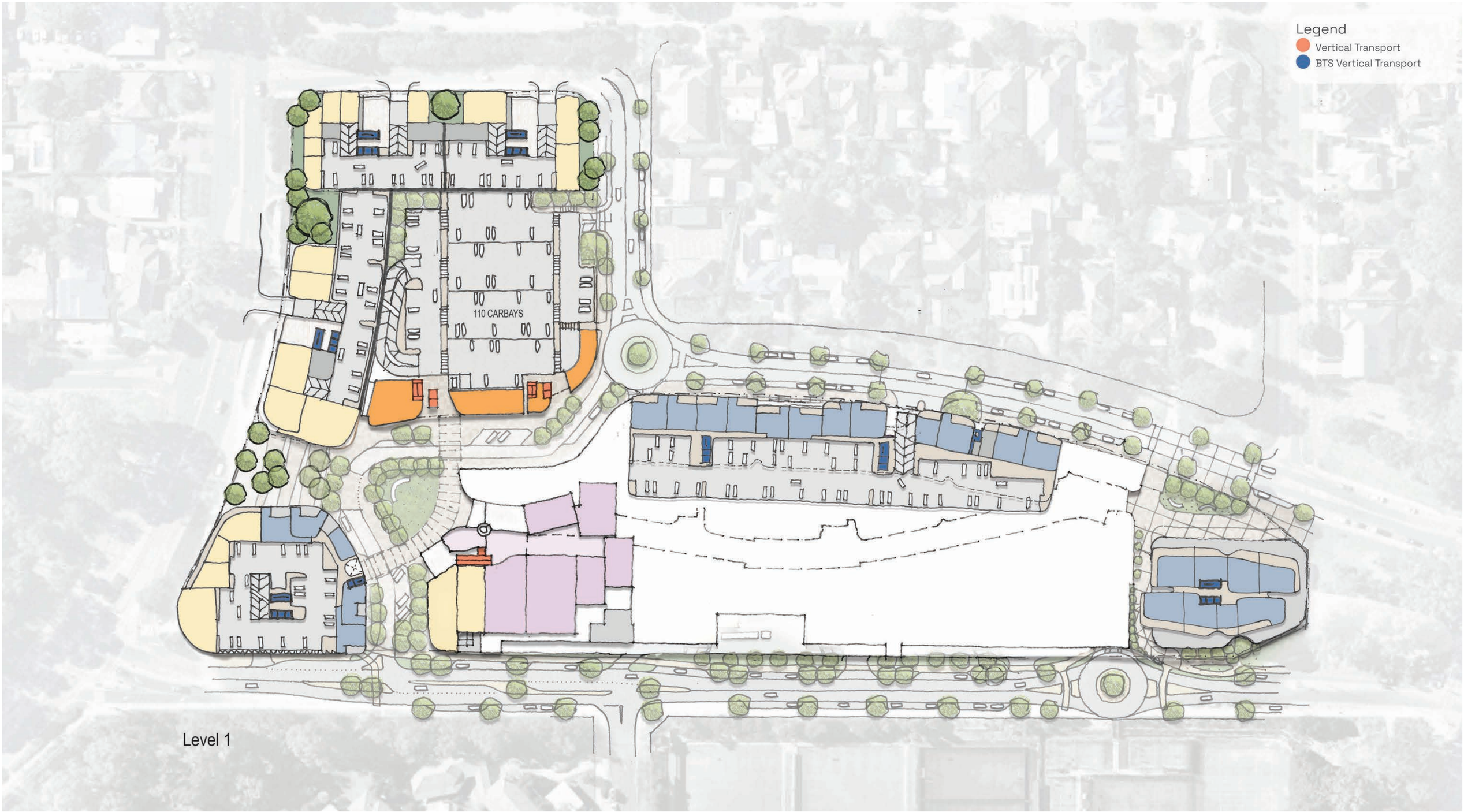
Local Government Authority	Town of Cambridge
Type of Development	Mixed use commercial development
Are the R-Codes referenced?	YES
If YES, nominate which:	State Planning Policy 7.3 Residential Design Codes Volume 2 - Apartments (Gazetted on 1 September 2023)
Is the NSW RTA Guide to Traffic Generating Developments Version 2.2 October 2002 (referenced to determine trip generation/attraction rates for various land uses) referenced?	YES
Which WAPC Transport Impact Assessment Guideline should be referenced?	Volume 4 - Individual Developments
Are there applicable LGA schemes for this type of development?	YES
If YES, Nominate:	
Name and Number of Scheme	• Local Planning Scheme No.1 (Updated to include AMD 40 GG 13/05/2022) • Local Planning Policy 2.3: Precinct P3: Floreat
Are Austroads documents referenced?	YES
Is the Perth Transport Plan for 3.5 million and Beyond referenced?	YES
Other documents referenced in the report:	Transport Modelling Guidelines for Activity Centre Structure Plans, DoT, 2016 Parking Guidelines for Activity Centres, DoT, 2016 Vehicle Crossover Policy, Policy 106, Town of Cambridge; Australian Standard 2980 set – Parking Facilities; Designing for things with small wheels, NACTO, 2022

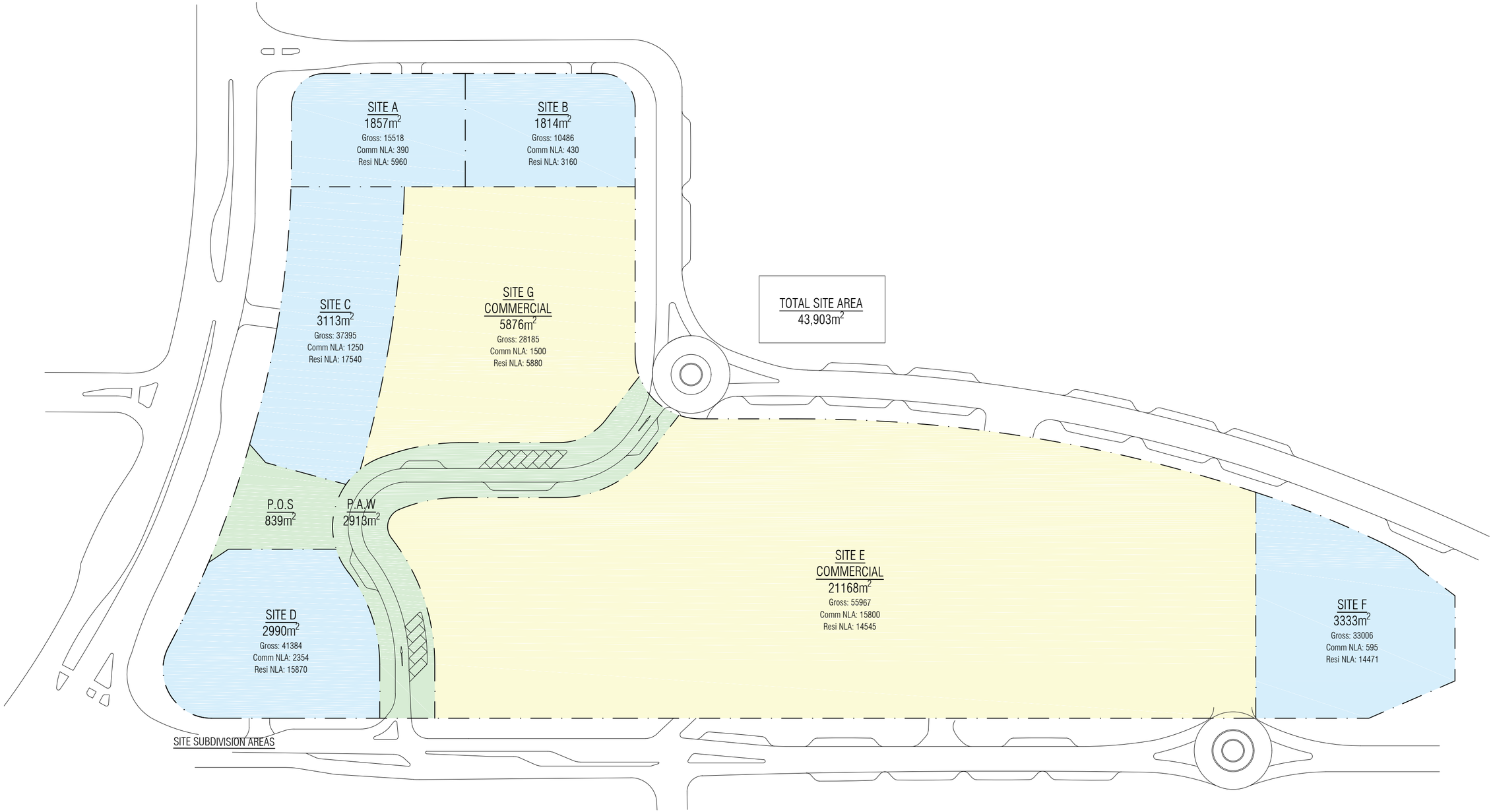
Appendix 1

The Layout of the Proposed Development



Basement Level

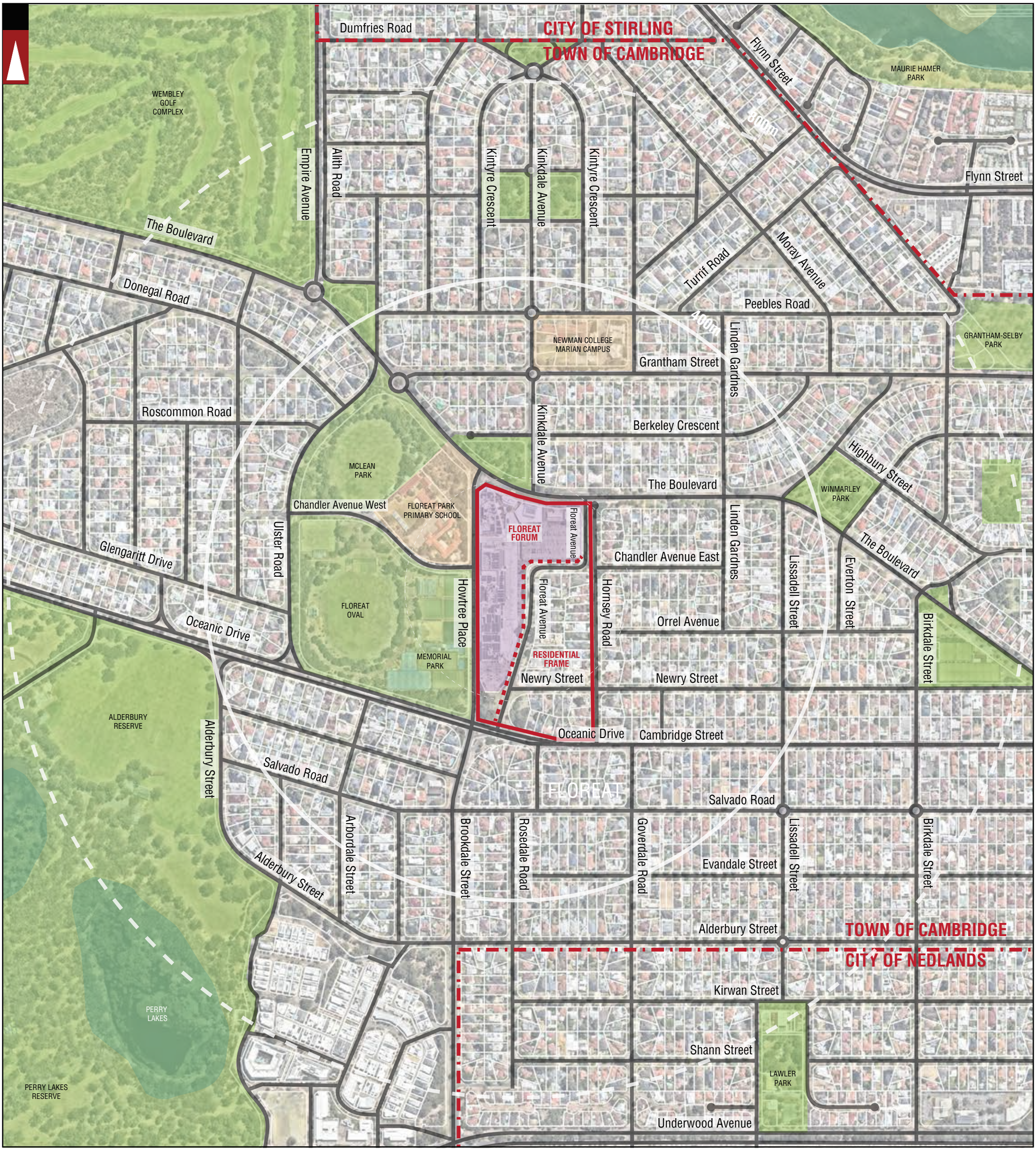

Legend
Vertical Transport
BTS Vertical Transport
110 CARBAYS
Level 1



Indicative Subdivision Layout Plan

Appendix 2

Transport Planning and Traffic Plans



PARKS AND RECREATION
WATERWAYS
PUBLIC PURPOSE
SHOPPING AREA
ROAD
Hay Street — STREET NAME
TOWN OF CAMBRIDGE — LOCAL GOVERNMENT NAME
FLOREAT — SUBURB NAME
LOCATION BOUNDARY
DISTANCE FROM LOCATION
LOCAL AUTHORITY BOUNDARY

LEGEND

No	DATE	AMENDMENT
B	01-04-2024	AMENDED AS PER COMMENTS
A	01-08-2022	ISSUED FOR REVIEW

PROJECT: FLOREAT FORUM – ACTIVITY CENTRE PLAN

TITLE: LOCALITY PLAN - 800M RADIUS

DRAWING NUMBER: KC01446.000_ S01

DRAWN BY: A.M.

Civil & Traffic Engineering Consultants
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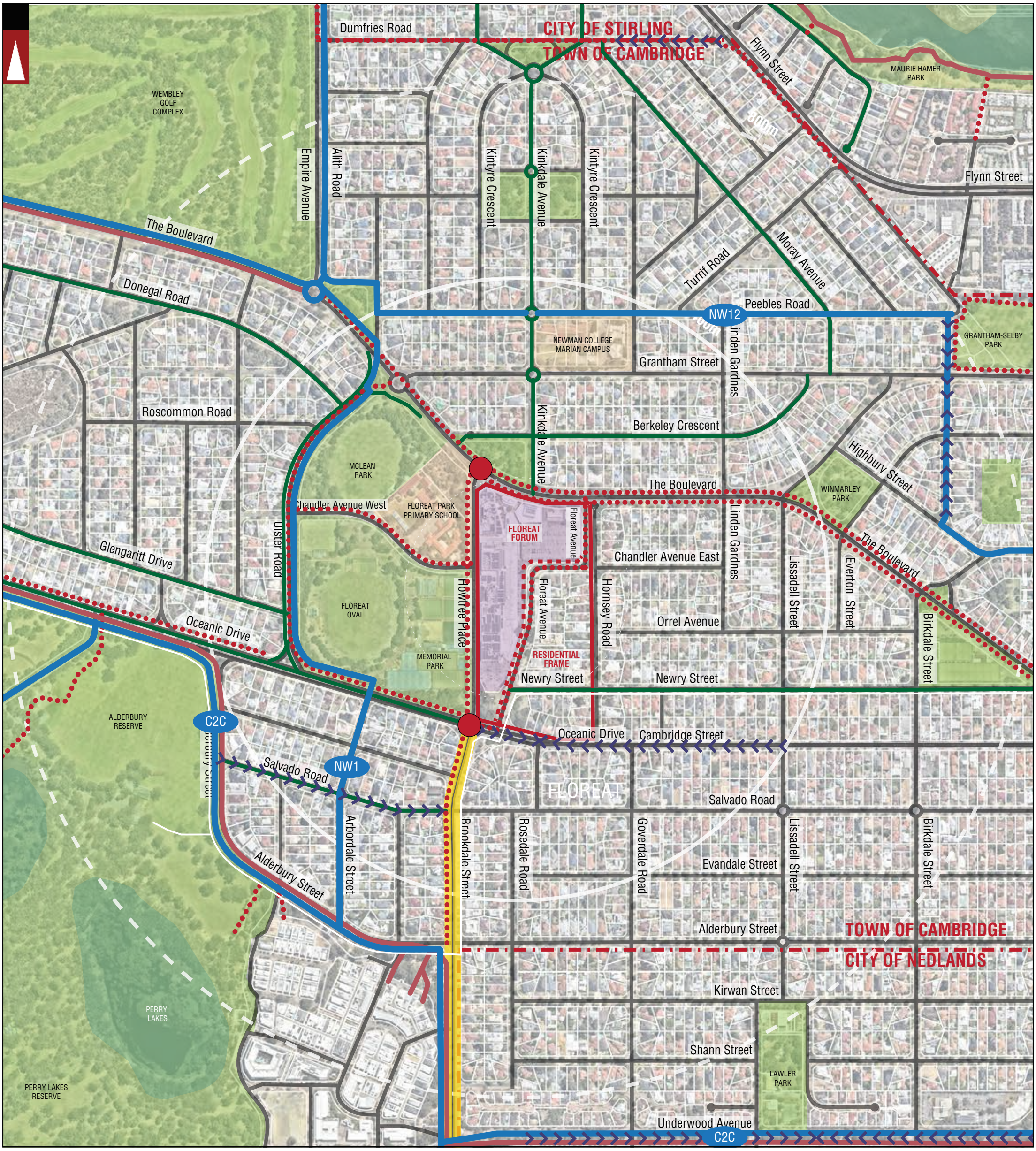
WEB: www.kctt.com.au
kctt PART OF Premise



PARKS AND RECREATION
WATERWAYS
PUBLIC PURPOSE
SHOPPING AREA

ROAD
Hay Street — STREET NAME
TOWN OF CAMBRIDGE — LOCAL GOVERNMENT NAME
FLOREAT — SUBURB NAME

LOCATION BOUNDARY
DISTANCE FROM LOCATION
LOCAL AUTHORITY BOUNDARY

HIGH QUALITY SHARED PATH
OTHER SHARED PATH (SHARED BY PEDESTRIANS & CYCLISTS)
GOOD ROAD RIDING ENVIRONMENT
BICYCLE LANES OR SEALED SHOULDER EITHER SIDE

GRADIENT ARROW
WALKING TRAIL
TRAFFIC LIGHT
NW12 — PERTH BICYCLE NETWORK (PBN) - CONTINUOUS SIGNED ROUTES

LEGEND

No	DATE	AMENDMENT
B	01-04-2024	AMENDED AS PER COMMENTS
A	01-08-2022	ISSUED FOR REVIEW

PROJECT: FLOREAT FORUM – ACTIVITY CENTRE PLAN

TITLE: BICYCLE NETWORK PLAN - 800M RADIUS

DRAWING NUMBER: KC01446.000_ S02

DRAWN BY: A.M.

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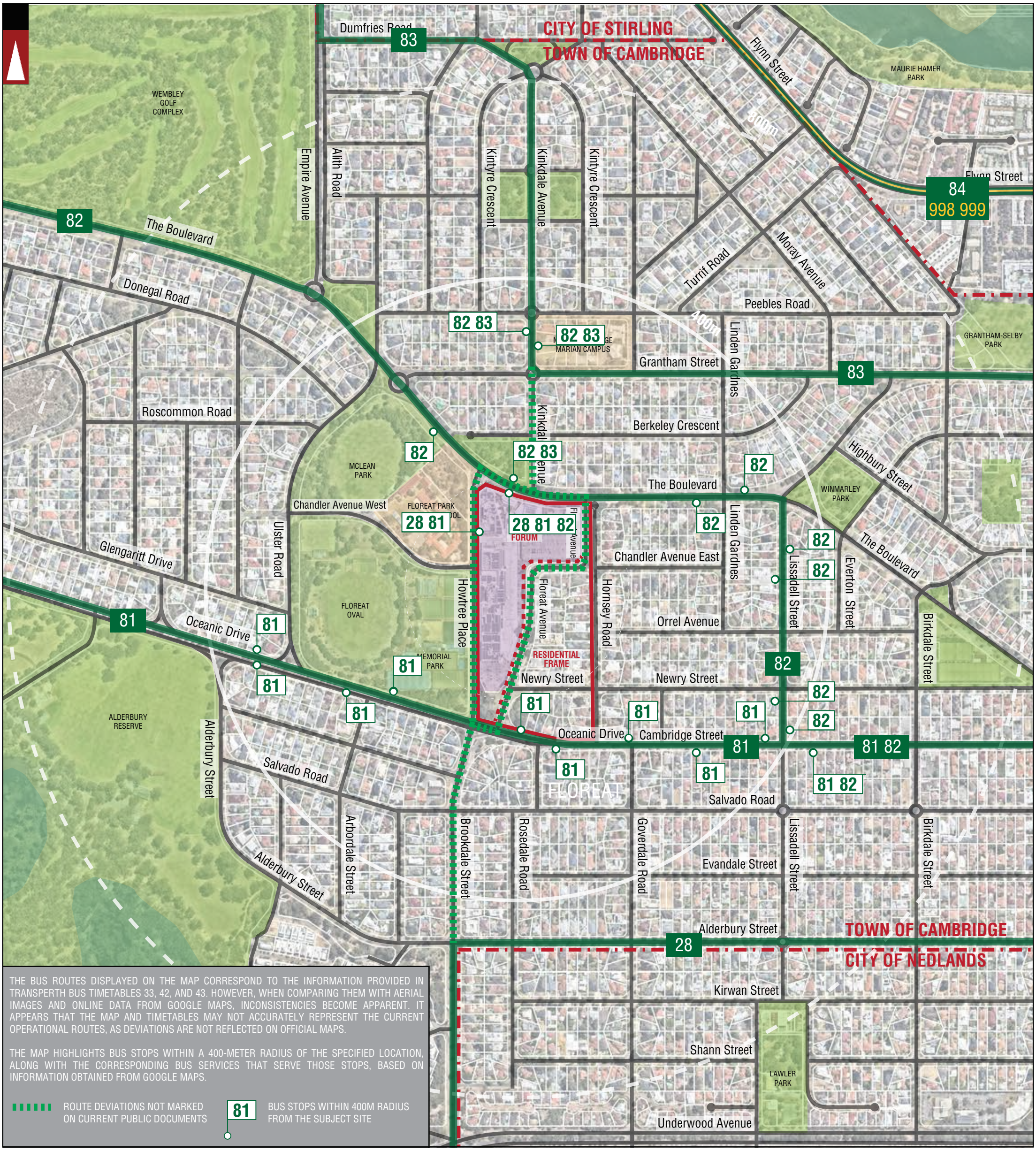

THE BUS ROUTES DISPLAYED ON THE MAP CORRESPOND TO THE INFORMATION PROVIDED IN TRANSPERTH BUS TIMETABLES 33, 42, AND 43. HOWEVER, WHEN COMPARING THEM WITH AERIAL IMAGES AND ONLINE DATA FROM GOOGLE MAPS, INCONSISTENCIES BECOME APPARENT. IT APPEARS THAT THE MAP AND TIMETABLES MAY NOT ACCURATELY REPRESENT THE CURRENT OPERATIONAL ROUTES, AS DEVIATIONS ARE NOT REFLECTED ON OFFICIAL MAPS.

THE MAP HIGHLIGHTS BUS STOPS WITHIN A 400-METER RADIUS OF THE SPECIFIED LOCATION, ALONG WITH THE CORRESPONDING BUS SERVICES THAT SERVE THOSE STOPS, BASED ON INFORMATION OBTAINED FROM GOOGLE MAPS.

ROUTE DEVIATIONS NOT MARKED ON CURRENT PUBLIC DOCUMENTS

81 BUS STOPS WITHIN 400M RADIUS FROM THE SUBJECT SITE

PARKS AND RECREATION

WATERWAYS

PUBLIC PURPOSE

SHOPPING AREA

ROAD

Hay Street STREET NAME

TOWN OF CAMBRIDGE LOCAL GOVERNMENT NAME

FLOREAT SUBURB NAME

LOCATION BOUNDARY

DISTANCE FROM LOCATION

LOCAL AUTHORITY BOUNDARY

BUS ROUTES

HIGH FREQUENCY BUS ROUTE

103 BUS ROUTE NUMBER

990 HIGH FREQUENCY BUS ROUTE NUMBER

NOTE : FOR MORE INFORMATION REGARDING THE DESCRIPTION OF BUS ROUTES AND THEIR INDICATIVE PEAK AND OFF-PEAK FREQUENCIES REFER TO THE REPORT.

LEGEND

No	DATE	AMENDMENT
B	01-04-2024	AMENDED AS PER COMMENTS
A	01-08-2022	ISSUED FOR REVIEW

PROJECT: FLOREAT FORUM – ACTIVITY CENTRE PLAN

TITLE: PUBLIC TRANSPORT PLAN - 800M RADIUS

DRAWING NUMBER: KC01446.000_ S03a

DRAWN BY: A.M.

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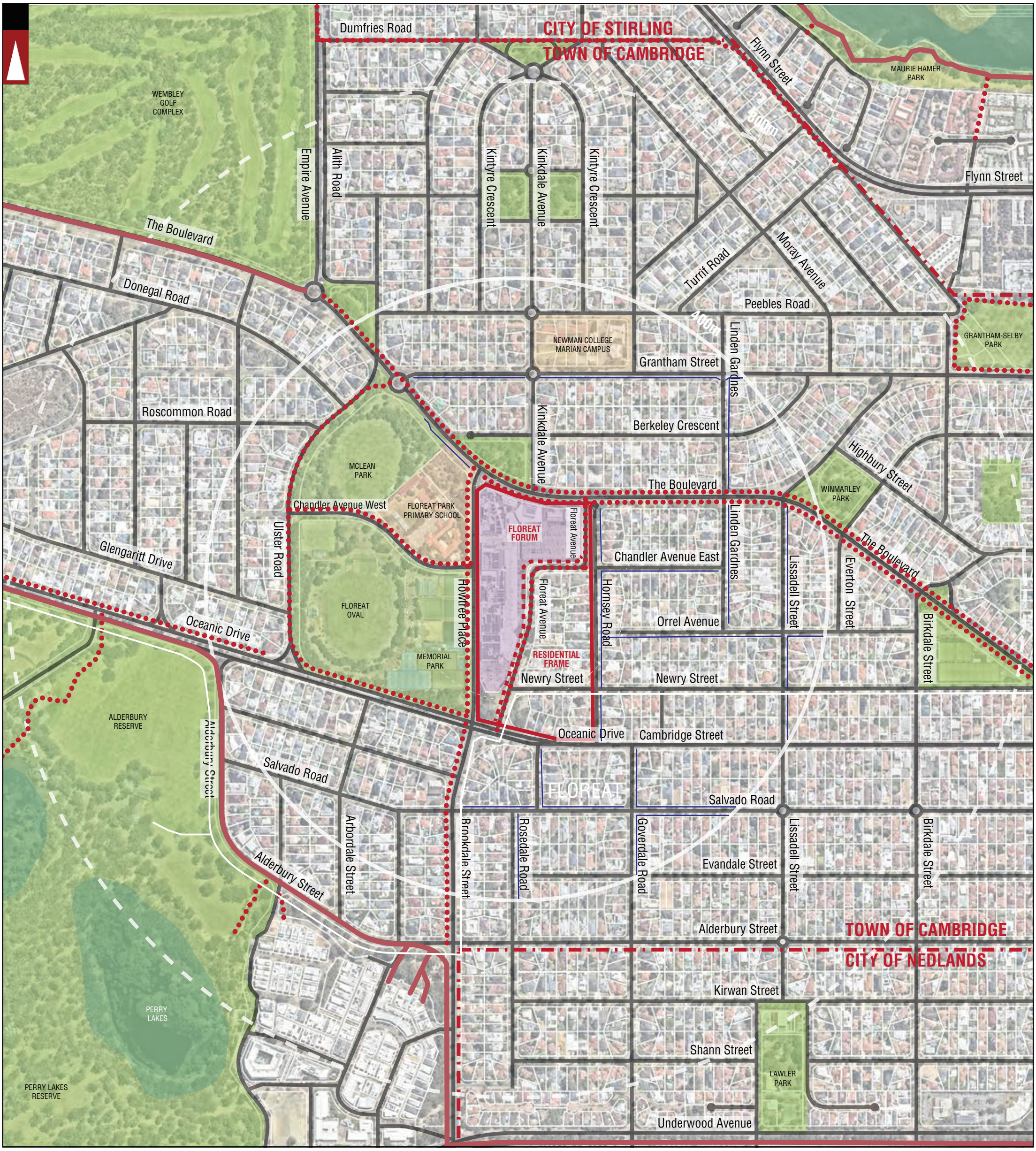

PARKS AND RECREATION
WATERWAYS
PUBLIC PURPOSE
SHOPPING AREA

ROAD
Hay Street — STREET NAME
TOWN OF CAMBRIDGE — LOCAL GOVERNMENT NAME
FLOREAT — SUBURB NAME

LOCATION BOUNDARY
DISTANCE FROM LOCATION
LOCAL AUTHORITY BOUNDARY

HIGH QUALITY SHARED PATH
OTHER SHARED PATH (SHARED BY PEDESTRIANS & CYCLISTS)
PEDESTRIAN PATH WITHIN 400M RADIUS OM THE SUBJECT LOCATION
WALKING TRAIL

LEGEND

No	DATE	AMENDMENT
B	01-04-2024	AMENDED AS PER COMMENTS
A	01-08-2022	ISSUED FOR REVIEW

PROJECT: FLOREAT FORUM – ACTIVITY CENTRE PLAN

TITLE: PEDESTRIAN NETWORK PLAN - 800M RADIUS

DRAWING NUMBER: KC01446.000_ S04

DRAWN BY: A.M.

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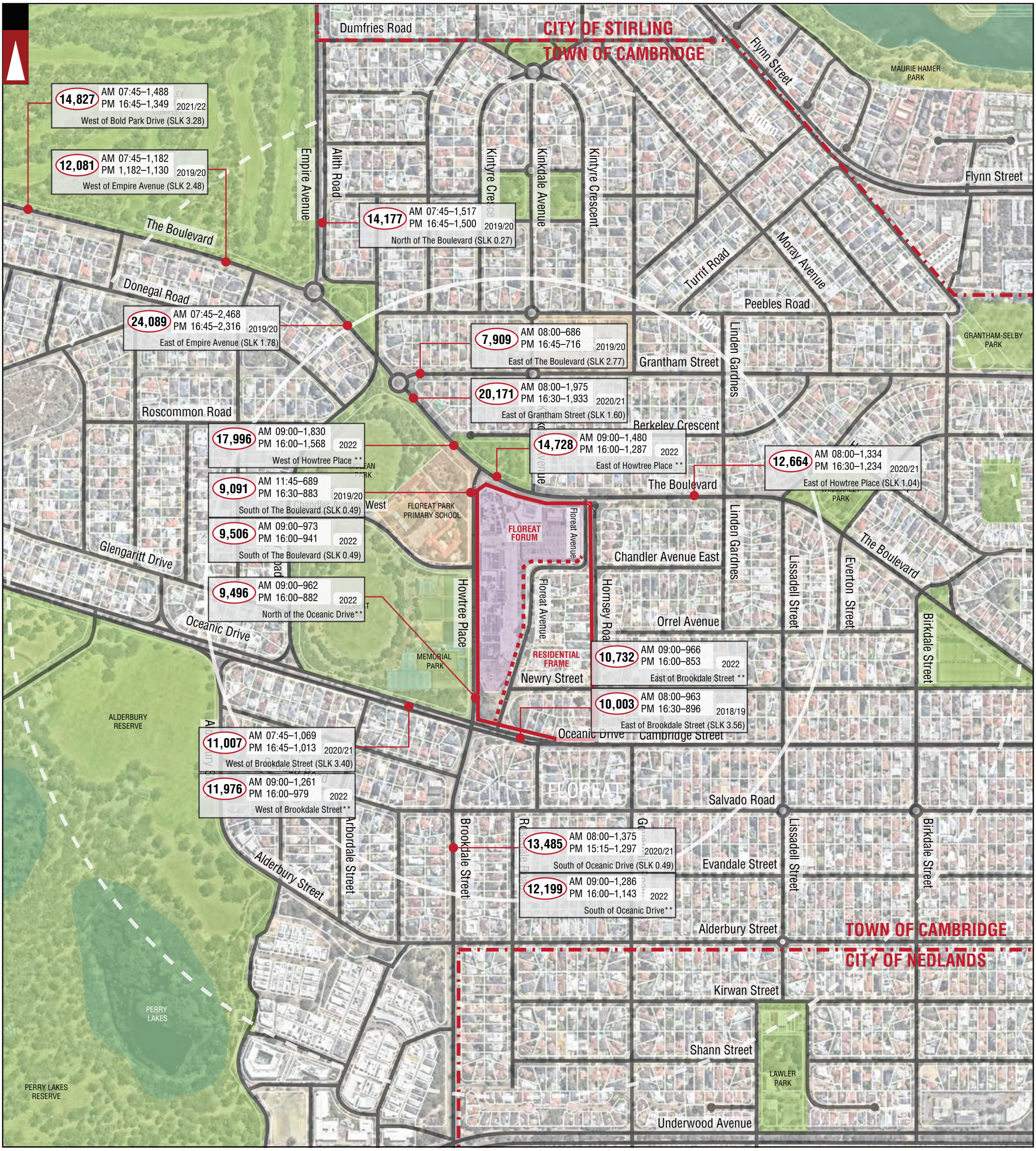

PARKS AND RECREATION
WATERWAYS
PUBLIC PURPOSE
SHOPPING AREA
ROAD
Hay Street — STREET NAME
TOWN OF CAMBRIDGE — LOCAL GOVERNMENT NAME
FLOREAT — SUBURB NAME
LOCATION BOUNDARY
DISTANCE FROM LOCATION
LOCAL AUTHORITY BOUNDARY
5,512 — NUMBER OF VEHICLES PER DAY
AM 1145 – 381 PM 1630 – 480 — NUMBER OF VEHICLES PER AM PEAK HOUR / NUMBER OF VEHICLES PER PM PEAK HOUR
2014 — YEAR
EAST OF HARLOW ROAD — LOCATION

LEGEND

No	DATE	AMENDMENT
B	01-04-2024	AMENDED AS PER COMMENTS
A	01-08-2022	ISSUED FOR REVIEW

PROJECT: FLOREAT FORUM – ACTIVITY CENTRE PLAN

TITLE: EXISTING TRAFFIC COUNTS - 800M RADIUS

DRAWING NUMBER: KC01446.000_ S05

DRAWN BY: A.M.

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Appendix 3

Traffic Modelling Report

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1. Introduction

1.1 Location

Street Number	5
Road Name	Howtree Place
Suburb	Floreat
Description of Site	The Subject Site includes Floreat Forum and the adjacent Residential Frame It is designated as a District Centre under SPP 4.2 (Activity Centres for Perth and Peel) and is one of two District Centres located within the Town of Cambridge. As the Town of Cambridge does not feature centres of higher order at present, the subject site represents an important public life node. Floreat Forum is bound by The Boulevard, Howtree Place, Oceanic Drive and Floreat Avenue. The site enjoys vehicular access from The Boulevard, Floreat Avenue and Howtree Place with loading docks for two anchor tenants (Coles and Woolworths) being on Howtree Place. Although the current physical form has limited interactivity to the street fronts, the pedestrian access points are located on all surrounding streets. The proposed amendments include an increase of commercial area to 22,319m^2 and the addition of 950 residential apartments. The Residential Frame (bound by Floreat Ave, Oceanic Drive and Hornsey Rd) with approximately 300 apartments in the residential area southwest from the Floreat Forum Shopping Centre. This area currently includes 37 single residential dwellings.

1.2 Traffic Volumes

Traffic volumes for the Base model have been obtained from the Survey conducted for the purposes of this project on 03/09/2022.

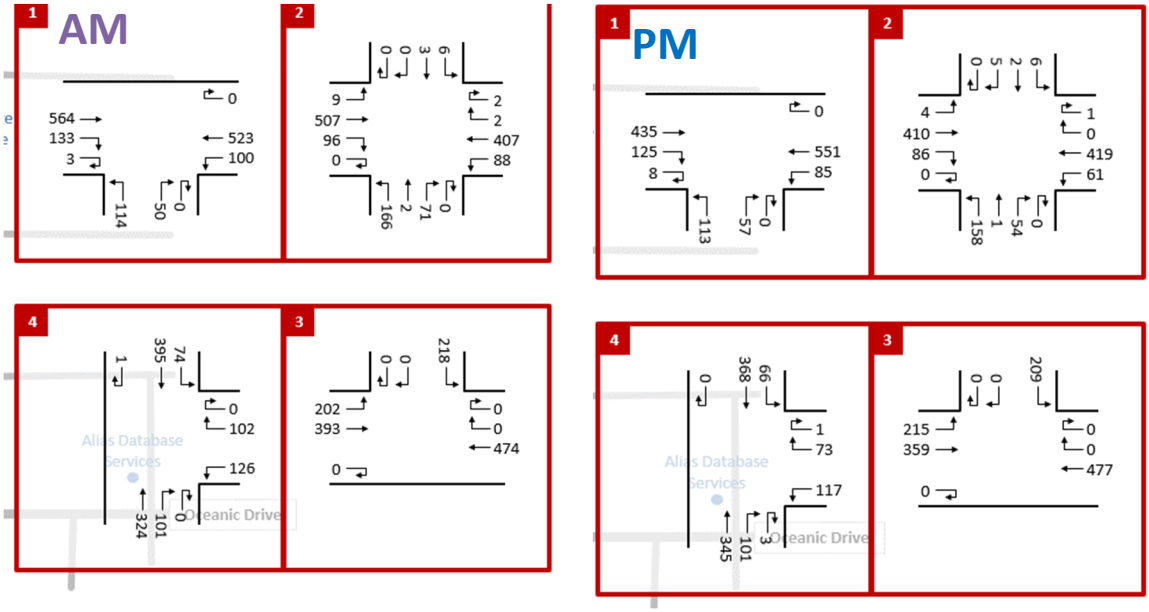
Below are the 4 major intersections' surveyed traffic counts in the peak assessment hours: AM 11:00-12:00 and PM 12:00-13:00.

M01 – Access/egress from/to The Boulevard

M02 – The Boulevard/Floreat Avenue

M03 – Oceanic Drive/Floreat Avenue

M04 – Access/egress from/to Howtree Place



Traffic volumes for signalised intersections M05 Howtree Place/Oceanic Drive and M06 Howtree Place/The Boulevard have been obtained from the SCATS History data for the same date as the survey – 03/09/2022.

2. Aimsun Model

2.1 Base Model Assumptions and Calibration

Matrices have been developed in accordance with the below process:

- Intersection turning movement counts have been extracted for the assessment peak hour period (11:00 – 13:00 Saturday 03/09/2022) from both the survey and SCATS data.
- The first entries in matrices were OD pairs which directly reflect a turn on one of the intersections. For example, right turn from Oceanic Drive onto Brookdale Street is a matrix entry with Origin in Zone 7 and Destination in Zone 6.
- For other turning movement counts with known origin, assumptions have been made on the unknown destinations and vice-versa to match the surveyed or SCATS data as close as possible.
- OD matrix was iteratively put through furness procedure and tested in trial model runs until the modelled turning movement counts have reflected the observed counts on a highest possible level (measured with the GEH Statistic). The required GEH <5 was achieved for all 41 detectors created in the network model. Refer to the below Section 1.3.2 for GEH data.
- In the current Rev B of the modelling, Newry Street, Orrel Avenue and Chandler Ave East have been added to the model. Zone 4 includes these roads. Given there was no survey undertaken for the new intersections, the following assumptions have been made to incorporate related traffic on the extended network:
    - 86 dwellings assumed to have a partial impact on the modelled network for trips unrelated to the Floreat Forum.
    - Vehicles travelling westbound via The Boulevard already included in the model from/to Zone 3 (20%). All vehicles are likely to use Linden Gardens connection to The Boulevard, which is out of the model's catchment area.
    - Vehicles travelling eastbound via Newry Street, Orrel Avenue and Chandler Avenue East are also outside of the model (20%)
    - 10% assumed to use the left-turn on Hornsey Rd to travel eastbound and vice-versa.
    - 20% assumed to use the right-turn on Hornsey Rd to travel westbound via Oceanic Drive and vice-versa; These vehicles are already accounted for in the original survey, given the survey location. Therefore, these vehicle trips were deducted from the original through traffic on Oceanic Drive.
    - 10% expected to travel westbound on Oceanic Drive (using connections to Oceanic Drive east of model catchment area - already included in the survey and model)
    - Remaining 20% assumed to travel to Floreat Shopping centre via Newry Street and Floreat Avenue. In addition to the abovementioned 86 dwellings, additional 100 dwellings in the block bound by The Boulevard and Oceanic Drive are assumed to have trips to the Floreat Forum via Orrel Avenue and Newry Street.
    - For these single house dwellings, an average of 0.5 vehicle trips per hour was adopted for the assessment peak hours of 11:00-12:00 and 12:00 – 13:00.
- New Zone 9 – Sunnyside Road (south of Oceanic Drive) - 10 dwellings with direct connection to Sunnyside Road; assumed additional 5 to use this minor connection to Oceanic Drive. (Traffic appearing west of Sunnyside Road also was deducted from Oceanic Drive Zone 5 since this was already accounted for in the survey). Total Traffic calculates to 8 vehicle trips per hour from/to Sunnyside Road
- New Zone 10 - Residential zone bound by Floreat Avenue, Newry Street and Hornsey Road – 22 dwellings x 0.5 vph = 11 vph. This is the future Residential Frame north zone.
- New Zone 11 - Residential zone bound by Floreat Avenue, Newry Street, Hornsey Road and Oceanic Drive – 13 dwellings x 0.5 vph = 7vph. This is the future Residential Frame south zone.

Heavy vehicles percentages have been obtained from the conducted survey and available traffic data for all roads within model.

Car and Heavy vehicle matrices are provided in Appendix 4.

Given the model assessment time is 11:00 – 13:00 on a Saturday, heavy vehicles do not have a significant impact on the network traffic flow.

Public Transport routes, bus stops and timetables were imported through the Transperth's GTFS data.

Signalised Intersections' Cycles and Phases were obtained from SCATS History Data for 03/09/2022 – same date as conducted survey.

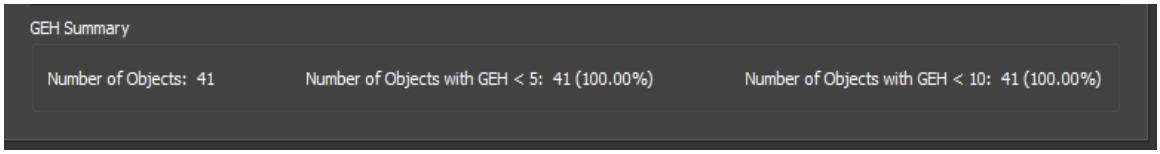
Appendix 5 shows the Cycle and Phase Calculations in accordance with the MRWA Operational Modelling Guidelines.

2.1.1 Validation

GEH (11:00 -13:00)

Detector	Count - All - AM 11-13h Saturday - All vehicles	Count - All - Replication 1785	Absolute Difference	Relative Difference (%)	GEH
1688: d1 (M01)	258	266	8	3.101	0.34948
1689: d2 (M01)	999	1057	58	5.806	1.2791
1690: d3 (M01)	1074	1011	-63	-5.866	1.3797
1691: d4 (M01)	185	205	20	10.81	1.0127
1692: d5 (M01)	107	104	-3	-2.804	0.20653
1693: d6 (M01)	331	297	-34	-10.27	1.3567
1694: d7 (M02)	182	216	34	18.68	1.7043
1695: d8 (M02)	917	949	32	3.49	0.74079
1696: d9 (M02)	975	964	-11	-1.128	0.24981
1697: d10 (M02)	449	451	2	0.4454	0.066667
1698: d11 (M03)	752	738	-14	-1.862	0.36269
1699: d12 (M03)	417	335	-82	-19.66	2.9902
1700: d13 (M03)	427	457	30	7.026	1.009
1701: d14 (M03)	951	915	-36	-3.785	0.83339
1702: d15 (M04)	669	603	-66	-9.865	1.8505
1703: d16 (M04)	202	211	9	4.455	0.44286
1704: d17 (M04)	903	878	-25	-2.769	0.59239
1705: d18 (M04)	175	170	-5	-2.857	0.26919
1706: d19 (M04)	243	255	12	4.938	0.53773
1722: lm364_d1 (M05)	370	455	85	22.97	2.9593
1723: lm364_d2 (M05)	228	210	-18	-7.895	0.86007
1725: lm364_d3 (M05)	203	212	9	4.433	0.44179
1726: lm364_d4 (M05)	688	602	-86	-12.5	2.3944
1727: lm364_d5 (M05)	386	466	80	20.73	2.7408
1732: lm364_d6 (M05)	192	269	77	40.1	3.5862

1733: lm364_d7 (M05)	323	219	-104	-32.2	4.4672
1734: lm364_d8 (M05)	129	125	-4	-3.101	0.25098
1735: lm364_d9 (M05)	470	453	-17	-3.617	0.55956
1736: lm364_d10 (M05)	288	302	14	4.861	0.57637
1737: lm364_d11 (M05)	301	303	2	0.6645	0.081379
1738: lm364_d12 (M05)	244	245	1	0.4098	0.045222
1743: lm747_d1 (M06)	411	418	7	1.703	0.24312
1744: lm747_d2 (M06)	508	512	4	0.7874	0.12524
1745: lm747_d3 (M06)	623	644	21	3.371	0.58997
1746: lm747_d4 (M06)	269	343	74	27.51	2.9913
1747: lm747_d5 (M06)	384	533	149	38.8	4.9204
1748: lm747_d6 (M06)	646	498	-148	-22.91	4.3757
1749: lm747_d7 (M06)	565	569	4	0.708	0.11878
1751: lm747_d8 (M06)	274	280	6	2.19	0.25492
1768: d20 (midblock)	343	440	97	28.28	3.4665
1769: d21 (midblock)	316	332	16	5.063	0.62854
Mean	448.22	451.512	3.2927	0.7346	1.3149



As per table above, all 41 detectors in the model attain GEH<5.

2.2 Future Traffic Generation and Distribution

Guideline Document Used	NSW Roads and Maritime Services; Report for High Density Residential Trip Generation Surveys; Survey Data Analysis Report (28 September 2012)
Rates from the above document:	***Residential*** – For Metropolitan developments, the surveyed trip rates showed a range from 0.18 - 0.32 vehicle trips per hour in the Saturday peak hour. KCTT have decided for a conservative approach of 0.3 vph to assess the worst-case scenario The same surveyed rate shows a maximum of 2 vehicle trips per day per unit. Same as above, KCTT have used this maximum rate to assess the worst-case scenario.
Guideline Document Used	NSW RTA Guide to Traffic Generating Developments (October 2022) and; NSW RTA Guide to Traffic Generating Developments – Updated Traffic Surveys (August 2013)
Rates from the above document:	**Shopping Centres (20,000 – 30,000m^2) -** 63 vehicular trips per day; 7 VPH in Saturday Peak hours

The survey has shown that 11:00-13:00 was the peak period of Saturday 03/09/2022, KCTT have used adjusted PM peak rate for both peak hours for commercial land use.
For the PM peak – existing traffic counts survey has shown that PM peak values are 92% of the AM peak. Therefore, the PM Peak rate was multiplied with 0.92.
Adjusted rate:
AM peak – 7 vehicular trips per hour
PM peak – 6.44 vehicular trips per hour

For residential land use KCTT have used 0.3 vehicular trips per hour, since the stipulated 0.8 vehicular trips per hour is given for workdays.

Development Type	Traffic Generation Rate	Yield	AM Peak VPH	PM Peak VPH
Commercial/ Retail	AM 7 VPH per 100m^2 PM 6.44 VPH per 100m^2	22,319m^2	1,562	1,437
Residential - Forum	AM 0.3 VPH per unit PM 0.3 VPH per unit	950 apartments	285	285
Residential - Frame	AM 0.3 VPH per unit PM 0.3 VPH per unit	300 apartments	90	90
		Total:	**1,937**	**1,812**

2.3 Passing Traffic Calculation

Nominate the annual growth rate used for passing traffic.	2% for all traffic originating in one external zone and ending in another external zone
Justification	The historical data for key roads show different growth rates, and it might be insufficient as it includes only 2-3 traffic counts (some of which were undertaken during the pandemic). Data for Oceanic Drive west of Howtree Place suggest a growth of 5.6% from 2018 – 2020. However, data for Howtree Place, The Boulevard and Brookdale Street suggest same levels of traffic or even decrease in traffic for the same periods. Therefore, KCTT have decided to apply a 2% annual growth rate for all passing traffic routes to incorporate possible changes in land uses, traffic from new developments and of course, overall passing traffic growth due to expected population growth in Perth.

2.4 Traffic Distribution

How many zones were created for the model?	15 zones for the Base model (11 external; 4 internal); 17 zones for the Future model (9 external; 8 internal)

Nominate external zones (Base and Future Model)	11 zones external to the subject lot:	
	Zone 1.	The Boulevard west of Howtree Place
	Zone 2.	Kirkdale Avenue north of The Boulevard
	Zone 3.	The Boulevard east of Floreat Avenue
	Zone 4.	Newry Street, Orrel Avenue and Chandler Avenue East (east of Hornsey Road)
	Zone 5.	Oceanic Drive east of Floreat Avenue
	Zone 6.	Brookdale Street south of Oceanic Drive
	Zone 7.	Oceanic Drive west of Howtree Place
	Zone 8.	Chandler Avenue West west of Howtree Place
	Zone 9.	Sunnyside Road south of Oceanic Drive
	Zone 10.	Existing residential zone bound by Floreat Avenue, Newry Street and Hornsey Road (future part of Residential Frame)
	Zone 11.	Residential zone bound by Floreat Avenue, Newry Street, Hornsey Road and Oceanic Drive (future part of Residential Frame)

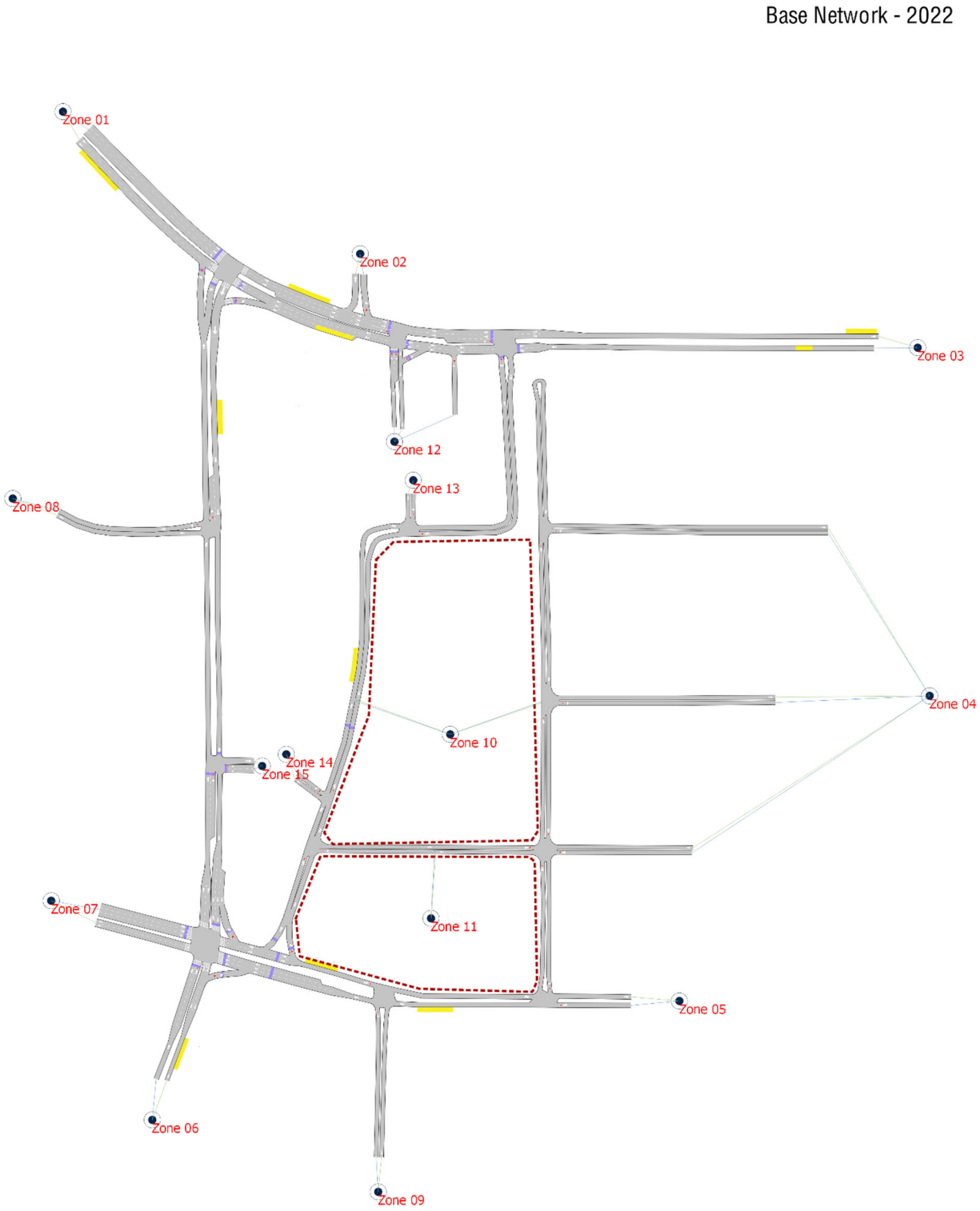


Figure 1 Base Model Zones Location – 2022

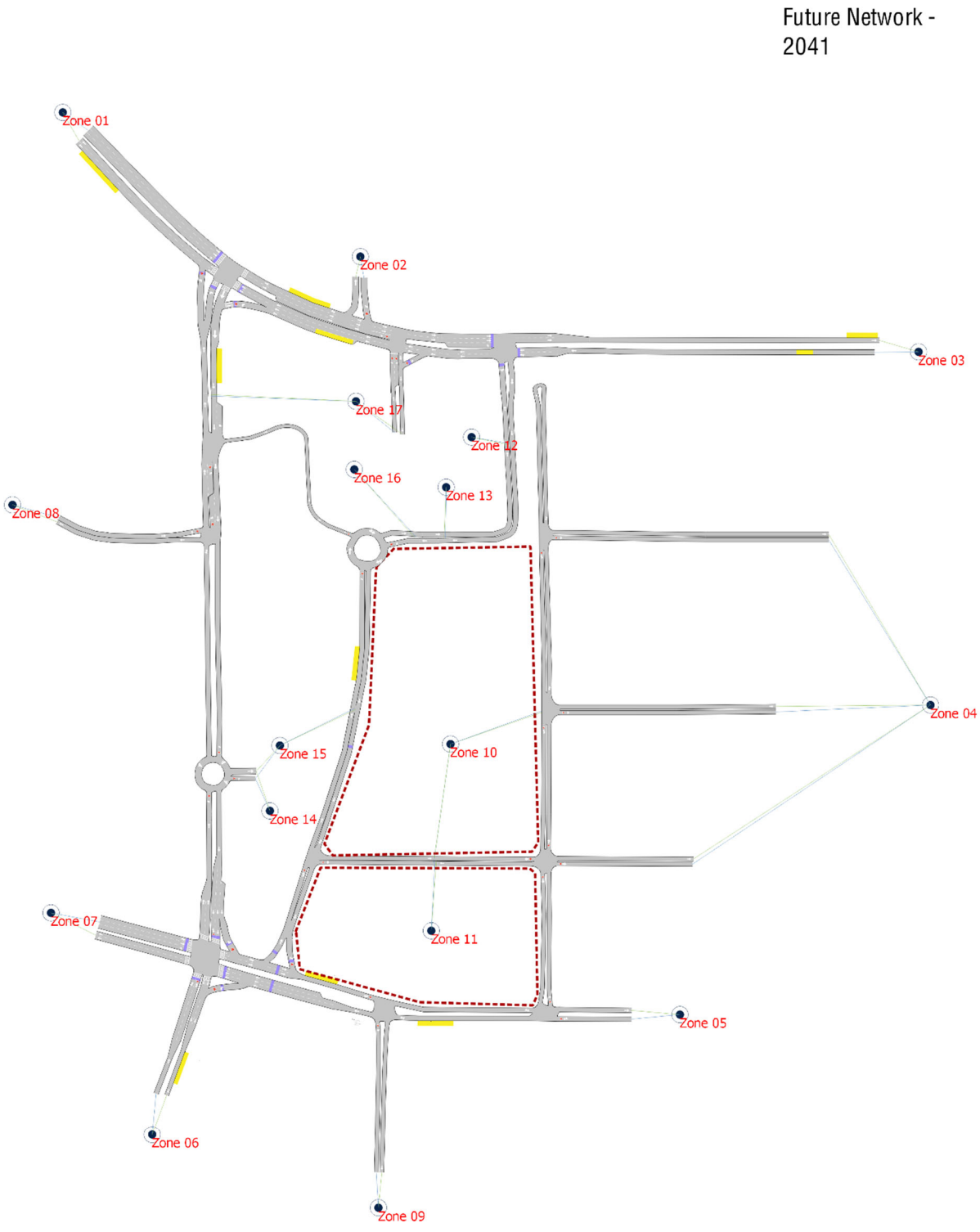


Figure 2 Future Model Zones Location - 2041

Nominate internal zones and traffic generation	**4 Base internal zones:** **Zone 12.** Access from/to The Boulevard **Zone 13.** Northern Access from/to Floreat Avenue **Zone 14.** Southern Access from/to Floreat Avenue **Zone 15.** Access from/to Howtree Place **8 Future internal zones:** **Zone 10.** Residential Frame North **Zone 11.** Residential Frame South **Zone 12.** Apartments Building A – Northern access from/to Floreat Avenue **Zone 13.** Apartments Building B – Southern access from/to Floreat Avenue **Zone 14.** Apartments Building F – Southern access from/to Howtree Place **Zone 15.** Commercial Retail and Apartments Building E – Southern access from/to Howtree Place and access from/to Floreat Avenue **Zone 16.** Commercial Retail + Apartments Building G – Northern access from/to Floreat Avenue **Zone 17.** Apartments Building C and D – Northern access from/to Howtree Place and from/to the Boulevard

2.5 Internal Traffic Flow Distribution onto External Road Networks

ZONE	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8
All Internal Zones	32%	2%	18%	6%	16%	13%	9%	3%

The above percentages were obtained from the Base Matrix developed from the conducted Survey.

2.6 Future Model Results Overview

The below section 2.6 shows the relevant Aimsun Output for both the Base and Future Model.

As seen from the 2041 Network figure, only modifications to the external network geometry are the proposed roundabouts (one on Howtree Place and one on Floreat Avenue) and the proposed one-way laneway connecting Howtree Place and Floreat Avenue, which is in accordance with the concept Floreat Precinct Structure Plans.

As expected, in 2041, adjustments of Cycle and Phase times on Signalised intersections are required to meet the expected changes in traffic volumes. Approximately 20% - 25% increase in Cycle length is expected on both existing signalised intersections.

At the signalised Intersection of Oceanic Drive / Howtree Place / Brookdale Street it is proposed that approaches from Howtree Place and Brookdale Street run in different phases rather than the existing one phase operation. This is proposed as with the growth of traffic approaching these intersections, it is much more difficult to find gaps for turning right when these movements run in the same phase with opposite direction through movements.

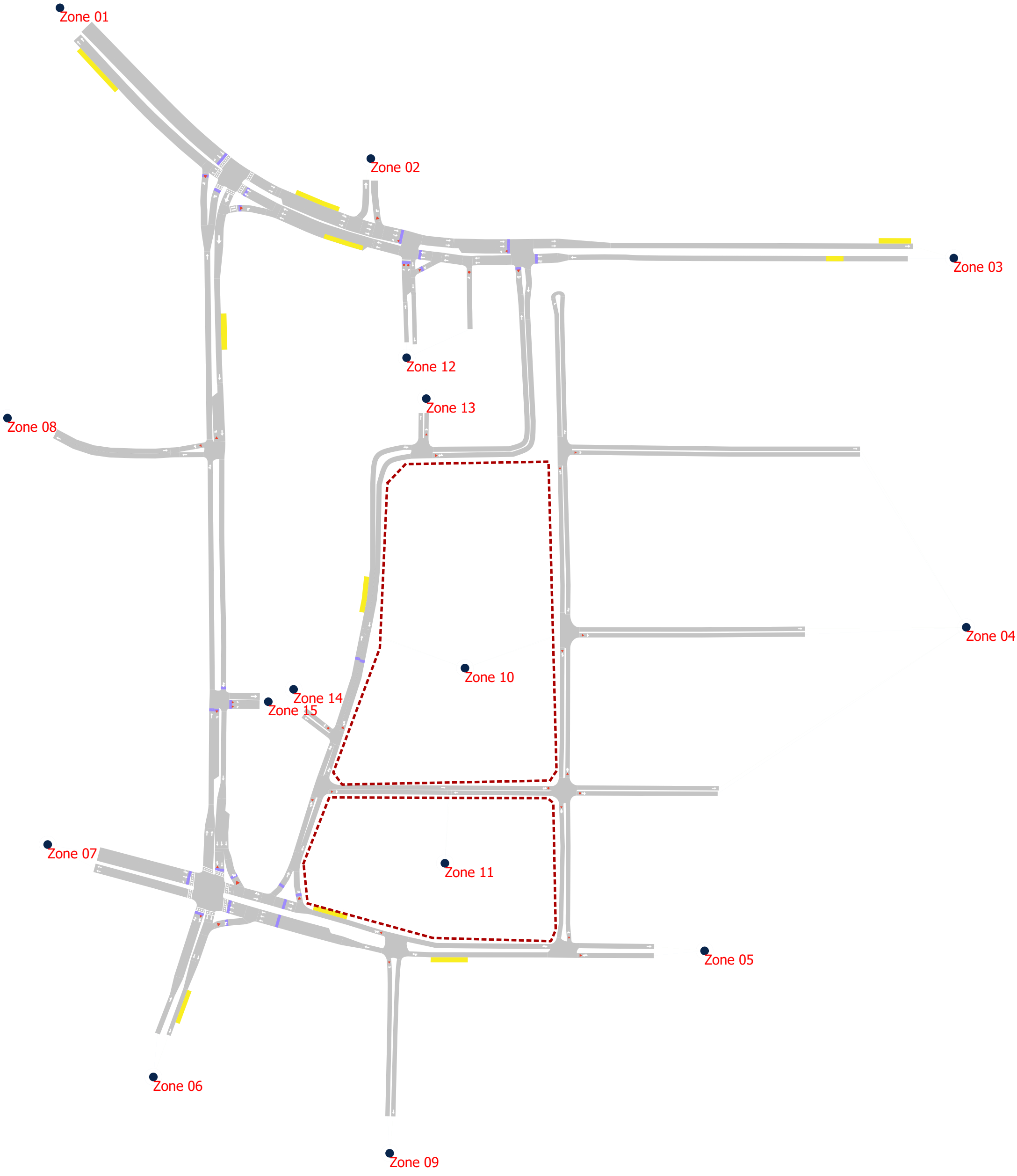
The Nodes LOS shown in the below section show that all intersections will perform at a satisfactory level in 2041 (Ranging in LOS A – LOS D).

The most significant anticipated change to the intersection operations is the addition of signals at the Floreat Avenue / The Boulevard intersection.

This intersection is a give-way T-intersection in the existing scenario. However, given the high increase in The Boulevard through movements, the intersection cannot operate at a satisfactory level in the future. Furthermore, Town of Cambridge's long-term planning foresees densification of the area, regardless of whether this project goes ahead, signalising this intersection would improve the safety conditions of the area. Roundabout was not considered as spatial limitations would not allow for a design compliant to current standards.

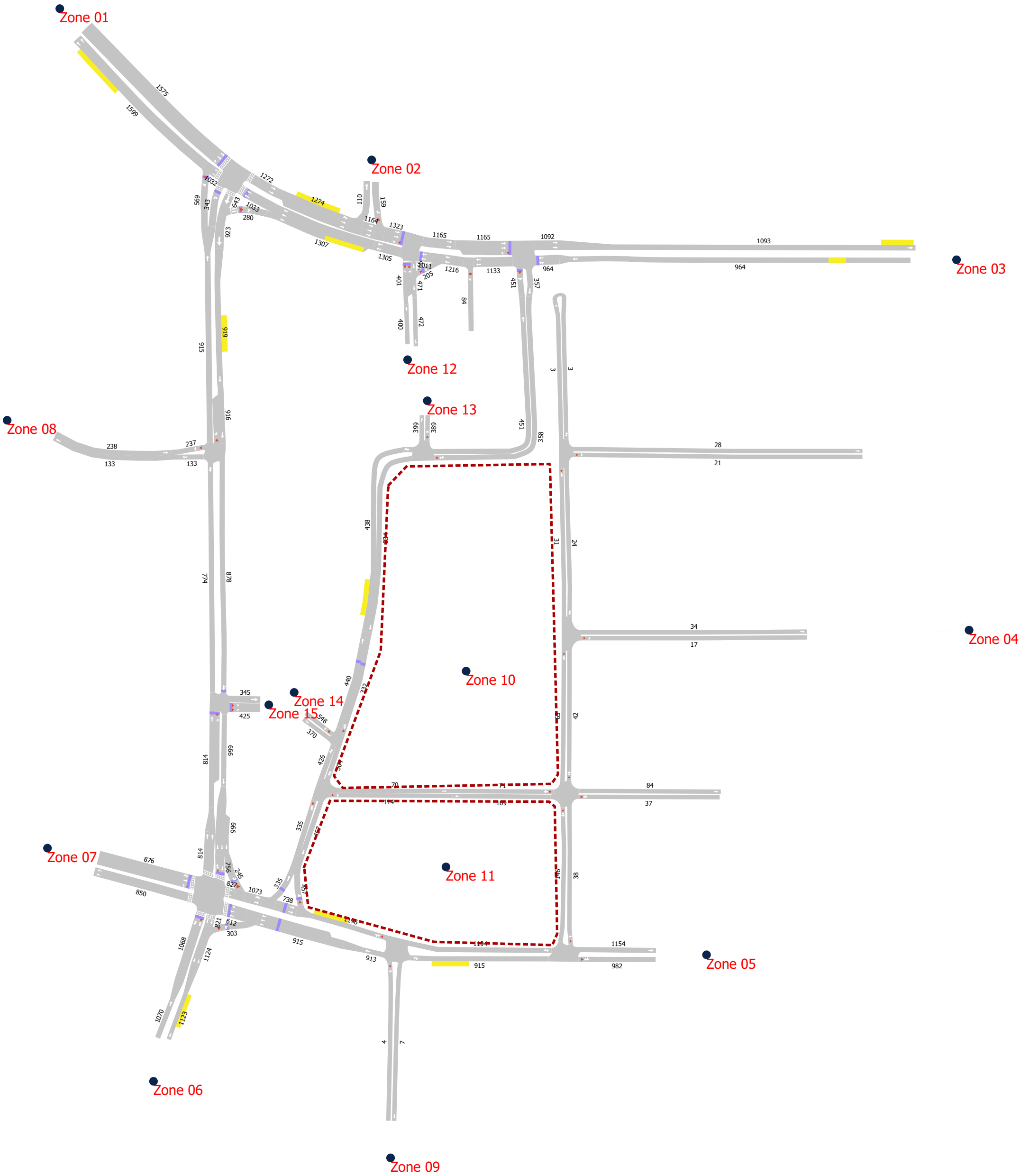
2.7 Aimsun Output

Base Network - 2022



Base Model - Saturday
11:00 - 13:00; 03/09/2022;
Micro SRC Experiment

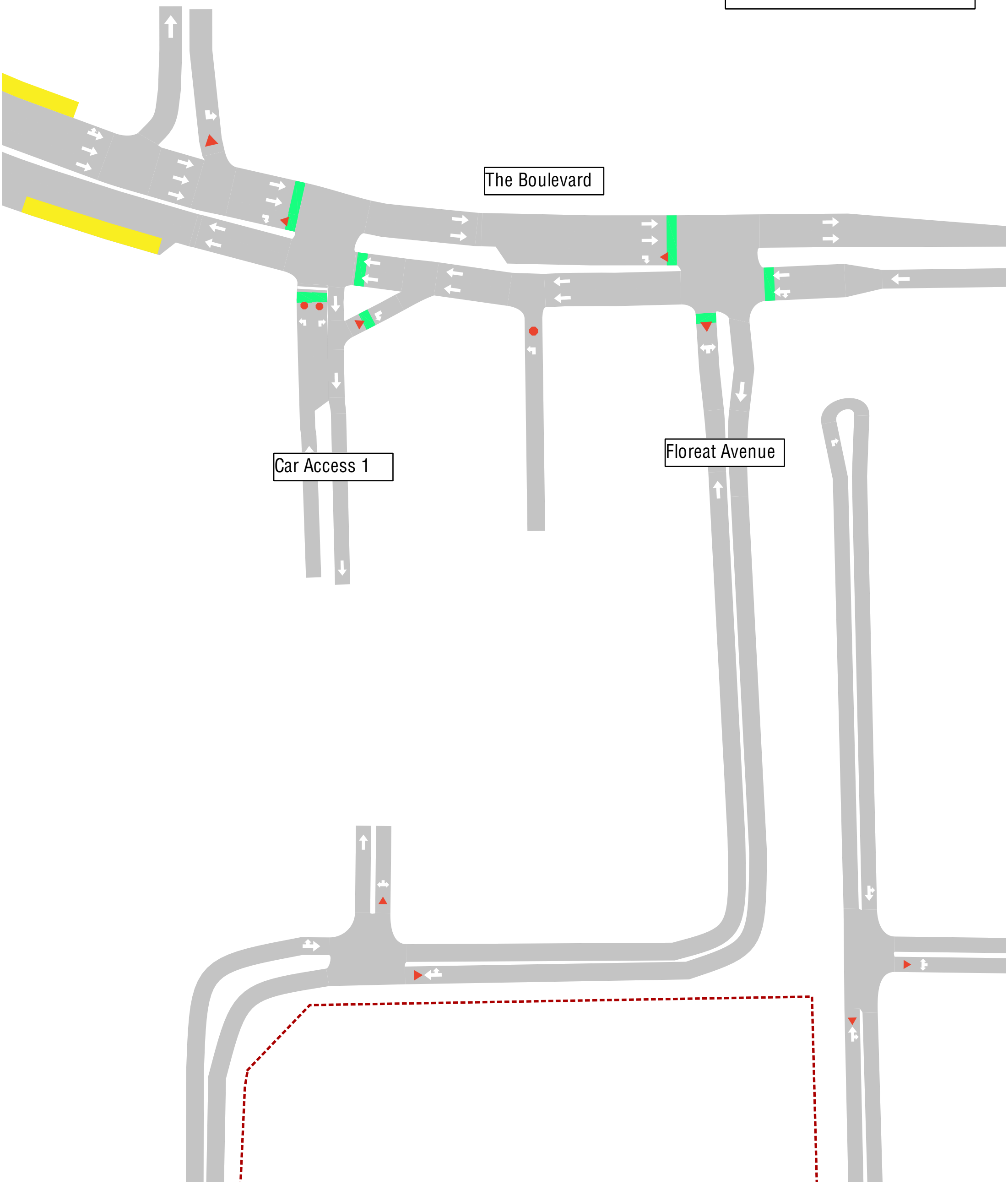
Traffic Volumes - 2-hour period



Base Model - Saturday
11:00 - 13:00; 03/09/2022;
Micro SRC Experiment

GEH Statistics
The Boulevard / Car Access 1 and;
The Boulevard / Floreat Avenue

GEH Statistic 1785 1710
- Good fit
- Requires further investigation
- Unacceptable



Base Model - Saturday
11:00 - 13:00; 03/09/2022;
Micro SRC Experiment

GEH Statistics
Floreat Avenue / Oceanic Drive;
Howtree Place / Car Access 4;
Howtree Place / Oceanic Drive

GEH Statistic 1785 1710
Good fit
Requires further investigation
Unacceptable

Car Access 4

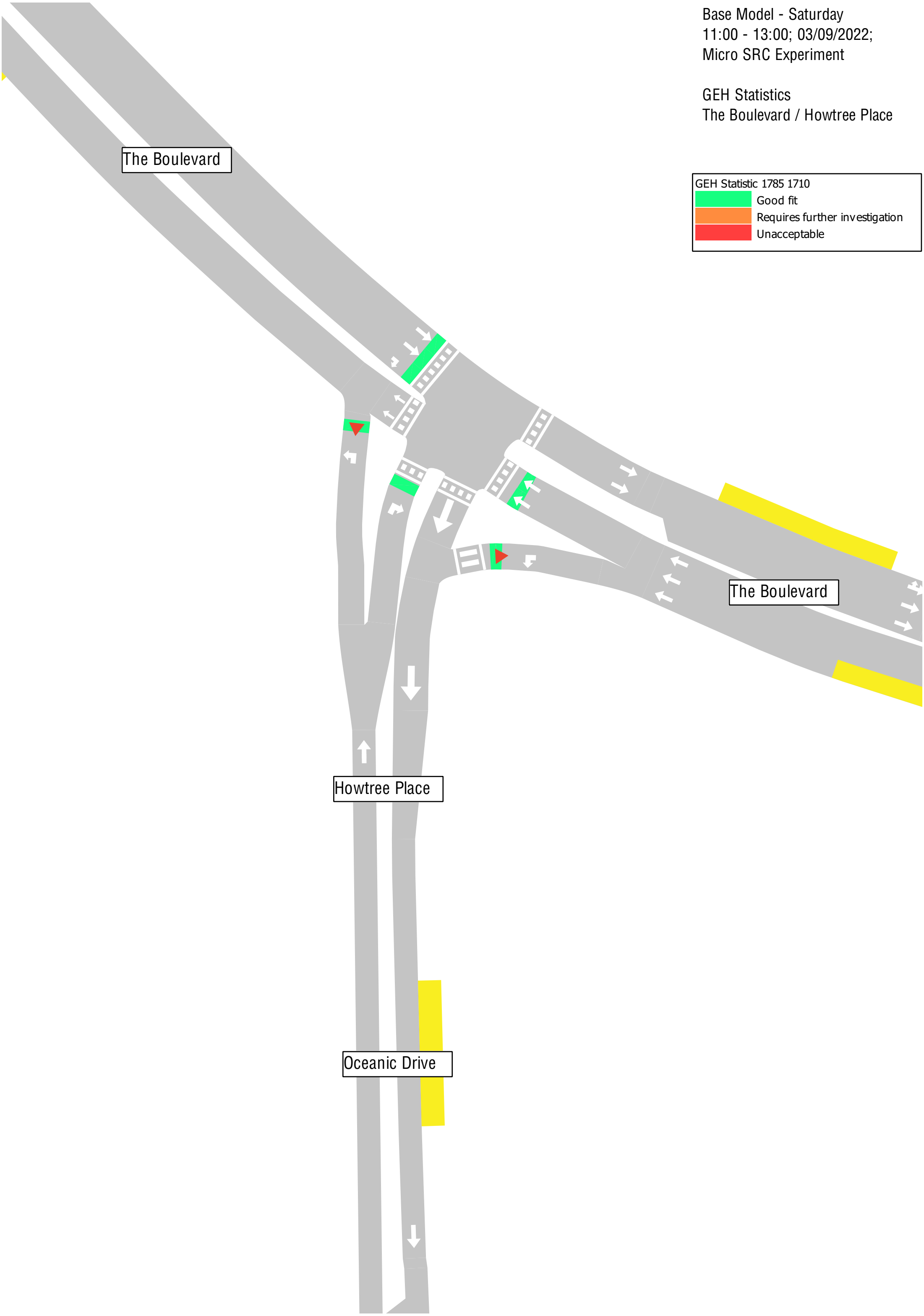
Car Access 3

Howtree Place

Oceanic Drive

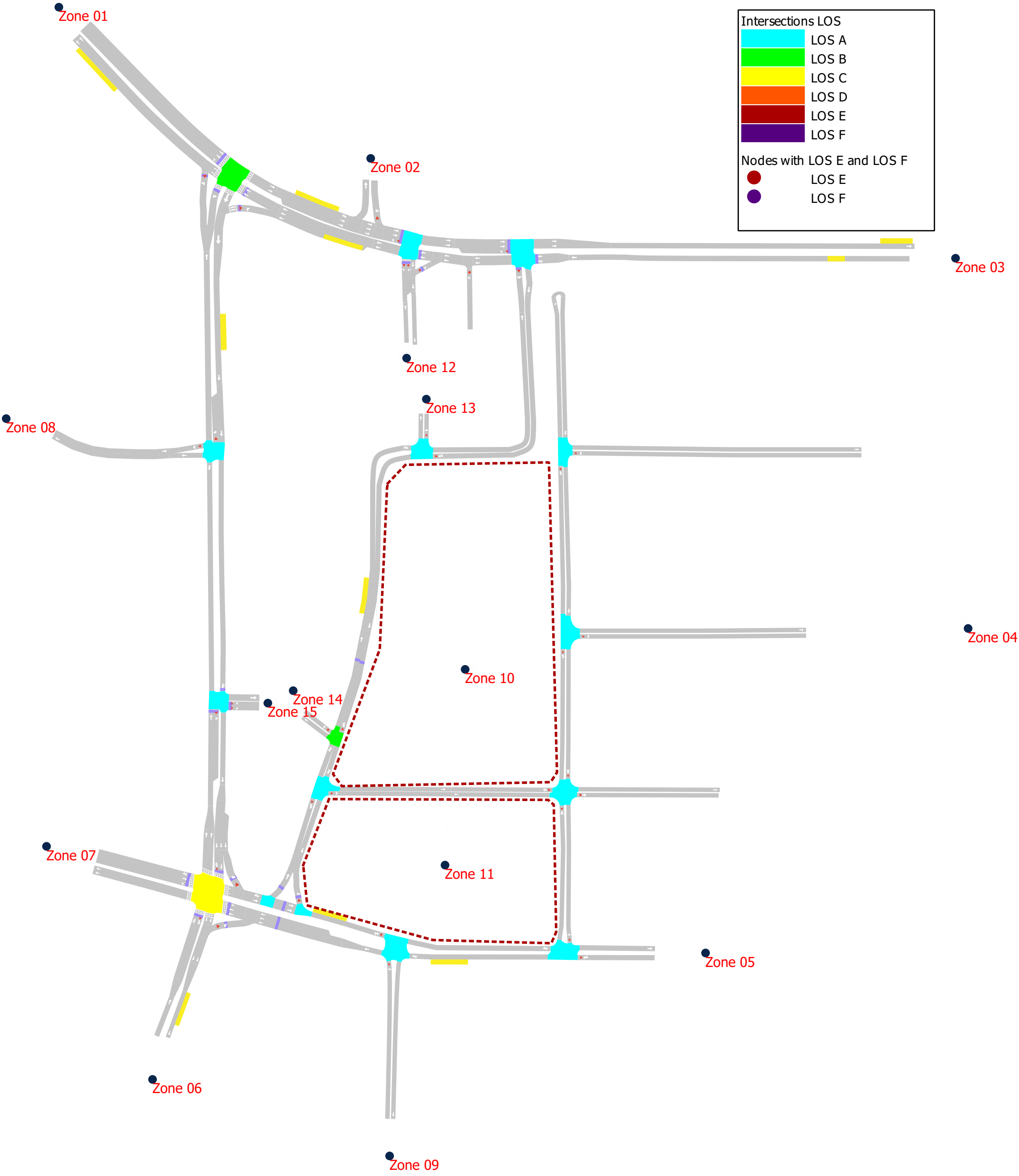
Base Model - Saturday
11:00 - 13:00; 03/09/2022;
Micro SRC Experiment

GEH Statistics
The Boulevard / Howtree Place

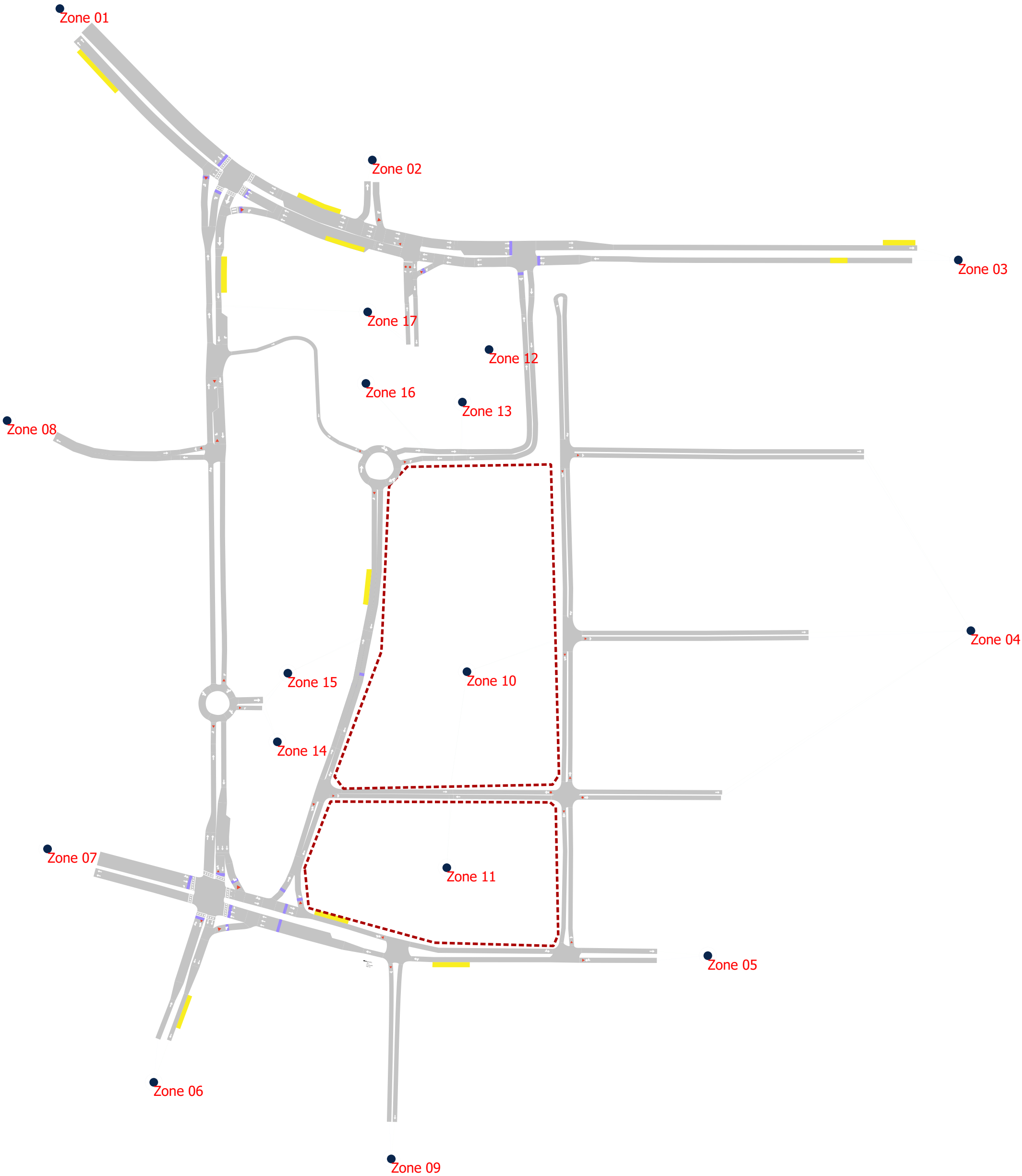


Base Model - Saturday
11:00 - 13:00; 03/09/2022;
Micro SRC Experiment

Nodes LOS

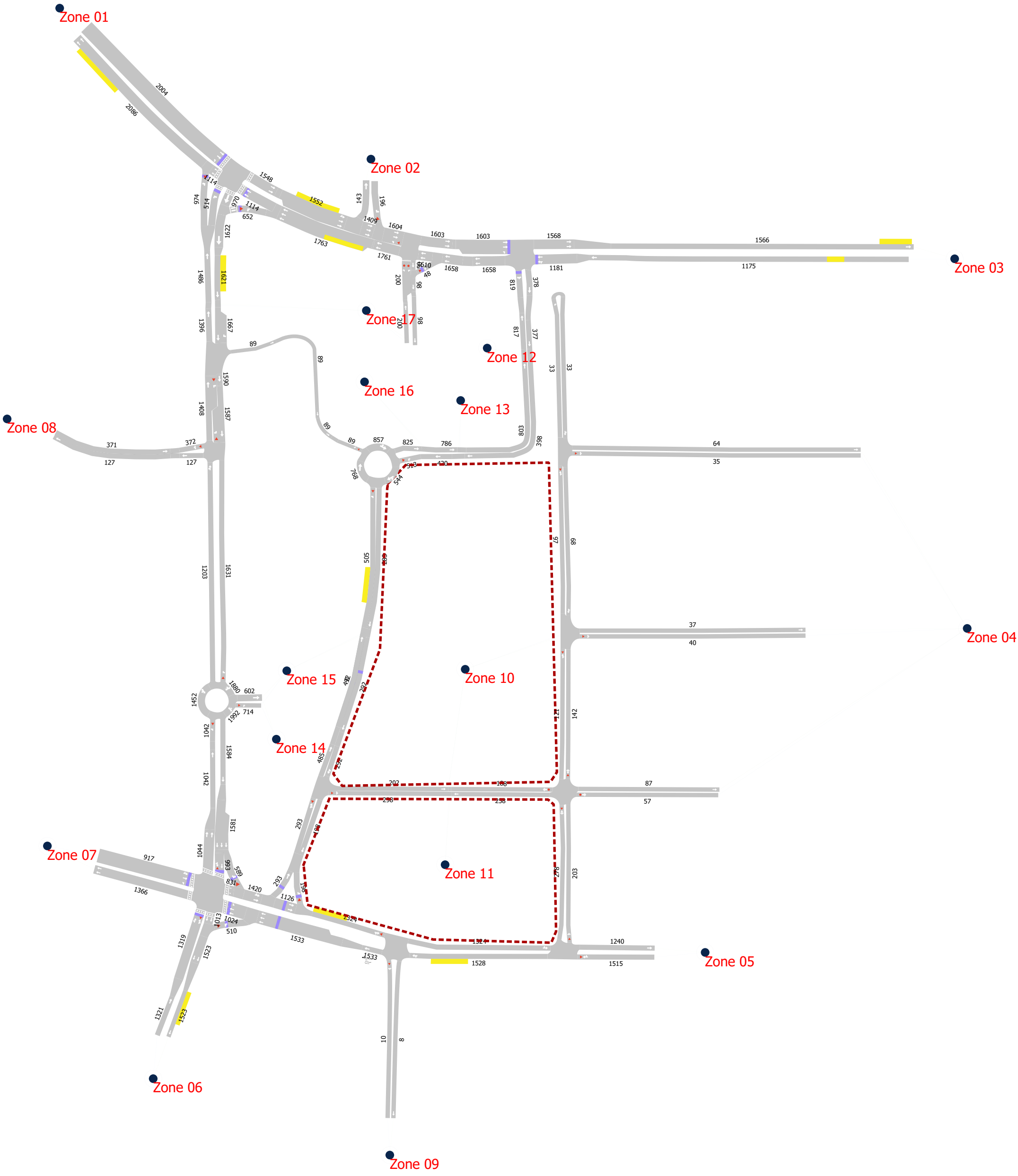


Future Network - 2041



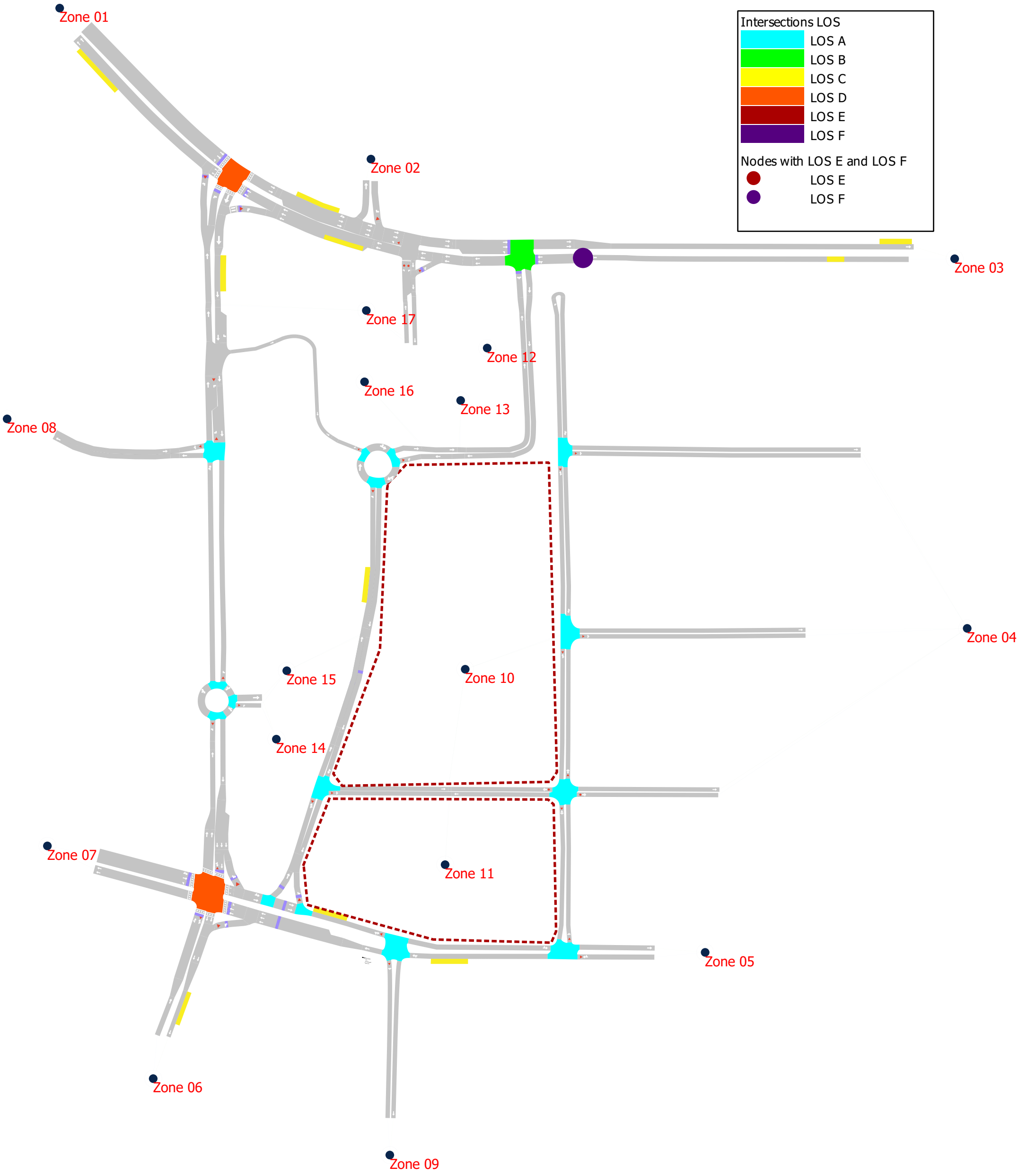
Ultimate Scenario - 2041
11:00 - 13:00; Saturday;
Micro SRC Experiment

Traffic Volumes - 2-hour period



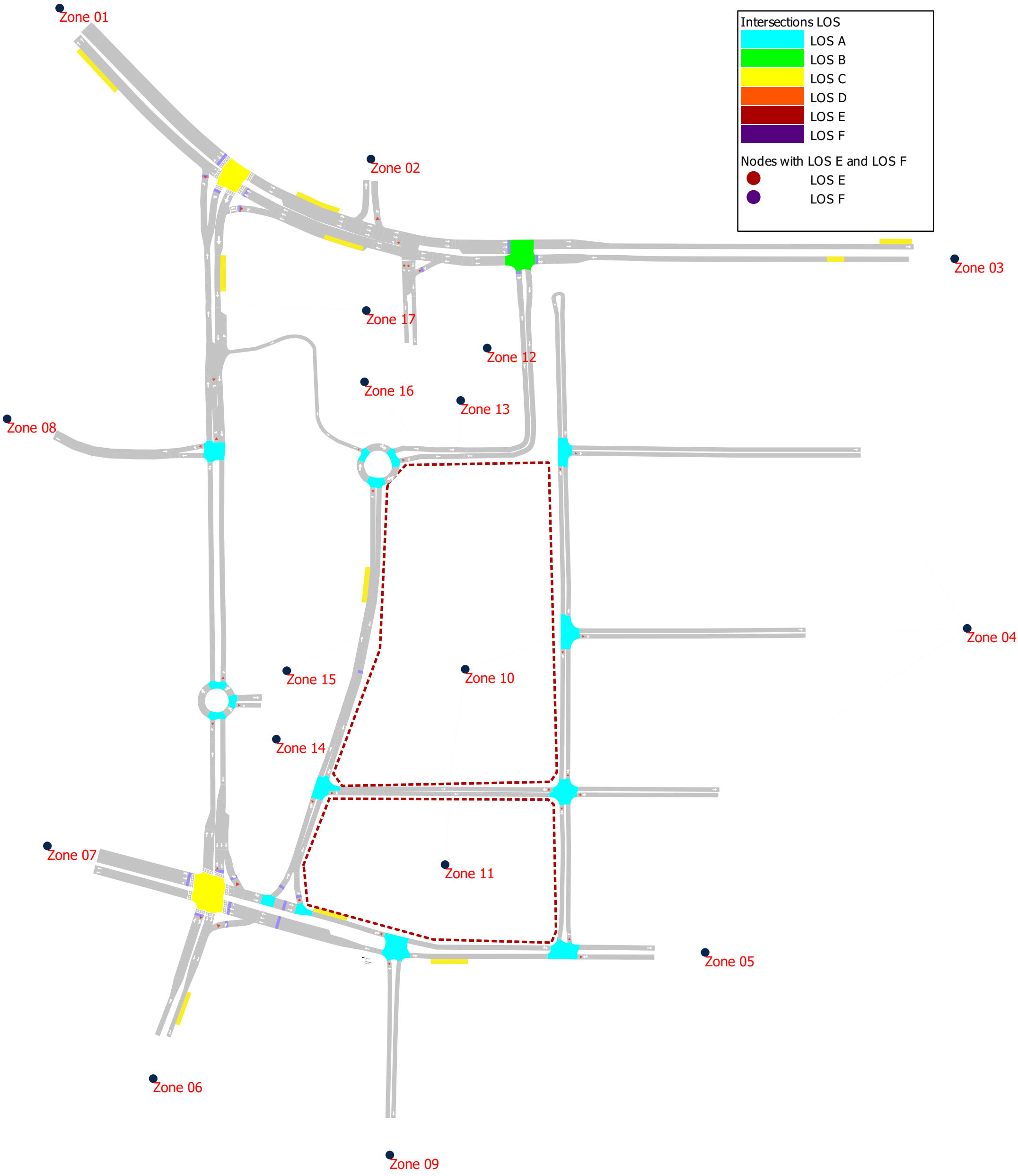
Ultimates Scenario - 2041
11:00 - 13:00; Saturday;
Micro SRC Experiment

Nodes LOS - Max 15 minutes



Ultimates Scenario - 2041
11:00 - 13:00; Saturday;
Micro SRC Experiment

Nodes LOS - Mean results



3. SIDRA Intersection Analysis

3.1 Analysed Intersections

This section of the report provides details on the SIDRA Analysis conducted to support the findings of the report KC01446.000_R01_Rev A. The following intersections have been modelled in AM and PM peak hours for the assessment years of 2022 (base year) and 2041 (ultimate scenario):

- M01 Howtree Place - The Boulevard
- M02 Howtree Place - Brookdale Street - Oceanic Drive
- M03 Floreat Avenue - Oceanic Drive
- M04 Floreat Avenue - The Boulevard
- M05 The Boulevard - Floreat Forum Access

The dimensions of the existing intersection elements have been scaled from aerial imagery which was obtained through our commercial arrangement with Nearmap and through publicly available Intramaps. These images are suitable for use in concept drafting applications with a level of accuracy to within +/- 10 centimetres.

3.2 Turning Movement Counts

Base Models – Intersection turning counts have been extracted for the assessment peak hour period (11:00 – 13:00 Saturday 03/09/2022) from both the survey and SCATS data.

Future Models – turning counts were extracted from the Aimsun Future 2041 model results.

Both Base and Future model turn counts are included in the below SIDRA Output section.

3.3 Model Settings and Calibration

KCTT have setup the user classes as described in the MRWA Operational Modelling Guidelines:

- LV – Light Vehicles – Austroads Class 1 – Vehicle length 4.85m; Queue Space 7.35m
- HV – Heavy Vehicles – Austroads Classes 2-5 - Vehicle length 12.5m; Queue Space15m
- U1 – Development Light vehicles – representing the separated traffic, generated/attracted by the Floreat Forum Precinct - Austroads Class 1 – Vehicle length 4.85m; Queue Space 7.35m
- U2 – Development Heavy Vehicles – representing the separated traffic, generated/attracted by the Floreat Forum Precinct - Austroads Classes 2-5 - Vehicle length 12.5m; Queue Space15m

Other Austroads classes were not included in the modelling process for the following reasons:

- SCATS detectors movement data does not allow for separated user classes.
- The available MRWA traffic data shows that on Saturdays there are only a few vehicles from Austroads Classes above Class 6. Therefore, this impact is considered negligible.
- However, Heavy vehicles are represented through Austroads Classes 2-5, which KCTT believe is sufficient given the assessment peak hours are 11:00 – 13:00 on a Saturday.

All other Vehicle Movement Data parameters are set as per MRWA Operational Modelling Guidelines, such as Gap Acceptance Factor and Opposing Vehicle Factor; and settings concerning PCU values and Fuel and Emissions in Parameter Settings.

3.4 Level of Service definitions

Level of Service for **v/c ≤ 1.0**	Average delay per vehicle in seconds (d)			Level of Service for **v/c > 1.0**
	Signals	"SIDRA Roundabout LOS" method (1)	Sign Control (*Default for roundabouts*) (1)	All Intersection Types
A	d ≤ 10	d ≤ 10	d ≤ 10	**F**
B	10 < d ≤ 20	10 < d ≤ 20	10 < d ≤ 15	**F**
C	20 < d ≤ 35	20 < d ≤ 35	15 < d ≤ 25	**F**
D	35 < d ≤ **55**	35 < d ≤ **50**	25 < d ≤ **35**	**F**
E	**55** < d ≤ 80	**50** < d ≤ 70	**35** < d ≤ 50	**F**
F	80 < d	70 < d	50 < d	**F**

The above table shows the thresholds for determining the LoS for different type of intersections based on delays and based on flow/capacity ratio.

3.5 Summary of Results

Nominate modelled intersections and intersections controls in the base year	• M01 Howtree Place - The Boulevard – signalised intersection • M02 Howtree Place - Brookdale Street - Oceanic Drive – signalised intersection • M03 Floreat Avenue - Oceanic Drive – Give-way intersection • M04 Floreat Avenue - The Boulevard - Give-way intersection • M05 The Boulevard - Floreat Forum Access – Stop-sign intersection
Nominate modelled intersections and intersections controls in the ultimate year	• M01 Howtree Place - The Boulevard – signalised intersection • M02 Howtree Place - Brookdale Street - Oceanic Drive – signalised intersection • M03 Floreat Avenue - Oceanic Drive – Give-way intersection • M04 Floreat Avenue - The Boulevard – Signalised Intersection • M05 The Boulevard - Floreat Forum Access – Stop-sign intersection
Nominate the assessment year(s)	• Base year – 2022 • Ultimate year – 2041
User Classes	• LV – Light Vehicles (Austroads Class 1) • HV – Heavy Vehicles (Austroads Classes 2-5) • U1 – Proposed development light vehicles • U2 – Proposed development heavy vehicles Refer to SIDRA Output Appendix for more details.
Describe the Level of Service and Delay results	**Base Models:** **M01 Howtree Place - The Boulevard** The signalised intersection operates at a satisfactory LOS C with the average delay at 22.7s.
	M02 Howtree Place - Brookdale Street - Oceanic Drive The signalised intersection operates at a satisfactory LOS C with the average delay at 25.4s.
	M03 Floreat Avenue - Oceanic Drive The give-way intersection operates at LOS A with highest delay of 4.9s on Floreat Avenue approach.
	M04 Floreat Avenue - The Boulevard The give-way intersection operates at LOS A and LOS C as a worst LOS approach with a delay of 22.7s in AM.
	M05 The Boulevard - Floreat Forum Access The stop-sign intersection lanes operate at LOS A with the exception of right-turn lane from the Floreat Forum access onto The Boulevard which operates at LOS E with approximately 40s delay.

Future Models – 2041:

M01 Howtree Place - The Boulevard

The signalised intersection is expected to operate at LOS C with average delays of 31.1s and 28.6s in AM and PM peak respectively.

There are no expected blockages at this intersection with individual approaches having maximum delay of 47s and Level of Service D.

M02 Howtree Place - Brookdale Street - Oceanic Drive

The signalised intersection is expected to operate at LOS E with average delay of 67.8s. Individual lanes might have delays between 90-109s. High-volume signalised intersections are likely to have these delays, which means that a vehicle joining a queue might require more than one cycle length to clear the intersection which is a common occurrence in peak hours.

It should be noted that both of the signalised intersections operate at a maximum LOS D in 2041 in the Aimsun Model and LOS C on average (as seen from the Aimsun Output). These software packages have different methods of interpreting and processing input.

M03 Floreat Avenue - Oceanic Drive

The give-way intersection is expected to continue operating at LOS A in 2041 AM and PM peak.

M04 Floreat Avenue - The Boulevard

Given the extremely high delays which would occur if the existing sign-controlled intersection is retained, KCTT proposed a signalised intersection, given the spatial limitations for a potential roundabout.

The proposed signalised intersection is expected to operate at LOS C with average delays up to 22.7s, assuming nominal phasing schedule.

M05 The Boulevard - Floreat Forum Access

Right-turn from the Floreat Forum Access onto The Boulevard shows 86s and 66s delays in AM and PM peak respectively. This is expected given the high through volumes on The Boulevard. However, the expected average back of queue does not exceed 3.2m which suggests that prolonged delay stems from high directional flows on major routes, not from the intersection being over capacity.

There is a possibility that drivers might seek alternative and more convenient routes that do not require right turning manoeuvres at peak time, therefore this should be reevaluated at following detailed stages of planning.

A summary of the results of the SIDRA analysis are shown on the following pages. For purposes of clarity we will provide intersection summaries below. The full SIDRA output report can be provided on request.

Note - SIDRA graphic is not an accurate representation of the intersection geometry. It is a simplified tool and its main purpose is to roughly illustrate main intersection elements. The graphic might show median breaks where there are none in reality, oversized splitter islands and central islands for roundabouts etc. The graphic representation does not influence the calculations nor any other output.*

3.6 Sensitivity Analysis – Upgrade Timeframe

This section reflects on the expected timeframe of Floreat Avenue / The Boulevard potential upgrade from sign-controlled to a signalised intersection.

KCTT have taken the below described approach to analyse this requirement:

- A reversed sensitivity analysis has been undertaken. This means that the ultimate model was used as a starting reference.
- A 2% annual decrease rate has been used for passing traffic for all movements.
- For development separated traffic (user classes were set as described in the above section) an annual decrease rate has been calculated separately for every turning movement within the intersection:
    - Turning movements in the base model are assumed to be mostly Floreat Forum Precinct traffic.
    - These volumes are expected to remain at the same levels until 2027 (KCTT assumed this year as development commencement).
    - Therefore, a corelation between surveyed and ultimate turning counts has been established for each turning movement. This enabled for each movement to have a specific annual decrease rate.
- The sensitivity analysis has shown that the LOS E, high delays and long queues start appearing after 10-12 years of compound traffic decrease. This means that the expected timeframe of upgrade should be between 2029-2031.
- Please note that the mentioned years are only used as a reference to the assumed commencement year.
- A more accurate prediction could be shown through the expected percentages of passing traffic growth/development completion:
    - When the passing traffic increases 15%-20% on top of the current values and when the additional works at the Floreat Forum reach 15%-20%, the delays and queues at the Floreat Avenue approach would trigger the requirement for upgrading the subject intersection.
    - This is an approximate equivalent of an additional 400 residential units (either within the Centre or in the Residential Frame) or approximately additional 1,750m^2 of retail space.

Below are LOS summary graphs from SIDRA software for the first year when LOS E appears (2029) and the first year when LOS F appears on Floreat Avenue approach (2031). Detailed Lane summary tables shown in SIDRA Output below.

The analysis suggests the requirement for signalisation is likely to arise at 15-20% precinct completion, if the passing traffic (not related to the Precinct Plan) grows 2% per annum.

LEVEL OF SERVICE

Lane Level of Service

▽ Site: s2.4a+ [s2.4a+ Floreat Avenue & The Boulevard - With Development - Sign Controlled (Site Folder: Sensitivity Analysis - With Development Sign Controlled)]

s2.4a+ Floreat Avenue & The Boulevard - With Development - Sign Controlled
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 12 years

	Approaches			Intersection
	South	East	West	
LOS	E[11]	NA	NA	NA

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.

