

**PROPOSED DISTRIBUTION
CENTRE DEVELOPMENT**

2 HUME HIGHWAY, CHULLORA

***Assessment of Traffic and Parking
Implications***

October 2015
(Rev E)

Reference 15222

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Prepared for Commercial & Industrial Property Pty Limited
9 October 2015

TABLE OF CONTENTS

1.	INTRODUCTION	1
2.	PROPOSED DEVELOPMENT	3
2.1	Site, Context and Former Use	3
2.2	Proposed Development.....	4
3.	ROAD NETWORK AND TRAFFIC CONDITIONS	5
3.1	Road Network.....	5
3.2	Traffic Controls	5
3.3	Traffic Conditions	6
3.4	Transport Services	7
4.	TRAFFIC	8
4.1	Operational.....	8
4.2	Construction	12
5.	PARKING	13
6.	ACCESS, INTERNAL CIRCULATION AND SERVICING	15
7.	CONCLUSION	16
APPENDIX A	PLANS OF EXISTING	
APPENDIX B	DEVELOPMENT PLANS	
APPENDIX C	INTERSECTION DETAILS	
APPENDIX D	SIDRA RESULTS	
APPENDIX E	EXTRACT FROM RMS TDT	
APPENDIX F	TURNING PATH ASSESSMENT	

LIST OF ILLUSTRATIONS

FIGURE 1	LOCATION
FIGURE 2	SITE
FIGURE 3	ROAD NETWORK
FIGURE 4	TRAFFIC CONTROLS
FIGURE 5	PEAK TRAFFIC MOVEMENTS

1. INTRODUCTION

This report has been prepared to accompany an Environmental Impact Statement to the Department of Planning and Environment for a proposed Warehouse and Distribution Facility on the site of the former Fairfax facility in the Chullora Industrial Area (Figure 1).

The Chullora Industrial Area is a modern mixed industrial precinct which has evolved out of the former expansive Chullora Railway Workshops landholding. There is a wide range of industrial, manufacturing, warehouse, waste recycling and other uses in the area and the subject site was occupied by the Fairfax printing and distribution facility for some 20 years until vacated in 2013.

The area has excellent access connections to the arterial road system which links to the cross regional and motorway systems. This presents an ideal circumstance for the multifarious vehicle movements associated with distribution centre use. The proposed development scheme comprises:

Warehouse	39,225 m ² (including breezeway)
Offices	3,580 m ²
Ground Floor Lobby/Cafe	360 m ²

Extensive areas of hardstand paving will be provided for car parking, loading docks and truck / trailer parking.

In response to a request to the Department of Planning and Environment the Secretarys Environmental Assessment Requirements (SEARS) were issued and included the following:

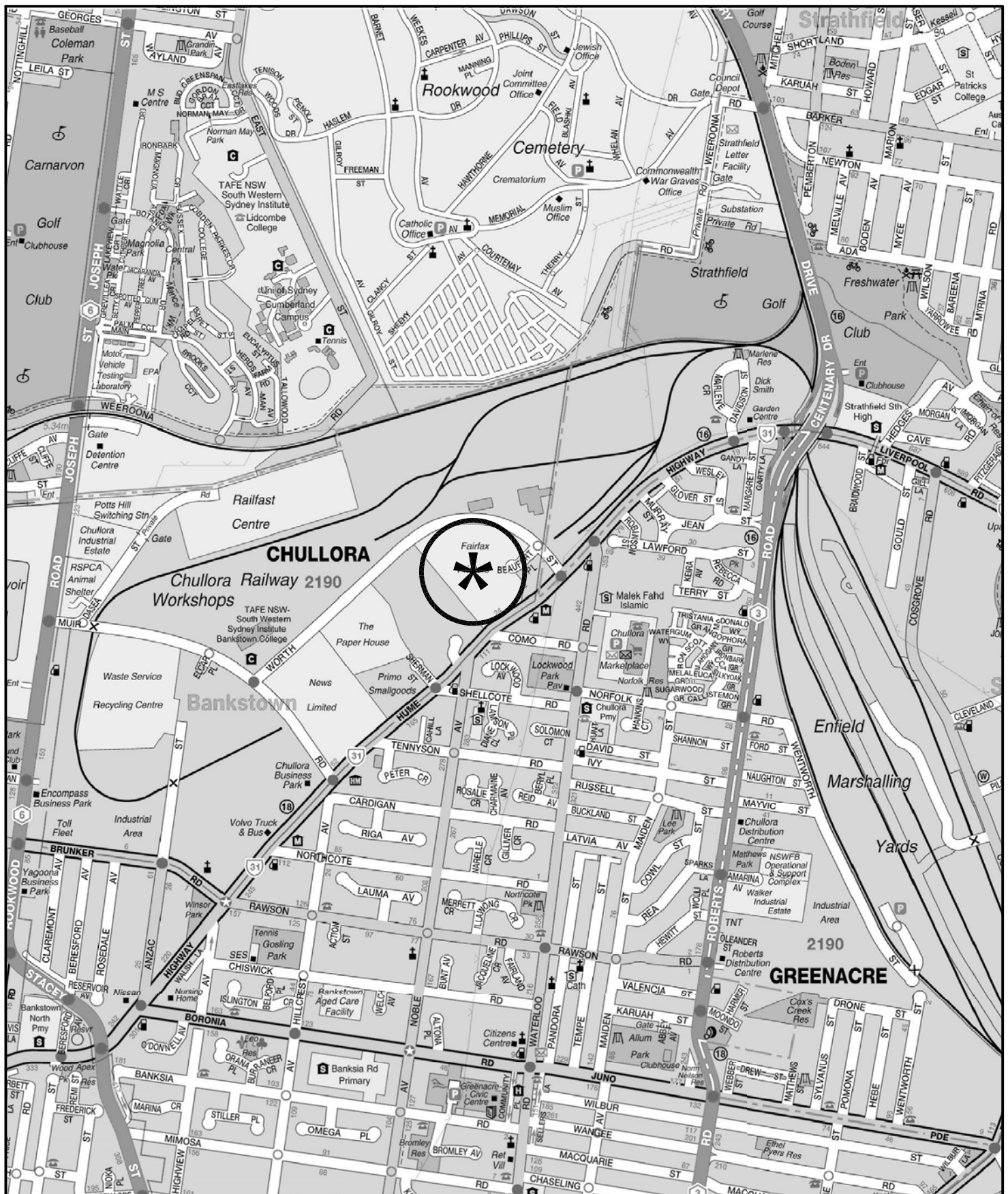
Transport, Access and Parking

- * *Accurate predictions of the traffic generated by the development during construction and operation;*
- * *A detailed assessment of the potential impacts of the development on the capacity, efficiency and safety of the road network during construction and operation, including the truck routes, cumulative traffic generated by the existing and proposed development and surrounding developments;*
- * *Details of any required upgrades to road infrastructure; and*
- * *Details of site accesses, internal roads and vehicular parking required as a result of the development*

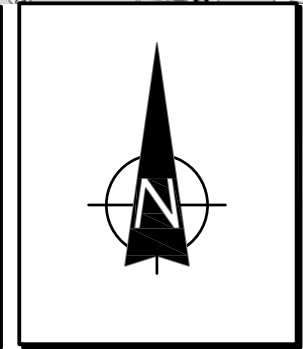
Roads and Maritime Services Requirements

- * *Details of the projected peak traffic movements generated by the proposed development and comparison with that of the former use on the site*
- * *SIDRA 6 analysis of the potential traffic impact on nearby intersections being:*
 - *Hume Highway / Worth Street*
 - *Hume Highway / Muir Street*
 - *Hume Highway / Waterloo Road*
 - *Worth Street / Muir Road*
- * *Details of envisaged service vehicle movements including vehicle type and arrival / departure times*
- * *Details of the proposed vehicle access and parking provision including compliance with the requirements of Australian Standards and Councils DCP*

The purpose of this report is to provide an assessment of the potential traffic and parking implications of the proposed development scheme and respond to the SEARS and RMS requirements.



LEGEND



LOCATION

FIG 1

2. PROPOSED DEVELOPMENT

2.1 SITE, CONTEXT AND FORMER USE

The site (Figure 2) is part Lot 12 in DP834734 and occupies an irregular shaped area of 83,914m² with extensive frontages to the Hume Highway, Worth Street and Beaufort Place within the expansive Chullora Industrial Area.

The nearby uses comprise:

- * Australia Post, which occupies the adjoining site to the west and the site on the opposite side of Worth Street
- * the Transfield Services complex to the north
- * the News Limited and Paperlinx uses to the south
- * the automotive business which adjoins to the east
- * the Rail East marshalling yard to the west

The existing development on the site comprises:

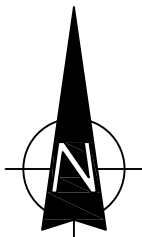
- 31,700m² NLA warehouse / production floor space
- 6,000m² NLA office floor space

There are some 250 parking spaces in two separate areas with vehicle access on Worth Street. The site has been vacant for 2 years and there is no available data or records in relation to staffing or traffic generation.

Details of the existing development on the site are provided on the plan provided in Appendix A.



LEGEND



SITE

FIG 2

2.2 PROPOSED DEVELOPMENT

The proposed development scheme comprises:

39,225 m ²	Warehouse
3,580 m ²	Offices
360 m ²	Ground Floor Lobby/Cafe

There will be extensive loading docks along both sides of the warehouse building supplemented by a breezeway provision. A total of 352 car parking spaces will be provided along with truck and trailer parking while vehicle access will comprise:

- * Separate ingress and egress driveways on the Worth Street frontage for trucks
- * Separate ingress and egress driveways on the Worth Street frontage for cars

Details of the proposed development scheme are provided on the plans prepared by Commercial & Industrial Property which accompany the Development Application and are reproduced in part in Appendix B.

3. ROAD NETWORK AND TRAFFIC CONDITIONS

3.1 ROAD NETWORK

The existing road network is shown on Figure 3 and comprises:

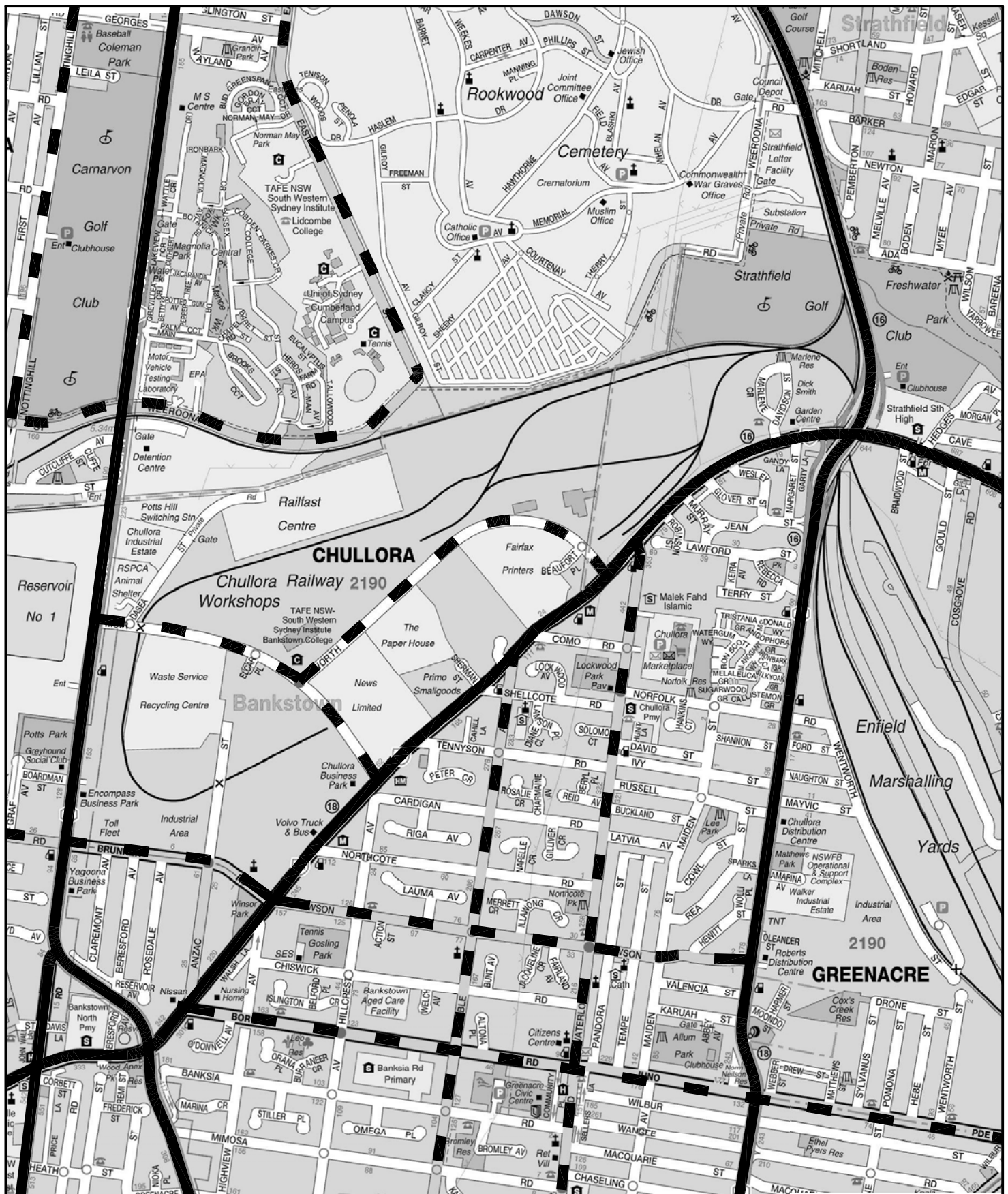
- * *Rookwood Road-Stacey Street* – a State Road and part of an arterial providing a north-south connection linking with numerous other arterial routes
- * *Hume Highway* – a State Road and arterial route between the City and Liverpool
- * *Roberts Road* – a State Road and major arterial route
- * *Brunker Road* – a State Road and major collector route
- * *Waterloo Road* – a Regional Road and collector route
- * *Muir Road and Worth Street* – collector road routes serving the Chullora Industrial Area

Worth Street is relatively straight and level, with a traffic lane and a parking lane in each direction, although there is a gentle curved section along the site frontage.

3.2 TRAFFIC CONTROLS

The existing traffic controls shown in Figure 4 comprise:

- * traffic signals at the Hume Highway/Worth Street and Hume Highway/Muir Road intersections
- * the roundabout at the Worth Street and Beaufort Place intersection



