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Traffic Engineering Assessment

Proposed Multi-Deck Car Park Expansion
1-5 Bogong Avenue, Glen Waverley

Prepared for
Monash City Council

July 2022

G30999R-01B

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1. Introduction

Traffic Group has been engaged by Monash City Council to undertake a Traffic Engineering Assessment for the Proposed Multi-Deck Car Park Expansion at 1-5 Bogong Avenue, Glen Waverley.

This report provides a detailed traffic engineering assessment of the proposed development.

2. Existing Conditions

2.1. Subject Site

The subject site is located at 1-5 Bogong Avenue in Glen Waverley, as presented in the locality plan at Figure 1.

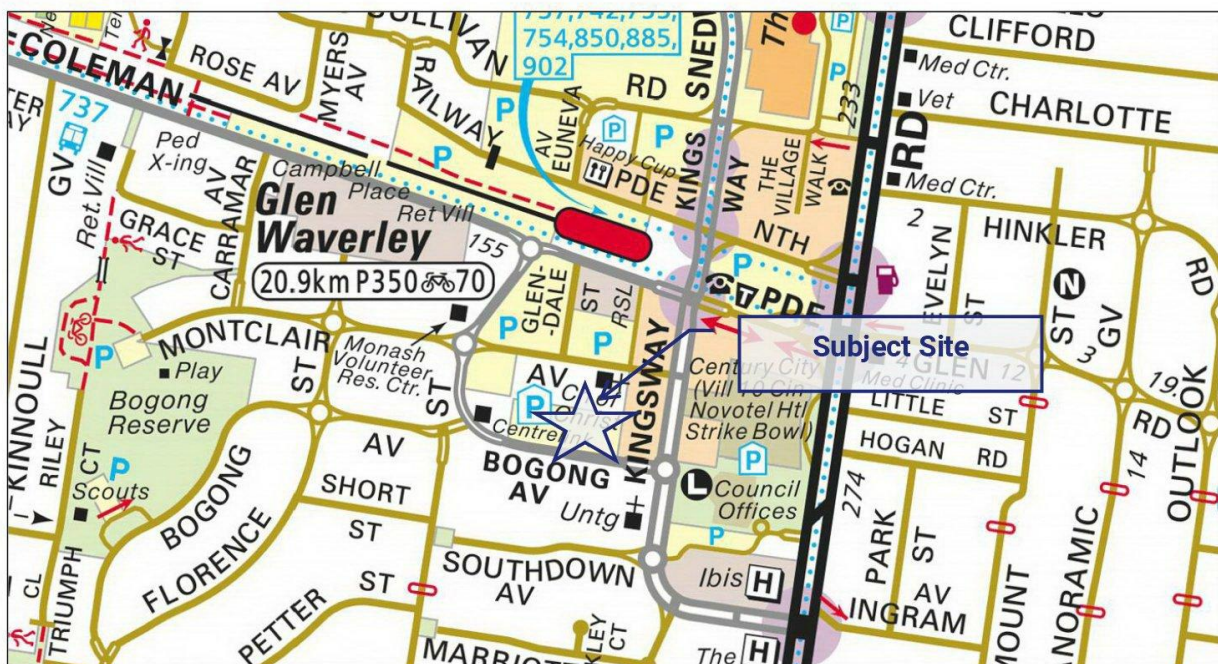


Figure 1: Locality Plan

The site is currently occupied by a four-storey multi-deck carpark which provides 514 car parking spaces; accessible via four site access connections.

An aerial photograph of the subject site and its surrounds is presented at Figure 2.

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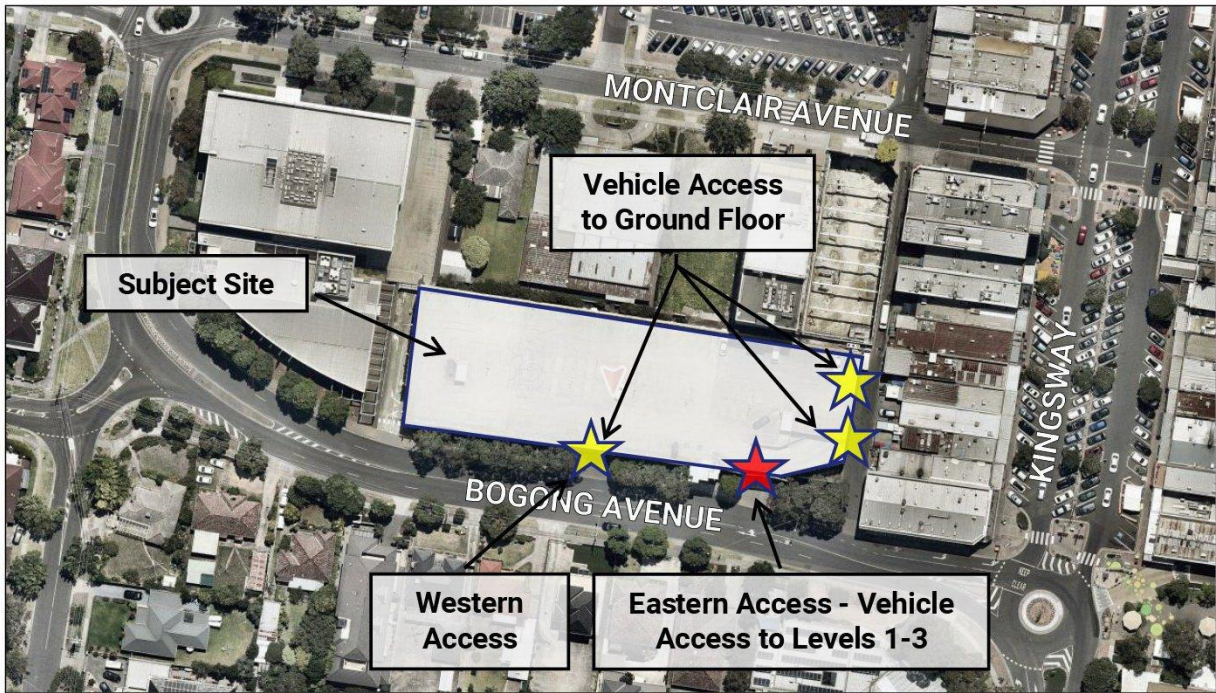


Figure 2: Aerial Photograph

The subject site is zoned 'Commercial 1 Zone (C1Z)' under the Monash Planning Scheme, as indicated in the land use zoning map at Figure 3.

The site is located within the Glen Waverley Major Activity Centre and is subject to a Design and Development Overlay (DDO12). Surrounding land uses generally comprise of residential, commercial, retail, public and transport uses.

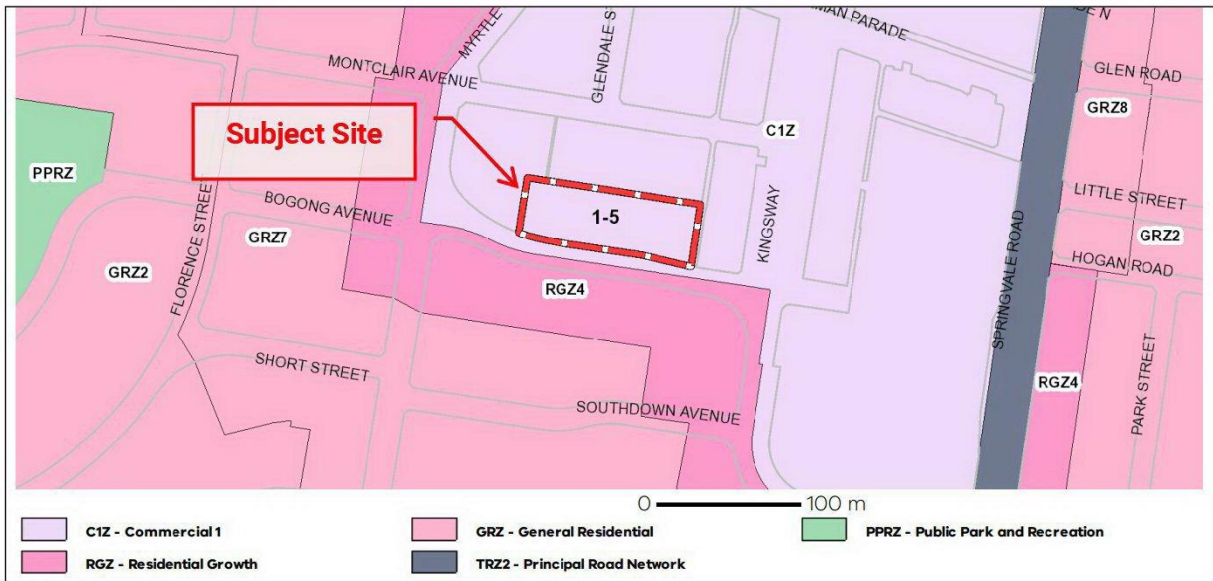


Figure 3: Land Use Zoning Map

2.2. Road Network

Bogong Avenue is a Council collector road that is aligned in a general east-west direction along the southern boundary of the site.

In the vicinity of the site, Bogong Avenue provides a single carriageway which accommodates two traffic lanes in each direction. A combined through and right-turn lane is provided into the eastern car park access point (providing access to levels 1-3).

On-street car parking on the south side of Bogong Avenue is subject to '2P 8am-6pm Monday-Saturday' restrictions whilst 'No Stopping' restrictions apply to the north side of Bogong Avenue.

A posted speed limit of 40km/h applies to Bogong Avenue past the site.

Bogong Avenue, adjacent to the subject site, is presented at Figure 4 and Figure 5.



Figure 4: Bogong Avenue - view east



Figure 5: Bogong Avenue - view west

A **Right of Way (RoW)** abuts the eastern boundary of the site and is aligned in a north-south direction between Montclair Avenue (north) and Bogong Avenue (south).

The RoW is approximately 6m wide adjacent to the subject site and narrows to approximately 3.6m wide north of the subject site. The RoW provides vehicle access to several properties which front Kingsway which is located to the east of the site.

The RoW, adjacent to the subject site, is presented at Figure 6 and Figure 7.

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Figure 6: RoW - view north



Figure 7: RoW - view south

2.3. Existing Car Parking Conditions

The existing multi-deck car park provides 514 car parking spaces across four levels.

A summary of the existing car parking provision, and parking restrictions, on each level, is provided at Table 1.

Table 1: Existing Car Parking Summary

Car Parking Level	Parking Restrictions	Existing Car Parking Supply
Ground Level	3P 8am-6pm Mon-Sat	128 Spaces
Level 1	4P 8am-6pm Mon-Sat	126 Spaces
Level 2	4P 8am-6pm Mon-Sat (Authorised Council Staff Excepted in Red Bays Only)	126 Spaces
Level 3 (Roof)	4P 8am-6pm Mon-Sat (Authorised Trader Permits Excepted in Yellow Bays Only)	134 Spaces
Total		514 Spaces

Traffic Group commissioned car parking surveys of the subject site. Surveys were completed at the following times during both 2021 and 2022. Car parking surveys completed in 2021 were completed as part of a separate project and are included for contextual purposes. The spot parking surveys completed in 2022 align with the start time of traffic surveys¹ of the subject site.

- Friday 30 April 2021: 6pm-12am
- Saturday 1 May 2021: 6pm-12am

¹ Refer to Section 5.3 for traffic survey results.

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- Thursday 17 February 2022: 7:30am & 4:30pm
- Saturday 19 February 2022: 11am.

Results of the car parking surveys are presented within Figure 8 with full details provided within Appendix B.

It is noted that the car parking inventory recorded an on-site car parking supply of 519 spaces, five more spaces than shown within existing architectural drawings, being 514 spaces. To ensure consistency with the architectural plans, and other permit documentation, we reference an existing on-site car parking supply of 514 spaces throughout our report. The reason for the discrepancy in figures is that some parking spaces have been painted over, block pedestrian access, are poorly line marked. That is, there are car parking 'spaces' which may or may not be considered to be a car parking space depending on interpretation.

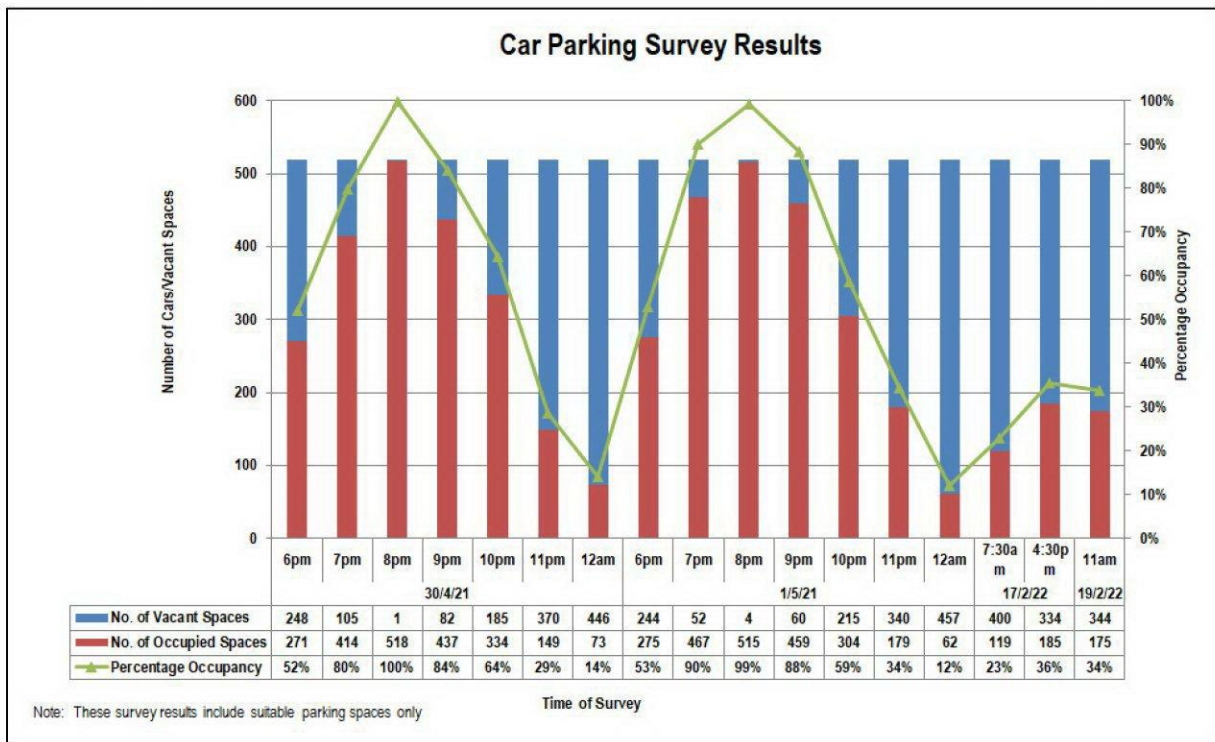


Figure 8: On-Street Car Parking Survey Results

Figure 8 demonstrates that peak recorded car parking demands during the Friday and Saturday evening surveys, completed in 2021, were high, equating to effective full occupancy of the on-site car park.

Car parking demands during the 2022 surveys were low to moderate, noting that surveys were not completed during Friday and Saturday evenings which we have been advised are typically the peak activity times for the Glen Waverley Major Activity Centre. A statement which is supported by the 2021 survey results. Rather, the 2022 car parking surveys were completed to provide context as to the on-site parking occupancy during the traffic surveys completed as part of this project.

3. Proposal

The proposal seeks to expand the existing multi-deck car park to provide an additional 518 car parking spaces across four additional above-ground levels (i.e. a total of 1,032 car spaces would ultimately be provided across eight levels of car parking). The total provision of on-site car parking is inclusive of 11 disabled spaces, two electronic vehicle charging bays as well as 26 small car parking spaces.

The vehicle access arrangements for the site are to remain consistent with the existing provisions. Vehicle access to the upper levels will remain via the eastern access to Bogong Avenue and internally via the continuation of the circulation ramp which will connect levels 1-7.

A total of 11 motorbike/scooter parking spaces are to be provided at ground level along with 12 bicycle parking spaces.

A copy of the proposed development plan, prepared by Katz Architecture, is attached at Appendix A.

4. Car Parking Considerations

4.1. Statutory Car Parking Requirements

The Planning Scheme sets out the parking requirements for various uses under Clause 52.06 of the Monash Planning Scheme.

No statutory car parking rate is specified for 'car park', nor is the use nested under other uses for which a rate is applicable under Clause 52.06.

In such instances Clause 52.06-6 requires that

"car parking must be provided to the satisfaction of the responsible authority".

4.2. Adequacy of Car Parking

Fundamentally, an off-street car park seeks to remove parking demands which may otherwise occur on-street. As such, the provision of 518 additional off-street car parking spaces is considered appropriate having regard to the relevant decision guidelines of Clause 52.06 of the Monash Planning Scheme.

4.3. Car Parking Layout and Access Arrangements

Traffic Group has provided design advice to the project architect to achieve a satisfactory car park and access layout. The proposed parking layout has been assessed under the following guidelines:

- Clause 52.06-9 of the Planning Scheme (Design standards for car parking), and
- The relevant Australian Standards.

Key elements of the design are discussed following. It is important to note that it is not sought to rectify any non-compliance within existing parking areas that are to remain unchanged as a result of the development proposal. Where layout changes are proposed which result in additional non-compliance, design modifications have been made to ensure compliance.

4.3.1. Car Spaces

- Standard car parking spaces are to be provided at a width of 2.6m, length of 4.9m and with an access aisle width of at least 6.4m in accordance with the requirements of Clause 52.06-9 (Design Standard 2).
- Disabled car spaces are to be provided at a width of 2.4m, minimum length² of 4.9m and with an access aisle width of 6.4m wide. This accords with the requirements of AS/NZS 2890.6:2009, noting that disabled parking spaces may project up to 0.5m into access aisles (as permitted by Clause 52.06).
- Columns and walls are located, relative to car parking spaces, in accordance with the clearance requirements of Diagram 1 of Clause 52.06.
- A maximum gradient of 1:16 is proposed throughout the site for car parking spaces located on ramped sections (parking spaces angled perpendicular to the slope of the ramp), in accordance with AS/NZS 2890.1:2004 requirements.
- A maximum ramp gradient of 1:5 is proposed, with 1:8 2.0m long transitions provided at either end of 1:5 ramp sections, in accordance with Design Standard 3 of Clause 52.06 for a public car park.
- Disabled car parking spaces are located within flat areas, consistent with the requirements of AS/NZS 2890.6:2009.
- A minimum height clearance of 2.2m to/from disabled spaces and 2.5m above disabled spaces and associated shared area is provided throughout the site. This accords with both relevant Planning Scheme and Australian Standard requirements.
- A minimum height clearance of 2.1m is provided within new car parking areas, including above ramps, in accordance with 52.06-9 (Design Standard 1).
- Motorcycle parking spaces are 2.5m long and 1.2m wide, in accordance with AS/NZS 2890.1:2004 requirements.
- An electronic swept path assessment of key vehicle movements and access to/from key car parking spaces is shown within Appendix C.

