Traffic Impact Assessment

Development Application for Manly Civic Club
2 West Promenade, Manly

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Contents

1. Introduction

TRAFFIX has been commissioned by Eastview Australia Pty Ltd to undertake a traffic impact assessment to accompany the Development Application for Manly Civic Club, located at 2 West Promenade, Manly. The application seeks approval to demolish the existing buildings to allow the construction of a new club with a number of facilities including a sports lounge, gaming lounge, bar area and a bistro, as well as the construction of a five (5) storey residential building with two (2) levels of basement parking. The development is located within the Manly Local Government Area, and the proposal has been developed with due consideration of Council's planning controls.

This report documents the findings of our investigations and should be read in the context of the Planning Report provided separately.

The report is structured as follows:

- Section 2: Describes the site and its location
- Section 3: Documents existing traffic conditions
- Section 4: Describes the proposed development
- Section 5: Assesses the parking requirements
- Section 6: Assesses traffic impact
- Section 7: Discusses access and internal design aspects
- Section 8: Presents the overall study conclusions.

2. Location and Site

The Manly Civic Club is located on the western side of West Promenade approximately 50 metres to the west of Belgrave Street, Manly and is known as 2 West Promenade. Manly Oval lies to the north of the site and Manly Wharf and bus terminals lie to the south and east across West Esplanade. The Corso lies approximately 100 metres east of the site connecting Manly beach in the east to Manly Wharf in the south. The Corso provides mostly pedestrian access to retail outlets and restaurants along its length.

The subject site currently accommodates an unused club building and a garage. It is legally described as Lot 1 on DP 859455.

The site has a frontage of about 44 metres to Gilbert Street along its southern boundary, a frontage of about 33 metres to West Promenade along its eastern boundary, a frontage of about 25 metres to Eustace Street along its western boundary, and residential properties adjoin the northern site boundary of about 49 metres northern site boundary. Gilbert Park is located opposite the site on the other side of West Promenade.

A location plan is presented in **Figure 1**, and the subject site is shown in **Figure 2**. Reference should also be made to the Photographic Record provided in **Appendix A,** which provides an appreciation of the road environment in the immediate locality.

Figure 1: Location Plan

Figure 2: Site Plan

3. Existing Traffic Conditions

3.1 Road Network

The broader road hierarchy surrounding the site is shown in **Figure 3**, with the following roads in proximity to the site being of particular interest:

- West Promenade: a local one-way street that runs in a north-south direction between Sydney Road in the north and Gilbert Street in the south. West Promenade is a 50km/hr road, with kerbside parking generally permitted on both sides.
- Sydney Road: a classified main road (MR 159) that generally runs in an east-west direction from Manly Road in the west to Belgrave Street in the east. It carries in the order of 16,500 vehicles per day (vpd) in the vicinity of the site.
- Gilbert Street: a local road that runs in an east-west direction between Belgrave Street in the east and ending in a cul-de-sac in the west. It provides vehicular access to the site car park.
- Eustace Street: a local road that runs in a north-south direction servicing local residential traffic and providing vehicular access to the site. It links Sydney Road in the north with West Esplanade in the south;
- West Esplanade: a local collector road (MR 2025) that runs in an east-west direction between Belgrave Road in the east and Sydney Road in the west. West Esplanade adopts other street names along its route between Belgrave Road and Sydney Road;

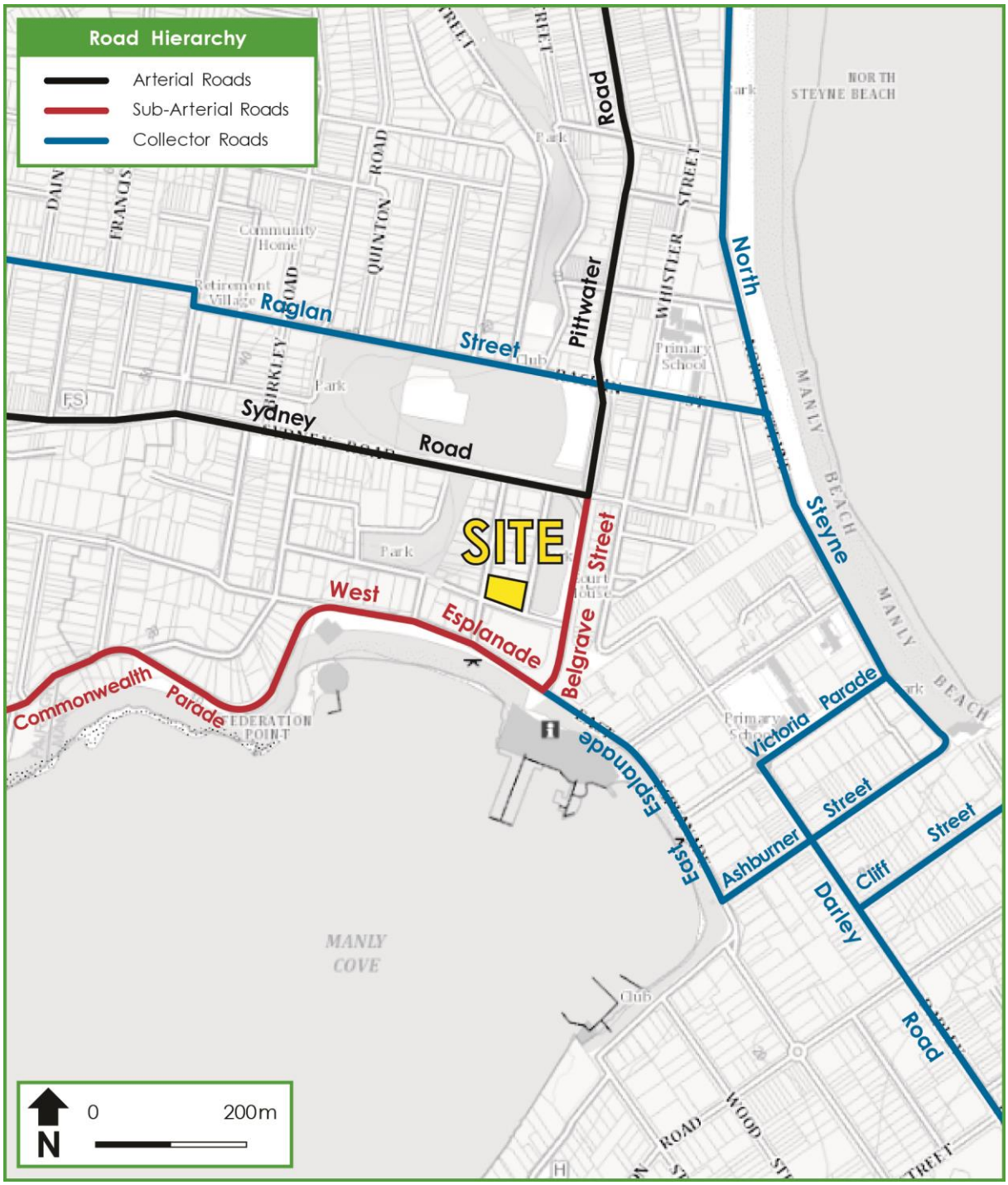


Figure 3: Road Hierarchy

3.2 Public Transport

The subject site is approximately a 300 metres from Manly Wharf, which is situated to the south-east of the site. There are no rail services in the locality.

