TRAFFIC & TRANSPORT ENGINEERING

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3 June 2022

PLANS AND DOCUMENTS referred to in the PDA DEVELOPMENT APPROVAL
Approval no: DEV2021/1248
Date: 14 June 2022
Queensland Government

Kennards Self Storage
C/- Neale Windress and Associates Pty Ltd
PO Box 343
Annerley QLD 4064

Attention: Neale Windress

Dear Neale,

RE: LOT 11 YARRABILBA DRIVE, YARRABILBA
TRAFFIC ENGINEERING ASSESSMENT

INTRODUCTION

This report has been prepared by PTT, as requested by Neale Windress and Associates Pty Ltd, to assess the traffic engineering aspects of a proposed self-storage development at Lot 11 Yarrabilba Drive, Yarrabilba.

The aim of this assessment is to review the proposed development in terms of its site access arrangements, internal layout and design, servicing arrangements, pedestrian and cyclist facilities and traffic impact, with respect to Economic Development Queensland's (EDQ) Yarrabilba Priority Development Area (PDA) Precinct 3D Plan of Development (POD), which also refers to Logan City Council's (Council) Planning Scheme (2015) and Australian Standards Parking Facilities Part 1: Off-street car parking (AS2890.1).

EXISTING CONDITIONS

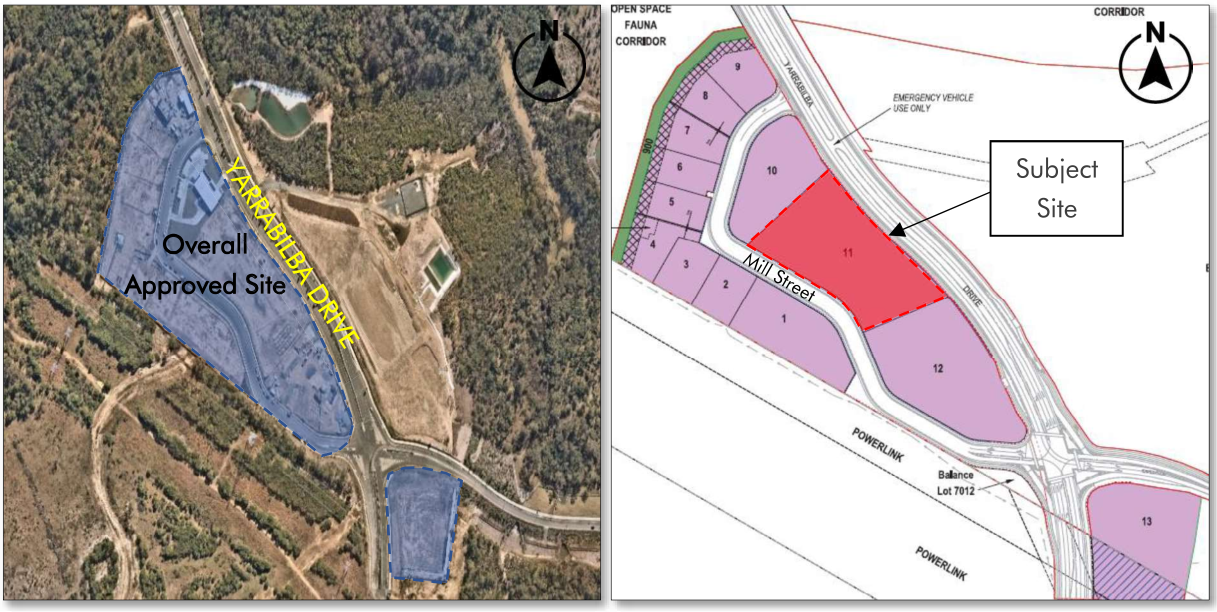
Subject Site

The subject site is located at 21-35 Mill Street, Yarrabilba and is formally identified as Lot 11 on SP304357. The site is located within Precinct 3D of the Yarrabilba PDA, which was adopted by EDQ in 2011, with a purpose of providing housing for up to 50,000 people in 20,000 dwellings. According to the Precinct 3D approved Plan of Development (Application Reference: DEV2018/922), the site is zoned as mixed business / infrastructure. The approved Plan of Development and the location of Lot 11 are shown in Figure 1.

The entire approved development site is bounded as follows:

- to the north by the Yarrabilba ambulance station and Yarrabilba Drive
- to the east by vacant land and Yarrabilba Drive
- to the south by Mill Street and vacant land
- to the west by the Yarrabilba ambulance station and Mill Street

Figure 1: APPROVED PLAN OF DEVELOPMENT



As shown in Figure 1, access to the approved sub-division and Lots 1-12 is provided via Mill Street. No driveway crossovers are currently provided to Lot 11.

Road Network

Mill Street is classified as an urban access street according to Council's road hierarchy. It is an undivided road with one lane of traffic in each direction and has a posted speed limit of 60km/h. Yarrabilba Drive is classified as an urban access street, is divided with two lanes of traffic in each direction and has a posted speed limit of 60km/h in the vicinity of the site.

Active and Public Transport

Pedestrian footpaths are provided on both sides of Yarrabilba Drive and Mill Street in the vicinity of the site. On-street cycle lanes are provided on both sides of Yarrabilba Drive in the vicinity of the site. No dedicated cyclist facilities are provided on Mill Street.