² Car spaces are shown at 4.9m in length on architectural drawings (with a 0.5m diagonally line marked intrusion into the aisle), noting that spaces can encroach 0.5m into the aisle, as per Clause 52.06 of the Monash Planning Scheme. The specific line marking extents of disabled spaces and adjacent shared areas would be confirmed within detailed design and construction phases.

4.3.2. Access Arrangements

- The minimum provision of 6.4m wide accessways throughout the car park is sufficient to accommodate simultaneous two-way traffic in accordance with Clause 52.06-9 (Design Standard 1) and AS/NZS 2890.1:2004.
- Vehicles can enter and exit the site in a forward direction in accordance with Clause 52.06-9 (Design Standard 1).
- No modifications are proposed to the existing vehicle access points/crossovers to the site.

4.3.3. Small Car Spaces

- Small car parking spaces measure 4.9m long x 2.3m. This is 0.1m less than the length required by AS/NZS 2890.1:2004 for small car parking spaces.
- There is a mismatch between the length of spaces nominated within the Australian Standard and Planning Scheme. The Australian Standard nominates that a 'small' car parking space is 0.1m longer (5.0m long) than a 'normal' car parking space (4.9m long) designed to the dimensions of Clause 52.06 of the Monash Planning Scheme.
- Whilst small car parking spaces could be line marked as being 5.0m in length to meet Australian Standard requirements 'by the book' it is considered a more practical and a preferred outcome, in our view, for small car parking spaces to be 4.9m in length. In doing so this equally ensures that rows of car parking spaces are of consistent length and spaces do not jut in and out of the aisle by 0.1m at the location of small car parking spaces.

4.3.4. Bicycle Parking

- A total of six bicycle hoops, allowing for 12 parked bicycles, are proposed within the ground floor.
- Bicycle hoops are staggered at 1.0m intervals and offset at least 0.5m from side obstructions in accordance with AS 2890.3:2015.
- Over and above the allowance for a parked bicycle, of the dimensions specified within Figure 2.1 of AS 2890.3:2015, a minimum 1.5m accessway is provided to all bicycle parking spaces in accordance with the requirements of Clause 52.34 of the Planning Scheme.

Based on the above, the proposed parking layout is satisfactory and the access arrangements for the site will provide for safe and efficient movements to and from the surrounding road network.

5. Traffic Considerations

5.1. Methodology

The following outlines the staged methodology of the proceeding traffic assessment of the development proposal.

- Record existing traffic volumes to/from site.
- Determine existing traffic generation rates for the site.
- Establish existing directional distributions of traffic to/from the site.
- Prepare a 'base case' traffic model.
- Calculate site generated traffic volumes.
- Distribute site generated traffic volumes via the road network.
- Add base case and site generated traffic volumes to establish anticipated post development traffic volumes.
- Prepare a traffic model and calculate the traffic impact of the development proposal, relative to existing conditions.

5.2. Assumptions

In preparing the traffic assessment several key assumptions were made and methodologies adopted, as follows:

- Parking restrictions within the existing car park vary level by level. The future parking restrictions of the subject site, level by level, are subject to determination by Council. Given this, for each peak hour the highest traffic generation rate³ of either ground level or upper-level parking was utilised. This provides for a conservative assessment, noting that the exact future car parking restrictions are not known at this time.
- Adopted traffic generation rates have been applied to all car parking spaces (both existing and additional) accessed via the eastern site access point to Bogong Avenue.
- A 2% annual linear growth rate to through traffic volumes on Bogong Avenue was adopted to reflect a 10-year post development scenario.
- All additional traffic associated with the development proposal is assumed to be 'new' to the network. Whilst not all traffic accessing the site will necessarily be 'new' to the surrounding road network (e.g. displacing parking within other exiting on-street/off-street

³ Upper levels had the highest traffic generation rate during the Weekday AM peak hour, this is likely due to all day staff/trader parking representing a greater proportionality of movements during this period. The ground level had the highest traffic generation rate during the Weekday PM and Saturday Midday peak hours, this is likely due to this parking being the most proximate/attractive to motorists and that ground level has the shortest time restriction within the car park thus resulting in a higher turnover of spaces.

areas) this is offset by the 'inducement' of traffic to the area as a result of providing additional car parking.

- No changes are anticipated to the distribution of, nor traffic volumes to/from, the ground level car park.
- No changes have been assumed to existing on-street car parking restrictions.

5.3. Existing Conditions

Traffic Group commissioned turning movement counts at the existing vehicle access points to the car park during the following time periods:

- Thursday 17 February 2022: 7:30am-9:30am
- Thursday 17 February 2022: 4:30pm-6:30pm
- Saturday 19 February 2022: 11am-1pm.

The nominated times and dates were selected in conjunction with Council officers to capture a balance of peak traffic arrival/departure volumes from the site as well as peak through traffic volumes on Bogong Avenue.

Existing traffic volumes for the relevant peak hours⁴ are shown within Figure 9 to Figure 11, noting that on-site car parking demands were low to moderate at the start of these peak periods, refer to Section 2.3 for further details regarding parking demands.

⁴ The peak hour was selected based upon the recorded peak hour at the intersection of Bogong Avenue and the eastern site access point (which provides access to levels 1-3 currently).

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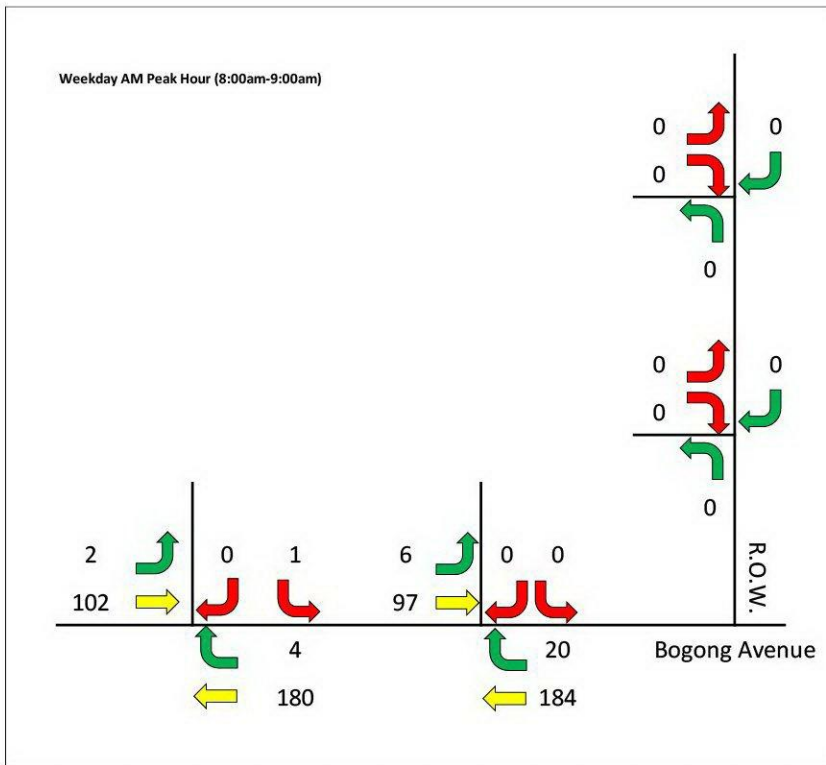


Figure 9: Existing Traffic Volumes - Weekday AM Peak Hour

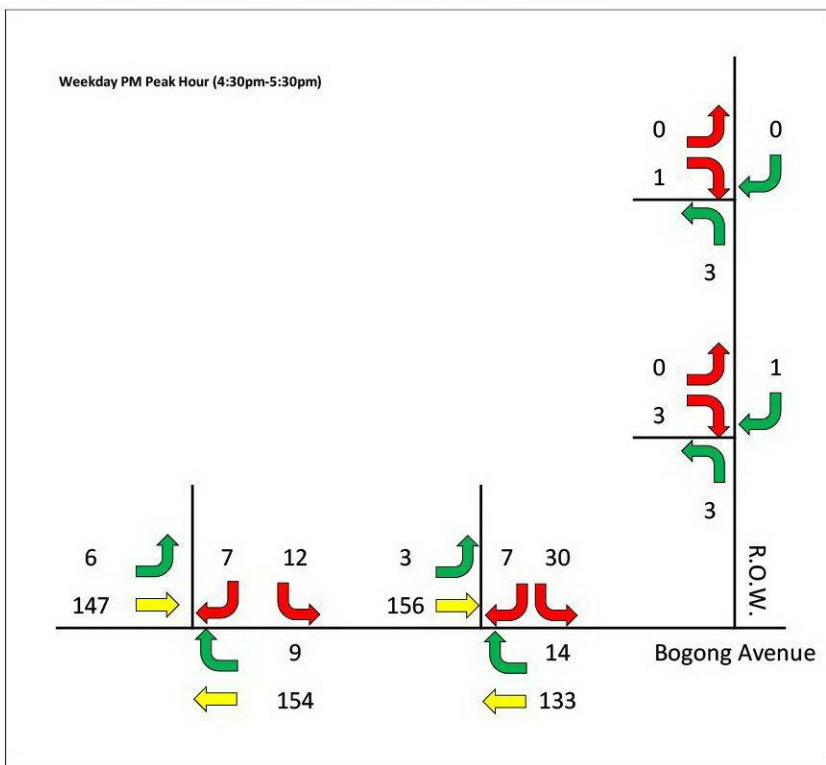


Figure 10: Existing Traffic Volumes - Weekday PM Peak Hour

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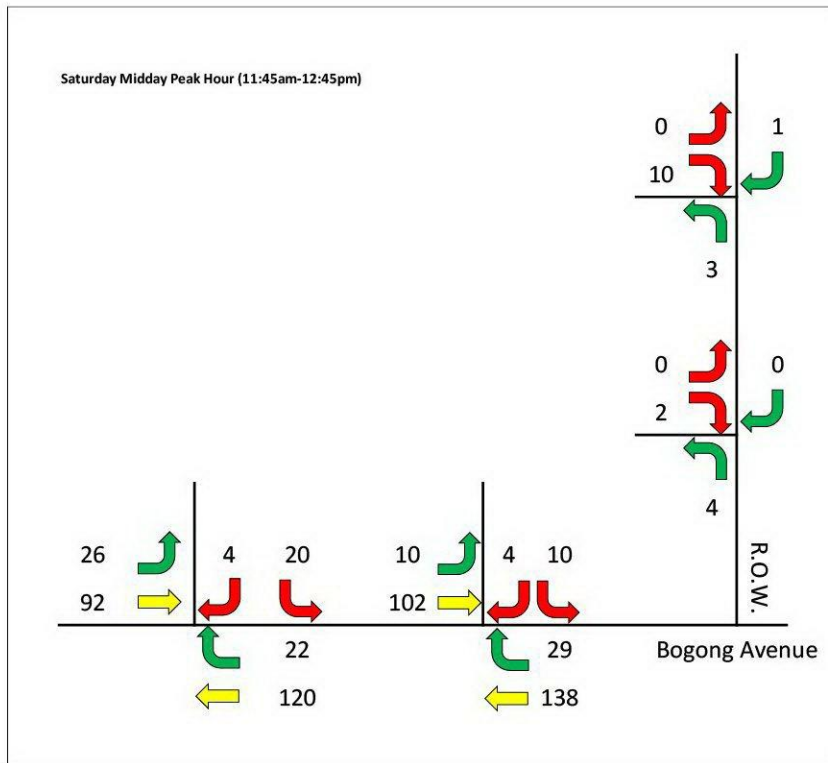


Figure 11: Existing Traffic Volumes - Saturday Midday Peak Hour

5.4. Traffic Generation Rates

Based on the recorded existing traffic volumes, Table 2 has been prepared to summarise both vehicle movements to/from the site as well as derived traffic generation rates.

Table 2: Traffic Generation Summary – Existing Conditions

Peak Hour	Movement	Vehicle Movements			Rate (movements / space) [1] [2]	
		Ground Level	Upper Levels	Total	Ground Level	Upper Levels
Weekday AM Peak Hour	Entry	6	26	32	0.05	0.07
	Exit	1	0	1	0.01	0.00
	Total	7	26	33	0.05	0.07
Weekday PM Peak Hour	Entry	22	17	39	0.17	0.04
	Exit	23	37	60	0.18	0.10
	Total	45	54	99	0.35	0.14
Saturday Midday Peak Hour	Entry	56	39	95	0.44	0.10
	Exit	36	14	50	0.28	0.04
	Total	92	53	145	0.72	0.14

[1] Derived traffic generation rates have been calculated based upon 128 and 386 spaces within the respective ground and upper levels (i.e. levels 1-3). For example, the Weekday AM Peak Hour entry movement to the Ground Level is calculated as the number of recorded movements (6 movements) divided by the number of spaces within the ground level (128 spaces) which equates to a rate of 0.05 movements/space.

[2] Traffic generation rates adopted for the subsequent traffic analysis have been bolded.

As outlined within Table 2, the subject site (comprising 514 spaces) currently generates 33, 99 and 145 vehicle movements during the respective weekday AM, PM and Saturday midday peak hours.

5.5. Traffic Distribution

Based upon the recorded peak movements to/from the subject site at both of the site access points to Bogong Avenue, the existing combined directional distribution of traffic to/from the site during the peak hours is shown within Figure 12 to Figure 14.

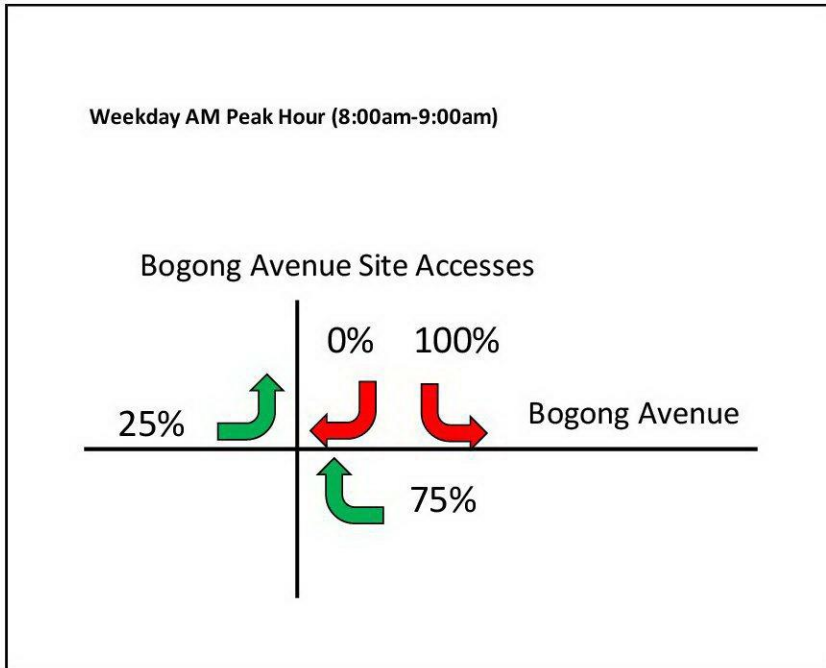


Figure 12: Existing Traffic Distribution - Weekday AM Peak Hour

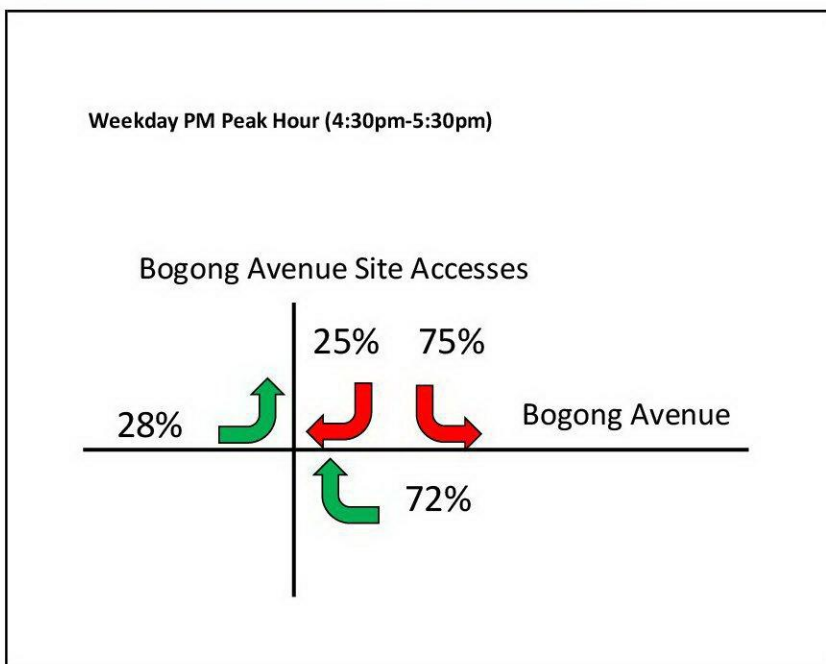


Figure 13: Existing Traffic Distribution - Weekday PM Peak Hour

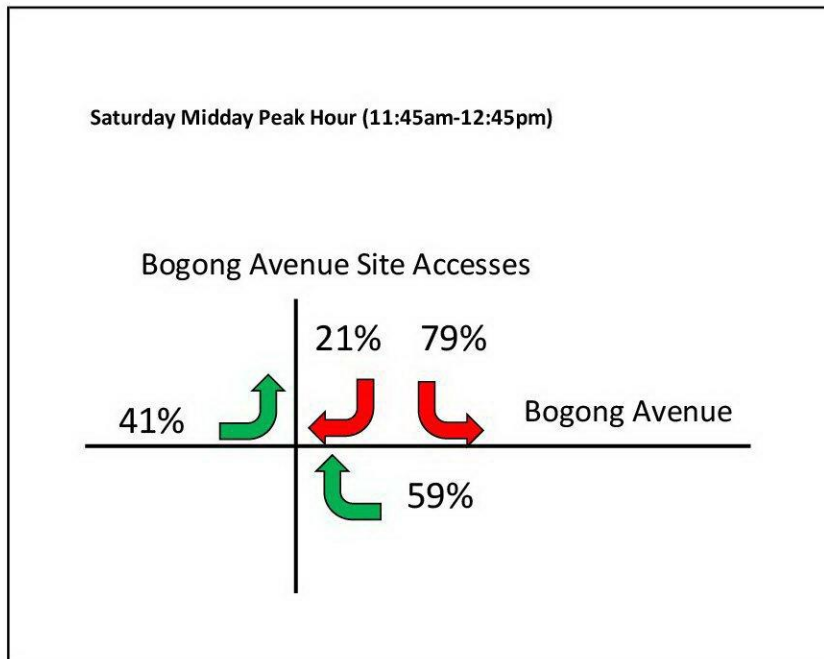


Figure 14: Existing Traffic Distribution - Saturday Midday Peak Hour

5.6. Base Case

A 'base case' scenario has been prepared which assumes the following:

- Traffic volume growth to through traffic volumes on Bogong Avenue. A 2% annual linear traffic growth rate has been applied across 10 years (i.e. 20% traffic volume growth).
- All traffic has been removed from the eastern site access point to Bogong Avenue. By doing this, this allows us to apply the adopted traffic generation rates to all car parking spaces accessed via the eastern site access point. At first glance this approach may appear counter intuitive, as opposed to simply applying a traffic generation rate to the new additional spaces only. The reason this approach was selected is it allows for the preparation of a conservative assessment⁵.