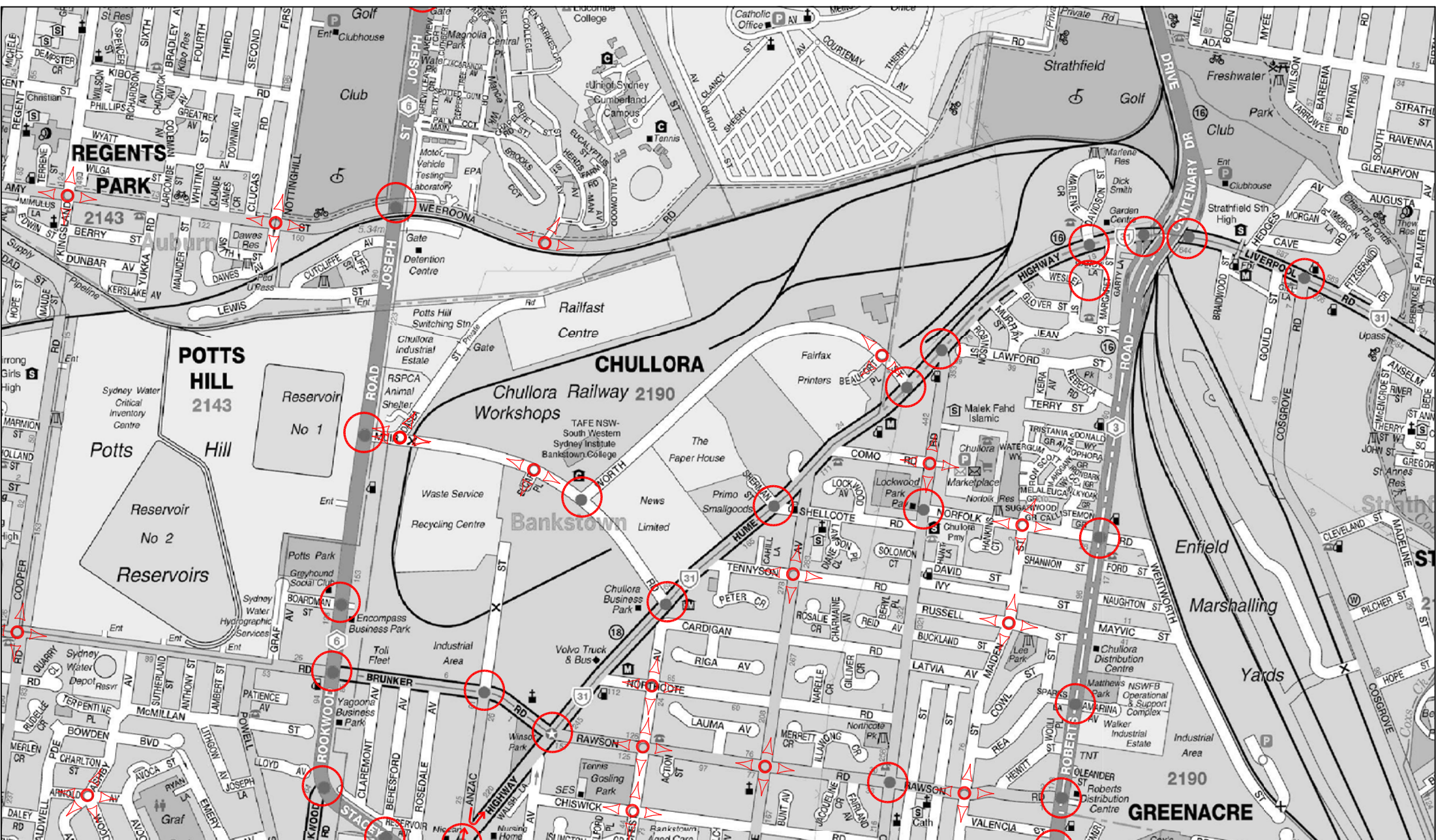
LEGEND

- ARTERIAL
- SUB-ARTERIAL
- COLLECTOR



ROAD NETWORK

FIG 3

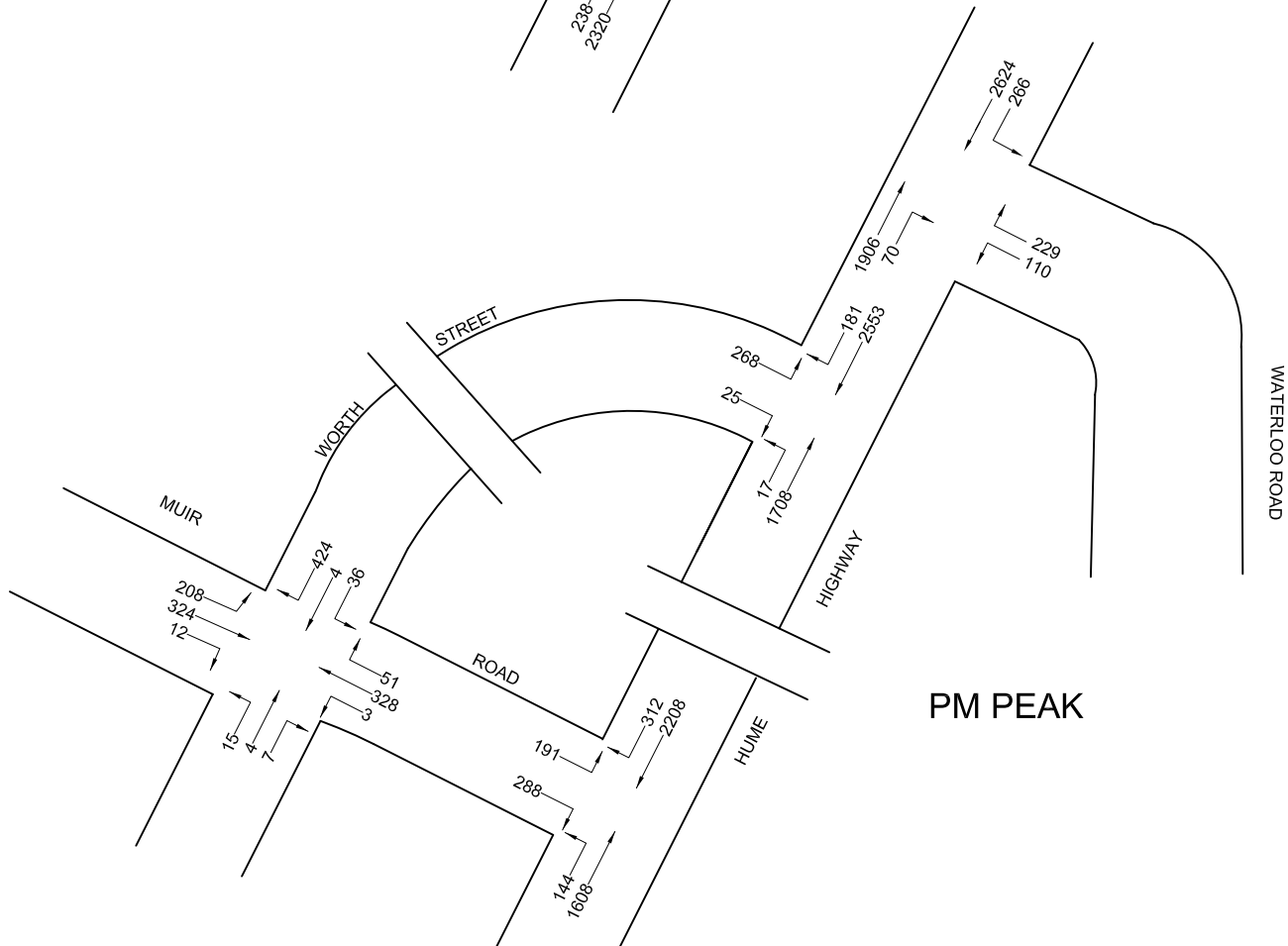
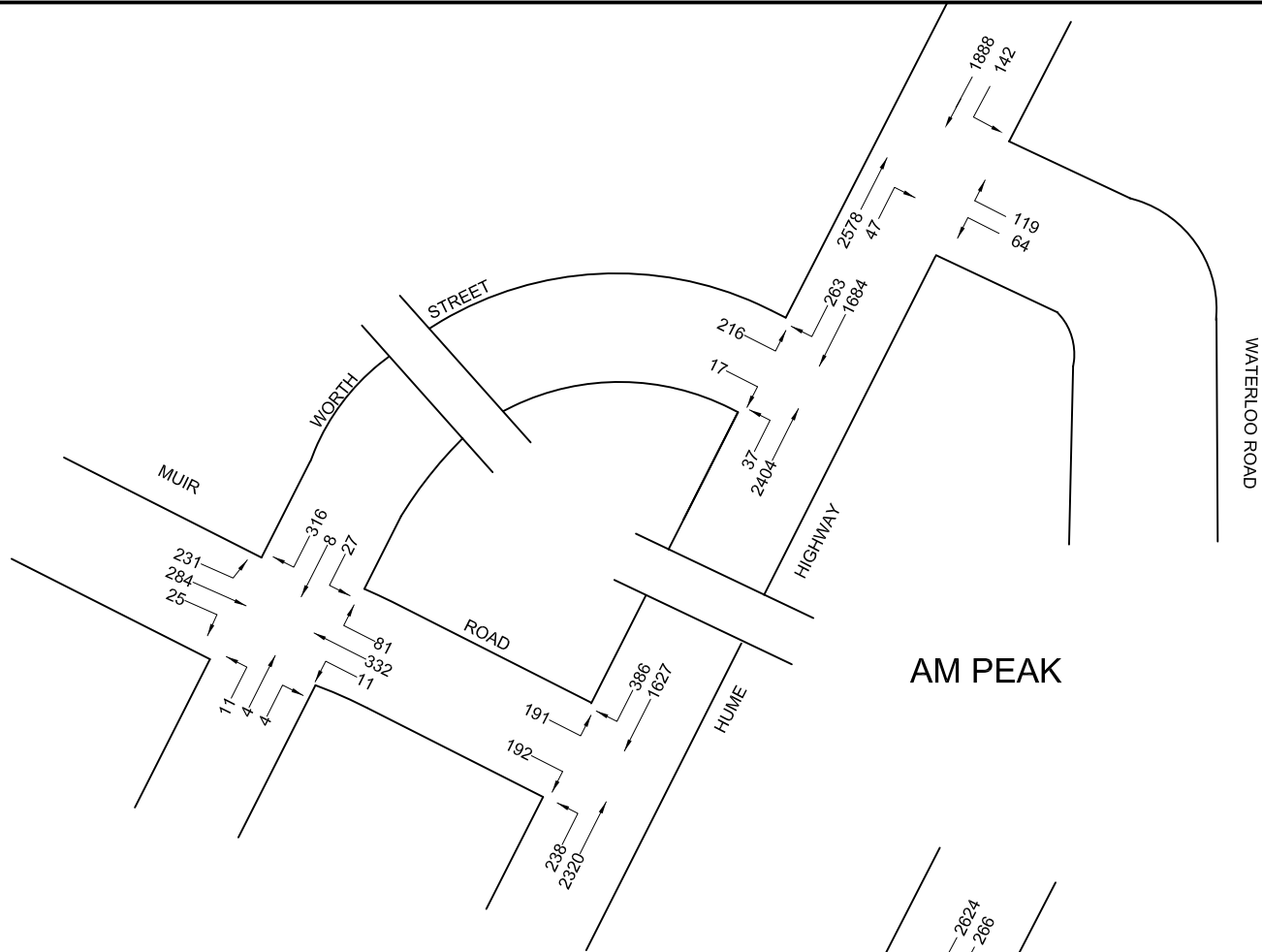


- LEGEND**
- TRAFFIC SIGNAL CONTROL
 - ◇ ROUNDBOUT
 - ✕ RESTRICTED TURNING MOVEMENT



**TRAFFIC
CONTROLS**

FIG 4



LEGEND



**EXISTING PEAK
TRAFFIC VOLUMES**

FIG 5

- * traffic signals at the Muir Road/Worth Street intersection
- * the other traffic signals along the Hume Highway route including the Waterloo Road and Rawson Road intersections
- * the approved B Double routes along Muir Road, Hume Highway, Rookwood Road and Worth Street

Details of the principal access intersections for the site are provided in Appendix B indicating the multiple through lanes, the turning lanes and the traffic signal control.

3.3 TRAFFIC CONDITIONS

Our indication of the traffic conditions on the road system serving the site (ie network peaks) is provided by data published by RMS and traffic surveys undertaken as part of this study. The RMS data is published in terms of Annual Average Daily Traffic in the following:

	AADT
Hume Highway north of Worth Street	59,296
Rookwood Road north of Muir Road	52,967

Details of the traffic movement volumes during the network morning and afternoon peak periods at the relevant access intersections are provided in Figure 5.

The operational performance of the access intersections under the existing peak traffic volumes has been assessed using SIDRA 6 and because of the substantial separation distances and intervening intersections, the modelling has been undertaken with Highway/Worth and Highway/Wattle as a system and Muir/Worth separate while Highway/Muir would be a system with Brunker, Boronia and Stacey. The results of that assessment indicate satisfactory circumstances are provided in Appendix C and summarised in the following while the criteria for interpreting SIDRA results is reproduced overleaf.

RMS specified the undertaking of SIDRA 6 modelling to reflect the coordination of traffic signals, however the Muir Road and Worth Street intersections on the highway are some 1.2km apart with a number of intersections in between. Accordingly the modelling has been undertaken in relation to the coordination of the Worth Street and Waterloo Street intersections on the highway and the Worth Street and Hume Highway intersections on Muir Road.

	AM			PM		
	LOS	DS	AVD	LOS	DS	AVD
Hume/Muir	B	0.835	3.6	B	0.582	21.6
Muir/Worth	B	0.538	5.9	B	0.599	6.0
Hume/Worth	B	0.799	19.0	A	0.592	12.6
Hume/Waterloo	A	0.598	9.5	A	0.762	12.6

3.4 TRANSPORT SERVICES

Bus services run along the road system just to the east of the Hume Highway providing connections to railway stations and the Metropolitan transport system (see details overleaf).

Criteria for Interpreting Results of SIDRA Analysis

1. Level of Service (LOS)

LOS	Traffic Signals and Roundabouts	Give Way and Stop Signs
'A'	Good	Good
'B'	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
'C'	Satisfactory	Satisfactory but accident study required
'D'	Operating near capacity	Near capacity and Accident Study required
'E'	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode	At capacity and requires other control mode
'F'	Unsatisfactory and requires additional capacity	Unsatisfactory and requires other control mode

2. Average Vehicle Delay (AVD)

The AVD provides a measure of the operational performance of an intersection as indicated on the table below, which relates AVD to LOS. The AVD's listed in the table should be taken as a guide only as longer delays could be tolerated in some locations (ie inner city conditions) and on some roads (ie minor side street intersecting with a major arterial route).

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabouts	Give Way and Stop Signs
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode	At capacity and requires other control mode

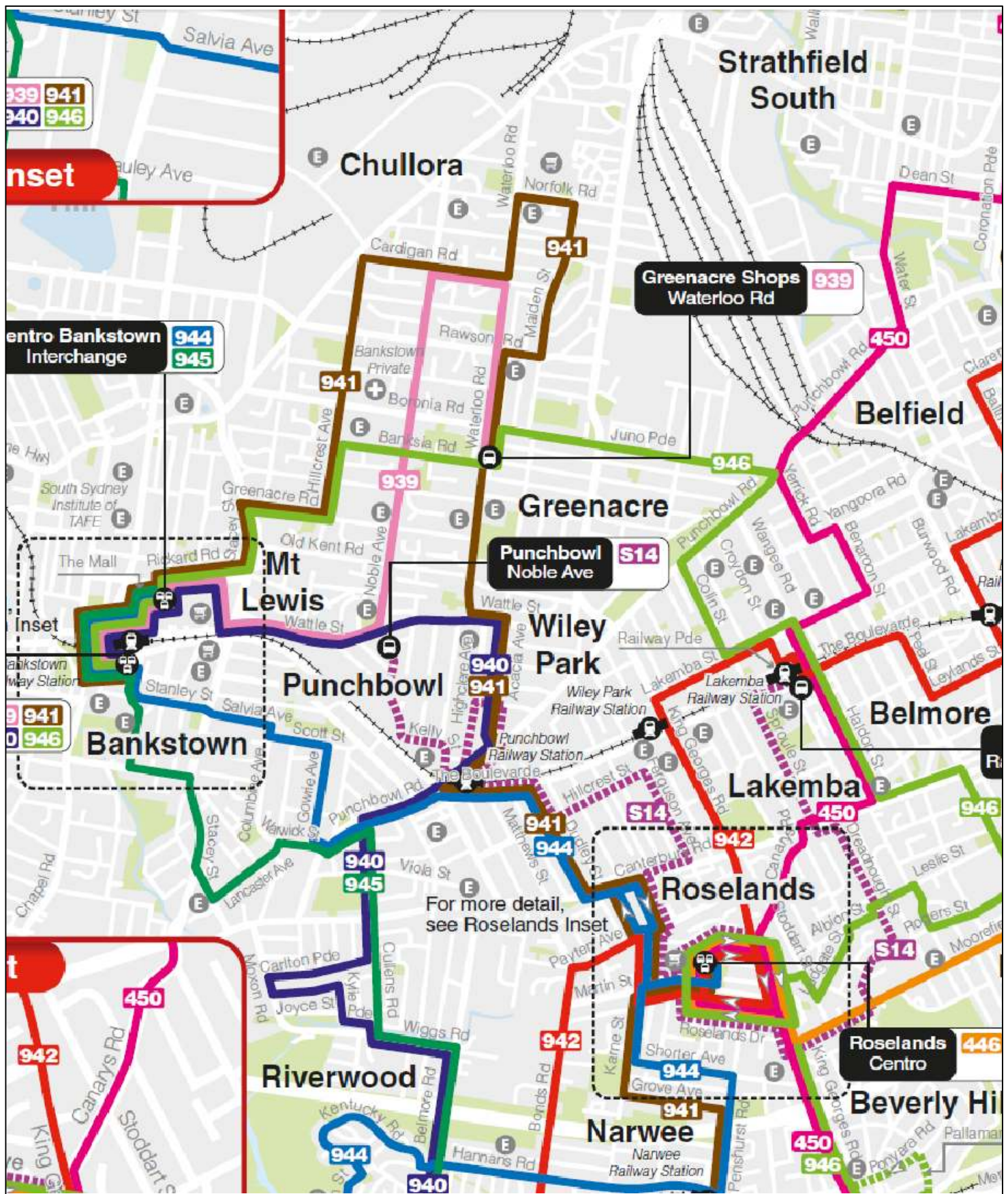
3. Degree of Saturation (DS)

The DS is another measure of the operational performance of individual intersections.

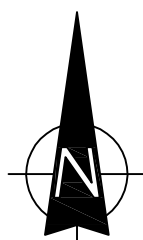
For intersections controlled by **traffic signals**¹ both queue length and delay increase rapidly as DS approaches 1, and it is usual to attempt to keep DS to less than 0.9. Values of DS in the order of 0.7 generally represent satisfactory intersection operation. When DS exceeds 0.9 queues can be anticipated.

For intersections controlled by a **roundabout or GIVE WAY or STOP signs**, satisfactory intersection operation is indicated by a DS of 0.8 or less.

¹ the values of DS for intersections under traffic signal control are only valid for cycle length of 120 secs



LEGEND



BUS SERVICES

4. TRAFFIC

4.1 OPERATIONAL

The former Fairfax production/office use on the site had a Net Lettable Area of 37,630m² including some 6,000m² of office floorspace. There were some 250 parking spaces and there were a significant number of staffing employed on the site involved in administration, editorial/reporting and production.

An assessment of the possible traffic generation of the former use can be made by application of RMS criteria for “office” and “factory” (production). The guidelines say where the office floorspace is some 20% or more of the total floorspace it should be assessed separately (i.e. from production floorspace) and the RMS criteria for office use is:

AM	PM
1.6 vtpm / 100m ²	1.2 vtpm / 100m ²

The guidelines also state that the type of industry affects the employee density and commercial vehicle trip generation. Table 3.5 of the RMS Guidelines provides a rating of the various industry types including the following:

	Employee Density	CV Generation Rate
Paper, Paper Products, Printing	High	Medium

The Guidelines also note that there is a high percentage of commuter traffic in the peak hour for a single business (as compared to say factory units). The RMS traffic generation rate for “production” use is 1.0 vtpm / 100m², however the peak in the case of the former Fairfax use may not have coincided with the on-street commuter peak.

Application of these traffic generation factors would indicate:

	AM	PM
6,000m ² office	96 vtpd	72 vtpd
37,630m ² Production	376 vtpd	376 vtpd
Total:	472 vtpd	448 vtpd

The RMS Guidelines indicate for a single business production use a factor of 67% is applicable to the commuter peak period indicating the following traffic generation outcome for the former Fairfax use:

AM	PM
316 vtpd	300 vtpd

A guide to the potential traffic generation of the proposed warehouse development is provided in the RMS Technical Direction TDT 2013-4b (see extract Appendix E). However there are numerous errors in this document (which have been brought to the attention of RMS) and the data for Industrial Estates needs to be assessed carefully.

There were 4 Metropolitan Area sites surveyed and assessed for the RMS study, namely:

Site 1

Erskine Park Industrial Area	Total GFA	693,605m ²
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Site 2

Helensburgh	Total GFA	1,605m ²
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Site 3

Wonderland Business Park	Total GFA	406,600m ²
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Site 4

Riverwood Business Park	Total GFA	29,983m ²
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Thus the Erskine Park and Wonderland sites have a total GFA of 1,100,000 m² and contain a mixture of large warehouse/distribution, factory, factory/warehouse and office uses. By comparison, Site 2 has 9 offices, 3 manufacturers and 1 commercial unit and Site 4 has 15 warehouses (small factory units) and 1 office use.

Clearly Sites 1 and 3 present the most pertinent data base for comparison for large contemporary warehouse/distribution use. In fact if the aggregated results of the 4 sites (as contained in TDT 2013-4b of 0.52 vtpm/100m² AM and 0.56 vtpm/100m² PM) are applied to the Erskine Park floorspace it would indicate peak generations of 3,606 vtpm and 3,884 vtpm for the AM and PM peaks respectively, whereas the actual surveyed peak generations were only 1,148 vtpm AM and 1,294 vtpm PM for site peaks and 976 vtpm AM and 1,073 vtpm PM for the “network peaks”.

