Traffic and Transport Assessment

Balmoral Quay Residential Development
Stage 5 - Liverpool Street, Rippleside

V162228

Prepared for
Balmoral Quay Pty Ltd

5 July 2022

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1 Introduction

1.1 Overview

Cardno has been retained by Balmoral Quay Pty Ltd to undertake a traffic and transport assessment of anticipated traffic volumes and intersection configurations for the proposed residential development at 43 Liverpool Street in Rippleside.

In the course of preparing this assessment, the subject site and its environs have been inspected, and concept plans of the development and relevant background information have been examined.

1.2 Purpose of Report

This masterplan report has been updated for currency and to accompany a town planning submission for Stage 5 of the Balmoral Quay residential development.

Cardno has had previous involvement in the assessment of traffic volumes at the site, having prepared an original traffic and transport assessment for Stages 1 and 2 of the development in 2017 (Cardno Ref#V162228REP001F02, dated 27th February 2017) and updating this assessment again for Stage 3 and 4 of the development 2020 (Cardno Ref#V162228REP001F04, dated 4th May 2020).

The ensuing report seeks to update the previous reports to allow assessment of Stage 5, which forms a proposed residential apartment building to the west of Stages 1 and 2 and will be the final stage of development at the site.

As such, this report considers that Stages 1 and 2 of the development and the corresponding road network has already been constructed, and that Stages 3 and 4 are also fully designed and will be developed imminently.

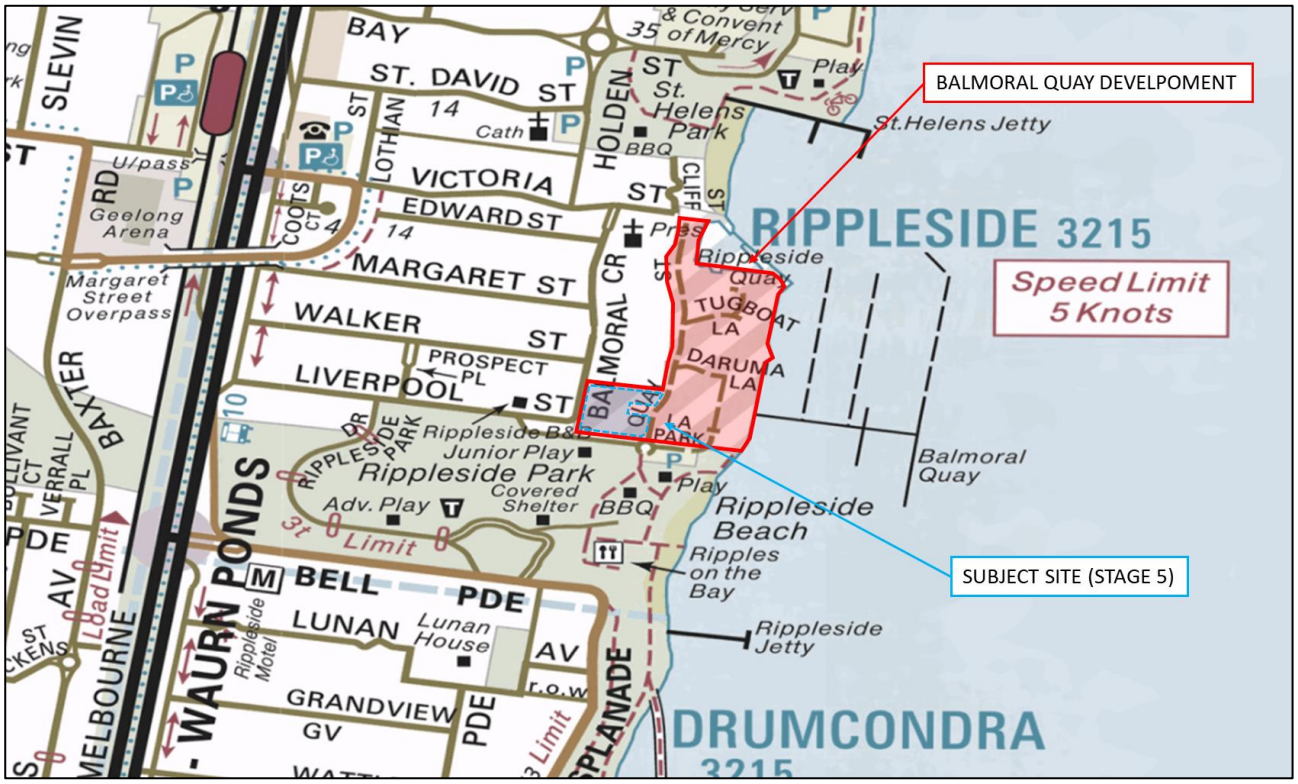
The report determines that the development of Stage 5 as currently proposed will have no adverse impacts on existing traffic or parking conditions proximate to the site. The amended plans for Stage 5 which incorporate Council's Request for Information (RFI) comments have been reviewed and can be found in Appendix A.

2 Background and Existing Conditions

2.1 Location and Land Use

The wider masterplan site is located at the end of the Liverpool Street extension in Rippleside, as shown in Figure 2-1. Site access to the external road network is currently provided via a T-intersection located on Liverpool Street, approximately 40 m west of Balmoral Crescent.

Figure 2-1 Site Location



The masterplan site is irregular in shape, bounded by Saint Helens Reserve to the north, Corio Bay (including the Balmoral Quay Marina) to the east, residential dwellings to the west (with frontage to Balmoral Crescent) and Rippleside Park to the south. To the immediate south is a small public car park with 39 spaces.

The land use within the vicinity of the masterplan site is primarily residential with some public park and recreational spaces. The site is located approximately 600 metres southeast of the North Geelong Railway Station.

More specifically, the subject site (Stage 5) is located at the south-western corner of the masterplan site. The subject site has an approximate area of 4,000m^2 and is irregular in shape, with frontage of approximately 68 metres to Balmoral Crescent to the west, 62 metres to the Liverpool Street extension to the south, and two distinct frontages to Harbourside Drive (comprising a ~40m frontage at the south and ~10m frontage at the north) within the masterplan development.

