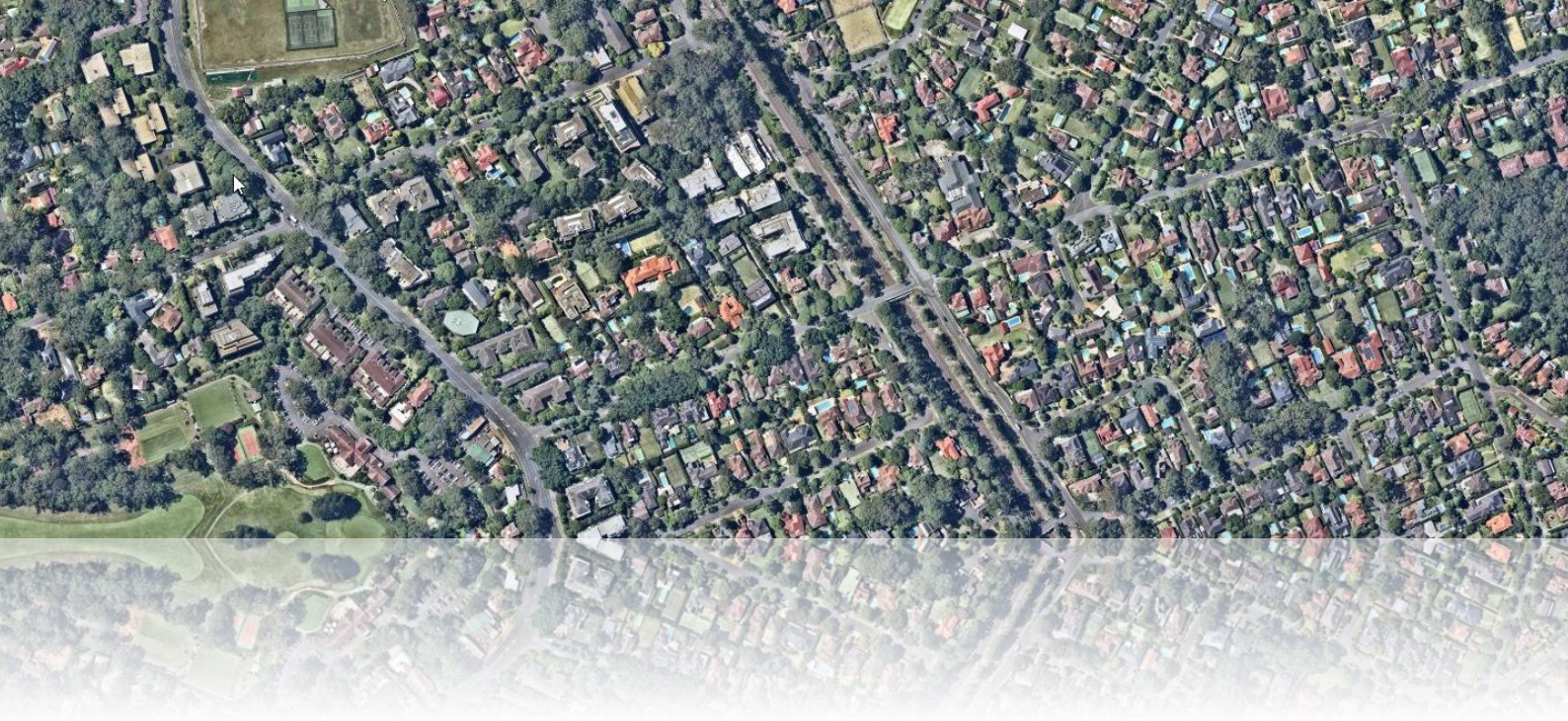




**TRANSPORT IMPACT ASSESSMENT OF
THE PROPOSED RESIDENTIAL FLAT BUILDINGS WITH IN-FILL
AFFORDABLE HOUSING
AT 10, 14, 14A STANHOPE ROAD, KILLARA**



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Transport Planning, Traffic Impact Assessments, Road Safety Audits, Expert Witness

Development Type: residential flat buildings with in-fill affordable housing

Site Address: 10, 14, 14A Stanhope Road, Killara

Prepared for: Stanhope Rd Residence Holdings Pty Ltd.

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1 INTRODUCTION

McLaren Traffic Engineering was commissioned by *Stanhope Rd Residence Holdings Pty Ltd.* to provide a transport impact assessment of the proposed residential flat buildings with in-fill affordable housing at 10, 14, 14A Stanhope Road, Killara as depicted in **Annexure A**.

This transport impact assessment accompanies an Environmental Impact Statement (EIS) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act), in support of a State Significant Development Application (SSDA) for the construction of the proposed residential flat buildings, reference SSD-81890707

This report addresses the Secretary's Environmental Assessment Requirements (SEARs) issued for the project with the relevant SEARs presented in **Table 1**.

TABLE 1: SEARS RELEVANT TO TRANSPORT

SEARs	Section of Report where response is provided
9. Provide a Transport Impact Assessment (TIA) in accordance with the processes and methodology recommended in the Guide to Transport Impact Assessment (GITA) published by TfNSW.	Whole document
9. If the construction of the development would cause interruptions to regular pedestrian and transport routes (including public transport, active transport or general traffic), a preliminary Construction Traffic (or Transport) Management Plan (CTMP) should be prepared as part of the TIA to mitigate any such impacts.	No interruptions to regular pedestrian and transport routes will result from construction. No assessment required. A preliminary CTMP can be prepared if necessary.

1.1 *Description and Scale of Development*

The proposed development has the following characteristics relevant to traffic and parking:

- A residential flat building with in-fill affordable housing consisting of **135** units as per the following:
 - 4 x one-bedroom units;
 - 40 x two-bedroom units (including 4 in-fill affordable housing dwellings);
 - 83 x three-bedroom units (including 22 in-fill affordable housing dwellings);
 - 8 x four-bedroom units.
- A basement level parking area with vehicular access via a proposed two-way driveway from Stanhope Road, accommodating **195** car parking spaces as per the following:
 - 166 residential car parking spaces;

- 27 visitor car parking spaces;
- 2 car share parking spaces.

1.2 State Environmental Planning Policy (Transport and Infrastructure) 2021

The proposed development does not qualify as a traffic generating development with relevant size and/or capacity under Clause 2.122 of the SEPP (Transport and Infrastructure) 2021. Accordingly, formal referral to Transport for NSW (TfNSW) is unnecessary.

1.3 Site Description

The subject site includes three (3) lots legally identified as Lot B in DP326483 and Lot 1 and 2 in DP224907 which are currently zoned *R2 – Low Density Residential* under the *Ku-ring-gai Local Environmental Plan 2015* and occupied by existing low density residential dwellings. The site has a single frontage to Stanhope Road to the south and is generally surrounded by low-density residential dwellings in all directions.

1.4 Site Context

The location of the site is shown on an aerial photo and a street map in **Figure 1** and **Figure 2** respectively.

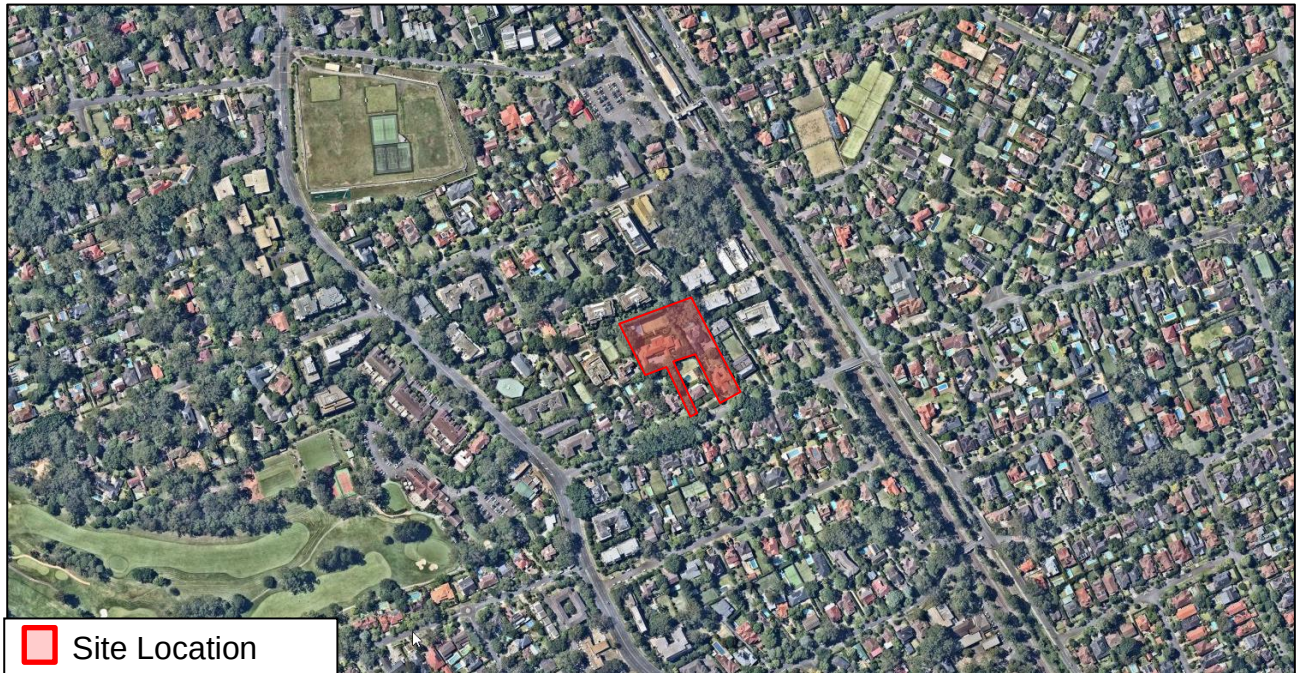


FIGURE 1: SITE CONTEXT – AERIAL PHOTO

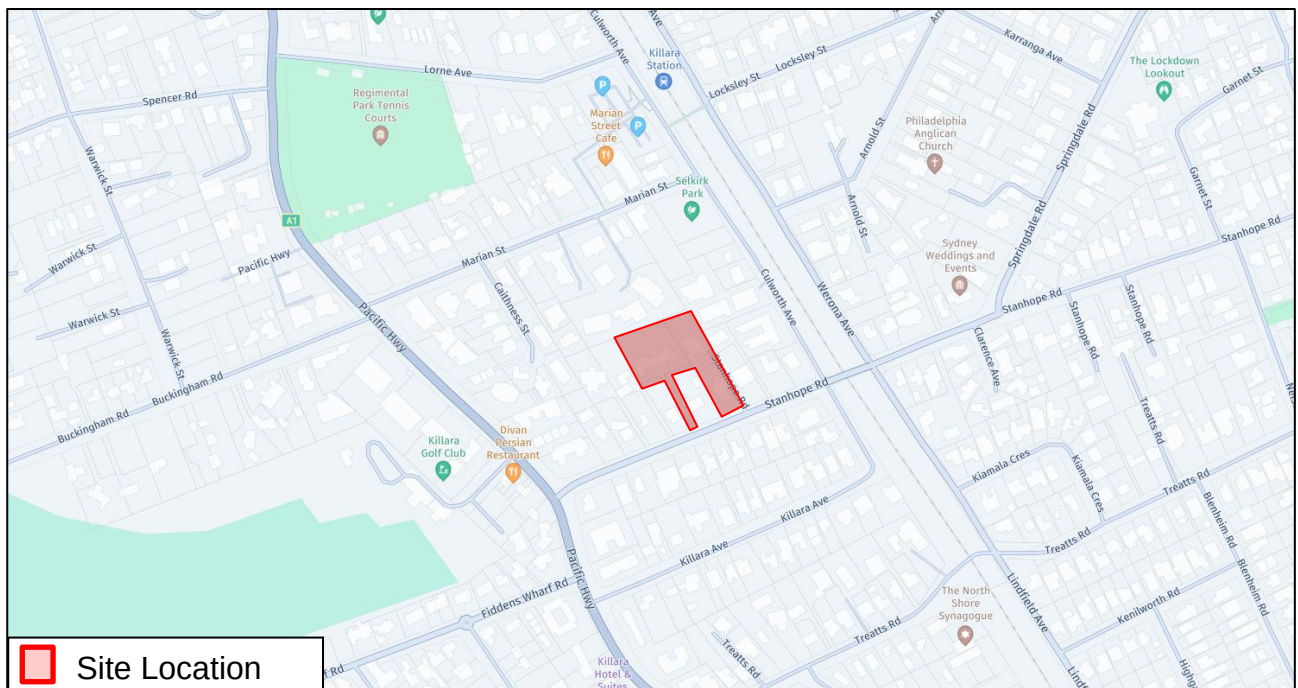


FIGURE 2: SITE CONTEXT – STREET MAP

2 EXISTING TRAFFIC AND PARKING CONDITIONS

2.1 *Road Hierarchy*

The road network servicing the site has characteristics as described in the following sub-sections.

2.1.1 Stanhope Road

- TfNSW Unclassified REGIONAL Road (No. 7349);
- The design of the road most closely relates to a suburban neighbourhood street under the TfNSW Movement and Place Framework;
- Approximately 10m wide carriageway facilitating two-way traffic flow lane and a kerbside parking lane on both sides of the road;
- Signposted 50km/h speed limit;
- Generally unrestricted kerbside parking permitted on both sides of the road;
- A footpath is provided on the both sides of the road.

2.1.2 Pacific Highway

- TfNSW Classified STATE Road (No. 10);
- The design of the road most closely relates to a secondary arterial under the TfNSW movement and place framework;
- Approximately 18m wide carriageway facilitating three (3) traffic flow in each direction;
- Signposted 60km/h speed limit;
- Kerbside parking generally not permitted on either side of the road;
- Footpaths provided along both sides of the road;
- The road is classified as a Principle Arterial in accordance with the TfNSW Movement and Place Framework.

2.1.3 Werona Avenue

- The design of the road most closely relates to a suburban connector street under the TfNSW movement and place framework;
- Approximately 8m wide carriageway one (1) traffic flow lane in each direction;
- Signposted 50km/h speed limit;
- Kerbside parking generally not permitted on either side of the road;
- Footpaths provided along both sides of the road to the south of Stanhope Road, and along the eastern side of the road to the north of Stanhope Road.

2.2 Existing Traffic Management

- “Give Way” controlled intersection of Stanhope Road / Pacific Highway;
- Signalised intersection of Stanhope Road / Werona Avenue.

2.3 Existing Traffic Environment

Turning movement count traffic surveys were conducted at the intersections of Stanhope Road / Pacific Highway and Stanhope Road / Werona Avenue from 7:00AM to 9:30AM and 3:00PM to 6:00PM on Thursday 20 March 2024 representing a typical operating weekday. The full survey results are shown in **Annexure B** for reference.

2.3.1 Existing Road Performance

The performance of the surrounding intersections under the existing traffic conditions has been assessed using SIDRA INTERSECTION 10, **Table 2** summarises the resultant intersection performance data, with full SIDRA results reproduced in **Annexure C**.

The following considerations have been undertaken to ensure a realistic calibrated model:

- Consideration to the TCS Plan for signalised intersection Stanhope Road / Werona Avenue (**Annexure D**);
- A review of the phase length and cycle times based upon video footage and which is reproduced in **Annexure E** for reference:
 - Output cycle and phase lengths fall within observed cycle and phase lengths.
- Validation of the model using approach queue lengths with consideration to the following input modifications:
 - 15% Extra Bunching applied to the northern approach of the intersection of Pacific Highway / Stanhope Road in accordance with the SIDRA manual and to be consistent with vehicle arrival patterns at the intersection;
 - A reduced gap acceptance of 5s critical gap and 3s follow up headway for vehicles turning right into Stanhope Road from Pacific Highway.
 - Observed queue lengths along Pacific Highway for Right turn movements into Stanhope Road during the PM peak period.

It should be noted that during the AM peak period right turn movements from Pacific Highway into Stanhope Road are operating A-typically with drivers accepting a significantly reduced gap acceptance and queued drivers in the southbound lanes of Pacific Highway providing gaps for drivers to turn into Stanhope Road. SIDRA is not able to accurately model these types of scenarios and as such consideration has been made to the observations only rather than the SIDRA outputs.

TABLE 2: EXISTING INTERSECTION PERFORMANCES (SIDRA INTERSECTION 10)

Intersection	Peak Hour	Degree of Saturation ⁽¹⁾	Average Delay ⁽²⁾ (sec/veh)	Level of Service ⁽³⁾⁽⁴⁾	Control Type	Worst Movement
EXISTING PERFORMANCE						
Stanhope Rd /Werona Ave	AM	0.57	15.2	B	Signals	RT from Werona Ave
	PM	0.54	14.2	A		RT from Werona Ave
Pacific Highway /Stanhope Road	AM	3.93	173.6 (Worst: >70)	N/A (Worst: F)	Give Way	RT from Pacific Highway
	PM	1.58	7.2 (Worst: >70)	N/A (Worst: F)		RT from Stanhope Road

Notes:

- (1) The Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.
- (2) The average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.
- (3) The Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.
- (4) No overall Level of Service is provided for Give Way and Stop controlled intersections as the low delays associated with the dominant movements skew the average delay of the intersection. The Level of Service of the worst approach is an indicator of the operation of the intersection, with a worse Level of Service corresponding to long delays and reduced safety outcomes for that approach.

As shown, the intersection of Stanhope Road / Werona Avenue is currently performing at a satisfactory level of efficiency, with an overall or worst movement Level of Service “B” conditions in both the AM & PM peak hour periods. The Level of Service “B” performance is characterised by low approach delays and spare capacity.

The intersection of Pacific Highway / Stanhope Road is currently operating at capacity for the right turn out from Stanhope Road. This is confirmed from review of the video footage where it was observed that multiple drivers undertook unsafe manoeuvres to turn right out of Stanhope Road during the peak periods after waiting for an extended time. During the peak AM and PM hours a total of nine (9) vehicles were recorded turning right from Stanhope Road onto Pacific Highway. Considering the low number of trips associated with the right turn and the unsafe nature of the turning movement it is recommended to include “No Right Turn – between 6_{AM} – 10_{AM} & 4_{PM} – 7_{PM}” signage for vehicles turning out of Stanhope Road.

The other critical turning movement for the intersection of Stanhope Road / Pacific Highway is the right turn into Stanhope Road from the south. The results from SIDRA currently indicate that this turning movement is operating at LoS “F” in the AM peak hour and LoS “D” in the PM peak hour. As discussed above, during the AM peak hour the intersection operates A-typically with drivers accepting a significantly reduced gap acceptance and queued drivers in the southbound lanes of Pacific Highway providing gaps for turning vehicles. Therefore, SIDRA over represents the queue length and delay and cannot correctly model the intersection. On review of the video footage it was observed that right turn movement does operate near capacity but with significantly less queueing than what SIDRA is reporting (and there would also be a lower average delays than what SIDRA is reporting). The largest queue that was observed during the AM peak hour period was approximately 13 vehicles. This length of queue does extend into the through lanes of the Pacific Highway.

The ultimate findings of the modelling indicate that the intersection is operating over capacity in both the AM and PM peak hour periods which is indicated by the degree of saturation exceeding 1, but also the behaviour of vehicles turning right and accepting lower than normal gap acceptance parameters to what would be expected for the type of road.