Existing traffic volumes for the relevant peak hours⁶ are shown within Figure 15 to Figure 17.

⁵ The future allocation of car parking and associated restrictions is a matter for Council. We have not been provided with information regarding future restrictions and as such have applied the 'highest' recorded traffic generation rates to all car parking spaces accessed via the eastern access. Removing existing traffic volumes at this location from the base case model allows us to apply these traffic generation rates to all car parking spaces accessed from the eastern access point.

⁶ The peak hour was selected based upon the recorded peak hour at the intersection of Bogong Avenue and the eastern site access point (which provides access to levels 1-3 currently).

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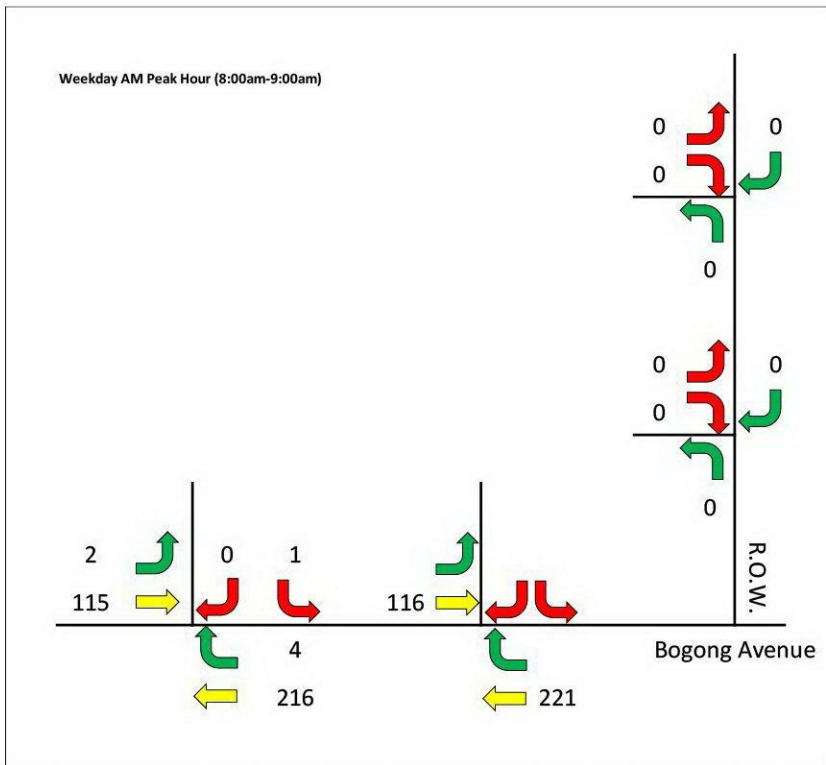


Figure 15: Base Case Traffic Volumes – Weekday AM Peak Hour

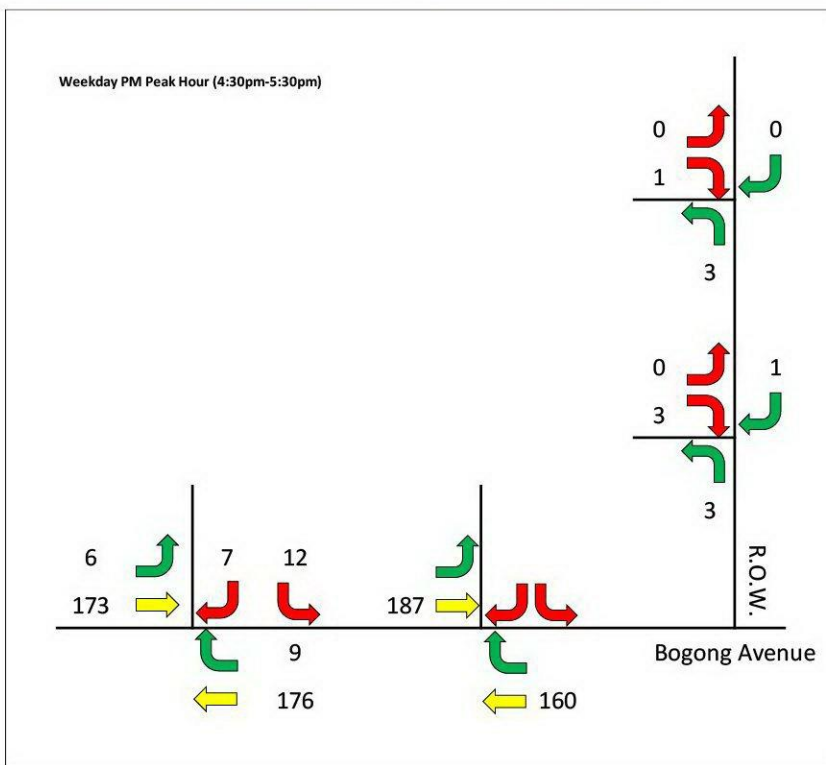


Figure 16: Base Case Traffic Volumes – Weekday PM Peak Hour

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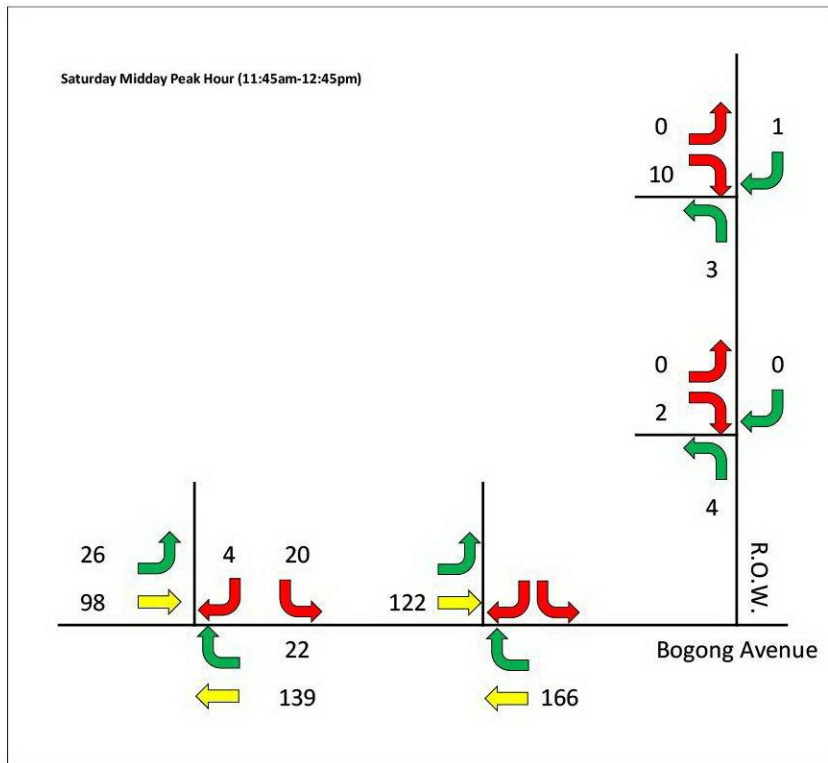


Figure 17: Base Case Traffic Volumes – Saturday Midday Peak Hour

5.7. Site Generation

Based on the previously outlined assumptions, traffic generation rates and distribution, Table 3 has been prepared to outline the anticipated traffic generation at the eastern site access point to Bogong Avenue.

Table 3: Traffic Generation Summary – Eastern Access Point (Levels 1-7)

Peak Hour	Movement	Rate (movements / space)	Vehicle Movements
Weekday AM Peak Hour	Entry	0.07	59
	Exit	0.00	2
	Total	0.07	61
Weekday PM Peak Hour	Entry	0.17	125
	Exit	0.18	193
	Total	0.35	318
Saturday Midday Peak Hour	Entry	0.44	426
	Exit	0.28	224
	Total	0.72	650

As outlined within Table 3, the eastern access point to Bogong Avenue is anticipated to generate a total of 61, 318 and 650 vehicle movements during the respective weekday AM, PM and Saturday midday peak hours.

Based on the above traffic volumes, and assuming that the directional distribution of traffic is consistent with existing conditions, Figure 18 to Figure 20 have been prepared to illustrate the anticipated traffic volumes at the eastern access during the assessed peak hours.

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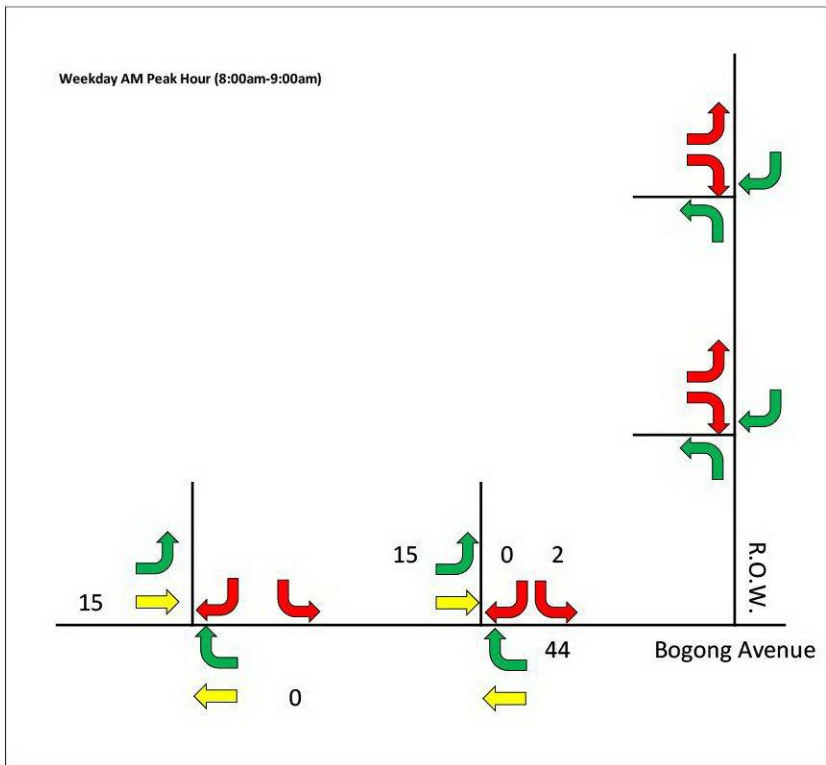


Figure 18: Site Generated Traffic Volumes – Weekday AM Peak Hour

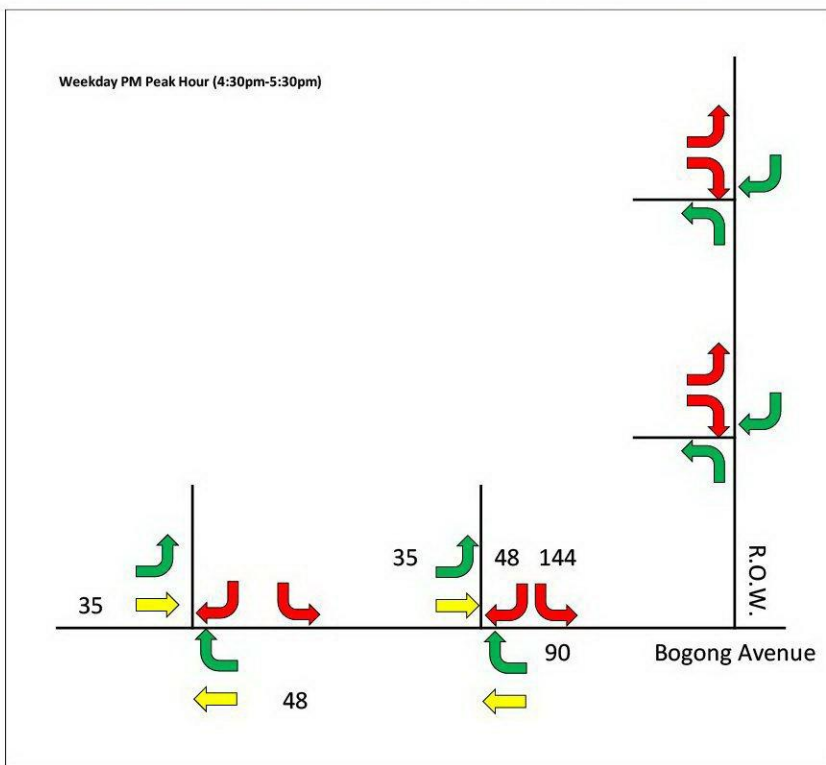


Figure 19: Site Generated Traffic Volumes – Weekday PM Peak Hour

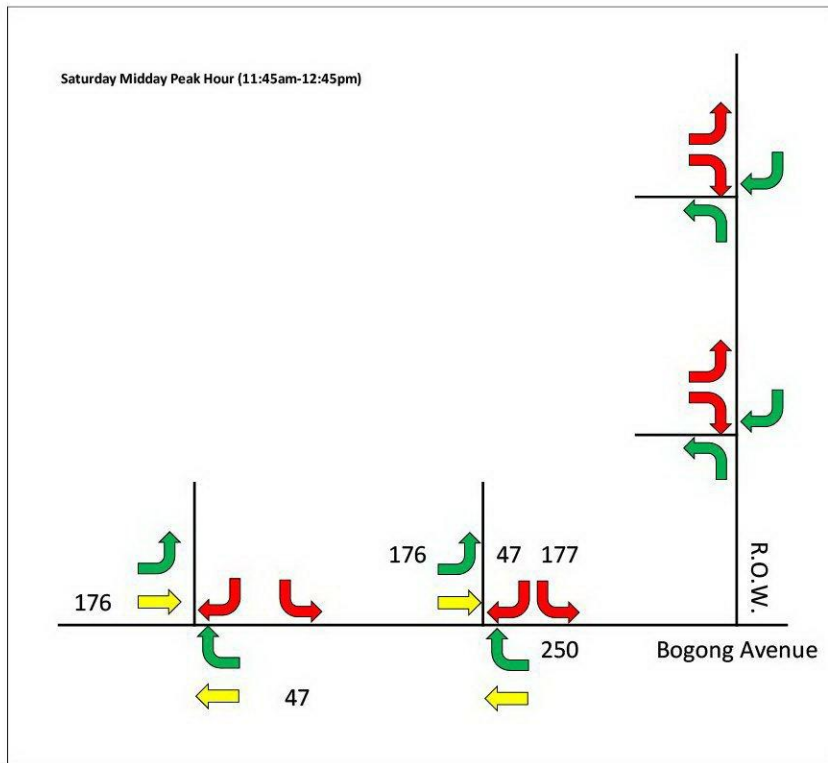


Figure 20: Site Generated Traffic Volumes – Saturday Midday Peak Hour

5.8. Post Development Traffic Volumes

By adding the anticipated site generated traffic volumes to the base case traffic volumes, we can predict the post development traffic volumes. We re-iterate that all additional site generated traffic is conservatively assumed to be 'new' to the network.

The predicted post development traffic volumes for peak hours are presented at Figure 21 to Figure 23.

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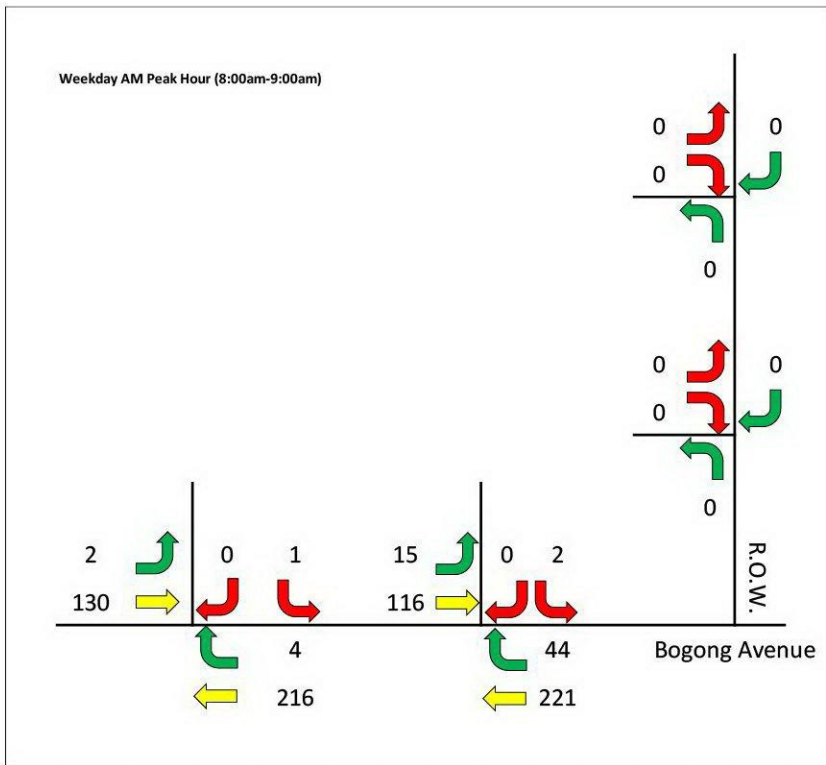


Figure 21: Post Development Traffic Volumes – Weekday AM Peak Hour

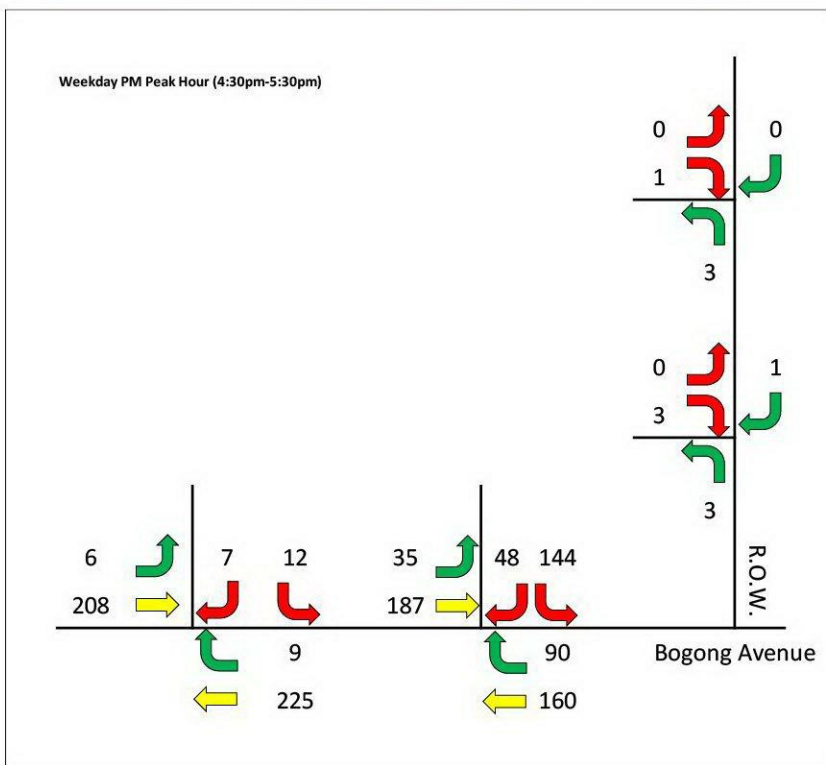


Figure 22: Post Development Traffic Volumes – Weekday PM Peak Hour

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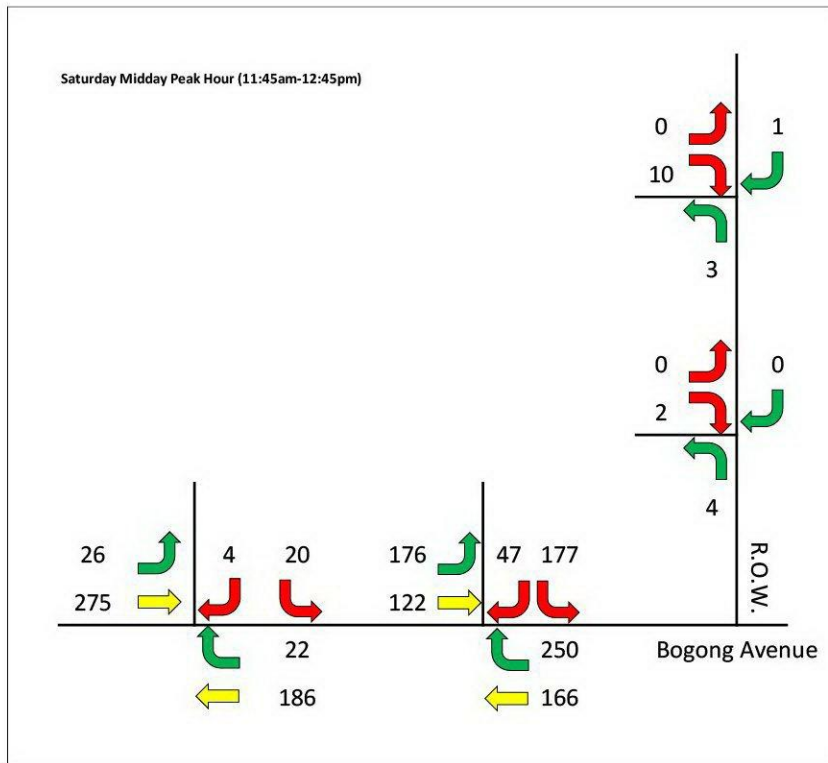


Figure 23: Post Development Traffic Volumes – Saturday Midday Peak Hour

5.9. Traffic Assessment Method

We have utilised SIDRA Intersection 9 to undertake an assessment of the Eastern Site Access/Bogong Avenue intersection.

