1 Introduction

1.1 Background

JMT Consulting has prepared this document to provide an overview of the traffic and transport implications of the proposed site development of 4 Forest Road, Warriewood. The proposal envisages the development of 13 residential lots on the site.

1.2 Site location

The site location is presented in Figure 1 below and is located within the Warriewood Valley Release Area. Existing residential development adjoins the northern and eastern boundaries of the site with bushland directly to the west. The existing Mater Maria Catholic College is south of the site. to the Vehicle access will be obtained via Forest Road to the south of the site through an existing roundabout.

Figure 1 Site location

2 Transport Assessment

2.1 Proposed vehicle site access

The primary site access for vehicles would be via the southern end of the site through Forest Road as presented in Figure 2 below. A road connection would be provided between Forest Road to the south and ultimately continue north to provide a link to the adjacent 8 Forest Road site and linking with Jubilee Avenue. A secondary road will also be provided within the site to provide local access to the development lots. Based on the requirements of the Warriewood Valley Roads Masterplan document the roads within the site have been designated as an 'access street' which will have a carriageway width of 7.5m and a road reserve width of 12.5m. This street classification aligns with that approved as part of the 8 Forest Road development.

Figure 2 Proposed vehicle site access arrangements

2.2 Internal access arrangements

Each development lot will be provided with individual access points as indicated in Figure 3 below. The access points for all lots, apart from Lot 1, are located within the internal road and not on the connecting roadway through to 8 Forest Road to minimise conflicts with general traffic travelling to or from Forest Road.

All streets within the site have been designed to accommodate two-way traffic flow with provision for on-street car parking – consistent with the recommendations contained in the Warriewood Valley Roads Masterplan document.