Considering the above, TfNSW and Council should consider increasing the capacity of right turning vehicles into and out of the eastern precinct of Killara (east of Pacific Highway). This is likely to involve additional signalised intersections along Pacific Highway.

2.4 Public Transport

Killara Train Station is located 500m (approximately 7 minutes) walking distance to the north of the subject site, servicing the T9 – Hornsby to North Shore via City line. A train service is provided every 15 minutes in commuter peak periods and provides direct access between Hornsby Gordon via Sydney CBD.

The location of the site subject to the surrounding public transport network is shown in Figure 3.

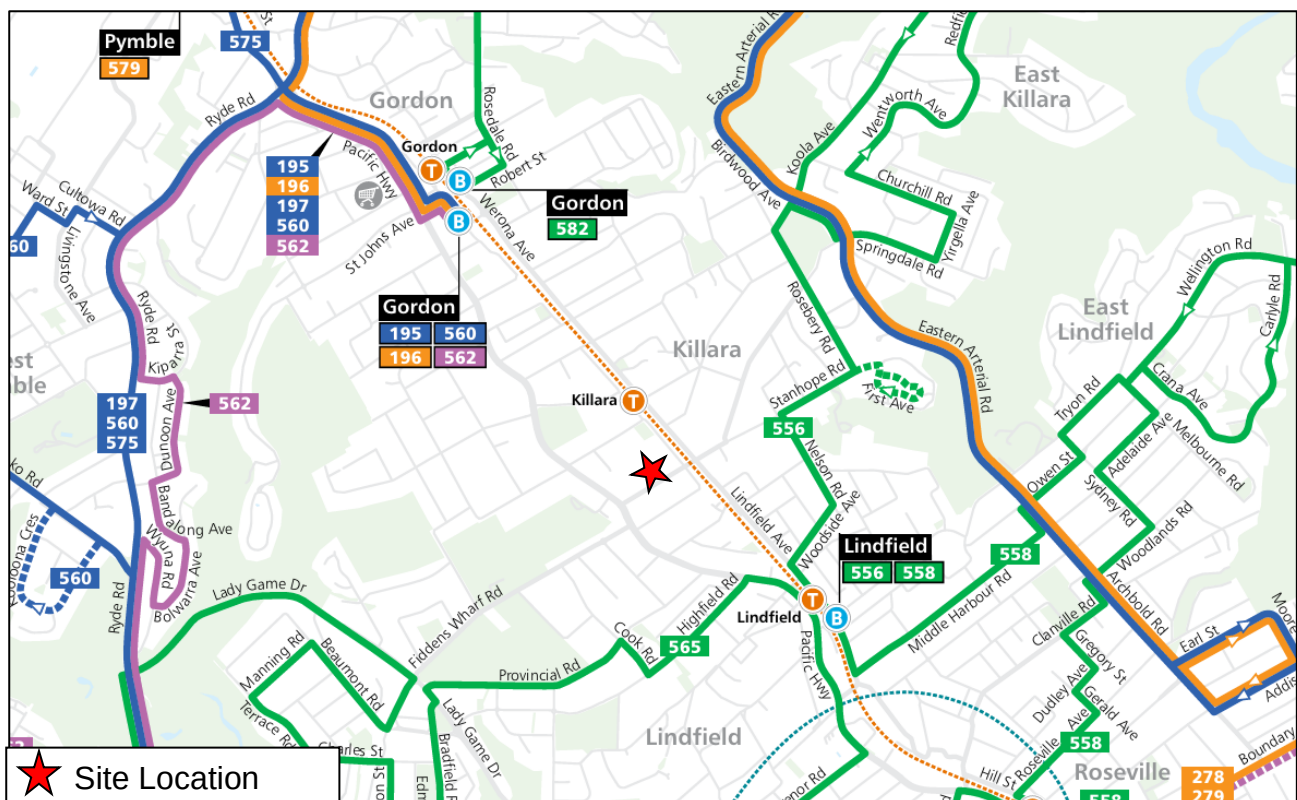


FIGURE 3: PUBLIC TRANSPORT NETWORK MAP

2.5 Future Road and Infrastructure Upgrades

From Ku-ring-gai Council website, Council is in the process of coordinating the design work for the upgrade of Pacific Highway / Havilah Road, Pacific Highway / Strickland Avenue and Pacific Highway / Balfour Street. The upgrade works include:

- Extension of the right turn bay from Pacific Highway (northbound) into Havilah Road;
- No right turn from Havilah Road into Pacific Highway;
- Upgrade of Strickland Avenue to new traffic lights on Pacific Highway (currently in the design stage);
- Future road widening to allow the extension of the right turn bay from Pacific Highway into Balfour Street;
- Minor adjustments to pedestrian crossings.

It is likely that the above upgrades work will improve traffic flow efficiency and safety along the Pacific Highway. It is expected that the upgrade works will increase the capacity of the right turn movements for vehicles to access the subject site via the local road network. A timeline for completion is unknown at this stage.

From Council's Development Application tracker and TfNSW Projects website, it appears that there are no further future planned road or public transport changes that will affect traffic conditions within the immediate vicinity of the subject site.

3 PARKING ASSESSMENT

3.1 *Affordable Housing Parking Requirement*

Reference is made to the *State Environmental Planning Policy (Housing) 2021: Chapter 2 Affordable Housing* which provides the following parking requirements for affordable housing:

(e) *the following number of parking spaces for dwellings used for affordable housing—*

(i) *for each dwelling containing 1 bedroom—at least 0.4 parking spaces,*

(ii) *for each dwelling containing 2 bedrooms—at least 0.5 parking spaces,*

(iii) *for each dwelling containing at least 3 bedrooms— at least 1 parking space,*

(f) *the following number of parking spaces for dwellings not used for affordable housing—*

(i) *for each dwelling containing 1 bedroom—at least 0.5 parking spaces,*

(ii) *for each dwelling containing 2 bedrooms—at least 1 parking space,*

(iii) *for each dwelling containing at least 3 bedrooms—at least 1.5 parking spaces,*

Error! Reference source not found. presents the parking requirements of the proposal according to the above SEPP car parking rates.

TABLE 3: SEPP AFFORDABLE HOUSING PARKING POLICY

Land Use	Scale	Rate	Spaces Required	Spaces Provided
Affordable Housing	4 x 2-Bedroom	0.5 per dwelling	2	24
	22 x 3-Bedroom	1.0 per dwelling	22	
Not affordable housing	4 x 1-Bedroom	0.5 per dwelling	2	142
	36 x 2-Bedroom	1 per dwelling	36	
	61 x 3-Bedroom	1.5 per dwelling	91.5	
	8 x 4-Bedroom	1.5 per dwelling	12	
TOTAL	-	-	165.5 (166)	166

As shown, strict application of SEPP (Housing) requires the provision of 166 car parking spaces. The *Guide to Transport Impact Assessment Chapter 8 - Section 8.5.2 Residential - Table 8.4 High Density residential dwellings* outlines a requirement of 1 visitor car parking space per 5 dwellings which relates to a requirement of 27 visitor car parking spaces. In

addition to the above, the Ku-ring-gai Development Control Plan 2015 (KDCP 2015) outlines the requirement of two (2) car share parking spaces.

The proposed plans detail the provision of **195** car parking spaces comprised of **166** residential car parking spaces, **27** visitor car parking spaces and **2** car share spaces resulting in compliance with the SEPP (Housing) 2021, GTIA 2024 and KDCP 2015 parking rates.

3.2 Parking for People with Disabilities

The KDCP 2015 states that “*Every Platinum Level (Accessible) unit requires an accessible car space designed to Australian Standard 2890.6.*” The proposed development provides the inclusion of nil (0) accessible or adaptable units, resulting in the requirement of nil (0) accessible parking spaces. The proposed plans detail 27 visitor car parking spaces, it is recommended to include one (1) accessible car parking space for use by visitors.

3.3 Bicycle & Motorcycle Parking Requirements

Reference is made to KDCP 2015 which outlines the following requirements for bicycle and motorcycle parking spaces.

7B.2 Bicycle Parking Provision

Residents

1 bicycle parking space per dwelling within the residential car park area.

Visitors

1 bicycle parking space per 10 units or part thereof within the visitor parking area.

The KDCP 2015 requires the provision of **135** residential bicycle parking spaces and **14** visitor bicycle parking spaces. Each resident is provided a storage cage within the car park that is of sufficient size to store a bicycle, therefore bicycle storage for the residents is available. 14 visitor bicycle spaces have been detailed in the proposed plans, satisfying DCP requirements. It is noted that some additional room or relocation is required to meet AS2890.3 compliance requirements.

KDCP 2015 does not require the provision of motorcycle parking. Accordingly, no motorcycle parking facilities have been provided, thus satisfying the DCP requirements.

3.4 Servicing & Loading

The KDCP 2015 provides the following requirements for service and waste vehicles for residential flat buildings.

7B.1 Car Parking Provisions

13. A clearly signposted parking bay for temporary parking of service and removalist vehicles is to be provided. The space is to have the following standards:

- i) a minimum dimension of 3.5m x 6m;
- ii) a minimum manoeuvring area 7m wide.

25A.3 Access to Collection Point

The vehicle access road leading to and from the collection point in a waste and recycling room is to have a minimum finished floor to ceiling height of 2.6m for residential waste rooms and 4.5m for commercial waste rooms for the entire length of travel within the building. This clearance is to be kept free of any overhead conduits, ducting, services or other obstructions.

25R.2 Council's Collection Vehicle Characteristics

- i) the gradient of the ramp access to basement should not exceed 1:5;

The proposed plans detail the provision of a dedicated 3.5m x 6m loading bay in the basement, with a minimum manoeuvring area 7m wide, thus satisfying council requirements. Swept path tests for a 6.4m long Small Rigid Vehicle (SRV) has been undertaken with the results presented in **Annexure F**.

3.5 Car Park Design & Compliance

The car parking layout as depicted in **Annexure A**, has been assessed to achieve the relevant clauses and objectives of AS2890.1:2004, AS2890.2:2018 and AS2890.6:2022. Any variances from standards are addressed in the following subsections including required changes, if any. Swept path testing has been undertaken and the results are reproduced within **Annexure F** for reference.

The proposed car parking and vehicular access design achieves the following:

- 6.5m wide two-way driveway facilitating access to Stanhope Road;
- Minimum 5.8m wide parking aisles;
- Minimum 5.4m long, 2.4m wide spaces for residents;
- Minimum 5.4m long, 2.5m wide spaces for visitors;
- Maximum ramp gradient of 20% for service vehicles and 25% for light vehicles;
- Minimum headroom of 2.2m for general circulation;
- Minimum headroom of 2.6m for service vehicle access;
- 2.0m x 2.5m pedestrian sight triangles clear of obstructions.

Whilst the plans have been assessed to comply with the relevant standards, it is usual and expected that a design certificate be required at the Construction Certificate stage to account for any changes following the development application.

3.6 External Access

3.6.1 Access for Pedestrians

The southern frontage of the site is serviced by a pedestrian footpath which provides access along Stanhope Road to the Pacific Highway and to Werona Avenue, hence providing full pedestrian connectivity to both the east and west of the site. In addition, a pedestrian footpath is provided from the site along the walking route to Killara station, hence providing pedestrian access to and from public transport.

The traffic volumes obtained in **Section 2.3** indicate that both Stanhope Road and Werona Avenue carry greater than 500 two-way vehicle trips in the peak hour periods. In accordance with *Austroads Guide to Road Design Part 4 – Section 8.2.2* a road with 500 two-way trips per hour is the point at which pedestrians will find it difficult to cross the road without additional crossing facilities such as pedestrian refuges and dedicated crossings.

The nearest shops for general day to day needs for residents are located within the Lindfield town centre. The convenient pedestrian access path between the subject site and Lindfield town centre is for pedestrians to walk on the footpath along Werona Avenue. However, as both Werona Avenue and Stanhope Road carry greater than 500 trips during the peak hour and there are no dedicated pedestrian crossing facilities within near vicinity of the site pedestrians would find it difficult to undertake this journey. It is recommended that pedestrian facilities be implemented at the signalised intersection of Werona Avenue / Stanhope Road on the northern and eastern legs to support pedestrian crossing movements between the subject site and Lindfield town centre. It is noted that this is an existing shortcoming with the pedestrian connection of Killara with only a minor increase in this movement resulting from the proposed development. Therefore, the exploration of a pedestrian connection on this road should be explored by Ku-ring-gai Council and TfNSW.

3.6.2 Access for Cyclists

The subject site has limited access to existing shared paths for cyclists. Cyclists are able to access the site using the surrounding road network, as well as the vehicular access driveway along the southern frontage of the site.

3.6.3 Access for Light Vehicles

Light vehicles are to access the site using the proposed 6.5m wide two-way driveway from Stanhope Road.

4 TRAFFIC ASSESSMENT

The impact of the expected traffic generation levels associated with the subject proposal is discussed in the following sub-sections.

4.1 **Traffic Generation**

4.1.1 Vehicle Trip Generation

The vehicle trip generation rates for the relevant land uses are provided in the *TfNSW Guide to Transport Impact Assessment (GTIA)*, which supersedes the *RTA Guide to Traffic Generating Developments (2002)*. The relevant vehicle trip generation rates are as follows:

Table 5.11 High Density Residential Sample Summary

Vehicle Trips

AM peak hour *0.19 vehicle trips / dwelling*

PM peak hour *0.15 vehicle trips / dwelling*

The resulting AM and PM peak hourly vehicle trip generation is summarised in **Table 4**.

TABLE 4: ESTIMATED VEHICLE TRIP GENERATION

Use	Scale	Peak	Generation Rate	Trips ⁽¹⁾
High Density Residential	135	AM	0.19 vehicle trips per dwelling	26 (5 in, 21 out)
		PM	0.15 vehicle trips per dwelling	20 (16 in, 4 out)

Notes:

(1) 20% inbound and 80% outbound assumed for the AM peak periods and vice versa for the PM peak periods.

As shown, the expected traffic generation associated with the proposed development is in the order of **26** vehicle trips in the AM peak period (5 in, 21 out) and **20** vehicle trips in the PM peak period (16 in, 4 out).

4.1.2 Pedestrian Trip Generation

Reference is made to *Table 5.11 of Guide to Transport Impact Assessment* which provides the following person trip generation rates for a high density residential development:

Table 5.11 High Density Residential Sample Summary

Person Trips

AM peak hour *0.66 person trips / dwelling*

PM peak hour *0.56 person trips / dwelling*

In addition, a mode share of persons walking to and from high density residential developments in the Sydney Region was found to be 62% in accordance with *GTIA Table*

5.12. The above rates have been applied in **Table 5** to determine the number of pedestrian trips during the site peak hours.

TABLE 5: ESTIMATED PEDESTRIAN TRIP GENERATION

Use	Scale	Peak	Generation Rate	Mode Share	Pedestrian Trips ⁽¹⁾
High Density Residential	135	AM	0.66 person trips per dwelling	62%	55 (11 in, 44 out)
		PM	0.56 person trips per dwelling		47 (38 in, 9 out)

Notes:

(1) 20% inbound and 80% outbound assumed for the AM peak periods and vice versa for the PM peak periods.

As shown, the expected pedestrian trip generation associated with the proposed development is in the order of **55** pedestrian trips in the AM peak period (11 in, 44 out) and **47** pedestrian trips in the PM peak period (38 in, 9 out).

As outlined in **Section 3.6.1**, the proposed pedestrian trips are able to access the site utilising the existing pedestrian footpath network surrounding the subject site.

4.2 Traffic Assignment

The road network, traffic surveys and locations of residential areas surrounding the site have been assessed and the following traffic assignment has been assumed for all vehicular traffic to and from the site, as shown in **Figure 4** and **Figure 5**. As discussed in the **Section 2.3** turning right out of Stanhope Road onto Pacific Highway currently has large delays and is an unsafe manoeuvre during peak periods. Therefore, no trips have been assigned to this turning movement and instead it is assumed drivers travelling from the site will instead utilise the signalised intersection to the north.

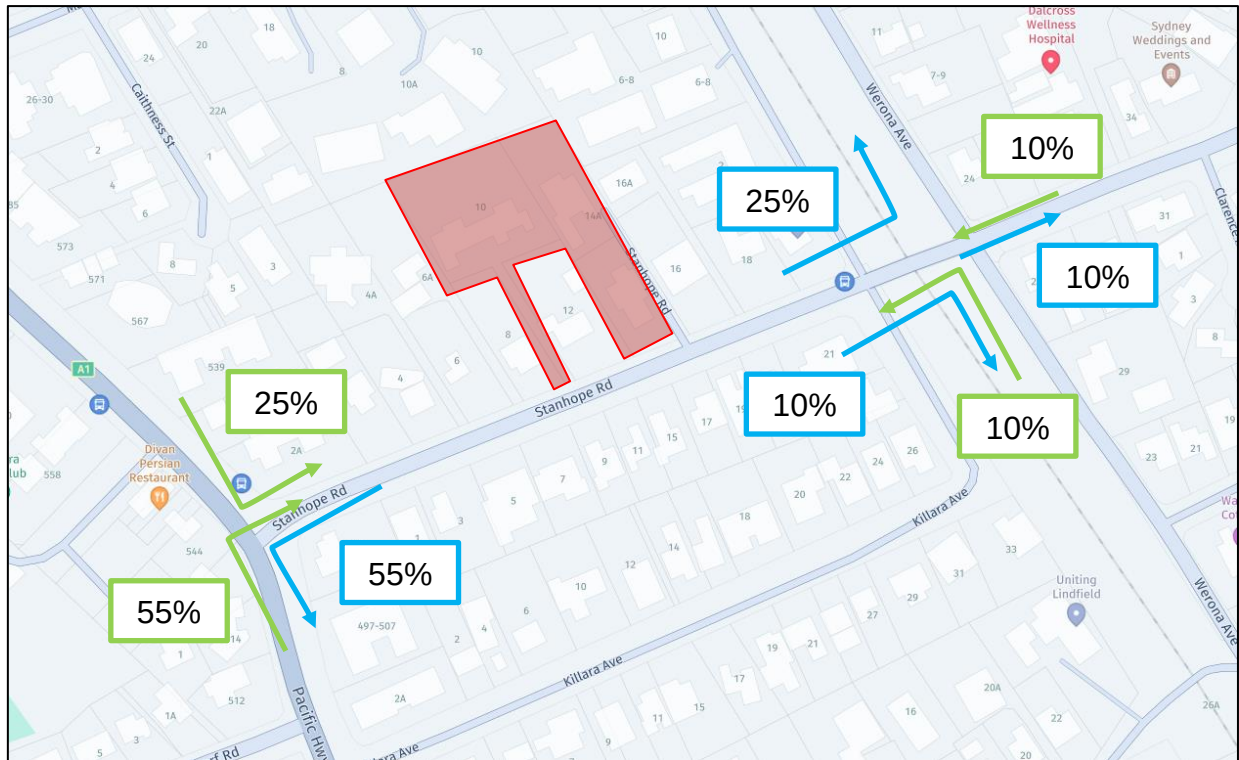


FIGURE 4: AM TRIP DISTRIBUTION



FIGURE 5: PM TRIP DISTRIBUTION

4.3 Traffic Impact

The traffic generation outlined in **Section 4.1 & 4.2** above has been added to the existing traffic volumes recorded. SIDRA INTERSECTION 10 was used to assess the intersections performance. The purpose of this assessment is to compare the existing intersection operations to the future scenario under the increased traffic load. The results of this assessment are shown in **Table 6** with detailed output presented in **Annexure C**.