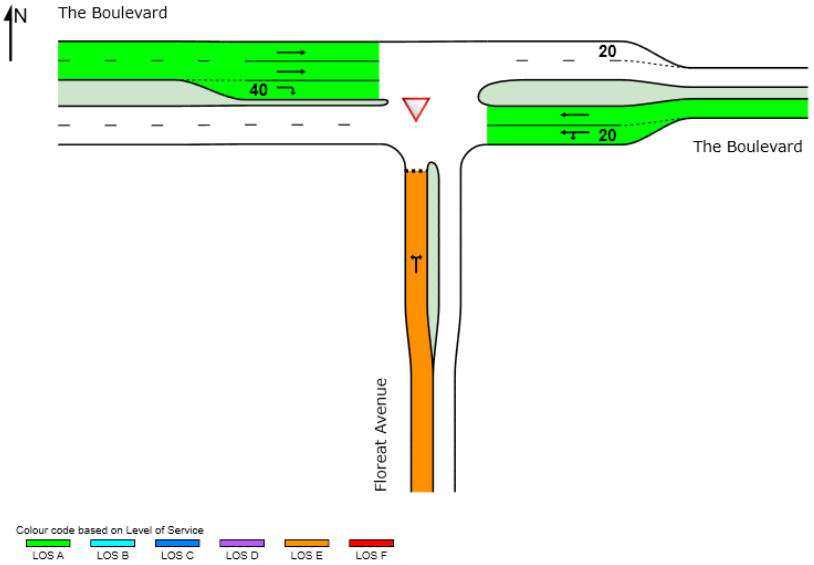


Figure 3 Level of Service - 2029

LEVEL OF SERVICE

Lane Level of Service

▽ Site: s2.4a+ [s2.4a+ Floreat Avenue & The Boulevard - With Development - Sign Controlled (Site Folder: Sensitivity Analysis - With Development Sign Controlled)]

s2.4a+ Floreat Avenue & The Boulevard - With Development - Sign Controlled
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

	Approaches			Intersection
	South	East	West	
LOS	F[11]	NA	NA	NA

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.

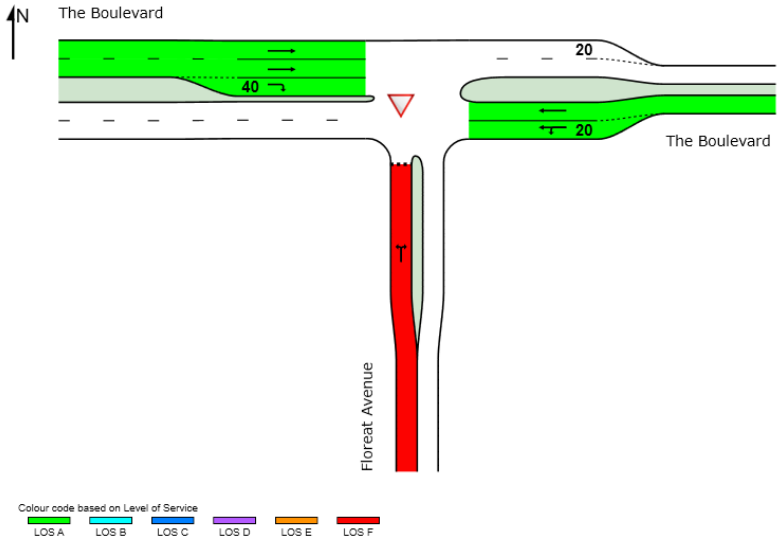


Figure 4 Level of Service - 2031

3.7 SIDRA Output

USER REPORT FOR SITE

All Movement Classes

Project: KC01446.000 M01 Howtree Place - The Boulevard **Template: Single Site User Report**

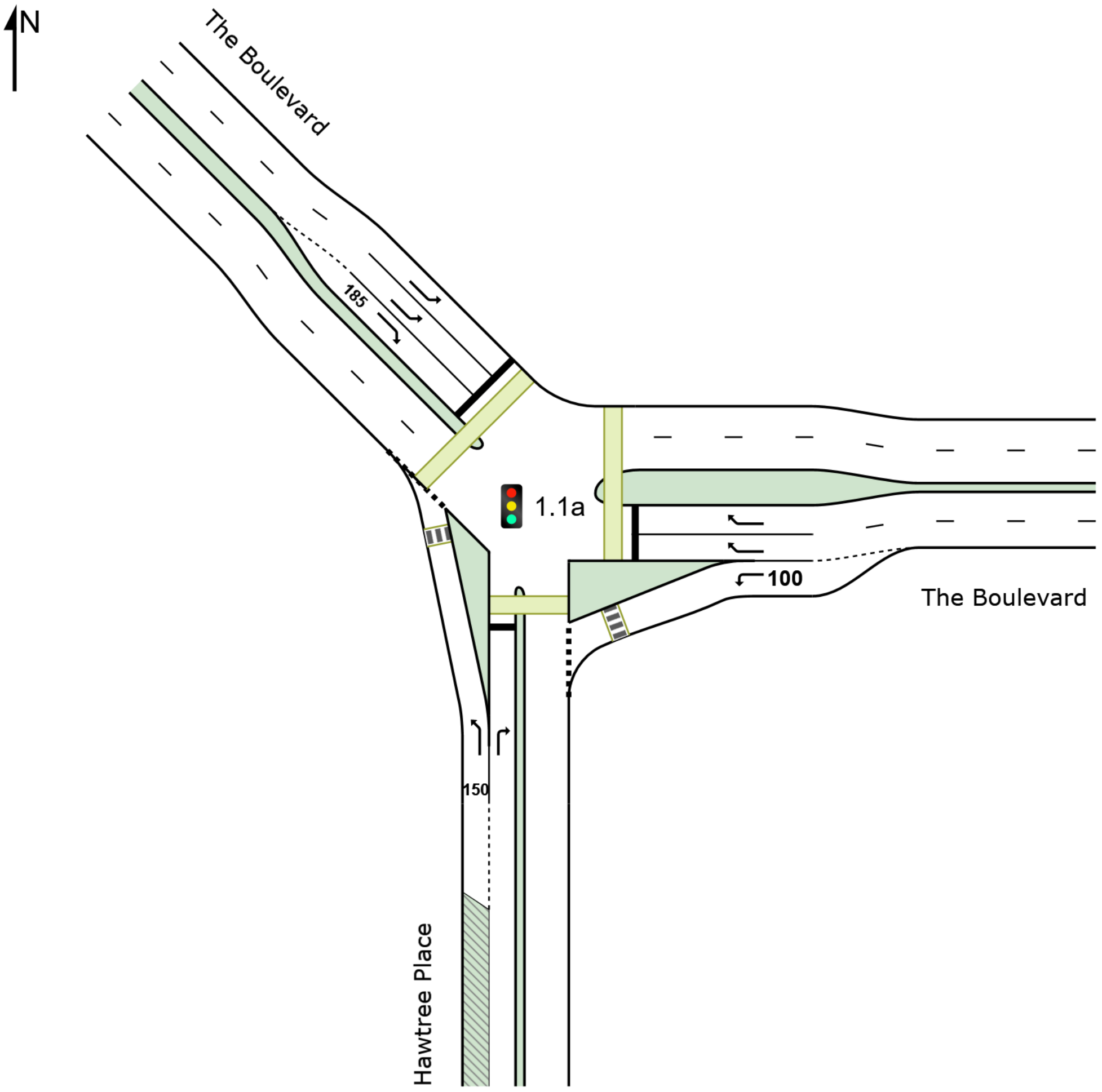
Site: 1.1a [1.1a Howtree Place & The Boulevard 2022 AM (Site Folder: General)]

1.1a Howtree Place & The Boulevard 2022 AM
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 59 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Site Layout

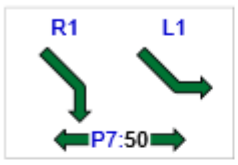
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

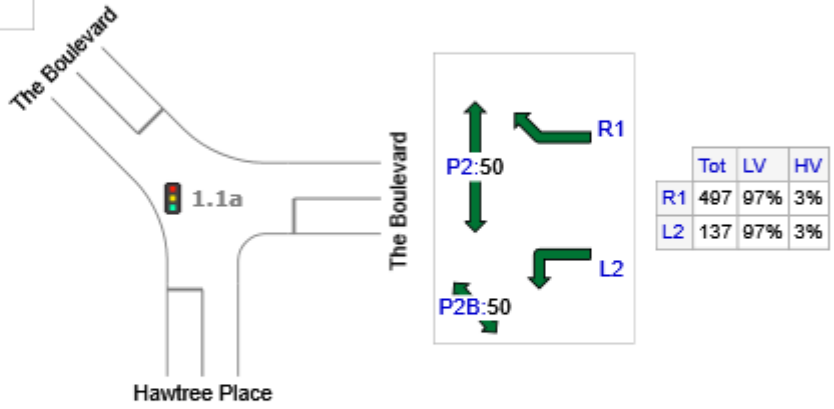


Input Volumes

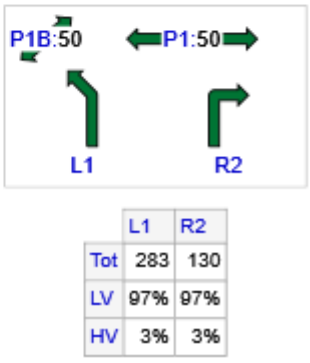
Volume Display Method: Total and %

	R1	L1
Tot	332	519
LV	97%	97%
HV	3%	3%





	Tot	LV	HV
R1	497	97%	3%
L2	137	97%	3%



	L1	R2
Tot	283	130
LV	97%	97%
HV	3%	3%

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Hawtree Place	413	401	12
E: The Boulevard	634	615	19
NW: The Boulevard	851	825	26
Total	1898	1841	57

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Hawtree Place													
Lane 1	298	3.0	939	0.317	100	7.2	LOS A	2.6	19.5	Short (P)	150	0.0	NA
Lane 2	137	3.0	270	0.507	100	32.0	LOS C	3.9	29.2	Full	175	0.0	0.0
Approach	435	3.0		0.507		15.0	LOS B	3.9	29.2				
East: The Boulevard													
Lane 1	144	3.0	1195	0.121	100	8.6	LOS A	1.3	9.6	Short	100	0.0	NA
Lane 2	260	3.0	433	0.600	100	27.1	LOS C	6.9	52.7	Full	120	0.0	0.0
Lane 3	264	3.0	440	0.600	100	27.0	LOS C	7.1	53.4	Full	120	0.0	0.0
Approach	667	3.0		0.600		23.1	LOS C	7.1	53.4				
NorthWest: The Boulevard													
Lane 1	273	3.0	433	0.631	100	27.5	LOS C	7.5	56.5	Full	213	0.0	0.0
Lane 2	273	3.0	433	0.631	100	27.5	LOS C	7.5	56.5	Full	213	0.0	0.0
Lane 3	349	3.0	556	0.628	100	24.3	LOS C	9.0	67.9	Short	185	0.0	NA
Approach	896	3.0		0.631		26.3	LOS C	9.0	67.9				
Intersection	1998	3.0		0.631		22.7	LOS C	9.0	67.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

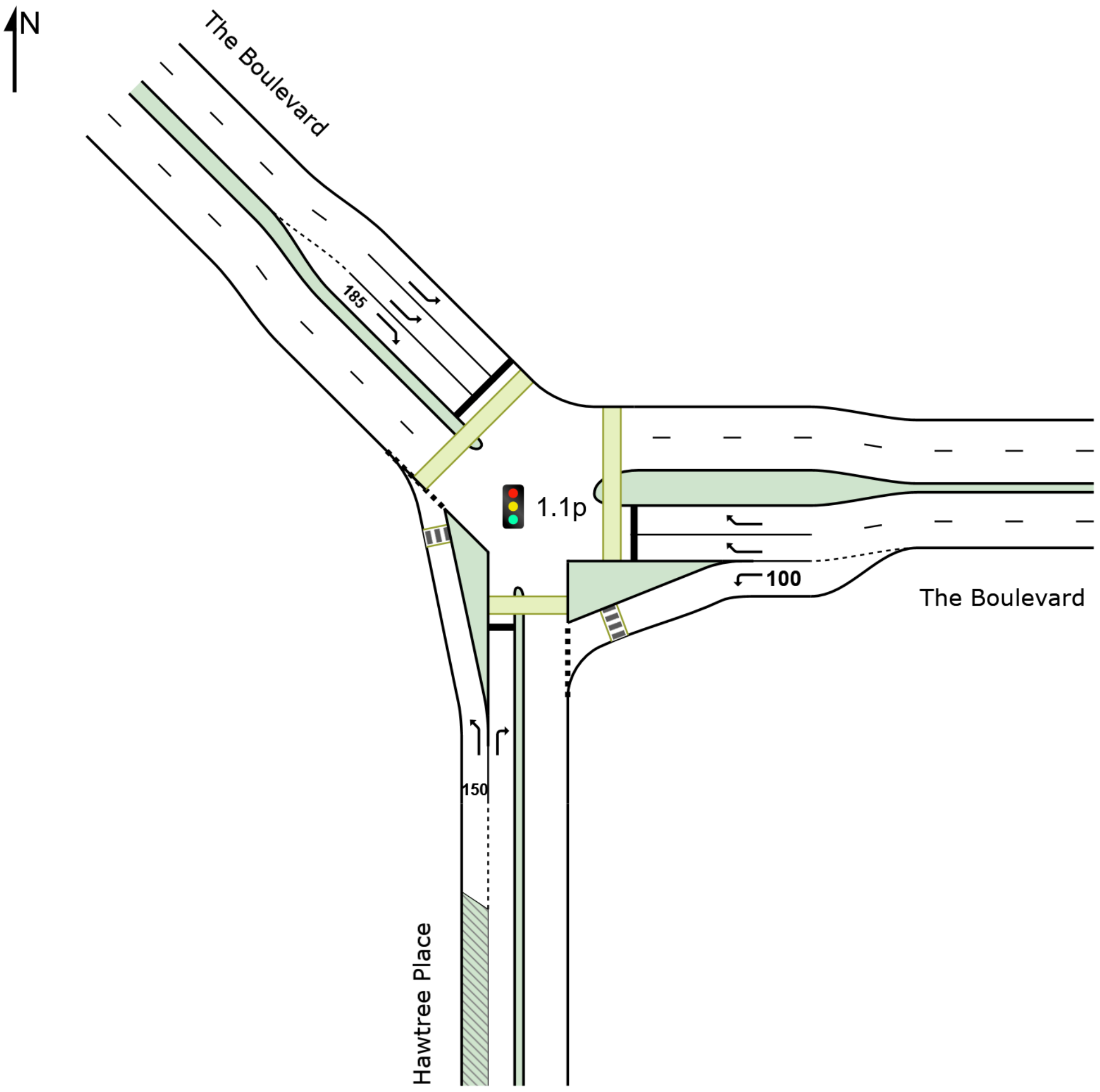
Site: 1.1p [1.1p Howtree Place & The Boulevard 2022 PM (Site Folder: General)]

1.1p Howtree Place & The Boulevard 2022 PM
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 57 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Site Layout

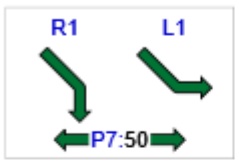
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

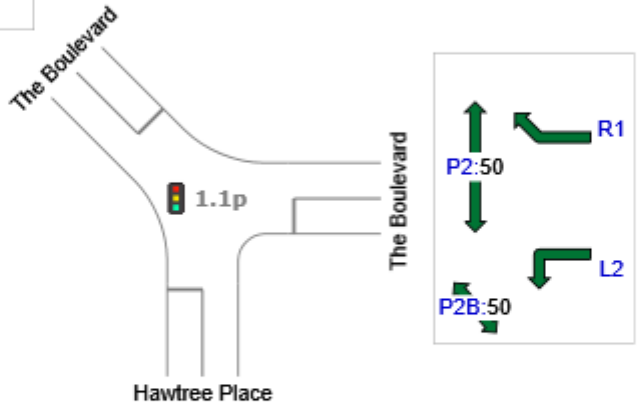


Input Volumes

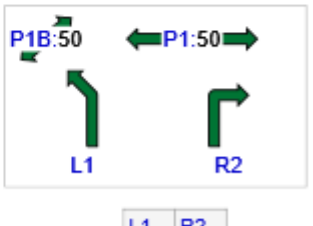
Volume Display Method: Total and %

	R1	L1
Tot	291	400
LV	97%	97%
HV	3%	3%





	Tot	LV	HV
R1	533	97%	3%
L2	137	97%	3%



	L1	R2
Tot	282	139
LV	97%	97%
HV	3%	3%

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Hawtree Place	421	408	13
E: The Boulevard	670	650	20
NW: The Boulevard	691	670	21
Total	1782	1729	53

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Hawtree Place													
Lane 1	297	3.0	918	0.323	100	7.3	LOS A	2.6	19.9	Short (P)	150	0.0	NA
Lane 2	146	3.0	249	0.589	100	32.5	LOS C	4.1	31.4	Full	175	0.0	0.0
Approach	443	3.0		0.589		15.6	LOS B	4.1	31.4				
East: The Boulevard													
Lane 1	144	3.0	1233	0.117	100	8.4	LOS A	1.2	8.9	Short	100	0.0	NA
Lane 2	278	3.0	480	0.580	100	25.0	LOS C	7.0	53.1	Full	120	0.0	0.0
Lane 3	283	3.0	488	0.580	100	25.0	LOS C	7.1	53.9	Full	120	0.0	0.0
Approach	705	3.0		0.580		21.6	LOS C	7.1	53.9				
NorthWest: The Boulevard													
Lane 1	211	3.0	480	0.439	100	24.1	LOS C	5.1	38.4	Full	213	0.0	0.0
Lane 2	211	3.0	480	0.439	100	24.1	LOS C	5.1	38.4	Full	213	0.0	0.0
Lane 3	306	3.0	512	0.598	100	24.4	LOS C	7.6	58.0	Short	185	0.0	NA
Approach	727	3.0		0.598		24.2	LOS C	7.6	58.0				
Intersection	1876	3.0		0.598		21.2	LOS C	7.6	58.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
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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Project: C:\Users\Nemanja\Box\KCTT Projects\KC00000 Current Projects\KC01446.000 Floreat Forum - Transport Study\Outgoing\SIDRA\Base Models\KC01446.000 M01 Howtree Place - The Boulevard.sip9

USER REPORT FOR SITE

All Movement Classes

Project: KC01446.000 M02 Howtree Place - Brookdale Street - Oceanic Drive **Template: Single Site User Report**

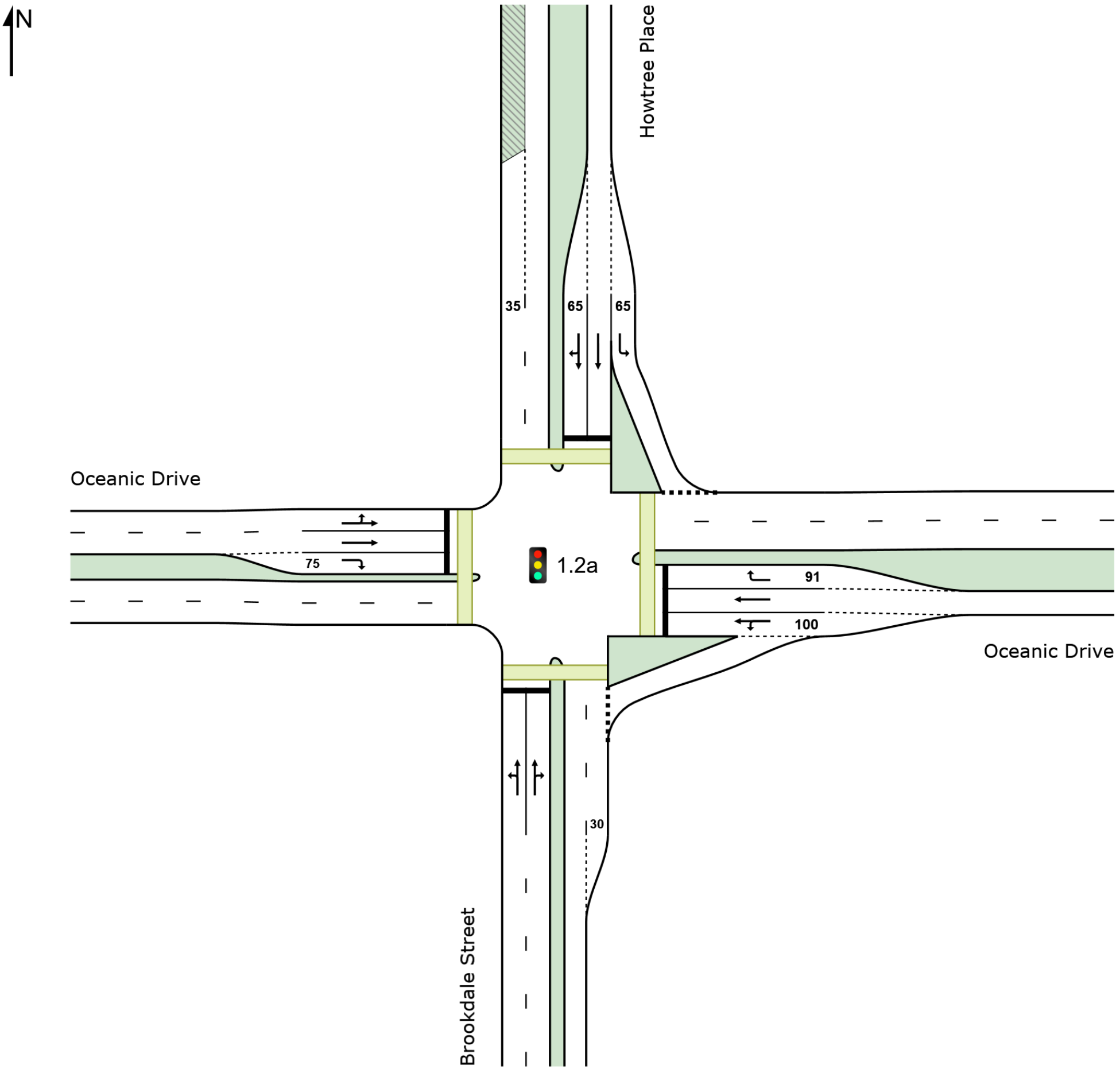
Site: 1.2a [1.2a Howtree Place & Brookdale Street & Oceanic Drive 2022 AM (Site Folder: General)]

1.2a Howtree Place & Brookdale Street & Oceanic Drive 2022 AM
Site Category: -
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 62 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

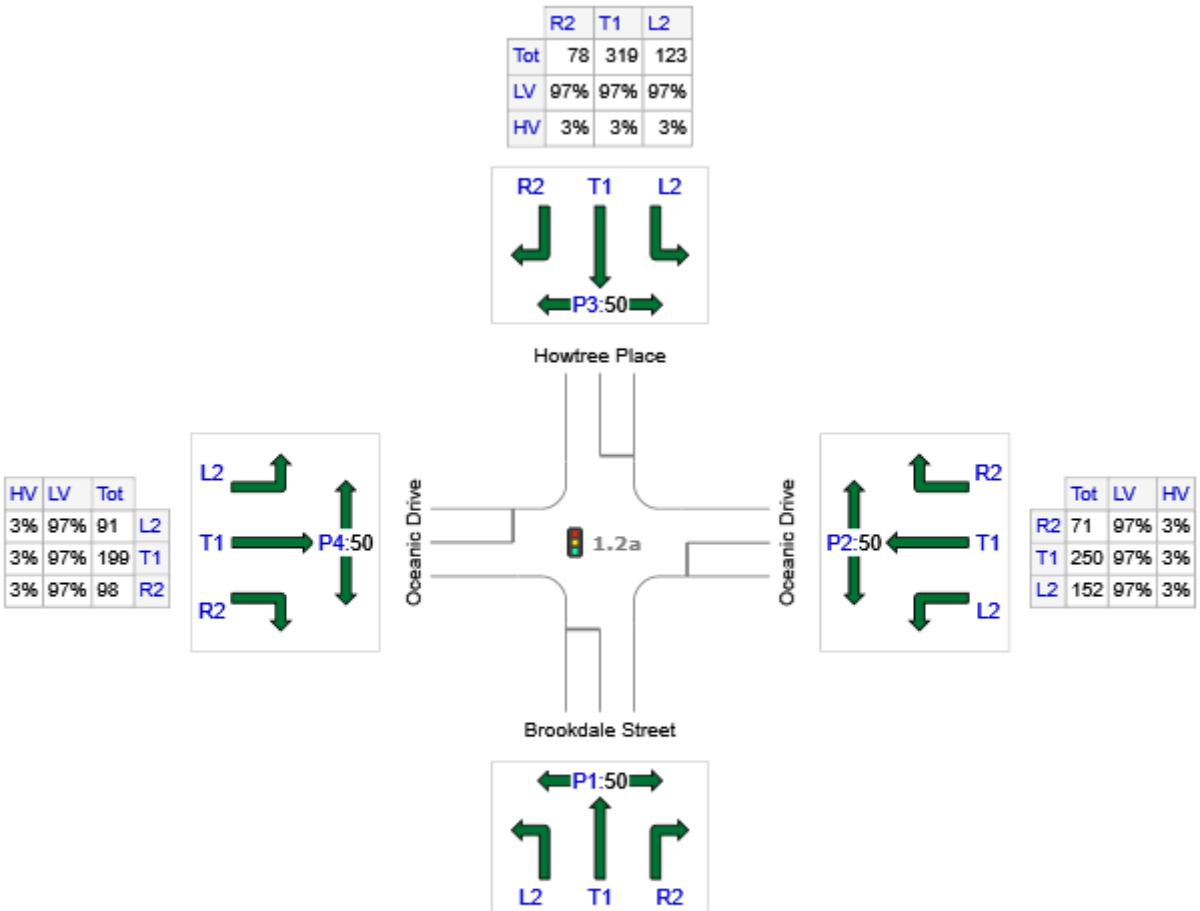
Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Brookdale Street	519	503	16
E: Oceanic Drive	473	459	14
N: Howtree Place	520	504	16
W: Oceanic Drive	388	376	12
Total	1900	1843	57

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Brookdale Street													
Lane 1	230	3.0	889	0.259	28[6]	13.4	LOS B	4.1	31.3	Full	80	0.0	0.0
Lane 2	317	3.0	349	0.908	100	44.0	LOS D	12.8	97.0	Full	80	0.0	22.5
Approach	546	3.0		0.908		31.2	LOS C	12.8	97.0				
East: Oceanic Drive													
Lane 1	282	3.0	487	0.579	100	14.8	LOS B	5.1	39.0	Short	100	0.0	NA
Lane 2	141	3.0	244	0.579	100	29.4	LOS C	4.3	32.8	Full	110	0.0	0.0
Lane 3	75	3.0	174	0.429	100	36.4	LOS D	2.3	17.5	Short	91	0.0	NA
Approach	498	3.0		0.579		22.2	LOS C	5.1	39.0				
North: Howtree Place													
Lane 1	129	3.0	993	0.130	100	8.5	LOS A	1.0	7.4	Short	65	0.0	NA
Lane 2	153	3.0	916	0.167	27[6]	10.3	LOS B	2.6	19.7	Full	175	0.0	0.0
Lane 3	265	3.0	423	0.627	100	24.2	LOS C	7.4	56.3	Short	65	0.0	NA
Approach	547	3.0		0.627		16.6	LOS B	7.4	56.3				
West: Oceanic Drive													
Lane 1	150	3.0	233	0.645	100	34.1	LOS C	4.7	35.8	Full	190	0.0	0.0
Lane 2	155	3.0	240	0.645	100	30.2	LOS C	4.9	36.9	Full	190	0.0	0.0
Lane 3	103	3.0	171	0.602	100	37.5	LOS D	3.3	25.0	Short	75	0.0	NA
Approach	408	3.0		0.645		33.5	LOS C	4.9	36.9				
Intersection	2000	3.0		0.908		25.4	LOS C	12.8	97.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

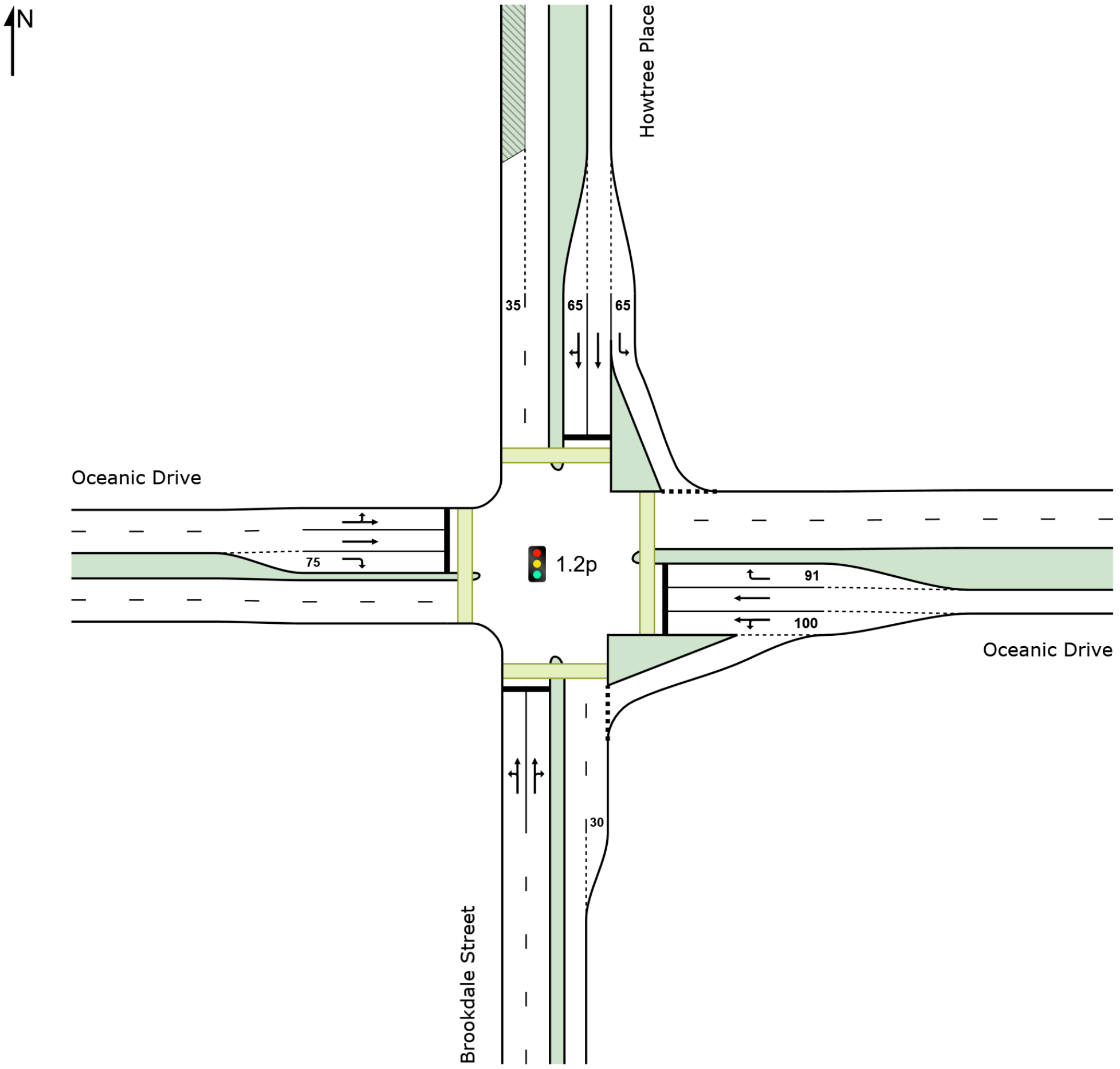
Site: 1.2p [1.2p Howtree Place & Brookdale Street & Oceanic Drive 2022 PM (Site Folder: General)]

1.2p Howtree Place & Brookdale Street & Oceanic Drive 2022 PM
Site Category: -
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 61 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

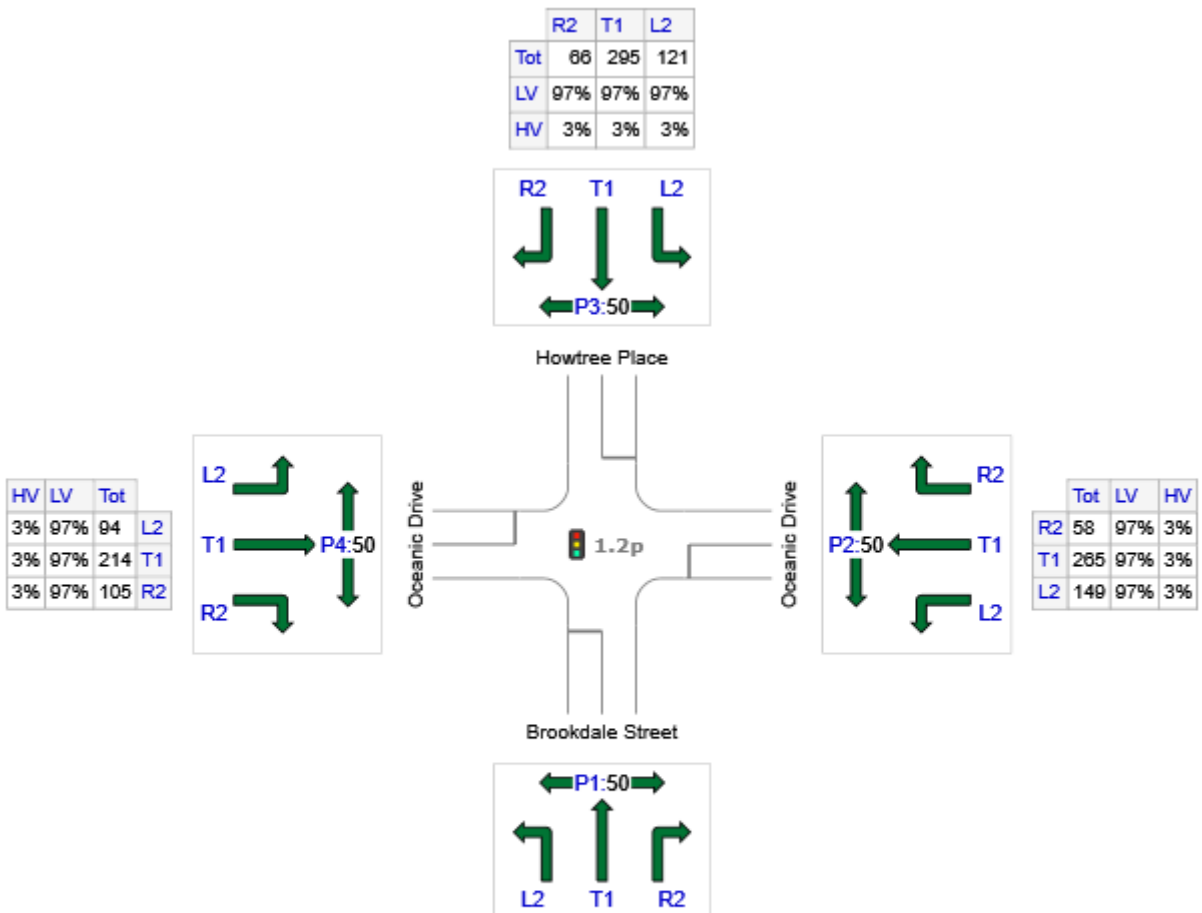
Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Brookdale Street	555	538	17
E: Oceanic Drive	472	458	14
N: Howtree Place	482	468	14
W: Oceanic Drive	413	401	12
Total	1922	1864	58

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Brookdale Street													
Lane 1	201	3.0	878	0.229	28[6]	12.9	LOS B	3.6	26.9	Full	80	0.0	0.0
Lane 2	383	3.0	475	0.805	100	28.9	LOS C	12.4	93.8	Full	80	0.0	19.4
Approach	584	3.0		0.805		23.4	LOS C	12.4	93.8				
East: Oceanic Drive													
Lane 1	287	3.0	478	0.600	100	14.0	LOS B	4.5	34.0	Short	100	0.0	NA
Lane 2	149	3.0	248	0.600	100	29.1	LOS C	4.5	34.2	Full	110	0.0	0.0
Lane 3	61	3.0	177	0.345	100	35.5	LOS D	1.8	13.9	Short	91	0.0	NA
Approach	497	3.0		0.600		21.2	LOS C	4.5	34.2				
North: Howtree Place													
Lane 1	127	3.0	919	0.139	100	8.5	LOS A	0.9	6.8	Short	65	0.0	NA
Lane 2	118	3.0	900	0.131	27[6]	10.3	LOS B	2.0	14.9	Full	175	0.0	0.0
Lane 3	262	3.0	533	0.492	100	19.7	LOS B	6.5	48.9	Short	65	0.0	NA
Approach	507	3.0		0.492		14.7	LOS B	6.5	48.9				
West: Oceanic Drive													
Lane 1	160	3.0	237	0.674	100	33.9	LOS C	5.0	37.8	Full	190	0.0	0.0
Lane 2	165	3.0	244	0.674	100	30.1	LOS C	5.1	38.9	Full	190	0.0	0.0
Lane 3	111	3.0	174	0.634	100	37.3	LOS D	3.5	26.6	Short	75	0.0	NA
Approach	435	3.0		0.674		33.3	LOS C	5.1	38.9				
Intersection	2023	3.0		0.805		22.8	LOS C	12.4	93.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

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USER REPORT FOR SITE

All Movement Classes

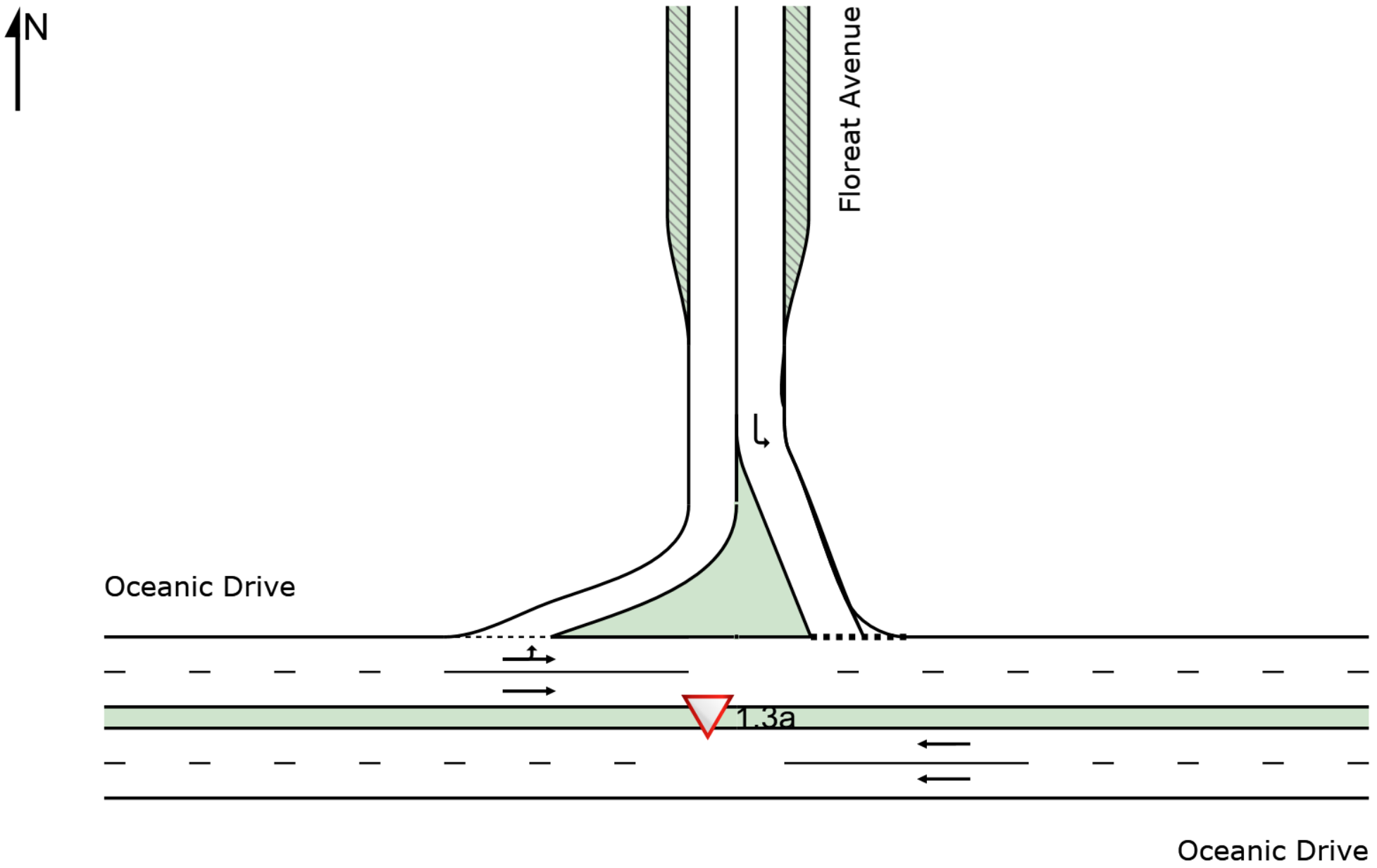
Project: KC01446.000 M03 Floreat Avenue - Oceanic Drive **Template: Single Site User Report**

Site: 1.3a [1.3a Floreat Avenue & Oceanic Drive 2022 AM (Site Folder: General)]

1.3a Floreat Avenue & Oceanic Drive 2022 AM
Site Category: (None)
Give-Way (Two-Way)

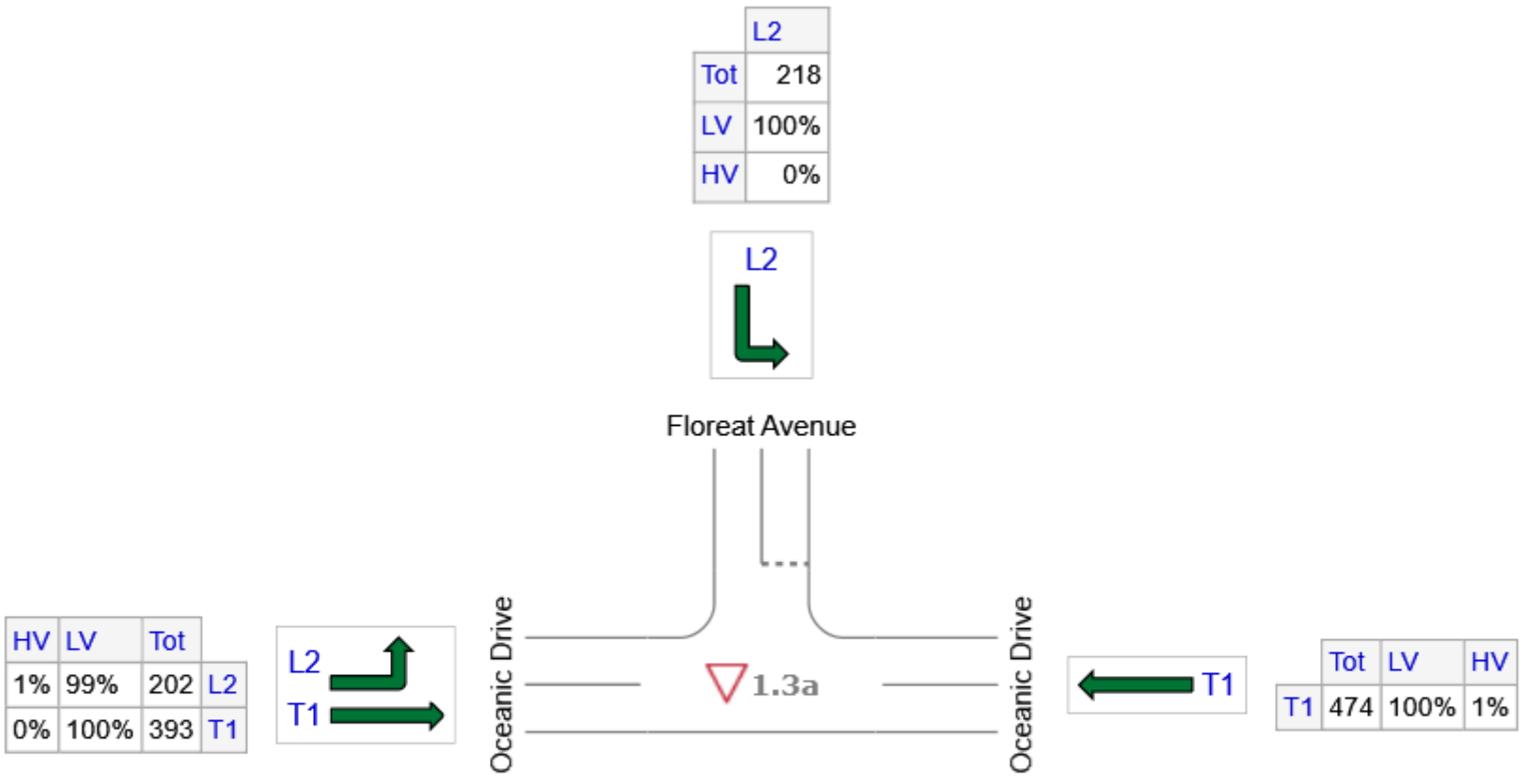
Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
E: Oceanic Drive	474	472	2
N: Floreat Avenue	218	218	0
W: Oceanic Drive	595	593	2
Total	1287	1283	4

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Oceanic Drive													
Lane 1	249	0.5	1940	0.129	100	0.0	LOS A	0.0	0.0	Full	72	0.0	0.0
Lane 2	249	0.5	1940	0.129	100	0.0	LOS A	0.0	0.0	Full	72	0.0	0.0
Approach	499	0.5		0.129		0.0	NA	0.0	0.0				
North: Floreat Avenue													
Lane 1	229	0.0	1224	0.187	100	4.9	LOS A	0.8	5.6	Full	77	0.0	0.0
Approach	229	0.0		0.187		4.9	LOS A	0.8	5.6				
West: Oceanic Drive													
Lane 1	307	0.7	1870	0.164	100	2.6	LOS A	0.0	0.0	Full	38	0.0	0.0
Lane 2	320	0.0	1950	0.164	100	0.0	LOS A	0.0	0.0	Full	38	0.0	0.0
Approach	626	0.3		0.164		1.3	NA	0.0	0.0				
Intersection	1355	0.3		0.187		1.4	NA	0.8	5.6				

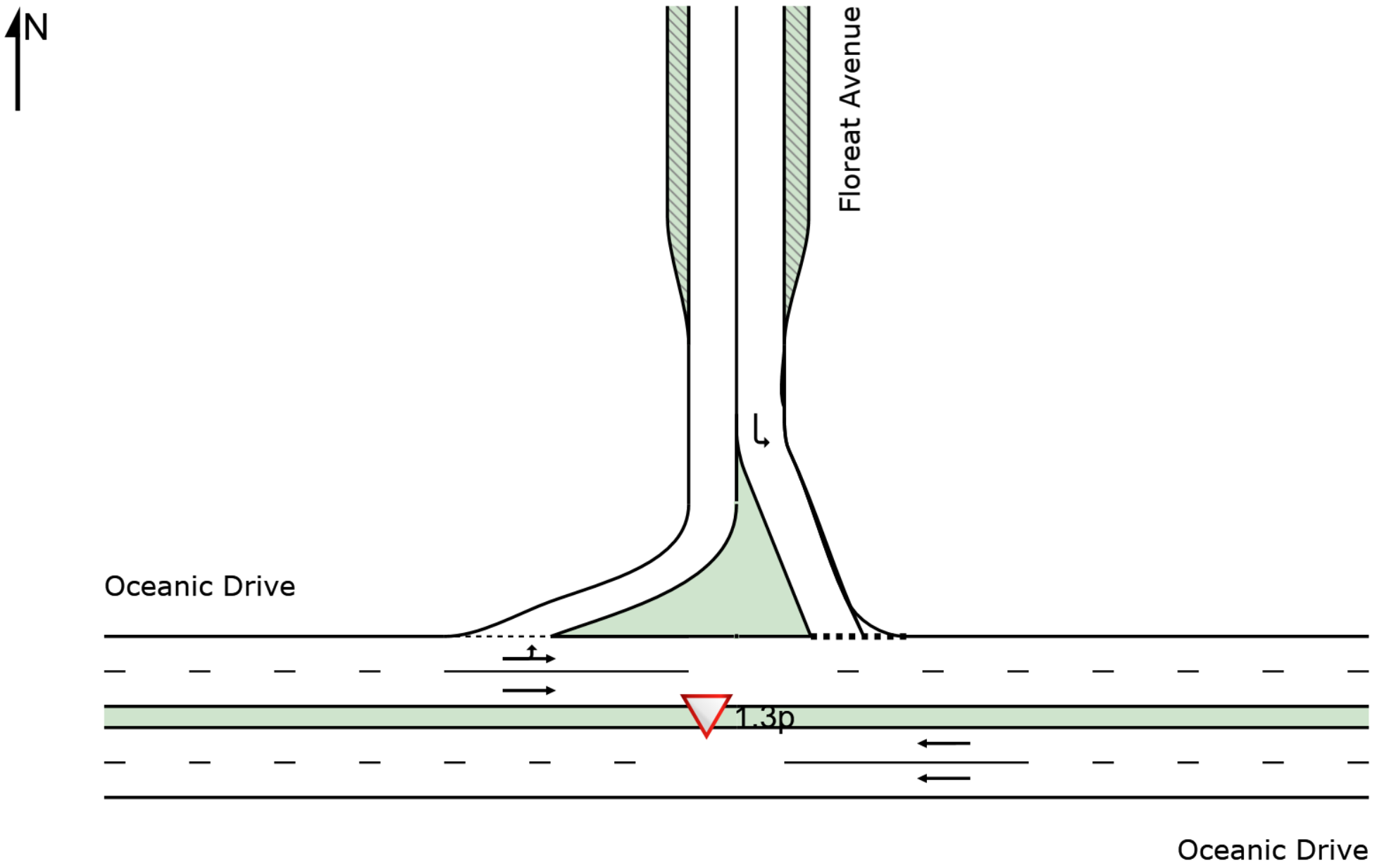
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values 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 lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site: 1.3p [1.3p Floreat Avenue & Oceanic Drive 2022 PM (Site Folder: General)]

1.3p Floreat Avenue & Oceanic Drive 2022 PM
Site Category: (None)
Give-Way (Two-Way)

Site Layout

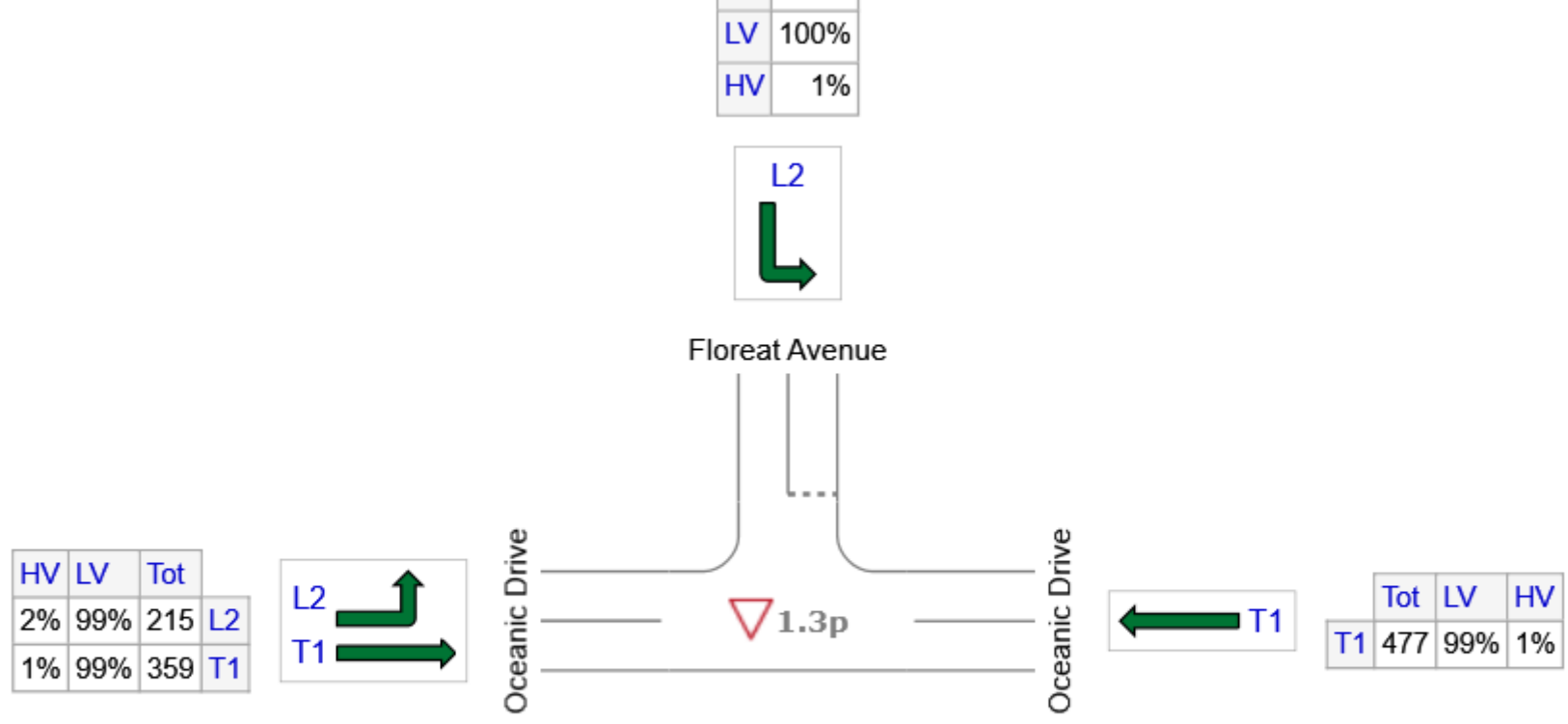
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %

	L2
Tot	209
LV	100%
HV	1%



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
E: Oceanic Drive	477	472	5
N: Floreat Avenue	209	208	1
W: Oceanic Drive	574	567	7
Total	1260	1247	13

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Oceanic Drive													
Lane 1	251	1.0	1931	0.130	100	0.0	LOS A	0.0	0.0	Full	72	0.0	0.0
Lane 2	251	1.0	1931	0.130	100	0.0	LOS A	0.0	0.0	Full	72	0.0	0.0
Approach	502	1.0		0.130		0.0	NA	0.0	0.0				
North: Floreat Avenue													
Lane 1	220	0.5	1249	0.176	100	4.8	LOS A	0.7	5.3	Full	77	0.0	0.0
Approach	220	0.5		0.176		4.8	LOS A	0.7	5.3				
West: Oceanic Drive													
Lane 1	296	1.4	1851	0.160	100	2.9	LOS A	0.0	0.0	Full	38	0.0	0.0
Lane 2	308	1.0	1931	0.160	100	0.0	LOS A	0.0	0.0	Full	38	0.0	0.0
Approach	604	1.2		0.160		1.4	NA	0.0	0.0				
Intersection	1326	1.0		0.176		1.4	NA	0.7	5.3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
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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USER REPORT FOR SITE

All Movement Classes

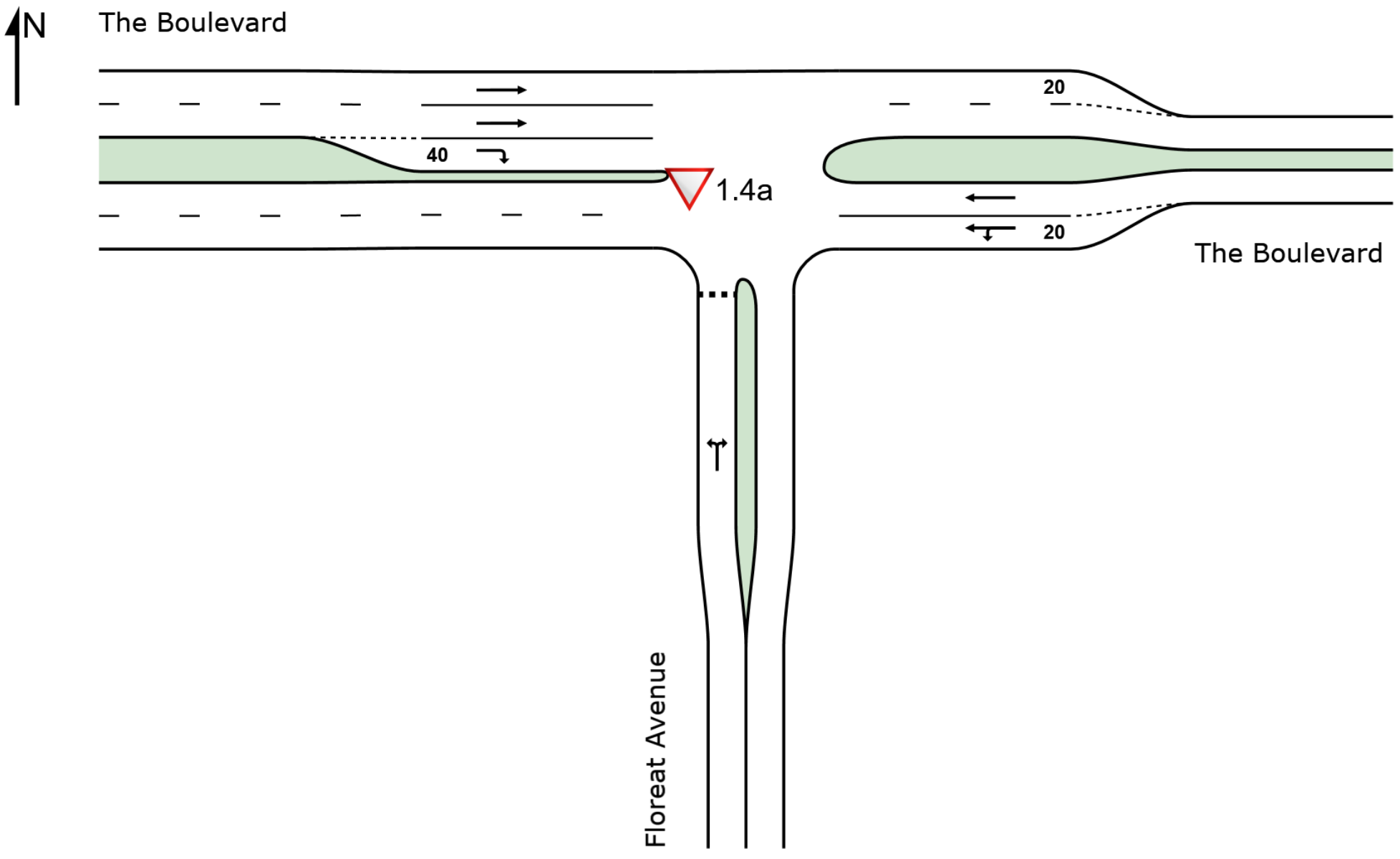
Project: KC01446.000 M04 Floreat Avenue - The Boulevard **Template: Single Site User Report**

Site: 1.4a [1.4a Floreat Avenue & The Boulevard 2022 AM (Site Folder: General)]

1.4a Floreat Avenue & The Boulevard 2022 AM
Site Category: (None)
Give-Way (Two-Way)

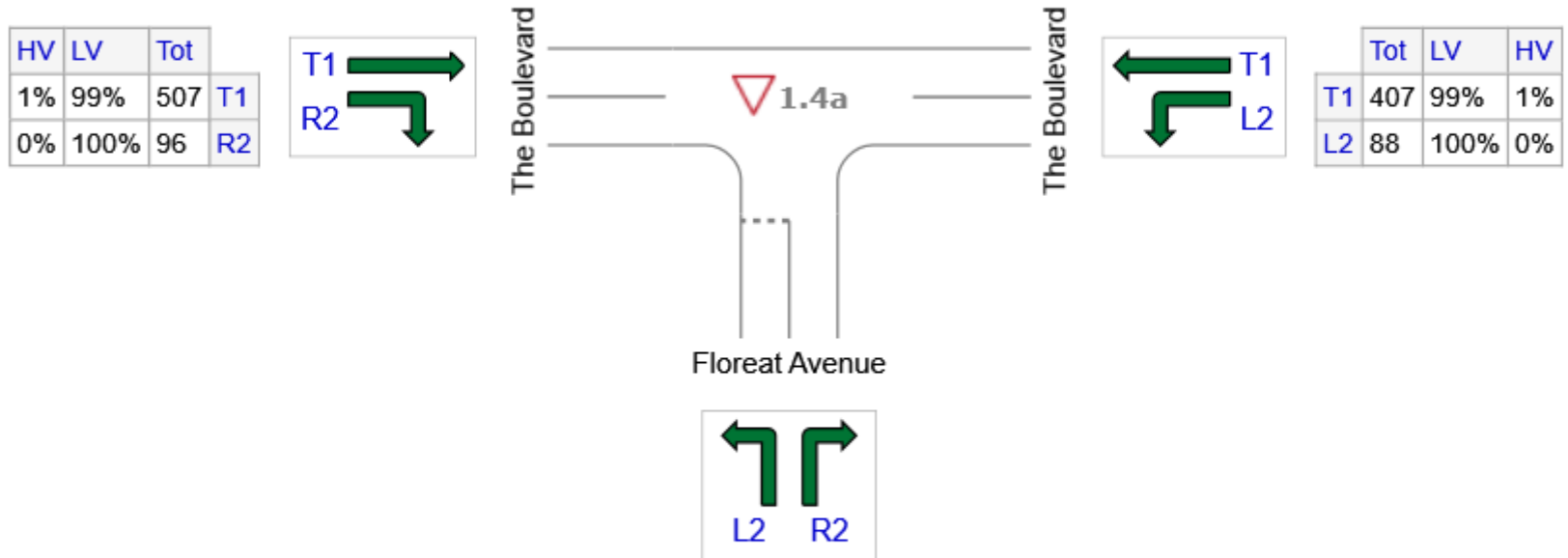
Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %



	L2	R2
Tot	166	71
LV	99%	100%
HV	2%	0%

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Floreat Avenue	237	235	2
E: The Boulevard	495	491	4
W: The Boulevard	603	599	4
Total	1335	1324	11

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Floreat Avenue													
Lane 1	249	1.1	395	0.632	100	22.3	LOS C	4.9	36.2	Full	450	0.0	0.0
Approach	249	1.1		0.632		22.3	LOS C	4.9	36.2				
East: The Boulevard													
Lane 1	259	0.6	1904	0.136	100	2.0	LOS A	0.0	0.0	Short	20	0.0	NA
Lane 2	262	1.0	1931	0.136	100	0.0	LOS A	0.0	0.0	Full	250	0.0	0.0
Approach	521	0.8		0.136		1.0	NA	0.0	0.0				
West: The Boulevard													
Lane 1	90	0.8	1935	0.047	20[6]	1.1	LOS A	0.0	0.0	Full	67	0.0	0.0
Lane 2	444	0.8	1918	0.231	100	0.0	LOS A	0.0	0.0	Full	67	0.0	0.0
Lane 3	101	0.0	839	0.120	100	7.2	LOS A	0.5	3.5	Short	40	0.0	NA
Approach	635	0.7		0.231		1.3	NA	0.5	3.5				
Intersection	1405	0.8		0.632		4.9	NA	4.9	36.2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

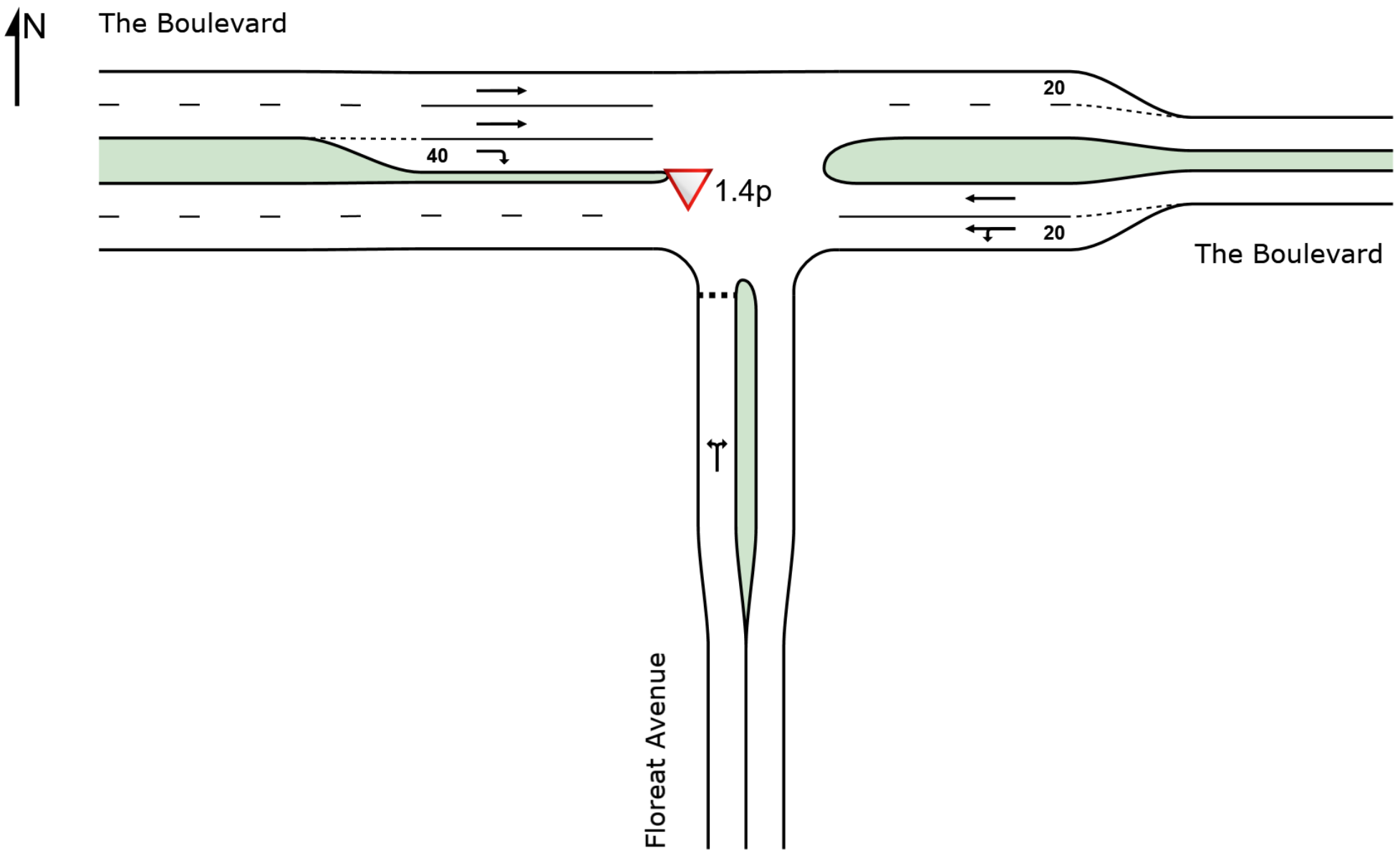
6 Lane under-utilisation due to downstream effects

Site: 1.4p [1.4p Floreat Avenue & The Boulevard 2022 PM (Site Folder: General)]

1.4p Floreat Avenue & The Boulevard 2022 PM
Site Category: (None)
Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

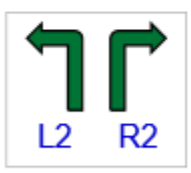
Volume Display Method: Total and %

HV	LV	Tot	
1%	100%	410	T1
0%	100%	86	R2





	Tot	LV	HV
T1	419	99%	1%
L2	61	100%	0%



	L2	R2
Tot	158	54
LV	99%	100%
HV	2%	0%

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Floreat Avenue	212	210	2
E: The Boulevard	480	476	4
W: The Boulevard	496	494	2
Total	1188	1179	9

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Floreat Avenue													
Lane 1	223	1.1	518	0.431	100	12.6	LOS B	2.4	17.6	Full	450	0.0	0.0
Approach	223	1.1		0.431		12.6	LOS B	2.4	17.6				
East: The Boulevard													
Lane 1	251	0.7	1911	0.132	100	1.4	LOS A	0.0	0.0	Short	20	0.0	NA
Lane 2	254	1.0	1931	0.132	100	0.0	LOS A	0.0	0.0	Full	250	0.0	0.0
Approach	505	0.9		0.132		0.7	NA	0.0	0.0				
West: The Boulevard													
Lane 1	73	0.5	1940	0.038	20[6]	0.8	LOS A	0.0	0.0	Full	67	0.0	0.0
Lane 2	359	0.5	1924	0.186	100	0.0	LOS A	0.0	0.0	Full	67	0.0	0.0
Lane 3	91	0.0	855	0.106	100	7.1	LOS A	0.4	3.0	Short	40	0.0	NA
Approach	522	0.4		0.186		1.3	NA	0.4	3.0				
Intersection	1251	0.7		0.431		3.1	NA	2.4	17.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

USER REPORT FOR NETWORK SITE

All Movement Classes

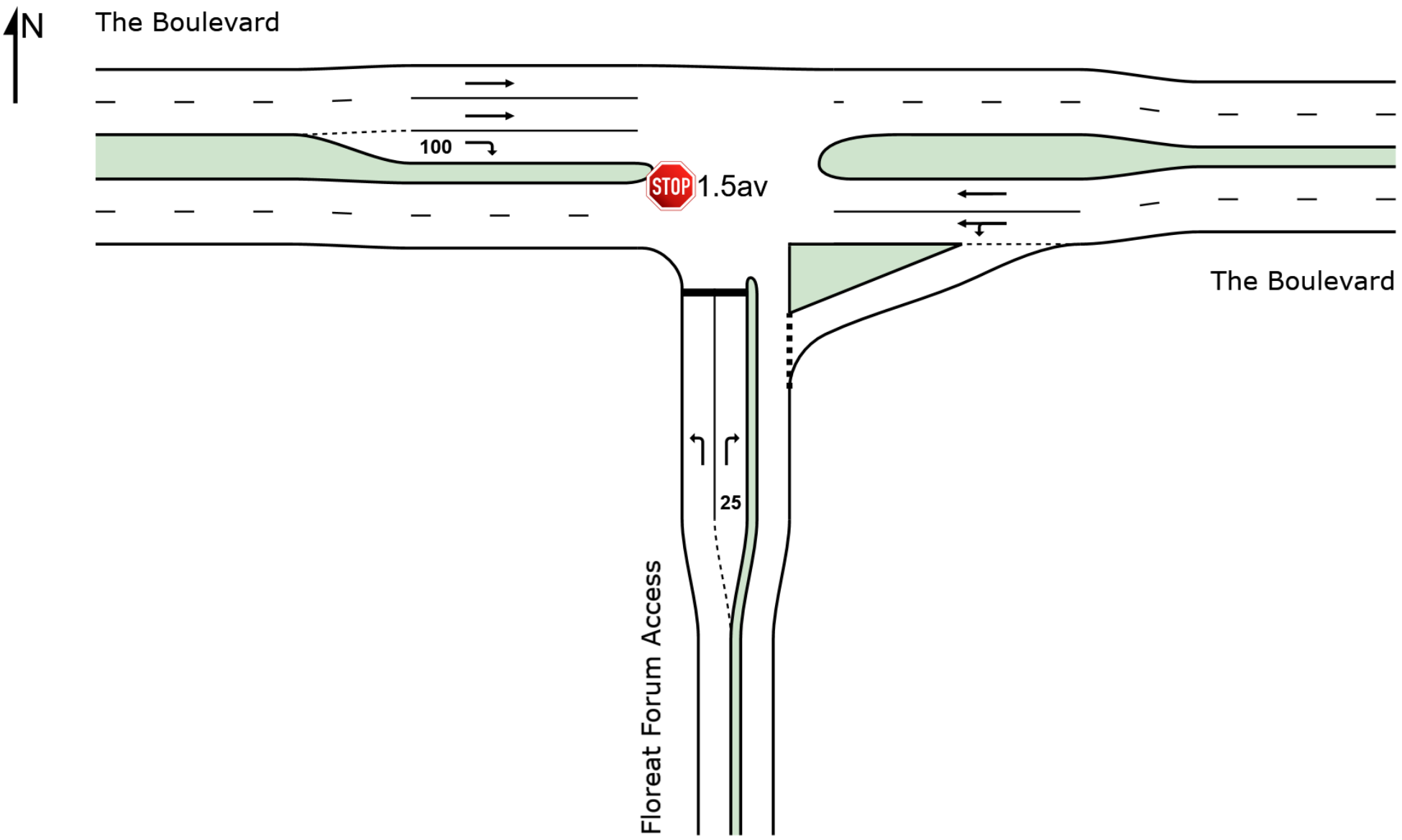
Project: KC01446.000 M05 The Boulevard - Floreat Forum Access | **Template: Site Report**

Site: 1.5av [1.5a The Boulevard - Floreat Forum Access 2022 AM - Conversion (Site Folder: General)] | **Network: 1 [n1.1a Network 2022 AM (Network Folder: General)]**

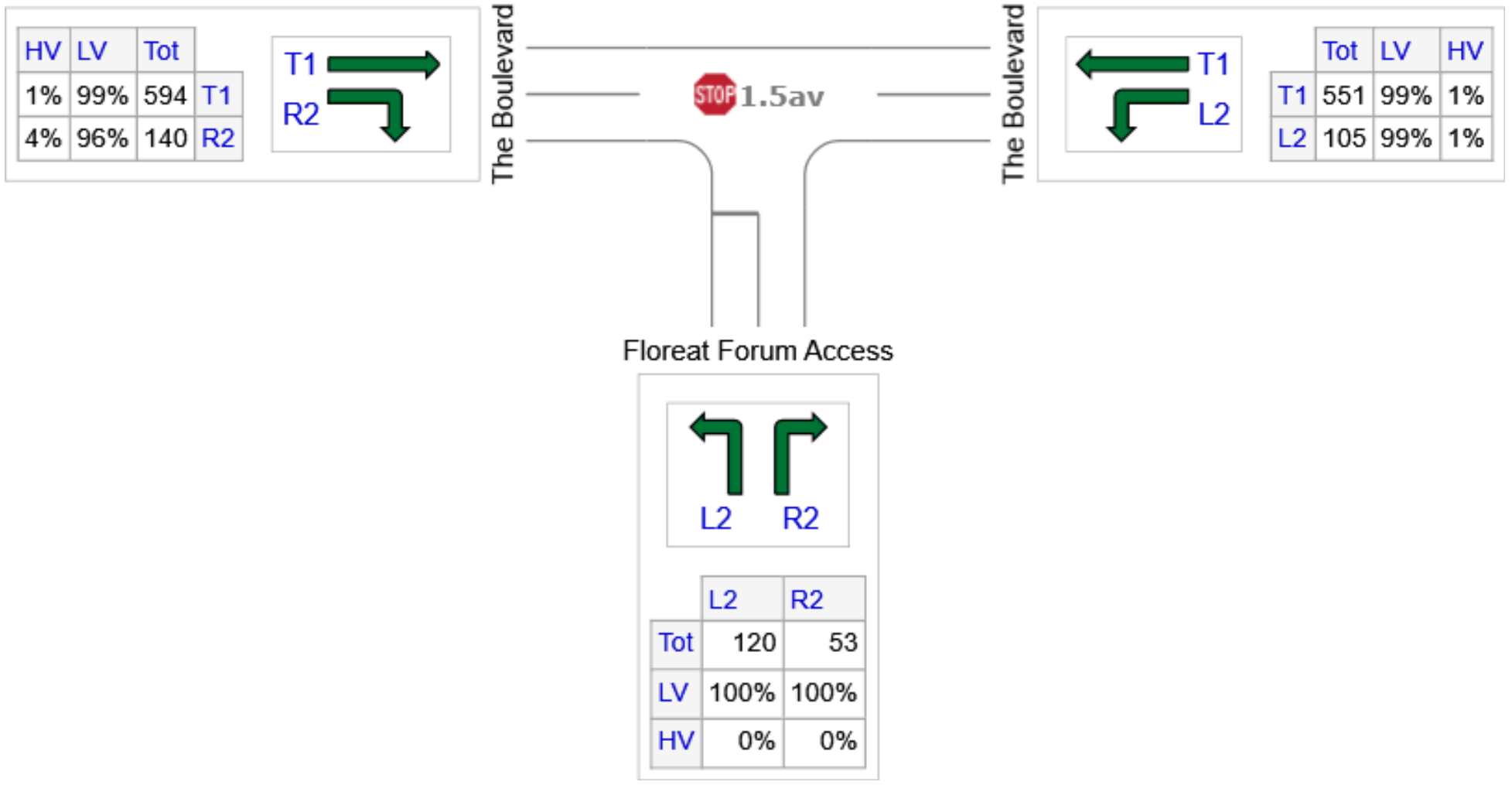
1.5a The Boulevard - Floreat Forum Access 2022 AM
Site Category: (None)
Stop (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



OD Arrival Flows



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Floreat Forum Access	173	173	0
E: The Boulevard	656	649	7
W: The Boulevard	734	724	9
Total	1562	1546	17

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Floreat Forum Access															

Lane 1	120	0.0	120	0.0	948	0.127	100	5.3	LOS A	0.2	1.4	Full	50	0.0	0.0
Lane 2	53	0.0	53	0.0	118	0.447	100	44.6	LOS E	0.6	4.8	Short	25	0.0	NA
Approach	173	0.0	173	0.0		0.447		17.3	LOS C	0.6	4.8				
East: The Boulevard															
Lane 1	325	1.1	325	1.1	1901	0.171	100	2.1	LOS A	0.3	2.2	Full	67	0.0	0.0
Lane 2	330	1.1	330	1.1	1929	0.171	100	0.0	LOS A	0.0	0.0	Full	67	0.0	0.0
Approach	656	1.1	656	1.1		0.171		1.0	NA	0.3	2.2				
West: The Boulevard															
Lane 1	299	0.7	299	0.7	1936	0.154	100	0.0	LOS A	0.0	0.0	Full	175	0.0	0.0
Lane 2	295	0.7	295	0.7	1908	0.154	100	0.0	LOS A	0.0	0.0	Full	175	0.0	0.0
Lane 3	140	3.8	140	3.8	779	0.180	100	8.8	LOS A	0.2	1.9	Short	100	0.0	NA
Approach	734	1.3	734	1.3		0.180		1.7	NA	0.2	1.9				
Intersection	1562	1.1	1562	1.1		0.447		3.1	NA	0.6	4.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

USER REPORT FOR NETWORK SITE

All Movement Classes

Project: KC01446.000 M05 The Boulevard - Floreat Forum Access

Template: Site Report

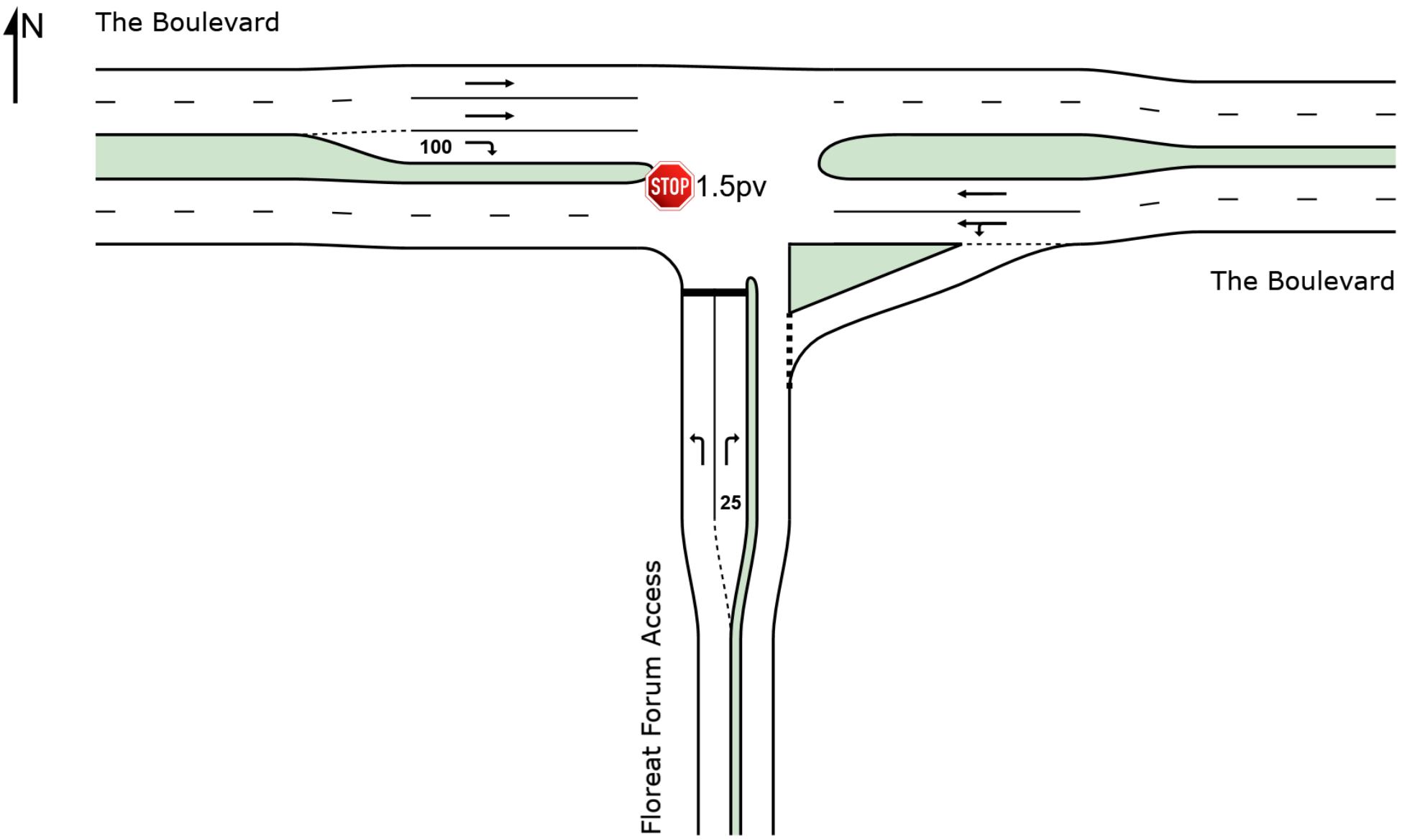
Site: 1.5pv [1.5p The Boulevard - Floreat Forum Access 2022 PM - Conversion (Site Folder: General)]

Network: 2 [n1.1p Network 2022 PM (Network Folder: General)]

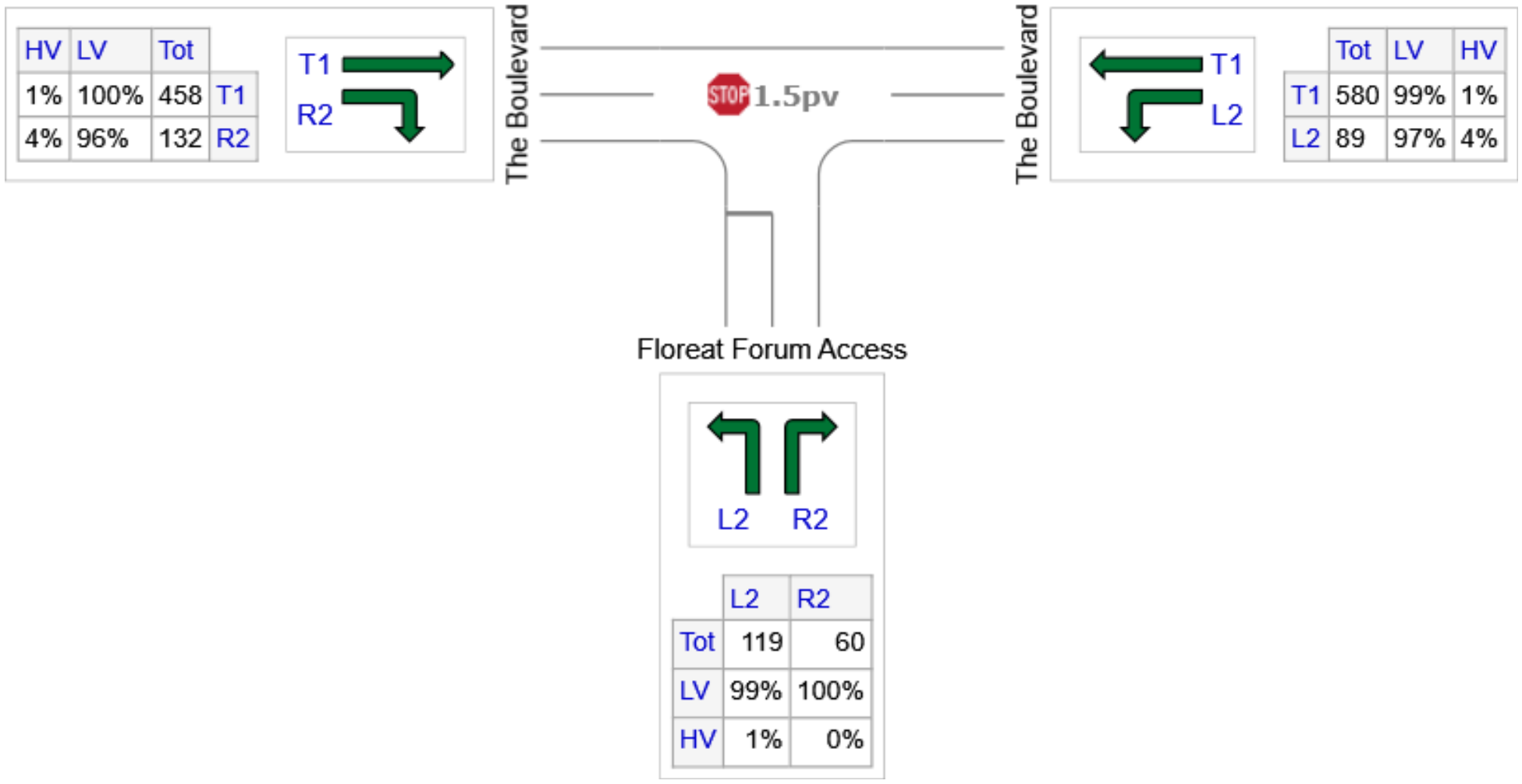
1.5p The Boulevard - Floreat Forum Access 2022 PM
Site Category: (None)
Stop (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



OD Arrival Flows



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Floreat Forum Access	179	178	1
E: The Boulevard	669	660	10
W: The Boulevard	589	582	8
Total	1438	1420	18

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Floreat Forum Access															

Lane 1	119	1.0	119	1.0	919	0.129	100	5.5	LOS A	0.2	1.5	Full	50	0.0	0.0
Lane 2	60	0.0	60	0.0	138	0.436	100	38.4	LOS E	0.7	4.8	Short	25	0.0	NA
Approach	179	0.7	179	0.7		0.436		16.5	LOS C	0.7	4.8				
East: The Boulevard															
Lane 1	331	1.7	331	1.7	1890	0.175	100	1.7	LOS A	0.3	2.0	Full	67	0.0	0.0
Lane 2	338	1.1	338	1.1	1929	0.175	100	0.0	LOS A	0.0	0.0	Full	67	0.0	0.0
Approach	669	1.4	669	1.4		0.175		0.9	NA	0.3	2.0				
West: The Boulevard															
Lane 1	231	0.5	231	0.5	1940	0.119	100	0.0	LOS A	0.0	0.0	Full	175	0.0	0.0
Lane 2	227	0.5	227	0.5	1907	0.119	100	0.0	LOS A	0.0	0.0	Full	175	0.0	0.0
Lane 3	132	4.0	132	4.0	750	0.176	100	9.0	LOS A	0.2	1.8	Short	100	0.0	NA
Approach	589	1.3	589	1.3		0.176		2.0	NA	0.2	1.8				
Intersection	1438	1.3	1438	1.3		0.436		3.3	NA	0.7	4.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

USER REPORT FOR SITE

All Movement Classes

Project: KC01446.000 M01 Howtree Place - The Boulevard **Template: Signalised**

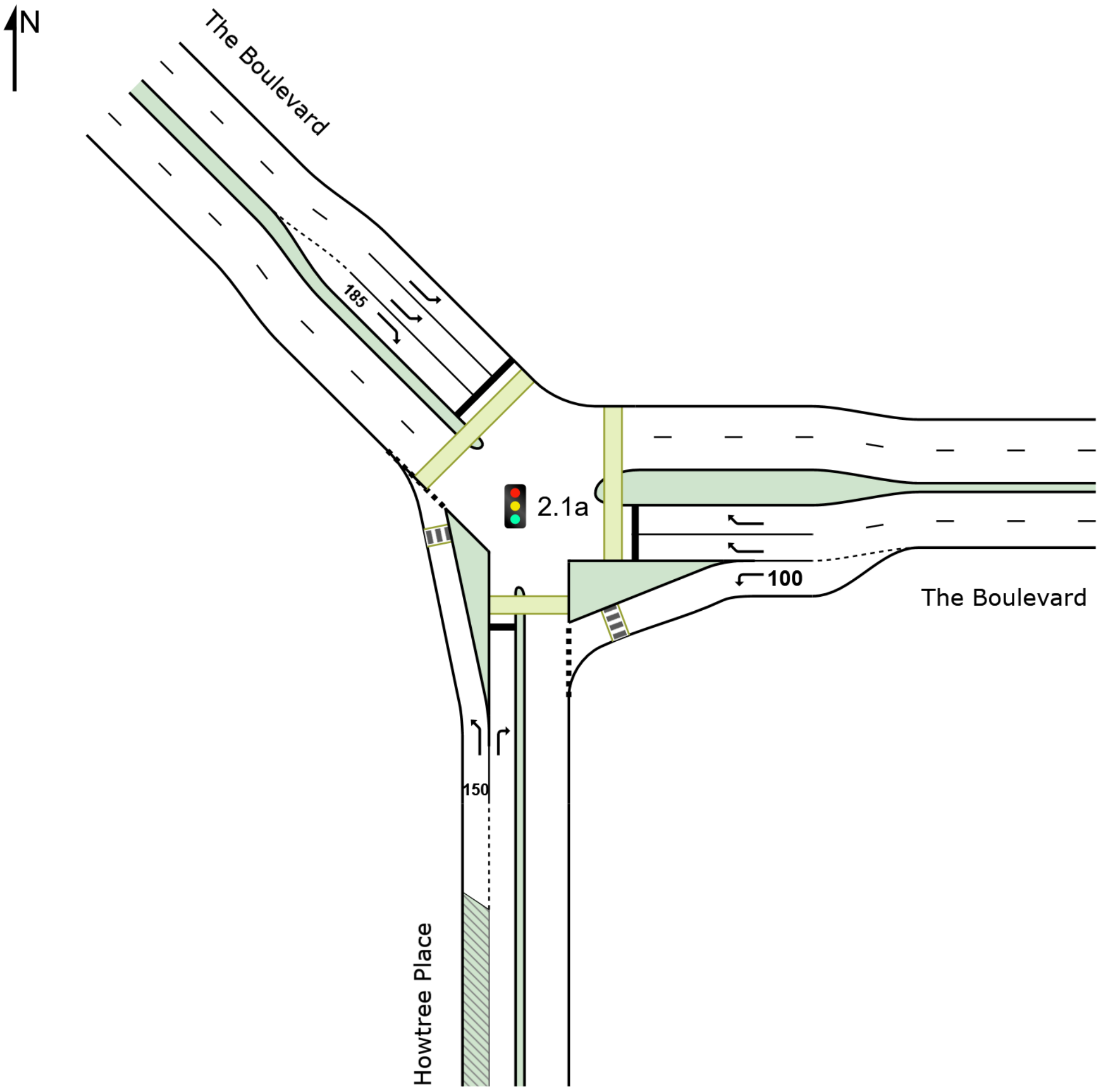
Site: 2.1a [2.1a Howtree Place & The Boulevard 2041 AM - No Development (Site Folder: No Development 2041)]

2.1a Howtree Place & The Boulevard 2041 AM - No Development
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Site Layout

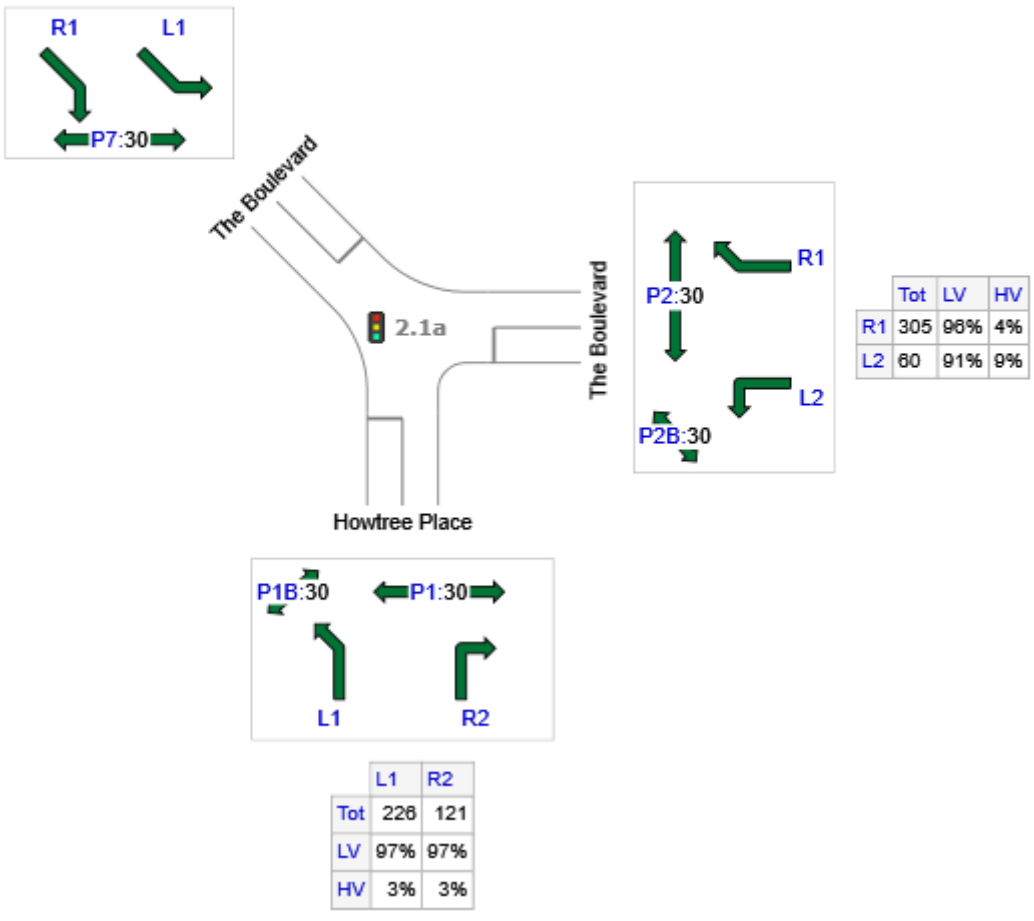
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %

	R1	L1
Tot	417	542
LV	97%	97%
HV	3%	3%



	Tot	LV	HV
R1	305	96%	4%
L2	60	91%	9%

	L1	R2
Tot	226	121
LV	97%	97%
HV	3%	3%

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Howtree Place	347	336	11
E: The Boulevard	365	347	18
NW: The Boulevard	959	926	33
Total	1671	1610	61

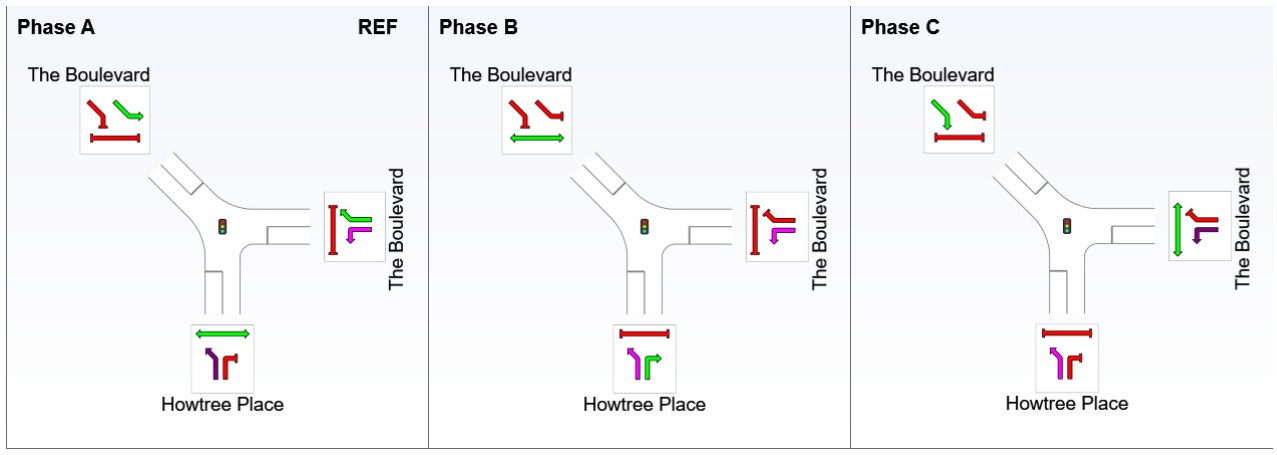
Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Howtree Place													
Lane 1	238	2.9	997	0.239	100	6.2	LOS A	1.3	10.2	Short (P)	150	0.0	NA
Lane 2	127	3.4	212	0.602	100	30.6	LOS C	3.3	24.9	Full	175	0.0	0.0
Approach	365	3.1		0.602		14.7	LOS B	3.3	24.9				
East: The Boulevard													
Lane 1	63	9.3	1044	0.060	100	9.3	LOS A	0.6	4.5	Short	100	0.0	NA
Lane 2	159	3.9	361	0.441	100	24.6	LOS C	3.6	27.6	Full	120	0.0	0.0
Lane 3	162	3.9	367	0.441	100	24.5	LOS C	3.7	28.0	Full	120	0.0	0.0
Approach	384	4.8		0.441		22.0	LOS C	3.7	28.0				
NorthWest: The Boulevard													
Lane 1	285	3.4	363	0.785	100	29.4	LOS C	7.7	58.5	Full	213	0.0	0.0
Lane 2	285	3.4	363	0.785	100	29.4	LOS C	7.7	58.5	Full	213	0.0	0.0
Lane 3	439	3.4	581	0.755	100	24.1	LOS C	10.9	82.6	Short	185	0.0	NA
Approach	1009	3.4		0.785		27.1	LOS C	10.9	82.6				
Intersection	1759	3.7		0.785		23.4	LOS C	10.9	82.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Input Phase Sequence

Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C



REF: Reference Phase
VAR: Variable Phase



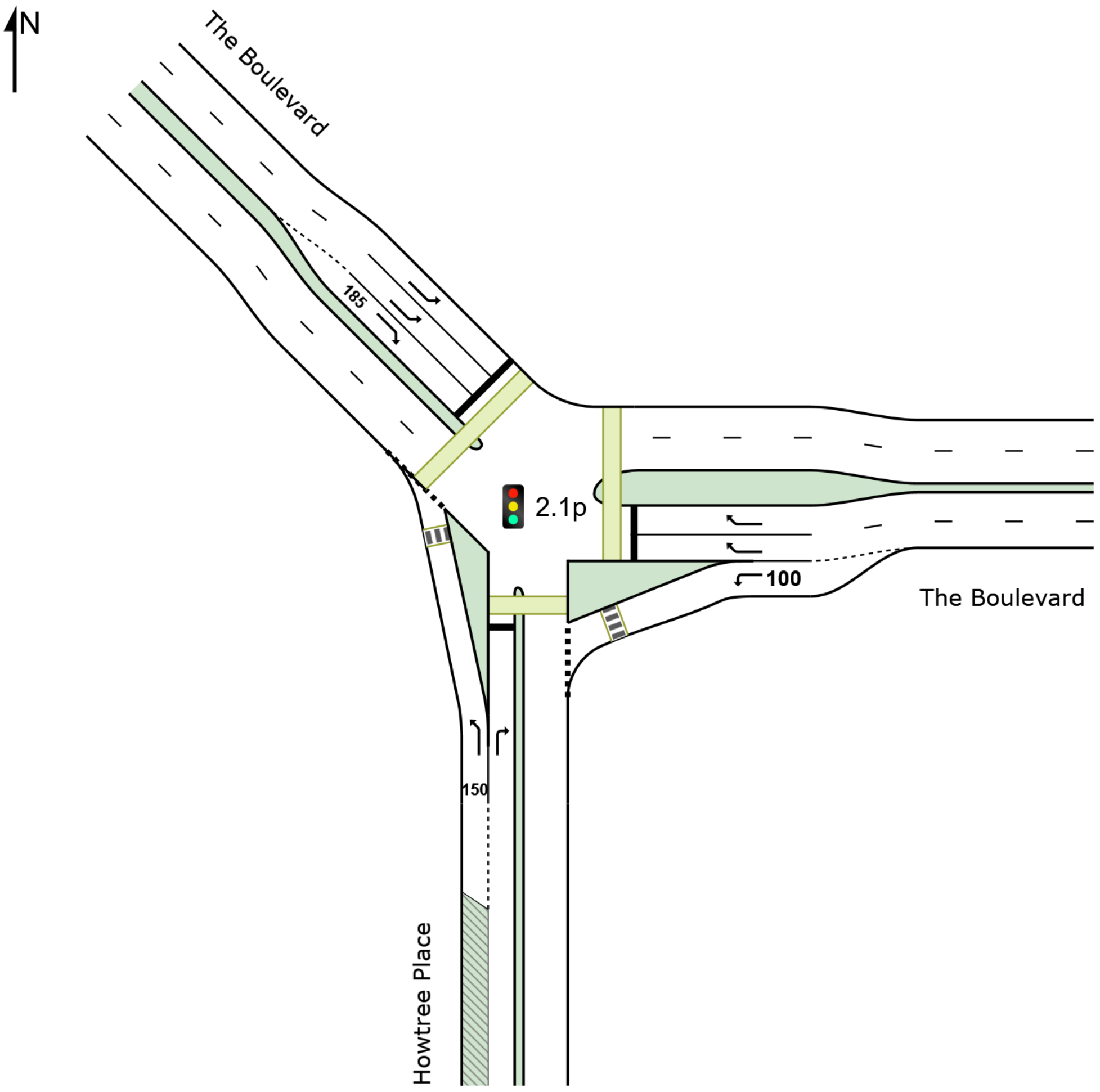
Site: 2.1p [2.1p Howtree Place & The Boulevard 2041 PM - No Development (Site Folder: No Development 2041)]

2.1p Howtree Place & The Boulevard 2041 PM - No Development
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

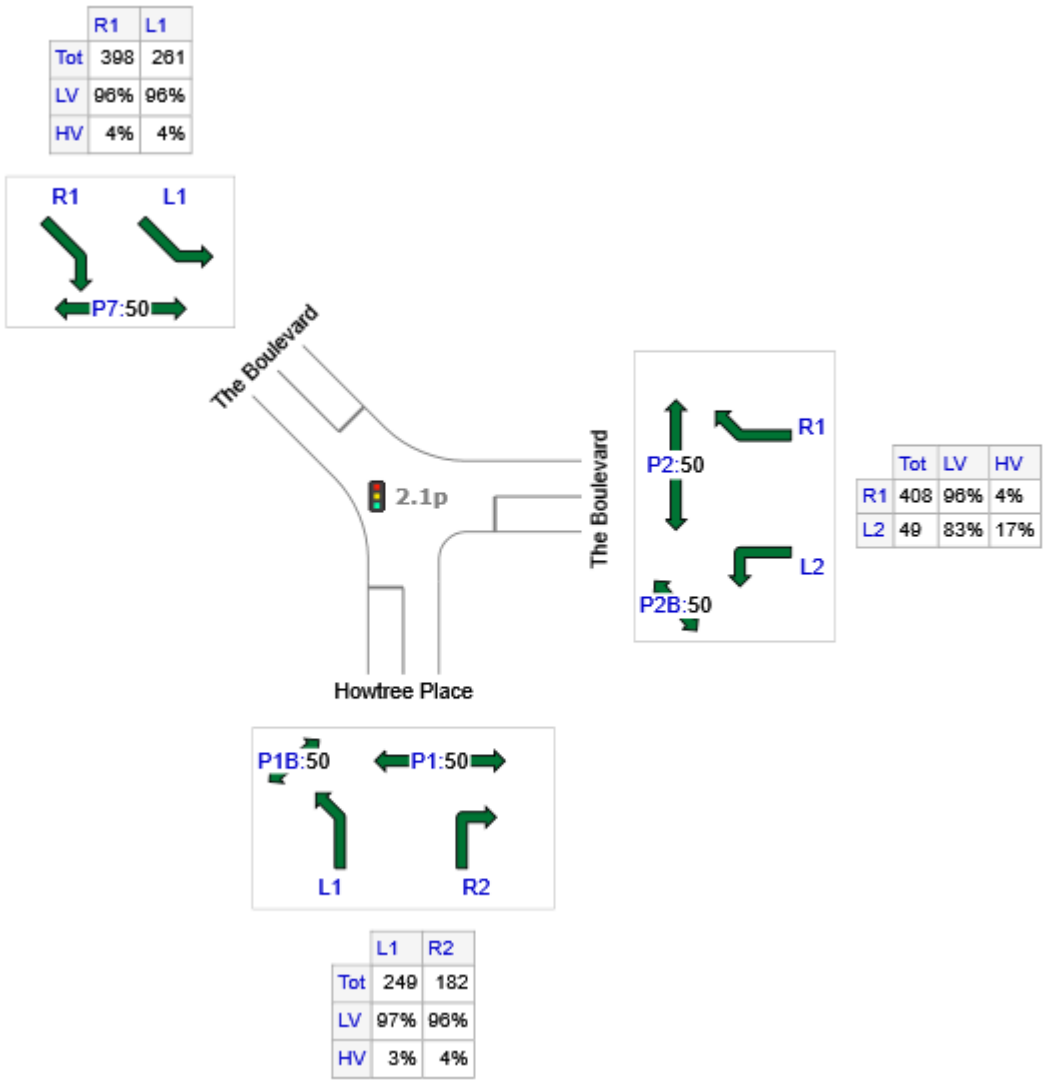
Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Howtree Place	431	417	14
E: The Boulevard	457	433	24
NW: The Boulevard	659	634	25
Total	1547	1484	63