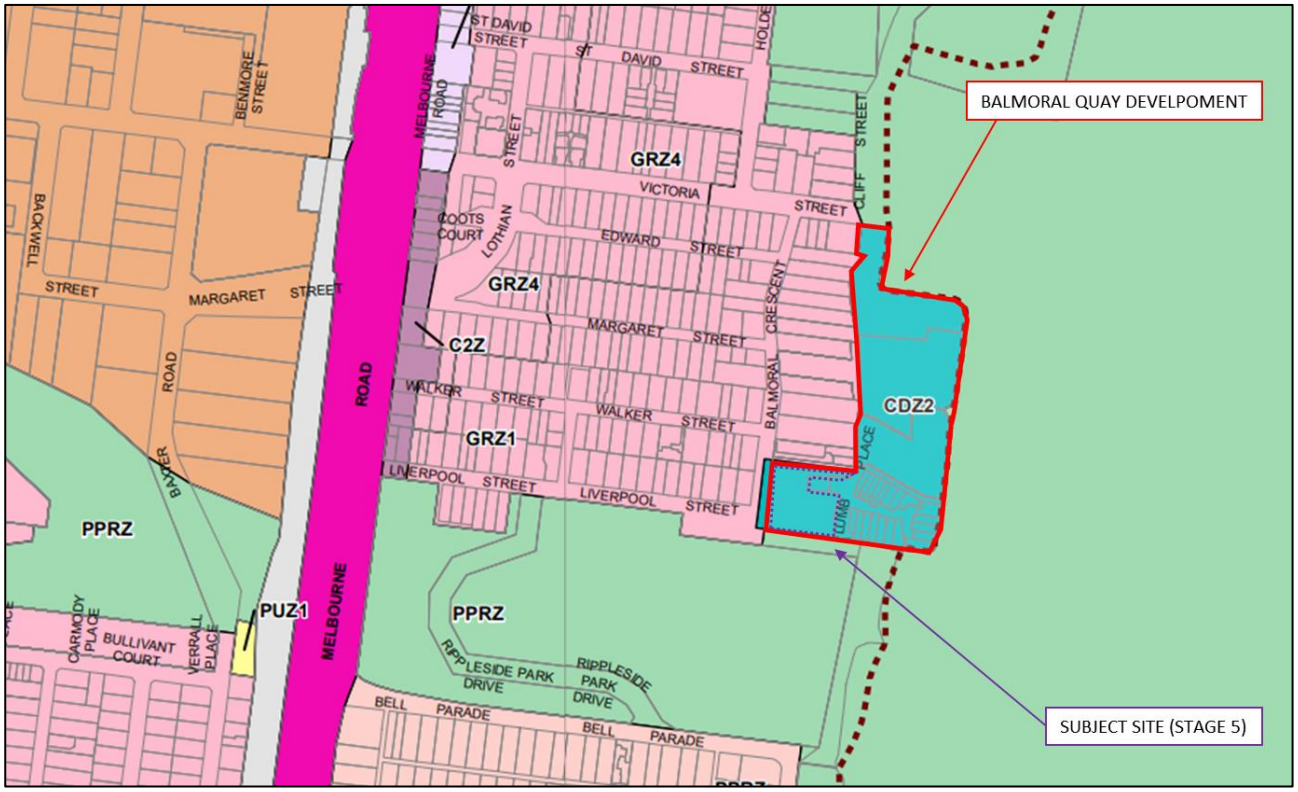
The Harbourside Drive frontages are separated by land that accommodates a Barwon Water Pumping Station.

An aerial view of the subject site and its surrounding environs are shown in Figure 2-2. With regard to the Greater Geelong Planning Scheme zones, the subject site is located within a Comprehensive Development Zone (CDZ2) as shown in Figure 2-3.

Figure 2-2 Aerial View

Source: Nearmap dated April 24, 2022

Figure 2-3 Greater Geelong Planning Scheme Zones



2.2 Road Network

2.2.1 Liverpool Street Extension

The extension of Liverpool Street operates as a local access street, extending westward from the subject site to a T-intersection at Liverpool Street just west of Balmoral Crescent.

In the vicinity of the subject site, the Liverpool Street extension accommodates a six-metre-wide two-way carriageway. Kerbside parking is not commonly observed; however, no signage is present banning kerbside parking.

Figure 2-4 and Figure 2-5 show the street cross section of the Liverpool Street extension adjacent the subject site looking west and east, respectively.

Figure 2-4 Liverpool Street Extension (Westbound)

Figure 2-5 Liverpool Street Extension (Eastbound)

2.2.2 Liverpool Street

Liverpool Street is a local street that extends in an east-west alignment from the two-way service road on the eastern side of Princes Highway at its western end, to a 90-degree bend in alignment against the western boundary of the site, where it extends northward as Balmoral Crescent.

In the vicinity of the site, Liverpool Street accommodates a 10.8-metre-wide carriageway comprising a single traffic lane in each direction. Unrestricted kerbside parking is permitted on both sides of the carriageway.

Figure 2-6 shows the road cross section of Liverpool Street looking east towards Balmoral Crescent.

Figure 2-6 Liverpool Street (Eastbound)

2.3 Sustainable Transport

The site is well located to take advantage of the good public transport services available in close proximity of the site.

In particular, North Geelong Railway Station is located approximately 800 metres (~10 minutes) walk to the north-west of the site. In addition, Bus Route 20 (Corio to Geelong Station) stops on the Princes Highway Service Road approximately 500 metres (~5 minutes) walk west of the site.

Table 2-1 and Figure 2-7 outline the public transport services in the vicinity of the subject site.

Table 2-1 Public Transport Services

Service	Route No.	Route	Location of Nearest Stop
Bus	20	Geelong Station – Corio SC	Walker St / Princes Highway
	22	Geelong Station – North Shore Station via Anakie Road	Church St / Pakington Street
	24	North Geelong Station via Newtown	North Geelong Railway Station
Train	V/Line	Geelong Line	North Geelong Railway Station

Figure 2-7 Public Transport Map

3 Planning Background

3.1 Masterplan Stages 1 to 4

3.1.1 Current Masterplan

Planning Permit No. PP-647-2004/A was originally issued for the site by City of Greater Geelong Council in 2004. The permit allowed for the development of a convenience shop, restricted recreation facilities, a marina and more than 98 dwellings across the eastern portion of the subject site (which is now known as Stages 1 to 4).

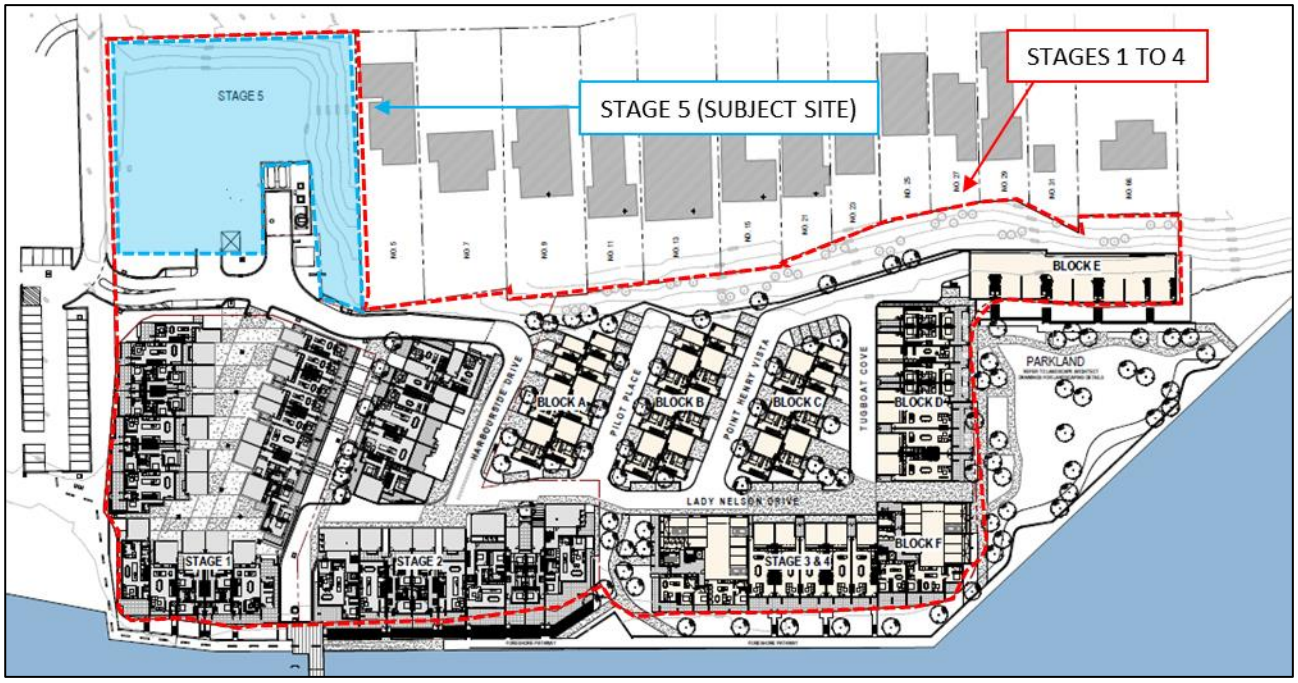
The Masterplan was updated by SJB in 2020 to provide 104 dwellings, with vehicular access maintained via a single roadway intersection to the extension of Liverpool Street at the southern end of the site.