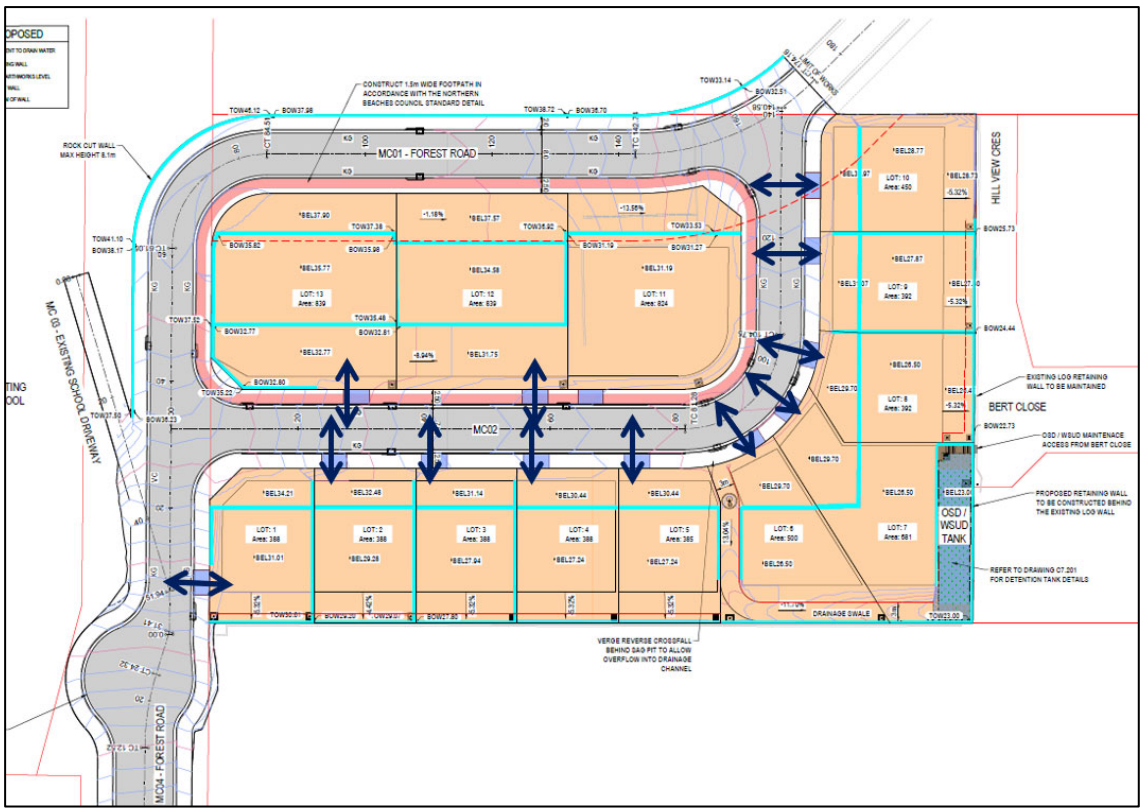

Figure 3 Proposed internal access arrangements

2.3 Road design

All roads have been designed with a 12.5m wide cross section including a 8.0m wide road carriageway - consistent with the recommendations contained in the Warriewood Valley Roads Masterplan document.

Despite the challenging topography all roads within the site will generally have a gradient of 16% or less as detailed in the engineering plans developed by ACOR. An exception to this is for a short section of roadway of approximately 25m in the area highlighted in Figure 4.

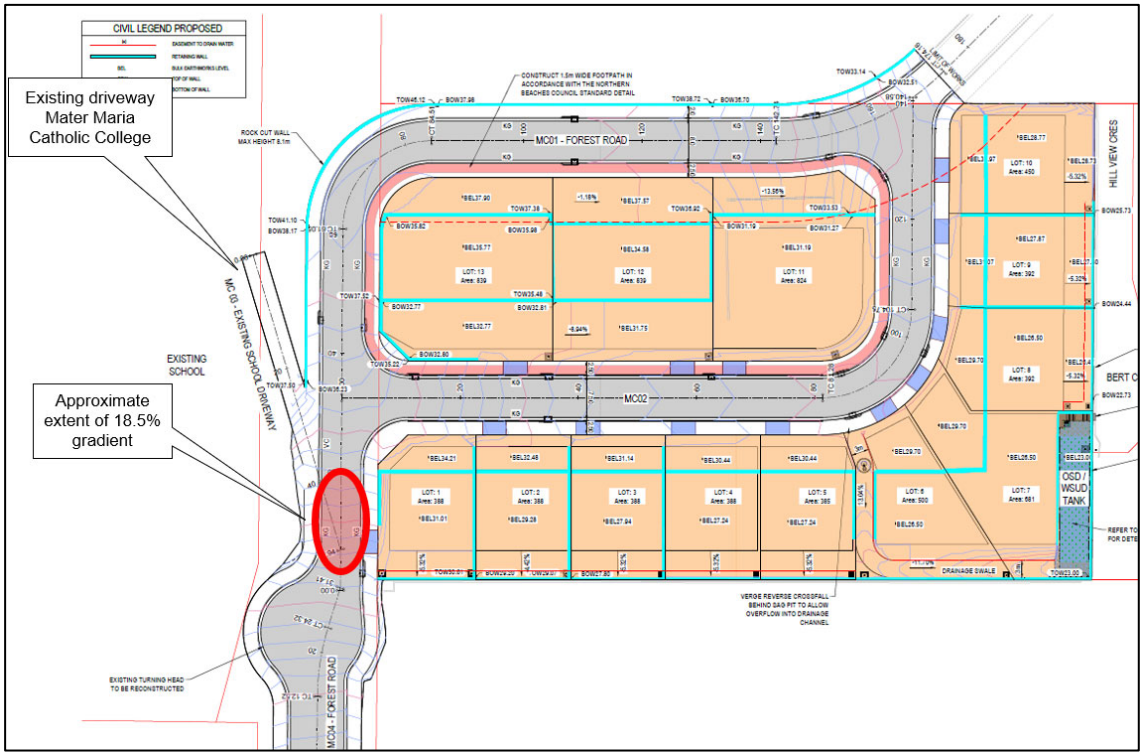

Figure 4 Extent of roadway with 18.5% gradient

Although Council recommends a maximum gradient for new roadways of 16%, the proposed road design is considered acceptable given:

- The 18.5% gradient covers a very short distance of approximately 25m
- The higher road gradient does not occur at an intersection within the site
- The 18.5% gradient is required to allow the new roadway to match the level of the existing driveway into the adjoining Mater Maria Catholic College. If this existing driveway into the school did not exist then the road profile could be adjusted so that all gradients within the site were no more than 16%.
- AUSTROADS guidelines[1] notes the following with respect to general maximum gradients “Higher values may be warranted to suit local conditions” and that grades of 15% to 33% are acceptable in some cases and over short lengths.
- Longitudinal gradients noted in Council’s road design documents note that these are “guidelines” and road design should have appropriate regard for climate, geology, hydrology and topography of the area.
- All vehicle access points into the future residential lots are on gradients of 6% or less

[1] Part 3: Geometric Design

2.4 Car parking provision

Detached dwellings

2 standard car parking spaces will be provided for each detached dwelling which complies with the Pittwater DCP requirement.