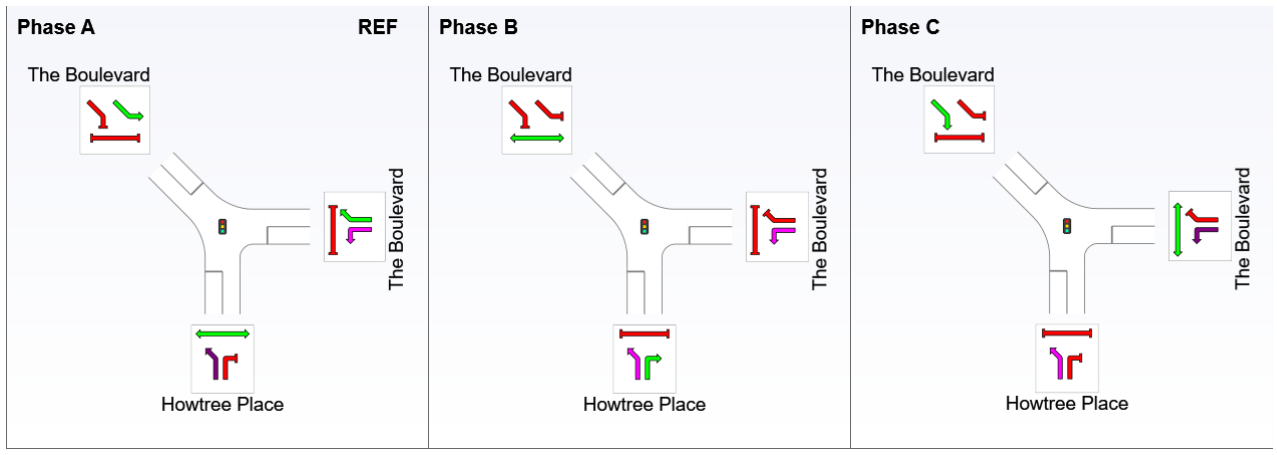
Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Howtree Place													
Lane 1	262	2.9	984	0.266	100	6.8	LOS A	1.7	13.2	Short (P)	150	0.0	NA
Lane 2	192	3.6	282	0.680	100	29.7	LOS C	4.9	37.5	Full	175	0.0	0.0
Approach	454	3.2		0.680		16.4	LOS B	4.9	37.5				
East: The Boulevard													
Lane 1	52	16.6	999	0.052	100	9.4	LOS A	0.5	3.9	Short	100	0.0	NA
Lane 2	213	4.0	289	0.737	100	29.6	LOS C	5.6	43.1	Full	120	0.0	0.0
Lane 3	216	4.0	294	0.737	100	29.5	LOS C	5.7	43.7	Full	120	0.0	0.0
Approach	481	5.3		0.737		27.4	LOS C	5.7	43.7				
NorthWest: The Boulevard													
Lane 1	137	4.1	288	0.476	100	26.6	LOS C	3.3	25.1	Full	213	0.0	0.0
Lane 2	137	4.1	288	0.476	100	26.6	LOS C	3.3	25.1	Full	213	0.0	0.0
Lane 3	419	3.6	580	0.722	100	23.1	LOS C	10.0	76.1	Short	185	0.0	NA
Approach	694	3.8		0.722		24.5	LOS C	10.0	76.1				
Intersection	1628	4.1		0.737		23.1	LOS C	10.0	76.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Input Phase Sequence

Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C



REF: Reference Phase
VAR: Variable Phase



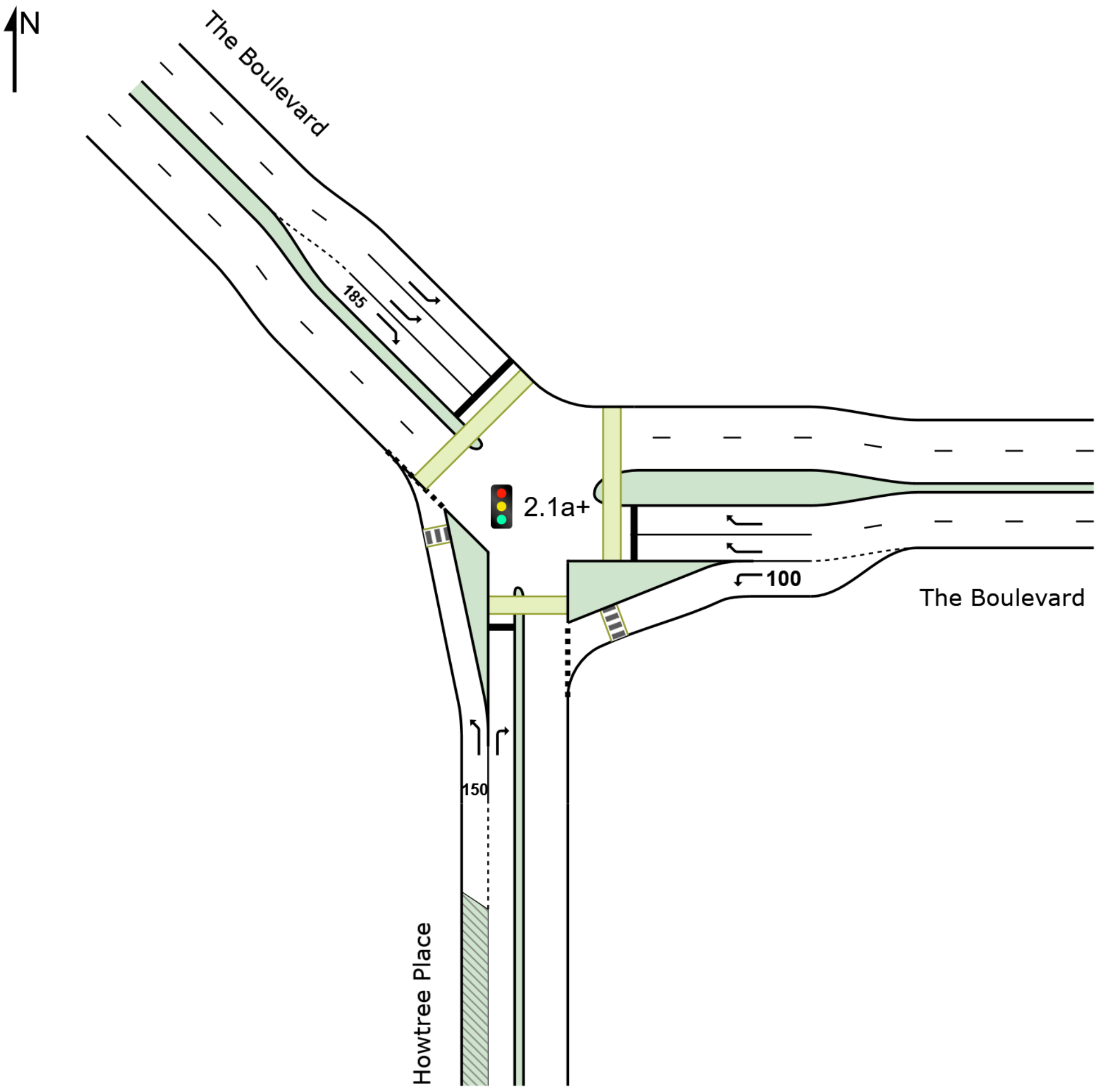
Site: 2.1a+ [2.1a+ Howtree Place & The Boulevard 2041 AM - With Development (Site Folder: With Development 2041)]

2.1a+ Howtree Place & The Boulevard 2041 AM
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 70 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Site Layout

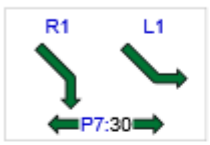
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

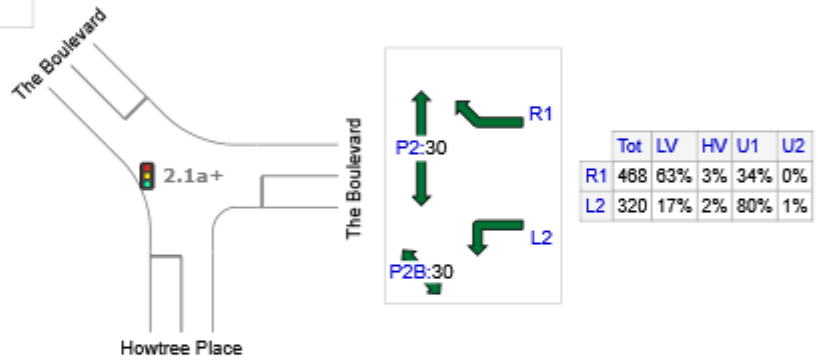


Input Volumes

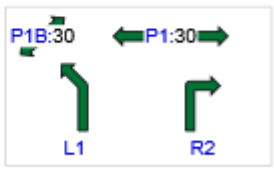
Volume Display Method: Total and %

	R1	L1
Tot	540	652
LV	75%	80%
HV	3%	3%
U1	22%	17%
U2	0%	0%





	Tot	LV	HV	U1	U2
R1	468	63%	3%	34%	0%
L2	320	17%	2%	80%	1%



	L1	R2
Tot	384	236
LV	57%	50%
HV	2%	2%
U1	40%	47%
U2	1%	1%

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Development LV (U1)	Development HV (U2)
S: Howtree Place	620	336	11	265	8
E: The Boulevard	788	347	18	417	6
NW: The Boulevard	1192	926	33	230	3
Total	2600	1610	61	912	17

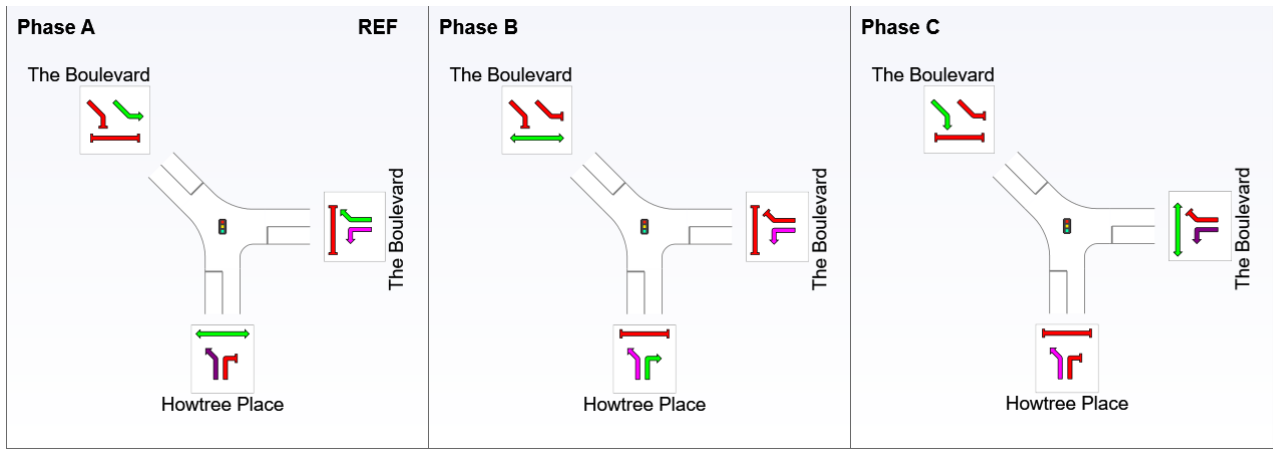
Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Howtree Place													
Lane 1	404	3.0	962	0.420	100	7.3	LOS A	4.1	31.2	Short (P)	150	0.0	NA
Lane 2	248	3.0	304	0.818	100	41.9	LOS D	9.4	71.6	Full	175	0.0	0.0
Approach	653	3.0		0.818		20.5	LOS C	9.4	71.6				
East: The Boulevard													
Lane 1	337	3.0	1068	0.315	100	13.3	LOS B	5.7	43.2	Short	100	0.0	NA
Lane 2	244	3.0	391	0.625	100	32.7	LOS C	7.9	60.0	Full	120	0.0	0.0
Lane 3	248	3.0	397	0.625	100	32.6	LOS C	8.0	60.9	Full	120	0.0	0.0
Approach	829	3.0		0.625		24.8	LOS C	8.0	60.9				
NorthWest: The Boulevard													
Lane 1	343	3.0	391	0.878	100	43.6	LOS D	14.0	106.0	Full	213	0.0	0.0
Lane 2	343	3.0	391	0.878	100	43.6	LOS D	14.0	106.0	Full	213	0.0	0.0
Lane 3	568	3.0	651	0.873	100	37.3	LOS D	22.5	170.8	Short	185	0.0	NA
Approach	1255	3.0		0.878		40.7	LOS D	22.5	170.8				
Intersection	2737	3.0		0.878		31.1	LOS C	22.5	170.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Input Phase Sequence

Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C



REF: Reference Phase
VAR: Variable Phase



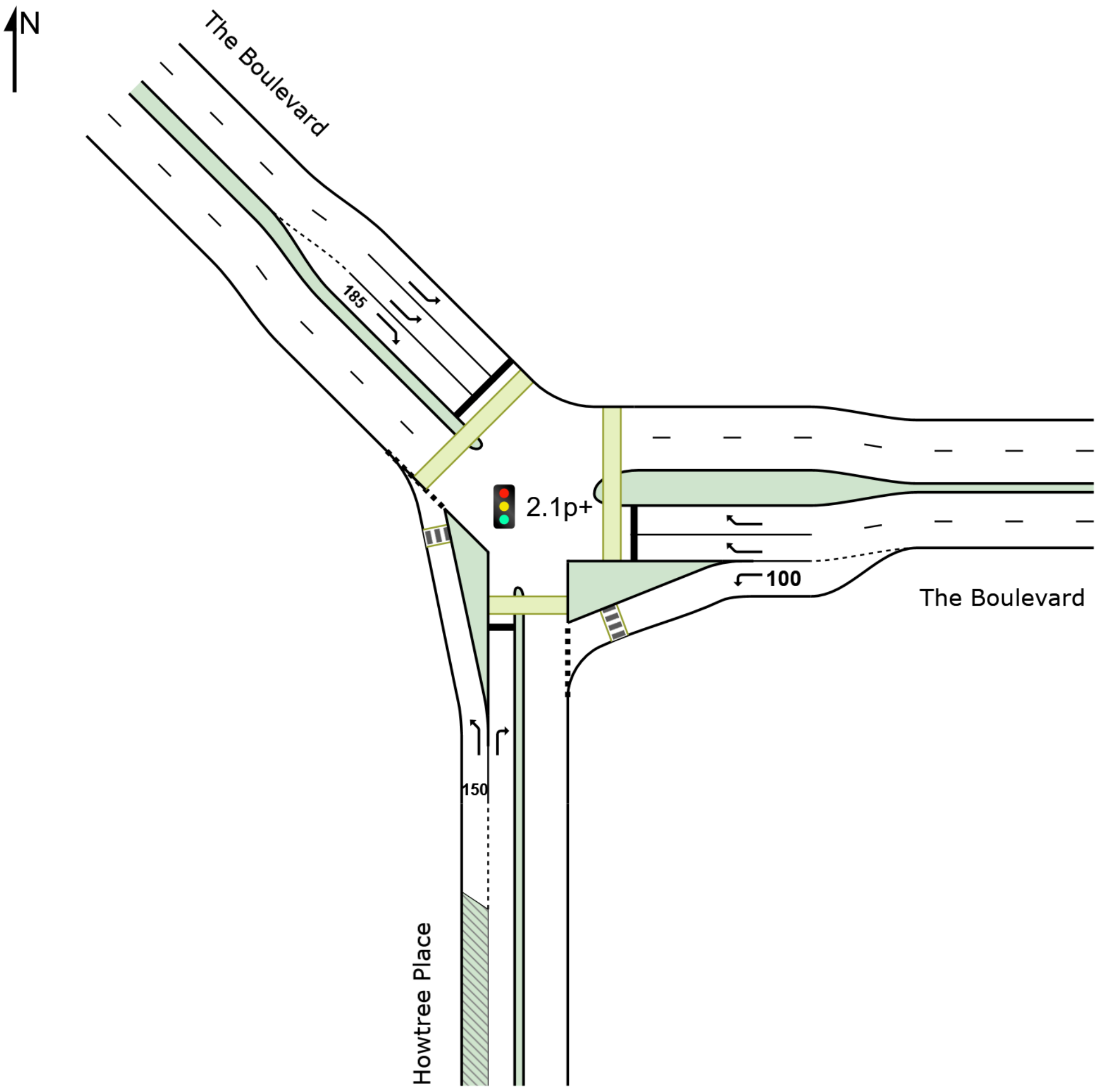
Site: 2.1p+ [2.1p+ Howtree Place & The Boulevard 2041 PM - With Development (Site Folder: With Development 2041)]

2.1p+ Howtree Place & The Boulevard 2041 PM
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Site Layout

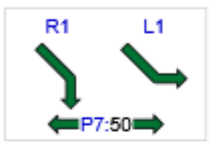
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

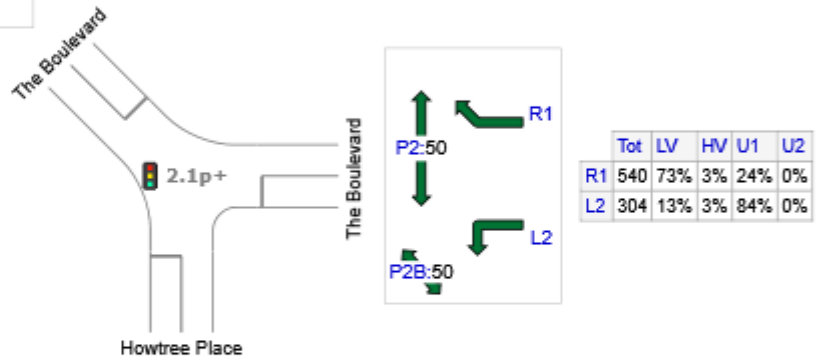


Input Volumes

Volume Display Method: Total and %

	R1	L1
Tot	512	360
LV	75%	70%
HV	3%	3%
U1	22%	28%
U2	0%	0%





	Tot	LV	HV	U1	U2
R1	540	73%	3%	24%	0%
L2	304	13%	3%	84%	0%

	L1	R2
Tot	440	284
LV	55%	62%
HV	2%	2%
U1	42%	35%
U2	1%	1%

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Development LV (U1)	Development HV (U2)
S: Howtree Place	724	417	14	285	8
E: The Boulevard	844	433	24	386	1
NW: The Boulevard	872	634	25	212	1
Total	2440	1484	63	883	10

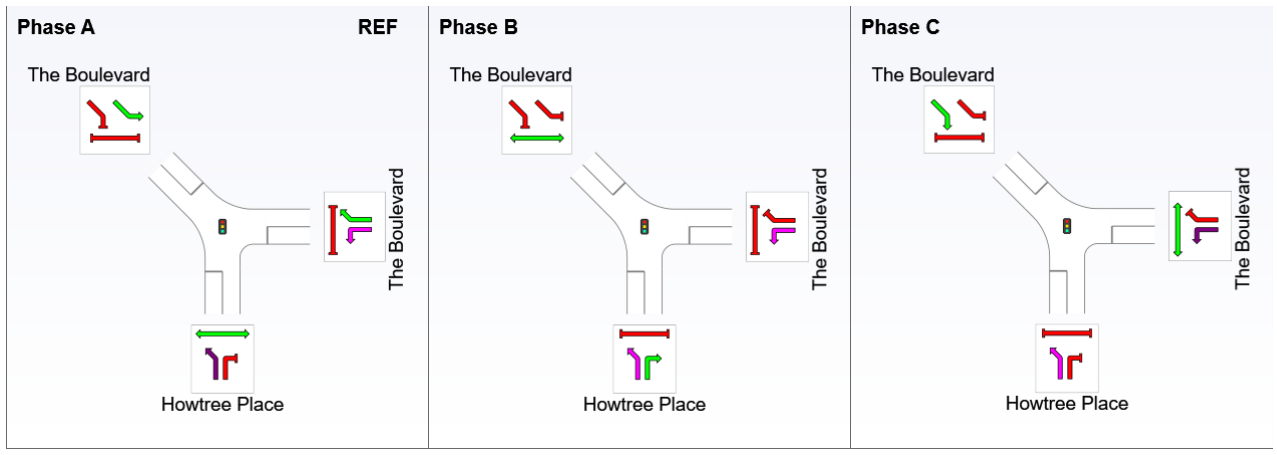
Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Howtree Place													
Lane 1	463	3.0	955	0.485	100	7.6	LOS A	4.3	32.7	Short (P)	150	0.0	NA
Lane 2	299	3.0	325	0.921	100	47.0	LOS D	11.7	88.5	Full	175	0.0	0.0
Approach	762	3.0		0.921		23.1	LOS C	11.7	88.5				
East: The Boulevard													
Lane 1	320	3.0	1077	0.297	100	11.9	LOS B	4.5	34.1	Short	100	0.0	NA
Lane 2	282	3.0	334	0.843	100	37.2	LOS D	9.6	72.4	Full	120	0.0	0.0
Lane 3	286	3.0	340	0.843	100	37.1	LOS D	9.7	73.4	Full	120	0.0	0.0
Approach	888	3.0		0.843		28.1	LOS C	9.7	73.4				
NorthWest: The Boulevard													
Lane 1	189	3.0	334	0.567	100	29.9	LOS C	5.3	40.4	Full	213	0.0	0.0
Lane 2	189	3.0	334	0.567	100	29.9	LOS C	5.3	40.4	Full	213	0.0	0.0
Lane 3	539	3.0	608	0.886	100	36.6	LOS D	19.5	148.0	Short	185	0.0	NA
Approach	918	3.0		0.886		33.8	LOS C	19.5	148.0				
Intersection	2568	3.0		0.921		28.6	LOS C	19.5	148.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Input Phase Sequence

Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C



REF: Reference Phase
VAR: Variable Phase



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USER REPORT FOR SITE

All Movement Classes

Project: KC01446.000 M02 Howtree Place - Brookdale Street - Oceanic Drive **Template: Signalised**

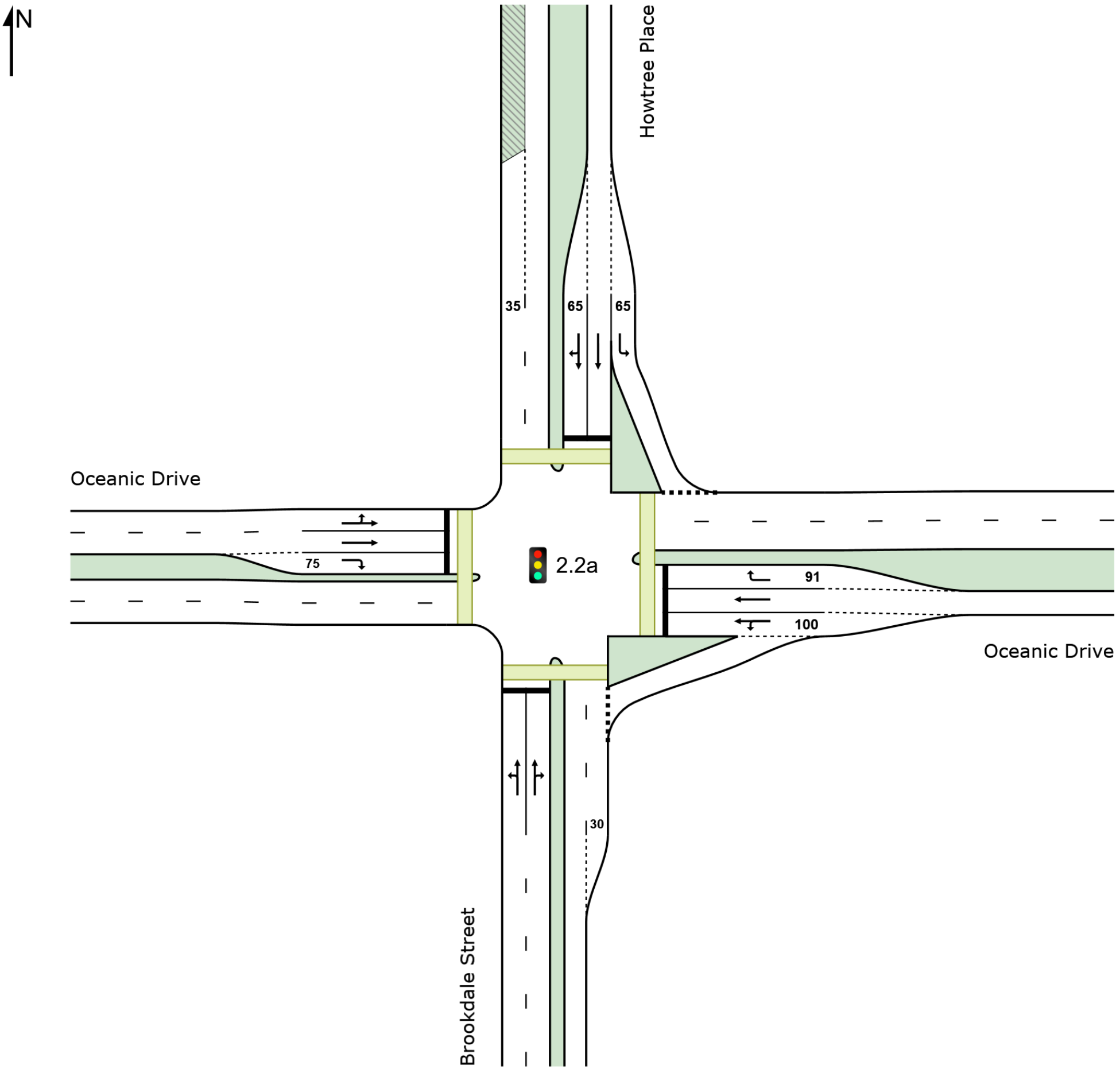
Site: 2.2a [2.2a Howtree Place & Brookdale Street & Oceanic Drive 2041 AM - No Development (Site Folder: No Development 2041)]

2.2a Howtree Place & Brookdale Street & Oceanic Drive 2041 AM - No Development
Site Category: -
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Practical Cycle Time)

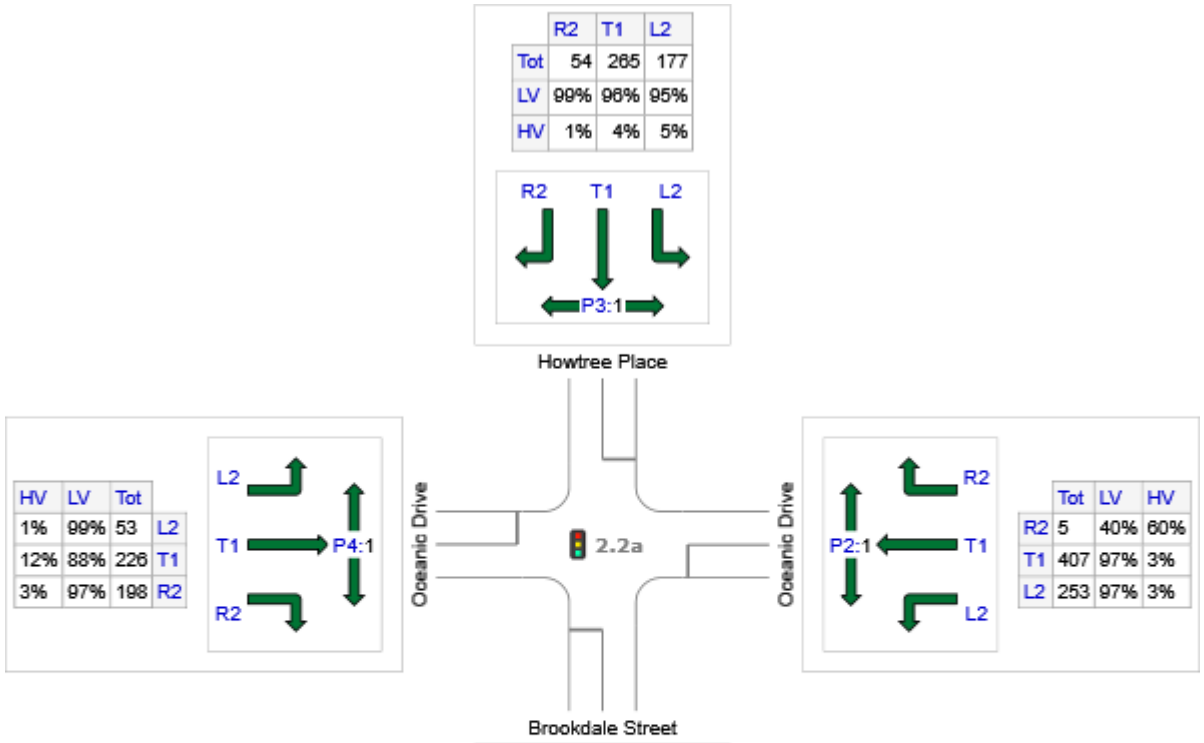
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



OD Demand Flows



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Brookdale Street	645	623	22
E: Oceanic Drive	665	641	25
N: Howtree Place	496	477	19
W: Oceanic Drive	477	444	33
Total	2283	2185	98

Lane Use and Performance

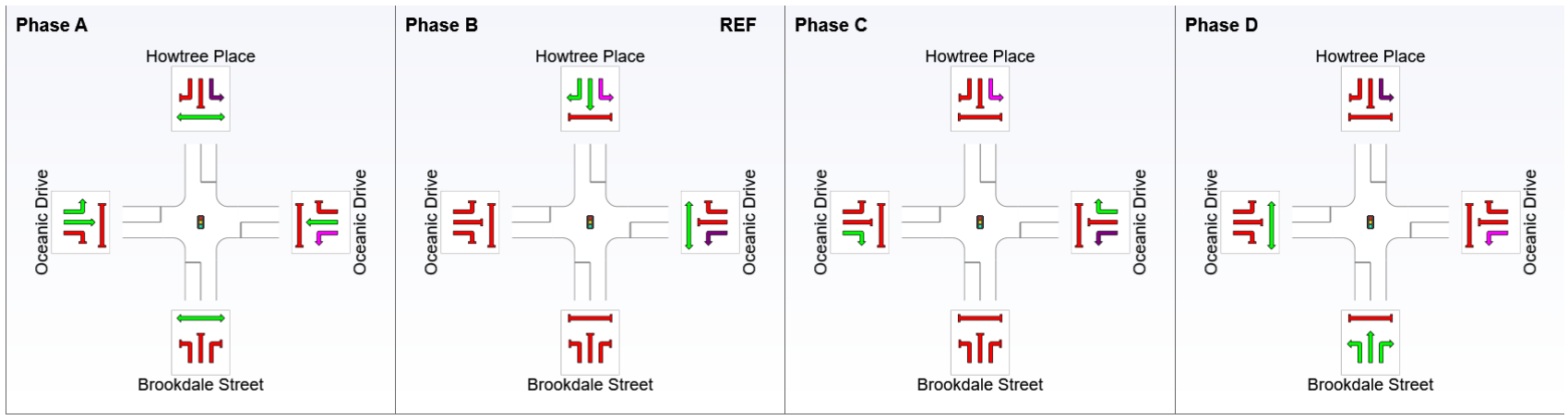
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Brookdale Street													
Lane 1	215	3.0	480	0.448	51[5]	35.2	LOS D	8.0	60.5	Full	80	0.0	0.0
Lane 2	431	3.6	488	0.882	100	48.1	LOS D	21.8	166.4	Full	80	0.0	73.1
Approach	645	3.4		0.882		43.8	LOS D	21.8	166.4				
East: Oceanic Drive													
Lane 1	407	3.3	541	0.753	100	21.3	LOS C	9.8	74.6	Short	100	0.0	NA
Lane 2	253	3.2	336	0.753	100	41.3	LOS D	11.4	86.2	Full	110	0.0	0.0
Lane 3	5	60.0	150	0.035	100	44.0	LOS D	0.2	2.5	Short	91	0.0	NA
Approach	665	3.7		0.753		29.1	LOS C	11.4	86.2				
North: Howtree Place													
Lane 1	177	4.8	1076	0.164	100	9.6	LOS A	2.3	17.9	Short	65	0.0	NA
Lane 2	67	3.5	293	0.230	27[6]	37.7	LOS D	2.7	20.3	Full	175	0.0	0.0
Lane 3	252	3.1	291	0.864	100	50.3	LOS D	12.6	95.2	Short	65	0.0	NA
Approach	496	3.7		0.864		34.1	LOS C	12.6	95.2				
West: Oceanic Drive													
Lane 1	141	7.8	311	0.453	100	39.0	LOS D	5.7	45.3	Full	190	0.0	0.0
Lane 2	138	11.7	305	0.453	100	36.8	LOS D	5.6	46.3	Full	190	0.0	0.0
Lane 3	198	3.0	236	0.838	100	54.3	LOS D	9.7	73.5	Short	75	0.0	NA
Approach	477	6.9		0.838		44.7	LOS D	9.7	73.5				
Intersection	2283	4.3		0.882		37.6	LOS D	21.8	166.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects

Input Phase Sequence

Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C, D



REF: Reference Phase
VAR: Variable Phase



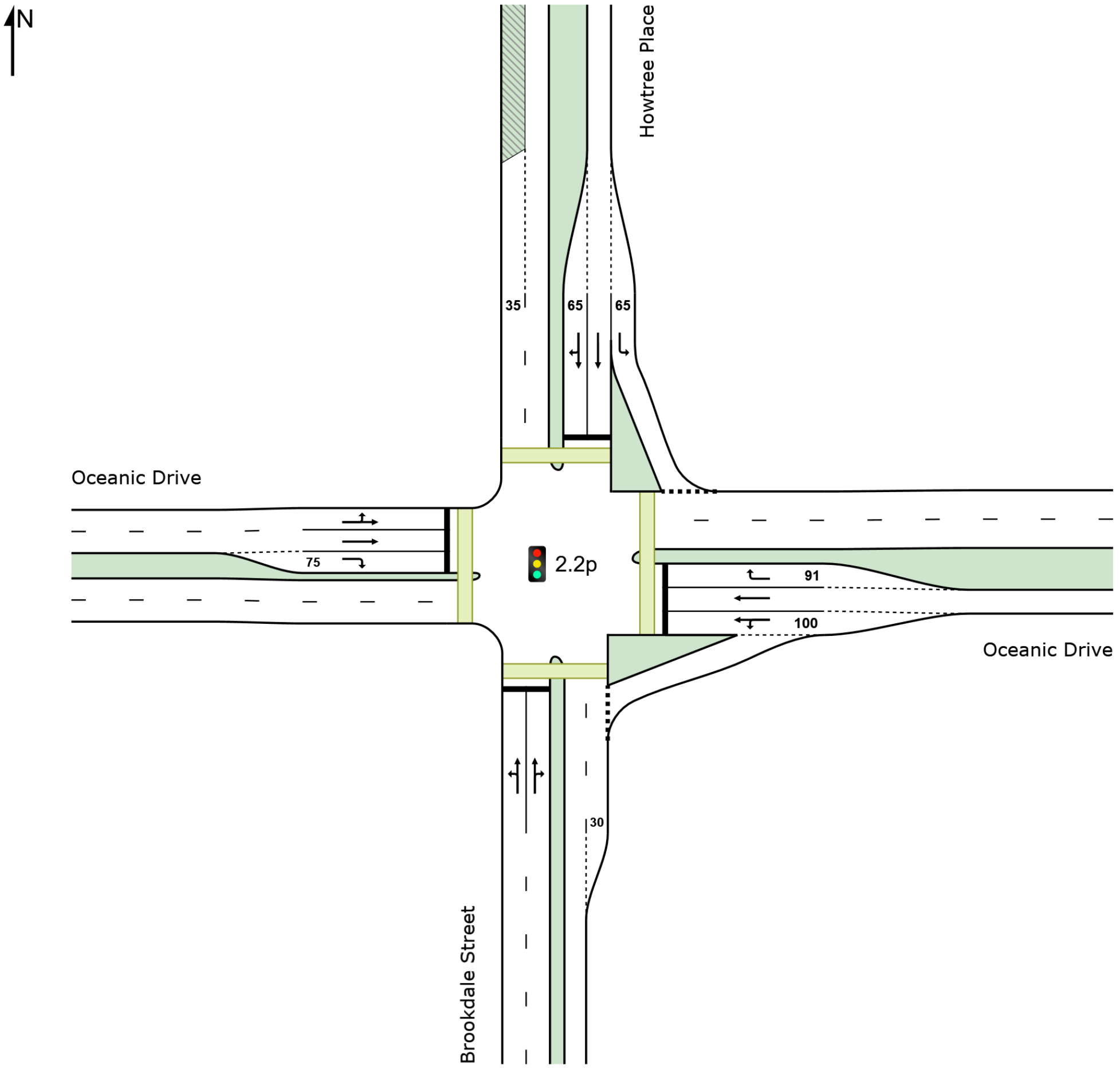
Site: 2.2p [2.2p Howtree Place & Brookdale Street & Oceanic Drive 2041 PM - No Development (Site Folder: No Development 2041)]

2.2p Howtree Place & Brookdale Street & Oceanic Drive 2041 PM - No Development
Site Category: -
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site Practical Cycle Time)

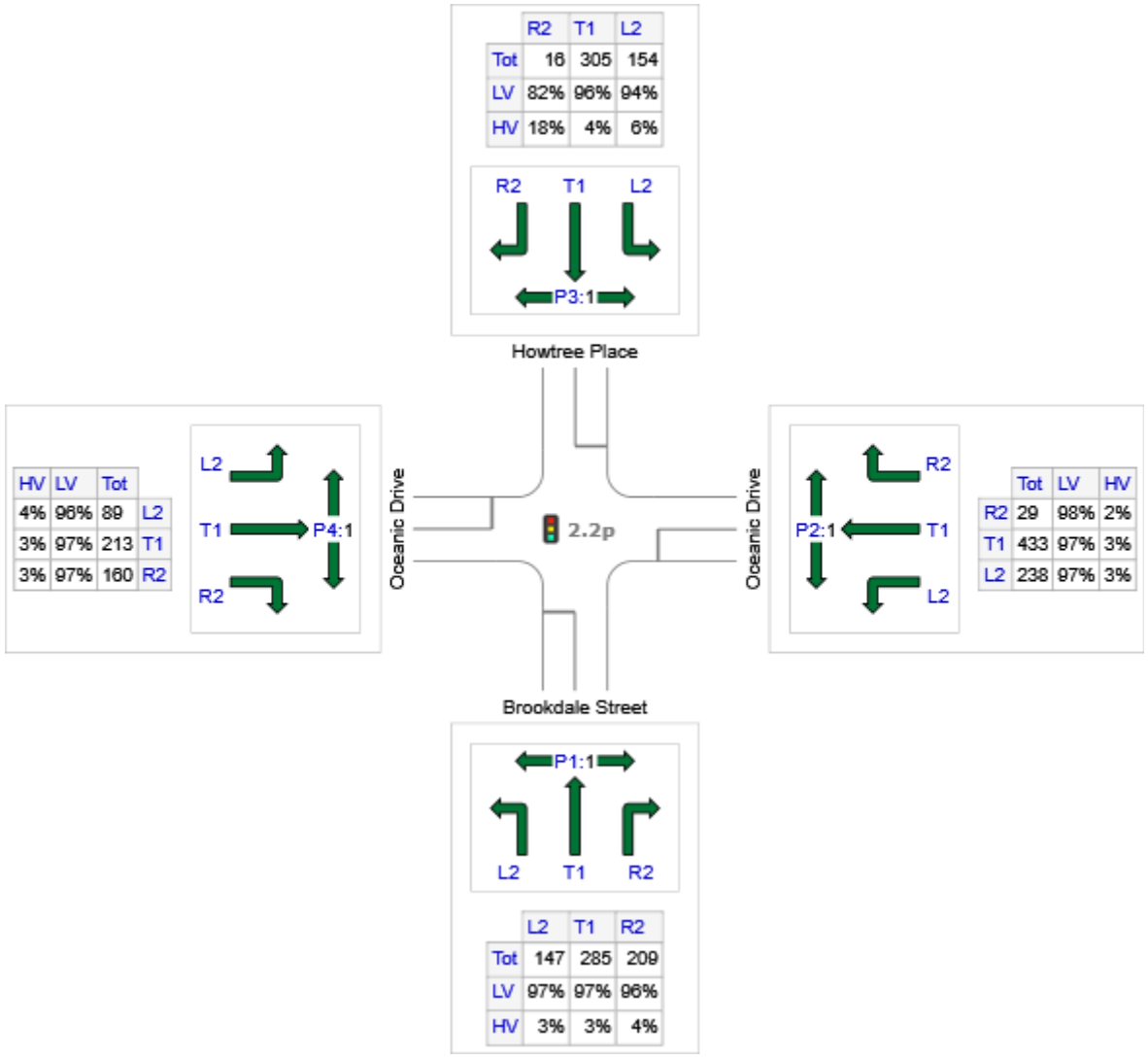
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



OD Demand Flows



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Brookdale Street	642	621	21
E: Oceanic Drive	700	678	22
N: Howtree Place	475	452	23
W: Oceanic Drive	462	447	16
Total	2279	2197	81

Lane Use and Performance

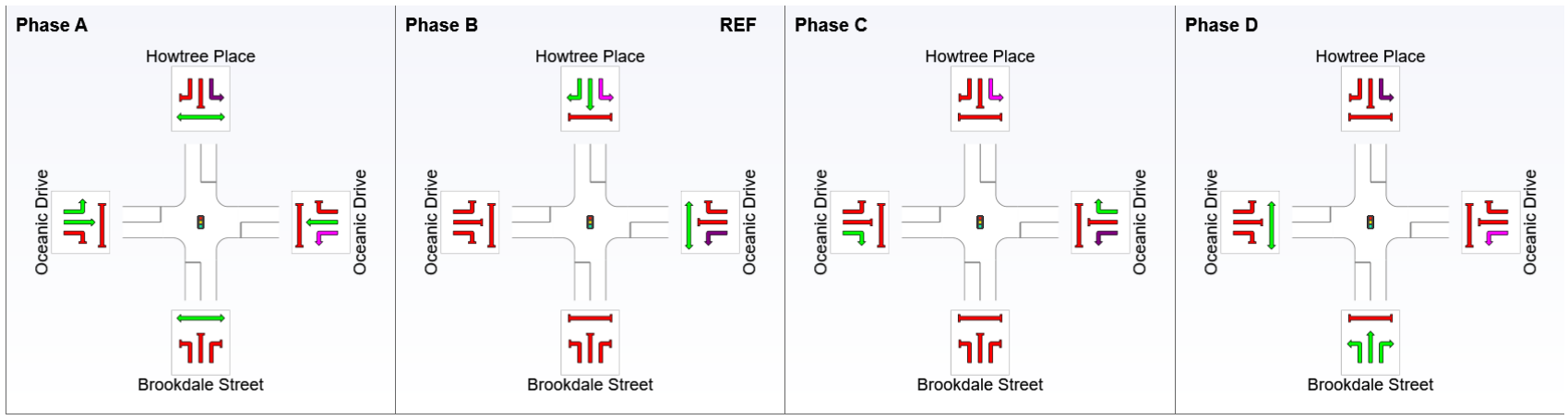
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Brookdale Street													
Lane 1	147	3.0	558	0.264	31[5]	33.1	LOS C	5.4	41.1	Full	80	0.0	0.0
Lane 2	495	3.3	572	0.864	100	46.2	LOS D	26.3	199.8	Full	80	0.0	91.1
Approach	642	3.2		0.864		43.2	LOS D	26.3	199.8				
East: Oceanic Drive													
Lane 1	398	3.3	523	0.760	100	23.7	LOS C	11.0	83.7	Short	100	0.0	NA
Lane 2	273	3.1	359	0.760	100	44.7	LOS D	13.5	102.2	Full	110	0.0	0.0
Lane 3	29	1.9	182	0.162	100	51.6	LOS D	1.4	10.2	Short	91	0.0	NA
Approach	700	3.2		0.760		33.0	LOS C	13.5	102.2				
North: Howtree Place													
Lane 1	154	5.7	1064	0.144	100	9.4	LOS A	2.1	16.0	Short	65	0.0	NA
Lane 2	68	3.7	301	0.226	27[6]	41.2	LOS D	3.0	22.6	Full	175	0.0	0.0
Lane 3	253	4.6	297	0.852	100	52.7	LOS D	13.7	105.3	Short	65	0.0	NA
Approach	475	4.8		0.852		37.0	LOS D	13.7	105.3				
West: Oceanic Drive													
Lane 1	148	3.8	340	0.436	100	43.1	LOS D	6.5	50.0	Full	190	0.0	0.0
Lane 2	154	3.3	353	0.436	100	39.3	LOS D	6.8	51.5	Full	190	0.0	0.0
Lane 3	160	3.0	177	0.903	100	67.3	LOS E	9.3	70.3	Short	75	0.0	NA
Approach	462	3.4		0.903		50.2	LOS D	9.3	70.3				
Intersection	2279	3.6		0.903		40.2	LOS D	26.3	199.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects

Input Phase Sequence

Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C, D



REF: Reference Phase
VAR: Variable Phase



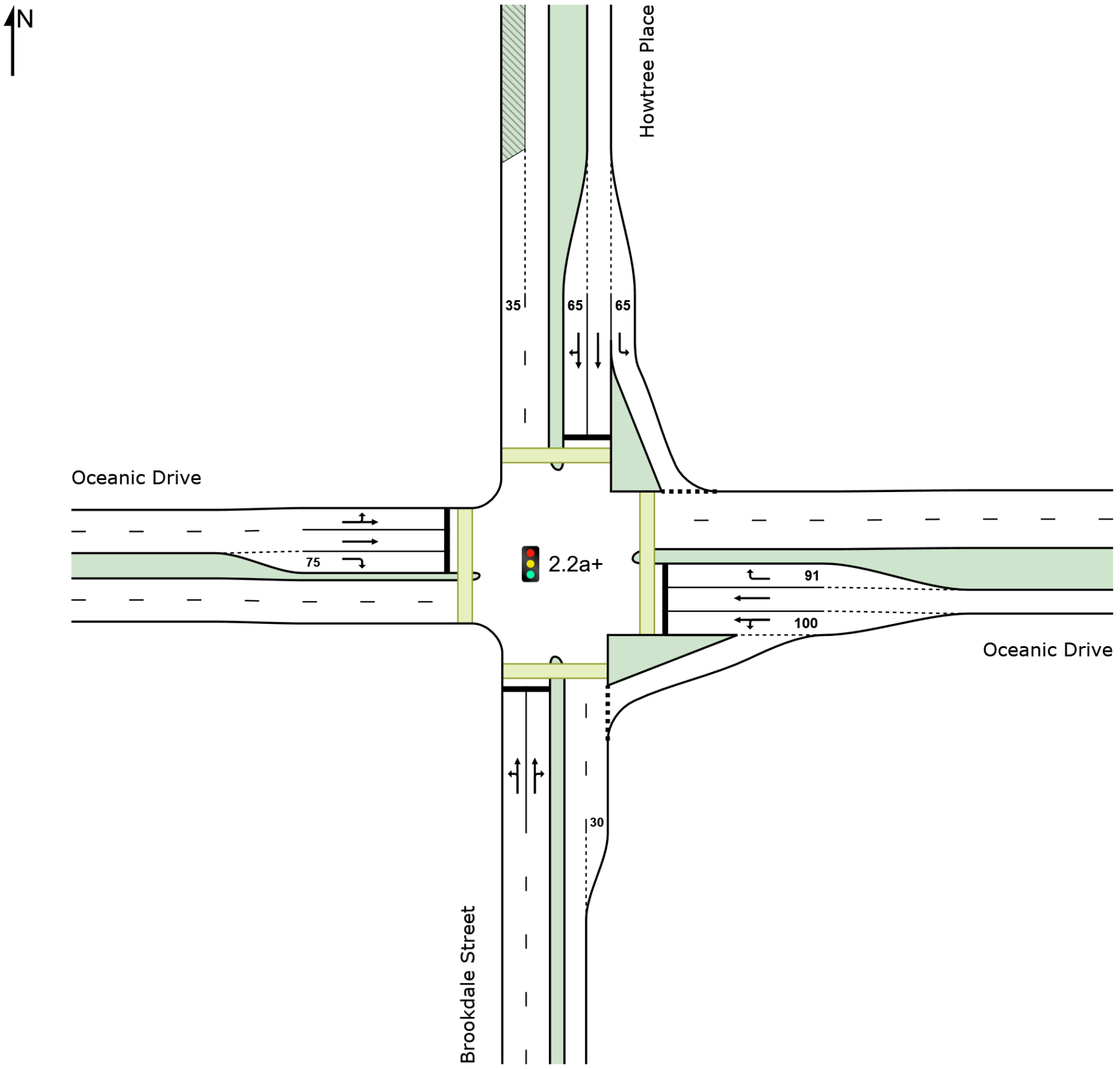
Site: 2.2a+ [2.2a+ Howtree Place & Brookdale Street & Oceanic Drive 2041 AM - With Development (Site Folder: With Development 2041)]

2.2a+ Howtree Place & Brookdale Street & Oceanic Drive 2041 AM
Site Category: -
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

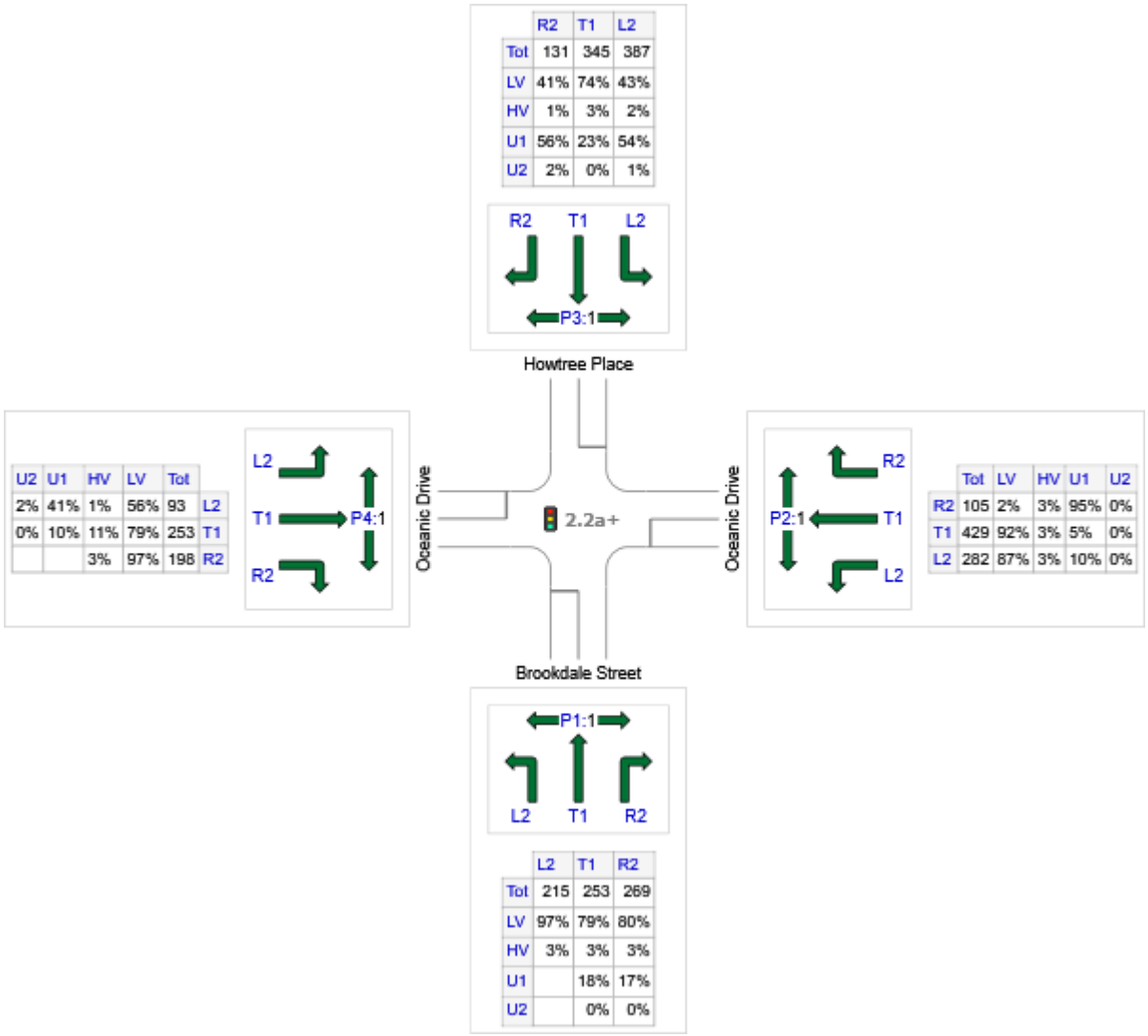
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



OD Demand Flows



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Development LV (U1)	Development HV (U2)
S: Brookdale Street	737	623	22	92	0
E: Oceanic Drive	817	641	25	152	0
N: Howtree Place	863	477	19	360	7
W: Oceanic Drive	543	444	33	64	2
Total	2960	2185	98	667	9

Lane Use and Performance

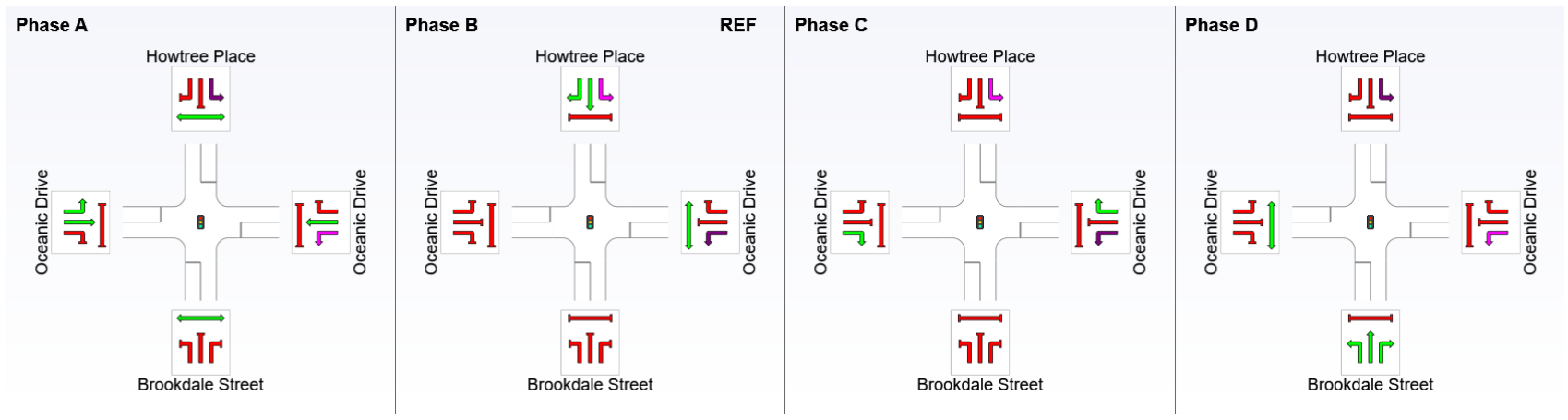
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Brookdale Street													
Lane 1	215	3.0	540	0.398	42[5]	49.7	LOS D	12.4	94.0	Full	80	0.0	19.6
Lane 2	522	3.0	553	0.944	100	82.6	LOS F	46.0	348.8	Full	80	0.0	100.0
Approach	737	3.0		0.944		73.0	LOS E	46.0	348.8				
East: Oceanic Drive													
Lane 1	418	3.0	504	0.830	100	38.2	LOS D	19.0	144.0	Short	100	0.0	NA
Lane 2	293	3.0	353	0.830	100	69.1	LOS E	22.1	167.5	Full	110	0.0	43.5
Lane 3	105	3.0	216	0.488	100	73.5	LOS E	7.4	55.8	Short	91	0.0	NA
Approach	817	3.0		0.830		53.9	LOS D	22.1	167.5				
North: Howtree Place													
Lane 1	387	3.0	1089	0.356	100	14.2	LOS B	11.0	83.4	Short	65	0.0	NA
Lane 2	111	3.0	442	0.252	27[6]	51.2	LOS D	6.6	50.0	Full	175	0.0	34.8[8]
Lane 3	364	3.0	384[1]	0.948	100	88.9	LOS F	32.0	242.7	Short	65	0.0	NA
Approach	863	3.0		0.948		50.5	LOS D	32.0	242.7				
West: Oceanic Drive													
Lane 1	174	6.5	328	0.530	100	63.1	LOS E	11.6	90.7	Full	190	0.0	0.0
Lane 2	172	10.5	324	0.530	100	59.8	LOS E	11.5	93.4	Full	190	0.0	0.0
Lane 3	198	3.0	213	0.931	100	96.7	LOS F	17.1	129.6	Short	75	0.0	NA
Approach	543	6.5		0.931		74.3	LOS E	17.1	129.6				
Intersection	2960	3.6		0.948		61.4	LOS E	46.0	348.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects
8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.

Input Phase Sequence

Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C, D



REF: Reference Phase
VAR: Variable Phase



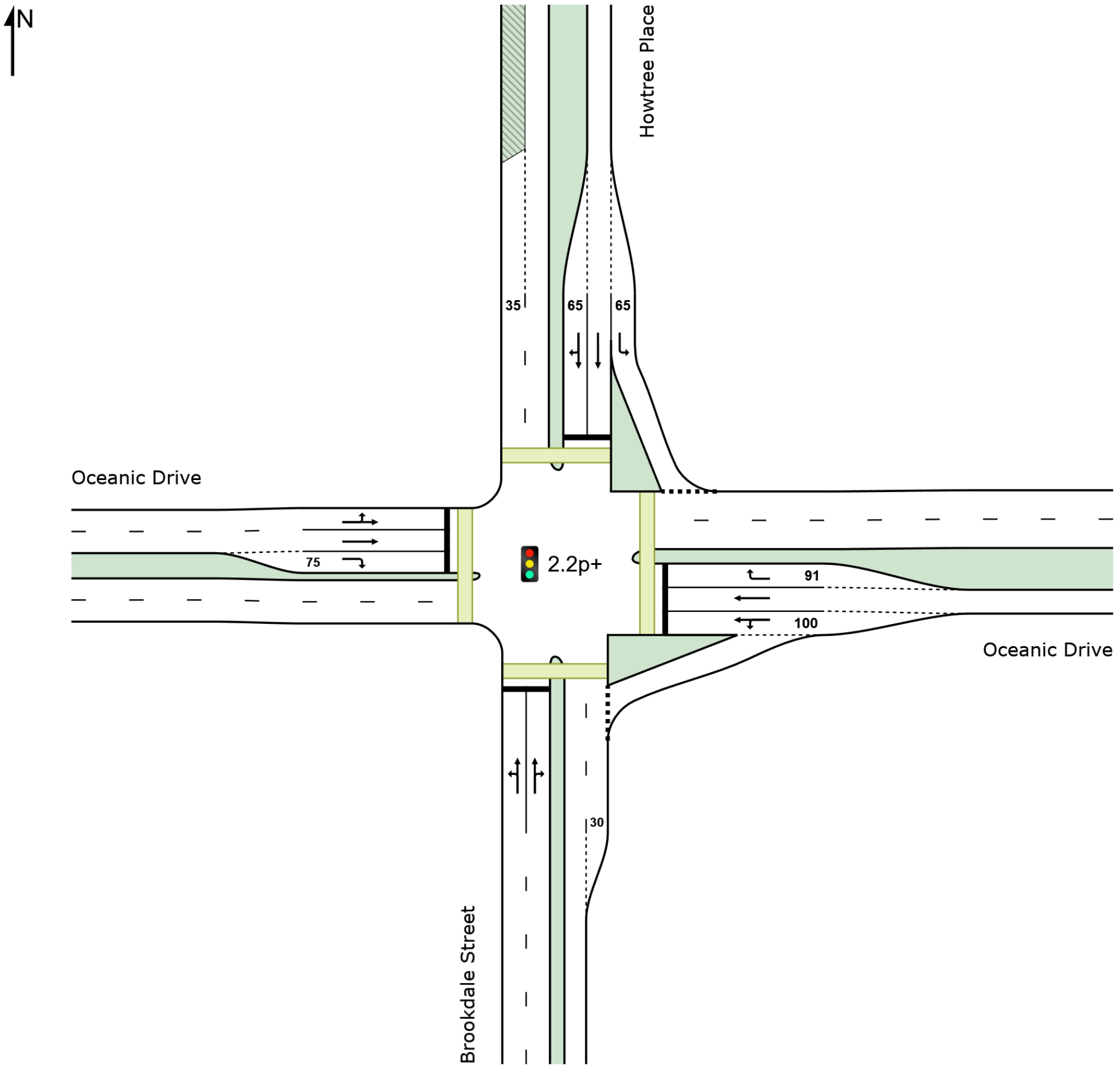
Site: 2.2p+ [2.2p+ Howtree Place & Brookdale Street & Oceanic Drive 2041 PM - With Development (Site Folder: With Development 2041)]

2.2p+ Howtree Place & Brookdale Street & Oceanic Drive 2041 PM
Site Category: -
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

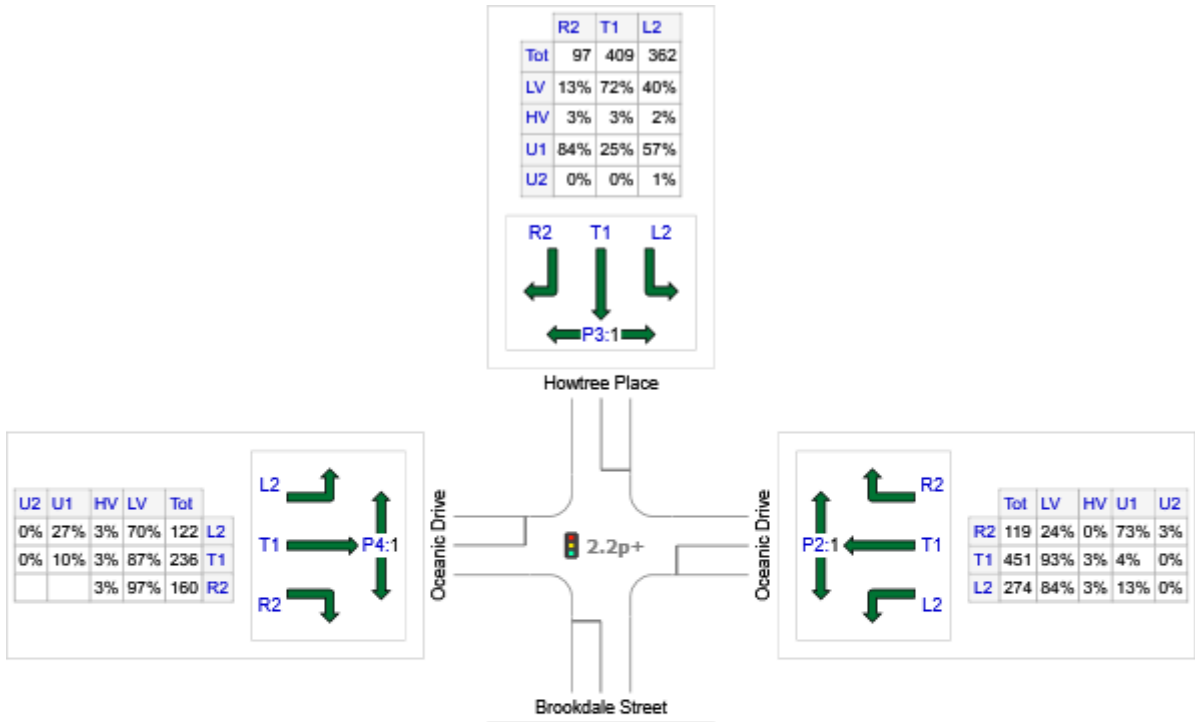
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



OD Demand Flows



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Development LV (U1)	Development HV (U2)
S: Brookdale Street	728	621	21	85	1
E: Oceanic Drive	843	678	22	140	3
N: Howtree Place	868	452	23	391	3
W: Oceanic Drive	518	447	16	56	0
Total	2958	2197	81	672	7

Lane Use and Performance

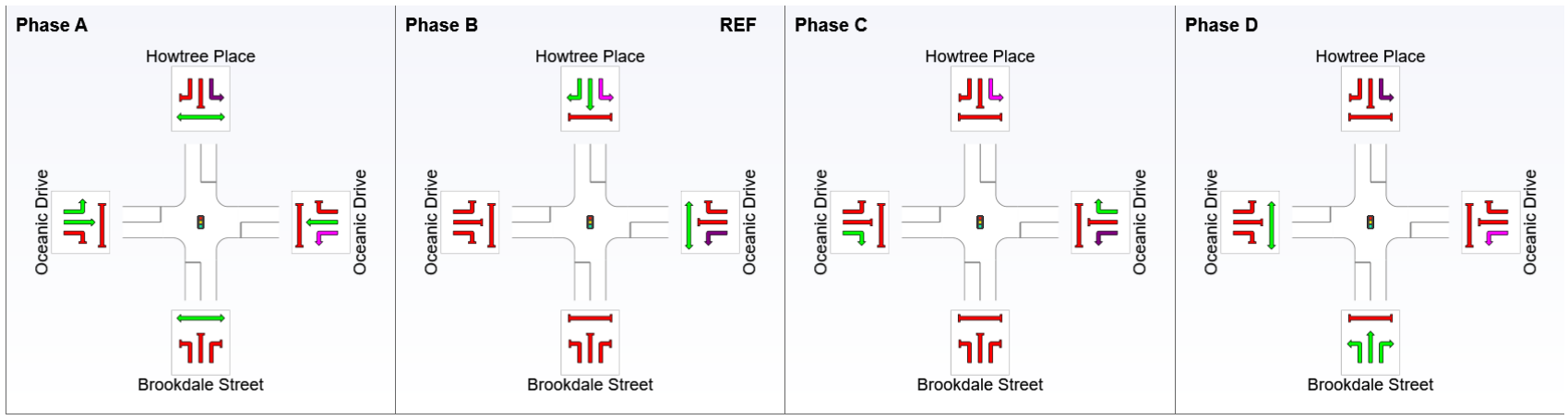
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Brookdale Street													
Lane 1	158	3.0	566	0.280	28[6]	46.1	LOS D	8.6	65.4	Full	80	0.0	0.0
Lane 2	570	3.0	580	0.983	100	98.5	LOS F	55.5	420.9	Full	80	0.0	100.0
Approach	728	3.0		0.983		87.1	LOS F	55.5	420.9				
East: Oceanic Drive													
Lane 1	422	3.0	487	0.867	100	47.2	LOS D	22.4	169.6	Short	100	0.0	NA
Lane 2	302	3.0	349[1]	0.867	100	72.9	LOS E	23.6	179.0	Full	110	0.0	49.7
Lane 3	119	3.1	168	0.709	100	80.6	LOS F	8.9	67.5	Short	91	0.0	NA
Approach	843	3.0		0.867		61.1	LOS E	23.6	179.0				
North: Howtree Place													
Lane 1	362	3.0	1092	0.331	100	13.5	LOS B	9.7	73.5	Short	65	0.0	NA
Lane 2	119	3.0	467	0.255	27[6]	49.7	LOS D	6.9	52.6	Full	175	0.0	42.3[8]
Lane 3	387	3.0	404[1]	0.958	100	90.9	LOS F	34.7	263.0	Short	65	0.0	NA
Approach	868	3.0		0.958		53.0	LOS D	34.7	263.0				
West: Oceanic Drive													
Lane 1	176	3.0	336	0.524	100	64.2	LOS E	11.7	88.6	Full	190	0.0	0.0
Lane 2	182	3.0	348	0.524	100	59.6	LOS E	12.1	91.7	Full	190	0.0	0.0
Lane 3	160	3.0	165	0.968	100	109.2	LOS F	14.7	111.1	Short	75	0.0	NA
Approach	518	3.0		0.968		76.5	LOS E	14.7	111.1				
Intersection	2958	3.0		0.983		67.8	LOS E	55.5	420.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects
8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.

Input Phase Sequence

Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C, D



REF: Reference Phase
VAR: Variable Phase



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Project: C:\Users\Nemanja\Box\KCTT Projects\KC00000 Current Projects\KC01446.000 Floreat Forum - Transport Study\Outgoing\SIDRA\Future Models\KC01446.000 M02 Howtree Place - Brookdale Street - Oceanic Drive.sip9

USER REPORT FOR SITE

All Movement Classes

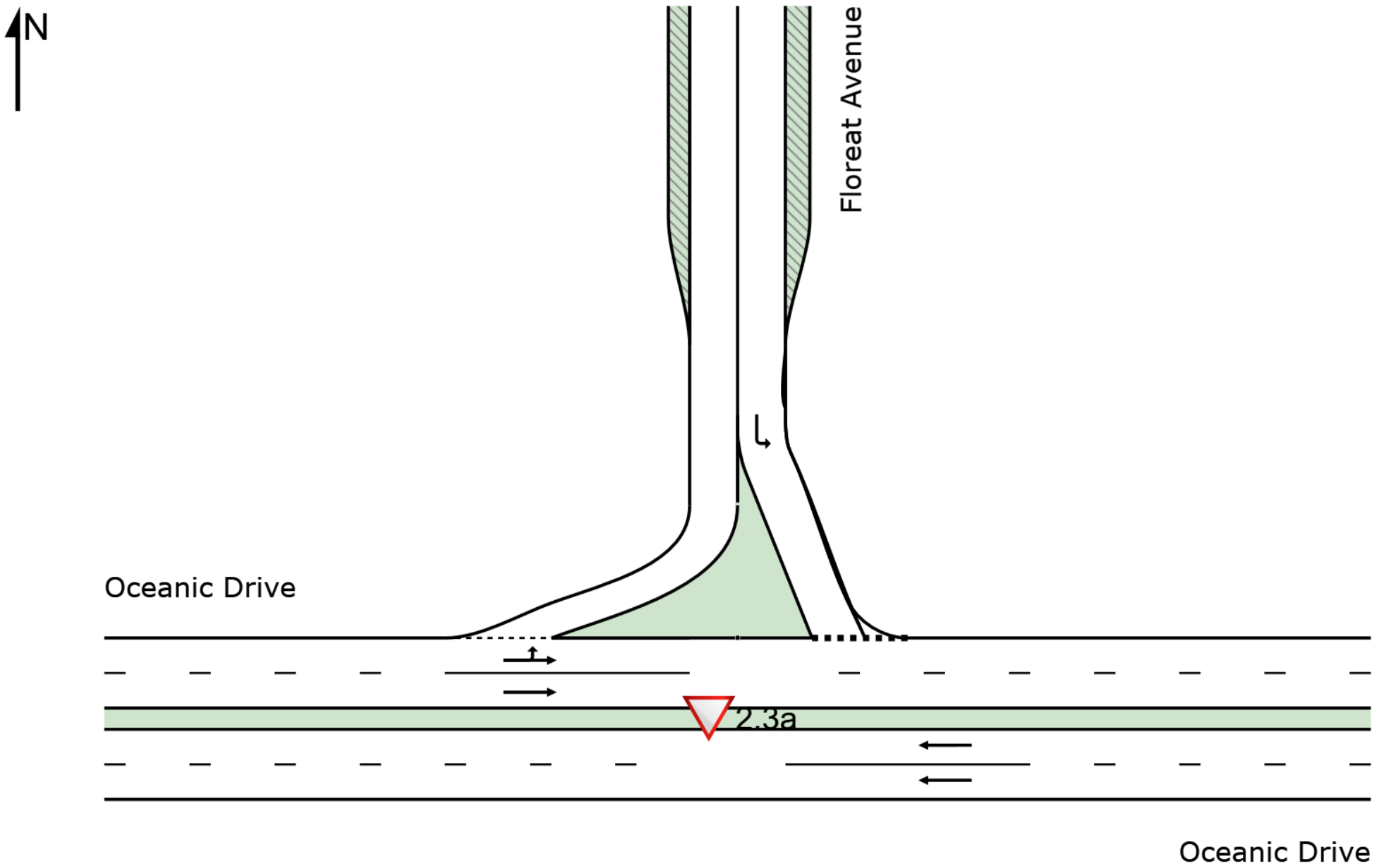
Project: KC01446.000 M03 Floreat Avenue - Oceanic Drive **Template: Single Site User Report**

Site: 2.3a [2.3a Floreat Avenue & Oceanic Drive 2041 AM - No Development (Site Folder: No Development - 2041)]

2.3a Floreat Avenue & Oceanic Drive 2041 AM - No Development
Site Category: (None)
Give-Way (Two-Way)

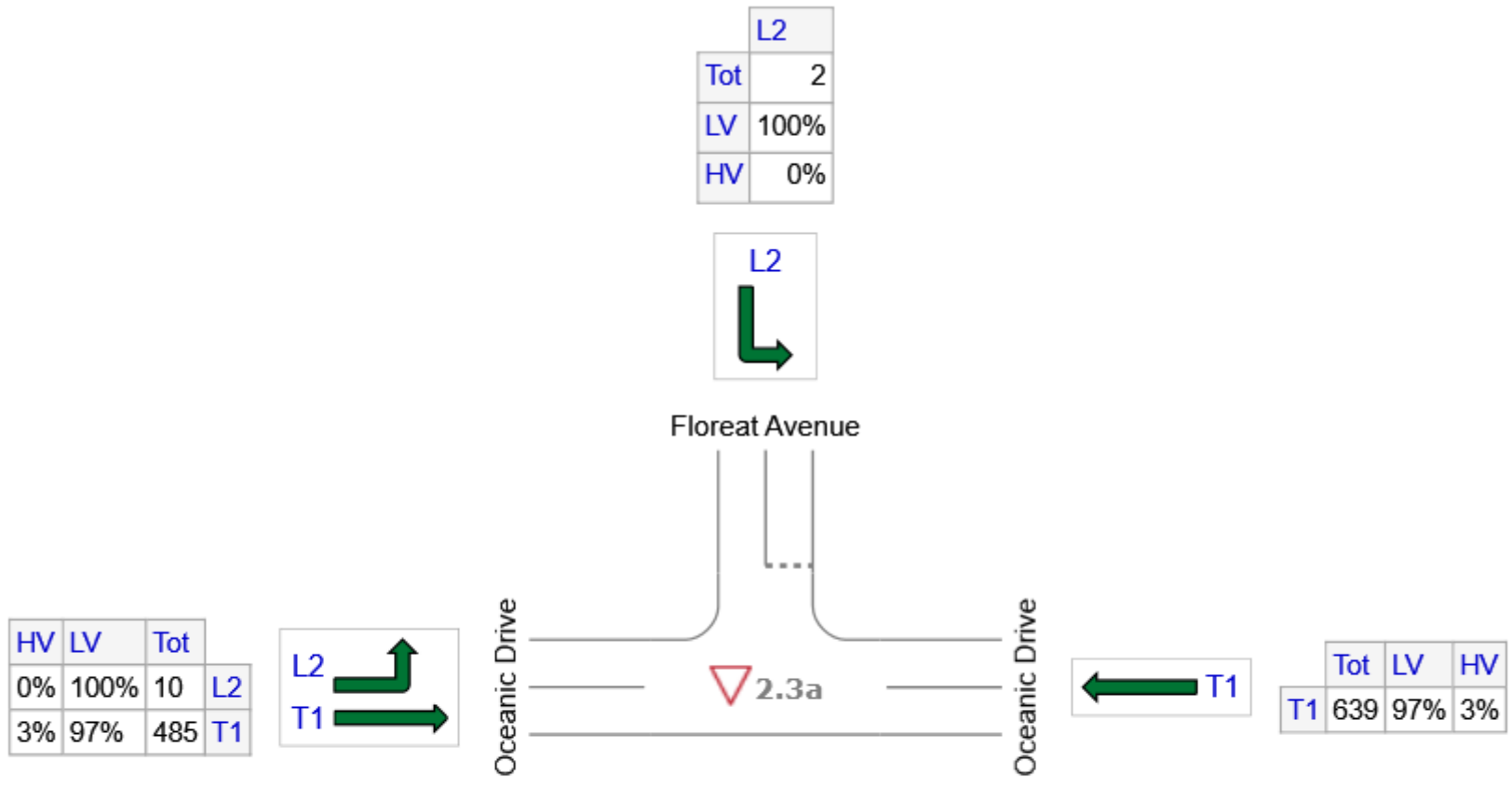
Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
E: Oceanic Drive	639	621	18
N: Floreat Avenue	2	2	0
W: Oceanic Drive	495	480	15
Total	1136	1103	33

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Oceanic Drive														
5	T1	639	2.8	673	2.8	0.177	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		639	2.8	673	2.8	0.177	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
North: Floreat Avenue														
7	L2	2	0.0	2	0.0	0.002	5.4	LOS A	0.0	0.1	0.32	0.48	0.32	31.5
Approach		2	0.0	2	0.0	0.002	5.4	LOS A	0.0	0.1	0.32	0.48	0.32	31.5
West: Oceanic Drive														
10	L2	10	0.0	11	0.0	0.138	3.7	LOS A	0.0	0.0	0.00	0.02	0.00	32.6
11	T1	485	3.1	511	3.1	0.138	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.3
Approach		495	3.0	521	3.0	0.138	0.1	NA	0.0	0.0	0.00	0.01	0.00	58.3
All Vehicles		1136	2.9	1196	2.9	0.177	0.0	NA	0.0	0.1	0.00	0.01	0.00	59.1

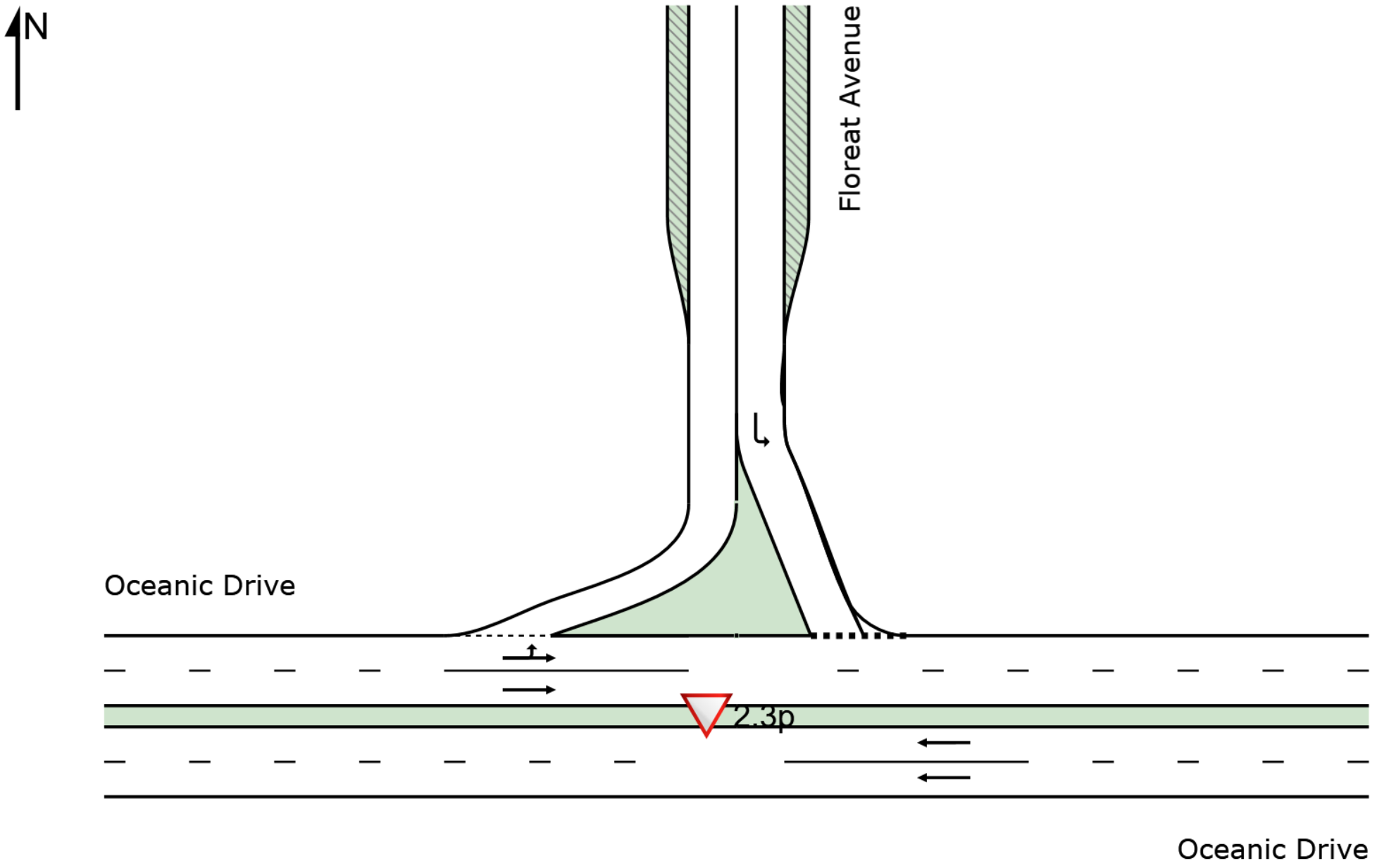
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and 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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site: 2.3p [2.3p Floreat Avenue & Oceanic Drive 2041 PM - No Development (Site Folder: No Development - 2041)]

2.3p Floreat Avenue & Oceanic Drive 2041 PM - No Development
Site Category: (None)
Give-Way (Two-Way)

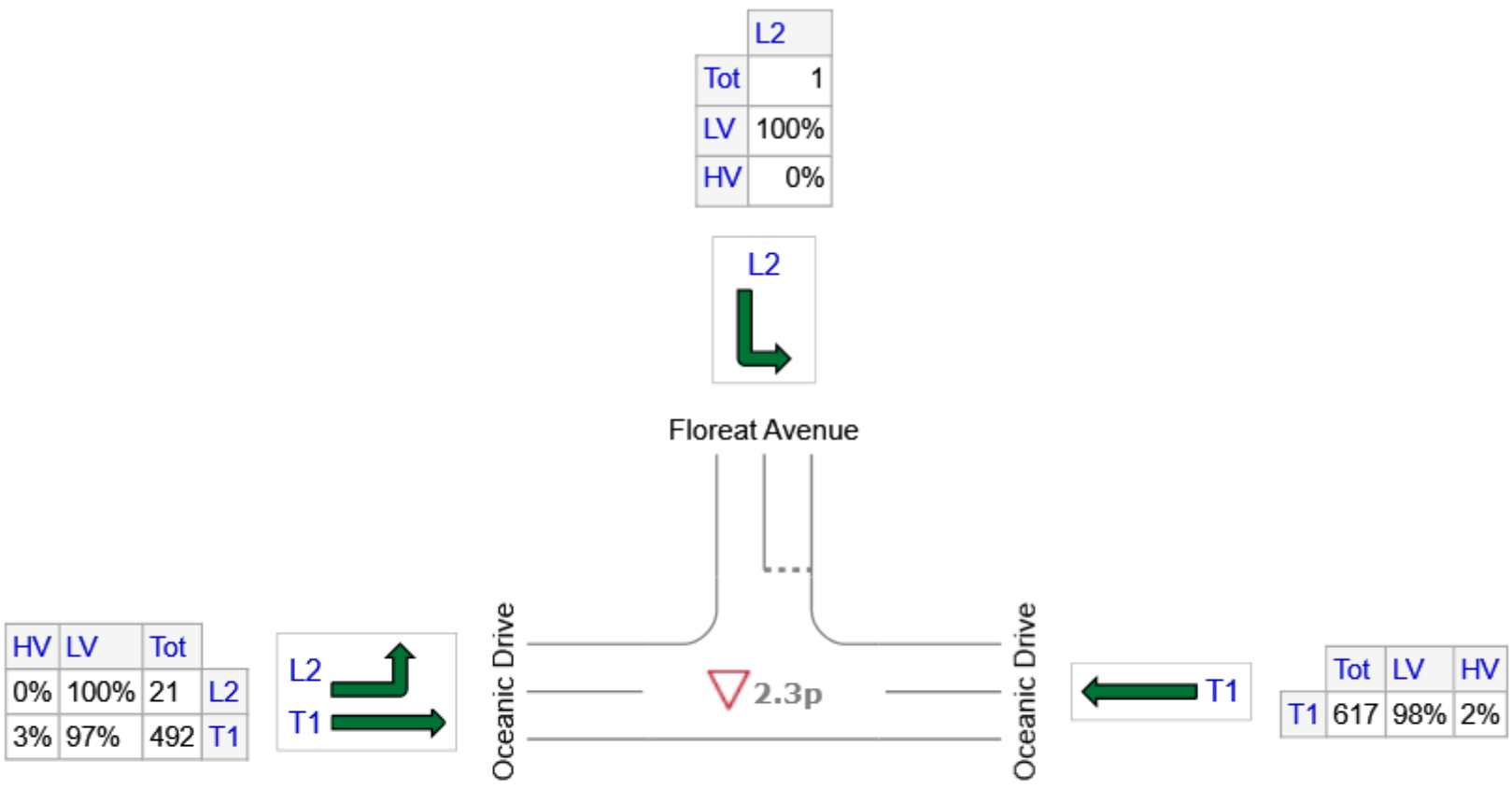
Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
E: Oceanic Drive	617	604	13
N: Floreat Avenue	1	1	0
W: Oceanic Drive	513	500	13
Total	1131	1105	26

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Oceanic Drive														
5	T1	617	2.1	649	2.1	0.170	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		617	2.1	649	2.1	0.170	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
North: Floreat Avenue														
7	L2	1	0.0	1	0.0	0.001	5.4	LOS A	0.0	0.0	0.32	0.47	0.32	31.5
Approach		1	0.0	1	0.0	0.001	5.4	LOS A	0.0	0.0	0.32	0.47	0.32	31.5
West: Oceanic Drive														
10	L2	21	0.0	22	0.0	0.142	3.7	LOS A	0.0	0.0	0.00	0.05	0.00	32.4
11	T1	492	2.6	518	2.6	0.142	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	58.7
Approach		513	2.5	540	2.5	0.142	0.2	NA	0.0	0.0	0.00	0.02	0.00	56.8
All Vehicles		1131	2.3	1191	2.3	0.170	0.1	NA	0.0	0.0	0.00	0.01	0.00	58.4

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.

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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

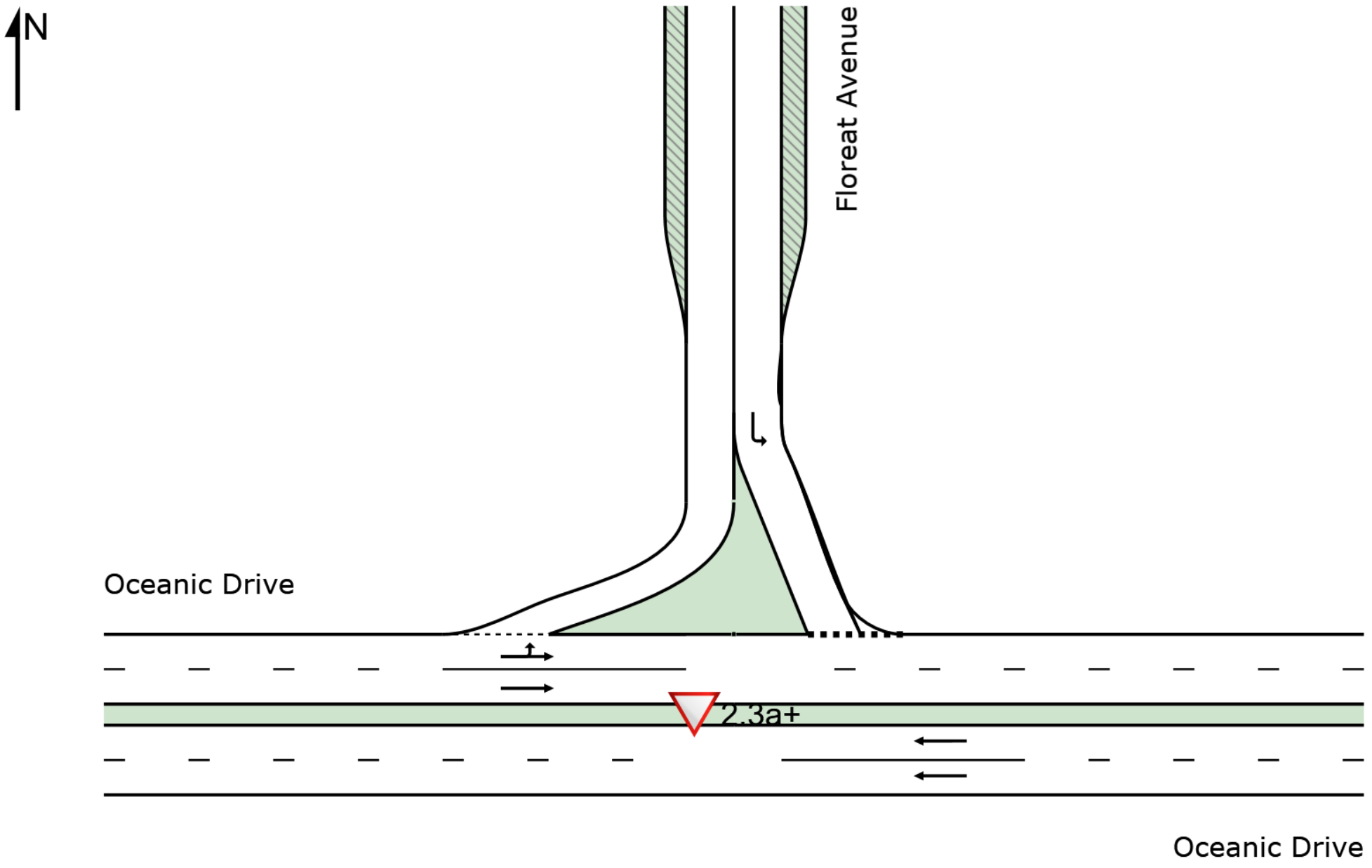
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site: 2.3a+ [2.3a+ Floreat Avenue & Oceanic Drive 2041 AM - With Development (Site Folder: With Development - 2041)]

2.3a+ Floreat Avenue & Oceanic Drive 2041 AM
Site Category: (None)
Give-Way (Two-Way)

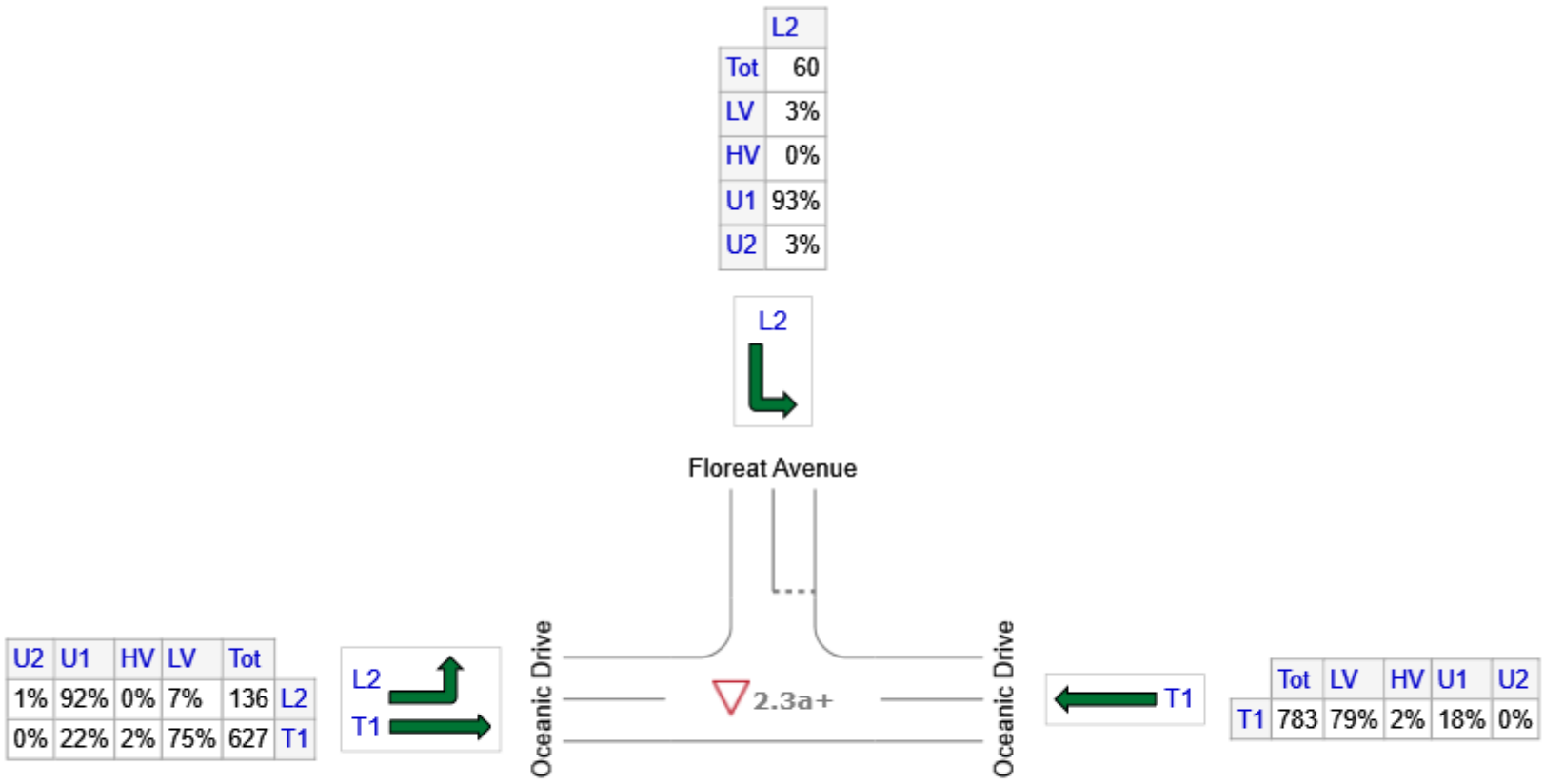
Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Development LV (U1)	Development HV (U2)
E: Oceanic Drive	783	621	18	144	0
N: Floreat Avenue	60	2	0	56	2
W: Oceanic Drive	763	480	15	265	3
Total	1606	1103	33	465	5

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Oceanic Drive														
5	T1	783	2.3	824	2.3	0.216	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		783	2.3	824	2.3	0.216	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
North: Floreat Avenue														
7	L2	60	3.3	63	3.3	0.062	5.6	LOS A	0.2	1.7	0.34	0.55	0.34	31.1
Approach		60	3.3	63	3.3	0.062	5.6	LOS A	0.2	1.7	0.34	0.55	0.34	31.1
West: Oceanic Drive														
10	L2	136	0.7	143	0.7	0.213	3.7	LOS A	0.0	0.0	0.00	0.20	0.00	30.7
11	T1	627	2.7	660	2.7	0.213	0.0	LOS A	0.0	0.0	0.00	0.08	0.00	56.0
Approach		763	2.4	803	2.4	0.213	0.7	NA	0.0	0.0	0.00	0.10	0.00	48.5
All Vehicles		1606	2.4	1691	2.4	0.216	0.5	NA	0.2	1.7	0.01	0.07	0.01	51.7

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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

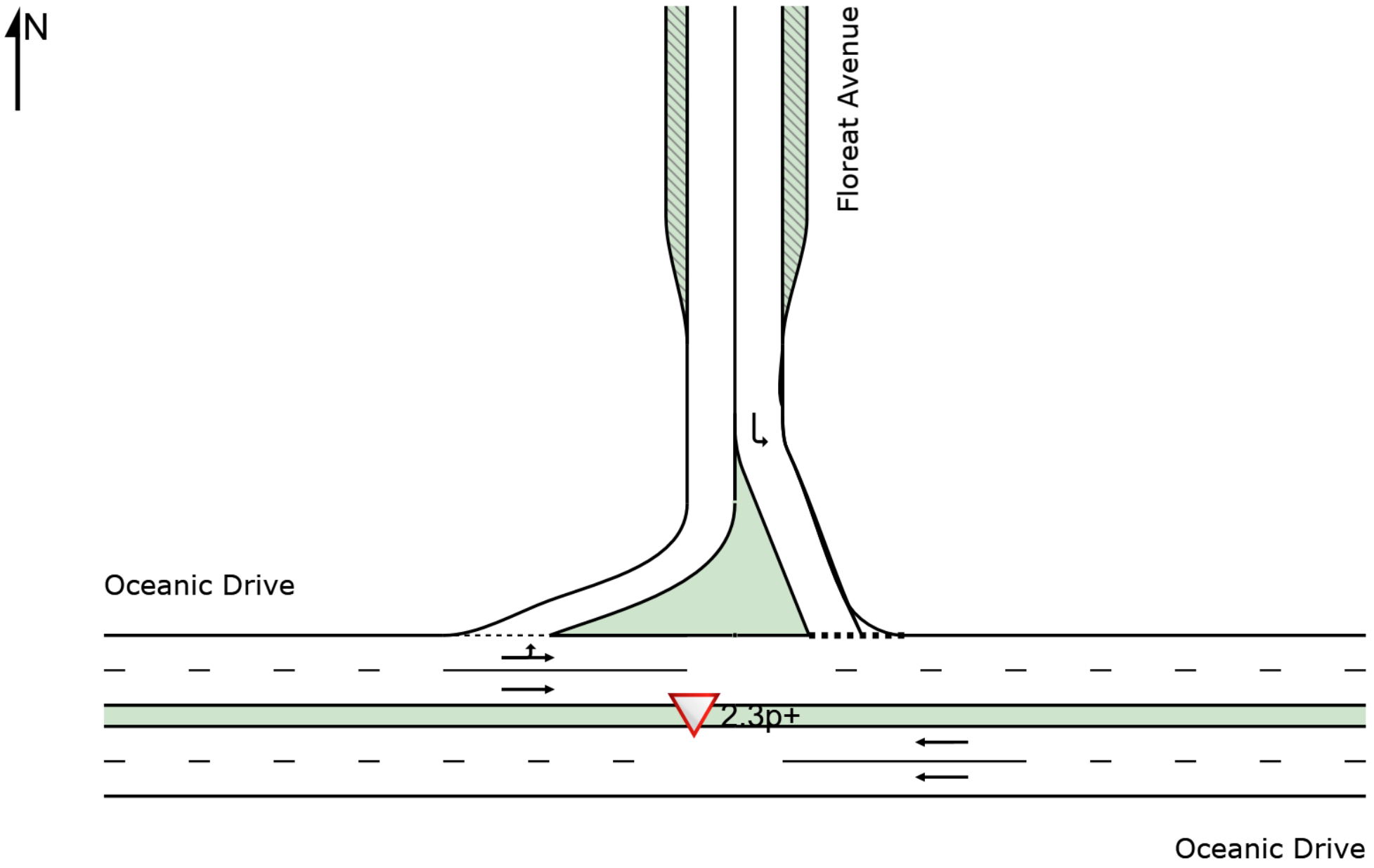
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site: 2.3p+ [2.3p+ Floreat Avenue & Oceanic Drive 2041 PM - With Development (Site Folder: With Development - 2041)]

2.3p+ Floreat Avenue & Oceanic Drive 2041 PM
Site Category: (None)
Give-Way (Two-Way)

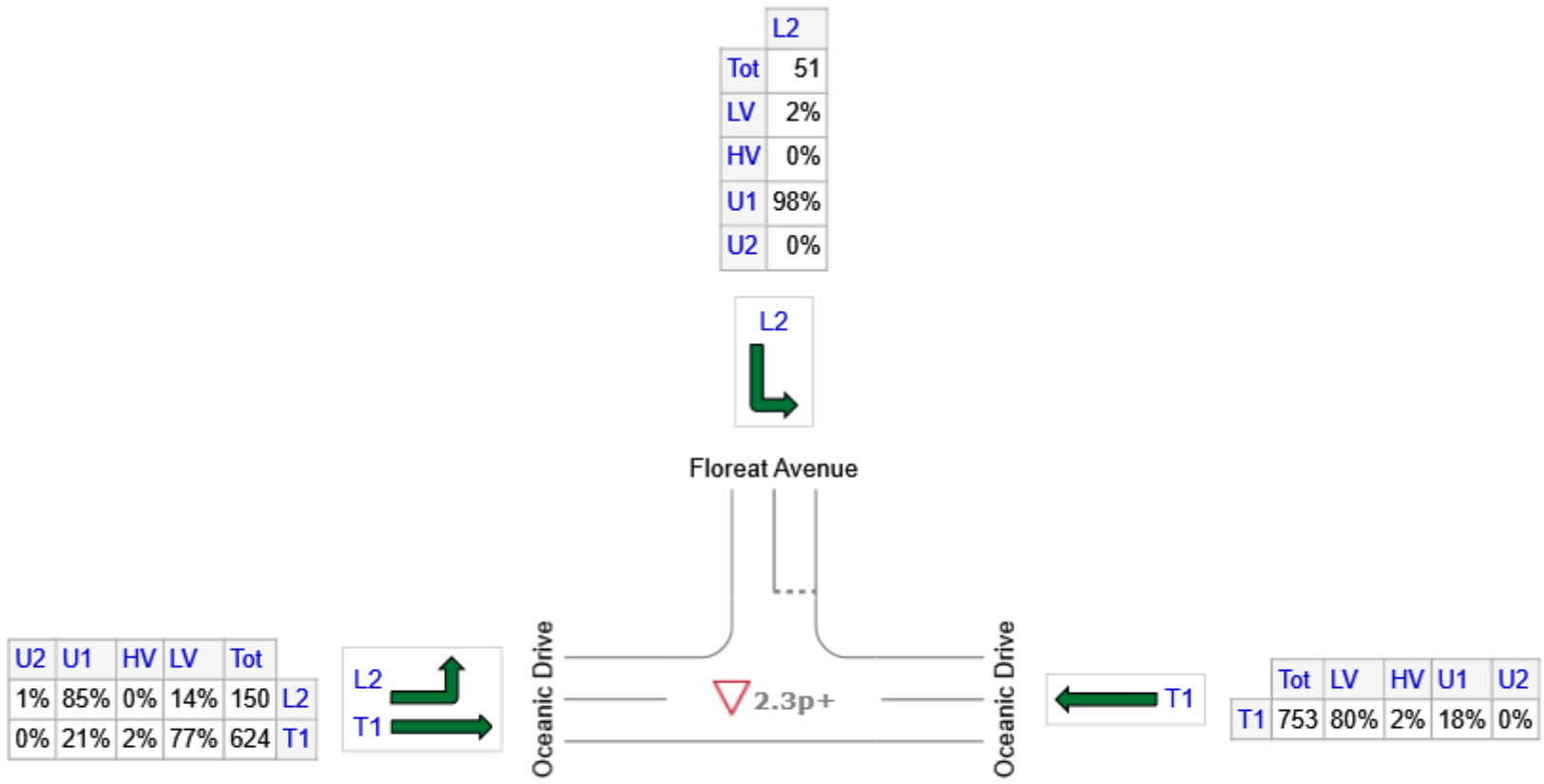
Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Development LV (U1)	Development HV (U2)
E: Oceanic Drive	753	604	13	133	3
N: Floreat Avenue	51	1	0	50	0
W: Oceanic Drive	774	500	13	259	2
Total	1578	1105	26	442	5

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Oceanic Drive														
5	T1	753	2.1	793	2.1	0.208	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		753	2.1	793	2.1	0.208	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
North: Floreat Avenue														
7	L2	51	0.0	54	0.0	0.051	5.5	LOS A	0.2	1.3	0.33	0.54	0.33	31.4
Approach		51	0.0	54	0.0	0.051	5.5	LOS A	0.2	1.3	0.33	0.54	0.33	31.4
West: Oceanic Drive														
10	L2	150	1.3	158	1.3	0.215	3.7	LOS A	0.0	0.0	0.00	0.21	0.00	30.6
11	T1	624	2.1	657	2.1	0.215	0.0	LOS A	0.0	0.0	0.00	0.08	0.00	55.8
Approach		774	1.9	815	1.9	0.215	0.7	NA	0.0	0.0	0.00	0.11	0.00	47.7
All Vehicles		1578	2.0	1661	2.0	0.215	0.5	NA	0.2	1.3	0.01	0.07	0.01	51.4

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.