SIDRA is a computer simulation package which assesses the operating performance of intersections and road networks.

A summary of key outputs is as follows:

- **Degree of Saturation (DoS)** – The ratio of traffic volume to maximum capacity for a particular turning movement.
- **Average Delay (Avg. Delay)** – The average delay in seconds for a vehicle making a particular turning movement.
- **95th Percentile Queue (95% Queue)** – The 95th percentile queue length is the length in metres which 95 per cent of all observed cycle queues fall below (or 5% exceed) during the peak analysis period.

The layout of the intersection is shown at Figure 24, noting that no changes to the intersection layout are proposed as part of the development proposal.

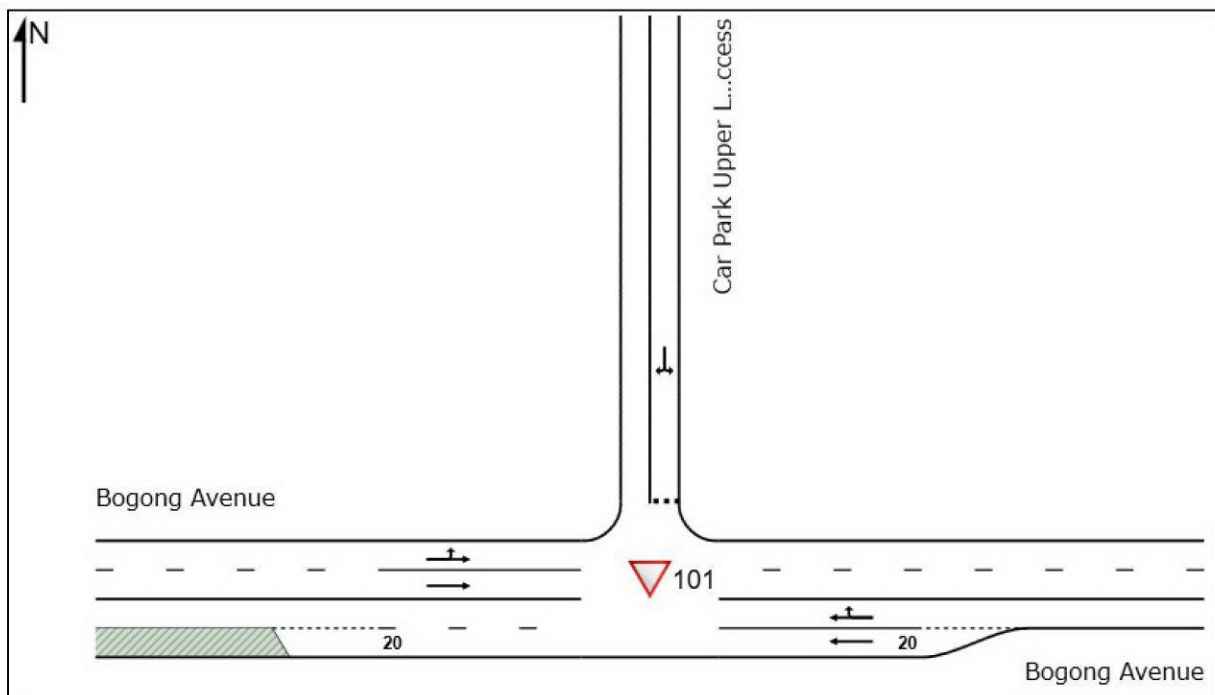


Figure 24: Intersection Layout

5.10. Traffic Impact

The key findings of our SIDRA assessment⁷ are summarised in Table 4 with full results provided at Appendix D.

⁷ Default SIDRA gap acceptance values were adopted for the purposes of our assessment.

Traffic Engineering Assessment

1-5 Bogong Avenue, Glen Waverley

Table 4: SIDRA Movement Summary

Peak Hour	Intersection Leg	Existing Conditions			Post Development		
		DoS	Avg. Delay (s)	95% Queue (m)	DoS	Avg. Delay (s)	95% Queue (m)
Weekday AM Peak Hour	Bogong Avenue (East)	0.10	1	1	0.13	1	3
	Car Park Access (North)	0.00	7	0	0.00	7	0
	Bogong Avenue (West)	0.03	3	0	0.04	1	0
Weekday PM Peak Hour	Bogong Avenue (East)	0.07	1	1	0.14	3	5
	Car Park Access (North)	0.04	6	2	0.21	7	6
	Bogong Avenue (West)	0.04	1	1	0.06	1	0
Saturday Midday Peak Hour	Bogong Avenue (East)	0.08	1	2	0.28	5	10
	Car Park Access (North)	0.01	6	0	0.25	7	3
	Bogong Avenue (West)	0.03	1	0	0.10	3	0

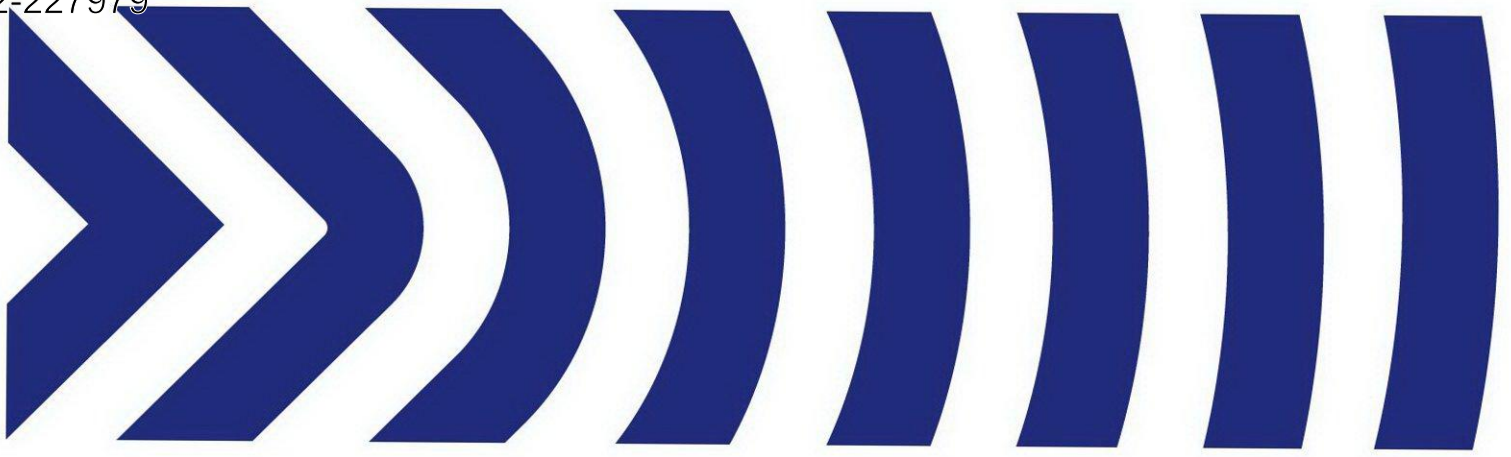
As shown in Table 4, the eastern site access point currently operates within and is predicted to continue to operate within acceptable limits post development.

The development proposal is not expected to result in a significant deterioration in the operation of the surrounding road network, with all post development queues and delays relatively modest and considered to be within acceptable limits.

6. Conclusions

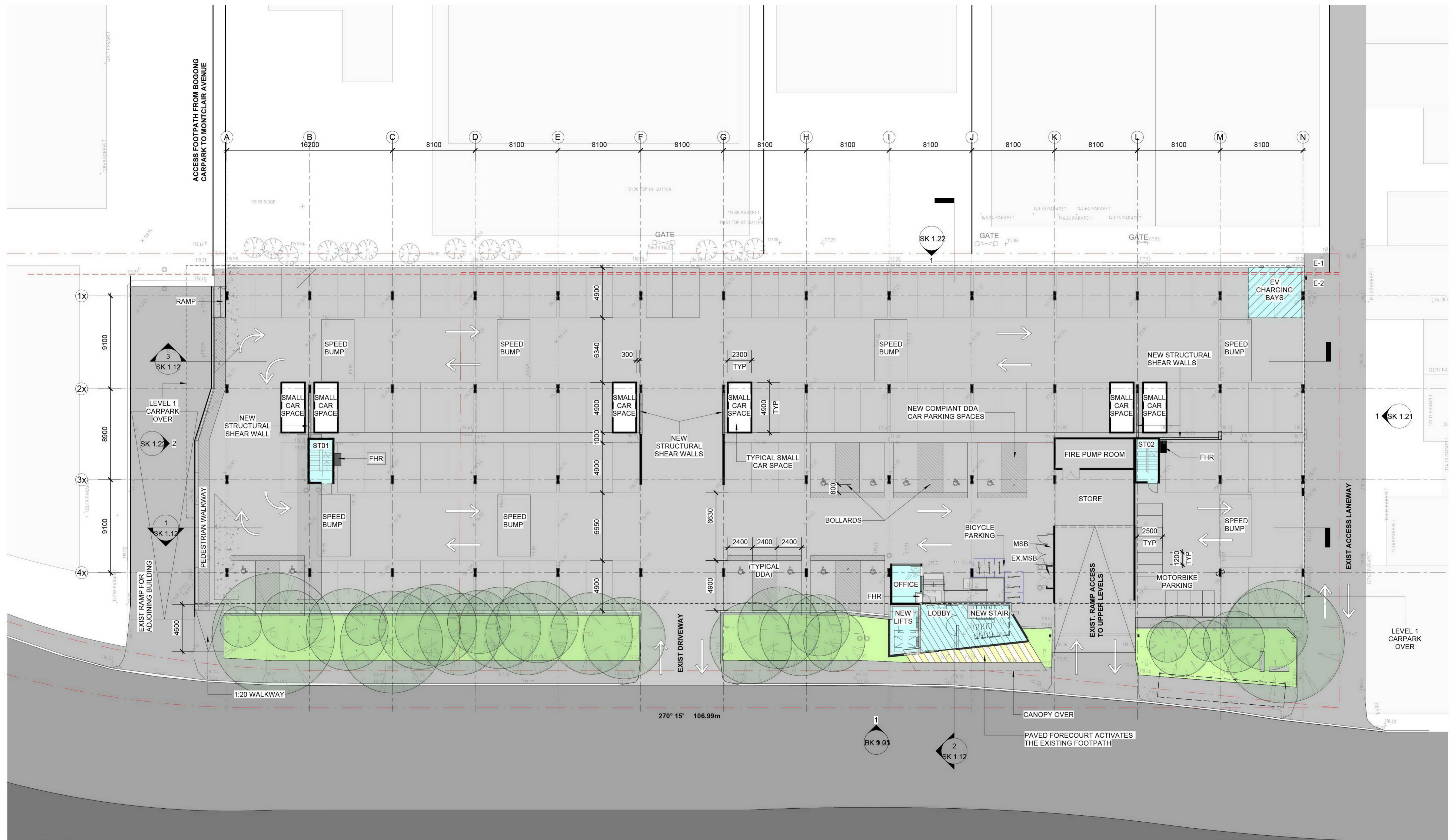
Having undertaken a detailed traffic engineering assessment of the proposed multi-storey car park extension at 1-5 Bogong Avenue, Glen Waverley, we are of the opinion that:



- a) The permit being sought under this application comprises a 'car park' use comprising a total of 1,032 car parking spaces.
- b) The provision of 518 additional car parking spaces is appropriate.
- c) The proposed parking layout and access arrangements are generally identified in accordance with or in excess of the requirements of the Planning Scheme, relevant Australian Standards and current practice where relevant.
- d) No changes are proposed to the existing vehicle access points to the site.
- e) Post development, a total of some 61, 318 and 650 vehicle movements during the respective Weekday AM, Weekday PM and Saturday Midday peak hours is anticipated at the eastern site access point to Bogong Avenue.
- f) We are satisfied that the traffic generation of the development proposal can be incorporated within the existing surrounding road network and intersections, with all post development queues and delays at site access points relatively modest and considered to be within acceptable limits.
- g) There are no traffic engineering reasons why a planning permit for the development proposal at 1-5 Bogong Avenue, Glen Waverley, should be refused.

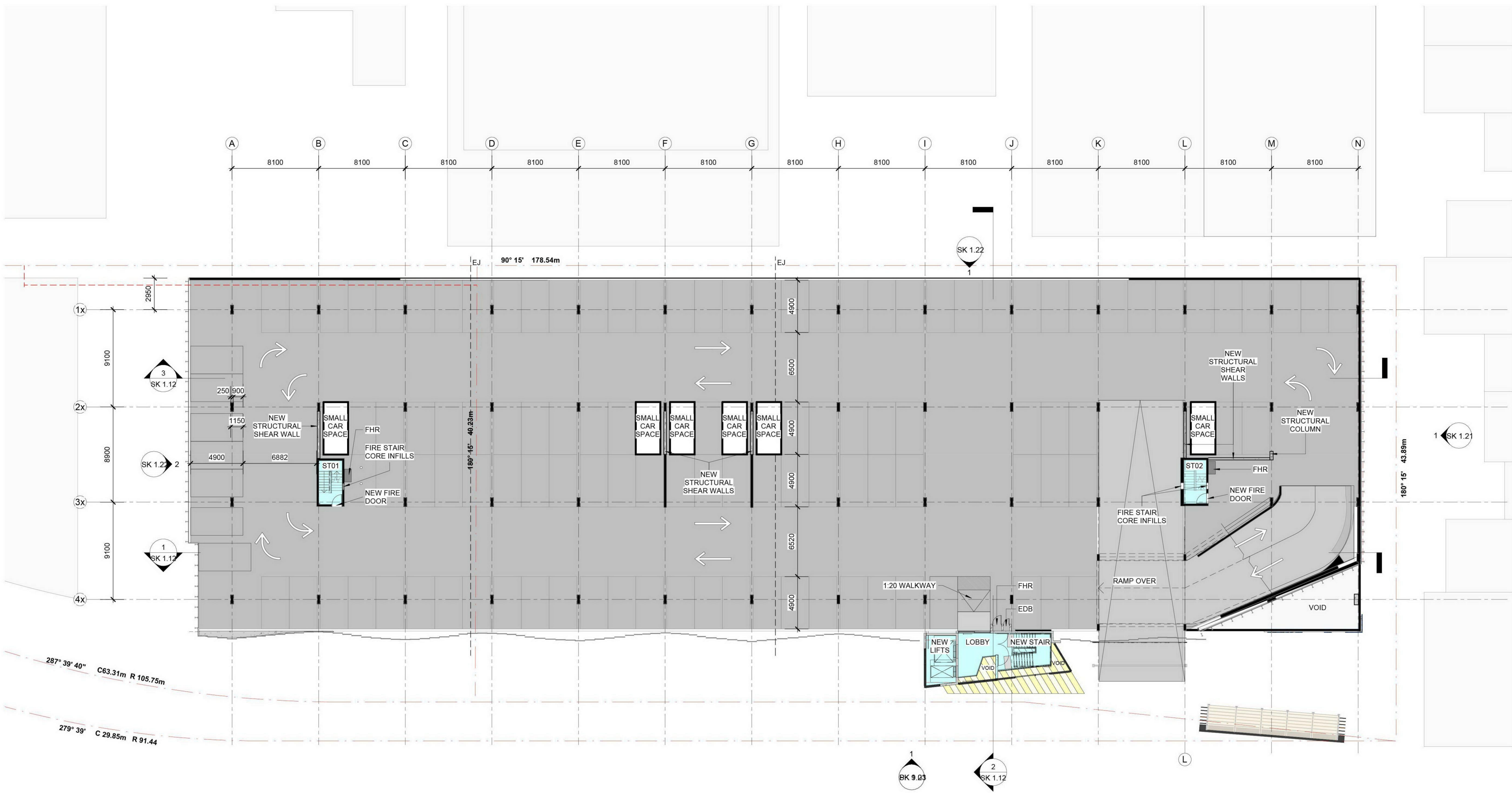


Appendix A

Development Plans



- LEGEND**
- B EXISTING BOLLARD
 - DP EXISTING DOWNPIPE
 - EJ CONSTRUCTION JOINT
 - MSA MAIN ELECTRICAL SWITCHBOARD
 - EDB ELECTRICAL DISTRIBUTION BOARD
 - FHR FIRE HOSE REEL
-  EXISTING TREE TO BE RETAINED
 EXISTING TREE TO BE DEMOLISHED



- LEGEND**
- B EXISTING BOLLARD
 - DP EXISTING DOWNPIPE
 - EJ CONSTRUCTION JOINT
 - MSA MAIN ELECTRICAL SWITCHBOARD
 - EDB ELECTRICAL DISTRIBUTION BOARD
 - FHR FIRE HOSE REEL
 - EXISTING TREE TO BE RETAINED
 - EXISTING TREE TO BE DEMOLISHED

BOGONG AVENUE

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 Only use figured dimensions. Do not scale. If in doubt, consult the architect. Check all dimensions on site before fabrication or set out.