Two public bus stops are located approximately 200m east of the subject site and are serviced by Translink bus route 587. This route operates once per hour from 5:10am to 6:10pm on weekdays and once every two hours from 9:10am to 3:10pm on weekends between Yarrabilba Drive and Loganlea. This route connects the site to the surrounding area as well as to the Loganlea train station which provides rail connectivity to Brisbane City, Brisbane Airport and the Gold Coast.

PROPOSED DEVELOPMENT

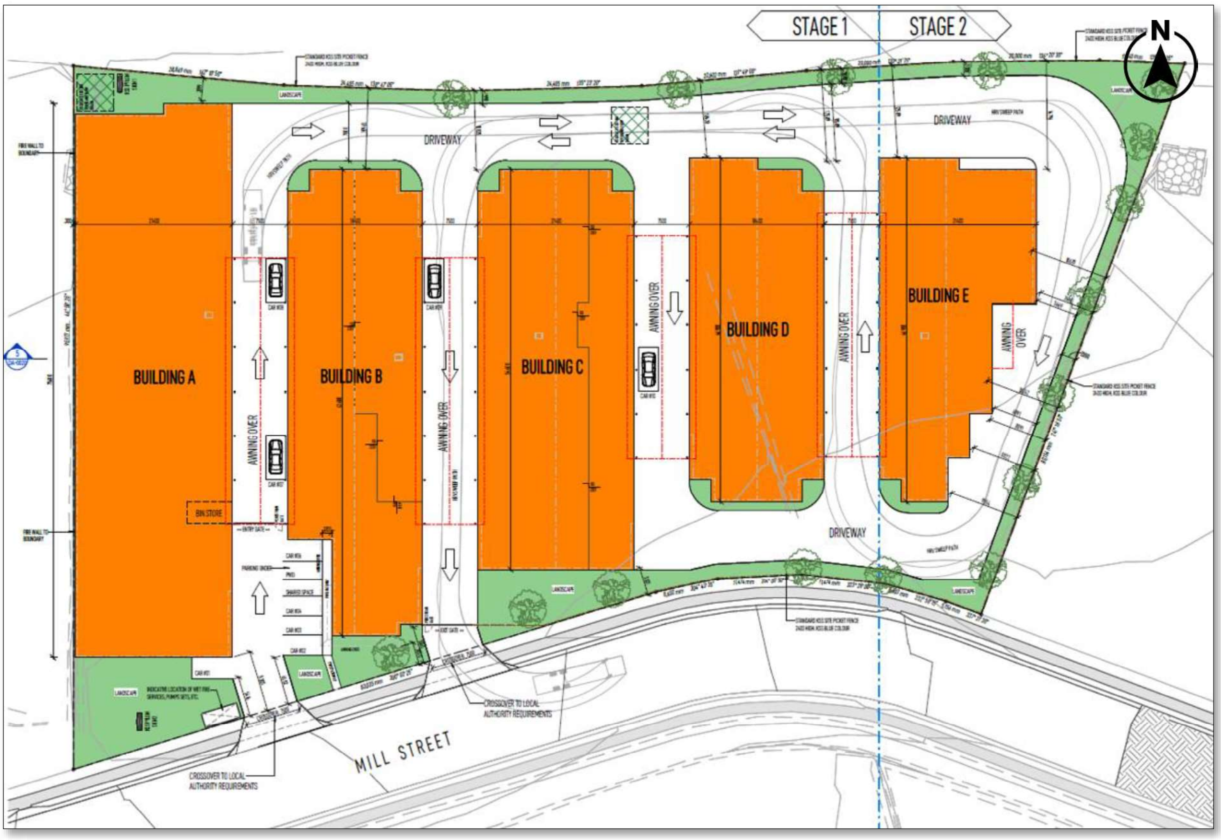
Proposal

The proposed development comprises a total of 795 self-storage units constructed over two stages as follows:

- Stage 1: 690 self-storage units
- Stage 2: 105 self-storage units

The proposed ground floor layout is shown in Figure 2, with dimensioned plans attached.

Figure 2: PROPOSED DEVELOPMENT LAYOUT



ACCESS

Driveway Crossover

Vehicular access to the site is proposed via a 7.5m wide entry-only crossover and a 7.5m wide exit-only crossover on Mill Street.

Council's Planning Scheme requires driveway crossovers be designed in accordance with the Institute of Public Works Engineering Australasia's (IPWEA) Standard Drawing RS-051. The proposed crossovers have been designed as General Wide Flared driveways in accordance with IPWEA Standard Drawing RS-051, consistent with Council's Planning Scheme. As demonstrated in Figure 3, the proposed driveway can accommodate the intended design vehicle (ie Heavy Rigid Vehicle).

Sight Distance

On a 50km/h road (ie Mill Street), Australian Standard AS2890.1:2004 Parking Facilities Part 1: Off-street Car Parking requires an absolute minimum sight distance of 45m, with a desirable sight distance of 69m. The proposed crossover on Mill Street achieves in excess of 69m sight distance in both directions, which is consistent with the requirements of AS2890.1. Therefore, the available sight distance at the Mill Street crossover is considered adequate.