The relevant surveyed results for Sites 1 and 3 from TDT 2013-4b are as follows:

	Site 1	Site 3	Average
Site Peak AM	0.15	0.20	0.18
Site Peak PM	0.16	0.19	0.18
Network Peak AM	0.13	0.17	0.15
Network Peak PM	0.14	0.17	0.16

These are very consistent results and the reasons for the difference between these generation rates and the other sites and earlier former RTA data are:

- * very large contemporary warehouses with low staffing levels
- * 12 hour shifts where worker arrival/departure does not occur during the network commuter peak periods

In order to provide some robustness a sensitivity factor of +66% is applied for the adopted peak generation rates for the “network” peaks of:

AM - 0.25 vtpm/100m² GFA

PM - 0.25 vtpm/100m² GFA

Application of the adopted peak traffic generation rates to the proposed development of 42,725m² (includes office floorspace which is less than 9% of the total) indicates the following projected traffic generation outcome:

	AM			PM	
	IN	OUT		IN	OUT
	80	27		27	80
Total:	107 vtp			107 vtp	

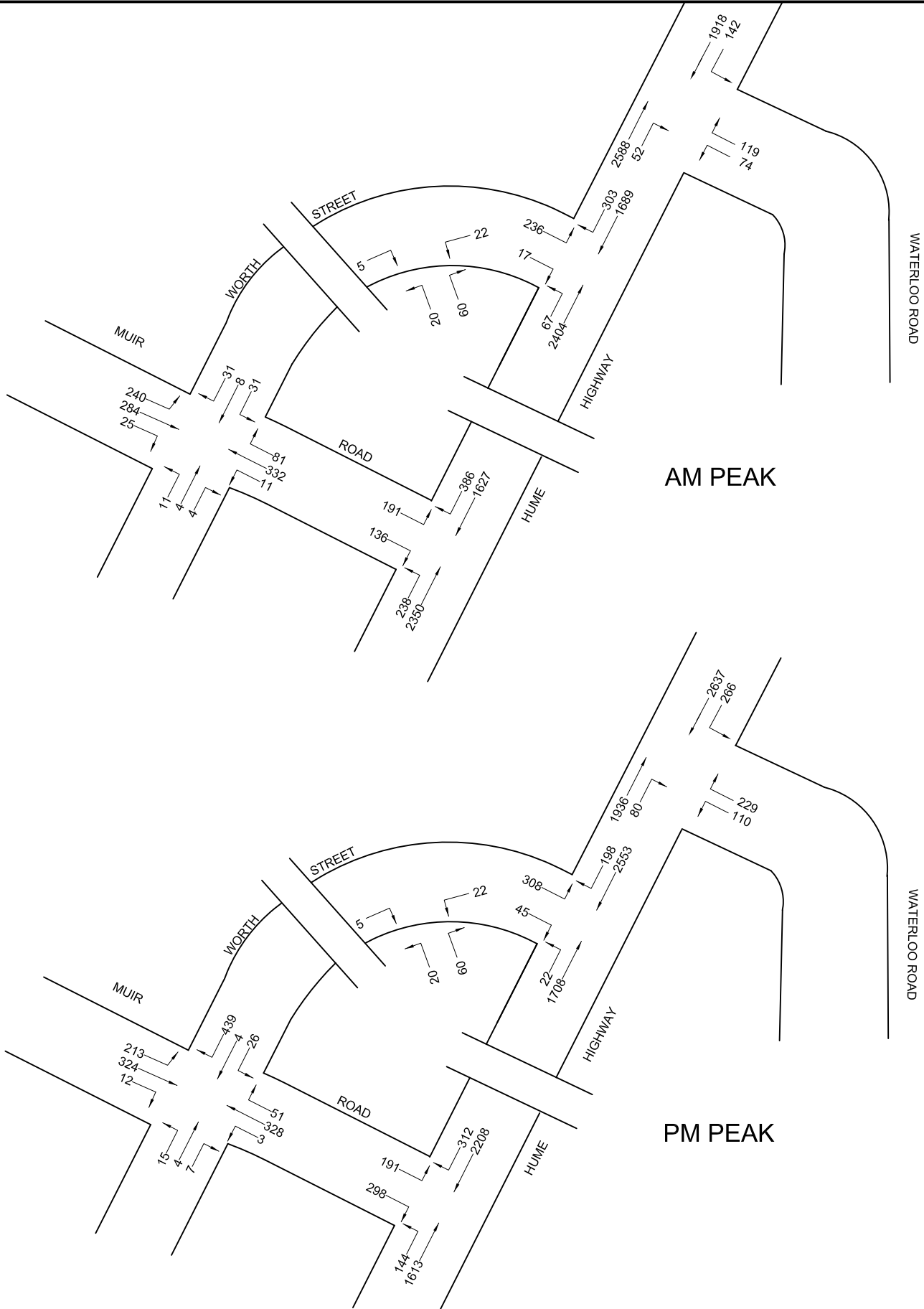
Assessment of the potential distribution of the vehicle movements generated by the proposed development indicates that they could be expected to be relatively evenly spread over the three access intersections, namely:

- Hume Highway/Worth Street
- Hume Highway/Muir Road
- Rookwood Road/Muir Road

The resultant traffic flows are shown on Figure 6 and SIDRA 6 assessment has been undertaken in relation to this outcome. The results of the SIDRA modelling are provided in Appendix D and summarised in the following:

	AM				PM		
	LOS	DS	AVD		LOS	DS	AVD
Hume/Muir	B	0.836	25.3		B	0.584	21.7
Muir/Worth	B	0.538	5.9		B	0.617	27.0
Hume/Worth	B	0.838	21.2		A	0.592	13.6
Hume/Waterloo	A	0.600	9.8		A	0.766	12.8

The results of the modelling indicate that the existing satisfactory operational performance of these intersections will be maintained.



LEGEND



**FUTURE PEAK
TRAFFIC VOLUMES**

FIG 6

4.2 CONSTRUCTION

EARTHWORKS

This activity will occur over a 9 month (36 weeks) period with an average of some 80 truck&dog visitations (160vt) per day.

The earthworks activity will involve:

- 1*DC6 dozer;
- 1*pad foot roller;
- 1*825 compactor;
- 1*smooth drum roller;
- 1*30T excavator; and
- 2*water carts.

The vehicle access arrangements will remain as per the foregoing.

CONSTRUCTION

This activity will occur over an 11 month (44 weeks) period with the following truck activity:

Steel erection	15 semitrailer visits per day for 12 weeks
Concrete slab	25 concrete truck visits per day for 12 weeks
Fitout	10 truck visits per day and 100 worker cars

There will be some overlap with these processes, however it is quite apparent that in general the vehicle movements associated with the construction processes will be less than that of either the former or proposed uses on the site.

The movement of construction vehicles will be facilitated by the traffic signal controlled access intersections and the arrangements for site access will be incorporated in a comprehensive Construction Traffic Management Plan prepared and submitted as part of the Construction Certificate documentation.

5. PARKING

An indication of the parking provision for the proposed development scheme is provided by Bankstown Councils DCP 2014 (March 2015) which specifies the following criteria in relation to the proposed use:

Freight Transport Terminal

Sufficient parking for employees and visitors to satisfy the projected peak parking demand plus 1 truck space for each vehicle present at the projected peak demand time (both fleet and contract operated vehicles)

Warehouse or distribution centres plus office premises

1 space per 300m² GFA plus 1 space per 40m² GFA

Application of Bankstown Council's criteria to the proposed total GFA of 43,290m² would indicate a requirement of 220 parking spaces. Whilst the proposal is for a distribution centre use there is a significant proposed office element of 3,580m² (i.e. 90 spaces @ 1 space per 40m² as per the DCP). There will be a mixture of shifts (e.g. 12 hour and 8 hour) however there will be a significant overlap which represents the peak daytime parking accumulation.

There are many large new warehouse/distribution centre developments in Blacktown LGA and that Council's DCP specifies a (relatively unique) minimum parking criteria as follows:

- 1 space per 100m² for 7,500m² plus
- 1 space per 200m² additional floorspace plus
- 1 space per 40m² for office

Application of Blacktown Council's criteria to the proposed development would indicate a provision of some 350 spaces.

It is proposed to provide a total of 352 parking spaces for workers and visitors reflecting Blacktown Council's DCP criteria which is based on significant practical experience and research. This proposed provision will ensure that there is the no on-street overflow (a frequent outcome in Industrial areas) and will include 5 designated and suitable (AS2890.6) accessible spaces.

There will also be extensive parking provision for "fleet" trucks and trailers while the expansive loading dock provisions will readily accommodate the peak demands for receipt and dispatch vehicles.

6. ACCESS, INTERNAL CIRCULATION AND SERVICING

ACCESS

The proposed vehicle access provisions comprise:

- * separate 4m wide secondary ingress and egress driveways on the Worth Street frontage for car park access
- * separate 8.5m wide ingress and egress driveways on the Worth Street frontage for truck access

The accesses on the Worth Street frontage will be located where good sight distances are available (satisfying the Austroads sight distance criteria) and there will be appropriate separation. The truck accesses will accommodate all vehicles requiring to access the site as indicated on the turning path diagrams in Appendix F.

INTERNAL CIRCULATION

The design of the carpark and access will comply with the requirements of AS2890.1 and 6 while the loading docks, access and manoeuvring for trucks will be designed to comply with AS2890.2. The results of turning path assessments for trucks are indicated on the development plans and the diagrams provided in Appendix F.

SERVICING

Refuse will be removed by a contractor and this vehicle as well as other service vehicles will be able to utilise the large hardstand area provided.

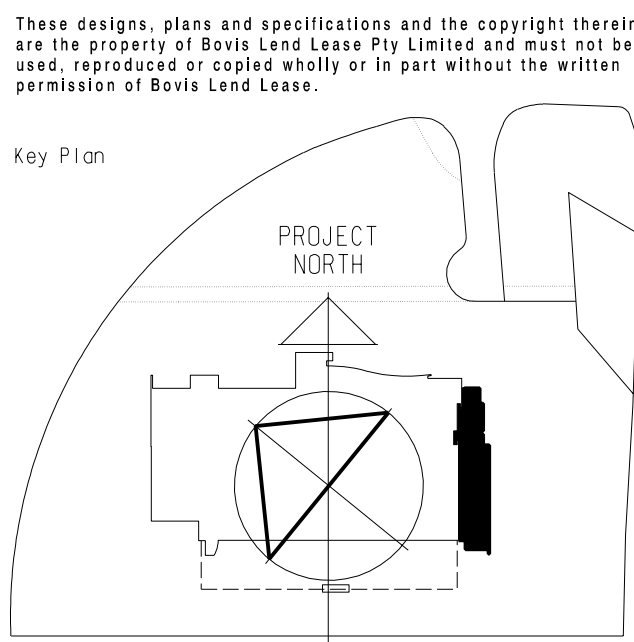
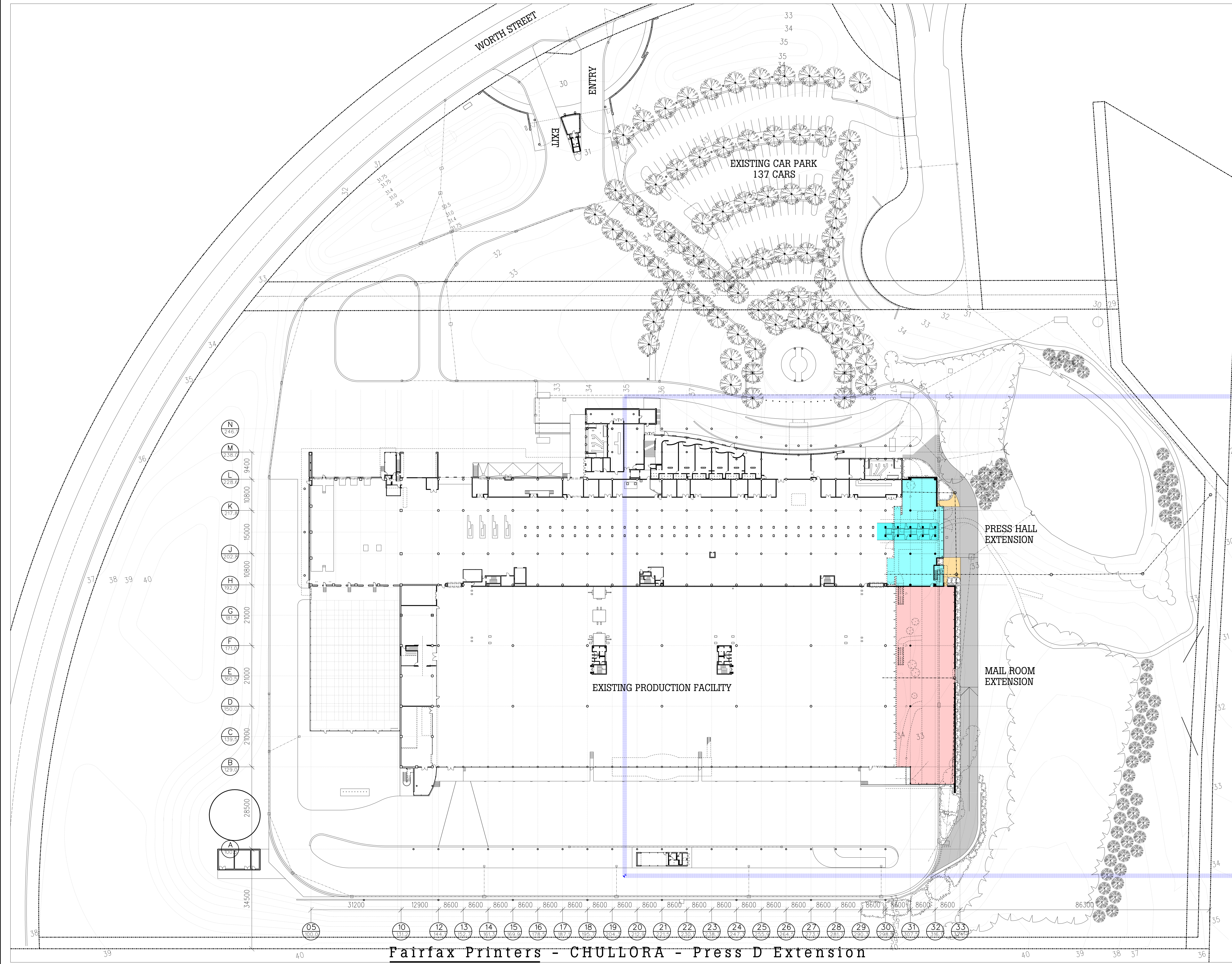
7. CONCLUSION

This assessment of the potential traffic and parking implications of the proposed new warehouse and distribution facility in Worth Street at Chullora has concluded that:

- * there will not be any unsatisfactory traffic implications
- * the proposed parking provision will be suitable and adequate
- * the proposed vehicle access arrangements will be appropriate and will accommodate all vehicles requiring to access the site
- * the proposed internal circulation arrangements will be suitable and appropriate for the manoeuvring and standing of trucks and cars

APPENDIX A

PLAN OF EXISTING



LEVEL 1 PLAN SEE A.20010
LEVEL 2 PLAN SEE A.20020
LEVEL 3 PLAN SEE A.20030
ROOF PLAN SEE A.20050

Issue	Rev.	Revision Description	Date
A		DEVELOPMENT APPLICATION FOR FIRST PRESS EXTENSION SEE A:009 FOR ORIGINAL BUILDING SEE A:006	30.10.00

Bovis
Lend Lease

Project Management and Design
Bovis Lend Lease Pty. Limited
PO BOX 998 142
Tower Building Australia Square
Sydney 2000

Fairfax Printers

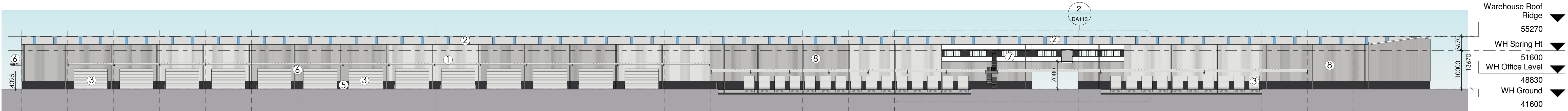
PRODUCTION FACILITY CHULLORA - PRESS D EXTN

SITE PLAN

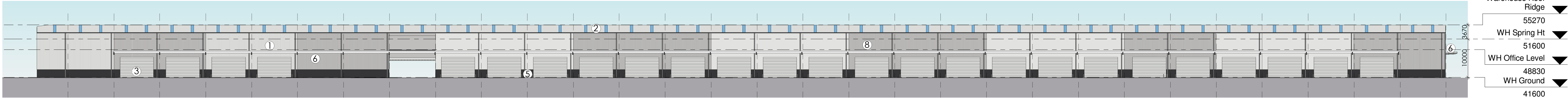
Scale: 1:500 @ B1, 1:1250@ A3				
Drawn	Checked	Coordinated	Approved	Date
RFD				30.10.0
Project Number : Drawing Number				Issue
102147: A.20009				A

APPENDIX B

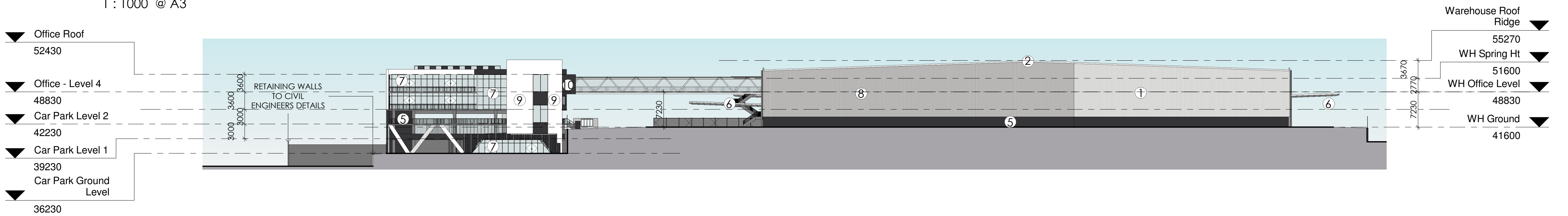
DEVELOPMENT PLANS



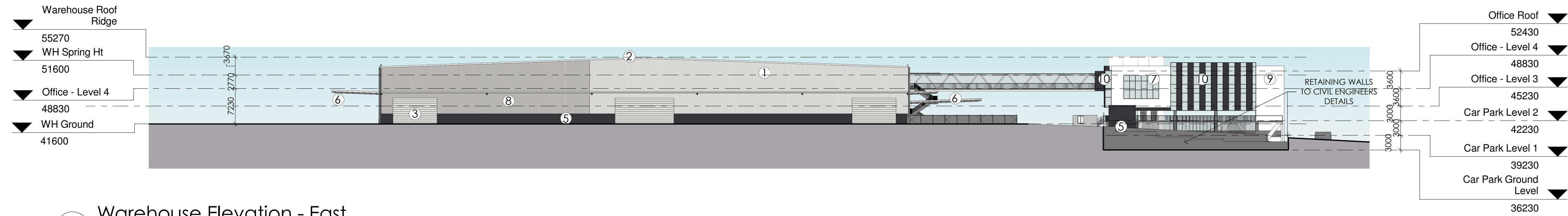
1 Warehouse Elevation - North
1 : 500 @ A1
1 : 1000 @ A3



