26 – 28 Shepherd Street, Liverpool

Traffic Report

Revision 1
21 December 2016

Prepared by: **Anne Coutts**
Director, InRoads Group
BE Civil, MIEAust

InRoads Group
www.inroadsgroup.com.au
PO Box 596 | Potts Point NSW 1335
02 8035 3417
ABN: 25 608 559 897
ACN: 608 559 897

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Appendices

1.0 Introduction

InRoads Group was engaged to undertake a Traffic Impact Assessment for a residential development to be located at 26 – 28 Shepherd Street, Liverpool. The proposed development comprises a 14-storey building on the site at 26 Shepherd Street comprising 82 residential apartments, and a development of up to 21-storeys on the site at 28 Shepherd Street, comprising 290 residential apartments. The overall development therefore proposes a total of 372 residential apartments.

A development application was previously lodged for a residential building comprising 144 apartments on 28 Shepherd Street (i.e. part of the subject site). This application is yet to be determined by the Joint Regional Planning Panel.

The current proposal increases the yield on 28 Shepherd Street from 144 apartments to 290 apartments, and extends the subject site to include 26 Shepherd Street, providing an additional 82 apartments on this site. The current proposal is generally consistent with the previous scheme in terms of overall traffic access, servicing, and circulation principles, with the exception of additional on-site parking in order to cater for the additional apartments now proposed.

Further, it should be noted that a Planning Proposal for increased density on the R4 site (permitting the delivery of up to 375 apartments on 26 – 28 Shepherd Street) was endorsed by Liverpool City Council at a meeting held on 29 June 2016 (Item No: DPG 03, File No: 145171.2016, Shepherd Street Precinct Planning Proposal). The current proposal is therefore consistent with the intended development outcomes under that Planning Proposal, with respect to the subject site.

The following sections of this report document the results and findings of our investigations for the purpose of a development application over the subject site, addressing the following key traffic design elements and issues surrounding the proposed development:

- Vehicular access arrangements;
- On-site car parking provision;
- Service vehicle requirements; and
- The traffic impacts anticipated as a result of the development.

2.0 Context

2.1 Subject Site and Relevant Planning Context

The subject site is located at 26 - 28 Shepherd Street, Liverpool, on the eastern side of Shepherd Street, as shown in **Figure 1** below. The site is described as Lot 22 and 23 on DP859055, and is approximately 8,681m^2 in area.

The site has frontage to Shepherd Street to the west, and adjoins the Georges River to the east, a new mixed-use development to the north which is currently under construction on the site at 20 Shepherd Street, and an existing industrial development to the south.

26 Shepherd Street currently accommodates J & J Towing, and the site is currently used for the purpose of vehicle storage. Vehicular access to this site is provided by way of a crossover located towards the southern site boundary.

28 Shepherd Street currently accommodates a disused industrial building, and vehicular access to this site is provided by way of a crossover located towards the southern site boundary.

Figure 1a: Subject Site

The site is zoned R4 – High Density Residential under the Liverpool Local Environmental Plan 2008. It is located within the Liverpool City Centre as identified by the Department of Planning and Environment in the Sydney Metropolitan Strategy, and the development has therefore been assessed under the relevant traffic controls as outlined in the Liverpool Development Control Plan 2008, within Part 1 - General Controls for all Development, and Part 4 - Development in Liverpool City Centre.

At a regional level, the site is located approximately 800 metres south of Liverpool Railway Station, and 1.2 kilometres south of the centre of Liverpool. It is located approximately 27 kilometres southwest of the Sydney CBD.

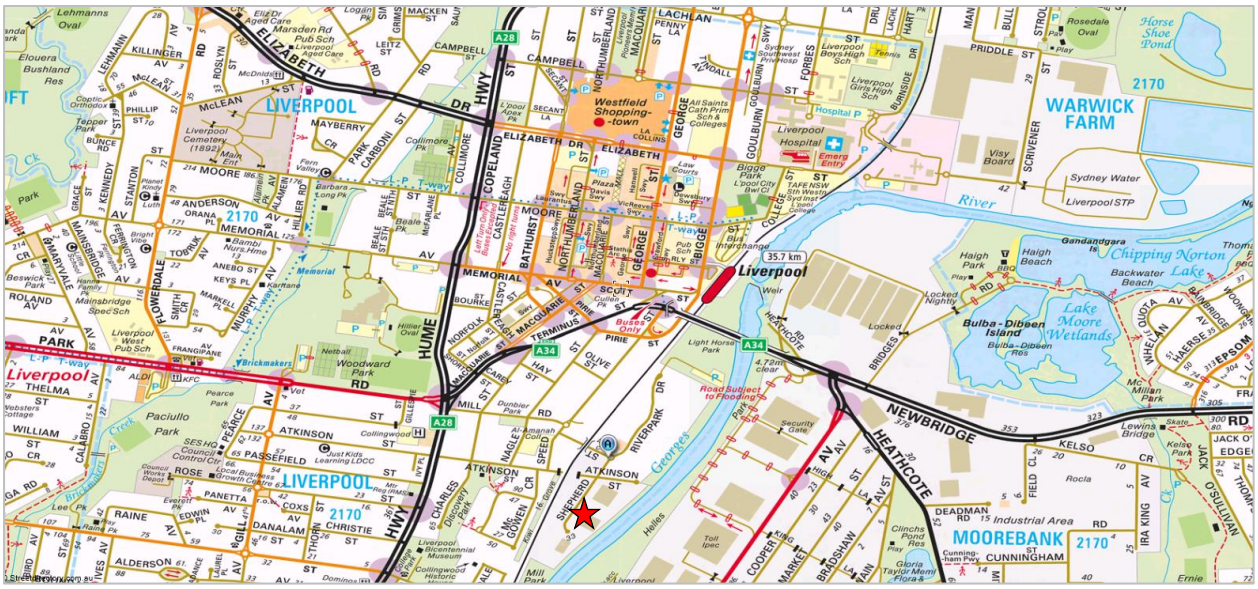


Figure 1b: Site Location

2.2 Road Network

The road in the immediate vicinity of the site can be described as follows.

Shepherd Street is a local road that connects from Speed Street to the north-west (via a rail underpass), to Powerhouse Road to the south (which provides access to the Casula Powerhouse). The subject site has frontage to Shepherd Street, which has a two-way, two-lane undivided cross-section, and accommodates kerbside parking on both sides clear of intersections and driveways. Shepherd Street has a pavement width of approximately 12.8m along the frontage of the site, and as a local road in a built-up area, has a speed limit of 50km/hr.

Figure 2.2a: Shepherd Street, looking north towards Atkinson Street

Atkinson Street is a local road that runs in an east-west direction to the north of the site, connecting to Shepherd Street. Atkinson Street has a two-way, two-lane undivided cross-section, and accommodates kerbside parking on both sides, clear of intersections and driveways. It has a pavement width of approximately 7.5m along the frontage of the site, and as a local road in a built up area, has a speed limit of 50km/hr. Atkinson Street terminates in a partially constructed cul de sac at its eastern end, just prior to the Georges River, and also terminates approximately 70m to the west of Shepherd Street, just prior to the rail line. It therefore functions as a local access road only.

Figure 2.2b: Atkinson Street, looking east from Shepherd Street

Riverpark Drive is a local road that generally runs in a north-south direction from Shepherd Street to the north of the site, terminating approximately 500m to the north of this intersection at Lighthorse Park. Riverpark Drive has a two-way, two-lane undivided cross-section, and accommodates kerbside parking on both sides, clear of intersections and driveways. It has a pavement width of approximately 10.5m, and as a local road in a built up area, has a speed limit of 50km/hr.

Figure 2.2c: Riverpark Drive, looking north from Shepherd Street roundabout

2.3 Key Intersections

The key intersections which are used to access the subject site include the Atkinson Street / Shepherd Street intersection (which is a four-way priority-controlled intersection as shown in **Figure 2.3a** below) and the Shepherd Street / Riverpark Drive roundabout (see **Figure 2.3b** below). The operation of, and the expected impact of the proposed development upon these intersections, is discussed further in the following sections.

