

21 July 2021

TO WHOM IT MAY CONCERN

**VEHICLE QUEUING ANALYSIS – POST S34
L&EC CASE NUMBER 2021/00046871
PROPOSED RESIDENTIAL DEVELOPMENT
WITH BASEMENT CARPARK
164 VICTORIA ROAD, BELLEVUE HILL**

Hemanote Consultants have undertaken a vehicle queuing analysis for the proposed mechanical turntable in the basement carpark for the proposed residential development at 164 Victoria Road, Bellevue Hill, as requested during the Section 34 conciliation conference held on 07 July 2021 as part of the Class 1 Appeal at the Land and Environment Court of NSW for case number 2021/00046871.

The queuing calculations and analysis determined that the use of the proposed mechanical turntable to be located towards the rear of the basement parking level is acceptable and will not result in vehicle queuing at the front boundary or on the fronting street. Refer to the detailed calculations on pages 3 and 4 of this statement.

If you require any further information, please do not hesitate to contact us.

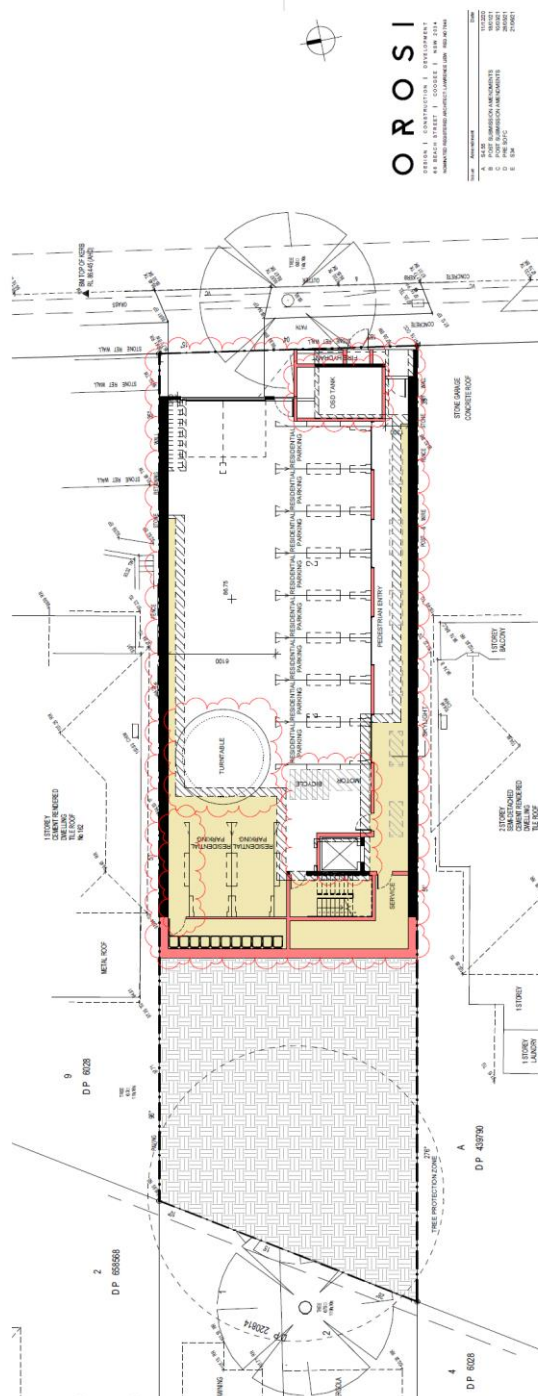
Yours sincerely



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LIST OF CHANGES 1 (28/05/2021 - REV'D)
 1. PROPOSED CHANGES TO THE OSD TANK AS PER SW DRAWINGS
 2. PROPOSED BICYCLE PARKING SPACES

LIST OF CHANGES 2 (21.06/2021 - REV E)

1 001 -- BASEMENT
1:100

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Vehicle Queuing Analysis at the access driveway

AS2890.1:2004 Section 3.5 requires that storage area shall be designed to accommodate the 98th Percentile queue for estimated arrival rates during normal peak periods, and mean service rates under continuous demand by applying conventional queuing theory.

Utilising *Austroads Guide To Traffic Management Part 2 – Traffic Theory Concepts*, Section 4.4 Steady state queues with Random Arrivals and Service.

Utilising the key formula related to queue lengths in an [M/M/1], for the required waiting length for the 98th Percentile queue. The following formula is utilised.

$\Pr (n > N) = \rho^{N+1} \leq 0.02$ equation 4.5

Information for the development:

- The turntable rotates at a speed of 1 RPM.
- Peak vehicle trips per hour for the proposed development is 2 vehicles / hour.

Calculations:

1. Utilising the above information, the average Service time of the turntable is T = 30 seconds per vehicle to perform a full turn around to the opposite way, but it can be stopped at any angle required, plus allowing for extra 30 seconds for getting into and out of the turntable, thus the average service time (s) = 3600 / 60 = 60 vehicles per hour.
2. The average arrival rate of the vehicle is @ 2 vehicles / hour
3. Calculating the utilisation factor = $\rho = r/s = 2 / 60 = 0.0333$
4. The required queue storage length is determined by the application of Equation 4.5, as the aim to find the smallest value of N for which n, the number of vehicles in the queuing system, satisfies.

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5. The probability of there being more than one car (N=1) in the system including the car being serviced by the car turntable

$$\Pr(n > 1) = 0.0333^{(1+1)} = 0.001$$

This is less than the 0.02 required in equation 4.5 above, therefore, no further calculation is required.

6. The above calculations show that with a Peak hour arrival generation rate of 2 vehicles/hour and a speed of a car turntable of 30 sec per full turn. There is a probability of 0.1% that there will be more than one car requiring service from the car turntable at a time. Accordingly, with the provision of no waiting bay while a car is being serviced by the turntable is acceptable and in accordance with the 98% percentile queue required by AS2890.1:2004. It should also be noted that the proposed turn table is located towards the rear of the basement carpark, allowing for more than one vehicle to wait within the site, if necessary, with no impact on the fronting street.

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