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Northern Beaches Council
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To whom it may concern,

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Wilga Wilson Precinct Ingleside – Flood and Bushfire Evacuation Capability Assessment

This letter sets out the results of flood and bushfire evacuation capability assessments which have been undertaken for a proposed urban planning precinct between Wilga Street and Wilson Avenue, Ingleside.

1 BACKGROUND

Mirvac and Truslan Holdings own several large properties between them in Ingleside in an area bounded by Wilson Avenue and Powderworks Road to the north, Powderworks Road and Wilga St to the east, Wilga St to the south and Monash Country Club to the west. They are proposing that the land be rezoned from its current Rural Landscape zoning to residential and open space zonings to permit urban development.



Figure 1: Wilga Wilson Precinct Land Ownership

An indicative layout plan for the precinct is shown in Figure 2. In this plan the existing church and aged care facility would both be retained. Riparian corridors would be created as open space along the existing creek



lines accompanied by local parks and stormwater detention basins. Four distinct blocks of medium density, community titled residential development are in the centre of the precinct. There will be some four-dwelling manor houses with the balance of the land proposed to be developed as Torrens titled residential lots some of which will be terrace housing and some of which will be free standing.

It is anticipated that this would permit development of 133 detached houses, 210 terrace houses and manor apartments and 193 apartments in four six-storey buildings. These numbers include the dwellings in the existing seniors housing estate within the precinct.

It is proposed to construct a roundabout at the intersection of Wilga Street and Powderworks Road and a new road connecting the precinct to Powderworks Road to the east of Wilson Avenue.