Visitor car parking

Car parking for visitors to the site can be provided on the local street network, with a 7.5m carriageway width to be provided on all roads within the site. As per the guidance provided in the Warriewood Valley Roads Masterplan document this carriageway width is sufficient to provide for two way traffic movements as well as on-street parking on one side of the road.

2.5 Traffic generation

Detached dwellings

The forecast level of traffic generated from the detached dwellings has been based off the rates outlined in the *RMS Guide to Traffic Generating Developments* (2013 update) document. The rates applicable to low density residential dwellings are as follows:

- AM peak hour (8am – 9am): 0.99 vehicles / dwelling
- PM peak hour (5pm – 6pm): 0.95 vehicles / dwelling

The expected directions of travel for vehicles, based again off guidance within the *RMS Guide to Traffic Generating Developments* document, is as follows:

- AM peak hour: 80% departing, 20% arriving
- PM peak hour: 20% departing, 80% arriving

Total Traffic Generation

The peak hour traffic generation arising from the development of the residential lots on the site is summarised in Table 1 below.

Table 1 Forecast traffic generation

Use	Use	No.	Generation Rate	Number of vehicle trips		
				Into site	Out of site	Total
AM Peak Hour	Residential Lots	13	0.95	2	10	12
PM Peak Hour			0.99	10	3	13

2.6 Road network impacts

Notwithstanding the relatively small increase in traffic as a result of the proposal, traffic modelling has been undertaken at the nearby Forest Road / Macpherson Street roundabout. As a conservative assumption all traffic entering and exiting the proposed development has been assumed to travel through this intersection – therefore representing a worst case scenario. A more likely scenario is that traffic will be dispersed both to the north and south which will reduce the extent of traffic movements through this intersection.

The modelling was based on traffic counts undertaken to support the 8 Forest Road development in October 2016. It is not anticipated traffic conditions have changed significantly since this time, however again as a conservative estimate a 1.5% per annum growth rate has been applied to this October 2016 traffic.

The performance of intersections in an urban environment is measured in terms of its Level of Service (LoS). Level of service ranges from A (very good) to F (over capacity with significant delays). This is described in the *RTA Guide to Traffic Generating Developments* as summarised in Table 2. In peak hours at intersections controlled by traffic signals on key regional and arterial routes, a LoS D is generally acceptable.

Table 2 Intersection level of service

Level of Service	Average Vehicle Delay (seconds)	Traffic Signals and Roundabouts	Priority Intersections ('Stop' and "Give Way')
A	< 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 delay. Roundabouts require other control mode	At capacity, requires other control mode
F	> 71	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing;

Another common measure of intersection performance is the degree of saturation (DOS), which provides an overall measure of the capability of the intersection to accommodate additional traffic. A DOS of 1.0 indicates that an intersection is operating at capacity.

The findings of the traffic modelling are summarised in Table 3. Detailed traffic modelling outputs are provided in Appendix A of this report.

Table 3 Traffic modelling results - Forest Road / Macpherson Street

Peak Hour	Existing Conditions			Existing Conditions + Proposed Development		
	AVD (sec)	DOS	LOS	AVD (sec)	DOS	LOS
AM Peak Hour	8.2	0.49	A	8.4	0.53	A
PM Peak Hour	7.4	0.42	A	7.5	0.43	A

AVD – Average vehicle delay (seconds) DOS – Degree of Saturation LOS – Level of Service

The traffic modelling demonstrates that the minor increase in traffic flows associated with the proposal will not result in adverse impacts on the surrounding road network. The Forest Road / Macpherson Street retains it's strong existing level of service A and average vehicle delay increases by less than one second across both peak hour periods. This confirms the traffic impacts will be acceptable with no additional measures required to accommodate future traffic demands.