Queuing

AS2890.1 recommends that queuing be provided in order to allow a free influx of traffic which will not adversely affect traffic or pedestrian flows on the frontage road (ie Mill Street). The 95th percentile queue at the site access is considered to be an adequate measure of an acceptable queue.

The predicted 99th percentile queue at the proposed site access has been calculated based on 15 vehicles (ie the predicted evening peak hour arrivals as detailed in Aurecon's Supplementary Australian Traffic and Parking Study 2009) arriving in the peak hour, using the queuing theory outlined in the PTT Queuing Practice Note, attached.

The results of the analysis indicate a 99th percentile queue of 0.66 vehicles (ie 4.0m) at the site access. The proposed layout incorporates 5.4m of queuing space, measured between the site boundary and first internal conflict point (ie first car parking space). This is considered to be acceptable taking into account the minimal site traffic generation, the low turnover of on-site car parking and the minor nature of Mill Street. Therefore, the proposed queuing provision is consistent with the requirements of AS2890.1.

PARKING

Requirement

EDQ's Plan of Development does not provide a parking rate for a self-storage facility. Therefore, the parking requirement for the self-storage facility has been determined based on the parking provision rates outlined in Council's Planning Scheme.

For self-storage developments comprising 795 self-storage units, Council's Planning Scheme recommends that 10 parking spaces be provided, as shown in Table 1.

Table 1: MINIMUM ON-SITE PARKING REQUIREMENT

LAND USE	SCALE	PARKING RATE	SOURCE	REQUIRED
Self-storage - Stage 1	690 storage units 2 employees	1 space per 100 storage units 1 space per employee	Council	9
Self-storage - Stage 2	795 storage units 2 employees	1 space per 100 storage units 1 space per employee	Council	10

Provision

Stages 1 and 2 will accommodate a total of nine and ten spaces on-site respectively, including one Persons with Disability (PWD) space. As such, the proposed parking provision is consistent with Council's Planning Scheme.

Persons with Disability Parking

The Building Code of Australia (BCA) specifies that parking spaces for persons with a disability be provided at a rate of one space per 100, or part thereof, for a Class 7 building. One PWD parking space is proposed on-site, which is consistent with the requirements of the BCA.

Car Park Design

The layout of on-site parking is generally consistent with the requirements of AS2890.1 in terms of bay dimensions and aisle widths. This is typified by:

- angle parking spaces dimensioned a minimum 2.4m wide by 5.4m long
- parallel parking spaces dimensioned a minimum 2.7m wide by 6.0m long
- PWD parking space dimensioned 2.4m wide by 5.4m long with adjacent 2.4m wide shared area
- an extra 0.3m width provided to parking spaces adjacent to a wall
- parking aisle dimensioned a minimum 6.9m wide (generally dimensioned 7.5m wide along self-storage aisles)

SERVICING

Council's Servicing, Access and Parking Code requires on-site servicing of a warehouse (where a mini storage establishment) by a Heavy Rigid Vehicle (HRV). Swept path analyses of on-site manoeuvring by a HRV has been undertaken, as demonstrated in Figure 3 and attached as drawing 22-210-001. A swept path analysis of a HRV turning around during Stage 1 is shown in Figure 4 and attached as drawing 22-210-002. As shown, the proposed layout is sufficient to accommodate HRV access and manoeuvring.

