TRAFFIC & TRANSPORT ENGINEERING

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12 April 2019

Park Genie
c/- RPS Group
PO Box 1559
Fortitude Valley QLD 4006

Attention: Wayne Window

Dear Wayne,

RE: 23-39 ABBOTSFORD ROAD, BOWEN HILLS
TRAFFIC ENGINEERING ADVICE

INTRODUCTION

This report has been prepared by Pekol Traffic and Transport (PTT), as requested by RPS Group to assess the traffic engineering aspects of a proposed temporary car parking facility at 23-39 Abbotsford Road, Bowen Hills.

The aim of this assessment is to review the proposed development in terms of the access arrangements, queueing requirements and internal layout with respect to Brisbane City Council's Transport, Access, Parking and Servicing (TAPS) Planning Scheme Policy (2014) and Australian Standards (AS2890:1) Parking Facilities Part 1 'Off-Street Car Parking'. This letter also evaluates the proposed development in terms of its likely peak period traffic generation.

EXISTING CONDITIONS

Site Description

The subject site is located within the Bowen Hills Priority Development Area as identified by Economic Development Queensland (EDQ) and includes Lot 1 on SP287744

As shown in Figure 1, the site is bounded by residential dwellings to the north, east and south, and Abbotsford Road to the west.

Figure 1: EXISTING SITE LOCALITY

The site currently includes a heritage listed dwelling and a single residential dwelling. Access is provided via six crossovers on Abbotsford Road. Parking along the Abbotsford Road frontage is prohibited on weekdays from 7:00am to 6:00pm.

Surrounding Area

The surrounding area is comprised of commercial and residential uses. Bowen Hills Railway Station is situated directly opposite the site on Abbotsford Road with a pedestrian access as indicated in Figure 1. Bus stops are located on both sides of Abbotsford Road in the vicinity of the site. These bus stops are serviced by TransLink routes 301, 310, 320 which provide services between Brisbane City and Chermside, Toombul and Redcliffe. Accordingly, the site is very well served by a range of public transport services.