It should be noted that the intersection of Stanhope Road / Pacific Highway has not been assessed under the increased traffic load due to existing intersection already operating near capacity and SIDRA not being able to accurately model the existing conditions. As observed, in the video footage the right turn bay from Pacific Highway into Stanhope Road is already extending into the through lanes and Council and TfNSW should explore alternative options for accessing the properties east of Pacific Highway.

As detailed in **Section 2.5**, Council are intending to undertake intersection works along Pacific Highway within the near vicinity of the site which will improve connectivity for the area including for the subject site. Additionally, the proposal is for a residential flat building and hence the drivers arriving to and departing from the site will have a good knowledge of alternative arrival and departure routes to/from the site. For example, between Lindfield Station and Killara Station there are four (4) separate right turn options for drivers travelling northbound wanting to access east of the highway with two (2) of these intersections signalised.

TABLE 6: EXISTING INTERSECTION PERFORMANCES (SIDRA INTERSECTION 10)

Intersection	Peak Hour	Degree of Saturation ⁽¹⁾	Average Delay ⁽²⁾ (sec/veh)	Level of Service ⁽³⁾⁽⁴⁾	Control Type	Worst Movement
EXISTING PERFORMANCE						
Stanhope Rd /Werona Ave	AM	0.57	15.2	B	Signals	RT from Werona Ave
	PM	0.54	14.2	A		RT from Werona Ave
Pacific Highway /Stanhope Road	AM	3.93	173.6 (Worst: >70)	N/A (Worst: F)	Give Way	RT from Pacific Highway
	PM	1.58	7.2 (Worst: >70)	N/A (Worst: F)		RT from Stanhope Road
POST DEVELOPMENT PERFORMANCE						
Stanhope Rd /Werona Ave	AM	0.57	15.3	B	Signals	RT from Werona Ave
	PM	0.54	14.2	A		RT from Werona Ave

NOTES: Refer to Table 2.

As shown, the intersection of Stanhope Road / Werona Avenue retains the same overall level of service under future conditions with low delays and spare capacity of LoS “B” or below, indicating that there will be no adverse impact on the existing road network as a result of the proposed development.

5 CONCLUSIONS

In view of the foregoing, the subject residential flat buildings with in-fill affordable housing proposal at 10, 14, 14A Stanhope Road, Killara (as depicted in **Annexure A**) has been assessed in terms of its traffic and parking impacts. The following outcomes of this transport impact assessment are relevant to note:

- a) The proposal includes the provision of **195** car parking spaces within a proposed carpark, comprised of **166** for residential use **27** for visitor use and **2** car share spaces, which represents compliance with the relevant requirements of the DCP and SEPP.
- b) The KDCP 2015 requires the provision of 135 residential bicycle parking spaces and 14 visitor bicycle parking spaces. Each resident is provided a storage cage within the car park that is of sufficient size to store a bicycle, therefore bicycle storage for the residents is available. 14 visitor bicycle spaces have been detailed in the proposed plans, satisfying DCP requirements. It is noted that some additional room or relocation is required to meet AS2890.3 compliance requirements.
- c) KDCP 2015 does not require the provision of motorcycle parking. Accordingly, no motorcycle parking facilities have been provided, thus satisfying the DCP requirements.
- d) The parking areas of the site have been assessed against the relevant sections of AS2890.1:2004, AS2890.2:2018 and AS2890.6:2022 and have been found to satisfy the objectives of each standard. Swept path testing has been undertaken and the results are reproduced within **Annexure F**.
- e) The traffic generation associated with the proposed development is in the order of 26 vehicle trips in the AM peak period (5 in, 21 out) and 20 vehicle trips in the PM peak period (16 in, 4 out). The impacts of the traffic generation have been modelled using SIDRA INTERSECTION 10, indicating that there will be no adverse impact to the performance of the intersections as a result of the generated traffic.
 - o The intersection of Pacific Highway / Stanhope Road is currently operating at capacity for the right turn out from Stanhope Road. TfNSW and Council should consider increasing the capacity of right turning vehicles into and out of the eastern precinct of Killara (east of Pacific Highway). Council are intending to undertake intersection works along Pacific Highway within the near vicinity of the site which will improve connectivity for the area including for the subject site. It is reiterated that this is an existing issue, and the proposal will not be exacerbating the issue.
- f) The pedestrian generation of the proposed development has been estimated to be some **55** pedestrian trips in the AM peak period (11 in, 44 out) and **47** pedestrian trips in the PM peak period (38 in, 9 out). Pedestrians accessing the site will be able to do so via the existing pedestrian footpaths along Stanhope Road.
 - o Investigations of a pedestrian facilities at the intersection of Stanhope Road / Werona Road should be explored by Ku-ring-gai Council and TfNSW. It is

reiterated that this is an existing issue, and the proposal will not be exacerbating the issue.

I Daniel Walker, confirm this transport impact assessment addresses the requirement of SEAR No.9 and relevant State and local legislation, policies, and guidelines including:

- SEPP (Transport and Infrastructure) 2021;
- SEPP (Housing) 2021;
- Apartment Design Guide 2015;
- Guide to Transport Impact Assessment 2024;
- Ku-ring-gai Development Control Plan 2015;
- AS2890 series.

I further confirm that none of the information contained in the transport impact assessment is false or misleading.

A handwritten signature in black ink that reads 'D. Walker'.

Daniel Walker
Principal Traffic Engineer
B.E. (Hons) (Schol) (Civil Engineering)
TfNSW Accredited Level 2 Road Safety Auditor



**ANNEXURE A: PROPOSED PLANS
(4 SHEETS)**

LEGEND:

AW AWNING
AH ACCESS HATCH
AC A/C CONDENSER UNITS
FH FIRE HYDRANT
FHR FIRE HOSE REEL
FS FIRE STAIRS
GC GARBAGE CHUTE
HW HIGHLIGHT WINDOW
MV MECHANICAL RISER TO FUTURE DETAIL
MB MAILBOX TO FUTURE DETAIL
SK SKYLIGHT

STR STORAGE
HWU HOT WATER UNITS

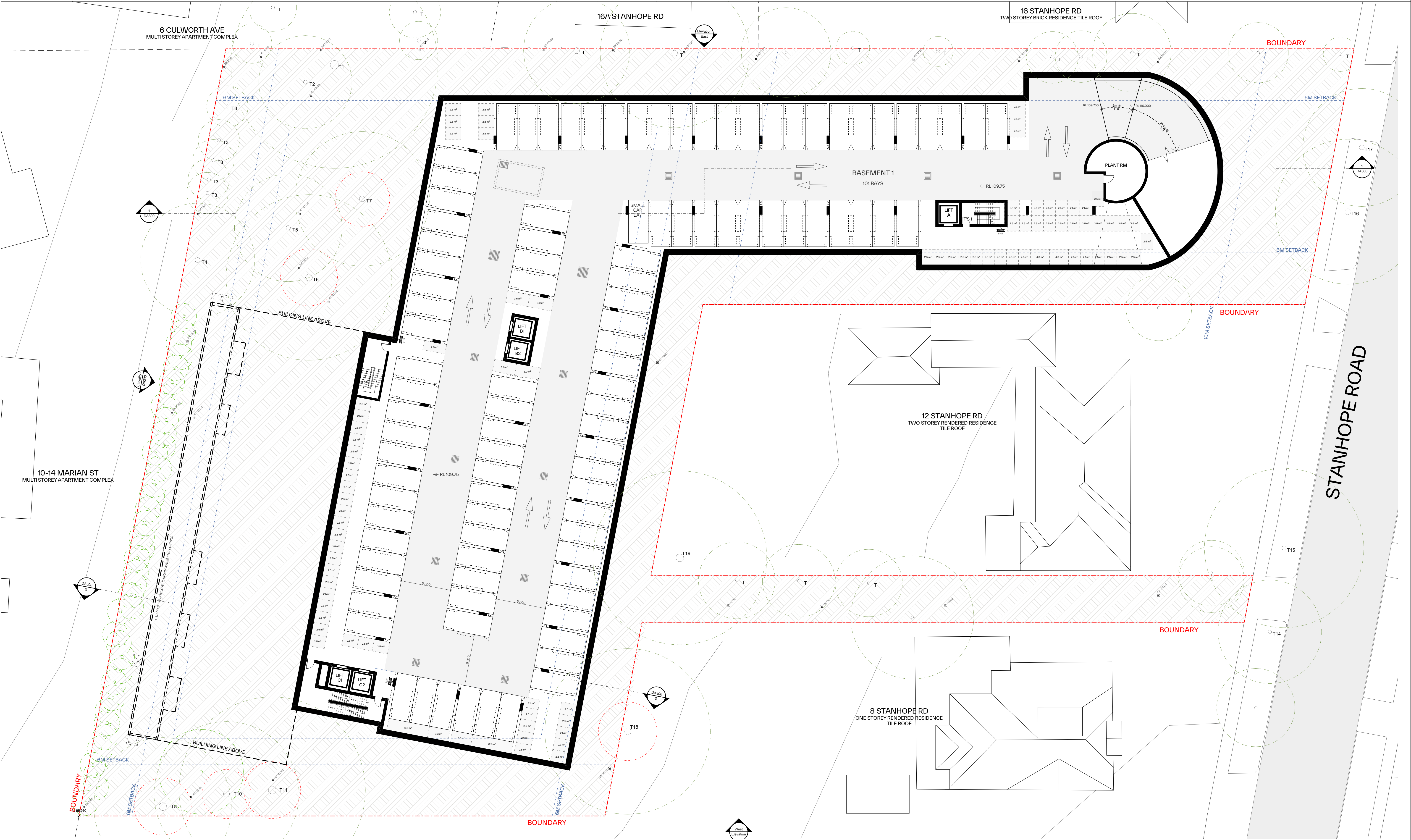
MATERIALS LEGEND:

AFG ALUMINIUM FRAMED GLAZING
LV ALUMINIUM ELLIPTICAL FIXED LOUVERS
AW AWNING (TO FUTURE DETAIL)
CONC CONCRETE
FB FACE BRICK
GB FRAMELESS TOUCHENED GLASS BALUSTRADE (TO BCA/AUS STANDARDS)
MB METAL BALLUSTRADE
MC METAL CLADDING
MF METAL FENCING (TO FUTURE SELECTION)

PSK PRIVACY SCREEN (TO FUTURE SELECTION)
PTX PAINT FINISH TYPE X
RP ROOF RIVER PEBBLES
RW RENDERED FINISH/SELECTED PAINT FINISH

TREE LEGEND:

TREE TPZ

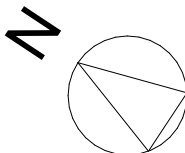


GENERAL NOTES:

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Issue	Date	Description
01	22/04/2025	Issue for SSDA Submission

Scale: 1:200 @ A1
Scale: 1:400 @ A3



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P - 02 9698 8140
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Level 2, 52 Abbot Street,
Surry Hills NSW 2010
ABN 36 147 035 550
Nominated Architect:
Paul Buljevic NSW 7768

PROJECT:

Residential flat buildings with in-fill affordable housing
10,14-14A Stanhope Road, Killara, NSW 2071

CLIENT:

Stanhope Rd Residence Holdings Pty Ltd.

DRAWING TITLE:

BASEMENT 1 PLAN

DRAWING BY:

KS, FS, KW

CHECKED BY:

KS, FS

DRAWING NO.:

DA100

PROJECT NO.:

2438

DATE:

FEB 2025

ISSUE:

01

LEGEND:

AW AWNING
AH ACCESS HATCH
AC A/C CONDENSER UNITS
FH FIRE HYDRANT
FHR FIRE HOSE REEL
FS FIRE STAIRS
GC GARBAGE CHUTE
HW HIGHLIGHT WINDOW
MV MECHANICAL RISER TO FUTURE DETAIL
MB MAILBOX TO FUTURE DETAIL
SK SKYLIGHT

STR STORAGE
HWU HOT WATER UNITS

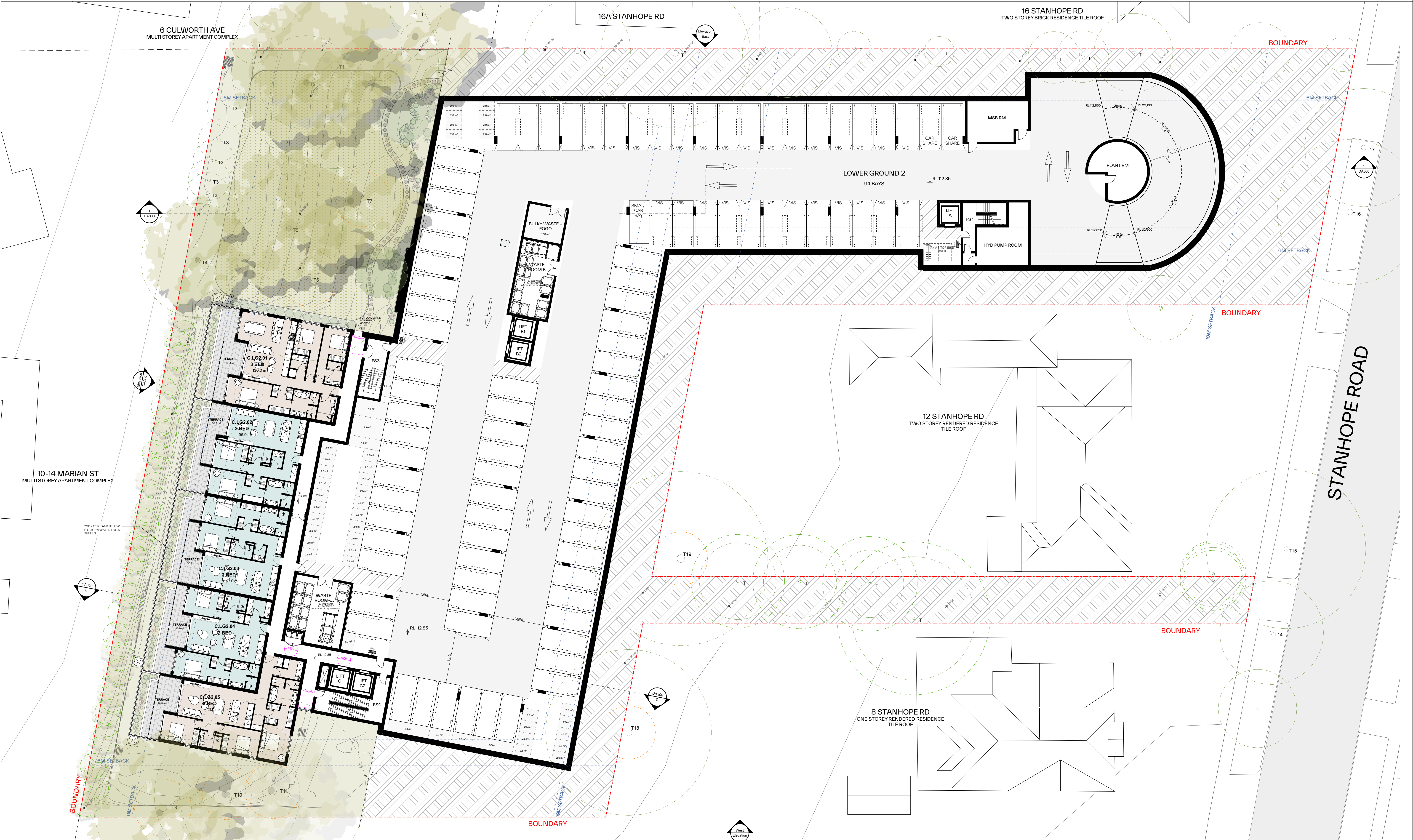
MATERIALS LEGEND:

AFG ALUMINIUM FRAMED GLAZING
LV ALUMINIUM ELLIPTICAL FIXED LOUVERS
AW AWNING (TO FUTURE DETAIL)
CONC CONCRETE
FB FACE BRICK
GB FRAMELESS TOUCHED GLASS BALUSTRADE (TO BCA/AUS STANDARDS)
MB METAL BALUSTRADE
MC METAL CLADDING
MF METAL FENCING (TO FUTURE SELECTION)

PSK PRIVACY SCREEN (TO FUTURE SELECTION)
PTX PAINT FINISH TYPE X
RP ROOF RIVER PEBBLES
RW RENDERED FINISH/SELECTED PAINT FINISH

TREE LEGEND:

TREE TPZ

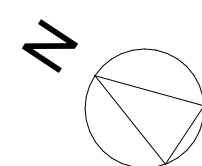


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Scale: 1:200 @ A1
Scale: 1:400 @ A3



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Sunny Hills NSW 2010
ABN 36 147 035 550
Nominated Architect:
Paul Buljevic NSW 7768

PROJECT:

Residential flat buildings with in-fill affordable housing
10,14-14A Stanhope Road, Killara, NSW 2071

CLIENT:

Stanhope Rd Residence Holdings Pty Ltd.

DRAWING TITLE:

LOWER GROUND 2 PLAN

DRAWING BY:

KS, FS, KW

SCALE:

1:200@A1

PROJECT NO:

2438

CHECKED BY:

KS, FS

DRAWING NO:

DA101

DATE:

FEB 2025

DATE:

FEB 2025

ISSUE:

01

LEGEND:

AW AWNING
AH ACCESS HATCH
AC A/C CONDENSER UNITS
FH FIRE HYDRANT
FHR FIRE HOSE REEL
FS FIRE STAIRS
GC GARBAGE CHUTE
HW HIGHLIGHT WINDOW
MV MECHANICAL RISER TO FUTURE DETAIL
MB MAILBOX TO FUTURE DETAIL
SK SKYLIGHT

STR STORAGE
HWU HOT WATER UNITS

MATERIALS LEGEND:

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LV ALUMINIUM ELLIPTICAL FIXED LOUVERS
AW AWNING (TO FUTURE DETAIL)
CONC CONCRETE
FB FACE BRICK
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MB METAL BALUSTRADE
MC METAL CLADDING
MF METAL FENCING (TO FUTURE SELECTION)

PSK PRIVACY SCREEN (TO FUTURE SELECTION)
PTX PAINT FINISH TYPE
RP ROOF RIVER PEBBLES
RW RENDERED FINISH/SELECTED PAINT FINISH

TREE LEGEND:

TREE TPZ

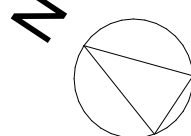


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Scale: 1:200 @ A1
Scale: 1:400 @ A3



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Sunny Hills NSW 2010
ABN 36 147 035 550
Nominated Architect:
Paul Buljevic NSW 7768

PROJECT:

Residential flat buildings with in-fill affordable housing
10,14-14A Stanhope Road, Killara, NSW 2071

CLIENT:

Stanhope Rd Residence Holdings Pty Ltd.