2 Warehouse Elevation - South
1 : 500 @ A1
1 : 1000 @ A3

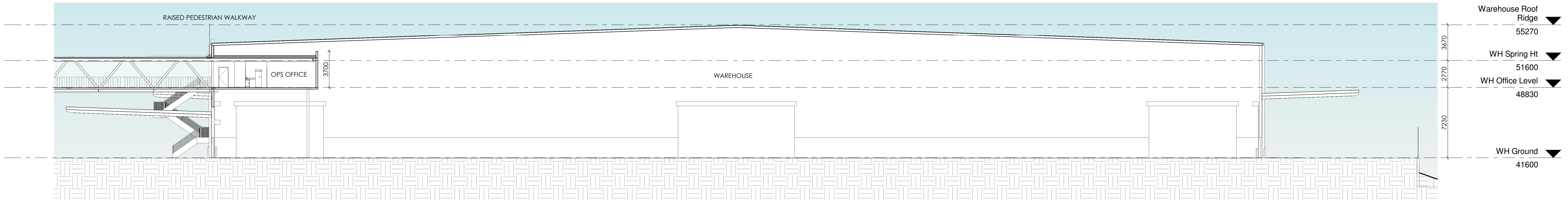


3 Warehouse Elevation - West
1 : 500 @ A1
1 : 1000 @ A3

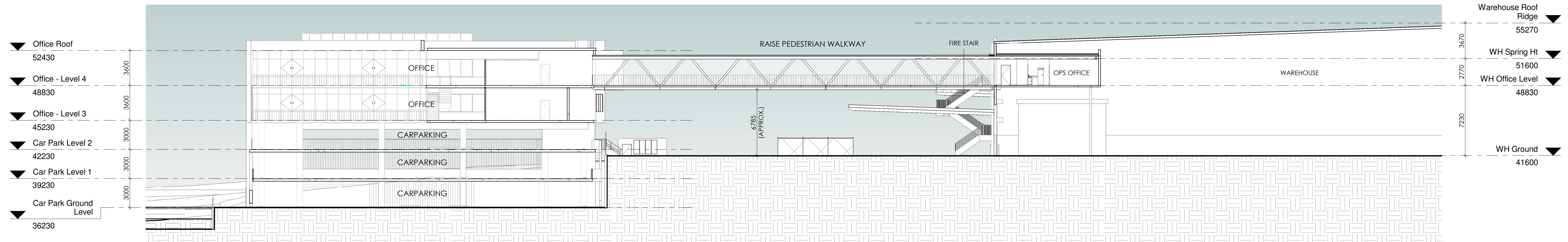


4 Warehouse Elevation - East
1 : 500 @ A1
1 : 1000 @ A3

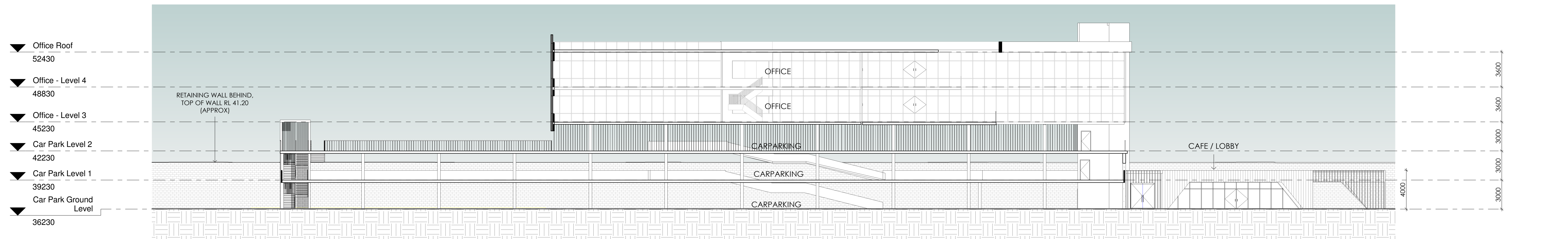
EXTERNAL FINISHES LEGEND	
1	COLORBOND METAL CLADDING - "SURFMIST"
2	ZINCALUME ROOF SHEETING WITH 10% TRANSLUCENT SHEETING
3	ROLLER SHUTTER DOORS - COLORBOND "WINDSPRAY"
4	PAINTED CONCRETE PRECAST PANEL - "SHALE GREY"
5	PAINTED CONCRETE PRECAST PANEL - "MONUMENT"
6	WAREHOUSE AWNING - COLORBOND "WINDSPRAY"
7	SELECTED GLAZING TO COMPLY WITH SECTION J OF BCA
8	COLORBOND METAL CLADDING - "SHALE GREY"
9	PAINTED CONCRETE - WHITE
10	ALUCOBOND CLADDING - "DARK METALLIC GREY"
11	COLORBOND METAL CLADDING - "MONUMENT"
12	ALUCUBOND CLADDING - "WHITE"
13	VERTICAL ALUMINIUM SCREENING



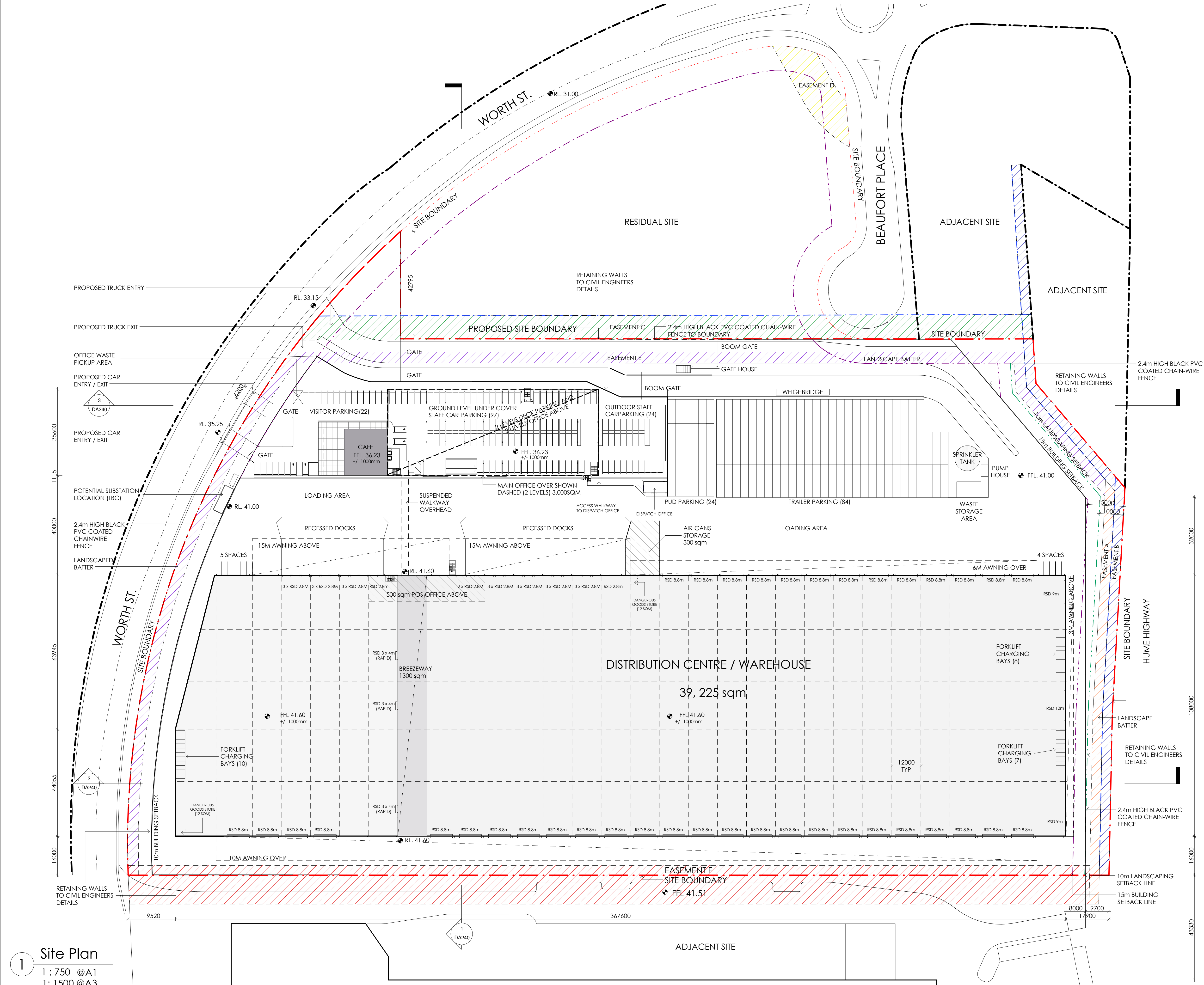
1 Warehouse Section 1.
1 : 200 @ A1
1 : 400 @ A3



2 Office Section 1
1 : 200 @ A1
1 : 400 @ A3



3 Office Section 2
1 : 200 @ A1
1 : 400 @ A3



LEGEND

BOUNDARY LINE

EXISTING EASEMENT

EASEMENT LEGEND

EASEMENT A - 4m WIDE SYDNEY TRAINS TRANSMISSION EASEMENT

EASEMENT B - 4m WIDE DRAIN WATER EASEMENT

EASEMENT C - 10m WIDE SEWER EASEMENT

EASEMENT D - 14m WIDE STORM WATER EASEMENT

EASEMENT E - 4.5m PROPOSED NEW SYDNEY TRAINS TRANSMISSION EASEMENT

EASEMENT F - 16m WIDE EXISTING SYDNEY TRAINS OVERHEAD TRANSMISSION EASEMENT TO BE EXTINGUISHED

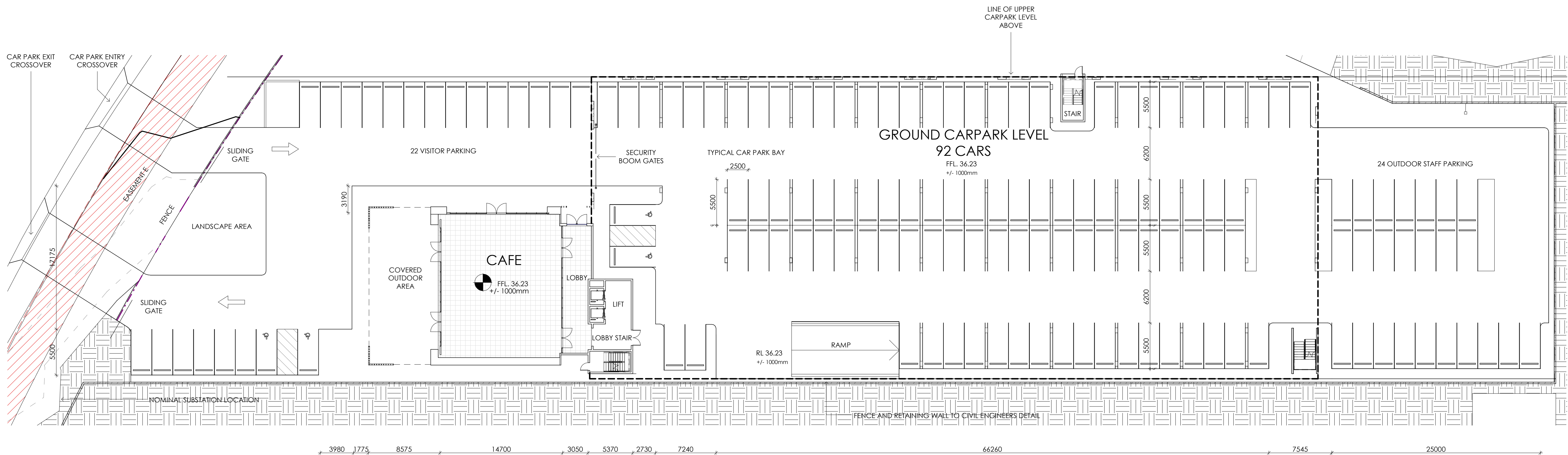
DEVELOPMENT SUMMARY	
SUBJECT SITE AREA:	85,360 SQM
RESIDUAL SITE AREA:	17,519 SQM
DISTRIBUTION CENTRE FACILITY	
TOTAL SITE AREA	85,360 SQM
WAREHOUSE (INCLUDING BREEZEWAY 1,300SQM)	39,225 SQM
MAIN OPS OFFICE 1 (MEZZANINE)	500 SQM
MAIN OFFICE (2 LEVELS)	3000 SQM
CAFE / GROUND FLOOR LOBBY	360 SQM
RAISED PEDESTRIAN WALKWAY)	125 SQM
GATE HOUSE	30 SQM
DISPATCH OFFICE	50 SQM
TOTAL BUILDING AREA	43,290 SQM
AWNING (3M)	324 SQM
AWNING (6M)	1008 SQM
AWNING (10M)	3355 SQM
AWNING (15M)	1979 SQM
CARPARKING DECK LEVEL 1	3100 SQM
CARPARKING DECK LEVEL2	3100 SQM
TOTAL CARPARKING DECK AREA	6200 SQM
VISITOR PARKING - GF	22 SPACES
STAFF PARKING - GF	121 SPACES
HARDSTAND OVERFLOW PARKING SPACES	9 SPACES
STAFF PARKING - L1	98 SPACES
STAFF PARKING - L2	102 SPACES
TOTAL CARPARK SPACES	352 SPACES
TRAILER PARKING	84 SPACES
PUD PARKING	24 SPACES

1

Site Plan

1 : 750 @A1

1 : 1500 @A3



1 Car Park / Office Floor
1 : 250 @ A1
1 : 500 @ A3

CAR PARKING NUMBERS	
VISITOR PARKING - GROUND FLOOR (INC. 2 ACCESSIBLE)	22
STAFF PARKING - GROUND FLOOR (INC. 2 ACCESSIBLE)	121
HARDSTAND OVERFLOW PARKING	9
LEVEL 1 PARKING	98
LEVEL 2 PARKING	102
TOTAL	352



project
Distribution Centre, Chullora
address
2 Hume Highway, Chullora
job no
150907

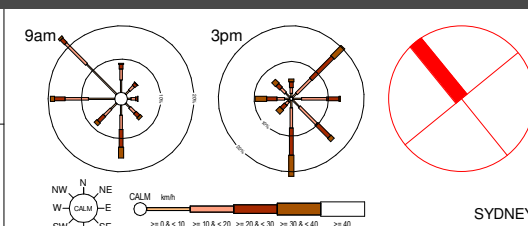
REV	DESCRIPTION	DATE
A	Issued for Development Application	8.10.15
B	Minor Revisions, retaining walls shown	20.10.15
C	Development Application - Final	23.10.15

DO NOT SCALE THIS DRAWING. VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING ANY WORK. COPYRIGHT © THIS DRAWING REMAINS THE PROPERTY OF PACEARCHITECTS. REPRODUCTION IN WHOLE OR PART IS FORBIDDEN.
NOTE: THE LOCATION OF PROPERTY ALIGNMENTS IS DETERMINED FROM SURVEY INFORMATION PROVIDED BY SURVEYOR.

