

25<sup>th</sup> January, 2019

Tolucy Pty Ltd c/- Playoust  
Churcher Architects  
Attn: Alan Woodwell  
(by email)

Dear Alan,

**RE: PRELIMINARY SITE STORMWATER AND FLOODING CONSTRAINTS ASSESSMENT: PROPOSED SENIORS LIVING AT 25 LAITOKI ROAD, TERREY HILLS, NSW**

Water management constraints outlined below have been identified following a review of Northern Beaches Council's engineering controls relating to stormwater quality, quantity and flooding.

For the purposes of this assessment, we note that the site is in the former Warringah Council area within the Northern Beaches Council (NBC) local government area (Council). The NBC Water Management Policy (July 2017) provides details of controls for stormwater, water sensitive urban design (WSUD) and flooding which are considered in this assessment.

**1. REVIEW OF COUNCIL CONTROLS**

**1.1. Stormwater Quantity**

NBC generally requires on-site detention (OSD) for developments where the total proposed impervious site area exceeds 40% of the total site area. This criteria does not apply to residential flat buildings, commercial and industrial developments and subdivisions resulting in the creation of 3 lots or more, which require OSD in all cases.

Considering the proposed development is for a seniors living facility, OSD will need to be provided. If internal dwelling rainwater re-use is proposed, Council is likely to consider an offset in OSD volume commensurate with rainwater tanks sizing and re-use.

Site stormwater drainage needs to meet the key water quantity objective specified by Warringah Council's OSD Technical Specification (2012), which has been adopted by NBC and states:

*"The general requirement of Council's OSD specification is to ensure that the site's stormwater runoff after any development does not exceed the runoff prior to the development."* and

*"For all developments, the runoff from the site after development is not to exceed the runoff from the total site prior to development (i.e. undeveloped or natural conditions), for all storm durations for the 5 year, 20 year and 100 year ARI storm event."*

**World Class Sustainable Engineering Solutions**

|                                                                                                                         |                                                                                                                                             |                                                                                                                                            |                                                                                                             |                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| <b>Environmental</b><br>EIS & REF<br>Streams & rivers<br>Coastal<br>Groundwater<br>Catchments<br>Bushfire<br>Monitoring | <b>Geotechnics</b><br>Foundations<br>Geotechnical survey<br>Contamination<br>Hydrogeology<br>Mining<br>Terrain analysis<br>Waste management | <b>Water</b><br>Supply & storage<br>Flooding<br>Stormwater & drainage<br>Wetlands<br>Water quality<br>Irrigation<br>Water sensitive design | <b>Wastewater</b><br>Treatment<br>Re-use<br>Biosolids<br>Design<br>Management<br>Monitoring<br>Construction | <b>Civil</b><br>Earthworks<br>Excavations<br>Pipelines<br>Roads<br>Pavements<br>Parking<br>Structures |
|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|

Suite 201, Level 2, George St,  
Hornsby, NSW, 2077  
**Ph** 02 9476 9999 **Fax** 02 9476 8767

> [mail@martens.com.au](mailto:mail@martens.com.au)  
[www.martens.com.au](http://www.martens.com.au)  
MARTENS & ASSOCIATES P/L  
ABN 85 070 240 890 ACN 070 240 890

Preliminary OSD modelling is based on varying final impervious area percentage of the site development. Preliminary results in terms of minimum likely volumes and outlet controls are summarised in Table 1.

**Table 1:** Summary of OSD requirements against site impervious area.

| Site impervious area as percentage of total site area | Volume of OSD |       |              | OSD orifice diameter at outlet <sup>1</sup> (mm) |       |
|-------------------------------------------------------|---------------|-------|--------------|--------------------------------------------------|-------|
|                                                       | OSD 1         | OSD 2 | Total volume | OSD 1                                            | OSD 2 |
| 60                                                    | 320           | 270   | 590          | 320                                              | 260   |
| 70                                                    | 350           | 290   | 640          | 310                                              | 260   |
| 80                                                    | 370           | 315   | 685          | 306                                              | 248   |

Notes:    <sup>1</sup> Subject to final depth and configuration of OSD.

Results of preliminary modelling indicate that the Site Storage Requirement (SSR) ranges from 291.6 kL/ha to 338.6 kL/ha. Based on the pre-development site conditions in the critical 2 hour 1 in 100 year ARI storm event, the Permissible Site Discharge (PSD) is approximately 550 L/s/ha.

The OSD volumes may be provided by either a buried tank or as an above ground storage within a landscaped basin or part of a parking area. Based on a buried OSD tank of 1.0 m deep, the required total OSD (i.e. two buried tanks) footprint area would be between approximately 600 and 700 m<sup>2</sup>. We note that the number of OSD tanks will be contingent on the detailed design of the site stormwater drainage system, which may not be conducive to draining all of the site drainage to one or two tanks.