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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

USER REPORT FOR SITE

All Movement Classes

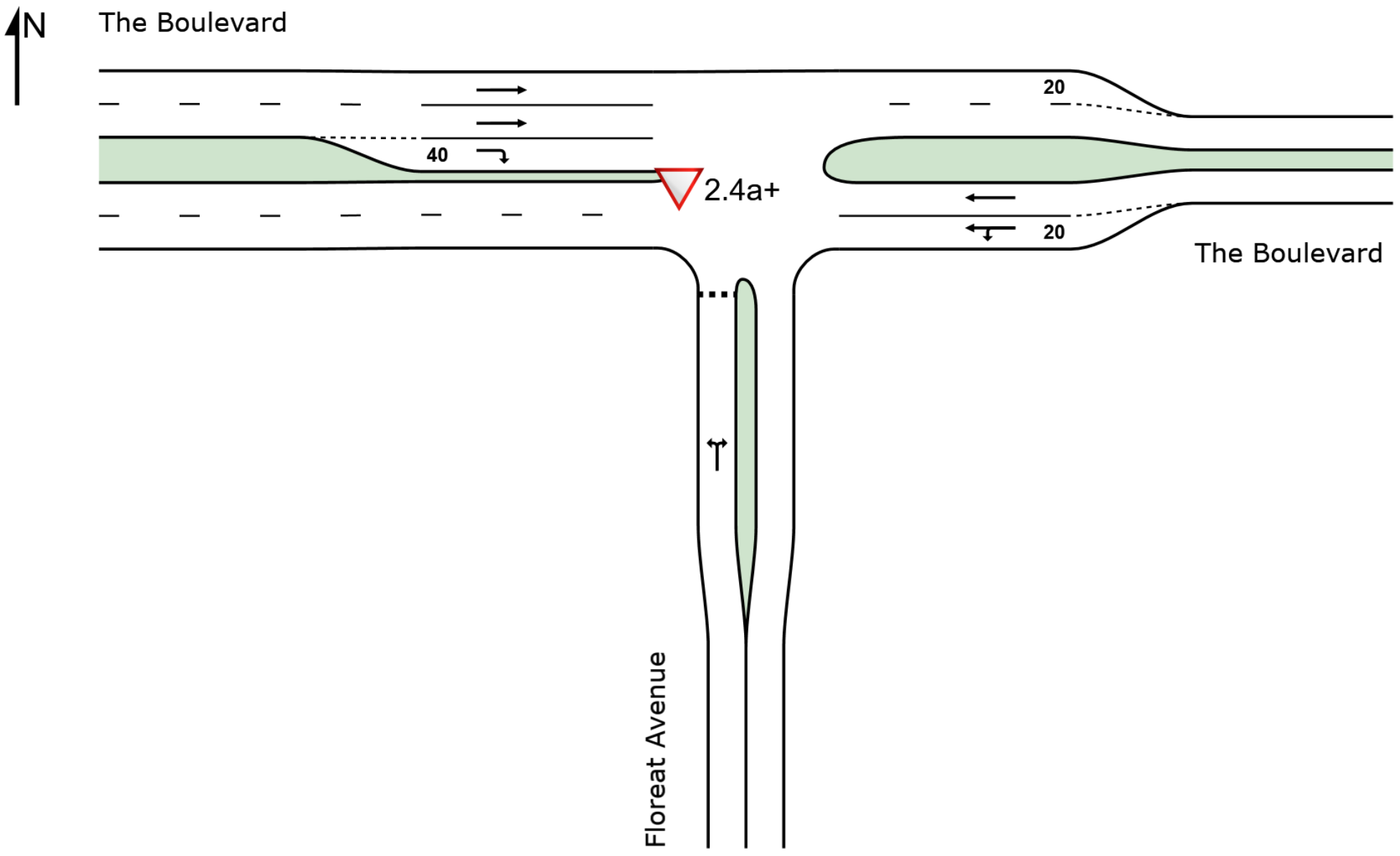
Project: KC01446.000 M04 Floreat Avenue - The Boulevard **Template: Signalised**

Site: 2.4a+ [2.4a+ Floreat Avenue & The Boulevard 2041 AM - With Development - Sign Controlled (Site Folder: With Development Sign Controlled - 2041)]

2.4a+ Floreat Avenue & The Boulevard 2041 AM - With Development - Sign Controlled
Site Category: (None)
Give-Way (Two-Way)

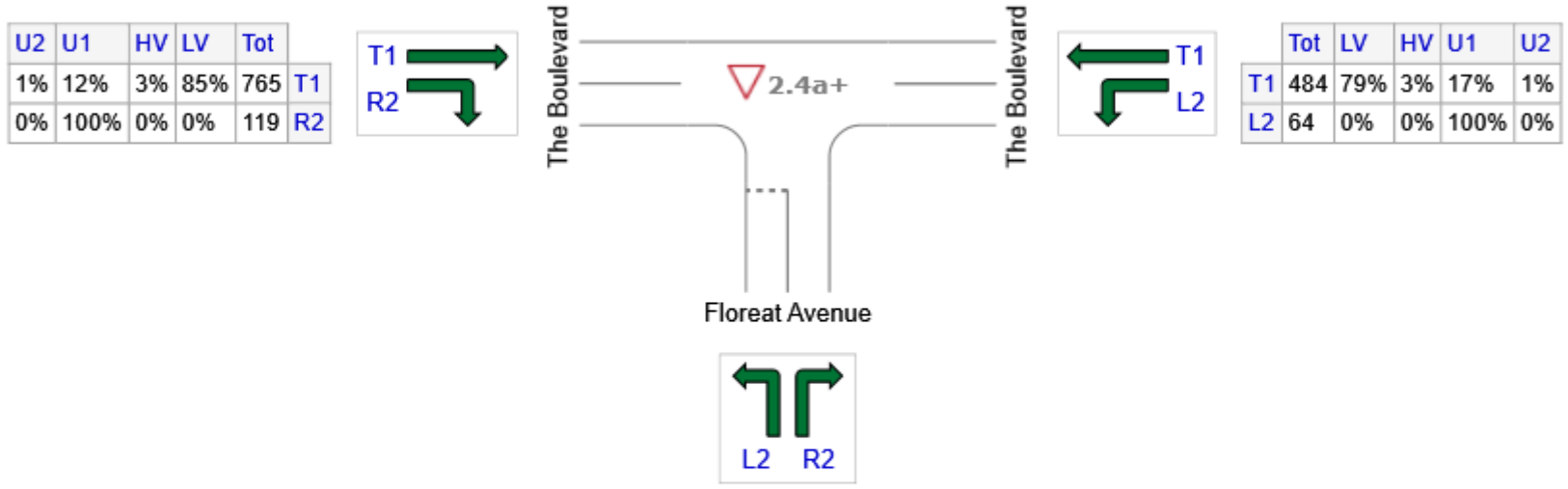
Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Development LV (U1)	Development HV (U2)
S: Floreat Avenue	396	30	0	363	3
E: The Boulevard	548	384	14	146	4
W: The Boulevard	884	649	20	211	4
Total	1828	1063	34	720	11

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Floreat Avenue													
Lane 1	417	0.8	205	2.032	100	968.2	LOS F	146.1	1082.0	Full	450	0.0	46.3
Approach	417	0.8		2.032		968.2	LOS F	146.1	1082.0				
East: The Boulevard													
Lane 1	288	2.8	1875	0.154	100	1.3	LOS A	0.0	0.0	Short	20	0.0	NA
Lane 2	289	3.7	1880	0.154	100	0.0	LOS A	0.0	0.0	Full	250	0.0	0.0
Approach	577	3.3		0.154		0.7	NA	0.0	0.0				
West: The Boulevard													
Lane 1	136	3.1	1891	0.072	20[6]	1.9	LOS A	0.0	0.0	Full	67	0.0	0.0
Lane 2	669	3.1	1875	0.357	100	0.0	LOS A	0.0	0.0	Full	67	0.0	0.0
Lane 3	125	0.0	778	0.161	100	7.8	LOS A	0.6	4.7	Short	40	0.0	NA
Approach	931	2.7		0.357		1.3	NA	0.6	4.7				
Intersection	1924	2.5		2.032		210.6	NA	146.1	1082.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

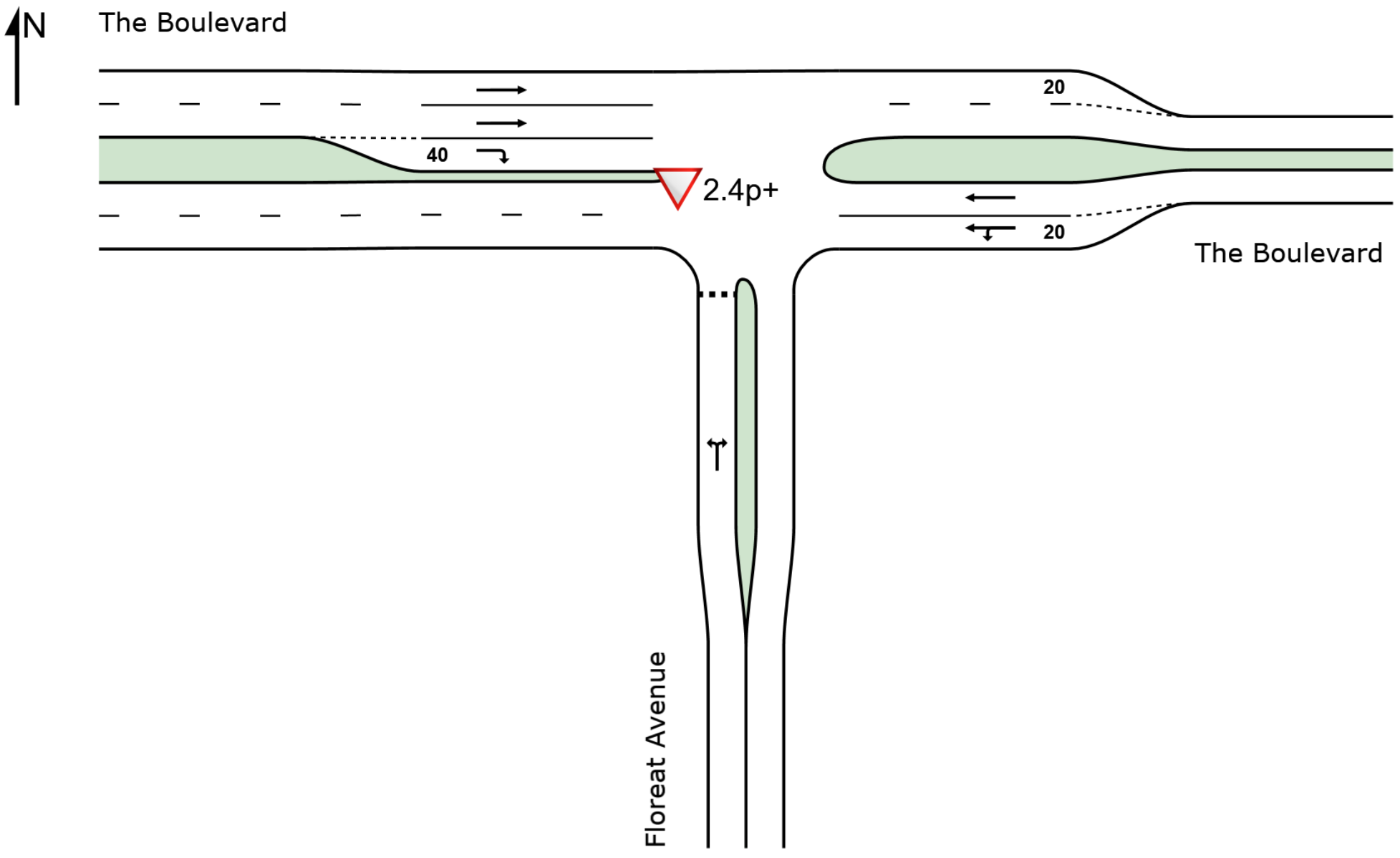
6 Lane under-utilisation due to downstream effects

Site: 2.4p+ [2.4p+ Floreat Avenue & The Boulevard 2041 PM - With Development - Sign Controlled (Site Folder: With Development Sign Controlled - 2041)]

2.4p+ Floreat Avenue & The Boulevard 2041 PM - With Development - Sign Controlled
Site Category: (None)
Give-Way (Two-Way)

Site Layout

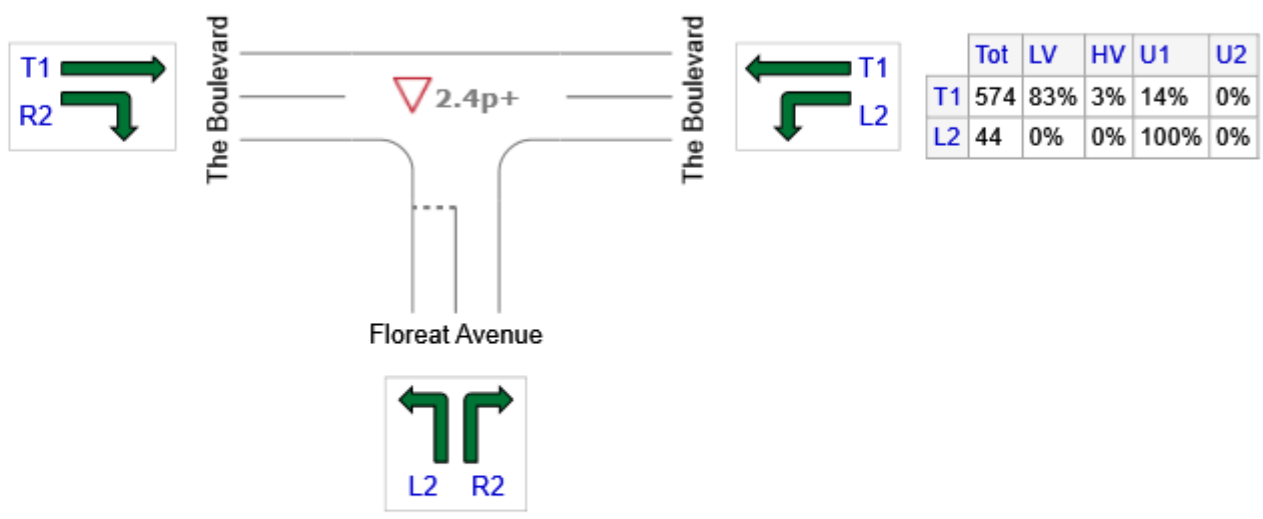
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %

U2	U1	HV	LV	Tot	
0%	13%	3%	84%	592	T1
0%	100%	0%	0%	109	R2



	Tot	LV	HV	U1	U2
T1	574	83%	3%	14%	0%
L2	44	0%	0%	100%	0%

	L2	R2
Tot	261	130
LV	5%	0%
HV	0%	0%
U1	95%	98%
U2	0%	2%

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Development LV (U1)	Development HV (U2)
S: Floreat Avenue	391	13	0	376	2
E: The Boulevard	618	474	16	127	1
W: The Boulevard	701	498	16	185	2
Total	1710	985	32	688	5

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Floreat Avenue													
Lane 1	412	0.5	224	1.837	100	787.8	LOS F	128.8	951.8	Full	450	0.0	35.9
Approach	412	0.5		1.837		787.8	LOS F	128.8	951.8				
East: The Boulevard													
Lane 1	325	2.5	1889	0.172	100	0.8	LOS A	0.0	0.0	Short	20	0.0	NA
Lane 2	326	3.0	1894	0.172	100	0.0	LOS A	0.0	0.0	Full	250	0.0	0.0
Approach	651	2.8		0.172		0.4	NA	0.0	0.0				
West: The Boulevard													
Lane 1	105	3.0	1892	0.056	20[6]	1.3	LOS A	0.0	0.0	Full	67	0.0	0.0
Lane 2	518	3.0	1872	0.277	100	0.0	LOS A	0.0	0.0	Full	67	0.0	0.0
Lane 3	115	0.0	711	0.161	100	8.4	LOS A	0.6	4.6	Short	40	0.0	NA
Approach	738	2.6		0.277		1.5	NA	0.6	4.6				
Intersection	1800	2.2		1.837		180.9	NA	128.8	951.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

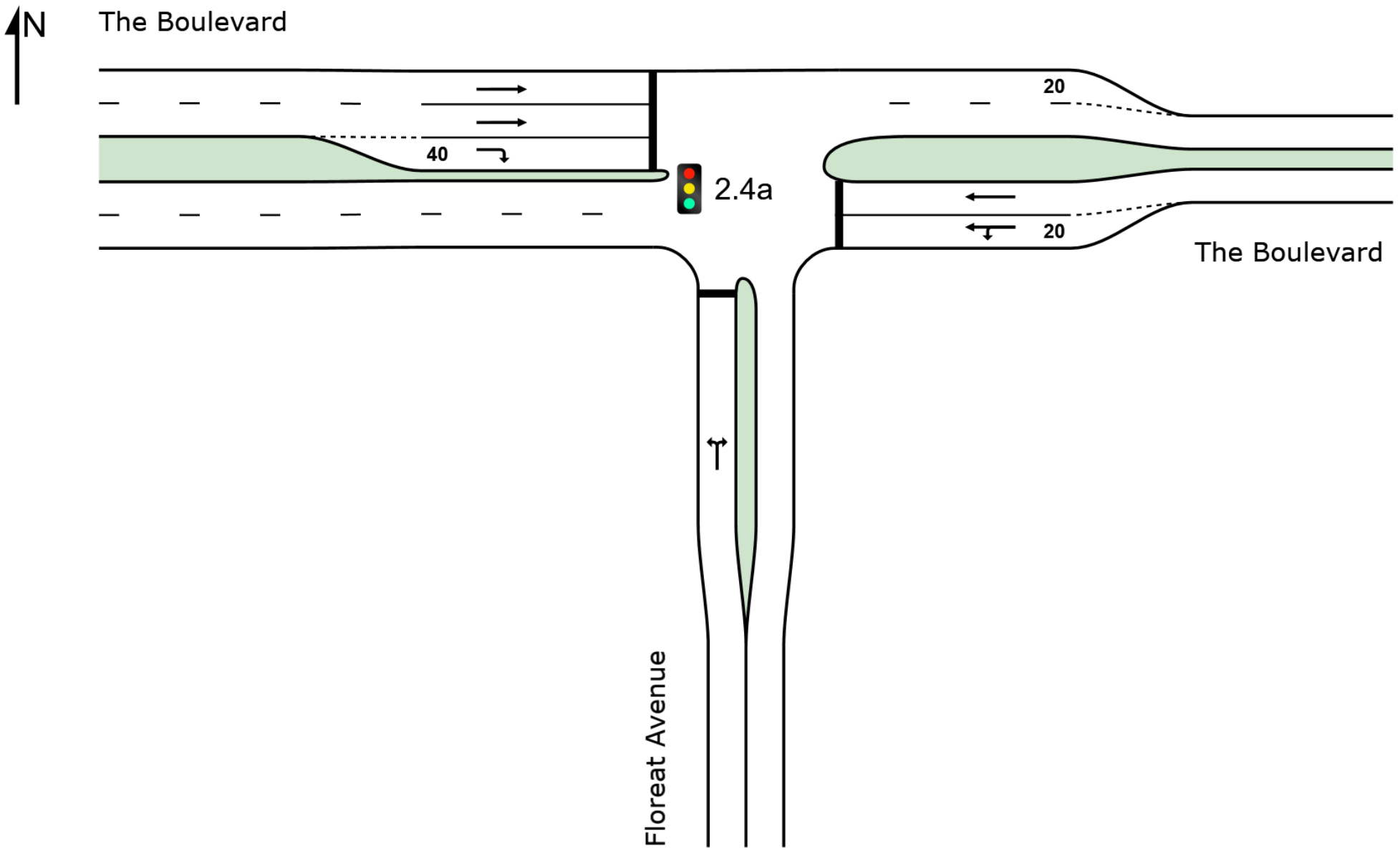
Site: 2.4a [2.4a Floreat Avenue & The Boulevard 2041 AM - No Development (Site Folder: No Development Signalised - 2041)]

2.4a Floreat Avenue & The Boulevard 2041 AM - No Development
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 40 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Convert Function Default
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

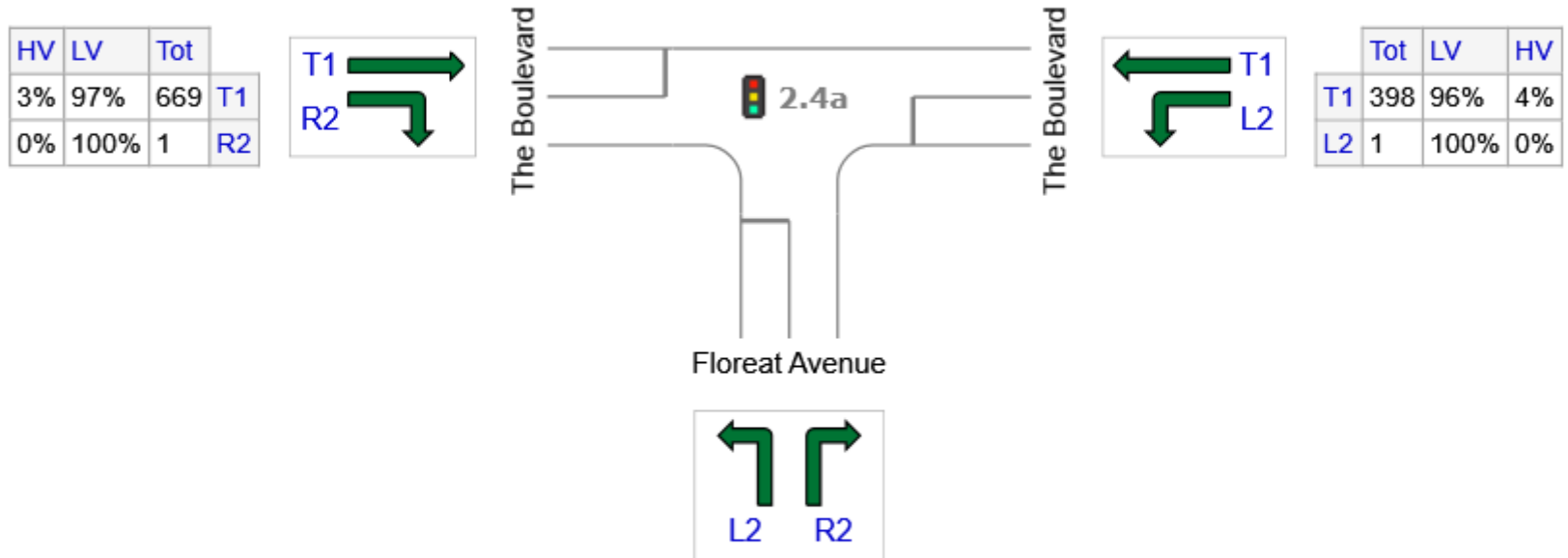
Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Floreat Avenue	31	31	0
E: The Boulevard	399	385	14
W: The Boulevard	670	650	20
Total	1100	1066	34

Lane Use and Performance

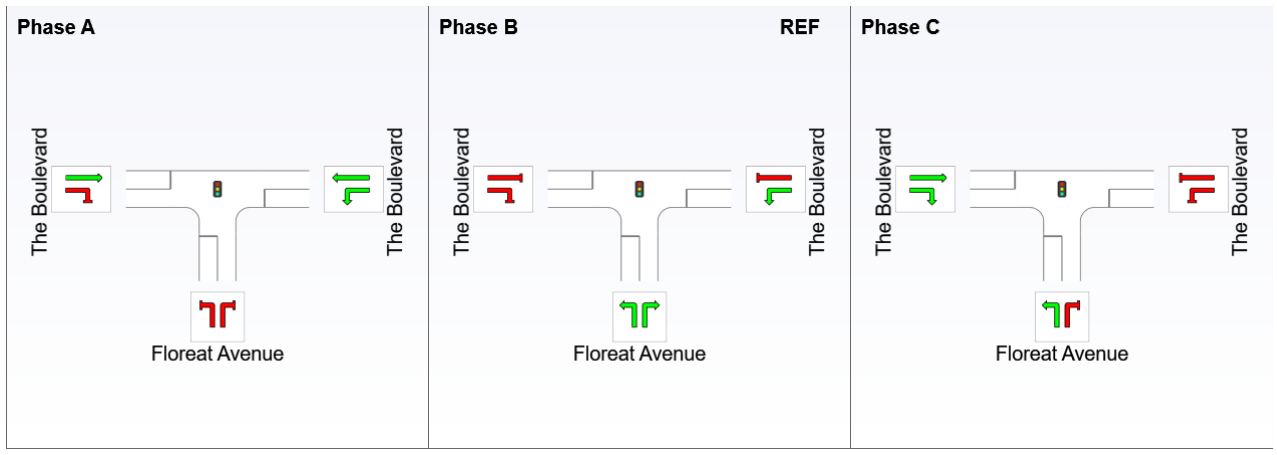
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Floreat Avenue													
Lane 1	33	0.0	792	0.041	100	11.9	LOS B	0.4	2.8	Full	450	0.0	0.0
Approach	33	0.0		0.041		11.9	LOS B	0.4	2.8				
East: The Boulevard													
Lane 1	210	3.5	471	0.446	100	13.7	LOS B	3.6	27.4	Short	20	0.0	NA
Lane 2	210	3.5	471	0.446	100	14.4	LOS B	3.7	27.9	Full	250	0.0	0.0
Approach	420	3.5		0.446		14.1	LOS B	3.7	27.9				
West: The Boulevard													
Lane 1	118	3.0	1041	0.113	20[6]	6.0	LOS A	1.1	8.5	Full	67	0.0	0.0
Lane 2	586	3.0	1041	0.563	100	6.5	LOS A	7.7	58.0	Full	67	0.0	0.0
Lane 3	1	0.0	279	0.004	100	20.6	LOS C	0.0	0.1	Short	40	0.0	NA
Approach	705	3.0		0.563		6.4	LOS A	7.7	58.0				
Intersection	1158	3.1		0.563		9.4	LOS A	7.7	58.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

Input Phase Sequence

Phase Sequence: Convert Function Default
Reference Phase: Phase B
Input Phase Sequence: A, B, C



REF: Reference Phase
VAR: Variable Phase



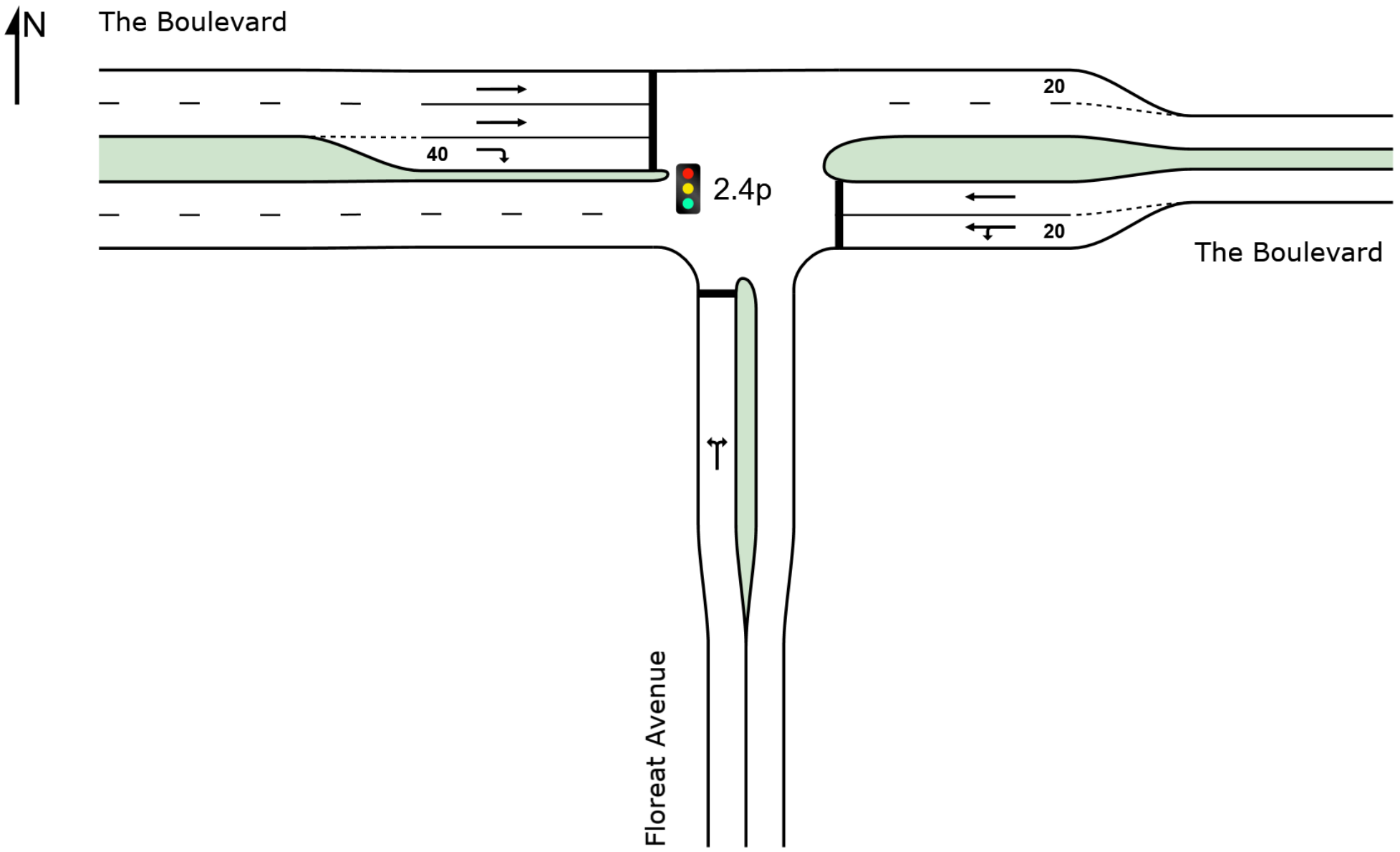
Site: 2.4p [2.4p Floreat Avenue & The Boulevard 2041 PM - No Development (Site Folder: No Development Signalised - 2041)]

2.4p Floreat Avenue & The Boulevard 2041 PM - No Development
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 40 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Convert Function Default
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

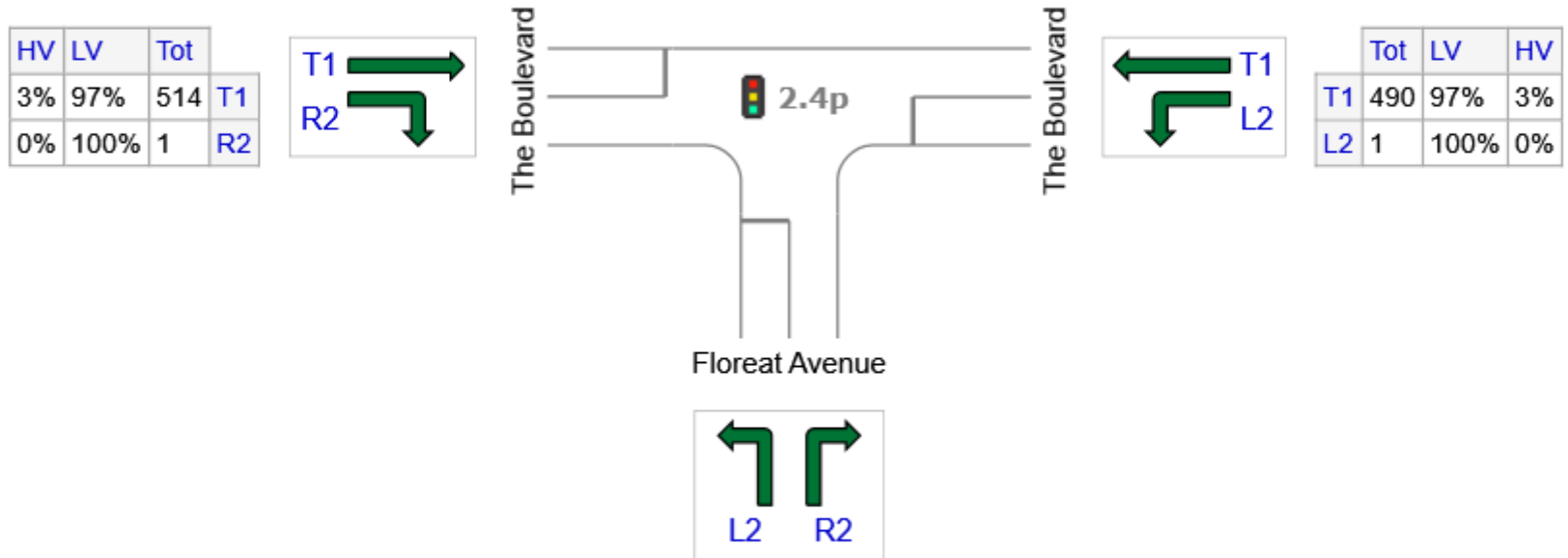
Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Floreat Avenue	14	14	0
E: The Boulevard	491	475	16
W: The Boulevard	515	499	16
Total	1020	988	32

Lane Use and Performance

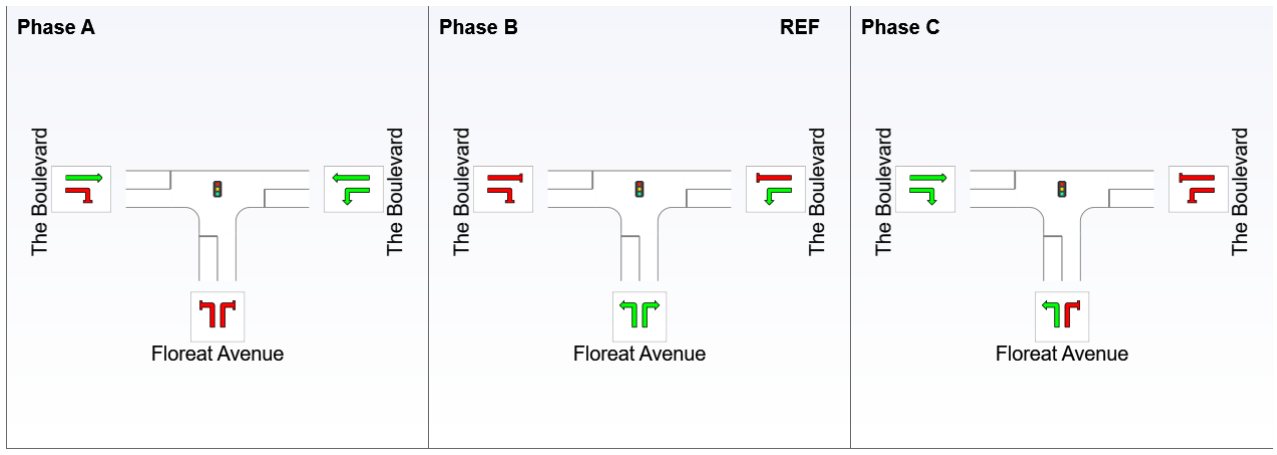
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Floreat Avenue													
Lane 1	15	0.0	723	0.020	100	12.5	LOS B	0.2	1.3	Full	450	0.0	0.0
Approach	15	0.0		0.020		12.5	LOS B	0.2	1.3				
East: The Boulevard													
Lane 1	259	3.3	472	0.547	100	14.2	LOS B	4.6	34.8	Short	20	0.0	NA
Lane 2	258	3.3	472	0.547	100	14.9	LOS B	4.7	35.4	Full	250	0.0	0.0
Approach	517	3.3		0.547		14.5	LOS B	4.7	35.4				
West: The Boulevard													
Lane 1	91	3.1	1040	0.087	20[6]	5.5	LOS A	0.8	6.4	Full	67	0.0	0.0
Lane 2	450	3.1	1040	0.433	100	5.9	LOS A	5.3	40.3	Full	67	0.0	0.0
Lane 3	1	0.0	279	0.004	100	20.6	LOS C	0.0	0.1	Short	40	0.0	NA
Approach	542	3.1		0.433		5.8	LOS A	5.3	40.3				
Intersection	1074	3.1		0.547		10.1	LOS B	5.3	40.3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

Input Phase Sequence

Phase Sequence: Convert Function Default
Reference Phase: Phase B
Input Phase Sequence: A, B, C



REF: Reference Phase
VAR: Variable Phase



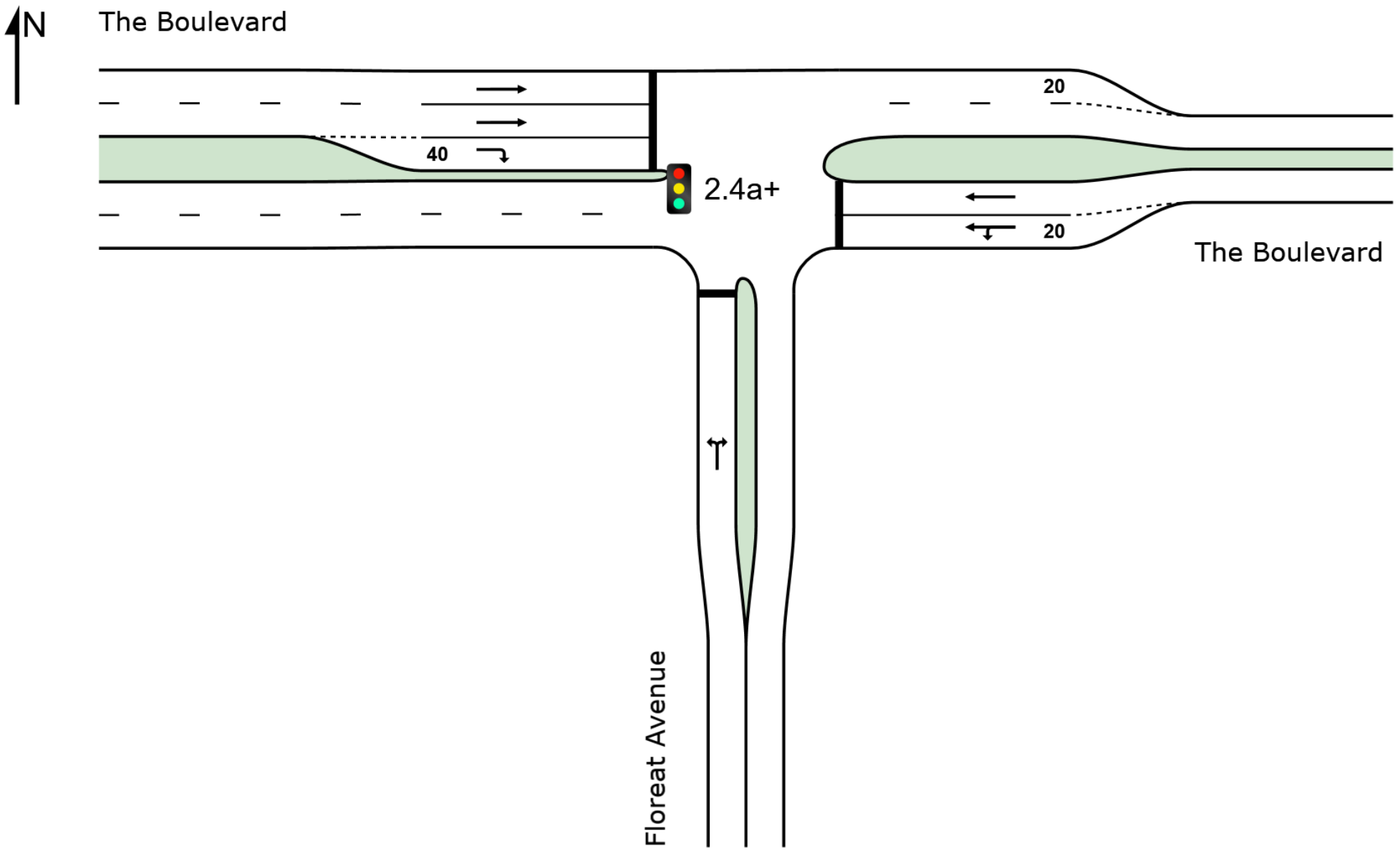
Site: 2.4a+ [2.4a+ Floreat Avenue & The Boulevard 2041 AM - With Development (Site Folder: With Development Signalised - 2041)]

2.4a+ Floreat Avenue & The Boulevard 2041 AM
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Convert Function Default
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

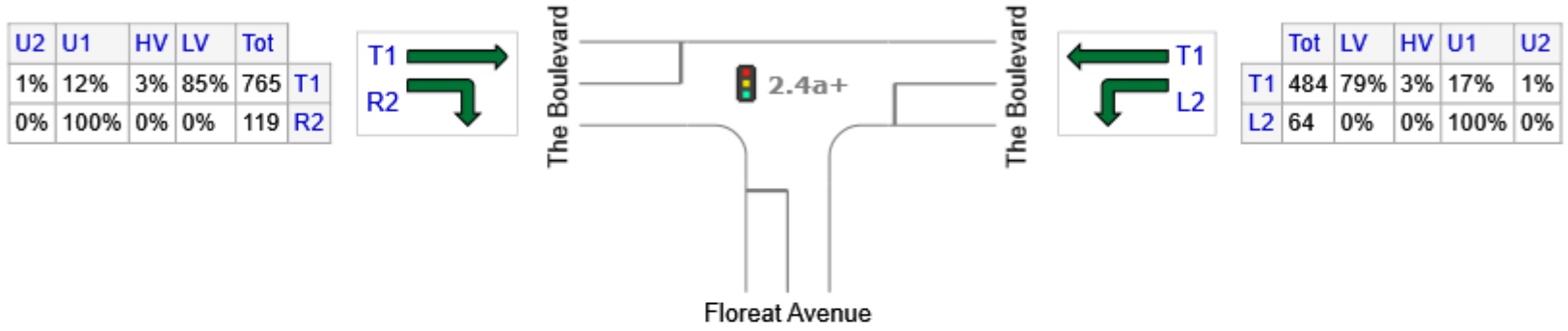
Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Development LV (U1)	Development HV (U2)
S: Floreat Avenue	396	30	0	363	3
E: The Boulevard	548	384	14	146	4
W: The Boulevard	884	649	20	211	4
Total	1828	1063	34	720	11

Lane Use and Performance

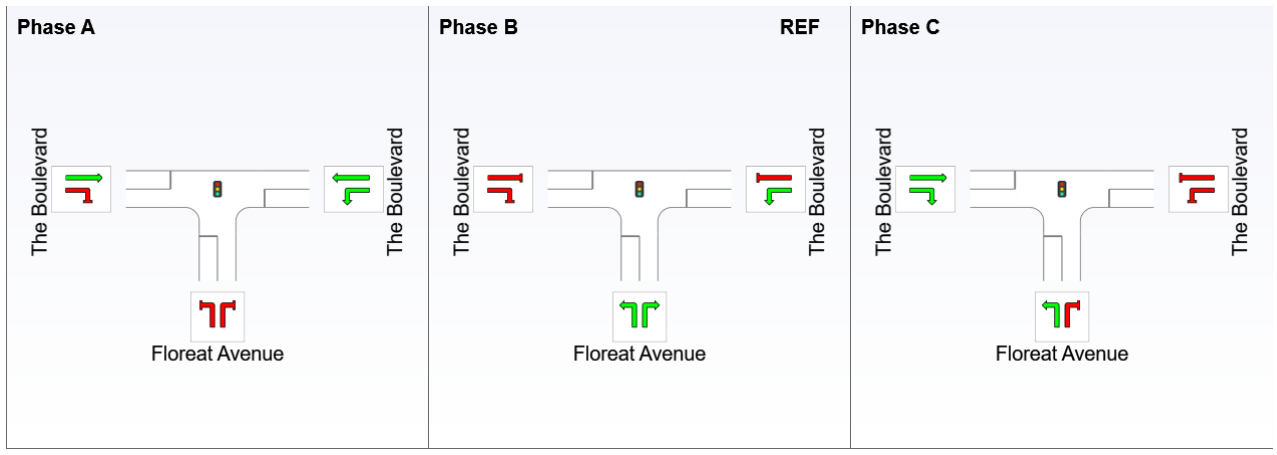
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Floreat Avenue													
Lane 1	417	0.8	602	0.692	100	22.1	LOS C	9.6	71.0	Full	450	0.0	0.0
Approach	417	0.8		0.692		22.1	LOS C	9.6	71.0				
East: The Boulevard													
Lane 1	296	2.9	436[1]	0.679	100	18.8	LOS B	6.6	49.9	Short	20	0.0	NA
Lane 2	281	3.7	414[1]	0.679	100	18.3	LOS B	6.3	48.3	Full	250	0.0	0.0
Approach	577	3.3		0.679		18.6	LOS B	6.6	49.9				
West: The Boulevard													
Lane 1	147	3.1	1021	0.144	20[6]	8.3	LOS A	1.8	13.7	Full	67	0.0	0.0
Lane 2	658	3.1	917[1]	0.718	100	9.9	LOS A	12.2	92.2	Full	67	0.0	34.2
Lane 3	125	0.0	260	0.482	100	27.6	LOS C	3.0	22.3	Short	40	0.0	NA
Approach	931	2.7		0.718		12.0	LOS B	12.2	92.2				
Intersection	1924	2.5		0.718		16.2	LOS B	12.2	92.2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects

Input Phase Sequence

Phase Sequence: Convert Function Default
Reference Phase: Phase B
Input Phase Sequence: A, B, C



REF: Reference Phase
VAR: Variable Phase



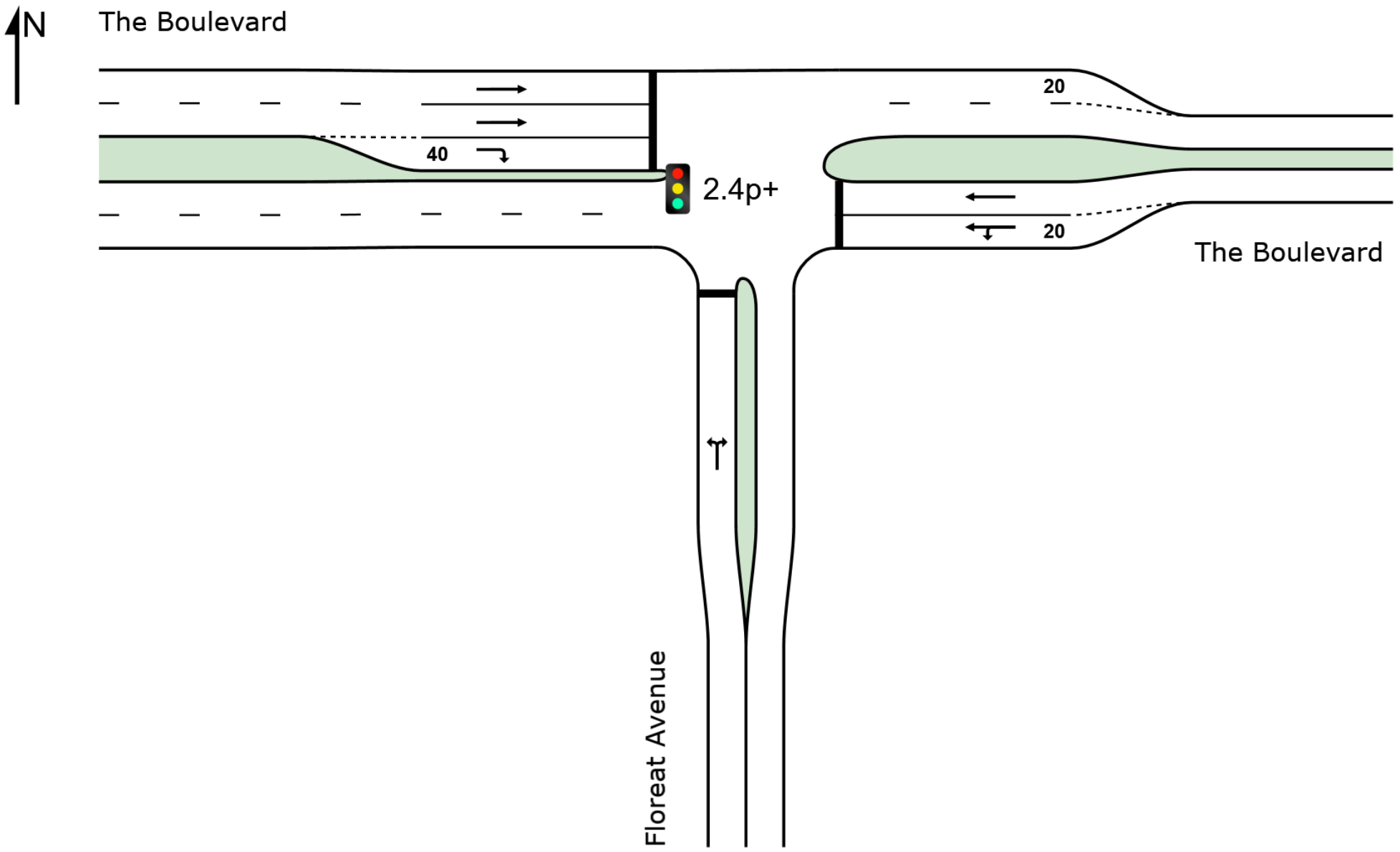
Site: 2.4p+ [2.4p+ Floreat Avenue & The Boulevard 2041 PM - With Development (Site Folder: With Development Signalised - 2041)]

2.4p+ Floreat Avenue & The Boulevard 2041 PM
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Convert Function Default
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

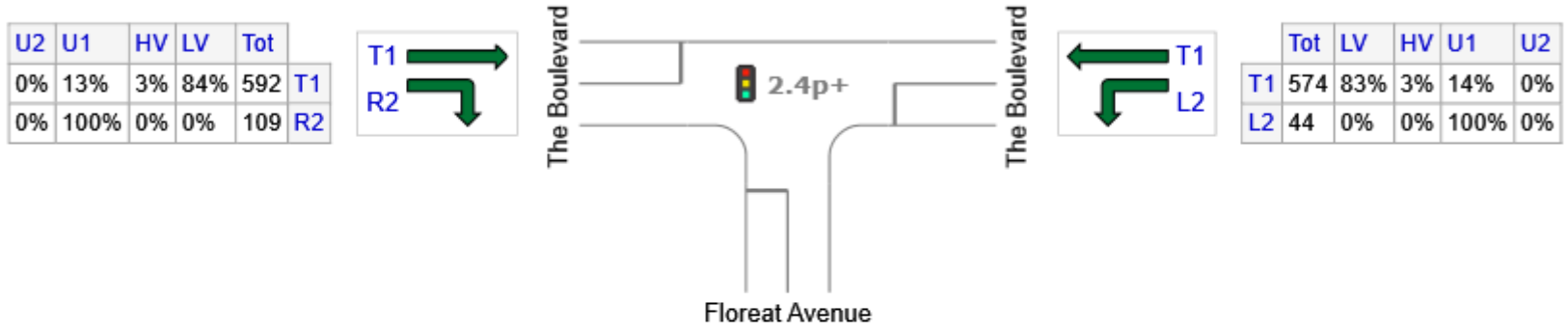
Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Development LV (U1)	Development HV (U2)
S: Floreat Avenue	391	13	0	376	2
E: The Boulevard	618	474	16	127	1
W: The Boulevard	701	498	16	185	2
Total	1710	985	32	688	5

Lane Use and Performance

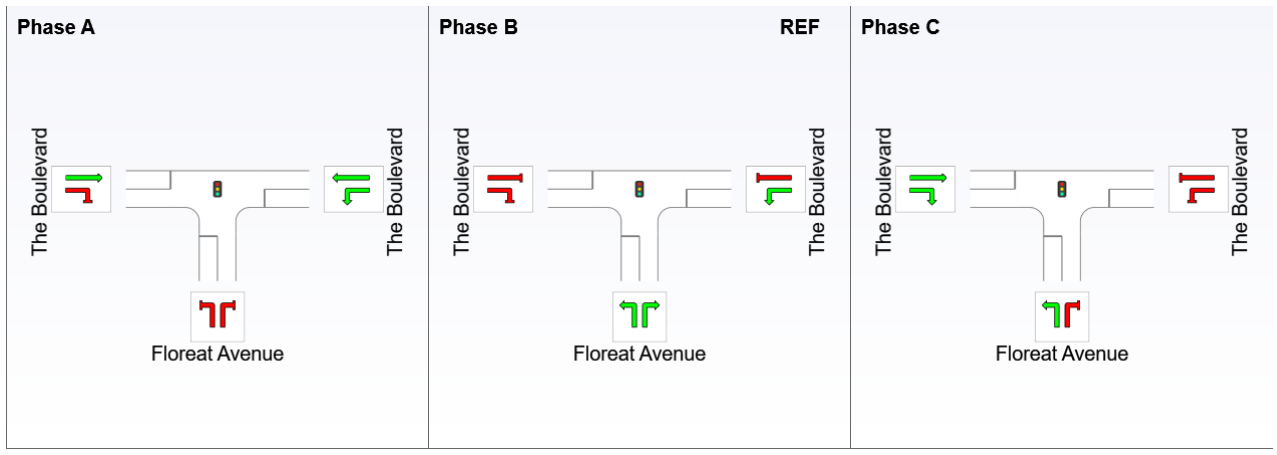
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Floreat Avenue													
Lane 1	412	0.5	549	0.749	100	24.5	LOS C	10.2	75.5	Full	450	0.0	0.0
Approach	412	0.5		0.749		24.5	LOS C	10.2	75.5				
East: The Boulevard													
Lane 1	334	2.6	432[1]	0.771	100	20.3	LOS C	8.0	60.4	Short	20	0.0	NA
Lane 2	317	3.0	411[1]	0.771	100	20.1	LOS C	7.6	57.8	Full	250	0.0	0.0
Approach	651	2.8		0.771		20.2	LOS C	8.0	60.4				
West: The Boulevard													
Lane 1	104	3.0	1022	0.102	20[6]	7.6	LOS A	1.2	9.4	Full	67	0.0	0.0
Lane 2	519	3.0	1022	0.508	100	8.0	LOS A	8.1	61.8	Full	67	0.0	0.0
Lane 3	115	0.0	223	0.515	100	28.8	LOS C	2.9	21.0	Short	40	0.0	NA
Approach	738	2.6		0.515		11.2	LOS B	8.1	61.8				
Intersection	1800	2.2		0.771		17.5	LOS B	10.2	75.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects

Input Phase Sequence

Phase Sequence: Convert Function Default
Reference Phase: Phase B
Input Phase Sequence: A, B, C



REF: Reference Phase
VAR: Variable Phase



USER REPORT FOR SITE

All Movement Classes

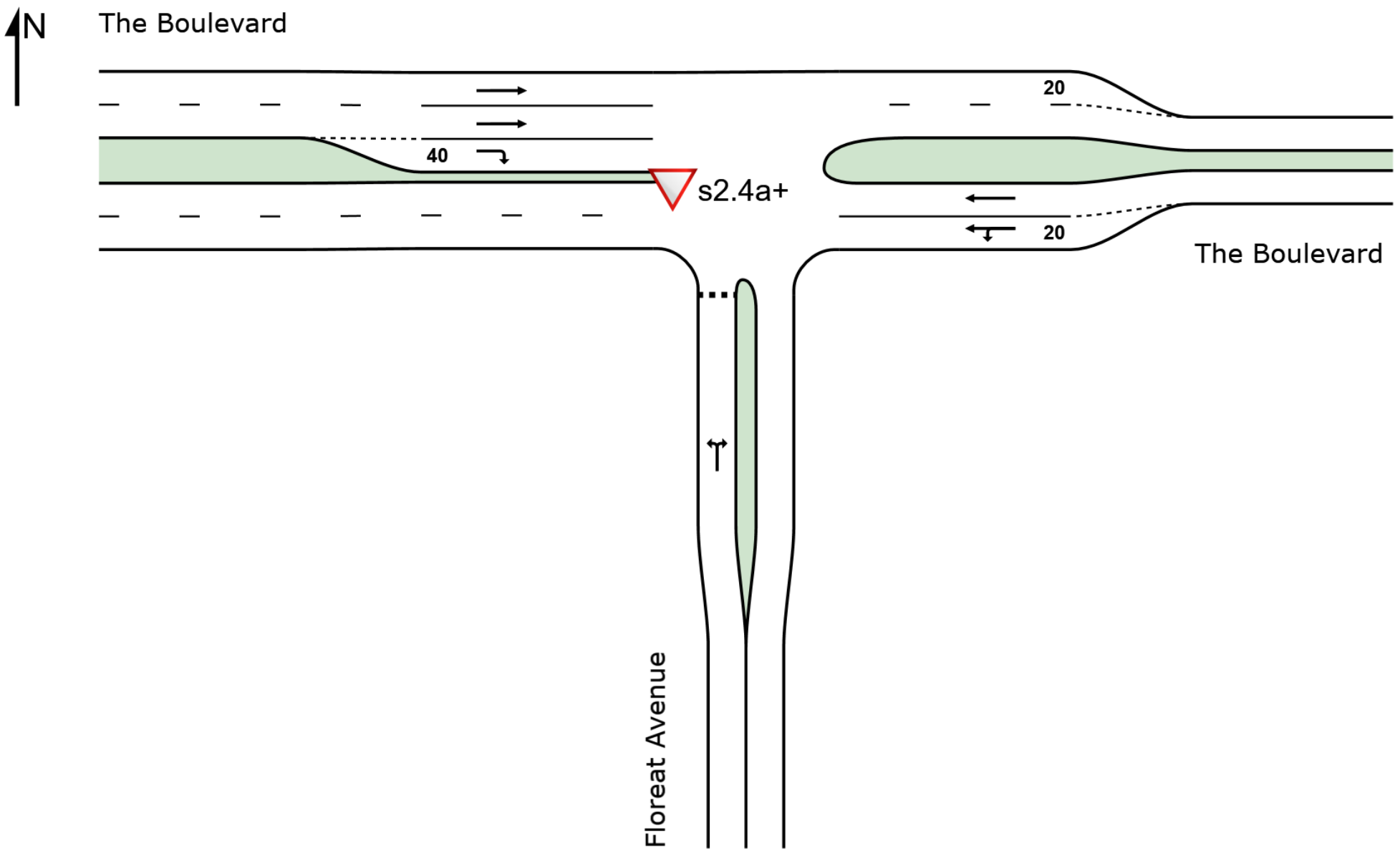
Project: KC01446.000 M04 Floreat Avenue - The Boulevard **Template: Single Site User Report**

Site: s2.4a+ [s2.4a+ Floreat Avenue & The Boulevard - With Development - Sign Controlled (Site Folder: Sensitivity Analysis - With Development Sign Controlled)]

s2.4a+ Floreat Avenue & The Boulevard - With Development - Sign Controlled
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 12 years

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

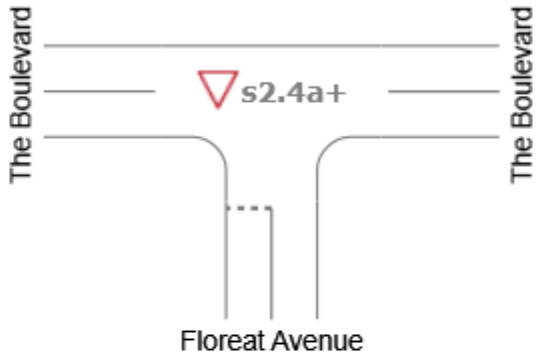


Input Volumes

Volume Display Method: Separate

U2	U1	HV	LV	Tot	
4	92	20	649	765	T1
0	119	0	0	119	R2







	Tot	LV	HV	U1	U2
T1	484	384	14	82	4
L2	64	0	0	64	0



	L2	R2
Tot	298	98
LV	30	0
HV	0	0
U1	266	97
U2	2	1

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Development LV (U1)	Development HV (U2)
S: Floreat Avenue	396	30	0	363	3
E: The Boulevard	548	384	14	146	4
W: The Boulevard	884	649	20	211	4
Total	1828	1063	34	720	11

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Floreat Avenue														
1	L2	298	2	196	0.7	0.778	25.9	LOS D	8.6	64.0	0.54	1.13	1.67	22.5
3	R2	98	1	78	1.0	0.778	62.0	LOS F[11]	8.6	64.0	0.54	1.13	1.67	29.6
Approach		396	3	274	0.8	0.778	36.3	LOS E[11]	8.6	64.0	0.54	1.13	1.67	24.6
East: The Boulevard														
4	L2	64	0	89	0.0	0.128	5.6	LOS A	0.0	0.0	0.00	0.22	0.00	55.1
5	T1	484	18	392	3.7	0.128	0.0	LOS A	0.0	0.0	0.00	0.08	0.00	57.6
Approach		548	18	480	3.0	0.128	1.0	NA	0.0	0.0	0.00	0.11	0.00	56.7
West: The Boulevard														
11	T1	765	24	623	3.1	0.276	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
12	R2	119	0	104	0.0	0.119	7.0	LOS A	0.5	3.5	0.50	0.71	0.50	42.3
Approach		884	24	727	2.7	0.276	1.2	NA	0.5	3.5	0.07	0.10	0.07	55.0
All Vehicles		1828	45	1481	2.4	0.778	7.6	NA	8.6	64.0	0.13	0.29	0.34	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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.

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USER REPORT FOR NETWORK SITE

All Movement Classes

Project: KC01446.000 M05 The Boulevard - Floreat Forum Access

Template: Network Site Report

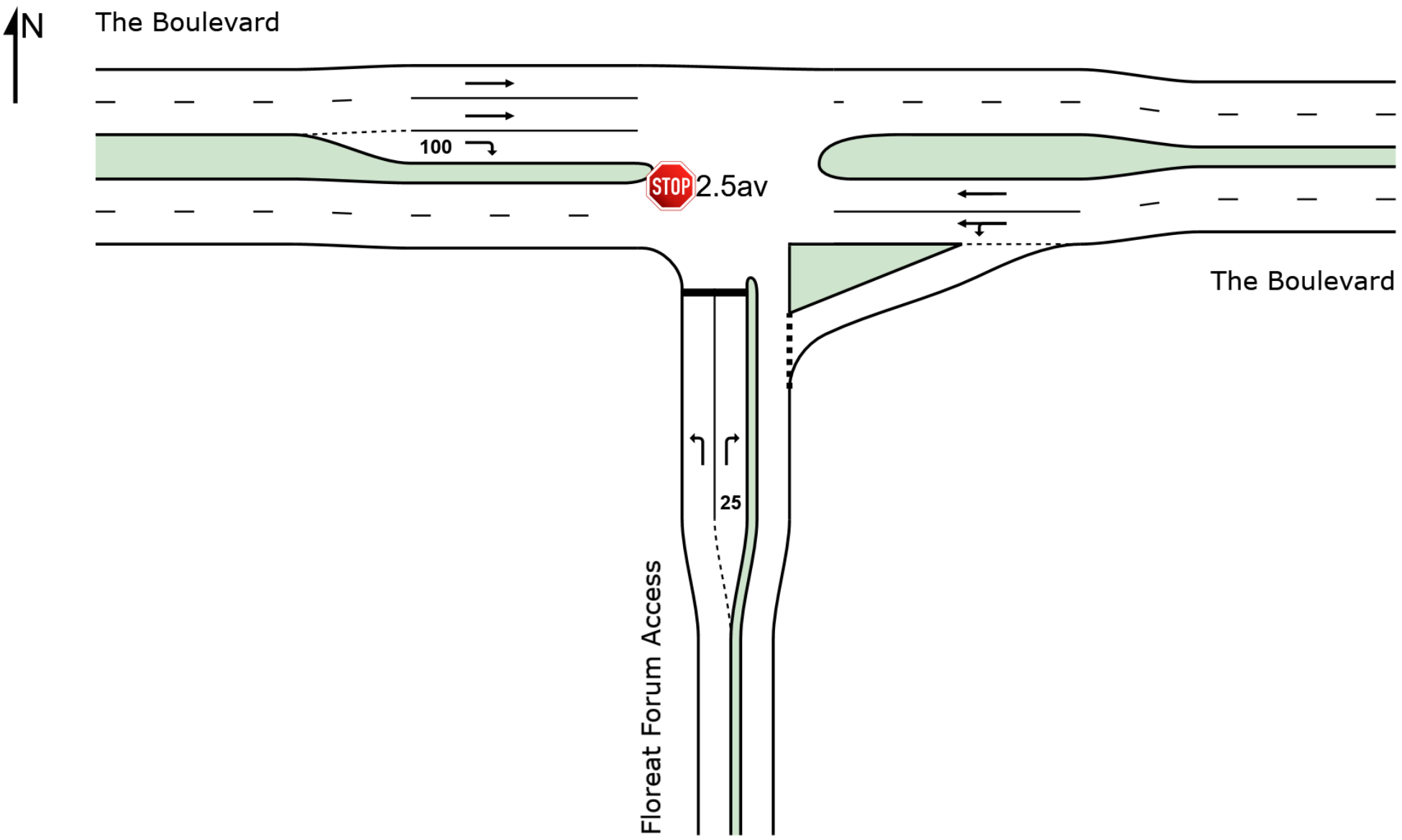
Site: 2.5av [2.5a The Boulevard - Floreat Forum Access 2041 AM - Conversion (Site Folder: General)]

Network: 1 [2041 AM (Network Folder: General)]

2.5a The Boulevard - Floreat Forum Access 2041 AM
Site Category: (None)
Stop (Two-Way)

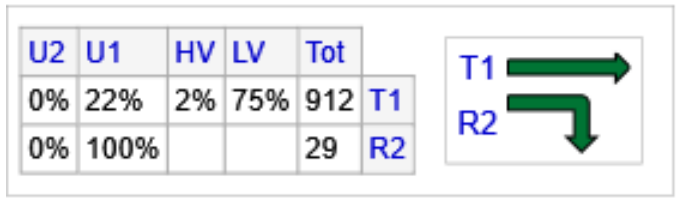
Site Layout

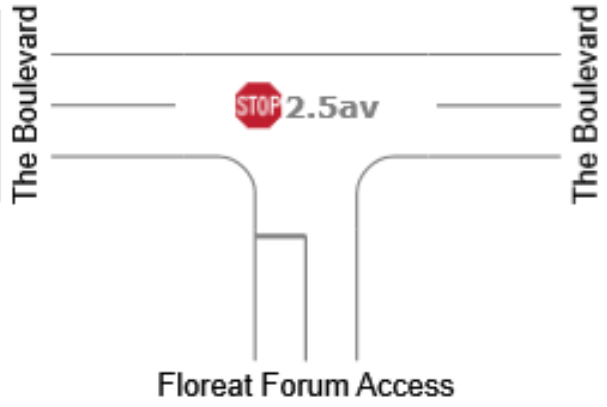
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

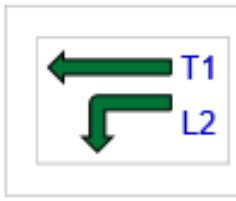


OD Arrival Flows

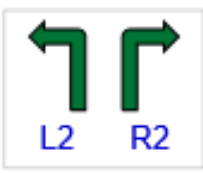
U2	U1	HV	LV	Tot	
0%	22%	2%	75%	912	T1
0%	100%			29	R2







	Tot	LV	HV	U1	U2
T1	801	54%	2%	43%	1%
L2	22			100%	0%



	L2	R2
Tot	95	19
LV		
HV		
U1	100%	100%
U2	0%	0%

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Development LV (U1)	Development HV (U2)
S: Floreat Forum Access	114	-	-	114	0
E: The Boulevard	823	436	15	366	6
W: The Boulevard	941	683	21	233	4
Total	1878	1119	36	713	11

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Floreat Forum Access															

Lane 1	95	0.0	95	0.0	763	0.124	100	6.5	LOS A	0.2	1.3	Full	50	0.0	0.0
Lane 2	19	0.0	19	0.0	53	0.360	100	86.2	LOS F	0.4	3.2	Short	25	0.0	NA
Approach	114	0.0	114	0.0		0.360		19.8	LOS C	0.4	3.2				
East: The Boulevard															
Lane 1	412	2.5	412	2.5	1907	0.216	100	0.3	LOS A	0.1	0.6	Full	67	0.0	0.0
Lane 2	411	2.6	411	2.6	1900	0.216	100	0.0	LOS A	0.0	0.0	Full	67	0.0	0.0
Approach	823	2.6	823	2.6		0.216		0.2	NA	0.1	0.6				
West: The Boulevard															
Lane 1	458	2.8	458	2.8	1897	0.241	100	0.0	LOS A	0.0	0.0	Full	175	0.0	0.0
Lane 2	453	2.8	453	2.8	1878	0.241	100	0.0	LOS A	0.0	0.0	Full	175	0.0	0.0
Lane 3	29	0.0	29	0.0	580	0.051	100	10.4	LOS B	0.1	0.5	Short	100	0.0	NA
Approach	941	2.7	941	2.7		0.241		0.3	NA	0.1	0.5				
Intersection	1878	2.5	1878	2.5		0.360		1.4	NA	0.4	3.2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

USER REPORT FOR NETWORK SITE

All Movement Classes

Project: KC01446.000 M05 The Boulevard - Floreat Forum Access

Template: Network Site Report

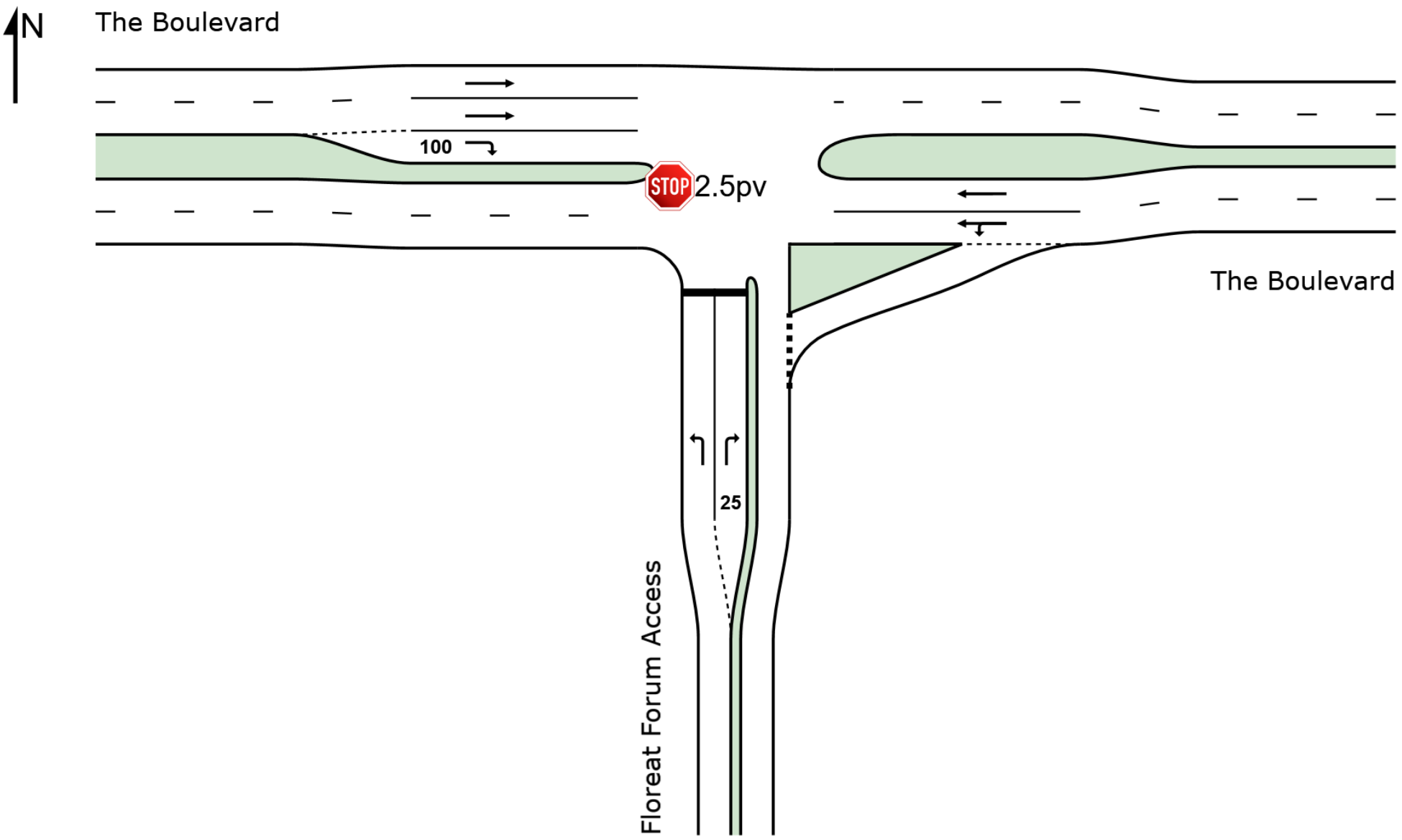
Site: 2.5pv [2.5p The Boulevard - Floreat Forum Access 2041 PM - Conversion (Site Folder: General)]

Network: 2 [2041 PM (Network Folder: General)]

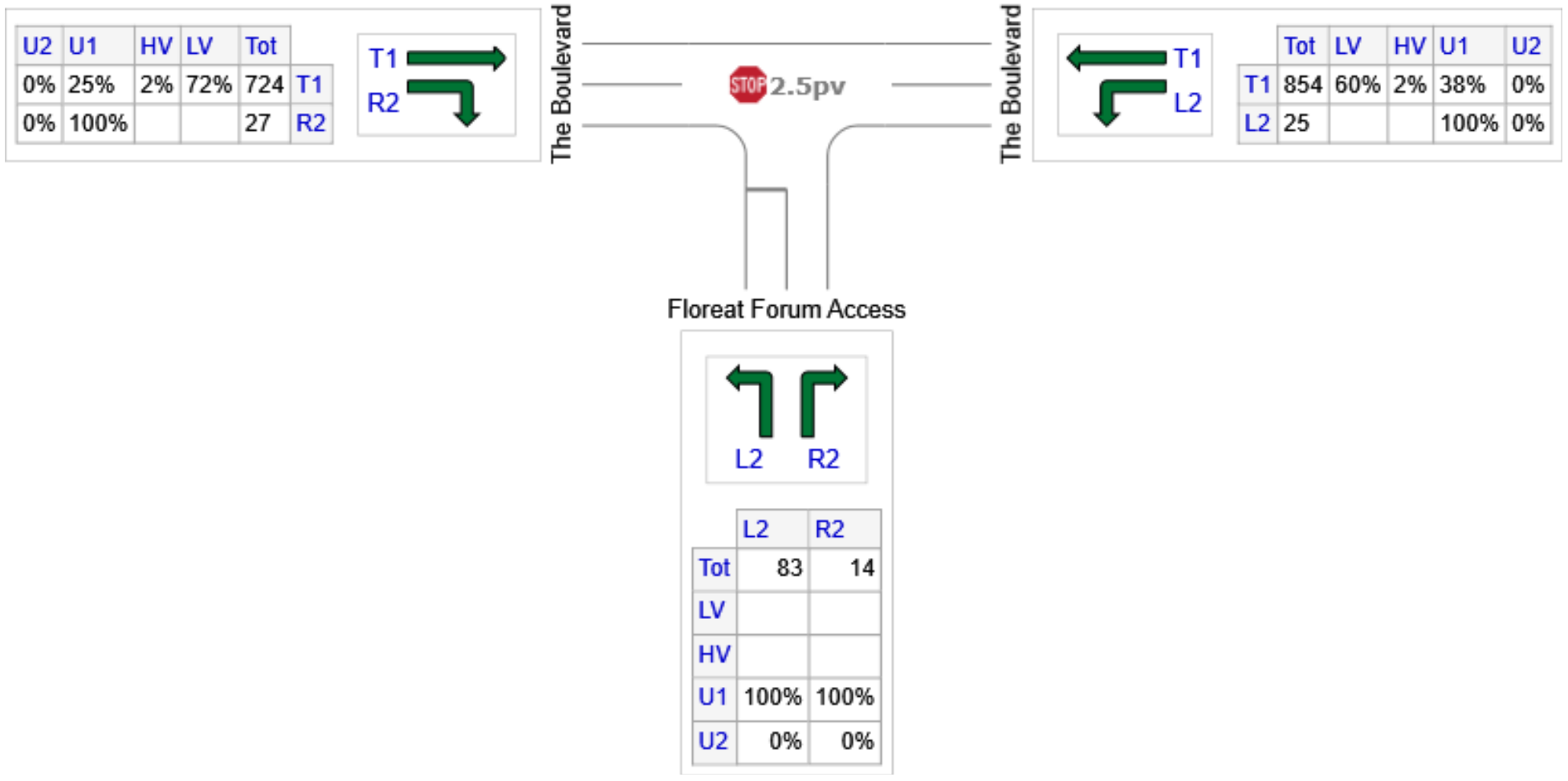
2.5p The Boulevard - Floreat Forum Access 2041 PM
Site Category: (None)
Stop (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



OD Arrival Flows



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Development LV (U1)	Development HV (U2)
S: Floreat Forum Access	97	-	-	97	0
E: The Boulevard	879	513	17	348	1
W: The Boulevard	752	524	17	208	2
Total	1727	1037	34	654	3

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Floreat Forum Access															

Lane 1	83	0.0	83	0.0	738	0.113	100	6.7	LOS A	0.2	1.2	Full	50	0.0	0.0
Lane 2	14	0.0	14	0.0	61	0.224	100	66.2	LOS F	0.3	1.9	Short	25	0.0	NA
Approach	97	0.0	97	0.0		0.224		15.1	LOS C	0.3	1.9				
East: The Boulevard															
Lane 1	440	2.0	440	2.0	1916	0.230	100	0.3	LOS A	0.1	0.6	Full	67	0.0	0.0
Lane 2	439	2.1	439	2.1	1910	0.230	100	0.0	LOS A	0.0	0.0	Full	67	0.0	0.0
Approach	879	2.0	879	2.0		0.230		0.2	NA	0.1	0.6				
West: The Boulevard															
Lane 1	362	2.6	362	2.6	1900	0.191	100	0.0	LOS A	0.0	0.0	Full	175	0.0	0.0
Lane 2	362	2.6	362	2.6	1900	0.191	100	0.0	LOS A	0.0	0.0	Full	175	0.0	0.0
Lane 3	27	0.0	27	0.0	540	0.051	100	10.9	LOS B	0.1	0.4	Short	100	0.0	NA
Approach	752	2.5	752	2.5		0.191		0.4	NA	0.1	0.4				
Intersection	1727	2.1	1727	2.1		0.230		1.1	NA	0.3	1.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

11-12h

2022 AM Car Base Matrix

name	Zone 01	Zone 02	Zone 03	Zone 04	Zone 05	Zone 06	Zone 07	Zone 08	Zone 09	Zone 10	Zone 11	Zone 12	Zone 13	Zone 14	Zone 15	Total
Zone 01	0.0	40.0	282.3	0.0	70.8	157.1	23.3	0.0	2.0	1.0	0.0	109.6	37.6	37.6	71.8	**833.2**
Zone 02	0.0	0.0	63.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	10.0	0.0	**83.0**
Zone 03	243.5	0.0	0.0	0.0	0.0	16.5	17.5	10.7	0.0	0.0	0.0	97.0	43.6	43.6	0.0	**472.2**
Zone 04	0.0	0.0	0.0	0.0	2.0	7.0	8.0	0.0	0.0	1.0	0.0	0.0	10.0	10.0	0.0	**38.0**
Zone 05	35.9	0.0	0.0	2.0	0.0	150.4	232.8	2.9	2.0	1.0	1.0	0.0	9.9	19.8	29.9	**487.6**
Zone 06	115.4	0.0	29.1	5.0	116.4	0.0	125.1	0.0	0.0	1.0	0.0	0.0	39.6	34.7	39.9	**506.2**
Zone 07	13.6	0.0	29.1	5.0	126.1	95.1	0.0	0.0	0.0	0.0	0.0	0.0	59.4	34.7	30.9	**393.8**
Zone 08	48.5	0.0	34.9	0.0	11.6	14.6	0.0	0.0	0.0	0.0	0.0	19.4	0.0	0.0	2.0	**131.0**
Zone 09	2.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**4.0**
Zone 10	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	**5.0**
Zone 11	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	**4.0**
Zone 12	78.0	0.0	50.0	0.0	0.0	62.0	0.0	24.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**214.0**
Zone 13	78.2	0.0	35.6	20.0	77.2	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	**213.1**
Zone 14	78.2	0.0	34.7	30.0	138.6	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	**283.5**
Zone 15	63.0	20.0	7.0	0.0	38.0	50.0	38.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**228.0**
Total	**756.3**	**60.0**	**565.7**	**64.0**	**584.8**	**553.6**	**444.7**	**49.6**	**4.0**	**6.0**	**3.0**	**226.0**	**212.1**	**192.3**	**174.6**	**3896.5**

12-13h

2022 PM Car Base Matrix

name	Zone 01	Zone 02	Zone 03	Zone 04	Zone 05	Zone 06	Zone 07	Zone 08	Zone 09	Zone 10	Zone 11	Zone 12	Zone 13	Zone 14	Zone 15	Total
Zone 01	0.0	38.0	173.6	0.0	68.9	164.9	19.4	0.0	2.0	1.0	0.0	111.6	34.7	29.7	52.9	**696.6**
Zone 02	0.0	0.0	42.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	10.0	0.0	**62.0**
Zone 03	281.3	0.0	0.0	0.0	0.0	11.6	10.7	10.7	0.0	0.0	0.0	82.5	30.7	29.7	0.0	**457.1**
Zone 04	0.0	0.0	0.0	0.0	2.0	7.0	8.0	0.0	0.0	1.0	0.0	0.0	10.0	10.0	0.0	**38.0**
Zone 05	23.3	0.0	0.0	20.0	0.0	137.7	249.3	4.9	2.0	1.0	1.0	0.0	9.9	19.8	29.9	**498.8**
Zone 06	131.0	0.0	81.5	15.0	97.0	0.0	88.3	0.0	0.0	1.0	0.0	0.0	44.6	35.6	39.9	**533.8**
Zone 07	29.1	0.0	29.1	10.0	122.2	88.3	0.0	0.0	0.0	0.0	0.0	0.0	59.4	39.6	30.9	**408.6**
Zone 08	48.5	0.0	9.7	0.0	14.6	14.6	0.0	0.0	0.0	0.0	0.0	9.7	0.0	0.0	13.0	**110.0**
Zone 09	2.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**4.0**
Zone 10	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	**5.0**
Zone 11	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	**4.0**
Zone 12	100.0	0.0	57.0	0.0	0.0	40.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**257.0**
Zone 13	64.4	0.0	26.7	10.0	68.3	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	**171.4**
Zone 14	69.3	0.0	26.7	20.0	138.6	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	**256.6**
Zone 15	40.0	15.0	8.0	0.0	35.0	47.0	35.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**190.0**
Total	**788.8**	**53.0**	**454.4**	**77.0**	**550.6**	**512.1**	**410.6**	**85.5**	**4.0**	**6.0**	**3.0**	**203.7**	**201.2**	**176.4**	**166.6**	**3692.9**

11-12h

2022 AM Truck Base Matrix

name	Zone 01	Zone 02	Zone 03	Zone 04	Zone 05	Zone 06	Zone 07	Zone 08	Zone 09	Zone 10	Zone 11	Zone 12	Zone 13	Zone 14	Zone 15	Total
Zone 01	0.0	0.0	8.7	0.0	2.2	4.9	0.7	0.0	0.0	0.0	0.0	3.4	0.4	0.4	0.2	**20.8**
Zone 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 03	7.5	0.0	0.0	0.0	0.0	0.5	0.5	0.3	0.0	0.0	0.0	3.0	0.4	0.4	0.0	**12.8**
Zone 04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 05	1.1	0.0	0.0	0.0	0.0	4.7	7.2	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.1	**13.4**
Zone 06	3.6	0.0	0.9	0.0	3.6	0.0	3.9	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.1	**12.8**
Zone 07	0.4	0.0	0.9	0.0	3.9	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.4	0.1	**9.2**
Zone 08	1.5	0.0	1.1	0.0	0.4	0.5	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	**4.0**
Zone 09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 13	0.8	0.0	0.4	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**1.9**
Zone 14	0.8	0.0	0.4	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**2.5**
Zone 15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Total	**15.7**	**0.0**	**12.3**	**0.0**	**12.2**	**13.4**	**12.3**	**0.4**	**0.0**	**0.0**	**0.0**	**7.0**	**1.9**	**1.7**	**0.4**	**77.5**

12-13h

2022 PM Truck Base Matrix

name	Zone 01	Zone 02	Zone 03	Zone 04	Zone 05	Zone 06	Zone 07	Zone 08	Zone 09	Zone 10	Zone 11	Zone 12	Zone 13	Zone 14	Zone 15	Total
Zone 01	0.0	0.0	5.4	0.0	2.1	5.1	0.6	0.0	0.0	0.0	0.0	3.5	0.4	0.3	0.1	**17.4**
Zone 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 03	8.7	0.0	0.0	0.0	0.0	0.4	0.3	0.3	0.0	0.0	0.0	2.6	0.3	0.3	0.0	**12.9**
Zone 04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 05	0.7	0.0	0.0	0.0	0.0	4.3	7.7	0.2	0.0	0.0	0.0	0.0	0.1	0.2	0.1	**13.2**
Zone 06	4.1	0.0	2.5	0.0	3.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.1	**13.2**
Zone 07	0.9	0.0	0.9	0.0	3.8	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.4	0.1	**9.4**
Zone 08	1.5	0.0	0.3	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	**3.0**
Zone 09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 13	0.7	0.0	0.3	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**1.6**
Zone 14	0.7	0.0	0.3	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**2.4**
Zone 15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Total	**17.2**	**0.0**	**9.6**	**0.0**	**11.5**	**12.9**	**11.4**	**0.5**	**0.0**	**0.0**	**0.0**	**6.3**	**1.8**	**1.6**	**0.4**	**73.1**

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name	Zone 01	Zone 02	Zone 03	Zone 04	Zone 05	Zone 06	Zone 07	Zone 08	Zone 09	Zone 10	Zone 11	Zone 12	Zone 13	Zone 14	Zone 15	Zone 16	Zone 17	Total
Zone 01	0.0	58.0	411.3	0.0	102.8	228.9	34.0	0.0	3.0	6.0	3.0	5.0	5.0	8.0	106.7	75.0	36.0	**1082.7**
Zone 02	0.0	0.0	92.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	7.8	5.0	3.0	**108.8**
Zone 03	355.0	0.0	0.0	0.0	0.0	24.3	25.2	15.5	0.0	4.0	2.0	3.0	3.0	5.0	60.1	42.0	20.0	**559.2**
Zone 04	0.0	0.0	0.0	0.0	3.0	10.0	12.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	19.4	13.0	6.0	**68.4**
Zone 05	52.4	0.0	0.0	3.0	0.0	219.2	339.5	3.9	3.0	3.0	2.0	3.0	2.0	4.0	54.3	38.0	18.0	**745.3**
Zone 06	167.8	0.0	42.7	7.0	169.8	0.0	182.4	0.0	0.0	3.0	1.0	2.0	2.0	3.0	43.7	30.0	15.0	**669.3**
Zone 07	19.4	0.0	42.7	7.0	183.3	138.7	0.0	0.0	0.0	2.0	1.0	2.0	1.0	2.0	31.0	22.0	10.0	**462.2**
Zone 08	70.8	0.0	50.4	0.0	16.5	21.3	0.0	0.0	0.0	1.0	0.0	1.0	0.0	1.0	10.7	8.0	4.0	**184.8**
Zone 09	3.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**6.0**
Zone 10	13.0	1.0	7.0	2.0	7.0	5.0	4.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**40.0**
Zone 11	6.0	0.0	4.0	1.0	3.0	3.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**20.0**
Zone 12	11.0	1.0	6.0	2.0	6.0	5.0	3.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**35.0**
Zone 13	10.0	1.0	5.0	2.0	5.0	4.0	3.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**31.0**
Zone 14	17.0	1.0	10.0	3.0	9.0	7.0	5.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**54.0**
Zone 15	112.5	7.8	64.0	20.4	57.2	45.6	33.0	11.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**352.1**
Zone 16	75.0	5.0	42.0	13.0	38.0	30.0	22.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**233.0**
Zone 17	72.0	5.0	41.0	13.0	37.0	29.0	21.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**225.0**
Total	**984.94**	**79.76**	**818.1**	**73.37**	**640.62**	**771.03**	**686.01**	**52.04**	**6**	**20**	**10**	**17**	**14**	**25**	**333.68**	**233**	**112**	**4876.55**

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name	Zone 01	Zone 02	Zone 03	Zone 04	Zone 05	Zone 06	Zone 07	Zone 08	Zone 09	Zone 10	Zone 11	Zone 12	Zone 13	Zone 14	Zone 15	Zone 16	Zone 17	Total
Zone 01	0.0	55.0	253.2	0.0	99.9	240.6	28.1	0.0	3.0	6.0	3.0	5.0	5.0	8.0	98.9	69.0	36.0	**910.7**
Zone 02	0.0	0.0	61.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	6.8	5.0	3.0	**76.8**
Zone 03	409.3	0.0	0.0	0.0	0.0	16.5	15.5	15.5	0.0	4.0	2.0	3.0	3.0	5.0	56.3	39.0	20.0	**589.1**
Zone 04	0.0	0.0	0.0	0.0	3.0	10.0	12.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	17.5	12.0	6.0	**65.5**
Zone 05	34.0	0.0	0.0	29.0	0.0	200.8	362.8	6.8	3.0	3.0	2.0	3.0	2.0	4.0	50.4	35.0	18.0	**753.8**
Zone 06	191.1	0.0	118.3	22.0	141.6	0.0	129.0	0.0	0.0	3.0	1.0	2.0	2.0	3.0	39.8	28.0	15.0	**695.8**
Zone 07	42.7	0.0	42.7	15.0	178.5	129.0	0.0	0.0	0.0	2.0	1.0	2.0	1.0	2.0	29.1	20.0	10.0	**475.0**
Zone 08	70.8	0.0	14.6	0.0	21.3	21.3	0.0	0.0	0.0	1.0	0.0	1.0	0.0	1.0	10.7	7.0	4.0	**152.7**
Zone 09	3.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**6.0**
Zone 10	13.0	1.0	7.0	2.0	7.0	5.0	4.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**40.0**
Zone 11	6.0	0.0	4.0	1.0	3.0	3.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**20.0**
Zone 12	11.0	1.0	6.0	2.0	6.0	5.0	3.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**35.0**
Zone 13	10.0	1.0	5.0	2.0	5.0	4.0	3.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**31.0**
Zone 14	17.0	1.0	10.0	3.0	9.0	7.0	5.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**54.0**
Zone 15	104.8	7.8	59.2	18.4	53.4	42.7	31.0	10.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**327.9**
Zone 16	69.0	5.0	42.0	13.0	38.0	30.0	22.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**227.0**
Zone 17	72.0	5.0	41.0	13.0	37.0	29.0	21.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**225.0**
Total	**1053.6**	**76.8**	**663.9**	**120.4**	**605.7**	**743.9**	**638.5**	**54.0**	**6.0**	**20.0**	**10.0**	**17.0**	**14.0**	**25.0**	**309.4**	**215.0**	**112.0**	**4685.2**

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name	Zone 01	Zone 02	Zone 03	Zone 04	Zone 05	Zone 06	Zone 07	Zone 08	Zone 09	Zone 10	Zone 11	Zone 12	Zone 13	Zone 14	Zone 15	Zone 16	Zone 17	Total
Zone 01	0.0	0.0	12.7	0.0	3.2	7.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0	0.0	**27.3**
Zone 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	**0.2**
Zone 03	11.0	0.0	0.0	0.0	0.0	0.8	0.8	0.5	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	**14.9**
Zone 04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	**0.6**
Zone 05	1.6	0.0	0.0	0.0	0.0	6.8	10.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	**20.7**
Zone 06	5.2	0.0	1.3	0.0	5.3	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	**18.8**
Zone 07	0.6	0.0	1.3	0.0	5.7	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	**12.8**
Zone 08	2.2	0.0	1.6	0.0	0.5	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	**5.3**
Zone 09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 15	3.5	0.2	2.0	0.6	1.8	1.4	1.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**10.9**
Zone 16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Total	**24.06**	**0.24**	**18.9**	**0.63**	**16.38**	**20.97**	**18.99**	**0.96**	**0**	**0**	**0**	**0**	**0**	**0**	**10.32**	**0**	**0**	**111.45**

12-13h 2041 PM Truck Future Matrix

name	Zone 01	Zone 02	Zone 03	Zone 04	Zone 05	Zone 06	Zone 07	Zone 08	Zone 09	Zone 10	Zone 11	Zone 12	Zone 13	Zone 14	Zone 15	Zone 16	Zone 17	Total
Zone 01	0.0	0.0	7.8	0.0	3.1	7.4	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.0	0.0	**22.3**
Zone 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	**0.2**
Zone 03	12.7	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	**15.9**
Zone 04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	**0.5**
Zone 05	1.1	0.0	0.0	0.0	0.0	6.2	11.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	**20.3**
Zone 06	5.9	0.0	3.7	0.0	4.4	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	**19.2**
Zone 07	1.3	0.0	1.3	0.0	5.5	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	**13.1**
Zone 08	2.2	0.0	0.5	0.0	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	**4.3**
Zone 09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 15	3.2	0.2	1.8	0.6	1.7	1.3	1.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**10.1**
Zone 16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Zone 17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Total	**26.4**	**0.2**	**15.1**	**0.6**	**15.3**	**20.1**	**17.5**	**1.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**9.6**	**0.0**	**0.0**	**105.8**

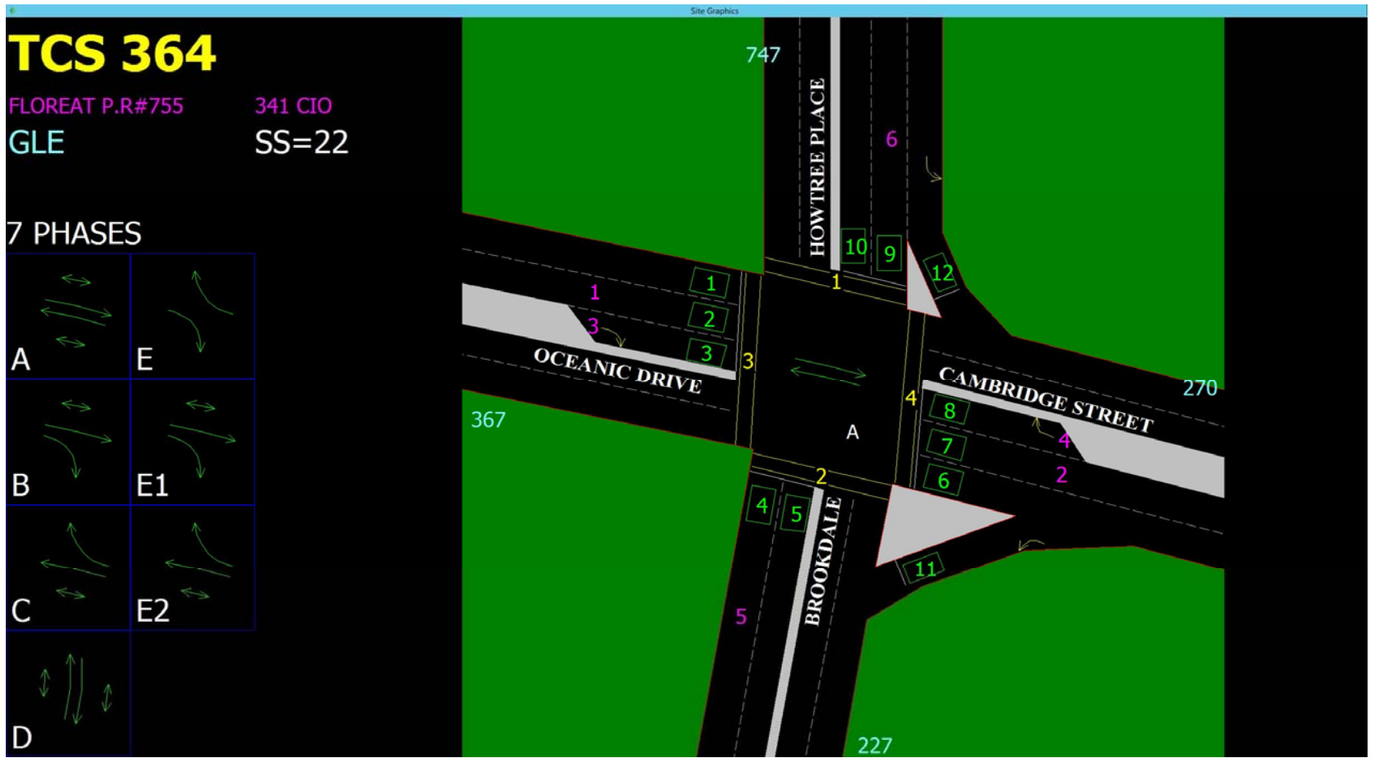
Appendix 5

Cycle Length Calculations

03-09-2022	<A>	19	11:00:46	11:01:05
03-09-2022	D	28	11:01:05	11:01:33
03-09-2022	E	17	11:01:33	11:01:50
03-09-2022	<A>	17	11:01:50	11:02:07
03-09-2022	D	32	11:02:07	11:02:39
03-09-2022	E	18	11:02:39	11:02:57
03-09-2022	<A>	14	11:02:57	11:03:11
03-09-2022	D	36	11:03:11	11:03:47
03-09-2022	E	17	11:03:47	11:04:04
03-09-2022	<A>	24	11:04:04	11:04:28
03-09-2022	D	49	11:04:28	11:05:17
03-09-2022	E	18	11:05:17	11:05:35
03-09-2022	<A>	16	11:05:35	11:05:51
03-09-2022	D	22	11:05:51	11:06:13
03-09-2022	<A>	14	11:06:13	11:06:27
03-09-2022	D	30	11:06:27	11:06:57
03-09-2022	E	19	11:06:57	11:07:16
03-09-2022	<A>	14	11:07:16	11:07:30
03-09-2022	D	25	11:07:30	11:07:55
03-09-2022	E	19	11:07:55	11:08:14
03-09-2022	<A>	20	11:08:14	11:08:34
03-09-2022	D	26	11:08:34	11:09:00
03-09-2022	E	14	11:09:00	11:09:14
03-09-2022	<A>	14	11:09:14	11:09:28
03-09-2022	D	21	11:09:28	11:09:49
03-09-2022	<A>	22	11:09:49	11:10:11
03-09-2022	D	25	11:10:11	11:10:36
03-09-2022	E	17	11:10:36	11:10:53
03-09-2022	<A>	19	11:10:53	11:11:12
03-09-2022	D	22	11:11:12	11:11:34
03-09-2022	E	15	11:11:34	11:11:49
03-09-2022	<A>	23	11:11:49	11:12:12
03-09-2022	D	21	11:12:12	11:12:33
03-09-2022	E	18	11:12:33	11:12:51
03-09-2022	<A>	16	11:12:51	11:13:07
03-09-2022	D	29	11:13:07	11:13:36
03-09-2022	E	17	11:13:36	11:13:53
03-09-2022	<A>	19	11:13:53	11:14:12
03-09-2022	D	26	11:14:12	11:14:38
03-09-2022	E	19	11:14:38	11:14:57
03-09-2022	<A>	26	11:14:57	11:15:23
03-09-2022	D	21	11:15:23	11:15:44
03-09-2022	E	14	11:15:44	11:15:58
03-09-2022	<A>	18	11:15:58	11:16:16
03-09-2022	D	37	11:16:16	11:16:53
03-09-2022	E	14	11:16:53	11:17:07
03-09-2022	<A>	21	11:17:07	11:17:28
03-09-2022	D	34	11:17:28	11:18:02
03-09-2022	E	16	11:18:02	11:18:18
03-09-2022	<A>	25	11:18:18	11:18:43
03-09-2022	D	52	11:18:43	11:19:35

Count <A>	Count D	Count E	All cycles length	Average cycle length
58	57	54	3573	61.60
Average phase <A> time	**Average phase D time**	**Average phase E time**		
18.19	27.93	17.15		63.27
Total phase <A> time	**Total phase D time**	**Total phase E time**		
1055	1592	926		
Frequency of phase <A>	**Frequency of phase D**	**Frequency of phase E**		
1	0.98	0.93		

Adjusted average phase time <A>	Adjusted average phase time D	Adjusted average phase time E	
18.19	27.45	15.97	61.60



03-09-2022	E	15	11:19:35	11:19:50
03-09-2022	<A>	19	11:19:50	11:20:09
03-09-2022	D	16	11:20:09	11:20:25
03-09-2022	E	25	11:20:25	11:20:50
03-09-2022	<A>	18	11:20:50	11:21:08
03-09-2022	D	44	11:21:08	11:21:52
03-09-2022	E	22	11:21:52	11:22:14
03-09-2022	<A>	19	11:22:14	11:22:33
03-09-2022	D	28	11:22:33	11:23:01
03-09-2022	E	17	11:23:01	11:23:18
03-09-2022	<A>	16	11:23:18	11:23:34
03-09-2022	D	23	11:23:34	11:23:57
03-09-2022	E	22	11:23:57	11:24:19
03-09-2022	<A>	21	11:24:19	11:24:40
03-09-2022	D	30	11:24:40	11:25:10
03-09-2022	E	14	11:25:10	11:25:24
03-09-2022	<A>	17	11:25:24	11:25:41
03-09-2022	D	22	11:25:41	11:26:03
03-09-2022	E	16	11:26:03	11:26:19
03-09-2022	<A>	20	11:26:19	11:26:39
03-09-2022	D	20	11:26:39	11:26:59
03-09-2022	E	17	11:26:59	11:27:16
03-09-2022	<A>	16	11:27:16	11:27:32
03-09-2022	D	36	11:27:32	11:28:08
03-09-2022	E	16	11:28:08	11:28:24
03-09-2022	<A>	19	11:28:24	11:28:43
03-09-2022	D	27	11:28:43	11:29:10
03-09-2022	E	14	11:29:10	11:29:24
03-09-2022	<A>	17	11:29:24	11:29:41
03-09-2022	D	35	11:29:41	11:30:16
03-09-2022	E	14	11:30:16	11:30:30
03-09-2022	<A>	19	11:30:30	11:30:49
03-09-2022	D	26	11:30:49	11:31:15
03-09-2022	E	15	11:31:15	11:31:30
03-09-2022	<A>	17	11:31:30	11:31:47
03-09-2022	D	25	11:31:47	11:32:12
03-09-2022	<A>	14	11:32:12	11:32:26
03-09-2022	E	15	11:32:26	11:32:41
03-09-2022	<A>	14	11:32:41	11:32:55
03-09-2022	D	19	11:32:55	11:33:14
03-09-2022	E	26	11:33:14	11:33:40
03-09-2022	<A>	14	11:33:40	11:33:54
03-09-2022	D	23	11:33:54	11:34:17
03-09-2022	E	17	11:34:17	11:34:34
03-09-2022	<A>	16	11:34:34	11:34:50
03-09-2022	D	27	11:34:50	11:35:17
03-09-2022	E	14	11:35:17	11:35:31
03-09-2022	<A>	14	11:35:31	11:35:45
03-09-2022	D	25	11:35:45	11:36:10
03-09-2022	E	17	11:36:10	11:36:27
03-09-2022	<A>	18	11:36:27	11:36:45

03-09-2022	D	27	11:36:45	11:37:12
03-09-2022	E	14	11:37:12	11:37:26
03-09-2022	<A>	16	11:37:26	11:37:42
03-09-2022	D	29	11:37:42	11:38:11
03-09-2022	E	17	11:38:11	11:38:28
03-09-2022	<A>	14	11:38:28	11:38:42
03-09-2022	D	32	11:38:42	11:39:14
03-09-2022	E	14	11:39:14	11:39:28
03-09-2022	<A>	17	11:39:28	11:39:45
03-09-2022	D	23	11:39:45	11:40:08
03-09-2022	E	14	11:40:08	11:40:22
03-09-2022	<A>	17	11:40:22	11:40:39
03-09-2022	D	30	11:40:39	11:41:09
03-09-2022	E	18	11:41:09	11:41:27
03-09-2022	<A>	14	11:41:27	11:41:41
03-09-2022	D	33	11:41:41	11:42:14
03-09-2022	E	17	11:42:14	11:42:31
03-09-2022	<A>	20	11:42:31	11:42:51
03-09-2022	D	29	11:42:51	11:43:20
03-09-2022	E	17	11:43:20	11:43:37
03-09-2022	<A>	18	11:43:37	11:43:55
03-09-2022	D	21	11:43:55	11:44:16
03-09-2022	E	18	11:44:16	11:44:34
03-09-2022	<A>	15	11:44:34	11:44:49
03-09-2022	D	29	11:44:49	11:45:18
03-09-2022	E	14	11:45:18	11:45:32
03-09-2022	<A>	21	11:45:32	11:45:53
03-09-2022	D	27	11:45:53	11:46:20
03-09-2022	E	16	11:46:20	11:46:36
03-09-2022	<A>	18	11:46:36	11:46:54
03-09-2022	D	32	11:46:54	11:47:26
03-09-2022	E	16	11:47:26	11:47:42
03-09-2022	<A>	19	11:47:42	11:48:01
03-09-2022	D	27	11:48:01	11:48:28
03-09-2022	E	14	11:48:28	11:48:42
03-09-2022	<A>	21	11:48:42	11:49:03
03-09-2022	D	22	11:49:03	11:49:25
03-09-2022	E	17	11:49:25	11:49:42
03-09-2022	<A>	14	11:49:42	11:49:56
03-09-2022	D	19	11:49:56	11:50:15
03-09-2022	<A>	14	11:50:15	11:50:29
03-09-2022	D	28	11:50:29	11:50:57
03-09-2022	E	24	11:50:57	11:51:21
03-09-2022	<A>	17	11:51:21	11:51:38
03-09-2022	D	22	11:51:38	11:52:00
03-09-2022	E	18	11:52:00	11:52:18
03-09-2022	<A>	17	11:52:18	11:52:35
03-09-2022	D	28	11:52:35	11:53:03
03-09-2022	E	19	11:53:03	11:53:22
03-09-2022	<A>	20	11:53:22	11:53:42
03-09-2022	D	27	11:53:42	11:54:09

03-09-2022	E	17	11:54:09	11:54:26
03-09-2022	<A>	20	11:54:26	11:54:46
03-09-2022	D	26	11:54:46	11:55:12
03-09-2022	E	18	11:55:12	11:55:30
03-09-2022	<A>	21	11:55:30	11:55:51
03-09-2022	D	29	11:55:51	11:56:20
03-09-2022	E	19	11:56:20	11:56:39
03-09-2022	<A>	29	11:56:39	11:57:08
03-09-2022	D	27	11:57:08	11:57:35
03-09-2022	E	14	11:57:35	11:57:49
03-09-2022	<A>	25	11:57:49	11:58:14
03-09-2022	D	26	11:58:14	11:58:40
03-09-2022	E	22	11:58:40	11:59:02
03-09-2022	<A>	19	11:59:02	11:59:21
03-09-2022	D	37	11:59:21	11:59:58
03-09-2022	E	21	11:59:58	12:00:19

03-09-2022	<A>	21	11:00:48	11:01:09
03-09-2022	C	16	11:01:09	11:01:25
03-09-2022	D	19	11:01:25	11:01:44
03-09-2022	<A>	22	11:01:44	11:02:06
03-09-2022	C	15	11:02:06	11:02:21
03-09-2022	D	20	11:02:21	11:02:41
03-09-2022	<A>	19	11:02:41	11:03:00
03-09-2022	D	24	11:03:00	11:03:24
03-09-2022	<A>	23	11:03:24	11:03:47
03-09-2022	D	19	11:03:47	11:04:06
03-09-2022	<A>	14	11:04:06	11:04:20
03-09-2022	C	20	11:04:20	11:04:40
03-09-2022	D	21	11:04:40	11:05:01
03-09-2022	<A>	42	11:05:01	11:05:43
03-09-2022	C	26	11:05:43	11:06:09
03-09-2022	D	26	11:06:09	11:06:35
03-09-2022	<A>	41	11:06:35	11:07:16
03-09-2022	C	13	11:07:16	11:07:29
03-09-2022	D	16	11:07:29	11:07:45
03-09-2022	<A>	24	11:07:45	11:08:09
03-09-2022	C	16	11:08:09	11:08:25
03-09-2022	<A>	21	11:08:25	11:08:46
03-09-2022	C	14	11:08:46	11:09:00
03-09-2022	D	29	11:09:00	11:09:29
03-09-2022	<A>	24	11:09:29	11:09:53
03-09-2022	C	18	11:09:53	11:10:11
03-09-2022	D	25	11:10:11	11:10:36
03-09-2022	<A>	30	11:10:36	11:11:06
03-09-2022	C	16	11:11:06	11:11:22
03-09-2022	D	26	11:11:22	11:11:48
03-09-2022	<A>	20	11:11:48	11:12:08
03-09-2022	D	20	11:12:08	11:12:28
03-09-2022	<A>	17	11:12:28	11:12:45
03-09-2022	C	22	11:12:45	11:13:07
03-09-2022	D	17	11:13:07	11:13:24
03-09-2022	<A>	30	11:13:24	11:13:54
03-09-2022	C	27	11:13:54	11:14:21
03-09-2022	D	37	11:14:21	11:14:58
03-09-2022	<A>	32	11:14:58	11:15:30
03-09-2022	C	17	11:15:30	11:15:47
03-09-2022	D	25	11:15:47	11:16:12
03-09-2022	<A>	21	11:16:12	11:16:33
03-09-2022	C	26	11:16:33	11:16:59
03-09-2022	D	25	11:16:59	11:17:24
03-09-2022	<A>	19	11:17:24	11:17:43
03-09-2022	D	17	11:17:43	11:18:00
03-09-2022	<A>	20	11:18:00	11:18:20
03-09-2022	D	15	11:18:20	11:18:35
03-09-2022	<A>	14	11:18:35	11:18:49
03-09-2022	D	24	11:18:49	11:19:13
03-09-2022	<A>	26	11:19:13	11:19:39