Figure 2.3a: Atkinson Street / Shepherd Street Intersection

Figure 2.3b: Shepherd Street / Riverpark Drive Roundabout

2.4 Location, Public and Active Transport

As previously discussed, the subject site is located within the Liverpool City Centre as identified by the Department of Planning and Environment in the Sydney Metropolitan Strategy.

It is approximately a 17 – 18 minute walk from the Liverpool city retail centre (north of Moore Street), a 13 - 14 minute walk from the adjacent commercial area (north of Memorial Avenue), and a 20 minute walk from the education and medical precinct. It therefore benefits from convenient access to existing services and facilities in the city centre, including employment and education nodes, which are within walking distance from the area.

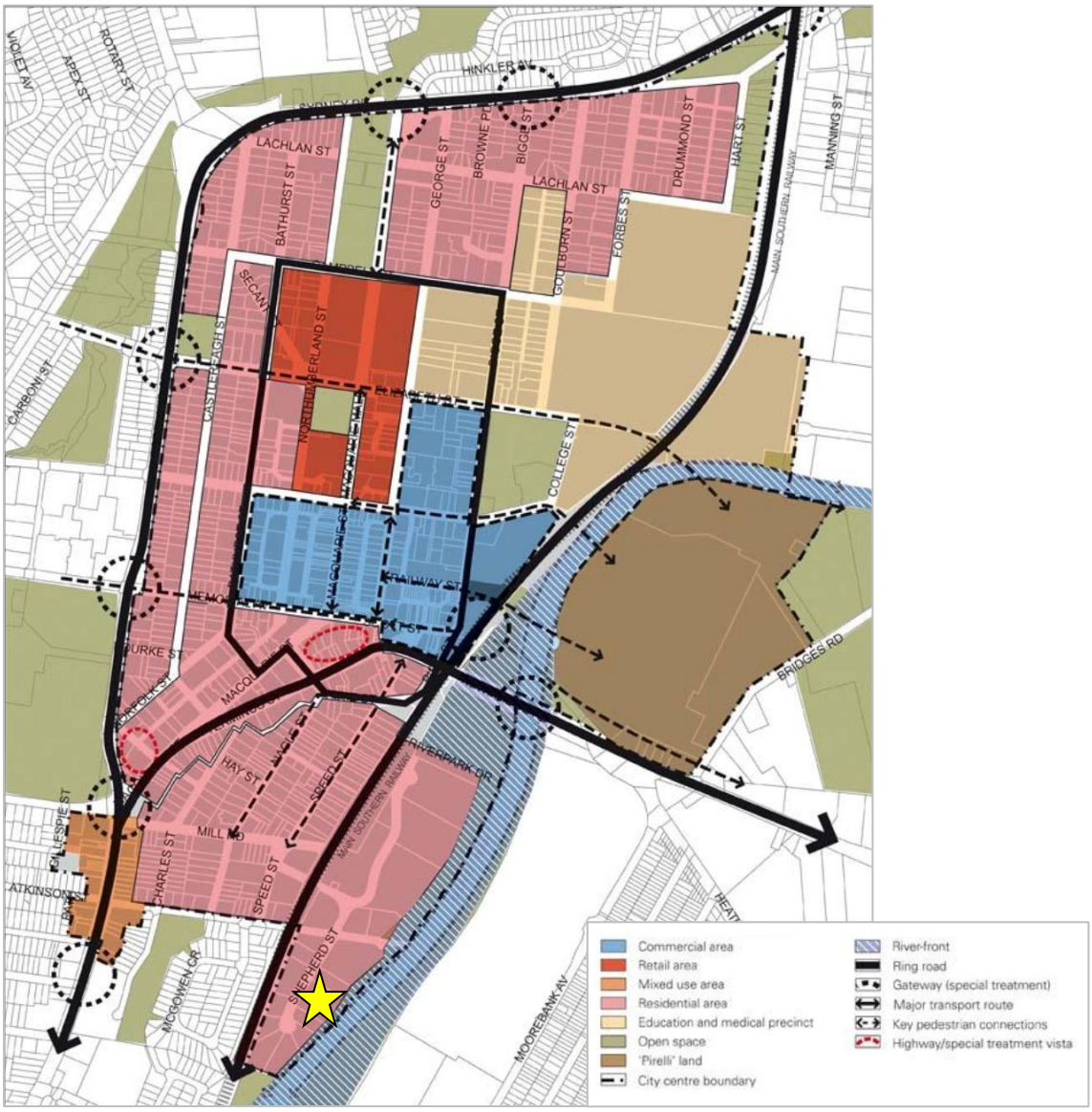


Figure 2.4: Site Location relative to Key CBD Areas (extract from Liverpool City Centre DCP)

2.4.1 Rail

The site is located approximately 1.1km (i.e. a 14 minute walk) from Liverpool Railway Station, with commuters benefiting from six CityRail lines passing through the station. These include:

- The Inner West (T2) line, which connects from Liverpool to Sydney City via Regents Park
- The South (T2) line, which connects from Macarthur to the City via Granville
- The Airport/East Hills (T2) line, which connects from Macarthur to the City via the International and Domestic Airports
- The Bankstown line (T3), which connects from Liverpool to the City via Bankstown
- The Cumberland (T5) line, which connects from Campbelltown to Blacktown
- The Southern Highlands line, which connects from Goulburn to Central and stops at Liverpool station.

Rail services from Liverpool Station run at a high frequency of approximately 19-20 services per hour in the morning peak period, and 14-15 services per hour in the afternoon peak period.

Figure 2.4.1: Sydney Rail Network

2.4.2 Bus

The bus interchange immediately to the north of Liverpool Rail Station is convenient to (i.e. an 18-minute walk from) the site, via footpaths on Shepherd Street, Riverpark Drive, and a dedicated walk/cycle path through Lighthorse Park (discussed further in the following sections).

The Liverpool bus interchange is a major interchange which is serviced by a considerable number of services travelling to key destinations throughout Sydney including Bankstown, Burwood, Cabramatta, Parramatta, Campbelltown, and Sydney CBD.

The interchange is also serviced by the Liverpool–Parramatta bus transit-way (T-way), which is a dedicated 20km bus priority transport route linking the two major centres via the industrial areas of Wetherill Park and Smithfield.

There are additional bus stops in walking distance of the site on the Hume Highway, as shown in **Figure 2.4.2** below.