DRAWING TITLE:

LOWER GROUND 1 PLAN

DRAWING BY:

KS, FS, KW

SCALE:

1:200@A1

PROJECT NO:

2438

CHECKED BY:

KS, FS

DRAWING NO:

DA102

DATE:

FEB 2025

DATE:

FEB 2025

ISSUE:

01

LEGEND:

AW AWNING
AH ACCESS HATCH
AC A/C CONDENSER UNITS
FH FIRE HYDRANT
FHR FIRE HOSE REEL
FS FIRE STAIRS
GC GARBAGE CHUTE
HW HIGHLIGHT WINDOW
MV MECHANICAL RISER TO FUTURE DETAIL
MB MAILBOX TO FUTURE DETAIL
SK SKYLIGHT

STR STORAGE
HWU HOT WATER UNITS

MATERIALS LEGEND:

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LV ALUMINIUM ELLIPTICAL FIXED LOUVERS
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MC METAL CLADDING
MF METAL FENCING (TO FUTURE SELECTION)

PSK PRIVACY SCREEN (TO FUTURE SELECTION)
PTX PAINT FINISH TYPEX
RP ROOF RIVER PEBBLES
RW RENDERED FINISH/SELECTED PAINT FINISH

TREE LEGEND:

TREE TPZ

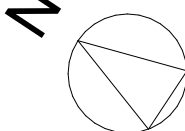


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Scale: 1:200 @ A1
Scale: 1:400 @ A3



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Surry Hills NSW 2010
ABN 36 147 035 550
Nominated Architect
Paul Buljevic NSW 7768

PROJECT:

Residential flat buildings with in-fill affordable housing
10,14-14A Stanhope Road, Killara, NSW 2071

CLIENT:

Stanhope Rd Residence Holdings Pty Ltd.

DRAWING TITLE:

GROUND FLOOR PLAN

DRAWING BY:

KS, FS, KW

SCALE:

1:200@A1

PROJECT NO:

2438

CHECKED BY:

KS, FS

DRAWING NO:

DA103

DATE:

FEB 2025

ISSUE:

01



**ANNEXURE B: TRAFFIC SURVEY DATA
(2 SHEETS)**

TRANS TRAFFIC SURVEY

TURNING MOVEMENT SURVEY

Intersection of Stanhope Rd and Pacific Hwy, Killara

GPS -33.769640, 151.160290

Date: 1 Nov 2010/25

Weather: Overcast

Suburban: Killara

Customer: McLaren

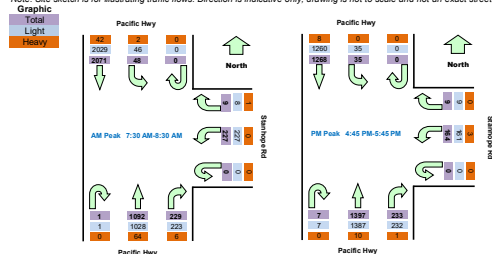
North: Pacific Hwy
East: Stanhope Rd
South: Pacific Hwy
West: N/A

Survey AM: 7:00 AM-9:30 AM
Period PM: 3:00 PM-5:00 PM
Traffic AM: 7:30 AM-8:30 AM
Peak PM: 4:45 PM-5:45 PM

All Vehicles													Hourly Total	
Period Start	Period End	North	U	SB	L	East	Approach	Sinhgore	R	South	Approach	NB	Hour	Peak
7:00	7:15	0	409	9	0	1	19	2	37	231		3377		
7:15	7:30	0	472	14	0	2	29	0	59	275		3569		
7:30	7:45	0	494	10	0	3	45	0	63	286		3677		Peak
7:45	8:00	0	502	8	0	2	65	1	62	277		3628		
8:00	8:15	0	495	11	0	3	60	0	49	282		3507		
8:15	8:30	0	580	19	0	1	57	0	55	247		3401		
8:30	8:45	0	479	22	0	6	57	1	55	232		3267		
8:45	9:00	0	411	27	0	4	62	0	38	254				
9:00	9:15	1	417	14	0	3	48	1	40	270				
9:15	9:30	0	429	8	0	3	43	1	46	295				
15:00	15:15	0	218	11	0	4	50	1	52	341		2951		
15:15	15:30	0	260	16	0	2	58	0	61	345		3004		
15:30	15:45	0	313	17	0	10	39	2	45	352		3031		
15:45	16:00	1	253	12	0	4	34	1	52	397		2952		
16:00	16:15	0	278	4	0	1	53	0	50	344		2957		
16:15	16:30	0	325	9	0	3	51	0	53	328		2986		
16:30	16:45	0	290	8	0	2	31	3	50	315		3010		
16:45	17:00	0	294	8	0	2	43	3	66	343		3113		Peak
17:00	17:15	0	302	3	0	2	49	4	59	340		3106		
17:15	17:30	0	347	13	0	2	30	0	48	353				
17:30	17:45	0	325	11	0	3	42	0	60	361				
17:45	18:00	0	281	7	0	4	39	4	54	353				

Peak Time		North Approach Pacific Hwy			East Approach Stanhope Rd			South Approach Pacific Hwy			Peak
Period Start	Period End	U	SB	L	U	R	L	U	R	NB	total
7:30	8:30	0	2071	45	0	9	227	1	229	1029	3677
16:45	17:45	0	1268	35	0	9	164	7	233	1397	3113

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.



Light Vehicles		Time												Hourly Total	
Period Start	Period End	U	SB	L	U	R	L	U	R	NB	Hour	Peak			
7:00	7:15	0	398	8	0	1	19	2	37	211					
7:15	7:30	0	464	13	0	2	29	0	58	265					
7:30	7:45	0	480	10	0	3	45	0	60	266					
7:45	8:00	0	493	8	0	2	65	1	60	261					
8:00	8:15	0	485	10	0	3	60	0	49	268					
8:15	8:30	0	571	18	0	0	57	0	54	233					
8:30	8:45	0	472	21	0	6	56	1	55	221					
8:45	9:00	0	402	27	0	4	62	0	37	244					
9:00	9:15	1	400	14	0	3	47	1	36	251					
9:15	9:30	0	420	8	0	2	41	1	44	280					
15:00	15:15	0	213	11	0	4	44	1	49	331					
15:15	15:30	0	255	16	0	2	54	0	61	337					
15:30	15:45	0	311	16	0	10	39	2	43	343					
15:45	16:00	1	251	11	0	4	33	1	51	394					
16:00	16:15	0	272	3	0	1	53	0	49	334					
16:15	16:30	0	323	9	0	2	51	0	52	322					
16:30	16:45	0	284	7	0	2	31	3	50	311					
16:45	17:00	0	291	8	0	2	42	3	65	340					
17:00	17:15	0	300	3	0	2	48	4	59	337					
17:15	17:30	0	344	13	0	2	30	0	48	349					
17:30	17:45	0	325	11	0	3	41	0	60	361					
17:45	18:00	0	279	7	0	4	39	4	54	359					

Peak Time		North Approach Pacific Hwy			East Approach Stanhope Rd			South Approach Pacific Hwy			Peak
Period Start	Period End	U	SB	L	U	R	L	U	R	NB	total
7:30	8:30	0	2029	46	0	8	227	1	223	1028	3562
16:45	17:45	0	1260	35	0	9	161	7	232	1387	3091

Heavy Vehicles		Time												Hourly Total	
Period Start	Period End	U	SB	L	U	R	L	U	R	NB	Hour	Peak			
7:00	7:15	0	11	1	0	0	0	0	0	0	0	20			
7:15	7:30	0	8	1	0	0	0	0	0	0	1	10			
7:30	7:45	0	14	0	0	0	0	0	0	0	3	20			
7:45	8:00	0	9	0	0	0	0	0	0	0	2	16			
8:00	8:15	0	10	1	0	0	0	0	0	0	0	14			
8:15	8:30	0	9	1	0	0	1	0	0	0	1	14			
8:30	8:45	0	7	1	0	0	1	0	0	0	0	11			
8:45	9:00	0	9	0	0	0	0	0	0	0	1	10			
9:00	9:15	0	17	0	0	0	1	0	4	19					
9:15	9:30	0	9	0	0	1	2	0	2	15					
15:00	15:15	0	5	0	0	0	0	6	0	3	10				
15:15	15:30	0	5	0	0	0	0	4	0	0	0	8			
15:30	15:45	0	2	1	0	0	0	0	0	0	2	9			
15:45	16:00	0	2	1	0	0	1	0	1	0	1	3			
16:00	16:15	0	6	1	0	0	0	0	0	0	1	10			
16:15	16:30	0	2	0	0	0	1	0	0	0	1	6			
16:30	16:45	0	6	1	0	0	0	0	0	0	0	4			
16:45	17:00	0	3	0	0	0	0	1	0	1	3				
17:00	17:15	0	2	0	0	0	0	1	0	0	0	3			
17:15	17:30	0	3	0	0	0	0	0	0	0	0	4			
17:30	17:45	0	0	0	0	0	0	1	0	0	0	0			
17:45	18:00	0	2	0	0	0	0	0	0	0	0	4			

Peak Time		North Approach Pacific Hwy			East Approach Stanhope Rd			South Approach Pacific Hwy			Peak
Period Start	Period End	U	SB	L	U	R	L	U	R	NB	total
7:30	8:30	0	42	2	0	1	0	0	6	64	115
16:45	17:45	0	8	0	0	0	3	0	1	10	22

Queues		North Approach				East Approach		Stanhope Rd		South Approach			
Time	Period	West Lane	Middle Lane	East Lane	North Lane	South Lane	East Lane	Middle Lane	West Lane	West Lane	Middle Lane	East Lane	West Lane
7:00	7:05	0	0	0	3	0	3	0	0	0	0	0	0
7:05	7:10	0	0	0	1	1	3	0	0	0	0	0	0
7:10	7:15	0	0	0	1	1	3	0	0	0	0	0	0
7:15	7:20	0	0	0	2	1	3	0	0	0	0	0	0
7:20	7:25	0	0	0	2	0	6	0	0	0	0	0	0
7:25	7:30	0	0	0	3	2	6	0	0	0	0	0	0
7:30	7:35	0	0	0	4	3	6	5	0	0	0	0	0
7:35	7:40	0	0	0	6	2	6	5	0	0	0	0	0
7:40	7:45	0	0	0	5	1	6	0	0	0	0	0	0
7:45	7:50	0	0	0	4	4	6	0	0	0	0	0	0
7:50	7:55	0	0	0	5	2	6	0	0	0	0	0	0
7:55	8:00	3	0	0	2	4	4	0	0	0	0	0	0
8:00	8:05	0	0	0	2	2	4	0	0	0	0	0	0
8:05	8:10	1	0	0	2	2	6	2	0	0	0	0	0
8:10	8:15	6	0	0	4	5	6	0	0	0	0	0	0
8:15	8:20	8	0	0	7	2	6	5	0	0	0	0	0
8:20	8:25	0	0	0	6	1	6	5	0	0	0	0	0
8:25	8:30	5	0	0	8	1	6	5	0	0	0	0	0
8:30	8:35	8	0	0	8	3	6	5	0	0	0	0	0
8:35	8:40	0	0	0	7	5	6	5	0	0	0	0	0
8:40	8:45	0	0	0	4	1	6	0	0	0	0	0	0
8:45	8:50	0	0	0	4	1	3	0	0	0	0	0	0
8:50	8:55	0	0	0	4	2	6	0	0	0	0	0	0
8:55	9:00	1	0	0	5	1	6	0	0	0	0	0	0
9:00	9:05	0	0	0	2	1	2	0	0	0	0	0	0
9:05	9:10	0	0	0	2	1	6	3	0	0	0	0	0
9:10	9:15	0	0	0	3	4	5	0	0	0	0	0	0
9:15	9:20	0	0	0	2	1	2	0	0	0	0	0	0
9:20	9:25	0	0	0	3	0	5	0	0	0	0	0	0
9:25	9:30	0	0	0	3	4	2	0	0	0	0	0	0
15:00	15:05	0	0	0	4	2	3	0	0	0	0	0	0
15:05	15:10	0	0	0	2	1	3	0	0	0	0	0	0
15:10	15:15	0	0	0	3	1	1	0	0	0	0	0	0
15:15	15:20	3	0	0	5	4	6	0	0	0	0	0	0
15:20	15:25	0	0	0	3	1	3	0	0	0	0	0	0
15:25	15:30	0	0	0	4	2	4	0	0	0	0	0	0
15:30	15:35	0	0	0	4	0	3	0	0	0	0	0	0
15:35	15:40	0	0	0	6	1	2	0	0	0	0	0	0
15:40	15:45	0	0	0	3	2	5	0	0	0	0	0	0
15:45	15:50	0	0	0	1	1	2	0	0	0	0	0	0
15:50	15:55	0	0	0	2	3	5	0	0	0	0	0	0
15:55	16:00	0	0	0	2	2	2	0	0	0	0	0	0
16:00	16:05	5	3	0	9	1	3	0	0	0	0	0	0
16:05	16:10	3	0	0	2	3	3	0	0	0	0	0	0
16:10	16:15	0	0	0	3	0	2	0	0	0	0	0	0
16:15	16:20	0	0	0	3	2	4	0	0	0	0	0	0
16:20	16:25	0	0	0	2	1	2	0	0	0	0	0	0
16:25	16:30	0	0	0	2	3	3	0	0	0	0	0	0
16:30	16:35	0	0	0	2	0	2	0	0	0	0	0	0
16:35	16:40	0	0	0	2	1	4	0	0	0	0	0	0
16:40	16:45	0	0	0	1	1	3	0	0	0	0	0	0
16:45	16:50	0	0	0	1	2	3	0	0	0	0	0	0
16:50	16:55	0	0	0	3	0	6	0	0	0	0	0	0
16:55	17:00	0	0	0	5	0	4	0	0	0	0	0	0
17:00	17:05	0	0	0	4	2	4	0	0	0	0	0	0
17:05	17:10	0	0	0	2	1	4	0	0	0	0	0	0
17:10	17:15	0	0	0	2	0	2	0	0	0	0	0	0
17:15	17:20	0	0	0	2	3	2	0	0	0	0	0	0
17:20	17:25	1	0	0	2	3	6	0	0	0	0	0	0
17:25	17:30	3	0	0	1	1	5	0	0	0	0	0	0
17:30	17:35	4	0	0	2	2	4	0	0	0	0	0	0
17:35	17:40	0	0	0	3	4	5	0	0	0	0	0	0
17:40	17:45	4	0	0	3	1	6	0	0	0	0	0	0
17:45	17:50	0	0	0	2	2	4	0	0	0	0	0	0
17:50	17:55	0	0	0	5	3	2	0	0	0	0	0	0
17:55	18:00	0	0	0	1	2	6	3	0	0	0	0	0

TRANS TRAFFIC SURVEY

TURNING MOVEMENT SURVEY

Intersection of Stanhope Rd and Werona Ave, Killara

GPS -33.768329 151.164219

Date: Thu 02/03/25

Weather: Overcast

Suburban: Killara

Customer: McLaren

North: Werona Ave

East: Stanhope Rd

South: Werona Ave

West: Stanhope Rd

Survey Period: AM: 7:00 AM-9:30 AM

PM: 3:00 PM-6:00 PM

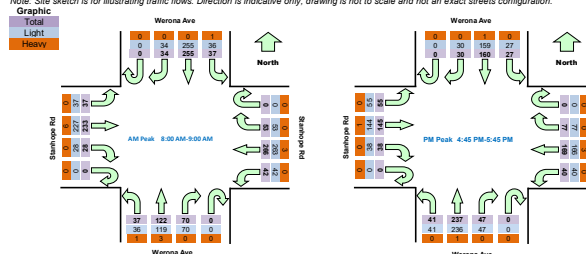
Traffic Peak: AM: 8:00 AM-9:00 AM

PM: 4:45 PM-5:45 PM

All Vehicles		North Approach Werona Ave				East Approach Stanhope Rd				South Approach Werona Ave				West Approach Stanhope Rd				Hourly Total	
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	Hour	Peak
7:00	7:15	0	4	22	8	0	11	18	2	0	5	24	3	0	2	35	12	855	
7:15	7:30	0	3	30	7	0	8	35	6	0	15	29	3	0	5	50	6	1007	
7:30	7:45	0	5	37	15	0	19	49	7	0	12	25	7	0	7	57	10	1130	
7:45	8:00	0	13	58	11	0	11	53	8	0	12	35	4	0	14	39	4	1192	
8:00	8:15	0	14	73	10	0	18	53	12	0	10	28	12	0	9	45	14	1214	Peak
8:15	8:30	0	6	81	10	0	9	64	4	0	16	37	8	0	6	72	7	1151	
8:30	8:45	0	8	45	9	0	13	70	14	0	30	29	8	0	6	75	5	1060	
8:45	9:00	0	6	56	8	0	13	79	12	0	14	28	9	0	7	41	11		
9:00	9:15	0	12	37	7	0	12	49	6	0	11	35	6	0	8	42	10		
9:15	9:30	0	5	46	8	0	14	47	4	0	9	23	15	0	9	40	9		
15:00	15:15	0	4	33	4	0	15	62	7	0	9	41	15	0	4	40	11	995	
15:15	15:30	0	2	35	10	0	20	64	6	0	6	42	11	0	14	53	8	1018	
15:30	15:45	0	10	40	8	0	16	47	10	0	5	52	10	0	9	36	14	1000	
15:45	16:00	0	6	33	3	0	17	34	7	0	8	46	11	0	10	36	11	990	
16:00	16:15	0	5	44	7	0	21	46	4	0	15	47	15	0	17	36	11	1047	
16:15	16:30	0	5	32	5	0	33	55	2	0	6	56	13	0	7	28	11	1037	
16:30	16:45	0	6	35	7	0	29	36	5	0	16	50	7	0	9	31	16	1038	
16:45	17:00	0	9	50	5	0	22	41	10	0	9	69	14	0	7	33	10	1066	Peak
17:00	17:15	0	8	31	8	0	18	47	6	0	10	61	6	0	10	39	14	1030	
17:15	17:30	0	4	40	8	0	22	40	10	0	13	45	10	0	10	38	14		
17:30	17:45	0	9	39	6	0	15	41	14	0	15	62	11	0	11	35	17		
17:45	18:00	0	10	23	7	0	18	36	7	0	9	60	11	0	13	36	13		

Peak Time		North Approach Werona Ave				East Approach Stanhope Rd				South Approach Werona Ave				West Approach Stanhope Rd				Peak total	
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	Hour	Peak
8:00	9:00	0	34	255	37	0	53	266	42	0	70	122	37	0	28	233	37	1214	
16:45	17:45	0	30	160	27	0	77	169	40	0	47	237	41	0	38	145	55	1066	

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.