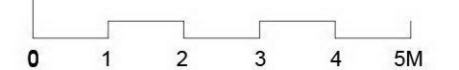


Bogong Carpark Extension

1-5 Bogong Avenue, Glen Waverley

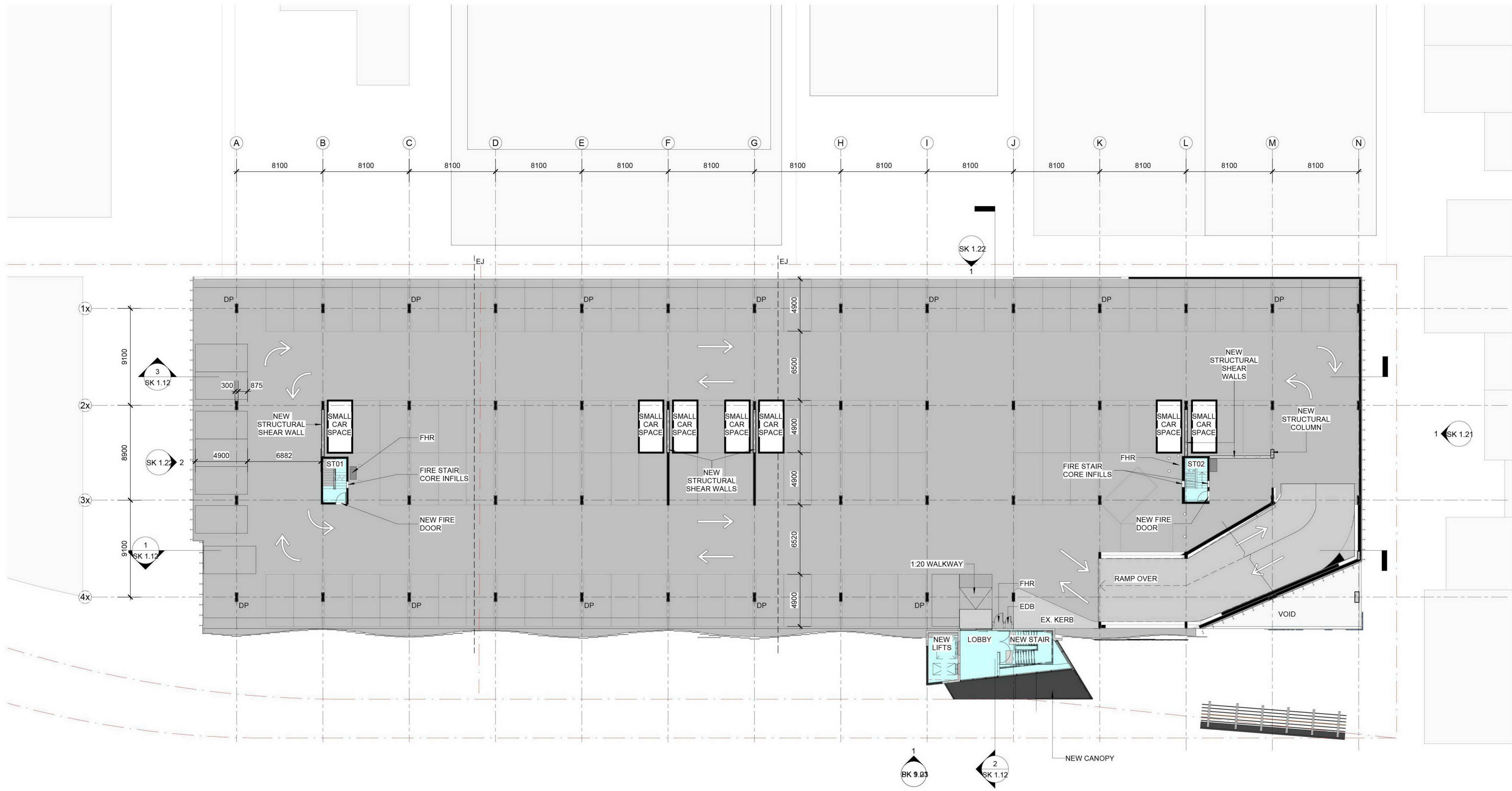
Proposed Level One

SK 1.02





1 : 200@A1

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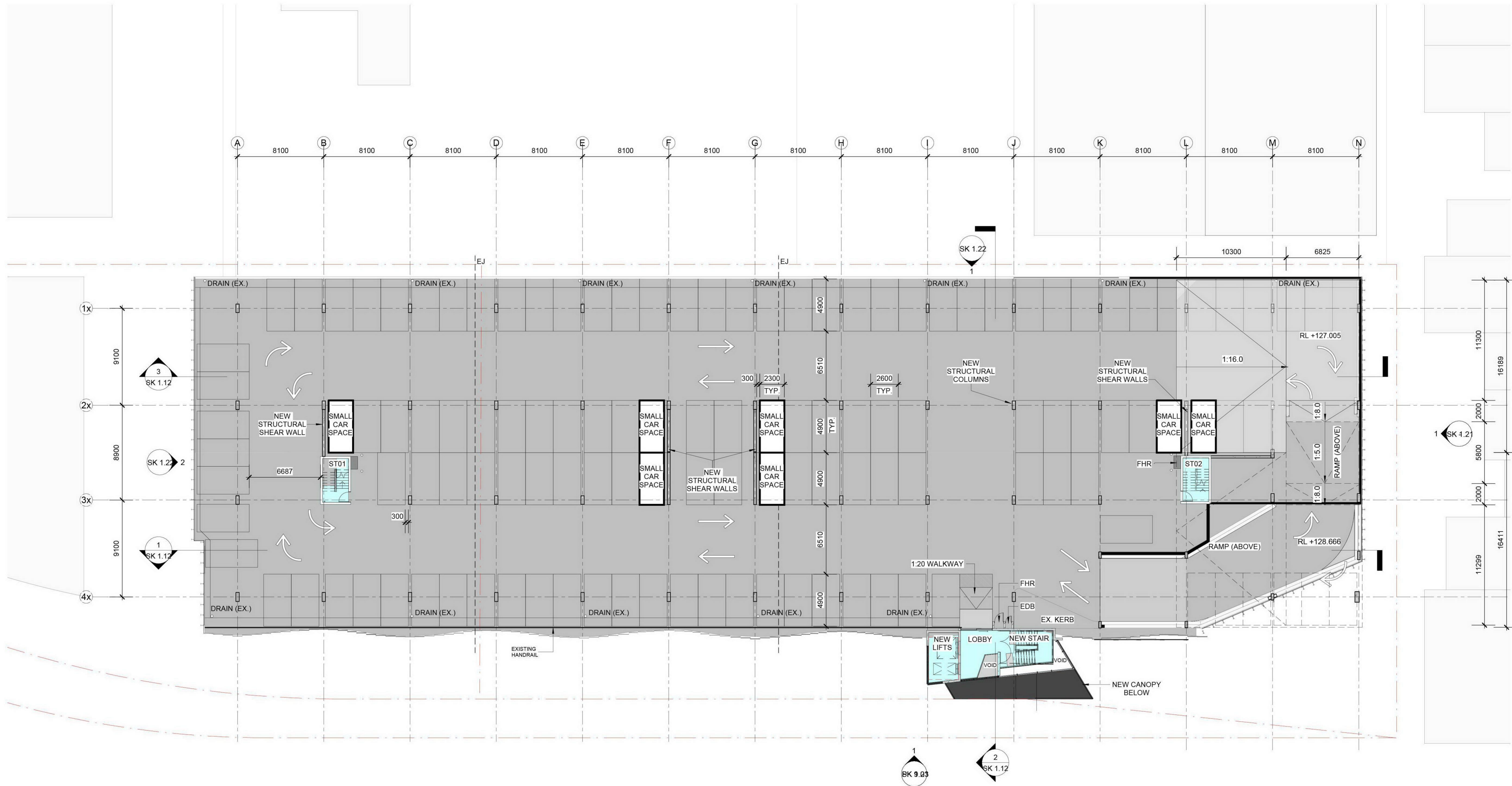


LEGEND

- B** EXISTING BOLLARD
- DP** EXISTING DOWNPIPE
- EJ** CONSTRUCTION JOINT
- MSA** MAIN ELECTRICAL SWITCHBOARD
- EDB** ELECTRICAL DISTRIBUTION BOARD
- FHR** FIRE HOSE REEL



 EXISTING TREE TO BE RETAINED
 EXISTING TREE TO BE DEMOLISHED



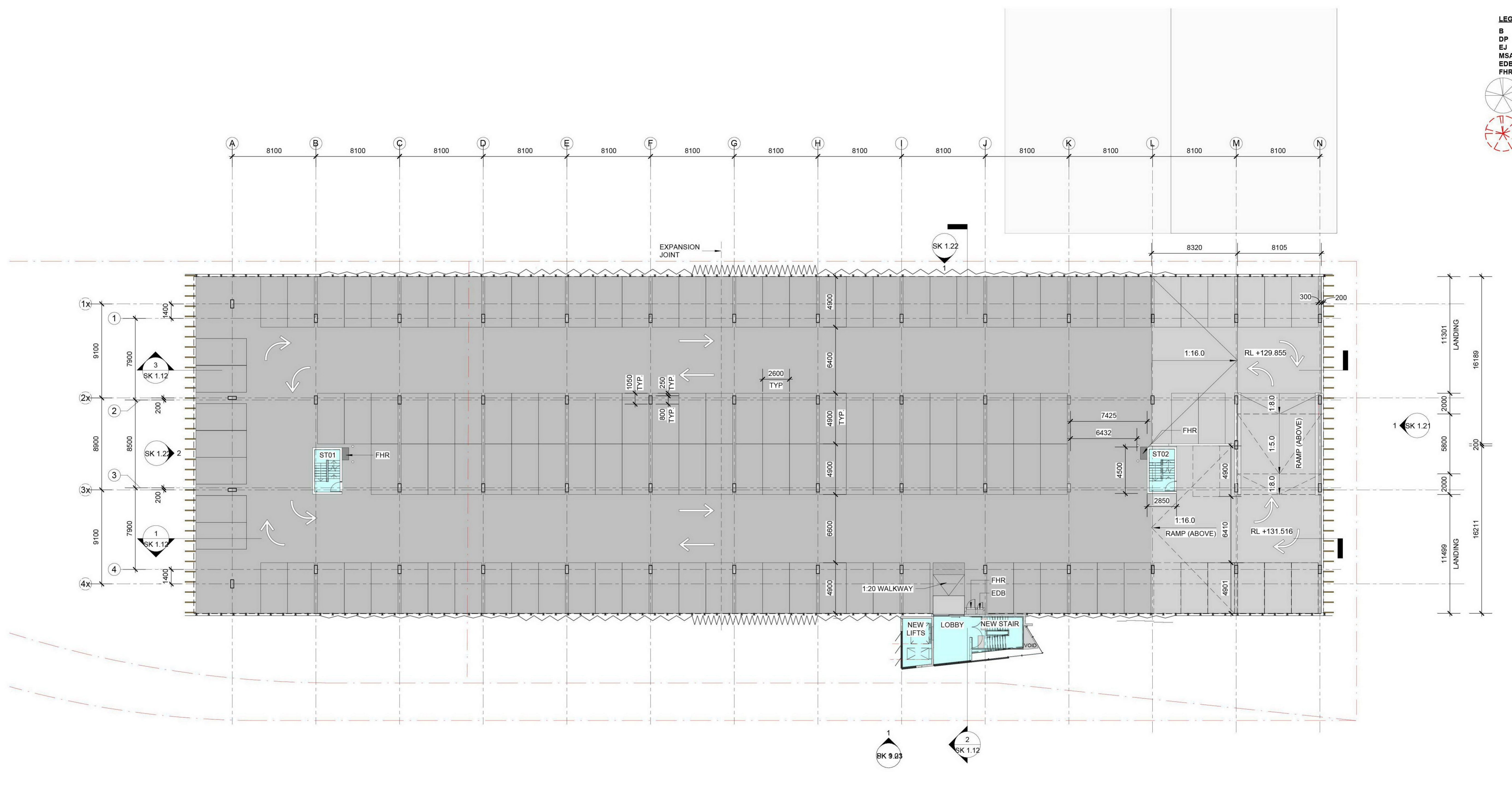


LEGEND

- B** EXISTING BOLLARD
- DP** EXISTING DOWNPIPE
- EJ** CONSTRUCTION JOINT
- MSA** MAIN ELECTRICAL SWITCHBOARD
- EDB** ELECTRICAL DISTRIBUTION BOARD
- FHR** FIRE HOSE REEL

 EXISTING TREE TO BE RETAINED
 EXISTING TREE TO BE DEMOLISHED







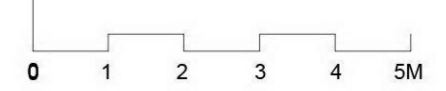
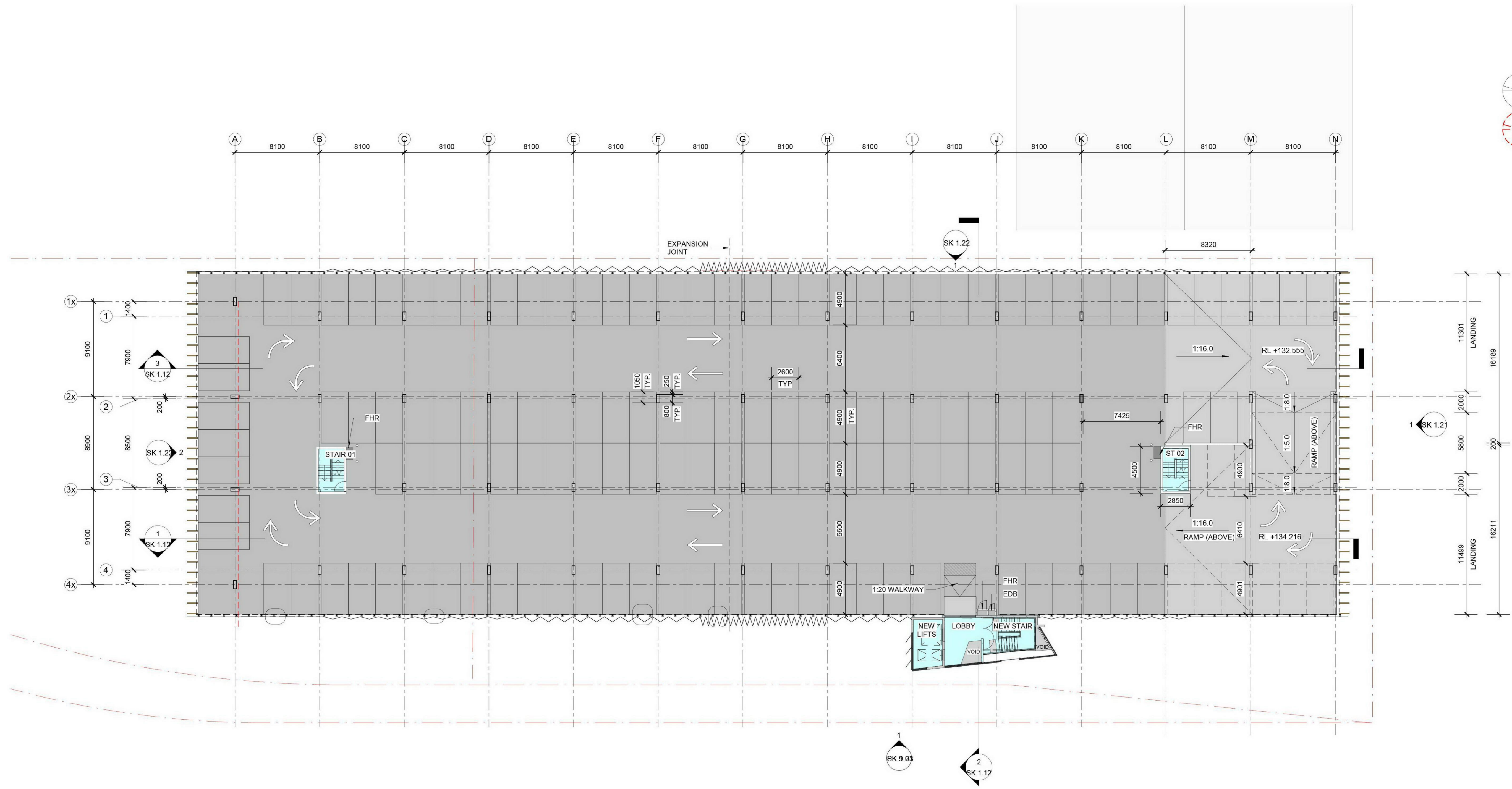
LEGEND

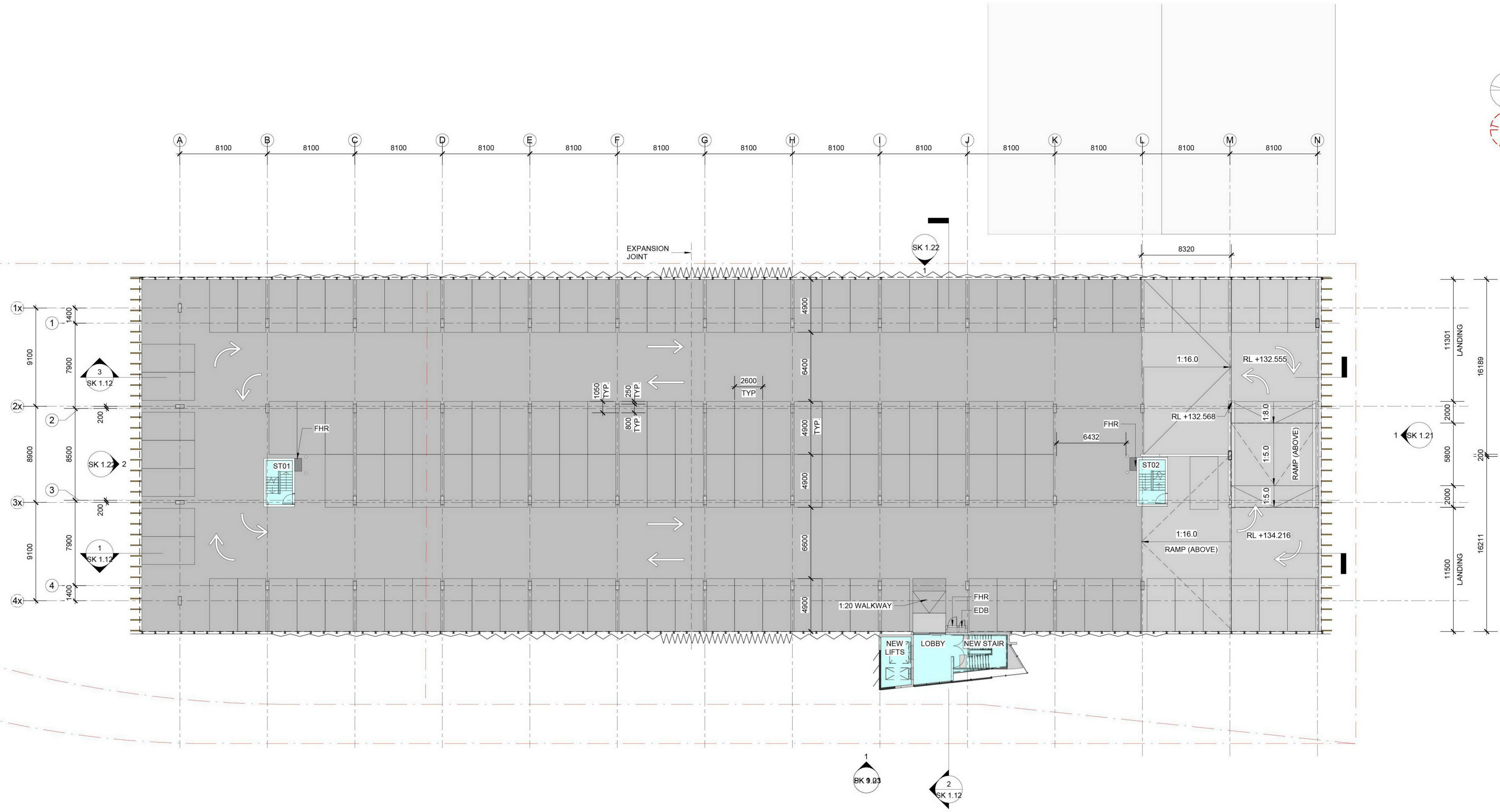
- B EXISTING BOLLARD
- DP EXISTING DOWNPIPE
- EJ CONSTRUCTION JOINT
- MSA MAIN ELECTRICAL SWITCHBOARD
- EDB ELECTRICAL DISTRIBUTION BOARD
- FHR FIRE HOSE REEL