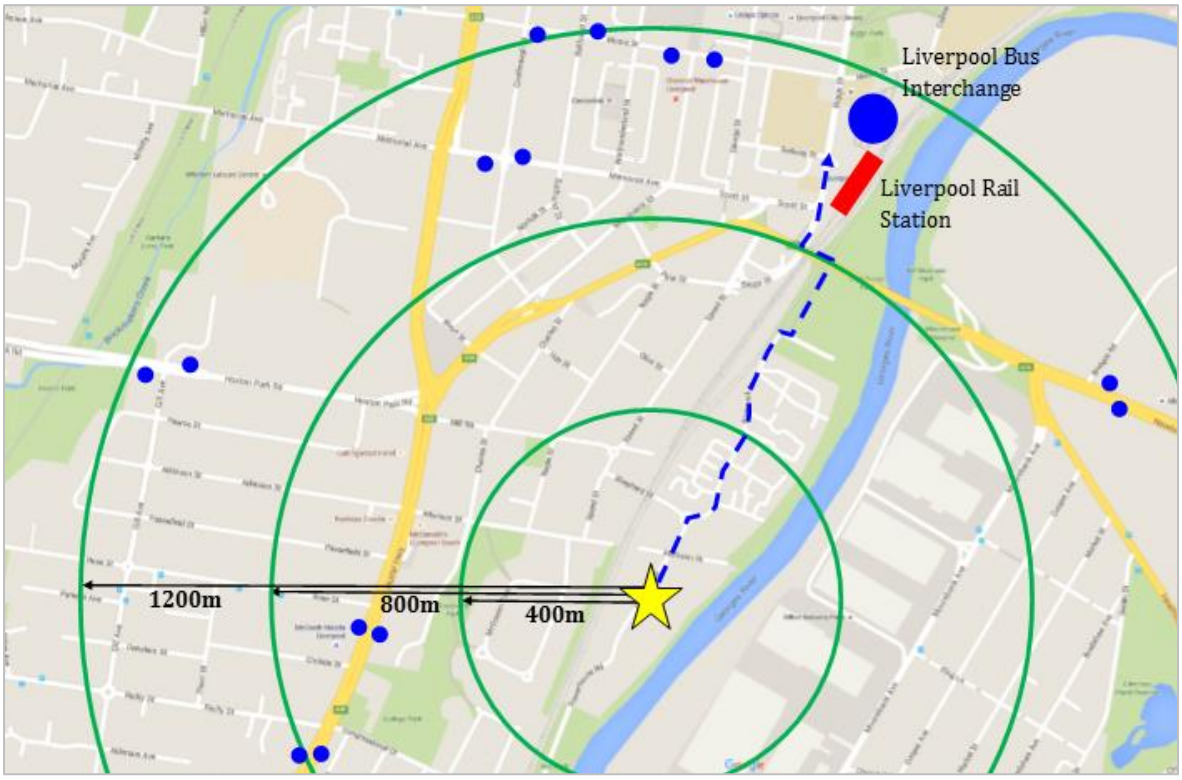


Figure 2.4.2: Key Bus Stops and Bus Interchange, within proximity to site

Overall, the site will benefit from convenient access to frequent public transport (bus and rail) services, as well as close proximity to a number of key attractions, destinations, and employment and education nodes.

2.4.3 Pedestrian and Cyclist Facilities

The key pedestrian / cycle links which service the site include:

- The off-road pedestrian / cycle path which travels the full length of Shepherd Street (western and southern side), and then continues to the north on the eastern side of Speed Street, towards the city centre. This is a high-standard shared path of approximately 3m width (see **Figure 2.4.3a** and **Figure 2.4.3b** below).
- The pathway connecting from the northern end of Riverpark Drive, through Lighthorse Park to Newbridge Road (see **Figure 2.4.3c** and **Figure 2.4.3d** below), providing direct access from Shepherd Street to the city centre as well as Liverpool Train Station and Bus intersection via Riverpark Drive (which has a footpath on the western side for half of its length, and a footpath on its eastern side for its full length).

Figure 3.4.3a: Shared Path (Speed Street)

Figure 3.4.3b: Shared Path (Shepherd Street)

Figure 3.4.3c: Pathway (Lighthorse Park)

Figure 3.4.3d: Pathway (Lighthorse Park)

2.5 Existing Travel Behaviour

Journey to Work data published by the NSW Government Bureau of Transport Statistics has been interrogated, in order to understand current resident travel behaviour in the area surrounding the site.

Figure 2.5a below shows the mode share for travel to work for residents who live in the areas immediately surrounding the site, and **Figure 2.5b** below shows the mode share for travel to work for residents who live in the city centre i.e. closer to the where key attractions, destinations, and employment and education nodes are concentrated, as well as Liverpool Train Station and Bus Interchange.

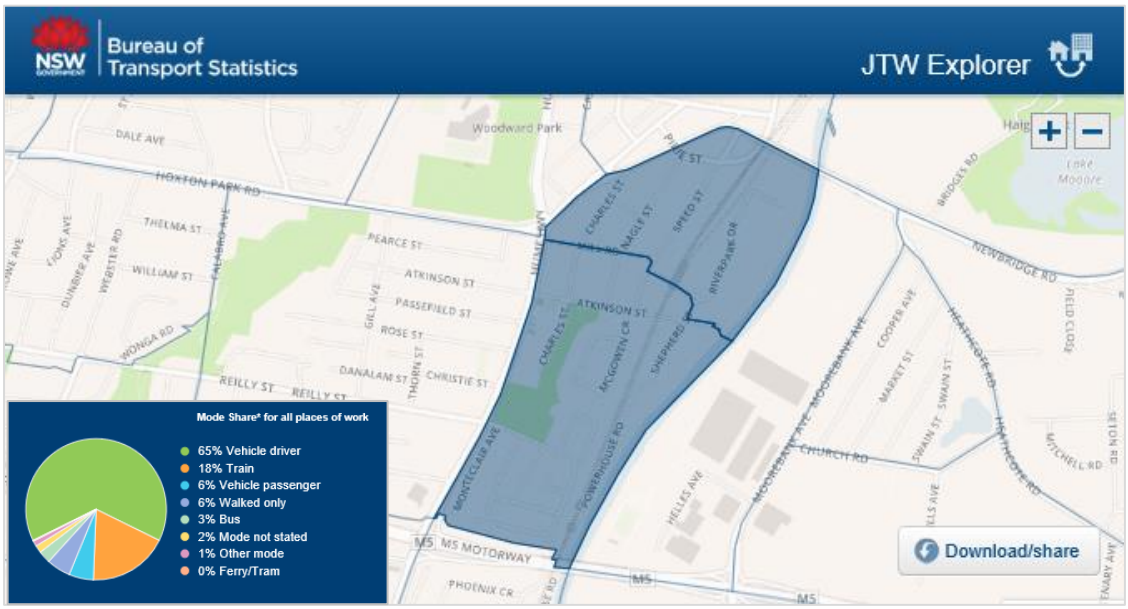


Figure 2.5a: Current Journey to Work Mode Share, Area Surrounding Subject Site

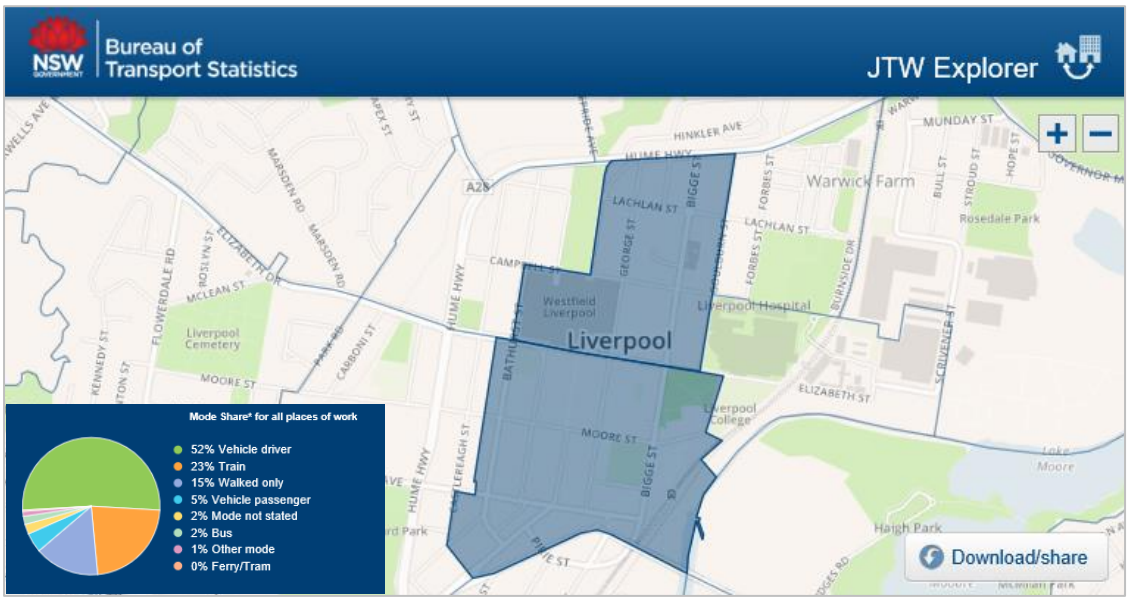


Figure 2.5b: Current Journey to Work Mode Share, Liverpool City Centre

The data in the figures above is summarised in the table below.

