

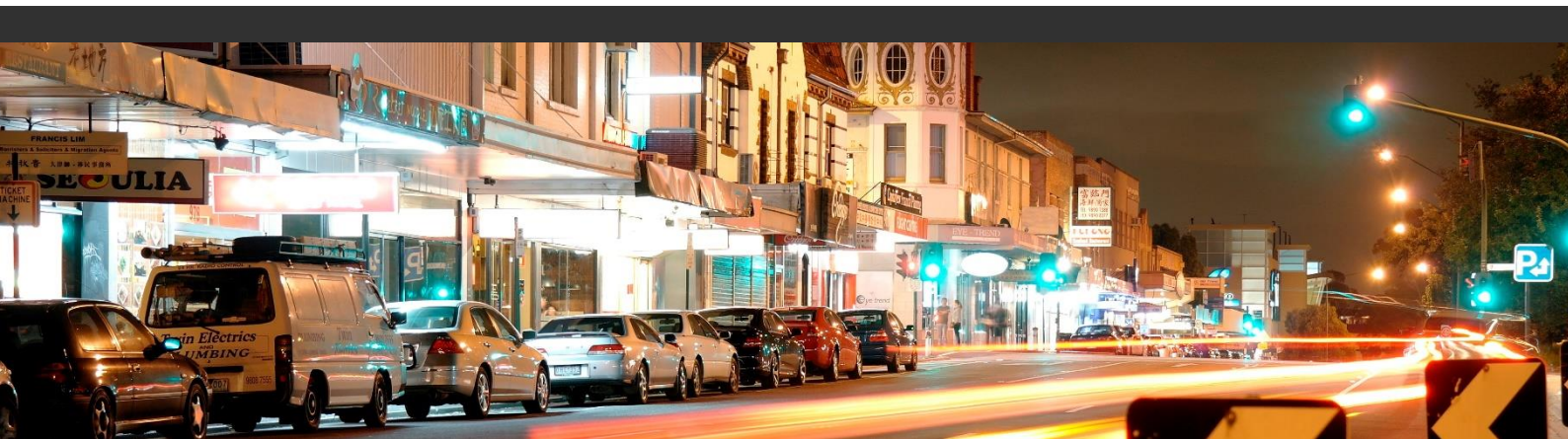
CITY OF WHITEHORSE

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16 – 18 Spring Street, Box Hill

Transport Impact Assessment



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23 January 2019

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CONTENTS

1	INTRODUCTION.....	6
2	EXISTING CONDITIONS	7
2.1	Site Location	7
2.2	Planning Zones	9
2.3	Background.....	9
2.4	Road Network.....	10
2.5	Traffic Volumes.....	12
2.5.1	2015 Survey Volumes	12
2.5.2	Traffic Growth 2015 - 2018	14
2.5.3	Whitehorse Road / Nelson Road Intersection.....	15
2.6	Sustainable Transport	17
2.6.1	General	17
2.6.2	Public Transport	18
2.6.3	Bicycle Facilities	19
2.7	Walkability	19
2.8	Car Parking	20
3	DEVELOPMENT PROPOSAL.....	21
3.1	General	21
3.2	Car Parking	21
3.3	Vehicle Access	22
3.4	Bicycle Parking	23
3.5	Spring Street Extension & Intersection with Nelson Road	24
4	DESIGN CONSIDERATIONS	26
4.1	General	26
4.1.1	Design Standard 1 – Accessways	26
4.1.2	Design Standard 2 – Car Parking Spaces	27
4.1.3	Design Standard 3 – Gradients	27
4.2	Waste Collection.....	28
4.3	Bicycle Parking	28
4.4	Loading and Garbage	28
5	LOADING CONSIDERATIONS	29
6	BICYCLE PARKING CONSIDERATIONS	29
7	CAR PARKING CONSIDERATIONS.....	30
7.1	Statutory Car Parking Requirements.....	30
7.1.1	Proposed Car Parking Provision.....	31
7.2	Car Parking Demand Assessment	31
7.2.1	VC148 Planning Provision Updates	31
7.2.2	Resident Car Parking Demands	32
7.2.3	Medical Centre	32
7.2.4	Education Centre	33
7.2.5	Retail	33
7.2.6	Temporal Variation of Car Parking Demands	34
7.2.7	Anticipated Car Parking Demand.....	37
7.3	Review of Car Parking Provision.....	38
7.3.1	Alternative Modes of Transport	38
7.3.2	Opportunities for Off-Site Car Parking	38
7.3.3	Box Hill Central Activity Area Car Parking Strategy	38
7.3.4	Adequacy of Proposed Car Parking Provision	39
7.4	Accessible Car Parking.....	39
8	TRAFFIC CONSIDERATIONS.....	40
8.1	Traffic Generation	40
8.1.1	Residential	40

8.1.2	Retail Tenancies.....	40
8.1.3	Medical Centre	40
8.1.4	Education Centre.....	40
8.1.5	Anticipated Traffic Generation	41
8.2	Traffic Distribution	41
8.2.1	General	41
8.3	Generated Traffic Volumes.....	42
8.4	Adjacent Development Traffic	44
8.5	Resultant Future Traffic Volumes	46
8.6	Traffic Impact	48
8.6.1	Modifications to SIDRA Phasing.....	48
8.6.2	Intersection Capacity Assessment.....	48
8.6.3	Intersection Operation	51
8.7	Traffic Review	51
8.8	Daily Traffic Volumes – Spring Street Private Road	51
9	SUMMARY OF RFI RESPONSE	53
10	CONCLUSIONS.....	54

TABLES

Table 1	Key Road Configurations.....	10
Table 2	Public Transport Provision.....	18
Table 3	Proposed Development	21
Table 4	Clause 52.06-9 Design Assessment – Design Standard 1	26
Table 5	Clause 52.34 – Bicycle Parking Requirements	29
Table 6	Statutory Car Parking Requirements	30
Table 7	Anticipated Car Parking Demand.....	37
Table 8	Anticipated Traffic Generation	41
Table 9	SIDRA Intersection Parameters	48
Table 10	AM Peak Hour - Existing/Future Conditions	49
Table 11	PM Peak Hour - Existing/Future Conditions	50
Table 12	RFI Response Table.....	53

FIGURES

Figure 1	Site Location.....	7
Figure 2	Aerial View of Site	8
Figure 3	Planning Scheme Zones.....	9
Figure 4	Spring Street North-South, looking South	10
Figure 5	Private Road (Spring Street to Nelson Road), looking West.....	11
Figure 6	Nelson Road	11
Figure 7	AM Peak Hour - Existing Traffic Volumes – April 2015.....	12
Figure 8	PM Peak Hour - Existing Traffic Volumes – April 2015	13
Figure 9	AM Peak Hour Traffic – 4% Volume Growth	14
Figure 10	P M Peak Hour Traffic – 4% Volume Growth.....	15
Figure 11	Whitehorse Road / Nelson Road detector layout	16
Figure 12	PM Peak Hour Existing Traffic Volumes – 18 April 2018	16
Figure 13	TravelSmart Map	17
Figure 14	Public Transport Provision.....	18
Figure 15	Off-Street Car Parking Areas – Box Hill Central Activities Area.....	20
Figure 16	Ground Floor Vehicle Access Arrangements	22
Figure 17	Basement Level 1 – Vehicle Access Arrangements	23
Figure 18	Spring Street Extension Concept Layout	24
Figure 19	PPTN and Parking Overlay Area Maps.....	32

Figure 20	Visitor Parking Demand Profile.....	34
Figure 21	Anticipated Visitor Car Parking Demand	35
Figure 22	Medical Centre Visitor Demand Profile	36
Figure 23	Anticipated Medical Centre Parking Demand.....	36
Figure 24	AM Peak Hour - Generated Traffic Volumes	42
Figure 25	PM Peak Hour – Generated Traffic Volumes	43
Figure 26	RSL – AM Peak Hour Traffic Generation	44
Figure 27	RSL – PM Peak Hour Traffic Generation.....	45
Figure 28	AM Peak Hour - Resultant Future Traffic Volumes	46
Figure 29	PM Peak Hour - Resultant Future Traffic Volumes	47

APPENDICES

APPENDIX A	SWEPT PATH ASSESSMENTS	55
APPENDIX B	SPRING STREET CONCEPT LAYOUT PLAN.....	56

1 INTRODUCTION

onemilegrid has been requested by RCP Project & Development Management to undertake a Transport Impact Assessment of the proposed mixed-use development at 16-18 Spring Street in Box Hill.

This assessment has been prepared to inform both the development plan and town planning applications for the site, noting the proposed development scheme is not proposed to materially change between the two applications. The site also includes an existing accessway which will be upgraded to a private roadway providing access to the site. This land extends from Spring Street to Nelson Road. These works are a requirement of the Development Plan Overlay but are exempt from a requirement for a Planning Permit under the Public Use Zone.

As part of this assessment the subject site has been inspected with due consideration of the development proposal, traffic data has been sourced and relevant background reports have been reviewed.

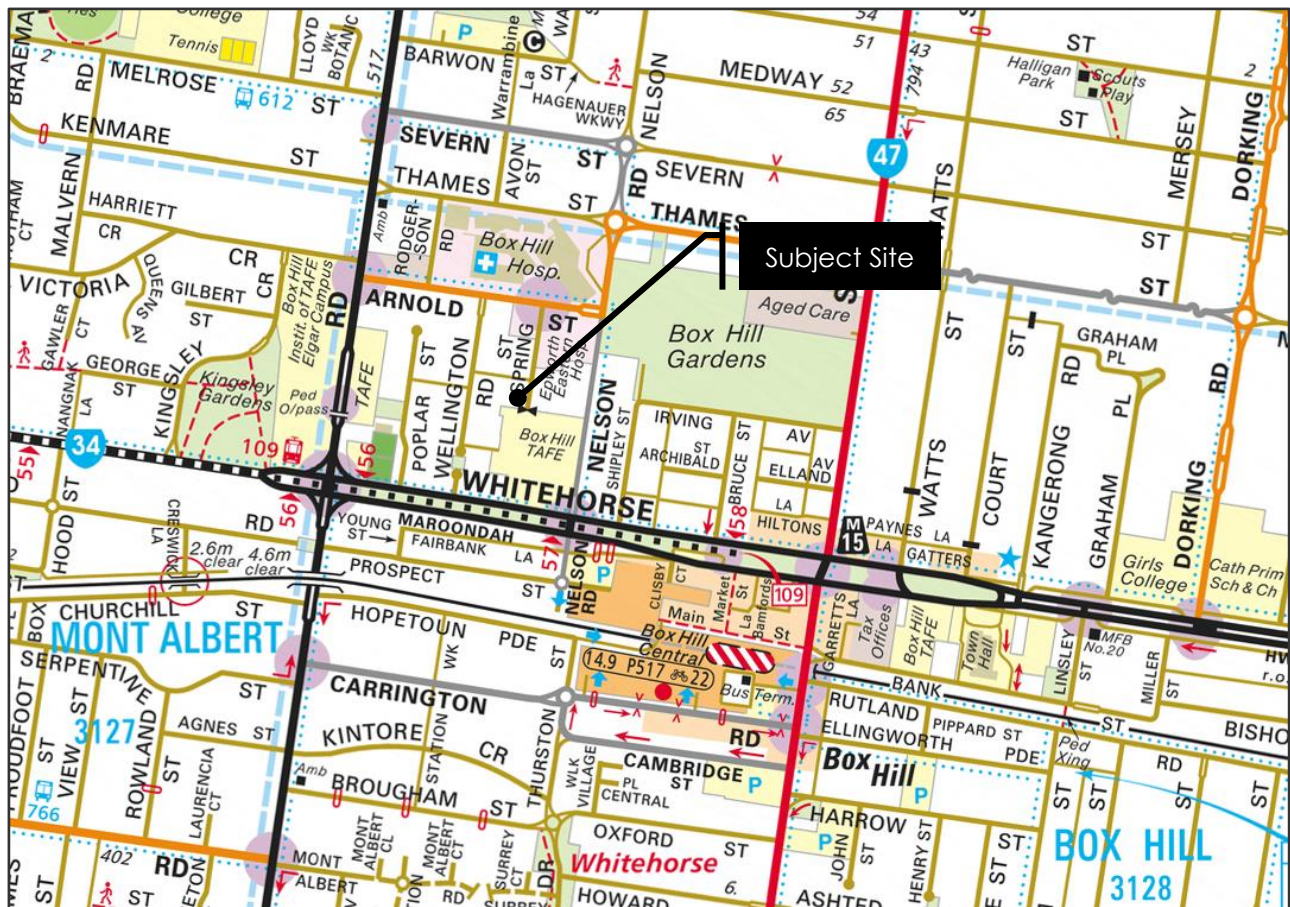
Finally, the following report has also been amended to respond to Whitehorse City Council's Request for Further Information (RFI) (dated Thursday 18 October 2018), with **onemilegrid's** response to these items contained within the report and summarised in Section 9.

2 EXISTING CONDITIONS

2.1 Site Location

The subject site is located on the western side of Spring Street between Box Hill TAFE and Arnold Street, as shown in Figure 1. The site is currently occupied by off-street car parking, with land uses surrounding the site being varied in nature, including Hospitals, education facilities, commercial uses and residential dwellings.

Figure 1 Site Location



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Figure 2 Aerial View of Site

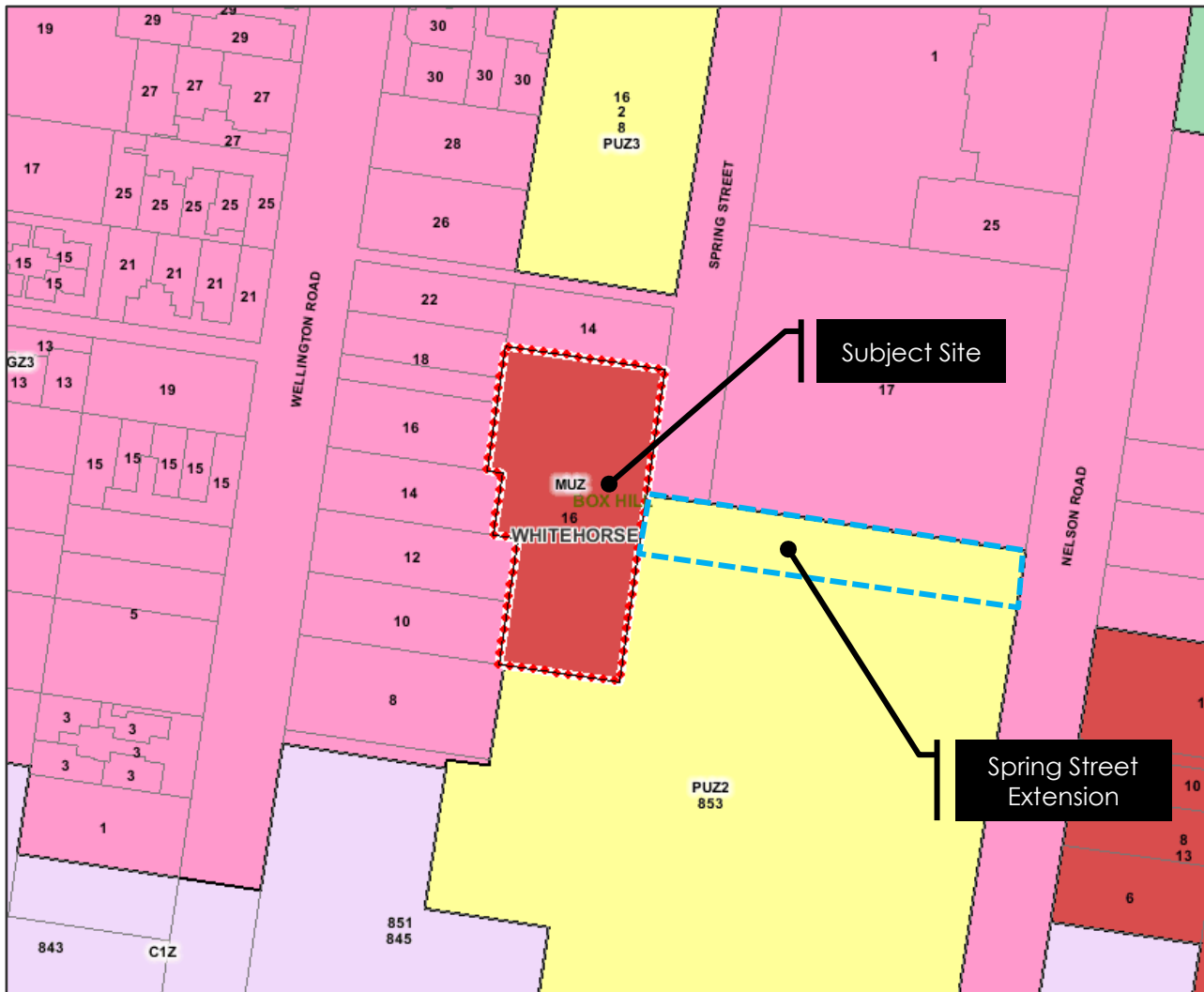


As shown in Figure 2 the site is currently occupied by a number of car parks, including a gravel car park on the northern portion of the site and car parking associated with the Box Hill Institute in the southern portion of the site. Access to the northern car park is currently provided from Spring Street. The southern car park is accessed via Nelson Road to the east. Access to the Box Hill car park from Spring Street is currently closed.

2.2 Planning Zones

It is shown in Figure 3 that the site is located within a Mixed Use Zone (MUZ), for which the permitted uses are listed in Clause 32.04 of the Whitehorse Planning Scheme. In addition, both a development plan overlay (DPO8) and parking overlay (PO1) are applicable to the subject site.

Figure 3 Planning Scheme Zones



2.3 Background

It is understood that the developer has entered into a development deed with the Box Hill Institute to provide additional educational facilities for the Box Hill Institute, a total of 34 car parking spaces and to construct a roadway connection between Spring Street and Nelson Road.

For the roadway connection to Nelson Road, the agreement between the Box Hill Institute and the developer is to provide 90 degree car parking on the north side of the roadway and parallel car parking on the southern side.

2.4 Road Network

A summary of the configuration of key roads in the vicinity of the site is provided in Table 1. The cross-sections of each road are shown in Figure 4 to Figure 6.

Table 1 Key Road Configurations

<i>Road</i>	<i>Alignment</i>	<i>Vehicle Lanes</i>	<i>Bike Lanes</i>	<i>Car Parking</i>	<i>Speed Limit</i>
Spring Street	North-South	One lane in each direction	None	Kerbside, time restricted and ticketed parking. East side of the road only.	50 km/hr
Private Road (Spring Street to Nelson Road)	East-West	One-lane in each direction (Private Road)	None	Kerbside parking, permit and ticketed.	-
Nelson Road	North-South	One lane in each direction	None	Kerbside, time restricted and ticketed parking.	50 km/hr

Figure 4 Spring Street North-South, looking South



Figure 5 Private Road (Spring Street to Nelson Road), looking West



Figure 6 Nelson Road



2.5 Traffic Volumes

2.5.1 2015 Survey Volumes

Traffic volumes were sourced from surveys commissioned by **onemilegrid** on Wednesday 15th April 2015 at the following intersections:

- Arnold Street / Elgar Road;
- Spring Street / Arnold Street;
- Nelson Road / Arnold Street; and
- Nelson Road / Whitehorse Road.