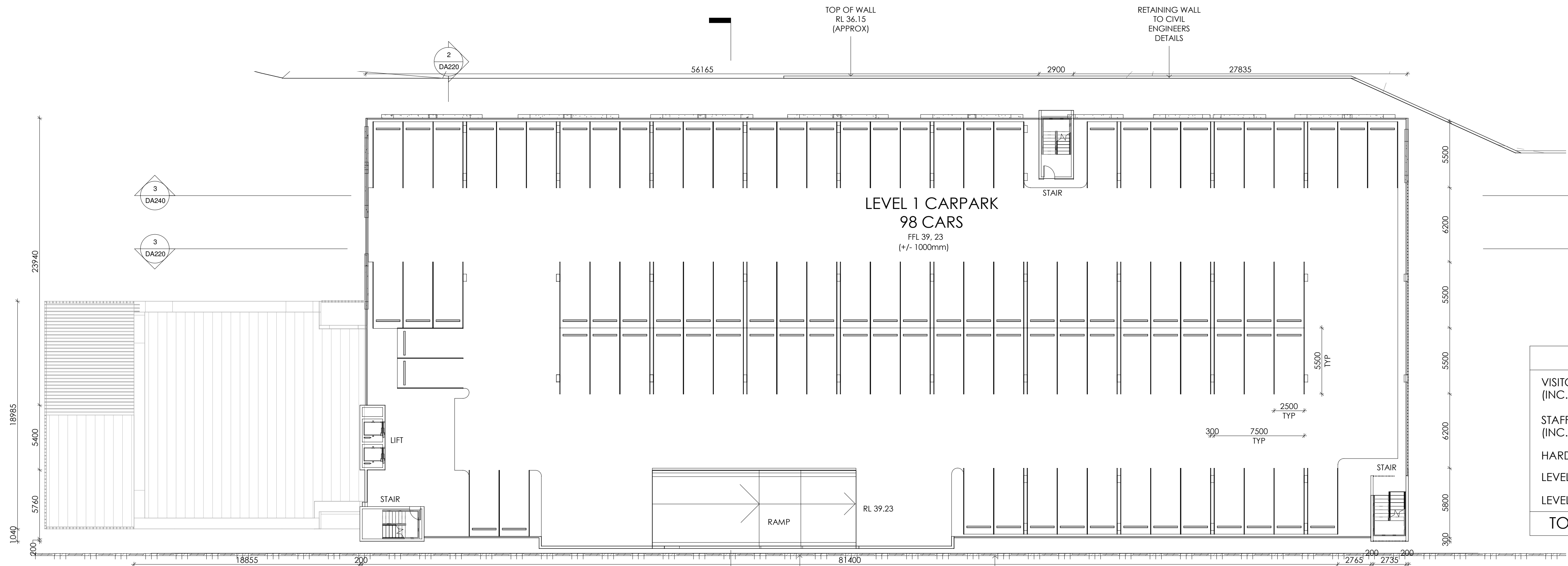
Office Car Park Floor Plan

dwg no
140204-DA110

issue
C
scale
as noted
dwn

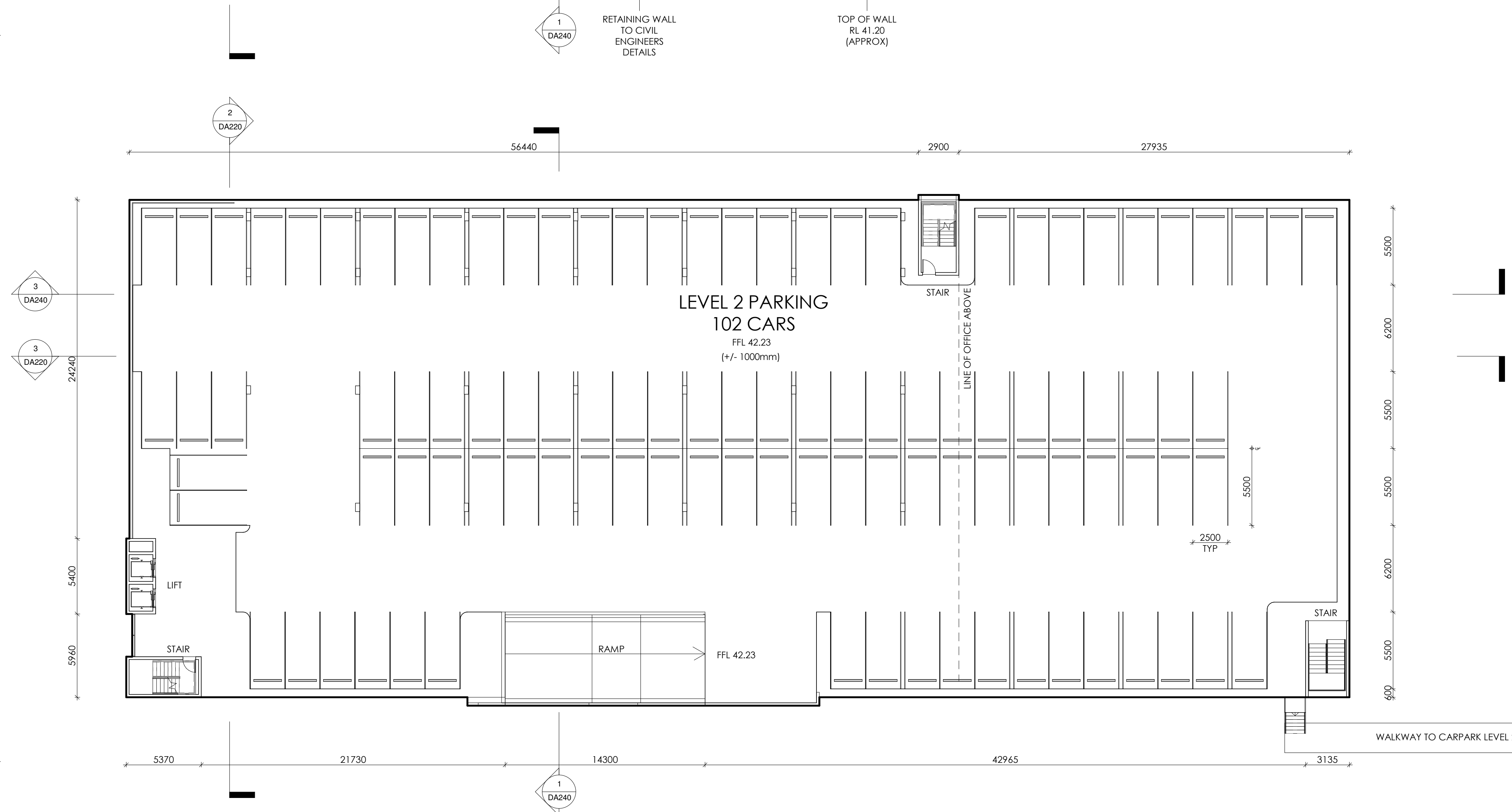


SYDNEY
PACEARCHITECTS



CAR PARKING NUMBERS	
VISITOR PARKING - GROUND FLOOR (INC. 2 ACCESSIBLE)	22
STAFF PARKING - GROUND FLOOR (INC. 2 ACCESSIBLE)	121
HARDSTAND OVERFLOW PARKING	9
LEVEL 1 PARKING	98
LEVEL 2 PARKING	102
TOTAL	352

1 Car Park Level 1
1 : 200 @ A1
1 : 400 @ A3



2 Car Park Level 2
1 : 200 @ A1
1 : 400 @ A3

APPENDIX C

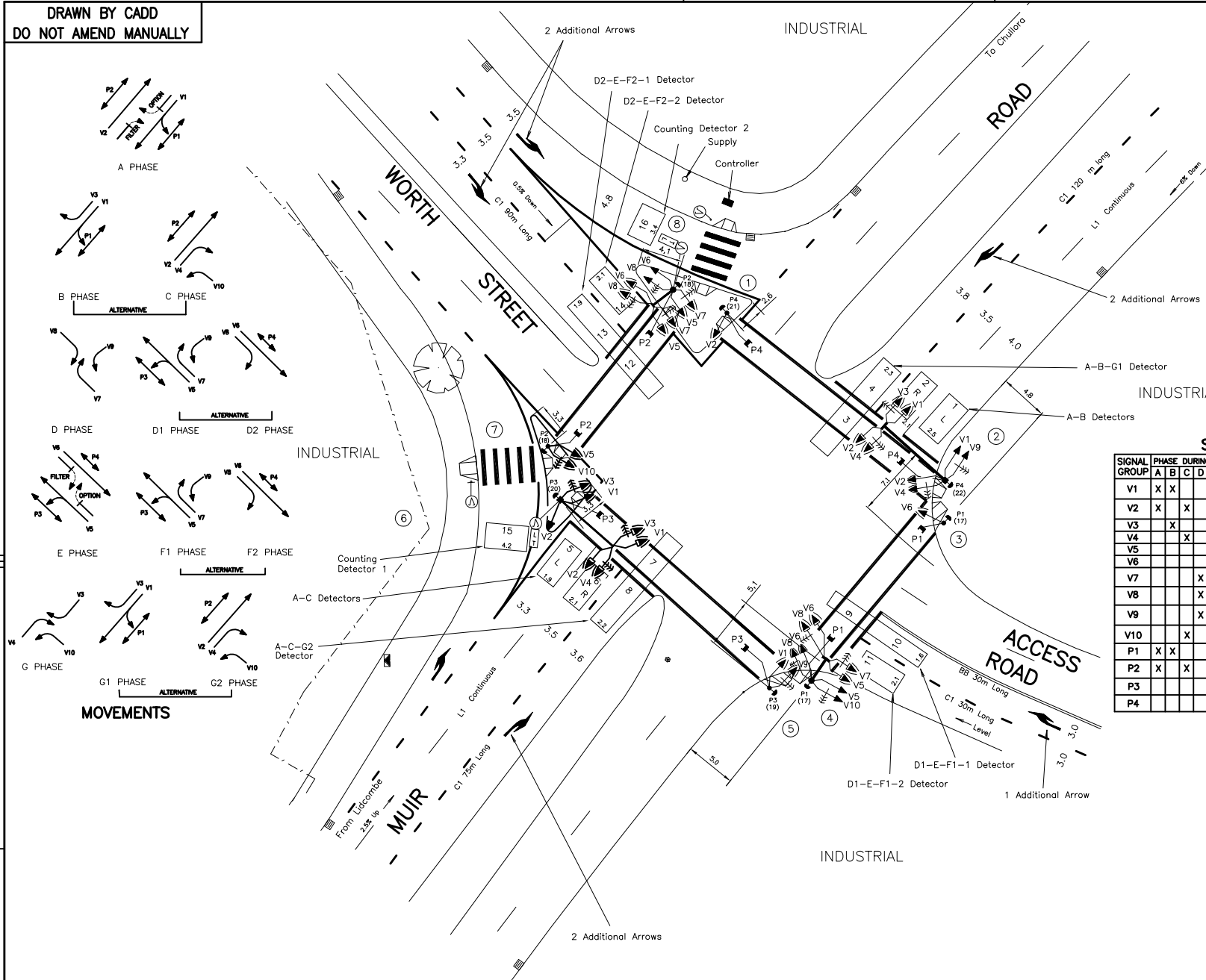
INTERSECTION DETAILS

DRAWN BY CADD
DO NOT AMEND MANUALLY

DATE IN SERVICE : 13/6/97



7000.026.W.2983



POSTS			
POST	TYPE	LENGTH	REMARKS
1	2	4.1	EXISTING
2	9	-	NEW 7.0m Outreach
3	2	4.1	NEW
4	SS	-	NEW
5	2	4.1	NEW
6	9	-	NEW 7.0m Outreach
7	2	4.1	NEW
8	SS	-	NEW

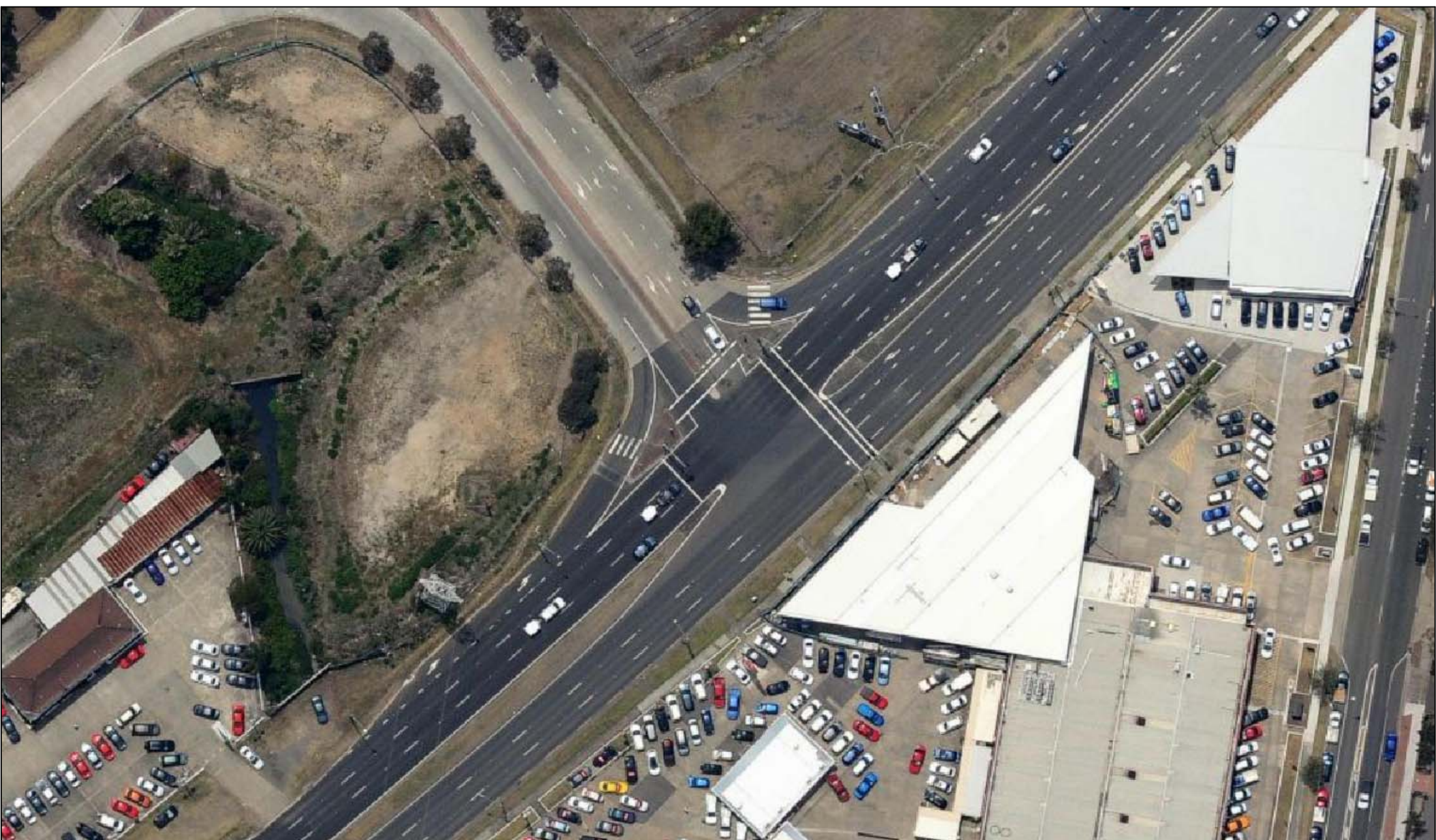
SIGNAL GROUP / PHASE CHART												
SIGNAL GROUP	A	B	C	D	D1	D2	E	F1	F2	G	G1	G2
V1	X	X								X		
V2	X	X								X		
V3	X									X	X	
V4		X								X	X	
V5					X	X	X	X				
V6					X	X	X	X				
V7			X	X								
V8			X	X								
V9			X	X								
V10			X							X	X	
P1	X	X								X		
P2	X	X								X		
P3				X	X							
P4				X	X							

* P.B. on post 2 extends R.A. timer
P.B. on post 6 extends R.A. timer

NOTES:

- This site is SCATS linked.
- Special stop sign (R1-4) placed on posts 4 & 8.
- Roadworks in accordance with Bankstown Council's construction plans.
- Kerb ramps to be constructed at all pedestrian crossings, in accordance with Model Drawing MD.R173.B01.A.
- All Push buttons are audio tactile.
- Double diamond overlap in accordance with standard drawing V018-6 except for filter options.

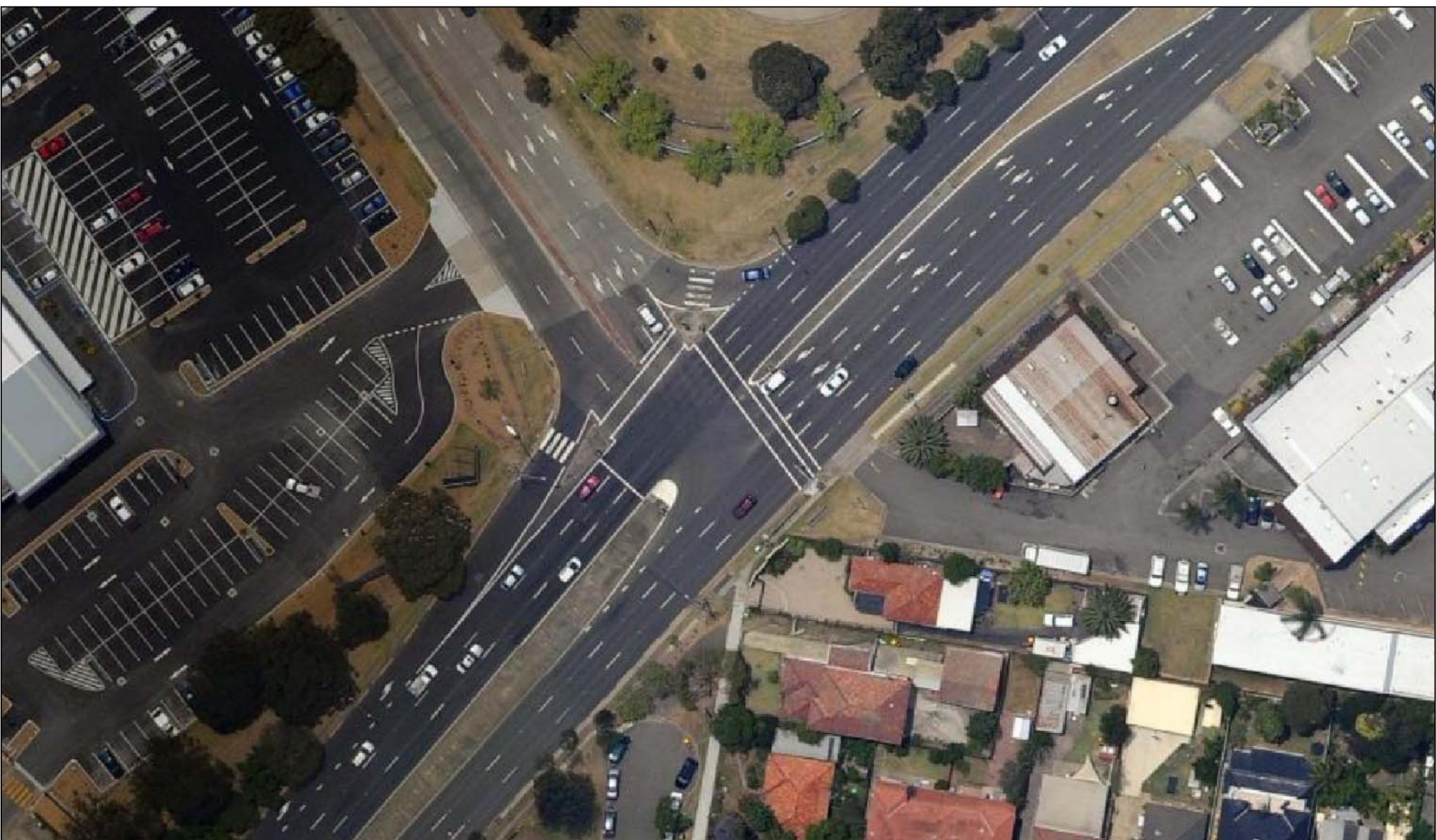
A ORIGINAL ISSUE	PUBLIC UTILITY LEGEND	REFERENCE PLANS	U.S.D. Ref. MAP 282 B8	DESIGN APPROVAL	RTA ACCEPTANCE	Roads and Traffic Authority, N.S.W.	EXISTING ☐ PROPOSED ☒
	HYDRANT ☐	SYMBOLS/ANNS V0003-8	U.S.D. E 304 218	APPROVED	RECOMMENDED	BANKSTOWN CITY COUNCIL AREA	SCAD FILE: W.2983_4A.dgn
	STOP VALVE ☐	STR. POST V0001-9	CO-ORDS No 1 248 148	ROSS NETTLE	POSITION	TRAFFIC SIGNALS AT INTERSECTION OF	SCALE 5 0 1(200) 5 10
	GAS VALVE ☐	DET. SCHED. EXP V0018-10	DESIGNED ROSS NETTLE	DATE 02.04.05	DATE	MUIR ROAD, WORTH STREET AND ACCESS ROAD	FILE 026 TS 344
	SEWER MANHOLE ☐	PRIN. DETENT V0009-17	CHECKED ROSS NETTLE	DESIGN PREPARED BY	TRANSPORT AND TRAFFIC PLANNING ASSOCIATES	CHULLORA	REGN: 7000.026.W.2983
	TELECOM. PVT. ☐	SSO. RES. SIG. V0018-8		DATE			SHEET 4
	ELECT. LIGHT POLE ☐						
	POWER POLE ☐						
	STAY POLE ☐						
	TELEPHONE BOX ☐	SURVEYORS Bankstown City					
	TELECOM. PILLAR ☐	DATE 1 2004					