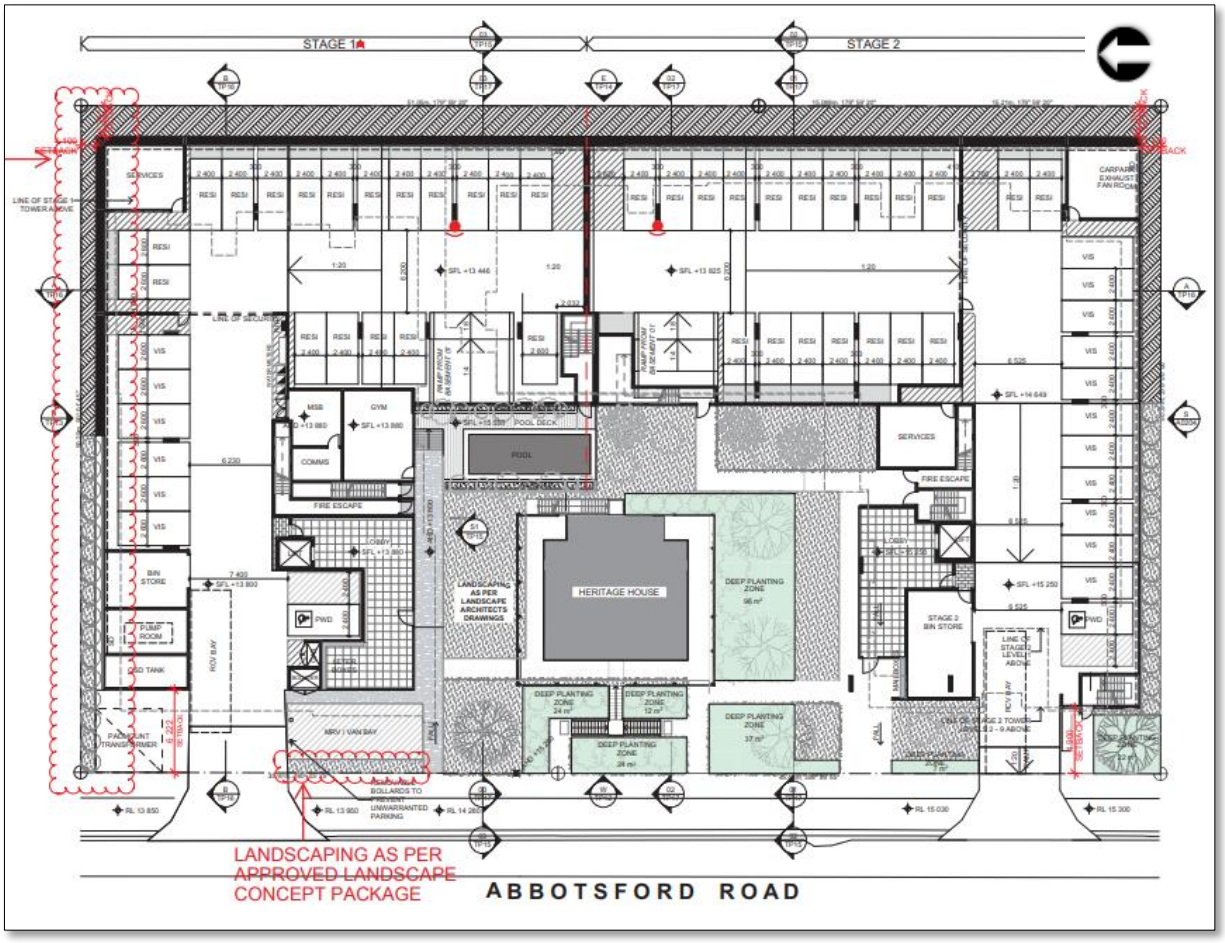
There are currently pedestrian footpaths along both sides of Abbotsford Road connecting the site to surrounding areas. No on-road cycle facilities are indicated on Abbotsford Road.

Approved Development

A development application (ref DEV2012/397) involving the demolition of the existing residential dwelling and the construction of 168 residential units was approved in February 2018. It is understood that the

existing heritage listed dwelling will remain in-situ and has been incorporated into the approved layout. The ground level layout of the residential development is shown in Figure 2.