Figure 3: HRV MANOEUVRING

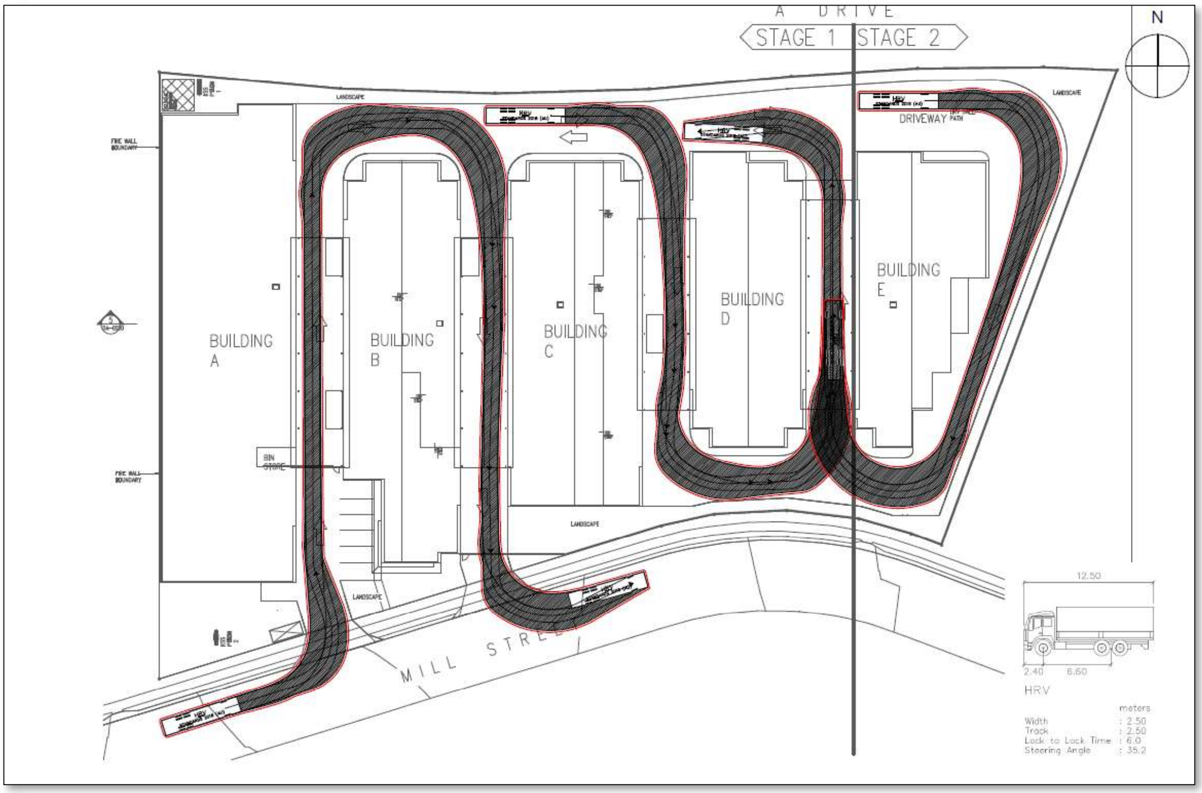
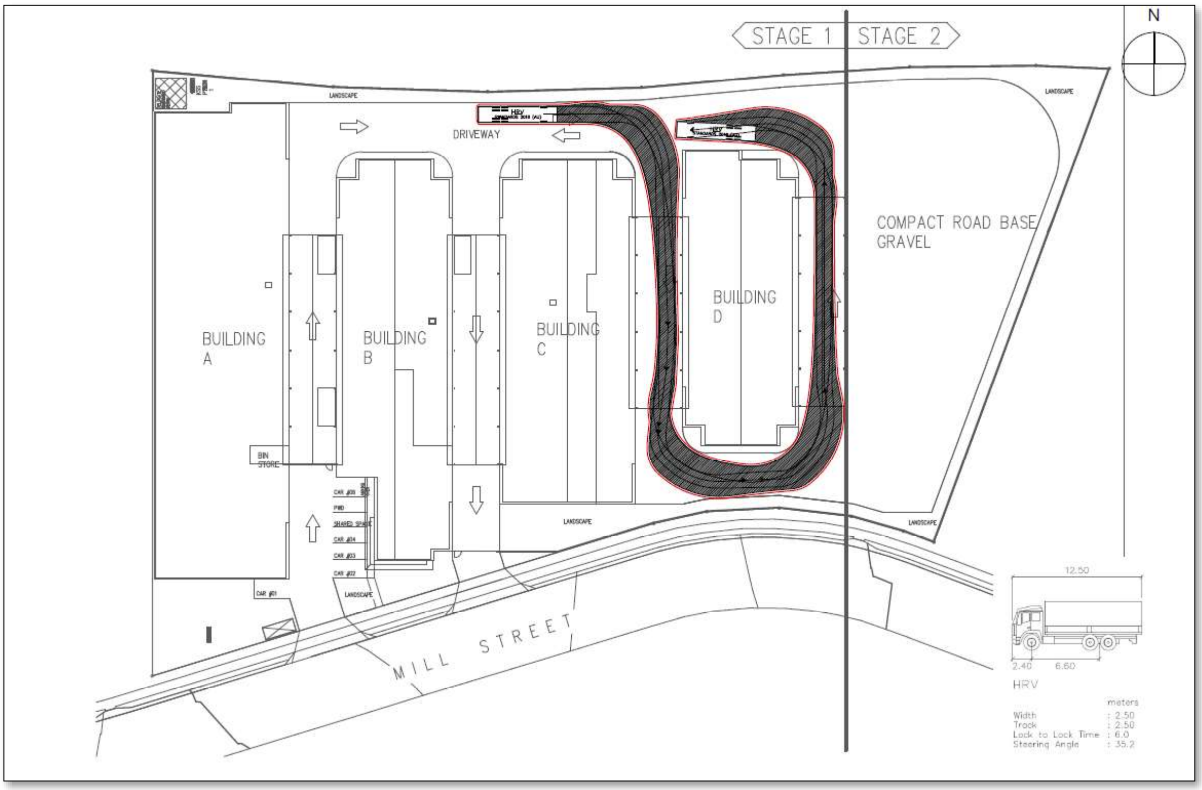


Figure 4: HRV MANOEUVRING - STAGE 1



ACTIVE TRANSPORT

Pedestrians

A dedicated pedestrian entrance and pathway is provided on Mill Street to the on-site parking area.

TRAFFIC OPERATIONS

Traffic Generation

The predicted peak hour traffic generation of the proposed development has been determined based on Aurecon's Supplementary Australian Traffic and Parking Study 2009, prepared on behalf of the Self-Storage Association of Australasia (SSAA). The study involved surveys of 32 existing self-storage facilities to determine the peak parking demand and traffic generation associated with these types of sites.

A second study was published by SSAA in 2016 but is not publicly available. Based on the information we have been able to obtain, the results of the 2016 study are reasonably comparable to those of the 2009 study.