Light Vehicles		North Approach Werona Ave				East Approach Stanhope Rd				South Approach Werona Ave				West Approach Stanhope Rd				Hourly Total	
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	Hour	Peak
7:00	7:15	0	4	22	8	0	11	18	2	0	5	24	3	0	2	35	12		
7:15	7:30	0	3	29	7	0	8	35	6	0	15	27	3	0	5	49	6		
7:30	7:45	0	5	37	14	0	19	49	7	0	11	25	7	0	7	54	9		
7:45	8:00	0	13	58	11	0	11	52	7	0	11	34	4	0	14	39	4		
8:00	8:15	0	14	73	10	0	18	53	12	0	10	28	12	0	9	43	14		
8:15	8:30	0	6	81	10	0	9	63	4	0	16	36	8	0	6	70	7		
8:30	8:45	0	8	45	8	0	13	69	14	0	30	29	8	0	6	74	5		
8:45	9:00	0	6	56	8	0	13	78	12	0	14	26	8	0	7	40	11		
9:00	9:15	0	11	36	7	0	12	49	6	0	11	34	6	0	8	39	10		
9:15	9:30	0	5	45	8	0	14	43	4	0	9	22	15	0	9	37	9		
15:00	15:15	0	3	31	4	0	15	58	7	0	9	39	15	0	4	37	11		
15:15	15:30	0	2	34	10	0	20	60	6	0	6	42	11	0	14	53	8		
15:30	15:45	0	10	40	8	0	16	47	10	0	5	52	10	0	8	34	14		
15:45	16:00	0	6	31	3	0	17	33	7	0	8	44	11	0	10	36	11		
16:00	16:15	0	5	42	7	0	21	45	4	0	15	44	15	0	17	34	11		
16:15	16:30	0	5	32	5	0	33	55	2	0	6	56	13	0	6	27	11		
16:30	16:45	0	6	35	7	0	29	36	5	0	16	49	7	0	8	31	16		
16:45	17:00	0	9	50	5	0	22	39	10	0	9	69	14	0	7	33	10		
17:00	17:15	0	8	30	8	0	18	47	6	0	10	61	6	0	10	38	14		
17:15	17:30	0	4	40	8	0	22	40	10	0	13	45	10	0	10	38	14		
17:30	17:45	0	9	39	6	0	15	40	14	0	15	61	11	0	11	35	17		
17:45	18:00	0	10	23	7	0	18	35	7	0	9	60	11	0	13	36	13		

Peak Time		North Approach Werona Ave				East Approach Stanhope Rd				South Approach Werona Ave				West Approach Stanhope Rd				Peak total	
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	Hour	Peak
8:00	9:00	0	34	255	36	0	53	263	42	0	70	119	36	0	28	227	37	1200	
16:45	17:45	0	30	159	27	0	77	156	40	0	47	236	41	0	38	144	55	1060	

Heavy Vehicles		North Approach Werona Ave				East Approach Stanhope Rd				South Approach Werona Ave				West Approach Stanhope Rd			
Time		U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L
Period Start	Period End																
7:00	7:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
7:15	7:30	0	0	1	0	0	0	0	0	0	0	2	0	0	0	1	0
7:30	7:45	0	0	0	1	0	0	0	0	0	1	0	0	0	0	3	1
7:45	8:00	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0
8:00	8:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
8:15	8:30	0	0	0	0	0	0	1	0	0	0	1	0	0	0	2	0
8:30	8:45	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0
8:45	9:00	0	0	0	0	0	0	1	0	0	0	2	1	0	0	1	0
9:00	9:15	0	1	1	0	0	0	0	0	0	0	1	0	0	0	3	0
9:15	9:30	0	0	1	0	0	0	4	0	0	0	1	0	0	0	3	0
15:00	15:15	0	1	2	0	0	0	4	0	0	0	2	0	0	0	3	0
15:15	15:30	0	0	1	0	0	0	4	0	0	0	0	0	0	0	0	0
15:30	15:45	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0
15:45	16:00	0	0	2	0	0	0	1	0	0	0	2	0	0	0	0	0
16:00	16:15	0	0	2	0	0	0	1	0	0	0	3	0	0	0	0	2
16:15	16:30	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
16:30	16:45	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
16:45	17:00	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
17:00	17:15	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
17:15	17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	17:45	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0
17:45	18:00	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0



**ANNEXURE C: SIDRA RESULTS
(6 SHEETS)**

MOVEMENT SUMMARY

 **Site: [2] EX AM Stanhope Rd / Werona Ave (Existing)**
Output produced by SIDRA INTERSECTION Version: 10.0.3.210

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 48.0 seconds (Site User-Given Cycle Time)
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Qued	Eff. Stop of Rate	Number of Cycles to Depart	Aver. Speed
			[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				km/h
South: Werona Ave (S)															
1	L2	All MCs	39	2.7	39	2.7	0.538	19.8	LOS B	5.1	36.3	0.91	0.78	0.91	38.0
2	T1	All MCs	128	2.5	128	2.5	0.538	15.2	LOS B	5.1	36.3	0.91	0.78	0.91	38.7
3	R2	All MCs	74	0.0	74	0.0	* 0.538	26.3	LOS B	5.1	36.3	0.91	0.78	0.91	37.9
Approach			241	1.7	241	1.7	0.538	19.4	LOS B	5.1	36.3	0.91	0.78	0.91	38.3
East: Stanhope Rd (E)															
4	L2	All MCs	44	0.0	44	0.0	0.542	16.4	LOS B	7.1	50.0	0.82	0.73	0.82	39.9
5	T1	All MCs	280	1.1	280	1.1	0.542	11.8	LOS A	7.1	50.0	0.82	0.73	0.82	40.8
6	R2	All MCs	56	0.0	56	0.0	* 0.542	21.1	LOS B	7.1	50.0	0.82	0.73	0.82	39.8
Approach			380	0.8	380	0.8	0.542	13.7	LOS A	7.1	50.0	0.82	0.73	0.82	40.5
North: Werona Ave (N)															
7	L2	All MCs	39	2.7	39	2.7	0.573	19.4	LOS B	7.0	48.8	0.88	0.76	0.88	39.2
8	T1	All MCs	268	0.0	268	0.0	0.573	14.8	LOS B	7.0	48.8	0.88	0.76	0.88	40.0
9	R2	All MCs	36	0.0	36	0.0	0.573	22.8	LOS B	7.0	48.8	0.88	0.76	0.88	39.1
Approach			343	0.3	343	0.3	0.573	16.2	LOS B	7.0	48.8	0.88	0.76	0.88	39.8
West: Stanhope Rd (W)															
10	L2	All MCs	39	0.0	39	0.0	0.435	15.8	LOS B	5.5	39.4	0.78	0.68	0.78	40.1
11	T1	All MCs	245	2.6	245	2.6	0.435	11.2	LOS A	5.5	39.4	0.78	0.68	0.78	40.9
12	R2	All MCs	29	0.0	29	0.0	0.435	21.3	LOS B	5.5	39.4	0.78	0.68	0.78	39.9
Approach			314	2.0	314	2.0	0.435	12.8	LOS A	5.5	39.4	0.78	0.68	0.78	40.7
All Vehicles			1278	1.2	1278	1.2	0.573	15.2	LOS B	7.1	50.0	0.84	0.74	0.84	40.0

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

 **Site: [2 (2)] EX PM Stanhope Rd / Werona Ave (Existing)**
Output produced by SIDRA INTERSECTION Version: 10.0.3.210

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 43.0 seconds (Site User-Given Cycle Time)
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Qued	Eff. Stop of Cycles	Number of Cycles Rate to Depart	Aver. Speed
			[Total HV]		[Total HV]					[Veh.	Dist]				
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Werona Ave (S)															
1	L2	All MCs	43	0.0	43	0.0	0.535	16.6	LOS B	6.0	41.9	0.85	0.74	0.85	40.2
2	T1	All MCs	249	0.4	249	0.4	0.535	12.0	LOS A	6.0	41.9	0.85	0.74	0.85	41.0
3	R2	All MCs	49	0.0	49	0.0	* 0.535	19.6	LOS B	6.0	41.9	0.85	0.74	0.85	40.0
Approach			342	0.3	342	0.3	0.535	13.7	LOS A	6.0	41.9	0.85	0.74	0.85	40.7
East: Stanhope Rd (E)															
4	L2	All MCs	42	0.0	42	0.0	0.537	17.1	LOS B	5.4	38.3	0.87	0.76	0.87	39.6
5	T1	All MCs	178	1.8	178	1.8	0.537	12.5	LOS A	5.4	38.3	0.87	0.76	0.87	40.4
6	R2	All MCs	81	0.0	81	0.0	* 0.537	20.5	LOS B	5.4	38.3	0.87	0.76	0.87	39.4
Approach			301	1.0	301	1.0	0.537	15.3	LOS B	5.4	38.3	0.87	0.76	0.87	40.0
North: Werona Ave (N)															
7	L2	All MCs	28	0.0	28	0.0	0.373	16.0	LOS B	3.8	26.6	0.80	0.69	0.80	40.0
8	T1	All MCs	168	0.6	168	0.6	0.373	11.4	LOS A	3.8	26.6	0.80	0.69	0.80	40.9
9	R2	All MCs	32	0.0	32	0.0	0.373	20.7	LOS B	3.8	26.6	0.80	0.69	0.80	39.9
Approach			228	0.5	228	0.5	0.373	13.3	LOS A	3.8	26.6	0.80	0.69	0.80	40.6
West: Stanhope Rd (W)															
10	L2	All MCs	58	0.0	58	0.0	0.418	16.5	LOS B	4.2	29.8	0.82	0.72	0.82	39.7
11	T1	All MCs	153	0.7	153	0.7	0.418	11.9	LOS A	4.2	29.8	0.82	0.72	0.82	40.5
12	R2	All MCs	40	0.0	40	0.0	0.418	20.1	LOS B	4.2	29.8	0.82	0.72	0.82	39.6
Approach			251	0.4	251	0.4	0.418	14.3	LOS A	4.2	29.8	0.82	0.72	0.82	40.2
All Vehicles			1122	0.6	1122	0.6	0.537	14.2	LOS A	6.0	41.9	0.84	0.73	0.84	40.4

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: [1] EX AM Stanhope Rd / Pacific Hwy (Existing)
Output produced by SIDRA INTERSECTION Version: 10.0.3.210

NA
Site Category: (None)
Give-Way (Two-Way)
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed
			[Total HV]		[Total HV]					[Veh.	Dist]				
			veh/h	%	veh/h	%	v/c	sec		veh	m				
South: Pacific Highway (S)															
2	T1	All MCs	1149	5.9	1149	5.9	0.568	8.2	LOS A	5.0	37.0	0.07	0.07	0.11	55.5
3	R2	All MCs	241	2.6	241	2.6	3.929	2706.2	LOS F	114.4	818.8	1.00	3.93	13.93	12.8
Approach			1391	5.3	1391	5.3	3.929	475.9	NA	114.4	818.8	0.23	0.74	2.51	35.1
East: Stanhope Road (E)															
4	L2	All MCs	239	0.0	239	0.0	0.379	10.6	LOS A	1.9	13.6	0.65	0.90	0.85	44.5
6	R2	All MCs	9	11.1	9	11.1	1.574	709.2	LOS F	4.0	30.9	1.00	1.19	1.87	10.3
Approach			248	0.4	248	0.4	1.574	37.2	LOS C	4.0	30.9	0.66	0.91	0.89	39.5
North: Pacific Highway (N)															
7	L2	All MCs	51	4.2	51	4.2	0.387	5.7	LOS A	0.0	0.0	0.00	0.04	0.00	56.8
8	T1	All MCs	2180	2.0	2180	2.0	0.387	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.6
Approach			2231	2.1	2231	2.1	0.387	0.3	NA	0.0	0.0	0.00	0.01	0.00	59.6
All Vehicles			3869	3.1	3869	3.1	3.929	173.6	NA	114.4	818.8	0.13	0.33	0.96	46.4

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: [1 (2)] EX PM Stanhope Rd / Pacific Hwy (Existing)
Output produced by SIDRA INTERSECTION Version: 10.0.3.210

NA
Site Category: (None)
Give-Way (Two-Way)
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed
			[Total HV]		[Total HV]					[Veh. veh	Dist] m				
			veh/h	%	veh/h	%									
South: Pacific Highway (S)															
2	T1	All MCs	1478	0.7	1478	0.7	0.538	1.7	LOS A	5.6	39.3	0.28	0.22	0.31	58.4
3	R2	All MCs	245	0.4	245	0.4	0.911	51.7	LOS D	8.3	58.4	0.97	1.60	3.30	40.2
Approach			1723	0.7	1723	0.7	0.911	8.9	NA	8.3	58.4	0.38	0.42	0.74	54.9
East: Stanhope Road (E)															
4	L2	All MCs	173	1.8	173	1.8	0.196	6.9	LOS A	0.8	5.8	0.48	0.66	0.48	46.2
6	R2	All MCs	9	0.0	9	0.0	1.578	720.1	LOS F	4.1	28.7	1.00	1.18	1.84	10.0
Approach			182	1.7	182	1.7	1.578	44.0	LOS D	4.1	28.7	0.50	0.69	0.55	38.9
North: Pacific Highway (N)															
7	L2	All MCs	37	0.0	37	0.0	0.236	5.6	LOS A	0.0	0.0	0.00	0.05	0.00	57.0
8	T1	All MCs	1335	0.6	1335	0.6	0.236	0.1	LOS A	0.0	0.0	0.00	0.02	0.00	59.7
Approach			1372	0.6	1372	0.6	0.236	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.7
All Vehicles			3277	0.7	3277	0.7	1.578	7.2	NA	8.3	58.4	0.23	0.27	0.42	55.5

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: [2 (3)] PD AM Stanhope Rd / Werona Ave (Post Development)**

Output produced by SIDRA INTERSECTION Version: 10.0.3.210

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 48.0 seconds (Site User-Given Cycle Time)
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Qued	Eff. Stop of Cycles Rate to Depart	Number of Cycles	Aver. Speed
			[Total HV]		[Total HV]					[Veh. veh	Dist] m				km/h
			veh/h	%	veh/h	%	v/c	sec							
South: Werona Ave (S)															
1	L2	All MCs	40	2.6	40	2.6	0.540	19.8	LOS B	5.1	36.5	0.91	0.78	0.91	38.0
2	T1	All MCs	128	2.5	128	2.5	0.540	15.2	LOS B	5.1	36.5	0.91	0.78	0.91	38.7
3	R2	All MCs	74	0.0	74	0.0	* 0.540	26.4	LOS B	5.1	36.5	0.91	0.78	0.91	37.9
Approach			242	1.7	242	1.7	0.540	19.4	LOS B	5.1	36.5	0.91	0.78	0.91	38.3
East: Stanhope Rd (E)															
4	L2	All MCs	44	0.0	44	0.0	0.544	16.4	LOS B	7.1	50.3	0.82	0.73	0.82	39.9
5	T1	All MCs	281	1.1	281	1.1	0.544	11.9	LOS A	7.1	50.3	0.82	0.73	0.82	40.8
6	R2	All MCs	56	0.0	56	0.0	* 0.544	21.4	LOS B	7.1	50.3	0.82	0.73	0.82	39.8
Approach			381	0.8	381	0.8	0.544	13.8	LOS A	7.1	50.3	0.82	0.73	0.82	40.5
North: Werona Ave (N)															
7	L2	All MCs	39	2.7	39	2.7	0.574	19.4	LOS B	7.0	48.9	0.88	0.76	0.88	39.2
8	T1	All MCs	268	0.0	268	0.0	0.574	14.9	LOS B	7.0	48.9	0.88	0.76	0.88	40.0
9	R2	All MCs	36	0.0	36	0.0	0.574	22.9	LOS B	7.0	48.9	0.88	0.76	0.88	39.1
Approach			343	0.3	343	0.3	0.574	16.2	LOS B	7.0	48.9	0.88	0.76	0.88	39.8
West: Stanhope Rd (W)															
10	L2	All MCs	44	0.0	44	0.0	0.450	15.9	LOS B	5.7	40.9	0.78	0.69	0.78	40.0
11	T1	All MCs	247	2.6	247	2.6	0.450	11.3	LOS A	5.7	40.9	0.78	0.69	0.78	40.9
12	R2	All MCs	32	0.0	32	0.0	0.450	21.4	LOS B	5.7	40.9	0.78	0.69	0.78	39.9
Approach			323	2.0	323	2.0	0.450	12.9	LOS A	5.7	40.9	0.78	0.69	0.78	40.7
All Vehicles			1289	1.1	1289	1.1	0.574	15.3	LOS B	7.1	50.3	0.85	0.74	0.85	39.9

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

 **Site: [2 (4)] PD PM Stanhope Rd / Werona Ave (Post Development)**

Output produced by SIDRA INTERSECTION Version: 10.0.3.210

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 43.0 seconds (Site User-Given Cycle Time)
Site Scenario: 1 | Local Volumes