A dwelling summary is provided in Table 3-1 with the masterplan for Stages 1 to 4 presented at Figure 3-1.

Table 3-1 Stages 1 to 4 Development Summary Overview

Stage	Townhouses		Apartments		Total Dwellings
	1-2 Bedrooms	3-4 Bedrooms	1-2 Bedrooms	3-4 Bedrooms	
Stage 1	-	20 dwellings	-	-	20 dwellings
Stage 2	4 townhouses	10 dwellings	3 dwellings	6 dwellings	23 dwellings
Stages 3 & 4	9 townhouses	35 dwellings	12 dwellings	5 dwellings	61 dwellings
Sub-Total	**13 townhouses**	**65 dwellings**	**15 dwellings**	**11 dwellings**	**104 dwellings**
Development Total	**78 townhouses**		**26 apartments**		**104 dwellings**

Figure 3-1 Balmoral Quay Master Plan (Stages 1 to 4)



Based on a yield of 104 dwellings, Stages 1 to 4 at Balmoral Quay generate a resident visitor car parking requirement for 20 spaces

It is understood that the resident visitor car parking provision across Stages 1 to 4 was increased to 22 spaces during the RFI stage, when additional parking was provided near to 'Block E' at the north of the site.

Therefore, Stages 1 to 4 will provide a surplus of two (2) resident visitor car parking spaces above minimum statutory requirements.

3.1.2 Site Access

Stages 1 to 4 of the masterplan are accessed via an internal road known as Harbourside Drive, which intersects the Liverpool Street extension as the minor leg of a T-intersection.

Vehicle priority is reinforced by Give Way line-marking and signage on the Harbourside Drive leg.

3.1.3 Development Staging (Stages 1 to 4)

Construction of Stage 1 is complete. Stage 1 is located at the southern end of the subject site and consists of 20 townhouses accessed via a joint crossover located on the eastern side of Harbourside Drive. Construction of Stage 2, which is located directly to the north of Stage 1 with access via an extension of Harbourside Drive, has also recently been completed.

Stages 3 and 4, which are located to the north of Stage 2, have received planning approval and preliminary earthworks have commenced.

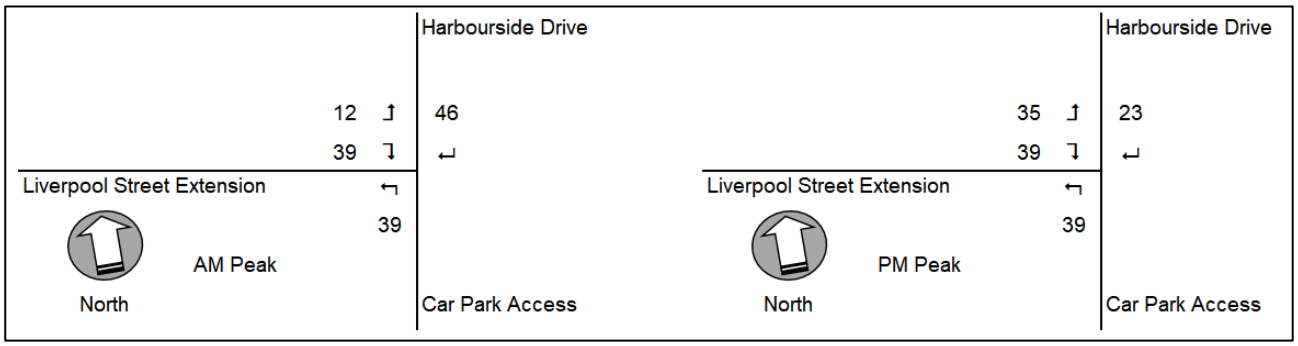
3.1.4 Post Stages 1 to 4 Traffic Conditions

Cardno has previously undertaken an assessment of the post-development traffic conditions at the intersection of Harbourside Drive and the Liverpool Street extension once Stages 1 to 4 are completed.

The analysis is presented in the previous masterplan report submitted alongside the approved development of stages 3 and 4 at the site (Cardno Ref#V162228REP001F04, dated 4th May 2020), and included conservative estimates of traffic generated by the dwellings proposed within the masterplan site and at the adjacent Liverpool Street public car park.

The anticipated turning volumes at the intersection are presented Figure 3-2, below.

Figure 3-2 Projected Peak Hour Post Development Turning Volumes (Stages 1 to 4)



The operation of the intersection was analysed using SIDRA Intersection. This computer package, originally developed by the Australian Road Research Board, provides information about the capacity of an intersection in terms of a range of parameters, as described below:

Degree of Saturation (D.O.S.) is the ratio of the volume of traffic observed making a particular movement compared to the maximum capacity for that movement. Various values of degree of saturation and their rating are shown in Table 3-2.

Table 3-2 Rating of Degrees of Saturation

D.O.S.	Rating
Up to 0.6	Excellent
0.6 to 0.7	Very Good
0.7 to 0.8	Good
0.8 to 0.9	Fair
0.9 to 1.0	Poor
Above 1.0	Very Poor

It is considered acceptable for some critical movements in an intersection to operate in the range of 0.9 to 1.0 during the high peak periods, reflecting actual conditions in a significant proportion of suburban intersections.

The ***95th Percentile (95%ile) Queue*** represents the maximum queue length, in metres, that can be expected in 95% of observed queue lengths in the peak hour; and,

Average Delay is the delay time, in seconds, which can be expected over all vehicles making a particular movement in the peak hour.

The results of the SIDRA Intersection analysis are summarised at Table 3-3, below.

Table 3-3 SIDRA Intersection Analysis Summary

Time Period	Approach	Degree of Saturation	Average Delay	95th%ile Queue
AM Peak Hour	Car Park Access (SE)	0.02	2 sec	0 m
	Development Access (NE)	0.04	5 sec	1 m
	Liverpool Street Extension (W)	0.03	5 sec	1 m
PM Peak Hour	Car Park Access (SE)	0.02	2 sec	0 m
	Development Access (NE)	0.02	5 sec	1 m
	Liverpool Street Extension (W)	0.04	5 sec	1 m

The analysis indicates that the T-intersection at Harbourside Drive and the Liverpool Street extension would operate well below capacity, with no significant delays and queues to motorists.

3.2 Masterplan Stage 5 (Subject Site)

3.2.1 Previously Endorsed Scheme (Building H)

It is understood that a previous scheme for the site, known as 'Building H' was endorsed by Council in 2007.

The scheme allowed for the development of a four-storey apartment building with two distinct car parking areas provided at Ground Level and Level 1. Vehicular access was to be provided via crossover connections to Harbourside Drive (Ground Level) and Balmoral Crescent (Level 1).

The Development Schedule for the endorsed scheme is provided at Table 3-4, below.

Table 3-4 Endorsed Development Schedule – Stage 5 (Building H)

Land Use	No.
Apartments	**(36 no.)**
- 1 Bedroom	1 no.
- 2 Bedroom	26 no.
- 3 Bedroom	6 no.
- 4 Bedroom	3 no.
Café	**256m²**
Car Parking Spaces	**121 no.**

A car parking provision of 121 spaces was proposed within Building H, comprising:

- 65 spaces for residents (i.e. an average rate of 1.8 spaces per apartment);
- 10 spaces for resident visitors;
- 14 spaces for café use; and
- 32 spaces for marina berths.

With regard to the marina parking spaces, a document prepared by Trendcorp to satisfy Condition 16 of the endorsed scheme titled "The Allocation of Accommodation for Bicycles and Car Parking Management Plan (January 2008) stated that:

20% of the marina berths (at Riverside Quay) will be available to the public; these berths (32) will be public moorings with the remaining berths to be made available to residents of the subject site. It is proposed that 1 car parking space per public berth will be made available in Building H. This equates to 32 car spaces.