The document indicates a peak hour trip generation rate of 15-30 trips in the morning peak hour and 20-30 trips in the evening peak hour for self-storage developments comprising 6,000m^2 – 9,500m^2 Maximum Leasable Area (MLA). The proposed development is expected to comprise approximately 6,000m^2 – 9,500m^2 MLA. Accordingly, the predicted traffic generation attributable to the proposed development is estimated to be a maximum of 30 trips in the morning and evening peak hours, as outlined in Table 2.

Table 2: DEVELOPMENT TRAFFIC GENERATION

LAND USE	SCALE	TRIP GENERATION RATE	IN : OUT	TRIPS
Morning Peak Hour				
Self-Storage	6,000m^2 – 9,500m^2 MLA	15-30 trips for 6,000m^2 – 9,500m^2 MLA	15 : 15	30 vph
Evening Peak Hour				
Self-Storage	6,000m^2 – 9,500m^2 MLA	20-30 trips for 6,000m^2 – 9,500m^2 MLA	15 : 15	30 vph

Traffic Impact

The impact of the development site on the external road network has been considered in the planning of Precinct 3D and was addressed in the Yarrabilba Precinct 3D Traffic Assessment report prepared by SLR dated 27 February 2018. In terms of additional traffic movements on the surrounding road network, the proposed development traffic generation is consistent with the traffic generation rates included in the Precinct 3D modelling. Accordingly, the impact of the development has been considered as part of the previous traffic modelling and the development is not expected to have an adverse impact on the surrounding road network.

CONCLUSIONS

The proposed development has been evaluated in terms of the site access arrangements, parking provision and design, servicing arrangements, pedestrian and cyclist facilities and likely traffic impact. The main points to note are:

- the proposed development comprises 795 self-storage units constructed over two stages
- vehicular access is proposed via a 7.5m wide entry-only crossover and a 7.5m wide exit-only crossover on Mill Street, designed as General Wide Flared crossovers in accordance with the IPWEA Standard Drawing RS-051
- sight distance and queuing at the crossovers are consistent with AS2890.1
- the development would be supported by nine and ten on-site parking spaces in Stage 1 and 2, respectively, consistent with Council's Planning Scheme
- the parking layout and design generally complies with Council's Planning Scheme and AS2890.1 requirements
- the proposal can accommodate on-site HRV servicing which is consistent with Council's Servicing, Access and Parking Code requirements
- the proposed development is expected to generate a maximum of 30 new vehicle trips during the morning and evening peak periods
- the proposed development is not expected to have an adverse impact on the surrounding road network

If you have any questions regarding the issues discussed above, please do not hesitate to contact us.

Yours sincerely,

James Gannon
Principal Engineer (RPEQ 22233)

18400
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21400
7500
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ILDING B
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AWNING OVER
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LANDSCAPE
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314° 05' 50"
11,474 mm
323° 28' 00"
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337° 31' 30"
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247° 16' 50"
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HRV SWEEP PATH
HRV SWEEP PATH
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LANDSCAPE
LANDSCAPE
PEDESTRIAN GATE
>> EXIT GATE >>
CROSSOVER: 7500
CROSSOVER TO LOCAL
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PWD PATHWAY
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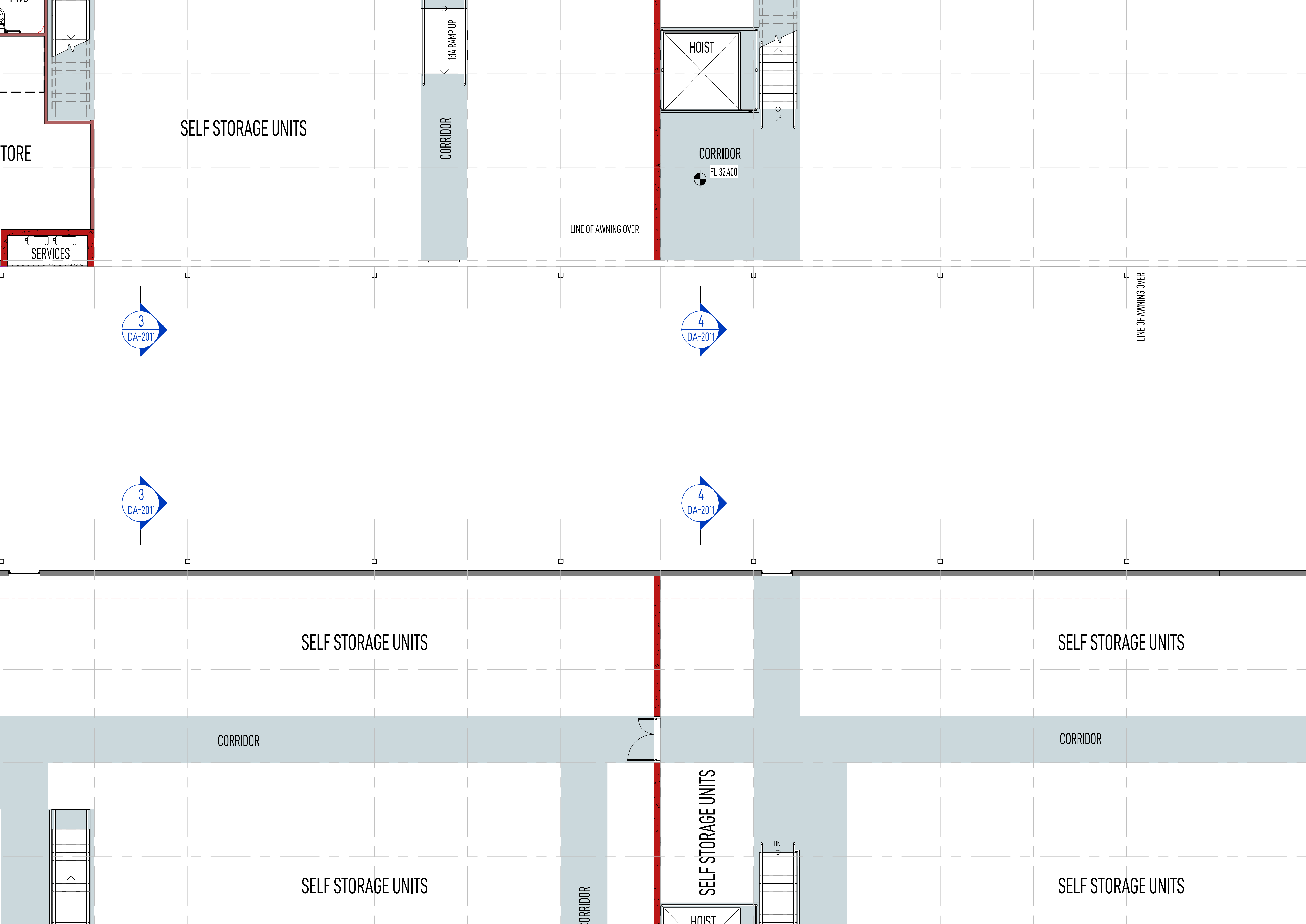