The peak hour results of the surveys are shown in Figure 7.

Figure 7 AM Peak Hour - Existing Traffic Volumes – April 2015

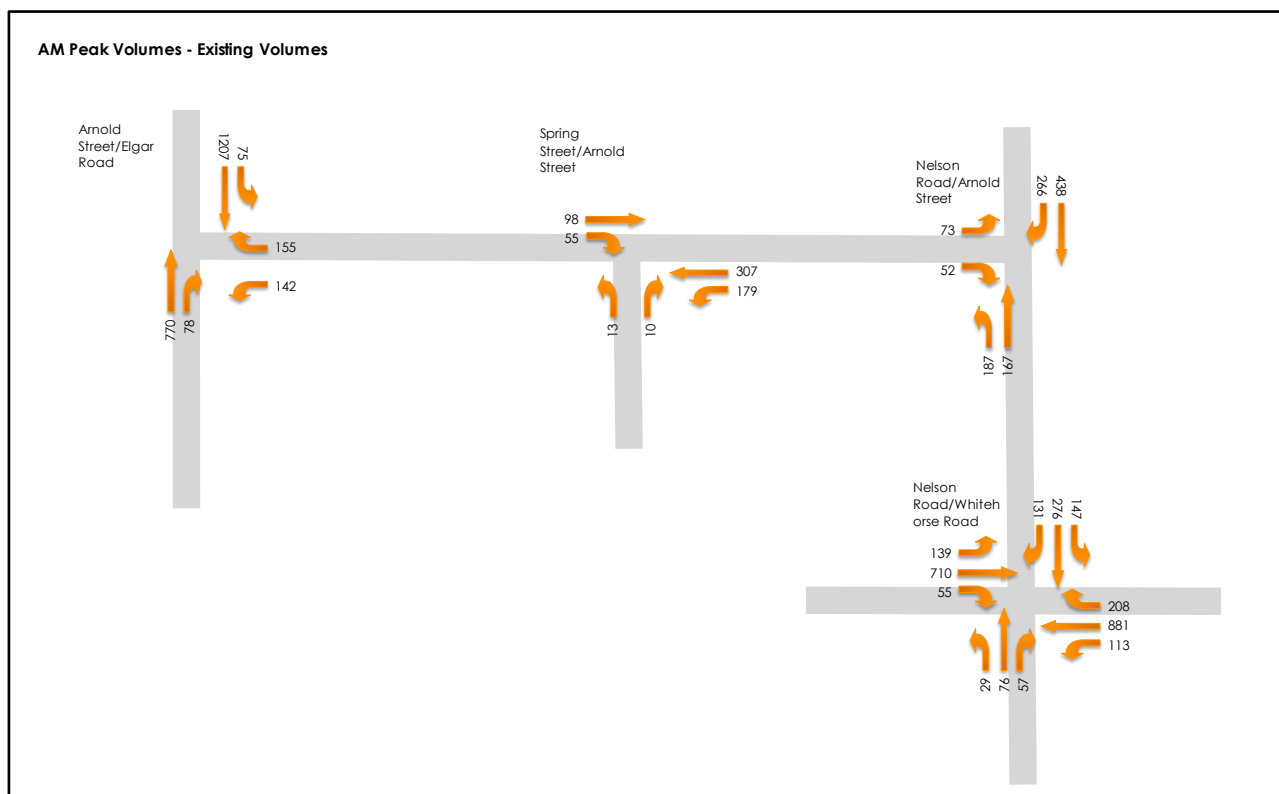
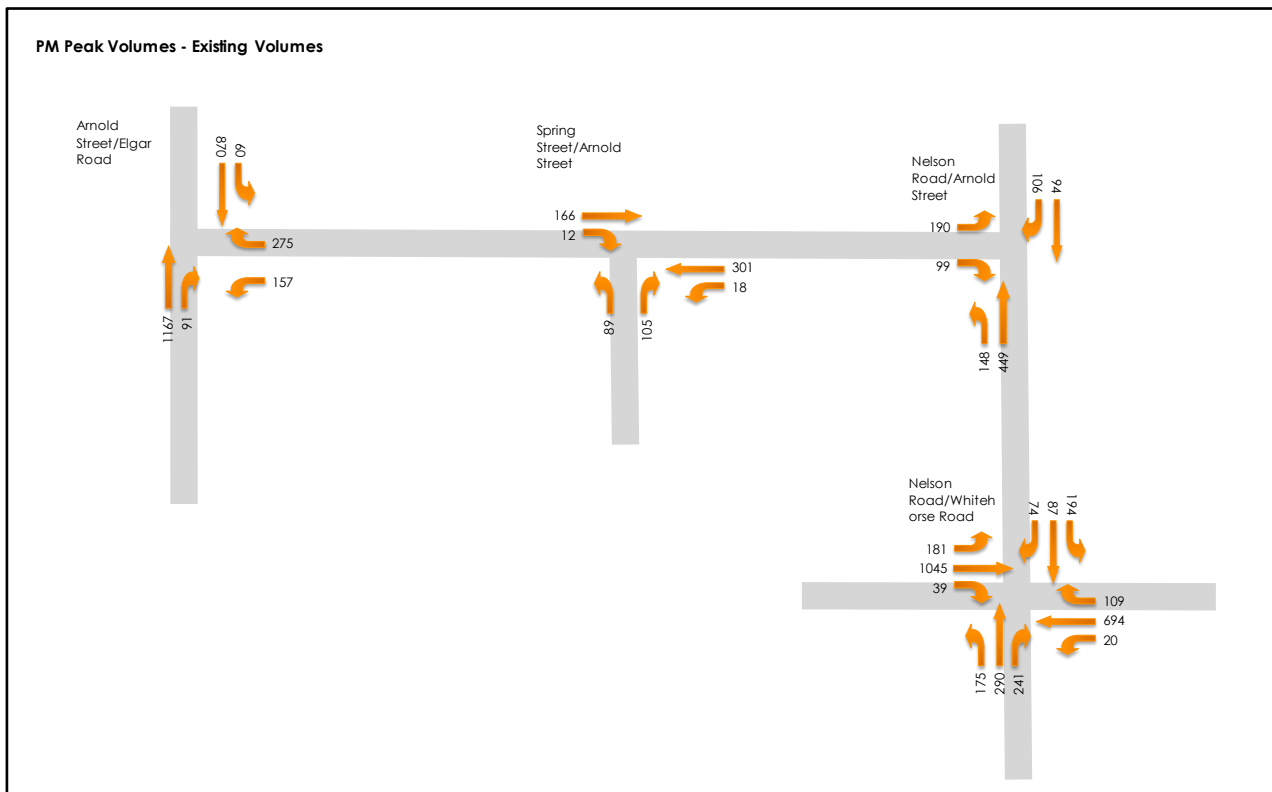


Figure 8 PM Peak Hour - Existing Traffic Volumes – April 2015



2.5.2 Traffic Growth 2015 - 2018

To assess the level of traffic growth between the 2015 and 2018 data, VicRoads' SCATS volume data was sourced for Wednesday 18th of April at the intersection of Nelson Road/Whitehorse Road, this data indicated 4% traffic volume growth between the dates. On this basis, Figure 9 and Figure 10 outline the traffic volume growth expected at each intersection.

Figure 9 AM Peak Hour Traffic – 4% Volume Growth

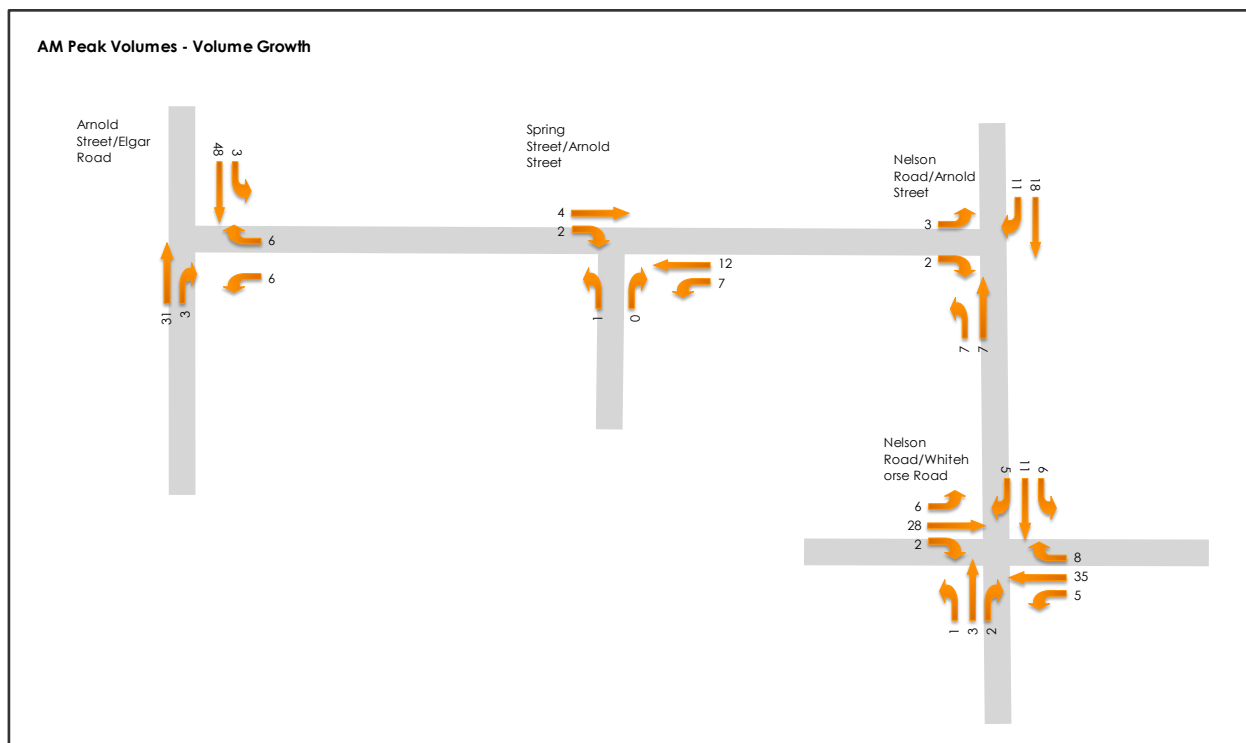
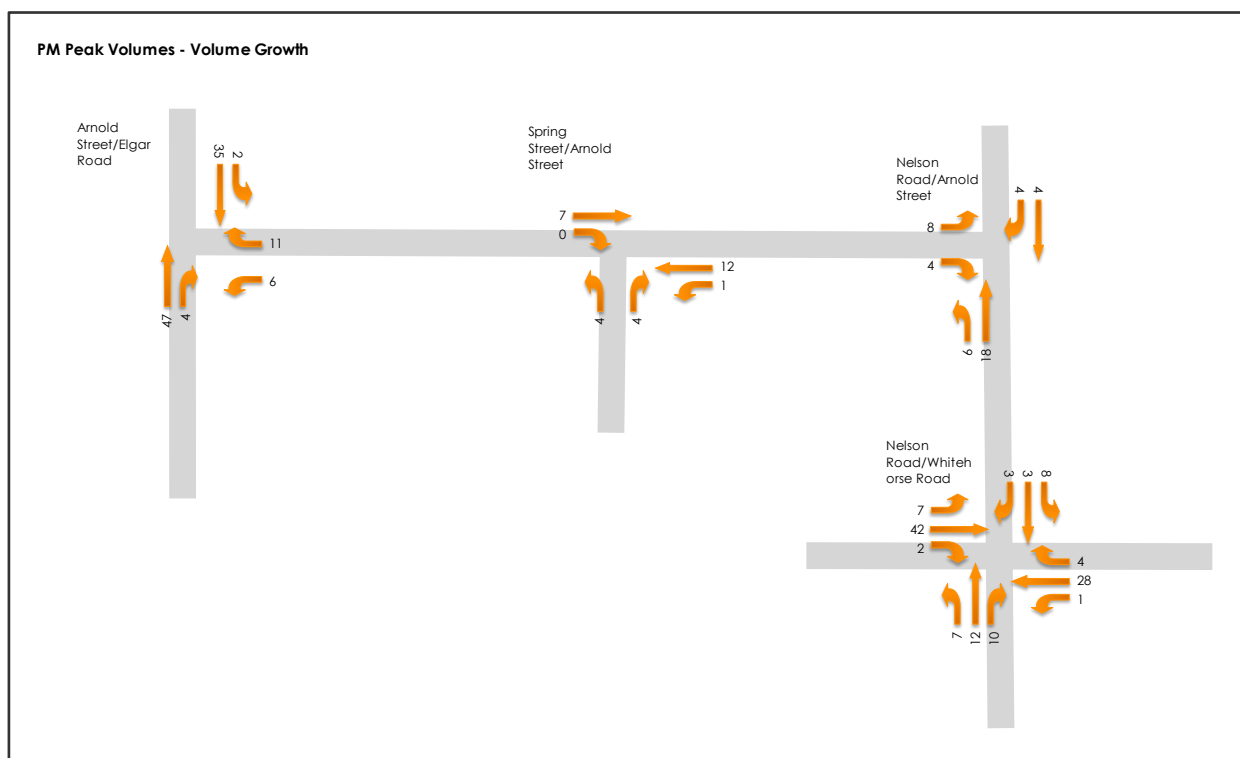


Figure 10 P M Peak Hour Traffic – 4% Volume Growth

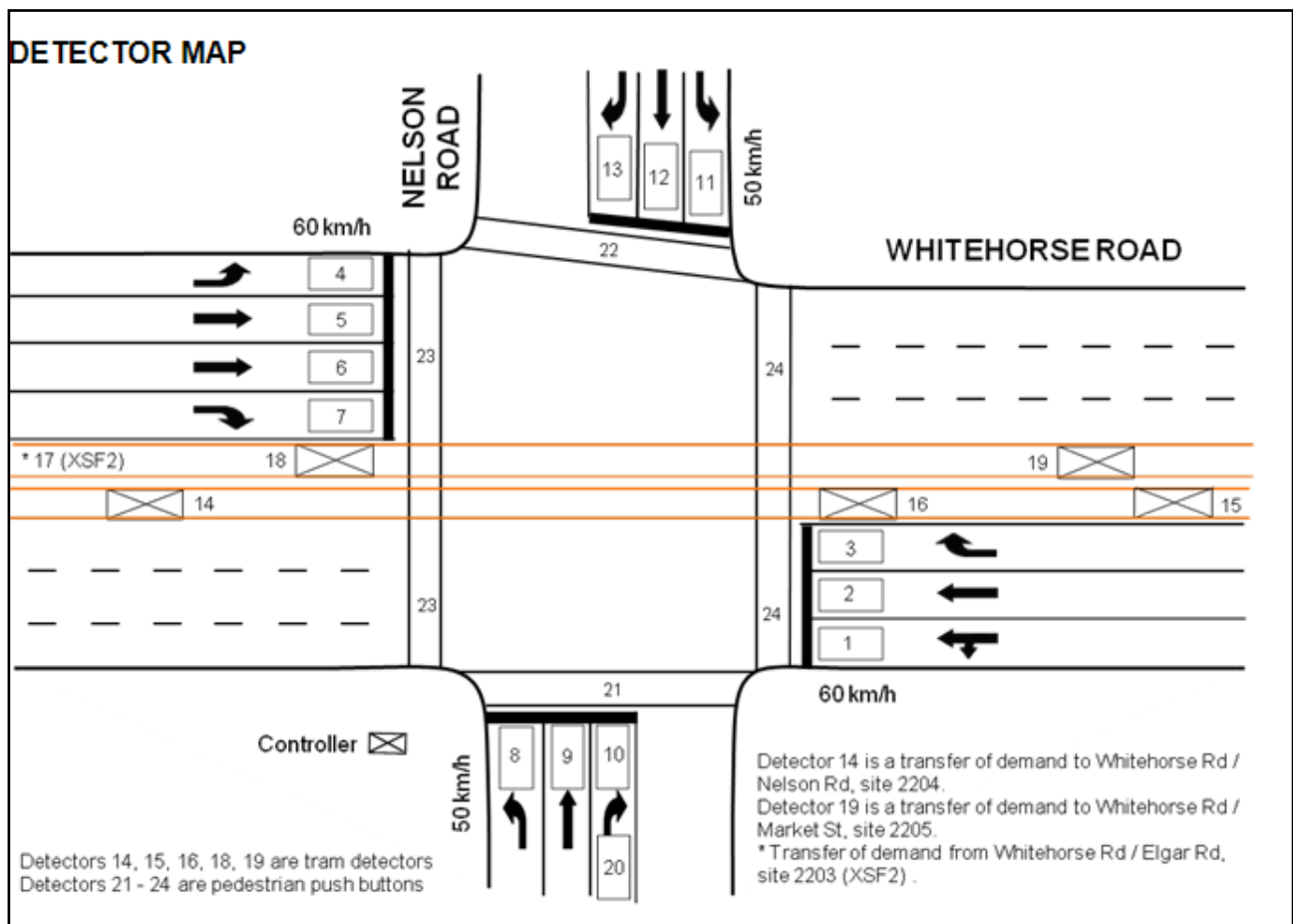


2.5.3 Whitehorse Road / Nelson Road Intersection

As outlined above, the original assessment relied on utilising SCATS data to apply a growth factor to the 2015 surveyed volumes.

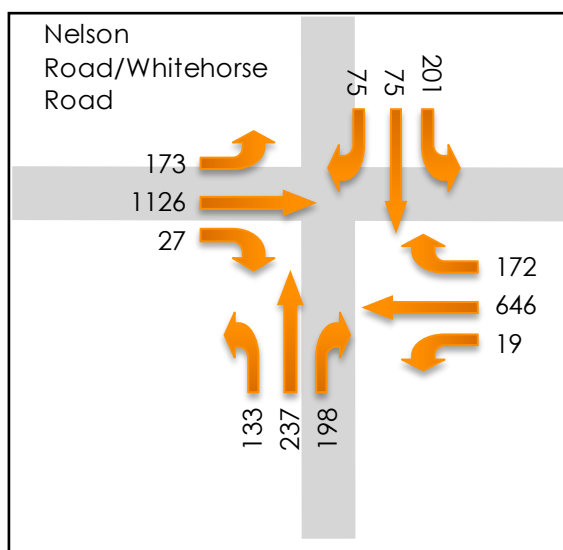
Further interrogation of the SCATS data and detector configuration at the intersection indicates that all but one movement (Detector Loop 1) at the intersection have a dedicated loop counting traffic volumes, as shown in Figure 11.

Figure 11 Whitehorse Road / Nelson Road detector layout



On this basis, to provide a more accurate representation of current traffic volumes at the intersection of Nelson Road/Whitehorse Road the SCATS volumes for Wednesday 18 April 2018 were utilised, with turn volume splits at Detector Loop 1 based on existing splits recorded in 2015. These revised volumes are shown in Figure 12, for the PM peak only, noting that this peak represents the critical peak hour in the previously undertaken assessment.