LEGEND



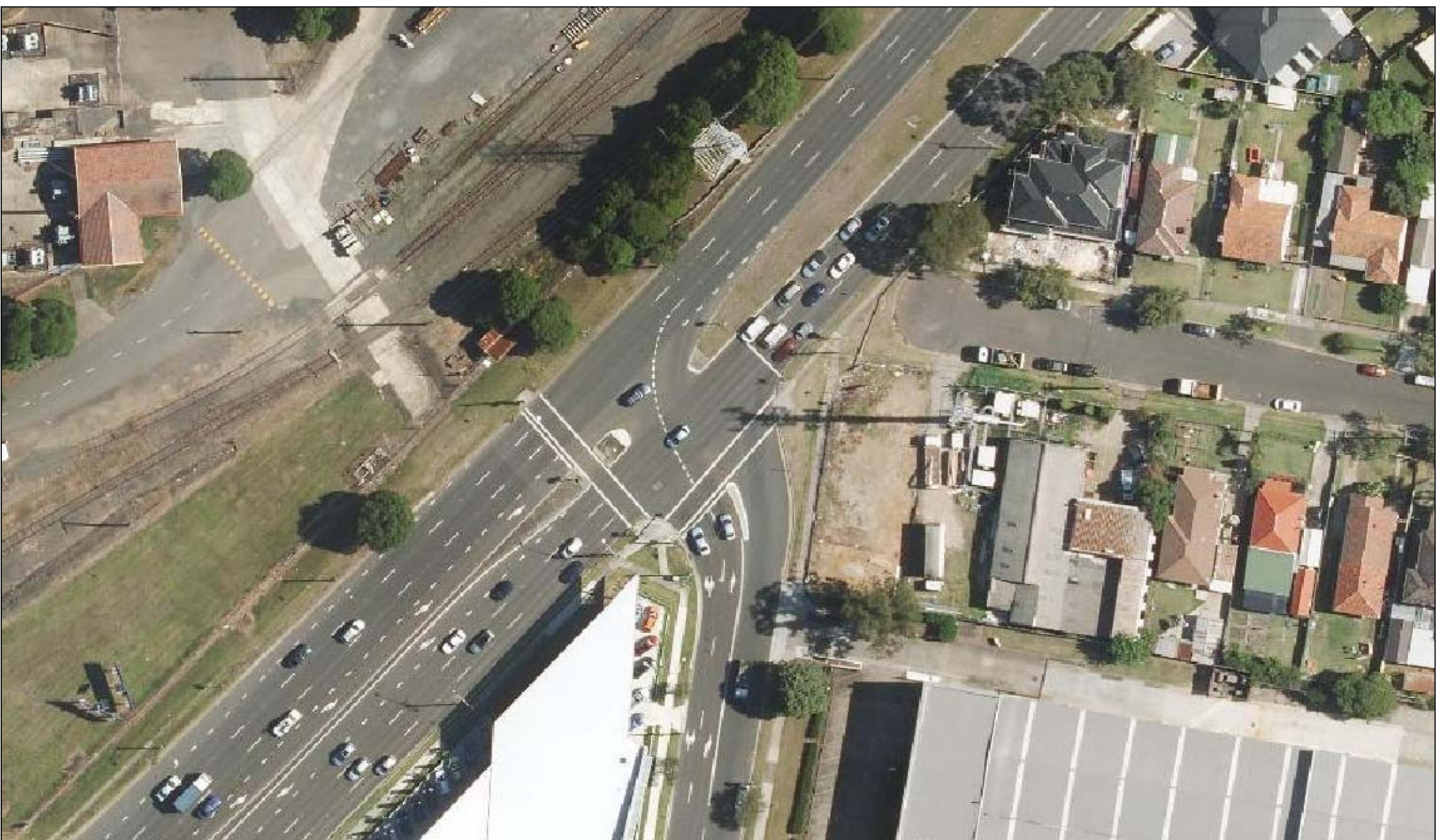
**HUME HIGHWAY &
WORTH STREET
INTERSECTION**



LEGEND



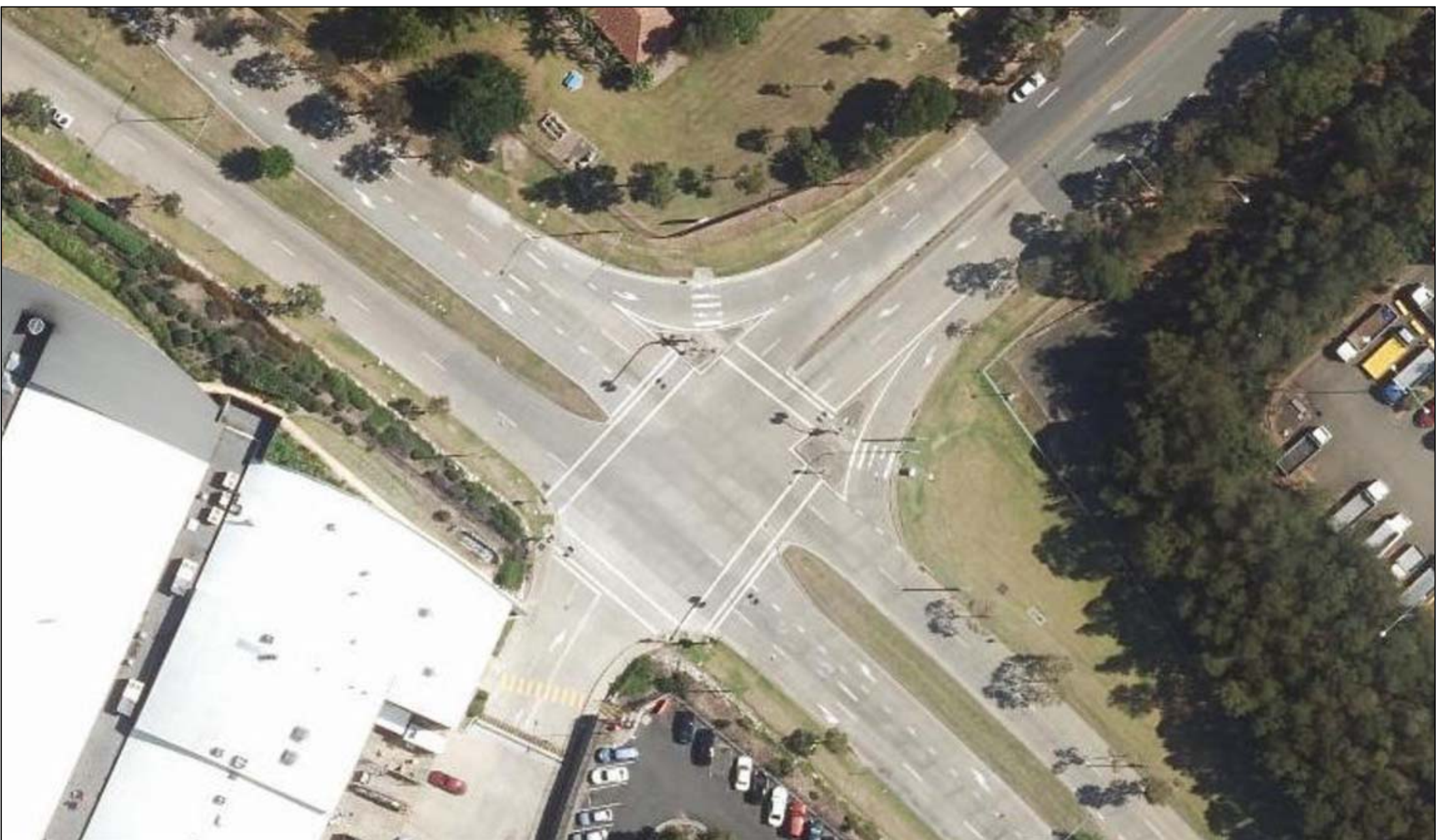
**HUME HIGHWAY &
MUIR STREET
INTERSECTION**



LEGEND



HUME HIGHWAY &
WATERLOO ROAD
INTERSECTION



LEGEND



**WORTH STREET & MUIR
ROAD INTERSECTION**

APPENDIX D

SIDRA RESULTS

MOVEMENT SUMMARY

 Site: MUIR WORTH AM Future

 Network: WORTH & HUME AM Future

Signals - Fixed Time Cycle Time = 80 seconds (Practical Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Arrival Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: MUIR													
4	L2	11	0.0	11	0.0	0.396	33.8	LOS C	5.8	41.0	0.89	0.73	38.7
5	T1	332	2.0	332	2.0	0.396	28.7	LOS C	5.8	41.5	0.89	0.73	39.4
6	R2	81	10.0	81	10.0	0.257	26.2	LOS B	2.3	17.2	0.86	0.74	39.8
Approach		424	3.5	424	3.5	0.396	28.3	LOS B	5.8	41.5	0.89	0.73	39.4
NorthEast: WORTH													
7	L2	31	10.0	31	10.0	0.031	8.7	LOS A	0.3	2.3	0.36	0.62	47.1
8	T1	8	10.0	8	10.0	0.017	23.4	LOS B	0.2	1.7	0.76	0.52	43.4
9	R2	316	10.0	316	10.0	0.538	21.7	LOS B	8.4	64.1	0.82	0.79	43.3
Approach		355	10.0	355	10.0	0.538	20.6	LOS B	8.4	64.1	0.77	0.77	43.5
NorthWest: MUIR													
10	L2	240	10.0	240	10.0	0.491	15.6	LOS B	5.4	40.8	0.78	0.76	47.9
11	T1	284	2.0	284	2.0	0.491	24.8	LOS B	7.4	52.7	0.88	0.76	32.8
12	R2	25	0.0	25	0.0	0.072	24.8	LOS B	0.7	4.6	0.81	0.69	41.8
Approach		549	5.4	549	5.4	0.491	20.8	LOS B	7.4	52.7	0.83	0.76	40.9
SouthWest: ACCESS RD													
1	L2	11	0.0	11	0.0	0.027	25.9	LOS B	0.4	2.8	0.72	0.63	42.0
2	T1	4	0.0	4	0.0	0.027	20.4	LOS B	0.4	2.8	0.72	0.63	42.8
3	R2	4	0.0	4	0.0	0.006	18.1	LOS B	0.1	0.6	0.64	0.62	38.0
Approach		19	0.0	19	0.0	0.027	23.1	LOS B	0.4	2.8	0.70	0.63	41.7
All Vehicles		1347	5.9	1347	5.9	0.538	23.2	LOS B	8.4	64.1	0.83	0.75	41.1

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P2	SouthEast Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93	
P3	NorthEast Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93	
P4	NorthWest Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93	
P1	SouthWest Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93	
All Pedestrians		200	34.3	LOS D			0.93	0.93	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

 **Site: HUME MUIR AM Future**  **Network: WORTH & HUME AM Future**

New Site
Signals - Fixed Time Coordinated Cycle Time = 150 seconds (Network Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Arrival Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: HUME HWY													
8	T1	1627	2.0	1627	2.0	0.388	8.2	LOS A	14.7	104.5	0.41	0.37	52.9
9	R2	386	10.0	386	10.0	0.835	52.9	LOS D	10.8	81.9	1.00	0.91	22.3
Approach		2013	3.5	2013	3.5	0.835	16.7	LOS B	14.7	104.5	0.52	0.47	46.1
NorthWest: MUIR													
10	L2	191	10.0	191	10.0	0.266	23.0	LOS B	7.4	56.4	0.60	0.73	41.7
12	R2	136	10.0	136	10.0	0.203	60.4	LOS E	4.2	31.8	0.88	0.75	28.3
Approach		327	10.0	327	10.0	0.266	38.6	LOS C	7.4	56.4	0.71	0.74	34.8
SouthWest: HUME HWY													
1	L2	238	10.0	238	10.0	0.168	7.9	LOS A	2.9	22.3	0.23	0.61	48.0
2	T1	2350	2.0	2350	2.0	0.836	32.5	LOS C	50.7	360.8	0.90	0.83	39.2
Approach		2588	2.7	2588	2.7	0.836	30.2	LOS C	50.7	360.8	0.84	0.81	39.6
All Vehicles		4928	3.5	4928	3.5	0.836	25.3	LOS B	50.7	360.8	0.70	0.67	41.5

Level of Service (LOS) Method: Delay (RTA NSW).
 Vehicle movement LOS values are based on average delay per movement
 Intersection and Approach LOS values are based on average delay for all vehicle movements.
 SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P3	NorthEast Full Crossing	50	69.3	LOS F	0.2	0.2	0.96	0.96	
P4	NorthWest Full Crossing	50	23.6	LOS C	0.1	0.1	0.56	0.56	
All Pedestrians		100	46.4	LOS E			0.76	0.76	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
 Pedestrian movement LOS values are based on average delay per pedestrian movement.
 Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Signals - Fixed Time Cycle Time = 90 seconds (Practical Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Arrival Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: MUIR													
4	L2	3	0.0	3	0.0	0.430	39.5	LOS C	6.5	45.9	0.91	0.75	36.4
5	T1	328	2.0	328	2.0	0.430	34.3	LOS C	6.5	46.3	0.92	0.75	37.0
6	R2	51	10.0	51	10.0	0.201	31.2	LOS C	1.7	12.7	0.89	0.73	37.5
Approach		382	3.1	382	3.1	0.430	33.9	LOS C	6.5	46.3	0.92	0.75	37.0
NorthEast: WORTH													
7	L2	26	10.0	26	10.0	0.025	9.1	LOS A	0.3	2.2	0.35	0.61	46.6
8	T1	4	10.0	4	10.0	0.007	23.4	LOS B	0.1	0.9	0.72	0.47	43.4
9	R2	439	10.0	439	10.0	0.617	20.8	LOS B	12.4	94.4	0.80	0.81	43.8
Approach		469	10.0	469	10.0	0.617	20.2	LOS B	12.4	94.4	0.78	0.79	43.9
NorthWest: MUIR													
10	L2	218	10.0	218	10.0	0.604	23.6	LOS B	7.5	55.7	0.89	0.82	43.6
11	T1	324	2.0	324	2.0	0.604	31.0	LOS C	9.5	67.8	0.94	0.81	29.6
12	R2	12	0.0	12	0.0	0.040	29.5	LOS C	0.4	2.6	0.84	0.67	39.7
Approach		554	5.1	554	5.1	0.604	28.1	LOS B	9.5	67.8	0.92	0.81	36.3
SouthWest: ACCESS RD													
1	L2	15	0.0	15	0.0	0.037	30.2	LOS C	0.6	4.2	0.74	0.65	39.9
2	T1	4	0.0	4	0.0	0.037	24.6	LOS B	0.6	4.2	0.74	0.65	40.7
3	R2	7	0.0	7	0.0	0.010	17.1	LOS B	0.1	1.0	0.62	0.63	38.7
Approach		26	0.0	26	0.0	0.037	25.8	LOS B	0.6	4.2	0.71	0.65	39.9
All Vehicles		1431	6.1	1431	6.1	0.617	27.0	LOS B	12.4	94.4	0.87	0.78	39.1

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P2	SouthEast Full Crossing	50	33.9	LOS D	0.1	0.1	0.87	0.87
P3	NorthEast Full Crossing	50	39.3	LOS D	0.1	0.1	0.94	0.94
P4	NorthWest Full Crossing	50	39.3	LOS D	0.1	0.1	0.94	0.94
P1	SouthWest Full Crossing	50	39.3	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		200	37.9	LOS D			0.92	0.92

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY


Site: HUME MUIR PM Future


Network: WORTH & HUME PM Future

New Site
 Signals - Fixed Time Coordinated Cycle Time = 150 seconds (Network Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Arrival Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: HUME HWY													
8	T1	2208	2.0	2208	2.0	0.558	9.6	LOS A	25.6	182.3	0.48	0.45	51.9
9	R2	312	10.0	312	10.0	0.562	42.3	LOS C	7.4	55.9	0.97	0.80	25.5
Approach		2520	3.0	2520	3.0	0.562	13.6	LOS A	25.6	182.3	0.54	0.49	48.5
NorthWest: MUIR													
10	L2	191	10.0	191	10.0	0.234	12.2	LOS A	4.6	35.0	0.39	0.67	48.2
12	R2	298	10.0	298	10.0	0.445	63.6	LOS E	9.7	73.6	0.93	0.80	27.6
Approach		489	10.0	489	10.0	0.445	43.5	LOS D	9.7	73.6	0.72	0.75	33.1
SouthWest: HUME HWY													
1	L2	144	10.0	144	10.0	0.101	7.1	LOS A	1.4	10.4	0.19	0.60	49.0
2	T1	1613	2.0	1613	2.0	0.584	29.0	LOS C	28.2	200.9	0.77	0.69	40.7
Approach		1757	2.7	1757	2.7	0.584	27.2	LOS B	28.2	200.9	0.72	0.68	41.0
All Vehicles		4766	3.6	4766	3.6	0.584	21.7	LOS B	28.2	200.9	0.63	0.59	43.5

Level of Service (LOS) Method: Delay (RTA NSW).
 Vehicle movement LOS values are based on average delay per movement
 Intersection and Approach LOS values are based on average delay for all vehicle movements.
 SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P3	NorthEast Full Crossing	50	69.3	LOS F	0.2	0.2	0.96	0.96
P4	NorthWest Full Crossing	50	25.9	LOS C	0.1	0.1	0.59	0.59
All Pedestrians		100	47.6	LOS E			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
 Pedestrian movement LOS values are based on average delay per pedestrian movement.
 Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY



Site: HUME WATERLOO AM Future



Network: WATERLOO & WORTH AM Future

Signals - Fixed Time Coordinated Cycle Time = 150 seconds (Network Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Arrival Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: WATERLOO													
4	L2	74	10.0	74	10.0	0.295	59.9	LOS E	6.5	49.1	0.89	0.78	20.5
6	R2	119	10.0	119	10.0	0.295	63.1	LOS E	6.5	49.1	0.91	0.77	29.2
Approach		193	10.0	193	10.0	0.295	61.9	LOS E	6.5	49.1	0.90	0.78	26.5
NorthEast: HUME HWY													
7	L2	142	10.0	142	10.0	0.567	22.0	LOS B	27.5	198.3	0.61	0.61	48.4
8	T1	1918	2.0	1918	2.0	0.567	15.2	LOS B	28.0	199.6	0.60	0.56	44.1
Approach		2060	2.6	2060	2.6	0.567	15.7	LOS B	28.0	199.6	0.60	0.57	44.6
SouthWest: HUME HWY													
2	T1	2588	2.0	2588	2.0	0.600	0.8	LOS A	3.0	21.3	0.05	0.05	68.3
3	R2	52	10.0	52	10.0	0.298	33.1	LOS C	2.7	20.6	0.72	0.78	32.7
Approach		2640	2.2	2640	2.2	0.600	1.5	LOS A	3.0	21.3	0.07	0.06	66.9
All Vehicles		4893	2.6	4893	2.6	0.600	9.8	LOS A	28.0	199.6	0.32	0.30	52.8