Council requirements for landscaped OSD basins are:

1. Ponding depths within landscaped basins for all residential developments must not exceed 300mm.
2. An additional 20% of storage volume is required for landscaped basins by increasing the basin surface area by 20%. This is to compensate for construction inaccuracies and vegetation growth.
3. Maximum basin side batters of 1V:4H.
4. Ponding depths on driveways and carpark used for OSD are not to exceed 200 mm.

Based on the above the proposed development would require basins with a combined surface area of between approximately 4,000 and 4,500 m<sup>2</sup> including side batters, or may be deeper with a reduced footprint provided appropriate fencing was included and approval for such a design obtained from Council.

Our experience with similar developments suggests buried OSD tanks while more costly to construct, provide greater development layout flexibility while limiting the overall OSD footprint required.

Preliminary locations of required OSD tanks are provided in Attachment A.

**1.2. Stormwater Quality**

Stormwater pollutants generated by the developed site will require treatment in order to meet Council requirements.

Stormwater reduction objectives for stormwater quality provided by Council's Northern Beaches Stormwater Management Plan (Former Warringah Council, 1999) are as follows:

**Table 2:** NBC's Stormwater Pollutant Reduction Objectives.

| Pollutants                   | Reduction objectives |
|------------------------------|----------------------|
| Total Suspended Solids (TSS) | 80%                  |
| Total Phosphorus (TP)        | 65%                  |
| Total Nitrogen (TN)          | 45%                  |
| Gross Pollutants (litter)    | 90% <sup>1</sup>     |

Notes

<sup>1</sup>. Retention of sediment coarser than 5 mm.

A stormwater treatment train to meet Council objectives is likely to include some or all of the following stormwater quality improvement devices (SQUID's), dependant on the development layout:

1. End of line stormwater quality improvement device (SQID).
2. Pit inserts to provide primary treatment upstream of the GPT.
3. Raingardens and/or bioremediation swale(s).

Preliminary MUSIC modelling has been completed for the site based on the assumptions of site impervious areas documented in Section 1.1. Modelling shows that the Council pollutant retention targets will likely be achieved through the provision of two end of the line media filtration type systems to treat all flows from developed areas of the site. These may be located adjacent to or incorporated into proposed OSD structures with appropriate high-flow bypasses.

As noted above in Section 1.1, the water quality design will depend on the final drainage design at detailed design stage. Additional water quality measures (e.g. pit inserts and bioremediation gardens) may be required depending on the final drainage design and extents of areas bypassing the proposed water quality system.

**1.3. Flooding**

Neverfail Creek is located within the site and drains approximately south-south-west. The Creek flows towards an existing headwall with 1,050mm diameter concrete pipe outlet draining under 35 Laitoki Road.

Neverfail Creek forms an upstream portion of the Kierans Creek sub-catchment within the Cowan catchment. The river style is described as confined with occasional floodplain pockets (Warringah Council, 2004).

Flooding from the creek is restricted to the central (lower) portion of the site. Assuming site access for vehicles and pedestrians are located above and away from the 1 in 100 year ARI and PMF flood liable areas, flood management measures (e.g. shelter in place, evacuation, etc.) are likely to be adequately addressed by an appropriate development layout and where required flood mitigation works.

A minimum freeboard of 0.5m is to be provided between the 1 in 100 year ARI flood level and floor levels. Floor levels of habitable structures are to be at or above the PMF flood level or 100 year plus freeboard, whichever is the greater.

If the development encroaches flooded areas of the site, detailed flood modelling will likely be required by Council to assess the flooding impacts of the development at DA stage. Preliminary flood modelling of the existing (pre developed) and developed conditions has been completed by Martens with the extents of the 1 in 100 year ARI flood and PMF included on the attached concept stormwater management plan. Refer to Martens preliminary flood assessment report (MA reference P1806682JR05V01, December 2018) for additional detail.

## 2.0 RECOMMENDATIONS

We recommend that the following engineering works are undertaken for the DA stage of the development:

- Water quantity analysis, preliminary drainage design and OSD requirements.
- Water quality analysis and concept stormwater treatment train details.
- Further flood modelling following final detailed design of proposed development, including building layout and bridge design.

Should you have any questions regarding the above, please don't hesitate to contact the undersigned.

**For and on behalf of**  
**MARTENS & ASSOCIATES PTY LTD**



**Michael Dumas**  
BEng (Environmental)  
Senior Environmental Engineer