Figure 12 PM Peak Hour Existing Traffic Volumes – 18 April 2018

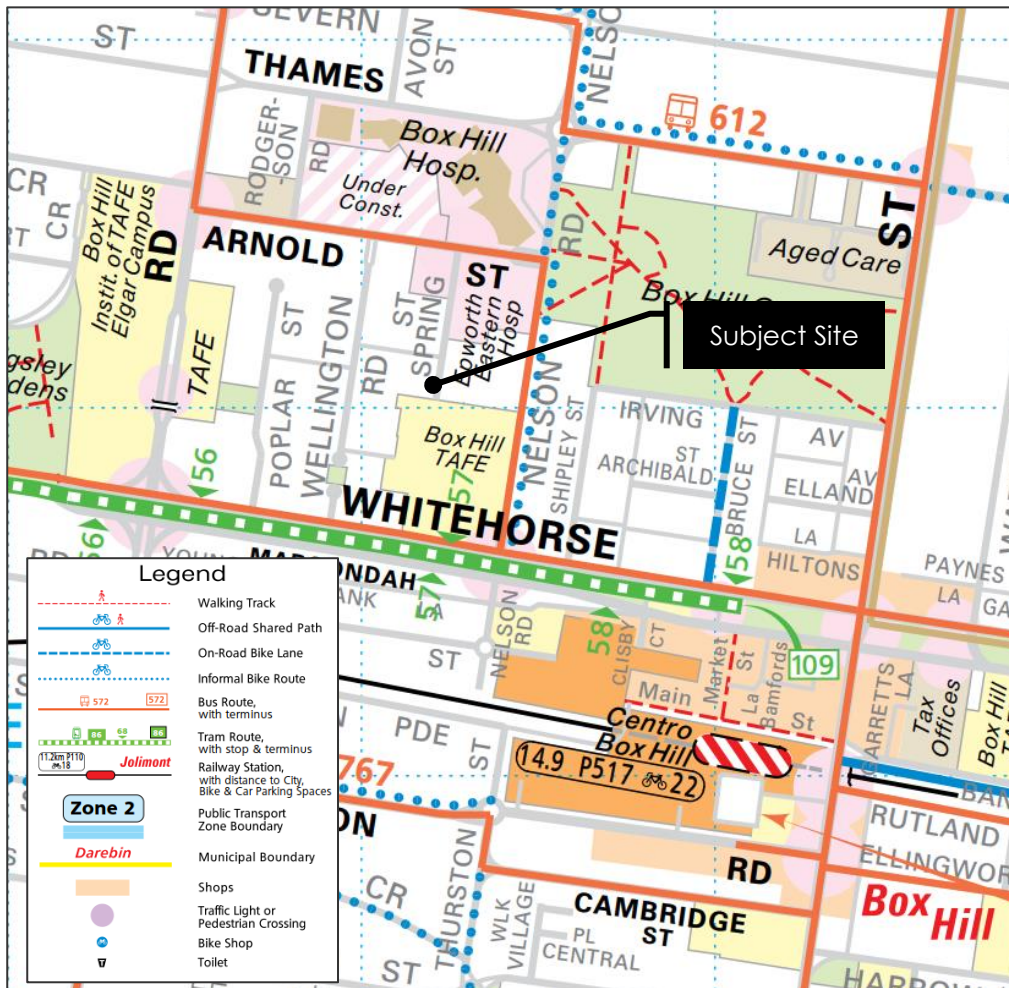


2.6 Sustainable Transport

2.6.1 General

An extract of the TravelSmart Map for the City of Whitehorse is shown in Figure 13, highlighting the public transport, bicycle and pedestrian facilities in the area.

Figure 13 TravelSmart Map



2.6.2 Public Transport

The full public transport provision in the vicinity of the site is shown in Figure 14 and detailed in Table 2.

Figure 14 Public Transport Provision

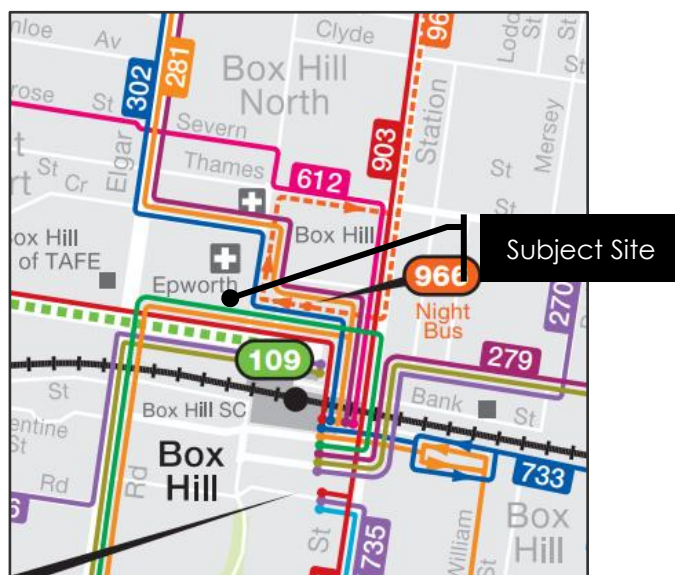


Table 2 Public Transport Provision

Mode	Route No	Route Description	Nearest Stop/Station
Train		Belgrave Line	Box Hill Central
		Lilydale Line	Box Hill Central
Tram	109	Box Hill - Port Melbourne	Nelson Road/Whitehorse Road
Bus	201	Box Hill Station - Deakin University	Box Hill Central
	270	Box Hill - Mitcham via Blackburn North	Box Hill Central
	271	Box Hill - Ringwood via Park Orchards	Box Hill Central
	279	Box Hill - Doncaster SC via Middleborough Rd	Box Hill Central
	281	Templestowe - Deakin University	Nelson Road/Whitehorse Road
	284	Doncaster Park & Ride - Box Hill via Union Road	Box Hill Central
	293	Box Hill - Greensborough via Doncaster SC	Nelson Road/Whitehorse Road
	302	City - Box Hill via Belmore Rd and Eastern Fwy	Nelson Road/Whitehorse Road
	612	Box Hill - Chadstone via Surrey Hills, Camberwell, Glen Iris	Box Hill Central
	732	Box Hill - Upper Ferntree Gully via Vermont South, Knox City, Mountain Gate	Box Hill Central
	733	Oakleigh - Box Hill via Clayton, Monash University, Mt Waverley	Box Hill Central

735	Box Hill to Nunawading	Box Hill Central
765	Mitcham - Box Hill via Brentford Square, Forest Hill, Blackburn	Box Hill Central
766	Box Hill - Burwood via Surrey Hills	Box Hill Central
767	Southland - Box Hill via Chadstone, Jordanville, Deakin University	Box Hill Central
903	Altona - Mordialloc (SMARTBUS Service)	Box Hill Central
966	Night Bus - City - Kew - Doncaster Rd - Box Hill	Box Hill Central

The site has excellent public transport accessibility, with a wide variety of transport modes and services servicing the immediate vicinity of the site.

In addition, it is noted that the site is located within 400m of the Principal Public Transport Network (PPTN). The PPTN reflects public transport routes that provide high-quality public transport services supporting integrated transport and land use.

2.6.3 Bicycle Facilities

Limited dedicated bicycle facilities exist in the vicinity of the subject site.

2.7 Walkability

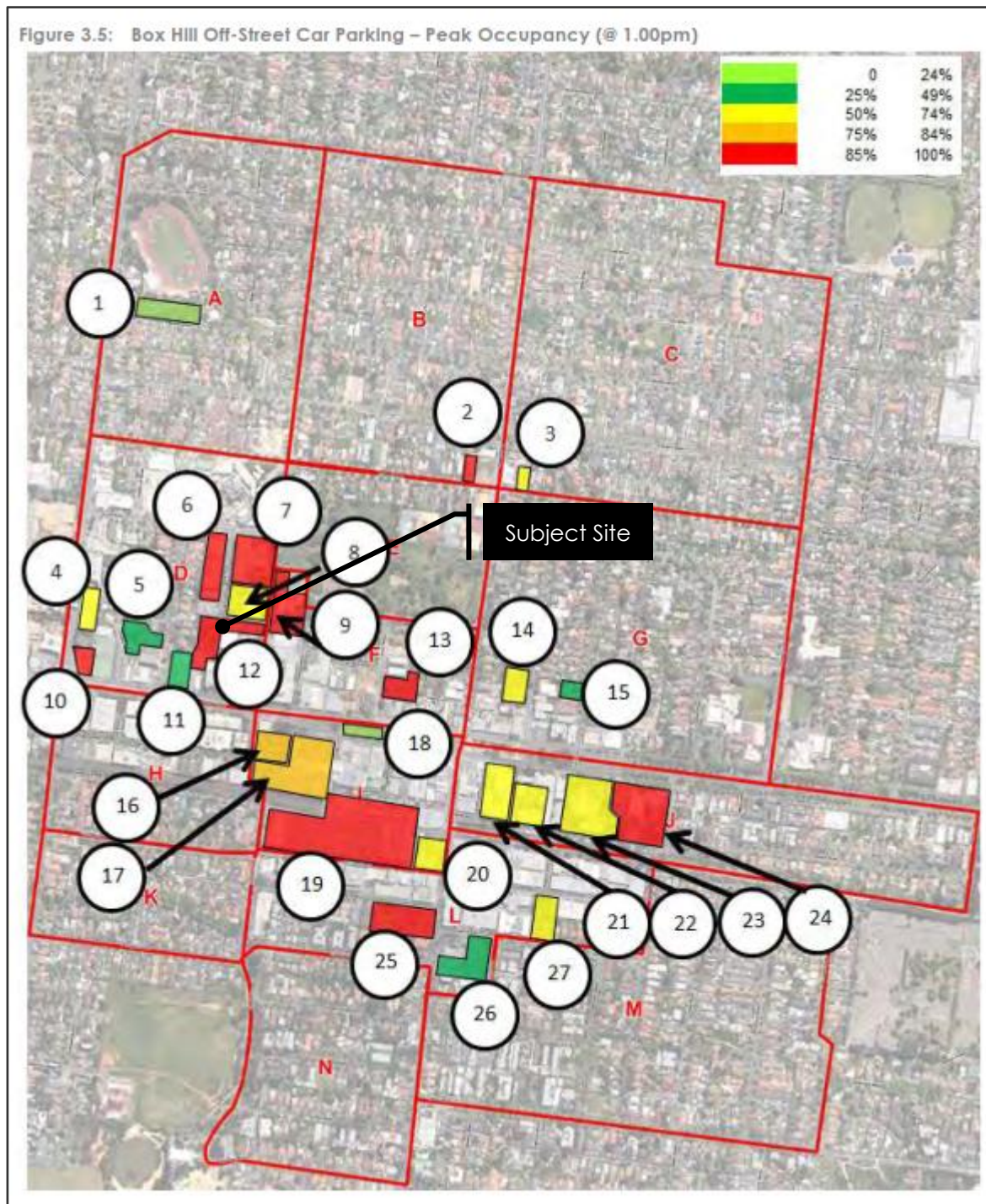
Walkability is a measure of how friendly an area is to walking. Walkability has many health, environmental, and economic benefits. Factors influencing walkability include the presence or absence and quality of footpaths or other pedestrian rights-of-way, traffic and road conditions, land use patterns, building accessibility, and safety.

The website www.walkscore.com offers an online tool to assess the walkability of an address. Based on the tool, the subject site has a Walk Score rating of 82/100 and is classified as a 'Very Walkable', with most errands able to be accomplished by foot.

2.8 Car Parking

Several off-street car parks exist near the site within the Box Hill Activity Centre. In this respect, reference is made to the Box Hill Central Activities Area Car Parking Strategy prepared by GTA Consultants for Whitehorse City Council. The strategy identified a total of 27 off-street car parks within the study area. An extract of the map identifying these car parks and their occupancy has been reproduced below for reference.

Figure 15 Off-Street Car Parking Areas – Box Hill Central Activities Area



3 DEVELOPMENT PROPOSAL

3.1 General

It is proposed to develop the subject site for the purposes of a mixed-use development, containing a number of uses, as shown in Table 3.

Table 3 Proposed Development

<i>Component</i>	<i>No/Area</i>
Studio/1-Bedroom Apartment	117
2-Bedroom Apartment	151
3-Bedroom Apartment	31
Total Apartments	299
Food & Drink	398sqm / 5 tenancies
Medical Centre	2,010sqm / 13 practitioners
Education Centre (Box Hill Institute)	4,288qm / 360 students

3.2 Car Parking

A total of 369 car spaces are proposed across five basement levels, including 36 tandem bays (72 spaces).

3.3 Vehicle Access

Vehicle access to the basement car park is proposed via the creation of a laneway on the sites northern boundary accessed via Spring Street to the east.

To facilitate access to the proposed loading area a traffic signalling system is proposed. The system will detect vehicles greater than 2.4m height as they pass the loading area. When a loading vehicle is detected a red light will hold vehicles at the top of the basement ramp as well as within the laneway, whilst the loading vehicle undertakes its reverse manoeuvre into the shared loading area. The location of the proposed traffic signals, hold line marking and height detection are shown in Figure 16.

In addition, access to both the loading area and basement will be controlled via roller doors. The roller door providing access to the basement car parking level will remain open during typical medical centre operating hours. An intercom will be provided along the laneway (as shown) to facilitate after hours access, with residents capable of buzzing in guests.

At basement level 2, a second roller door is proposed to limit access to the lower basement levels to residents. This arrangement is shown in Figure 17.

Figure 16 Ground Floor Vehicle Access Arrangements

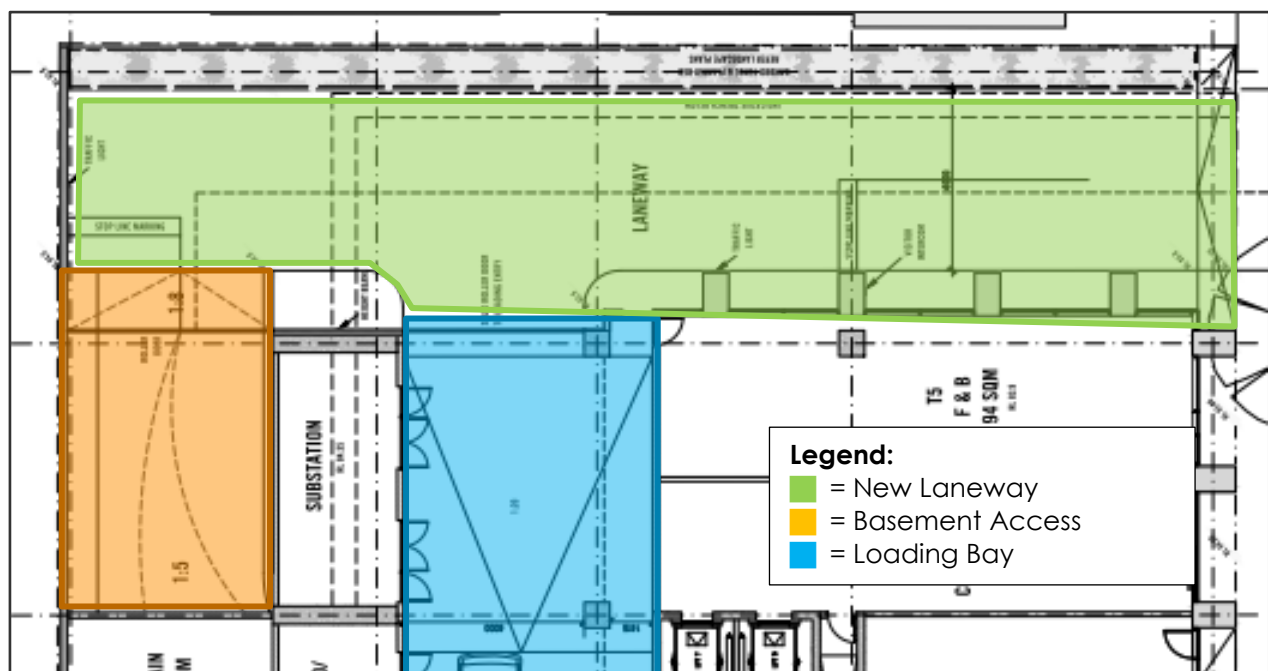
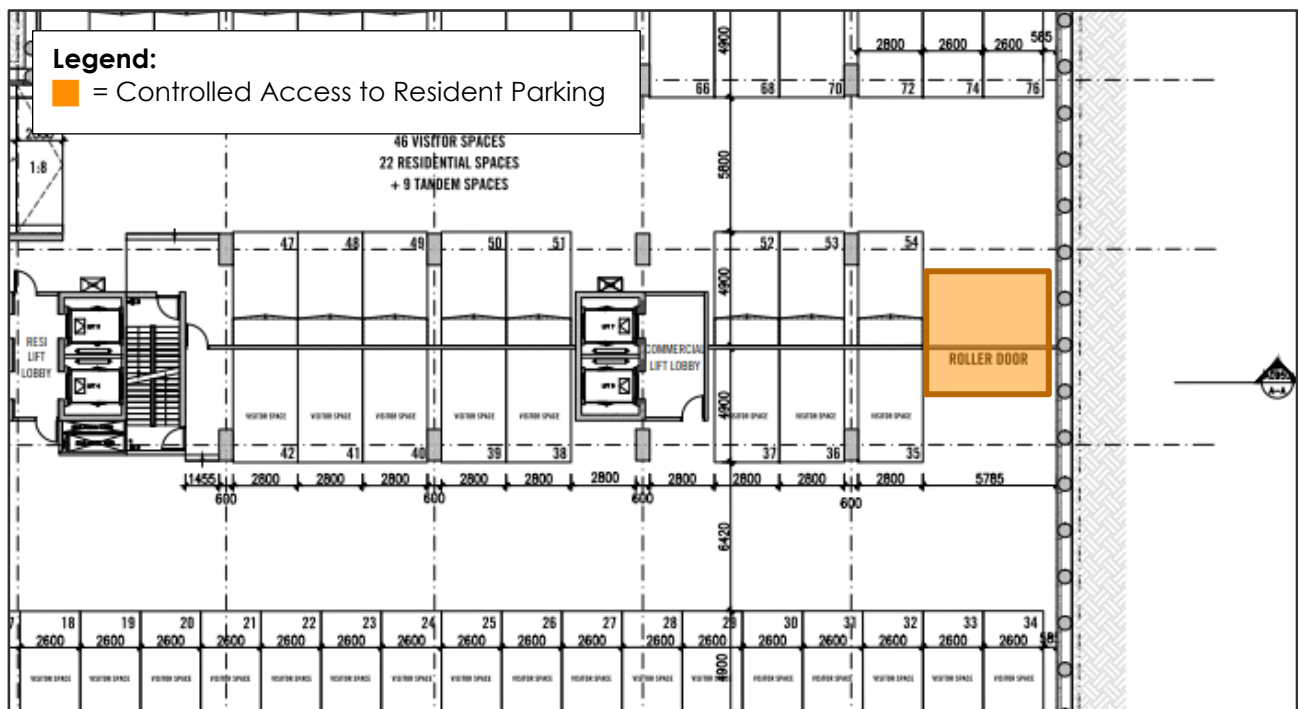


Figure 17 Basement Level 1 – Vehicle Access Arrangements



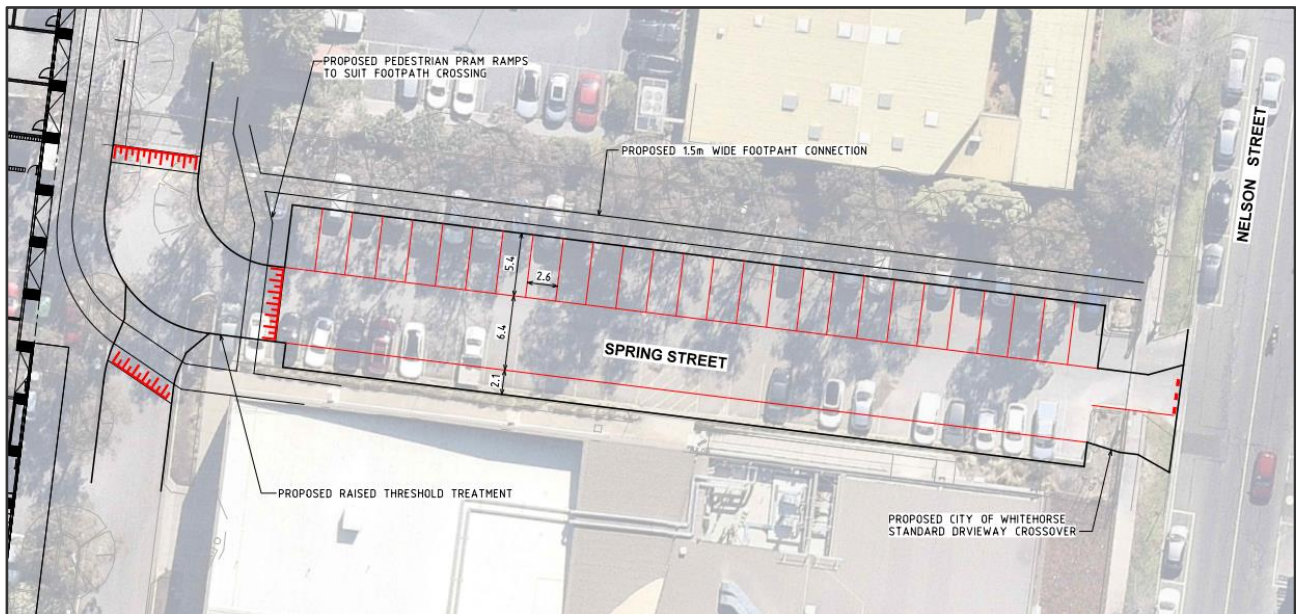
3.4 Bicycle Parking

A total of 120 bicycle parking spaces are proposed within secure compounds on basement level 1.