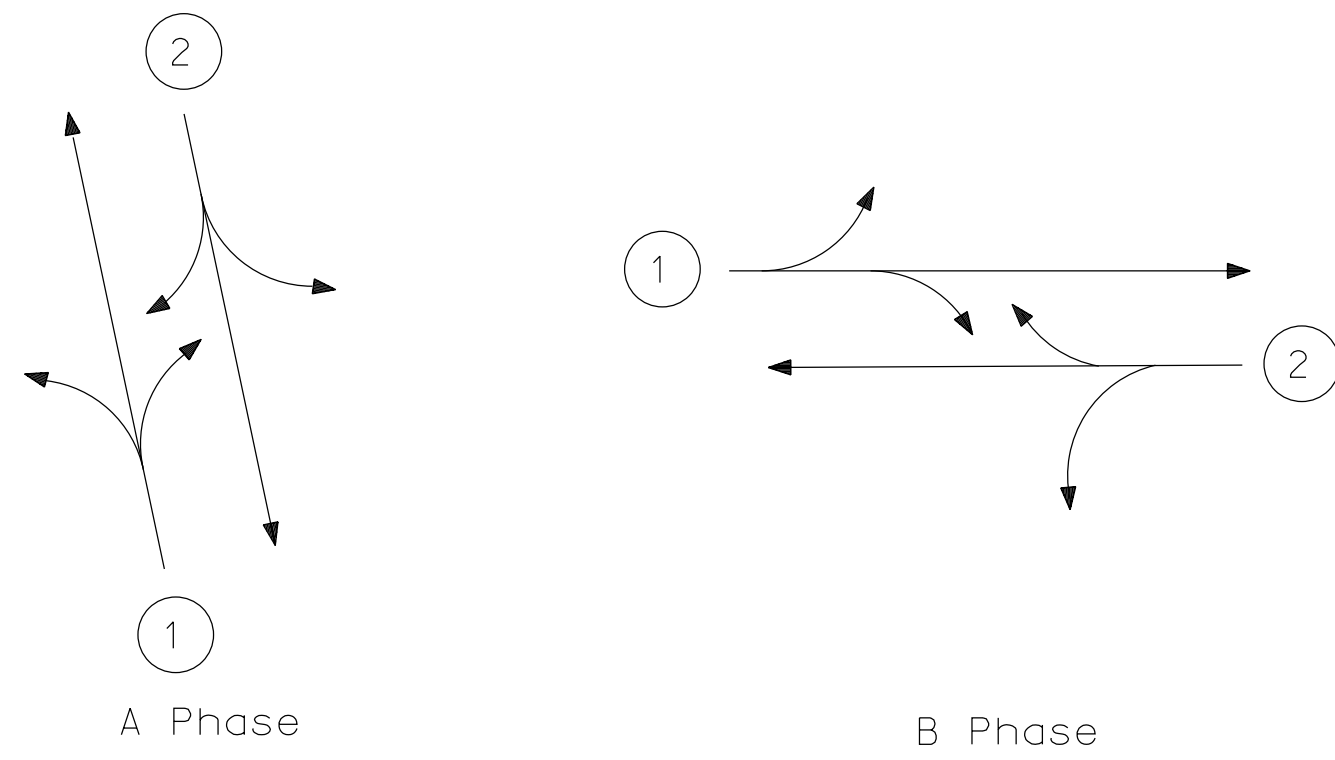
Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	Dist]				km/h
South: Werona Ave (S)															
1	L2	All MCs	45	0.0	45	0.0	0.538	16.6	LOS B	6.0	42.3	0.85	0.74	0.85	40.2
2	T1	All MCs	249	0.4	249	0.4	0.538	12.1	LOS A	6.0	42.3	0.85	0.74	0.85	41.0
3	R2	All MCs	49	0.0	49	0.0	* 0.538	19.7	LOS B	6.0	42.3	0.85	0.74	0.85	40.0
Approach			344	0.3	344	0.3	0.538	13.8	LOS A	6.0	42.3	0.85	0.74	0.85	40.7
East: Stanhope Rd (E)															
4	L2	All MCs	42	0.0	42	0.0	0.540	17.1	LOS B	5.5	38.6	0.87	0.76	0.87	39.6
5	T1	All MCs	180	1.8	180	1.8	0.540	12.5	LOS A	5.5	38.6	0.87	0.76	0.87	40.4
6	R2	All MCs	81	0.0	81	0.0	* 0.540	20.6	LOS B	5.5	38.6	0.87	0.76	0.87	39.4
Approach			303	1.0	303	1.0	0.540	15.3	LOS B	5.5	38.6	0.87	0.76	0.87	40.0
North: Werona Ave (N)															
7	L2	All MCs	28	0.0	28	0.0	0.374	16.0	LOS B	3.8	26.6	0.80	0.69	0.80	40.0
8	T1	All MCs	168	0.6	168	0.6	0.374	11.5	LOS A	3.8	26.6	0.80	0.69	0.80	40.8
9	R2	All MCs	32	0.0	32	0.0	0.374	20.8	LOS B	3.8	26.6	0.80	0.69	0.80	39.9
Approach			228	0.5	228	0.5	0.374	13.3	LOS A	3.8	26.6	0.80	0.69	0.80	40.6
West: Stanhope Rd (W)															
10	L2	All MCs	60	0.0	60	0.0	0.425	16.5	LOS B	4.3	30.4	0.82	0.72	0.82	39.7
11	T1	All MCs	154	0.7	154	0.7	0.425	11.9	LOS A	4.3	30.4	0.82	0.72	0.82	40.5
12	R2	All MCs	41	0.0	41	0.0	0.425	20.2	LOS B	4.3	30.4	0.82	0.72	0.82	39.5
Approach			255	0.4	255	0.4	0.425	14.3	LOS A	4.3	30.4	0.82	0.72	0.82	40.2
All Vehicles			1131	0.6	1131	0.6	0.540	14.2	LOS A	6.0	42.3	0.84	0.73	0.84	40.4

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)



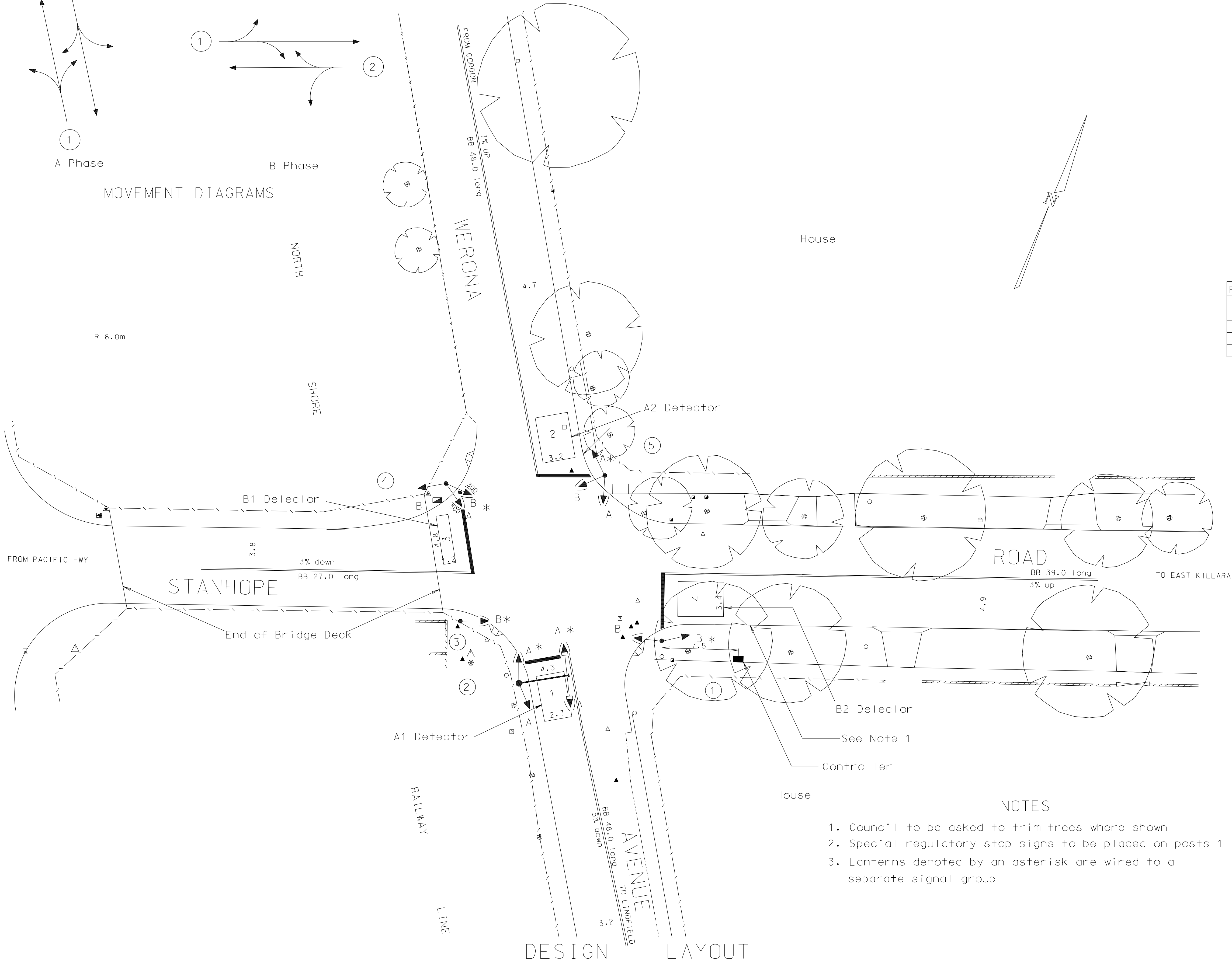
**ANNEXURE D: TCS PLANS
(1 SHEET)**



MOVEMENT DIAGRAMS

POST CHART

POST	TYPE	LENGTH	REMARKS
1	2	4.1	NEW
2	5L	-	NEW
3	2	4.1	NEW
4	2	4.1	NEW
5	2	4.1	NEW



NOTES

1. Council to be asked to trim trees where shown
2. Special regulatory stop signs to be placed on posts 1 and 4
3. Lanterns denoted by an asterisk are wired to a separate signal group

PUBLIC UTILITY LEGEND

HYDRANT	□	ELECTRIC LIGHT POLE	⊗
STOP VALVE	▼	TELEPHONE POLE	●
GAS VALVE	#	STAY POLE	⋈
SEWER MANHOLE	⊗	TELEPHONE BOX	⊞
TELECOM PIT	■	TELECOM PILLAR	⦿

FILE : K:/Signals/TCS/.../vv1831_1Bdgn
ARCHIVE LOCATION :

A ORIGINAL ISSUE	B Issue J/1 SS 333 2/22/04 Removed: LTR signs from all posts, notes 4.5 and 6. Added: Notes, Movements, and Controller. B.M.C. 10/22/04	U.B.D. REF MAP 41 E3 I.S.G. E..315115 E... CO-ORDS N..1262056 N.. Refer to sheet 1 Issue A for original Details DESIGNED	THESE DRAWINGS HAVE BEEN EXAMINED AND ARE RECOMMENDED FOR APPROVAL SIGNATURE..... NAME.....AL KRUSE SNR ROAD DESIGN OFFICER DATE.....	APPROVED Refer to sheet 1 Issue A for original Approval SIGNATURE..... NAME.....A.J.WESLEY DESIGN ENGINEER DATE.....	ROADS AND TRAFFIC AUTHORITY MUNICIPALITY OF KU-RING-GAI STANHOPE ROAD AND WERONA AVENUE KILLARA	REGION : PARRAMATTA	SHEET 1	
						DIVISION : SYDNEY		
						SCALE 5 0 5 10		ISSUE
						FILE 238 TS 278		SUPERSEDES SHEET 1A
REGN. 7000.238.VV.1831								



**ANNEXURE E: SIGNAL PHASE REVIEW
(2 SHEETS)**

Intersection	Stanhope Road / Werona Avenue
Period Start	Period Finish
8:45:00 AM	9:00:00 AM

No. of Cycle Recorded	Mod	Phase	Min	Max	Average	Occurences
18		A	12	40	23	100%
		B	13	36	25	100%

Cycle 1	TIME START			TIME END			Phase Duration (s)	Cycle Time (s)			
Phase	HR	MIN	SEC	HR	MIN	SEC					
A	8	45	17	8	45	51	34	55		8:45:17 AM	8:45:51 AM
B	8	45	51	8	46	12	21			8:45:51 AM	8:46:12 AM
A	8	46	12	8	46	33	21	41		8:46:12 AM	8:46:33 AM
B	8	46	33	8	46	53	20			8:46:33 AM	8:46:53 AM
A	8	46	53	8	47	9	16	36		8:46:53 AM	8:47:09 AM
B	8	47	9	8	47	29	20			8:47:09 AM	8:47:29 AM
A	8	47	29	8	47	56	27	53		8:47:29 AM	8:47:56 AM
B	8	47	56	8	48	22	26			8:47:56 AM	8:48:22 AM
A	8	48	22	8	48	47	25	45		8:48:22 AM	8:48:47 AM
B	8	48	47	8	49	7	20			8:48:47 AM	8:49:07 AM
A	8	49	7	8	49	22	15	34		8:49:07 AM	8:49:22 AM
B	8	49	22	8	49	41	19			8:49:22 AM	8:49:41 AM
A	8	49	41	8	50	0	19	54		8:49:41 AM	8:50:00 AM
B	8	50	0	8	50	35	35			8:50:00 AM	8:50:35 AM
A	8	50	35	8	50	54	19	44		8:50:35 AM	8:50:54 AM
B	8	50	54	8	51	19	25			8:50:54 AM	8:51:19 AM
A	8	51	19	8	51	46	27	63		8:51:19 AM	8:51:46 AM
B	8	51	46	8	52	22	36			8:51:46 AM	8:52:22 AM
A	8	52	22	8	52	59	37	65		8:52:22 AM	8:52:59 AM
B	8	52	59	8	53	27	28			8:52:59 AM	8:53:27 AM
A	8	53	27	8	53	45	18	31		8:53:27 AM	8:53:45 AM
B	8	53	45	8	53	58	13			8:53:45 AM	8:53:58 AM
A	8	53	58	8	54	10	12	35		8:53:58 AM	8:54:10 AM
B	8	54	10	8	54	33	23			8:54:10 AM	8:54:33 AM
A	8	54	33	8	54	56	23	54		8:54:33 AM	8:54:56 AM
B	8	54	56	8	55	27	31			8:54:56 AM	8:55:27 AM
A	8	55	27	8	56	1	34	66		8:55:27 AM	8:56:01 AM
B	8	56	1	8	56	33	32			8:56:01 AM	8:56:33 AM
A	8	56	33	8	57	2	29	58		8:56:33 AM	8:57:02 AM
B	8	57	2	8	57	31	29			8:57:02 AM	8:57:31 AM
A	8	57	31	8	58	11	40	71		8:57:31 AM	8:58:11 AM
B	8	58	11	8	58	42	31			8:58:11 AM	8:58:42 AM
A	8	58	42	8	58	56	14	32		8:58:42 AM	8:58:56 AM
B	8	58	56	8	59	14	18			8:58:56 AM	8:59:14 AM
A	8	59	14	8	59	26	12	32		8:59:14 AM	8:59:26 AM
B	8	59	26	8	59	46	20			8:59:26 AM	8:59:46 AM

Cycle Time	31	71	48
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Intersection	Stanhope Road / Werona Avenue
Period Start	Period Finish
5:00:00 PM	5:15:00 PM

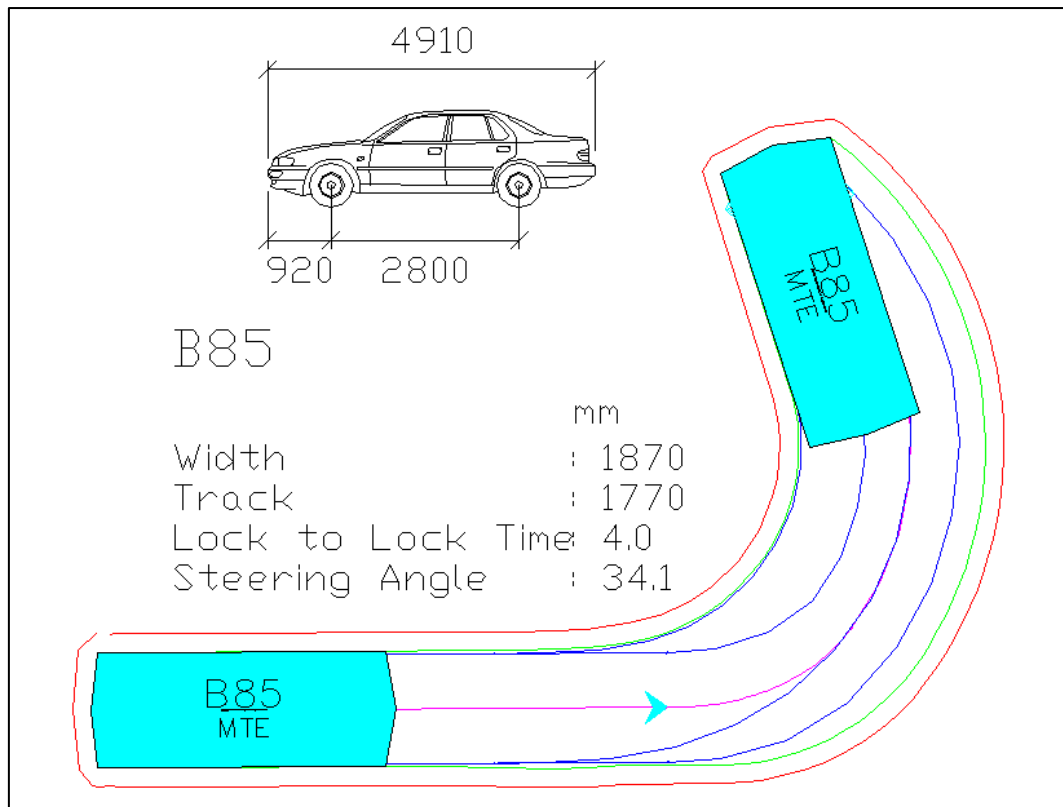
No. of Cycle Recorded	Mod	Phase	Min	Max	Average	Occurences
20		A	12	47	23	100%
		B	12	30	20	100%

Cycle 1	TIME START			TIME END			Phase Duration (s)	Cycle Time (s)			
Phase	HR	MIN	SEC	HR	MIN	SEC					
A	17	0	40	17	1	4	24	44		5:00:40 PM	5:01:04 PM
B	17	1	4	17	1	24	20			5:01:04 PM	5:01:24 PM
A	17	1	24	17	1	48	24	43		5:01:24 PM	5:01:48 PM
B	17	1	48	17	2	7	19			5:01:48 PM	5:02:07 PM
A	17	2	7	17	2	31	24	47		5:02:07 PM	5:02:31 PM
B	17	2	31	17	2	54	23			5:02:31 PM	5:02:54 PM
A	17	2	54	17	3	9	15	31		5:02:54 PM	5:03:09 PM
B	17	3	9	17	3	25	16			5:03:09 PM	5:03:25 PM
A	17	3	25	17	3	47	22	36		5:03:25 PM	5:03:47 PM
B	17	3	47	17	4	1	14			5:03:47 PM	5:04:01 PM
A	17	4	1	17	4	13	12	28		5:04:01 PM	5:04:13 PM
B	17	4	13	17	4	29	16			5:04:13 PM	5:04:29 PM
A	17	4	29	17	4	49	20	36		5:04:29 PM	5:04:49 PM
B	17	4	49	17	5	5	16			5:04:49 PM	5:05:05 PM
A	17	5	5	17	5	22	17	38		5:05:05 PM	5:05:22 PM
B	17	5	22	17	5	43	21			5:05:22 PM	5:05:43 PM
A	17	5	43	17	6	3	20	32		5:05:43 PM	5:06:03 PM
B	17	6	3	17	6	15	12			5:06:03 PM	5:06:15 PM
A	17	6	15	17	7	2	47	65		5:06:15 PM	5:07:02 PM
B	17	7	2	17	7	20	18			5:07:02 PM	5:07:20 PM
A	17	7	20	17	7	35	15	30		5:07:20 PM	5:07:35 PM
B	17	7	35	17	7	50	15			5:07:35 PM	5:07:50 PM
A	17	7	50	17	8	18	28	48		5:07:50 PM	5:08:18 PM
B	17	8	18	17	8	38	20			5:08:18 PM	5:08:38 PM
A	17	8	38	17	8	59	21	51		5:08:38 PM	5:08:59 PM
B	17	8	59	17	9	29	30			5:08:59 PM	5:09:29 PM
A	17	9	29	17	9	50	21	39		5:09:29 PM	5:09:50 PM
B	17	9	50	17	10	8	18			5:09:50 PM	5:10:08 PM
A	17	10	8	17	10	28	20	39		5:10:08 PM	5:10:28 PM
B	17	10	28	17	10	47	19			5:10:28 PM	5:10:47 PM
A	17	10	47	17	11	32	45	68		5:10:47 PM	5:11:32 PM
B	17	11	32	17	11	55	23			5:11:32 PM	5:11:55 PM
A	17	11	55	17	12	24	29	51		5:11:55 PM	5:12:24 PM
B	17	12	24	17	12	46	22			5:12:24 PM	5:12:46 PM
A	17	12	46	17	12	59	13	36		5:12:46 PM	5:12:59 PM
B	17	12	59	17	13	22	23			5:12:59 PM	5:13:22 PM
A	17	13	22	17	13	44	22	43		5:13:22 PM	5:13:44 PM
B	17	13	44	17	14	5	21			5:13:44 PM	5:14:05 PM
A	17	14	5	17	14	34	29	54		5:14:05 PM	5:14:34 PM
B	17	14	34	17	14	59	25			5:14:34 PM	5:14:59 PM