Current transport planning guidelines state that a development is advantageously located to benefit from bus services if it is within 400 metres walking distance of a bus stop. The bus stops on the local road network within 400 metres of the site are presented in **Figure 4**, which provide access to the following bus services:

- Route 131 North Balgowlah-Manly Loop
- Route 132 Manly to Warringah Mall
- Route 171 Manly to City
- Route 135 Warringah Mall to North Head
- Route 136 Manly to Chatswood
- Route 139 Manly to Warringah Mall
- Route E36 PrePay- Manly- Pitt and Playfair
- Route 140 Manly- Wharf to Epping station
- Route 143 Chatswood to Manly
- Route E41 PrePay- Manly- North Balgowlah
- Route E50 Milsons Point to Manly
- Route E70 PrePay- City to Manly
- Route 142 Manly to skyline shops
- Route 144 Chatswood/RNSH to Manly
- Route 155 Manly to Bayview Village
- Route 156 Manly to McCarrs Creek

- Route 158 Manly to Collaroy Plateau
- Route 159 Manly to Dee why
- Route 159 City to Manly
- Route E69 City to Manly (Express)

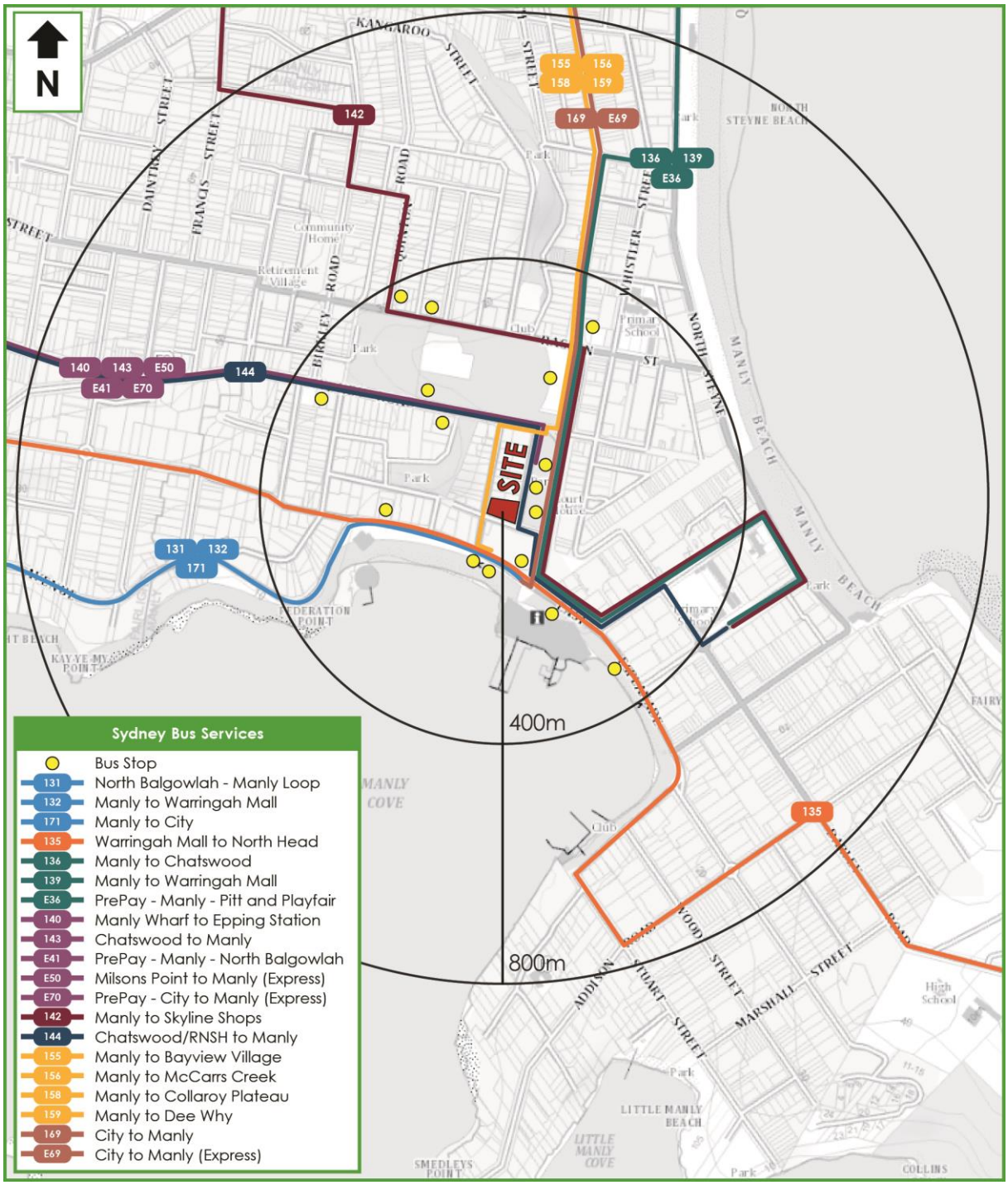


Figure 4: Public Transport

4. Proposed Development

4.1 Development Overview

A detailed description of the proposed development is provided in the Planning Report provided separately. In summary, the proposal seeks consent for the following:

- Demolition of all structures within the site
- Construction of a Club with 764m² GFA
- Construction of a five (5) storey residential apartment building with the following unit schedule
    - seven (7) x one (1) bedroom units
    - 23 x two (2) bedroom units
    - 8 x three (3) bedrooms units
- Construction of two (2) levels of basement car parking consisting of 46 residential parking spaces and 25 club parking spaces.
- Access to the basement level car park from Eustace Street
- Access to a loading dock will be via Gilbert Street which can accommodate an SRV; and
- Provision of a pedestrian entrance to the club located on the West Promenade

The parking and traffic impact arising from the development are discussed in **Section 5** and **Section 6** respectively. Reference should be made to the concept plans which are presented at reduced scale in **Appendix B**.

5. Parking Requirements

5.1 Council Controls

Schedule 3 – Part A1 of Manly Development Control Plan 2013 requires the rate of one parking space for every 40m^2 of gross floor area for commercial premises including Pubs and supermarkets, restaurant or Cafes and Take Away Food and Drink Premises. Parking for the proposed development has been assessed having regard for the requirements of Manly Development Control Plan 2013.

The parking requirements for the whole development under Council's DCP are presented in **Table 1** below.

Table 1: Council Car Parking Requirements

Type	Number / Area	Council Parking Rates	Spaces Required	Spaces Provided (daytime)	Spaces Provided (night)
1 bed	7	0.6 space / one bedroom dwelling	5	5	5
2 bed	23	1 spaces / two bedroom dwelling	23	25	25
3 bed	8	2 spaces / three bedroom dwelling	16	16	16
Visitor	38	0.16 space / dwelling	7	5	25
club/pub	764m^2	1 space /40sqm GFL	20	20	
		Total	71	71	71

As outlined above, Council's DCP requires a minimum of 71 parking spaces made up of 44 residential parking spaces, seven (7) visitor parking spaces and 20 club parking spaces. In response, the development proposes to provide a total of 71 parking spaces including 46 residential parking spaces, five (5) visitor parking spaces and 20 club parking spaces. The residential and club components are

compliant with Council's DCP, with the residential spaces providing a superior number of spaces by two (2) spaces. However, there is a minor deficiency of two (2) parking spaces for the residential visitors.

The development will be subject to a stratum subdivision. The club will own the ground floor and basement level 1, and the residential tower and basement level 2 will be owned and managed separately. For this reason, the basement car park levels will be subject to an operational management plan as the residents are required to cross land owned by the club to access basement level 2.

Club members will access basement level 1 by using a ticket dispensing system located at the ground level entrance driveway to be allowed into the car park to occupy parking spaces. There will be a sign telling club patrons the amount of parking spaces available on basement level 1. Parking tickets will be validated at reception, thereby giving the club control over usage of the Club's car parking space. The club will generally operate between the hours of 10.30am to 11.30pm, and parking on basement level 1 will be for club patrons and residential visitors. Residents will access basement level 2 by using a remote control to activate the roller shutter to gain access to basement level 2.

Residential visitors will not have direct access to the parking spaces. This is so the club can ensure that residents cannot control who accesses the basement car parking levels as to protect their parking spaces on basement level 1. Residents will therefore need to prior arrange to meet their guests, and accompany them down to basement level 1 to use the visitor parking spaces.

Basement level 1 provides a total of five (5) visitor parking spaces. Although this represents a minor deficiency of two (2) parking spaces, this level of visitor parking provision is deemed acceptable for the following reasons:

- The club parking will only be reserved for its exclusive use during operational hours, which will be from 10.30am – 11.30pm daily. Outside of these hours, the 25 parking spaces on basement level 1 will be available for residential visitor parking, thereby providing a far superior visitor parking provision within the development outside of these hours.

- Due to the strict operational management plan requiring residents to prior book their guest's parking spaces, it will therefore be easier to manage the on-site parking provision for visitors. Furthermore, residents can make alternative arrangements for their guests by utilising neighbouring vacant parking spaces (with the relevant permission) if required.

- The site is centrally located within the Manly Town Centre, and therefore has excellent access to public transport facilities. The subject site is located approximately a 300 metres from Manly

Wharf and numerous bus services operate in the vicinity of the site. In addition, a taxi rank is seen in Belgrave Street to the south-east of the site. Therefore, suitable public transport options are always available for residential visitors. A restriction on the number of available on-site visitor spaces is considered to actively discourage parking in circumstances where there is excellent public transport availability.

In summary, while the proposed development does not provide the required number of residential / visitor parking spaces, the proposed parking provision is considered acceptable for the reasons outlined above.