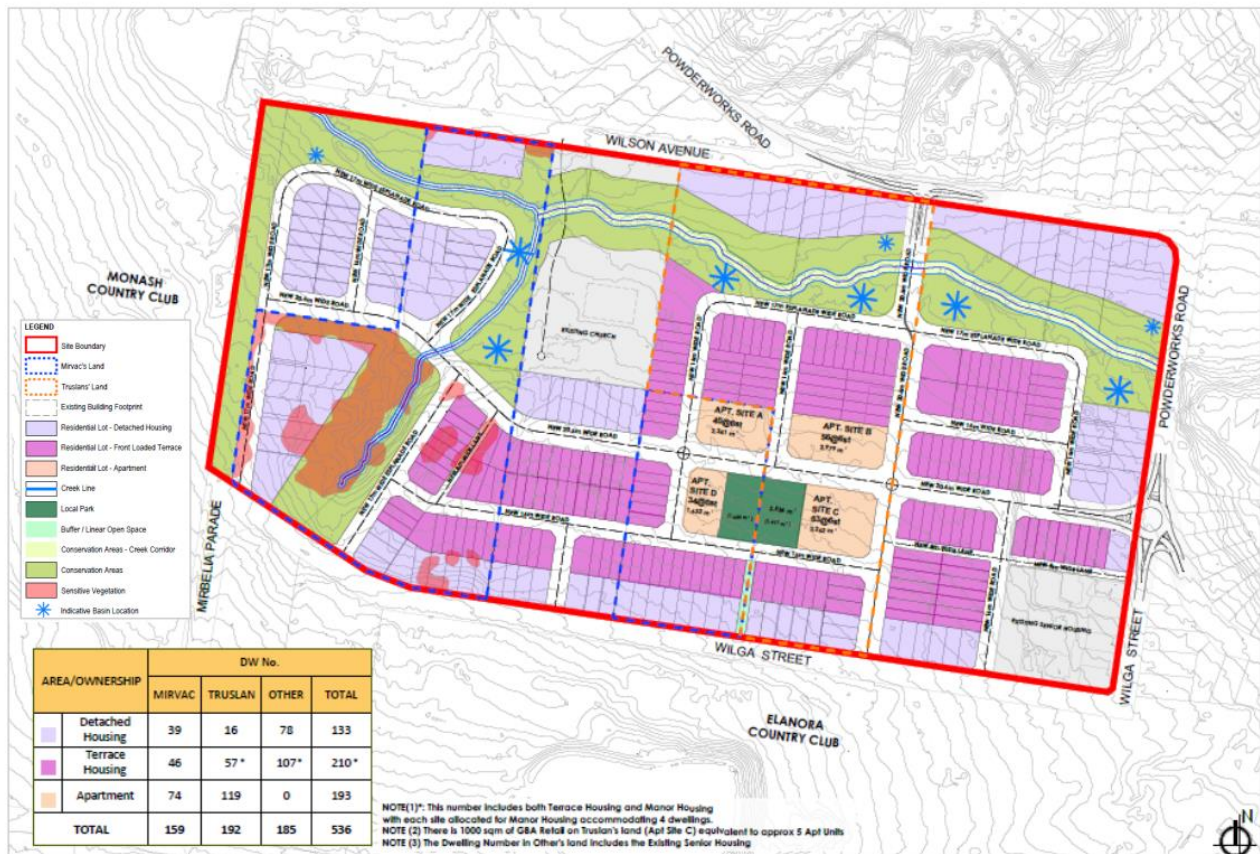


Figure 2: Precinct Indicative Layout Plan

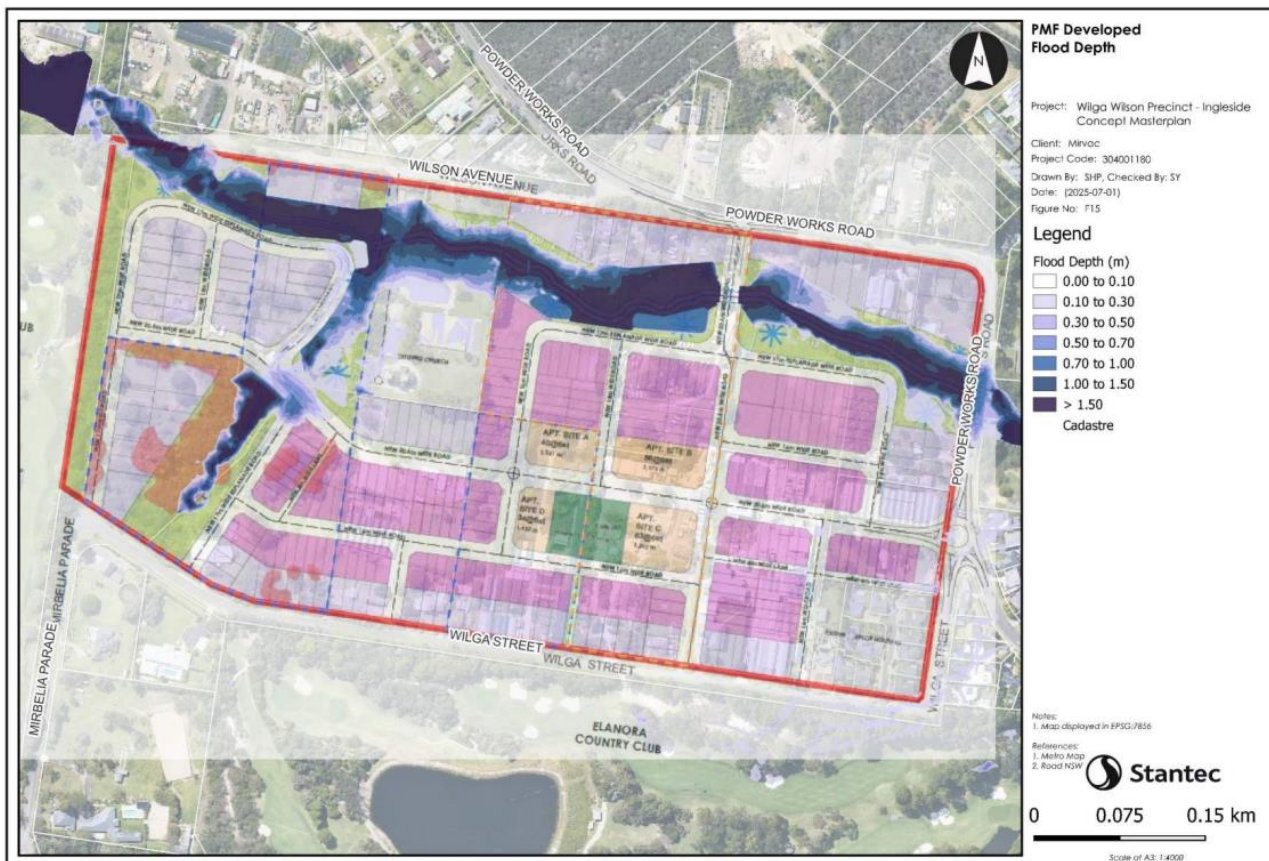


2 FLOOD

Flood modelling undertaken by Stantec shows that the probable maximum flood (PMF) extent will mostly be restricted to the riparian corridor reserves (Figure 3) with some minor overtopping of the bridge over the north flowing creek and the road running parallel to the west of that creek. This means that none of the proposed dwellings are at risk of being flooded and therefore would not have to evacuate.

The bridge over the smaller creek and the nearby road will be flooded for less than 15 minutes in a PMF and not at all in the 1% AEP event. The proposed bridge over the creek on the road connecting the site to Powderworks Road to the north of the site would be above the PMF level. This means that all but 7 dwellings will have access to Powderworks Road even in a PMF and those 7 will have access cut for less than 15 minutes. Isolation of the development due to flooding would therefore not be an issue.

While Powderworks road east of the site will be cut by flooding of the creek, the project will actually reduce the depth and duration of that flooding. Being high in the catchment, even in a PMF Powderworks Road would be overtopped for no more than 30 minutes. Furthermore, the development will create a flood free route which will enable through traffic safely detour around the flooding in Powderworks Road.



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Figure 3: Probable Maximum Flood Extent



3 BUSHFIRE

3.1 Bushfire Exposure

The riparian corridors through the site will be vegetated with native species including trees and, when mature, these will form a strip of forest which could be a potential bushfire hazard.