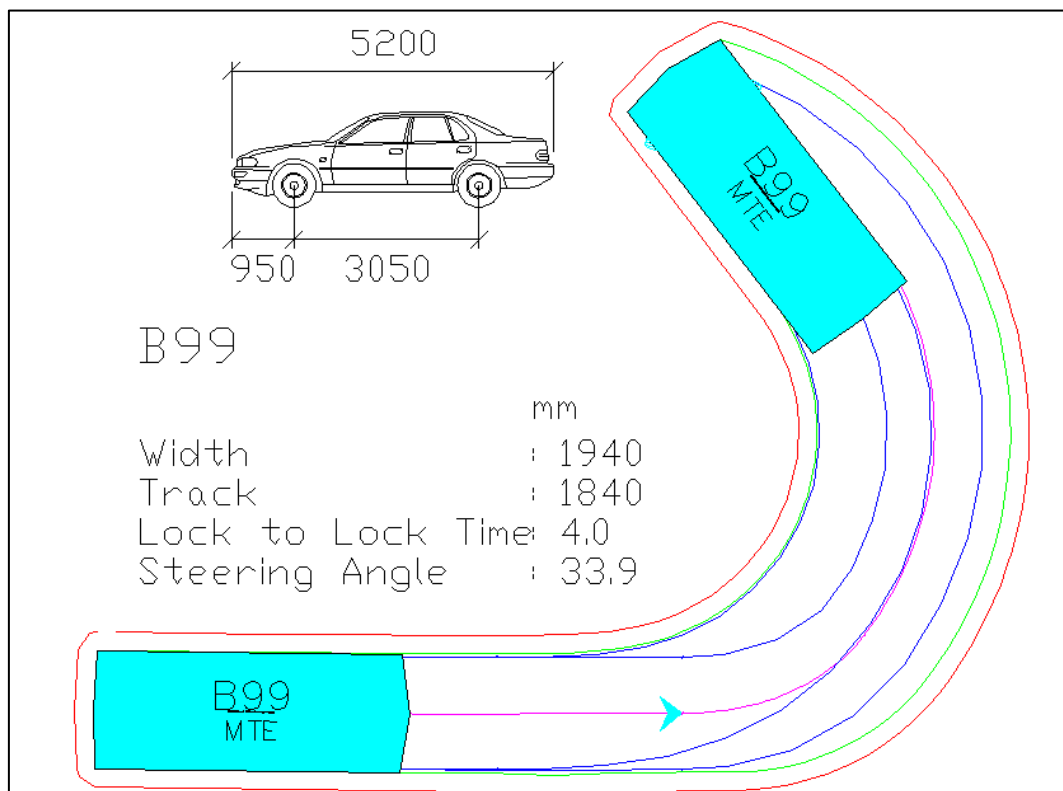
Cycle Time	28	68	43
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**ANNEXURE F: SWEPT PATH TESTING
(8 SHEETS)**



AUSTRALIAN STANDARD 85TH PERCENTILE SIZE VEHICLE (B85)



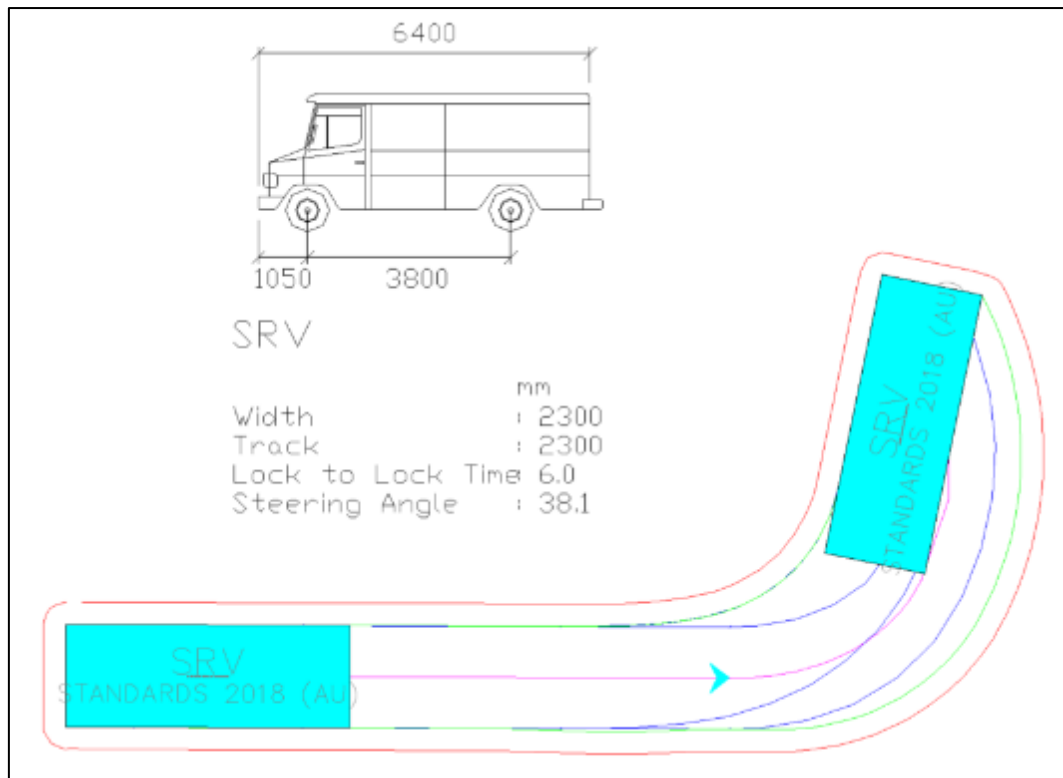
AUSTRALIAN STANDARD 99.8TH PERCENTILE SIZE VEHICLE (B99)

Blue – Tyre Path

Green – Vehicle Body

Red – 300mm Clearance

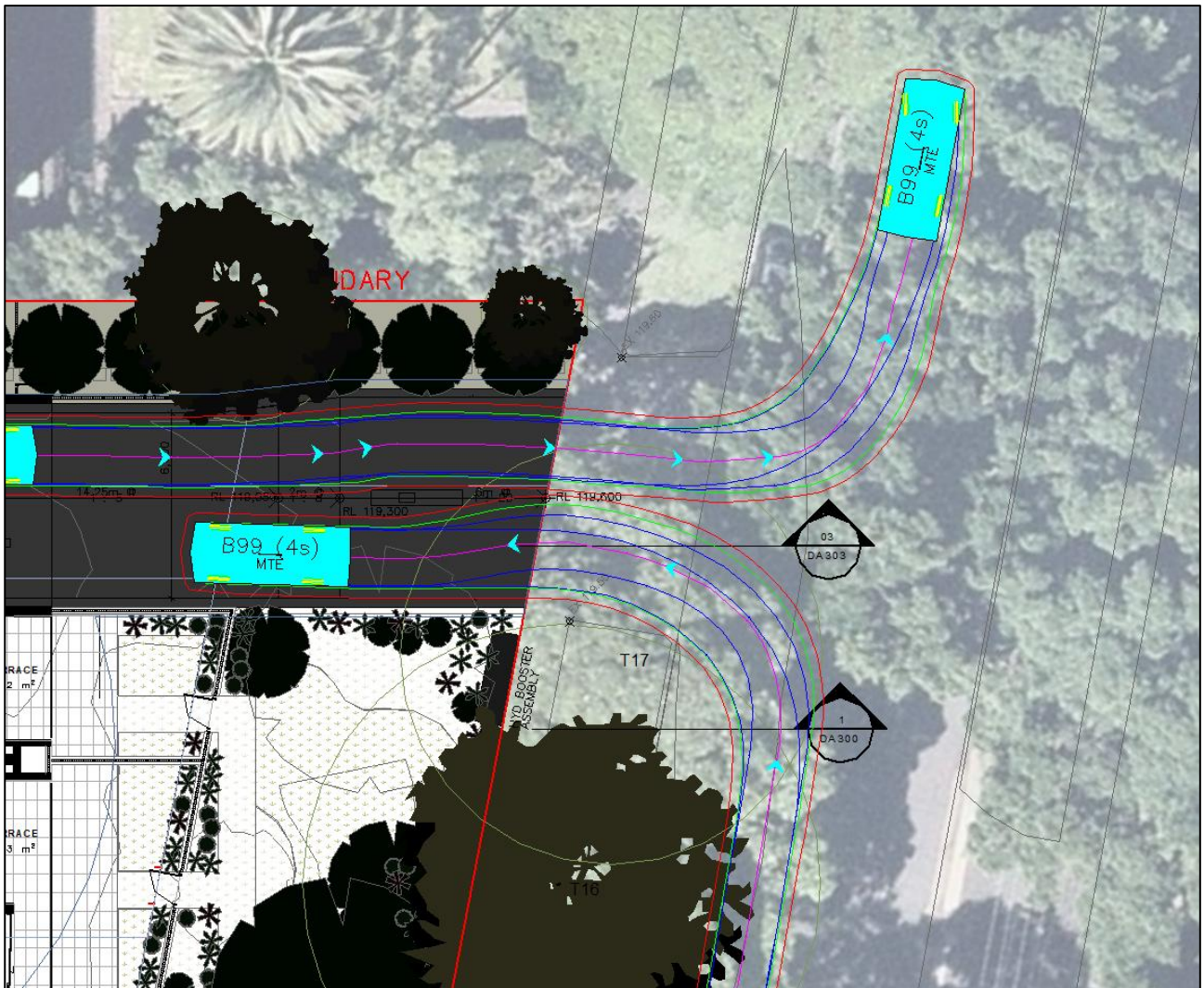
All tests performed at 10km/h on public roads and 5km/h internally.



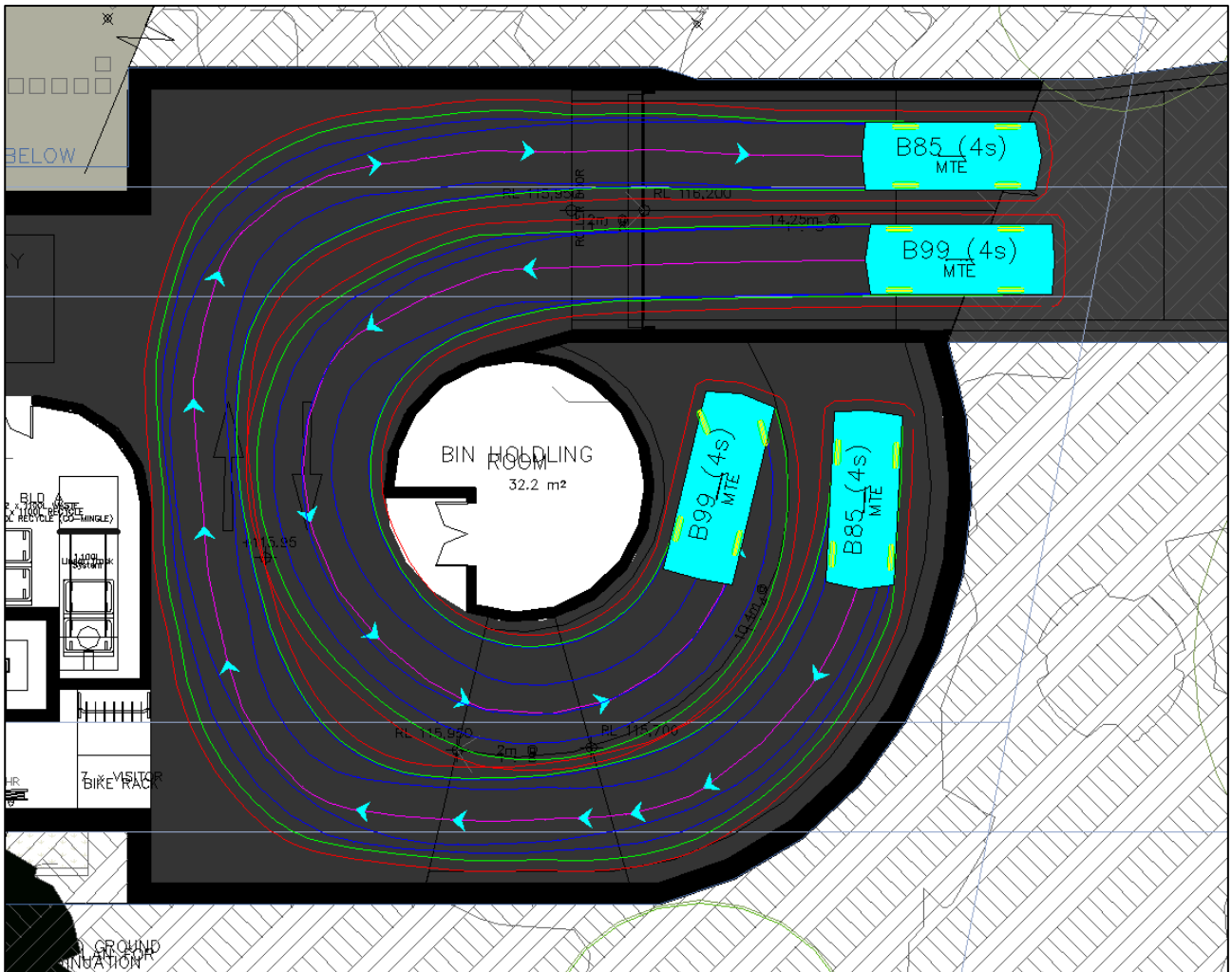
AUSTRALIAN STANDARD SMALL RIGID VEHICLE (SRV)

Blue – Tyre Path
Green – Vehicle Body
Red – 500mm Clearance

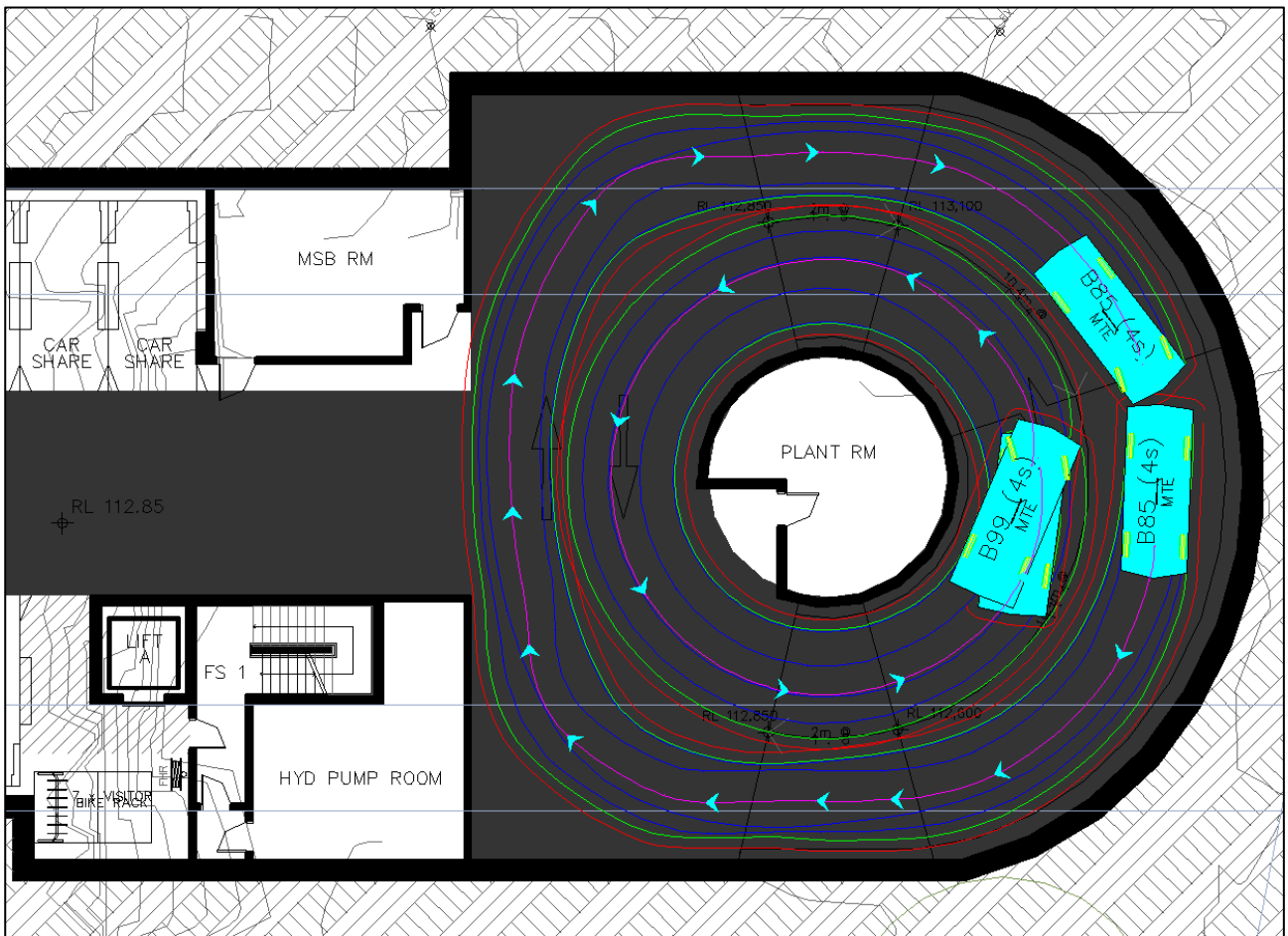
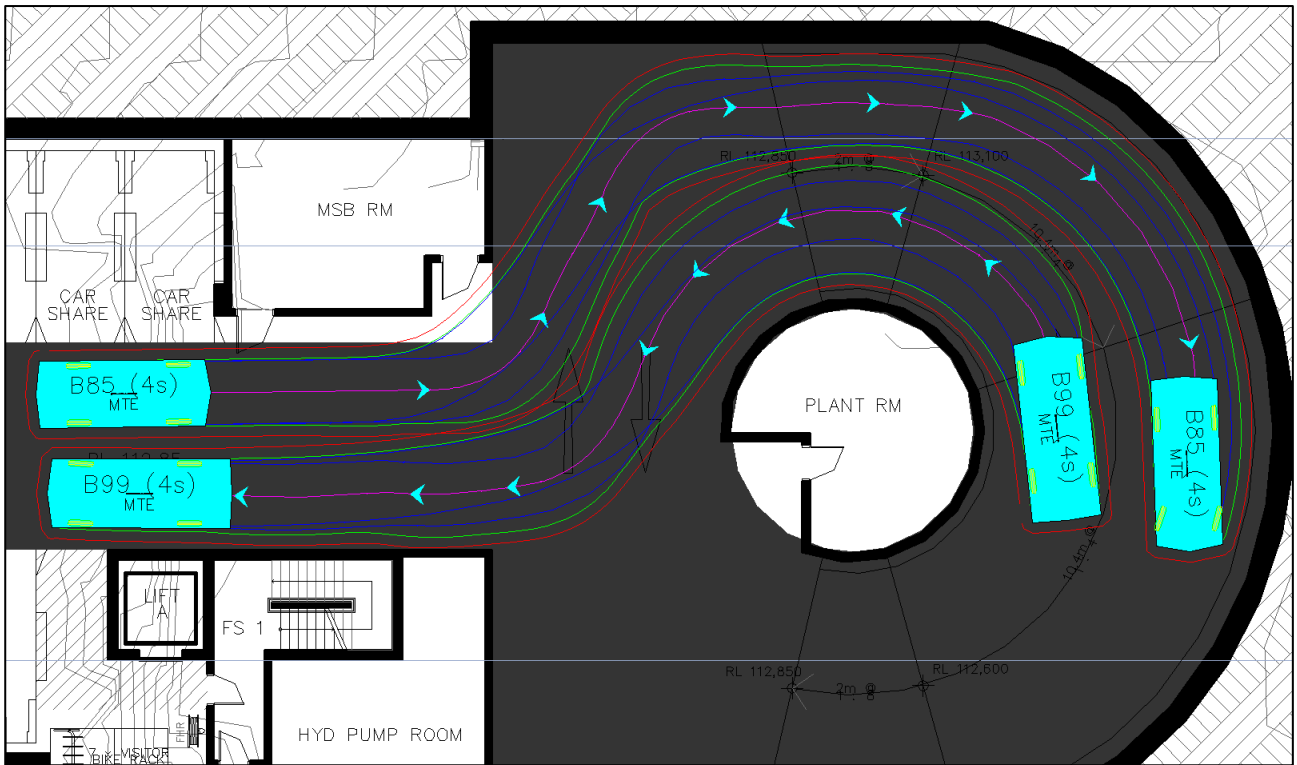
All tests performed at 10km/h on public roads and 5km/h internally.