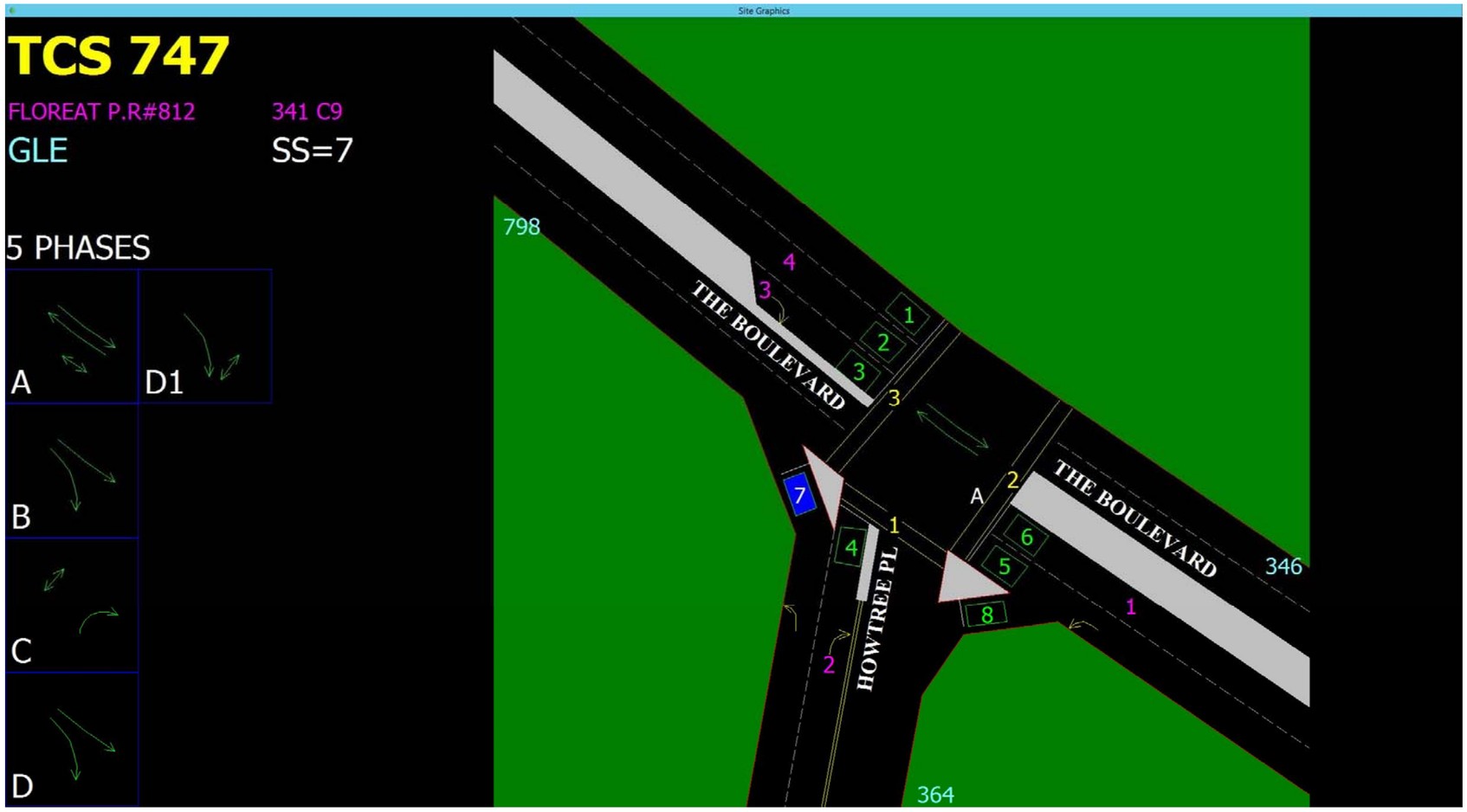
Count <A>	Count C	Count D	All cycles length	Average cycle length
61	46	59	3573	58.57

Average phase <A> time	Average phase C time	Average phase D time		
22.84	18.26	22.71		63.81

Total phase <A> time	Total phase C time	Total phase D time
1393	840	1340

Frequency of phase <A>	Frequency of phase C	Frequency of phase D
1	0.754098361	0.967213115

Adjusted average phase time <A>	Adjusted average phase time C	Adjusted average phase time D	
22.84	13.77	21.97	58.57



03-09-2022	C	15	11:19:39	11:19:54
03-09-2022	D	37	11:19:54	11:20:31
03-09-2022	<A>	23	11:20:31	11:20:54
03-09-2022	C	22	11:20:54	11:21:16
03-09-2022	D	36	11:21:16	11:21:52
03-09-2022	<A>	18	11:21:52	11:22:10
03-09-2022	C	22	11:22:10	11:22:32
03-09-2022	D	22	11:22:32	11:22:54
03-09-2022	<A>	18	11:22:54	11:23:12
03-09-2022	C	26	11:23:12	11:23:38
03-09-2022	D	27	11:23:38	11:24:05
03-09-2022	<A>	36	11:24:05	11:24:41
03-09-2022	C	17	11:24:41	11:24:58
03-09-2022	D	15	11:24:58	11:25:13
03-09-2022	<A>	23	11:25:13	11:25:36
03-09-2022	C	19	11:25:36	11:25:55
03-09-2022	D	15	11:25:55	11:26:10
03-09-2022	<A>	21	11:26:10	11:26:31
03-09-2022	C	16	11:26:31	11:26:47
03-09-2022	D	24	11:26:47	11:27:11
03-09-2022	<A>	19	11:27:11	11:27:30
03-09-2022	C	15	11:27:30	11:27:45
03-09-2022	<A>	12	11:27:45	11:27:57
03-09-2022	D	15	11:27:57	11:28:12
03-09-2022	<A>	13	11:28:12	11:28:25
03-09-2022	D	12	11:28:25	11:28:37
03-09-2022	<A>	16	11:28:37	11:28:53
03-09-2022	C	15	11:28:53	11:29:08
03-09-2022	D	17	11:29:08	11:29:25
03-09-2022	<A>	19	11:29:25	11:29:44
03-09-2022	C	20	11:29:44	11:30:04
03-09-2022	D	17	11:30:04	11:30:21
03-09-2022	<A>	30	11:30:21	11:30:51
03-09-2022	C	18	11:30:51	11:31:09
03-09-2022	D	12	11:31:09	11:31:21
03-09-2022	<A>	20	11:31:21	11:31:41
03-09-2022	C	20	11:31:41	11:32:01
03-09-2022	D	20	11:32:01	11:32:21
03-09-2022	<A>	24	11:32:21	11:32:45
03-09-2022	D	26	11:32:45	11:33:11
03-09-2022	<A>	14	11:33:11	11:33:25
03-09-2022	C	16	11:33:25	11:33:41
03-09-2022	D	23	11:33:41	11:34:04
03-09-2022	<A>	20	11:34:04	11:34:24
03-09-2022	C	14	11:34:24	11:34:38
03-09-2022	D	12	11:34:38	11:34:50
03-09-2022	<A>	17	11:34:50	11:35:07
03-09-2022	C	15	11:35:07	11:35:22
03-09-2022	D	22	11:35:22	11:35:44
03-09-2022	<A>	26	11:35:44	11:36:10
03-09-2022	D	24	11:36:10	11:36:34

03-09-2022	<A>	19	11:36:34	11:36:53
03-09-2022	C	17	11:36:53	11:37:10
03-09-2022	D	26	11:37:10	11:37:36
03-09-2022	<A>	27	11:37:36	11:38:03
03-09-2022	C	15	11:38:03	11:38:18
03-09-2022	D	28	11:38:18	11:38:46
03-09-2022	<A>	28	11:38:46	11:39:14
03-09-2022	C	25	11:39:14	11:39:39
03-09-2022	D	34	11:39:39	11:40:13
03-09-2022	<A>	18	11:40:13	11:40:31
03-09-2022	C	20	11:40:31	11:40:51
03-09-2022	D	24	11:40:51	11:41:15
03-09-2022	<A>	24	11:41:15	11:41:39
03-09-2022	C	21	11:41:39	11:42:00
03-09-2022	D	20	11:42:00	11:42:20
03-09-2022	<A>	19	11:42:20	11:42:39
03-09-2022	D	18	11:42:39	11:42:57
03-09-2022	<A>	17	11:42:57	11:43:14
03-09-2022	D	19	11:43:14	11:43:33
03-09-2022	<A>	18	11:43:33	11:43:51
03-09-2022	C	24	11:43:51	11:44:15
03-09-2022	D	30	11:44:15	11:44:45
03-09-2022	<A>	27	11:44:45	11:45:12
03-09-2022	D	22	11:45:12	11:45:34
03-09-2022	<A>	29	11:45:34	11:46:03
03-09-2022	D	21	11:46:03	11:46:24
03-09-2022	<A>	21	11:46:24	11:46:45
03-09-2022	C	15	11:46:45	11:47:00
03-09-2022	D	17	11:47:00	11:47:17
03-09-2022	<A>	35	11:47:17	11:47:52
03-09-2022	C	22	11:47:52	11:48:14
03-09-2022	D	29	11:48:14	11:48:43
03-09-2022	<A>	22	11:48:43	11:49:05
03-09-2022	C	16	11:49:05	11:49:21
03-09-2022	D	22	11:49:21	11:49:43
03-09-2022	<A>	20	11:49:43	11:50:03
03-09-2022	D	31	11:50:03	11:50:34
03-09-2022	<A>	22	11:50:34	11:50:56
03-09-2022	C	15	11:50:56	11:51:11
03-09-2022	D	24	11:51:11	11:51:35
03-09-2022	<A>	27	11:51:35	11:52:02
03-09-2022	C	15	11:52:02	11:52:17
03-09-2022	D	24	11:52:17	11:52:41
03-09-2022	<A>	26	11:52:41	11:53:07
03-09-2022	C	12	11:53:07	11:53:19
03-09-2022	D	28	11:53:19	11:53:47
03-09-2022	<A>	26	11:53:47	11:54:13
03-09-2022	C	18	11:54:13	11:54:31
03-09-2022	D	22	11:54:31	11:54:53
03-09-2022	<A>	22	11:54:53	11:55:15
03-09-2022	C	19	11:55:15	11:55:34

03-09-2022	D	28	11:55:34	11:56:02
03-09-2022	<A>	25	11:56:02	11:56:27
03-09-2022	C	20	11:56:27	11:56:47
03-09-2022	D	17	11:56:47	11:57:04
03-09-2022	<A>	22	11:57:04	11:57:26
03-09-2022	C	15	11:57:26	11:57:41
03-09-2022	D	31	11:57:41	11:58:12
03-09-2022	<A>	25	11:58:12	11:58:37
03-09-2022	C	14	11:58:37	11:58:51
03-09-2022	D	14	11:58:51	11:59:05
03-09-2022	<A>	25	11:59:05	11:59:30
03-09-2022	C	21	11:59:30	11:59:51
03-09-2022	D	30	11:59:51	12:00:21

03-09-2022	<A>	21	12:00:19	12:00:40
03-09-2022	D	40	12:00:40	12:01:20
03-09-2022	E	20	12:01:20	12:01:40
03-09-2022	<A>	22	12:01:40	12:02:02
03-09-2022	D	33	12:02:02	12:02:35
03-09-2022	E	22	12:02:35	12:02:57
03-09-2022	<A>	19	12:02:57	12:03:16
03-09-2022	D	37	12:03:16	12:03:53
03-09-2022	E	17	12:03:53	12:04:10
03-09-2022	<A>	22	12:04:10	12:04:32
03-09-2022	D	21	12:04:32	12:04:53
03-09-2022	E	18	12:04:53	12:05:11
03-09-2022	<A>	21	12:05:11	12:05:32
03-09-2022	D	31	12:05:32	12:06:03
03-09-2022	E	18	12:06:03	12:06:21
03-09-2022	<A>	25	12:06:21	12:06:46
03-09-2022	D	25	12:06:46	12:07:11
03-09-2022	E	14	12:07:11	12:07:25
03-09-2022	<A>	19	12:07:25	12:07:44
03-09-2022	D	33	12:07:44	12:08:17
03-09-2022	E	16	12:08:17	12:08:33
03-09-2022	<A>	17	12:08:33	12:08:50
03-09-2022	D	37	12:08:50	12:09:27
03-09-2022	E	18	12:09:27	12:09:45
03-09-2022	<A>	16	12:09:45	12:10:01
03-09-2022	D	34	12:10:01	12:10:35
03-09-2022	<A>	26	12:10:35	12:11:01
03-09-2022	D	28	12:11:01	12:11:29
03-09-2022	<A>	22	12:11:29	12:11:51
03-09-2022	D	15	12:11:51	12:12:06
03-09-2022	<A>	22	12:12:06	12:12:28
03-09-2022	D	21	12:12:28	12:12:49
03-09-2022	E	18	12:12:49	12:13:07
03-09-2022	<A>	18	12:13:07	12:13:25
03-09-2022	D	28	12:13:25	12:13:53
03-09-2022	<A>	19	12:13:53	12:14:12
03-09-2022	D	27	12:14:12	12:14:39
03-09-2022	E	16	12:14:39	12:14:55
03-09-2022	<A>	18	12:14:55	12:15:13
03-09-2022	D	26	12:15:13	12:15:39
03-09-2022	E	14	12:15:39	12:15:53
03-09-2022	<A>	20	12:15:53	12:16:13
03-09-2022	D	26	12:16:13	12:16:39
03-09-2022	E	15	12:16:39	12:16:54
03-09-2022	<A>	20	12:16:54	12:17:14
03-09-2022	D	25	12:17:14	12:17:39
03-09-2022	E	14	12:17:39	12:17:53
03-09-2022	<A>	14	12:17:53	12:18:07
03-09-2022	D	29	12:18:07	12:18:36
03-09-2022	<A>	20	12:18:36	12:18:56
03-09-2022	D	22	12:18:56	12:19:18
03-09-2022	E	21	12:19:18	12:19:39
03-09-2022	<A>	25	12:19:39	12:20:04

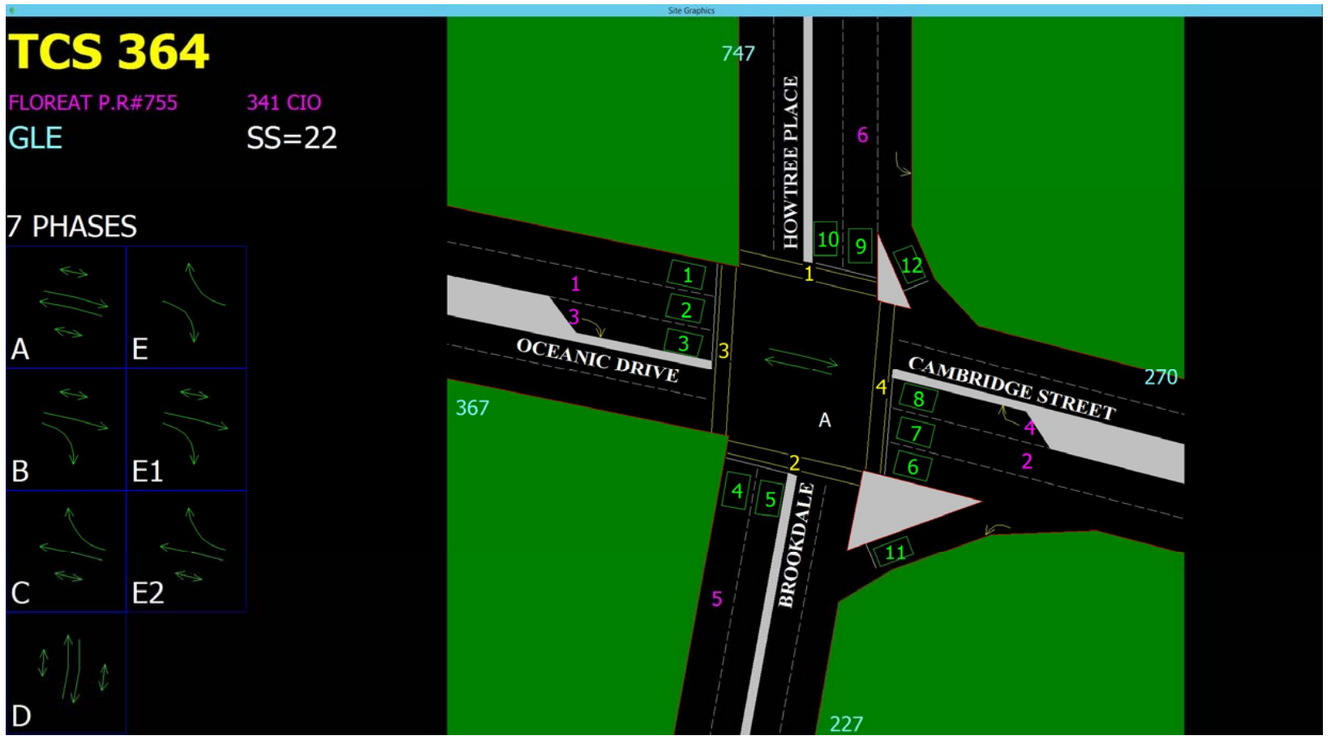
Count <A>	Count D	Count E	All cycles length	Average cycle length
60	60	53	3632	60.53

Average phase <A> time	Average phase D time	Average phase E time		
19.02	27	16.43		62.45

Total phase <A> time	Total phase D time	Total phase E time
1141	1620	871

Frequency of phase <A>	Frequency of phase D	Frequency of phase E
1	1	0.88

Adjusted average phase time <A>	Adjusted average phase time D	Adjusted average phase time E	
19.02	27.00	14.52	60.53



03-09-2022	D	18	12:20:04	12:20:22
03-09-2022	E	14	12:20:22	12:20:36
03-09-2022	<A>	19	12:20:36	12:20:55
03-09-2022	D	27	12:20:55	12:21:22
03-09-2022	E	18	12:21:22	12:21:40
03-09-2022	<A>	22	12:21:40	12:22:02
03-09-2022	D	26	12:22:02	12:22:28
03-09-2022	E	15	12:22:28	12:22:43
03-09-2022	<A>	16	12:22:43	12:22:59
03-09-2022	D	22	12:22:59	12:23:21
03-09-2022	E	15	12:23:21	12:23:36
03-09-2022	<A>	14	12:23:36	12:23:50
03-09-2022	D	23	12:23:50	12:24:13
03-09-2022	E	15	12:24:13	12:24:28
03-09-2022	<A>	19	12:24:28	12:24:47
03-09-2022	D	23	12:24:47	12:25:10
03-09-2022	E	17	12:25:10	12:25:27
03-09-2022	<A>	22	12:25:27	12:25:49
03-09-2022	D	27	12:25:49	12:26:16
03-09-2022	E	14	12:26:16	12:26:30
03-09-2022	<A>	26	12:26:30	12:26:56
03-09-2022	D	24	12:26:56	12:27:20
03-09-2022	E	16	12:27:20	12:27:36
03-09-2022	<A>	22	12:27:36	12:27:58
03-09-2022	D	28	12:27:58	12:28:26
03-09-2022	E	14	12:28:26	12:28:40
03-09-2022	<A>	17	12:28:40	12:28:57
03-09-2022	D	39	12:28:57	12:29:36
03-09-2022	E	15	12:29:36	12:29:51
03-09-2022	<A>	16	12:29:51	12:30:07
03-09-2022	D	34	12:30:07	12:30:41
03-09-2022	E	16	12:30:41	12:30:57
03-09-2022	<A>	15	12:30:57	12:31:12
03-09-2022	D	40	12:31:12	12:31:52
03-09-2022	E	14	12:31:52	12:32:06
03-09-2022	<A>	25	12:32:06	12:32:31
03-09-2022	D	20	12:32:31	12:32:51
03-09-2022	E	18	12:32:51	12:33:09
03-09-2022	<A>	20	12:33:09	12:33:29
03-09-2022	D	16	12:33:29	12:33:45
03-09-2022	E	16	12:33:45	12:34:01
03-09-2022	<A>	16	12:34:01	12:34:17
03-09-2022	D	32	12:34:17	12:34:49
03-09-2022	E	17	12:34:49	12:35:06
03-09-2022	<A>	14	12:35:06	12:35:20
03-09-2022	D	19	12:35:20	12:35:39
03-09-2022	E	14	12:35:39	12:35:53
03-09-2022	<A>	16	12:35:53	12:36:09
03-09-2022	D	23	12:36:09	12:36:32
03-09-2022	E	14	12:36:32	12:36:46
03-09-2022	<A>	18	12:36:46	12:37:04
03-09-2022	D	22	12:37:04	12:37:26
03-09-2022	E	19	12:37:26	12:37:45

03-09-2022	<A>	15	12:37:45	12:38:00
03-09-2022	D	31	12:38:00	12:38:31
03-09-2022	E	16	12:38:31	12:38:47
03-09-2022	<A>	17	12:38:47	12:39:04
03-09-2022	D	28	12:39:04	12:39:32
03-09-2022	E	15	12:39:32	12:39:47
03-09-2022	<A>	18	12:39:47	12:40:05
03-09-2022	D	27	12:40:05	12:40:32
03-09-2022	E	14	12:40:32	12:40:46
03-09-2022	<A>	15	12:40:46	12:41:01
03-09-2022	D	31	12:41:01	12:41:32
03-09-2022	E	15	12:41:32	12:41:47
03-09-2022	<A>	15	12:41:47	12:42:02
03-09-2022	D	35	12:42:02	12:42:37
03-09-2022	E	14	12:42:37	12:42:51
03-09-2022	<A>	20	12:42:51	12:43:11
03-09-2022	D	36	12:43:11	12:43:47
03-09-2022	E	15	12:43:47	12:44:02
03-09-2022	<A>	19	12:44:02	12:44:21
03-09-2022	D	20	12:44:21	12:44:41
03-09-2022	E	14	12:44:41	12:44:55
03-09-2022	<A>	15	12:44:55	12:45:10
03-09-2022	D	19	12:45:10	12:45:29
03-09-2022	E	22	12:45:29	12:45:51
03-09-2022	<A>	16	12:45:51	12:46:07
03-09-2022	D	22	12:46:07	12:46:29
03-09-2022	E	17	12:46:29	12:46:46
03-09-2022	<A>	19	12:46:46	12:47:05
03-09-2022	D	50	12:47:05	12:47:55
03-09-2022	E	16	12:47:55	12:48:11
03-09-2022	<A>	20	12:48:11	12:48:31
03-09-2022	D	21	12:48:31	12:48:52
03-09-2022	E	16	12:48:52	12:49:08
03-09-2022	<A>	19	12:49:08	12:49:27
03-09-2022	D	25	12:49:27	12:49:52
03-09-2022	E	18	12:49:52	12:50:10
03-09-2022	<A>	19	12:50:10	12:50:29
03-09-2022	D	20	12:50:29	12:50:49
03-09-2022	E	19	12:50:49	12:51:08
03-09-2022	<A>	16	12:51:08	12:51:24
03-09-2022	D	29	12:51:24	12:51:53
03-09-2022	E	18	12:51:53	12:52:11
03-09-2022	<A>	18	12:52:11	12:52:29
03-09-2022	D	28	12:52:29	12:52:57
03-09-2022	<A>	21	12:52:57	12:53:18
03-09-2022	D	21	12:53:18	12:53:39
03-09-2022	E	18	12:53:39	12:53:57
03-09-2022	<A>	23	12:53:57	12:54:20
03-09-2022	D	22	12:54:20	12:54:42
03-09-2022	E	14	12:54:42	12:54:56
03-09-2022	<A>	16	12:54:56	12:55:12
03-09-2022	D	24	12:55:12	12:55:36
03-09-2022	E	18	12:55:36	12:55:54

03-09-2022	<A>	24	12:55:54	12:56:18
03-09-2022	D	36	12:56:18	12:56:54
03-09-2022	<A>	17	12:56:54	12:57:11
03-09-2022	D	16	12:57:11	12:57:27
03-09-2022	E	18	12:57:27	12:57:45
03-09-2022	<A>	18	12:57:45	12:58:03
03-09-2022	D	27	12:58:03	12:58:30
03-09-2022	E	17	12:58:30	12:58:47
03-09-2022	<A>	22	12:58:47	12:59:09
03-09-2022	D	22	12:59:09	12:59:31
03-09-2022	E	18	12:59:31	12:59:49
03-09-2022	<A>	16	12:59:49	13:00:05
03-09-2022	D	29	13:00:05	13:00:34
03-09-2022	E	17	13:00:34	13:00:51

03-09-2022	<A>	21	11:00:48	11:01:09
03-09-2022	C	16	11:01:09	11:01:25
03-09-2022	D	19	11:01:25	11:01:44
03-09-2022	<A>	22	11:01:44	11:02:06
03-09-2022	C	15	11:02:06	11:02:21
03-09-2022	D	20	11:02:21	11:02:41
03-09-2022	<A>	19	11:02:41	11:03:00
03-09-2022	D	24	11:03:00	11:03:24
03-09-2022	<A>	23	11:03:24	11:03:47
03-09-2022	D	19	11:03:47	11:04:06
03-09-2022	<A>	14	11:04:06	11:04:20
03-09-2022	C	20	11:04:20	11:04:40
03-09-2022	D	21	11:04:40	11:05:01
03-09-2022	<A>	42	11:05:01	11:05:43
03-09-2022	C	26	11:05:43	11:06:09
03-09-2022	D	26	11:06:09	11:06:35
03-09-2022	<A>	41	11:06:35	11:07:16
03-09-2022	C	13	11:07:16	11:07:29
03-09-2022	D	16	11:07:29	11:07:45
03-09-2022	<A>	24	11:07:45	11:08:09
03-09-2022	C	16	11:08:09	11:08:25
03-09-2022	<A>	21	11:08:25	11:08:46
03-09-2022	C	14	11:08:46	11:09:00
03-09-2022	D	29	11:09:00	11:09:29
03-09-2022	<A>	24	11:09:29	11:09:53
03-09-2022	C	18	11:09:53	11:10:11
03-09-2022	D	25	11:10:11	11:10:36
03-09-2022	<A>	30	11:10:36	11:11:06
03-09-2022	C	16	11:11:06	11:11:22
03-09-2022	D	26	11:11:22	11:11:48
03-09-2022	<A>	20	11:11:48	11:12:08
03-09-2022	D	20	11:12:08	11:12:28
03-09-2022	<A>	17	11:12:28	11:12:45
03-09-2022	C	22	11:12:45	11:13:07
03-09-2022	D	17	11:13:07	11:13:24
03-09-2022	<A>	30	11:13:24	11:13:54
03-09-2022	C	27	11:13:54	11:14:21
03-09-2022	D	37	11:14:21	11:14:58
03-09-2022	<A>	32	11:14:58	11:15:30
03-09-2022	C	17	11:15:30	11:15:47
03-09-2022	D	25	11:15:47	11:16:12
03-09-2022	<A>	21	11:16:12	11:16:33
03-09-2022	C	26	11:16:33	11:16:59
03-09-2022	D	25	11:16:59	11:17:24
03-09-2022	<A>	19	11:17:24	11:17:43
03-09-2022	D	17	11:17:43	11:18:00
03-09-2022	<A>	20	11:18:00	11:18:20
03-09-2022	D	15	11:18:20	11:18:35
03-09-2022	<A>	14	11:18:35	11:18:49
03-09-2022	D	24	11:18:49	11:19:13
03-09-2022	<A>	26	11:19:13	11:19:39

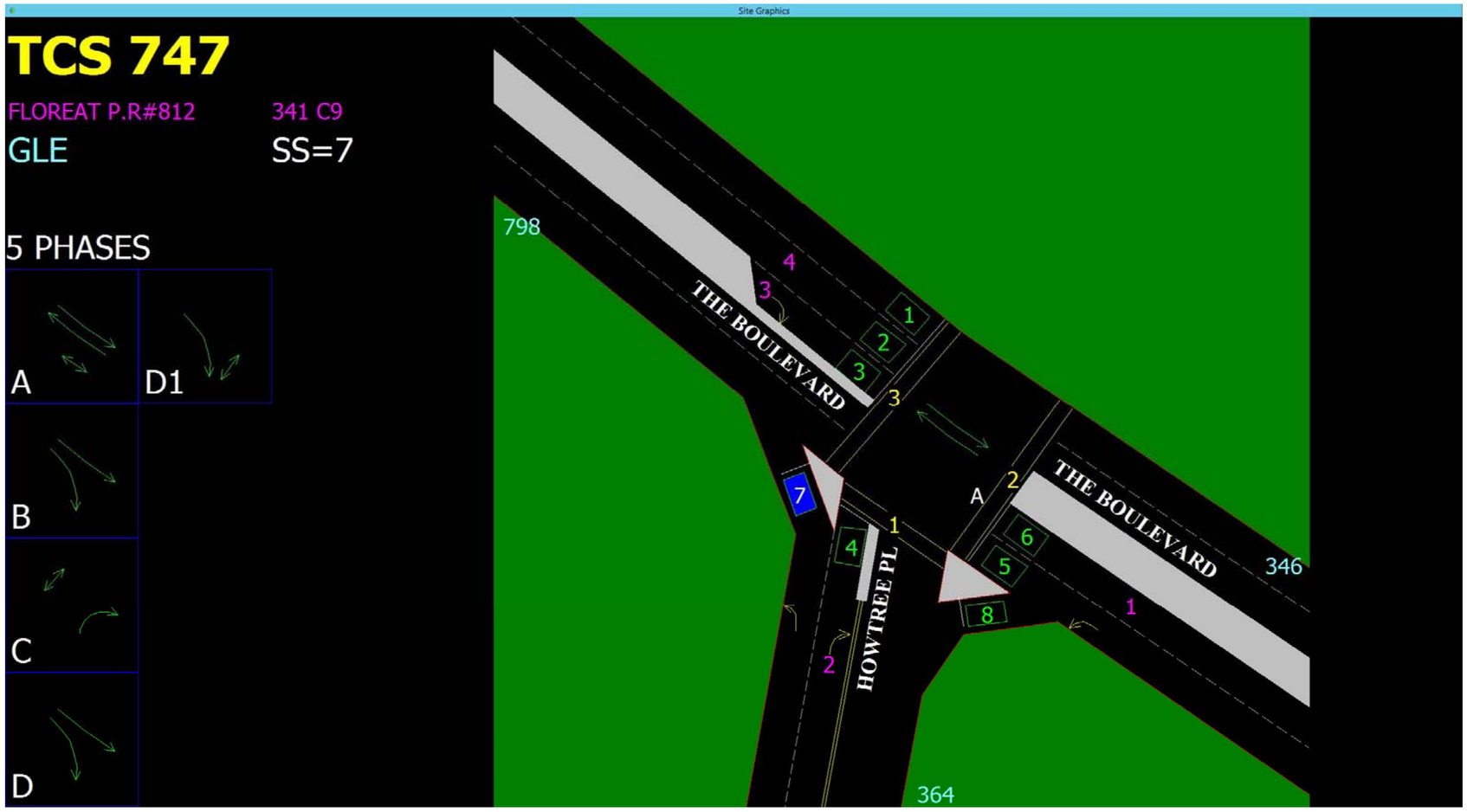
Count <A>	Count C	Count D	All cycles length	Average cycle length
61	46	59	3573	58.57

Average phase <A> time	Average phase C time	Average phase D time		
22.84	18.26	22.71		63.81

Total phase <A> time	Total phase C time	Total phase D time
1393	840	1340

Frequency of phase <A>	Frequency of phase C	Frequency of phase D
1	0.754098361	0.967213115

Adjusted average phase time <A>	Adjusted average phase time C	Adjusted average phase time D	
22.84	13.77	21.97	58.57



03-09-2022	C	15	11:19:39	11:19:54
03-09-2022	D	37	11:19:54	11:20:31
03-09-2022	<A>	23	11:20:31	11:20:54
03-09-2022	C	22	11:20:54	11:21:16
03-09-2022	D	36	11:21:16	11:21:52
03-09-2022	<A>	18	11:21:52	11:22:10
03-09-2022	C	22	11:22:10	11:22:32
03-09-2022	D	22	11:22:32	11:22:54
03-09-2022	<A>	18	11:22:54	11:23:12
03-09-2022	C	26	11:23:12	11:23:38
03-09-2022	D	27	11:23:38	11:24:05
03-09-2022	<A>	36	11:24:05	11:24:41
03-09-2022	C	17	11:24:41	11:24:58
03-09-2022	D	15	11:24:58	11:25:13
03-09-2022	<A>	23	11:25:13	11:25:36
03-09-2022	C	19	11:25:36	11:25:55
03-09-2022	D	15	11:25:55	11:26:10
03-09-2022	<A>	21	11:26:10	11:26:31
03-09-2022	C	16	11:26:31	11:26:47
03-09-2022	D	24	11:26:47	11:27:11
03-09-2022	<A>	19	11:27:11	11:27:30
03-09-2022	C	15	11:27:30	11:27:45
03-09-2022	<A>	12	11:27:45	11:27:57
03-09-2022	D	15	11:27:57	11:28:12
03-09-2022	<A>	13	11:28:12	11:28:25
03-09-2022	D	12	11:28:25	11:28:37
03-09-2022	<A>	16	11:28:37	11:28:53
03-09-2022	C	15	11:28:53	11:29:08
03-09-2022	D	17	11:29:08	11:29:25
03-09-2022	<A>	19	11:29:25	11:29:44
03-09-2022	C	20	11:29:44	11:30:04
03-09-2022	D	17	11:30:04	11:30:21
03-09-2022	<A>	30	11:30:21	11:30:51
03-09-2022	C	18	11:30:51	11:31:09
03-09-2022	D	12	11:31:09	11:31:21
03-09-2022	<A>	20	11:31:21	11:31:41
03-09-2022	C	20	11:31:41	11:32:01
03-09-2022	D	20	11:32:01	11:32:21
03-09-2022	<A>	24	11:32:21	11:32:45
03-09-2022	D	26	11:32:45	11:33:11
03-09-2022	<A>	14	11:33:11	11:33:25
03-09-2022	C	16	11:33:25	11:33:41
03-09-2022	D	23	11:33:41	11:34:04
03-09-2022	<A>	20	11:34:04	11:34:24
03-09-2022	C	14	11:34:24	11:34:38
03-09-2022	D	12	11:34:38	11:34:50
03-09-2022	<A>	17	11:34:50	11:35:07
03-09-2022	C	15	11:35:07	11:35:22
03-09-2022	D	22	11:35:22	11:35:44
03-09-2022	<A>	26	11:35:44	11:36:10
03-09-2022	D	24	11:36:10	11:36:34

03-09-2022	<A>	19	11:36:34	11:36:53
03-09-2022	C	17	11:36:53	11:37:10
03-09-2022	D	26	11:37:10	11:37:36
03-09-2022	<A>	27	11:37:36	11:38:03
03-09-2022	C	15	11:38:03	11:38:18
03-09-2022	D	28	11:38:18	11:38:46
03-09-2022	<A>	28	11:38:46	11:39:14
03-09-2022	C	25	11:39:14	11:39:39
03-09-2022	D	34	11:39:39	11:40:13
03-09-2022	<A>	18	11:40:13	11:40:31
03-09-2022	C	20	11:40:31	11:40:51
03-09-2022	D	24	11:40:51	11:41:15
03-09-2022	<A>	24	11:41:15	11:41:39
03-09-2022	C	21	11:41:39	11:42:00
03-09-2022	D	20	11:42:00	11:42:20
03-09-2022	<A>	19	11:42:20	11:42:39
03-09-2022	D	18	11:42:39	11:42:57
03-09-2022	<A>	17	11:42:57	11:43:14
03-09-2022	D	19	11:43:14	11:43:33
03-09-2022	<A>	18	11:43:33	11:43:51
03-09-2022	C	24	11:43:51	11:44:15
03-09-2022	D	30	11:44:15	11:44:45
03-09-2022	<A>	27	11:44:45	11:45:12
03-09-2022	D	22	11:45:12	11:45:34
03-09-2022	<A>	29	11:45:34	11:46:03
03-09-2022	D	21	11:46:03	11:46:24
03-09-2022	<A>	21	11:46:24	11:46:45
03-09-2022	C	15	11:46:45	11:47:00
03-09-2022	D	17	11:47:00	11:47:17
03-09-2022	<A>	35	11:47:17	11:47:52
03-09-2022	C	22	11:47:52	11:48:14
03-09-2022	D	29	11:48:14	11:48:43
03-09-2022	<A>	22	11:48:43	11:49:05
03-09-2022	C	16	11:49:05	11:49:21
03-09-2022	D	22	11:49:21	11:49:43
03-09-2022	<A>	20	11:49:43	11:50:03
03-09-2022	D	31	11:50:03	11:50:34
03-09-2022	<A>	22	11:50:34	11:50:56
03-09-2022	C	15	11:50:56	11:51:11
03-09-2022	D	24	11:51:11	11:51:35
03-09-2022	<A>	27	11:51:35	11:52:02
03-09-2022	C	15	11:52:02	11:52:17
03-09-2022	D	24	11:52:17	11:52:41
03-09-2022	<A>	26	11:52:41	11:53:07
03-09-2022	C	12	11:53:07	11:53:19
03-09-2022	D	28	11:53:19	11:53:47
03-09-2022	<A>	26	11:53:47	11:54:13
03-09-2022	C	18	11:54:13	11:54:31
03-09-2022	D	22	11:54:31	11:54:53
03-09-2022	<A>	22	11:54:53	11:55:15
03-09-2022	C	19	11:55:15	11:55:34

03-09-2022	D	28	11:55:34	11:56:02
03-09-2022	<A>	25	11:56:02	11:56:27
03-09-2022	C	20	11:56:27	11:56:47
03-09-2022	D	17	11:56:47	11:57:04
03-09-2022	<A>	22	11:57:04	11:57:26
03-09-2022	C	15	11:57:26	11:57:41
03-09-2022	D	31	11:57:41	11:58:12
03-09-2022	<A>	25	11:58:12	11:58:37
03-09-2022	C	14	11:58:37	11:58:51
03-09-2022	D	14	11:58:51	11:59:05
03-09-2022	<A>	25	11:59:05	11:59:30
03-09-2022	C	21	11:59:30	11:59:51
03-09-2022	D	30	11:59:51	12:00:21

03-09-2022	<A>	26	12:00:21	12:00:47
03-09-2022	C	24	12:00:47	12:01:11
03-09-2022	<A>	22	12:01:11	12:01:33
03-09-2022	C	20	12:01:33	12:01:53
03-09-2022	D	35	12:01:53	12:02:28
03-09-2022	<A>	29	12:02:28	12:02:57
03-09-2022	C	21	12:02:57	12:03:18
03-09-2022	D	14	12:03:18	12:03:32
03-09-2022	<A>	39	12:03:32	12:04:11
03-09-2022	C	22	12:04:11	12:04:33
03-09-2022	D	28	12:04:33	12:05:01
03-09-2022	<A>	24	12:05:01	12:05:25
03-09-2022	C	18	12:05:25	12:05:43
03-09-2022	D	24	12:05:43	12:06:07
03-09-2022	<A>	33	12:06:07	12:06:40
03-09-2022	C	15	12:06:40	12:06:55
03-09-2022	D	23	12:06:55	12:07:18
03-09-2022	<A>	26	12:07:18	12:07:44
03-09-2022	C	20	12:07:44	12:08:04
03-09-2022	D	31	12:08:04	12:08:35
03-09-2022	<A>	26	12:08:35	12:09:01
03-09-2022	C	18	12:09:01	12:09:19
03-09-2022	D	28	12:09:19	12:09:47
03-09-2022	<A>	28	12:09:47	12:10:15
03-09-2022	C	21	12:10:15	12:10:36
03-09-2022	D	25	12:10:36	12:11:01
03-09-2022	<A>	29	12:11:01	12:11:30
03-09-2022	C	21	12:11:30	12:11:51
03-09-2022	D	32	12:11:51	12:12:23
03-09-2022	<A>	26	12:12:23	12:12:49
03-09-2022	C	20	12:12:49	12:13:09
03-09-2022	D	26	12:13:09	12:13:35
03-09-2022	<A>	29	12:13:35	12:14:04
03-09-2022	C	21	12:14:04	12:14:25
03-09-2022	D	16	12:14:25	12:14:41
03-09-2022	<A>	24	12:14:41	12:15:05
03-09-2022	C	13	12:15:05	12:15:18
03-09-2022	D	21	12:15:18	12:15:39
03-09-2022	<A>	18	12:15:39	12:15:57
03-09-2022	D	12	12:15:57	12:16:09
03-09-2022	<A>	19	12:16:09	12:16:28
03-09-2022	C	15	12:16:28	12:16:43
03-09-2022	D	19	12:16:43	12:17:02
03-09-2022	<A>	32	12:17:02	12:17:34
03-09-2022	C	20	12:17:34	12:17:54
03-09-2022	D	28	12:17:54	12:18:22
03-09-2022	<A>	25	12:18:22	12:18:47
03-09-2022	C	16	12:18:47	12:19:03
03-09-2022	D	22	12:19:03	12:19:25
03-09-2022	<A>	13	12:19:25	12:19:38
03-09-2022	D	12	12:19:38	12:19:50
03-09-2022	<A>	18	12:19:50	12:20:08
03-09-2022	D	20	12:20:08	12:20:28

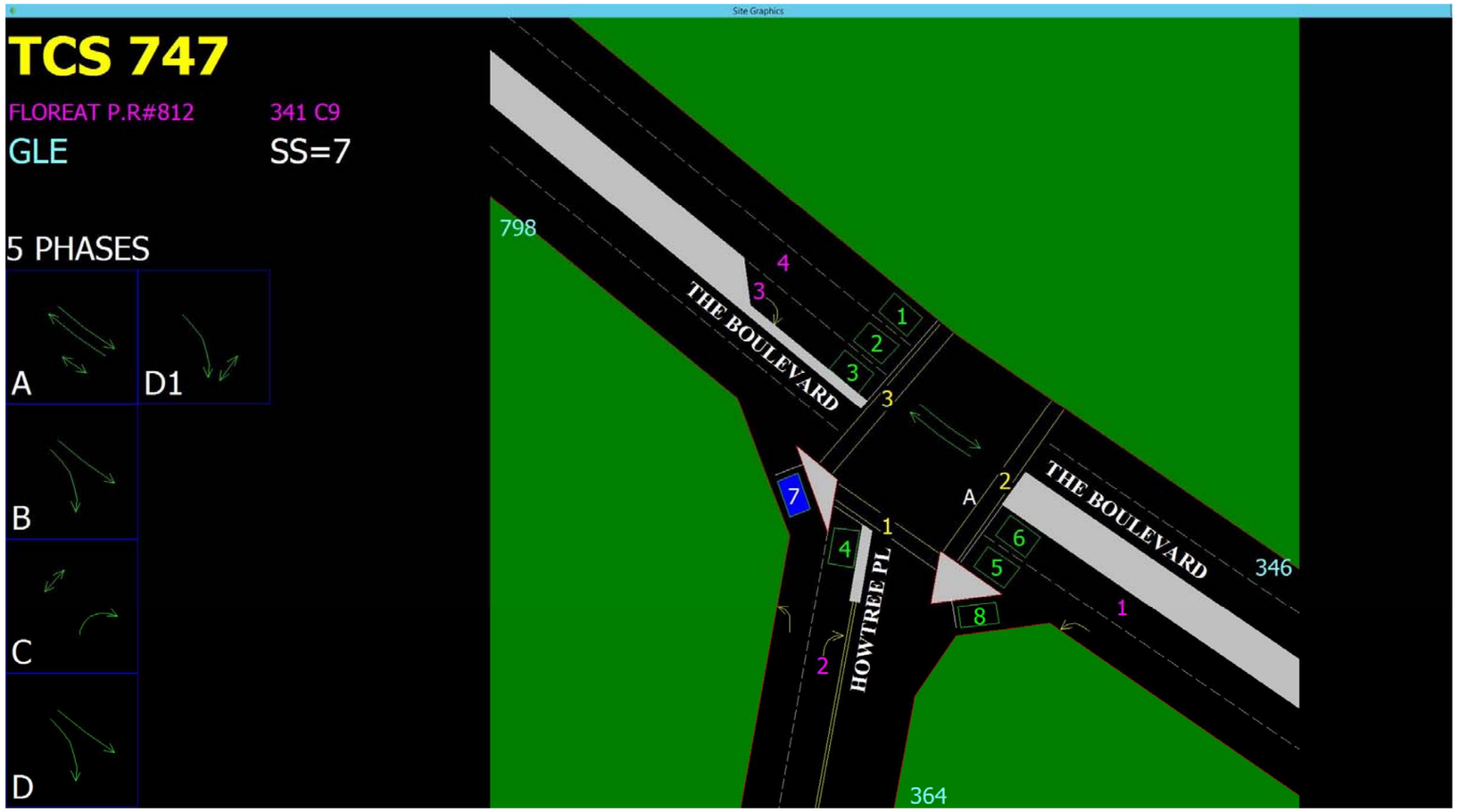
Count <A>	Count D	Count D	All cycles length	Average cycle length
63	48	60	3584	56.89

Average phase <A> time	Average phase C time	Average phase D time	
23.03174603	18.20833333	20.98333333	62.22

Total phase <A> time	Total phase C time	Total phase D time
1451	874	1259

Frequency of phase <A>	Frequency of phase C	Frequency of phase D
1	0.761904762	0.952380952

Adjusted average phase time <A>	Adjusted average phase time C	Adjusted average phase time D	
23.03	13.87	19.98	56.89



03-09-2022	<A>	20	12:20:28	12:20:48
03-09-2022	C	19	12:20:48	12:21:07
03-09-2022	D	23	12:21:07	12:21:30
03-09-2022	<A>	28	12:21:30	12:21:58
03-09-2022	C	22	12:21:58	12:22:20
03-09-2022	D	23	12:22:20	12:22:43
03-09-2022	<A>	20	12:22:43	12:23:03
03-09-2022	C	21	12:23:03	12:23:24
03-09-2022	D	24	12:23:24	12:23:48
03-09-2022	<A>	23	12:23:48	12:24:11
03-09-2022	C	16	12:24:11	12:24:27
03-09-2022	D	22	12:24:27	12:24:49
03-09-2022	<A>	22	12:24:49	12:25:11
03-09-2022	D	15	12:25:11	12:25:26
03-09-2022	<A>	13	12:25:26	12:25:39
03-09-2022	D	16	12:25:39	12:25:55
03-09-2022	<A>	14	12:25:55	12:26:09
03-09-2022	C	17	12:26:09	12:26:26
03-09-2022	D	20	12:26:26	12:26:46
03-09-2022	<A>	19	12:26:46	12:27:05
03-09-2022	C	23	12:27:05	12:27:28
03-09-2022	D	22	12:27:28	12:27:50
03-09-2022	<A>	32	12:27:50	12:28:22
03-09-2022	C	13	12:28:22	12:28:35
03-09-2022	D	23	12:28:35	12:28:58
03-09-2022	<A>	20	12:28:58	12:29:18
03-09-2022	C	13	12:29:18	12:29:31
03-09-2022	D	12	12:29:31	12:29:43
03-09-2022	<A>	25	12:29:43	12:30:08
03-09-2022	C	19	12:30:08	12:30:27
03-09-2022	D	22	12:30:27	12:30:49
03-09-2022	<A>	18	12:30:49	12:31:07
03-09-2022	C	16	12:31:07	12:31:23
03-09-2022	D	13	12:31:23	12:31:36
03-09-2022	<A>	28	12:31:36	12:32:04
03-09-2022	C	19	12:32:04	12:32:23
03-09-2022	D	20	12:32:23	12:32:43
03-09-2022	<A>	25	12:32:43	12:33:08
03-09-2022	D	12	12:33:08	12:33:20
03-09-2022	<A>	18	12:33:20	12:33:38
03-09-2022	C	19	12:33:38	12:33:57
03-09-2022	D	14	12:33:57	12:34:11
03-09-2022	<A>	25	12:34:11	12:34:36
03-09-2022	C	14	12:34:36	12:34:50
03-09-2022	D	27	12:34:50	12:35:17
03-09-2022	<A>	21	12:35:17	12:35:38
03-09-2022	C	16	12:35:38	12:35:54
03-09-2022	D	16	12:35:54	12:36:10
03-09-2022	<A>	20	12:36:10	12:36:30
03-09-2022	C	17	12:36:30	12:36:47
03-09-2022	D	20	12:36:47	12:37:07
03-09-2022	<A>	59	12:37:07	12:38:06
03-09-2022	C	26	12:38:06	12:38:32

03-09-2022	D	20	12:38:32	12:38:52
03-09-2022	<A>	24	12:38:52	12:39:16
03-09-2022	D	35	12:39:16	12:39:51
03-09-2022	<A>	27	12:39:51	12:40:18
03-09-2022	C	18	12:40:18	12:40:36
03-09-2022	D	33	12:40:36	12:41:09
03-09-2022	<A>	21	12:41:09	12:41:30
03-09-2022	C	18	12:41:30	12:41:48
03-09-2022	D	25	12:41:48	12:42:13
03-09-2022	<A>	30	12:42:13	12:42:43
03-09-2022	C	22	12:42:43	12:43:05
03-09-2022	D	14	12:43:05	12:43:19
03-09-2022	<A>	24	12:43:19	12:43:43
03-09-2022	C	16	12:43:43	12:43:59
03-09-2022	D	33	12:43:59	12:44:32
03-09-2022	<A>	20	12:44:32	12:44:52
03-09-2022	C	22	12:44:52	12:45:14
03-09-2022	D	28	12:45:14	12:45:42
03-09-2022	<A>	23	12:45:42	12:46:05
03-09-2022	C	12	12:46:05	12:46:17
03-09-2022	D	36	12:46:17	12:46:53
03-09-2022	<A>	18	12:46:53	12:47:11
03-09-2022	C	17	12:47:11	12:47:28
03-09-2022	D	12	12:47:28	12:47:40
03-09-2022	<A>	20	12:47:40	12:48:00
03-09-2022	D	19	12:48:00	12:48:19
03-09-2022	<A>	37	12:48:19	12:48:56
03-09-2022	D	12	12:48:56	12:49:08
03-09-2022	<A>	18	12:49:08	12:49:26
03-09-2022	C	15	12:49:26	12:49:41
03-09-2022	<A>	25	12:49:41	12:50:06
03-09-2022	D	15	12:50:06	12:50:21
03-09-2022	<A>	15	12:50:21	12:50:36
03-09-2022	C	18	12:50:36	12:50:54
03-09-2022	D	22	12:50:54	12:51:16
03-09-2022	<A>	20	12:51:16	12:51:36
03-09-2022	C	15	12:51:36	12:51:51
03-09-2022	<A>	16	12:51:51	12:52:07
03-09-2022	D	16	12:52:07	12:52:23
03-09-2022	<A>	12	12:52:23	12:52:35
03-09-2022	C	15	12:52:35	12:52:50
03-09-2022	D	23	12:52:50	12:53:13
03-09-2022	<A>	24	12:53:13	12:53:37
03-09-2022	C	16	12:53:37	12:53:53
03-09-2022	D	17	12:53:53	12:54:10
03-09-2022	<A>	18	12:54:10	12:54:28
03-09-2022	D	21	12:54:28	12:54:49
03-09-2022	<A>	19	12:54:49	12:55:08
03-09-2022	C	17	12:55:08	12:55:25
03-09-2022	D	15	12:55:25	12:55:40
03-09-2022	<A>	22	12:55:40	12:56:02
03-09-2022	D	14	12:56:02	12:56:16
03-09-2022	<A>	14	12:56:16	12:56:30

03-09-2022	C	18	12:56:30	12:56:48
03-09-2022	D	12	12:56:48	12:57:00
03-09-2022	<A>	18	12:57:00	12:57:18
03-09-2022	C	19	12:57:18	12:57:37
03-09-2022	D	19	12:57:37	12:57:56
03-09-2022	<A>	20	12:57:56	12:58:16
03-09-2022	D	16	12:58:16	12:58:32
03-09-2022	<A>	13	12:58:32	12:58:45
03-09-2022	D	12	12:58:45	12:58:57
03-09-2022	<A>	17	12:58:57	12:59:14
03-09-2022	C	21	12:59:14	12:59:35
03-09-2022	D	30	12:59:35	13:00:05

Appendix C - Design Principles Report (MJA)



10 Principles Summary Report
prepared by_

trmj COLLECTIVE PTY LTD | APIL STRATEGIC • ASTUTE • TRUSTED | HATCH | RobertsDay | ASPECT Studios | pritchard francis | kctt

Floreat Forum Masterplan

June 2023
Rev F

Project Introduction_

The Floreat Precinct Structure Plan

The PSP is seeking to address the Town of Cambridge activity centre aspirations identified within the Local Planning Strategy for the Floreat Forum and adjacent Frame sites.

This precinct has been identified as one of the key infill growth zones within the Western end of the Town with a target of 1250 dwellings.



Context+ Character_

Floreat: The Garden Suburb

Floreat is known as the "**Garden Suburb**" of Perth, the outcome of 1920s residential subdivision planning based on the Garden City Movement.

The locale is distinctively defined by large residential blocks in a parkland setting. Mature trees and lush planting create a green and welcoming character.

Local architecture has built fabric of high significance, especially that belonging to the mid-century and inter-war periods. Iwan Iwanoff's Paganin House and residence on 16 Lifford Road are two key examples.



The green surrounds of Floreat



Paganin House by Iwan Iwanoff



16 Lifford Road by Iwan Iwanoff



The "Garden Suburb" Character



Katherine Street, Floreat Park circa 1962

** All images belong to their respective owners.*

Floreat Forum History

Floreat Forum is the cornerstone of the local community and has been since its inception in the 1960s. It was one of Perth's first American style malls and brought many cues from this direction in retail design.

Key cues were:

+ **Civic meeting places**
+ **Pedestrian colonnades**
+ **Importance of landscape integration**

The original centre had a strong civic presence with the North entry forecourt addressing The Boulevard and a secondary more neighbourly interface to the South.

The shops were linked by protective, covered colonnades with a feature spiral stair linking the supermarkets with the upper level buffet restaurant.

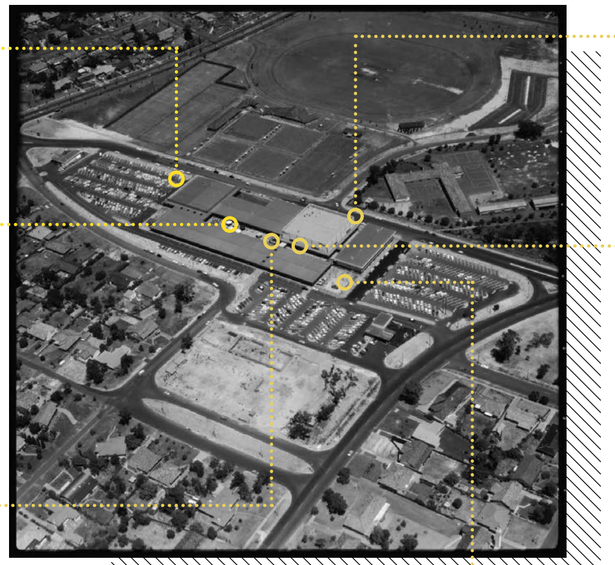
The Forum precinct has developed uniquely over time to service the local community with a focus on independent retail and fresh food.

The proposed Precinct Structure Plan seeks to draw on this history and evolve the precinct for the next generation.


Woolworths South Entrance


Central Courtyard


Spiral Stairs to Restaurant



Floreat Forum looking West

The first enclosed "American style" shopping mall in Perth, the inward-looking shopping centre was a popular venue for social gatherings and significantly activated the local neighbourhood.


Floreat Park Civic Hall & Library


Shaded Walkway & Stairs



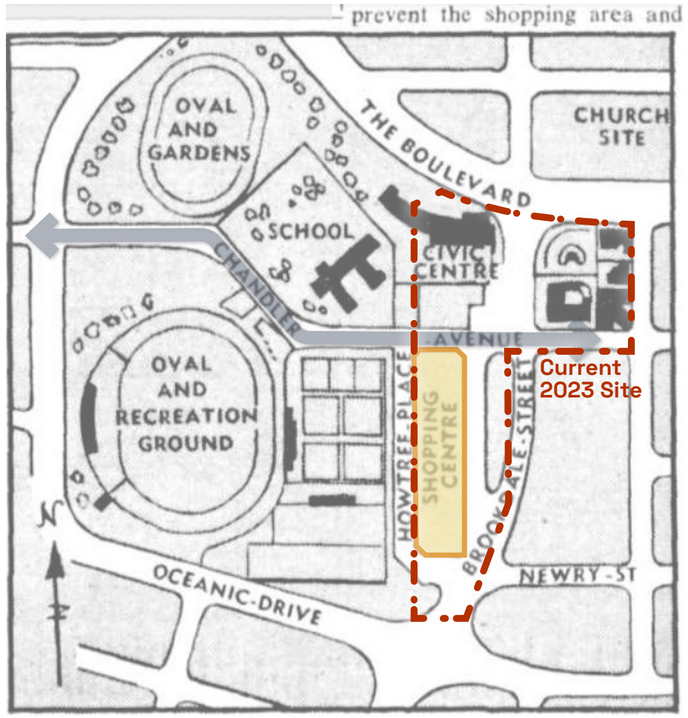
Northern Civic Forecourt Entrance


1971: Major upgrades undertaken


1984: The "Big Top" Added

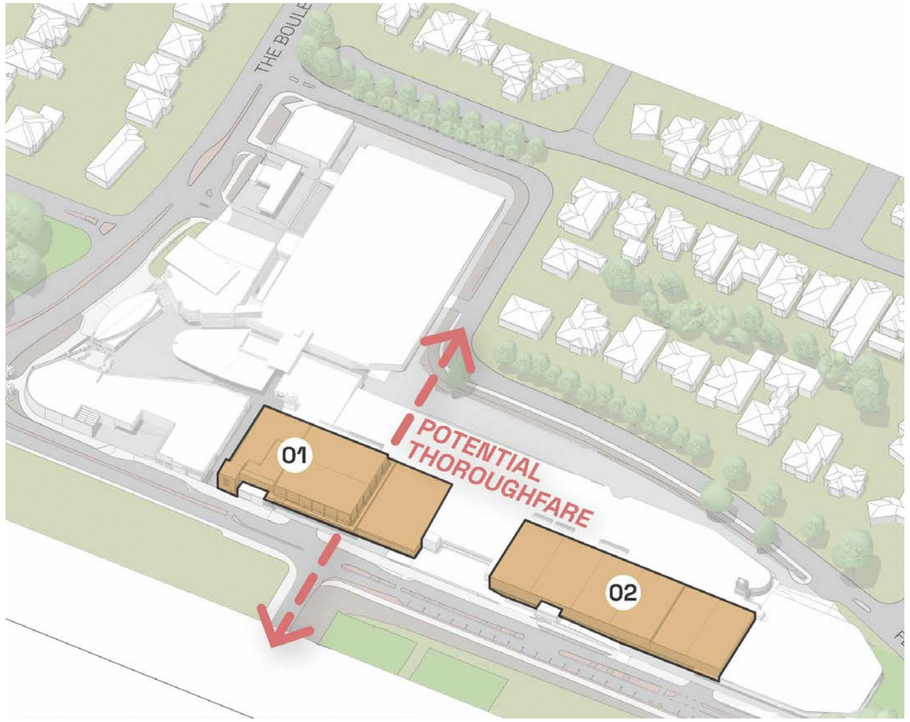

2004 - Present: Master Planning Commenced

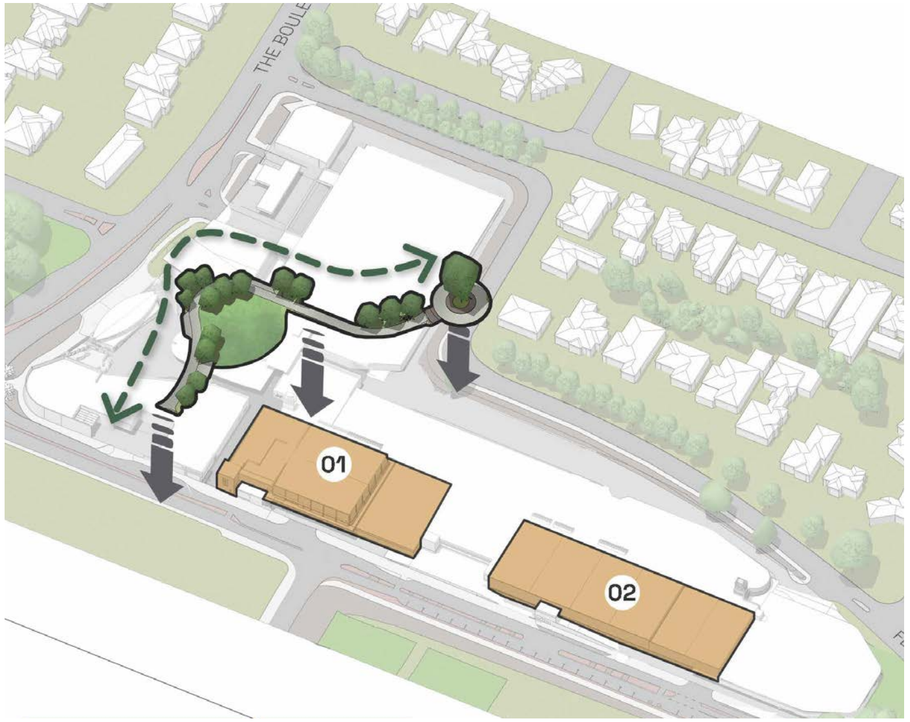
Context+ Character_



Road Network Pre-construction, 1953

Excerpt from "The West Australian", 1953





Connected Streets

+ Prior to construction commencing on the Floreat Forum shopping centre, Chandler Ave facilitated an East- West connection.
+ The Forum Site was originally envisioned as a civic centre and shopping area.

Existing Disconnection

+ An east-west linear thoroughfare has the potential to reinstate site connectivity in a similar manner to Chandler Ave.
+ However, this is limited by the location of existing commercial assets with extended lease agreements.

Activated High Street Link

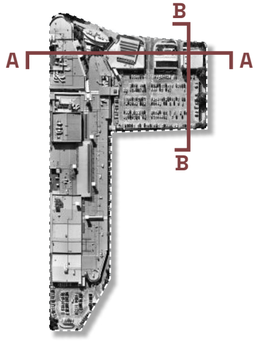
+ A new activated High Street that loops around key commercial tenancies will bind the precinct together, facilitating significant community benefit initiatives.
+ The link will open up opportunities for deep soil zones, parks & playgrounds reminiscent of the original Forum forecourt.
+ The High Street will unlock residential sites across the precinct, facilitating the target 1250 residential density identified in the Town of Cambridge Local Planning Strategy.

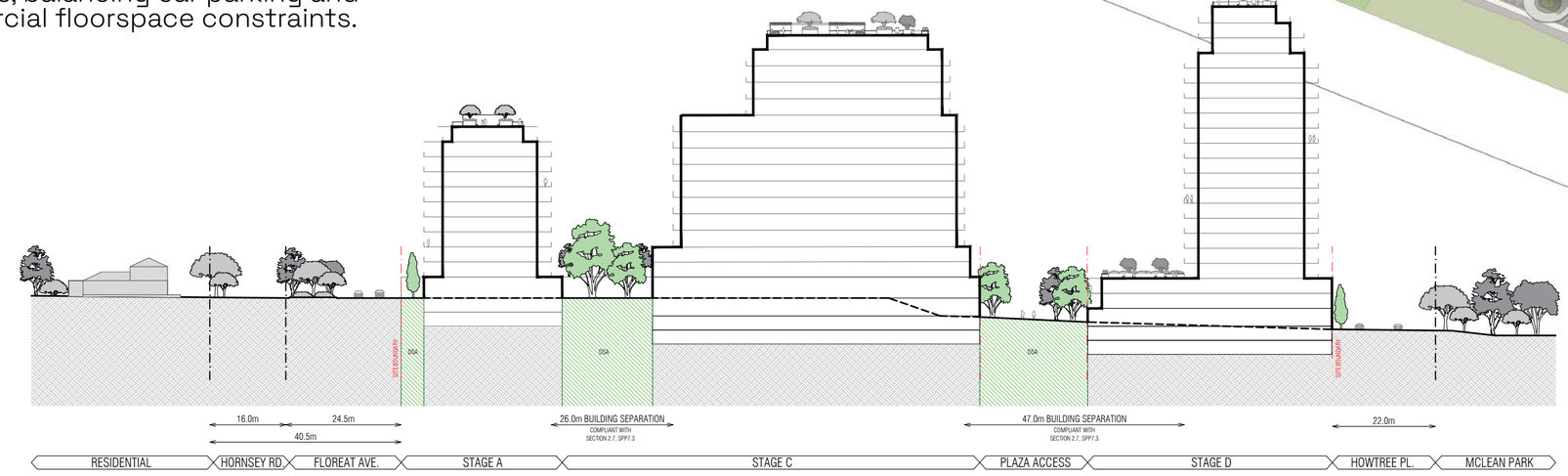
Built Form+
Scale_

Built Form Strategy

+ Considered building massing aims to provide good built form outcomes that maximise amenity and mitigate impact to neighbours.
+ Greater height is allocated to the North and West. Reduced height is allocated to the East, transitioning in scale down to the adjacent residential transition precincts - Activity Centre Frame identified in the Town of Cambridge Local Planning Strategy.
+ Landmark buildings will be located at the prominent Northern corner and Southern corner, away from sensitive interfaces and adjacent to existing landscaped open space buffers.
+ The proposal will be developed across 5 stages, balancing car parking and commercial floorspace constraints.







SECTION A-A

Built Form+ Scale_









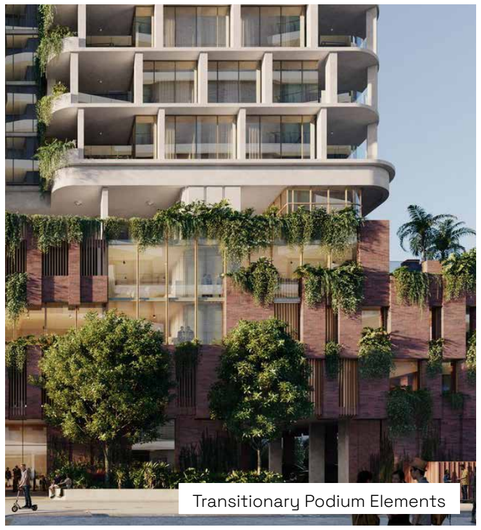




Low-rise Scale (2-3 Storeys)



Mid-rise Scale (4-5 Storeys)



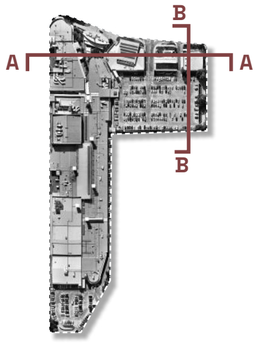
Transitionary Podium Elements



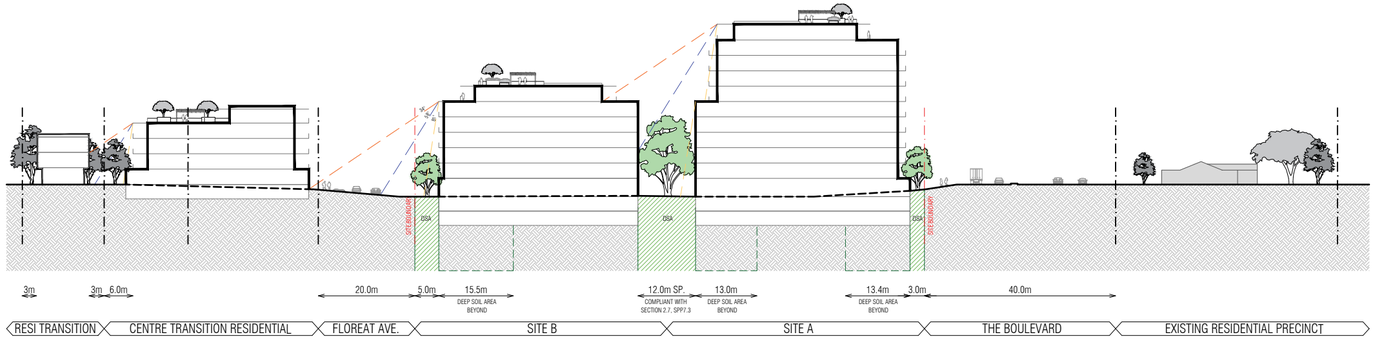
Transitionary Podium Elements



Sculpted Tower Elements



Built Form Transition



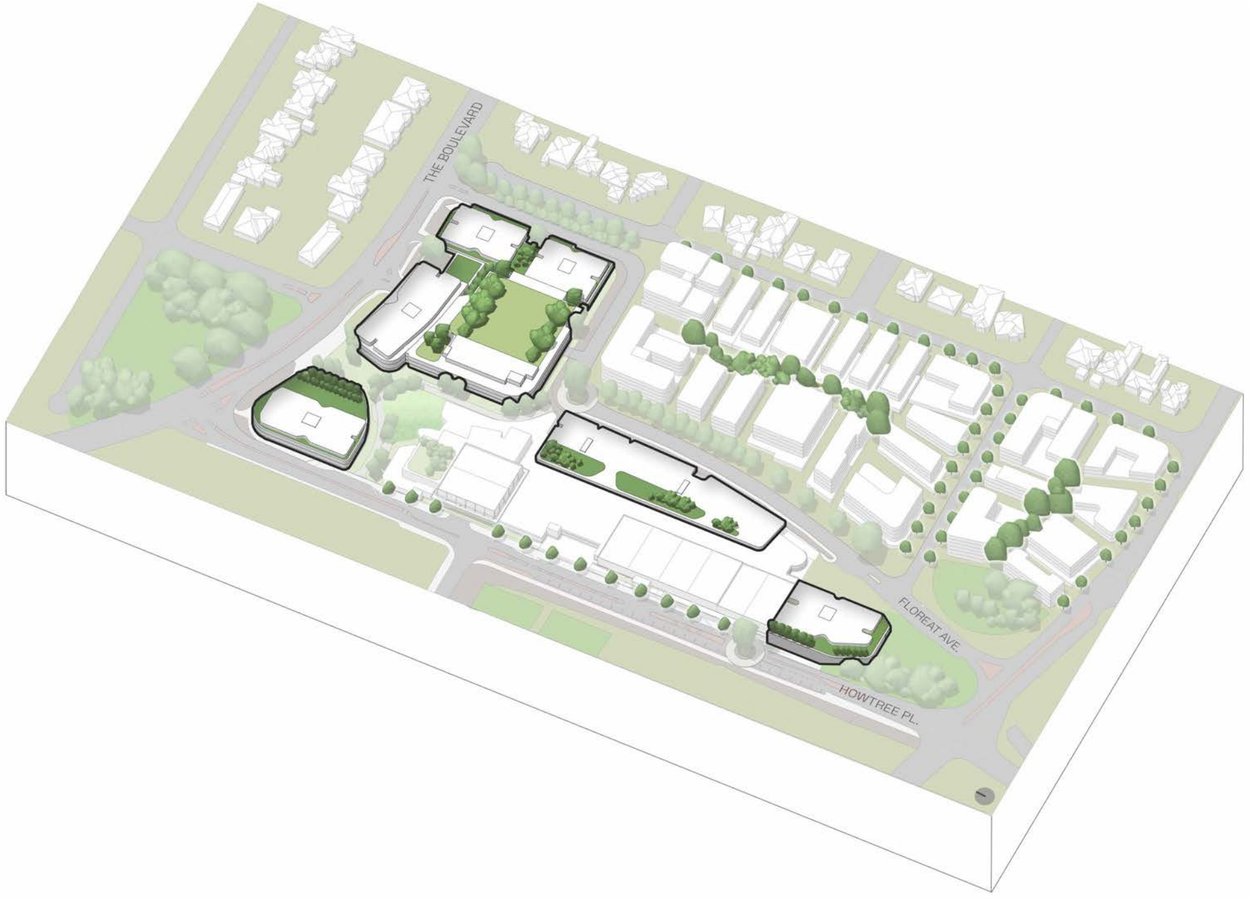
SECTION B-B

+ The Frame/Residential Transition Precinct consists of low-rise forms. This tapers up to mid-rise articulated podiums, which negotiate the middle ground between low and high built elements.

+ Tower mass will be carefully sculpted and set back from podiums to be “good neighbours” in the locale.

Landscape Quality_





Deep Soil Zones

+ Deep soil zones are primarily distributed along site edges to act as green buffer to streets, extending into “green fingers” within the site.
+ Total Deep Soil Area = **4652m²** (**10.6%** of overall site area).
+ A significant proportion of deep soil area is publicly accessible and will double up as useable public open space.
+ Existing trees are being assessed by an arborist and will be retained where possible.

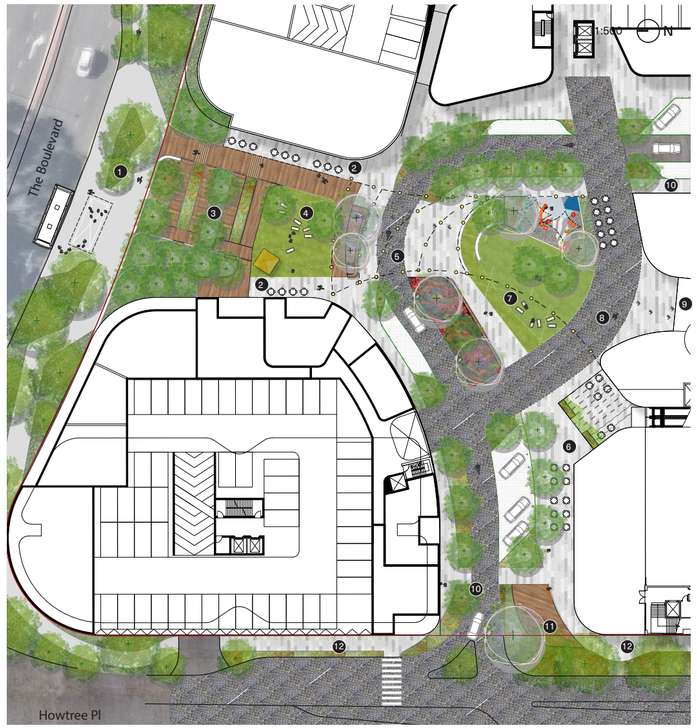
Planting on Structure

+ Planting on structure is envisioned for building podiums to further enhance a green and leafy character for the precinct, reducing the heat island effect.
+ These structured planting zones are co-located with communal open space on podiums for residential amenity, as well as improving the outlook of residents.
+ The structured planting provision is above and beyond SPP7.3 requirements.

Landscape Quality_

North Entry Square

1. Pedestrian footpath along The Boulevard
2. Al-fresco balcony over deep soil area
3. Landscape mound with trees and integrated suspended boardwalk connections from The Boulevard to the new Forum
4. Lawn area around existing tree including informal seating and decking
5. Shared zone, with alternate surface treatment, feature lighting, and one-way slow vehicular circulation
6. Al-fresco dining and F&B
7. Civic square including lawn chill-out zone, seating walls, play space and flexible event space
8. Feature paved pedestrian walkway
9. Main entrance to shopping mall
10. Urban link, connecting Howtree Place to Floreat Avenue
11. Gateway pocket park, including shaded timber deck, seating and planting
12. Pedestrian footpath along Howtree Place











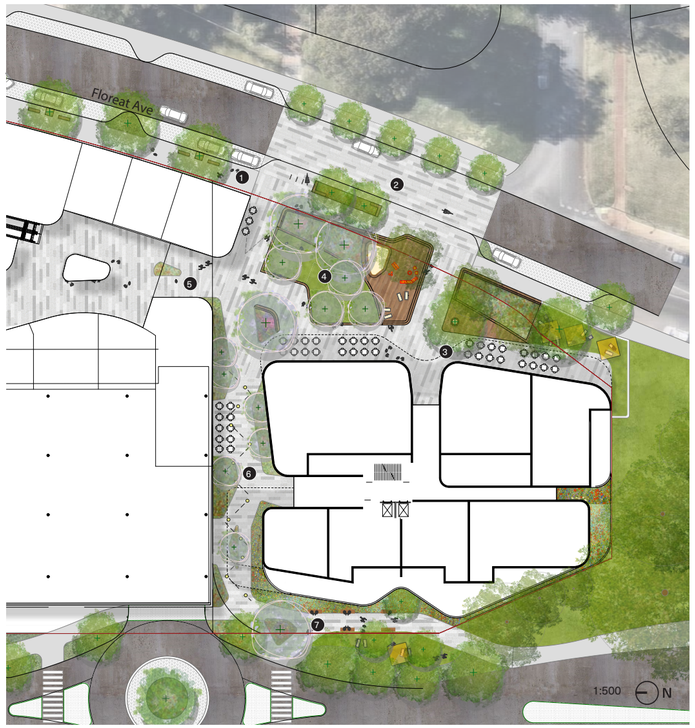
ASPECT Studios | DATE 16.03.2022 | FLOREAT FORUM LANDSCAPE CONCEPT

South Entry Square

1. Pedestrian footpath along Floreat Avenue
2. Raised pedestrian crossing / Shared Space
3. Residential upper, with Al-fresco and F&B at ground-level
4. Raised timber deck, including shaded lawn area, play space and seating
5. Pedestrian access to internal shopping mall
6. Laneway connection between Howtree Place and Floreat Avenue
7. Pocket park and pedestrian footpath along Howtree Place















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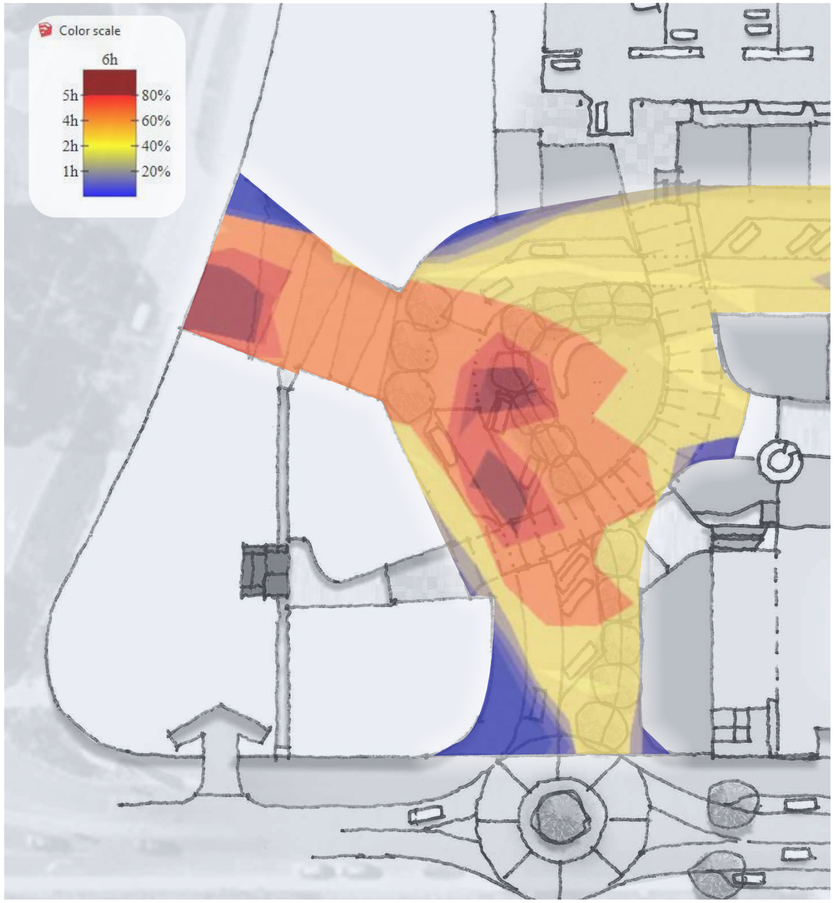
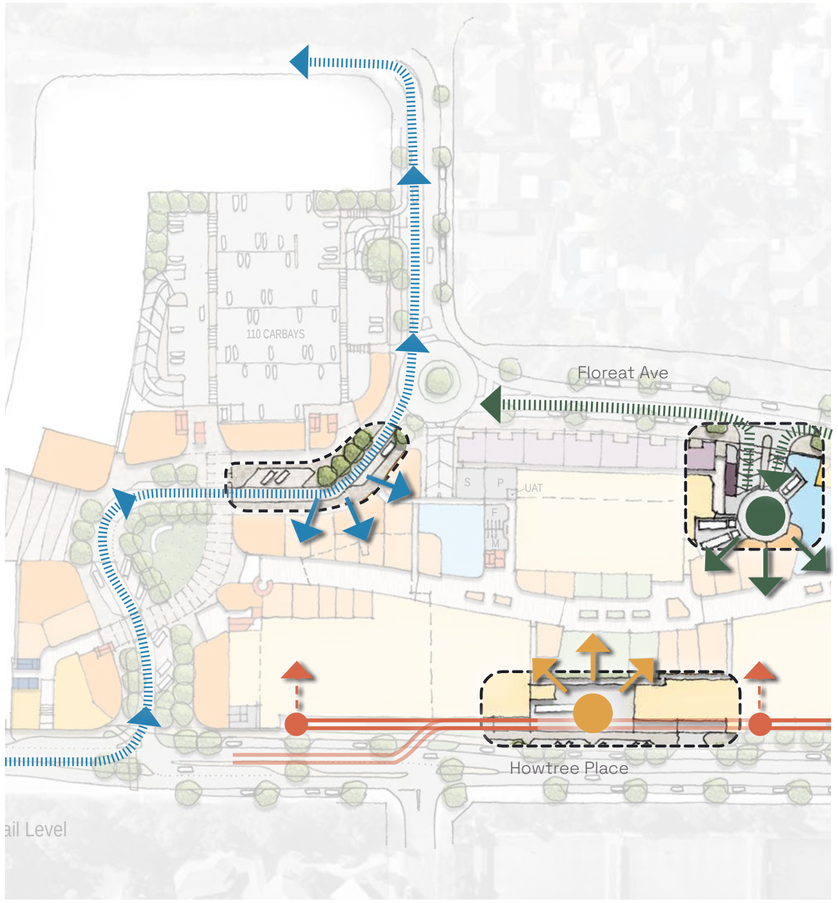
Functionality+
Build Quality_



Solar Access to Public Space

+ Sculpting of the residential tower envelopes ensures solar access to the primary civic space during midwinter (June 21st).
+ The proposal is targeting a minimum of 2hrs of direct solar access to the public realm.



Servicing Strategy

+ Retention of existing servicing to anchor supermarkets
+ The proposal is targeting a minimum of 2hrs of direct solar access to the public realm.



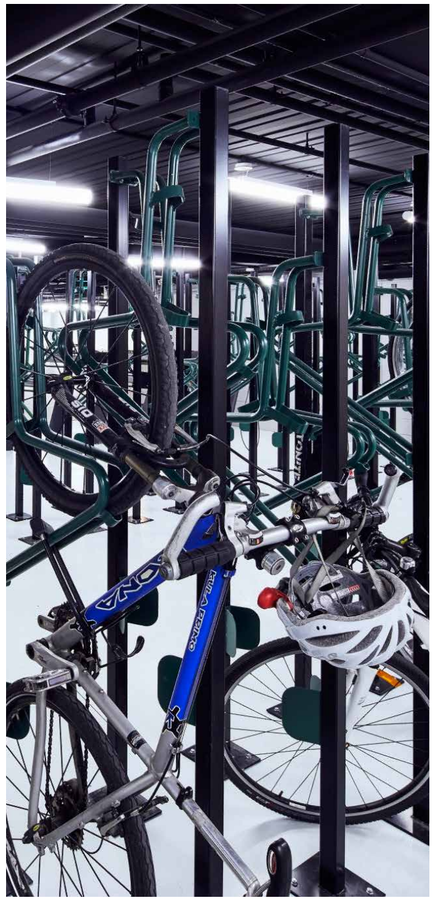
Internal Slow Street

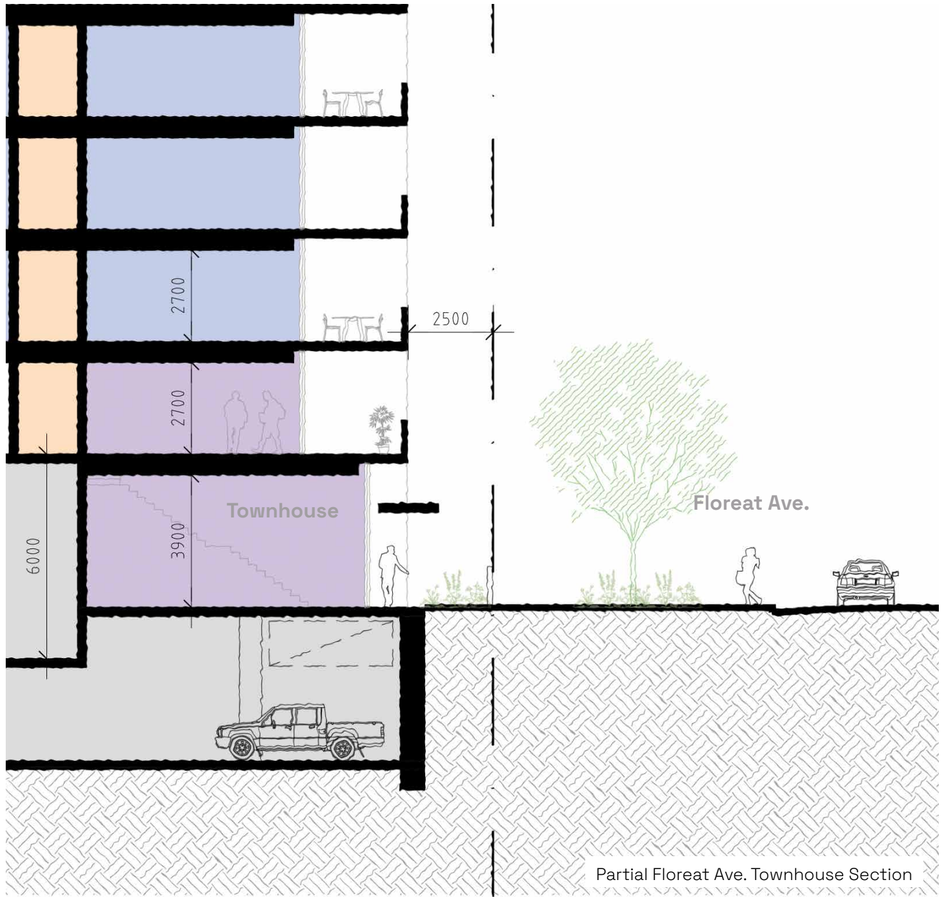
+ Proposed shared street linking Howtree Pl. with Floreat Ave, envisioned to be pedestrian and cyclist-friendly
+ Slow street which can be closed for events, with a roundabout to calm traffic
+ One way lane with clear access to large format carparks and on-street bays

Sustainability_









Partial Floreat Ave. Townhouse Section


Clifton & Central Project Reference

Sustainability Initiatives

The proposal will integrate a mix of passive and active sustainability initiatives. Buildings will aim to feature:

- Electric vehicle charging bays
- End-of-Trip facilities
- Passive shading and deep overhangs to reduce internal heat gain
- Ongoing building tuning and performance optimisation

Future Building Adaptability

+ The site frontage to Floreat Ave. will be sleeved with a townhouse typology.
+ Generous floor-to-ceiling heights for the ground floor will cater for flexible future uses.
+ This presents a possible adaptation to shop houses for small businesses with compact two-key apartments above.

Amenity_

Overshadowing Impact

+ Building mass onsite is distributed so that neighbouring properties are not unduly impacted.
+ A broader overshadowing analysis demonstrates that the proposal has negligible overshadowing impact on its surrounds.
+ The equinox scenario best represents the yearly average. Throughout the day, no existing houses are overshadowed by the proposal.
+ Neighbouring properties are not cast in shadow during the critical time - midday on 21st June.


Winter Solstice **9am**


Winter Solstice **12pm**


Winter Solstice **3pm**


Autumn Equinox **9am**


Autumn Equinox **12pm**


Autumn Equinox **3pm**

Legibility, Safety, Community_

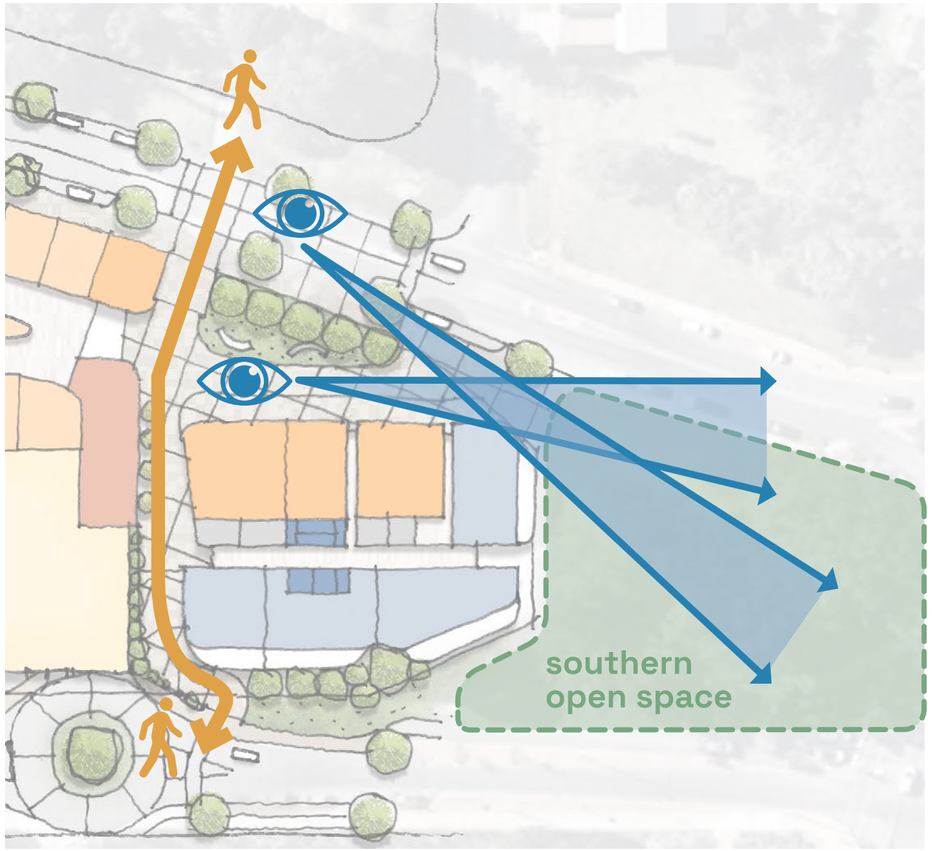












Signage & Wayfinding

+ A signage strategy will be implemented for concise and clear interpretation.
+ Key access ways will be distinctively delineated for ease of circulation.
+ Creative signage opportunities will be identified to facilitate a clear and enjoyable wayfinding experience.

Day & Night Legibility

+ Primary entry points to buildings will be legible, safe and secure. Entry thresholds are to be level from outdoors to indoors.
+ Entries will be clearly demarcated and visible from daytime through to nighttime.

Sightlines to South Open Space

+ The southern ground plane and entry plaza has been configured to open up significant view lines to the southern open space, strengthening the Forum's green context.
+ This ensures clear sightlines and an added sense of safety.
+ The existing length of the Howtree Place elevation is broken down via a new pedestrian link connecting Howtree Place to Floreat Ave.

Legibility, Safety, Community_

Communal Rooftop Deck

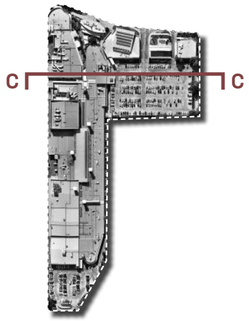
+ A key communal asset is the proposed landscaped deck atop the retail parking structure.
+ This space will house semi-public and private spaces with access from residential lobbies, hotel and public access via feature spiral stairs in conjunction with traditional lifts.
+ Primary features include a running track, outdoor activity zones, food kiosks and seating areas.
+ The space will be passively surveilled from above, providing a sense of safety in accordance with CPTED principles.

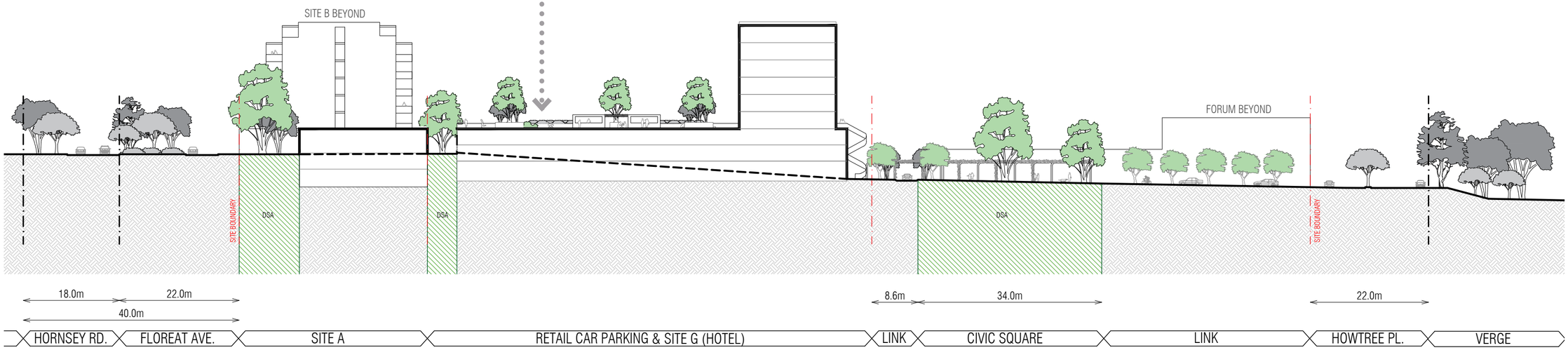












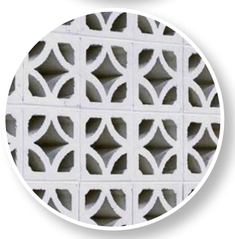
Aesthetics_

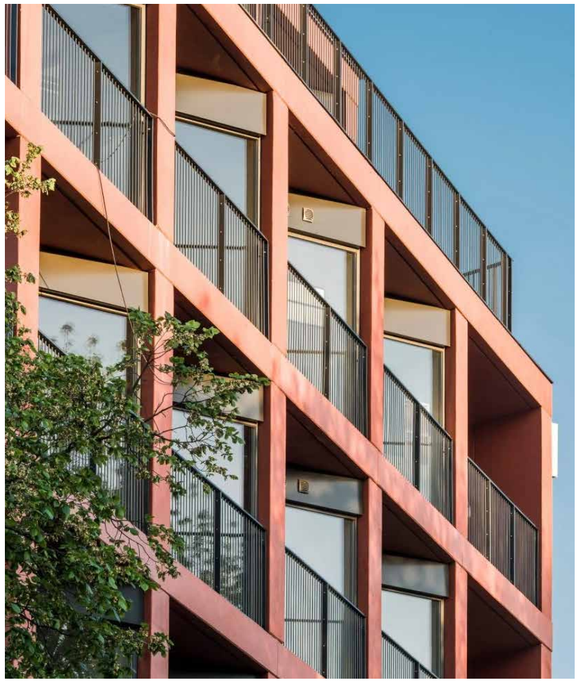
Considered Materiality

+ Material gradation will be fine grained, highly textured and tactile at lower levels, progressing to simplified textures on upper levels.
+ Stall risers are envisioned at ground, with reduced expanses of commercial glazing.
+ The selected materiality will reference the existing built fabric of Floreat Forum, as well as mid-century and inter-war bungalows in the locale.
+ Structured planting opportunities will be optimised where possible.

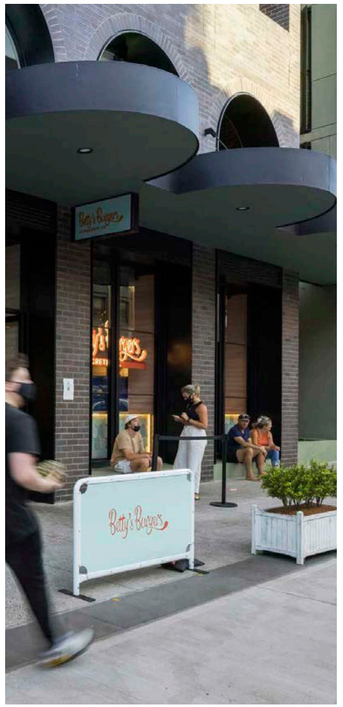








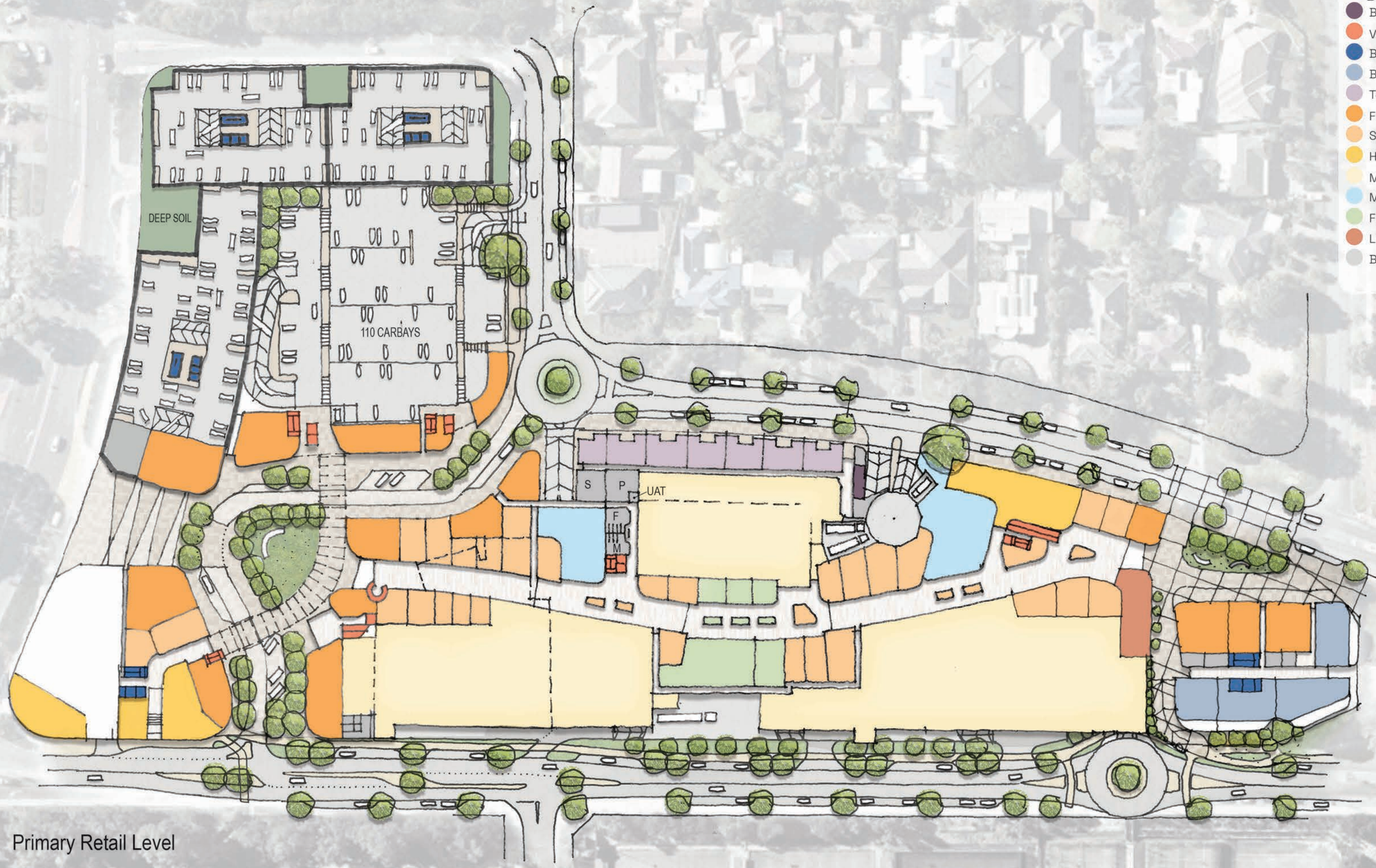








Consolidated ground-podium plan testing

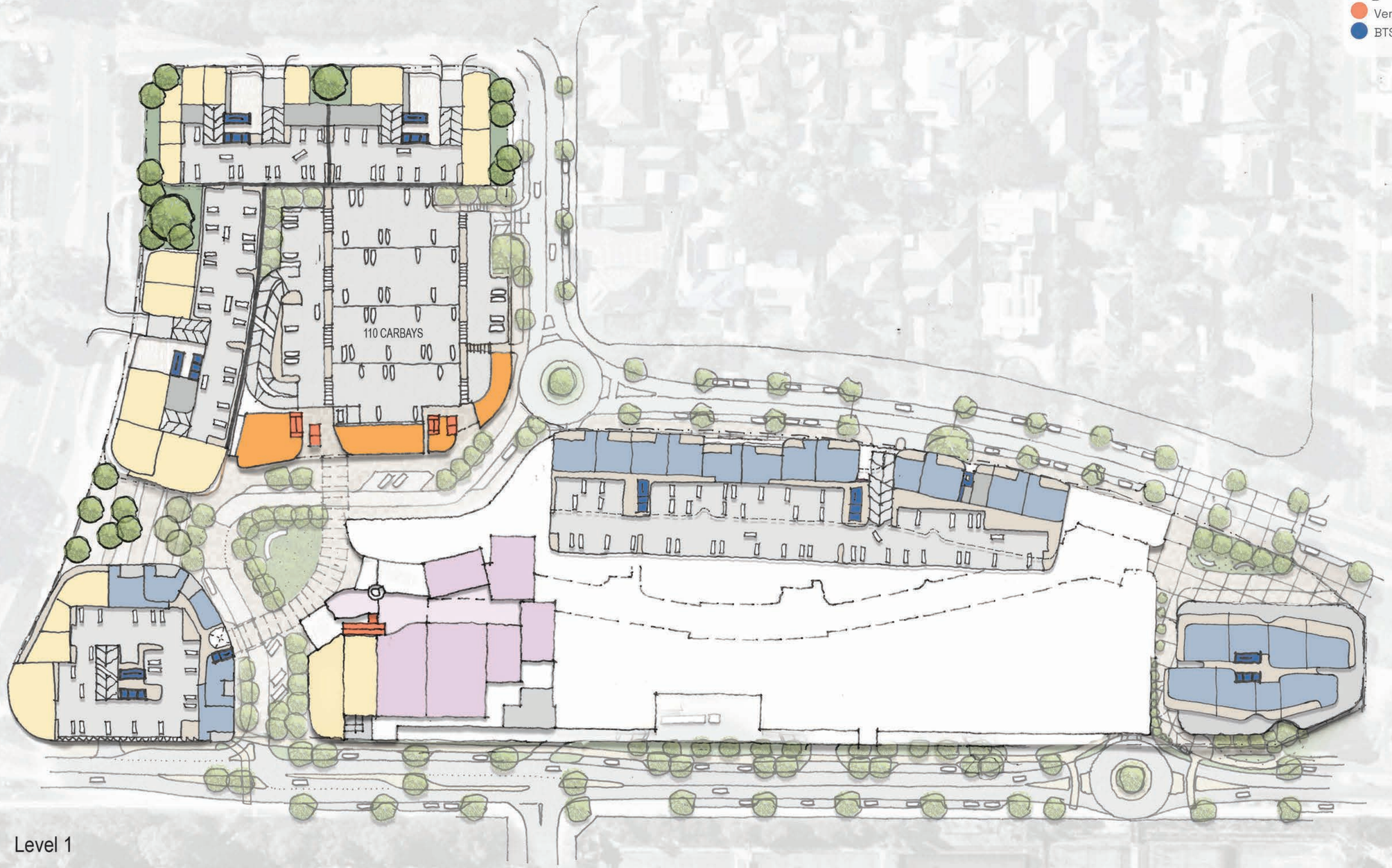


Primary Retail Level

Legend
- Vertical Transport
- BTS Vertical Transport



Basement Level


Legend
Vertical Transport
BTS Vertical Transport
110 CARBAYS

Level 1

Appendix D - Servicing Report (Pritchard Francis)

Floreat Forum Activity Centre Plan

Service Assessment Report

Project No: 22-231



pritchard francis
civil and structural engineering consultants

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Appendix One: Activity Centre Plan

Appendix Two: Precinct Assumptions and Projections

Appendix Three: BYDA – Water and Sewer Infrastructure

Appendix Four: BYDA – Town of Cambridge Drainage Requirements

Appendix Five: BYDA – Gas Infrastructure

Appendix Six: BYDA – Power Infrastructure

Appendix Seven: BYDA – Communications Infrastructure

Revision	Description	Author	Date
A	Issued for Review	Alex Caldwell	6 October 2022

1 Introduction

1.1 General

Pritchard Francis has been engaged by APIL Group as the Civil Engineering Consultants to provide technical servicing and due diligence advice for the proposed Floreat Forum Activity Centre, which comprised of the Floreat Forum Precinct, the Centre Frame Precinct, and the Residential Transition Precinct. Please refer to Appendix One for the Activity Centre Plan area and Appendix Two for the Precinct Assumptions and Projections.