4 Proposed Development

4.1 General

Balmoral Quay Pty. Ltd. is proposing to construct a six storey mixed-use building on the land identified as 'Stage 5' to the west of the constructed masterplan area. The Development Schedule for the subject proposal is summarised at Table 4-1, below.

Table 4-1 Stage 5 Development Schedule

134	No.
Apartments	***(84 no.)***
- 1 Bedroom	36 no.
- 2 Bedroom	30 no.
- 3 Bedroom	18 no.
Tenancy (Shop)	77.8m^2
Office (Marina Office)	34.7m^2
Car Parking Spaces	***(134 no.)***
- **Resident**	102 no.
- **Resident Visitor**	To be shared with Marina Berth spaces
- **Marina Berths**	32 no.
- **Tenancy**	1 no.
- **Office**	1 no.
Bicycle Parking Spaces	115 no.
Motorbike Parking Spaces	5 no.

The development is largely residential in nature. A small tenancy at the lower ground level presents a commercial opportunity at the south-eastern corner of the site fronting the intersection of Harbourside Drive and the Liverpool Street extension.

A small office to the immediate north of the tenancy is proposed to accommodate the Marina Offices, which would be responsible for the ongoing management and leasing of public berths at the Balmoral Quay Marina.

4.2 Car Parking and Access Arrangements

A total of 136 car parking spaces are proposed at the site, comprising:

- 63 spaces across a lower ground car parking level accessed via a new crossover to Harbourside Drive at the east of the site. These spaces are proposed to be allocated as follows:
  - 31 spaces for residents;
  - 30 visitor spaces to be shared by marina leases and resident visitors (inclusive of 2 DDA spaces, 2 electric vehicle charging spaces and 1 car share space);
  - 1 space for the marina office; and,
  - 1 space for the small tenancy at the south-eastern corner of the site.
- 71 spaces across the ground and L1 levels for resident use. These spaces are proposed to be accessed at Level 1 via a new crossover to Balmoral Crescent at the west of the site, with a single width internal vehicle ramp proposed to provide access between the two levels; and
- 2 on-street car parking spaces for resident visitor use to the north of the Barwon Water Pumping Station. A third on-street parking space is proposed alongside these two spaces to negate the loss of an on-street parking space where vehicular access from Harbourside Drive is proposed.

The allocation of 32 spaces to the marina berths is consistent with the 2008 parking management plan prepared for the site by Trendcorp. The spaces are to be shared with resident visitor spaces.

4.3 Bicycle Parking

A total of 115 bicycle parking spaces are proposed, comprising:

- 84 spaces for resident use in a secured compound at ground level. A dedicated cyclist access point is proposed from Harbourside Drive adjacent to the car park entry and internal pedestrian access is proposed via the fire stair. An electric bike charging point has also been nominated within the compound;
- 21 internal visitor bicycle parking spaces located in two separate areas of the ground level car park. Cyclist access to these areas is proposed via the car park entrance; and
- 10 external visitor bicycle parking spaces, comprising 6 spaces in the verge to the north of the Harbourside Drive car park access and 4 spaces adjacent to the pedestrian entrance from the Liverpool Street extension.

4.4 Waste Collection

Waste collection is proposed to occur from within the site adjacent to the bin store room at ground level. Vehicular access to and from the area is proposed via the Harbourside Drive crossover.

5 Design Considerations

The car park has been assessed against the requirements of the Greater Geelong Planning Scheme and the Australian Standard for Parking Facilities *Part 1: Off-street Car Parking* (AS2890.1) where applicable.

5.1 Design Standard 1 – Accessways

Design Standard 1 of Clause 52.06-8 of the Greater Geelong Planning Scheme lists the various design requirements relating to accessways for applications to construct more than one dwelling on a lot, which are summarised for the subject proposal at Table 4-1 below.

Table 5-1 Design Standard 1- Accessways

Design Standard 1 Requirement	Response
Be at least 3 metres wide.	Compliant. The Harbourside Drive site access has a width of 6.4 metres at the property boundary and the Balmoral Crescent site access has a width of 6.4 metres at the property boundary. Internally, the ramp between levels 1 and 2 has a width of 4.0 metres between walls and the remaining parking aisles all have a width greater than 6.2 metres.
Have an internal radius of at least 4 metres at changes of direction or intersection or be at least 4.2 metres wide.	Compliant. All parking aisles are at least 4.2m wide at changes of direction or intersections. The vehicle ramp between levels 1 and 2 has a width of 4.0 metres though is accessed from parking aisles that are 6.4m wide (Ground Level) and 6.2m wide (L1). Swept path diagrams have been prepared to demonstrate vehicular movements to and from the ramp.
Allow vehicles parked in the last space of a dead-end accessway in public car parks to exit in a forward direction with one manoeuvre.	Not applicable. The car park will be for private use only. Notwithstanding, all dead end aisles are provided with a blind aisle extension of 1.0 metre as per the Australian Standard, which allows egress from the 'end' parking spaces in a single manoeuvre.
Provide at least 2.1 metres headroom beneath overhead obstructions calculated for a vehicle with a wheel base of 2.8 metres.	Achievable. The car parking levels have a floor to floor height of 3.2 metres, which will allow a minimum 2.1 metres overhead clearance to be achieved with suitable overhead structure design.
If the accessway serves four or more car spaces or connects to a road in a Road Zone, the accessway must be designed so that cars can exit the site in a forward direction.	Compliant. Vehicles can exit the site from all car parking spaces in a forward direction.
Provide a passing area at the entrance at least 6.1 metres wide and 7 metres long if the accessway serves ten or more car parking spaces and is either more than 50 metres long or connects to a road in a Road Zone	Compliant. The minimum widths of the site access points are 6.4m (Harbourside Drive) and 6.4m (Balmoral Crescent).
Have a corner splay or area at least 50 per cent clear of visual obstructions extending at least 2 metres along the frontage road from the edge of an exit lane and 2.5 metres along the exit lane from the frontage, to provide a clear view of pedestrians on the footpath of the frontage road. The area clear of visual obstructions may include an adjacent entry or exit lane where more than one lane is provided, or adjacent landscaped areas, provided the landscaping in those areas is less than 900mm in height.	Achievable. A landscaping bay (inclusive of a drinking fountain) is located to the north of the Harbourside Drive site access. The landscaping bay is 3.5 metres long by 2.0 metres wide and allows motorist-pedestrian sightlines to be provided to the pedestrian route along the site frontage, which is also within the site boundary. The landscaping and drinking fountain within the bay should be maintained at a height no greater than 900mm height in accordance with the Planning Scheme. A sight triangle has been provided at the Balmoral Crescent site access.
If an accessway to four or more car parking spaces is from land in a Road Zone, the access to the car spaces must be at least 6 metres from the road carriageway.	Not applicable.
If entry to the car space is from a road, the width of the accessway may include the road.	Not applicable.

As demonstrated in Table 4-1, the accessways proposed for the development are considered to comply with the requirements of Design Standard 1 of Clause 52.06-8 of the Greater Geelong Planning Scheme.

Swept path diagrams have been prepared to demonstrate vehicular circulation between the ground and L1 levels which are attached at Appendix B.

The diagrams indicate that there are adequate areas for concurrent opposing vehicle movements to pass each other on the approaches to the ramps. The installation of convex mirrors at the ends of the parking aisles, or a red/green stop/go light could be considered to assist passing movements.

5.2 Design Standard 2 – Car Parking Spaces

The design requirements relating to the dimensions of car parking spaces are outlined at Design Standard 2 of Clause 52.06-8 of the Greater Geelong Planning Scheme, which are summarised for the subject proposal at Table 4-2 below.