2.7 Walking and cycling network

The site will benefit from being located in close proximity to a number of existing and future walking and cycling paths to be provided within the Warriewood Valley Release Area. These pathways are shown in Figure 5 and include a shared pathway along the southern bank of Narrabeen Creek which will provide connections through to Warriewood. This network of walking and cycling facilities will support access to the site via sustainable transport modes.

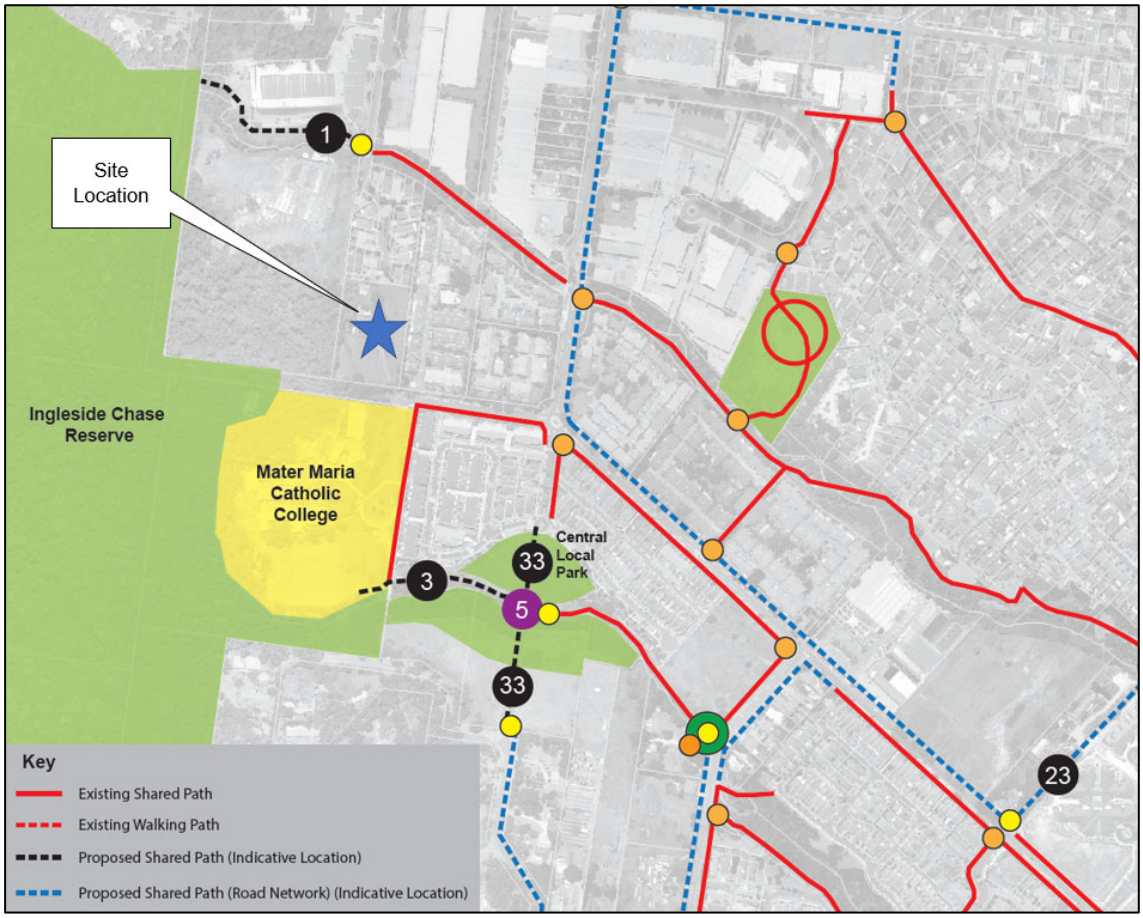

Figure 5 Future walking and cycling network

2.8 Public transport

Public transport access to the site is provided via two bus routes within viable walking distance which are as follows:

- Route 182 which runs between Mona Vale and Narrabeen via Forest Road and Macpherson Street
- Route 185 which runs between Mona Vale and Narrabeen via Garden Street and Macpherson Street

Bus stops for the 182 bus route are located within a five minute walk of the site as illustrated in Figure 6.