The site is located within the Town of Cambridge and is bordered by Howtree Place on the western boundary, The Boulevard on the northern boundary, Hornsey Road on the eastern boundary and Oceanic Drive on the southern boundary. Figure 1 below depicts an aerial photograph of the area.

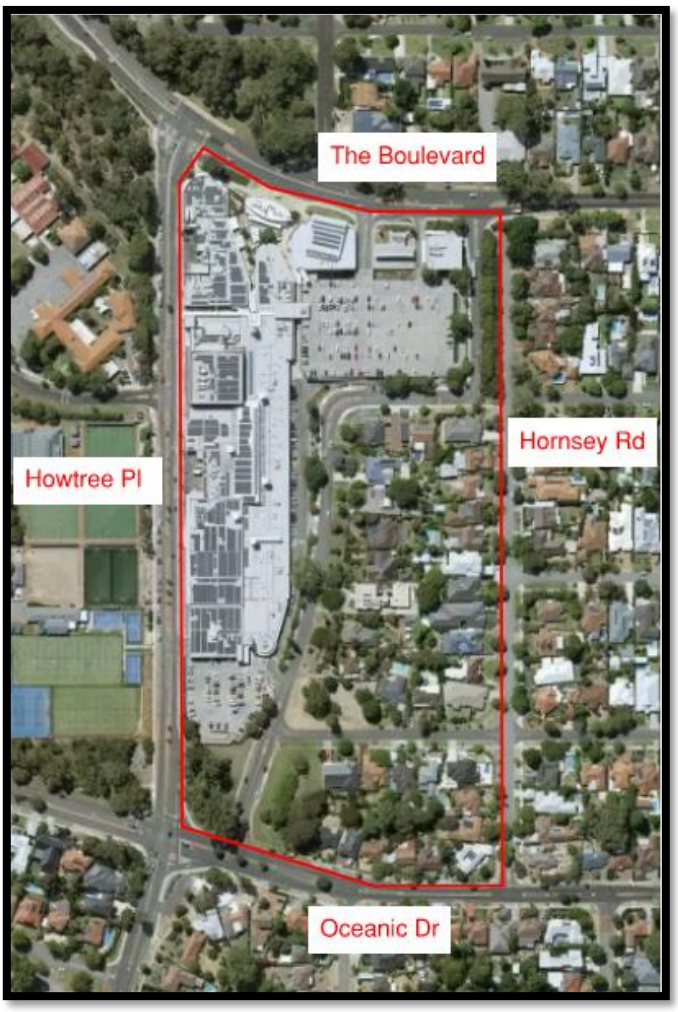


Figure 1 – Aerial Photograph of Proposed Floreat Forum Activity Centre (January 2022)

This report outlines the capacity of existing utilities to service the development. The services under assessment are:

- Water and Sewer Reticulation (Water Corporation WA)
- Drainage (Town of Cambridge)
- Gas (ATCO Gas Australia)
- Power (Western Power)
- Communications (Telstra, NBN, Optus, Vocus, AARNet, Nextgen)

1.2 Consulting Scope of Work

Pritchard Francis's scope of work includes:

- High level servicing, reporting, detailing:
  - Existing servicing and future extension strategies.
  - Information relating to service provider discussions, agreements, and programming of upgrades.
  - Input into a development staging plan considering the logical extension of services to key sites.
  - Inclusion of external sewer, water, stormwater, roads, paths, site preparation, remediation, earthworks, power, and communications.
- Liaison/coordination with authorities.
- Compilation of Engineering servicing report.

1.3 Report Qualifications

In line with this report, Pritchard Francis make the following qualifications:

- This report was prepared exclusively for the client, APIL Group. Unless otherwise stated, the use of this report by third parties is not permitted.
- The information provided in this report may be considered valid for three (3) months from the date of the report.
- The information provided in this report is based upon the information and documentation provided by the client. Pritchard Francis have relied on such information and documents being true. Where we are uninformed of developments outside of this report, Pritchard Francis cannot be held responsible or liable for any problems or issues that may arise as a consequence.
- Assumptions have been made which, if incorrect, have the potential to impact the recommendations of this report. Major development implications existing through avenues which cannot be assured at the time of this report, including the upgrading and provision of utility services, WAPC Conditions, DA Conditions, Local Authority Scheme Requirements, timing of adjacent developments, etc.
- Unless otherwise stated, the capacities of existing services have not been verified via calculations. Where required, specialty consultants may need to be engaged to provide accurate assessments of existing and future servicing capacities.
- A site visit has not been conducted as part of this desktop study. An underground service scan has not been completed and information containing existing service information may differ from the physical service locations. Where possible, Pritchard Francis recommend verifying existing service locations and conditions.
- No geotechnical investigation has been undertaken.
- All cost estimates mentioned in this report represent our best judgment based on information available at the time of providing but Pritchard Francis cannot and does not warrant that it represents the final construction cost. Pritchard Francis is not a Quantity Surveyor and does not employ quantity surveyors.
- Where design is carried out by third parties using information provided by Pritchard Francis, it is recommended that Pritchard Francis be engaged or involved in the design process.

2 Information Sources

The table below outlines the background information provided to Pritchard Francis during the schematic and design development phase.

Description of Data	Obtained From	Date
Before You Dig Australia	1100	12/08/2022
Water Corporation Data	Water Corporation	12/08/2022
Aboriginal Heritage Data	Aboriginal Heritage Inquiry System	25/08/2022
Groundwater Data	Department of Water & Environmental Regulation	25/08/2022
Aerial Image (taken 07/04/2022)	Metro Maps	25/08/2022
1:50,000 Geology Mapping Series, Perth Metropolitan Region Map	Department of Mines, Industry Regulation & Safety	25/08/2022
Town of Cambridge Demography and Planning	APIL	30/08/2022
Floreat Precinct Structure Plan (11/08/2022)	Hatch Roberts Day	01/09/2022
Stormwater Drainage as Cons	Town of Cambridge Intramaps	01/09/2022
Historical Aerial Image c. 1974	Landgate Interactive Mapping	08/09/2022
Electrical and Communications Advice	3E Consulting Engineers	15/09/2022
Wastewater and Water Planning Advice	Water Corporation	28/09/2022

3 Site Conditions

3.1 Geology

Data from the 1:50,000 environmental geology mapping series Perth sheet indicates the site is underlain sand (S7) derived from Tamala Limestone (Qts), which is described as pale and olive yellow, medium to coarse-grained, sub-angular to sub-rounded quartz, traces of feldspar, moderately sorted of residual origin. Such soils typically have medium permeability and are suitable for urbanisation, excavation, and general construction. The exact strength and permeability should be confirmed by a geotechnical investigation prior to design, as the soil is generally well draining, on site drainage disposal may only be a problem in areas of high groundwater levels, refer Section 3.3.



Figure 2 – 1:50,000 Environmental Geology Mapping Series excerpt (1986)

3.2 Topography

The topography of the site generally grades from east to west, ranging from RL 32.0mAHD in the southeast to RL 14.0mAHD at the southeast end of the Floreat Forum main building, which is central on the eastern boundary of the Activity Centre. The main building sits at approximately RL 17.0-18.0mAHD. The service station and outdoor shops at the northern end of the complex grade from east to west from RL 22.0mAHD at the northeast corner of the site, to RL 17.0mAHD at the northwest corner of the site. The southern boundary of the precinct grades from RL 32.0mAHD at the Oceanic Dr/Hornsey Rd intersection to RL 16.0mAHD at the Oceanic Dr/Howtree Pl intersection.

Landgate historical imagery indicates the Central Transition Precinct and Residential Transition Precinct areas were first modified for residential housing in the 1940's and 1950's, with construction commencing in this period. Clearing and earthworks commenced at the Floreat Forum main building site in the 1950's and construction of the original forum building started in the early 1960's.

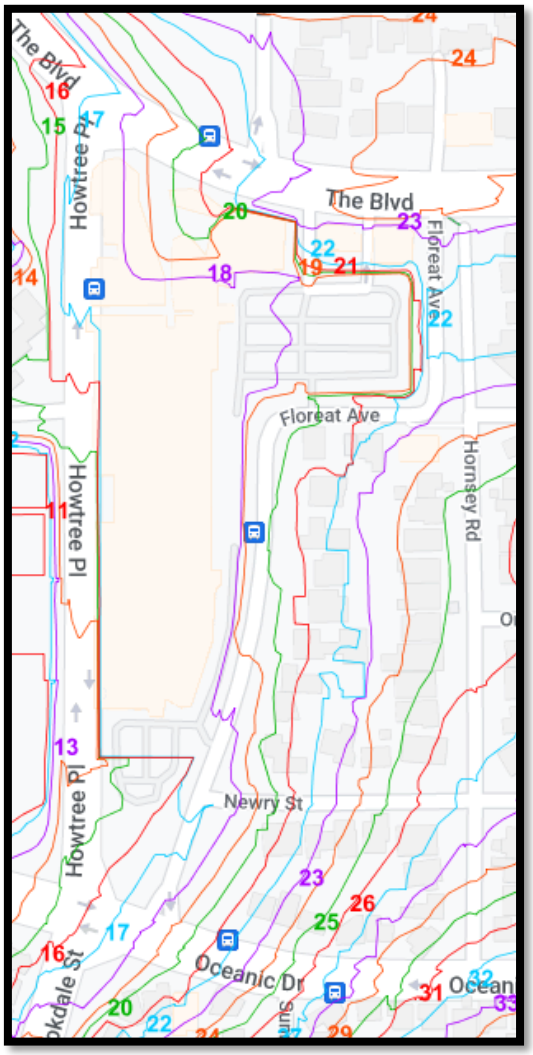


Figure 3 – Water Corporation myWorld Esinet Contours (2022)

3.3 Groundwater Levels

Department of Water and Environmental Regulation (DWER) groundwater mapping in Figure 4 shows minimum (purple) and historical maximum (pink) groundwater. Historical maximum levels are used for the basis of design. The map indicates the historical maximum groundwater levels ranging from approximately RL 6.0m AHD in the southwest corner of the site, to RL 6.5m AHD at the northeast corner of the site. Therefore, depths from surface level to historical maximum groundwater levels range from 8.0m in the southwest of the site, to 15.5m in the northeast of the site, and as such groundwater is not expected to impact the development.

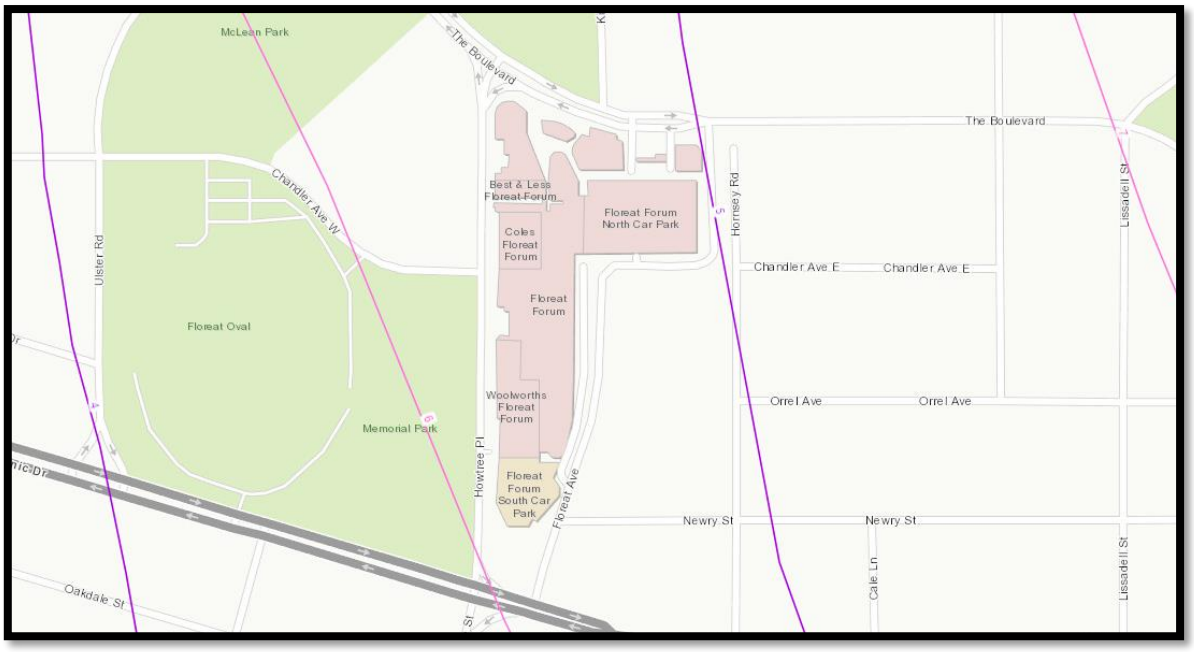


Figure 4 – Perth Groundwater Map Groundwater Contours (2022)

Current flood mapping data confirms that this site is not located in a 1 in 100 ARI (1% AEP) Floodplain Development Control Area.

3.4 Aboriginal Heritage Places

The site is located within land that has a Whadjuk People Indigenous Land Use Agreement.

The ILUAs bind the parties (including 'the State', which encompasses all State Government Departments and certain State Government agencies) to enter into a Noongar Standard Heritage Agreement (NSHA) when conducting Aboriginal Heritage Surveys in the ILUA areas, unless they have an existing heritage agreement.

It is recommended a Noongar Standard Heritage Agreement (NSHA) is entered into, and an 'Activity Notice' issued under the NSHA, if there is a risk that an activity will 'impact' (i.e. by excavating, damaging, destroying or altering in any way) an Aboriginal heritage site.

3.5 Bush Fire Prone Areas

Department of Fire and Emergency Services (DFES) mapping indicates this development is not located within a Bush Fire Prone Area.

3.6 Acid Sulfate Soil Risk (ASS)

Publicly available acid sulphate soil (ASS) risk mapping shows that the site is in an area having 'no known risk' of encountering ASS within 3m of the ground surface.

3.7 Contamination

The proposed Floreat Forum Activity Plan Centre has not been identified as a Contaminated Site on Landgate's Contaminated Sites Database. As such no contamination remediation works are expected to be required.

Review of Landgate's Interactive Maps indicates construction of the original Floreat Forum building commenced around 1965. Minor extensions were completed by 1974. Please refer to Figure 5 and 6 for aerial images showing the original building completion around 1974, and further development in the north-east and north-west of the site between 2001 and 2003. Given the age of the complex, it is likely asbestos cement and other materials now recognised as hazardous were used in construction. A site assessment and subsequent remediation may be required during any development.

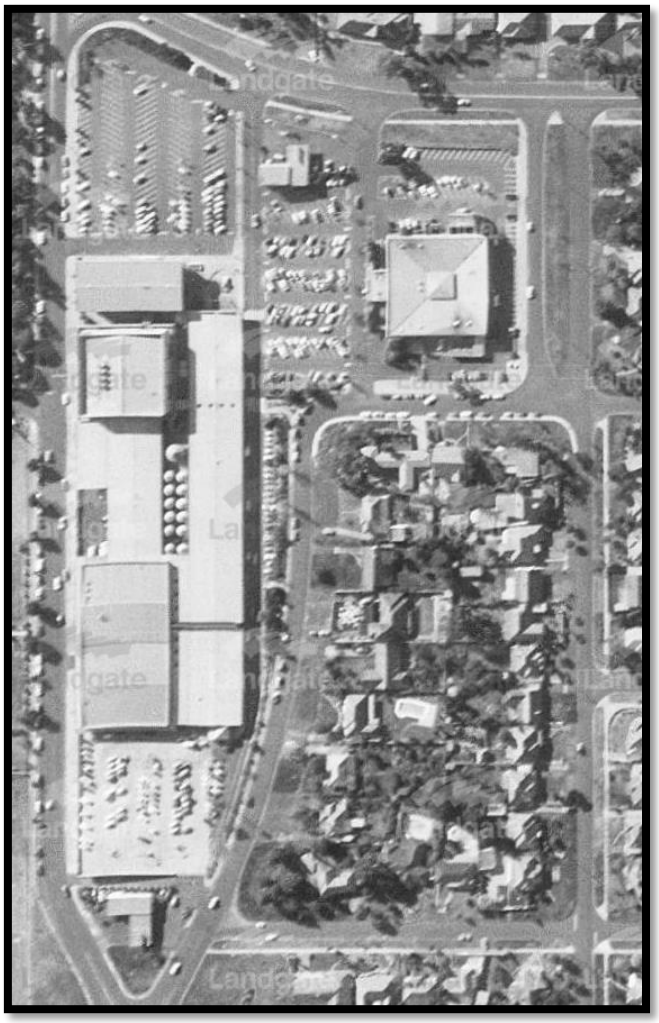


Figure 5 – Aerial Photography of Floreat Forum (1974)



Figure 6 – Aerial Photography of Floreat Forum (2003)

3.8 Site Levels and Retaining/Bulk Earthworks Methodology

The design strategy for this development will take into consideration the existing levels and use of built form to tie into the existing environment.

Pritchard Francis intend to implement split lot levels across the Centre Transition Precinct and the Residential Transition Precinct to tie the internal roads in with the surrounding arterial roads. This will allow the 7-8m difference along the eastern boundary of the precinct to be absorbed by the structure in built form, reducing the need for significant import of fill and heavy use of retaining walls, while thereby minimising the effect on the adjacent neighbours as much as possible.

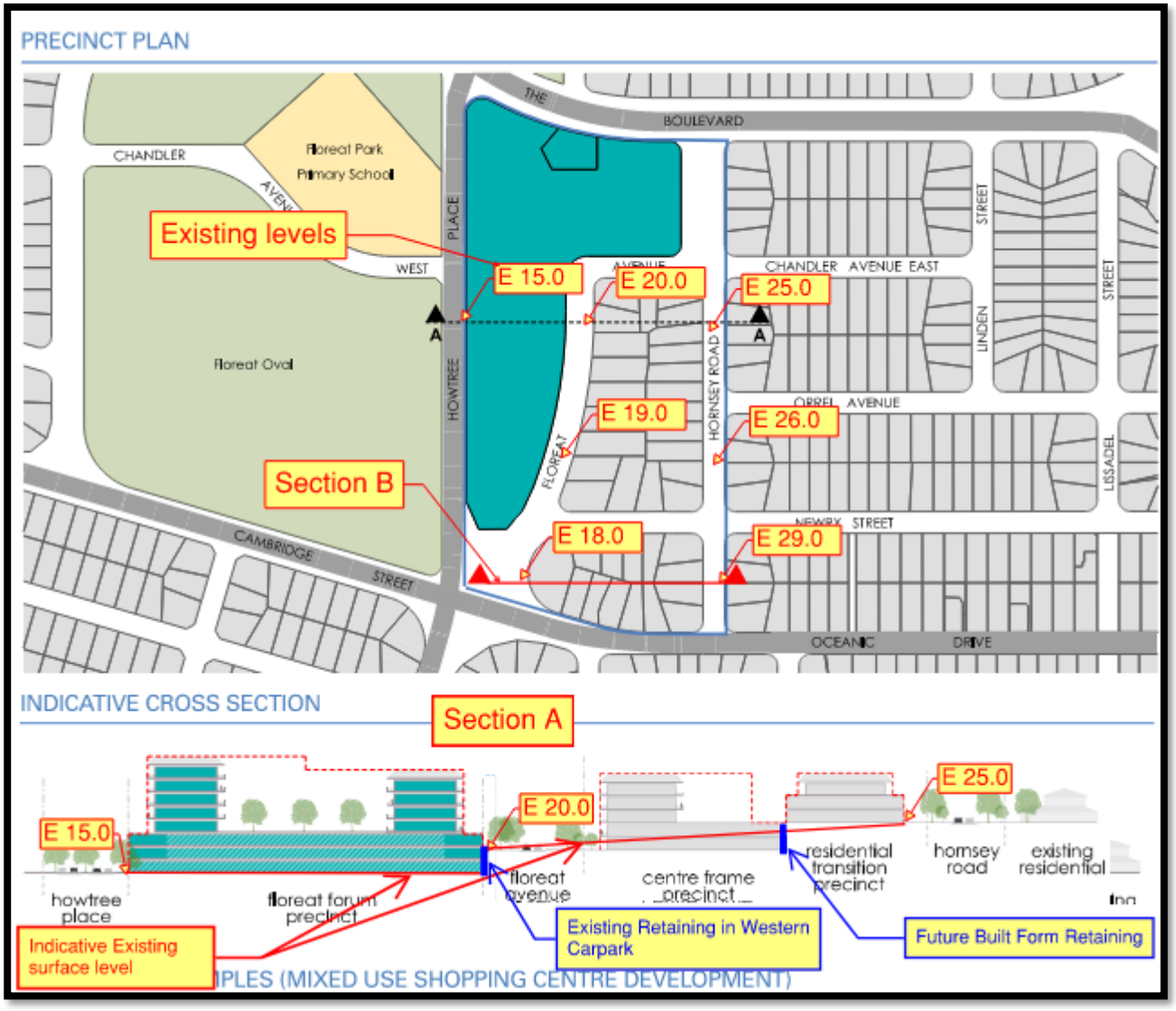


Figure 7 – Indicative Levels and Precinct Arrangement Through Section A

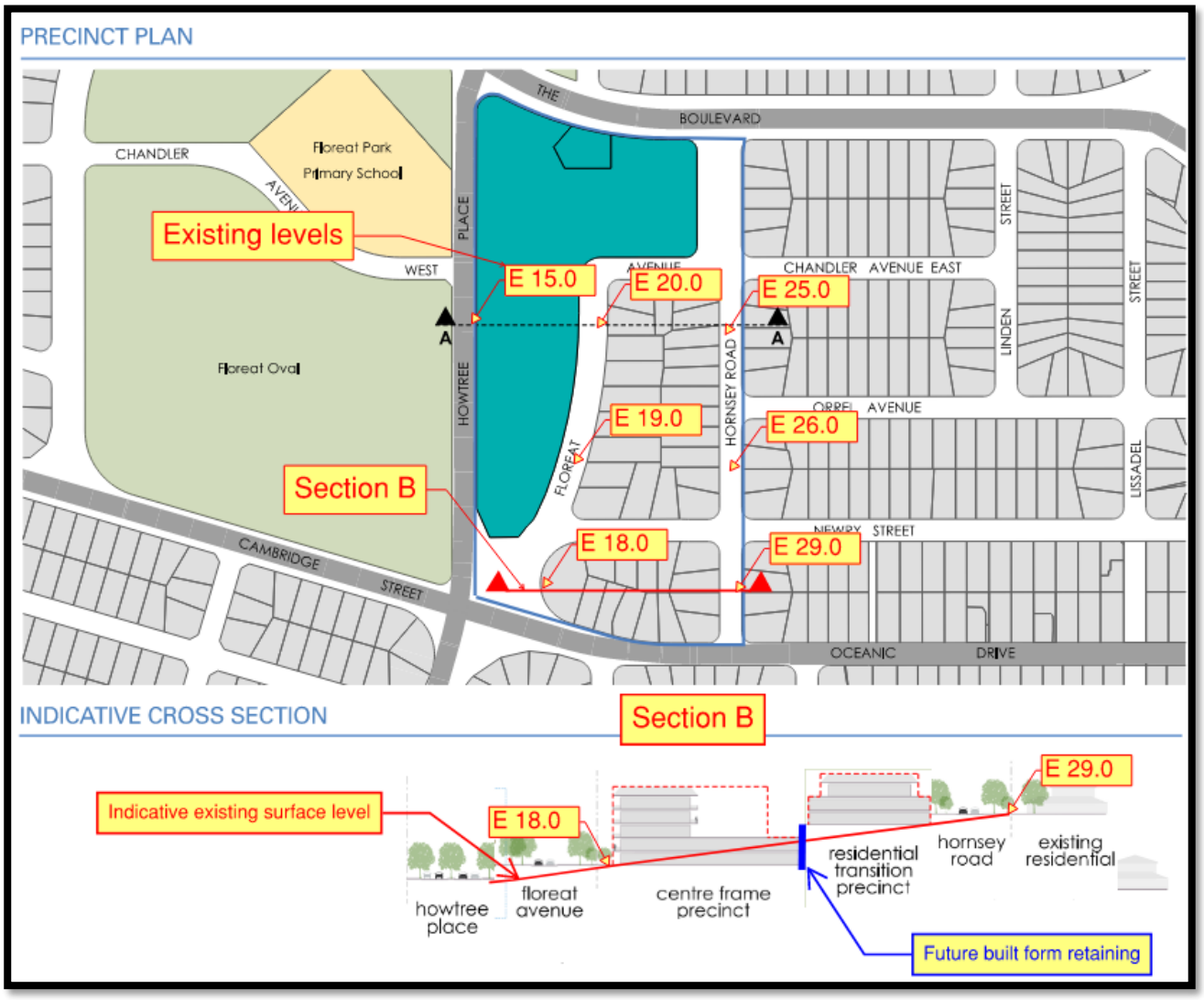


Figure 8 – Indicative Levels and Precinct Arrangement Through Section B

4 Infrastructure

4.1 Sewer Reticulation

The proposed Activity Centre area has multiple 150mm reticulation mains surrounding both the existing floreat forum precinct and the enclosed residential areas. These mains are predominantly vitrified clay, with PVC-U pipework implemented for network upgrades in the following locations:

- Southern end of the shopping precinct, where the VC main intersecting the carpark has been replaced.
- Northern end of the shopping precinct where PVC-U mains have been extended to service the petrol station and commercial tenancy in the north-east corner of the Floreat Forum Precinct.

There is sufficient depth in the existing sewer mains on the west side of Floreat Forum, to the existing residential areas in the south-east to service future development in the planned Activity Centre area. The existing sewer reticulation mains lie some 3m below the existing surface levels depicted on Water Corporations Spatial database.

Standard headworks fees apply for future green title lots. At the time of publication, the standard infrastructure contribution requirements for wastewater services are $3,414.00 per lot.

The Water Corporation advice below references upgrading a main on the west side of the forum. Alternative to this view, we consider connecting future reticulation services from the precinct to the main on Oceanic Dr via Floreat Ave and Oceanic Dr. A new DN225 main would need to be constructed to achieve this. Please refer to Figure 12 for the mark up showing the proposed connection point.

4.1.1 Water Corporation Servicing Advice

Pritchard Francis received the below information from the Water Corporation following the lodgement of a Land Planning and Servicing Advice request:

> Water Corporation Preamble
>
> The analysis below looks at the impact on the wastewater network. In accordance with the Infrastructure Network Funding Model, we will be responsible for the upgrades to the DN300 Sewer and Perry Lake SPS, we will monitor the progression of the development and program them in when required. The upgrades to the DN150 sewer will need to be funded by the proponent of the development that triggers the exceeding of design capacity, the Town of Cambridge could consider setting up a contribution scheme that collects funds for this upgrade to make it more equitable.
>
> Impacts from Floreat Forum Redevelopment proposal on the wastewater network
>
> The proposed Floreat Forum rezoning has some impacts on the Perry Lakes pumping station catchment in Subiaco Sewer District as summarized below.

Station	Long term Pump Rate (pre-Rezoning)	Long term Pump Rate (Post-Rezoning)	Current well type	Long term Well Type (Pre-Rezoning)	Long term Well Type (Post-Rezoning)
Perry Lakes SPS	54.3L/s	66L/s	Type-90	Type-90	Type-90

> – The existing civil structure should be able to accommodate the long-term pumping rate of 66L/s with no upgrade required.
> – The current pumping rate at the existing pumping station is about 40 L/s. Due to an increase in flow from the redevelopment, the pumping time for the pump station will increase from the current 11 hrs/d to 14.8 hrs/d, and a mechanical and electrical upgrade of the pump station will be required in the future.

- Due to rezoning, there will be impacts on the sewer from the access chamber 7127 to the inlet of Perry Lakes SPS. As a result, 601m of these sewers will have its design capacity exceeded, and 80m will be surcharged, as shown in Figure 10. Therefore, these existing DN305 sewer will need to be upgraded to DN375. Upgrades of mains of this size are usually funded wholly or in part by the Water Corporation.
- The proposed redevelopment is currently serviced by a DN150 sewer from the access chamber 7133 to Howtree Pl. This section of sewer will need to be upgraded to DN225 as the design capacity of the existing DN150 will be exceeded by the new development. See Figure 11.

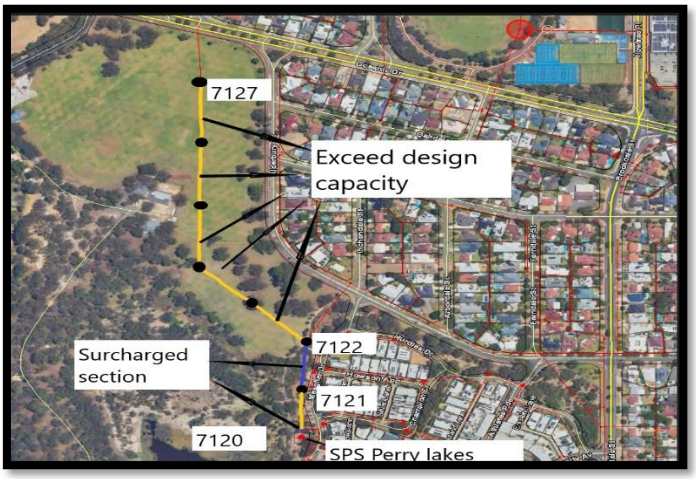


Figure 10 - DN300 Form MH-7127 to SPS Perry Lakes



Figure 11 - DN 150 From MH-7133 to MH-7244

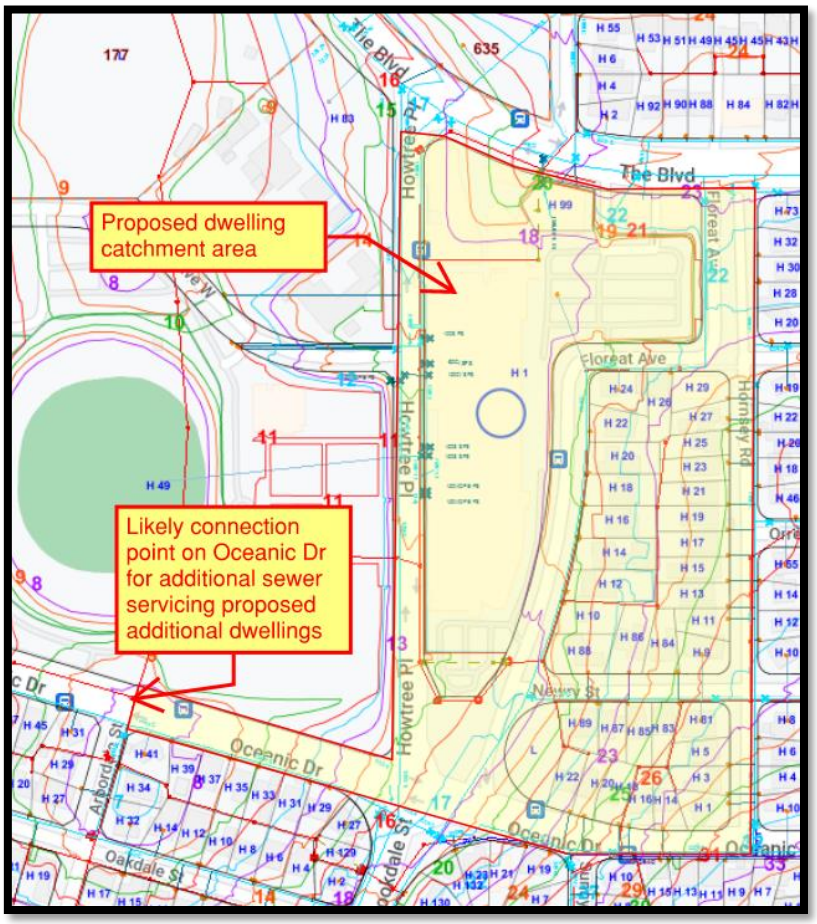


Figure 12 – Water Corporation Esinet Data Map (September 2022) with Sewer Catchment and Possible Future Connection.

See Appendix Three for BYDA sewer infrastructure plans.

4.2 Water Reticulation

4.2.1 Water Services

Water Corporation Esinet Data indicates the following water reticulations mains along the main streets within the Floreat Forum Activity Centre precinct.

- Ø535mm Reinforced Concrete (RC) main along the western verge of Howtree Pl.
- Ø305mm Cast Iron (CI) main in the southern verge of The Boulevard.
- Ø220mm RC main in the northern portion of Floreat Ave. The Esinet database indicates a proposed potable water connection to the Floreat Forum site.
- Ø205mm RC main in the eastern verge of the southern portion of Floreat Ave.
- Ø100mm RC main in the eastern verge of Hornsey Rd.
- Ø100mm RC main in the southern verge of Newry St.
- Ø250mm Polyethylene (PE) main in the southern verge of The Boulevard.
- Existing Fire services and booster hydrants are located centrally on the eastern side of Howtree Pl.
- 3x Potable water connections to the existing Floreat Forum Building located in the northern portion of the site

The existing 535RC watermain within Howtree Pl, is expected to be supplied from Mount Kenneth Reservoir. This main should provide sufficient capacity to service the proposed development.

Standard headworks fees apply for future green title lots. At the time of publication, the standard infrastructure contribution requirements for water services are $2,353.00 per lot.

4.2.2 Fire Services

Fire service connections to the three precincts can be served from Howtree Pl, The Boulevard, and Oceanic Dr, which can all accommodate a 150mm fire service connection.

If Fire Services are to be provided to future developments via Hornsey Rd and Newry St, the existing water mains will need to be upgraded to 150mm diameter mains.

4.2.3 Water Corporation Servicing Advice

Pritchard Francis received the below information from the Water Corporation following the lodgement of a Land Planning and Servicing Advice request:

> Our planners have modelled the impact on the water network and can confirm there are no system constraints caused by the increases in density. There is a 90AC water main in Hornsey Rd that may need to be upgraded to meet fire flow requirements, it would need to be tested at the time of the development, any upgrade would be funded by the proponent.

See Appendix Three for BYDA water infrastructure plans.

4.3 Stormwater Drainage

4.3.1 Town of Cambridge Drainage Infrastructure

The Town of Cambridge Intramaps shows existing council drainage infrastructure in proximity to the proposed site:

- Stormwater pit and pipe system within the Floreat Ave, starting in the north east on Floreat Ave and Hornsey Road, connecting to Oceanic Drive network and terminating within Floreat Oval.
- Multiple pits and interconnecting pipework to the south of Floreat Forum between Howtree Pl and Floreat Ave, similarly, ultimately discharging into Floreat Oval.
- Pit and Pipe on the Boulevard to the north, appear to discharge into Mclean Park but needs to be confirmed.

Figure 13 below depicts the pit and pipe locations in proximity to the Floreat Forum precinct.

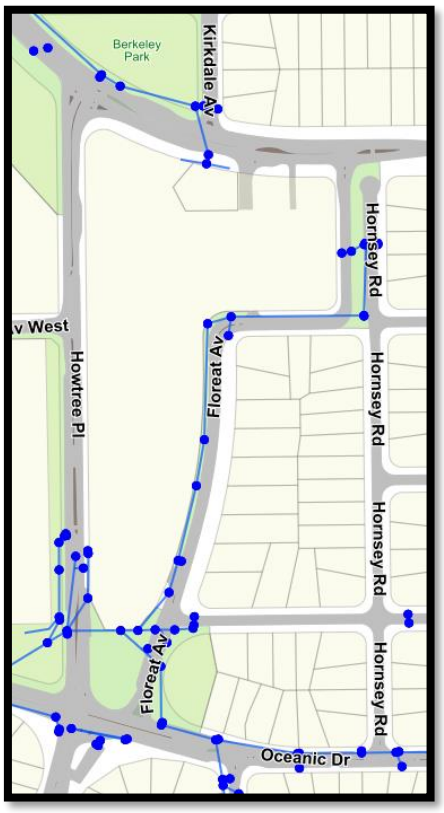


Figure 13 – Town of Cambridge Stormwater Drainage Network (2022)

4.3.2 Town of Cambridge Drainage Requirements

The Town of Cambridge requires that stormwater drainage infrastructure for private, commercial properties shall be contained on site and disposed of through soakage into the ground in accordance with the Building Code of Australia. Storage capacity is to be 1 cubic metre of storage per 30 square metres of paved or roofed area, catering for a 1 in 100-year event. Please refer to Appendix Four for the Town of Cambridge stormwater drainage requirements for private property.

The proposed Centre Frame Precinct and the Residential Transition Precinct have an approximate area of 45,000m2. Assuming 80% of this is to be hardstand/roofed areas, 1500 cubic metres of in ground storage is required as per the Town of Cambridge guidelines. This is equivalent to 328 x Ø1800x1800 soakwells. Pritchard Francis anticipate new drainage infrastructure would be required to cater for stormwater runoff, which would then be designed in conjunction with proposed buildings to optimise land use.

4.4 Gas Supply

A Dial Before You Dig investigation indicates that there is existing gas infrastructure within the vicinity of the proposed development as below:

- Ø50mm PVC medium pressure 70kPa main located within the western verge Howtree Pl.
- 63PE 1.5MP 70kPa service to the Floreat Forum on the north side of Howtree Pl.
- Two Service locations to Floreat Forum at the intersection of Chandler Ave and Howtree Pl.
- Ø100mm PVC 1.5 MLP 7kPa main located within the eastern verge of Hornsey Rd.
- Ø50mm PVC MLP 7kPa main located within Floreat Ave
- Ø80mm PVC 1.5 MLP 7kPa main located within Floreat Ave

If gas services are required, advice from ATCO is to be sought regarding the existing networks capability to service the future development, and any subsequent network upgrades necessary to meet demand.

Refer to Appendix Five for BYDA Gas infrastructure plans.

4.5 Electrical Supply

A Dial Before You Dig investigation indicates that there is existing power infrastructure within the vicinity of the proposed development as below:

- High voltage main (underground) located in the southern verge of The Boulevard, with an existing service connection to the precinct.
- Low voltage main (underground) located in the southern verge of The Boulevard, with an existing service connection to the precinct.
- High voltage main (underground) located in the northern verge of the Floreat Ave, along the Chandler Ave East alignment.
- Low voltage main (underground) located in the northern verge of the Floreat Ave, along the Chandler Ave East alignment.
- High voltage main (underground) located in the eastern verge of The Boulevard, with an existing service connection to the precinct.
- Low voltage main (underground) located in the eastern verge of The Boulevard, with an existing service connection to the precinct.
- High voltage main (underground) located in the northern verge of Oceanic Dr, with an existing service connection to the precinct.
- Low voltage main (underground) located in the northern verge of Oceanic Dr, with an existing service connection to the precinct.
- Low voltage main (overhead) located in the verge along Howtree Pl.
- Power poles are in both verges along The Boulevard and Oceanic Dr, the western verge of Howtree Pl, eastern verge of Floreat Ave.

4.5.1 3E Power Advice

Pritchard Francis engaged with 3E Electrical seeking further power advice, with the following comments received:

Introduction

The site plan appears to maintain the existing road reserves, and so it is assumed that the majority of existing in-ground electrical and telecommunications assets can remain as they are.

We understand that the subject site is to be redeveloped, whereby the existing electrical & telecoms network demand will not remain and so the estimated demand of the proposed redevelopment will make up the total demand.

Electrical Demand

The estimated electrical demand for the proposed development is likely to be in the order of the below:

- 11,000sqm of commercial: ~1.5MVA
- 1,250 residential dwellings: ~6.5MVA

The total estimated electrical demand is therefore in the order of ~8MVA.

The estimated increase in electrical demand due to the proposed redevelopment of the site is therefore likely to be in the order or ~5-6MVA.

Network Capacity

The capacity of the existing HV networks is unknown. There is moderate to low risk of the existing networks not having sufficient capacity to support the additional electrical demand. Network reinforcement headworks may therefore apply. Further consultation with Western Power will be required to determine the need for a new HV feeder and the most likely source Zone substation. The process to procure further clarification from Western Power could be 3 to 6 months, while the process to get cost estimates could be around 9 months.

HV Substations and Network – Forward Planning

The site may likely require the removal of significant existing Western Power assets. Relocating and removal of existing assets are often complex, costly and require very long lead times (6 to 24 months). This is particularly the case when substations are involved. Early planning will be the key to determine the extent and limits of the removals of existing Western Power assets to suit the ultimate network arrangement and to programme the timing of the works. Particularly for the removal or relocation of any existing substations, as may be required. Consideration to the staging of works should be given such that new substation locations are identified and applications to Western Power made sufficiently in advance as to allow for the removal of any of the existing substations that are required.

HV Substations and Network – Ultimate Arrangement

A number of distribution substations (6 to 12) may be required throughout the site, dependent on the development arrangement. A HV network will be required throughout the site to connect the substations and the existing HV feeder network. Each individual stage of the project is anticipated to require a timeframe of up to 24 months from the application to Western Power to the energisation of the new network.

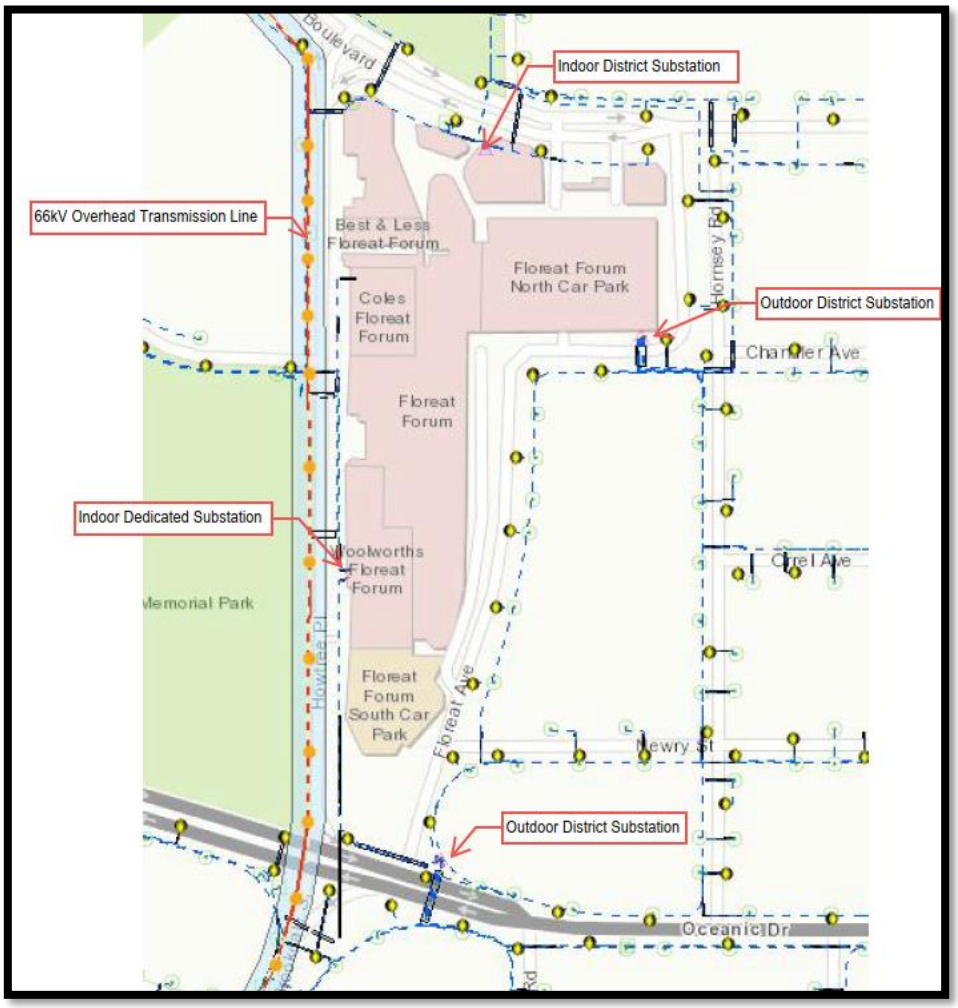


Figure 14 – Western Power Network

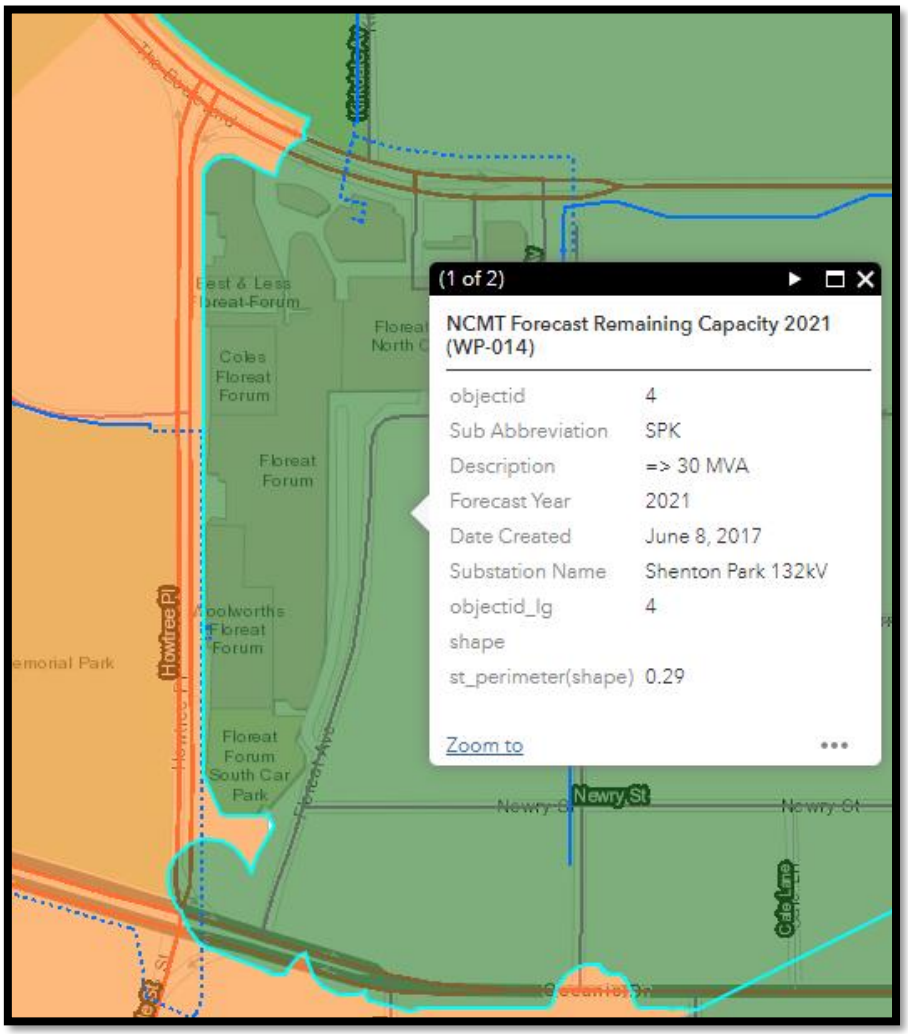


Figure 15 – Zone Substation Capacity

Refer to Appendix Six for BYDA power infrastructure plans.

4.6 Communications

A Dial Before You Dig investigation, and liaison with Telstra infrastructure teams indicates that there is existing AARnet, Nextgen, Optus, Vocus, NBN and Telstra communications infrastructure within the vicinity of the proposed development as below:

- NBN:
  - No existing NBN service on Howtree Pl.
  - NBN conduit and cable in the southern verge along The Boulevard
  - NBN conduits and cables in the eastern verge along Hornsey Rd, 2x pits at Chandler Ave intersection, 2x Pits Orrel Ave intersection, 1x Pit Newry St intersection, 1x Pit Oceanic Dr intersection.
  - NBN conduits and cables in the eastern verge along Floreat Ave.
  - NBN conduits and cables in the north and south verges along Newry St.
  - NBN conduits and cables in the north and south verges along Oceanic Dr, 1x Pit on the south side of Oceanic Dr at each southbound connecting street.

  Oceanic Dr and Hornsey Rd are the main NBN service corridors in close proximity to the precinct.
- Telstra:
  - Telstra conduits and cables in the western verge of Howtree Pl servicing Floreat Park Primary School and Cambridge Bowling Club.
  - Telstra conduits and cables in the southern verge along The Boulevard, servicing Cambridge Library and the petrol station.
  - Telstra conduits and cables in the eastern verge along Hornsey Rd, 2x pits at Chandler Ave intersection, 2x Pits Orrel Ave intersection, 1x Pit at the Newry St intersection, 1x Pit at Oceanic Dr intersection.
  - Telstra Cables and conduits in the eastern verge along Floreat Ave. 1x Pillar in the northern portion of Floreat Ave adjacent Hornsey Rd. The Floreat Forum main building is serviced from the southern portion of Floreat Ave, east of the main building.
  - Telstra conduits and cables in the north and south verges along Newry St.
  - Telstra conduits and cables in the north and south verges along Oceanic Dr, 1x Pit on the south side of Oceanic Dr at Grovedale and 1x Pit on the south side of Oceanic Dr at Sunnyside Rd intersections.
- AARNet
  - Fibre Optics Assets in the eastern verge of Floreat Ave, entering the precinct from the southern side of the Boulevard and the eastern side of Oceanic Dr.
- NextGen
  - 1 x Cable within Third Party duct on the western side of Howtree Pl, entering the precinct form the southern side of The Boulevard and the western side of Brookdale St.
- Optus
  - 1 x Optic fibre cable servicing the site from Floreat Ave.
- Vocus
  - 1 x Vocus Group Conduit
  - 2 x Vocus Group pits in the southern verge of The Boulevard.

4.6.1 3E Communications Advice

Pritchard Francis engaged with 3E Electrical seeking further communications advice, with the following comments received:

> Floreat Forum is currently serviced by NBN Fibre to the Basement (FTTB) technology, leasing Telstra pit & pipe. It's our opinion that the existing Telstra and other carriers' networks surrounding the Floreat Forum Precinct meet Fibre Ready standards set out in the Telecommunications Act 1997. However, since the super-lot is neither subdividing nor amalgamating, the developer wouldn't be bound by the Fibre Ready obligations of the Act. The existing infrastructure is sufficient for NBNCo to provide the proposed additional commercial services. Multiple carriers surround the Floreat Forum Precinct and relocation of assets will need to be assessed at detailed design to accommodate entryway changes, level changes if any, and impacts caused by changes to the power reticulation.
>
> The existing homes located in the proposed Centre Transition and Residential Transition Precincts are currently serviced by NBN Hybrid Fibre Coaxial (HFC). All existing lots meet the Fibre Ready requirements in the Act, and as such no further remediation would be required to fulfil the developer's obligation. The existing infrastructure is sufficient for NBNCo to provide service to the proposed additional residential dwellings. Multiple carriers surround the Centre and Residential Transition Precincts and relocation of assets will need to be assessed at detailed design to accommodate entryway and lot boundary changes, level changes if any, and impacts caused by changes to the power reticulation.

Refer to Appendix Seven for BYDA communications infrastructure plans.

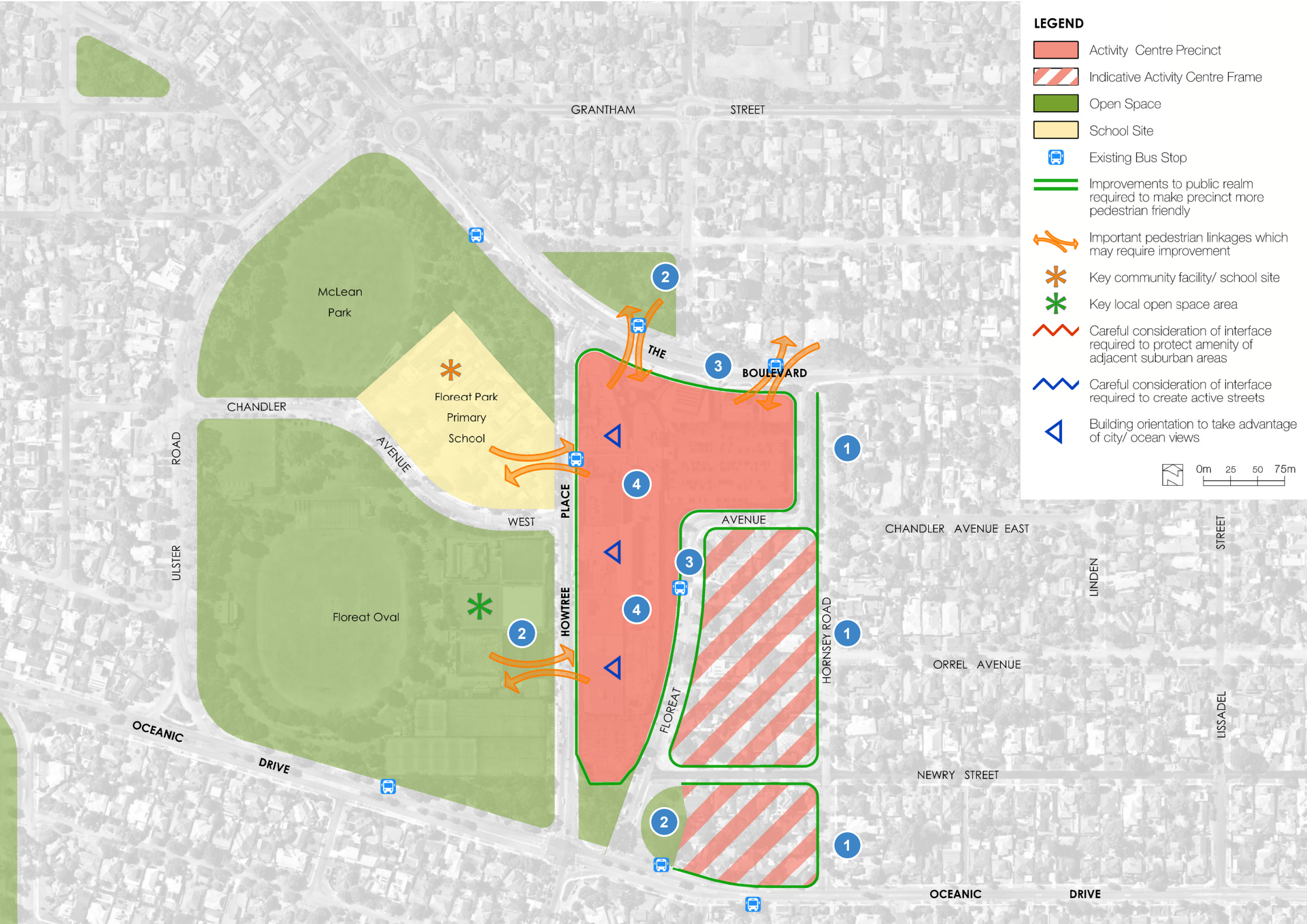
5 Conclusion

Pritchard Francis has been commissioned by APIL to review engineering service requirements for the proposed Floreat Forum Activity Centre Precinct. Based on preliminary investigations, Pritchard Francis do not envisage any issues servicing the development to support the proposed additional residential dwellings and commercial space. This assessment is high level and has been made based on readily available information and preliminary planning advice from the Water Corporation.

Appendices

Appendix One:	Activity Centre Plan
Appendix Two:	Precinct Assumptions and Projections
Appendix Three:	BYDA – Water and Sewer Infrastructure
Appendix Four:	BYDA – Town of Cambridge Drainage Requirements
Appendix Five:	BYDA – Gas Infrastructure
Appendix Six:	BYDA – Power Infrastructure
Appendix Seven:	BYDA – Communications Infrastructure

Appendix One: Activity Centre Plan


LEGEND
Activity Centre Precinct
Indicative Activity Centre Frame
Open Space
School Site
Existing Bus Stop
Improvements to public realm required to make precinct more pedestrian friendly
Important pedestrian linkages which may require improvement
Key community facility/ school site
Key local open space area
Careful consideration of interface required to protect amenity of adjacent suburban areas
Careful consideration of interface required to create active streets
Building orientation to take advantage of city/ ocean views
0m 25 50 75m
GRANTHAM STREET
McLean Park
Floreat Park Primary School
CHANDLER AVENUE WEST
ULSTER ROAD
Floreat Oval
OCEANIC DRIVE
THE BOULEVARD
PLACE
HOWTREE
AVENUE
FLOREAT
HORNSEY ROAD
CHANDLER AVENUE EAST
LINDEN STREET
ORREL AVENUE
LISSADEL
NEWRY STREET
OCEANIC DRIVE
1
2
3
4

Appendix Two: Precinct Assumptions and Projections

FLOREAT FORUM PRECINCT

ASSUMPTIONS & PROJECTIONS

FLOREAT ACTIVITY CENTRE

TOTAL DEVELOPMENT AREA

4.39 HECTARES

MINIMUM NEW BUILDING HEIGHT

CURRENTLY NO MINIMUM APPLIED

MAXIMUM NEW BUILDING HEIGHT

7-8 STOREYS

ESTIMATED AVERAGE NEW BUILDING HEIGHT

6-8 STOREYS

PROPORTION OF NEW FLOORSPACE BUILT FOR RESIDENTIAL PURPOSES

60-70 PERCENT RESIDENTIAL

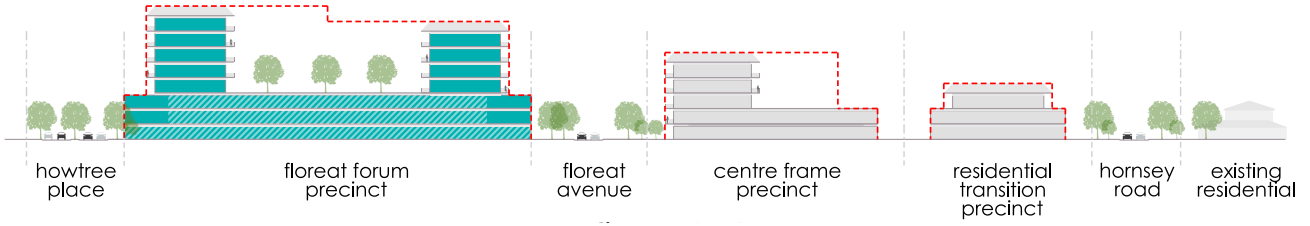
ESTIMATED NEW DWELLING YIELD

650-950 DWELLINGS

PRECINCT PLAN



INDICATIVE CROSS SECTION



BUILT FORM EXAMPLES (MIXED USE SHOPPING CENTRE DEVELOPMENT)







ASSUMPTIONS & PROJECTIONS

FLOREAT ACTIVITY CENTRE

TOTAL DEVELOPMENT AREA

1.72 HECTARES

MINIMUM NEW BUILDING HEIGHT

CURRENTLY NO MINIMUM APPLIED

MAXIMUM NEW BUILDING HEIGHT

3-5 STOREYS

ESTIMATED AVERAGE NEW BUILDING HEIGHT

4-5 STOREYS

PROPORTION OF NEW FLOORSPACE BUILT FOR RESIDENTIAL PURPOSES

100 PERCENT RESIDENTIAL

ESTIMATED NEW DWELLING YIELD

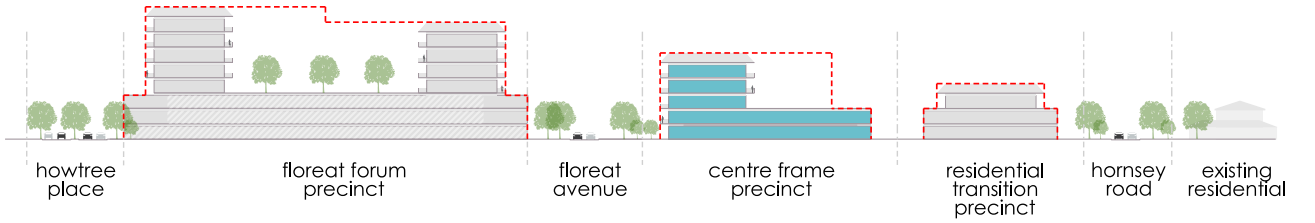
175-200 DWELLINGS

CENTRE TRANSITION PRECINCT

PRECINCT PLAN



INDICATIVE CROSS SECTION



BUILT FORM EXAMPLES (3-5 STOREY RESIDENTIAL DEVELOPMENT)







ASSUMPTIONS & PROJECTIONS

FLOREAT ACTIVITY CENTRE

TOTAL DEVELOPMENT AREA

1.85 HECTARES

MINIMUM NEW BUILDING HEIGHT

CURRENTLY NO MINIMUM APPLIED

MAXIMUM NEW BUILDING HEIGHT

2-3 STOREYS

ESTIMATED AVERAGE NEW BUILDING HEIGHT

2-3 STOREYS

PROPORTION OF NEW FLOORSPACE BUILT FOR RESIDENTIAL PURPOSES

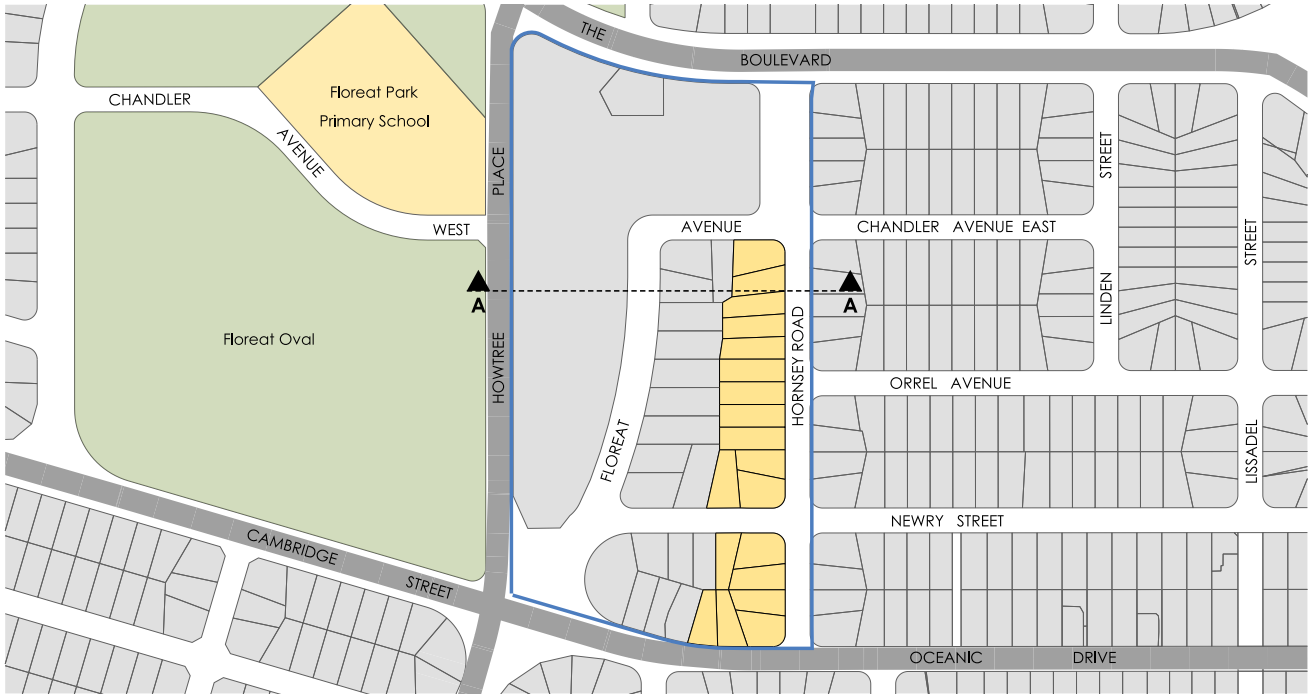
100 PERCENT RESIDENTIAL

ESTIMATED NEW DWELLING YIELD

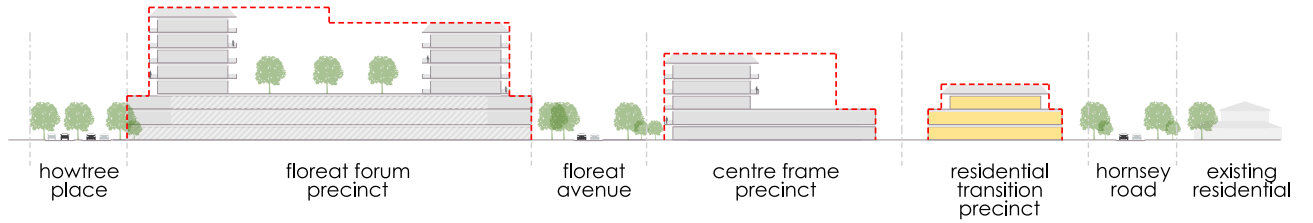
75-100 DWELLINGS

RESIDENTIAL TRANSITION PRECINCT

PRECINCT PLAN



INDICATIVE CROSS SECTION



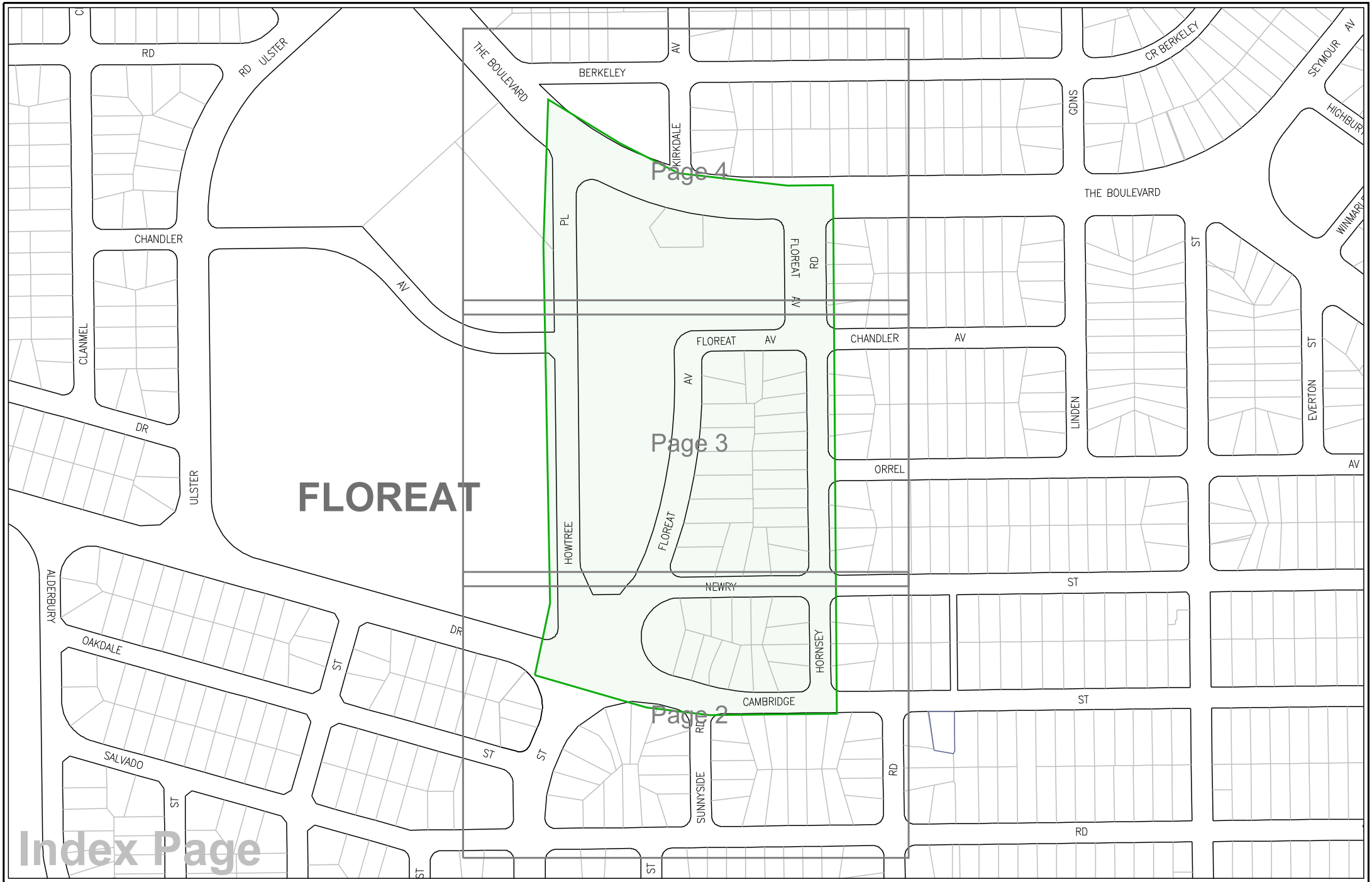
BUILT FORM EXAMPLES (2-3 STOREY RESIDENTIAL DEVELOPMENT)







Appendix Three: BYDA – Water and Sewer Infrastructure



WATER CORPORATION

Scale: 1:4567

Sequence No: 214755266

Print Date: 12/08/2022 Page: 1 of 4

N

Water

WARNING - CRITICAL PIPELINE

Refer to *Information Brochure Damage Prevention* and *Legend* for details

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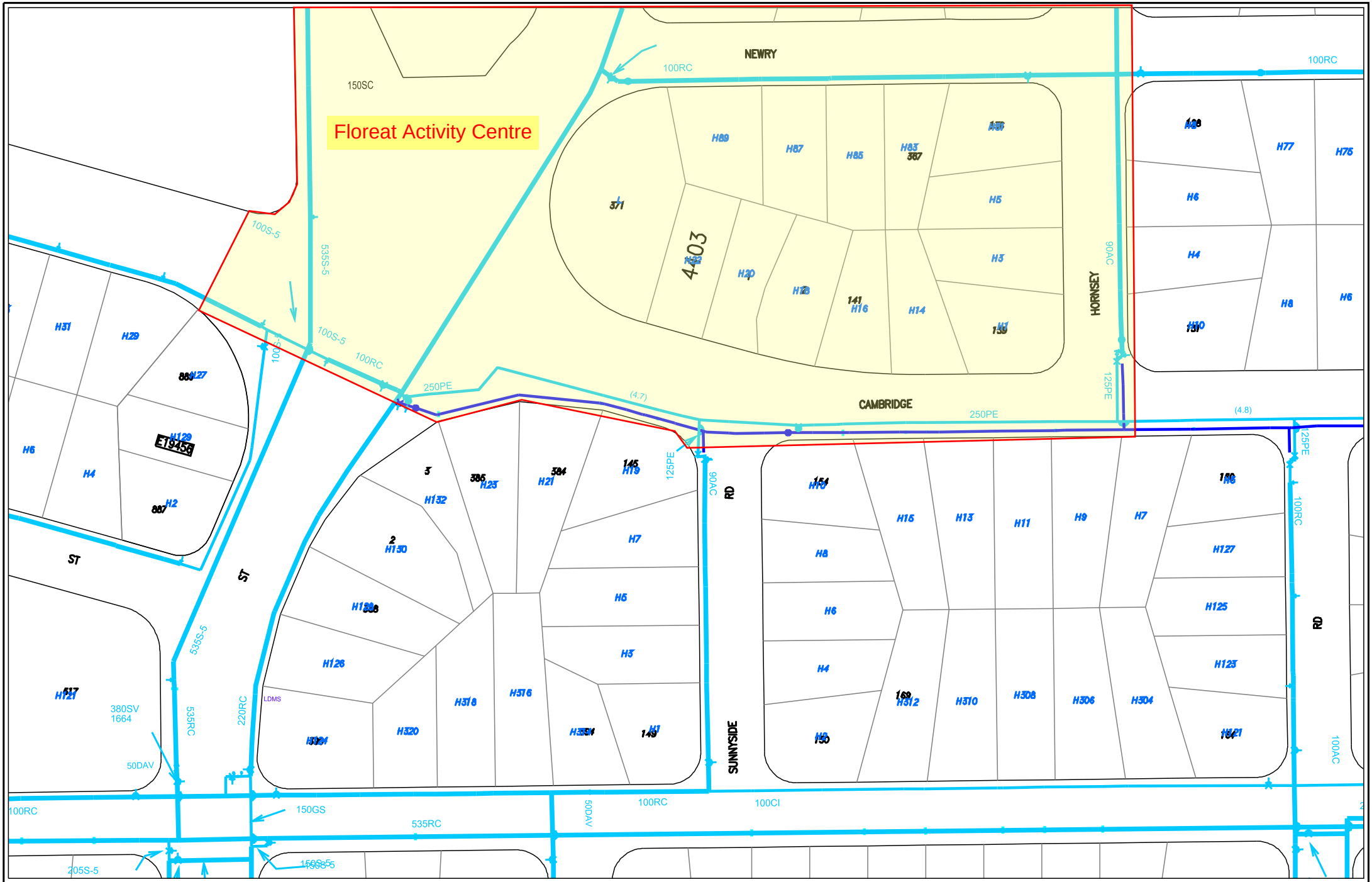

WATER CORPORATION

Scale: 1:1500 Centre Point: 115.793°, -31.941°

Sequence No: 214755266

Print Date: 12/08/2022 Page: 2 of 4

N

Water

WARNING - CRITICAL PIPELINE

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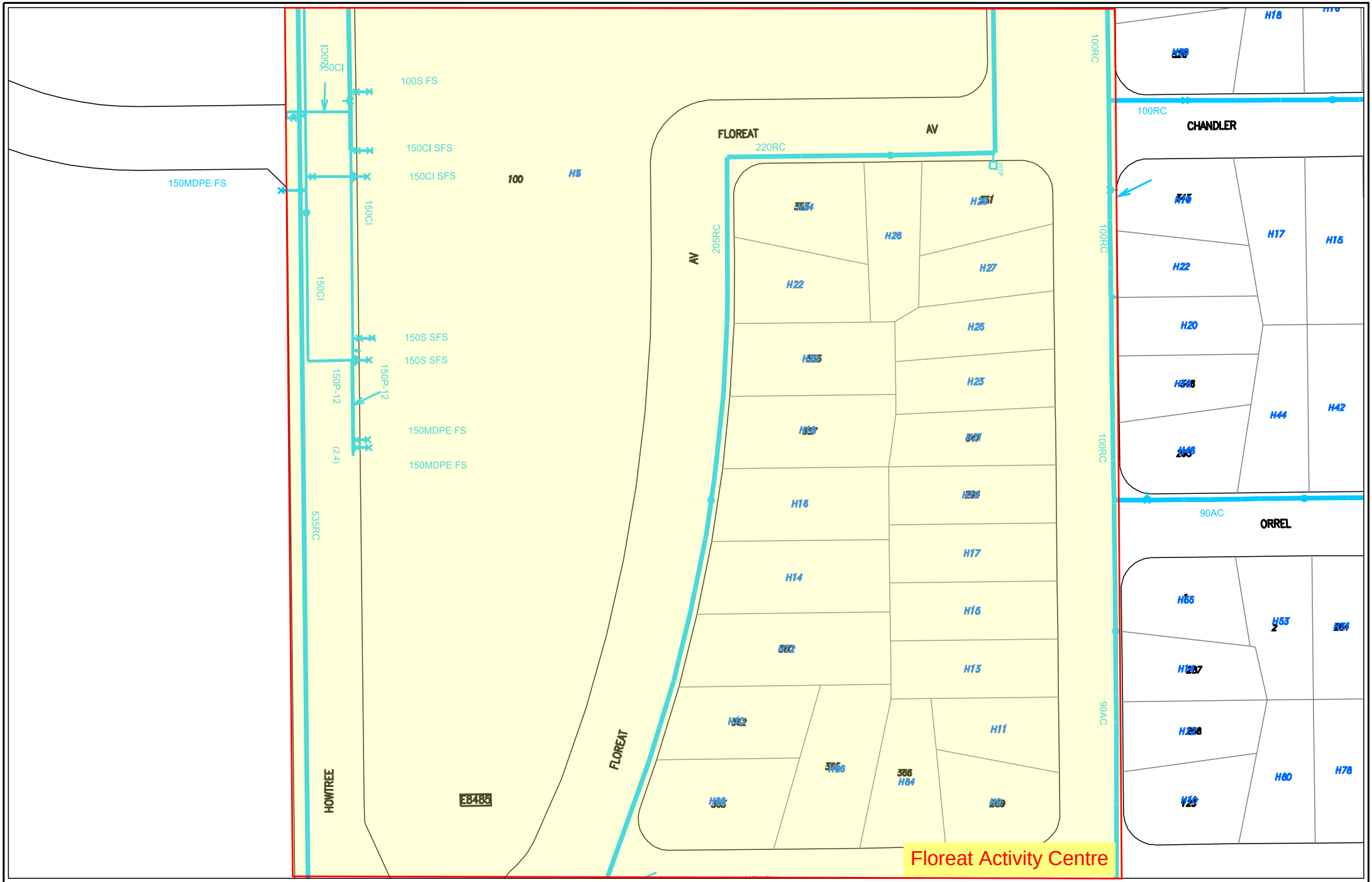

WATER CORPORATION

Scale: 1:1500 Centre Point: 115.793°, -31.939°

Sequence No: 214755266

Print Date: 12/08/2022 Page: 3 of 4

N

Water

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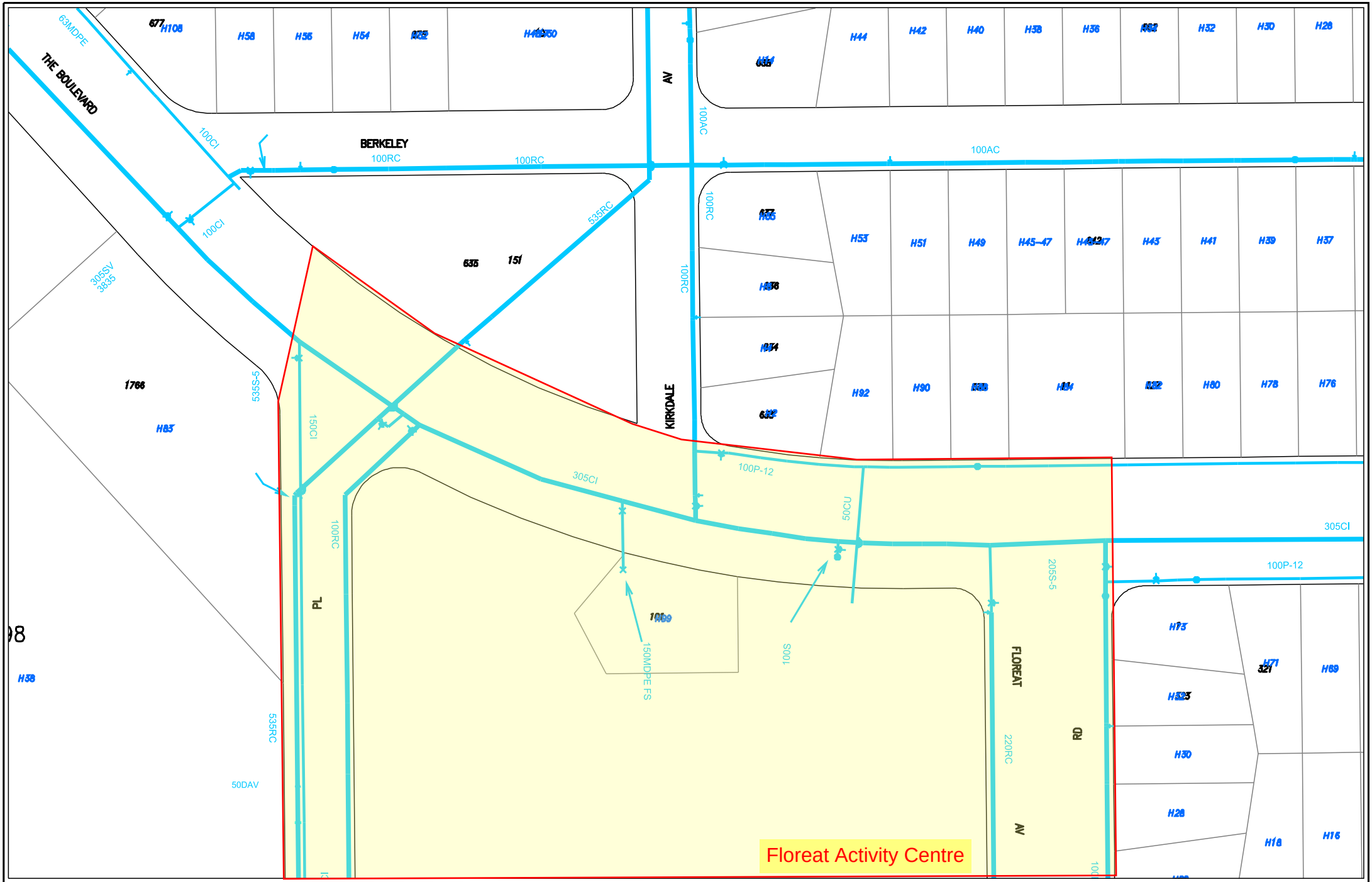

WATER CORPORATION

Scale: 1:1500 Centre Point: 115.793°, -31.936°

Sequence No: 214755266

Print Date: 12/08/2022 Page: 4 of 4

N

Water

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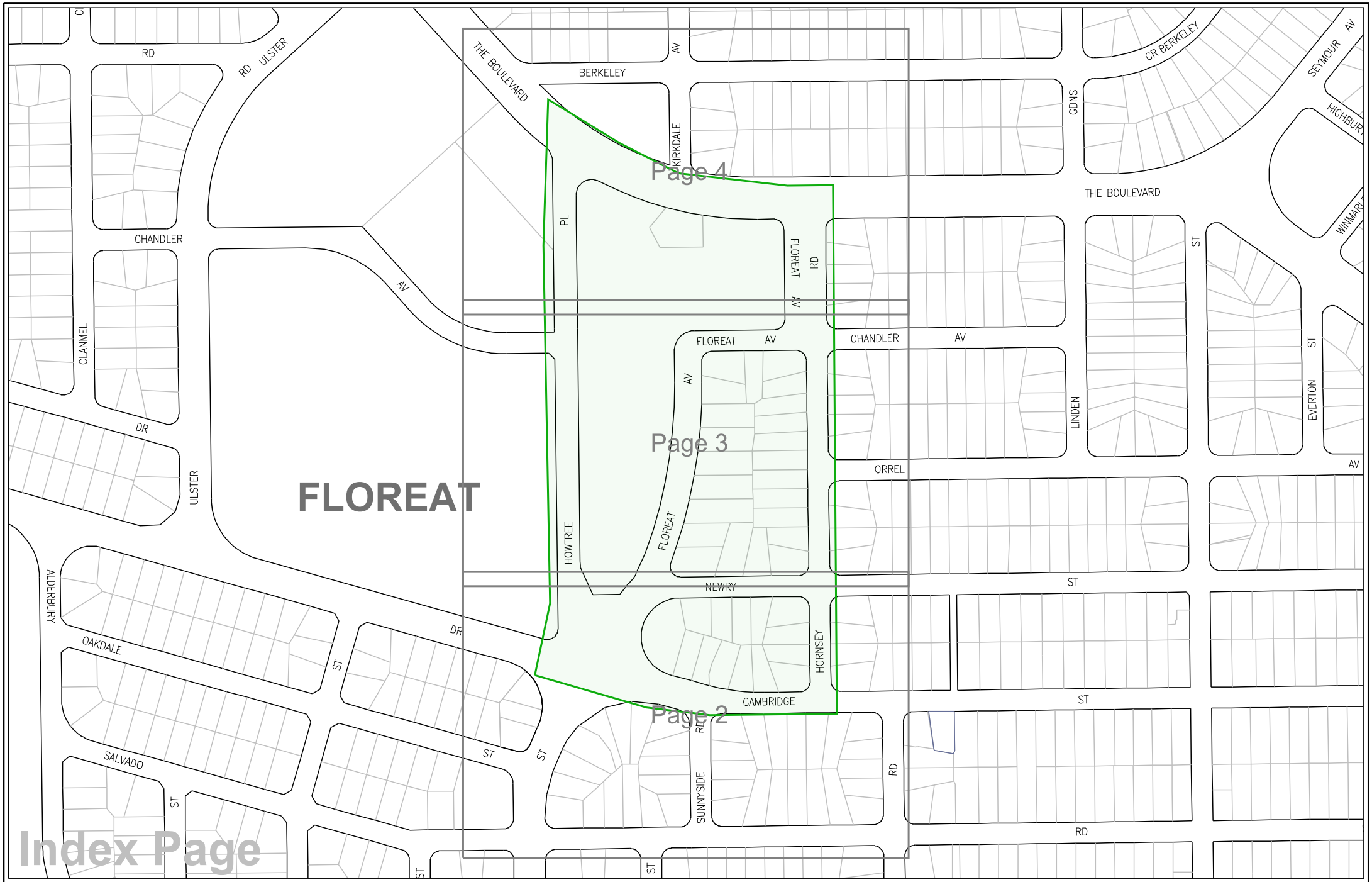

WATER CORPORATION

Scale: 1:4567

Sequence No: 214755266

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N

Sewer

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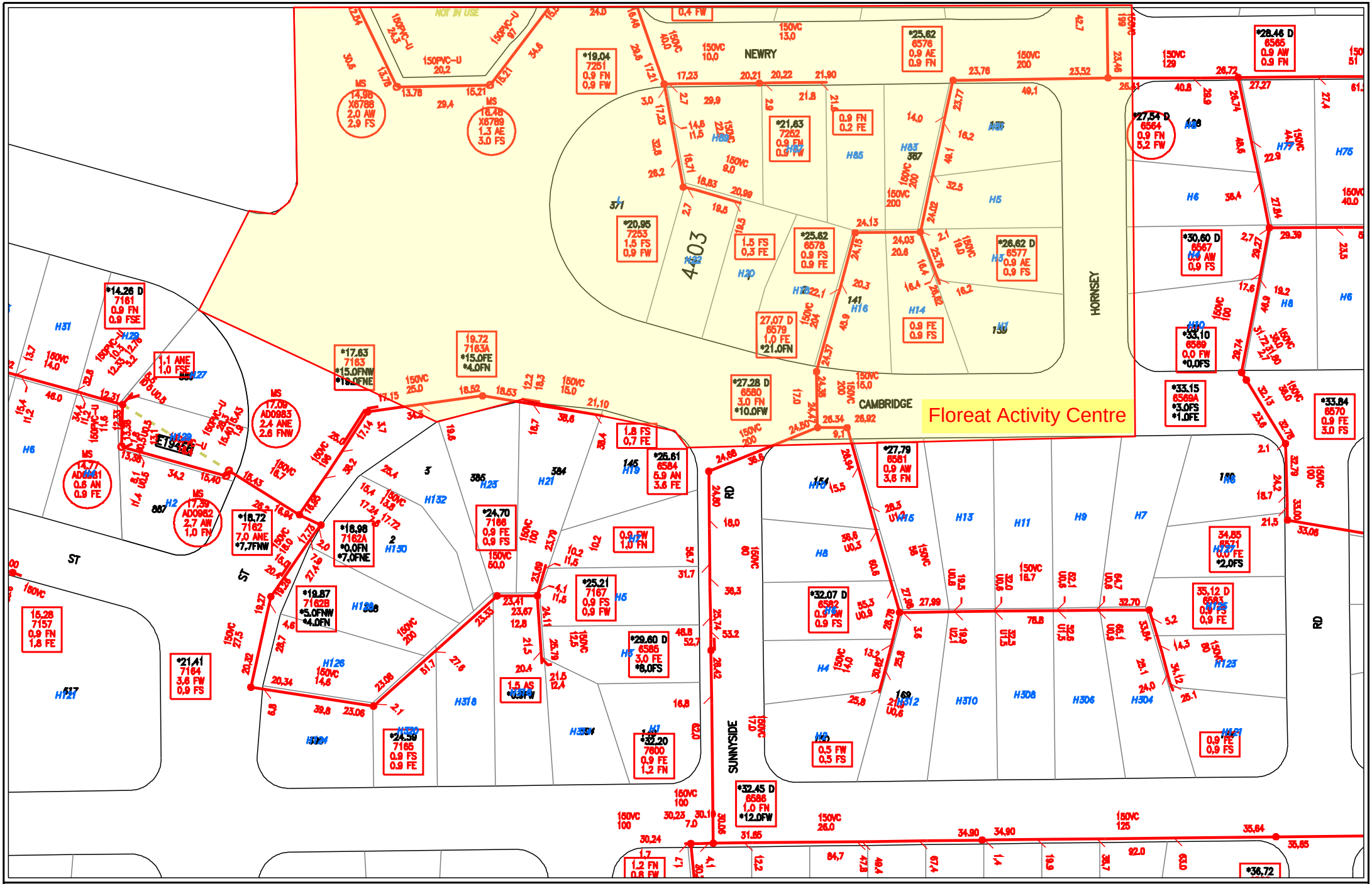

WATER CORPORATION

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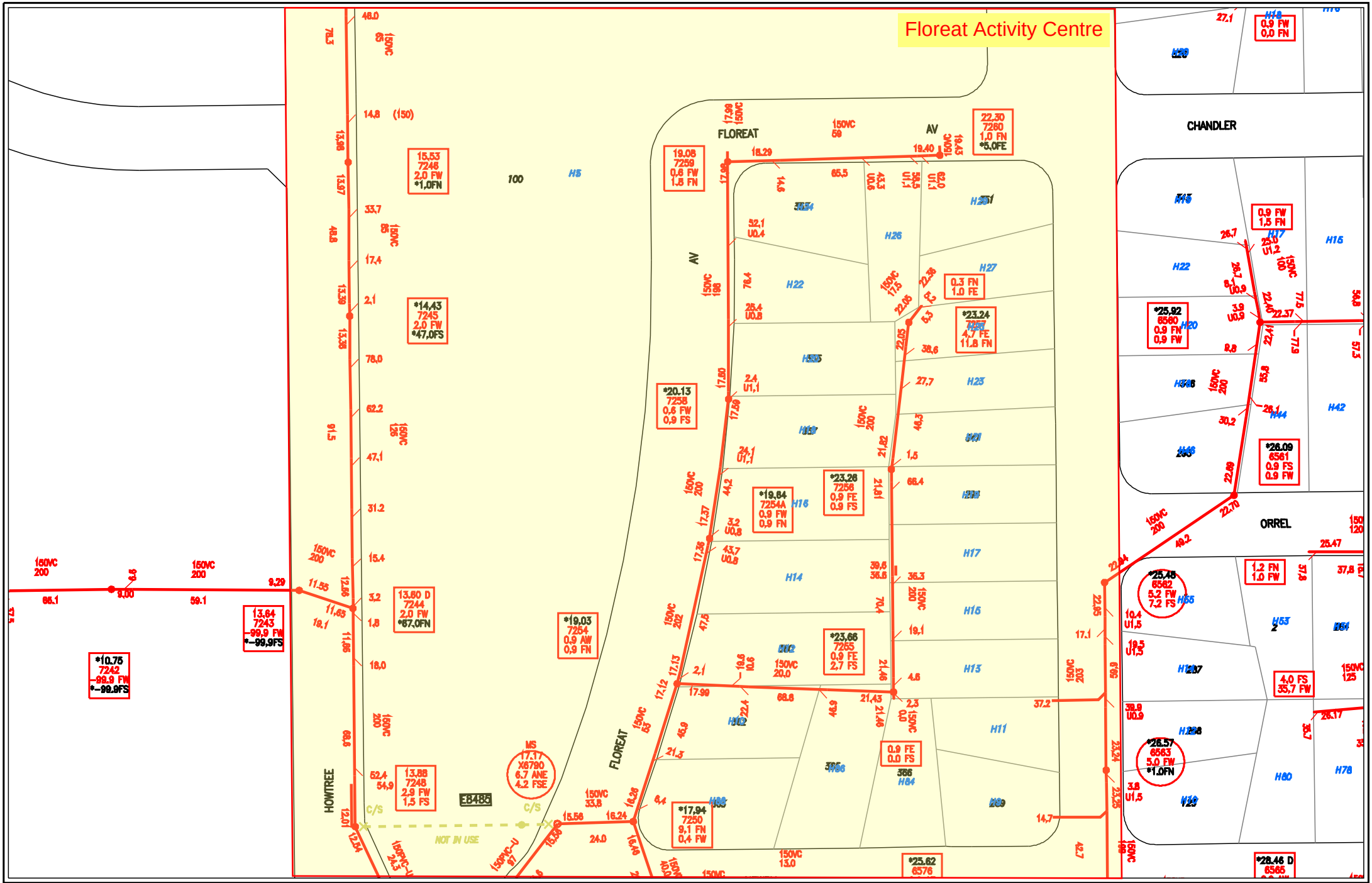

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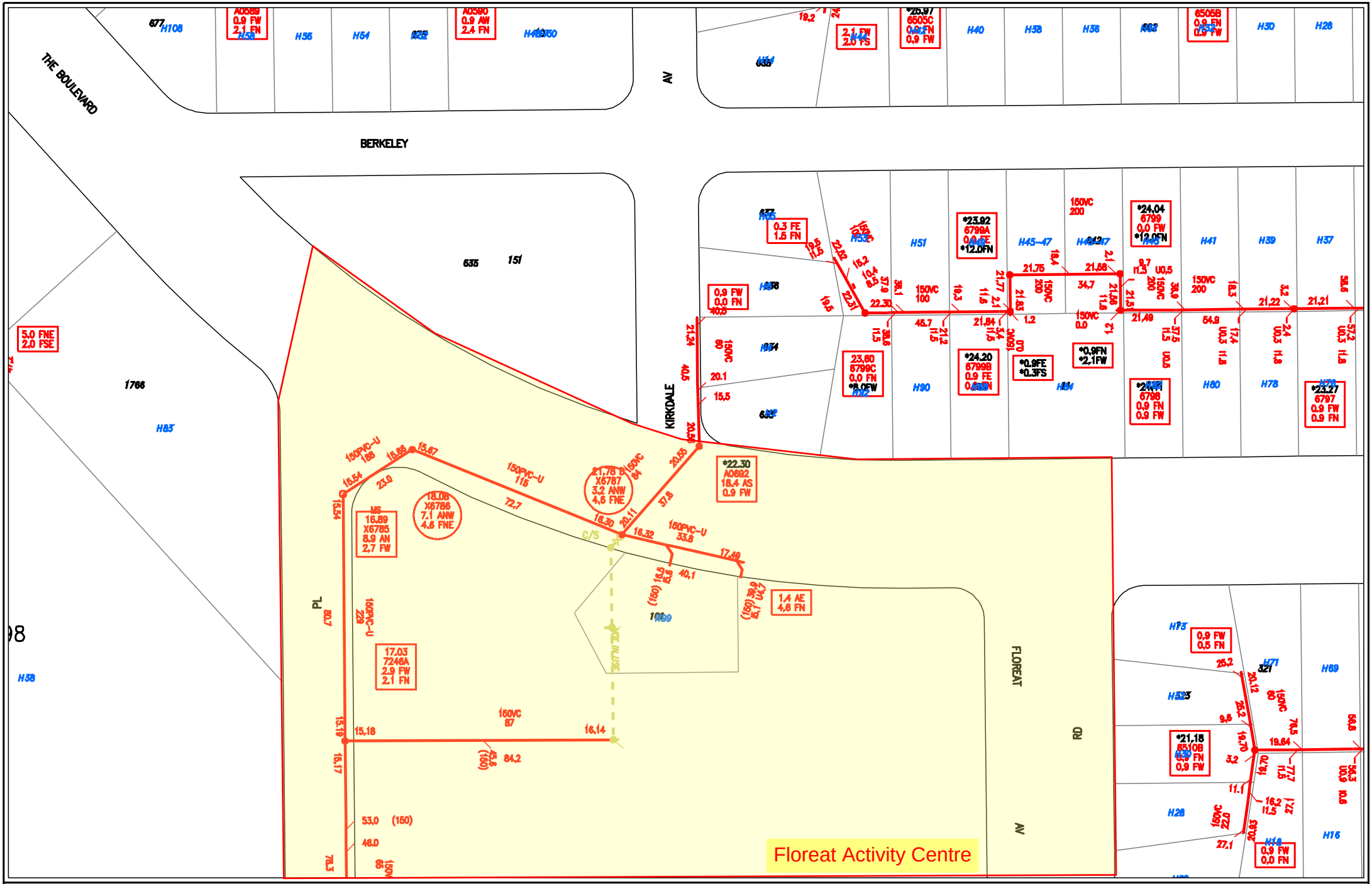

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Sequence No: 214755266

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Appendix Four: BYDA – Town of Cambridge Drainage Requirements

STORMWATER DRAINAGE REQUIREMENTS FOR PRIVATE PROPERTY POLICY

COUNCIL POLICY NO: 091	
Responsible Directorate	Infrastructure and Works
Responsible Section	Technical Services and Works
Responsible Officer	Manager Technical Services and Works

OBJECTIVE:

Identification of the arrangements to be made for the disposal of stormwater on commercial, industrial and residential properties.

SCOPE:

This policy applies to all private property owners within the Town of Cambridge.

POLICY STATEMENT:

1. New Developments

Disposal of stormwater generated on private property shall be contained on site and disposed of through soakage into the ground in accordance with the Building Code of Australia (current version). A soakwell or "rain garden" with capacity of 1 cubic metre per 30 square metres of paved or roofed area is required for a "once in 100 year" storm event.

The soakwell system is to be maintained by the property owner including the removal of dirt/leaves and other contaminants at least every 6 months. Removal of dirt/leaves and other contaminants at least every 6 months.

2. Existing Commercial Properties

Existing overflow pipes from older commercial properties shall be maintained by the property owner. This shall include all pipes and pits between the private property and the road kerb.

DEFINITIONS:

Definitions are taken as those detailed in the *Local Government Act 1995* and associated legislation.

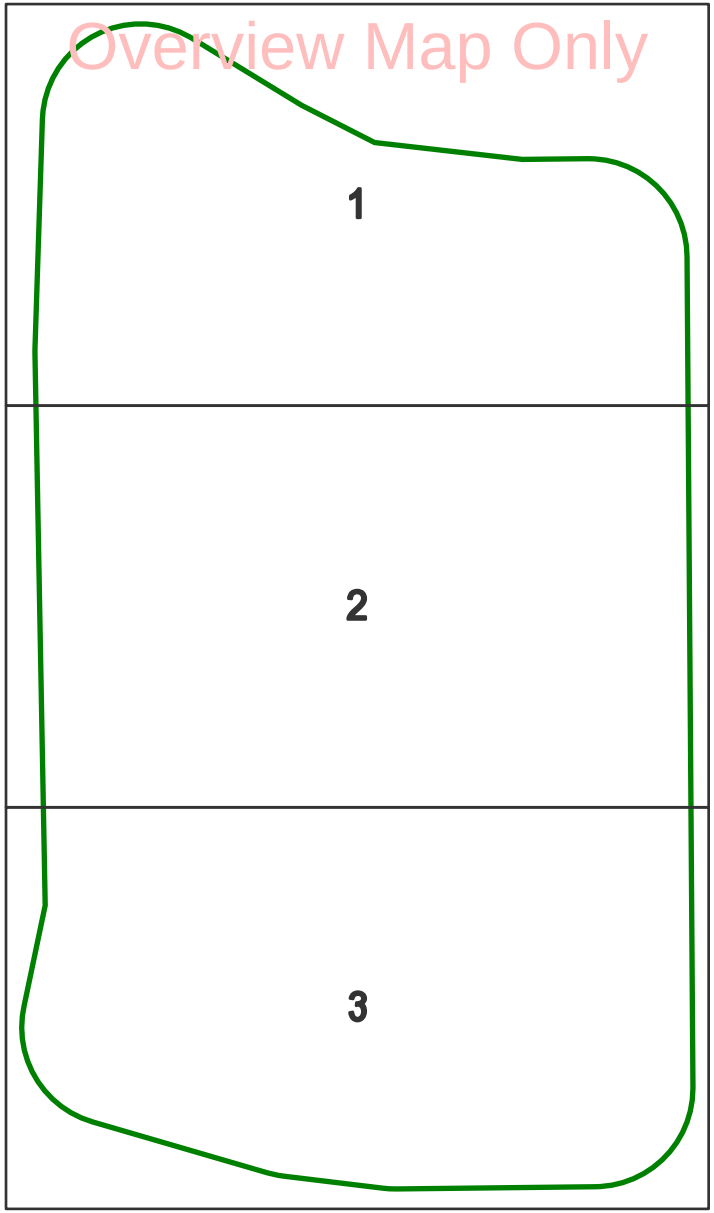
Soakwell - is an underground tank which allows water to seep away without causing damage to surrounding areas.

Rain garden - is a system that collects water from paving, hard surfaces, roofs, and puts it through a filtering mechanism that removes nutrients and pollutants.

Document Control				
Office Use Only:				
Previous Policy No	Policy No. 5.2.11			
Statutory Legislation and Compliance	*Local Government Act 1995;*			
Related Documents/Legislation				
Date of Adoption by Council	Council Meeting – 1 July 1994			
Date Reviewed/Amended	17 September 1996 28 October 2003 24 April 2012 23 June 2020	27 May 1997 22 November 2005 23 June 2015	27 June 2000 22 April 2008 24 May 2016	26 August 2003 25 May 2010 26 June 2018
Next Review Date	April 2024			

Appendix Five: BYDA – Gas Infrastructure

Overview Map Only



Sequence No: 214755268
Map Tile:
Scale: 1:4612
Job No: 32518360
Date:12/08/2022
Location: 18 Floreat Avenue, Floreat 6014

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Please read all **warnings**, conditions and information on the attached "Underground Asset Details" information sheet. This plan is issued subject to that information and those conditions and **warnings** (including, but not limited to, the "NO HOT WORKS" warning). Plans are current for only **30 days** from date of request, indicative only and not warranted to be accurate. It is your responsibility to carefully locate underground assets and follow safe work practises and procedures (eg pot-holing). ATCO Gas Australia will seek compensation for damage caused to assets.