Table 5-2 Design Standard 2 – Car Parking Spaces

Design Standard 2 Requirement	Response
Car parking spaces and accessways must have the minimum dimensions as outlined in Table 2 of Clause 52.06-8.	Compliant. Almost all car parking spaces (156 no.) are provided in a 90-degree arrangement. These spaces are each 2.6m wide by 4.9m long and accessed from a parking aisle of at least 6.4m width in accordance with Planning Scheme requirements.
A wall, tree or tree guard or any other structure that abuts a car space must not encroach into the area marked 'clearance required' on Diagram 1 within Clause 52.06-8.	Compliant. All car parking spaces that are bounded by walls or obstructions are provided an additional 300mm offset. Columns have been located outside of the door opening zones in accordance with Diagram 1: Clearance to parking spaces.
Car spaces in garages or carports must be at least 6 metres long and 3.5 metres wide for a single space and 5.5 metres wide for a double space measured inside the garage or carport.	Not applicable.
Where parking spaces are provided in tandem (one space behind another) an additional 500mm in length must be provided between each space.	Compliant. All tandem car parking spaces are provided with a minimum length of 5.4 metres (i.e. a conventional 4.9m long space and additional 500mm length).
Where two parking spaces are provided for a dwelling, at least one space must be under cover.	Compliant. All parking spaces are under cover.
Disabled car parking spaces must be designed in accordance with Australian Standard AS2890.6 (disabled) and the Building Code of Australia. Disabled car parking spaces may encroach into an accessway width specified in Table 2 by 500mm.	Compliant. Two (2) visitor car parking spaces have been nominated as DDA spaces. These spaces are both 2.6m wide by 4.9m long and located adjacent to a shared are of the same dimensions, which exceeds the minimum dimensions outlined in the Australian Standard and reduced in length to fit Victorian Planning Scheme modules as permitted by the Planning Scheme.

Based on the above, all car parking spaces have been designed in accordance with the requirements at Design Standard 2 of Clause 52.06-8 of the Greater Geelong Planning Scheme.

5.3 Design Standard 3 – Gradients

The car park gradients proposed for the subject development are assessed against the requirements of Clause 52.06-8 of the Greater Geelong Planning Scheme in Table 4-3 below.

Table 5-3 Design Standard 3 – Gradients

Element	Design Standard 4 Requirement	Response
Accessway grade within 5 metres of the frontage.	Maximum 1:10 (10%)	Compliant. The architectural plans indicate that the maximum grade of both accessways within 5 metres of the site boundaries will be no greater than 1:10 (10%).
Gradient for ramp in residential car park <20m in length.	Maximum 1:4 (25%)	Compliant. The subject car park has a maximum ramp grade of 1:4 (25%) for ramps <20m.
Grade transitions	2m transitions for 1:8 (12.5%) for a summit grade change and 1:6.7 (15%) for a sag grade change.	Compliant. Grade transitions of 1:8 are provided for 3 metres at both the top and base of the vehicle ramp.
Grade changes	Assessment of grade changes greater than 1:5.6 (18%).	Not applicable.

Based on the above, the gradients proposed for the development are considered to comply with the requirements of Design Standard 3 of Clause 52.06-8 of the Greater Geelong Planning Scheme.

5.4 Bicycle Parking and Access

A secured bicycle parking area for residents is proposed to be located on the eastern side of the ground floor level for residents, with 'End of Trip' access provided from Harbourside Drive via a dedicated cyclist route and internal access (for pedestrians) provided from the internal stairwell.

The bicycle parking area will provide a total of 84 bicycle parking spaces, comprising a mix of stacked, vertical (wall mounted) and at-grade bicycle parking spaces:

- The stacked bicycle parking spaces are each 2.0 metres long, separated by 500mm and provided access from an aisle of 2.0 metres width.

  These dimensions are suitable for the installation of a stacked product like the Securabike CBR2GS or similar, which achieves the necessary separation of handlebars required to accommodate the bicycle parking envelope through a staggered installation;

- The vertical bicycle parking spaces are each provided a depth of 1.2 metres from the wall for bike storage and are provided access from a 1.5m wide aisle. The spaces are provided a separation of 500mm, which will allow for the installation of a staggered arrangement using a 'Ned Kelly' bicycle rack or similar;

- The horizontal bicycle parking spaces are each spaced at 1.0 metre centres with access from an aisle of 1.5 metres width in accordance with the Australian Standard for Off-Street Bicycle Parking Facilities (AS2890.3:2015).

In addition to the above, a further 31 spaces are provided for visitors, including 21 spaces with the above vertical bicycle parking space dimensions and required minimum access aisle widths, and 10 horizontal spaces via the installation of double sided rails at 1.0 metre centres.

Based on the above, each of the proposed bicycle parking arrangements accords with the relevant installation specifications and/or the Australian Standard for Off-Street Bicycle Parking Facilities (AS2890.3:2015).

5.5 Motorcycle Parking

Each of the motorcycle parking spaces is 1.2 metres wide by 2.5 metres long in accordance with the design criteria outlined in the Australian Standard for Off-Street Car Parking Facilities (AS2890.1:2004).

5.6 Waste Collection

A Waste Management Plan (WMP) has been prepared for the site by Leigh Design. The document indicates that waste collection is proposed to occur from the parking aisle adjacent to the bin store at the lower ground level.

A low clearance waste collection vehicle such as the 6.35m long WasteWise Mini will be nominated for use at the site, which is proposed to enter the site in a forward direction from Harbourside Drive, turn around using the internal parking aisles and prop adjacent to the bin store room. Once collection has been completed, the vehicle will then depart in a forward direction onto Harbourside Drive.

A swept path diagram has been prepared to demonstrate the above manoeuvres and is attached at Appendix B, confirming that an appropriate waste collection service can be provided.

6 Bicycle Parking Considerations

Clause 52.34 of the Greater Geelong Planning Scheme outlines bicycle parking requirements for new developments, which are summarised for the subject proposal at Table 5-1 below.

Table 6-1 Planning Scheme Bicycle Parking Requirements – Clause 52.34

Component	Yield	Requirement	
		Rate	Total
Dwelling	84 apartments	1 space per 5 dwellings for residents 1 space per 10 dwellings for visitors	17 8
Shop	77.8m^2	1 space to each 300 m^2 leasable floor area for employees 1 space to each 500 m^2 leasable floor area for shoppers	0 0
Office	34.7m^2	1 space to each 300 m^2 net floor area for employees 1 space to each 500 m^2 net floor area for shoppers	0 0
Total		**Employee / Resident** **Visitor / Shopper**	**17** **8**

Based on the above, the statutory bicycle parking requirement for the proposal is 25 spaces, comprising 17 spaces for residents and 8 spaces for resident visitors.

The development plans indicate 115 bicycle parking spaces will be provided, comprising 84 spaces for residents (i.e. 1 space per apartment) and 31 spaces for visitors to the site, which far exceeds the statutory requirement.

Further to the above, 15 of the stacked bicycle spaces will be provided at-grade, which in addition to the 6 at-grade spaces in the resident compound and 10 at-grade spaces provided adjacent to the site access points forms a total at-grade provision of 31 spaces.

This represents (31 / 115) 27% of the total bicycle parking supply, which exceeds the minimum requirement for 20% of bicycle parking spaces to be provided at-grade as required by the Australian Standard (AS2890.3:2015).

7 Car Parking Considerations

7.1 Statutory Car Parking Requirement

Clause 52.06-5 of the Greater Geelong Planning Scheme outlines car parking requirement rates for a variety of different land uses, which are summarised for the subject proposal at Table 7-1, below.