Table 3.5: Current Mode Share

Area	Drive (driver / passenger)	Walk	Train	Bus
Vicinity of Site (Travel Zone 3845 and 3847)	71%	6%	18%	3%
Liverpool City Centre (Travel Zone 3843 and 3839)	57%	15%	23%	2%

The mode share information in the table above suggests the following:

- Whilst the residents in the Liverpool City Centre are much closer to the Liverpool Train Station, the proportion of residents travelling to work by train is not substantially higher than that for those in the vicinity of the site, suggesting that the distance to walk from home to the train station is not a significant deterrent to travel by train for those who live in the vicinity of the site; and
- Whilst the residents in the Liverpool City Centre are much closer to the Liverpool Bus Interchange (as well as a number of additional bus stops in the city centre), the proportion of residents travelling to work by bus is marginally lower than that for those in the vicinity of the site, suggesting that the distance to walk from home to the bus interchange is not a deterrent to travel by bus for those who live in the vicinity of the site.

In summary, it would appear that there is the potential for a substantial proportion of future residents of the proposed development to travel to/from work by public transport.

3.0 Proposal

This application seeks approval for the following:

- a 14-storey building on the site at 26 Shepherd Street comprising 82 residential apartments, including:
    - 28 one-bedroom apartments
    - 52 two-bedroom apartments
    - 2 three-bedroom apartments
- a development of up to 21-storeys on the site at 28 Shepherd Street, comprising 290 residential apartments, including:
    - 2 studio apartments
    - 103 one-bedroom apartments
    - 178 two-bedroom apartments
    - 7 three-bedroom apartments
- A consolidated basement car park accessed via a driveway adjacent to the southern boundary of 28 Shepherd Street, providing on-site parking for 422 cars and 22 motorcycles over three (3) basement levels.

Whilst the developments on 26 and 28 Shepherd Street are the subject of two separate applications, the traffic design and implications of each are interrelated and have therefore been considered in a consolidated manner, with the results outlined in this report.

Architectural plans of the proposed have been prepared by Woods Bagot Architects, and the relevant plans are included as **Appendix A**.

These plans have been developed based upon the requirements of Council's Development Control Plan (DCP) and the relevant Australian Standards, as discussed in the following sections.

3.1 Vehicle Access

Consistent with the application previously lodged over 28 Shepherd Street, access is proposed via a driveway onto Shepherd Street located adjacent to the southern site boundary. This is shown in the ground floor plan included in **Appendix A**, and the extract from the ground floor plan provided as **Figure 3.1** below.

Given Shepherd Street terminates to the south of the subject site, it carries very low volumes of traffic. Furthermore, the movements at this driveway would essentially be limited to the left-in and right-out movements only. As such, and in order to minimise the impact of the driveway upon the Shepherd Street frontage, the driveway is shown at 5.5m width, which is adequate for two-way passenger vehicle flow, as well as access / egress by the appropriate design service vehicle (a refuse collection vehicle) as discussed in Section 3.6.

Provision is made for a 2.5m deep and 2.0m wide sight triangle adjacent to the exit side of the driveway in accordance with the requirements of AS2890.1, to ensure adequate visibility between an exiting vehicle and a pedestrian approaching the driveway from the south along the Shepherd Street footpath.

The gradient of the access does not exceed 1:20 for a distance of approximately 25m inside the Shepherd Street site boundary for pedestrian safety, and the change in grade at the access would ensure that sufficient vehicle underside clearance would be provided to limit vehicle underside scraping, in accordance with the requirements of AS2890.1 and AS2890.2.

The access driveway connects to an internal roadway which extends along the southern boundary of the site, providing access to the basement car park (approximately 15m from the Shepherd Street boundary) and to the loading / servicing area (approximately 40m from the Shepherd Street boundary), as shown in **Figure 3.1** below.

The proposed access arrangements are generally consistent with those proposed under the application for 28 Shepherd Street. They meet the requirements stipulated in AS2890.1 for separation from an intersection (i.e. 6m, measured from the kerbline tangent point), as well as Council's separation requirements as stipulated in the DCP (i.e. 10m from the perpendicular of any intersection of any two roads). The proposed access arrangements are therefore supportable from a traffic engineering perspective, subject to detailed design of the crossover which should be in accordance with Council's Standard Drawing R25. It is anticipated that this could reasonably be addressed as a condition of the consent, with refinement undertaken at detailed design stage (i.e. prior to the release of a Construction Certificate).

Figure 3.1: Proposed Access Arrangements

3.2 Car Parking Provision

The application of the parking rates in the Liverpool Development Control Plan 2008, Part 4 - Development in Liverpool City Centre provides the requirements as outlined in **Table 1** below.

Table 3.2: Parking Requirements based upon Council's DCP Parking Rates

Component of Development		Number of Apartments	DCP Parking Rate	Parking Requirement
26 Shepherd Street	Studio	0	0.5 spaces per apartment	0.0
	1-bedroom	28	1.0 spaces per apartment	28.0
	2-bedroom	52	1.0 spaces per apartment	52.0
	3-bedroom	2	1.5 spaces per apartment	3.0
	Residential Visitor	82	1.0 spaces per 10 apartments	8.2
	Sub-Total	**82**		**91.2**
28 Shepherd Street	Studio	2	0.5 spaces per apartment	1.0
	1-bedroom	103	1.0 spaces per apartment	103.0
	2-bedroom	178	1.0 spaces per apartment	178.0
	3-bedroom	7	1.5 spaces per apartment	10.5
	Residential Visitor	290	1.0 spaces per 10 apartments	29.0
	Sub-Total	**290**		**321.5**
	TOTAL	**372**		**412.7**

Under the provisions of Council's DCP, a total of 413 car parking spaces are therefore required to be provided.

As shown in the architectural plans included as **Appendix A**, a total of 422 car parking spaces are proposed, including 38 accessible parking spaces to service 38 accessible apartments, and an additional two (2) accessible parking spaces for visitors to the development.

The proposal therefore exceeds Council's DCP requirements in this regard, and in our view, strikes an appropriate balance between catering on-site for parking demand (minimising the potential for parking overspill into surrounding streets), and encouraging alternative and more sustainable modes of travel (e.g. public and active transport).

3.3 Bicycle Parking

The Liverpool Development Control Plan 2008 requires 1 bicycle space per 200m^2 gross floor area, with 15% of this requirement to be accessible to visitors.

The overall GFA of the proposed development is 31,432m^2, requiring a total of 158 bicycle parking spaces, with 24 of these to be available for visitor use, and the remaining 134 for residents.

As shown in the architectural plans included as **Appendix A**, there are several areas throughout the basement levels which could reasonably provide for bicycle parking, by way of bicycle racks or rails. Alternatively, or in addition, resident bicycles could be wall mounted at the front of parking spaces above the nose of the vehicle, as shown in **Figure 3.4** below. It is understood that this is becoming a more common arrangement in residential flat buildings and multi-unit dwelling developments.