Figure 2: APPROVED DEVELOPMENT GROUND FLOOR LAYOUT



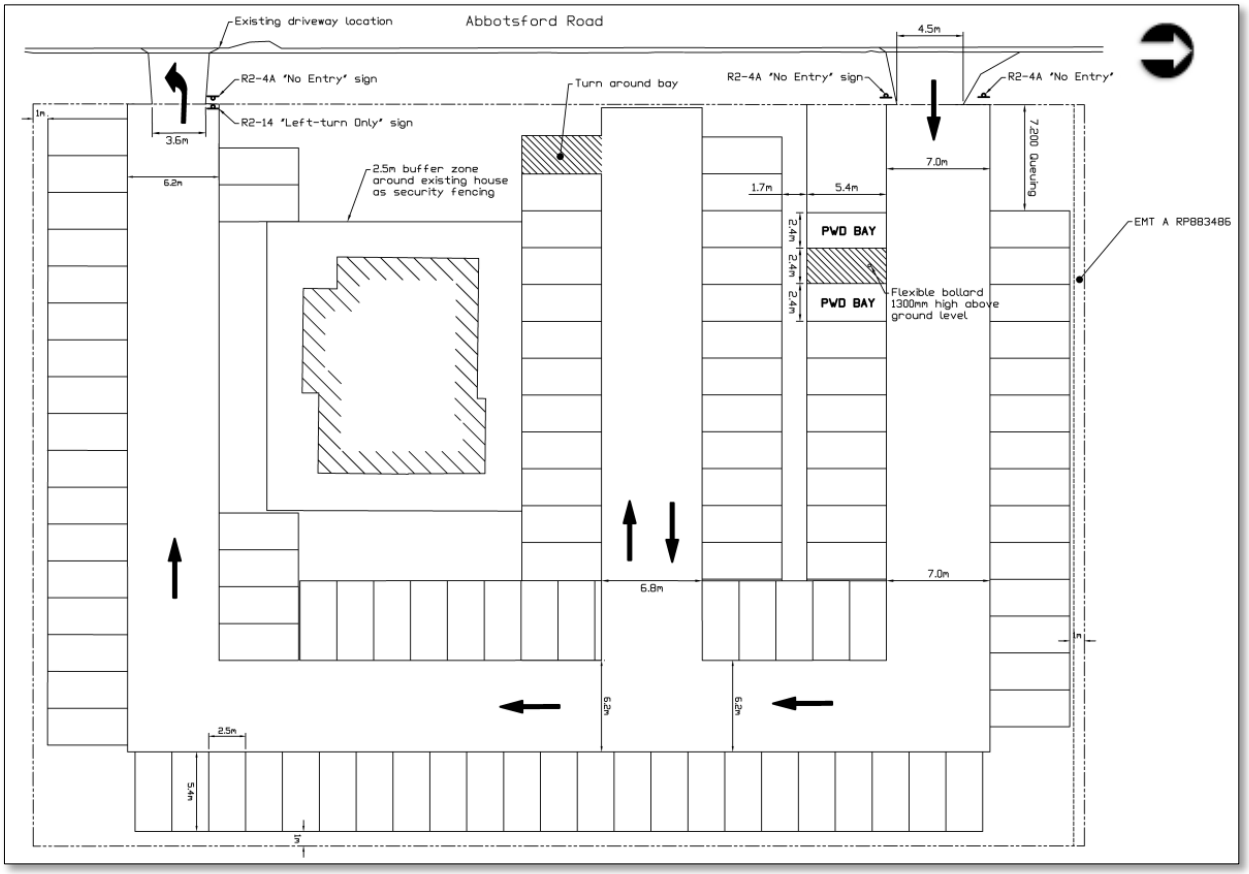
Access to the approved development will be provided via two separate (newly constructed) left-in / left-out crossovers onto Abbotsford Road. It is understood that the existing crossovers on Abbotsford Road will be removed as part of the approved development. The development will be supported by a total of 169 car parking spaces.

PROPOSED DEVELOPMENT

The proposed development involves the construction of a temporary carpark comprising 105 car parking bays. The layout of the proposed carpark is shown in Figure 3 with dimensioned plans attached.

It is understood that the carpark will operate on a contract basis and will not provide casual parking.

Figure 3: PROPOSED CAR PARK LAYOUT



ACCESS

Crossover

Vehicular access to the carpark is proposed via two separate crossovers, including:

- a 4.5m wide left-in entry-only driveway on Abbotsford Road
- a 3.6m wide left-out exit-only driveway on Abbotsford Road

It is understood that the proposed access arrangements will be achieved by maintaining two of the existing crossovers on Abbotsford Road.

For a car parking facility with 105 bays accessed from a Major Road (ie Abbotsford Road), Council's TAPS Policy requires a Type C1 crossover with a minimum entry width of 4.5m and minimum exit width of 3.5m be provided. Therefore, the proposed entry and exit driveways are consistent with Council's TAPS Policy.

Queuing

For an on-site car parking area accommodating 105 spaces, Table 3.3 of AS2890.1 and Table 10 of Council's TAPS Policy would typically require a minimum on-site queuing provision of three - five car lengths (ie 18m - 30m), measured from the property boundary to the first internal conflict point.

It has been advised that there will be no control point on entry.

The minimum queuing area requirements from AS2890.1 and Council's TAPS Policy are typically adopted in the absence of site-specific considerations and are very conservative. However, as identified by both AS2890.1 and Council's TAPS Policy, the size of the queuing area may be determined on a case by case basis, taking into account factors such as the anticipated peak entry / exit flow, classification of the frontage road and the rate of entry / exit at the control / conflict points (ie design turnover rate). Therefore, we have calculated the anticipated queue length at site access using conventional queuing theory. The queuing area calculations are set out below.