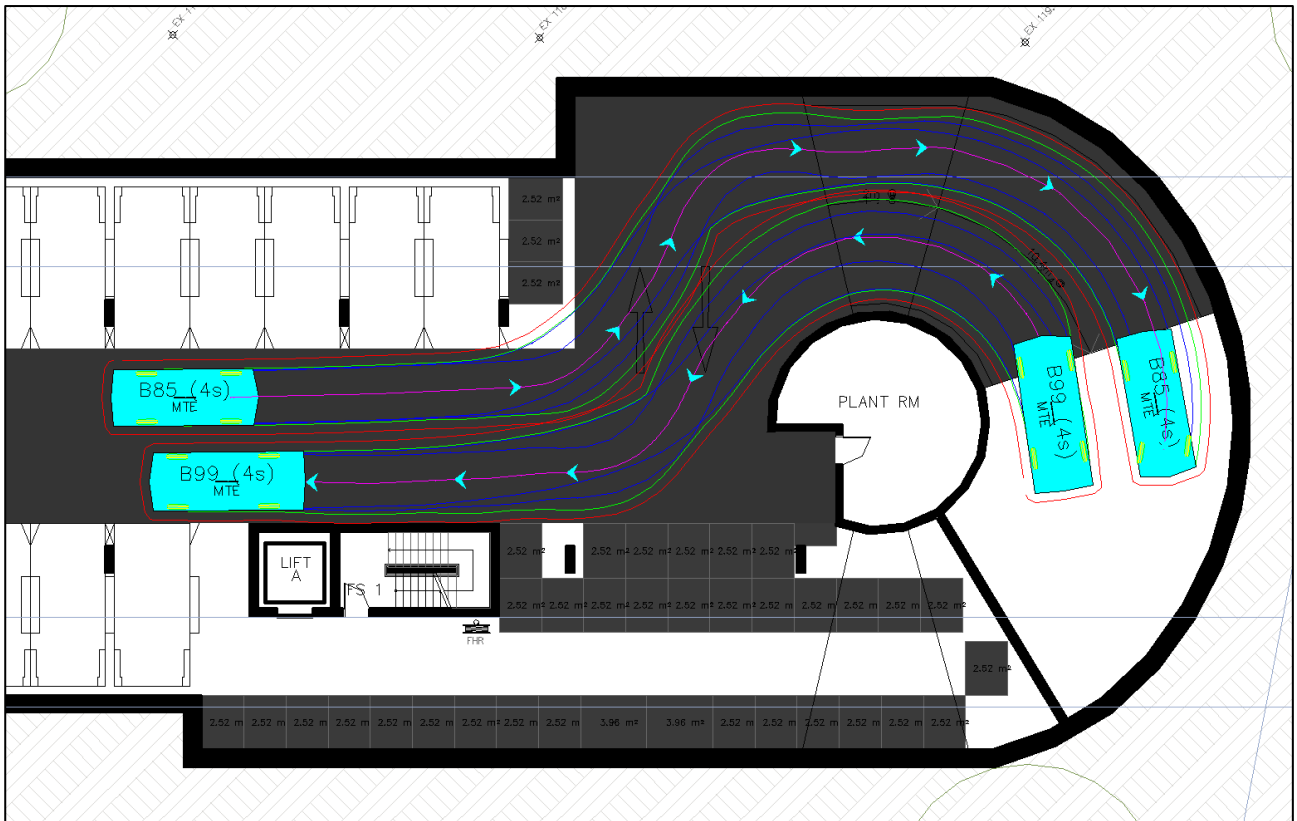
**B99 Entry and Exit at Site Boundary
Successful**



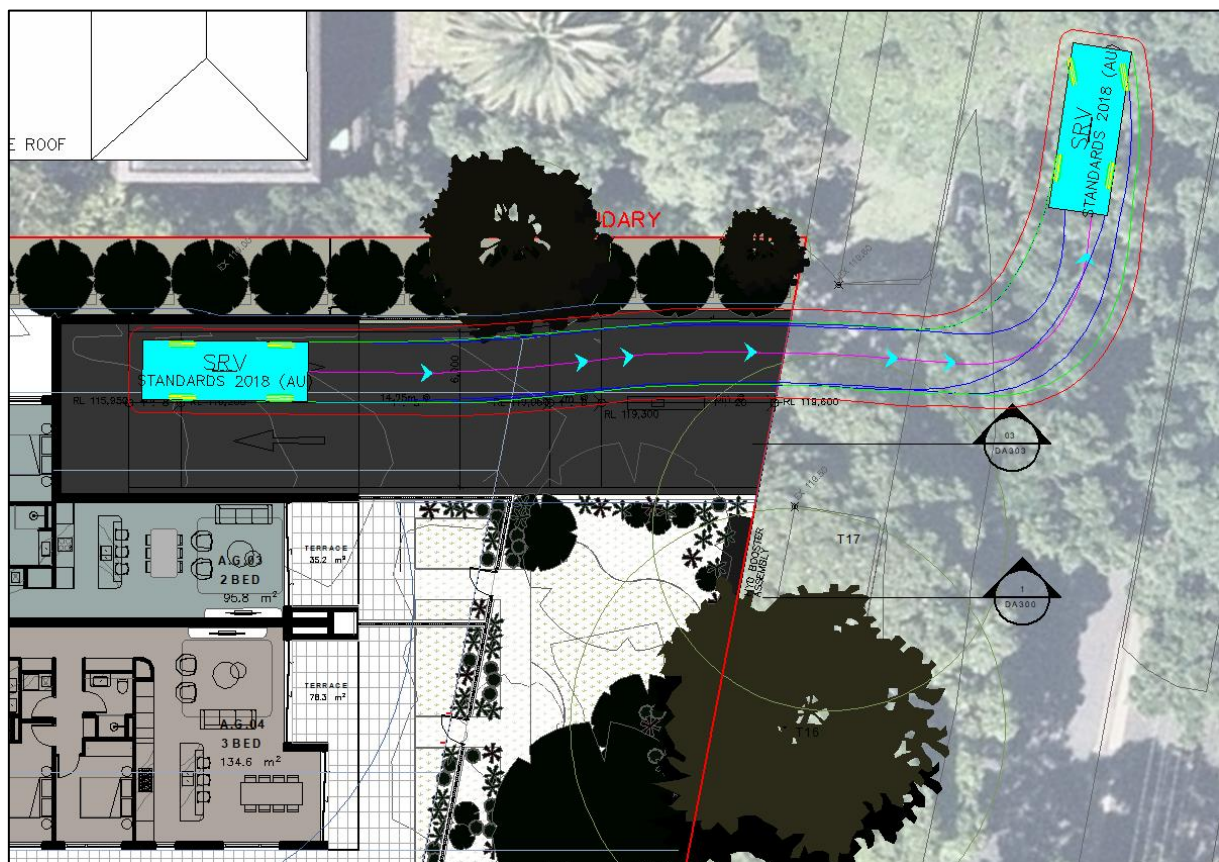
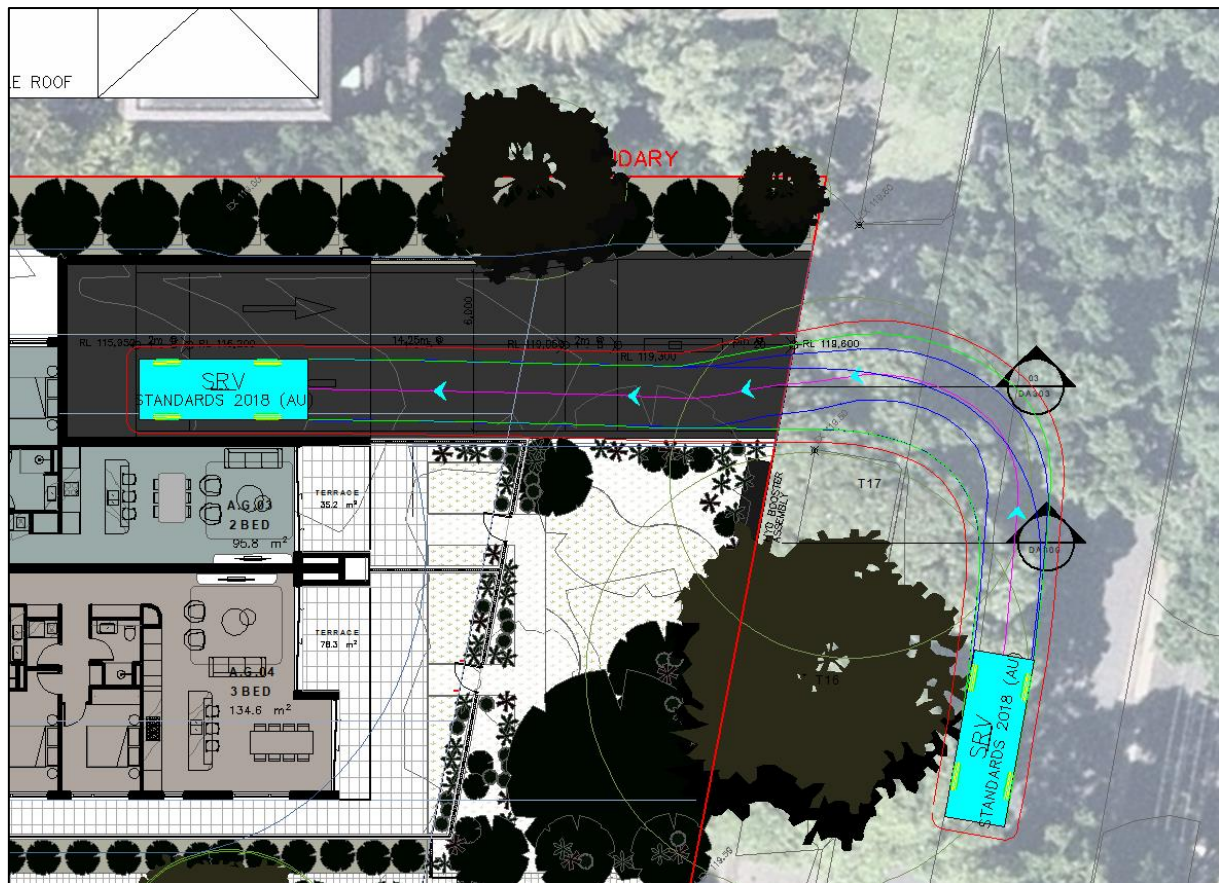
**B99 Passing B85 on Lower Ground 1 ramp
Successful**



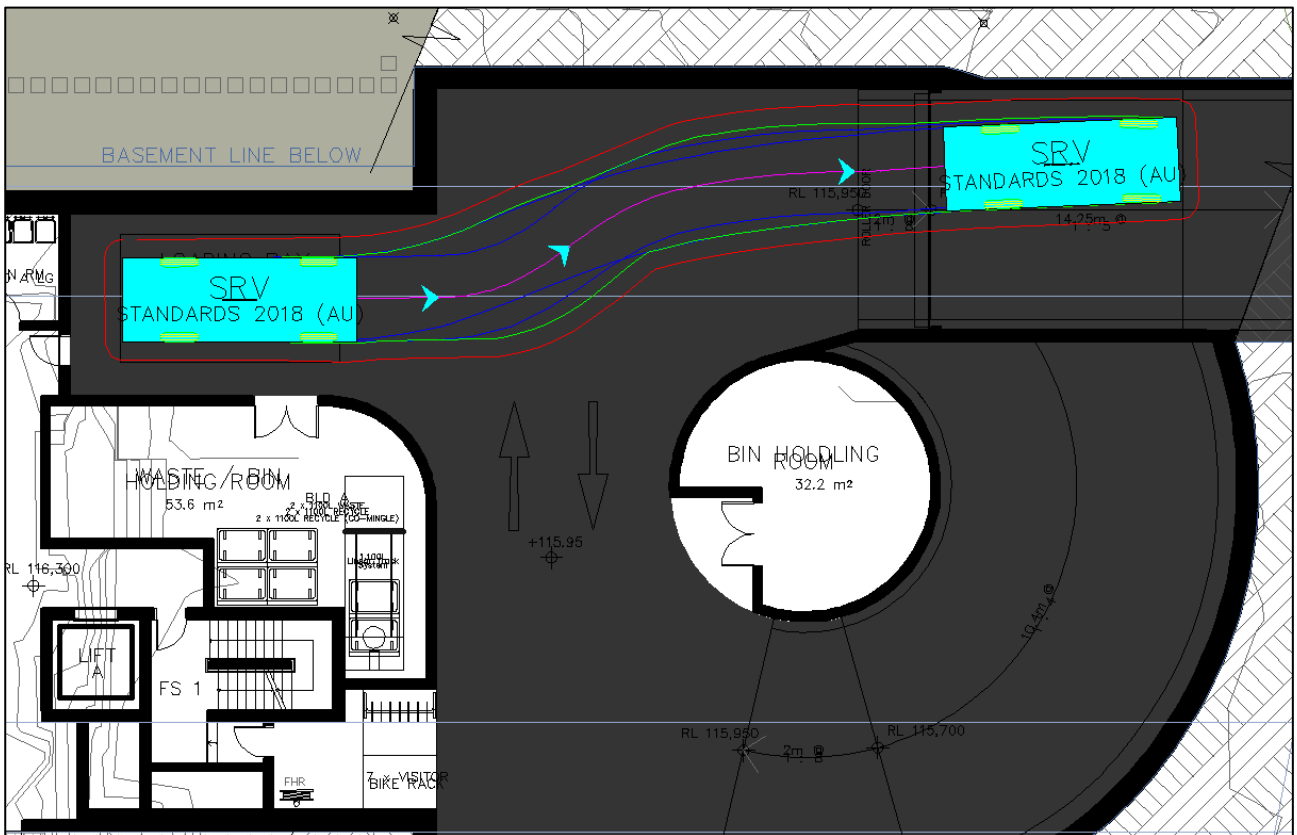
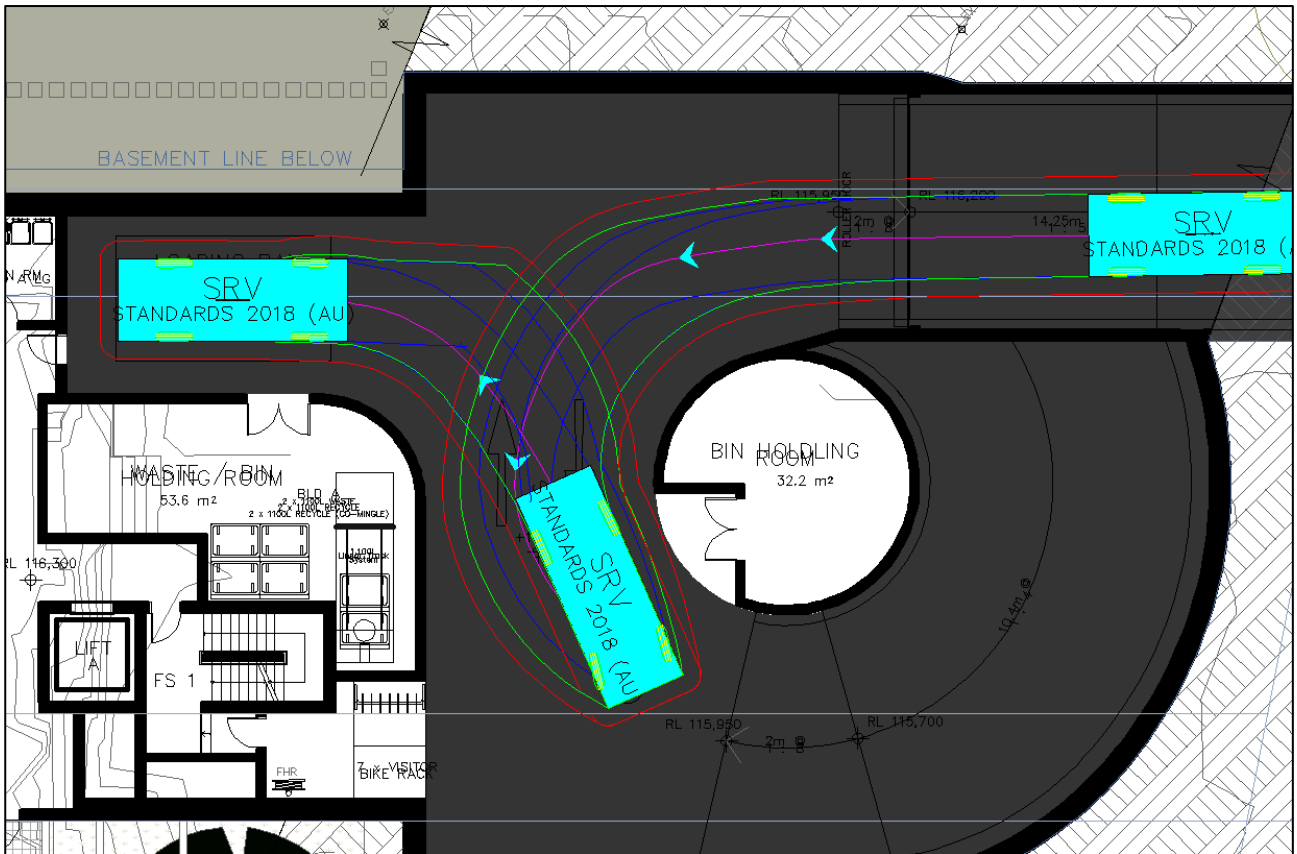
**B99 Passing B85 on Lower Ground 2 ramp
Successful**



**B99 Passing B85 on Basement ramp
Successful**



**SRV Entry and Exit Site Driveway
SUCCESFUL**



**SRV Entry and Exit Loading Bay
SUCCESFUL**