5.2 Parking for People with Disabilities

On-site car parking for People with Disabilities (PWD) should be provided in accordance with the requirements of the *Disability (Access to Premises — Buildings) Standards 2010,* and designed in accordance with the requirements of AS2890.6. These spaces should be located within close proximity to lifts, for ease of access. The Disability standards require one (1) parking space to be provided for every adaptable residential unit provided within the development, and a further one (1) parking space for every 100 parking spaces provided on the site. The development is proposing four (4) adaptable apartments within the residential apartment building.

In response to this, the development provides four (4) adaptable parking spaces for the four (4) adaptable apartments within the residential apartment building. One (1) adaptable parking space has been provided within basement level 1 for use by club patrons. Therefore, the disabled parking provision is compliant with the Disability Standards and Council's DCP.

5.3 Bicycle Parking

Council's DCP requires bicycle parking facilities to be provided at a minimum rate of 1 space per 3 car parking spaces with a minimum provision of one stand for each premise. The bicycle parking requirement for the whole development under Council's DCP is outlined in **Table 2** below.

Table 2: Council bicycle Parking Requirements

Type	Number / Area	Council Bicycle Parking Rates	Spaces Required	Spaces Provided
Visitor	71	1 stand / 3 car parking space with a minimum provision of one stand for each premise	24	25
Total			24	25

In response, the development proposes to provide 25 bicycle parking spaces, consisting of five (5) spaces at street level, 18 bicycle parking spaces in basement level 1 and two (2) spaces in basement level 2. Therefore, the bicycle parking provision is compliant with Council's DCP providing a superior number of spaces by one (1) space.

5.4 Servicing

As shown in the reduced plans presented in **Appendix B**, a consolidated servicing area is proposed on the ground level, next to the club. This servicing area is of adequate size to accommodate a SRV. A height clearance of 3.4m would be required to accommodate service vehicles according to Manly DCP section 4.2.4.3.

All servicing and garbage collection activities will take place via the ground level loading dock, and will be restricted to vehicles with the maximum dimensions of an SRV. This will adequately allow vehicles to service the site. However, service vehicles should reverse into the loading dock to ensure that they exit the site in a forward direction. In the event that this manoeuvre encroaches into the on-coming lane this is acceptable as it is an infrequent event and is permitted under AS 2890.2.

6. Traffic Impact

6.1 Trip Generation

The traffic generation rate stipulated in the RMS Guide to Traffic Generating Technical Direction TDT 2013/04a for the residential component of the development is 0.19 and 0.15 vehicles per hour per dwelling during the AM and PM Peak hour respectively.

Application of this rate to the 38 units results in a peak hour generation of seven (7) vehicle trips per hour in the AM peak hour and six (6) vehicle trips per hour in the PM peak hour. Assuming an 80% / 20% arrival / departure split provides the following forecast traffic volumes for the residential component of the development:

- 1 arrival and 6 departures during the AM peak
- 5 arrivals and 1 departure during the PM peak

The RMS Guide to Traffic Generating Development also provides a PM peak period traffic generation rate of 10 veh/hr/100 m^2 licenced floor area. Application of this rate to the licenced floor area of 460sqm results in a peak hour generation of 46 vehicle trips per hour in the PM peak period. Assuming an 80% / 20% arrival / departure split provides the following forecast traffic volumes for the club:

- 37 arrivals and 9 departures during the PM peak

6.1.1 Total Traffic Generation (Residential and Non-Residential Traffic)

The overall traffic generation for the full development has been assessed and presented in **Table 3** below:

Table 3: Trip Generation based on DCP

Land Use	No. / Area	Traffic Generation Rate		Traffic Generation	Traffic Generation	
					IN	OUT
Residential	38	AM	0.19 veh/hr/unit	7	1	6
		PM	0.15 veh/hr/unit	6	5	1
Club	460	AM	—			
		PM	10 veh/hr/100 m^2 licenced floor area	46	37	9
TOTAL AM PEAK				7	1	6
TOTAL PM PEAK				52	42	10

As can be seen from **Table 3,** the overall traffic generation is seven (7) vehicle trips per hour in the AM peak period, and 52 vehicle trips per hour in the PM peak period. This represents one (1) vehicle trip approximately every nine (9) minutes in the AM peak, and one (1) vehicle trip approximately every 69 seconds. This represents a moderate increase in traffic generation, and will be distributed onto the external road network making use of all possible access routes, with minimal impact on the performance of the external road network.

7. Access & Internal Design Aspects

7.1 Access

The proposed development requires a Category 2 Driveway under AS2890.1, being a combined entry-exit driveway of width 6.0 to 9.0 metres. In response, the development proposes a combined entry / exit driveway of width 6.7 metres. These arrangements, therefore, exceed the requirements of AS 2890.1 (2004). Swept path analysis has also been undertaken of the proposed site access entry / exit manoeuvres, which demonstrates satisfactory in operation. These swept paths are included in **Appendix C** for reference.

Swept path analysis has been undertaken of the site access, as is permissible under AS 2890.1 (2004), demonstrating satisfactory operation and this is included in **Appendix C**. The design complies with the requirements of AS 2890.1 (2004) and will ensure satisfactory operation.

7.2 Traffic Signals

The development generally proposes two-way flow internally, however traffic controls are proposed at the ramps to help diminish conflict of opposing vehicle movements. The signals will operate with a 'green' signal in passive mode, so that all arriving vehicles will be able to enter unimpeded to reduce the likelihood of queuing. The only time when an entering vehicle may be delayed is if a vehicle has activated the signals internally to exit the site. Vehicles internally should be held within their parking spaces until a green signal is shown, and operate an exit button or remote system to activate the green signal internally. Alternatively, stop lines have been provided with traffic signals to allow for vehicles already circulating to give way to oncoming vehicles.

In these circumstances, AS2890.1 requires that the storage area shall be designed to accommodate the 98th percentile queue. Accordingly, the operation has been assessed based on queuing theory and this analysis is provided in **Appendix D.** The queuing theory analysis demonstrates that the access driveway requires one (1) waiting bay for entering vehicles during the more critical PM peak period. This is provided and this requirement is satisfied. This arrangement also provides improved opportunities for landscaping and will create a slow speed environment at the access driveway.

Notwithstanding this analysis, the signal operations system will be documented at construction stage in response to a suitable condition of consent.

7.3 Internal Design

The basement level 1 and level 2 car parking generally complies with the requirements of AS 2890.1 (2004) and AS 2890.6 (2009) and the following characteristics are noteworthy:

7.3.1 Parking Modules

- All residential parking spaces have been designed in accordance with a Class 1A user and are provided with a minimum space length of 5.4m a minimum width of 2.4m and a minimum aisle width of 5.8m.
- All club/visitor parking spaces have been designed in accordance with a Class 2 user and are provided with a minimum space length of 5.4m a minimum width of 2.5m and a minimum aisle width of 5.8m.
- All small visitor/club parking spaces are to be provided with a minimum space length of 5.0m, a minimum width of 2.3m and a minimum aisle width of 5.8m. However, two (2) visitor parking spaces have been designed with a minimum space length of 5.0m, a minimum aisle width of 5.1m with a wider width of 3.6m and 2.5m. An aisle width reduction from 5.8 metres to 5.1 metres is considered to be acceptable due to the provision of a wider width.
- All disabled parking spaces are designed in accordance with AS 2890.6 (2009). Spaces are provided with a clear width of 2.4m and located adjacent to a minimum shared area of 2.4m.
- All spaces located adjacent to obstructions of greater than 150mm in height are to be provided with an additional width of 300mm.
- Dead-end aisles are to be provided with the required 1.0m aisle extension in accordance with Figure 2.3 of AS2890.1 (2004).
- Bicycle parking spaces are provided with a minimum width of 500mm, a minimum length of 1800mm and a minimum aisle width of 1500mm.

7.3.2 Ramps

- All ramps within the car park have a maximum grade of 1 in 5 (20%) which is acceptable for a private car park, where ramps are less than 20 metres in length. Ramp transitions at 1:8 (12.5%) are proposed at the top and bottom of all ramps, which complies with the requirements of AS2890.1.

7.3.3 Clear Head heights

- A minimum clear head height of 2.2m is provided for all areas within the basement car park as required by AS 2890.1 (2004),

- An additional head height of 2.5m to be provided above all disabled spaces / shared areas in accordance with AS 2890.6 (2009).

7.3.4 Service Area Design

- The internal design of the service area has been undertaken in accordance with the requirements of AS2890.2 for the maximum length vehicle permissible on-site being an SRV.