To the north of the site there is an area of bushland on the northern side of Powderworks Road with is a bushfire hazard whose radiant heat could reach the properties in the north eastern corner of the site. Similarly, there is a patch of vegetation in the north eastern corner of the Elanora Country Club golf course which presents a potential bushfire hazard to some of the properties on the south boundary of the site.

Monash Country Club golf course provides a wide buffer between the site and bushland to the west while residential development to the east means that end of the development has minimal bushfire hazard.

Blackash Bushfire Consulting¹ has calculated the bushfire attack level (BAL) across the site in accordance with the methods in Planning for Bushfire Protection (PBP) 2019 and these are shown in Figure 4.

As required by PBP 2019, these BALs have been calculated assuming a fire danger index of 100 (FDI100). Higher FDIs are possible but Lew Short of Blackash Bushfire Consulting has advised that because the riparian corridors are narrow and the contiguous strip of vegetation is relatively short, even with a much higher FDI the maximum BALs on individual properties are unlikely to change significantly.

The provision of perimeter roads between the riparian corridor and the residential blocks means that 3 detached dwelling on Wilson Avenue, 16 on Powderworks Road and 7 on the extension to Mirbelia Parade would have some exposure to BAL 40. A further 18 would have a maximum of BAL 29, another 25 a maximum BAL 19 and approximately 27 that have a maximum exposure of BAL 12.5. The remainder would have a BAL of less than 12.5. In most cases the dwelling could be positioned on the block to avoid the area with the highest BAL rating and in so doing reduce the exposure of the dwelling and reduce construction costs.