SELF STORAGE UNITS
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PRACTICE NOTE

QUEUING CHARACTERISTICS AT SITE ACCESSES

BACKGROUND

On-site queuing areas are required at site access locations to ensure that vehicles do not queue across pedestrian paths or back onto the frontage road.

However, with queuing requirements in planning scheme policies becoming increasingly onerous, the usage of these figures can result in excessive queuing areas which can unnecessarily have an adverse effect construction costs and development yields.

This practice note demonstrates how conventional queuing theory can be used in traffic engineering to determine the anticipated queue length at access locations as a function of local conditions.

QUEUING THEORY

To calculate the amount of queuing space required, we must estimate the probability of a number of vehicles in a queue (*n*) exceeding a specified number of vehicles (*N*) at any instant. This is calculated using the following formula:

$$\Pr(n > N) = \rho^{N+1} \leq \alpha$$

Where:

- ρ is the queue utilisation factor
- α is the probability of a queue of *N* vehicles being exceeded

Rearranging this formula enables the calculation of the design queue length in terms of the number of vehicles as follows:

$$N = \frac{\log(\alpha)}{\log(\rho)} - 1$$

The **minimum** design queue would be calculated as *N* vehicles, which may include a fraction of a vehicle (eg 1.2 vehicles). This design queue could be applied subject to engineering judgment.

The **desirable** design queue would be the smallest integer which contains the value, *N* (ie rounded up to the nearest integer).

Application of a standard vehicle length of 6m per vehicle results in a design queue length in metres.

QUEUE UTILISATION FACTOR

The utilisation factor, ρ, is the ratio of the mean arrival rate (*r*) and the mean service rate (*s*), ie:

$$\rho = \frac{r}{s}$$

The mean arrival rate (veh/hr) varies for each situation. It is calculated using the peak hour trip generation for the facility. This is expressed in vehicles per hour.

The mean service rate (veh/hr) is determined by observing the operations of similar facilities.

PTT has calculated the mean service rate for a non-controlled (ie no boom gate) parking facility by surveying the average time taken for cars to enter and leave from visitor parks in a residential development.

This survey was undertaken at a recently approved and constructed mixed use commercial/residential development at Nundah on a Wednesday in July 2014 between 4:30-6:00pm. A minimum of 30 observations were made for both “parking” and “unparking” manoeuvres The results of this analysis are shown in Table 1.

Table 1: MEAN VEHICLE MANOEUVRING TIME (seconds/vehicle)

MANOEUVRE	MEAN TIME	STD DEV	MIN	MAX
Parking	12.2	13.8	1.1	69.5
Unparking	14.7	7.1	2.1	37.2

The application of the mean "unparking" value from Table 1 assumes that each vehicle which enters the access will be waiting for a car to "unpark" from the space nearest to the access. This is an extremely conservative assumption, which will result in an over-estimate of queue lengths.

The mean service time for car parks with entrance controls such as boom gates, ticket dispensing machines, car stackers and mechanical parking installations can usually be provided by the supplier of the product.

PROBABILITY OF EXCEEDANCE

The queuing formula is used to calculate the queue length given a specified probability (α).

Generally, the 95th percentile queue is considered an adequate measure of an acceptable queue at access driveways. This infers that there is a 5% probability that the queue length will be exceeded (ie $\alpha=0.05$).

Australian Standards, AS2890.1, outlines the requirement to provide a 98th percentile queue for situations where mechanical parking installations such as car stackers are used (ie $\alpha=0.02$).