3.5 Spring Street Extension & Intersection with Nelson Road

As part of the proposed development, it is understood that Spring Street will be extended to connect through to Nelson Road, as shown in Figure 18.

Figure 18 Spring Street Extension Concept Layout



A concept layout plan has been prepared for this extension and is attached in Appendix B. The proposed layout of Spring Street will provide for the following:

- 6.4m two-way road;
- A maximum of 27, 90-degree car parking spaces along the northern boundary (dependent on DDA parking provision);
- A 2.1m Parallel car parking lane which will be capable of accommodating 11 car spaces on the southern boundary;
- A pedestrian path along the southern boundary;
- A 1.5m pedestrian path on the northern boundary;
- A raised threshold treatment at the intersection of the new road and the existing North-South portion of Spring Street; and
- A threshold treatment/crossover to Nelson Road, subject to Council approval;

It is understood that following meetings with Whitehorse City Council that the road will be maintained as a private access road by the Box Hill Institute.

Notwithstanding, the on-street car parking and road width has been designed in accordance with AS2890-5 On-street Parking and the road width is consistent with the existing cross-section of Spring Street. A standard crossover or threshold treatment is proposed to Nelson Road.

In addition, it is anticipated that the road will operate with characteristics similar to that of a pedestrian shared area with alternate roadway treatments and a speed limit of 10km/hr. The specific function of the road and relevant treatments will be incorporated in the detailed design of the road.

The suitability of the proposed connection to Nelson Road with regards to traffic impacts is assessed in Section 8.6.3.5 of this report.

In addition, swept paths have been undertaken to demonstrate the ability for vehicles to satisfactorily access the proposed Spring Street extension, including the an 8.8m service vehicle. These swept paths are provided in Appendix B of this report.

4 DESIGN CONSIDERATIONS

4.1 General

onemilegrid has undertaken an assessment of the car parking layout and access for the proposed development with due consideration of the Design Standards detailed within Clause 52.06-9 of the Planning Scheme. A review of those relevant Design Standards is provided in the following section.

4.1.1 Design Standard 1 – Accessways

A summary of the assessment for Design Standard 1 is provided in Table 4.

Table 4 Clause 52.06-9 Design Assessment – Design Standard 1

Requirement	Comments
Be at least 3 metres wide	Satisfied – minimum ramp width of 5.5 metres
Have an internal radius of at least 4 metres at changes of direction or intersection or be at least 4.2 metres wide	Satisfied
Allow vehicles parked in the last space of a dead-end accessway in public car parks to exit in a forward direction with one manoeuvre	Satisfied – no publicly available car parking is located at the end of a dead-end aisle
Provide at least 2.1 metres headroom beneath overhead obstructions, calculated for a vehicle with a wheelbase of 2.8 metres	Satisfied – a minimum height clearance of 2.1 metres is achieved
If the accessway serves four or more car spaces or connects to a road in a Road Zone, the accessway must be designed so that cars can exit the site in a forward direction	Satisfied
Provide a passing area at the entrance at least 6.1 metres wide and 7 metres long if the accessway serves ten or more car parking spaces and is either more than 50 metres long or connects to a road in a Road Zone	N/a – does not connect to a road zone. Notwithstanding, the accessway has been designed to accommodate two-way vehicle flows.
Have a corner splay or area at least 50 per cent clear of visual obstructions extending at least 2 metres along the frontage road from the edge of an exit lane and 2.5 metres along the exit lane from the frontage, to provide a clear view of pedestrians on the footpath of the frontage road. The area clear of visual obstructions may include an adjacent entry or exit lane where more than one lane is provided, or adjacent landscaped areas, provided the landscaping in those areas is less than 900mm in height.	Satisfied
If an accessway to four or more car parking spaces is from land in a Road Zone, the access to the car spaces must be at least 6 metres from the road carriageway.	N/a – does not connect to a road zone.

4.1.2 Design Standard 2 – Car Parking Spaces

Car parking spaces are proposed to be provided as a mixture of Planning Scheme compliant dimensions and will include:

- 2.6m wide by 4.9m long spaces accessed via a 6.4m wide aisle;
- 2.8m wide by 4.9m long spaces accessed via a 5.8m wide aisle; and
- 2.8m wide by 4.9m long spaces accessed via a 6.4m wide aisle.

Spaces adjacent to walls have been suitably widened in accordance with Design Standard 2 of the Planning Scheme.

In addition, a number of tandem bay are proposed, these bays are generally dimensioned between 2.8m and 2.6m wide with the rear space provided as 5.4m long (total tandem bay length 10.3m) according with Planning Scheme requirements.

No disabled car parking has been provided on-site, it is recommended that any disabled parking is designed in accordance with the Australian Standards and Planning Scheme requirements. Specifically, accessible bays should be provided with an adjacent shared area, in accordance with the with the Australian Standard for Off-Street Parking for People with Disabilities AS2890.6.

4.1.3 Design Standard 3 – Gradients

The laneway entrance to the site will be at-grade complying with Planning Scheme requirements. Following this the proposed ramping into the basement car park is proposed to be provided at a grade of no more than 1:5 in accordance with the requirements of Design Standard 3. Transitions are provided where changes of grade exceed 12.5%, and transition lengths have been designed to prevent potential scraping.

4.2 Waste Collection

Refer to the Waste Management Plan for further information.

4.3 Bicycle Parking

A total of 120 bicycle parking spaces are proposed, including 20 'Ned Kelly' style vertical hanging bikes and 100 spaces provided within a Josta Two-Tier System.

The design of the parking area is generally in accordance with Australian Standard requirements and manufacturer specifications and is considered appropriate.

4.4 Loading and Garbage

A dedicated loading bay has been provided for the development. Swept path assessments have been undertaken to demonstrate the ability for the loading bay to be accessed by vehicles up to and including 10.7m Compactor Truck. These swept paths are attached as Appendix A.

5 LOADING CONSIDERATIONS

Clause 65 (Decision Guidelines) of the Whitehorse Planning Scheme identifies that “Before deciding on an application or approval of a plan, the responsible authority must consider, as appropriate: The adequacy of loading and unloading facilities and any associated amenity, traffic flow and road safety impacts.”

A dedicated loading area is proposed on ground level to service the retail and commercial uses on the site. As outlined in Section 4.4, swept paths have been undertaken demonstrating the loading bay is able to be accessed by vehicles up to and including an 10.7m Compactor Truck. This level of loading provision is considered appropriate for the proposed development.

6 BICYCLE PARKING CONSIDERATIONS

The bicycle parking requirements for the subject site are identified in Clause 52.34 of the Whitehorse Planning Scheme, which specifies the following requirements for the different components of the proposed development.

Table 5 Clause 52.34 – Bicycle Parking Requirements

Component	No/Area	Requirement	Total
Dwelling (four or more storeys)	299 dwellings	1 space per 5 dwellings for residents	60
		1 space per 10 dwellings for visitors	30
Education Facility	9 staff ¹	1 space per 20 employees	0
	360 students	1 space per 20 full-time students	18
Medical Centre	13 practitioners	1 space per 8 practitioners for employees	2
		1 space per 4 practitioners for visitors	3
Retail	398m ²	1 space per 300m ² for employees	1
		1 space per 500m ² for visitors	1
Total		Residents	60
		Students	18
		Employees	3
		Visitors	34
		Total	115

¹ Estimate based on 1 staff member per 40 students

Furthermore, where 5 or more employee bicycle spaces are provided, employee facilities are required in accordance with Clause 52.34 of the Whitehorse Planning Scheme. As only 3 staff spaces are required, additional facilities are not required.

A total of 120 bicycle parking spaces are proposed, satisfying the bicycle parking requirements for the site.

7 CAR PARKING CONSIDERATIONS

7.1 Statutory Car Parking Requirements

The subject site is affected by a parking overlay (Clause 45.09 of the Whitehorse Planning Scheme). Schedule 1 to the parking overlay sets out the minimum number of car spaces to be provided for a number of uses within the overlay area, with a permit required to reduce the required parking. Where a use is not listed, the 'Column B' rates of Clause 52.06-5 apply as a minimum.

On this basis, the car parking requirements for those uses listed in the Whitehorse Planning Scheme are outlined below.

Table 6 Statutory Car Parking Requirements

<i>Use</i>	<i>No/Area</i>	<i>Min Rate</i>	<i>Car Parking Measure</i>	<i>Total</i>
Dwelling	117 dwellings	0.5	to each one bedroom dwelling	58
	151 dwellings	0.75	to each two-bedroom dwelling	113
	31 dwellings	1.0	to each three or more bedroom dwelling	31
	Dwelling Residents Sub-Total			202
	5 dwellings	0.2	for visitors to every dwelling for the first five dwellings; plus	1
	294 dwellings	0.1	for visitors to every dwelling for subsequent dwellings	29
	Dwelling Visitors Sub-total			30
Medical Centre	2,010sqm / 13 practitioners	3.5	to each 100sqm of leasable floor area	70
Education Centre	4,288sqm / 360 students	0.3	to each student that is part of the maximum number of students on the site at any time	108
Retail (Food & Drink or Shop)	398sqm	3.5	to each 100sqm of leasable floor area	13
Total				423

Based on the above assessment, the development generates a statutory requirement to provide a minimum of 423 spaces.

7.1.1 Proposed Car Parking Provision

It is proposed to provide 369 car parking spaces on-site allocated as follows:

- Dwelling Residents: 268 spaces, including 36 tandem bays (72 spaces);
- Education Centre: 34 spaces;
- Medical Centre: 16 staff spaces
- Retail Staff: 5 spaces;
- Shared Visitors: 46 spaces.

On the above basis, the proposed development has a shortfall of car parking associated with the education centre, retail, dwelling visitor and medical centre uses.

Clause 52.06-7 of the Whitehorse Planning Scheme indicates that an application to reduce (including reducing to zero) the requirement for car spaces must be accompanied by a Car Parking Demand Assessment. The Assessment must assess the car parking demand likely to be generated by the proposed development, having consideration to:

- The likelihood of multi-purpose trips within the locality which are likely to be combined with a trip to the land in connection with the proposed use.
- The variation of car parking demand likely to be generated by the proposed use over time.
- The short-stay and long-stay car parking demand likely to be generated by the proposed use.
- The availability of public transport in the locality of the land.
- The convenience of pedestrian and cyclist access to the land.
- The provision of bicycle parking and end of trip facilities for cyclists in the locality of the land.
- The anticipated car ownership rates of likely or proposed visitors to or occupants (residents or employees) of the land.
- Any empirical assessment or case study.

An assessment of the likely parking demands and the appropriateness of reducing the car parking provision below them is set out below.

7.2 Car Parking Demand Assessment

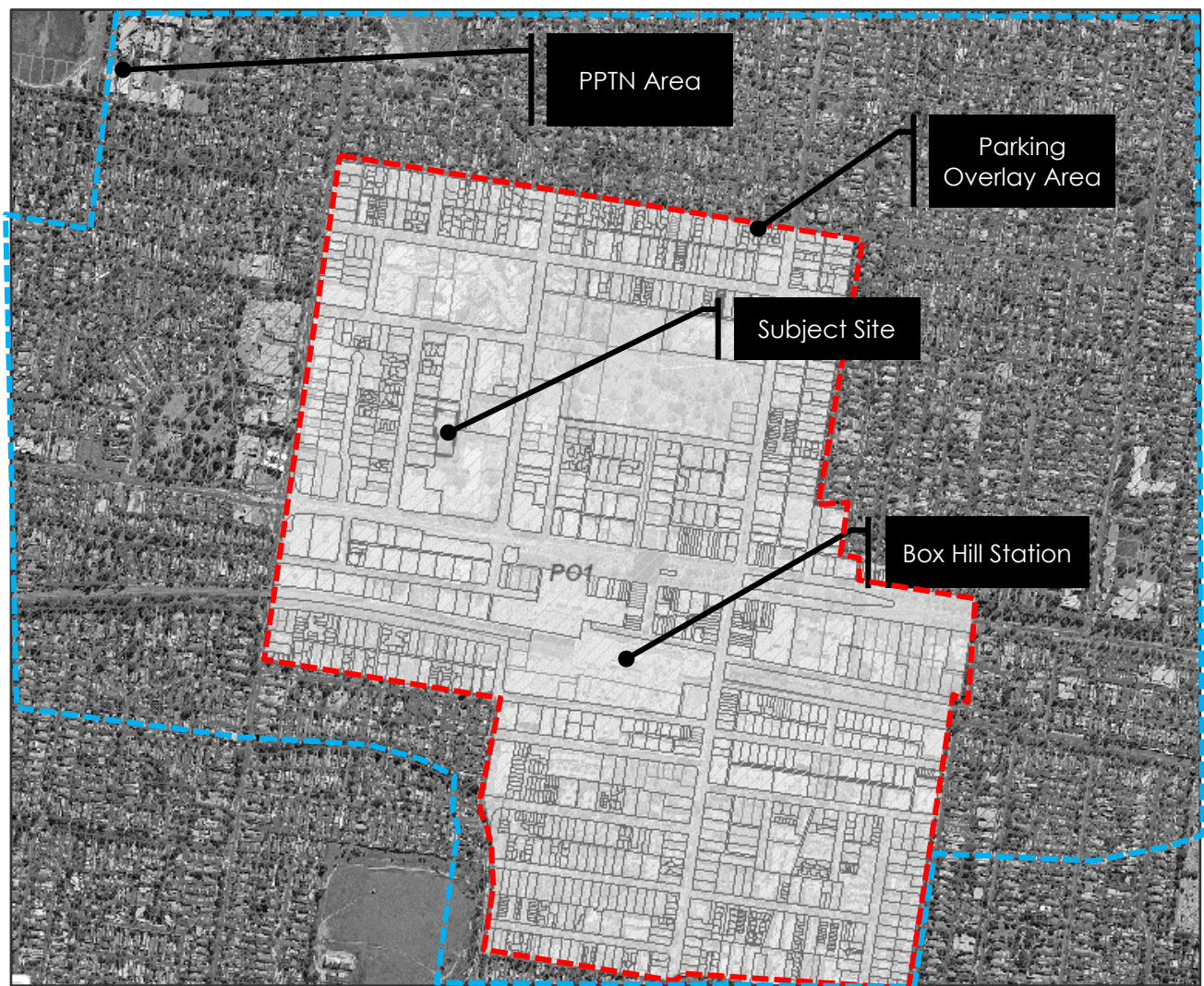
7.2.1 VC148 Planning Provision Updates

On 31 July 2018, amendment VC148 to the Victorian Planning Scheme was gazetted. This amendment contained a number of revisions, including revisions to the car parking requirements for land within walking distance of the Principal Public Transport Network (PPTN). Specifically, the amendment allows for the use of Column B parking rates for development sites identified as being within the PPTN area.

Although this requirement does not apply to the site as it sits within a Parking Overlay, it is considered appropriate to consider the reduced parking requirements allowed for under Column B rates, when assessing the car parking demands of the development. Specifically, consideration is given to the residential visitor requirement with Column B rates of Clause 52.06-5 of the Whitehorse Planning Scheme specifying no requirement for residential visitor parking.

As shown in the figure below, there are a number of locations in the vicinity of the site that are not affected by the Parking Overlay that are capable of adopting the reduced Column B rates for dwelling visitors. These sites, are located further away from the key public transport infrastructure in the area (Box Hill Station).

Figure 19 PPTN and Parking Overlay Area Maps



The adoption of Column B rates for the residential visitor portion of the development should be considered in this instance, noting that this provision will result in better design outcomes for the building, noting that on-site residential visitor parking is typically poorly managed, underutilised or used by residents for long-term car parking.

7.2.2 Resident Car Parking Demands

The resident car parking requirements set out Clause 45.09 of the Whitehorse Planning Scheme are considered appropriate to adopt as a minimum for the site, noting that the rates are consistent with ABS Census 2016 data.

7.2.3 Medical Centre

With regards to the Medical Centre use, reference is made to the Box Hill Central Activities Area Car Parking Strategy ('the Strategy') prepared by GTA Consultants for Whitehorse City Council. The Strategy nominates a car parking rate of 2.0 spaces per 100sqm of net floor area for Medical Centre type uses.

Application of this equates to a car parking demand of 41 car parking spaces for the medical centre. Of this demand, it is expected that 16 spaces will be for staff and 24 spaces will be for visitors.

By way of comparison, adopting Column A rates from Table 1 of Clause 52.06 for Medical Centre uses (13 practitioners), also equates to a car parking demand of 41 spaces.

It is noted that, Column B rates are typically adopted in areas to assist in reducing car parking demands, and in this instance the application of the Column B rate results in a significant increase in the car parking demand when compare to both the Column A rate and empirical evidence.

7.2.4 Education Centre

The education centre car parking requirements set out Clause 45.09 of the Whitehorse Planning Scheme are considered appropriate for a site in an unconstrained location.

With respect to the location of the subject site it is noted that it is located within the Box Hill Activity Centre and is proximate to a number of nearby public transport services (as outlined in Section 2.6).