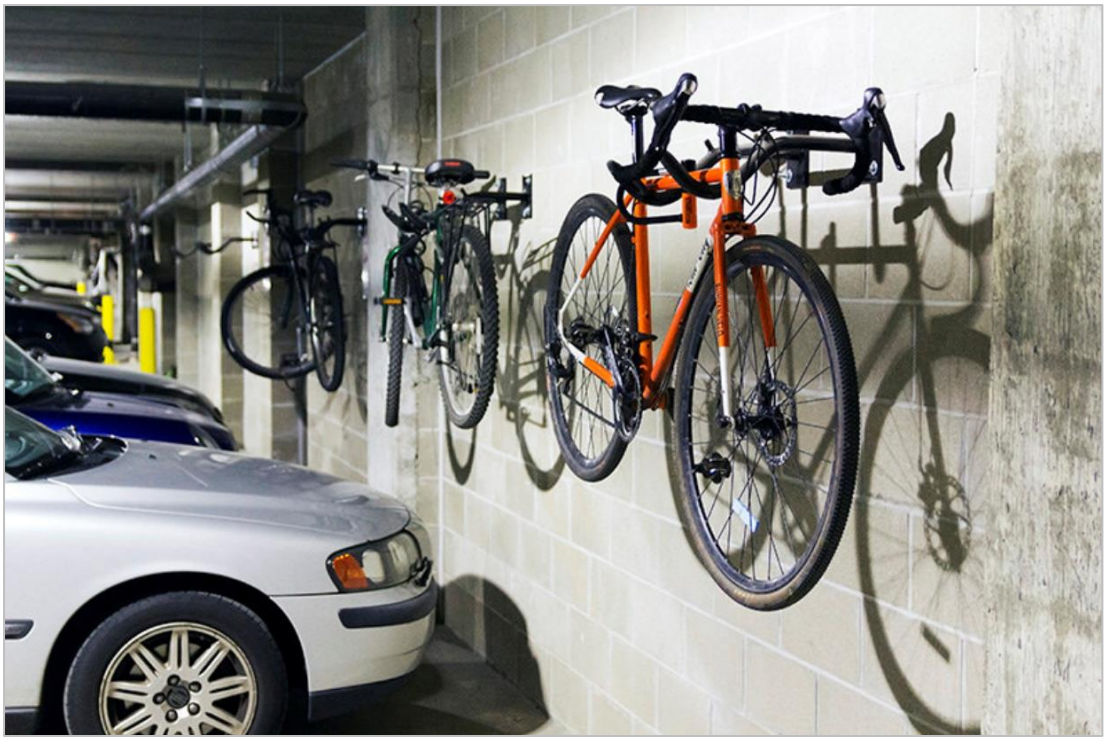


Figure 3.4: Example of Bicycle Parking Arrangement in Residential Flat Building

It is suggested that the 24 visitor bicycle parking spaces required could be provided for by way of three (3) bicycle racks on ground level, so as to be publicly accessible. Positioning these racks so as to provide double sided access would result in a capacity of up to 10 bicycles per rack, bringing the visitor bicycle parking capacity to 30 spaces.

It is considered that the detail of the bicycle parking arrangements could reasonably be addressed at detailed design stage (prior to the release of a Construction Certificate), in response to a suitable condition of consent.

3.4 Motorcycle Parking

The Liverpool Development Control Plan 2008 states that provision is to be made for motorcycle parking at the rate of 1 motorcycle space per 20 car spaces.

Given a total of 422 parking spaces are proposed, 22 motorcycle parking spaces are required based upon Council's DCP requirements.

As shown in the architectural plans included as **Appendix A**, a total of 22 motorcycle parking spaces are proposed in the basement car park, meeting Council's requirements in this regard.

3.5 Parking Layout and Geometric Design

The key elements of the car park layout can be summarised as follows:

- Car parking spaces have been designed to User Class 1A (low turnover) requirements for parking bays at 90°, with spaces 2.4 metres in width, 5.4 metres in length and with a minimum aisle width of 5.8 metres, in accordance with the requirements of AS2890.1.

- Accessible parking spaces are designed in accordance with AS2890.6 (i.e. 2.4m wide spaces with a 2.4m wide adjacent shared area), or Council's DCP (3.2m wide spaces). A minimum height clearance of 2.5m is to be provided over these parking spaces and the associated shared areas.
- Standard car parking spaces located adjacent to vertical obstructions greater than 150mm in height are provided with an additional width of 300mm, where these obstructions are outside the clearance envelope as identified Figure 5.2 of AS2890.1.
- Small car bays have minimum dimensions of 2.3m by 5.0m, as required under the provisions of AS2890.1;
- Minimum aisle extensions of 1.0m are provided at terminated aisles to accommodate manoeuvring to/from the end parking spaces, in accordance with the requirements of AS2890.1;
- Motorcycle parking spaces are 1.2m wide by 2.5m long, in accordance with AS2890.1 requirements.
- Ramp grades do not exceed 1:4 with transitions at 1:8, which meets the requirements of Australian Standards AS2890.1.
- Ramp widths are a minimum of 5.5m between kerbs (with additional clearances to walls), which meets the requirements of AS2890.1.

In summary, the internal site layout is efficient and legible, and designed generally in accordance with the requirements of the relevant Australian Standards. Notwithstanding this, it is envisaged that a standard condition of consent would be imposed requiring compliance with the relevant standards and as such any minor amendments considered necessary (if any) could be dealt with prior to the release of a Construction Certificate.

3.6 Servicing

Given the nature of the proposed development (i.e. primarily residential), the demand for service vehicles would be limited. With the exception of the occasional furniture removal / delivery vehicle or tradesman / courier, the only servicing requirement would be regular refuse collection.

As shown in the architectural plans included as **Appendix A**, a dedicated loading / servicing area is proposed on the ground level at the rear of the site (separated from access to/from the basement car park). This area would be capable of accommodating:

- to the north of the column located within the servicing area: refuse collection vehicles as well as other service vehicles (i.e. removalist or delivery vehicles) up to medium rigid vehicle (MRV) size (8.8m in length), and up to approximately 3.6m in height; and
- to the south of the column located within the servicing area: small rigid vehicles (SRV) and vans.

Swept path analyses have been undertaken to ensure that the largest vehicle expected to access the site (a 9.9m long refuse collection vehicle, in accordance with the specifications for a rear-loading vehicle in Council's *Implementation Note 2 : 2014 - Changes to Waste Management Services for residential flat buildings*) can be accommodated. The vehicle tracking diagram included as **Appendix B** demonstrates that a vehicle of this size would be able to enter the site from Shepherd Street, travel towards the servicing area using the internal roadway along the southern site boundary, reverse into the loading bay for servicing / refuse collection, and then exit the site in a forward gear.

In summary, the proposed servicing and refuse collection arrangements are considered appropriate given the nature and scale of the proposed development.

4.0 Traffic Impact Assessment

4.1 Adjacent Road Network

Traffic analyses were previously undertaken for a development scheme comprising a total of 169 residential apartments on the site at 28 Shepherd Street (refer to the Traffic Report which accompanied DA-612/2015).

These analyses focused on the Shepherd Street / Riverpark Drive roundabout as the critical intersection in proximity to the site. The results of the intersection modelling demonstrated that this roundabout was expected to operate well within acceptable capacity limits, at Level of Service A during both peak periods and with negligible queuing and delays, with the additional traffic expected to be generated by the previously proposed development.

The currently proposed development comprises a total of 372 apartments, i.e. an additional 203 apartments, compared with the scheme previously assessed.

The RMS Guide to Traffic Generating Developments provides a peak hour trip rate of 0.29 vehicle trips / dwelling for High density residential flat buildings in Metropolitan Sub-Regional Centres.

The application of this rate to the development now proposed provides a forecast traffic generation of:

- 108 vehicle movements in the peak hours (total); and
- An additional 59 vehicle movements in the peak hours, compared with the previously assessed scheme.

This equates to less than one additional vehicle movements per minute on average during the peak hours (compared with the previously approved scheme), which represents a very minor increase in site-generated traffic. The results of the previous analyses undertaken suggest that there would be more than adequate capacity at the Shepherd Street / Riverpark Drive roundabout to accommodate the additional trips expected to be generated by the additional apartments under the amended (higher density) scheme.

4.2 Strategic Context and Traffic Modelling

It is noted that Council has submitted a Planning Proposal to the NSW Department of Planning and Environment to amend the Liverpool Local Environmental Plan 2008 (LLEP) to permit B4 mixed-use developments in the existing B3 zoning in the Liverpool City Centre Precinct. The proposal is estimated to result in an additional 7,500 residential dwellings, which will have significant impacts on the existing road network and transport facilities within the Liverpool City Centre.

Accordingly, it is understood that Liverpool City Council has engaged the services of a traffic and transport consultant to undertake a comprehensive traffic and transport study for the City Centre Precinct. The study (which is currently underway) is understood to include strategic transport modelling as well as an AIMSUN micro-simulation model, to identify and assess traffic and transport strategies to accommodate additional development in the City Centre and the local government area more broadly.

In addition, and as previously discussed, a Planning Proposal for increased density on various R4 properties on Shepherd Street, including the subject sites, was endorsed by Liverpool City Council at a meeting held on 29 June 2016 (Item No: DPG 03, File No: 145171.2016, Shepherd Street Precinct Planning Proposal). This Planning Proposal anticipates the delivery of up to 375 apartments on the subject site, consistent with the proposal under this development application.