EXAMPLE

A development with a mean peak hour trip generation of 100 veh/hr and a 80:20 in:out split results in a vehicle arrival rate of 80 veh/hr.

The service rates from Table 1 can be applied to calculate the queue utilisation factor. However common units are required to find a ratio.

Therefore, the service rate, s, is:

$$\frac{vehicle}{hour} = 3{,}600\left(\frac{seconds}{vehicle}\right)^{-1}$$

$$s = \frac{3{,}600}{14.7} = 244.9 \text{ vehicles per hour}$$

The queue utilisation factor is:

$$\rho = \frac{r}{s} = \frac{80}{244.9} = 0.327$$

The 95th percentile design queue:

$$N = \frac{\log(\alpha)}{\log(\rho)} - 1$$

$$N = \frac{\log(0.05)}{\log(0.327)} - 1$$

$N = 1.68$ vehicles

Therefore, desirably, the development should be designed to allow for an entrance queue of two vehicles (ie 12m). However, an available queuing distance of 1.68 vehicles (ie 10.1m) would be considered acceptable to cater for the 95th percentile queue, subject to engineering judgment.

CONCLUSION

Conventional traffic engineering queuing theory can be used to determine the anticipated queue length at access locations. This ensures that queuing does not adversely impact on nearby traffic or pedestrian flows whilst ensuring that the queuing area is not excessive.

REFERENCES

Bennett, DW and Rose, G (1988), *Unsignalised Intersection Analysis*, University of Melbourne

Institute of Transport Studies Monash University (2003), *Traffic Engineering and Management*, Volume 2, Caufield East

Standards Australia (2004), *AS2890.1:2004 Parking facilities Part 1: Off-street car parking*, Sydney

DISCLAIMER

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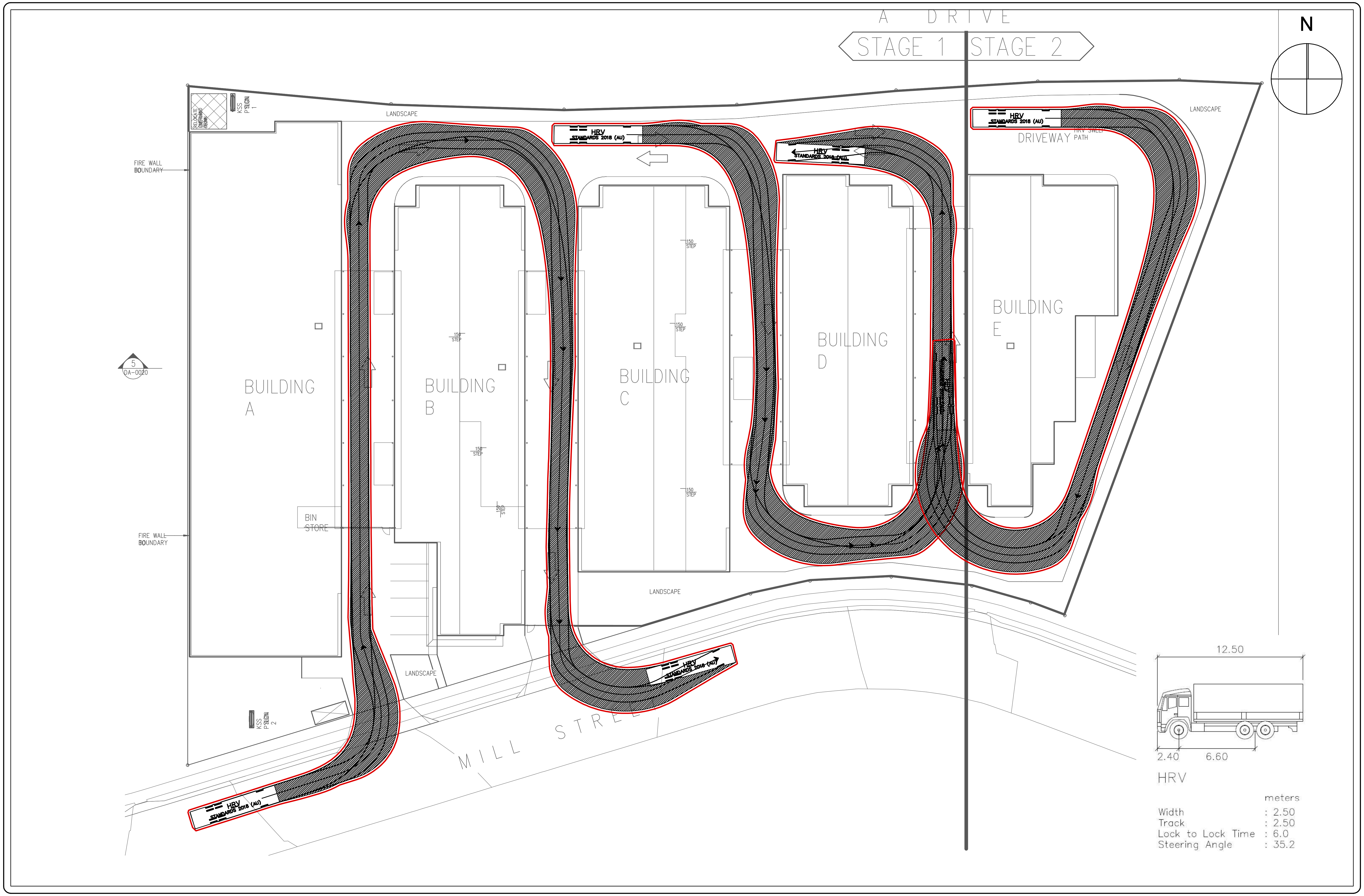