- A clear head height of 3.5m is provided within the service area

- A bay width of 3.5m and bay length of 9m is provided within the service area.

- A swept path analysis has been undertaken as permissible under AS2890.1 and confirms the internal design. The swept path assessment is included in **Appendix C**.

7.3.5 Other Considerations

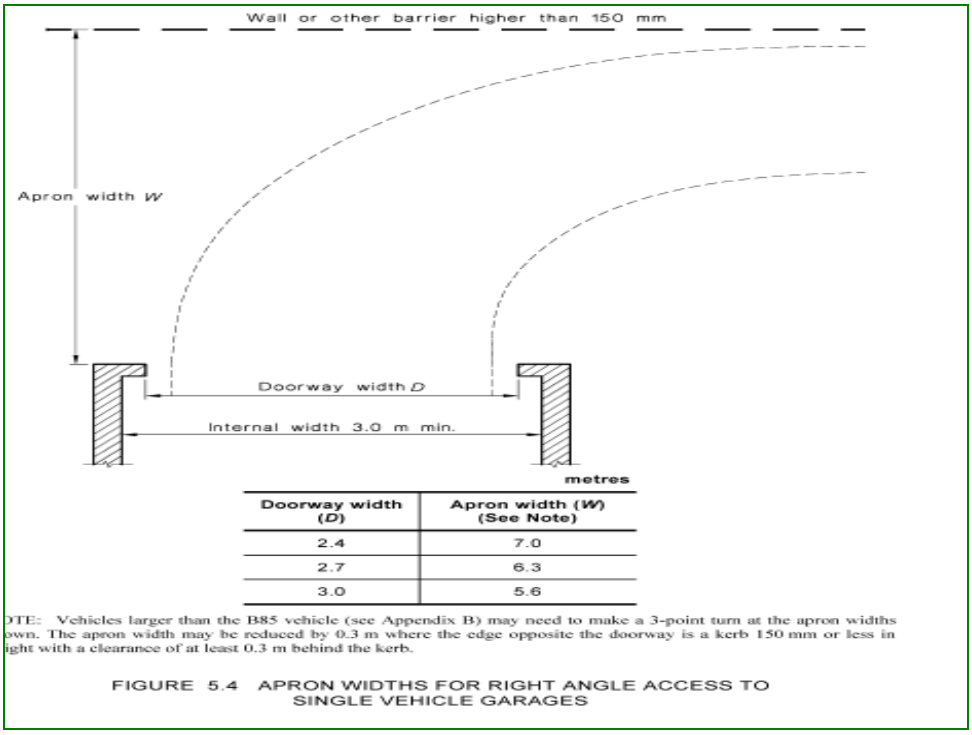
- All columns are located outside of the parking space design envelope shown in Figure 5.2 of AS 2890.1 (2004).

- Appropriate visual splays in accordance with Figure 3.3 of AS 2890.1 (2004) are provided and are proposed by the development, due to site constraints. Convex mirrors, speed humps and flashing lights are to be provided at the access driveway as a means of improving pedestrian safety. This arrangement is superior to existing conditions and is therefore considered acceptable.

- A swept path analysis of all critical movements has been undertaken to confirm geometry and compliance with the relevant standards. The swept path assessment is included in **Appendix C**.

7.3.6 Car Stackers

The proposed car stackers accommodate a total of 18 parking spaces in basement level 2. In terms of compliance with AS 2890.1 (2004), a standard car park space would technically require a minimum 2.4m parking space width and 300mm clearance to any obstruction greater than 150mm in height, so the internal dimensions of the stacker will need to be 2.7m if it is enclosed. If the stacker is not enclosed, the 300mm clearance may be shared between the stacker spaces. Access to the car stackers has also been reviewed in accordance with AS 2890.1. It is noted that AS 2890.1 (2004) does not specifically provide design guidance for stackers, although it is considered reasonable to adopt the same principles for accessing a car garage. In this regard, reference should be made to **Figure 5** below, which is an extract from AS 2890.1 regarding appropriate aisle widths for access into a single space with boundaries on both sides. Application of this requirement with a single space width of 2.4m would require a 7m aisle. The site provides a 6.1m aisle in front of the stackers, which would nominally require a space width of between 2.7m and 3m. However, it will be the responsibility of the company that is providing the stackers to certify the spatial requirements for the installations (including all associated machinery) so that the required number of parking spaces can be achieved.



metres

Doorway width (*D*)	Apron width (*W*) (See Note)
2.4	7.0
2.7	6.3
3.0	5.6

OTE: Vehicles larger than the B85 vehicle (see Appendix B) may need to make a 3-point turn at the apron widths own. The apron width may be reduced by 0.3 m where the edge opposite the doorway is a kerb 150 mm or less in ight with a clearance of at least 0.3 m behind the kerb.

FIGURE 5.4 APRON WIDTHS FOR RIGHT ANGLE ACCESS TO SINGLE VEHICLE GARAGES

Figure 5: Apron Widths for Access to Single Vehicle Garages.

In summary, the internal configuration of the basement level car parking has been designed in accordance with AS 2890.1 (2004), as 2890.2 (2002), AS 2890.3 (2015) and AS 2890.6 (2009). It is however envisaged that a condition of consent would be imposed requiring compliance with these standards and as such any minor amendments considered necessary (if any) can be dealt with prior to the release of a Construction Certificate.

8. Conclusions

In summary:

- Specifically, the development provides 71 off-street parking including 46 residential parking spaces, five (5) residential/visitor spaces and 20 club spaces. Whilst the proposed development does not provide the required number of residential/visitor parking spaces, the proposed parking provision is considered acceptable for the reasons discussed in the above report.

- The proposed 38 residential units and a club are expected to generate a combined total of 52 veh/hr during PM peak periods. This represents a moderate increase in traffic generation, and will be distributed onto the external road network making use of all possible access routes, with minimal impact on the performance of the external road network.

- The driveway complies with AS2890.1 with access onto Eustace Street, being a combined entry / exit driveway of width 6.70 metres. The use of signals internally is the optimal planning outcome and also complies with AS2890.1, based on the queuing analysis undertaken.

- The internal design arrangements comply with the requirements of AS 2890.1 (2004) and will operate safely and efficiently. The car park has also been assessed using the computer program Auto Track, as permitted by AS 2890.1 (2004), which demonstrates satisfactory operation.

It is therefore concluded that the proposed development is supportable on traffic planning grounds and will operate satisfactorily, with the likelihood of improved safety and amenity for residents in the locality.