EXISTING TREE TO BE RETAINED

EXISTING TREE TO BE DEMOLISHED

- LEGEND**
- B EXISTING BOLLARD
 - DP EXISTING DOWNPIPE
 - EJ CONSTRUCTION JOINT
 - MSA MAIN ELECTRICAL SWITCHBOARD
 - EDB ELECTRICAL DISTRIBUTION BOARD
 - FHR FIRE HOSE REEL
-  EXISTING TREE TO BE RETAINED
 EXISTING TREE TO BE DEMOLISHED



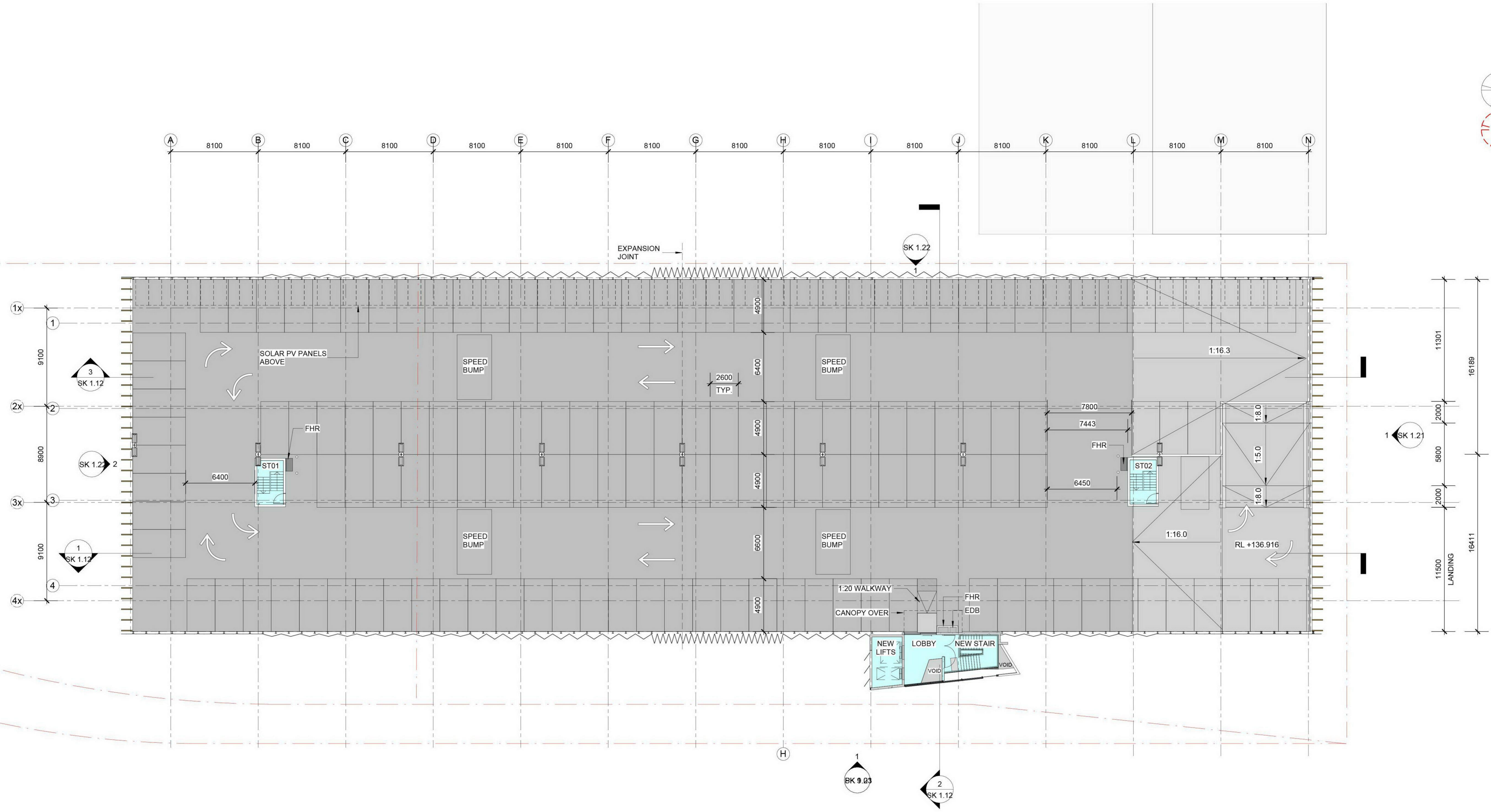


LEGEND

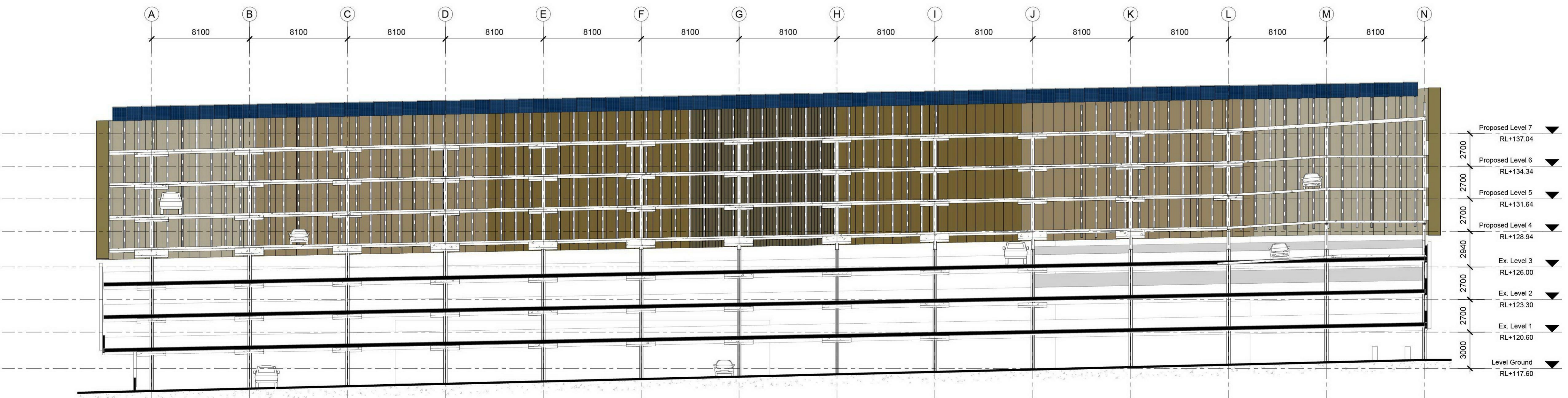
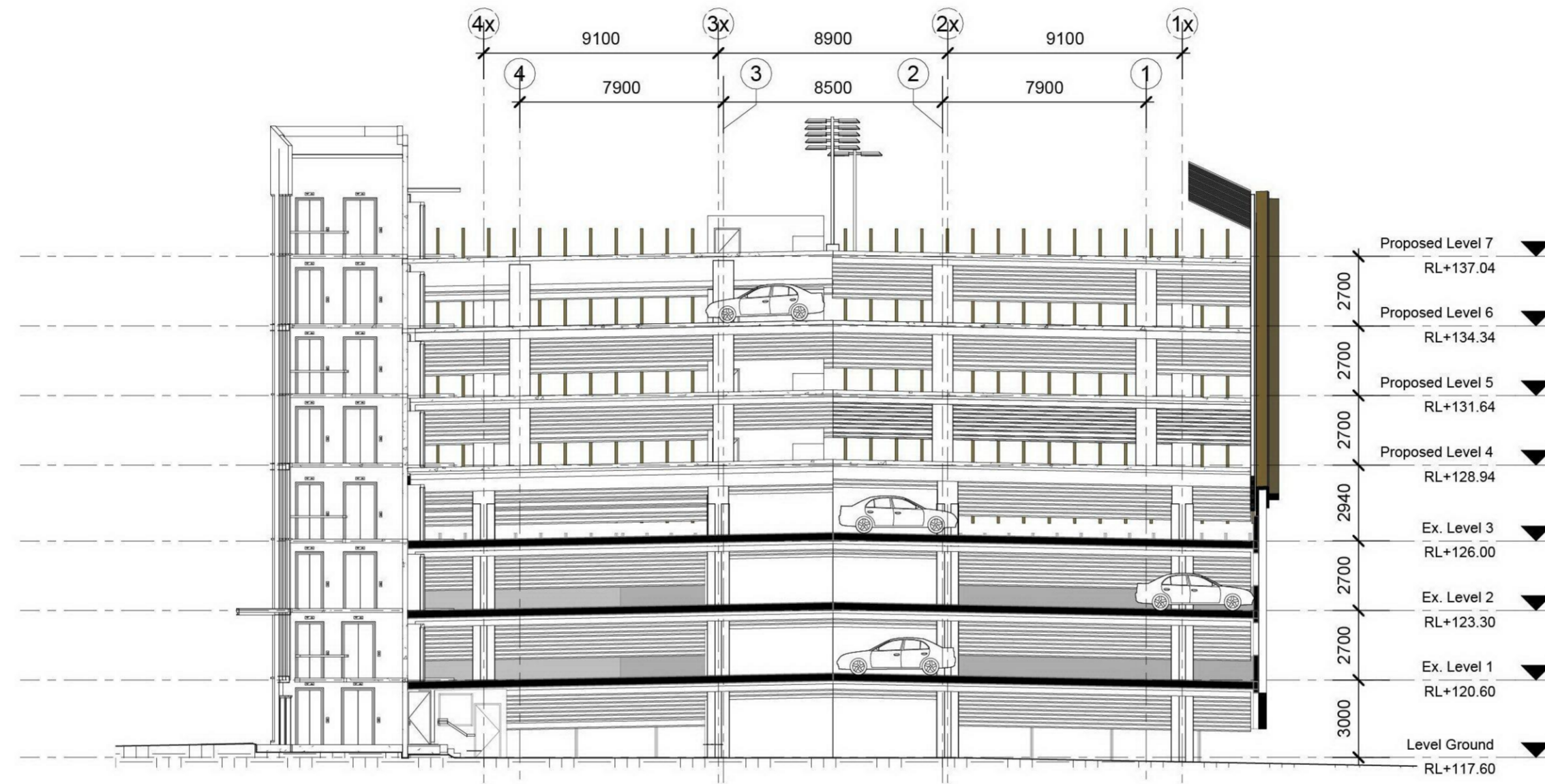
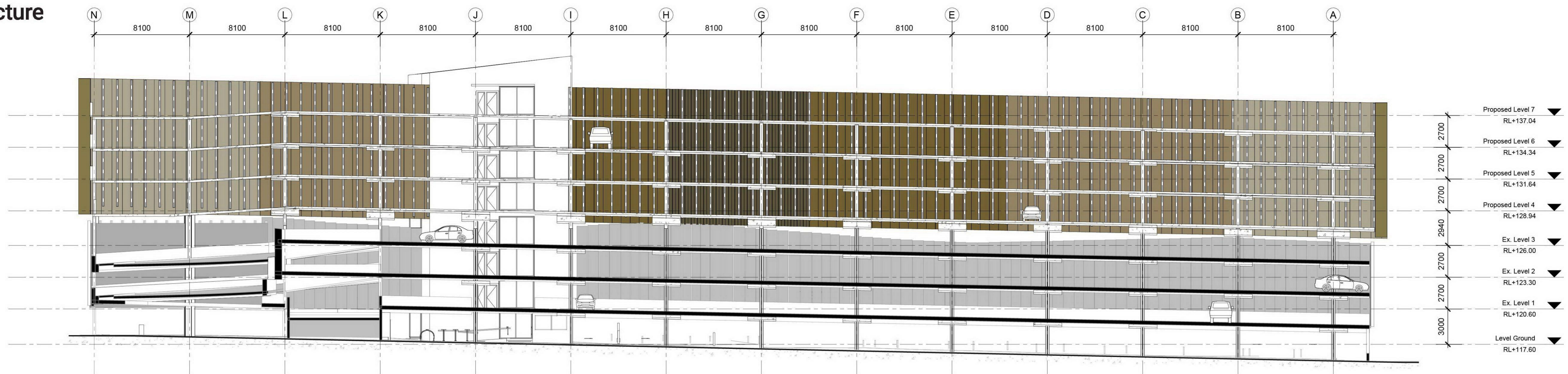
- B EXISTING BOLLARD
- DP EXISTING DOWNPIPE
- EJ CONSTRUCTION JOINT
- MSA MAIN ELECTRICAL SWITCHBOARD
- EDB ELECTRICAL DISTRIBUTION BOARD
- FHR FIRE HOSE REEL

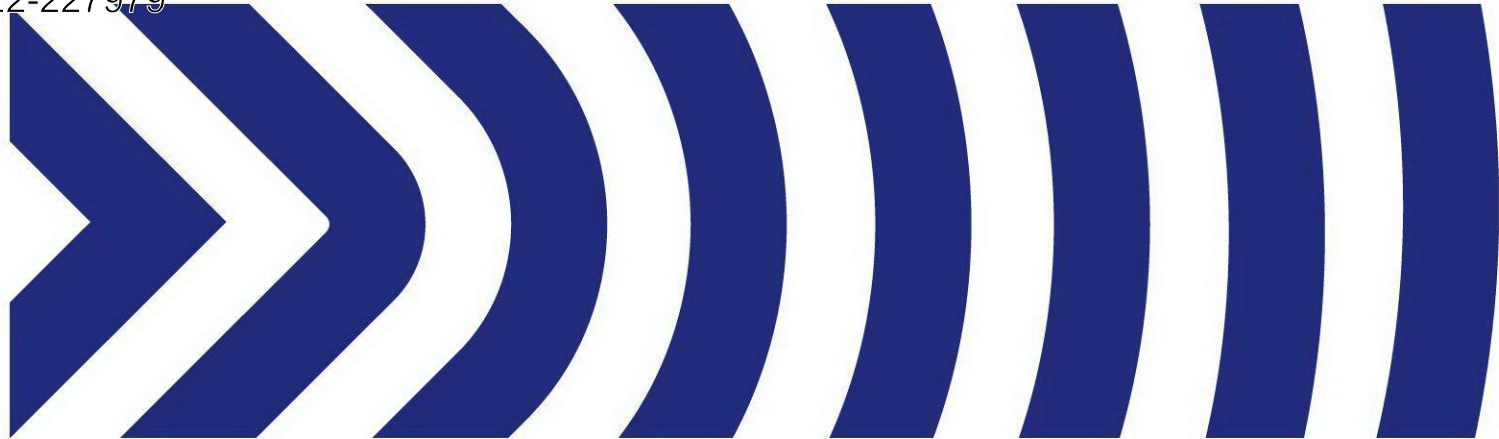
EXISTING TREE TO BE RETAINED

EXISTING TREE TO BE DEMOLISHED



- LEGEND**
- B EXISTING BOLLARD
 - DP EXISTING DOWNPIPE
 - EJ CONSTRUCTION JOINT
 - MSA MAIN ELECTRICAL SWITCHBOARD
 - EDB ELECTRICAL DISTRIBUTION BOARD
 - FHR FIRE HOSE REEL
 - (Tree symbol) EXISTING TREE TO BE RETAINED
 - (Tree symbol) EXISTING TREE TO BE DEMOLISHED





Appendix B

Car Parking Survey Results

Supervised By: Kane Bollock
Surveyed By: Frank Feller, San Murali

Survey Date & Time: See below

Location	Restriction	Capacity Min - Max	30/4/21								1/5/21						17/2/22		19/2/22	
			6pm	7pm	8pm	9pm	10pm	11pm	12am	6pm	7pm	8pm	9pm	10pm	11pm	12am	7:30am	4:30pm	11am	
OFF-STREET CARPARKING																				
BOGONG AVENUE MULTI-STOREY CARPARK																				
Ground Level	3P 8am-6pm Mon-Sat	126	111	126	126	124	109	43	26	126	126	126	125	102	61	13	40	63	76	
	Disabled Parking	6	4	5	6	5	3	0	0	2	4	2	1	1	1	0	4	3	2	
Level 1	4P 8am-6pm Mon-Sat	124	98	120	124	112	92	45	23	105	124	124	104	91	57	19	29	57	46	
	Disabled Parking	2	1	2	2	2	2	0	0	2	2	2	2	2	2	1	2	2	2	
Level 2	4P 8am-6pm Mon-Sat	41	15	41	41	32	20	13	6	14	41	41	31	17	8	2	7	9	3	
	Council Staff 4P 8am-6pm Mon-Sat	84	12	80	84	57	36	16	7	4	84	84	69	32	16	9	3	4	5	
	Disabled Parking	2	0	2	2	0	2	1	1	1	2	2	2	0	0	0	2	2	2	
Level 3	Trader Permits 4P 8am-6pm Mon-Sat	132	29	37	132	103	68	30	9	21	84	132	124	59	34	18	30	43	37	
	Disabled Parking	2	1	1	1	2	2	1	1	0	0	2	1	0	0	0	2	2	2	
SUMMARY => OFF-STREET CARPARKING																				
Spaces Available		519 - 519	519	519	519	519	519	519	519	519	519	519	519	519	519	519	519	519	519	
Total Number of Cars Parked			271	414	518	437	334	149	73	275	467	515	459	304	179	62	119	185	175	
Total Number of Vacant Spaces			248	105	1	82	185	370	446	244	52	4	60	215	340	457	400	334	344	
Percentage Occupancy			52%	80%	100%	84%	64%	29%	14%	53%	90%	99%	88%	59%	34%	12%	23%	36%	34%	