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REV.	AMENDMENTS	DRN	DATE

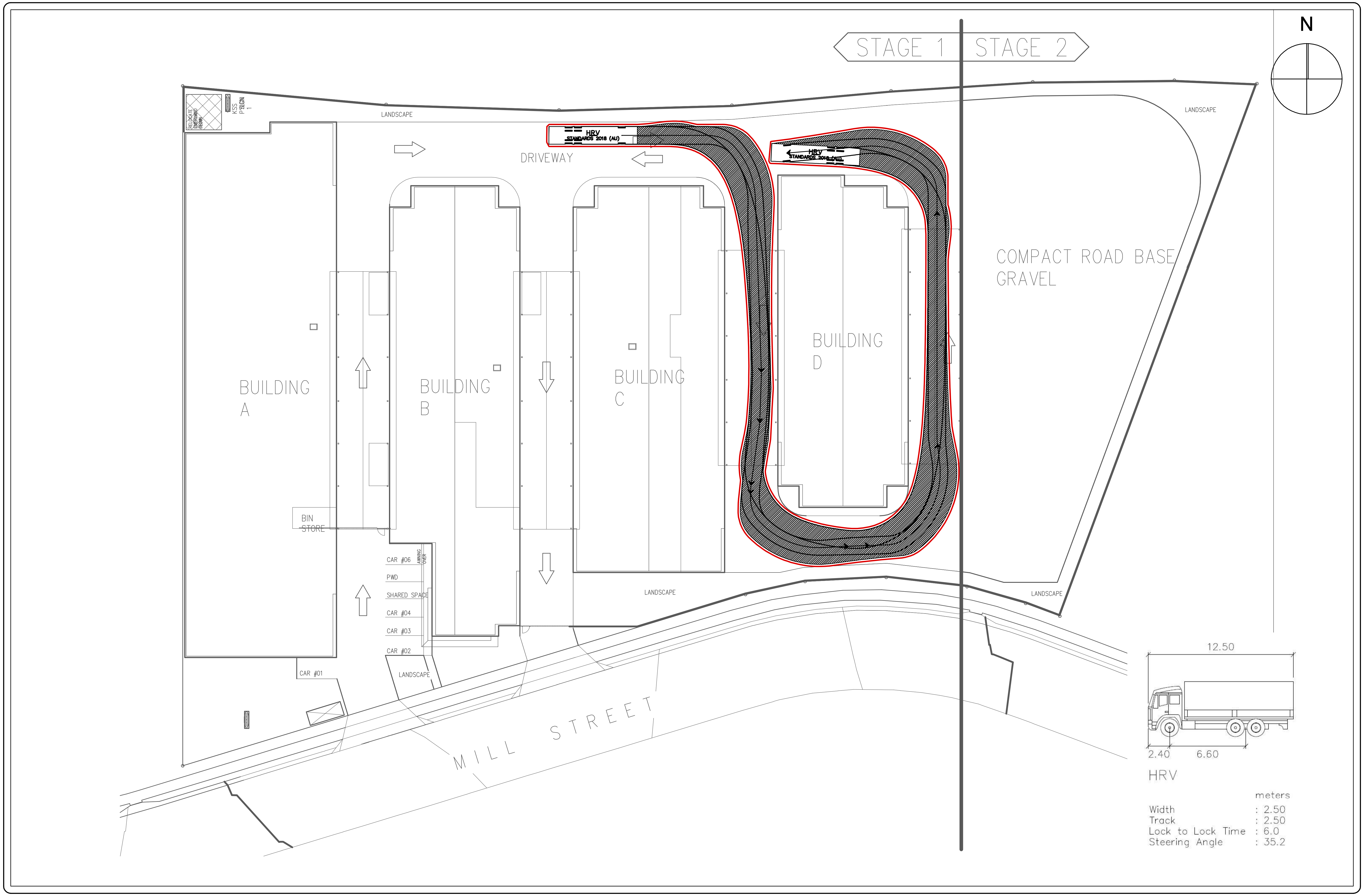
PROJECT TITLE: LOT 11 YARRABILBA DRIVE, YARRABILBA

DRAWING TITLE: HRV MANOEUVRING

CLIENT: KENNARDS SELF STORAGE

DATE:	SCALE:	DRAWN:	APPROVED:
3/06/2022	1:500	BH	CB

DRAWING NO.	REV	JOB NO.
22-210-001	B	22-210



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REV.	AMENDMENTS	DRN	DATE

PROJECT TITLE: LOT 11 YARRABILBA DRIVE, YARRABILBA

DRAWING TITLE: HRV MANOEUVRING - STAGE 1

CLIENT: KENNARDS SELF STORAGE

DATE:	SCALE:	DRAWN:	APPROVED:
3/06/2022	1:500	BH	CB

DRAWING NO.	REV	JOB NO.
22-210-002	B	22-210