With regard to the terrace blocks, none would have a BAL 40 exposure, 40 would be exposed to BAL 29, 3 would have a maximum of BAL 19 and 115 exposed to only BAL 12.5. The balance would have less than 12.5 BAL rating exposure. Again, most buildings should be able to be positioned on the blocks to avoid exposure to the highest bushfire attack level rating for that block.

Three of the 4 medium density blocks have part of their site with a 12.5 BAL level but all have substantial areas of less than BAL 12.5 which means that these buildings too can be positioned to minimise bushfire hazard exposure.

¹ Blackash Bushfire Consulting Strategic Bushfire Study, Wilga-Wilson Precinct Ingleside NSW, Planning Proposal, V1.4, April 2025



Figure 4: Site Bushfire Attack Levels



3.2 Evacuating Vehicles

In theory, none of these dwellings should need to evacuate during a bushfire. However, it would be conservative to assume that some of the occupants in the dwellings which face the bushland may decide to evacuate. There are about 82 blocks that meet that criterion. While this may include some manor house blocks it excludes all of the medium density apartment blocks. That means that less than 100 dwellings in total which would fall into that category.

Of course not all residents would choose to evacuate and those that do would not necessarily all leave at the same time. A large number of studies have been completed on the human behavioural aspects of the 2009 Victorian Bushfires and the 2017 NSW Bushfires. A report on the 2009 Victorian Bushfire by the Bushfire Cooperative Research Centre (McLennan et al, 2011)² found that 54.1% of residents evacuated during a bushfire. This is similar to the findings by Whittaker & Taylor ('Community Preparedness & Response to the 2017 NSW Bushfires'³) which notes that 48% of survey respondents left or were away from their home during the fire.

The same the BCRC report indicated that of the 54.1% of residents that evacuated, 46.7% left prior to the last hour before the bushfire arrived.

In summary this means that about 25% of residents would evacuate well in advance of the fire arriving, 25% would evacuate in the final hour and 50% would not evacuate. When that is applied to the approximately 100 dwellings fronting bushfire prone land about 25 would evacuate well before the fire arrives, 25 would evacuate in the final hour and about 50 are unlikely to evacuate at all.

According to 2021 ABS Census data there are an average of 2.2 vehicles per dwelling in Elanora Heights, the residential suburb immediately to the east of the site. Applying that ownership to the site, and assuming all vehicles are evacuated from the dwellings then about 55 vehicles could be evacuating from the site in the final hour.

It would be expected that these would evacuate onto Powderworks Road and head east into residential areas and away from the bushland to the north and west which pose a bushfire danger.

² McLennan, Elliot, Omodei 2011 – Issues in Community Bushfire Safety: Analyses of Interviews Conducted by the 2009 Victorian Bushfires Research Task Force – p4 – Executive Summary item 6.

³ Whittaker and Taylor, 2018 – Community Preparedness and Response to the 2017 New South Wales Bushfires p5.



While the proposed development is evacuating, areas to the west and south of the site may also be evacuating from bushfires. As shown in Figure 5, in addition to the planning proposal site, there are three other catchments which could potentially need to evacuate along Powderworks Road ahead of a bushfire.

- There are rural residential areas north of Mona Vale Road and south of Ku-ring-gai Chase National Park. They have access onto Mona Vale Road at a number of locations and could evacuate east or west on Mona Vale Road. However, there is extensive bushland flanking Mona Vale Road in both directions and this may pose too great a risk in some fires. If Mona Vale Road is not an available route out of the area, then this traffic would have to travel south onto Powderworks Road.
- The rural residential areas between Mona Vale Road and Powderworks Road have a large area of bushland to the east as well patches along Mona Vale Road and Powderworks Road which are a bushfire hazard. Evacuation south on Powderworks Road is the most logical and safest evacuation route for these vehicles.
- The area west of Elanora Country Club and south of Monash Country Club has rural residential properties on Dendrobium Crescent between extensive bushland to the west and other bushland to the east. This area also includes several rural residences along Caladenia Close and Mirbelia Parade. These would all evacuate onto Powderworks Road via Wilga Street.