Traffic analyses undertaken as part of this Planning Proposal demonstrated that there is more than adequate capacity to accommodate the traffic expected to be generated following the development of the precinct with 1,500 residential apartments (including 375 apartments proposed on the subject site) at the following intersections in proximity to the precinct:

- The Shepherd Street / Atkinson Street intersection;
- The Shepherd Street / Riverpark Drive roundabout;
- The Speed Street / Shepherd Street intersection; and
- The Speed Street / Mill Road roundabout.

These intersections would therefore be more than capable of accommodating the traffic generated by the apartments proposed on the subject site, from a capacity perspective.

Furthermore, as part of this Planning Proposal the Applicant agreed to fund a 'variation' to the modelling to be undertaken by Council's consultant (as previously discussed), to assess the impact of the Planning Proposal for the Shepherd Street precinct upon the broader road network. This modelling will allow Council and the Applicant to finalise the commitments required to ensure traffic impacts of the Planning Proposal are appropriately addressed. In light of the above, it is concluded that:

- The development proposed on the site at 26 - 28 Shepherd Street under this application would be more than adequately accommodated on the immediately adjacent road network; and
- The cumulative impact of the development proposed on the site at 26 - 28 Shepherd Street, and the additional development in the Shepherd Street precinct anticipated under the Shepherd Street Planning Proposal upon the broader road network, will be appropriately assessed through a 'variation' to the modelling being undertaken by Council's consultant for the Liverpool City Centre.

Accordingly, no external roadworks are considered to be required to support the development proposed under this application, over and above those which may be identified as part of the 'variation' to the modelling being undertaken by Council's consultant for the Liverpool City Centre.

5.0 Recommendation

In light of the information contained within this report, it is considered that the proposal is satisfactory from a traffic operations perspective, and it is recommended that the development application be approved from a traffic engineering perspective.

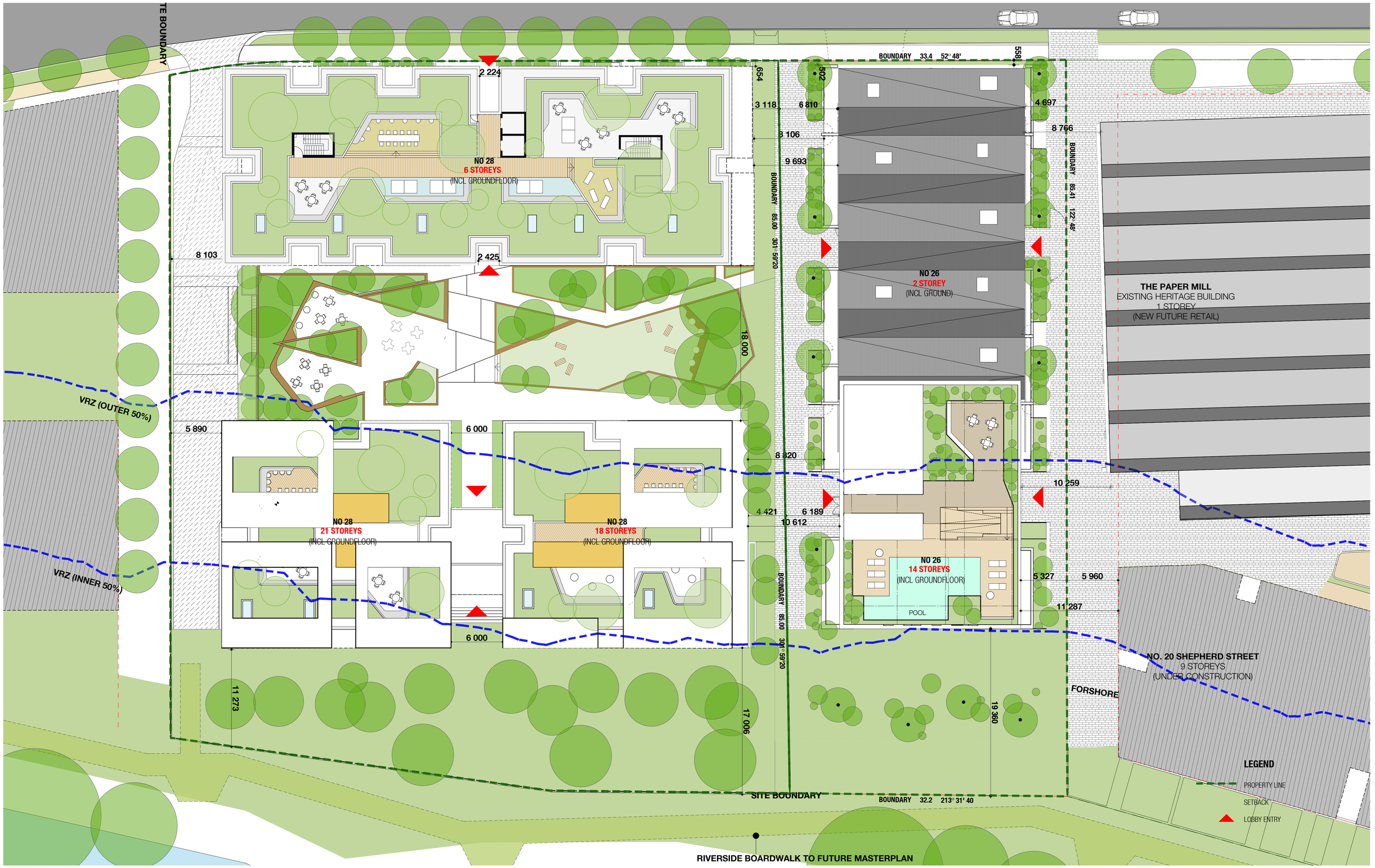
5.1 Qualifications

This report has been prepared and/or approved by:

Anne Coutts
Director, InRoads Group
BE Civil, MIEAust, MAITPM

APPENDIX A

Relevant Architectural Drawings



Notes
CONTRACTOR MUST VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK OR PREPARING SHOP DRAWINGS. DO NOT SCALE DRAWING.

Rev	Description	Date	App'd

Rev	Description	Date	App'd

D1 - DA Submission

Rev	Description	Date	App'd

Project
26/28 SHEPHERD ST

28 SHEPHERD ST
LIVERPOOL NSW

Client
CORONATION PROPERTY CO

Coronation Property Co Pty Ltd
9-25 Commonwealth Street

Drawing title
COMBINED DA/STAGE 2 DA
SITE PLAN

Date generated 20-12-16
Checked
Approved

Scale
1:200
@ A1 sheet size
50mm on original

WOODS BAGOT
AUSTRALIA
ASIA
MIDDLE EAST
EUROPE
NORTH AMERICA

Project number 120809/120597
Drawing number **A11002**
Revision D1

Status
DA/STAGE 2 DA

GENERAL NOTES:

1) ALL WORKS TO BE CARRIED OUT TO BE IN ACCORDANCE WITH AUSTRALIAN STANDARDS AND ALL OTHER REQUIRED STATUTORY REGULATIONS

2) ACOUSTIC REQUIREMENTS HAVE BEEN INCORPORATED

DISCLAIMER

1) FINAL CO-ORDINATION OF STRUCTURE AND SERVICES TO BE CONFIRMED

2) ALIGNMENT WITH MARKETING DRAWINGS TO BE CONFIRMED

Notes
CONTRACTOR MUST VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK OR PREPARING SHOP DRAWINGS. DO NOT SCALE DRAWING.