Table 7-1 Planning Scheme Car Parking Requirement

Land Use		Yield	Car Parking Requirement	Parking Requirement
Dwellings	Resident	66	1 space to each one or two bedroom dwelling, plus	66 spaces
		18	2 spaces to each three or more bedroom dwelling (with studies or studios that are separate rooms counted as bedrooms)	36 spaces
	Visitor	84	1 space for visitors to every 5 dwellings for developments of 5 dwellings or more.	16 spaces
Shop		77.8m^2	4 spaces to each 100m^2 of leasable floor area	3 spaces
Office		34.7 m^2	3.5 spaces to each 100m^2 of net floor area	1 spaces
Marina Berths		As per Condition 16 of the endorsed permit		32 spaces
Total				**154 spaces**

Based on the above, the subject proposal has a statutory requirement to provide 154 spaces.

The architectural plans indicate the following with regard to the allocation of parking spaces at the site:

- 102 spaces will be provided for residents in accordance with the above requirements / allocations. Spaces provided in a tandem arrangement will be allocated in pairs to the 3-bedroom dwellings;
- 32 spaces will be provided for use by the public marina berths in accordance with the Condition 16 of the endorsed scheme; These spaces will be shared for resident visitor use to satisfy the above resident visitor parking requirement;
- 1 space will be provided for the marina office as per the above requirement; and
- 1 space will be provided for the tenancy at the south-east of the site for staff use.

Based on the above, the resident, marina office and marina berth car parking requirements are all met and resident visitors spaces are to be shared with marina berth spaces. In addition, a waiver of two (2) spaces associated with the tenancy land use at the south-eastern corner of the site is sought.

Section 3.1.1 of this report indicates that the approved development of Stages 1 to 4 at Balmoral Quay will provide 2 on-street car parking spaces surplus to statutory requirements.

Therefore, the overall car parking requirement across the full development of Stages 1 to 5 at Balmoral Quay is satisfied.

8 Traffic Considerations

8.1 Traffic Generation

8.1.1 Residential Traffic Generation

The Roads and Maritime Service (RMS) of NSW *Guide to Traffic Generating Developments* document (commonly known as the 'RTA Guide') suggests the following trip generation rates for medium density residential as follows:

> 4.0 to 5.0 movements per dwelling for smaller flats and units (i.e. up to two bedrooms); and

> 5.0 to 6.5 movements per dwelling for larger units and townhouses (i.e. with three or more bedrooms).

For the purposes of assessment, a rate of 4.0 movements per dwelling will be adopted for the 1-bedroom dwellings, 5.0 movements per dwelling for the 2-bedroom dwellings, and 6.0 movements per dwelling for the 3-bedroom dwellings. Daily traffic is assumed to be split 50% inbound and 50% outbound throughout the course of a day.

Peak hour traffic typically accounts for around 10% of the daily traffic volume, with directional distributions during the peak commuter periods generally adopted as follows:

> AM Peak 80% Outbound / 20% inbound

> PM Peak 40% Outbound / 60% Inbound

Based on the above, the residential component of the development is anticipated to generate the traffic volume forecast at Table 8-1, below.

Table 8-1 Residential Trip Generation

Apartments	Daily			AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total	In	Out	Total
1-Bedroom	72	72	144	3	11	14	8	6	14
2-Bedroom	75	75	150	3	12	15	9	6	15
3-Bedroom	54	54	108	2	9	11	7	4	11
Total	***201***	***201***	***402***	***8***	***32***	***40***	***24***	***16***	***40***

8.1.2 Marina Berths and Marina Office Traffic Generation

A total of 32 spaces are proposed to be allocated to the marina berths, which will lease the spaces to boat owners in combination with a marina berth. The marina berth spaces are to be shared with resident visitors. However, there is generally more residential visitors activity during the evenings and weekends, outside of normal business, and thus have not been considered in the peak period traffic analysis.

One (1) space has been allocated to the marina office for staff use.

For the purposes of assessment, the following assumptions have been made:

> 50% boat owners would like to access their boat over the course of a typical weekday; of these, 25% are returning from boating activities to collect their car and 25% are arriving to park their vehicle during each peak period. Based on a maximum of 32 marina berths this equates to 4 inbound and 4 outbound movements during each peak period);

> One (1) staff member is employed at the office, whom will generate 1 inbound movement during the morning peak and 1 outbound movement during the afternoon peak;

Based on the above, the marina is estimated to generate in the order of 5 inbound and 4 outbound movements during the AM peak period, and 4 inbound and 5 outbound movements during the PM peak period.

8.1.3 Shop Traffic Generation

Given the location of the site, a large proportion of the shop trade is likely to be generated by people who live or work in the area rather than be a stand-alone attraction to the area. These customers will have either walked to the site or already arrived to the area and will not generate an additional car parking demand.

It is assumed that the one (1) space allocated to the shop for staff use will generate an inbound movement during the AM peak period and an outbound movement during the PM peak period.

8.1.4 Combined Traffic Generation

Based on the preceding sections, the subject proposal is estimated to generate the overall traffic volume summarised at Table 8-2, below.

Table 8-2 Overall Traffic Generation Estimate

Land Use	Daily			AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total	In	Out	Total
Apartments	201	301	402	8	32	40	24	16	40
Marina	17	17	34	5	4	9	4	5	9
Shop	1	1	2	1	0	1	0	1	1
Total	***219***	***219***	***438***	***14***	***36***	***50***	***28***	***22***	***50***

The subject proposal is estimated to generate in the order of 50 vehicle movements during each of the peak commuter periods, which equates to less than 1 vehicle movement (inbound and outbound combined) per minute.

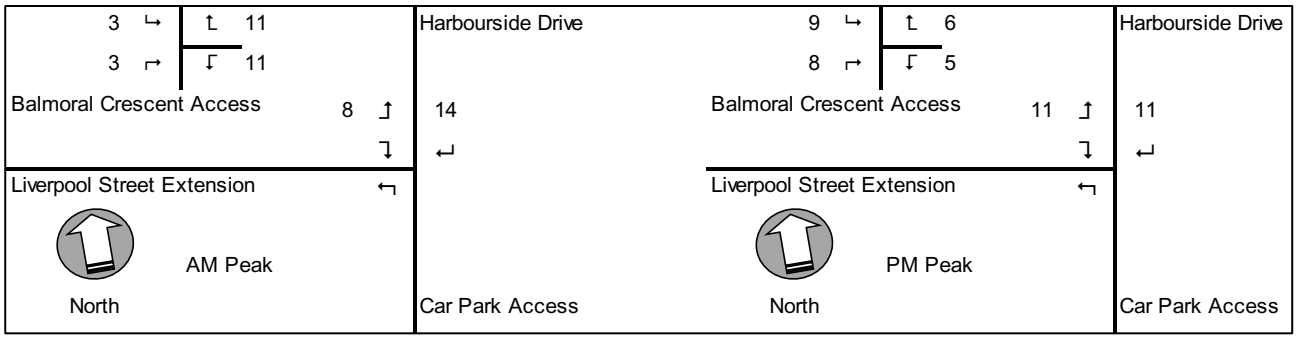
This is considered relatively low in a traffic engineering context.

8.2 Traffic Distribution

The development plans indicate that 71 of the 102 resident car parking spaces (70%) will be accessed from Balmoral Crescent. The remaining 30% will be accessed from Harbourside Drive.

Given the above, and on the assumption that traffic generated to/from the Balmoral Crescent access will be evenly distributed to the north and south, the additional traffic generated by the site is estimated at Figure 8-1, below.

Figure 8-1 Projected Peak Hour Post Development Turning Volumes (Stage 5)



8.3 Traffic Impact

The additional traffic generated by the Stage 5 development has been added to the base case traffic scenario presented at Section 3.1.4 to assess the impact of site generated traffic on the intersection of the Liverpool Street extension, car park and subject site access.

These results are presented for comparison with the base case scenario at Table 8-3, below.