APPENDIX A

Photographic Record

View looking west to the subject site along Gilbert Street

View looking west along Gilbert Street

View looking along West Promenade Street at the subject site

View looking east along Gilbert Street at the subject site

View looking North along Eustace Street

View looking South along Eustace Street

View looking south along west Promenade Street

View looking across West Promenade Street to the subject site

APPENDIX B

Reduced Plans

REVISIONS

R	DATE	DESCRIPTION

ARCHITECT

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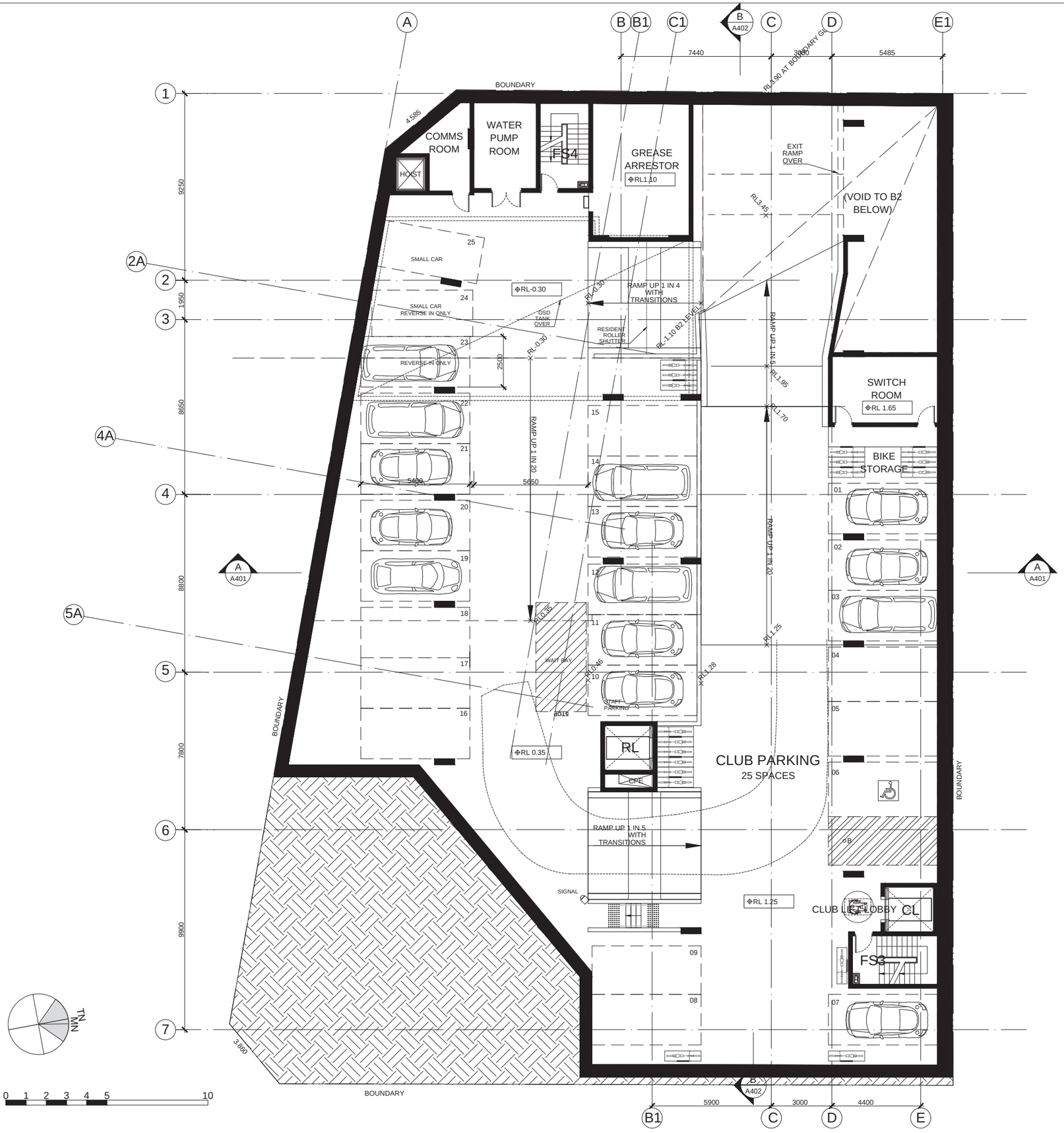
CLIENT

THE MANLY CIVIC CLUB

PROJECT
REDEVELOPMENT
MANLY CIVIC CLUB
2 WEST PROMENADE, MANLY NSW

DRAWING
PLAN - LEVEL GROUND (CLUB LEVEL)