The location is a constrained in terms of access with moderately to heavily trafficked road space, in part caused by Council's planning policy to encourage and concentrate high density residential development in this area. A statutory planning measure that provides an alignment with the 'CBD' location is provided in the Parking Overlay 1 which sets lower parking rates for dwellings and offices.

In the assessment of the car parking supplied for the Proposal, the land use which is under provided for is 'Education', being the BHI use. Education is not a specified use under PO1. For unspecified uses, the PO1 requirement reverts to Column B of CI 52.06-05. Column B is a lower rate to Column A, reflecting a preference for reduced car parking provision in more intensively developed locations. Under Column B, car parking for educational uses is required at 0,3 car space per student, unless a permit is granted to reduce or waive car parking.

Given this explanation, the Proposal meets the car parking requirements of PO1 for the land uses for which it was designed. That is, the nomination of the education parking rate is an unplanned consequence of adopting a Parking Overlay control.

In the case of BHI parking we note that there are two campuses and in the order of 700 car spaces accessible by students. Some of these car spaces are situated immediately south of the Proposal. And, where tertiary campuses are in commercial locations, the provision of car parking is generally very limited.

Additionally, the site is readily accessible by both pedestrians and cyclists with adequate bicycle parking proposed to be provided on-site.

The combination of these factors is likely to result in car parking associated with the institute being generated at rates lower than those outlined within the Planning Scheme.

Notwithstanding, for the purpose of assessment a demand of 108 has been conservatively assumed. As 34 spaces are proposed for staff on-site, the education component results in a shortfall of 74 spaces, likely to be associated with students.

7.2.5 Retail

The proposed retail uses are anticipated to operate in an ancillary manner to the proposed uses within the building, with the majority of the trade generated by these uses coming from existing residents and visitors to the proposed uses at the site. In this respect, the provision of no visitor car parking for the retail uses is considered acceptable.

With regards to staff demands a single car space is provided for each tenancy (5 total spaces). This equates to a car parking provision of approximately 1 space per 100m².

7.2.6 Temporal Variation of Car Parking Demands

7.2.6.1 Residential Visitors

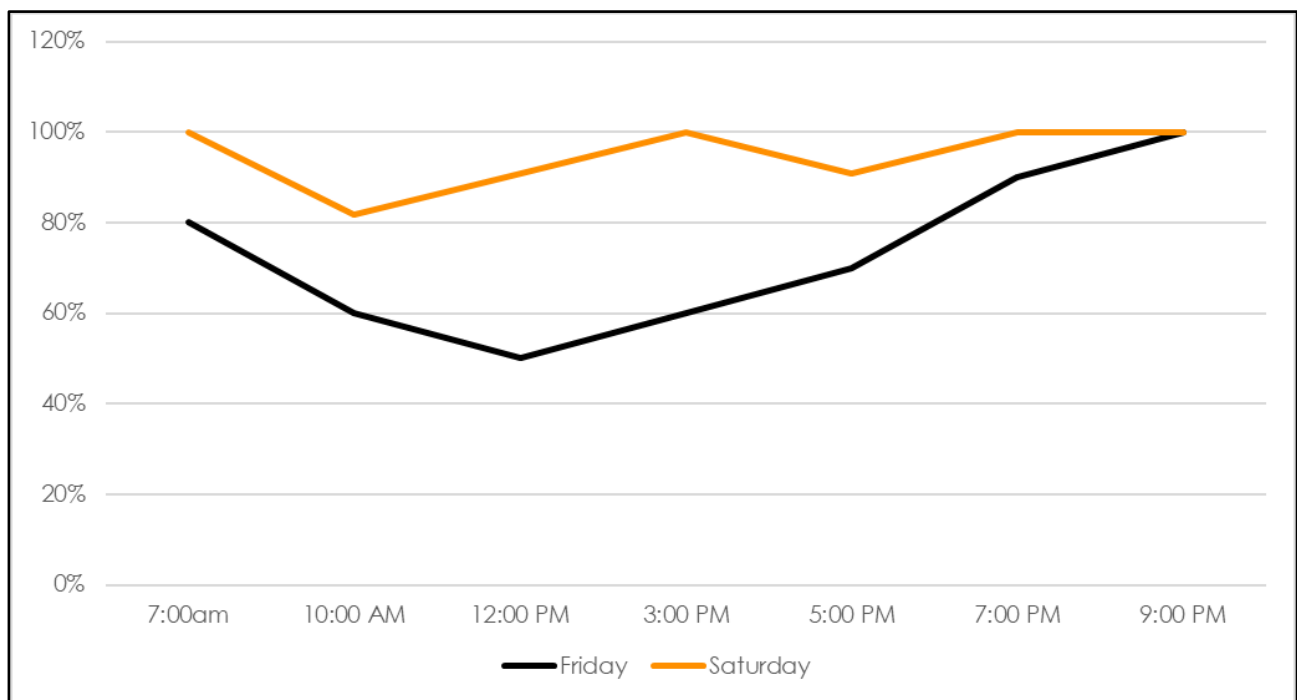
As discussed in Section 7.2.1, it is considered that Column B rates should be applied to the residential visitor component of the development. Notwithstanding, the parking overlay rate has been adopted for the purposes of the temporal demand assessment.

In order to estimate the temporal variation of visitor car parking demands associated with the residential use on-site, reference is made to a visitor parking study undertaken by **onemilegrid** at the 'Scala' apartment complex, located at 1 Roy Street, South Melbourne.

Parking surveys were undertaken on Friday 23rd and Saturday 24th of October 2015 between 7:00 AM and 9:00 PM with a view to establishing a profile of parking demands across a weekday and weekend.

A view of the parking demand profile for both days is provided in Figure 20 below.

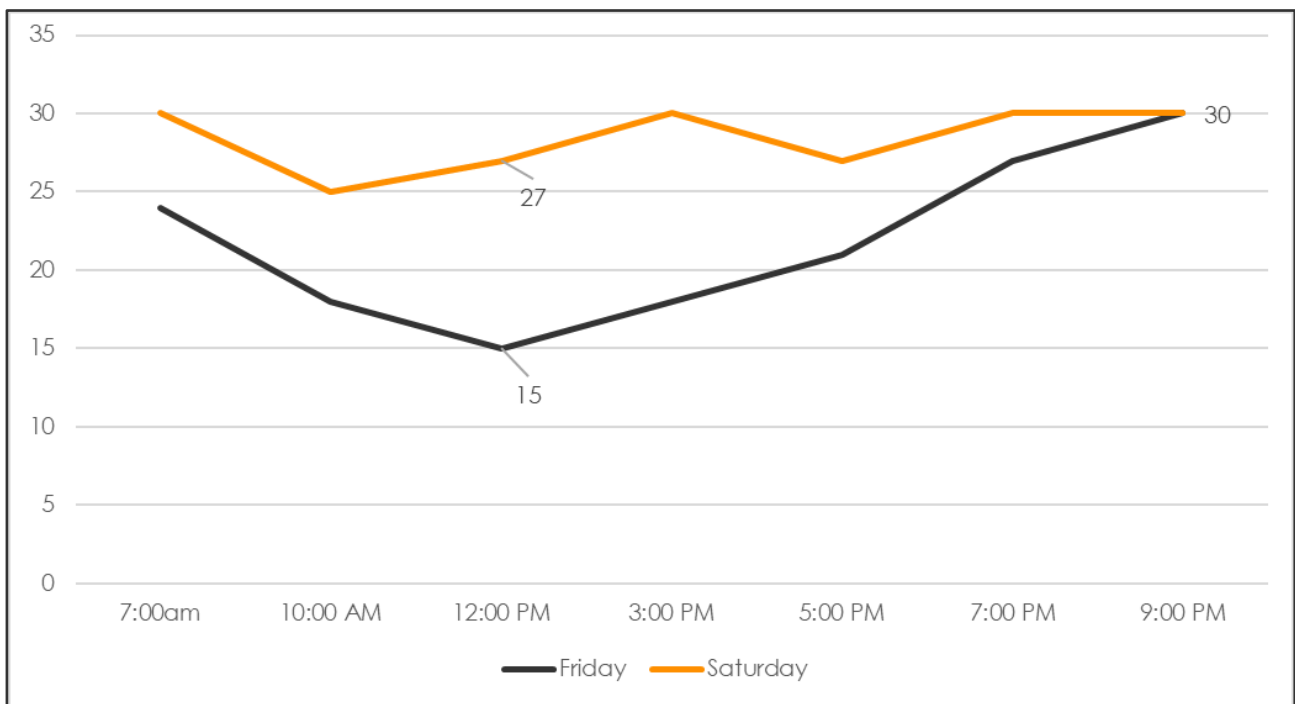
Figure 20 Visitor Parking Demand Profile



As outlined in Figure 20 residential visitor car parking demands vary significantly on the Friday with demands during the day representing approximately 50% of the peak evening demand at 9:00 PM. With regards to Saturday parking demands the profile is relatively linear.

Application of the above car parking demand profile to the statutory residential visitor car parking requirement of 30 spaces equates to the following anticipated residential visitor car parking demands across the course of the day.

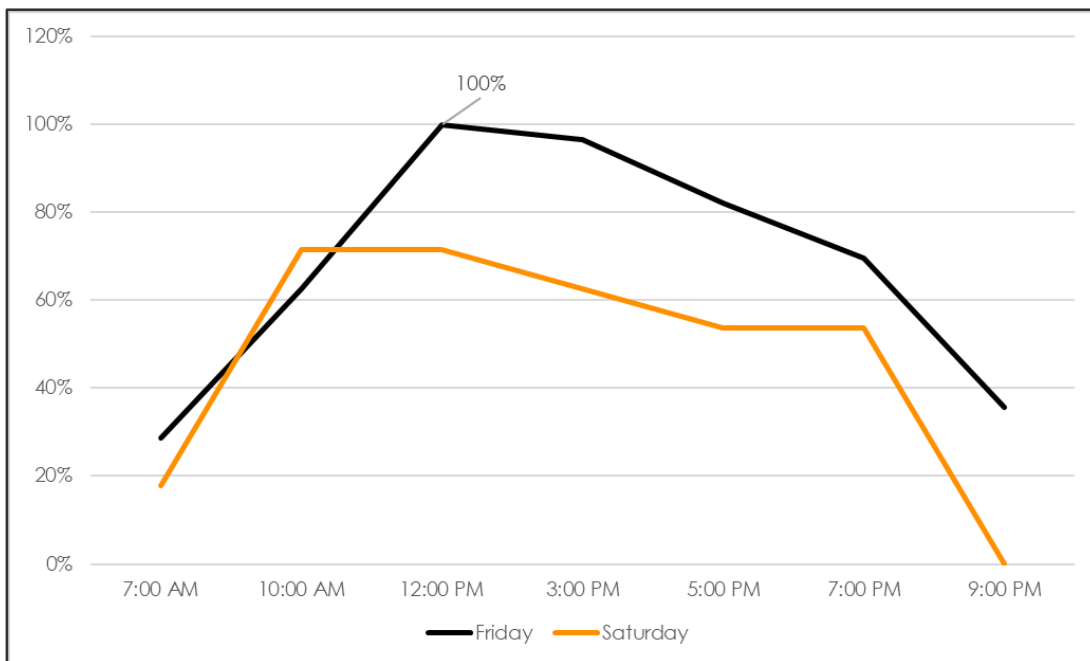
Figure 21 Anticipated Visitor Car Parking Demand



7.2.6.2 Medical Centre Visitors

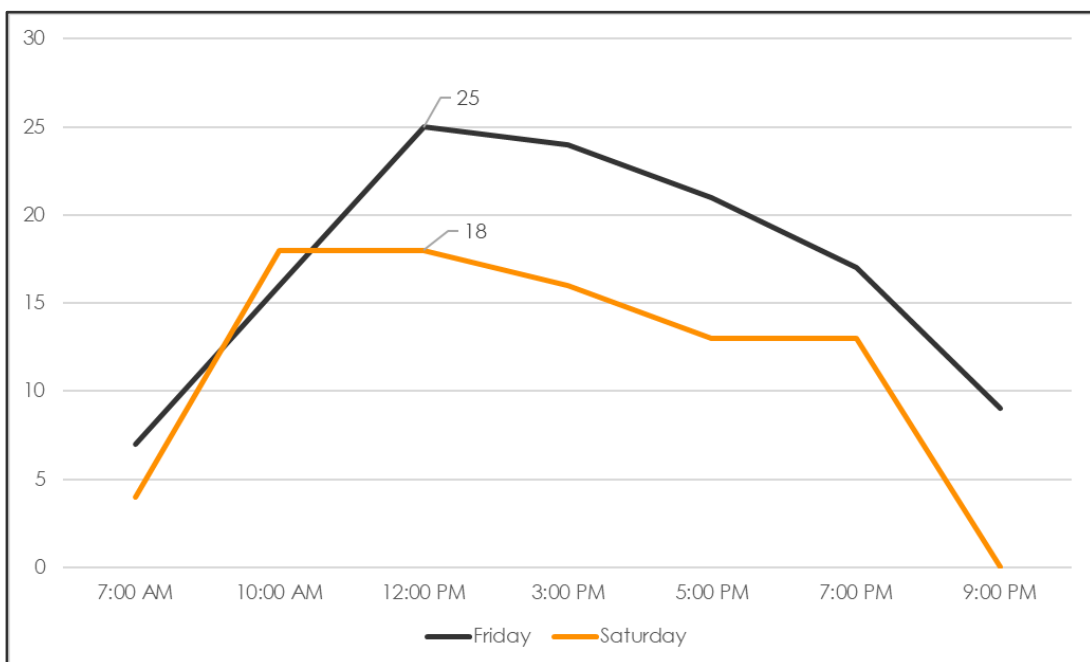
Guidance on the temporal demand variation for the medical centre use has been sought from Google, which provides charts indicating popular times for businesses (read more at <https://support.google.com/business/answer/6263531?hl=en>). 'Popular Times' data was sourced for a number of existing medical centres in close proximity of the site, based on this data, Figure 22 has been produced outlining the demand profile for the medical centre use.

Figure 22 Medical Centre Visitor Demand Profile



Application of the above demand profile to the anticipated peak demand of 18 spaces equates to the following car parking demand profile.

Figure 23 Anticipated Medical Centre Parking Demand



7.2.6.3 Education Centre

For the purpose of assessment, it has been assumed that the education centre use will have 100% demand during the weekday periods with demands reducing to 20% over the weekend.

7.2.7 Anticipated Car Parking Demand

Based on the above, it is anticipated the development will generate the following car parking demands:

Table 7 Anticipated Car Parking Demand

Use	Anticipated Demand			
	Weekday Midday	Weekday Evening	Weekend Midday	Weekend Evening
Long Term Demand				
Resident	205	205	205	205
Education Centre Staff	34	34	7	7
Retail Staff	5	5	5	5
Medical Centre Staff	16	16	16	16
Total Long Term Demand	260	260	233	233
Total Long Term Supply	323	323	323	323
Visitor Demand				
Residential Visitor	15	30	27	30
Medical Centre Visitor	25	9	18	0
Total Visitor Demand	40	39	45	30
Visitor Parking Supply	46	46	46	46
Visitor Surplus/Shortfall	6+	7+	1+	+16
Student Demand				
Students	74	74	15	15

Based on the above, all long-term car parking demands associated with the development will be able to be accommodated on-site. Further, short-term car parking demands associated with residential and medical centre visitors are also anticipated to be able to be fully accommodated on-site, with surplus visitor parking.

Finally, a shortfall of up to 74 spaces associated with the student component of the education centre is anticipated, noting that this level of demand is considered conservative on the high side, when having consideration to the location of the site. A review of the proposed shortfall follows acknowledging that the Planning Scheme allows for a reduction in car parking including to zero subject to a number of decision guidelines.

7.3 Review of Car Parking Provision

7.3.1 Alternative Modes of Transport

As indicated in Section 2.6, the site has excellent access to Public Transport, with numerous train, tram and bus services in the immediate vicinity. The provision of excellent public transport ensures that visitors to the development will have access to a variety of options for site access.

In addition, with respect to the education use there is an abundance of student accommodation proximate to the site, with students housed in this accommodation likely to ride or walk to the site in-lieu of private motor vehicle.

7.3.2 Opportunities for Off-Site Car Parking

Several car parking options exist for those visitors to the development that cannot be accommodated on-site. On-street car parking is available on the majority of streets immediately surrounding the development providing a mixture of ticketed and time restricted parking.

Additionally, as identified in Section 2.8, numerous off-street car parking also exists within the vicinity of the site providing further parking opportunities for visitors to the site.

With respect to the proposed education use, it is noted that similar uses located within proximity to high quality public transport services, typically offer discounted student car parking in nearby paid car parks, with these car parks typically also accessible by the general public. Examples of this include Australian Catholic University on Victoria Street in Fitzroy, Melbourne University in Carlton and RMIT Melbourne Campus. Students of these universities are typically encouraged to utilise public transport services where possible, with students that elect to drive directed to off-street car parking within the area.

Given the abundance of public off-street car parking in the vicinity of the site as well as the existing car parking provided by the BHI at nearby campuses, it is considered that there is ample opportunity within the surrounding area for students to park when required.

7.3.3 Box Hill Central Activity Area Car Parking Strategy

The subject site is located within the Box Hill Central Activities Area, in this regard reference is made to the Box Hill Central Activities Area Car Parking Strategy ('the Strategy') prepared by GTA Consultants for Whitehorse City Council.

The study outlines a number of considerations with regards to visitor parking demands including, "...short-term car parking (i.e. hospital patient visitors and TAFE students) is recommended to be provided along street frontages." and, "The use of nearby car parking vacancies where available should, however, be considered on a case-by-case basis as a means to satisfy residential visitor parking demands."

The strategy clearly outlines the suitability of providing visitor parking on-street for a number of uses, including specifically outlining the suitability of accommodating demands for students and patients on-street.

7.3.4 Adequacy of Proposed Car Parking Provision

It is expected that the proposed supply of car parking is appropriate for the proposed development, considering the following:

- The parking provision is generally in accordance with the Parking Overlay rates applicable to the site;
- The peak visitor carparking demands associated with the Medical Centre and residential uses are anticipated to be capable of being accommodated within the on-site visitor car parking supply;
- The shortfall of Education Centre car parking is expected to be readily accommodated within available off-street parking within the broader Box Hill Activity Centre;
- Car parking demands associated with the education centre use are anticipated to be less than those outlined within the Planning Scheme noting the sites high level of accessibility;
- Based on the recent VC148 amendment residential visitor car parking is no longer required to be provided on site where a site is within 400m of the PPTN;
- A number of off-site car parking opportunities exist in the vicinity of the site including on-street car parking and numerous off-street car parks;
- The proposed development provides bicycle parking in excess of the statutory requirements, therefore providing an alternate means of transportation;
- The development is within an easy walking distance of amenities, including shops, education, entertainment and recreational facilities;
- The site has excellent access to public transport, with numerous train, tram and bus services in the immediate vicinity, providing access options for residents and employees with no on-site parking space;
- Reduced car parking provision assists with the desired reduction in private vehicle usage, therefore minimising traffic impacts in the vicinity.

7.4 Accessible Car Parking

The Building Code of Australia (BCA) specifies the minimum requirements for the provision of accessible car parking.