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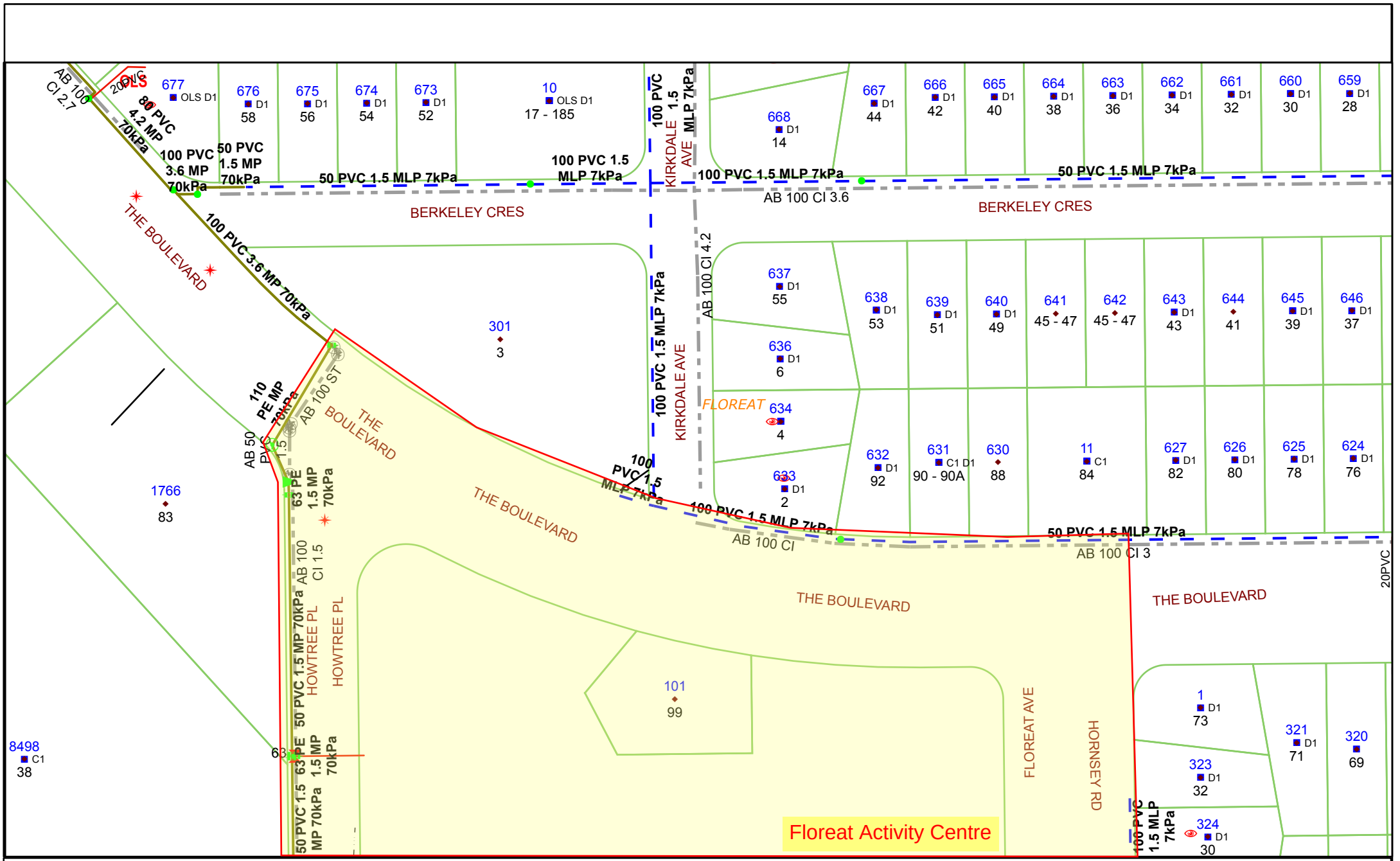

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Job No: 32518360 Date:12/08/2022 Location: 18 Floreat Avenue, Floreat 6014

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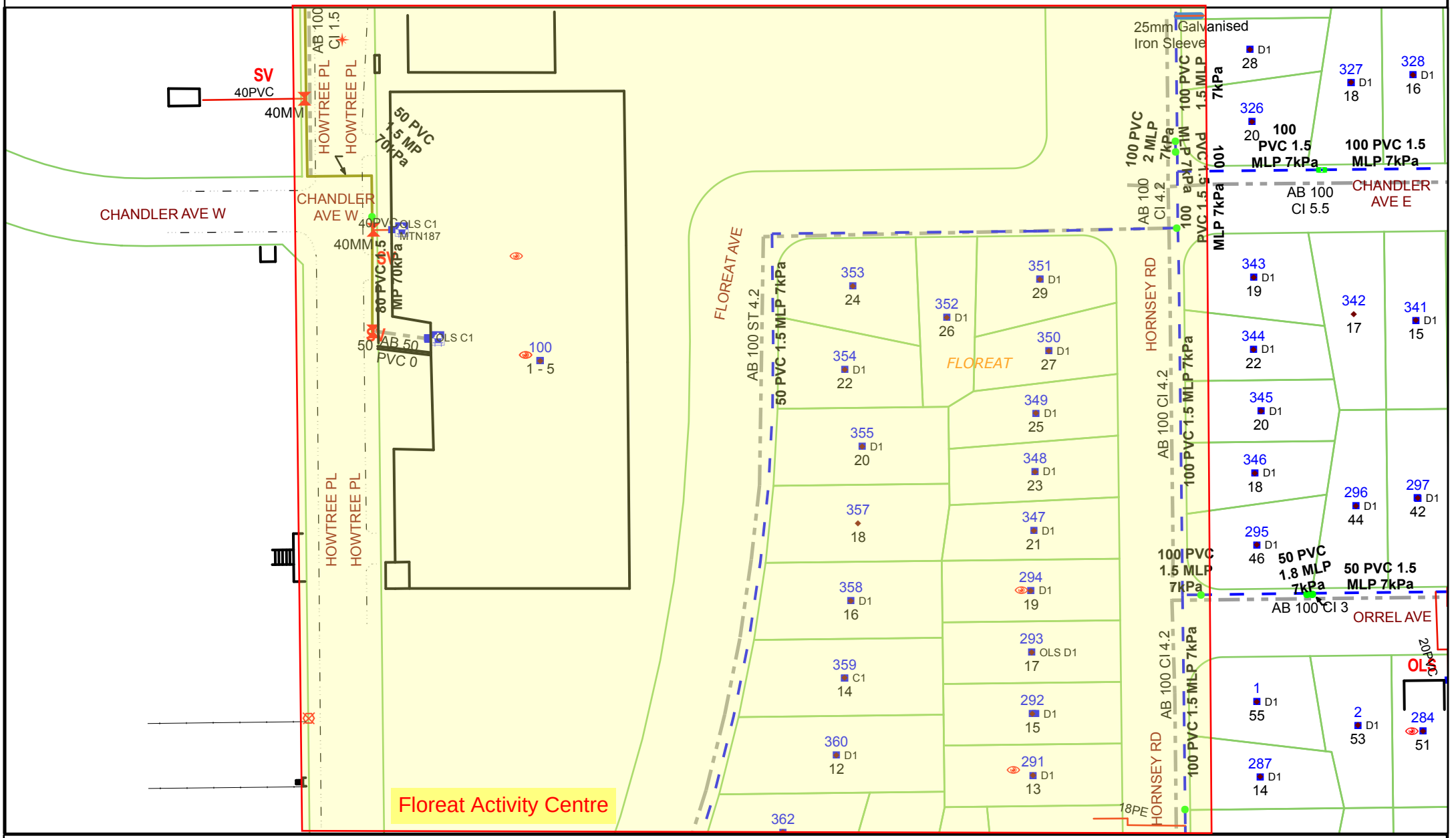

Sequence No: 214755268 Map Tile: 2 Scale: 1:1500

Job No: 32518360 Date:12/08/2022 Location: 18 Floreat Avenue, Floreat 6014

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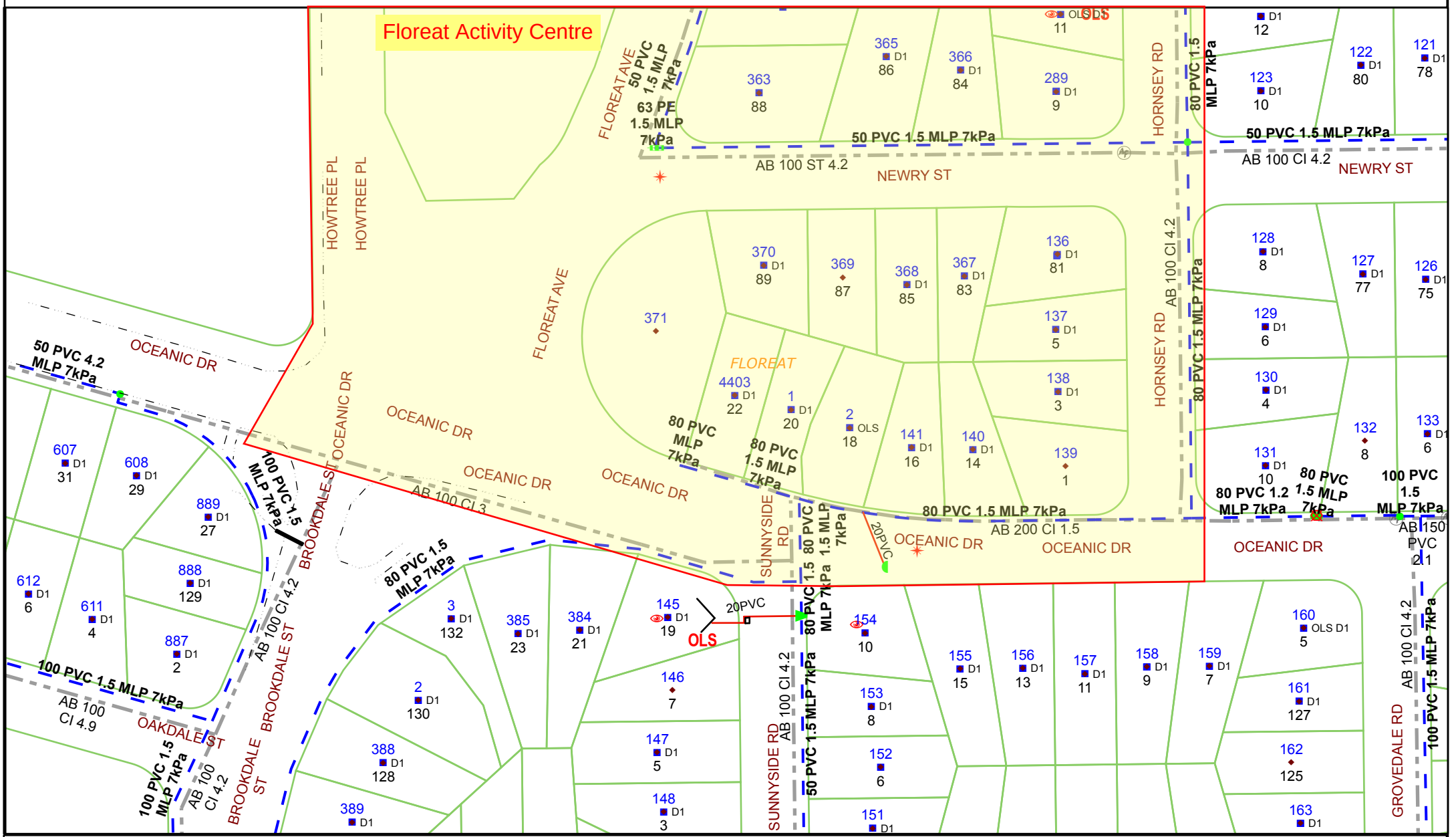

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Job No: 32518360 Date:12/08/2022 Location: 18 Floreat Avenue, Floreat 6014

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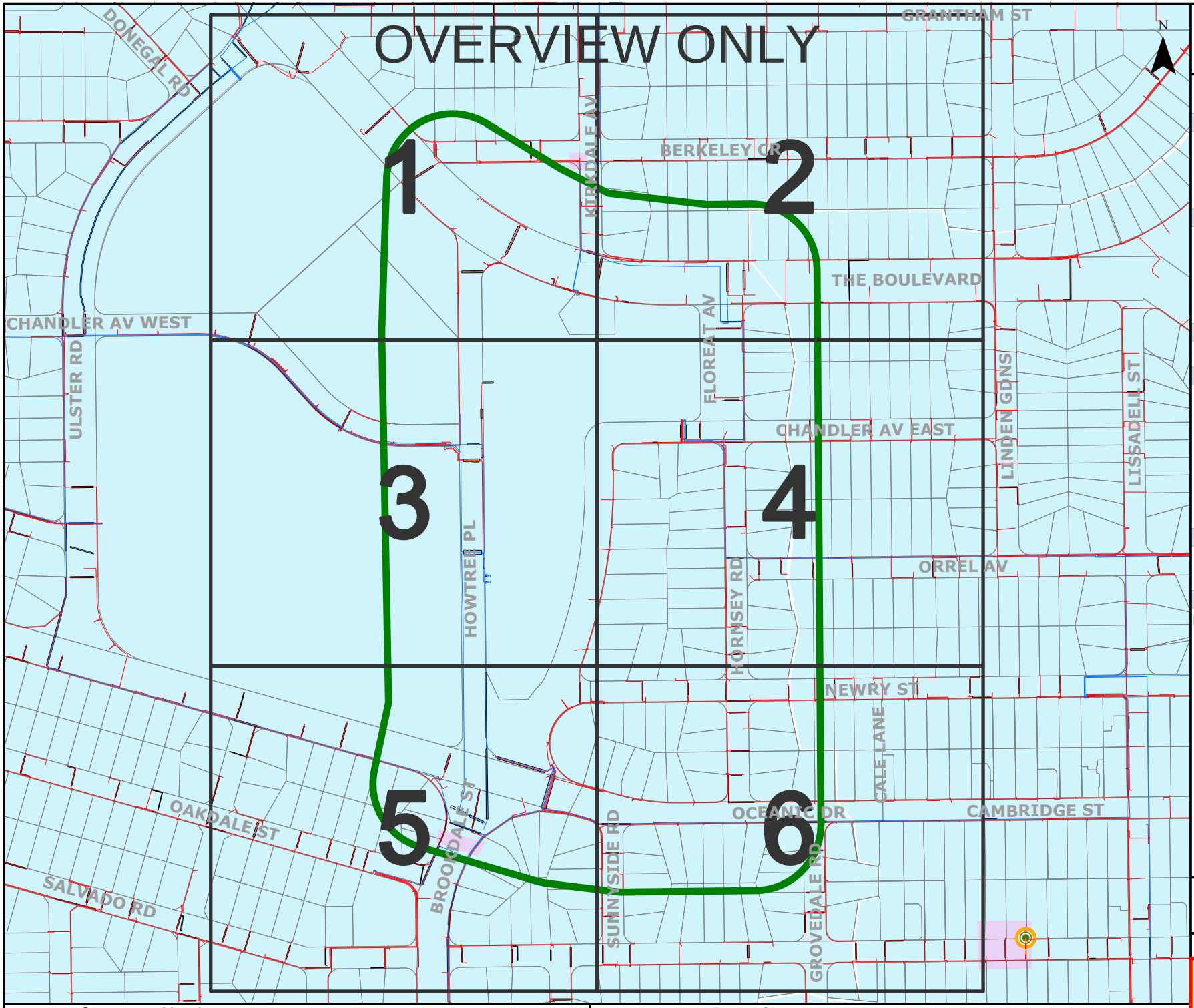
Appendix Six: BYDA – Power Infrastructure



westernpower

UNDERGROUND LEGEND

Structures

- Pillar
- Metal Pole
- Transformer Site
- UG Crossing *
- Ring Main Unit
- LV Distribution Frame

Distribution Cables

- High Voltage Cable (1kV - 33kV)
- Low Voltage Cable (< 1kV)
- Street Light Circuit (< 1kV)
- Street Light Pilot (< 1kV)
- Earth Wire

Cable Pole Terminations

- HV Termination
- LV Termination

Proposed Construction Assets

- Design Area *
- High Voltage Underground Cable
- Low Voltage Underground Cable
- Metal Pole
- Pillar
- Transformer site
- HV Termination
- LV Termination

State Underground Power Project

- CURRENT Work Area *
- COMPLETED Area *

Feature

- Area of Interest

*** Please refer to coversheet**

Privately owned cables NOT SHOWN (including house services)

This map is INDICATIVE ONLY. Hand exposure via pothole method is MANDATORY.

Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30

Information valid for 30 days from date of issue

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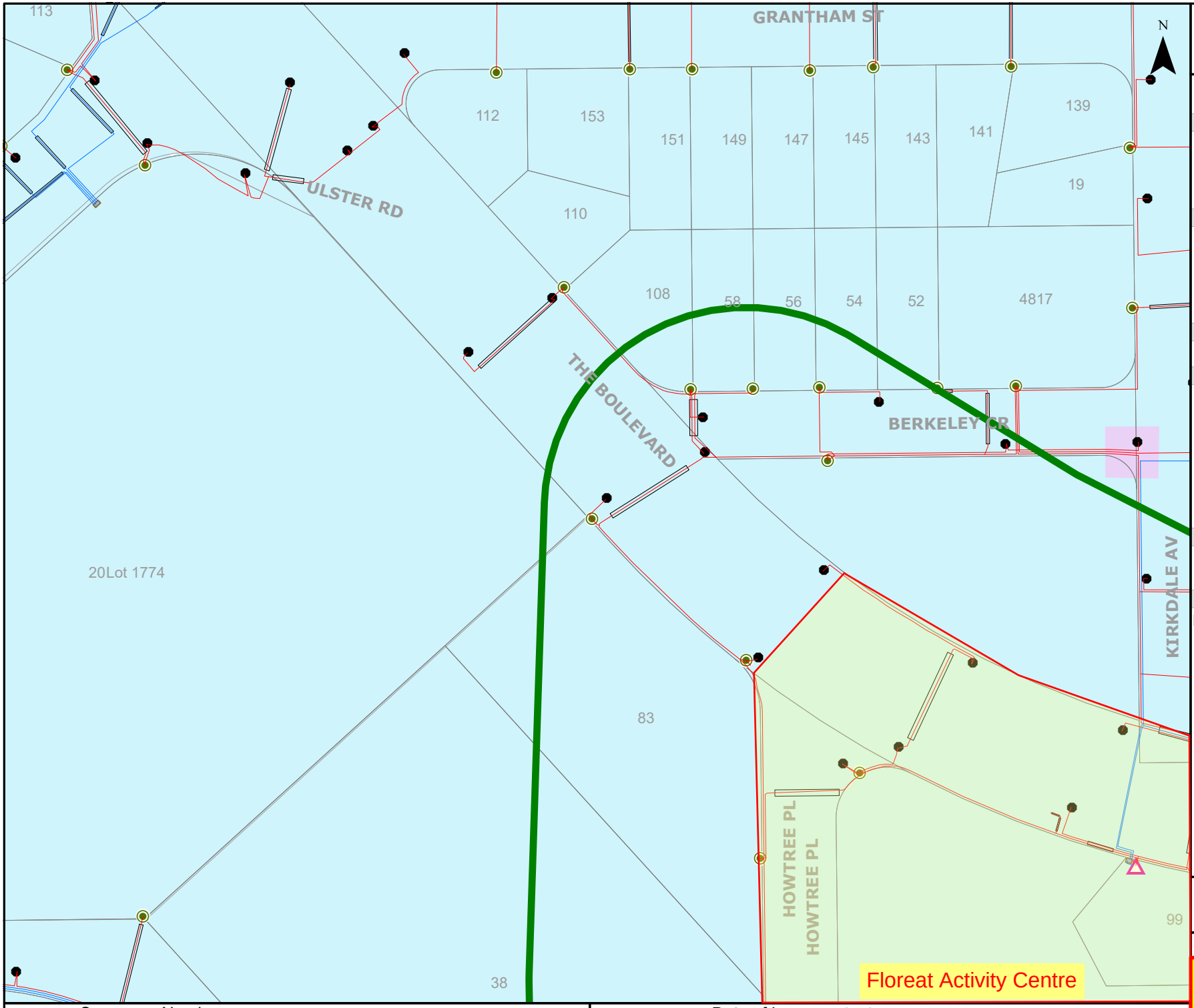
WARNING! Look out for overhead power lines

Sequence Number: 214755271

Date of Issue: 12/08/2022



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UNDERGROUND LEGEND

Structures

- Pillar
- Metal Pole
- Transformer Site
- UG Crossing *
- Ring Main Unit
- LV Distribution Frame

Distribution Cables

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- Earth Wire

Cable Pole Terminations

- HV Termination
- LV Termination

Proposed Construction Assets

- Design Area *
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State Underground Power Project

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Feature

- Area of Interest

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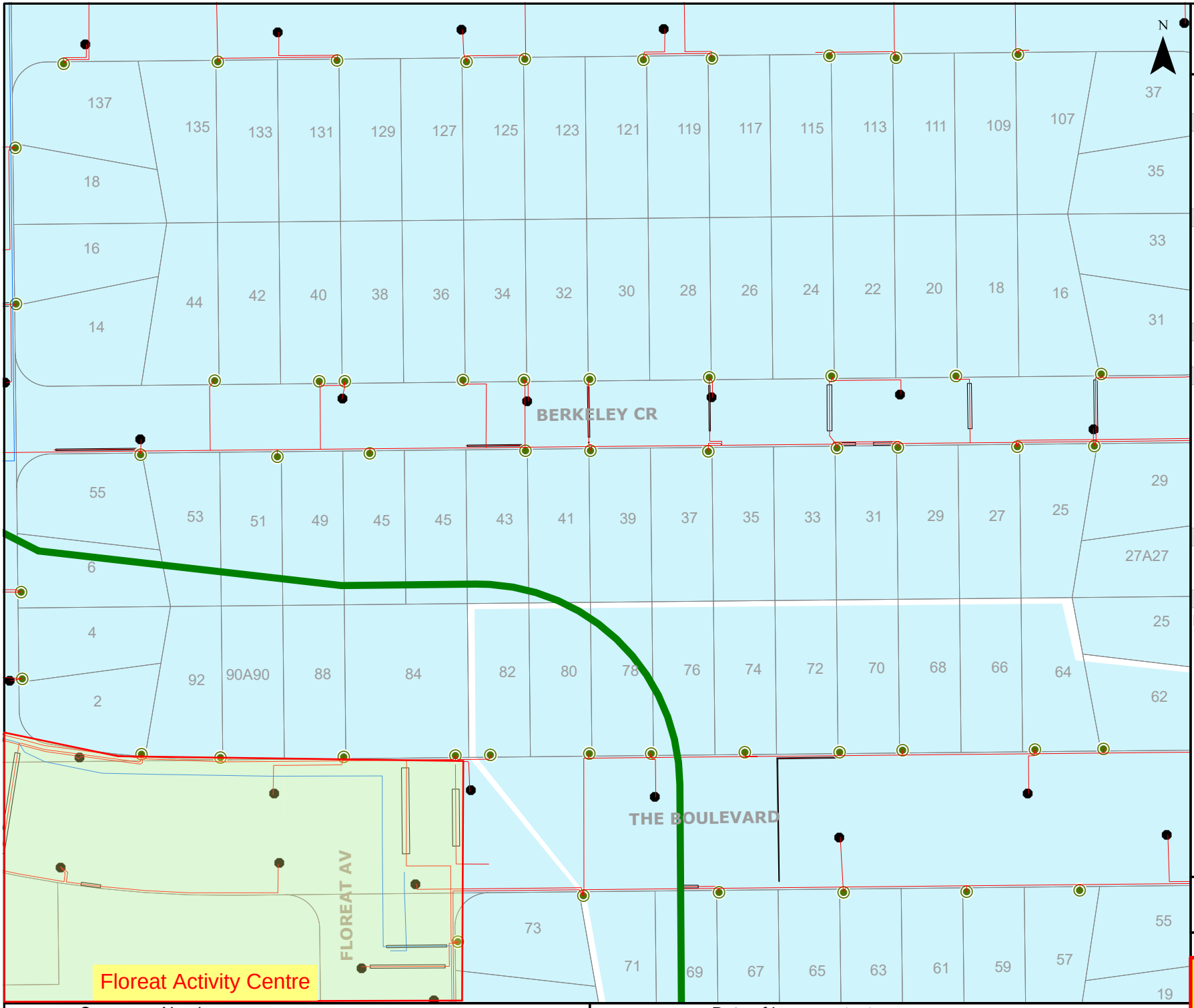

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UNDERGROUND LEGEND

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Distribution Cables

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Cable Pole Terminations

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Proposed Construction Assets

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State Underground Power Project

- CURRENT Work Area *
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Feature

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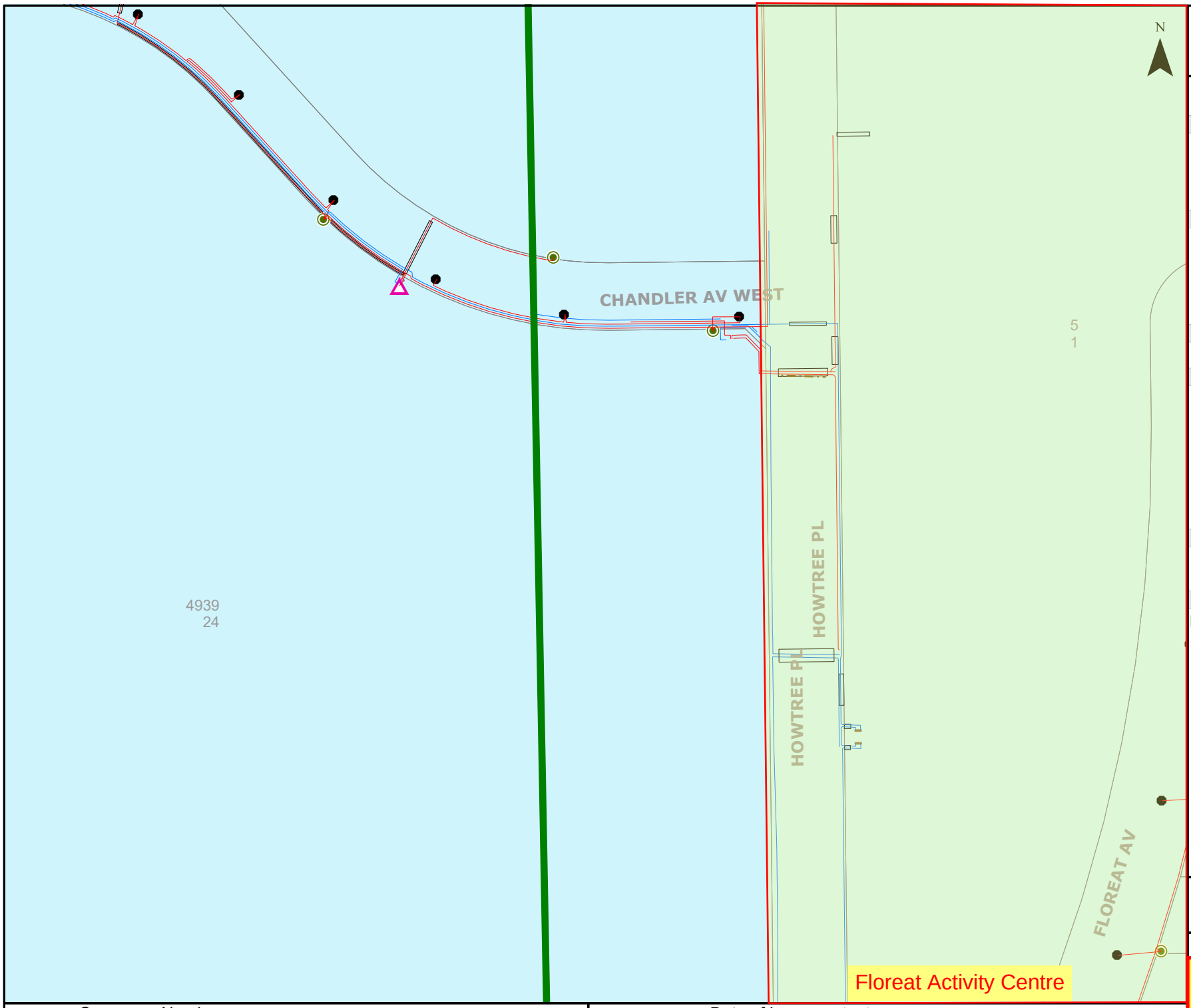

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State Underground Power Project

- CURRENT Work Area *
- COMPLETED Area *

Feature

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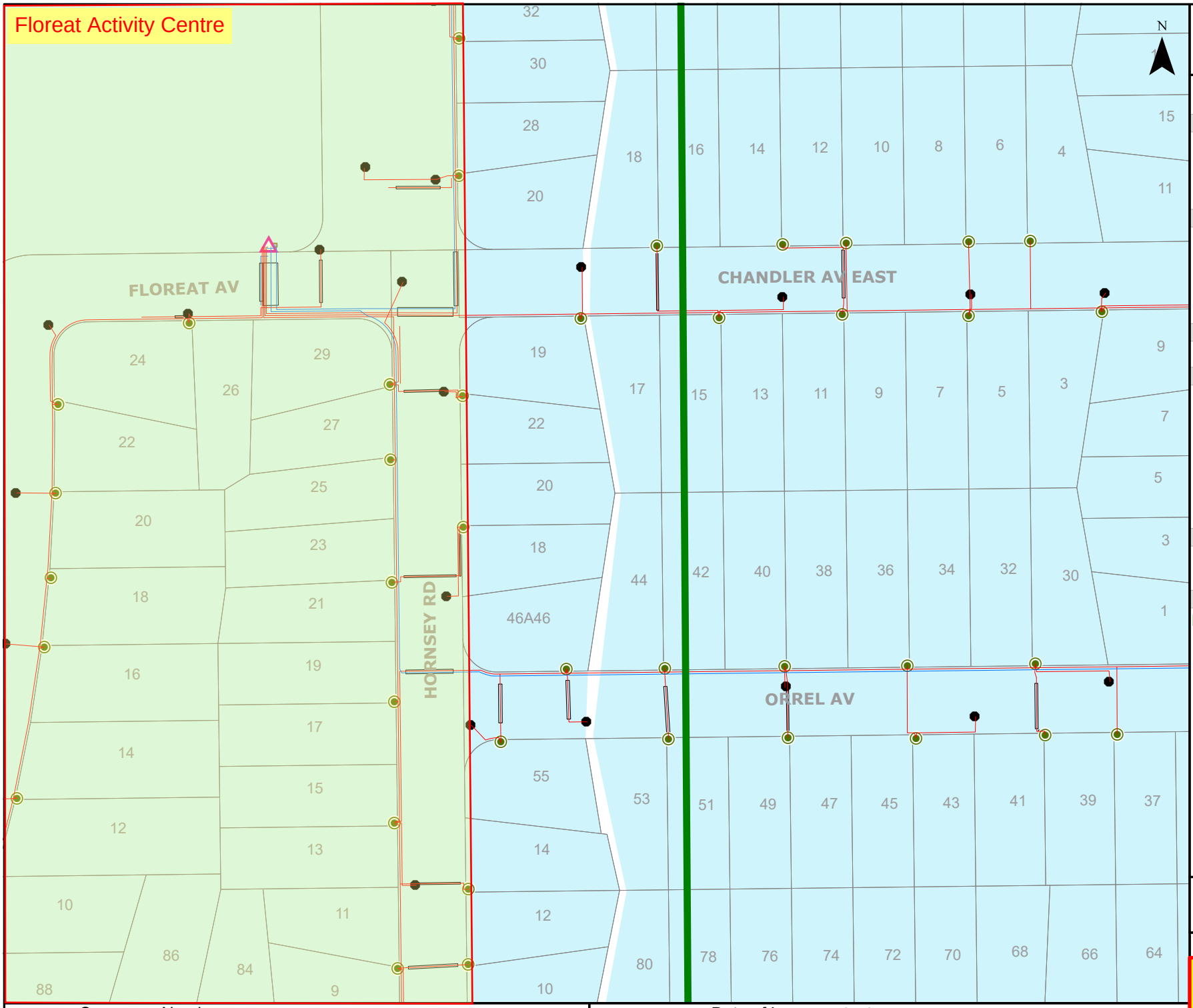

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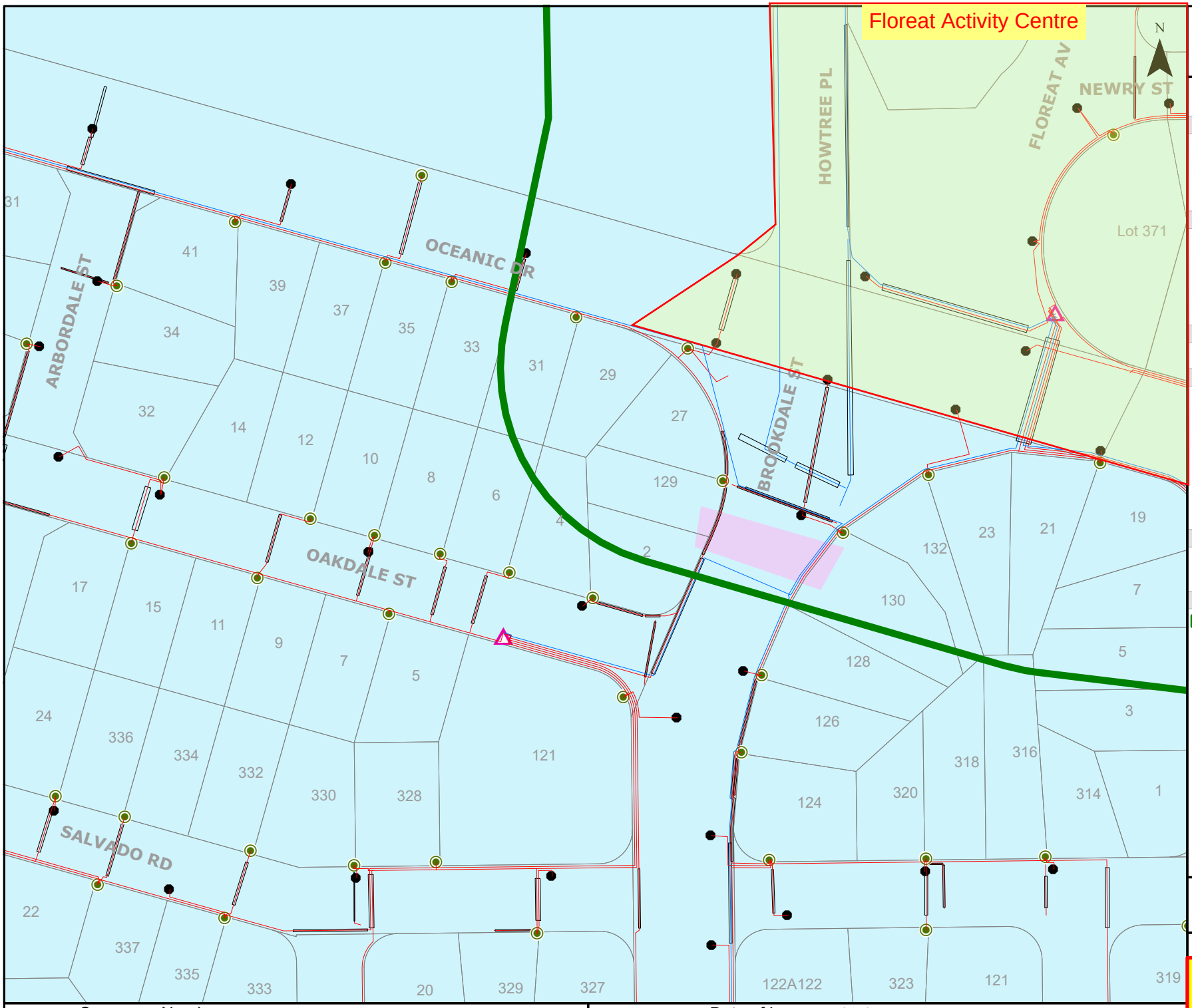

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- COMPLETED Area *

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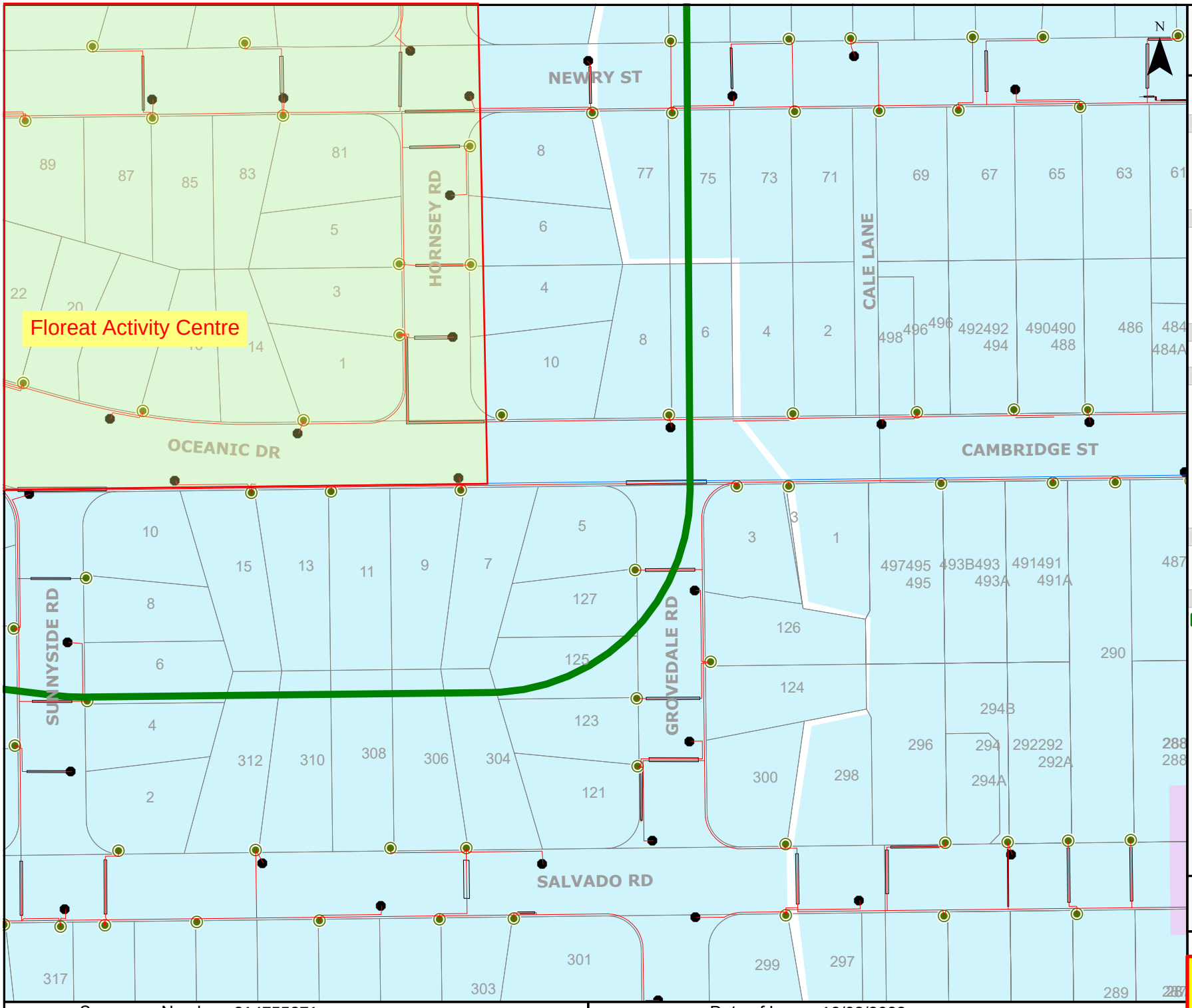

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- HV Termination
- LV Termination

State Underground Power Project

- CURRENT Work Area *
- COMPLETED Area *

Feature

- Area of Interest

*** Please refer to coversheet**

Privately owned cables NOT SHOWN (including house services)

This map is INDICATIVE ONLY. Hand exposure via pothole method is MANDATORY.

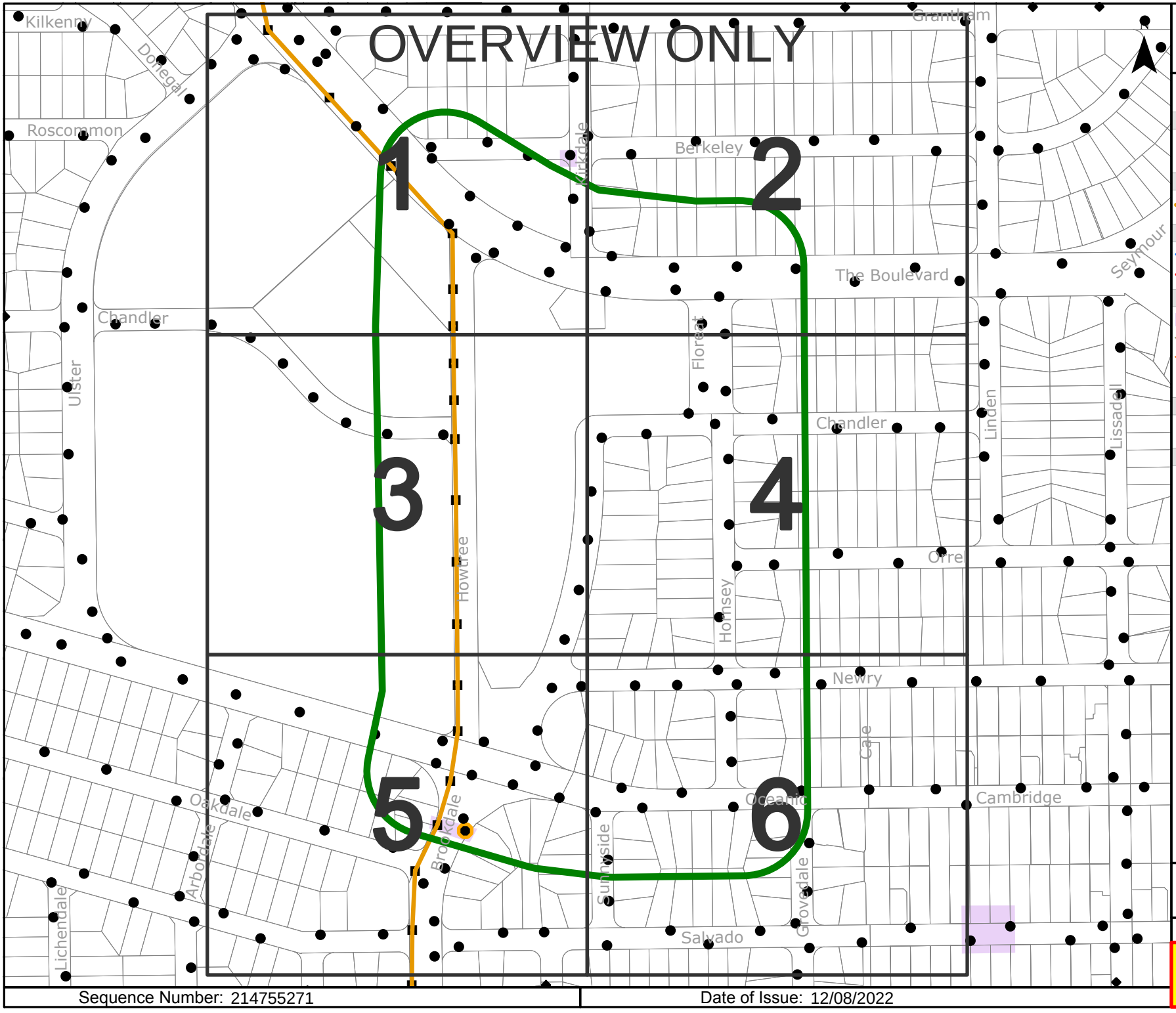
Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30

Information valid for 30 days from date of issue

A4 | Scale : 1:1500

WARNING! Look out for overhead power lines

Sequence Number: 214755271 | Date of Issue: 12/08/2022



westernpower

OVERHEAD LEGEND

Structures

- Power Pole
- Transmission Poles

Transmission Overhead Powerline

- Transmission (33kV - 330kV)

Distribution Overhead Powerline

- High Voltage (1kV - 33kV)
- Low Voltage (< 1kV)

Proposed Construction Assets

- Design Area *
- High Voltage Overhead Powerline
- Low Voltage Overhead Powerline
- Power Pole

Communications Assets

- Overhead Pilot Cable

Feature

- Area of Interest

*** Please refer to coversheet**

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Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30

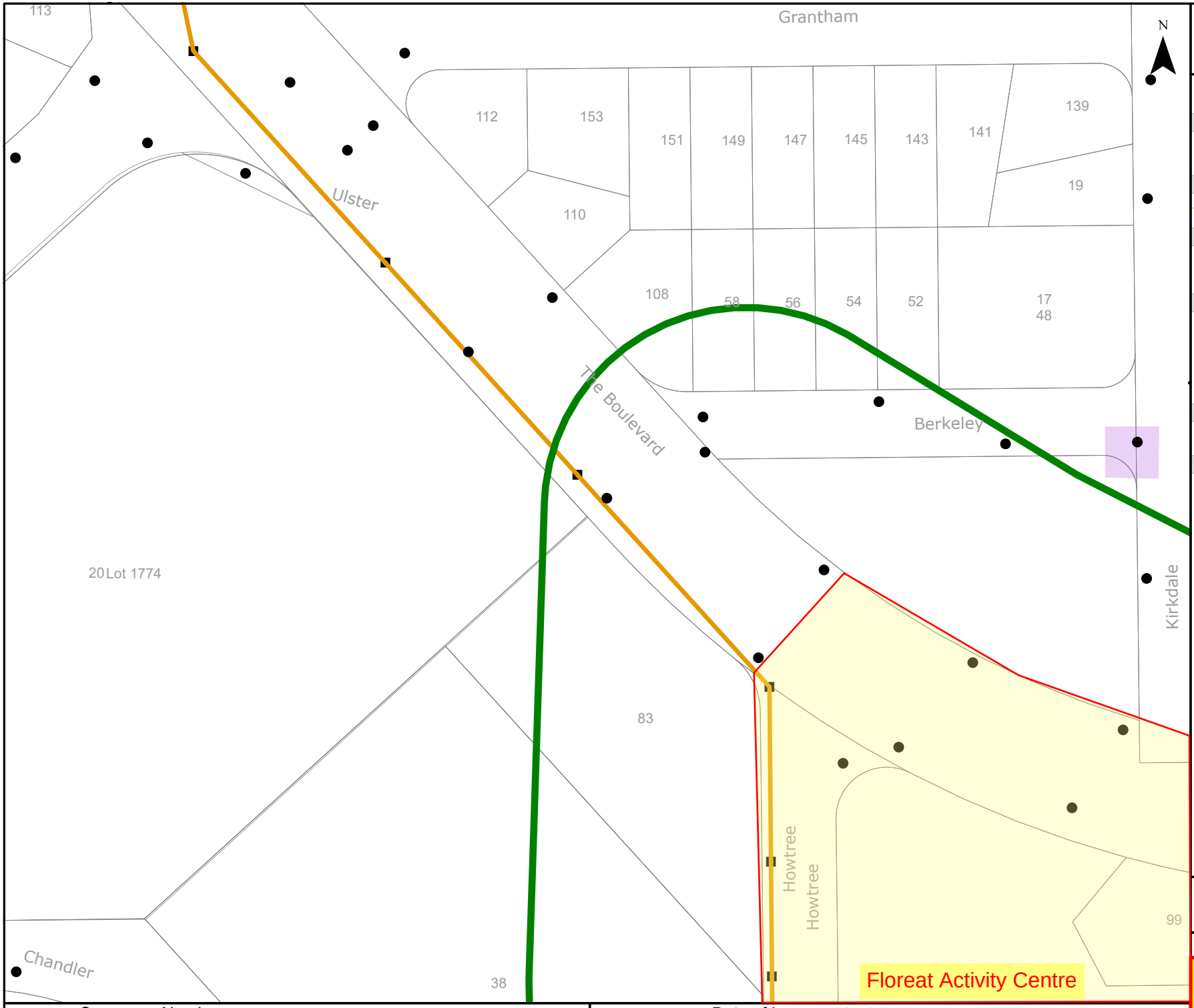
Information valid for 30 days from date of issue

A4 | Scale : 1:4612

WARNING! Look out for overhead power lines

Sequence Number: 214755271

Date of Issue: 12/08/2022



westernpower

OVERHEAD LEGEND

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Feature

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A4 | Scale : 1:1500

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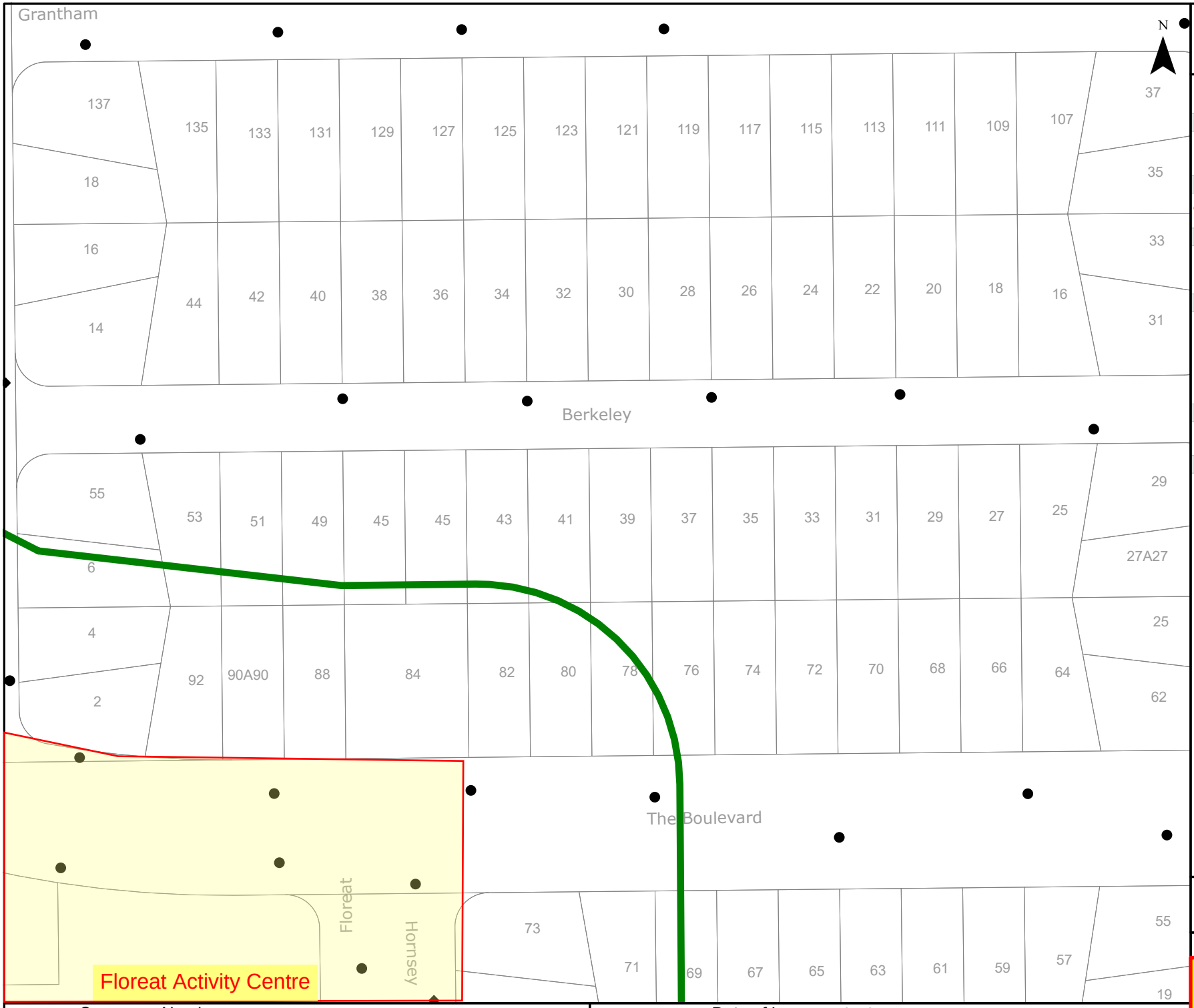

Sequence Number: 214755271

Date of Issue: 12/08/2022

westernpower

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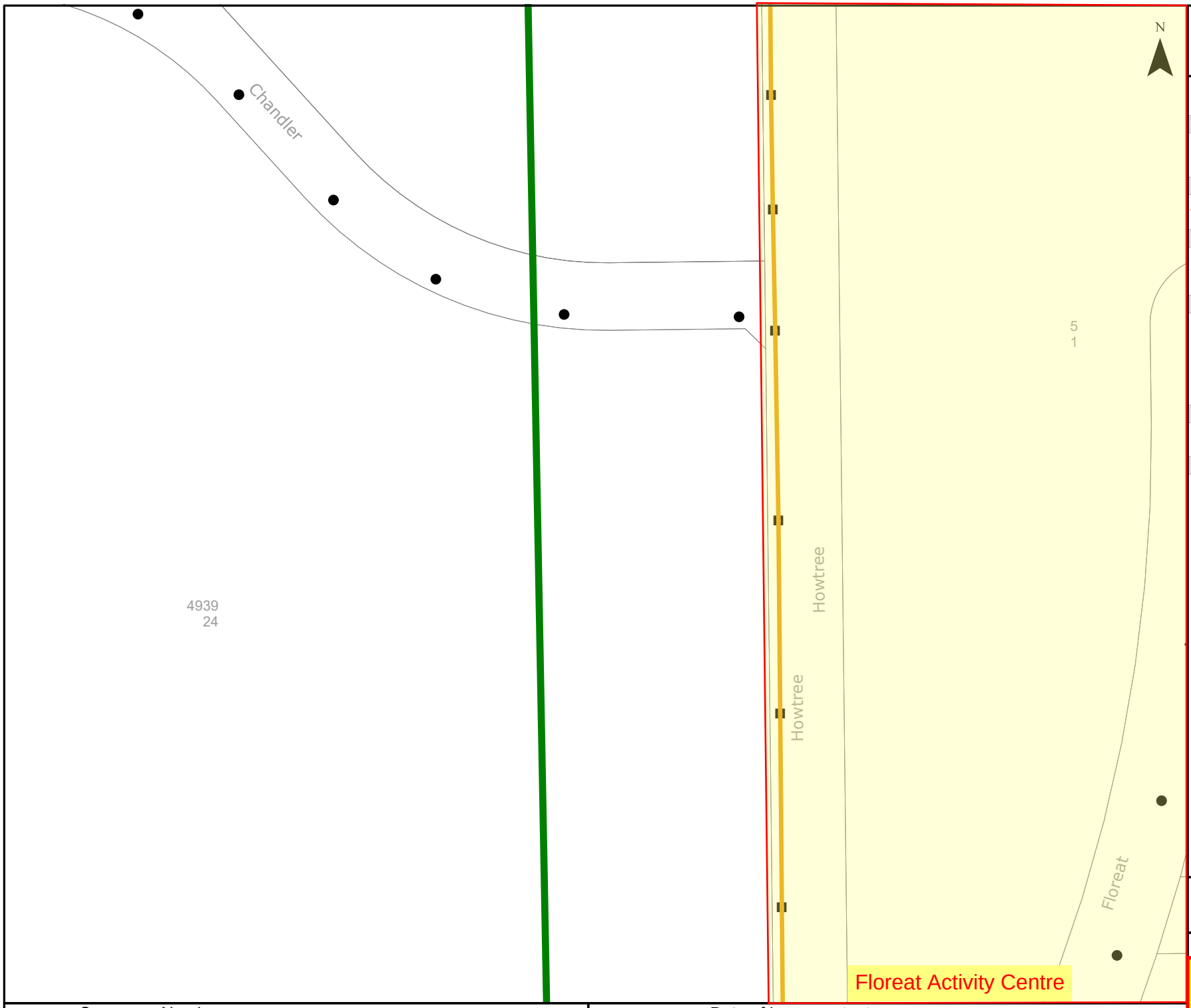

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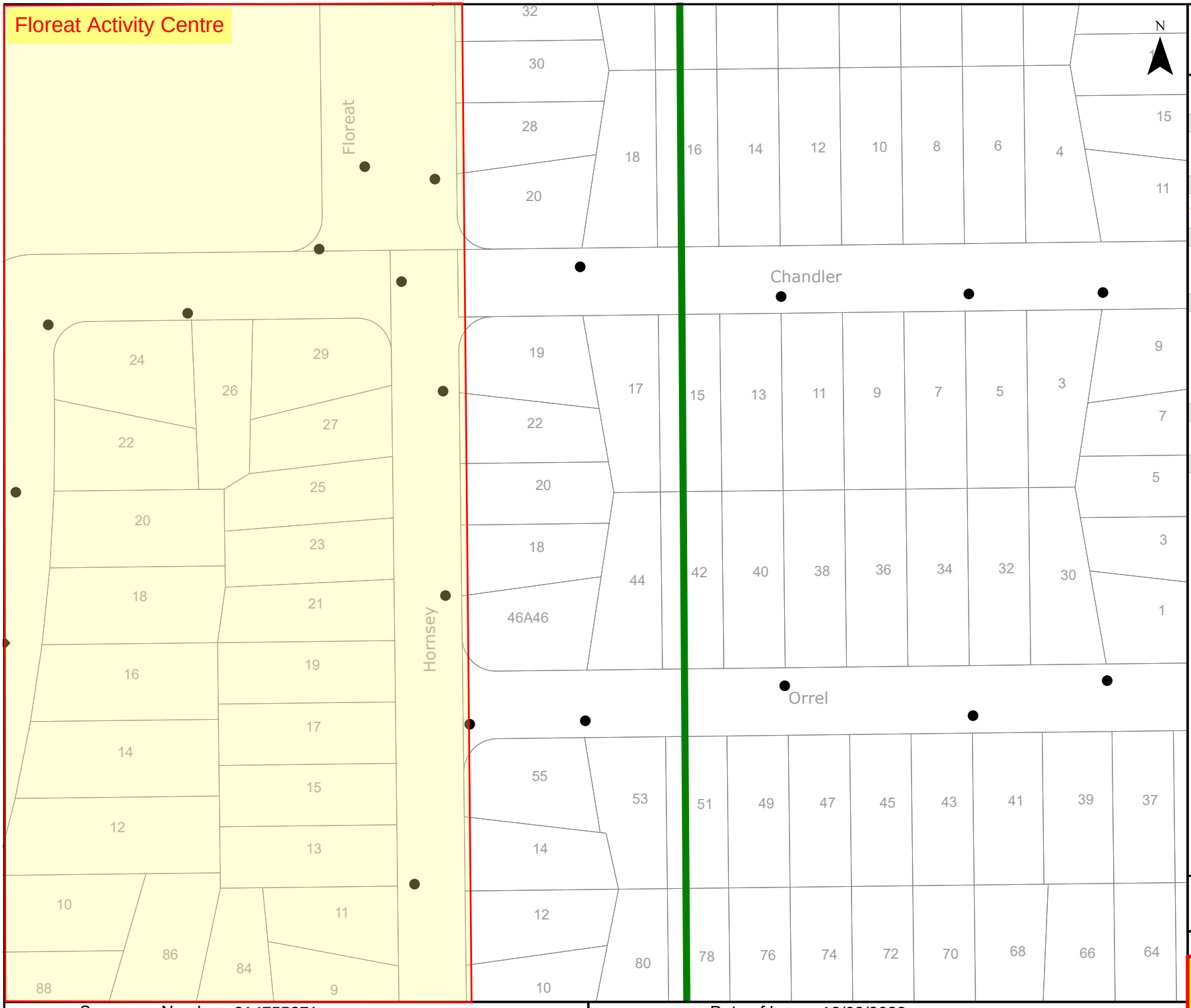

westernpower

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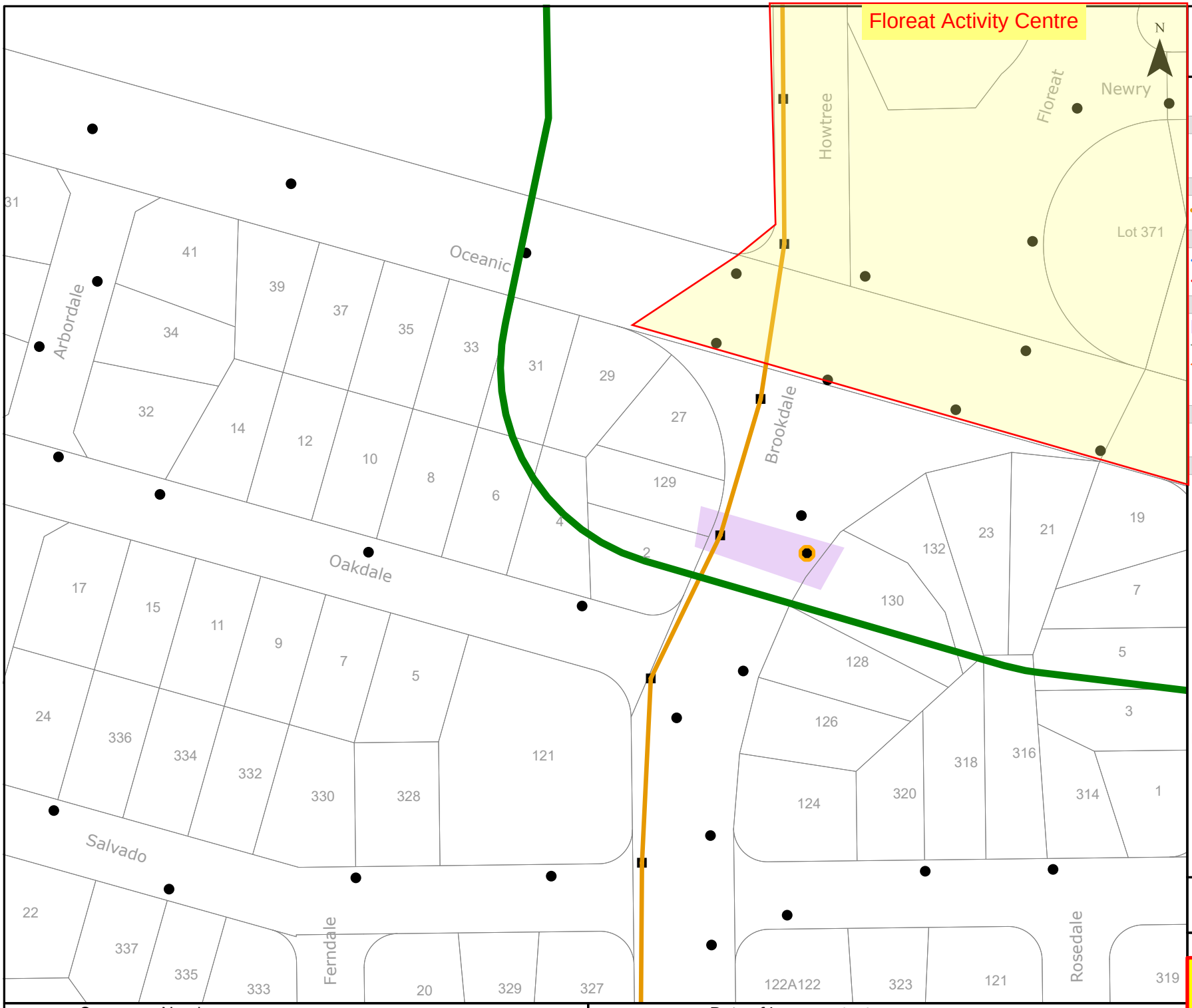

westernpower

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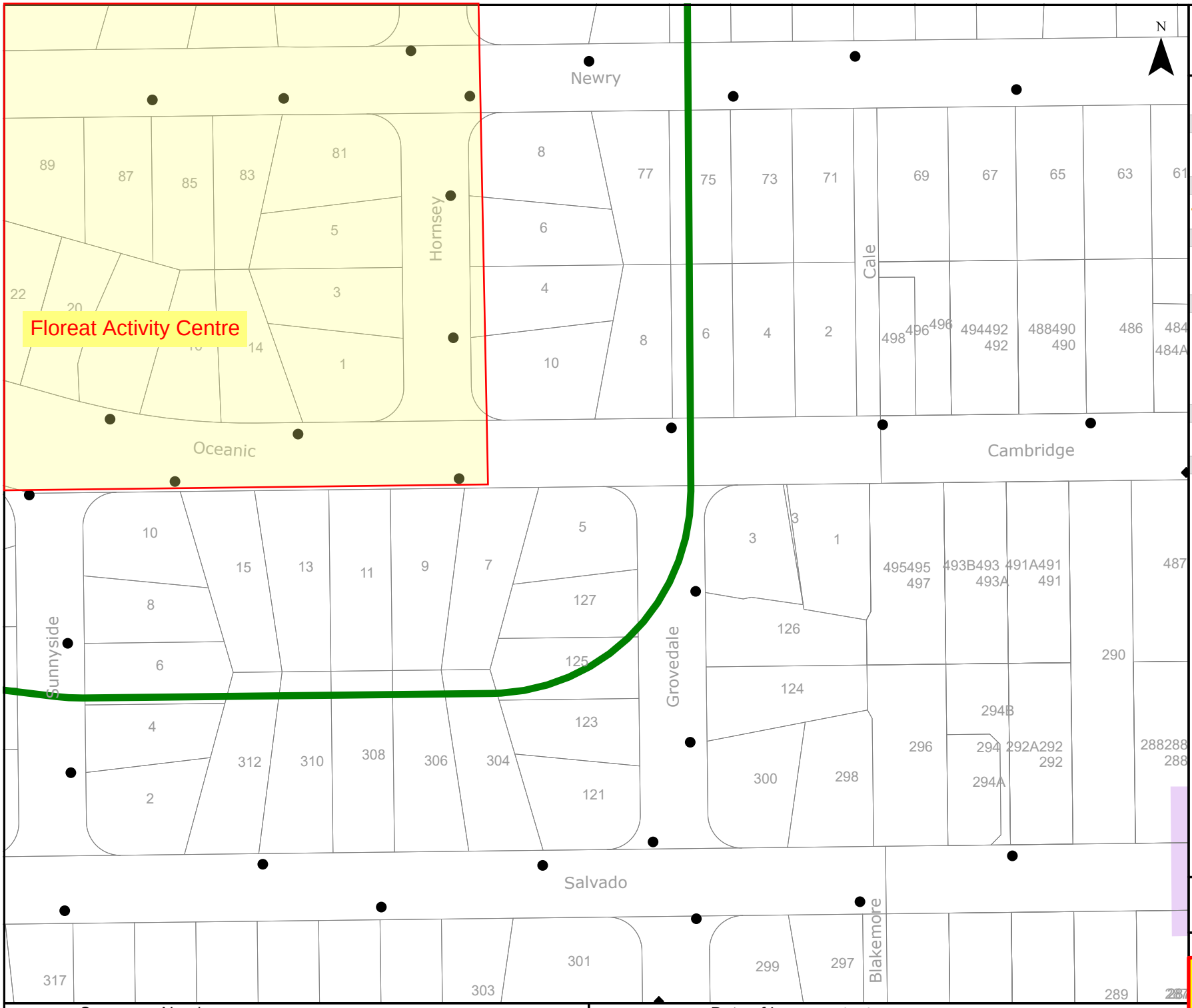

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A4 | Scale : 1:1500

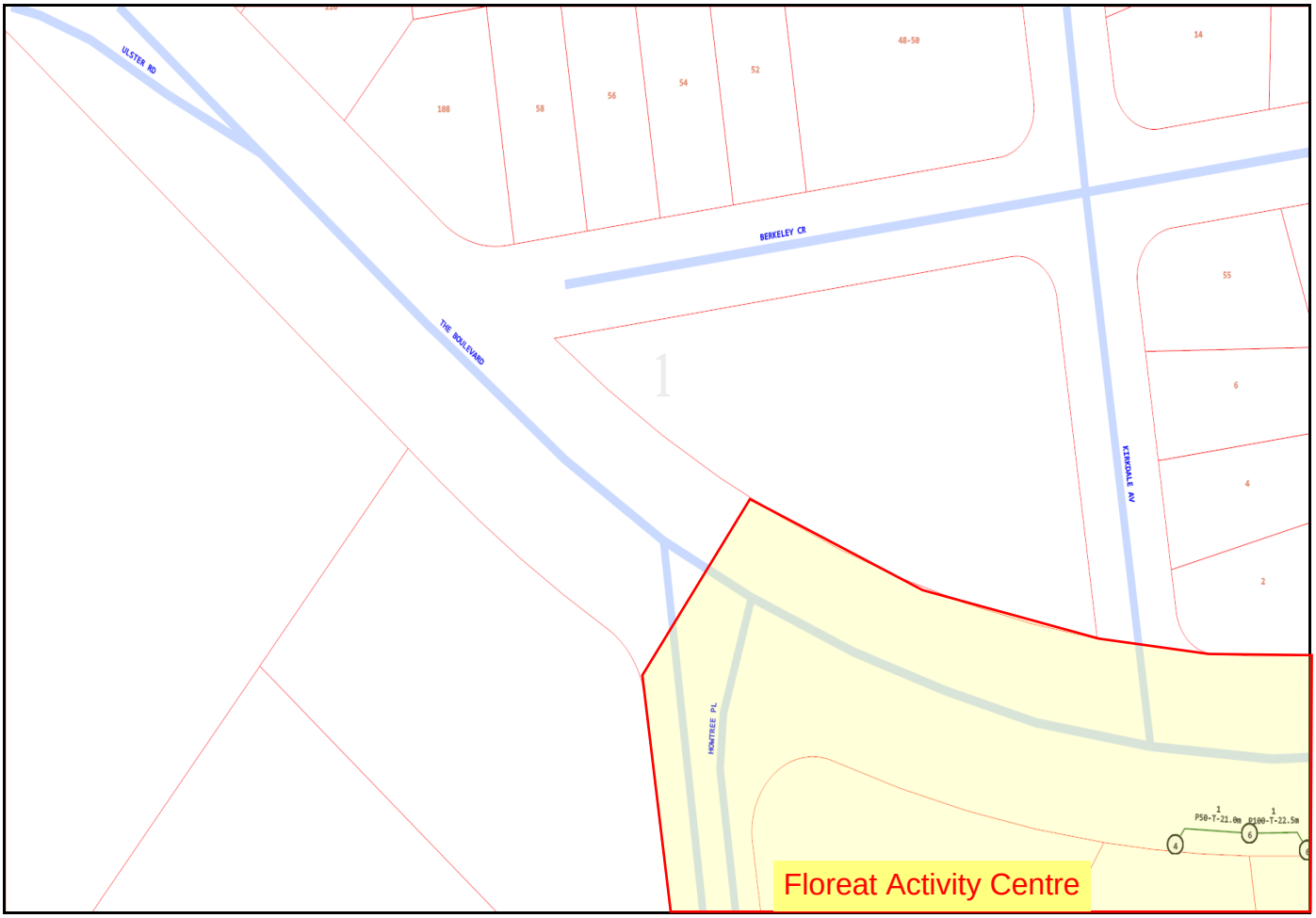
WARNING! Look out for overhead power lines

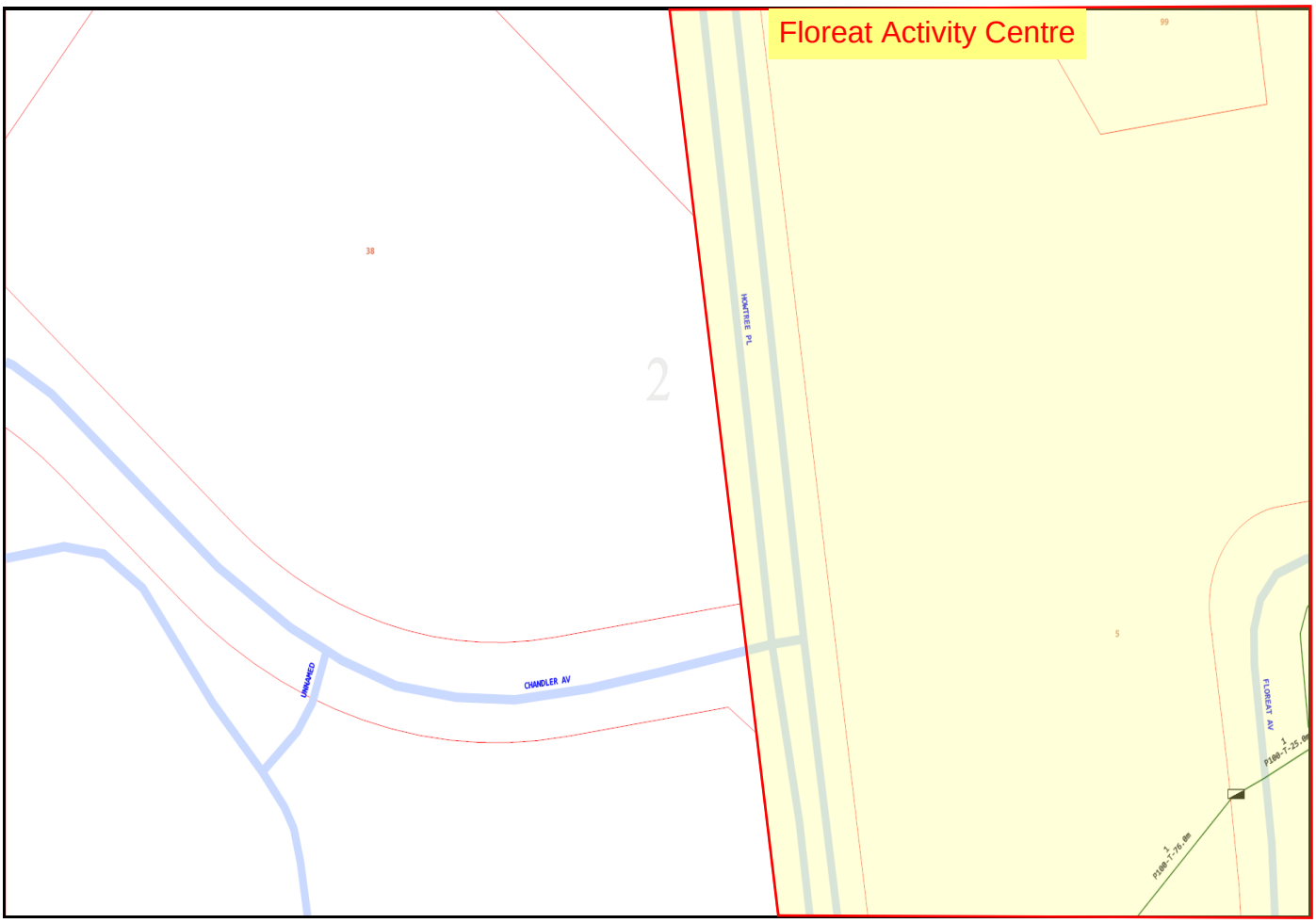
Sequence Number: 214755271 | Date of Issue: 12/08/2022

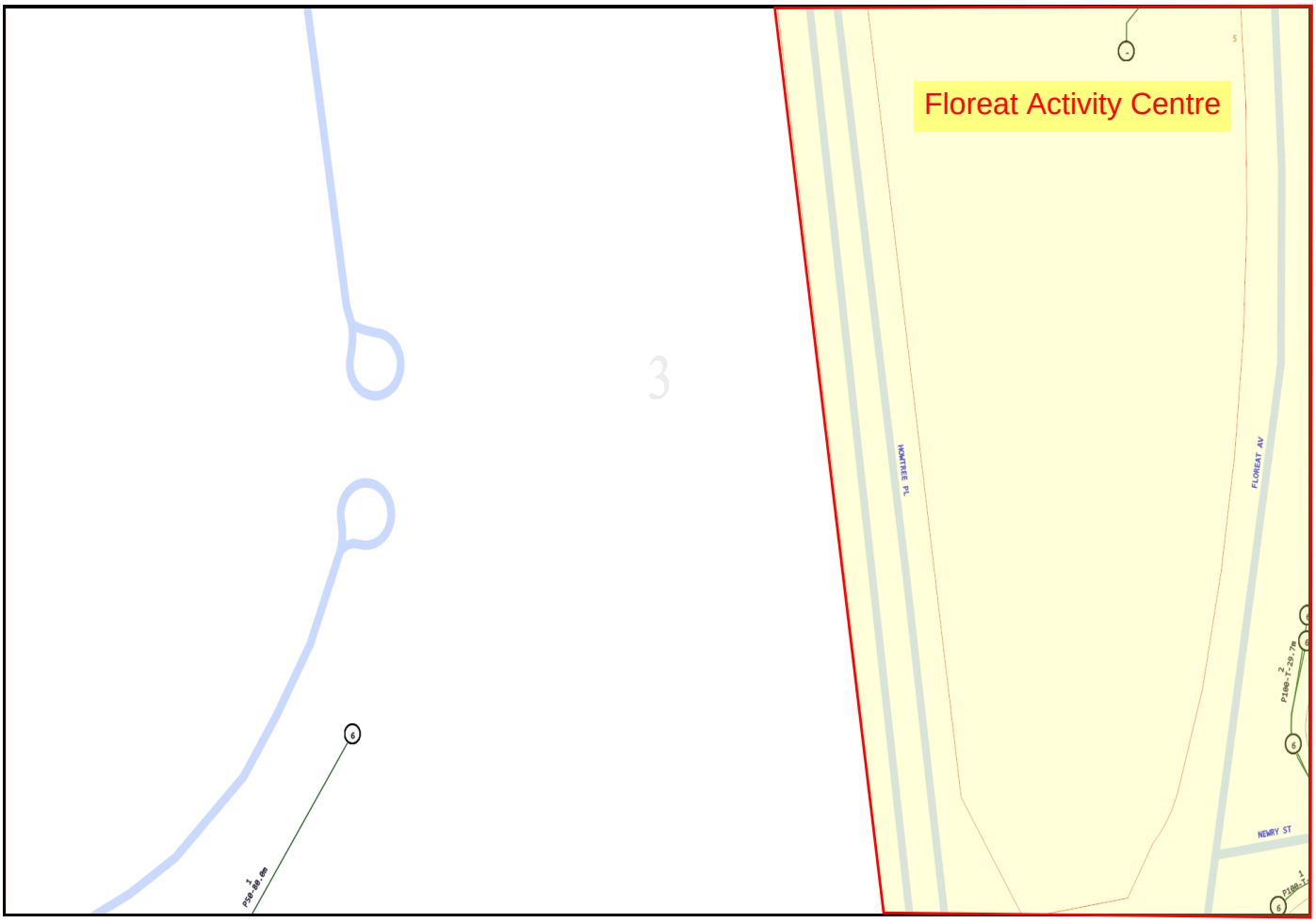
Appendix Seven: BYDA – Communications Infrastructure

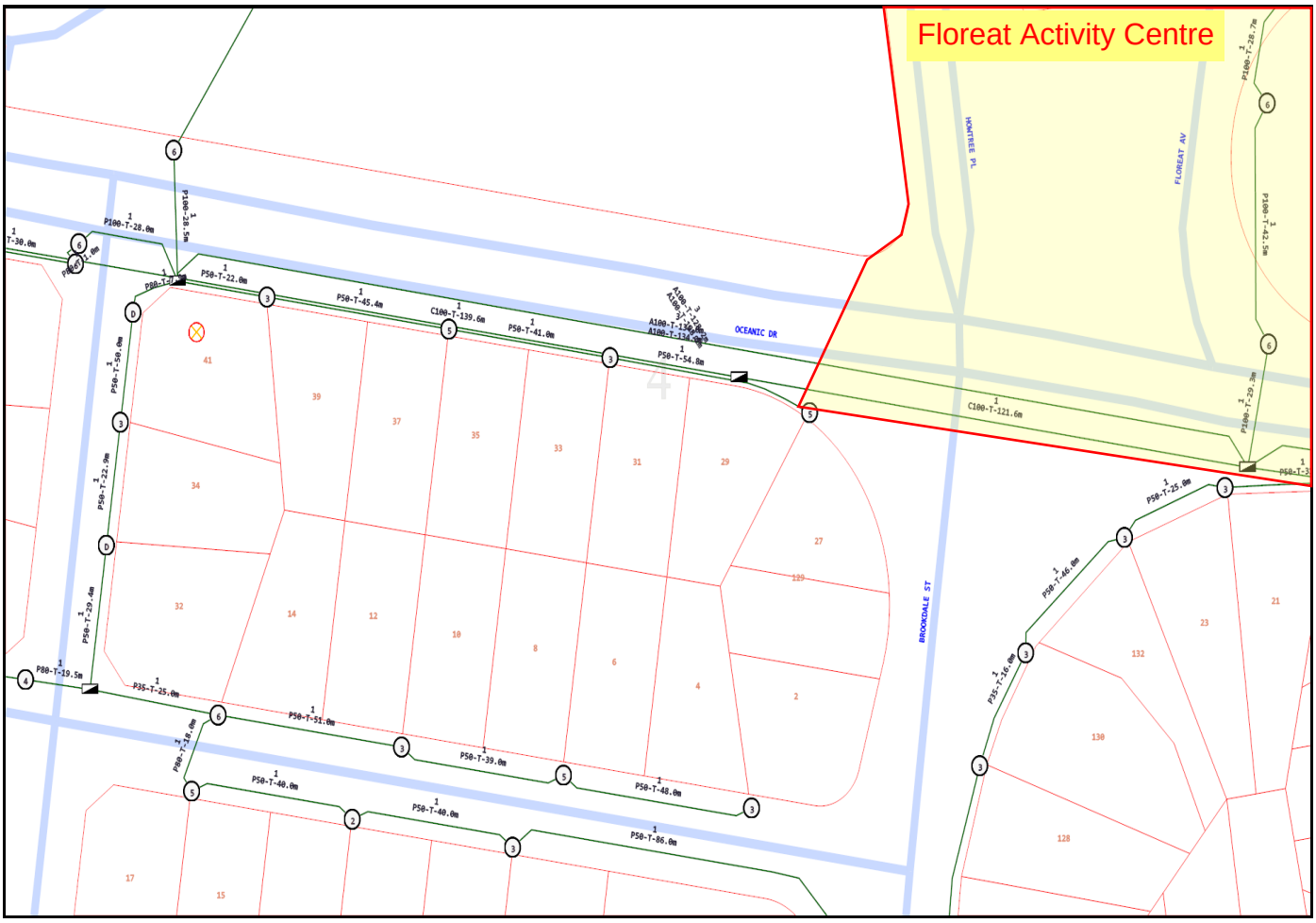
LEGEND

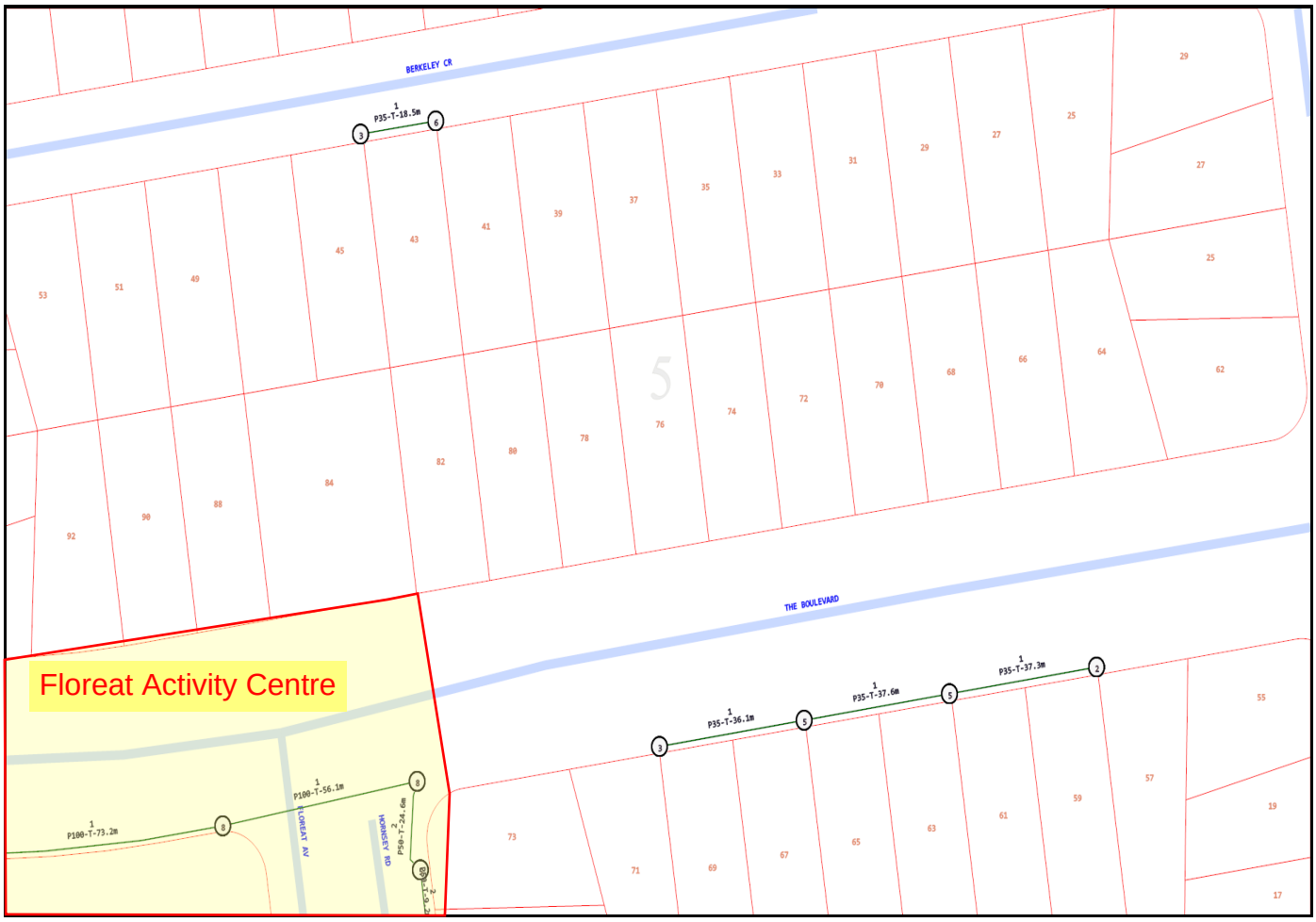
34	Parcel and the location
5	Pit with size "5"
2E	Power Pit with size "2E". Valid PIT Size: e.g. 2E, 5E, 6E, 8E, 9E, E, null.
	Manhole
	Pillar
2 PO – T- 25.0m P40 – 20.0m 5 9	Cable count of trench is 2. One "Other size" PVC conduit (PO) owned by Telstra (-T-), between pits of sizes, "5" and "9" are 25.0m apart. One 40mm PVC conduit (P40) owned by NBN, between pits of sizes, "5" and "9" are 20.0m apart.
2 10.0m 5 9	2 Direct buried cables between pits of sizes ,"5" and "9" are 10.0m apart.
5 9	Trench containing any INSERVICE/CONSTRUCTED (Copper/RF/Fibre) cables.
5 9	Trench containing only DESIGNED/PLANNED (Copper/RF/Fibre/Power) cables.
5 9	Trench containing any INSERVICE/CONSTRUCTED (Power) cables.
BROADWAY ST	Road and the street name "Broadway ST"
Scale	0 20 40 60 Meters 1:2000 1 cm equals 20 m


ULSTER RD
THE BOULEVARD
BERKELEY CR
KIRKDALE AV
HOWTREE PL
108
58
56
54
52
48-50
14
55
6
4
2
1
Floreat Activity Centre

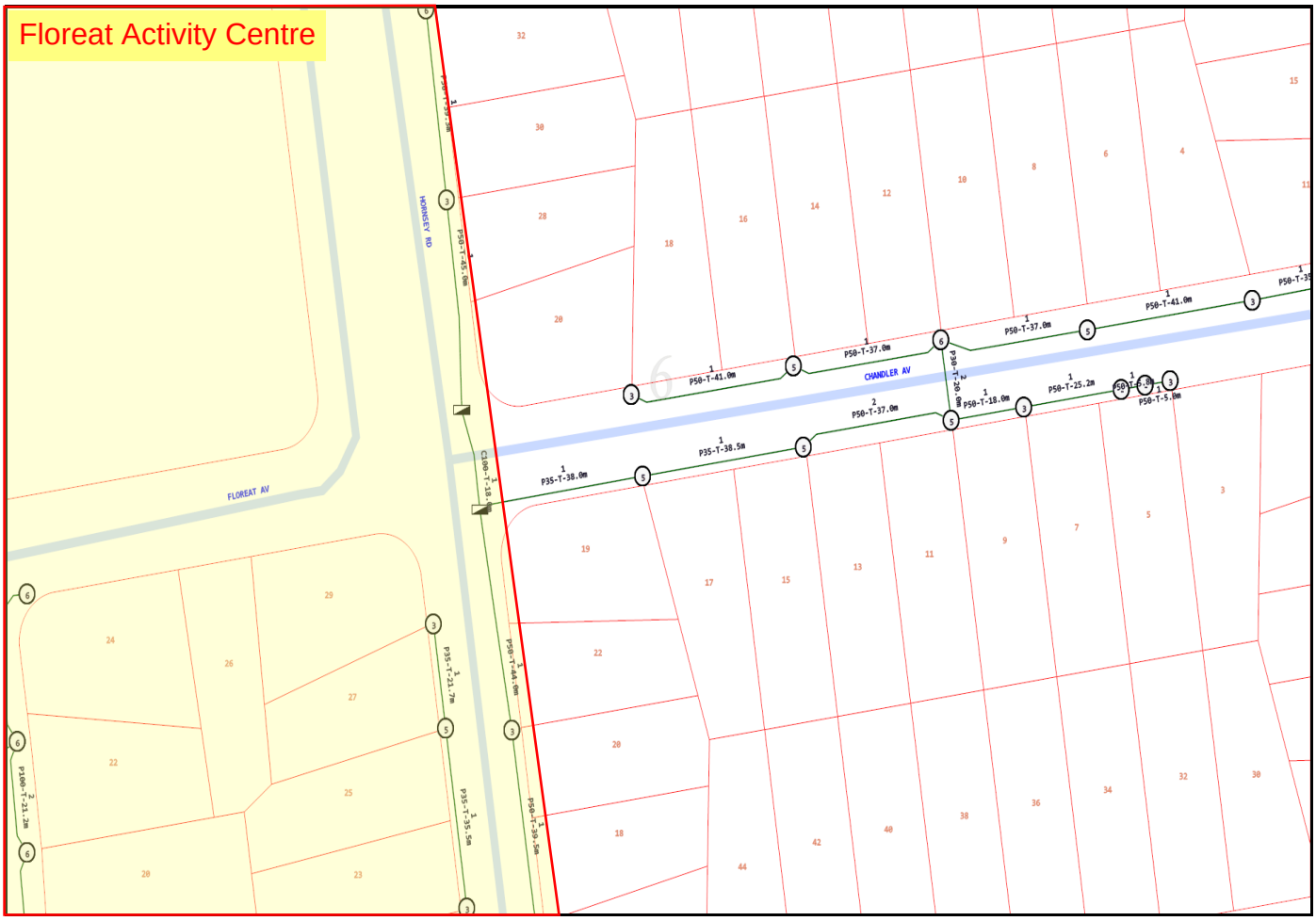

Floreat Activity Centre
HOMTREE PL
CHANDLER AV
UNNAMED
FLOREAT AV
38
99
5
2

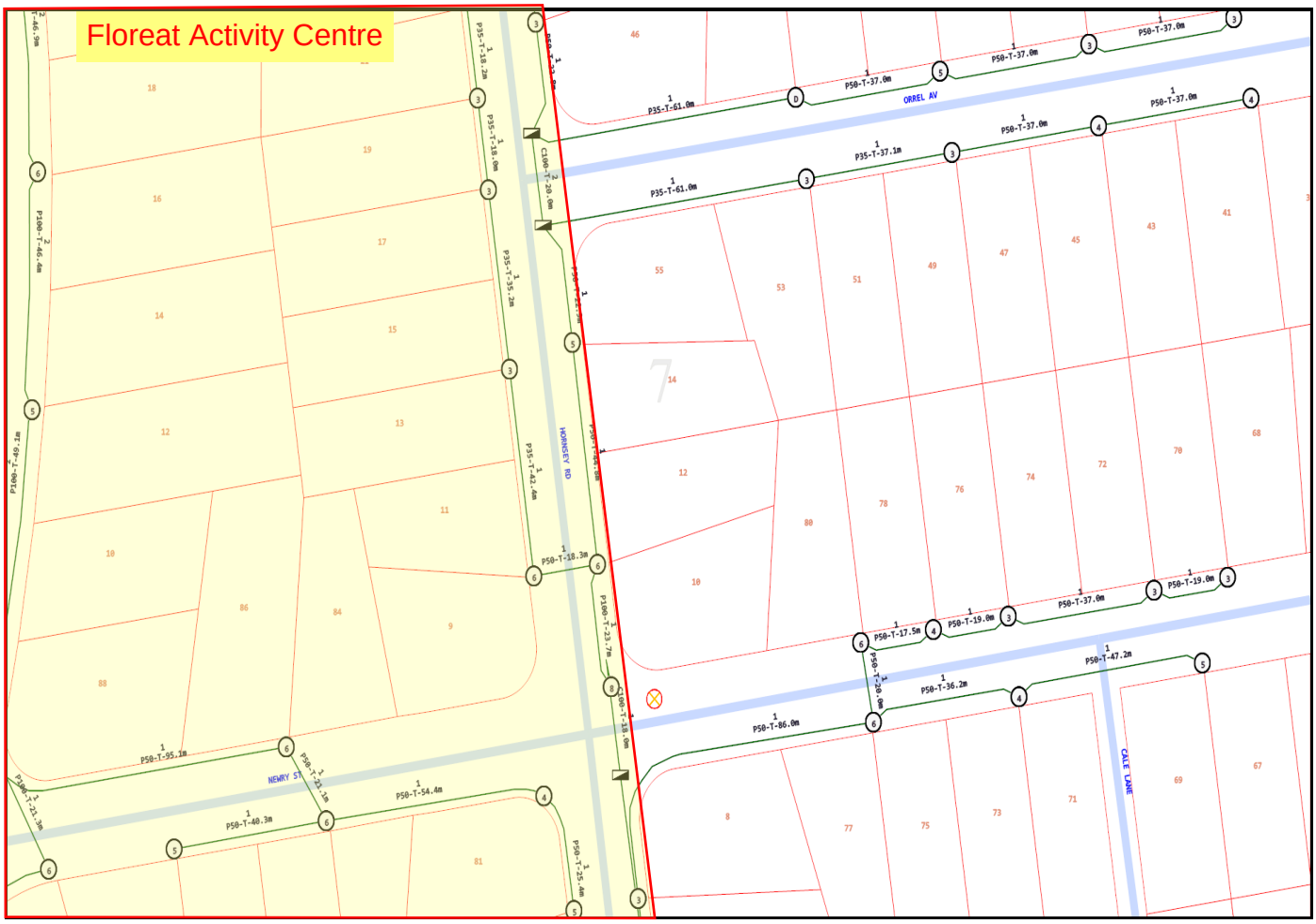

Floreat Activity Centre
HOMTREE PL
FLOREAT AV
NEWRY ST

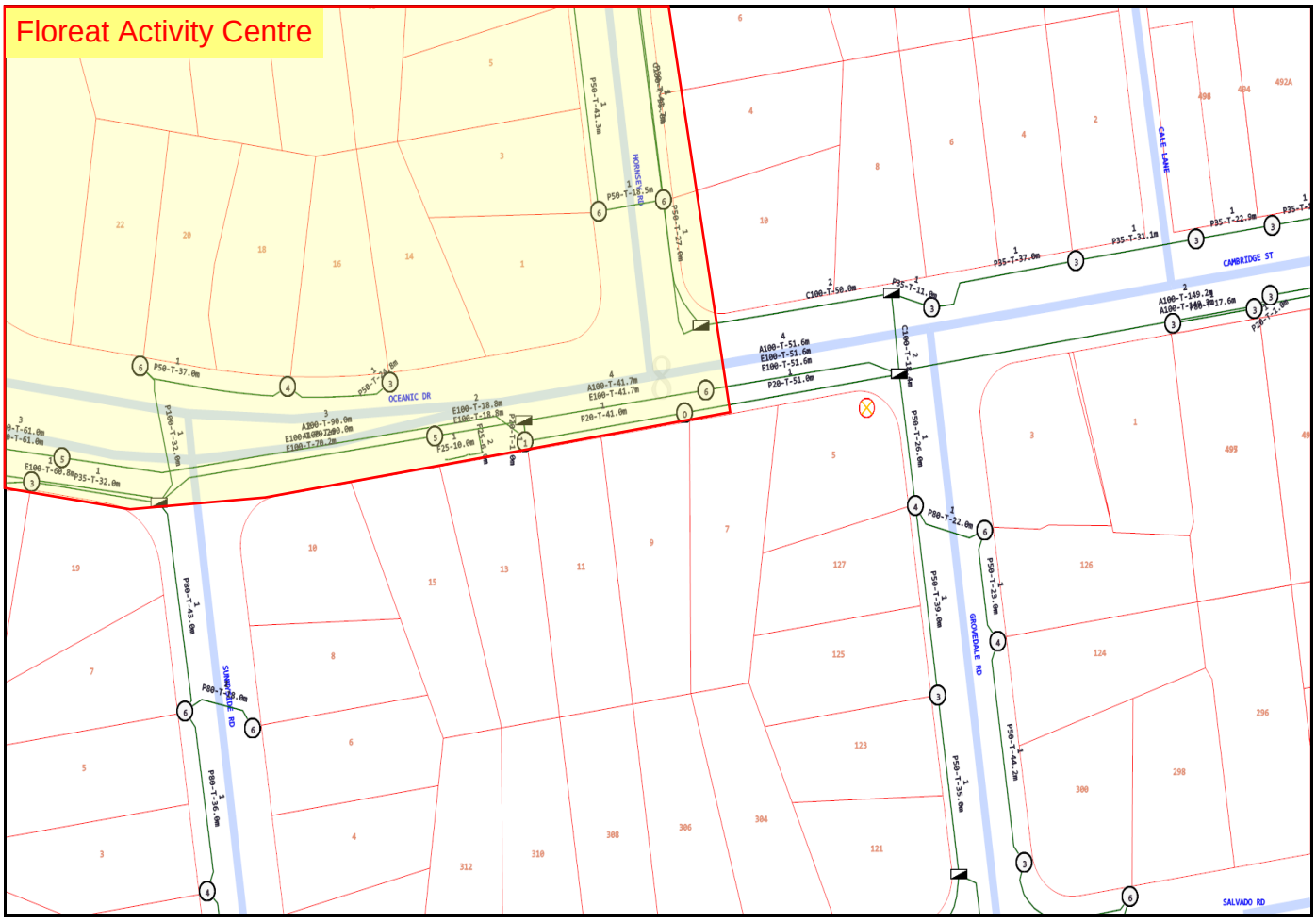

Floreat Activity Centre
OCEANIC DR
HONTREE PL
FLOREAT AV
BROOKDALE ST



Floreat Activity Centre
BERKELEY CR
THE BOULEVARD
FLOREAT AV
HORNSEY RD
P35-T-18.5m
P35-T-36.1m
P35-T-37.6m
P35-T-37.3m
P100-T-73.2m
P100-T-56.1m
P50-T-24.6m


Floreat Activity Centre
HORNSEY RD
FLOREAT AV
CHANDLER AV

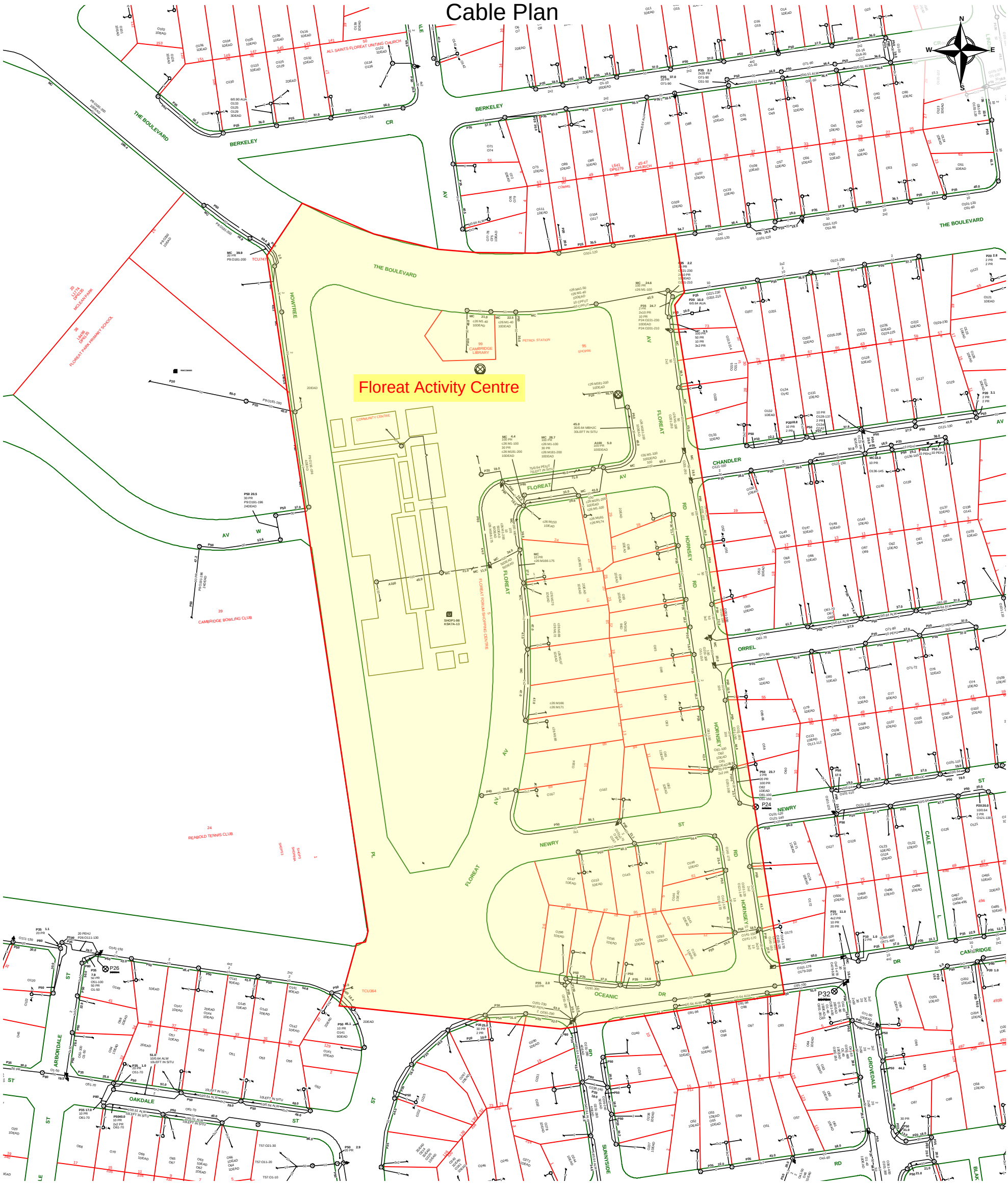

Floreat Activity Centre
ORREL AV
HOWSON RD
NEWRY ST
CALE LANE



Emergency Contacts

You must immediately report any damage to the **nbn™** network that you are/become aware of. Notification may be by telephone - 1800 626 329.

Cable Plan



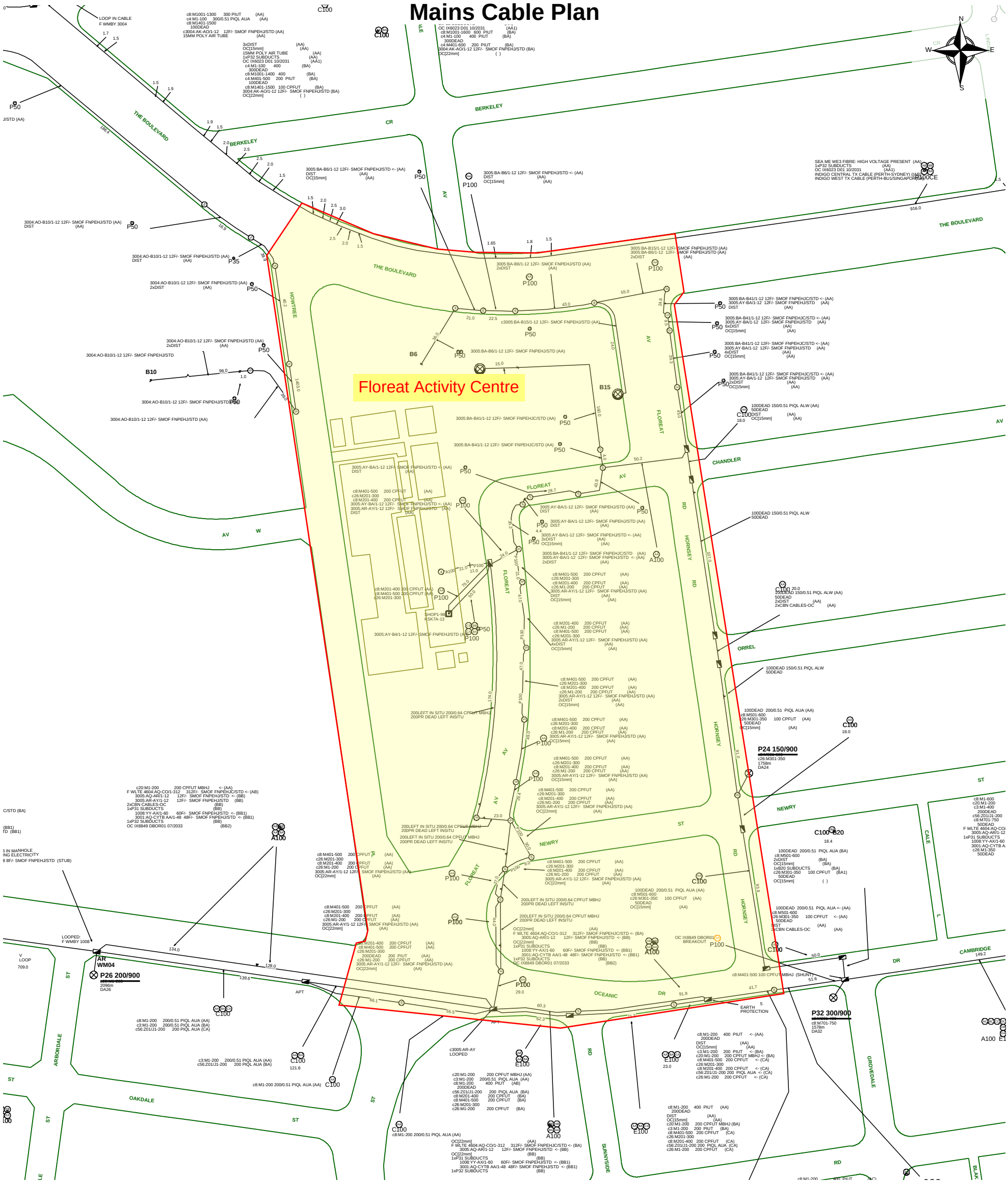
Report Damage: https://service.telstra.com.au/customer/general/forms/report-damage-to-telstra-equipment Ph - 13 22 03 Email - Telstra.Plans@team.telstra.com Planned Services - ph 1800 653 935 (AEST bus hrs only) General Enquiries	Sequence Number: 215495018
TELSTRA CORPORATION LIMITED A.C.N. 051 775 556	CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.
Generated On 01/09/2022 11:38:57	

The above plan must be viewed in conjunction with the Mains Cable Plan on the following page

WARNING
Telstra plans and location information conform to Quality Level "D" of the Australian Standard AS 5488-Classification of Subsurface Utility Information.
As such,Telstra supplied location information is indicative only.Spatial accuracy is not applicable to Quality Level D.
Refer to AS 5488 for further details. The exact position of Telstra assets can only be validated by physically exposing it.
Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy.
Further on site investigation is required to validate the exact location of Telstra plant prior to commencing construction work.
A Certified Locating Organisation is an essential part of the process to validate the exact location of Telstra assets and to ensure the asset is protected during construction works.

See the Steps- Telstra Duty of Care that was provided in the email response.

Mains Cable Plan



Report Damage: https://service.telstra.com.au/customer/general/forms/report-damage-to-telstra-equipment
Ph - 13 22 03
Email - Telstra.Plans@team.telstra.com
Planned Services - ph 1800 653 935 (AEST bus hrs only) General Enquiries

TELSTRA CORPORATION LIMITED A.C.N. 051 775 556

Generated On 01/09/2022 11:39:00

Sequence Number: 215495018

CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.