1548	A203-P3	
DA		MC



REVISIONS

R	DATE	DESCRIPTION

ARCHITECT

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CLIENT

THE MANLY CIVIC CLUB

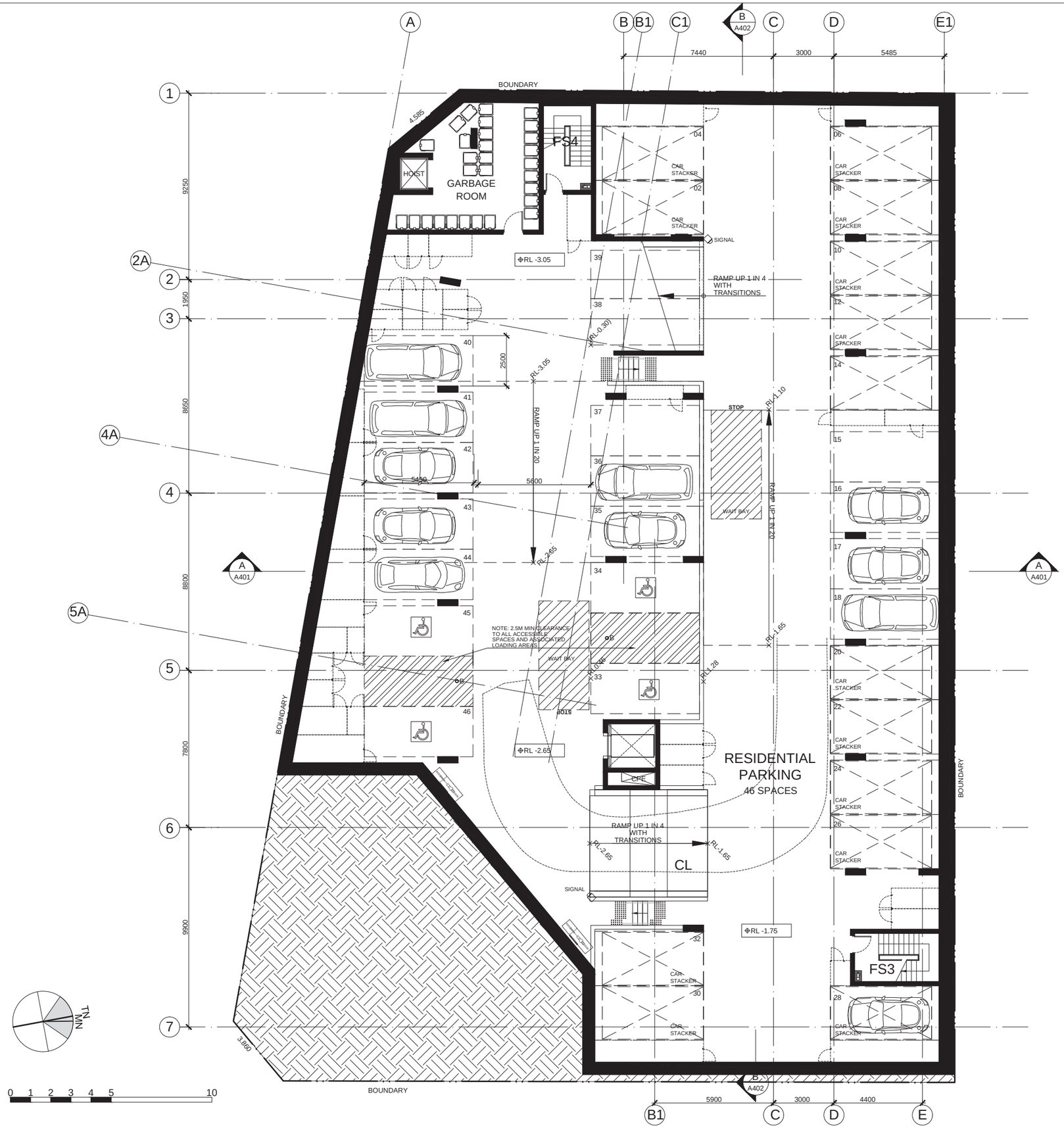
PROJECT

REDEVELOPMENT
MANLY CIVIC CLUB
2 WEST PROMENADE, MANLY NSW

DRAWING

PLAN - LEVEL B1

1548	A202-P3b	
DA		MC



REVISIONS

R	DATE	DESCRIPTION

ARCHITECT

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CLIENT

THE MANLY CIVIC CLUB

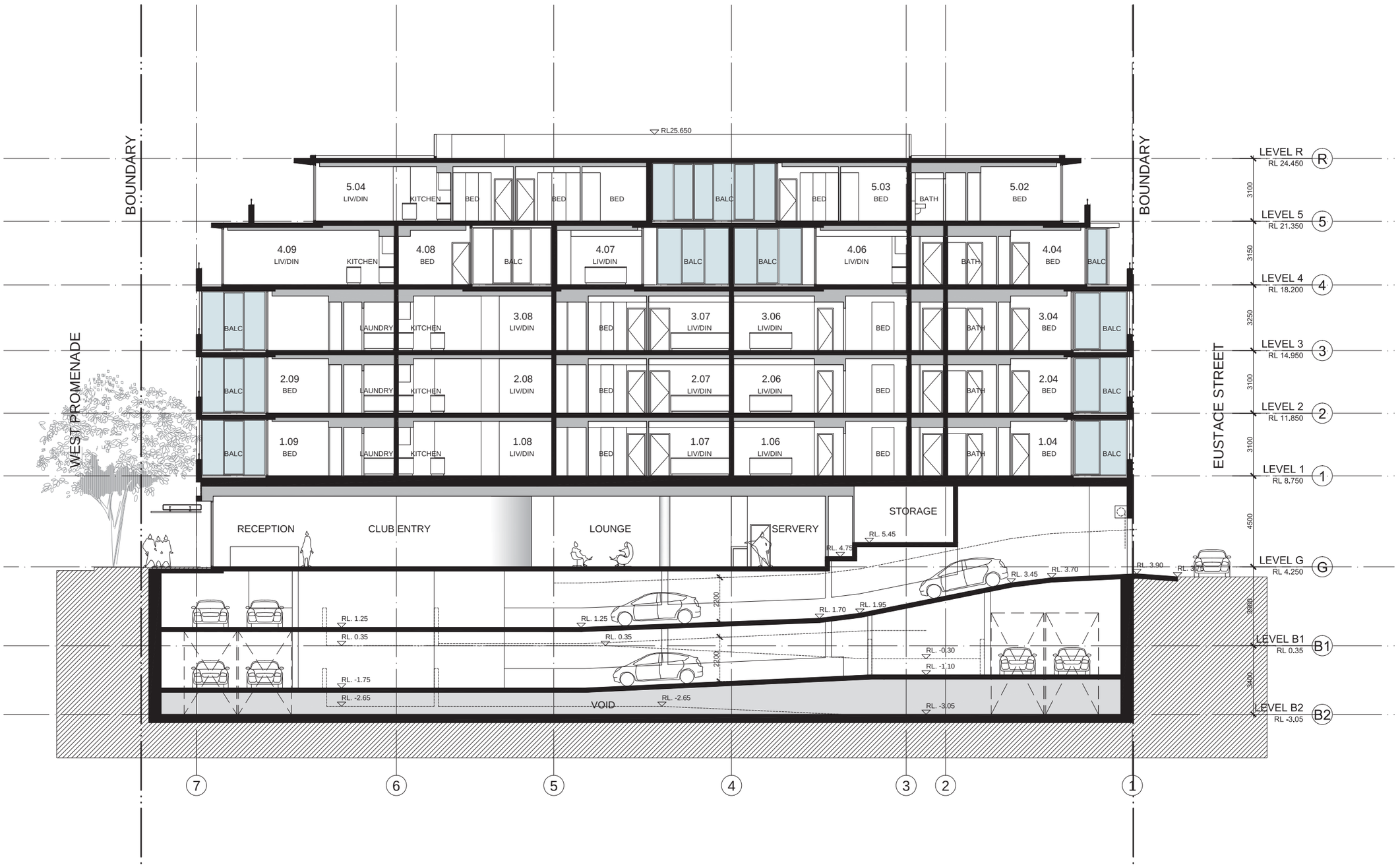
PROJECT

REDEVELOPMENT
MANLY CIVIC CLUB
2 WEST PROMENADE, MANLY NSW

DRAWING

PLAN - LEVEL B2

1548	A201-P3b	
DA		MC



A SECTION B-B
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REVISIONS

R	DATE	DESCRIPTION

ARCHITECT

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CLIENT
THE MANLY CIVIC CLUB

PROJECT
REDEVELOPMENT
MANLY CIVIC CLUB
2 WEST PROMENADE, MANLY NSW

DRAWING
SECTIONS
B-B

1548	A402-P3	
DA		MC

APPENDIX C

Swept Path Analysis

CAD LEGEND

LAYERS
0
AREAS - GBA
AREAS - GFA
AREAS - NSA
BOUNDARIES
CEILINGS
DIMENSIONS
DOORS
ELEVATIONS - FRAMES
ELEVATIONS - INFILL
FLOORS
FURNITURE
GRAPHICS - PRESENTATION
GRAPHICS - WORKING
GRIDS
HATCH - INFILL
HATCH - PATTERNS
INTERIORS - FIXTURES
INTERIORS - JOINERY
LANDSCAPE
ROADS
SERVICES - ELECTRICAL
SERVICES - HYDRAULIC
SERVICES - MECHANICAL
STAIRS
STRUCTURE
TEXT - 25
TEXT - 35
TEXT - 50
TEXT - 70
WALLS - EXTERNAL
WALLS - HALF HEIGHT
WALLS - INTERNAL
WALLS - PARTY
WINDOWS
XREFS

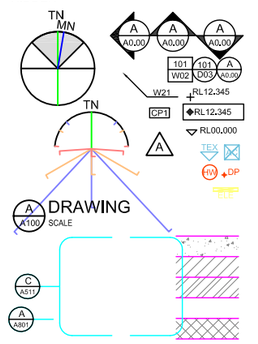
RED
BLUE
GREEN

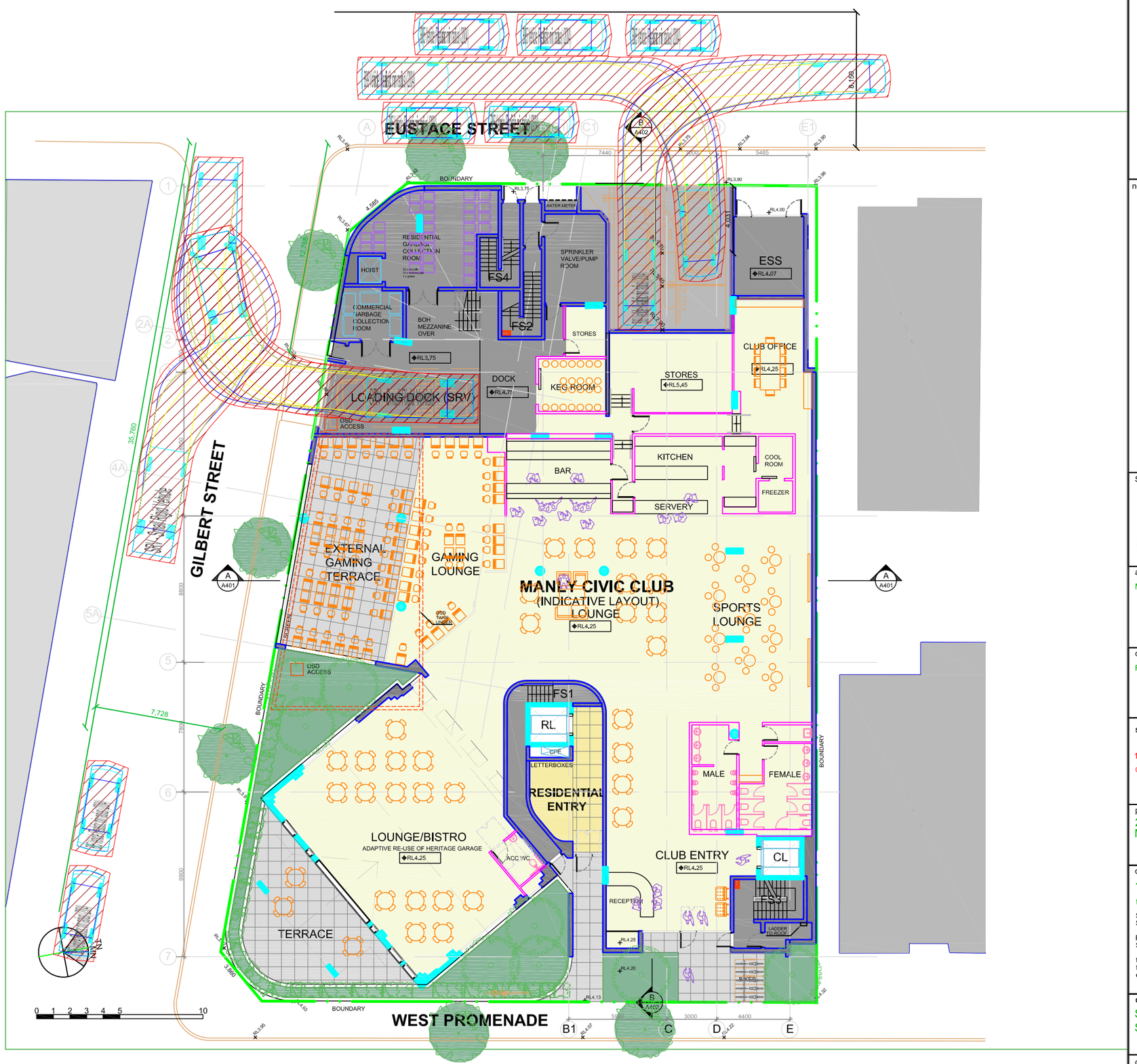
TEXT 25 - MULTILINE
TEXT 35 - MULTILINE
TEXT 50 - MULTILINE
TEXT 70 - MULTILINE

TEXT 25 - SINGLELINE
TEXT 35 - SINGLELINE
TEXT 50 - SINGLELINE
TEXT 70 - SINGLELINE

LINETYPES

BATTING
CONTINUOUS
DASHEDX2
DASHED
DASHDOT
DASHDOTDOT
DASHSPACE
DOT
HIDDEN





Notes

This drawing is prepared for information purposes only. It is not to be used for construction.