Rev	Description	Date	App'd

Rev	Description	Date	App'd

Rev	Description	Date	App'd
D1	DA Submission		

Project
26/28 SHEPHERD ST

28 SHEPHERD ST
LIVERPOOL NSW

Client
CORONATION PROPERTY CO

Coronation Property Co Pty Ltd
9-25 Commonwealth Street

Drawing title
COMBINED DA/STAGE 2 DA
GROUND FLOOR (1)

Date generated 20-12-16
Checked
Approved
Scale 1:200 @ A1 sheet size
50mm on original

WOODS BAGOT
AUSTRALIA
ASIA
MIDDLE EAST
EUROPE
NORTH AMERICA

Project number 120597/120809
Drawing number A12200
Revision D1
Status
STAGE 2 DA

Notes
CONTRACTOR MUST VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK OR PREPARING SHOP DRAWINGS. DO NOT SCALE DRAWING.

Rev	Description	Date	App'd
D1	DA Submission		

Project
26/28 SHEPHERD ST

28 SHEPHERD ST
LIVERPOOL NSW

Client
CORONATION PROPERTY CO

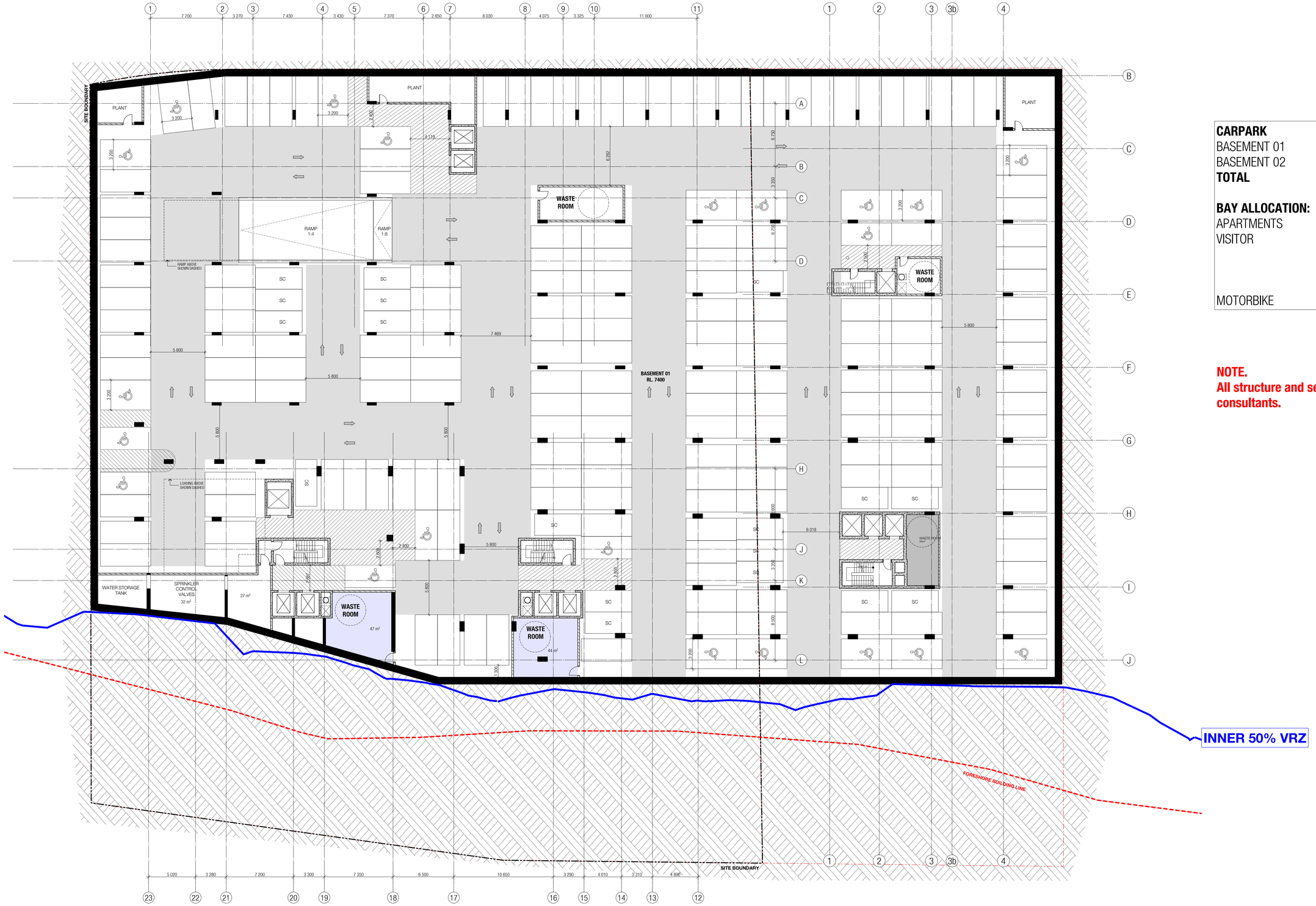
Coronation Property Co Pty Ltd
9-25 Commonwealth Street

Drawing title
COMBINED DA/STAGE 2 DA
GROUND FLOOR PLAN

Date generated 19-12-16
Checked
Approved
Scale NTS @ A1 sheet size
50mm on original

WOODS BAGOT
AUSTRALIA
ASIA
MIDDLE EAST
EUROPE
NORTH AMERICA

Project number 120597/120809
Drawing number A22200
Revision D1
Status
DEVELOPMENT APPLICATION



CARPARK	
BASEMENT 01	206- 21 DDA
BASEMENT 02	216 - 19 DDA
TOTAL	**422 - 40 DDA**
BAY ALLOCATION:	
APARTMENTS	372 (38 DDA)
VISITOR	38 (2 DDA)
MOTORBIKE	22

NOTE.
All structure and services to be reviewed by consultants.

Notes
CONTRACTOR MUST VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK OR PREPARING SHOP DRAWINGS. DO NOT SCALE DRAWING.

Rev	Description	Date	App'd
D1	DA Submission		

Project
26/28 SHEPHERD ST

28 SHEPHERD ST
LIVERPOOL NSW

Client
CORONATION PROPERTY CO

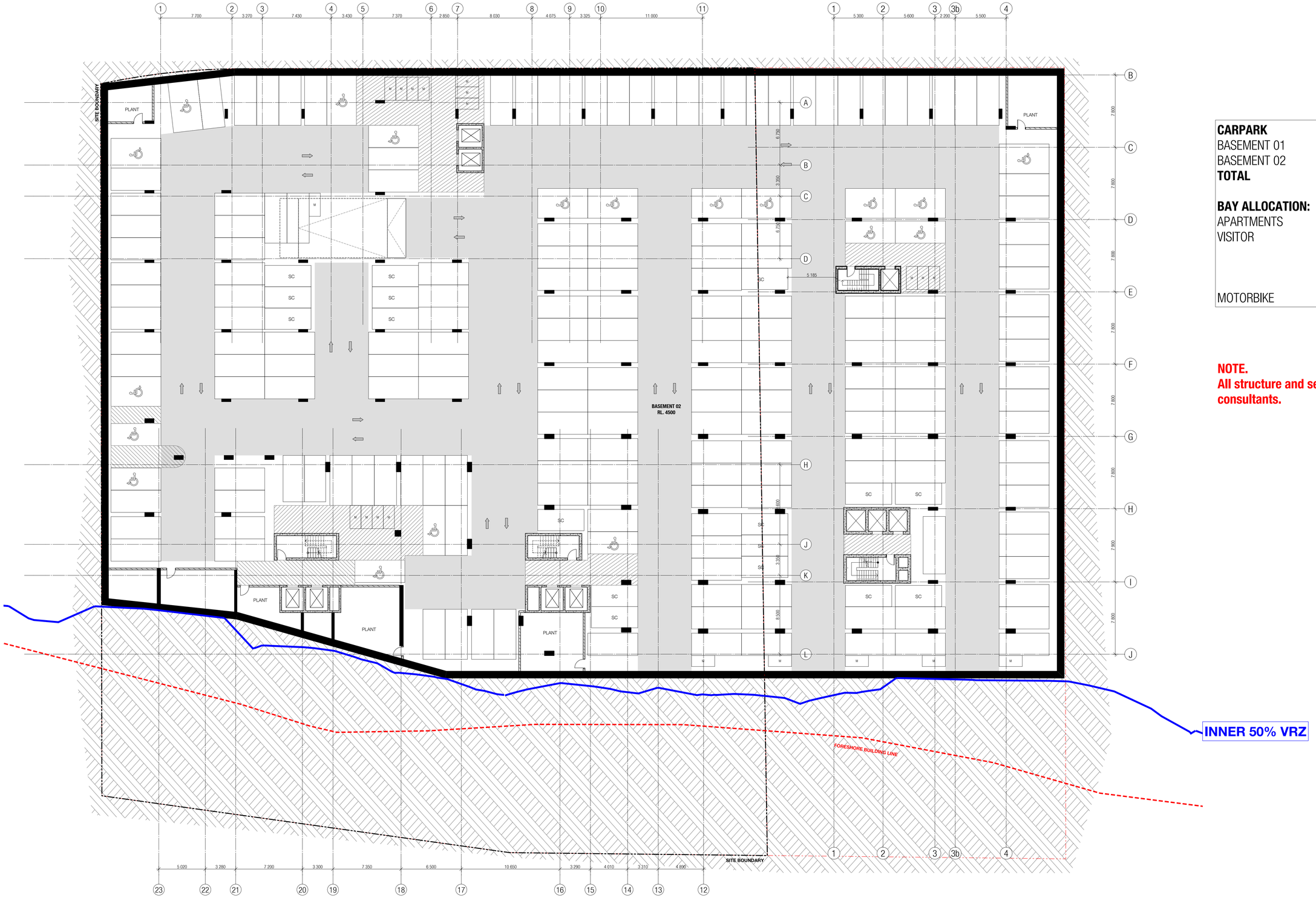
Coronation Property Co Pty Ltd
9-25 Commonwealth Street