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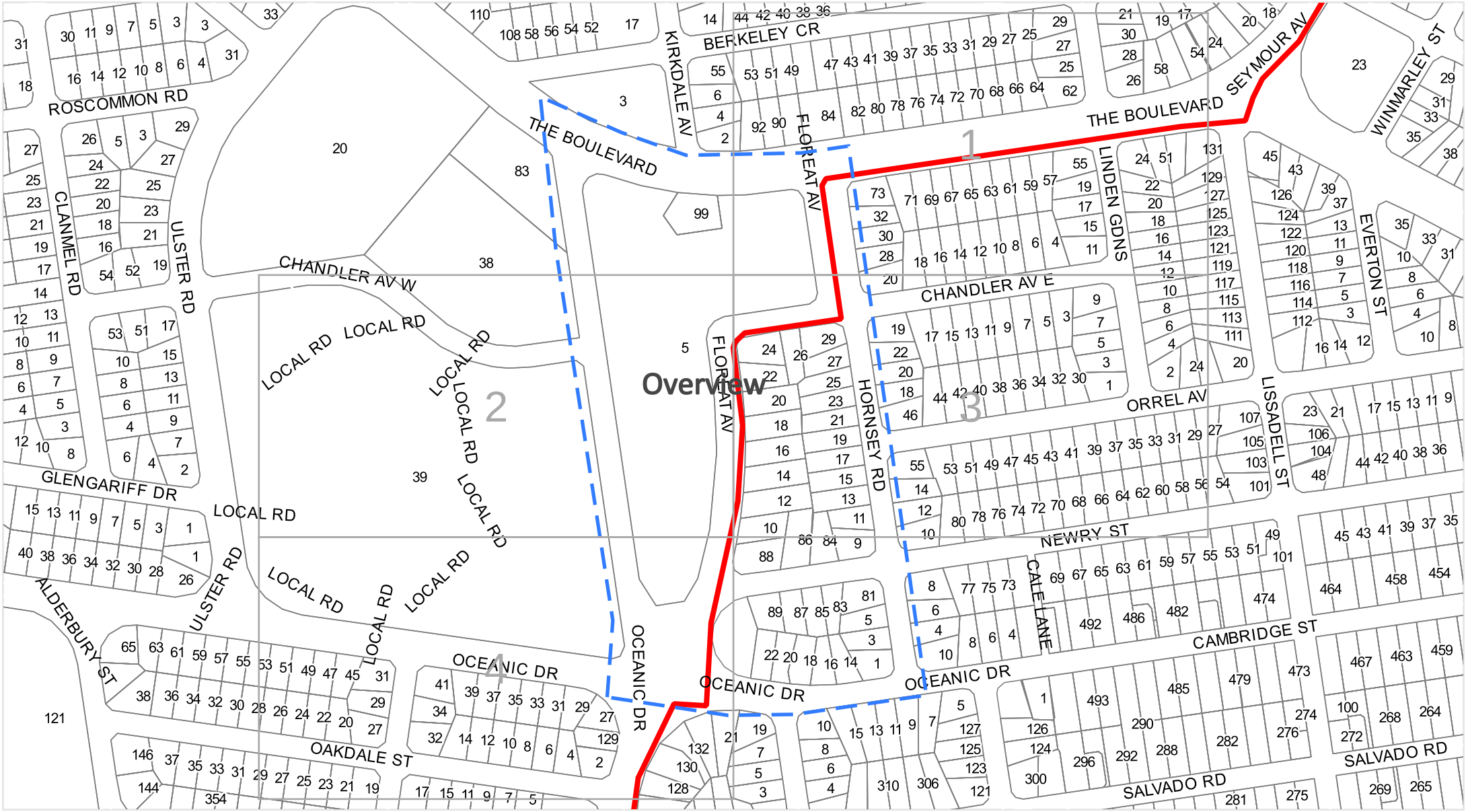
aarnet
Australia's Academic and Research Network

Sequence No: 214755267
Job No: 32518360
Location: 18 Floreat Avenue, Floreat, WA 6014

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



Legend | Scale: 1:4612

N

- Enquiry Area
- AARNet Fibre Optic Assets
- AARNet Power Assets
- Cadastre

DISCLAIMER: While reasonable measures have been taken to ensure the accuracy of the information contained in this plan response, neither AARNet or PelicanCorp shall have any liability whatsoever in relation to any loss, damage, cost or expense arising from the use of this plan response or the information contained in it or the completeness or accuracy of such information. Use of such information is subject to and constitutes acceptance of these terms.

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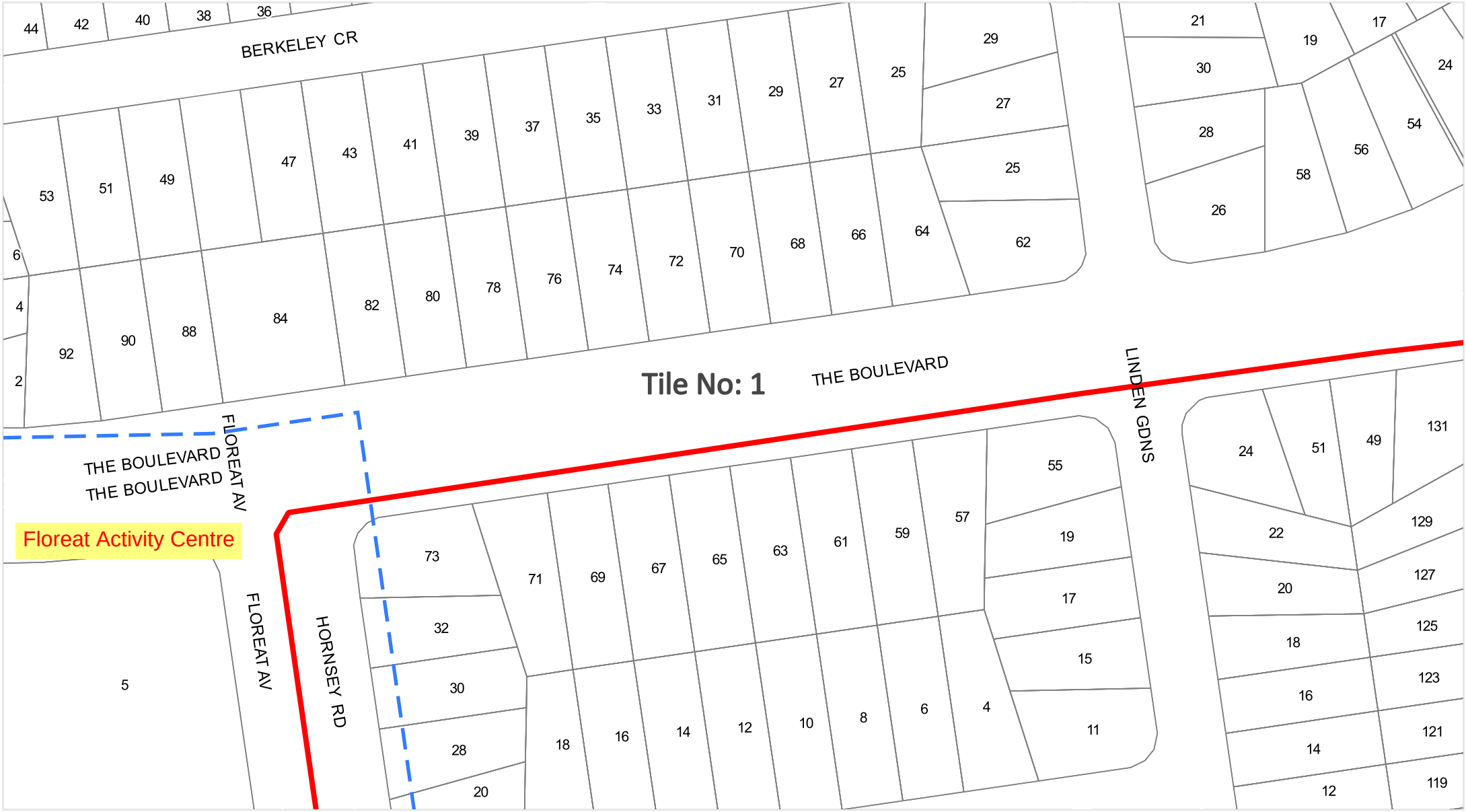

Legend | Scale: 1:1500

N

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- AARNet Fibre Optic Assets
- AARNet Power Assets
- Cadastre

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- Cadastre

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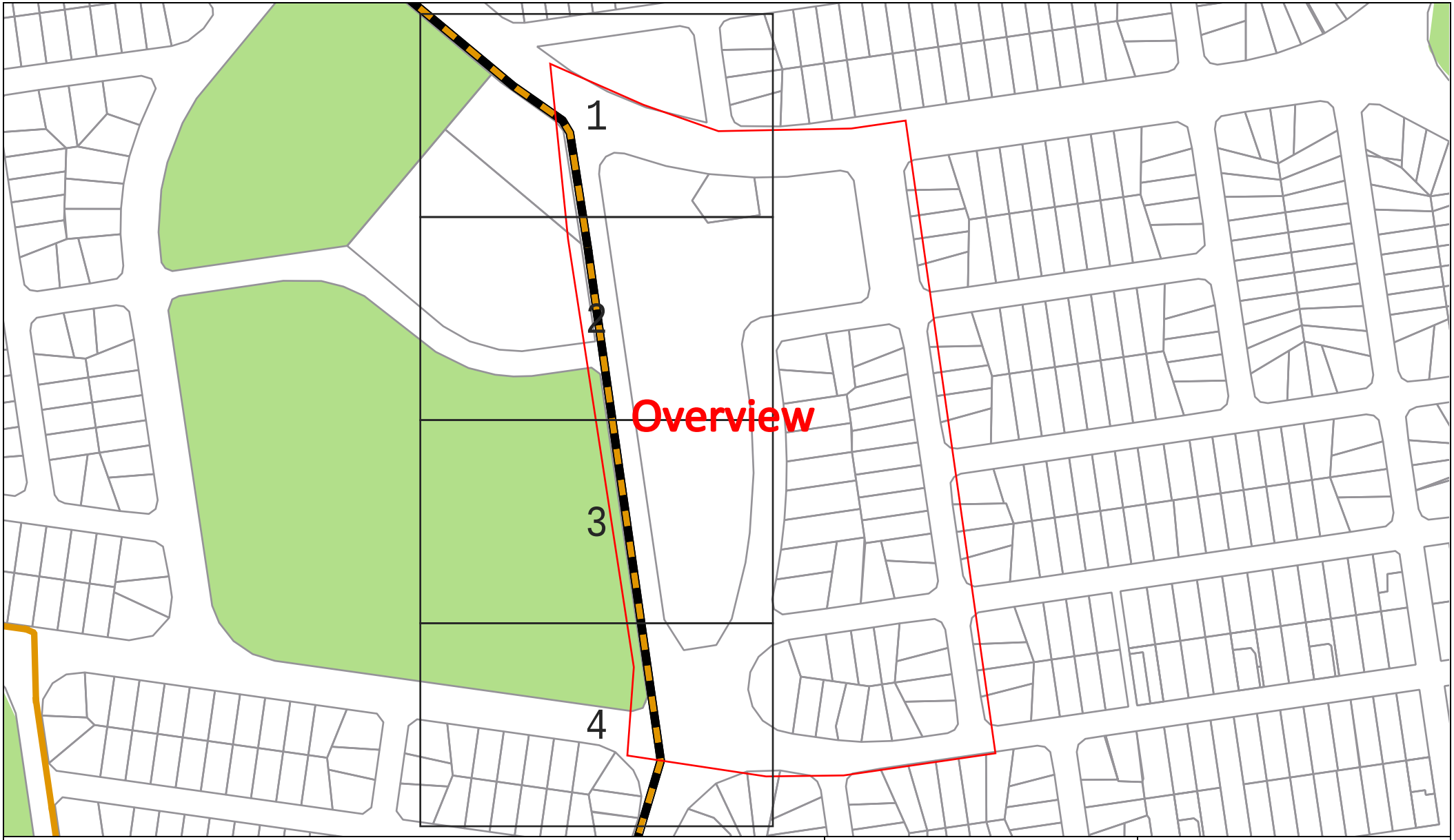

Sequence Number: 214755270

Date: 12/08/2022

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nextgen GROUP

LEGEND

Digsite

Area

Assets

Cable

3rd Party Duct

Marker Post



Sequence Number: 214755270

Date: 12/08/2022

DISCLAIMER: THIS DRAWING SHOULD NOT BE SCALED TO LOCATE CABLES. NO WARRANTY IS GIVEN THAT THE INFORMATION IS ACCURATE OR COMPLETE. IF YOU REQUIRE INFORMATION REGARDING LOCATING THE CABLE PLEASE CALL NEXTGEN. THIS DOCUMENT HAS BEEN PREPARED SOLELY FOR DIAL BEFORE YOU DIG USE. THIS PLAN CONTAINS COMMERCIALLY SENSITIVE INFORMATION AND IS TO BE TREATED ACCORDINGLY. NO SUCH INFORMATION IS TO BE PASSED ONTO OTHER PARTIES WITHOUT WRITTEN CONSENT FROM NEXTGEN PTY LTD.

nextgen GROUP

LEGEND

Digsite

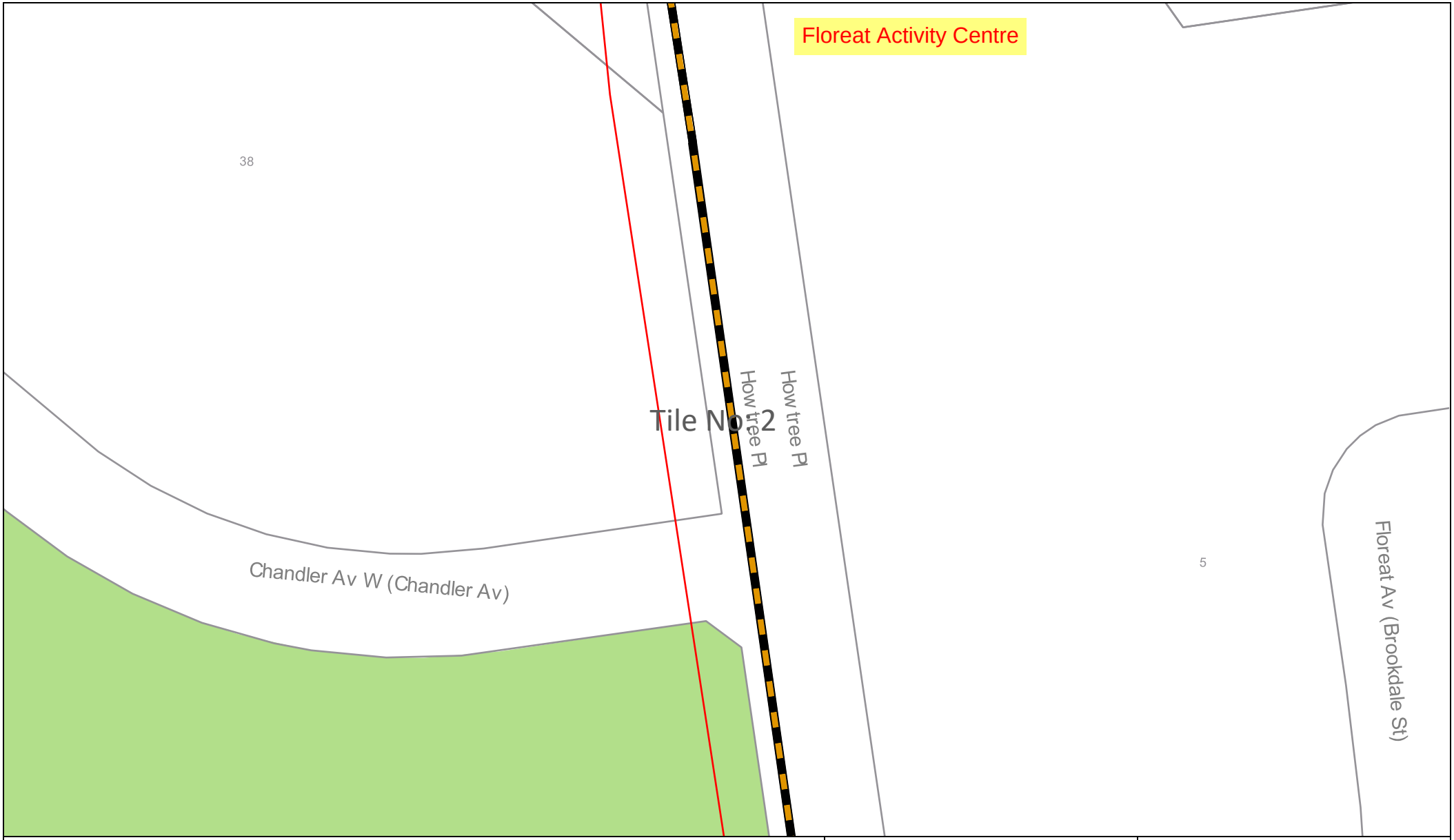
Area

Assets

Cable

3rd Party Duct

Marker Post



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Date: 12/08/2022

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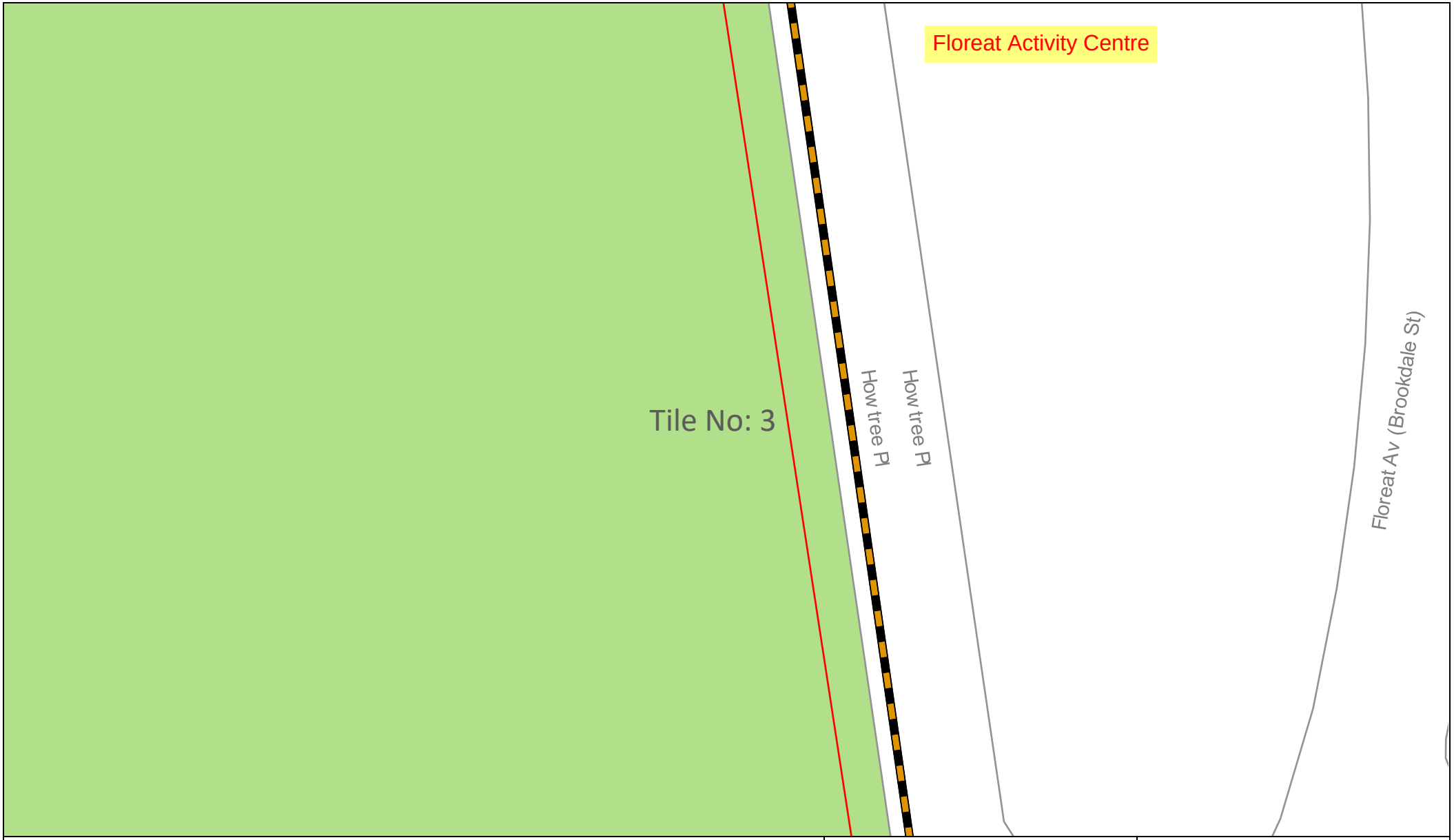
nextgen GROUP

LEGEND

Digsite		Assets	
	Area		Cable
			3rd Party Duct
			Marker Post



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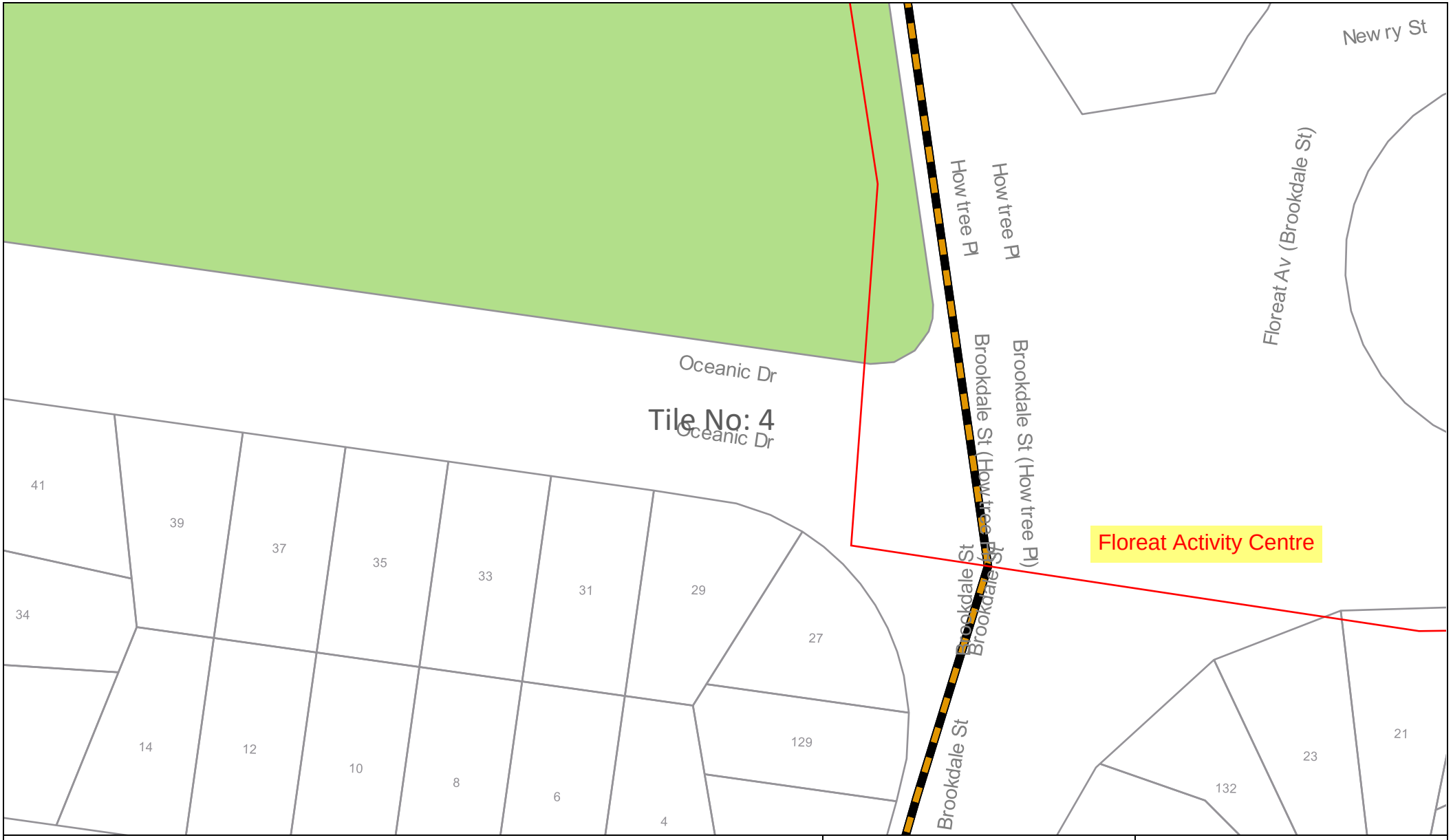

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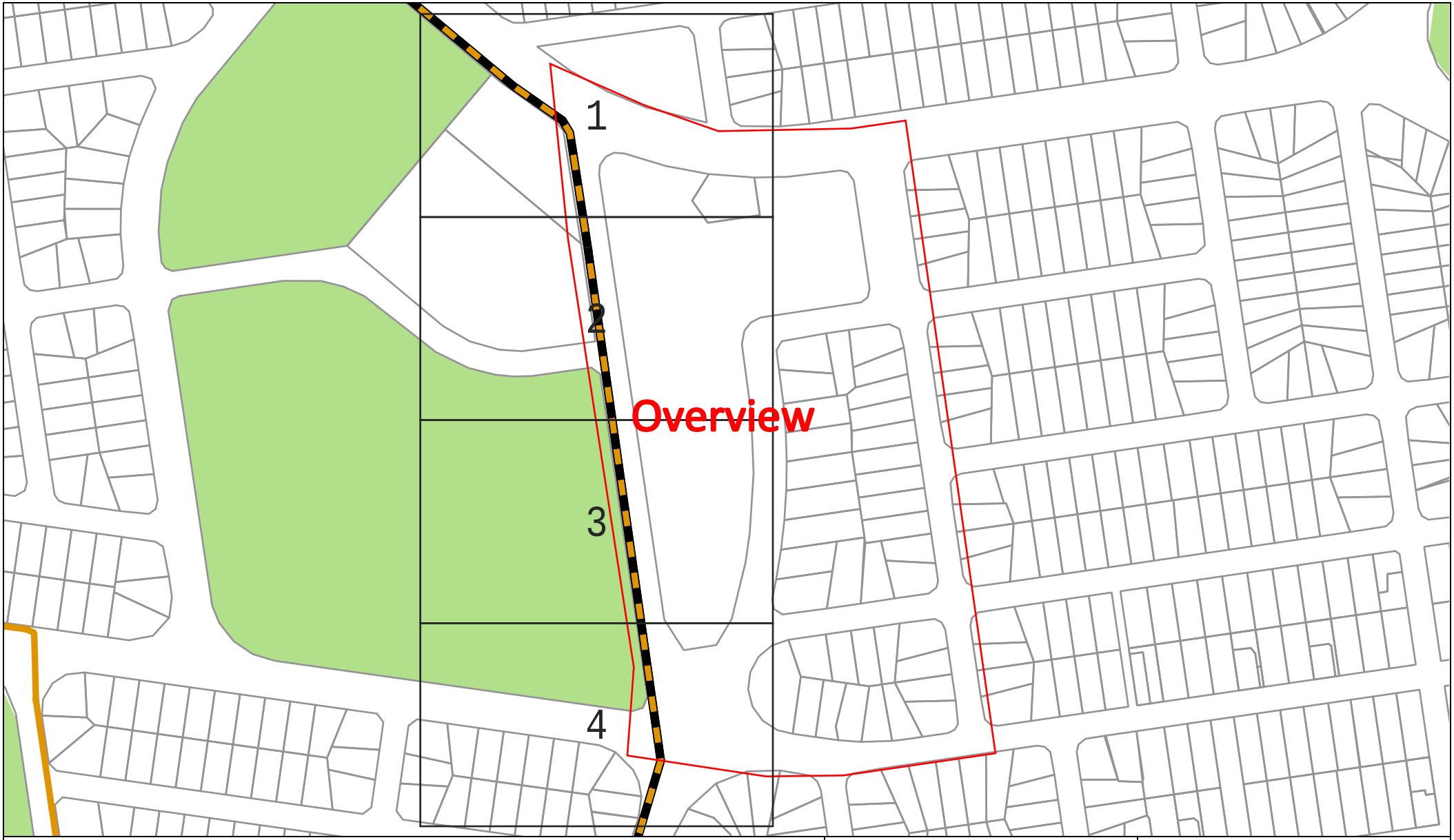

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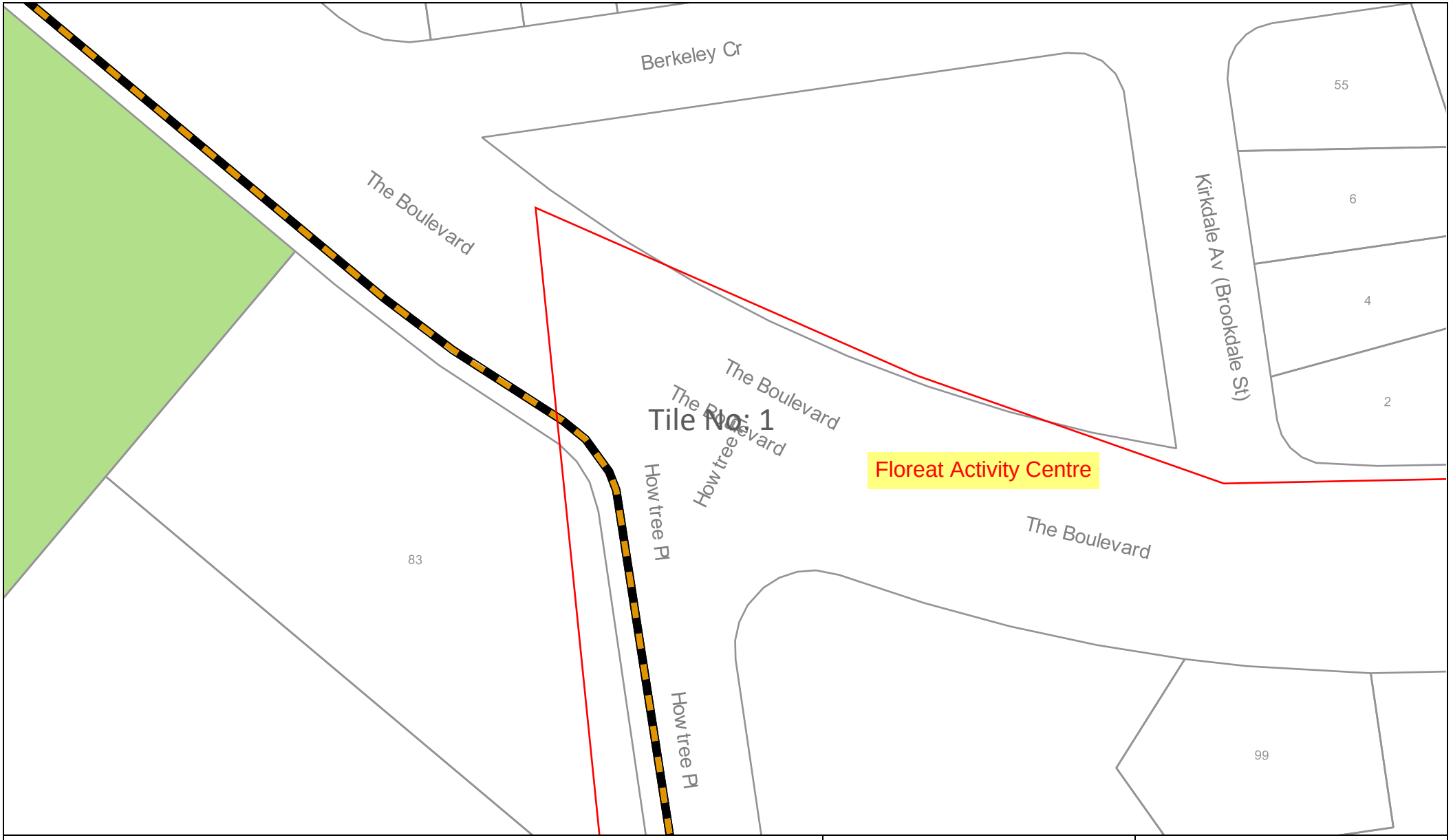

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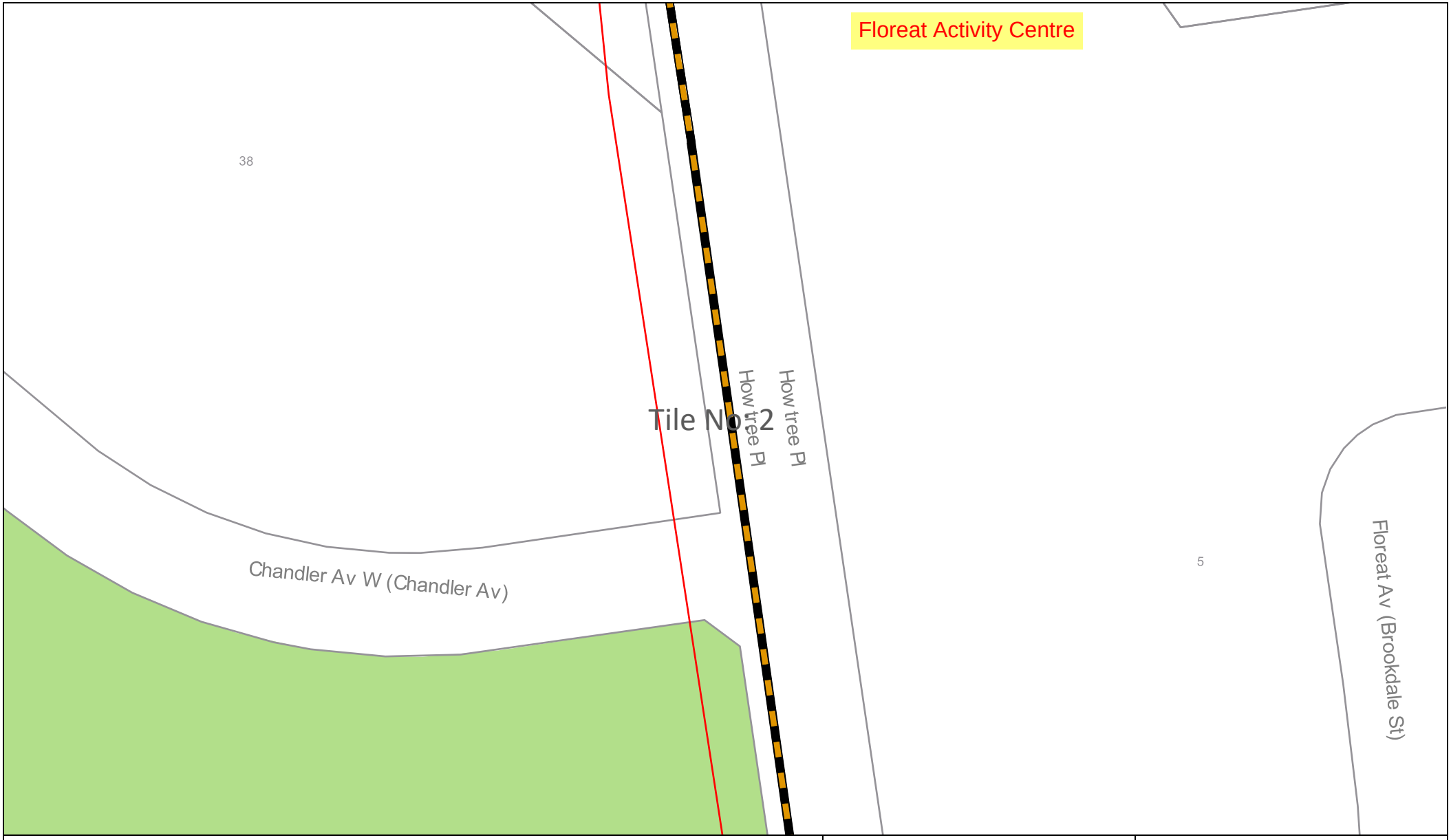

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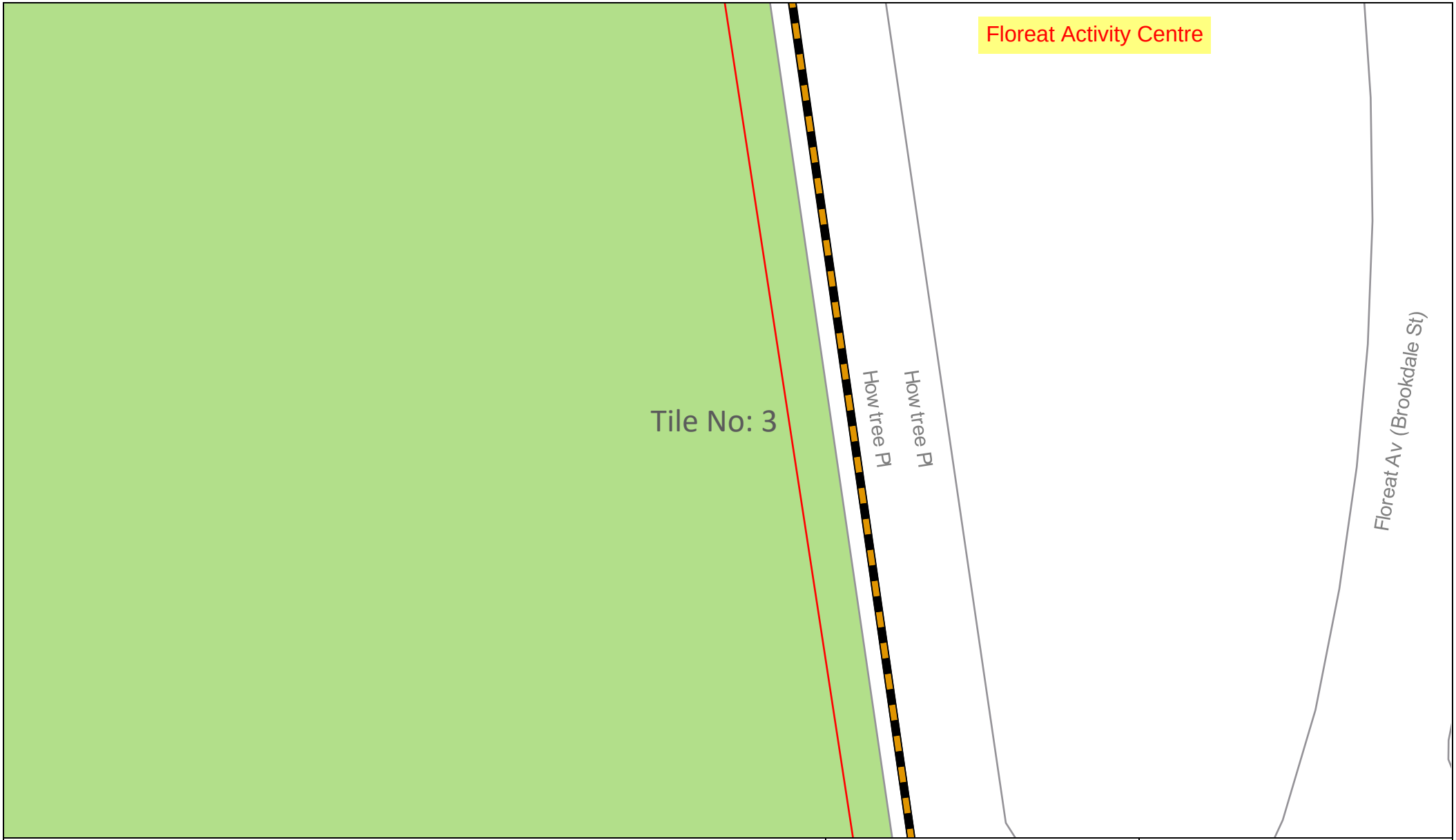

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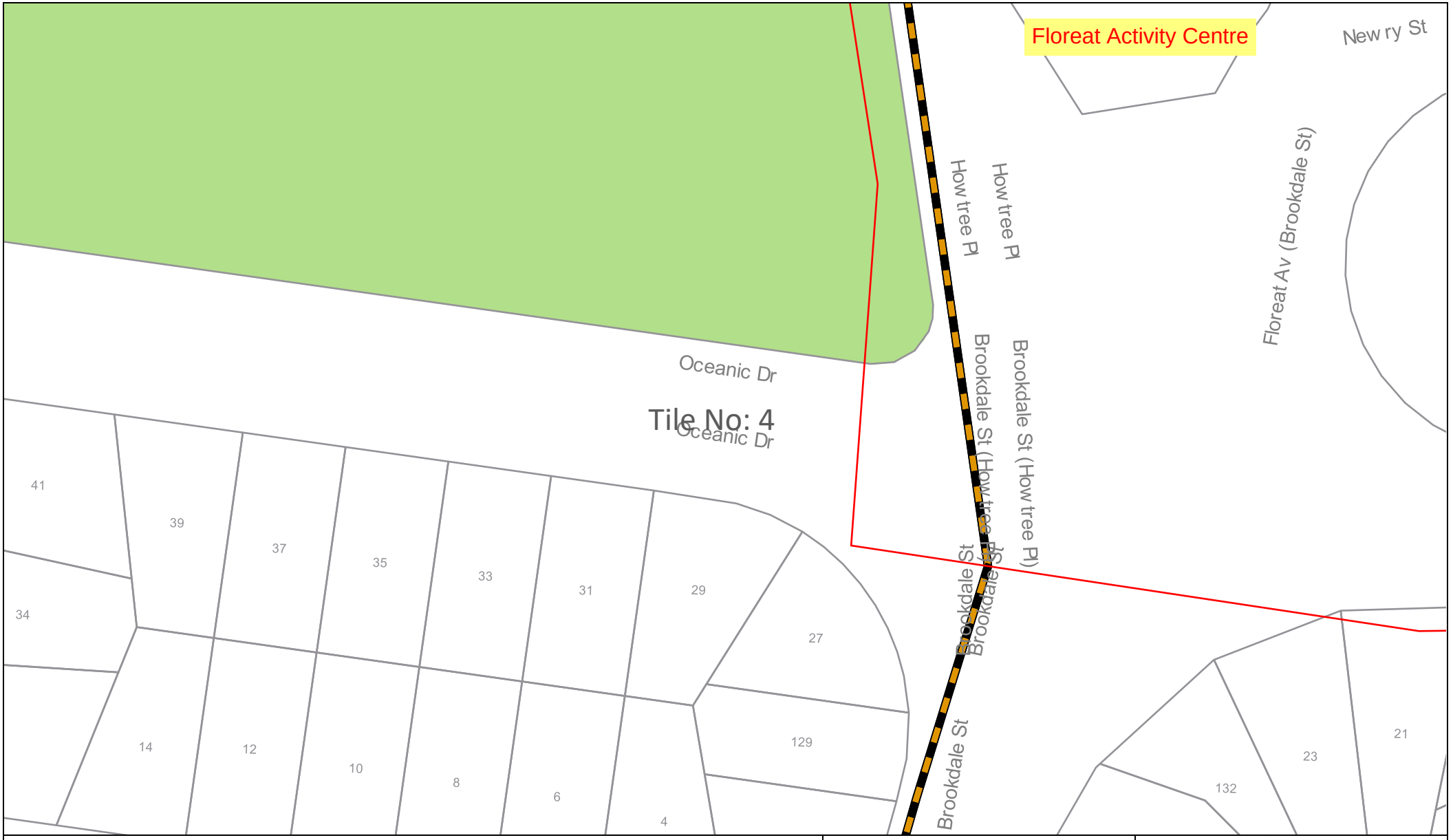

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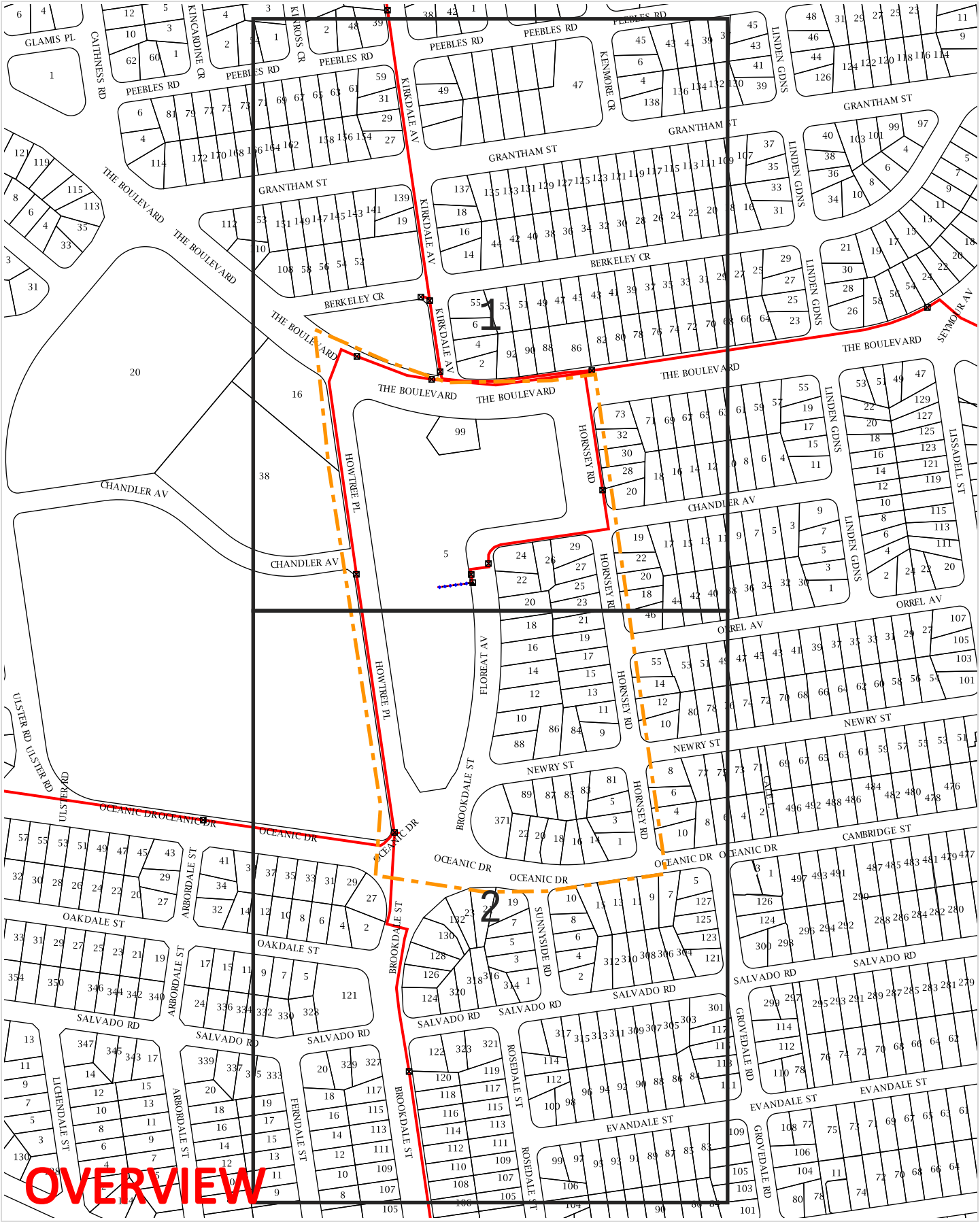

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22231.14

1 April 2026

Yeuston Gabriel
Apil Group
L2, 30 The Esplanade
PERTH WA 6000

Dear Yeuston,

Floreat Forum Precinct Plan – Servicing Report Addendum

At the request of Apil Group and DLPH, Colliers (formerly Pritchard Francis) have reviewed the current Floreat Forum Precinct Plan with respect to the amended building sizes (number of storeys) and yields as compared with the proposed building sizes and yields at the time of the publication of the original servicing report.

Colliers confirms we do not anticipate that the amended proposal requires substantially different servicing demand and solutions than those outlined in the original report.

With respect to electrical infrastructure, while we would recommend a precinct wide strategy for greater efficiency, a precinct wide strategy is not anticipated to be required for the development and release of individual lots.

Colliers notes that the servicing report is based on high level assumptions about the proposed development and future servicing in the area due to the project being in the early stages of planning.

Yours sincerely



Alex Caldwell
Associate, Civil
Perth

Appendix E - Economics, Retail & Market Assessment (Hatch)



Floreat Forum Precinct

Retail and Market Demand Assessment

December 2022

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Floreat Forum Precinct
Executive Summary

Background

Hatch Roberts Day (“HRD”) has been engaged by APIL to prepare an economic and market assessment of a proposed expansion of the Floreat Forum activity centre (“subject site”) in the suburb of Floreat.

Floreat Forum is one of Australia’s earliest internal mall based activity centres that is unique in its mix of two supermarket anchors, a large volume of supporting specialty retail and services and the co-location of cafes, restaurants and food catering services. The centre also includes a Council library and other non retail services.

The Town of Cambridge Local Planning Strategy identifies the subject site as having an opportunity to expand its retail and non retail commercial offer to the community and businesses, together with the ability to co-locate additional residential development on and around the precinct.

The retail expansion opportunity

The Floreat primary catchment area and the surrounding catchments have average incomes and retail expenditure levels significantly above Perth and national averages. Combined with forecasted population growth, the requirement for additional retail floorspace across the catchment between 2021 and 2031 equates to an additional 50,000 sqm net of beyond trade area spend.

Based on existing market shares and current visitation it is expected that the subject site could capture between 10 and 15% of this growth in the market. Existing turnover figures for current tenancies (many of which are trading above benchmarks) together with an assessment of a current market gap also indicate that in 2021 there is a market gap of up to 3,000 sqm in food and grocery together with up to 1,500 sqm in food catering / restaurants.

The overall expansion in retail floorspace recommended by 2031 equates to 5,000 sqm of food and grocery retailing including liquor, 2,000 sqm in restaurant & food catering and between 3,000 and 4,000 sqm in non food retailing including mini majors and retail services. Further expansion opportunity beyond 2031 exists supported by an additional local residential catchment at the subject site.

The residential expansion opportunity

An assessment of the residential market opportunity including supporting components such as aged care confirms that Floreat can play an important role in providing housing diversity for the Floreat / City Beach and wider sub-market. The population is expected to age significantly and this will drive downsizer activity for those aged 55 to 75 together with demand for aged care accommodation for those aged 75+.

We expect that the subject site and surrounding frame could initially capture around 10% to 15% of the medium and high density apartment market from 2026 growing to 20% beyond 2031. This would imply capacity for annual take up at the site averaging 60 to 70 per year growing to over 100 per annum beyond 2031 subject to capacity. Part of this volume could include Build to Rent product and a separate aged care component.

Details of floorspace staging recommendations across residential and commercial uses including retail floorspace are provided in part 9 of the Report.

01
Introduction and Scope

Hatch Roberts Day ("HRD") has been engaged to develop a masterplan concept into a formal PSP for APIL, to support the development of the Floreat Forum shopping centre and adjoining residential frame area.

The PSP will be designed to support the future development and transition of the existing activity centre from an existing asset that is retail focused to a facility that is a genuine mixed-use precinct providing a mix of economic, social and community benefits for the wider region.

To support this process HRD has undertaken a needs assessment ("This Report or Report") to support the expansion of the facility across various land uses. This needs assessment and its scope is designed to be compliant with Draft SPP 4.2 – Activity Centres (October 2000) together with other reports that may be undertaken.

As part of the development of a needs assessment the Report also considers how development of the site will sustain its own demand for additional retail and commercial floorspace driven by:

- Greater volumes of residents at the activity centre
- A higher local worker population.

The purpose of the Report is to demonstrate the overall need for a range of land uses and consider whether the existing floorspace directions in the current concept masterplan should be extended and to what volume, scale, and timing.

Summary of scope items / tasks

Key scope items and activities included in the Report are as follows:

- Market Demand assessment and review of masterplan
- Participate in workshops to discuss implications of market assessment for the masterplan
- Undertake a focused land use needs assessment for retail uses at the subject site including:
  - Market need for land uses in the updated masterplan
  - Capacity of the market to absorb the composition of uses.
  - Identification and confirmation of gaps in land uses and services in the catchment.
  - Commentary on why the proposed updated masterplan is appropriate for the Floreat Forum location
- Provide advice on market gaps across other land uses including residential, aged care and retirement villages and commercial, floorspace together with recreation uses.
- Provide advice on staging of additional floorspace and consider how market gap analysis compares to floorspace recommendations in the Town of Cambridge LPS.

02
Overview of Subject Site and Study Area

This Report utilizes two study areas.

The first study area is a broader area created to consider the regional context and support a demand assessment for proposed residential and aged care uses and nonretail commercial uses including office floorspace. ("Study Area A").

A second study area is utilized in the retail demand assessment in part 5 of this Report. This study area and its details reflect the retail trading environment together with existing and proposed retail supply.

Study Area A is depicted in the diagram below.



A Growing Neighbourhood - Study Area A

2021	2026	2031
119,150	136,275	153,850

The preliminary study area include the following surrounding suburbs

Churchlands	Mount Claremont	Wembley
City Beach	Shenton Park	Wembley Downs
Floreat	Subiaco	West Leederville
Glendalough	Swanbourne	Woodlands

Demographic characteristics of the Town of Cambridge

The study area includes the Town of Cambridge which is the municipality that Floreat Forum is located in.

Demographic trends can provide an indication of the type of land uses that are most appropriate in a mixed-use precinct based on age, wealth and home ownership status.

The figure on the right provides an overview of how the municipality compares with Perth and national averages.

KEY OBSERVATIONS

AVERAGE AGE AND INCOME LEVELS

The average age and income levels are higher than Perth indicating a greater capacity to fund to demand a high quality retail offer and with an emerging downsizer market.

COST OF HOUSING

The cost of housing is higher with a level of households that either rent or have a mortgage being relatively lower than Perth. This also indicates a capacity to downsize from detached housing product.

FAMILY COMPOSITION

The volume of households who are couples with children is relatively high indicating demand for education services and childcare in the municipality.

Source: ABS, 2021

Note: numbers rounded

1









		Town of Cambridge	Perth Metropolitan Area	Western Australia	Australia
AGE	Median age	**41**	37	38	38
INCOME	Median weekly household income	**$2,964**	$1,865	$1,815	$1,746
	Couples with children	**53%**	46%	45%	44%
CHILDREN	Older couples without children	**37%**	38%	39%	44%
DWELLING TYPES	Medium and high - density housing	**26%**	22%	20%	27%
	Households with a mortgage	**36%**	42%	40%	35%
	Median weekly rent	**$450**	$350	$340	$375
COST OF HOUSING	Households renting	**21%**	27%	27%	31%
ETHNICITY	Non english speaking background	**19%**	24%	21%	25%
	University attendance	**21%**	16%	14%	15%
	Bachelor of higher degree	**52%**	27%	24%	26%
SCHOOL/ EDUCATION	Vocational	**4%**	8%	7%	8%

Subject Site

Floreat Forum is a Sub-Regional Shopping Centre located along key arterial routes in the affluent western suburb of Floreat. It is identified as a District Centre in State Planning Policy 4.2. Activity Centres.

Just seven kilometers from Perth's CBD, Floreat Forum lies in close proximity to some of Perth's most popular beaches, parklands and sporting complexes.

This community focused centre comprises both indoor and outdoor shopping and dining precincts, housing a broad retail offering.

Anchored by Coles and Woolworths, the centre is home to a newly opened medical centre, swim school and an extensive selection of specialty stores.



03
Existing Centre and Development Opportunities

Background Planning framework and controls

Town of Cambridge Local Planning Strategy and Floreat Activity Centre

The Town of Cambridge Local Planning Strategy ('LPS') provides direction as to recommended expansions in employment floorspace in activity centres across the municipality.

The LPS provides the following directions in relation to the subject site.

The Floreat Activity Centre will transform into an attractive and vibrant mixed-use precinct with a broad range of residential and commercial/retail uses.

The Floreat Forum Shopping Centre and the Cambridge Library form a key part of the activity centre and will be redeveloped to better interface with the surrounding public streets and open space, accommodating residential development above the commercial/retail area.

The LPS provides a forecast of additional employment floorspace that could be accommodated within the subject site which is depicted in the extract from the LPS in the Emplyoment floorspace targets table.

The LPS clarifies that West Leederville is expected to play the primary role of accommodating additional employment floorspace within the municipality with up to 51,000 sqm of additional floorspace between 2011 and 2051. This equates to an average development volume of 1,270 sqm per annum.

The LPS however identifies consumer centres including the Floreat Activity Centre as playing an important supporting role with the provision of around 40,000 sqm of additional floorspace including between 9,000 and 11,000 sqm at Floreat.

An example of this distribution is provided in the below pie chart.



Employment floorspace targets for identified precincts – Town of Cambridge LPS

Economy and Employment Precinct	Employment Floorspace (2011)	Employment Floorspace Target (2050)	Percentage Increase (%)
Strategic Centre			
West Leederville	83,500m²	134,500m²	+ 61%
City Beach / Floreat Beach Nodes	6,500m²	10,500m²	+ 66%
Sub-Total	**90,000m²**	**145,000m²**	
Knowldge Centre			
Medical Precinct	24,000m²	38,000m²	+ 58%
Other Knowledge Centres	7,000m²	11,000m²	+ 57%
Sub-Total	**31,000m²**	**49,000m²**	
Consumer Centre			
Wembley Activity Centre	18,000m²	29,000m²	+ 61%
Floreat Activity Centre	19,000m²	28,000m²	+ 47%
Gayton Street Neighbourhood Centre	3,200m²	4,400m²	+ 37.5%
Ocean Village Neighbourhood Centre	2,300m²	3,400m²	+ 48%
Other Centres*	31,000m²	49,000m²	+ 63%
Sub-Total	**73,500m²**	**113,800m²**	

*Grantham Street and Cambridge Sreet, Herdsman Parade

Overview of Centre

The Floreat Forum activity centre has strong connections to the community and a high level of customer loyalty with a strong food offer including with two full line supermarkets supported by an independent butcher and a separate fruit and vegetable food grocer and up to 80 retail specialities.

The centre acts as a drawcard for the community with a closed and open mall environment providing alternative areas for visitors to dwell and use the diverse café and food catering offer together with retail services.

As discussed further in the retail opportunity assessment chapter the centre has relatively strong performance in regard to turnover for many categories of retail however its visitation could be enhanced by a wider non food and health and wellness offer given the community age profile and wealth in the catchment.

The centres overall turnover at $8,461 per sqm is strong and turnover has benefited throughout 2022 from growing consumer confidence, An increase in interest rates together with impacts on consumer confidence throughout the remainder of 2022 may have less of an impact in this centres catchment given the relatively older population with lower mortgages and savings that benefit from elevated interest rates.

CENTRE INFORMATION

Annual Traffic

3.5 MILLION

Passing Vehicle Traffic

7.4 MILLION

Car Bays

900

Speciality Retailer

80+

MAT

$153 MILLION | **$8,461** $PSM MAT

Total GLA

18,628 SQM

MAJORS

- Woolworths
- Coles

MINI MAJORS

- Best & Less
- Goodlife Health Clubs

MEDICAL

- Life Ready
- OPSM
- Audika
- Floreat
- Chiropractic
- HBF Floreat Forum General Practice
- Abernethy Owens

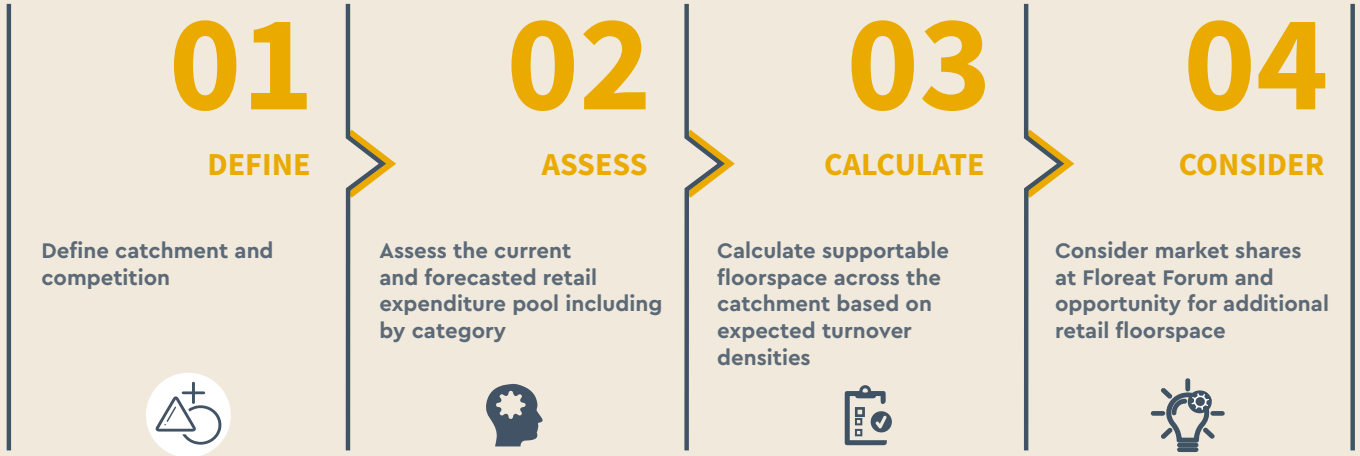
04
Retail Opportunity Assessment - Approach

The estimated retail expenditure capacity provided in this model is based on the latest available 2021 Consumer Spend Potential (CSP) data sourced from Precisely (formerly Pitney Bowes MapInfo).

Unlike other products on the market, CSP was designed using a top-down method which overcomes several biases in base data for household expenditure. The size of the market for each CSP category is calculated from a variety of sources, the primary one being Household Final Consumption Expenditure (HFCE) tables from the National Accounts (Australia's gross domestic product figures).

Precisely uses other data sources to augment HFCE data. These include other National Accounts tables from the Australian Bureau of Statistics, as well as Retail Trade, Apparent Consumption of Alcohol, International Trade in Services, and Socio-Economic Indexes for Areas (SEIFA). They also incorporate data from other Commonwealth sources – the Australian Prudential Regulation Authority, the Productivity Commission, and Tourism Research Australia – as well as other publicly available sources.

Key steps in calculating the retail expenditure in the catchment and a sustainable volume of floorspace at the subject site is outlined in the diagram below.



Retail Catchment

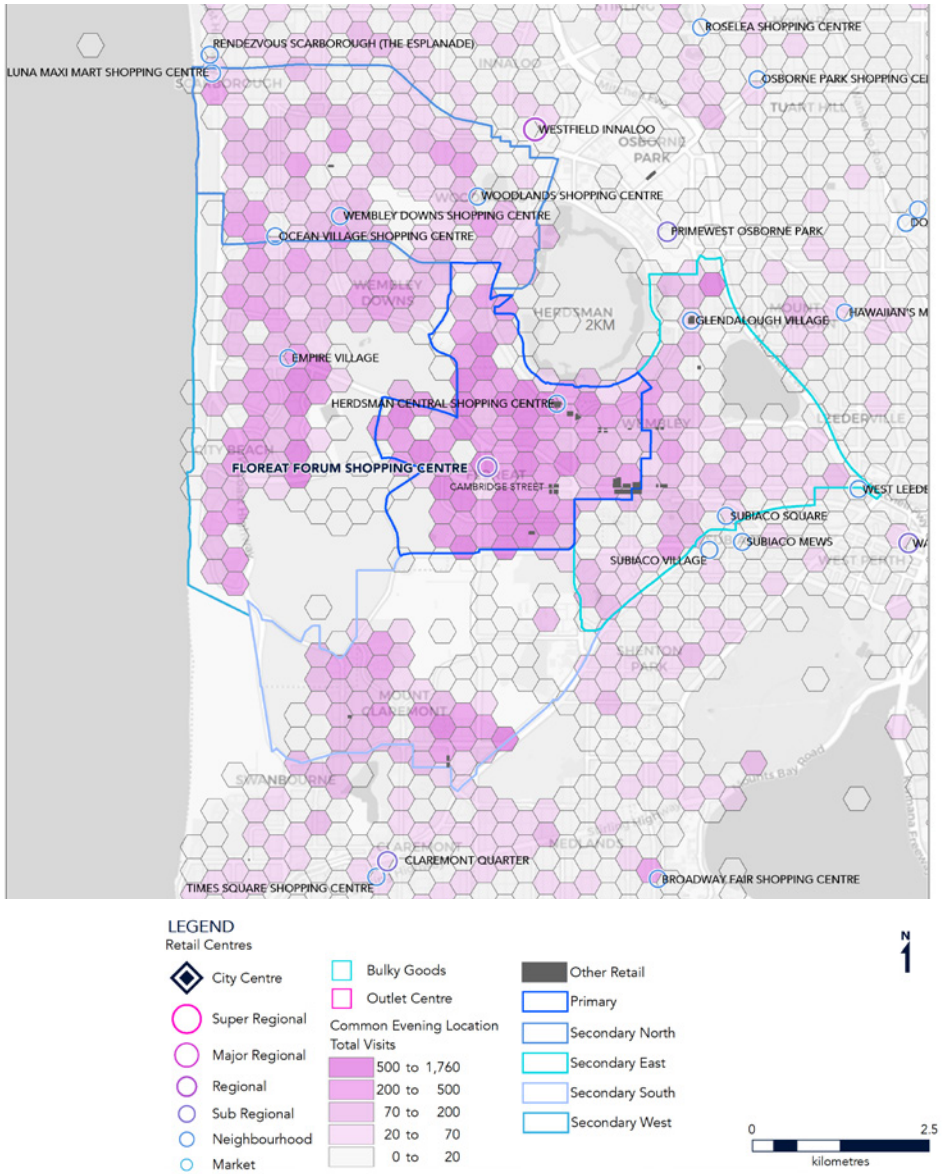
The trade area refers to the area likely to be served by the retail component at Floreat Forum. The definition of the trade area for any retail development is determined by several factors including:

- The strength and attraction of the centre in question, determined by success factors such as composition, layout, car parking and the presence of other local complementary uses
- The proximity, composition, quality, size and diversity of retail, business services and community facilities in competing retail centres
- The accessibility of the subject centre in terms of road and public transport networks
- Topography and other physical barriers such as rivers, railways and freeways
- Proximity and accessibility to potential shoppers.

The adopted trade area has been based on visitation data surrounding the subject site sourced from Precisely. Visitation metrics are on total annual visits from a common evening location / place of residence.

The trade area considers the current centres role and the ability for its role to change based on a change in the mix of retail and non-retail floorspace together with other facilities. On this basis, we have defined the trade area sectors as follows:

- Primary trade area extends over the entire Floreat suburb and parts of Wembley where strong visitation has been sampled.
- Secondary North extends over Wembley Downs, Doubleview and to the edge of Scarborough.
- Secondary East trade area extends to Daglish, West Leederville and the edge of the Subiaco Activity Centre. It is bounded by the Mitchell Freeway to the east.
- Secondary South trade area extends to Mount Claremount and the edge of the Fremantle rail corridor.
- Secondary West extends to City Beach where parts of the catchment have visitation levels as high as the PTA.



Source: Think Economics

Supermarket competition in the catchment

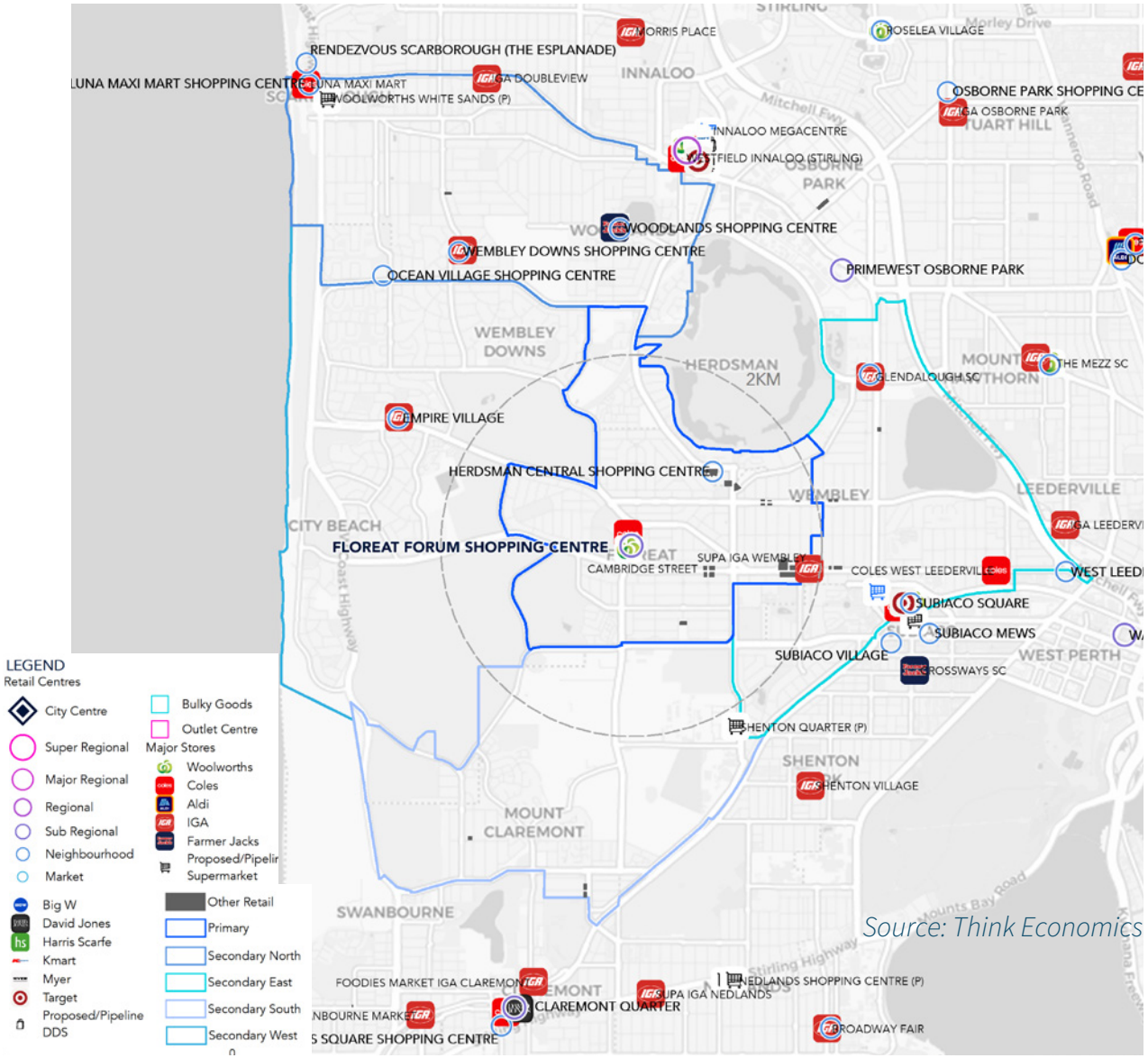
HRD has also reviewed the competitive framework for competing activity centres which include supermarket facilities and fresh food retailing.

The retail hierarchy included in the catchment includes the Stirling Regional Centre which accommodates the Innerloo Megacentre together with a number of Secondary and District centres.

In relation to supermarket anchored activity centres key local competition includes:

- Herdsman Central Shopping Centre to the northeast of the subject site
- Wembley Shopping Centre which includes a Supa IGA
- Empire Village in the Secondary West catchment which includes a local IGA anchored centre
- Several smaller supermarket-based activity centres including Wembley Downs and Woodlands in the Secondary North catchment.

As the visitation data confirms on the previous slide, apart from the primary catchment, market penetration is strongest in the Secondary South and Secondary East catchments.



Source: Think Economics

Population Forecast

A population growth forecast has been prepared for the defined catchment including the expected PTA and secondary trade areas.

Population in the PTA is expected to increase from 16,585 persons to 20,095 persons over the ten years to 2031 with the total trade area population increasing to 94,000 persons over the same period.

Average annual population growth over the trade area will accelerate from around 1,500 p.a. between 2021 and 2026 to 1.900 p.a. between 2026 and 2031.

This level of population growth will support a significant enhancement in consumer spend.

Note: Population projections have been calculated using the State Government produced forecast growth rates at an SA2 (Statistical Area Level 2) level which fall within the delineated catchments. These SA2s may not align with delineated catchment boundaries. The population forecast scenario is based on WA Tomorrow (medium) scenario.

Estimated Residential Population Growth | **Forecasted Population**

Population (Persons)

		2006	2011	2016	2021	2026	2031
Primary		12,851	13,722	15,274	16,585	18,256	20,095
Secondary		50,073	54,773	57,551	60,728	66,487	73,925
	Secondary North	18,811	20,843	21,680	22,904	24,906	26,874
	Secondary East	15,637	17,686	19,134	20,272	22,513	26,171
	Secondary South	5,565	5,776	5,996	6,391	7,215	8,163
	Secondary West	10,060	10,468	10,741	11,161	11,853	12,718
Main Trade Area		62,924	68,495	72,825	77,313	84,743	94,020

Average Annual Growth (Persons)

		2006-11	2011-16	2016-21	2021-26	2026-31
Primary		174	310	328	334	368
Secondary		940	556	794	1,152	1,488
	Secondary North	406	167	306	400	394
	Secondary East	410	290	285	448	731
	Secondary South	42	44	99	165	190
	Secondary West	82	55	105	138	173
Main Trade Area		1,114	866	1,122	1,486	1,855

Average Annual Growth (%)

		2006-11	2011-16	2016-21	2021-26	2026-31
Primary		1.3%	2.2%	1.7%	1.9%	1.9%
Secondary		1.8%	1.0%	1.1%	1.8%	2.1%
	Secondary North	2.1%	0.8%	1.1%	1.7%	1.5%
	Secondary East	2.5%	1.6%	1.2%	2.1%	3.1%
	Secondary South	0.7%	0.8%	1.3%	2.5%	2.5%
	Secondary West	0.8%	0.5%	0.8%	1.2%	1.4%
Main Trade Area		1.7%	1.2%	1.2%	1.9%	2.1%

Retail Expenditure Pool

The retail expenditure pool for the MTA defined in this Report has been estimated based on the catchment population, retail expenditure per capita and growth in population and incomes.

The assessment of relative retail expenditure in the catchment confirms that higher income levels – particularly in the PTA – are driving relatively higher levels of retail expenditure per capita.

Key observations for the PTA and MTA 2021 include:

- PTA spend on **total retail equates to $20,969 per capita** relative to $17,704 in Perth a variance of **+ 18.4%**
- **PTA spend on Food & Grocery items equates to $6,904** per capita relative to a Perth average of $5,901 per capita – a variance of **+ 16.9%.**
- The MTA spend for food and non-food retail categories is also substantially above averages for the Perth metro area.
- Total expenditure on food and groceries in the MTA is expected to **increase by $467m between 2021 and 2031** – essentially doubling in nominal terms due to population growth, income and inflation.
- Average annual expenditure growth in the catchment is expected to equate to 6.7% across all retail categories in nominal terms.

Retail Expenditure per Capita

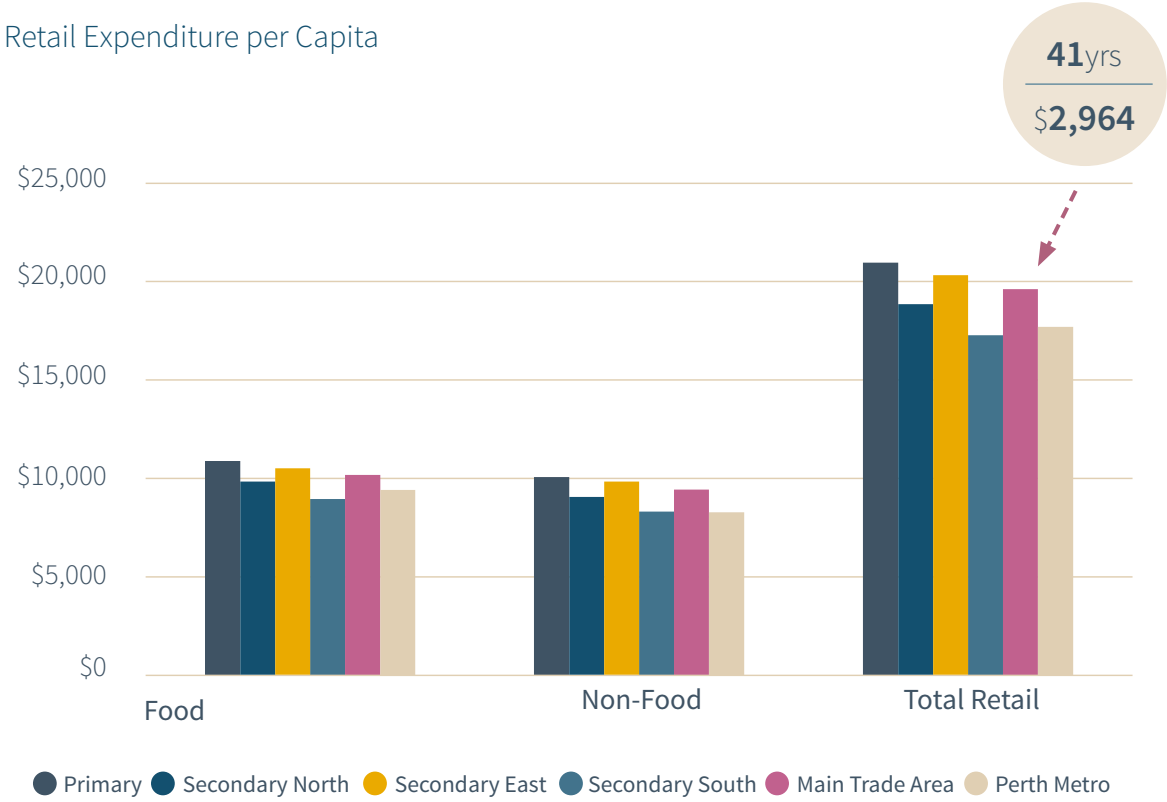


Table 2 – Floreat Forum - Retail Expenditure ($M), 2021 -2031

	Food & Grocery	Off Premise Liquor	Meals Out & Fast Food	Apparel	Household Goods	Leisure	General Retail	Retail Services	Total Retail
2021	494.5	114.4	178.9	122.1	310.1	115.0	140.3	42.3	1,517.8
2022	528.2	122.2	191.7	129.8	330.3	122.4	149.4	45.2	1,619.3
2026	685.2	158.6	251.5	165.2	423.6	156.4	191.6	58.4	2,090.6
2031	961.2	222.7	358.0	226.4	586.0	215.3	265.1	81.6	2,916.3
Average annual growth ($M)									
2021 - 2031	46.7	10.8	17.9	10.4	27.6	10.0	12.5	3.9	139.9
Average annual growth (%)									
2021 - 2031	6.9%	6.9%	7.2%	6.4%	6.6%	6.5%	6.6%	6.8%	6.7%

Current trading performance and future retail turnover productivity

In addition to the market gap analysis in this part of the Report it is also instructive to consider how the current trading performance of existing tenancies – including various categories of tenancies - compare to market averages.

In general, a trading performance above market averages will indicate an existing market gap, particularly if the trading performance is well in excess of market averages.

HRD has reviewed the current trading performance of a range of categories of retail to consider current performance. The data is based on performance in July 2022.

Retail Trading Performance

	Turnover per SQM	Retail Average	Variation
Supermarket	**14,149**	**12,114**	**17%**
Takeaway Food	**9,192**	**7,016**	**31%**
Hairdressing & Beauty	**9,758**	**4,190**	**133%**
Women Apparel	**5,059**	**2,857**	**77%**

Source: APIL Group & Urbis Retail Averages

Key variations in performance include:

- Hairdressing and Beauty tenancies trading at an average of $9,760 per sqm – equivalent to 133% above average
- Supermarket tenancies trading at 17% above market averages with strong performance in other fresh food specialty retailers
- Women and men's apparel retailing trading at more than 60% above national averages indicating a strong demand for additional non-food retailing particularly clothing and footwear
- Takeaway food trading at more than 30% above averages

The existing trading performance of retailers confirms that the subject site is experiencing turnover at levels above market benchmarks for many categories. This in turn suggests a market gap and an opportunity to supply additional retail floorspace to meet community needs.

Retail Expenditure Pool

The calculation of supportable retail floorspace in the trade area and consideration of the potential floorspace at the subject site provides consideration of four steps:

01 Calculate the total supportable floorspace in the trade area

02 Apply market shares at Floreat Forum

03 Calculate total sustainable floorspace at Floreat Forum

04 Consider staging options

1. Calculate the total supportable floorspace in the trade area by dividing the retail expenditure pool for various categories of retail expenditure by estimated retail turnover densities. (i.e total expenditure / assumed retail turnover density required per sqm for each category)
2. Apply market shares at Floreat Forum using visitation data estimates from each part of the trade area including primary and secondary catchments. Weight visitation by the relative size of each part of the sub-catchment.
3. Calculate total sustainable floorspace at Floreat Forum and compare to existing supply of floorspace.
4. Consider staging options.

The analysis confirms that the volume of food related floorspace currently supplied at Floreat Forum is in line with the current market share estimates. However, there is a significant potential to provide a greater volume of food catering and non-food retail floorspace at the centre if market shares for these categories increased in line with market penetration for food and grocery retail.

Estimates of market gaps and staging are provided overleaf.

Note: The retail demand forecasts use average retail turnover densities (RTDs) by retail category to estimate floorspace demand.

The RTDs are averages across the national market and are escalated by inflation and real operating costs to account for increased retail trading overheads during the forecast period.

The growth in estimated supportable floorspace is therefore significantly below nominal increases in retail turnover.

Main Trade Area - Supportable Floorspace, 2021 -2031

	Food & Grocery	Off Premise Liquor	Meals Out & Fast Food	Apparel	Household Goods	Leisure	General Retail	Retail Services	Total Retail
2021	47,171	8,733	20,082	16,640	49,307	14,630	14,871	5,385	176,819
2022	48,062	8,899	20,520	16,874	50,096	14,850	15,109	5,482	179,892
2023	48,952	9,064	20,961	17,105	50,879	15,068	15,345	5,578	182,953
2026	52,628	9,747	22,729	18,129	54,235	16,017	16,357	5,980	195,822
2031	**61,198**	**11,345**	**26,814**	**20,592**	**62,190**	**18,281**	**18,756**	**6,924**	**226,102**

17%
Average Market Share

across the MTA for all retail categories

Floreat Forum - Supportable Floorspace, 2021 -2031

	Food and Grocery	Off Premise Liquor	Meals Out and Fast Food	Apparel	Household Goods	Leisure	General Retail	Retail Services	Total Retail
2021	8,150	1,509	3,470	2,875	8,519	2,528	2,569	930	30,549
2022	8,304	1,537	3,545	2,915	8,655	2,566	2,610	947	31,080
2023	8,457	1,566	3,621	2,955	8,790	2,603	2,651	964	31,609
2026	8,611	1,595	3,698	2,995	8,925	2,641	2,692	980	32,136
2031	**8,850**	**1,639**	**3,811**	**3,063**	**9,146**	**2,704**	**2,758**	**1,007**	**32,978**

Market Gap Analysis

Consideration of the opportunity to supply additional floorspace at Floreat Forum has been mindful of several realities and the existing structure of the centre:

1. The need to maintain trading performance and not disrupt existing tenancies where possible

2. The current centre does not have a wide mix of retail anchors apart from the supermarket and small mini major offer. Penetration into the non-food retail market will be difficult.

3. The incomes and demographic in the area present an opportunity to expand retail services, a high-quality restaurant and café offer and an expansion in food and grocery retailing with a potential third anchor or expanded food market.

Potential staging options are outlined in the figure opposite.

01

FOOD GROCERY INCLUDING LIQUOR

- **Expansion in food and grocery offer of circa 4,000 to 5,000 sqm**
- **Expanded liquor retail 500sqm**

02

RESTAURANT AND FOOD CATERING

- **Expanded restaurant offer particularly in unison with residential development post 2026 to 2031 circa 2,000m^2**
- **Increased food court 500m^2**

03

NON-FOOD RETAILING

- **Additional mini major where possible incl. electricla / household goods circa 2,000m^2**
- **Other large retailers difficult to accommodate within site boundary**

	Food & Grocery (incl Liquor)			Restaurant & Food Catering			Non Food Retail			Retail Services			Total		
	Supply	Demand	Gap	Supply	Demand	Gap	Supply	Demand	Gap	Supply	Demand	Gap	Supply	Demand	Gap
2022	7,163	9,841	2,678	2,384	3,545	1,161	3,689	16,746	13,057	847	947	100	14,083	31,080	16,997
2023	7,163	10,023	2,860	2,384	3,621	1,237	3,689	17,000	13,311	847	964	117	14,083	31,609	17,526
2026	7,163	10,206	3,043	2,384	3,698	1,314	3,689	17,252	13,563	847	980	133	14,083	32,136	18,053
2031	7,163	10,489	3,326	2,384	3,811	1,427	3,689	17,671	13,982	847	1,007	160	14,083	32,978	18,895

Note: Non-Food Retail includes Bulky Goods which will not be supplied on site. While demand for these categories exist from shoppers in theory, site constraints and competition mean that they are difficult to accommodate

05
Other Commercial Development Opportunities & Centre

Overview of Benchmarking Approach

The subject site has the opportunity to supply a significant volume of additional non retail commercial floorspace over the forecast period from 2021 to 2031 and beyond.

In addition to the assessment of demand for core retail floorspace and high density residential development we have considered the opportunity to deliver other components of commercial floorspace by conducting a benchmark assessment of mall based sub-regional centres in WA and nationally.

The approach has included consideration of the floorspace mix primarily within the confines of each mall based centre however we have also noted tenancies directly adjacent to each benchmark where appropriate.

The results of the assessment appear on the following slides.



01

Review Benchmark Centres

- Subregional centres
- Anchored by Supermarket



02

Consider non-retail floorspace mix

- Medical and associated services
- Office tenancies
- Recreational facilities



03

Implications for Floreat

- Average volume of floorspace by type
- Opportunity & gap analysis
- Staging advice

Summary Table Benchmarking Assessment: **Medical**

Three broad categories of commercial floorspace were reviewed in the benchmark assessment, medical related uses including wellness, gym / recreation uses and office related floorspace.

The findings of the medical related uses benchmark assessment appear in the table below. The assessment confirms that across all three categories the subject site has a relatively low volume of tenancies including in core medical services, ancillary medical including pharmacies and wellness related services including day spas etc.

While some benchmark centres have larger catchments and anchor visitation generators, the wealth and ageing of the population in Floreat indicates an opportunity for expansion.

Tenancy Type	Benchmark Centre Average no tenancies	Benchmark Centre Sqm average	Floreat Forum Provision tenancies	Floreat Forum Sqm	Gap at Floreat Forum Sqm	Opportunity
Medical GPs / specialists / dental	**3**	**600**	**1**	**260**	**-340**	Based on benchmarks at other sub regional centres Floreat has a low volume of medical centre and specialist floorspace. With aging of the population ad the demographic in the area this type of commercial tenancy could be expanded significantly
Other medical (incl Pharmacy)	**6**	**875**	**4**	**650**	**-225**	There is also an opportunity to deliver a greater volume of ancillary medical including optical, pharmacy and podiatory services etc
Wellness	**7**	**700**	**4**	**230**	**-470**	Most other sub-regional centres had a greater volume of wellness tenancies including day spas, massage, skin care etc. Given the demographic and wealth in the catchment this is also an opportunity

Market Gap = 1,100m^2

Staging - From 2024

Summary Table Benchmarking Assessment: **Commercial Services**

The findings of the assessment of commercial services and office related floorspace is included in the table below. The assessment confirms that benchmark sub-regional services typically have a low volume of office related tenancies including small strata offices. Some benchmark centres have larger volumes of tenancies accommodating suburban businesses including in the professional services sector.

The only centre benchmarked with a significant office offering adjacent to the shopping mall offering was Box Hill in Victoria where a ATO regional office is located. Box Hill enjoys access to a frequent rail service.

Tenancy Type	Benchmark Centre Average no tenancies	Benchmark Centre Sqm average	Floreat Forum Provision tenancies	Floreat Forum Sqm	Gap at Floreat Forum Sqm	Opportunity
Banking / financial services / insurance / real estate	**4**	**625**	**6**	**730**	**105**	The provision of banking and insurance tenancies (i.e. health inurance) is in line with current benchmarks
Strata Office	**2**	**267**	**1**	**215**	**-52**	Most sub regional centres have a relatively low volume of office related floorspace. Tenancies typically include local accounting and legal services together with centre management activities. There may be an opportunit to expand this category of tenancies given the high volume of white collar workers in the surrounding catchment
Head office / anchor tenant	**1**	**833**			**-833**	Corporate head offices are also rare with the exception of large town centres like Box Hill. A site could be set aside for a Government tenancy or related use with accommodation of 2,000 to 3,000sqm however would require active marketing program

Market Gap = 780m^2

Additional strata office of circa 1,000m2 should be supplied together with an anchor campus office tenant if attracted within the short to medium term . Examples include a head office for a utility company, ATO, other Government tenant or corporate

Summary Table Benchmarking Assessment: **Recreational Uses**

Tenancy Type	Benchmark Centre Average no tenancies	Benchmark Centre Sqm average	Floreat Forum Provision tenancies	Floreat Forum Sqm	Gap at Floreat Forum Sqm	Opportunity
Childcare / playcentre / education	**1**	**267**	**0**	**0**	**-267**	Floreat does not currenlty provide floorspace for childcare, play centres or educational facilties. Supply should be adjsuted in the medium term to meet the demand.
Cinema / Gym	**3**	**1,333**	**1**	**1253**	**-80**	Floreat has an existing supply of gym and recreation facilities. A cinema would significantly add to centre visitation as an anchor and assist the performance of food catering tenancies. There are currently cinemas in Innerloo, Leederville and Claremont.
Hotel / short stay	**1**	**n.a.**				This component could be incorporated as part of a boutique hotel or short stat apartment offer in the residential precinct. Between 50 and 100 rooms / units would be an appropriate sizing based on benchmarks. The Alex Hotel in Northbridge is a model that could work.

Market Gap = 350m^2

A childcare centre and boutique cinema post residential development should be planned for – From 2030 onwards.

06
Residential Opportunity Assessment

An assessment of the opportunity for medium and high-density apartment style development has been undertaken utilizing Study Area A and residential demand metrics in the study area.

The assessment considers the opportunity to deliver apartment development on the Floreat Forum activity centre and in the surrounding structure plan frame.

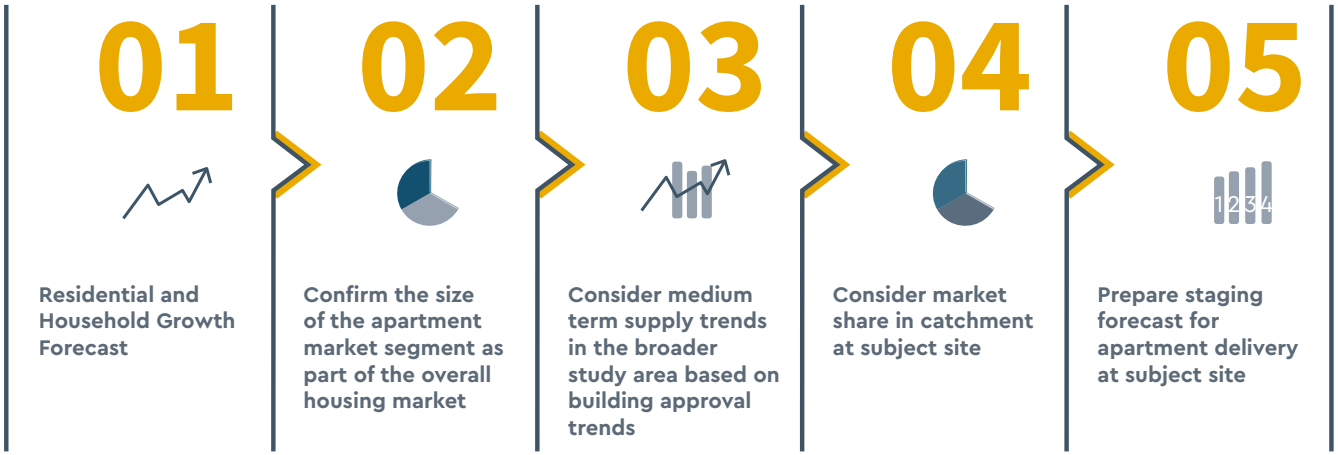
The methodology for the residential demand assessment is outlined in the opposite diagram.

Key data sets include:

- ABS Census of Population and Housing 2011, 2016 and 2021
- WA State Government population Forecasts WA Tomorrow
- ABS small area building approvals trends

It should be noted that the forecast for residential growth in the study area includes consideration of supply at the subject site.

Methodology



Dwelling forecast and market size

To understand the size of the residential housing market in the study area HRD has reviewed population forecasts from the WA State Government and considered the expected volumes of dwelling demand including demand for apartments.

We have also considered the age profile to consider trends in the downsizer market and reviewed the latest data on the dwelling mix in the catchment based on 2021 Census of Population and Housing statistics and forecasts to 2041.

The key data observations are outlined in the opposite table. Based on the assessment, for Floreat and the secondary catchment it can be confirmed that:

Key observations include:

1. **Population and dwelling demand is expected to increase to 2,800 persons and 1,300 dwellings respectively annually between 2021 and 2031.**
2. **Accounting for detached dwelling demolition and a beyond catchment investor market annual dwelling demand could peak at over 1,500 per annum in the catchment**
3. **Apartments are expected to attract up to 50% of buyer segments as land prices escalate and detached dwelling supply is exhausted.**
4. **Based on a 50% share of dwelling supply low and medium density apartment demand will average around 750 per year over the forecast period.**
5. **The Floreat sub-catchment has limited existing apartment projects due to a lack of suitable development sites. The availability of a new development project that is well-located and has access to local services should allow for a 20% share of the overall catchment particularly as the retail and amenity offer at Floreat improves.**
6. **The growing sales performance beyond 2031 will also be supported by a growing investor market from the eastern seaboard as Perth's apartment price are expected to remain at a significant discount with higher rental yields.**
7. **The ageing population, amenity offer (proximity to the beach) and the relative lack of superior local competition may lead to a relatively higher volume of localized demand**
8. **Given the preceding factors justifying a 20% share, forecast demand of around 140-150 apartments per annum over the long term is anticipated**

		Estimated Residential Population Growth					Total Growth
		Population (Persons)					
	Assumption/ Note	2016	2021	2026	2031	2041	2021 to 2041
Floreat		7,900	8,621	8,735	9,265	10,210	1,589
Secondary Catchment		71,692	77,338	91,305	102,835	135,077	57,739
Total		79,592	85,959	100,040	112,100	145,287	59,328
Average Annual Growth			1,273	2,816	2,412	3,319	n.a.
		Annual Dwelling Demand					
Annual dwelling demand	2.2 persons per dwelling	7,900	579	1,280	1,096	1,508	n.a
Total additional dwellings to a/c for demolition	10%	71,692	637	1,408	1,206	1,659	n.a
Adding beyond catchment buyers and investors	10%		700	1,549	1,327	1,825	n.a
		Annual Dwelling Mix					
Detached	10%		70	155	133	183	3,263
Townhouses	40%		280	620	531	730	13,052
Apartments	50%		350	774	663	913	16,315
		Market Share at Floreat					
Apartments	10% share		35	77	66	91	1,632
	20% share		70	155	133	183	2,544

Summary Table Benchmarking Assessment

In parallel to the population driven demand assessment a review of supply trends has also been undertaken. The supply assessment utilizes ABS Building Approvals data at SA2 level for the Floreat SLA and the broader study area.

The supply assessment has considered recent trends in building approvals across the study area including trends in detached and 'other' dwellings which includes apartments and townhouses.

Key observations include:

1. **Across the study area the total volume of building approvals for Townhouses and Apartments has averaged 555 per annum over the 5-year period between 2016 and 2021.**
2. **More recently over the last two financial years including FY 20/21 and FY 21/22 there has been an average of 703 building permits per annum for townhouse and apartment product in the study area.**
3. **This is somewhat less than the indicative demand for medium and high-density dwellings based on future population driven forecasts described on the previous page of this report.**
4. **It can therefore be concluded that there is likely to be significant upside in market activity over coming years in the study area as new suitable development sites are brought forward and population ageing together with downsizer activity accelerates.**
5. **Recovering rental yields in the study area is also expected to drive investor demand as increased population growth and international migration into Perth over the coming two to three years accelerates.**
6. **In the Floreat SLA, no building approvals for Townhouses and Apartments were issued in FY 20/21 and FY 21/22. This is symptomatic of a lack of development sites as opposed to a lack of market demand.**
7. **High density development has been limited in the locality due to a lack of suitable development sites, particularly with the completion of Perry Lakes**
8. **Considering the broader study area there would appear to be demand for apartments which is not being met within Floreat**

Staging strategy at Subject Site

Based on the review of population driven demand and actual supply within the study area a forecast for apartment development at the subject site has been developed.

The forecast considers where the residential market cycle is likely to evolve over the coming 3 to 5 years including broader market drivers such as:

- Growth in immigration
- Maturity of the Perth apartment market and economy more broadly
- Competitiveness of residential investor yields in Perth relative to eastern States.

Development Strategy

The provision of apartment product at Floreat from 2026 to 2028 to 2036 would be feasible at the rate of 50 to 70 units per annum.

The timing of development will also be influenced by local amenity and improvements to Floreat Forum activity centre and its local services.

The staging allows for growth in localized resident demand for an enhanced café and dining / restaurant offer at Floreat Forum.

01

Early Marketing and Site Title Preparation

Timeframe 2023 to 2025 subject to recovery in market conditions including interest rates and population growth

02

Development of Sites with Partner Developers - early Market Maturity

4 * 80-unit developments equivalent to 24,000 sqm of residential GFA (FAR of 4:1)

Timing 2026 to 2029.

Delivered across four project sites @ average of 1,000 sqm per site

03

Ongoing Development Post 2030 with increased Density and Market Maturity

6 * 100-unit developments equivalent to 48,000 sqm of residential GFA (FAR of 6 to 8:1)

Timing 2030 to 2036

Delivered across six project sites @ average of 1,000 sqm per site (height limits TBC)

Retirement Village / Aged Care Opportunity

In parallel to consideration of the size of the apartment market, HRD has also considered the opportunity for the delivery of a retirement village (including Independent Living Units) and the potential co-location of an Aged Care facility.

The overall steps in the methodology to consider the opportunity for both land uses are outlined in the figure below. They include:

- Defining the relevant age cohorts for retirement villages and aged care whereby penetration rates typically adjust materially at 65+ and 85+ respectively
- Confirming the proportion of individuals in each aged group who are housed in retirement villages and aged care nationally and in WA.
- Reviewing the supply of units and beds in the surrounding catchment to consider a market gap
- Confirming market growth in unit and bed numbers
- Considering other market factors including the minimum sustainable operating size of a facility and other drivers including the price of dwellings in the area.

Based on the review of population driven demand and consideration of competing supply a forecast of the need for aged care facilities and retirement village product has also been prepared.

The official State Government – WA Tomorrow forecasts for the study area and Floreat point to significant growth in the 65+ cohort between 2021 and 2041. Key findings include:

- The volume of individuals aged 65+ is expected to increase from 16,945 persons in 2021 to 26,568 persons by 2041 – growth of over 56% or 9,600 persons.
- In Floreat alone the volume of individuals aged 65+ will increase from 1,340 to 3,200 over the same period.

When considering the Aged Care market in Australia there are currently around 245,000 people in permanent residential aged care or nearly 1% of the population.

In general, beds in residential long-term care per 1,000 people aged 65+ equate to 55. This means that around 5.5% of individuals aged 65+ reside in permanent aged care. Based on the population forecast of an additional 9,600 persons across the catchment there will be a requirement for an additional 530 beds / rooms between 2021 and 2041.

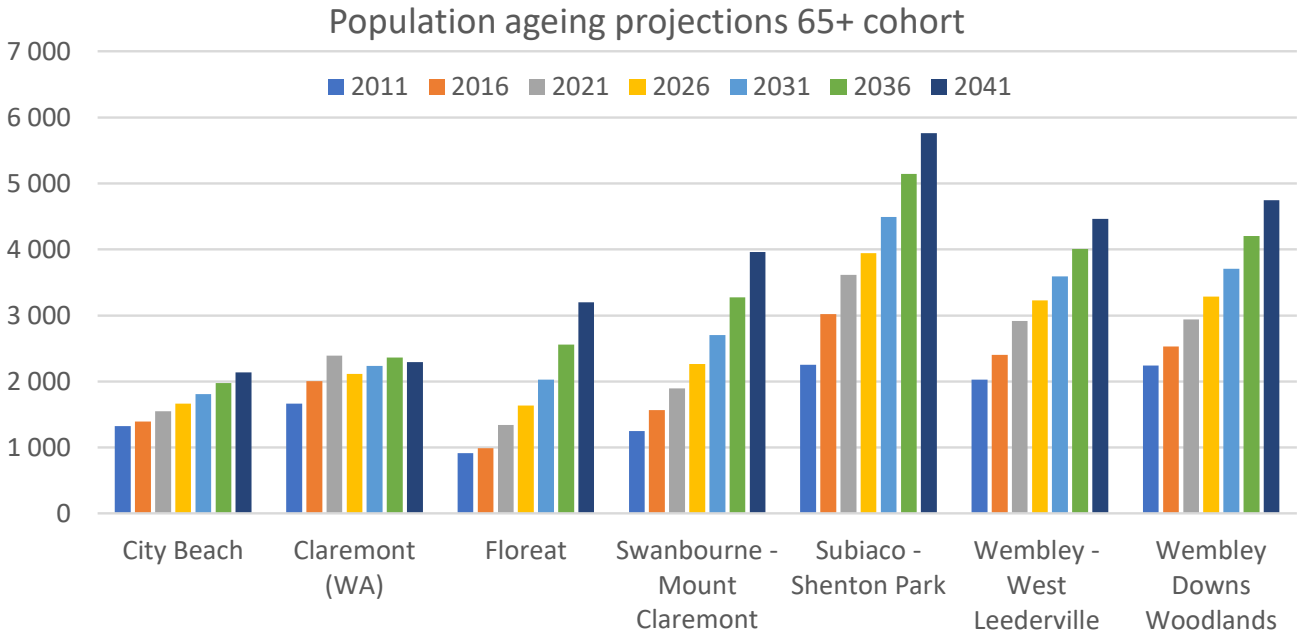
For aged care facilities to work and cover overheads (particularly given the growing regulatory environment) a sustainable facility size that enables research partnerships and provides an appropriate mix of services is circa 80 beds and preferably 100 beds +.

In addition, the aged care facility could include a vertical retirement village facility equates to 100 to 120 independent living units which we could deliver on a 3 to 4 storey site.

Aged care - Australian Institute of Health and Welfare (aihw.gov.au)

Market Gap

A residential aged care facility of 80 to 100 beds could be delivered on a site of from 2026 to 2031 onwards with the potential co-location of a retirement village. This land use could act as an alternative to apartment development depending on market conditions



Competing aged care facilities in the surrounding suburbs are listed below. Based on current bed numbers – supply equates to around 3% of the current population aged 65+ which indicates an under supply.

- Regis Woodlands – 122 rooms
- Bethanie Subiaco – 70 rooms estimated
- Koh I Noor Contemporary Care in Wembley – 80 rooms
- Mercy Care Wembley – 126 rooms (single storey)
- Aegis Montgomery House – Mount Claremont – 80 rooms
- Bethanie Innaloo – 38 beds.

07
Summary of Development Opportunities & Staging

Summary floorspace and land allocation provision

Subject to the modelling assessment of commercial floorspace and consideration of complementary land uses including residential development, an overview of recommended floorspace allocation by type is provided in the tables below. The assessment allocates floorspace according to the categories of:

1. Public Amenity
2. Communal Spaces
3. Activity Drivers including commercial and residential uses.

Puplic Amenity								
Land Use	Floorspace Gap 2021 sqm	Floorspace Gap 2031 sqm	Recommended additional provision sqm	Recommended number tenancies	Assumed FAR	Land allocation	Staging	Strategy
Grocery / Fresh Food (incl Liquor)	2,680	5,000	5,000	3	0.8	6250	From 2030	Additional floorspace could include the expansion of Coles and Woolworths to 1,800-2,000, a smaller supermarket circa 1,800 sqm combined with a larger liquor tenant +500 sqm and a larger independent food market offer +500 sqm
Restaurant and Catering	1,160	1,430	1,400	6	1	1400	From 2030 in stages	The allocation will be reliant on obtaining a local spend including from greater residential density on site. The success of the restaurant / café offer will be influenced by delivery of up to 2,000 new residents on site in apartments and or a greater worker population
Non Food Retail	2,000	3,000	3000	4 to 6	1.5	3300	From 2025 to 2035	Additional non food retail specialities including apparell, homewares and mini-major tenancies will be the most challenging to source given the lack of a Department Store or DDS on site. However they are critical to drawing and retaining market share across the broader retail offer. Tenants such as Best & LEss, JB-HiFi or small discount stores / discount variety etc will be important assets to the tenancy mix
Retail Services	100	160	200		1	200	From 2030	This format is separate from health and welness related services outlined below. There is an opportunity for additional retail service tenancies including drycleaning, clothing alterations based on catchment growth and incomes
Total	**5,940**	**9,590**	**9,600**			**11,150**		The core retail offer can be expanded by circa 8,500 sqm. If feasibilities allow a second storey provision would provide greater land productivity

Communal Spaces								
Land Use	Floorspace Gap 2021 sqm	Floorspace Gap 2031 sqm	Recommended additional provision sqm	Recommended number tenancies	Assumed FAR	Land allocation	Staging	Strategy
Cinema	na	na	1300	1	0.6	2,167	From 2025	Cinema size assumed to be a 9 screen facility at 9*500sqm plus reception area etc. Latest designs should be benchmarked in more detail. There are a number of competing complexes in the area however the cinema offer would assist the subject sites catchment and compliment a restuarant / food offer
Gym / Fitness / recreation	na	na	600	1	0.8	750	From 2028	Increasingly gyms are being located on industrial land to reduce rental and other overheads and allow longer trading hours. A gym footprint could be set aside to be repurposed for a number of uses including a childeens gaming centre or arcade / game facility. All of these land uses will increase catchment and dwell time.
Health & Wellness	500	na	1000	4	1	1000	From 2025	Most other sub-regional centres had a greater volume of wellness tenancies including day spas, massage, skin care etc. Given the demographic and wealth in the catchment this is also an opportunity

Summary floorspace and land allocation provision

The table below provides an overview of recommended land parcel allocations for residential uses. These allocations are preliminary and will be finalised subject to the residential demand assessment in part 7 of this Report.

Activity Drivers

Land Use	Floorspace Gap 2021 sqm	Floorspace Gap 2031 sqm	Recommended additional provision sqm	Recommended number tenancies	Assumed FAR	Land allocation	Staging	Strategy
Aged Care	na	na	8000	1	2	4000	From 2028	An aged care facility requires at least 100 beds / rooms to be viable given current overheads and regulatory costs. The allocation of 8,000 sqm assumes 5,000 sqm of accommodation GFA (100 rooms * 50 sqm) and 3,000 sqm of activity related GFA that could be co-shared with other providers or residents in independent living units if offered in parrallel.
Retirement / Independent Living	na	na	4000	1	2	2000	From 2026	A retirement village with up to 50 independent living units could be incorporated into the aged care facility with co-sharing of recretational floorspace. The site allocation could be reduced depending on density. However one to two storey facilities are geberally preferred in the market unless a high standard of facilities are provided.
Residential Units	na	na	72000 (900 units @ 80sqm per unit)	na	4	18000	From 2025 to 2034	The land allocation will depend on density and height limits. Staging advice will be confirmed in the report. The residential built form could incorporate other uses outlined above on the same site area including cafes, wellness and strata office
Hotel / short stay								This land use will be challenging to provide in this location in the short to medium term however it may be viable in the longer term as the bredth of land uses at the site evolves.