TRAFFIX is responsible for vehicle swept path diagrams and/or drawing mark-ups only. Base drawing prepared by others.

Vehicle swept path diagrams prepared using computer generated turning path software and associated CAD drawing platforms. Vehicle data based upon relevant Australian Standards (*AS/NZS 2890.1-2004 Parking facilities - Off-street car parking*, and/or *AS 2890.2-2002 Parking facilities - Off-street commercial vehicle facilities*). These standards embody a degree of tolerance, however the vehicle characteristics in these standards represent a suitable design vehicle and do not account for all variations in vehicle dimensions / specifications and/or driver ability or behaviour.

no.	revision note	by.	date

Swept Path Legend:

- Wheel Path
- Vehicle Body Envelope
- Clearance Envelope (300mm)

architect
Mijolla

client
Ronald Arthur

scale
1:250 @ A3
0m 2 4 6 8

project
2 West Promenade
Manly

drawing prepared by
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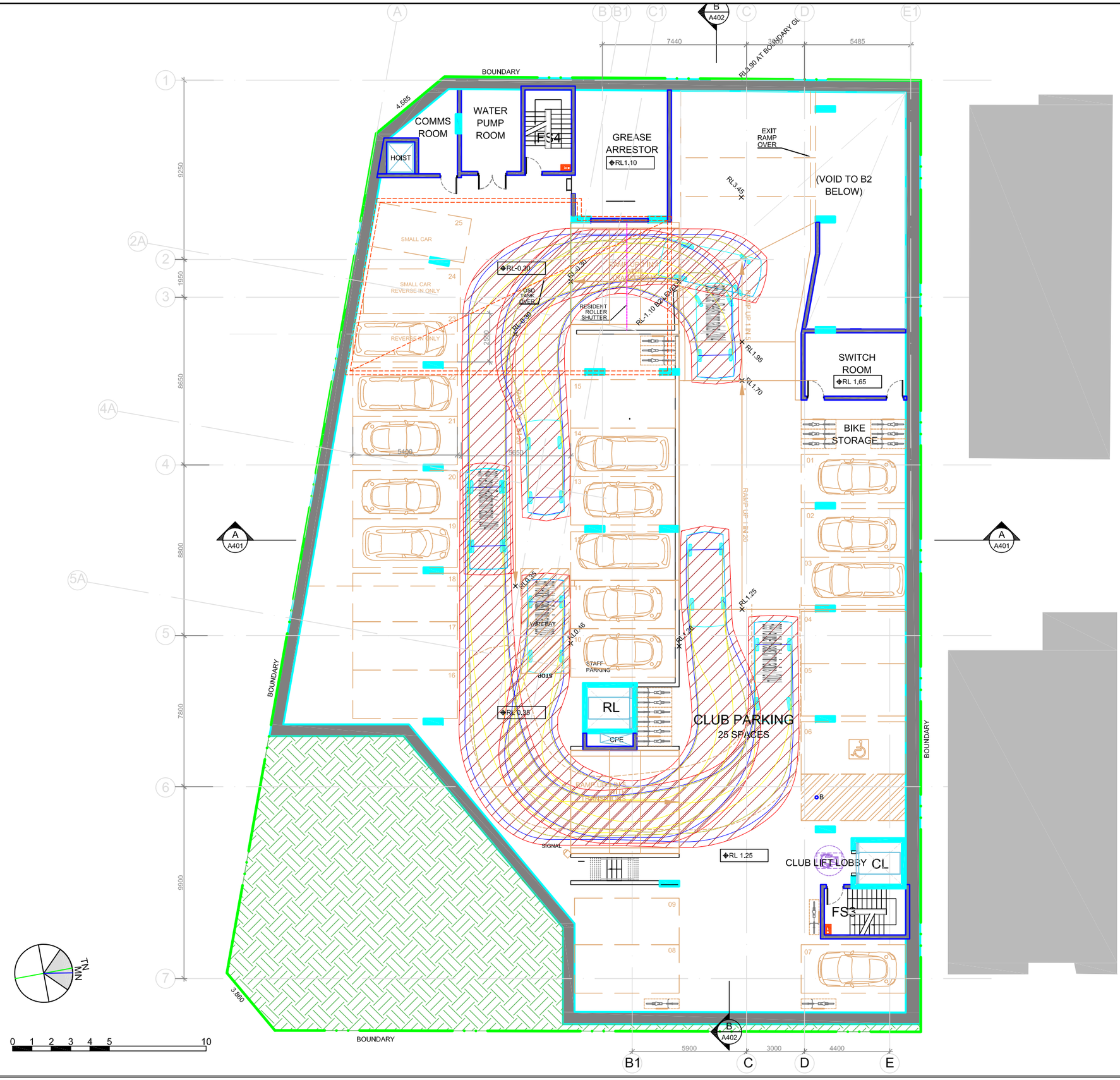
drawing title
Swept Paths
Street level- SRV and B99 for Entrance

drawn:	checked:	date:
LK	MM	10-Feb-17

project no.	drawing phase.	drawing no.	rev
16.136	01	TX.01	02



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no.	revision note	by.	date

Swept Path Legend:

- Wheel Path
- Vehicle Body Envelope
- Clearance Envelope (300mm)

architect
Mijolla

client
Ronald Arthur

scale
1:200 @ A3
0m 2 4 6 8

project
2 West Promenade
Manly

drawing prepared by

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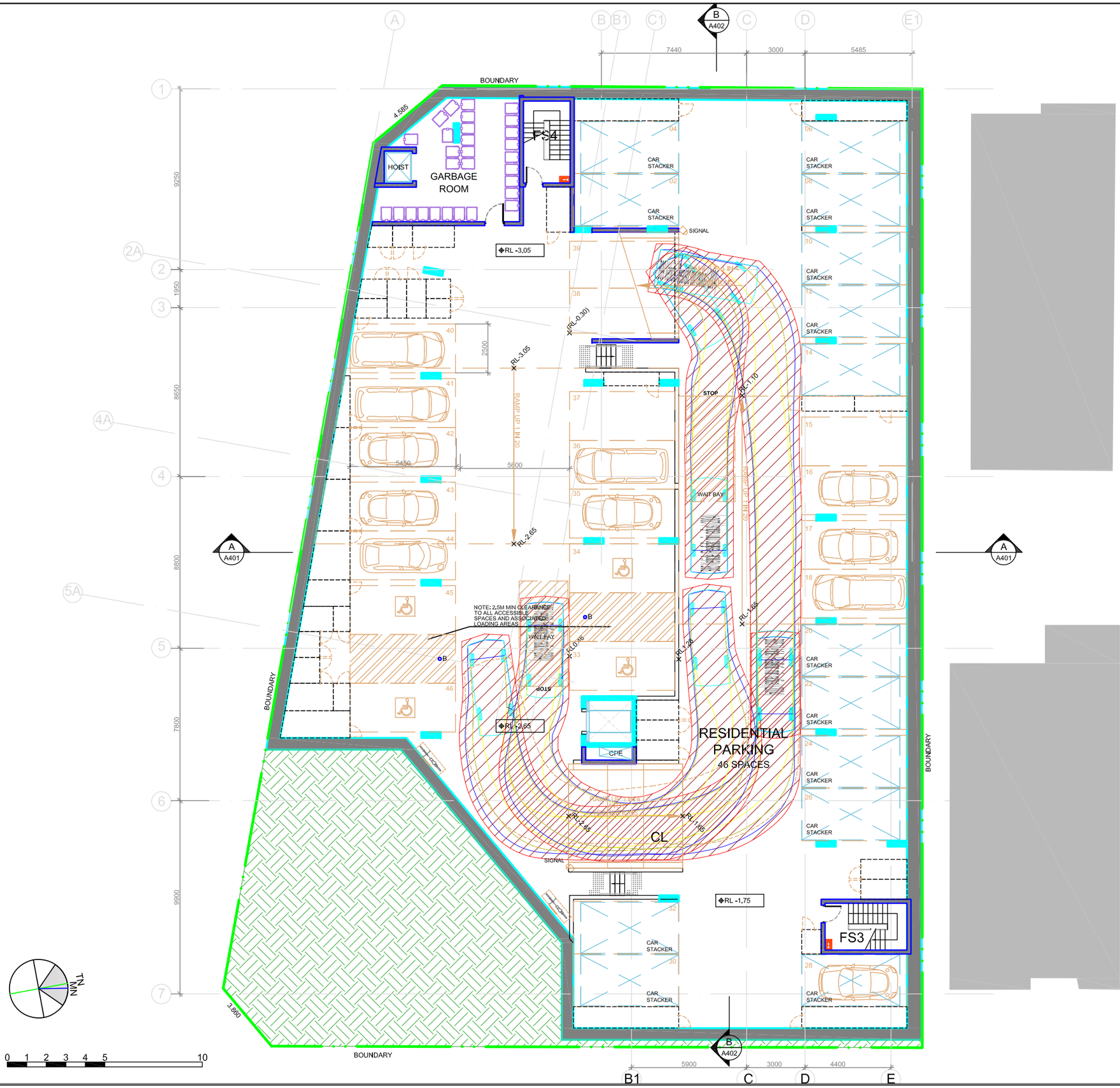
drawing title
Swept Paths
Level B1

drawn:	checked:	date:
LK	MM	10-Feb-17

project no.	drawing phase.	drawing no.	rev
16.136	01	TX.02	02



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no.	revision note	by.	date

Swept Path Legend:

- Wheel Path
- Vehicle Body Envelope
- Clearance Envelope (300mm)

architect
Mijolla

client
Ronald Arthur

scale
1:200 @ A3
0m 2 4 6 8

project
2 West Promenade
Manly

drawing prepared by

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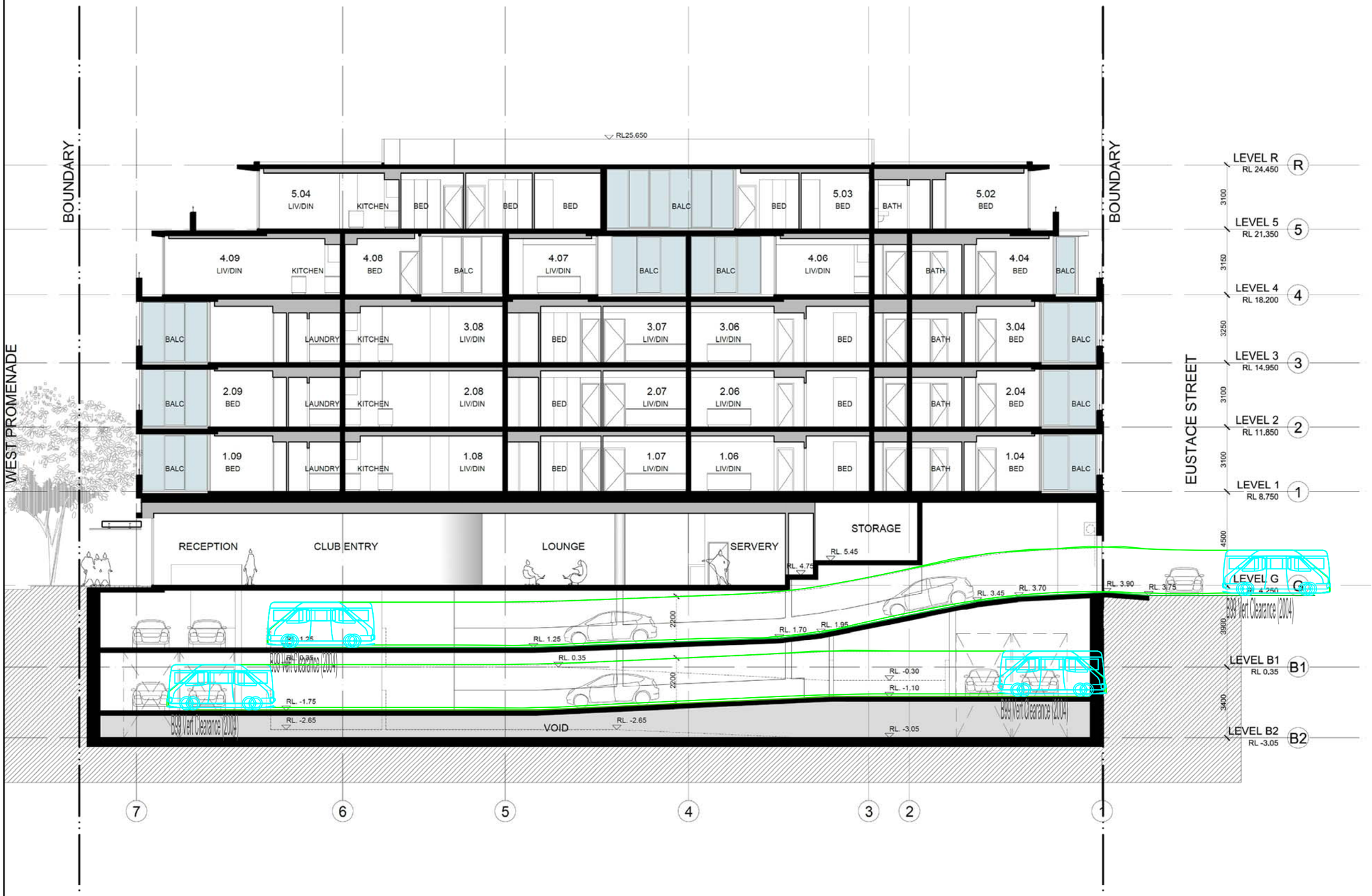
drawing title
Swept Paths
Level B2

drawn:	checked:	date:
LK	MM	10-Feb-17

project no.	drawing phase.	drawing no.	rev
16.136	01	TX.04	03



A SECTION B-B
1 :100

Notes

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no.	revision note	by.	date

Swept Path Legend:

- Wheel Path
- Vehicle Body Envelope
- Clearance Envelope (300mm)

architect
Mijolla

client
Ronald Arthur

scale
1:200 @ A3
0m 2 4 6 8

project
2 West Promenade
Manly

drawing prepared by

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drawing title
Swept Paths
Vertical Clearance test

drawn:	checked:	date:
LK	MM	10-Feb-17

project no.	drawing phase.	drawing no.	rev
16.136	01	TX.04	03

APPENDIX D

Queuing Analysis

Based on the Average Travel Distance

16.136 - 2-West Promenade Street, Manly

ARRIVALS

Travel Distance		
Level	No Cars/ Motorcycles	Horiz Distance from G (m)
G	0	0
B1	23	72
B2	34	146
B3	0	0
Average Travel Distance		116
MAX Travel Distance		190

Vehicle Arrivals (veh/hr)	42
Travel Speed (m/sec)	2.8
Load & Exit Time (sec) (assumed)	12
Signal Timing	0
Travel Time (sec) for ATD	0
Clearance (sec)	0
Total Service Time for ATD	12

Queuing Theory Factors		
average arrival rate (r)	42.00	*r=(veh/hr)
average service rate (s)	300.00	*s=3600/(Total Average Time)
utilisation factor (p)	0.14000	*p=r/s
mean queue (E(m))	0.02279	*E(m)=(p/(1-p))-p

Probability of Vehicles in System (P(n))		*P(n)=(1-p)p^n	
No. Vehicles in System (n)	Probability (%)	Prob of More than n (%)	Peobability of <n+1 vehicles
0	86.0%	14.0%	86.0%
1	12.0%	2.0%	98.0%
2	1.7%	0.3%	99.7%
3	0.2%	0.0%	100.0%
4	0.0%	0.0%	100.0%

DEPARTURES

Average Travel Distance		
Level	No Cars/ Motorcycles	Avg. Horiz Distance from G (m)
G	0	0
B1	23	72
B2	34	146
B3	0	0
Average Travel Distance		159

Vehicle Arrivals (veh/hr)	9
Travel Speed (m/sec)	2.8
Load & Exit Time (sec) (assumed)	0
Signal Timing	117
Travel Time (sec)	57
Clearance (sec)	2
Total Service Time for	176

Queuing Theory Factors		
average arrival rate (r)	9.00	*r=(veh/hr)
average service rate (s)	30.77	*s=3600/(Total Average Time)
utilisation factor (p)	0.29250	*p=r/s
mean queue (E(m))	0.12093	*E(m)=(p/(1-p))-p

Probability of Vehicles in System		*P(n)=(1-p)p^n	
No. Vehicles in System (n)	Probability (%)	Prob of More than n (%)	Peobability of <n+1 vehicles
0	70.8%	29.3%	70.8%
1	20.7%	8.6%	91.4%
2	6.1%	2.5%	97.5%
3	1.8%	0.7%	99.3%
4	0.5%	0.2%	99.8%

PRODUCT

Probability of >0 Arrival		14.0%
Probability of >0 Departure		29.3%
Probability of 'n' Vehicles Queuing at Access	n	%
	1	4.10%
	2	0.17%
	3	0.01%
	4	0.00%
	5	0.00%