The proposed retail, medical and education uses within the development, generate requirements to provide DDA parking, with a minimum of 1 space per use required. On this basis, the development generates a requirement to provide three disable parking spaces.

It is recommended that three DDA car parking spaces be provided on-site and designed in accordance with Australian Standard requirements.

As less than 6 (i.e. no more than 5) car spaces are provided for the proposed retail use (which requires the provision of accessible parking), the accessible bay does not need to be designated, so as to restrict the use of the car parking space only for people with a disability, also noting that the proposed retail parking will be for staff only.

8 TRAFFIC CONSIDERATIONS

8.1 Traffic Generation

8.1.1 Residential

Surveys undertaken by other traffic engineering firms at residential dwellings have shown that the daily traffic generation rates vary depending on the size, location and type of the dwelling, the parking provision and proximity to local facilities and public transport. These surveys indicate a daily traffic generation rate of 2 vehicle movements per day per dwelling would be appropriate for a development if this scale. Application of this rate equates to 598 vehicle movements per day or 60 vehicle movements in a peak hour (adopting a peak-to-daily ratio of 10%).

In addition, the distribution of inbound and outbound traffic during the AM and PM peak hours has been assumed as follows:

- AM Peak Hour:
 - + Inbound: 20%
 - + Outbound: 80%
- PM Peak Hour:
 - + Inbound: 60%
 - + Outbound: 40%

8.1.2 Retail Tenancies

With regard to the Retail tenancies, it is anticipated that each allocated parking space may generate one inbound trip during the AM peak period, and one outbound trip during the PM peak period, equivalent to 5 vehicle trips per hour.

8.1.3 Medical Centre

To assess the level of traffic generated by the proposed Medical Centre a first principals-based assessment has been undertaken. It has been assumed that each doctor on the site will see a patient for an average of 10-15 minutes, with approximately 5 minutes between patients. This equates to each doctor seeing 3 patients over an hour, or 6 vehicle movements per practitioner per hour.

It is noted that medical centres are not typically fully staffed throughout the entire day, in this respect it has been assumed approximately 50% of staff will be on-site seeing patients in a peak hour (8 staff on-site).

Adopting this rate equates to 48 vehicle movements in a peak hour, including 24 inbound and 24 outbound trips.

8.1.4 Education Centre

As on-site parking for the centre will be limited to staff only, it has been conservatively assumed that each car space will generate one vehicle movement in a peak hour representing a staff member arriving to site in the AM peak hour and departing in the PM peak hour.

Adoption of this rate equates to 34 vehicle movements generated by the Education Centre use in a peak hour.

8.1.5 Anticipated Traffic Generation

Based on the above survey results, the anticipated traffic generated by the proposed development is shown in Table 8.

Table 8 Anticipated Traffic Generation

Use	AM Peak Hour			PM Peak Hour		
	Inbound	Outbound	Total	Inbound	Outbound	Total
Resident	12	48	60	36	24	60
Medical Centre	24	24	48	24	24	48
Education Centre	34	0	34	0	34	34
Retail	6	0	6	0	6	6
Total	76	72	148	60	88	148

8.2 Traffic Distribution

8.2.1 General

Considering the location of the site in relation to the arterial road network, public transport facilities, schools, recreation and retail and employment precincts, the directional distribution of traffic has been assumed as follows:

- 50% to/from the north; and
- 50% to/from the south;

Traffic has been further distributed between the key intersections surrounding the site to generally align with existing traffic distributions.

8.3 Generated Traffic Volumes

Based on the above, the following traffic volumes are expected to be generated by the proposed development.

Figure 24 AM Peak Hour - Generated Traffic Volumes

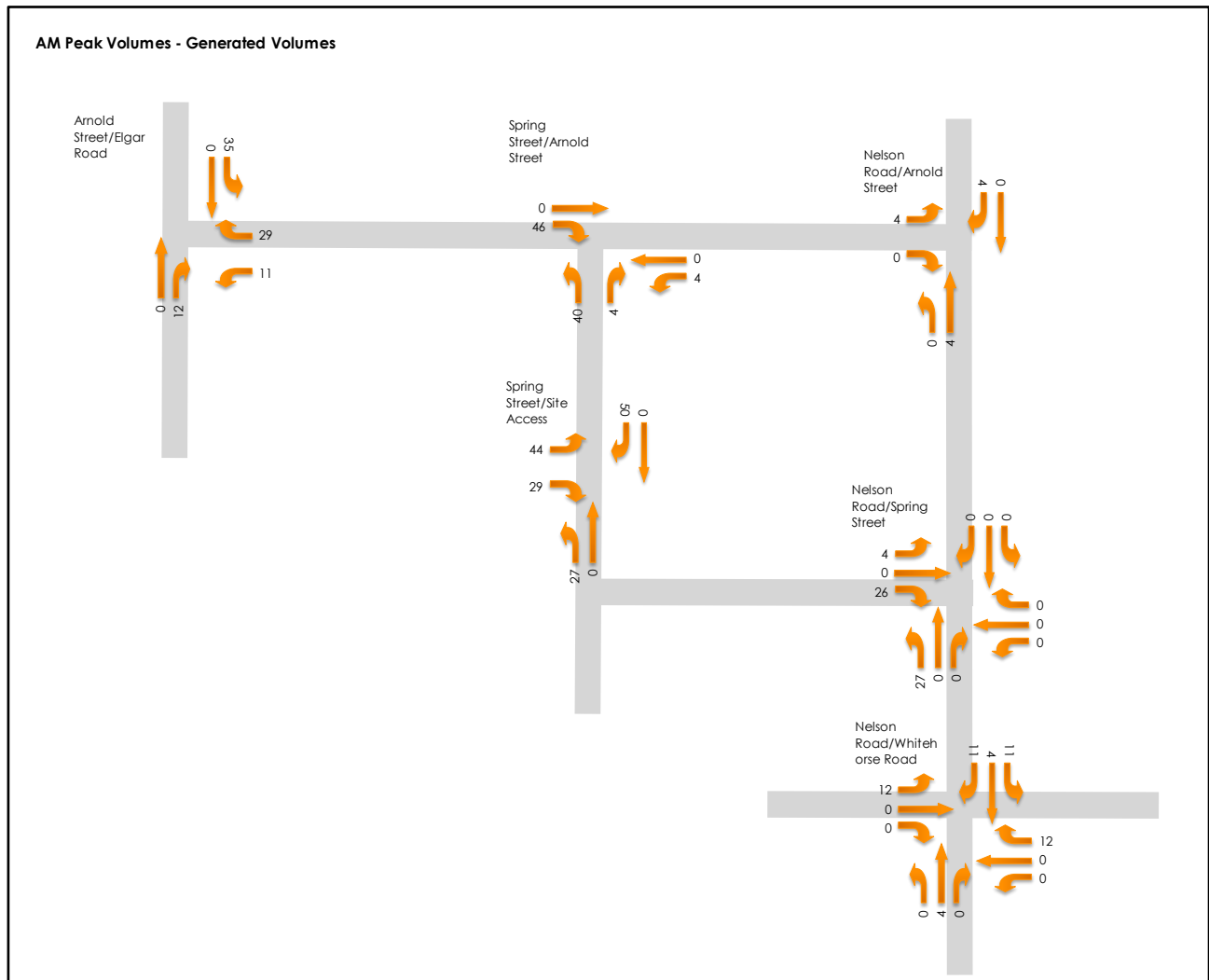
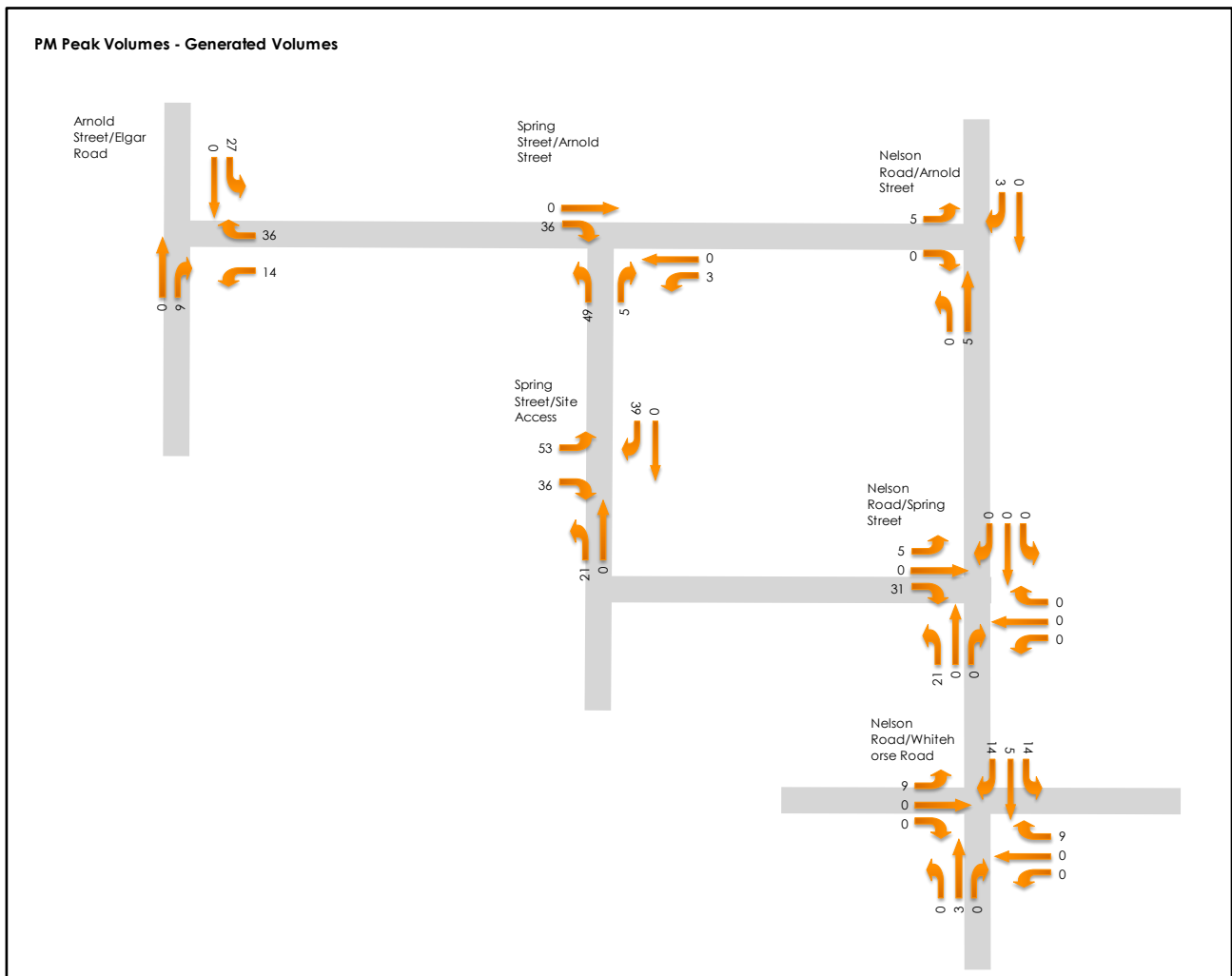


Figure 25 PM Peak Hour – Generated Traffic Volumes



8.4 Adjacent Development Traffic

It is noted that a number of developments are either under construction or proposed in the vicinity of the site, with the most critical of these being the development of a 500 space car park at the RSL adjacent the proposed Spring Street East-West extension.

In this respect, to account for a level of this growth, it has been assumed that the 500 space RSL car park will turnover at 50% of the number of spaces during a peak hour, with movements split evenly between inbound and outbound. This equates to 125 inbound and 125 outbound vehicle movements in a peak hour. This level of traffic generation is considered to be conservative on the high side.

The distribution of the RSL traffic on the adjacent road network is shown in Figure 26.

Figure 26 RSL – AM Peak Hour Traffic Generation

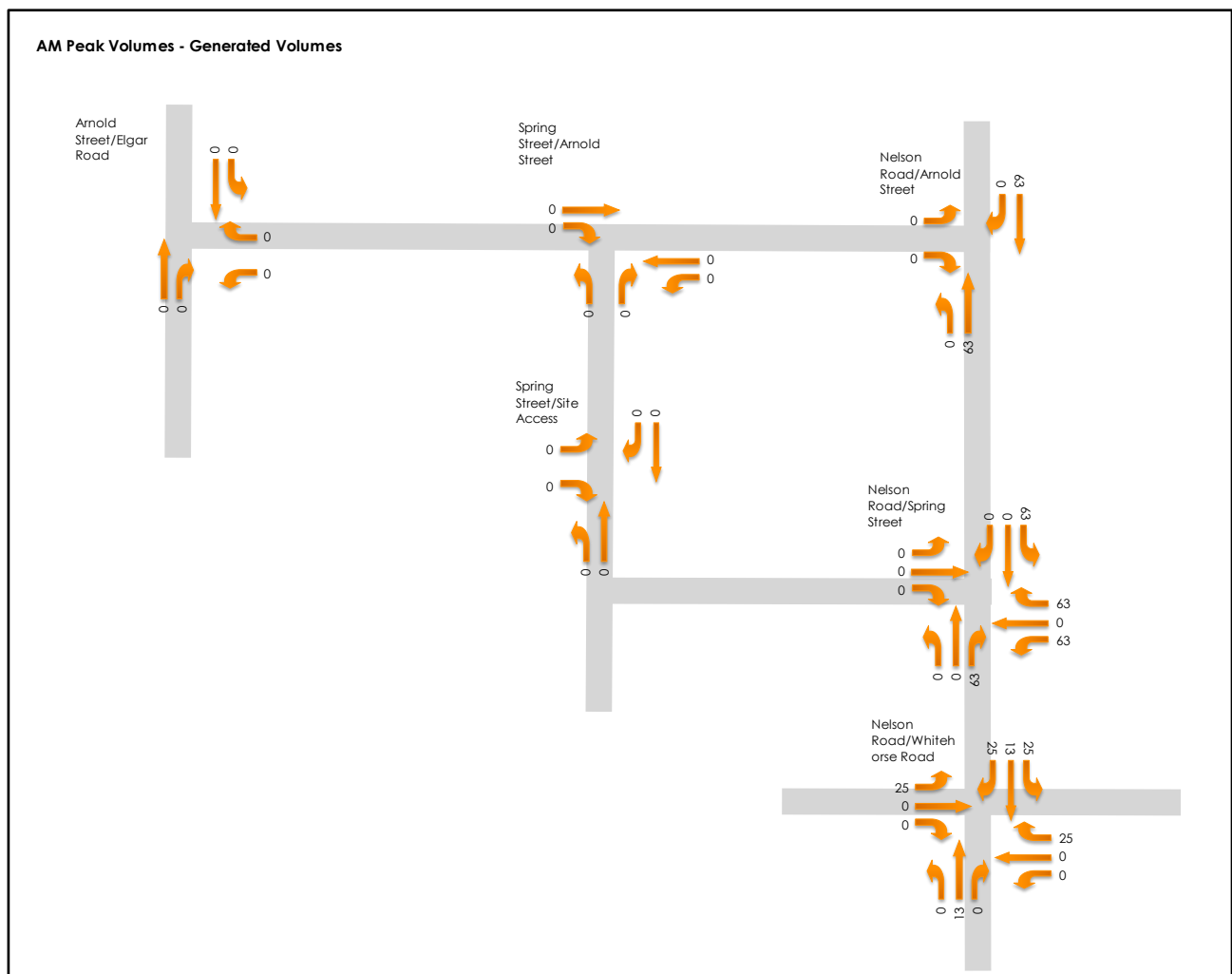
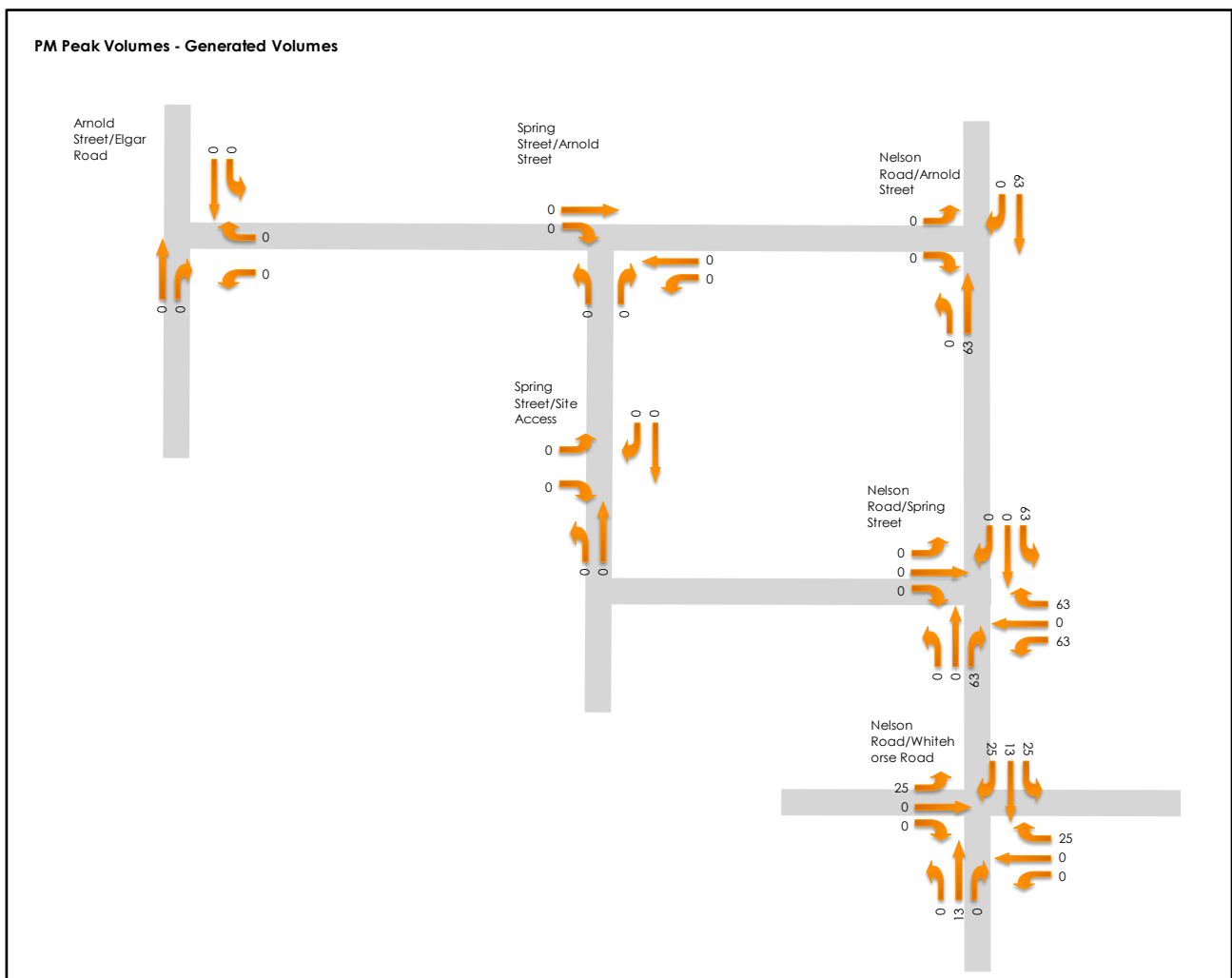


Figure 27 RSL – PM Peak Hour Traffic Generation



8.5 Resultant Future Traffic Volumes

Based on the above, the future intersection volumes can be calculated by combining the existing volumes with the expected traffic volume growth and superimposing the traffic anticipated to be generated by the proposed development and adjacent RSL. It is noted that, as discussed in Section 2.5.3, traffic volumes in the PM peak hour have been adjusted based on SCATS data at the intersection of Whitehorse Road/Nelson Road.