Table 1 shows the number of vehicles in each of these areas as per 2021 ABS Census data.

Table 1 Total Vehicles in the Catchment Area of Powderworks Road

Area	Mesh Blocks Included	Dwellings	Average Vehicles per Dwelling (Census of Population and Housing, 2021, TableBuilder)	Max vehicles
Dendrobium Crescent, Elanora Heights	10626130000	42	2.2	92
North of Mona Vale Road, Ingleside	10626920000, 106268820000, 10626890000, 10626910000, 10626900000, 10626770000	188	2.6	489
North of Powderworks Road, Ingleside	10626750000, 10626870000, 10626720000, 10626061000	128	2.6	333
Total		358		914

If the same assumption is made that about 25% of the population from these areas will evacuate in the last hour before the bushfire arrives, then that would mean that **229 vehicles** could be evacuating on Powderworks Road in that window. When these vehicles are added to those that may be evacuating from the site, there could be a total of **284 vehicles** evacuating along Powderworks Road in that one hour window.



Figure 5: Powderworks Road Bushfire Evacuation Catchments



Under normal weather conditions this road might have a capacity of about 1,200 vehicles per hour but this could be reduced due to low visibility from smoke during a fire. The NSW State Emergency Service uses a flow rate of 600 vehicles per hour per lane in its flood evacuation calculations to account for adverse driving conditions⁴. The estimated combined bushfire evacuation traffic on Powderworks Road is within that capacity.

However, it is arguable that the estimated number of vehicles using Powderworks Road at the same time during a bushfire evacuation is conservatively high because it assumes that:

- Fires will be arriving west of Mona Vale Road, north of Powderworks Road, West of Dendrobium Crescent and within the Wilga Wilson Precinct at about the same time. If they arrive at different times then the departures from each area will be staggered and they will not all be using Powderworks Road in the same hour
- Everyone will be at home when the fire occurs. Census data shows that about 8% of dwellings were unoccupied on the night of the census so vehicle numbers could be about 8% less than assumed
- Evacuees will leave with all of the vehicles on the premises. In their haste they may choose to leave some vehicles behind further reducing the load on the road system
- Mona Vale Road will be closed in both directions as an evacuation route. It is possible that fires will not be threatening either or both the western and eastern end of Mona Vale Road in which case some of the evacuation traffic, particularly that from north of Mona Vale Road will take that route and the traffic loads on Powderworks Road will be less. Furthermore, should a recent Federal Government funding announcement (<https://minister.infrastructure.gov.au/c-king/media-release/investing-roads-and-rail-build-australias-future>) result in an upgrade to Mona Vale Road, then it may be less susceptible to fire hazard and be more likely used as an evacuation route.

There is unlikely to be any background traffic on Powderworks Road because if Mona Vale Road is not suitable for bushfire evacuation then it would be closed to through traffic and traffic would not be allowed to travel along Powderworks Road towards it.

This would suggest that even with the most conservative assumptions the proposed development is not going to cause the bushfire evacuation capacity of Powderworks Road to be exceeded.



4 CONCLUSIONS

The urban planning proposal for the Wilga Wilson Precinct at Ingleside can be developed in such a way that no dwellings would be at risk of being flooded even in a PMF and so flood evacuation from the precinct would not be necessary. Furthermore, all but 7 dwellings would be connected to Powderworks Road via a road which would be above the PMF level, ensuring that most of the site would not be isolated in any flood and 7 dwellings would be isolated for no more than 15 minutes in such an event.

The provision of vegetated riparian corridors through the precinct will expose some dwellings to a bushfire hazard. The positioning of buildings on each block and the construction of the buildings to the appropriate BAL rating will ensure that all residents in the precinct can stay in their homes during a bushfire.

However, using conservative assumptions and assuming residents will evacuate onto Powderworks Road at the same time as bushfire evacuees from surrounding areas, it is expected that all vehicles will be able to evacuate in the time available.

Yours sincerely

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