Table 8-3 SIDRA Intersection Analysis Summary

Time Period	Approach	Base Case (Post Stages 1 - 4)			Post-Development		
		Degree of Saturation	Average Delay	95th%ile Queue	Degree of Saturation	Average Delay	95th%ile Queue
AM Peak Hour	Car Park Access (SE)	0.02	2 *s*	0 *m*	0.02	2 *s*	0 *m*
	Development Access (NE)	0.04	5 *s*	1 *m*	0.05	5 *s*	1 *m*
	Liverpool Street Extension (W)	0.03	5 *s*	1 *m*	0.03	5 *s*	1 *m*
PM Peak Hour	Car Park Access (SE)	0.02	2 *s*	0 *m*	0.02	2 *s*	0 *m*
	Development Access (NE)	0.02	5 *s*	1 *m*	0.03	5 *s*	1 *m*
	Liverpool Street Extension (W)	0.04	5 *s*	1 *m*	0.05	5 *s*	1 *m*

The above table indicates that the additional traffic generated by the proposed development of Stage 5 at Balmoral Quay will have no discernible impacts on the forecast traffic conditions at the site once Stages 1 to 4 have been constructed.

The intersection of Harbourside Drive and the public car park at the Liverpool Street extension will continue to operate well below capacity, with minimal delays and queue lengths.

Similarly, the 14 to 15 vehicle movements likely to be generated to / from the north along Balmoral Crescent during each peak period will have no capacity, safety or amenity related impacts on the surrounding road network.

9 Conclusions

Balmoral Quay Pty. Ltd. is proposing to construct a six storey mixed-use building on the land identified as 'Stage 5' to the west of the constructed Balmoral Quay Masterplan Area. The development will comprise 84 apartments, a marina office and small retail tenancy at the south-eastern corner of the site.

Based on the preceding analysis, it is concluded that:

> The subject proposal generates a statutory car parking requirement for 154 spaces:
  - On-site car parking for residents and the marina office is provided in accordance with the statutory car parking requirement rates outlined at Clause 52.06 of the Greater Geelong Planning Scheme;
  - On-site car parking for the publicly available marina berths at Balmoral Quay (32 no.) is provided in accordance with Condition 16 of the previously endorsed scheme for the site;
  - The marina berth spaces are to be shared with residential visitors;
  - The shop land use is seeking a reduction of 2 spaces against statutory requirements, which is considered appropriate given the approved development of Stages 1 to 4 at the site are to provide 2 on-street car parking spaces surplus to statutory requirements to satisfy this demand.

> The car park layout and access arrangements are designed in accordance with Clause 52.06 of the Greater Geelong Planning Scheme and the Australian Standard for Off-Street Car Parking (AS2890.1:2004) where applicable; and

> The traffic volume likely to be generated by the site is considered low in a traffic engineering context. The intersection of Harbourside Drive and the public car park at the Liverpool Street extension will continue to operate well below capacity with minimal delays and queue lengths, and the additional traffic likely to be generated along Balmoral Crescent will have no capacity, safety or amenity related impacts on the surrounding road network.

Balmoral Quay Residential Development Stage 5 - Liverpool Street, Rippleside

APPENDIX A

STAGE 5 LAYOUT PLANS

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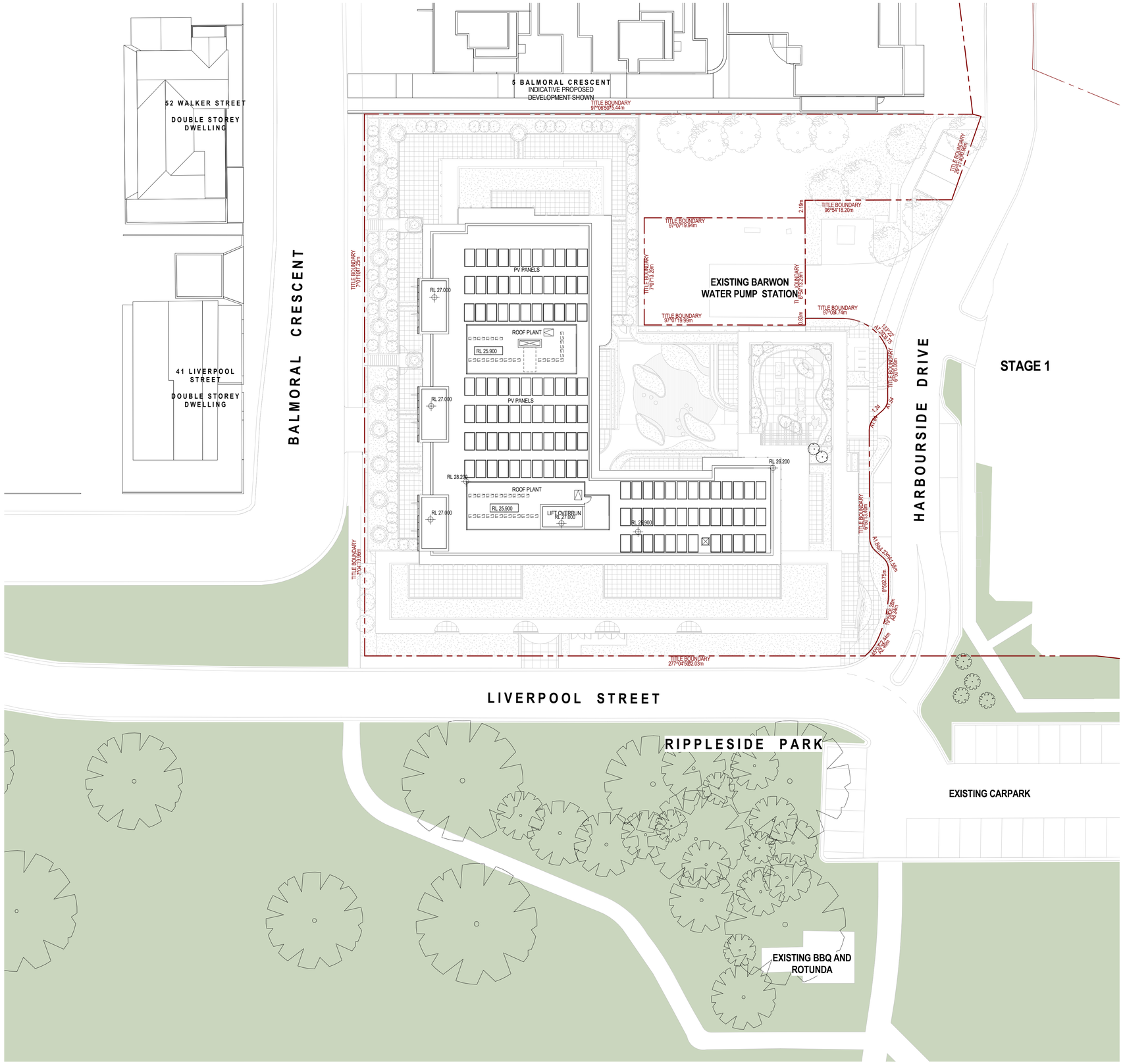