The resultant peak hour traffic volumes are shown in Figure 28.

Figure 28 AM Peak Hour - Resultant Future Traffic Volumes

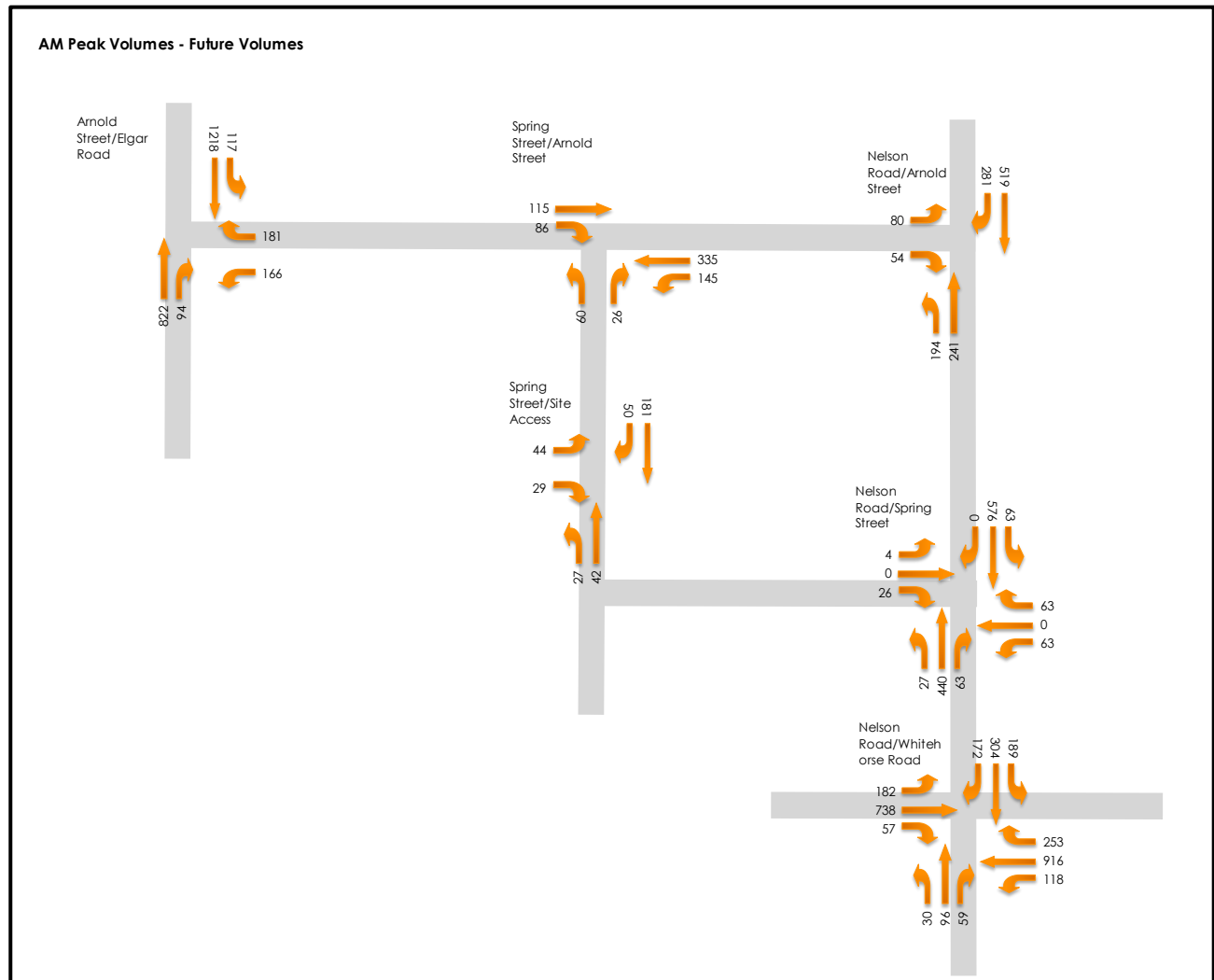
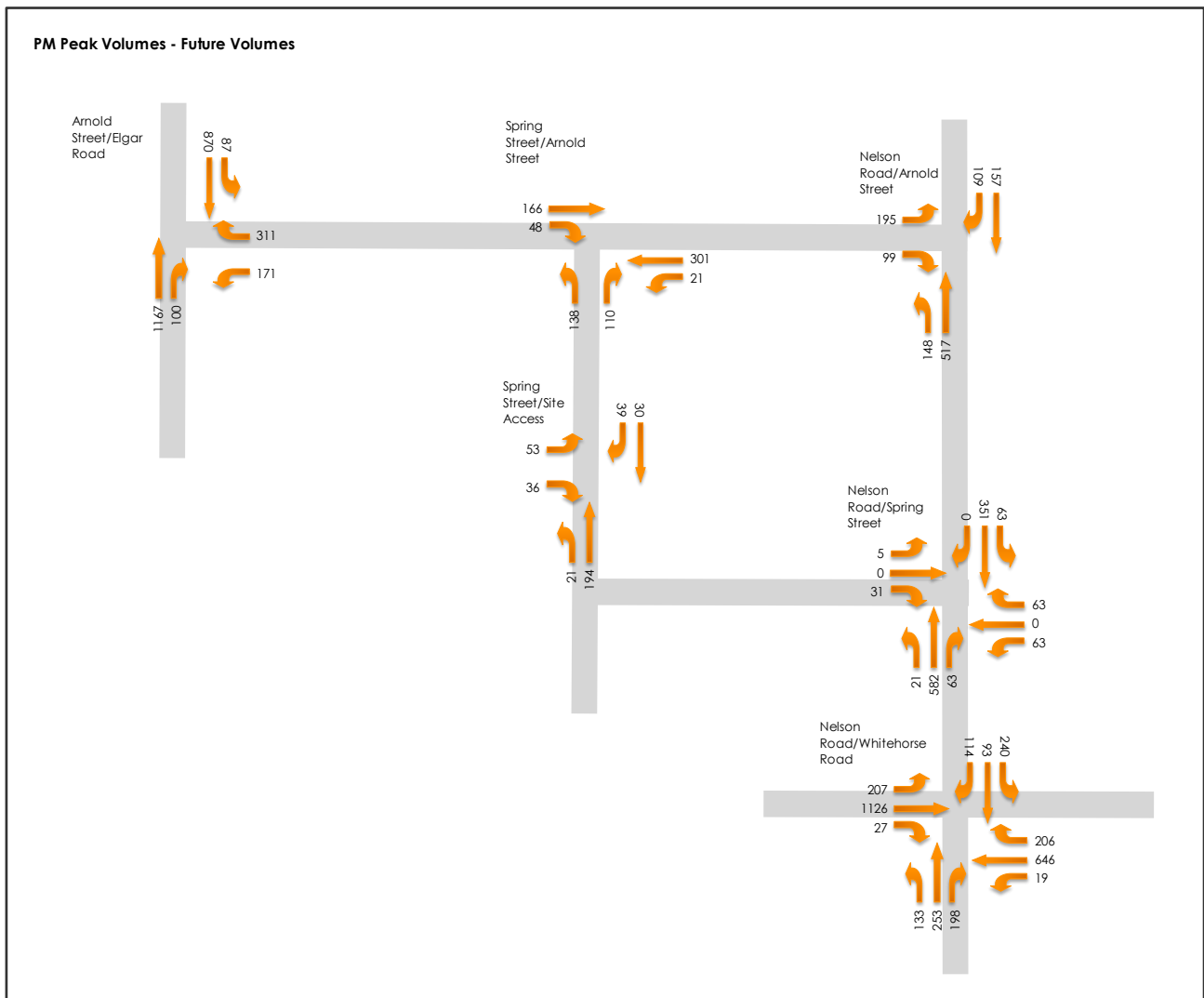


Figure 29 PM Peak Hour - Resultant Future Traffic Volumes



8.6 Traffic Impact

8.6.1 Modifications to SIDRA Phasing

In addition to a review of input traffic volumes, changes to the phasing of traffic signals at the intersection has also been reviewed and updated.

Specifically, phasing at the intersection was updated to reflect the phasing provided within the SCATS site Ops Sheet.

Additionally, a cycle time of 120 seconds was adopted for the intersection.

8.6.2 Intersection Capacity Assessment

To assess the operation of the intersection the traffic volumes have been input into SIDRA Intersection, a traffic modelling software package.

The SIDRA Intersection software package has been developed to provide information on the capacity of an intersection with regard to a number of parameters. Those parameters considered relevant are, Degree of Saturation (DoS), 95th Percentile Queue, and Average Delay as described below.

Table 9 SIDRA Intersection Parameters

Parameter	Description	
Degree of Saturation (DoS)	The DoS represents the ratio of the traffic volume making a particular movement compared to the maximum capacity for that particular movement. The value of the DoS has a corresponding rating depending on the ratio as shown below.	
	Degree of Saturation	Rating
	Up to 0.60	Excellent
	0.61 – 0.70	Very Good
	0.71 – 0.80	Good
	0.81 – 0.90	Fair
	0.91 – 1.00	Poor
	Above 1.00	Very Poor
It is noted that whilst the range of 0.91 – 1.00 is rated as ‘poor’, it is acceptable for critical movements at an intersection to be operating within this range during high peak periods, reflecting actual conditions in a significant number of suburban signalised intersections.		
Average Delay (seconds)	Average delay is the time delay that can be expected for all vehicles undertaking a particular movement in seconds.	
95th Percentile (95%ile) Queue	95%ile queue represents the maximum queue length in metres that can be expected in 95% of observed queue lengths in the peak hour	

The results of the analysis are provided in Table 10 and Table 11.

Table 10 AM Peak Hour - Existing/Future Conditions

Intersection	Approach	DoS		Avg. Delay (sec)		Queue (m)	
		Existing	Future	Existing	Future	Existing	Future
AM Peak							
Arnold Street / Elgar Road	Elgar Rd – South	0.468	0.561	7.7	8.8	58.9	59.1
	Arnold St – East	0.495	0.567	46.2	41.0	52.3	57.0
	Elgar Rd – North	0.519	0.560	7.8	9.0	113.2	119.1
Spring Street / Arnold Street	Spring St – South	0.063	0.193	16.7	17.1	2.1	6.6
	Arnold St – East	0.463	0.464	8.9	8.9	28.4	28.4
	Arnold St – West	0.157	0.213	8.7	10.1	8.4	9.0
Nelson Road / Arnold Street	Nelson Rd – South	0.209	0.243	3.0	2.5	0.0	0.0
	Nelson Rd – North	0.498	0.553	4.6	5.3	31.5	39.5
	Arnold St – West	0.222	0.297	9.9	12.2	5.4	8.0
Nelson Road / Whitehorse Road	Nelson Rd – South	0.678	0.678	41.1	39.0	27.8	27.8
	Whitehorse Rd – East	0.807	0.878	43.4	52.6	216.0	250.8
	Nelson Rd – North	0.827	0.889	40.7	43.2	125.6	144.7
	Whitehorse Rd – West	0.792	0.852	45.4	50.9	160.3	177.7
Spring Street Extension / Nelson Road	Nelson Rd – South	-	0.339	-	2.8	-	10.5
	RSL Access – East	-	0.475	-	24.6	-	14.0
	Nelson Rd – North	-	0.358	-	0.6	-	0.2
	Spring St Extension – West	-	0.174	-	26.3	-	3.7

Table 11 PM Peak Hour - Existing/Future Conditions

Intersection	Approach	DoS		Avg. Delay (sec)		Queue (m)	
		Existing	Future	Existing	Future	Existing	Future
PM Peak							
Arnold Street / Elgar Road	Elgar Rd – South	0.664	0.712	13.4	15.3	140.3	154.2
	Arnold St – East	0.665	0.716	31.7	31.0	73.6	84.6
	Elgar Rd – North	0.480	0.521	11.6	13.3	86.8	96.5
Spring Street / Arnold Street	Spring St – South	0.313	0.411	17.5	17.8	11.1	15.0
	Arnold St – East	0.428	0.428	7.6	7.7	26.2	26.2
	Arnold St – West	0.237	0.246	7.2	8.3	13.1	13.7
Nelson Road / Arnold Street	Nelson Rd – South	0.349	0.383	1.4	1.3	0.0	0.0
	Nelson Rd – North	0.192	0.243	6.2	6.3	7.5	10.4
	Arnold St – West	0.417	0.498	10.2	12.1	15.4	19.4
Nelson Road / Whitehorse Road	Nelson Rd – South	0.637	0.864	38.7	43.1	83.5	94.9
	Whitehorse Rd – East	0.808	0.854	43.8	44.3	119.9	118.4
	Nelson Rd – North	0.770	0.866	56.4	53.7	78.4	88.1
	Whitehorse Rd – West	0.802	0.866	32.9	41.0	234.5	273.6
Spring Street Extension / Nelson Road	Nelson Rd – South	-	0.407	-	1.5	-	8.9
	RSL Access – East	-	0.432	-	22.2	-	12.7
	Nelson Rd – North	-	0.243	-	0.9	-	0.2
	Spring St Extension – West	-	0.183	-	26.3	-	4.0

8.6.3 Intersection Operation

8.6.3.1 Arnold Street / Elgar Road

As outlined above the intersection of Arnold Street/Elgar Road is anticipated to go from a 'Very Good' level of service to a 'Good' level of service during the PM peak hour following the development of the site, with minimal increases to queues and delays on all approaches.

8.6.3.2 Spring Street / Arnold Street

The intersection of Spring Street/Arnold Street is anticipated to continue to operate with an 'Excellent' level of service following the development of the site.

8.6.3.3 Nelson Road / Arnold Street

As outlined above, the intersection of Nelson Road/Arnold Street is anticipated to continue to operate with an 'Excellent' level of service following the development of the site.

8.6.3.4 Nelson Road/Whitehorse Road

As outlined in Table 10, the intersection of Nelson Road/Whitehorse Road is anticipated to continue to operate at a 'Fair' level of service during the AM and PM peak hours following the development of the site.

In the PM peak hour, the operation of the intersection will go from 'Fair' to 'Poor' with DoS values of between 0.910 and 0.940 following the development of the site.

8.6.3.5 Spring Street Extension/Nelson Road

The new intersection of Spring Street/Nelson Road is anticipated to operate with an 'Excellent' level of service following the development of the site. In this respect, it is not considered necessary to implement signalisation at this intersection.

Further, supplementary gap acceptance surveys have been undertaken at the existing intersection. These surveys indicate the following existing gap capacity at the intersection:

- AM Peak Hour:
 - + Left Out: 669 vehicles
 - + Right Out: 471 vehicles
 - + Right In: 1,092 vehicles
- PM Peak Hour:
 - + Left Out: 859 vehicles
 - + Right Out: 525 vehicles
 - + Right In: 1,360 vehicles

As indicated above, there are enough gaps along Nelson Road to accommodate additional traffic in and out of the proposed extension.

8.7 Traffic Review

As shown above, all intersections are expected to operate satisfactorily following the development of the site, with limited impact on existing levels of service.

8.8 Daily Traffic Volumes – Spring Street Private Road

Finally, based on the anticipated traffic generated by the development it is anticipated that the Spring Street extension will carry in the order of 555 vehicle movements a day. The proposed extension is considered to have characteristics suitably similar to an 'Access Place' which has an indicative daily traffic threshold of between 300 and 1,000 vehicles per day.

On this basis, the proposed Spring Street road is anticipated to operate satisfactorily following its development.

9 SUMMARY OF RFI RESPONSE

A summary of the response to the traffic and transport related RFI items is provided in Table 12.

Table 12 RFI Response Table

<i>RFI Item</i>	<i>Section of Report Responding to Item</i>	<i>Notes</i>
Preparation of a Green Travel Plan	N/A	A separate green travel plan has been prepared (refer to 180430GTP001A-F)
4a. A lack of parking provision for the proposed use	Section 7	As outlined in Section 7, the development is no longer anticipated to have a shortfall of parking.
4b. The impact upon the intersection of Nelson Road and Whitehorse Road which should be referred to VicRoads for comment	Section 8.6	As outlined in Section 8.6, a more thorough assessment of the traffic impacts at the intersection indicate the proposed development is not anticipated to materially impact on the operation of the intersection with a 'Fair' level of service anticipated to be maintained post development.
4c. A queue length analysis for the entry into the proposed development.	N/A	The boom gates originally proposed have now been removed. Further, the roller doors providing access to the visitor and staff parking will be maintained in an open position during typical operating hours.
4d. Alteration of the proposed east-west spring street road layout is required.	Section 3.5	The cross-section has been altered to accommodate a 1.5m pedestrian path along the northern boundary of the road.
Other Items Raised		
Gap acceptance survey at the intersection of Nelson Road and the existing BHI car park access.	Section 8.6.3.5.	Adequate gaps have been identified on Nelson Road adjacent the existing intersection.