Drawing title
COMBINED DA/STAGE 2 DA
BASEMENT LEVEL 01

Date generated 19-12-16
Checked
Approved
Scale 1:200 @ A1 sheet size
50mm on original

WOODS BAGOT
AUSTRALIA
ASIA
MIDDLE EAST
EUROPE
NORTH AMERICA

Project number 120597/120809
Drawing number **A022B1**
Revision D1
Status
FOR INFORMATION



CARPARK	
BASEMENT 01	206- 21 DDA
BASEMENT 02	216 - 19 DDA
TOTAL	**422 - 40 DDA**
BAY ALLOCATION:	
APARTMENTS	372 (38 DDA)
VISITOR	38 (2 DDA)
MOTORBIKE	22

NOTE.
All structure and services to be reviewed by consultants.

Notes
CONTRACTOR MUST VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK OR PREPARING SHOP DRAWINGS. DO NOT SCALE DRAWING.

Rev	Description	Date	App'd
D1	DA Submission		

Project
26/28 SHEPHERD ST

28 SHEPHERD ST
LIVERPOOL NSW

Client
CORONATION PROPERTY CO

Coronation Property Co Pty Ltd
9-25 Commonwealth Street

Drawing title
COMBINED DA/STAGE 2 DA
BASEMENT LEVEL 02

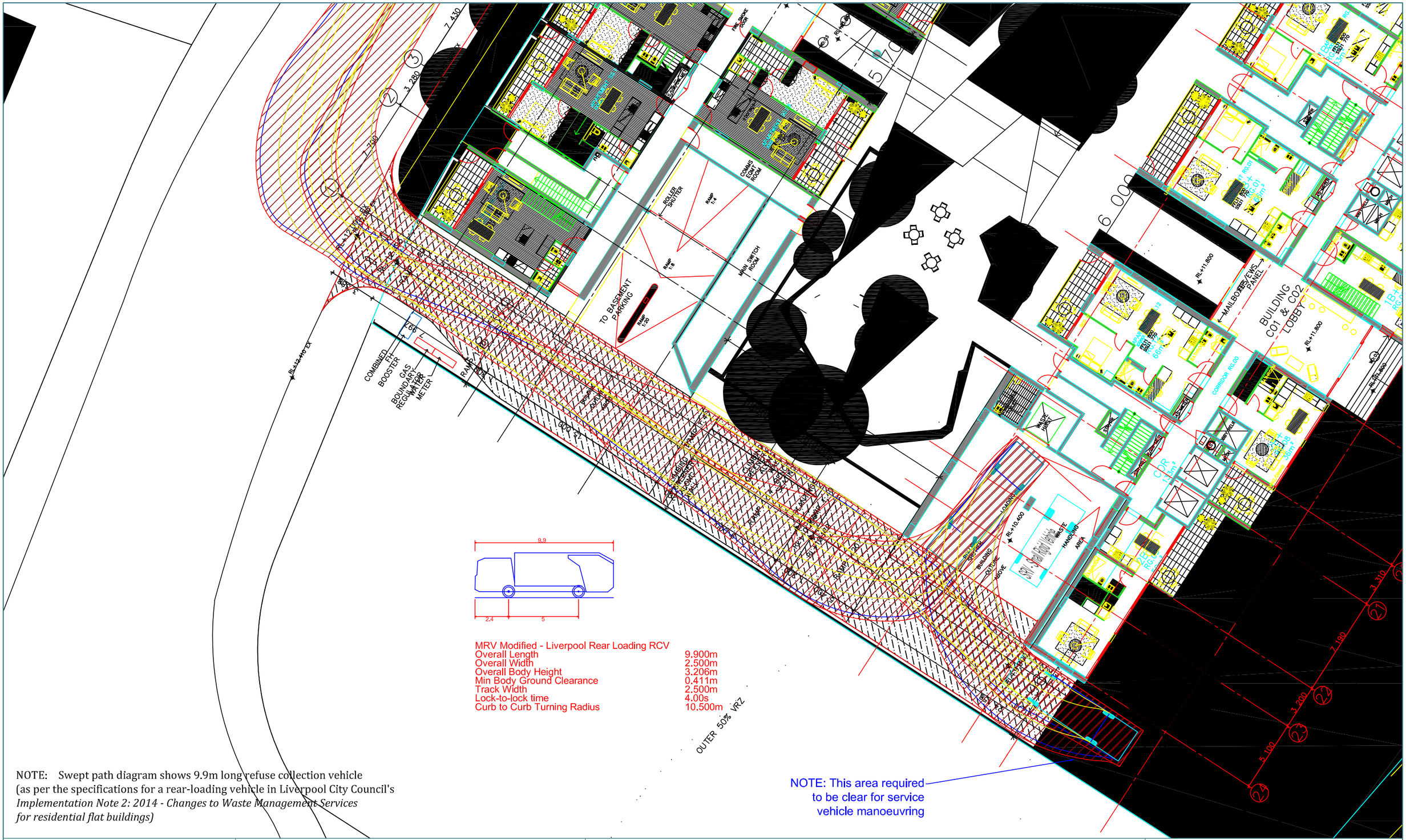
Date generated 19-12-16
Checked
Approved
Scale 1:200 @ A1 sheet size
50mm on original

WOODS BAGOT
AUSTRALIA
ASIA
MIDDLE EAST
EUROPE
NORTH AMERICA

Project number 120597/120809
Drawing number **A022B2**
Revision D1
Status
FOR INFORMATION

APPENDIX B

Vehicle Swept Path Analyses – Refuse Collection Vehicle



MRV Modified - Liverpool Rear Loading RCV

Overall Length	9.900m
Overall Width	2.500m
Overall Body Height	3.206m
Min Body Ground Clearance	0.411m
Track Width	2.500m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	10.500m

NOTE: Swept path diagram shows 9.9m long refuse collection vehicle (as per the specifications for a rear-loading vehicle in Liverpool City Council's *Implementation Note 2: 2014 - Changes to Waste Management Services for residential flat buildings)*

INROADS:GROUP

drawing prepared by

InRoads Group

PO Box 596
Potts Point NSW 1335

ABN: 25 608 559 897

project: 26 - 28 Shepherd Street, Liverpool

drawing title: Vehicle Tracking Diagram

project no.	drawing no.	revision	date	scale
16-010	DWG01	A	21/12/2016	1:250 @ A3

FOR INFORMATION ONLY - NOT FOR CONSTRUCTION