The proposed carpark layout provides 7.2m of clear queuing space for entering vehicles, measured from the property boundary to the first internal conflict point (ie on-site car parking spaces).

To determine the adequacy of this queuing provision, we have undertaken an assessment of the predicted 95th percentile queuing at the site access using the queuing theory outlined in the PTT Queuing Practice Note (attached). This assessment is based on an expected weekday peak arrival rate of 62 vehicles and included the following assumptions:

- 80% carpark occupancy
- 70% peak hour arrival rate
- a mean service rate of 14.7 seconds for a non-controlled parking facility

The results of the queuing analysis indicate a 95th percentile queue at the site access of 1.2 vehicles. Based on an average vehicle length of 6.0m, this equates to a 95th percentile queue length of 7.2m. Therefore, the proposed queuing area of 7.2m is consistent with the requirements of AS2890.1 and the BCC TAPS Policy and would not be expected to result in any significant queuing of vehicles at the access to the site.

Sight Distance

On a 60km/h road (ie Abbotsford Road), Council's TAPS Policy requires a minimum sight distance of 110m be provided. There is in excess of 110m sight distance to the north along Abbotsford Road at the proposed exit driveway location. Therefore, the available sight distance at the proposed access satisfies Council's TAPS Policy and is consistent with the existing approval.

PARKING

Persons with Disability Spaces

Two PWD spaces are proposed as indicated in Figure 3. This is consistent with the Building Code of Australia (BCA) which specifies that parking for persons with a disability be provided at a rate of one space per 100 spaces, or part thereof, for a Class 7 building (ie a carpark).

Car Park Design

The design and layout of on-site car parking is generally consistent with the requirements of Council's TAPS Policy and AS2890.1 in terms of bay dimensions and aisle widths. This is typified by:

- car parking spaces dimensioned 2.4m – 2.5m wide by 5.4m long
- appropriately dimensioned PWD spaces (2.4m wide by 5.4m long) with an adjacent shared space (2.4m wide by 5.4m long)
- parking aisles 6.2m wide and greater
- turn-around bay provided
- end-of-aisle treatment provided

TRAFFIC GENERATION

The peak hour traffic generation for the proposed carpark has been compared to the traffic generation of the approved residential development and found to be of about the same order.

CONCLUSIONS

The proposed temporary carpark has been evaluated in terms of its impact on the surrounding road network, site access and parking. The main points to note are:

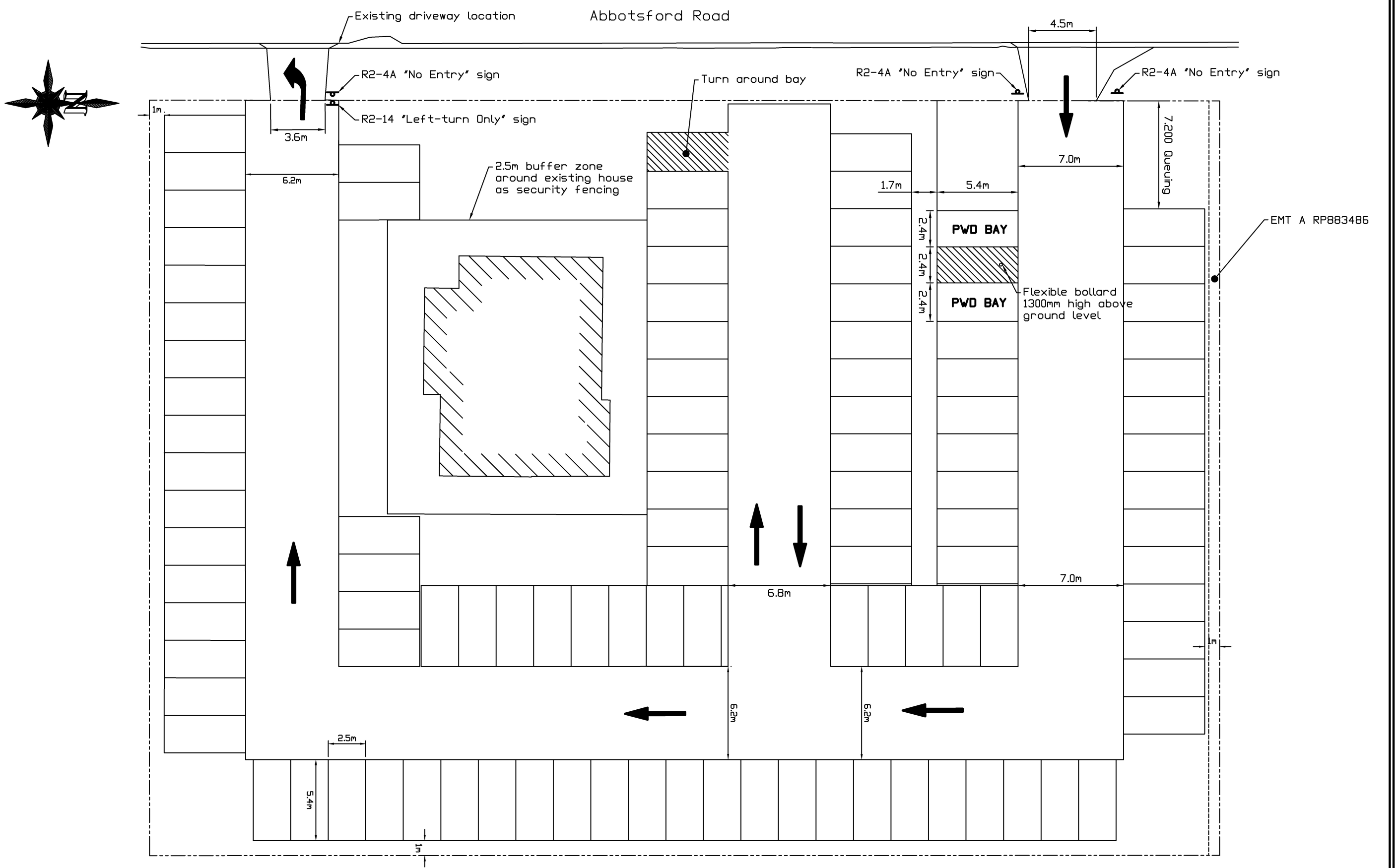
- the proposed car park includes 105 spaces
- the proposed access is via a 4.5m wide left-in entry driveway and a 3.6m wide left-out exit driveway
- the proposed entry and exit driveways are consistent with Council's TAPS Policy
- the proposed queuing area is consistent with Council's TAPS Policy and AS2890.1
- sight distance at the exit driveway is consistent with Council's TAPS Policy
- the layout of on-site car parking is generally consistent with the requirements of the Council's TAPS Policy and AS2890.1
- the peak hour traffic generation for the proposed carpark has been compared to the traffic generation of the approved residential development and found to be of about the same order.

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

Yours sincerely,

Adam Pekol

Director (RPEQ 5286)



DRAWING CHANGES			
REV.	DATE	REVISION DESCRIPTION	INITS.
A		ORIGINAL	

DRAWN	T Reynolds
DATE	25/11/18
SCALE	1:200
CHECKED	
APPROVED	

Client: PARK GENIE

Title: Proposed Temporary Carpark
39 Abbotsford Road,
Bowen Hill

Drawing Name: Carpark Layout

Drawing Number: **A0010**

Revision: A

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.

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PRACTICE NOTE

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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 α=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 α=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:

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

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

$$N = 1.68 \text{ vehicles}$$

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.

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PRACTICE NOTE

QUEUING CHARACTERISTICS AT SITE ACCESSES

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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