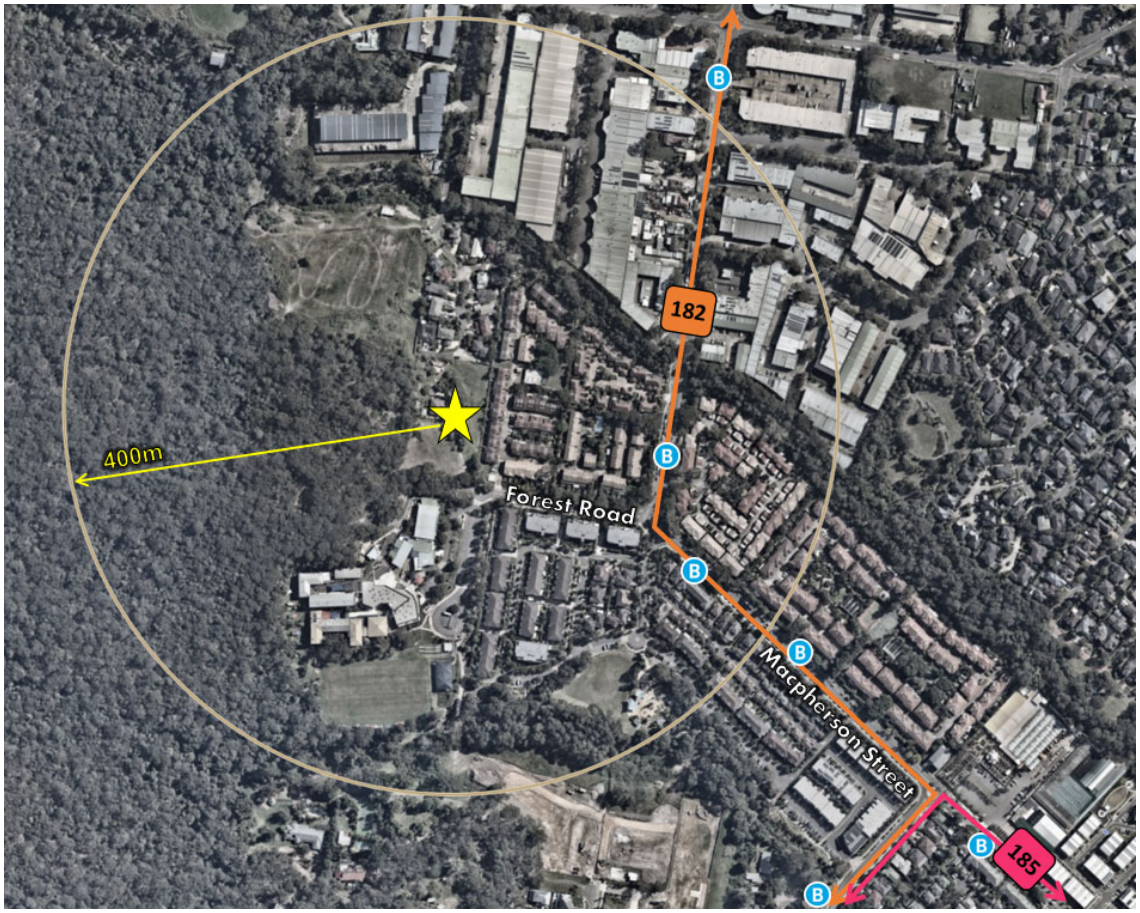

Figure 6 Public transport access

3 Summary

This transport assessment has been developed by JMT Consulting for the proposed site development at 4 Forest Road, Warriewood. The proposal envisages the development of 13 residential lots. Key findings of the assessment are as follows:

- Access from the surrounding road network will be provided in a manner that is consistent with the Warriewood Valley Roads Masterplan document.
- All vehicle driveways are located well away from intersections to minimise conflicts and queuing onto public roadways.
- Car parking for all site uses will be provided in accordance with the recommendations of the Pittwater DCP.
- Traffic modelling indicates that the operation of the road network would not be impacted by the relatively small increase in traffic associated with the proposal.
- The site benefits from a range of alternate transport options such as public transport as well as walking and cycling paths.

Based on the above key findings, it is considered that the proposal's impact on the transport network will be acceptable.

Appendix A: Traffic Modelling Outputs