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P2	SouthEast Full Crossing	50	12.4	LOS B	0.1	0.1	0.41	0.41
P1	SouthWest Full Crossing	50	69.3	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		100	40.8	LOS E			0.68	0.68

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Processed: Wednesday, 7 October 2015 4:41:13 PM

SIDRA INTERSECTION 6.0.24.4877

Project: P:\P2293 TTPA Ad Hoc Assistance September 2015\Technical Work\Models\Chullorra\Bitzios)

CHULLORRA - Future.sip6

8000283, 6019145, BITZIOS CONSULTING, PLUS / Floating

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SIDRA
INTERSECTION 6

MOVEMENT SUMMARY

 Site: HUME WORTH AM Future

 Network: WATERLOO & WORTH AM Future

Signals - Fixed Time Coordinated Cycle Time = 150 seconds (Network Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Arrival Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: HUME													
8	T1	1689	2.0	1689	2.0	0.392	7.1	LOS A	14.3	102.1	0.39	0.35	58.0
9	R2	303	10.0	303	10.0	0.750	70.3	LOS E	20.3	154.6	0.99	1.05	21.8
Approach		1992	3.2	1992	3.2	0.750	16.7	LOS B	20.3	154.6	0.48	0.46	46.3
NorthWest: WORTH													
10	L2	236	10.0	236	10.0	0.339	19.6	LOS B	8.3	63.1	0.56	0.73	37.0
12	R2	17	10.0	17	10.0	0.028	60.6	LOS E	0.5	3.9	0.86	0.67	30.0
Approach		253	10.0	253	10.0	0.339	22.3	LOS B	8.3	63.1	0.58	0.73	36.0
SouthWest: HUME													
1	L2	67	10.0	67	10.0	0.039	6.8	LOS A	0.0	0.0	0.00	0.57	58.3
2	T1	2404	2.0	2404	2.0	0.838	25.2	LOS B	44.0	313.4	0.79	0.73	36.0
Approach		2471	2.2	2471	2.2	0.838	24.7	LOS B	44.0	313.4	0.77	0.73	36.7
All Vehicles		4716	3.1	4716	3.1	0.838	21.2	LOS B	44.0	313.4	0.64	0.61	40.7

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P3	NorthEast Full Crossing	50	69.3	LOS F	0.2	0.2	0.96	0.96	
P4	NorthWest Full Crossing	50	24.7	LOS C	0.1	0.1	0.57	0.57	
All Pedestrians		100	47.0	LOS E			0.77	0.77	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

 Site: HUME WATERLOO PM Future

 Network: WATERLOO & WORTH PM Future

Signals - Fixed Time Coordinated Cycle Time = 150 seconds (Network Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Arrival Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: WATERLOO													
4	L2	110	10.0	110	10.0	0.532	64.0	LOS E	11.8	89.9	0.95	0.82	19.6
6	R2	229	10.0	229	10.0	0.532	66.2	LOS E	11.8	89.9	0.96	0.81	28.5
Approach		339	10.0	339	10.0	0.532	65.5	LOS E	11.8	89.9	0.95	0.81	26.2
NorthEast: HUME HWY													
7	L2	266	10.0	266	10.0	0.766	17.1	LOS B	30.8	223.4	0.50	0.56	51.4
8	T1	2637	2.0	2637	2.0	0.766	7.8	LOS A	30.8	223.4	0.41	0.41	53.3
Approach		2903	2.7	2903	2.7	0.766	8.7	LOS A	30.8	223.4	0.42	0.42	53.0
SouthWest: HUME HWY													
2	T1	1936	2.0	1936	2.0	0.449	7.6	LOS A	17.5	124.6	0.41	0.38	57.3
3	R2	80	10.0	80	10.0	0.642	63.9	LOS E	6.5	49.8	1.00	0.95	23.0
Approach		2016	2.3	2016	2.3	0.642	9.8	LOS A	17.5	124.6	0.44	0.40	54.1
All Vehicles		5258	3.0	5258	3.0	0.766	12.8	LOS A	30.8	223.4	0.46	0.44	48.9

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P2	SouthEast Full Crossing	50	11.6	LOS B	0.1	0.1	0.39	0.39	
P1	SouthWest Full Crossing	50	69.3	LOS F	0.2	0.2	0.96	0.96	
All Pedestrians		100	40.4	LOS E			0.68	0.68	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Signals - Fixed Time Coordinated Cycle Time = 150 seconds (Network Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Arrival Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: HUME													
8	T1	2553	2.0	2553	2.0	0.592	0.8	LOS A	2.9	20.6	0.05	0.05	68.4
9	R2	198	10.0	198	10.0	0.453	49.4	LOS D	12.2	93.1	0.90	0.95	26.9
Approach		2751	2.6	2751	2.6	0.592	4.3	LOS A	12.2	93.1	0.11	0.11	61.5
NorthWest: WORTH													
10	L2	308	10.0	308	10.0	0.412	13.8	LOS A	8.9	67.8	0.47	0.71	41.8
12	R2	45	10.0	45	10.0	0.075	61.4	LOS E	1.4	10.5	0.87	0.71	29.8
Approach		353	10.0	353	10.0	0.412	19.8	LOS B	8.9	67.8	0.53	0.71	38.3
SouthWest: HUME													
1	L2	22	10.0	22	10.0	0.013	6.8	LOS A	0.0	0.0	0.00	0.57	58.3
2	T1	1708	2.0	1708	2.0	0.588	27.4	LOS B	28.9	205.9	0.76	0.68	34.6
Approach		1730	2.1	1730	2.1	0.588	27.1	LOS B	28.9	205.9	0.75	0.68	34.9
All Vehicles		4834	2.9	4834	2.9	0.592	13.6	LOS A	28.9	205.9	0.37	0.36	48.2

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P3	NorthEast Full Crossing	50	69.3	LOS F	0.2	0.2	0.96	0.96
P4	NorthWest Full Crossing	50	24.7	LOS C	0.1	0.1	0.57	0.57
All Pedestrians		100	47.0	LOS E			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

APPENDIX E

EXTRACT FROM RMS TDT



in association with

GENNAOUI CONSULTING PTY LTD

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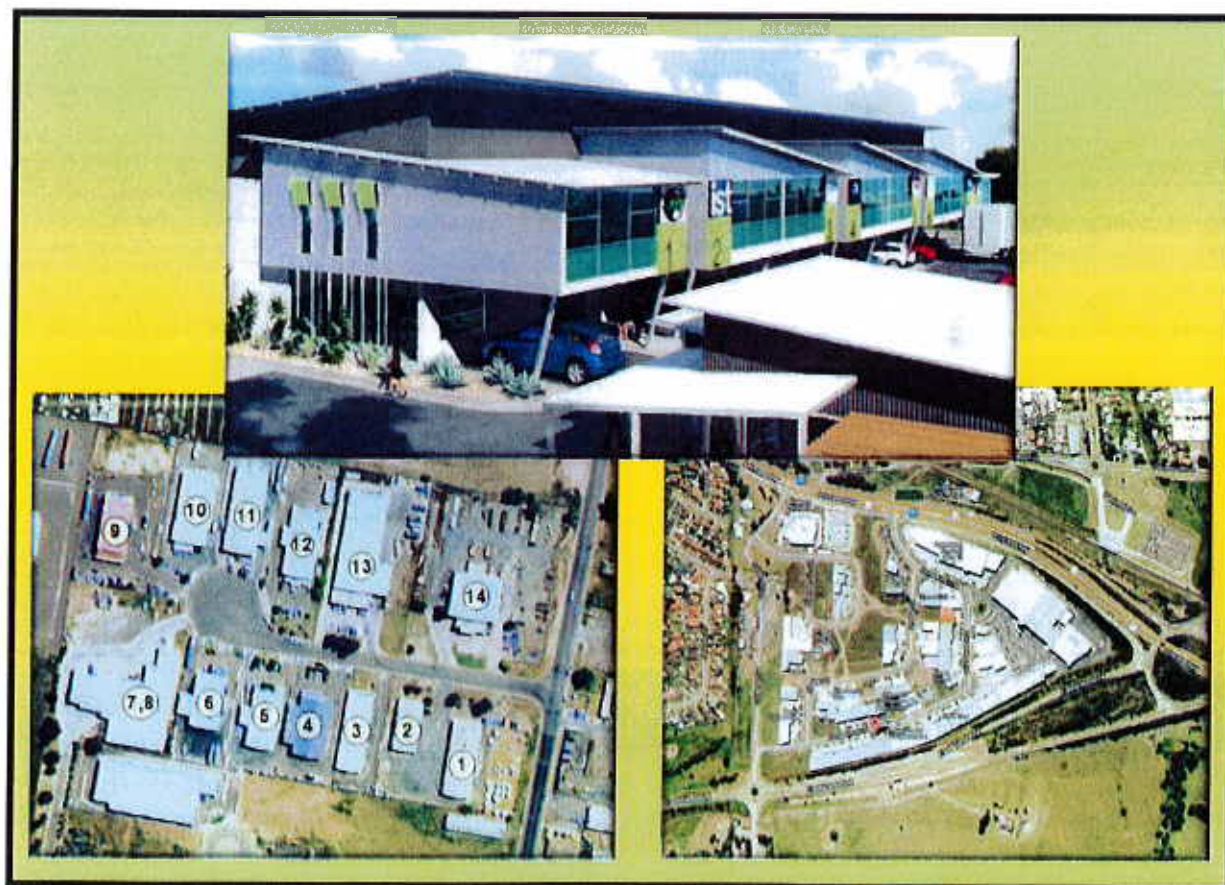
Transport
Roads & Maritime
Services

ROADS AND MARITIME SERVICES

TRIP GENERATION SURVEYS

BUSINESS PARKS AND INDUSTRIAL ESTATES

ANALYSIS REPORT



3 SURVEY ANALYSIS

3.1 Survey Output Requirements

The data was analysed with the key parameters needing to be established being

- Weekday survey site peak hourly generation AM & PM
- Weekday hourly generation in adjacent network AM & PM peak
- Weekday daily trip generation

3.2 Average Trip Rates for Business Parks and Industrial Estates

The trip generation calculation that was to be performed would depend upon the variable that was interrogated, in this case the total floor area by type of land use.

The summary of the survey data for each of the surveyed areas is shown in Table 3.1. Average trip generation rates for sites in the Sydney area are summarised in Table 3.2 together with those for non-Sydney area. The detailed results are contained in a separate "Data Report".

Table 3.1 Traffic survey results summary.

Site ID	Sydney areas				Non-Sydney areas							
	Site 1 Enkine Park Industrial Estate, Enkine Park	Site 2 Helensburgh Business Park, Helensburgh	Site 3 Wonderland Business Park, Eastern Creek	Site 4 Riverwood Business Park, Riverwood	Site 5 Tuggerah Business Park, Tuggerah	Site 6 Central Business Park, Albion Park Rail	Site 7 Anambah Business Park, Ruthven	Site 8 Freeway Business Park, Beresfield	Site 9 Shearwater Business Park, Taylors Beach	Site 10 Port Stephens Industrial Estate, Taylors Beach	Site 11 Johnson Street Business Park, Dubbo	
Gross Floor Area in estate m ²	663,605	1,055	406,650	29,583	136,737	47,699	28,795	88,281	48,022	19,881	14,419	
Person-based trips												
Site AM peak hour	1148	28	885	173	1416	294	168	575	244	94	120	
Trips per 100 m ² of GFA	0.17	1.74	0.23	0.58	1.04	0.69	0.56	0.64	1.52	0.47	0.83	
Site PM peak hour	1294	29	927	157	1458	519	204	555	285	97	149	
Trips per 100 m ² of GFA	0.19	1.81	0.23	0.52	1.07	1.21	0.69	0.62	1.78	0.49	1.03	
Vehicle network AM peak hour	976	24	743	173	1408	270	123	575	176	93	120	
Trips per 100 m ² of GFA	0.14	1.50	0.18	0.58	1.03	0.63	0.41	0.64	1.10	0.47	0.83	
Vehicle network PM peak hour	1073	7	822	94	1060	477	160	396	258	54	136	
Trips per 100 m ² of GFA	0.15	0.44	0.20	0.31	0.78	1.11	0.54	0.44	1.61	0.27	0.94	
Daily total person trips:												
During Survey Times	0600 to 1900	0700 to 1900	0700 to 1900	0700 to 1900	0700 to 1900	700 to 1900	0600 to 1900	0700 to 1900	0600 to 1900	0600 to 1900	0600 to 1900	
24 hours	11750	144	7654	1344	10796	3396	1893	1230	2253	911	1227	
Trips per 100 m ² of GFA (24hrs)	14056	144	9919	1410	12066	4205	2044	6399	2389	975	1316	
Trips per 100 m ² of GFA (24hrs)	2.03	10.49	2.44	4.70	8.82	9.81	6.93	7.17	14.91	4.90	9.13	
Vehicle-based trips												
Site AM peak hour	1048	21	831	129	1256	268	143	504	193	64	108	
Trips per 100 m ² of GFA	0.15	1.31	0.20	0.43	0.92	0.62	0.40	0.56	1.20	0.32	0.73	
Site PM peak hour	1118	24	763	123	1,222	418	173	481	209	78	116	
Trips per 100 m ² of GFA	0.16	1.50	0.19	0.41	0.89	0.97	0.58	0.54	1.30	0.39	0.80	
Network AM peak hour	924	19	679	129	1256	246	111	495	147	64	108	
Trips per 100 m ² of GFA	0.13	1.18	0.17	0.43	0.92	0.57	0.37	0.55	0.92	0.32	0.75	
Network PM peak hour	963	7	703	69	794	382	127	354	187	42	116	
Trips per 100 m ² of GFA	0.14	0.31	0.17	0.23	0.58	0.89	0.43	0.40	1.17	0.21	0.80	
Daily total vehicle trips												
During Survey Times	0600 to 1900	0700 to 1900	0700 to 1900	0700 to 1900	0700 to 1900	700 to 1900	0600 to 1900	0700 to 1900	0600 to 1900	0600 to 1900	0600 to 1900	
24 hours	11076	196	7327	1259	9271	2822	1640	4831	1813	714	1164	
Trips per 100 m ² of GFA (24hrs)	13125	168	9084	1166	10383	5151	1793	5676	1921	751	1340	
Trips per 100 m ² of GFA (24hrs)	1.89	10.47	2.31	3.72	7.59	7.81	6.02	6.58	11.99	3.78	8.64	

Table 3.2 Trips rate summary.

Site ID	Sydney areas				Non-Sydney areas				All survey sites				Avg Non-Sydney / Sydney %
	Site 1 to Site 4				Site 5 to Site 11				Site 1 to Site 11				
Trips per 100 m ² of GFA	Min	Max	Avg	St Dev	Min	Max	Avg	St Dev	Min	Max	Avg	St Dev	
Person-based trips													
Site AM peak hour	0.17	1.74	0.68	0.74	0.47	1.52	0.82	0.36	0.17	1.74	0.77	0.50	122%
Site PM peak hour	0.19	1.81	0.69	0.76	0.49	1.78	0.98	0.44	0.19	1.81	0.88	0.56	143%
Vehicle network AM peak hour	0.14	1.50	0.60	0.63	0.41	1.10	0.73	0.27	0.14	1.50	0.68	0.41	122%
Vehicle network PM peak hour	0.15	0.52	0.32	0.19	0.27	1.61	0.83	0.45	0.15	1.61	0.65	0.44	259%
Daily total person trips	2.03	10.49	4.92	3.90	4.90	14.91	8.81	3.16	2.03	14.91	7.39	3.79	179%
Vehicle-based trips													
Site AM peak hour	0.15	1.31	0.52	0.54	0.32	1.20	0.70	0.29	0.15	1.31	0.63	0.38	133%
Site PM peak hour	0.16	1.50	0.56	0.63	0.39	1.30	0.78	0.31	0.16	1.50	0.70	0.43	139%
Network AM peak hour	0.13	1.18	0.48	0.49	0.32	0.92	0.63	0.24	0.13	1.18	0.57	0.34	132%
Network PM peak hour	0.14	0.41	0.25	0.13	0.21	1.17	0.66	0.32	0.14	1.17	0.51	0.33	263%
Daily total vehicle trips	1.89	10.47	4.60	3.99	3.78	11.99	7.49	2.53	1.89	11.99	6.44	3.28	163%

Table 2.1 Details of the selected survey sites.