ISSUE FOR COORDINATION
30.06.22

TOWN PLANNING

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BALMORAL QUAY PTY LTD
LIVERPOOL STREET, RIPPLESIDE

Job No.
21511

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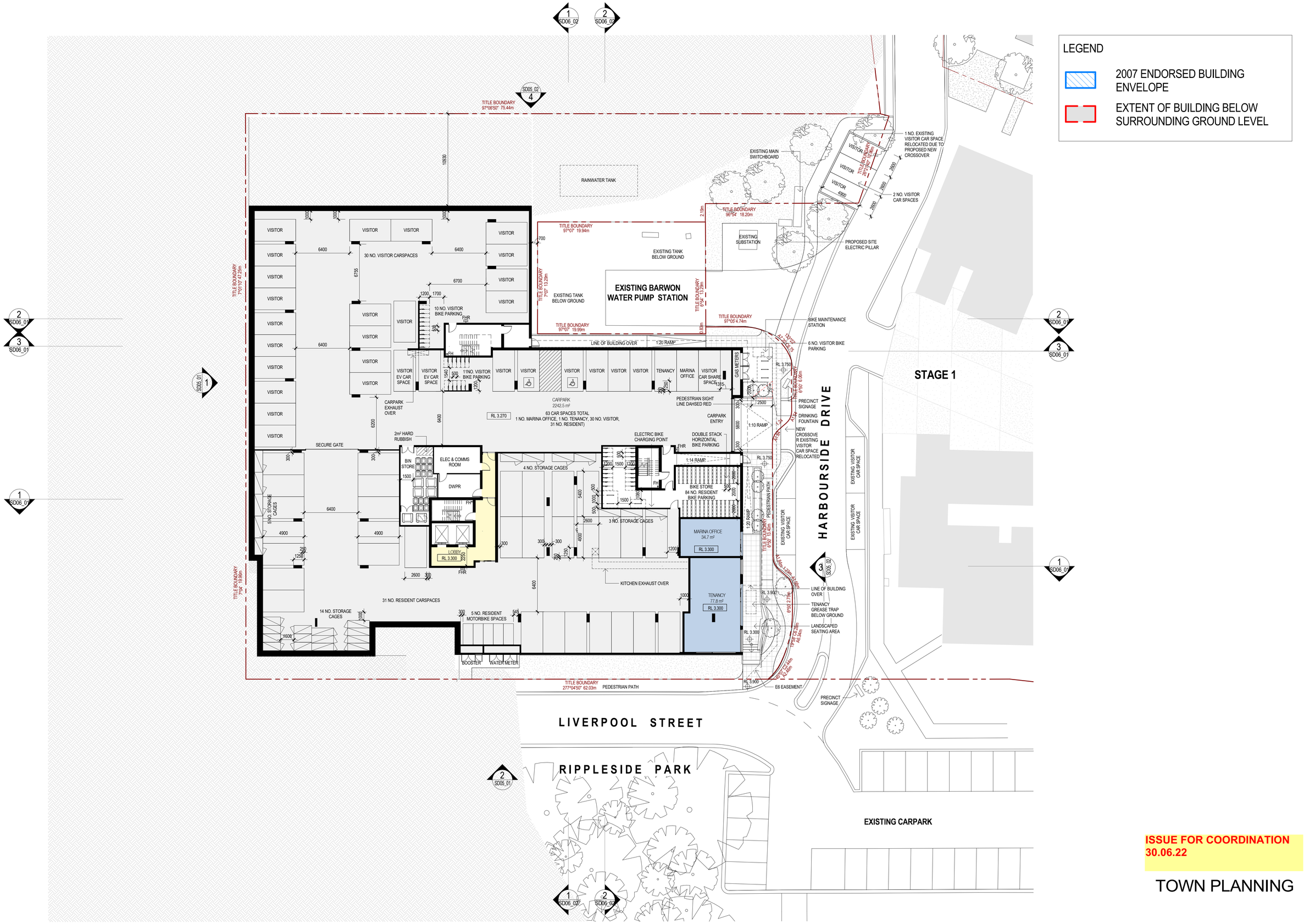
Drawin
SD01_02
PROPOSED SITE PLAN

Revisio
[4] TOWN PLANNING ISSUE
04.05.21

Draw
SB
Chk
KB

SJB Architects
Level 5, 18 Oliver Lane, Melbourne VIC 3000
T. 61 3 9699 6688 sjb.com.au
SJB Architecture Pty Ltd
ABN 68 065 207 490 ACN 065 207 490



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BALMORAL QUAY PTY LTD
LIVERPOOL STREET, RIPPLESIDE

Job No.
21511

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Drawin
SD02_01
LOWER GROUND LEVEL PLAN

Revisio
[12] TOWN PLANNING RFI
23.11.21

Draw
SB
Chk
KB

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30.06.22

TOWN PLANNING

Projec BALMORAL QUAY PTY LTD LIVERPOOL STREET, RIPPLESIDE	Job No. 21511	Scal 1 : 200 @A1 0 2 4 6 8 10 20	Drawin SD02_02 GROUND LEVEL PLAN	Revisio [12] TOWN PLANNING RFI 23.11.21	Draw SB Chk KB	SJB Architects Level 5, 18 Oliver Lane, Melbourne VIC 3000 T. 61 3 9699 6688 sjb.com.au SJB Architecture Pty Ltd ABN 68 065 207 490 ACN 065 207 490

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ISSUE FOR COORDINATION 30.06.22

TOWN PLANNING

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Balmoral Quay Residential Development Stage 5 - Liverpool Street, Rippleside

APPENDIX B

SWEPT PATH DIAGRAMS

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BALMORAL CRESCENT

SUBJECT SITE:
BALMORAL QUAY
LEVEL 1

HARBOURSIDE DRIVE

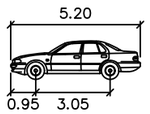
LIVERPOOL STREET

B99 CAR SWEPT PATH
(0.3m CLEARANCE SHOWN)

N

MELWAY MAP REF 422 B10

DESIGN VEHICLE



B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9

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BALMORAL QUAY PTY LTD
BALMORAL QUAY DEVELOPMENTS
43 LIVERPOOL STREET, RIPPLESIDE
STAGE 5 - LEVEL 1
B99 CAR SWEPT PATH ANALYSIS

Drawn/Check	Date	Scale	Size
EK / VO	04.07.2022	1:250	A3

Drawing Number	Revision
V162228-TR-SK-0041	1

B99 CAR SWEPT PATH
(0.3m CLEARANCE SHOWN)

SUBJECT SITE:
BALMORAL QUAY
GROUND LEVEL

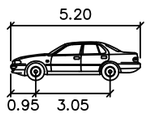
HARBOURSIDE DRIVE

LIVERPOOL STREET

N

MELWAY MAP REF 422 B10

DESIGN VEHICLE



B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9

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BALMORAL QUAY PTY LTD
BALMORAL QUAY DEVELOPMENTS
43 LIVERPOOL STREET, RIPPLESIDE
STAGE 5 - GROUND LEVEL
B99 CAR SWEPT PATH ANALYSIS

Drawn/Check	Date	Scale	Size
EK / VO	04.07.2022	1:250	A3

Drawing Number	Revision
V162228-TR-SK-0042	1

HARBOURSIDE DRIVE

SUBJECT SITE:
BALMORAL QUAY
LOWER GROUND LEVEL

6.4m WASTE WISE MINI GARBAGE TRUCK
INGRESS SWEPT PATH (TYP.)
(0.6m CLEARANCE SHOWN)

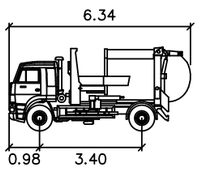
6.4m WASTE WISE MINI GARBAGE TRUCK
EGRESS SWEPT PATH (TYP.)
(0.6m CLEARANCE SHOWN)

LIVERPOOL STREET

N

MELWAY MAP REF 422 B10

DESIGN VEHICLE



Waste Wise Mini (Hino 616 IFS)

meters

Width	: 1.85
Track	: 1.85
Lock to Lock Time	: 6.0
Steering Angle	: 38.3

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BALMORAL QUAY PTY LTD
BALMORAL QUAY DEVELOPMENTS
43 LIVERPOOL STREET, RIPPLESIDE
STAGE 5 - LOWER GROUND LEVEL
6.4m WASTE WISE MINI SWEPT PATH ANALYSIS

Drawn/Check	Date	Scale	Size
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Drawing Number: V162228-TR-SK-0043
Revision: 1