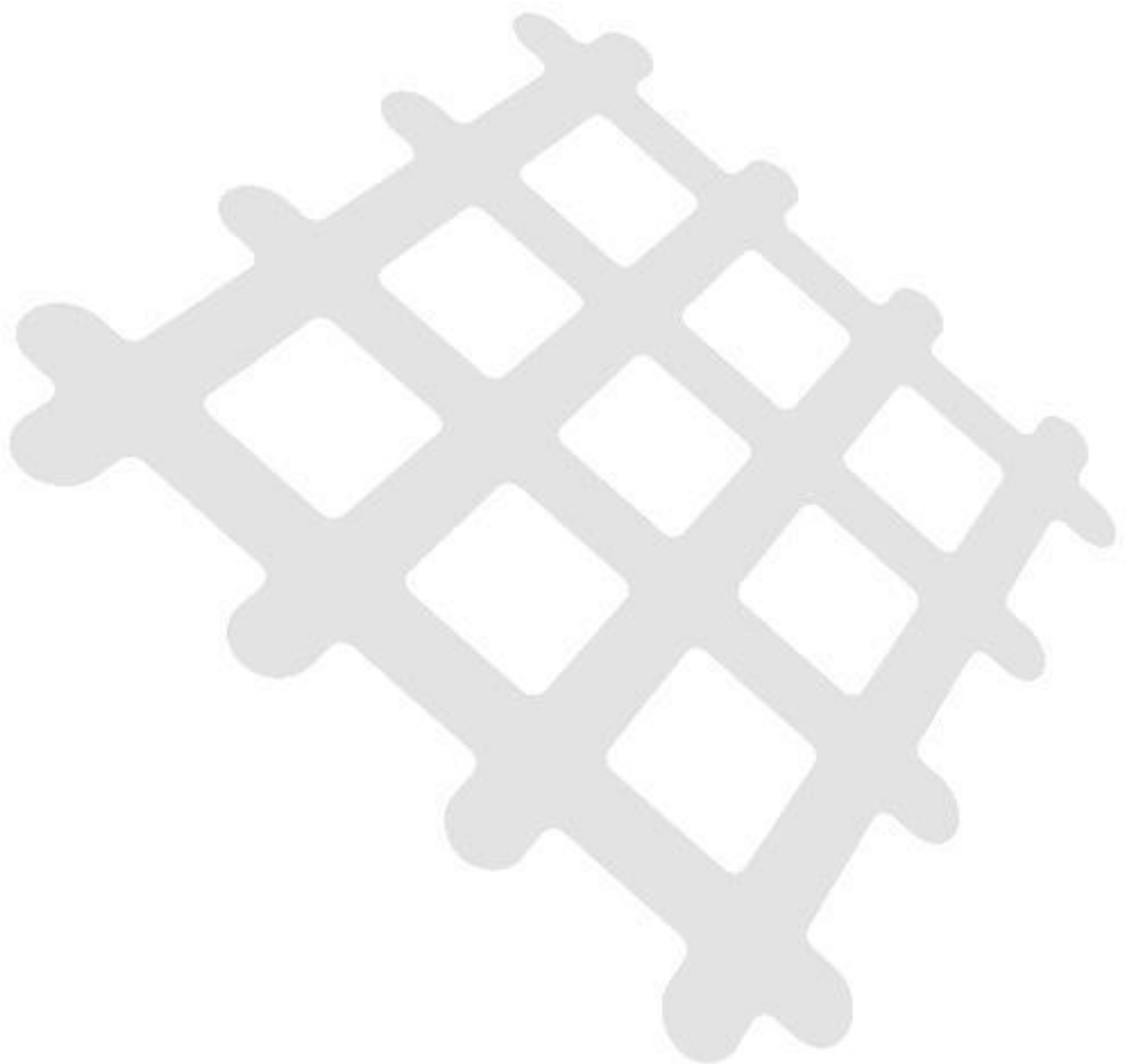
10 CONCLUSIONS

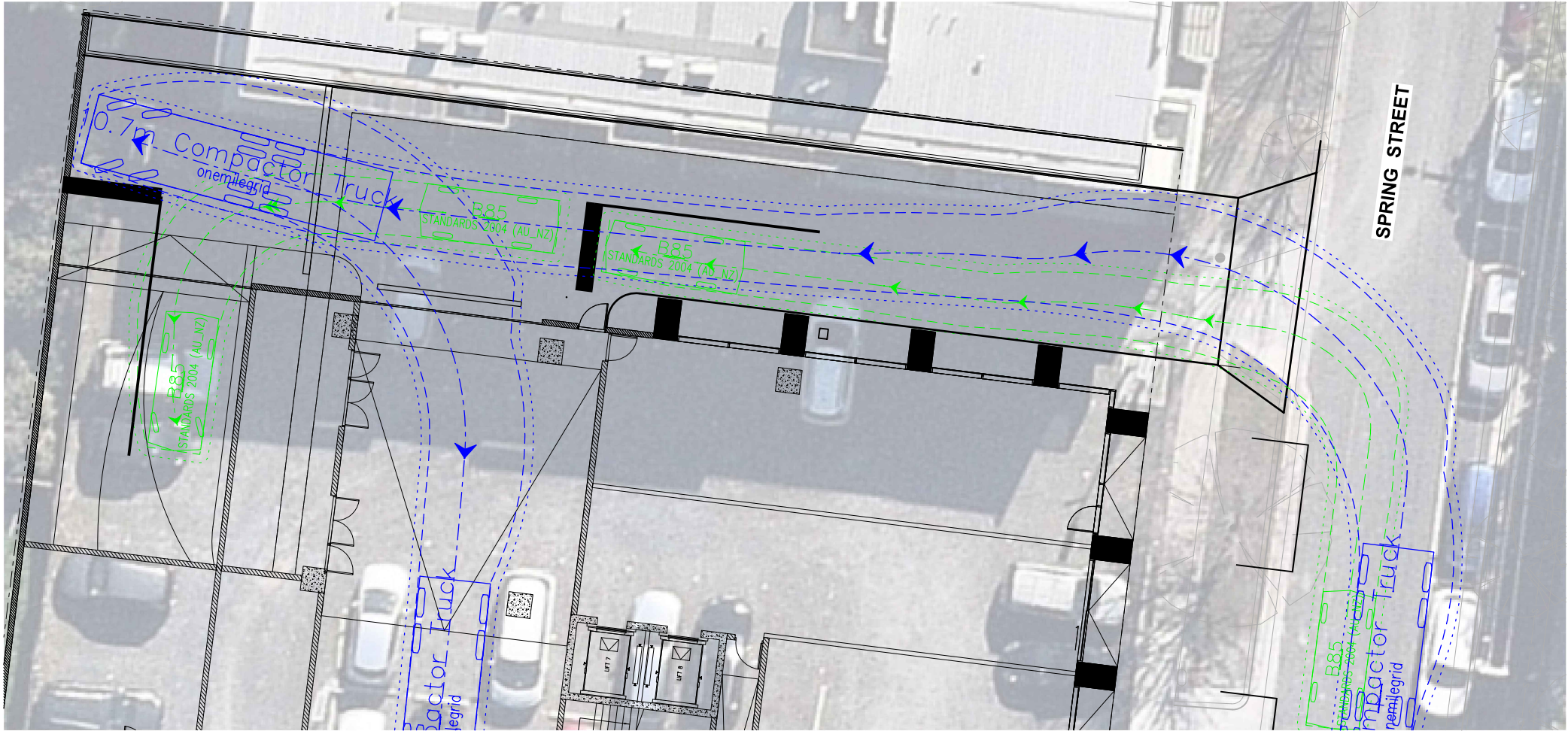
It is proposed to develop the subject site for the purposes of mixed-use development consisting of residential, medical, education and retail uses.

Considering the analysis presented above, it is concluded that:

- The proposed car parking and access design is considered appropriate;
- The proposed Spring Street extension has been designed to meet the relevant design requirements and is considered appropriate;
- The proposed bicycle parking provision and design is considered appropriate;
- The proposed supply of car parking is appropriate for the proposed development;
- The proposed development is expected to have a negligible impact on the surrounding road network when compared to the existing operation.
- There are no traffic engineering reasons which would preclude a permit from being issued for this proposal.

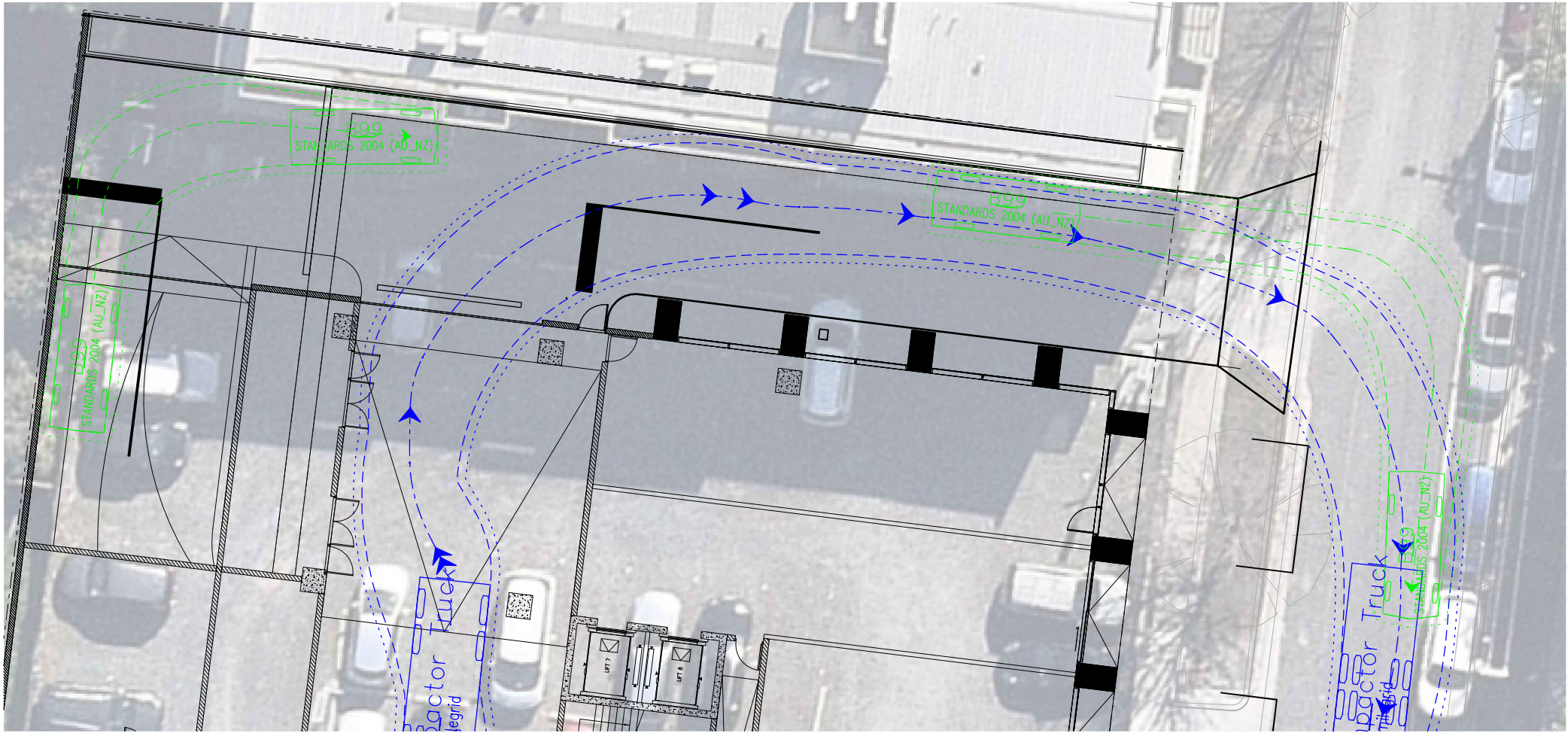
Appendix A Swept Path Assessments





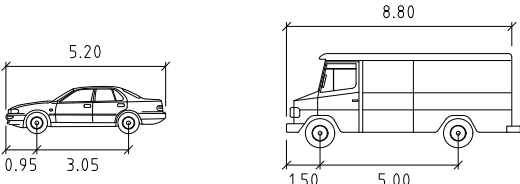
ENTRY MANOEUVRES

----- DESIGN VEHICLE SWEEP PATHS SHOWN DASHED
..... 300mm CLEARANCE ENVELOPE SHOWN DOTTED



EXIT MANOEUVRES

----- DESIGN VEHICLE SWEEP PATHS SHOWN DASHED
..... 300mm CLEARANCE ENVELOPE SHOWN DOTTED

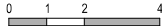


B99		STANDARDS 2004 (AU_NZ)	SERVICE VEHICLE		STANDARDS 2004 (AU_NZ)
Width	: 1.94	meters	Width	: 2.50	meters
Track	: 1.84		Track	: 2.50	
Lock to Lock Time	: 6.0		Lock to Lock Time	: 6.0	
Steering Angle	: 33.9		Steering Angle	: 38.7	

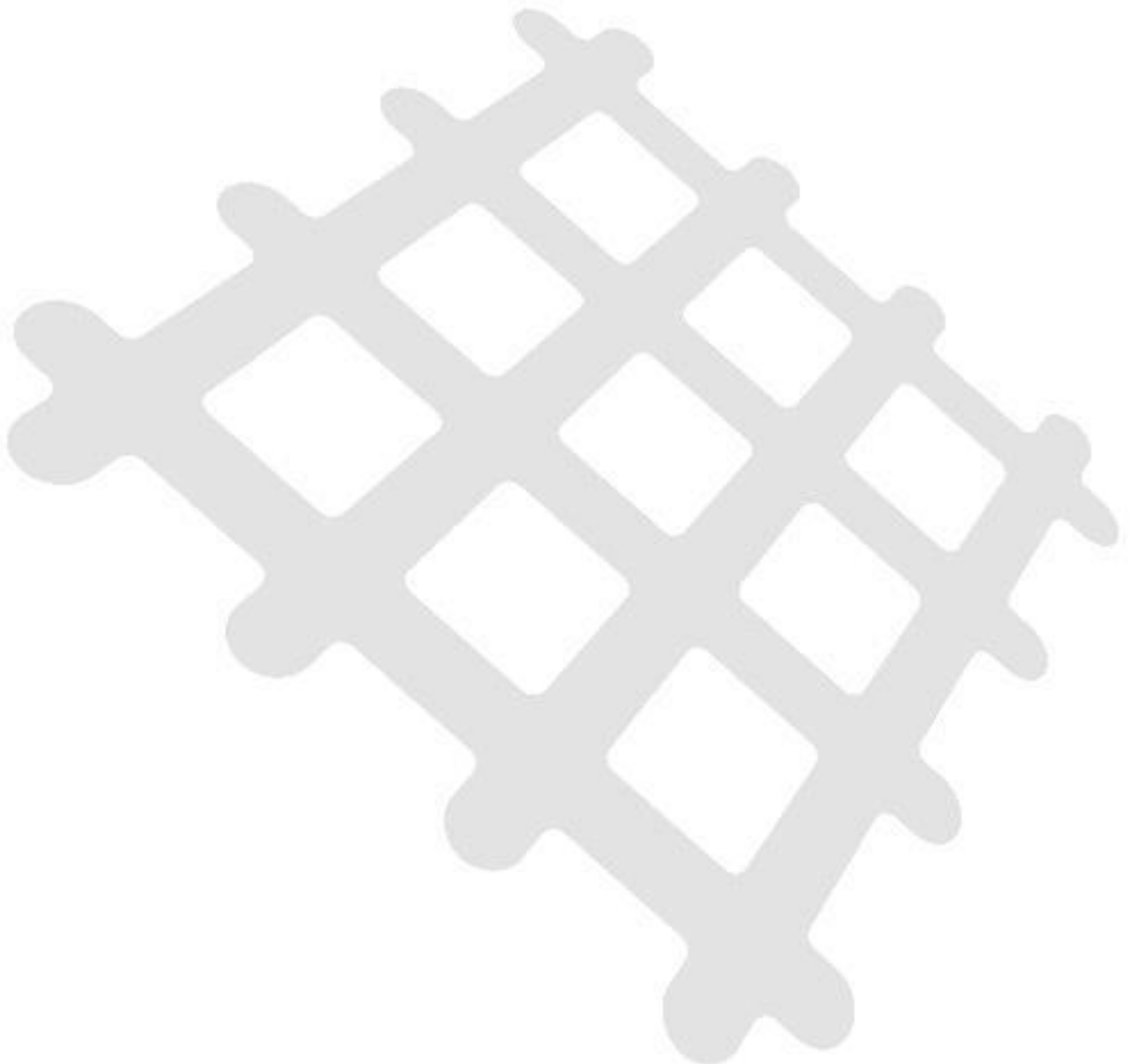


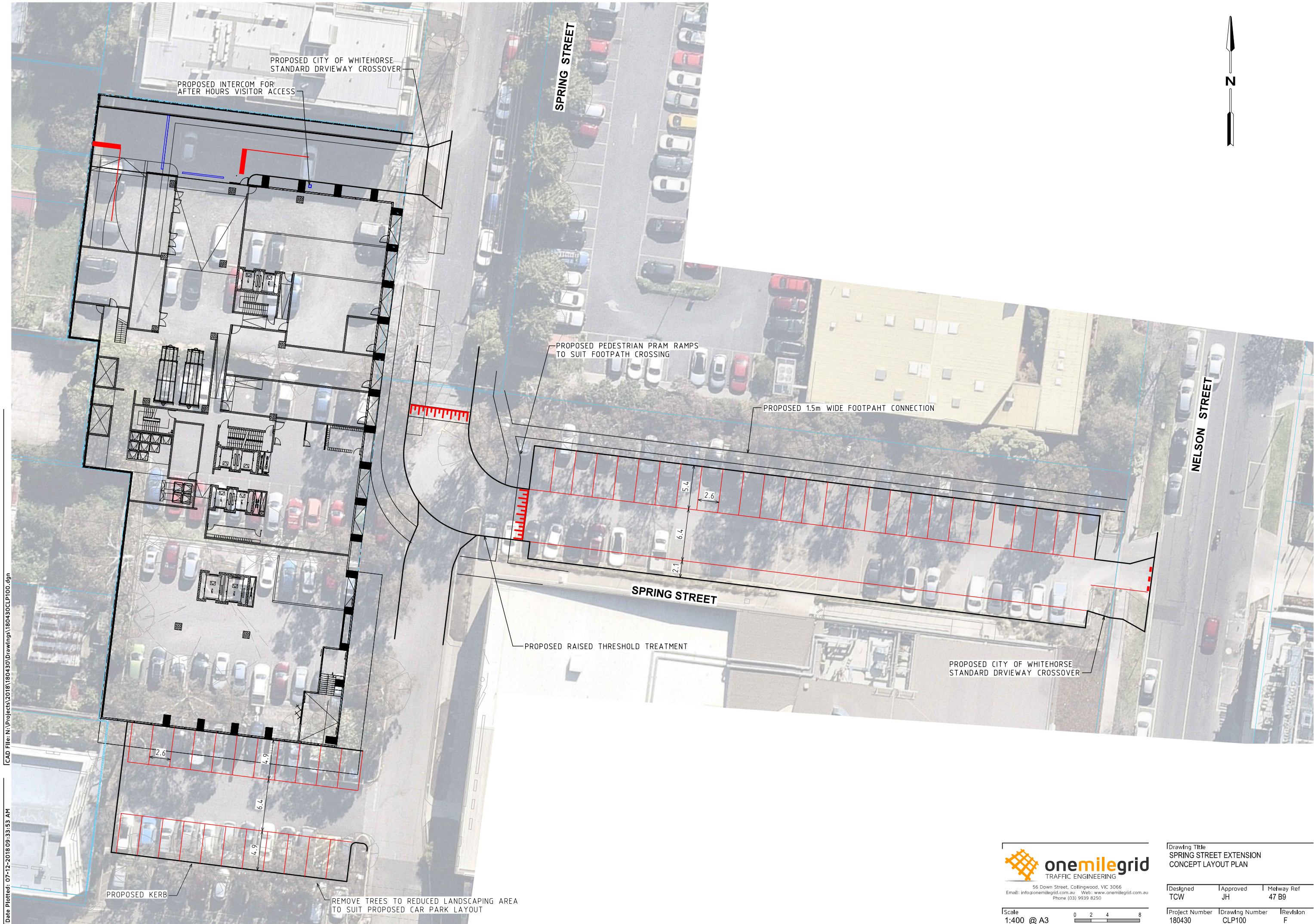
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SPRING STREET EXTENSION CAR PARK ACCESS CONTROL SWEEP PATH ANALYSIS		
Designed TCW	Approved JH	Metway Ref 47 B9
Project Number 180430	Drawing Number SPA101	Revision E

Scale
1:200 @ A3



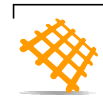
Appendix B Spring Street Concept Layout Plan





CAD File: N:\Projects\2018\180430\Drawings\180430CLP100.dgn

Date Plotted: 07-12-2018 09:33:53 AM



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Scale
1:400 @ A3

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8

Drawing Title SPRING STREET EXTENSION CONCEPT LAYOUT PLAN		
Designed TCW	Approved JH	Metway Ref 47 B9
Project Number 180430	Drawing Number CLP100	Revision F