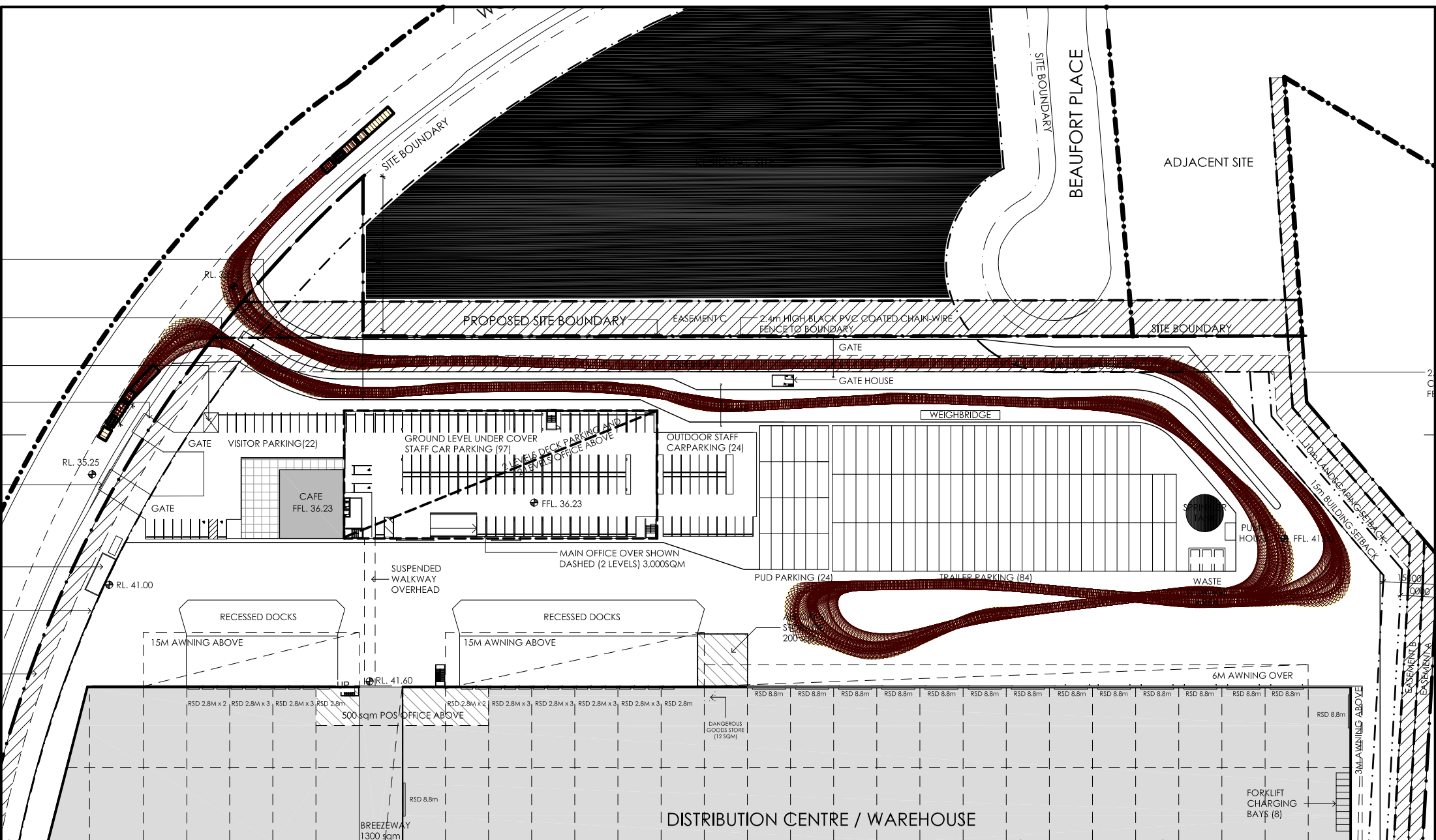
Survey area ID	Sydney areas		New-Sydney areas	
	Site 1 Erskine Park Industrial	Site 2 Holmsburg Business Park	Site 3 Wondelands Business Park	Site 4 Riverwood Business Park
Date of survey	29/03/2012	29/03/2012	29/03/2012	29/03/2012
Day of survey	Thursday	Wednesday	Thursday	Thursday
Duration of survey	06:00-18:00	07:00-18:00	07:00-18:00	07:00-18:00
Surrounding land use (eg residential, commercial, open space, etc)	Commercial	Residential	Residential	Residential
Indicative Public Transport Accessibility Score	2	4	4	4
Principal adjacent road - AM peak period (weekdays) 8.00 to 9.00 am	8.00 to 9.00 am	8.00 to 9.00 am	8.00 to 9.00 am	8.00 to 9.00 am
Principal adjacent road - PM peak period (weekdays) 3.30 to 4.30 pm	4.30 to 5.30 pm	4.30 to 5.30 pm	4.30 to 5.30 pm	4.30 to 5.30 pm
Principal adjacent road - daily peak period (weekdays) 1.00 to 2.00 pm	1.00 to 2.00 pm	1.00 to 2.00 pm	1.00 to 2.00 pm	1.00 to 2.00 pm
Establish characteristics				
Year opened	2003	2011	2007	2004
Total site area (hectares)	368.9	0.6	14.0	4.1
No. of units (including vacant units/voids)	38	21	26	16
No. of occupied units/voids	38	21	26	16
Predominant business types within estate				
no. of factories	5	0	0	0
no. of business/warehouses	2	0	0	0
no. of showrooms	37	0	0	0
no. of offices	1	9	0	0
no. of retail	0	0	0	0
no. of workshops	1	0	0	0
no. of manufacturing	0	3	0	0
no. of other commercial/business	0	1	2	0
Gross Floor Area in estate m ² (occupied)	693,605	1,405	446,000	28,933
No. of employees				
Person Trips				
Peak 1-hour person-trips	1294	29	927	173
Time of peak 1-hour person-trips	14:45-15:45	14:45-15:45	14:00-15:00	08:15-09:15
Peak person-trips per business	30.9	2.2	42.1	10.6
Peak person-trips per hectare	4	48.4	8.1	37.0
Peak person-trips per 100 m ² of GFA	0.167	1.807	0.228	0.977
Peak person-trips per employee	140/65	158	8929	1410
Total daily person-trips	30.4	13.0	4513	88
Total daily person-trips per hectare	43.0	287.0	85.6	301.5
Total daily person-trips per 100 m ² of GFA	2.005	10.492	2.442	4.704
Total daily person-trips per employee	876	24	769	123
Person-trips during adjacent road AM peak	1073	7	658	94
Person-trips during adjacent road PM peak	1128	24	820	126
Vehicle Trips				
Peak 1-hour vehicle-trips	1445-15:45	14:45-15:45	14:00-15:00	08:15-09:15
Time of peak 1-hour vehicle-trips	31	1.8	37.3	5.1
Peak vehicle-trips per business	3.5	40.9	7.2	27.6
Peak vehicle-trips per hectare	0.163	1.405	0.202	0.430
Peak vehicle-trips per 100 m ² of GFA				
Peak vehicle-trips per employee	131/25	139	2749	110
Total daily vehicle-trips	394.5	12.9	423.5	69.70
Total daily vehicle-trips per hectare	481	288.3	81.9	288.0
Total daily vehicle-trips per 100 m ² of GFA	1.892	10.407	2.308	4.83
Total daily vehicle-trips per employee	1165	125	2749	1608
Vehicle-trips in adjacent road AM peak (Average)	972	145	2693	1513
Vehicle-trips during adjacent road PM peak	905	19	724	128
Vehicle-trips during adjacent road PM peak	865	5	774	69
Average vehicle occupancy	1.50	1.30	1.32	1.16
% of total trips by principal mode:				
% Car (as driver)	82.5%	81.9%	63.2%	68.8%
% Car (as passenger)	8.0%	8.3%	12.3%	12.3%
% Commercial Vehicles	28.3%	4.2%	25.9%	12.6%
% Bus	0.0%	0.0%	2.1%	0.6%
% Cycle	0.1%	0.0%	0.3%	0.1%
% Motorbike	0.1%	0.0%	0.0%	0.0%
% On foot	0.1%	5.9%	0.2%	5.7%
% Other	0.0%	0.0%	0.0%	0.0%

Trip Generation Surveys—Business Parks and Industrial Estates

TEF Consulting in association with Gemaoui Consulting – ABN 65 092 476 143

APPENDIX F

TURNING PATH ASSESSMENT

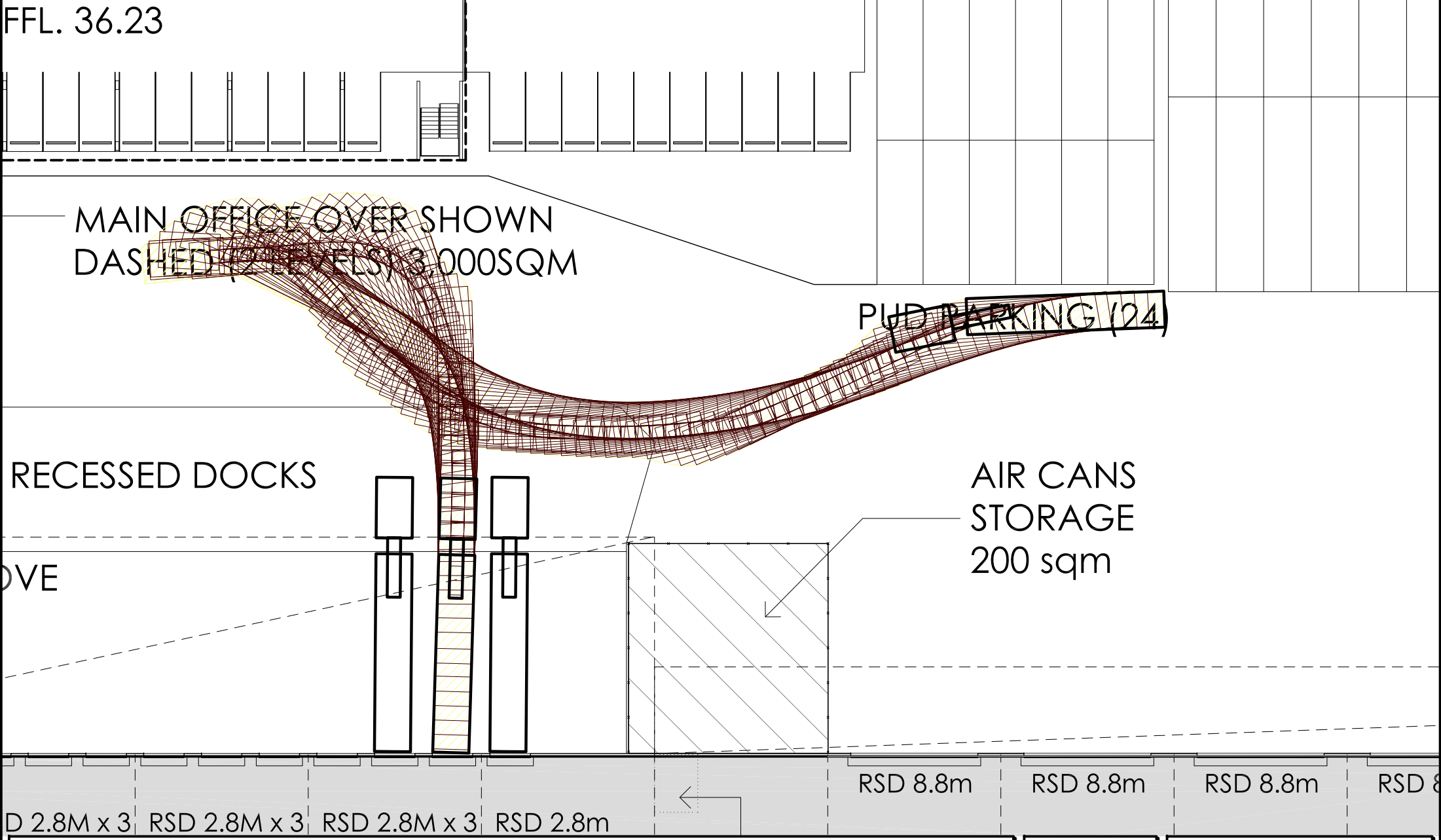


LEGEND



SWEPT PATH ANALYSIS
OF A 25m ARTICULATED
VEHICLES ENTERING AND
EXITING THE SITE

FFL. 36.23



LEGEND



SWEPT PATH ANALYSIS
OF A 19m ARTICULATED
VEHICLE ENTERING THE SITE

MAIN OFFICE OVER SHOWN
DASHED (2 LEVELS) 3,000SQM

BUD PARKING (24)

RECESSED DOCKS

AIR CANS
STORAGE
200 sqm

ABOVE

x 3 RSD 2.8M x 3 RSD 2.8M x 3 RSD 2.8M x 3 RSD 2.8m

RSD 8.8m

RSD 8.8m

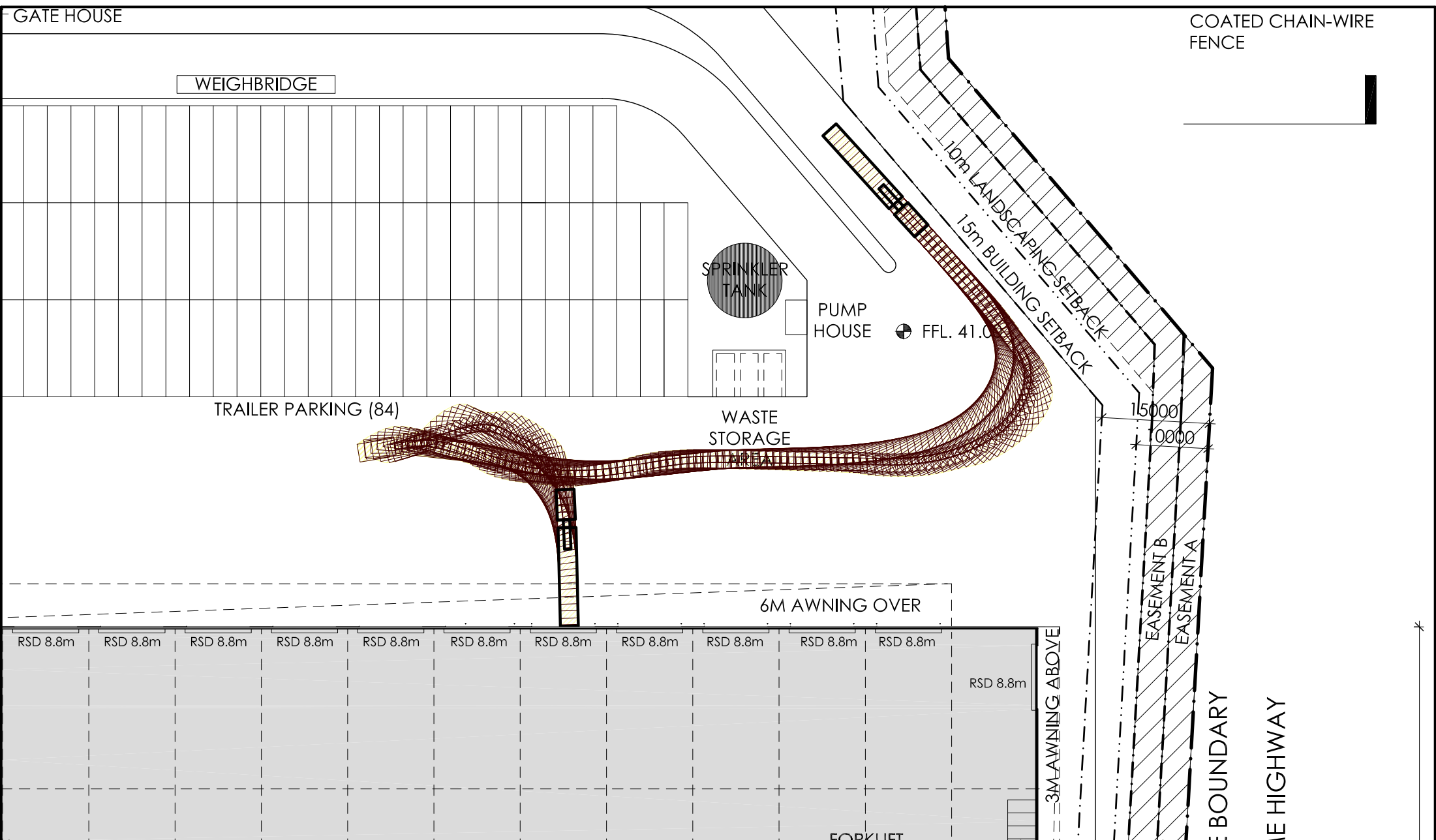
RSD 8.8m

LEGEND



SWEPT PATH ANALYSIS
OF A 19m ARTICULATED
VEHICLE EXITING THE SITE

SP 3

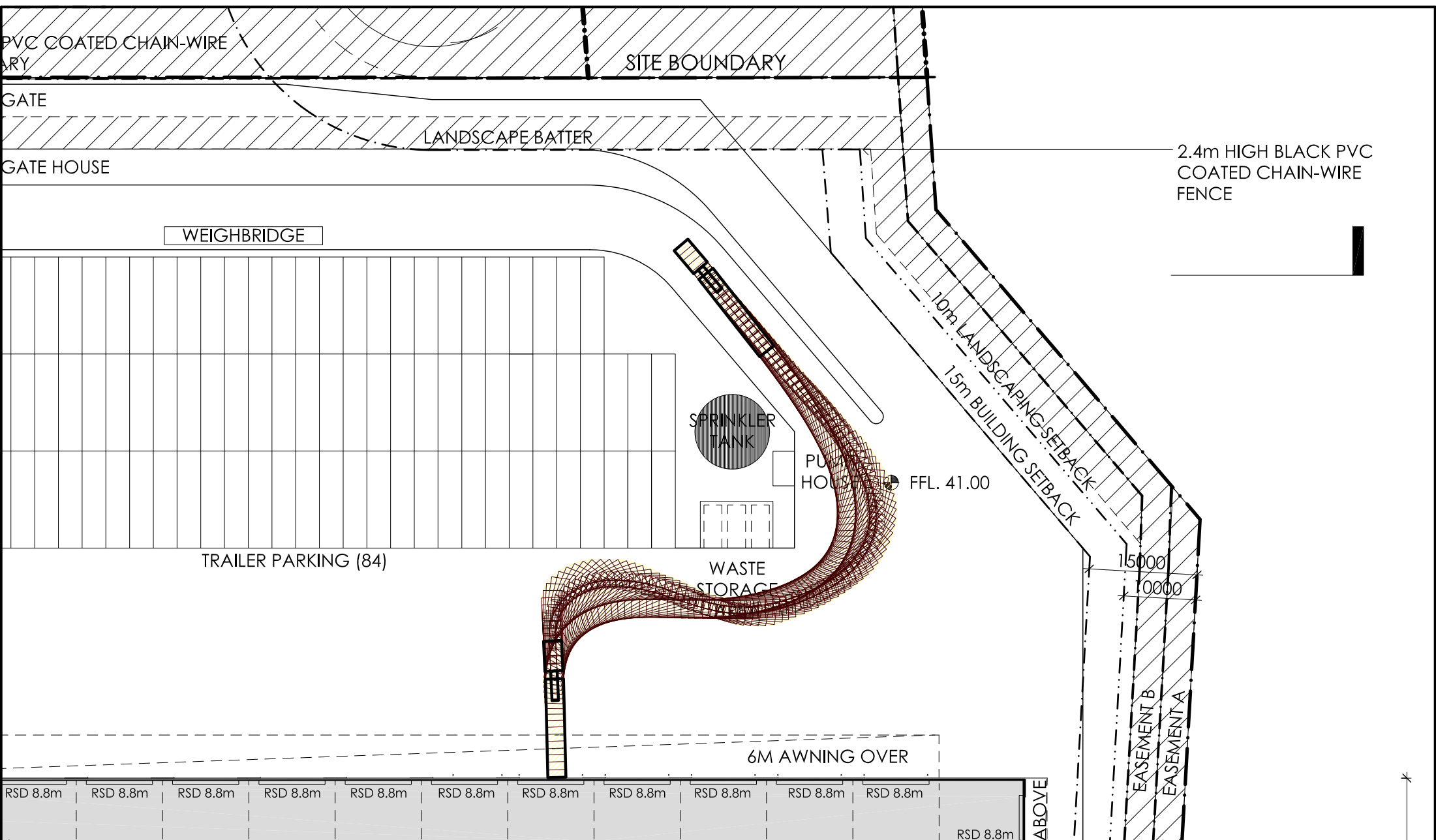


COATED CHAIN-WIRE FENCE

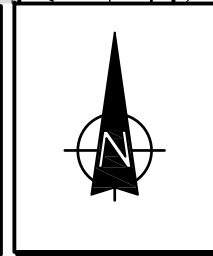
LEGEND



SWEPT PATH ANALYSIS
OF A 19m ARTICULATED
VEHICLE ENTERING THE SITE



LEGEND



**SWEPT PATH ANALYSIS
OF A 19m ARTICULATED
VEHICLE EXITING THE SITE**

SP 5