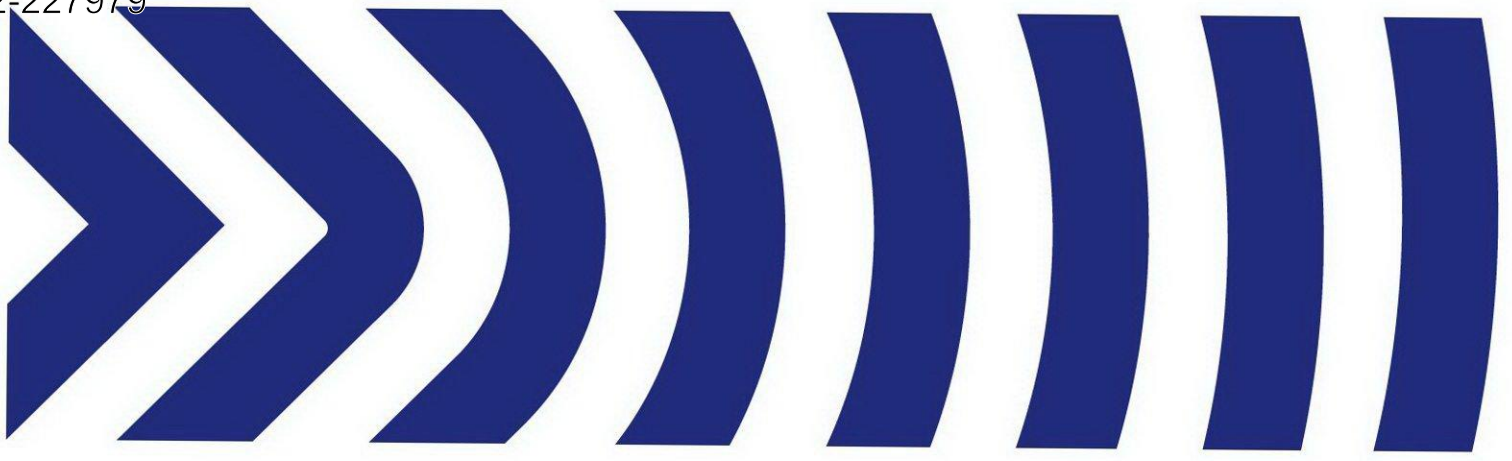
Note: Suitable parking spaces are spaces that could be used by residents or visitors of the development and excludes 'No Stopping' areas, 'Loading Zones' and 'No Parking' areas during the relevant enforcement periods

LEGEND:

Suitable

Unsuitable

No Stopping
Other No Parking

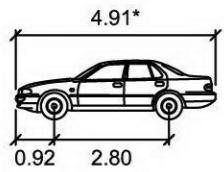


Appendix C

Swept Path Diagrams

VEHICLE PROFILE

VEHICLE USED IN SIMULATION



85th percentile
(AS/NZS 2890.1:2004)

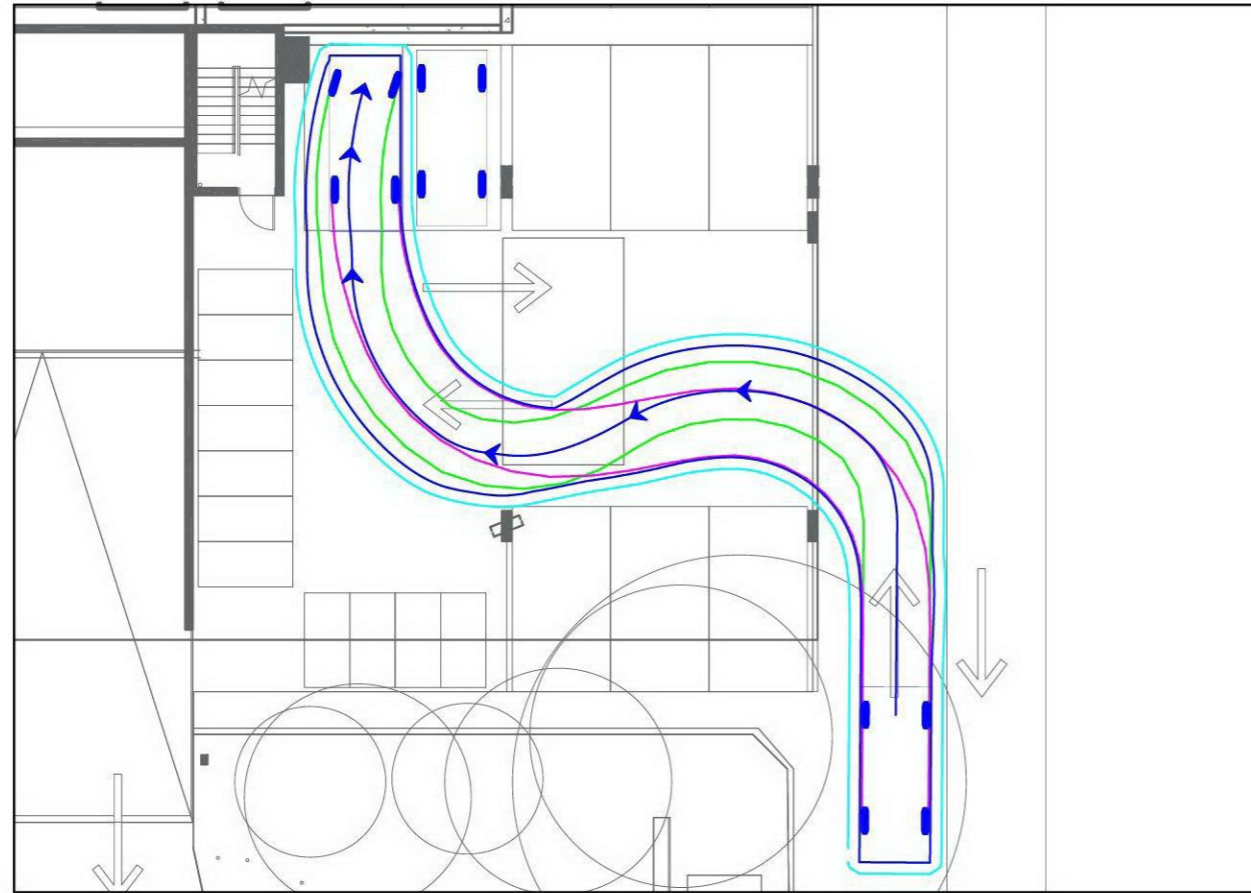
Width : 1.87m
Track : 1.77m
Kerb to Kerb Radius : 11.5m

* actual template based on 'relevant longitudinal dimensions that affect swept path' as set out in Section B2.1 of AS/NZS 2890.1:2004

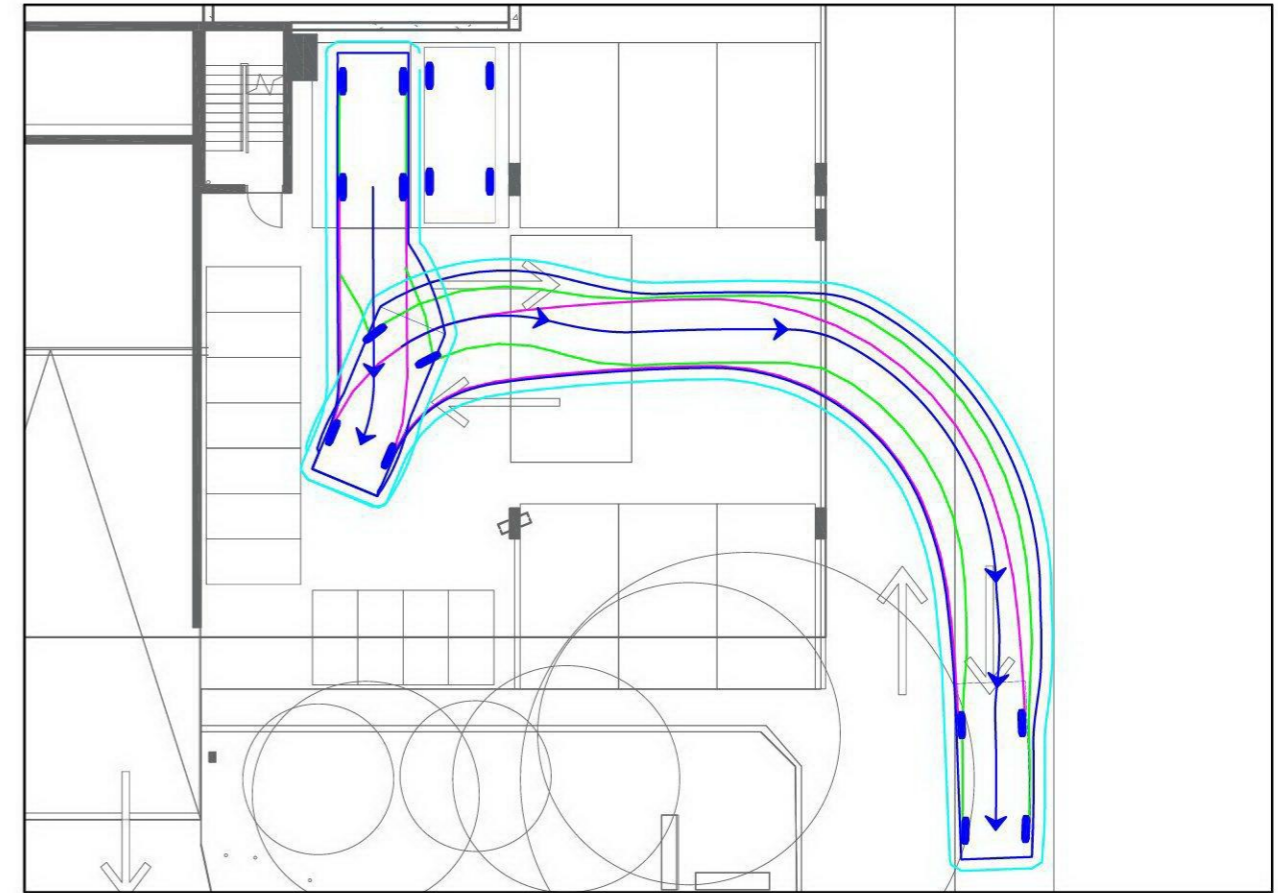
LEGEND

- REAR WHEELS
- FRONT WHEELS
- VEHICLE BODY
- BODY CLEARANCE

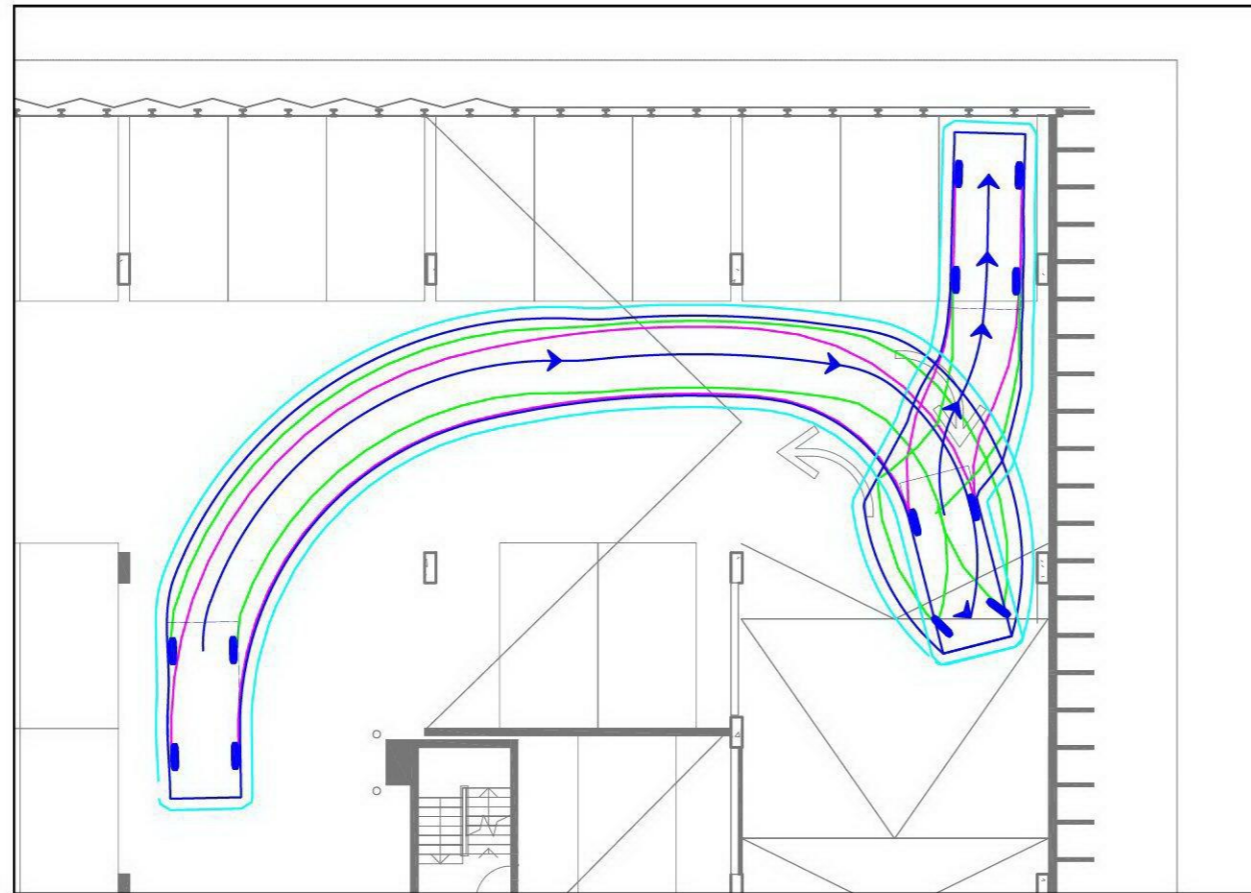
GROUND LEVEL CAR SPACE - INGRESS



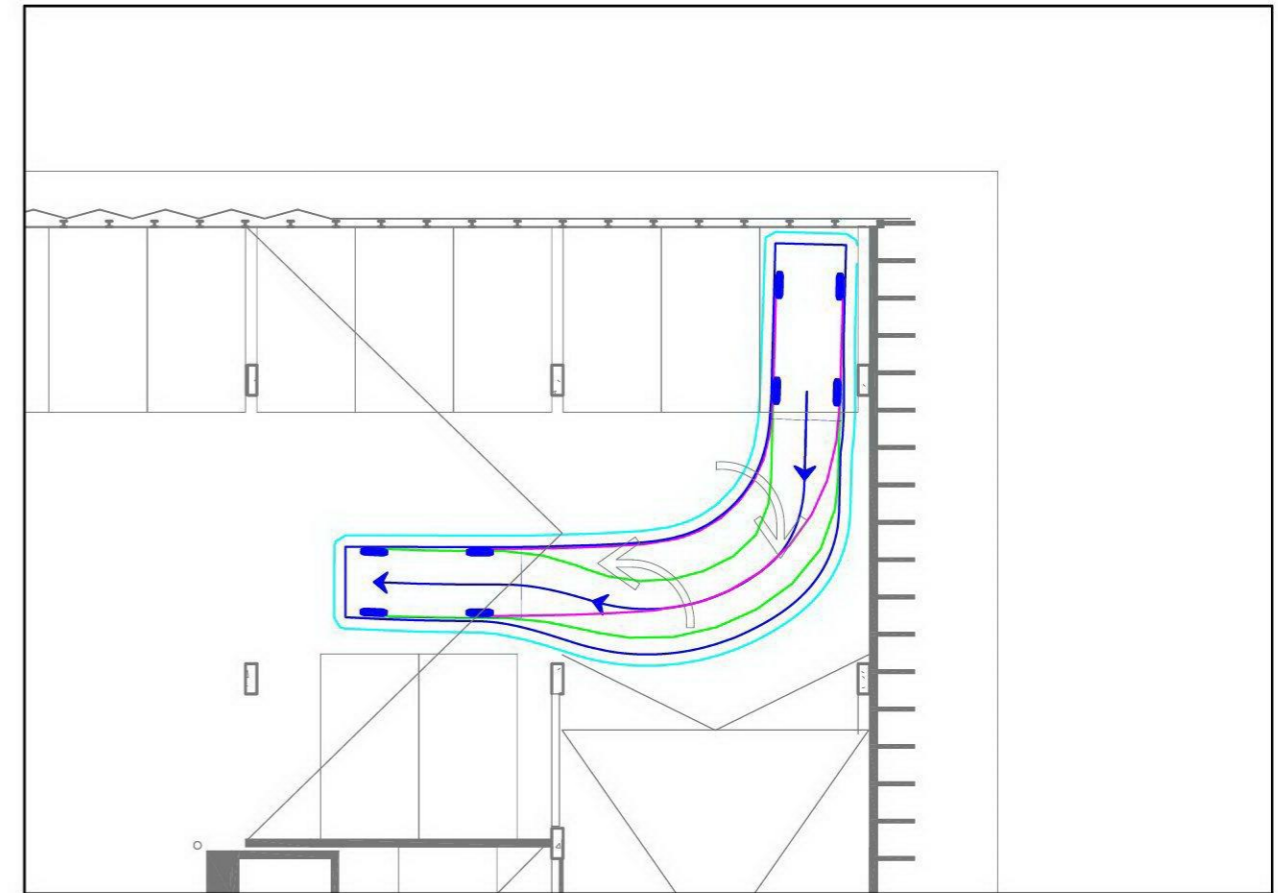
GROUND LEVEL CAR SPACE - EGRESS



LEVEL 4 CAR SPACE - REVERSE INGRESS



LEVEL 4 CAR SPACE - FORWARD EGRESS



REV	DATE	NOTES	DESIGNED BY	CHECKED BY
A	04-07-2022	ORIGINAL ISSUE	K. BULLOCK	D. TROTTER

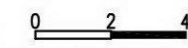
1-5 BOGONG AVENUE, GLEN WAVERLEY
PROPOSED MULTI-DECK CAR PARK EXPANSION

GENERAL NOTES:
BASE PLANS PREPARED BY KATZ
ARCHITECTURE, RECEIVED 04-07-2022

FILE NAME: 30999-01A
SHEET NO.: 01



SCALE:
1:200 (A3)



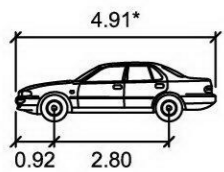
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VEHICLE PROFILE

VEHICLE USED IN SIMULATION

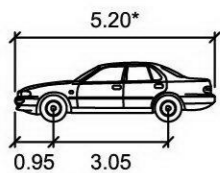


85th percentile
(AS/NZS 2890.1:2004)

Width : 1.87m
Track : 1.77m
Kerb to Kerb Radius : 11.5m

* actual template based on 'relevant longitudinal dimensions that affect swept path' as set out in Section B2.1 of AS/NZS 2890.1:2004

VEHICLE USED IN SIMULATION



99th percentile
(AS/NZS 2890.1:2004)

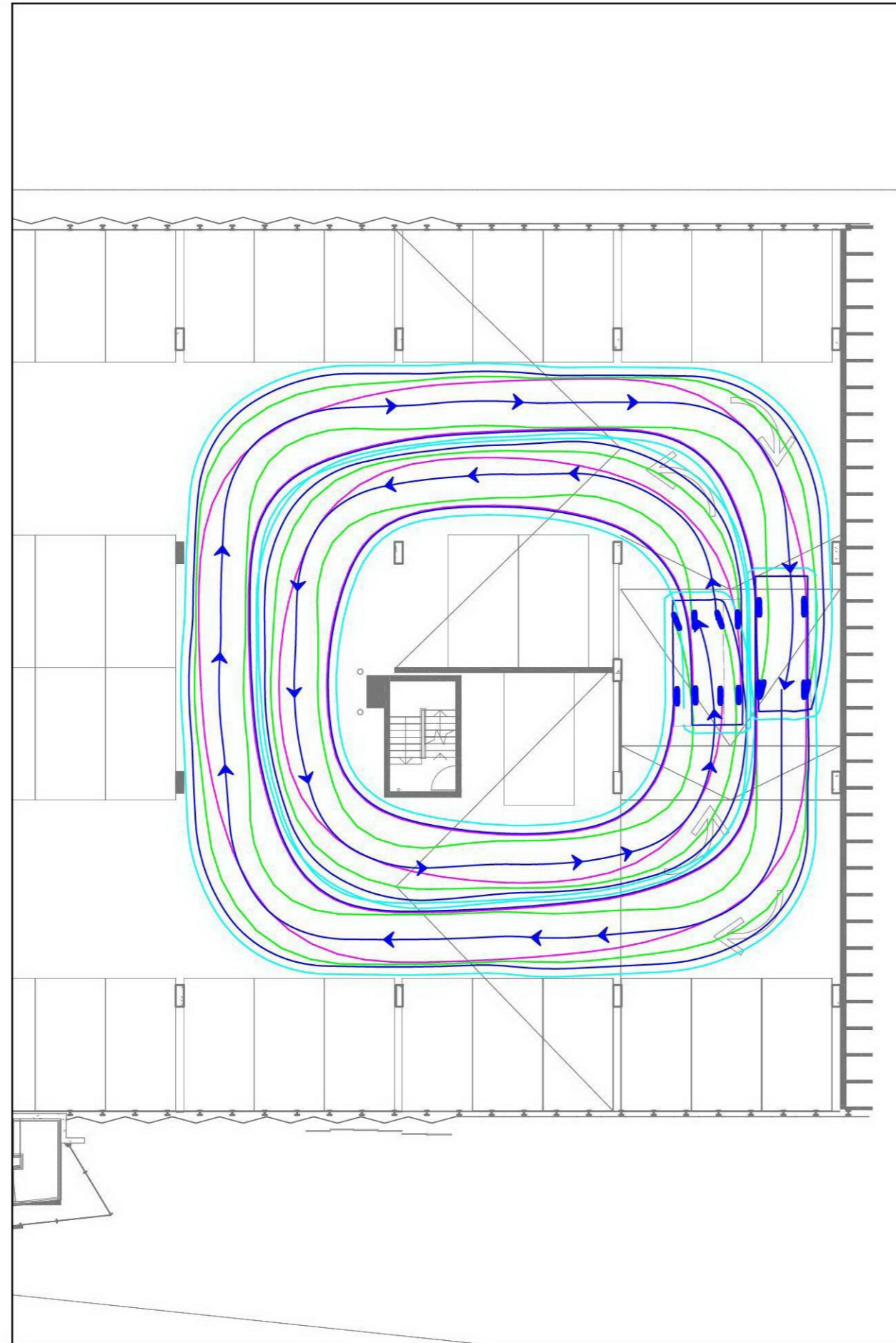
Width : 1.94m
Track : 1.84m
Kerb to Kerb Radius : 12.5m

* actual template based on 'relevant longitudinal dimensions that affect swept path' as set out in Section B2.1 of AS/NZS 2890.1:2004

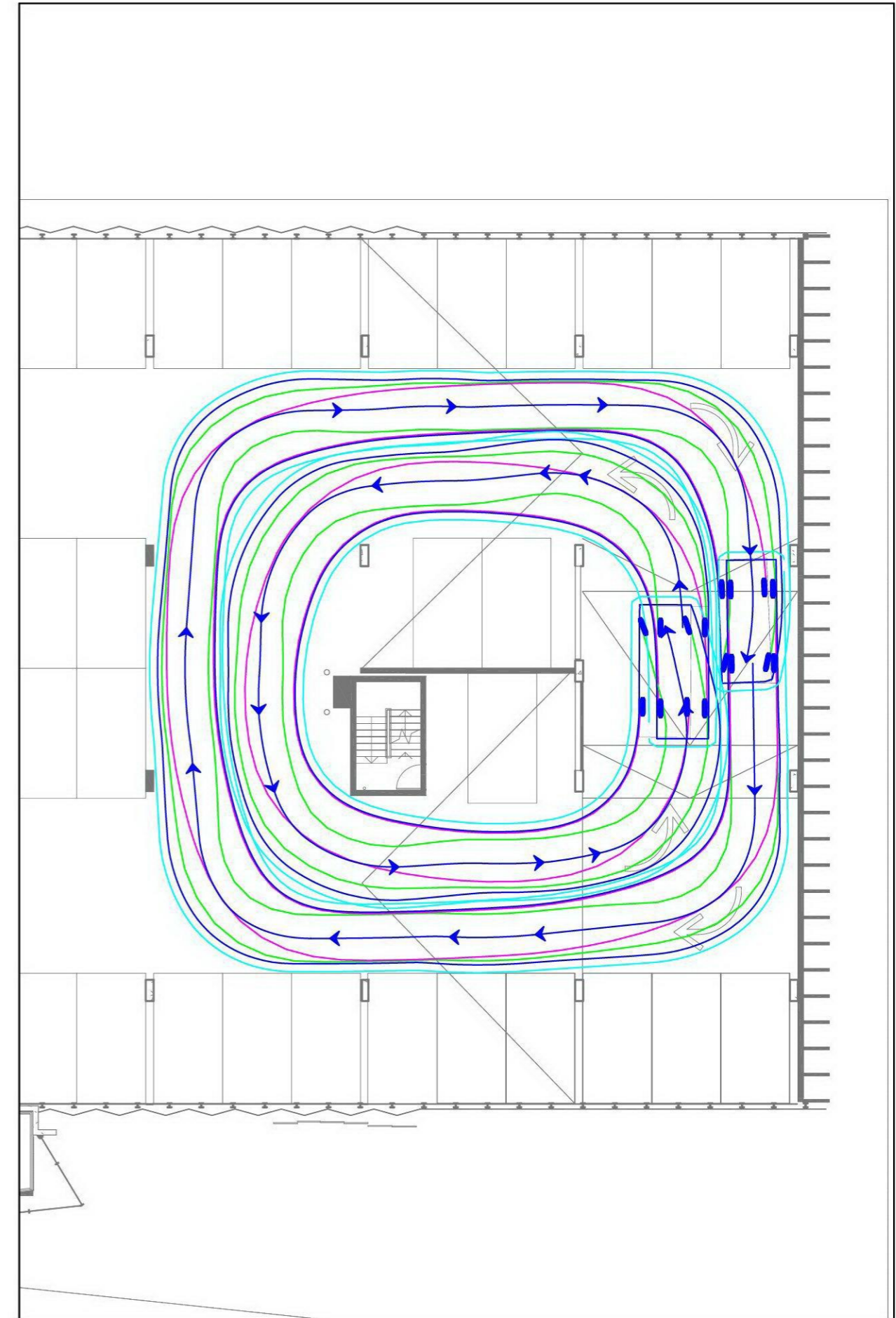
LEGEND

- REAR WHEELS
- FRONT WHEELS
- VEHICLE BODY
- BODY CLEARANCE

RAMP CIRCULATION - SIMULTANEOUS B99 & B85 DESIGN VEHICLES



RAMP CIRCULATION - SIMULTANEOUS B85 & B99 DESIGN VEHICLES



REV	DATE	NOTES	DESIGNED BY	CHECKED BY
A	04-07-2022	ORIGINAL ISSUE	K. BULLOCK	D. TROTTER

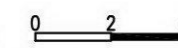
1-5 BOGONG AVENUE, GLEN WAVERLEY
PROPOSED MULTI-DECK CAR PARK EXPANSION

GENERAL NOTES:
BASE PLANS PREPARED BY KATZ
ARCHITECTURE, RECEIVED 04-07-2022

FILE NAME: 30999-01A
SHEET NO.: 02



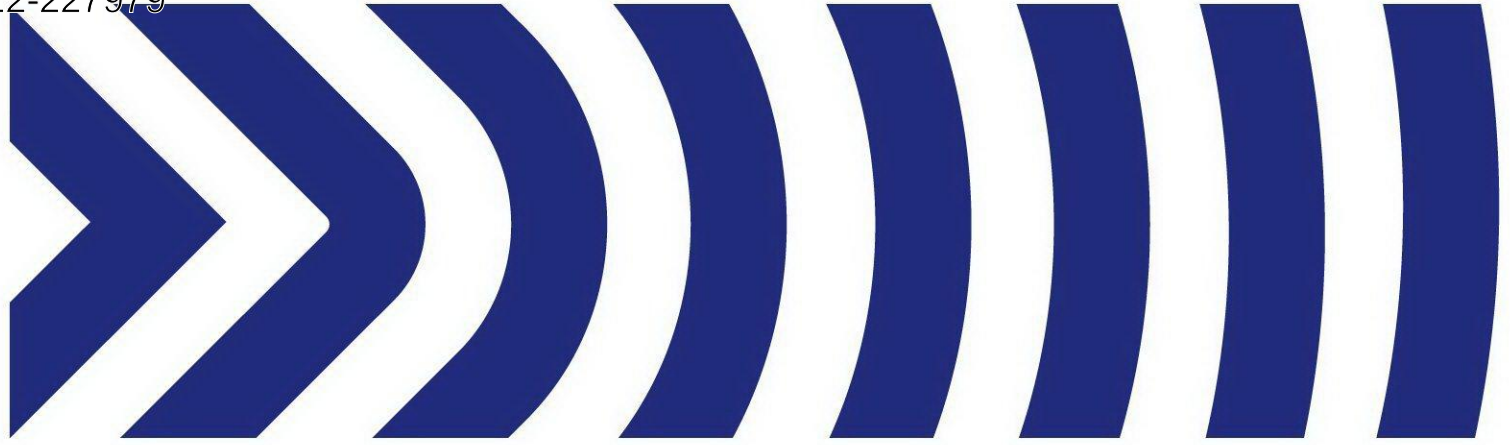
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Appendix D

SIDRA Intersection Results

MOVEMENT SUMMARY

▽ Site: 101 [Existing Conditions - Weekday AM Peak Hour (Site Folder: Existing Conditions)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
East: Bogong Avenue														
5	T1	184	2.0	194	2.0	0.098	0.1	LOS A	0.2	1.1	0.05	0.06	0.05	59.3
6	R2	20	0.0	21	0.0	0.098	5.9	LOS A	0.2	1.1	0.06	0.07	0.06	57.2
Approach		204	1.8	215	1.8	0.098	0.7	NA	0.2	1.1	0.05	0.06	0.05	59.1
North: Car Park Upper Level Access														
7	L2	1	0.0	1	0.0	0.002	5.7	LOS A	0.0	0.1	0.15	0.55	0.15	52.8
9	R2	1	0.0	1	0.0	0.002	7.6	LOS A	0.0	0.1	0.15	0.55	0.15	52.5
Approach		2	0.0	2	0.0	0.002	6.7	LOS A	0.0	0.1	0.15	0.55	0.15	52.6
West: Bogong Avenue														
10	L2	6	0.0	6	0.0	0.028	5.5	LOS A	0.0	0.0	0.00	0.07	0.00	57.7
11	T1	97	2.0	102	2.0	0.028	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.7
Approach		103	1.9	108	1.9	0.028	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.6
All Vehicles		309	1.8	325	1.8	0.098	0.6	NA	0.2	1.1	0.03	0.05	0.03	59.2

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

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: P:\Synergy\Projects\GRP3\GRP30999\07-Analysis\SIDRA\220630sid-GRP30999.sip9

MOVEMENT SUMMARY

▽ Site: 101 [Existing Conditions - Weekday PM Peak Hour (Site Folder: Existing Conditions)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] m				
East: Bogong Avenue														
5	T1	133	2.0	140	2.0	0.071	0.1	LOS A	0.1	0.8	0.06	0.06	0.06	59.2
6	R2	14	0.0	15	0.0	0.071	6.2	LOS A	0.1	0.8	0.08	0.07	0.08	57.2
Approach		147	1.8	155	1.8	0.071	0.7	NA	0.1	0.8	0.06	0.06	0.06	59.0
North: Car Park Upper Level Access														
7	L2	30	0.0	32	0.0	0.036	5.8	LOS A	0.1	0.9	0.18	0.55	0.18	53.1
9	R2	7	0.0	7	0.0	0.036	7.8	LOS A	0.1	0.9	0.18	0.55	0.18	52.8
Approach		37	0.0	39	0.0	0.036	6.2	LOS A	0.1	0.9	0.18	0.55	0.18	53.0
West: Bogong Avenue														
10	L2	3	0.0	3	0.0	0.044	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	58.1
11	T1	156	2.0	164	2.0	0.044	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
Approach		159	2.0	167	2.0	0.044	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles		343	1.7	361	1.7	0.071	1.0	NA	0.1	0.9	0.05	0.09	0.05	58.7

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.

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MOVEMENT SUMMARY

▽ Site: 101 [Existing Conditions - Saturday Midday Peak Hour
(Site Folder: Existing Conditions)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
East: Bogong Avenue														
5	T1	138	2.0	145	2.0	0.083	0.2	LOS A	0.2	1.5	0.08	0.10	0.08	58.8
6	R2	29	0.0	31	0.0	0.083	6.0	LOS A	0.2	1.5	0.11	0.13	0.11	56.6
Approach		167	1.7	176	1.7	0.083	1.2	NA	0.2	1.5	0.09	0.10	0.09	58.4
North: Car Park Upper Level Access														
7	L2	10	0.0	11	0.0	0.014	5.7	LOS A	0.0	0.3	0.13	0.55	0.13	53.1
9	R2	4	0.0	4	0.0	0.014	7.4	LOS A	0.0	0.3	0.13	0.55	0.13	52.9
Approach		14	0.0	15	0.0	0.014	6.2	LOS A	0.0	0.3	0.13	0.55	0.13	53.0
West: Bogong Avenue														
10	L2	10	0.0	11	0.0	0.031	5.5	LOS A	0.0	0.0	0.00	0.11	0.00	57.4
11	T1	102	2.0	107	2.0	0.031	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	59.5
Approach		112	1.8	118	1.8	0.031	0.5	NA	0.0	0.0	0.00	0.05	0.00	59.3
All Vehicles		293	1.6	308	1.6	0.083	1.2	NA	0.2	1.5	0.06	0.11	0.06	58.5

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

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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MOVEMENT SUMMARY

▽ Site: 101 [Post Development - Weekday AM Peak Hour (Site Folder: Post Development)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
East: Bogong Avenue														
5	T1	221	2.0	233	2.0	0.132	0.2	LOS A	0.4	2.5	0.09	0.09	0.09	58.7
6	R2	44	0.0	46	0.0	0.132	6.1	LOS A	0.4	2.5	0.12	0.12	0.12	56.6
Approach		265	1.7	279	1.7	0.132	1.2	NA	0.4	2.5	0.10	0.10	0.10	58.4
North: Car Park Upper Level Access														
7	L2	2	0.0	2	0.0	0.003	5.7	LOS A	0.0	0.1	0.14	0.55	0.14	52.8
9	R2	1	0.0	1	0.0	0.003	8.4	LOS A	0.0	0.1	0.14	0.55	0.14	52.6
Approach		3	0.0	3	0.0	0.003	6.6	LOS A	0.0	0.1	0.14	0.55	0.14	52.7
West: Bogong Avenue														
10	L2	15	0.0	16	0.0	0.036	5.5	LOS A	0.0	0.0	0.00	0.14	0.00	57.2
11	T1	116	2.0	122	2.0	0.036	0.0	LOS A	0.0	0.0	0.00	0.06	0.00	59.4
Approach		131	1.8	138	1.8	0.036	0.6	NA	0.0	0.0	0.00	0.07	0.00	59.2
All Vehicles		399	1.7	420	1.7	0.132	1.0	NA	0.4	2.5	0.07	0.09	0.07	58.6

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

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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MOVEMENT SUMMARY

▽ Site: 101 [Post Development - Weekday PM Peak Hour (Site Folder: Post Development)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] m				
East: Bogong Avenue														
5	T1	160	2.0	168	2.0	0.142	0.6	LOS A	0.7	4.7	0.20	0.19	0.20	57.6
6	R2	90	0.0	95	0.0	0.142	6.6	LOS A	0.7	4.7	0.30	0.28	0.30	54.8
Approach		250	1.3	263	1.3	0.142	2.7	NA	0.7	4.7	0.24	0.22	0.24	56.5
North: Car Park Upper Level Access														
7	L2	144	0.0	152	0.0	0.209	5.9	LOS A	0.9	6.0	0.21	0.58	0.21	52.5
9	R2	48	0.0	51	0.0	0.209	10.2	LOS B	0.9	6.0	0.21	0.58	0.21	52.3
Approach		192	0.0	202	0.0	0.209	7.0	LOS A	0.9	6.0	0.21	0.58	0.21	52.5
West: Bogong Avenue														
10	L2	35	0.0	37	0.0	0.061	5.6	LOS A	0.0	0.0	0.00	0.19	0.00	56.7
11	T1	187	2.0	197	2.0	0.061	0.0	LOS A	0.0	0.0	0.00	0.08	0.00	59.3
Approach		222	1.7	234	1.7	0.061	0.9	NA	0.0	0.0	0.00	0.09	0.00	58.9
All Vehicles		664	1.0	699	1.0	0.209	3.3	NA	0.9	6.0	0.15	0.28	0.15	56.0

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

Vehicle movement LOS values are based on average delay per movement.

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.

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MOVEMENT SUMMARY

▽ Site: 101 [Post Development - Saturday Midday Peak Hour
(Site Folder: Post Development)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] m				
East: Bogong Avenue														
5	T1	166	2.0	175	2.0	0.282	0.8	LOS A	1.5	10.2	0.17	0.21	0.17	57.8
6	R2	250	0.0	263	0.0	0.282	7.2	LOS A	1.5	10.2	0.46	0.54	0.46	52.9
Approach		416	0.8	438	0.8	0.282	4.6	NA	1.5	10.2	0.34	0.41	0.34	54.7
North: Car Park Upper Level Access														
7	L2	177	0.0	186	0.0	0.252	5.5	LOS A	0.5	3.3	0.00	0.58	0.00	52.3
9	R2	47	0.0	49	0.0	0.252	13.6	LOS B	0.5	3.3	0.00	0.58	0.00	52.1
Approach		224	0.0	236	0.0	0.252	7.2	LOS A	0.5	3.3	0.00	0.58	0.00	52.3
West: Bogong Avenue														
10	L2	176	0.0	185	0.0	0.100	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.6
11	T1	122	2.0	128	2.0	0.067	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		298	0.8	314	0.8	0.100	3.3	NA	0.0	0.0	0.00	0.34	0.00	56.0
All Vehicles		938	0.6	987	0.6	0.282	4.8	NA	1.5	10.2	0.15	0.43	0.15	54.5

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

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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