Civil Works Report – Site Compatibility

Elanora Country Club, 154-156 Elanora Rd Elanora Heights NSW 2101

Prepared for Elanora Country Club / 15.08.2017

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1.0 Introduction

Elanora Country Club has commissioned Taylor Thomson Whitting to undertake a preliminary civil works study on the feasibility of the proposed works at the Club. As indicated in Figure 1 below, the site is located within the red boundary however the proposed works will be limited to the area as indicate in yellow.

Figure 1: Site Location

2.0 Existing Site

Elanora Country Club located at 154-156 Elanora Road, Elanora Heights is within Northern Beaches Council. Pittwater Council DCP apply to all design work undertaken for this job. The entire site area as indicated in Figure 2 below is approximately 58.7 Ha in area and is located

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at the top of a large hill that falls towards Deep Creek and Mullet Creek. The red arrows in Figure 2 indicate the directions and locations of discharge of the catchment.

Figure 2: Existing Site location

The civil works to be undertaken on this site will be located in the area as indicated in Figure 1 above and Figure 3 below. The existing site in this location is predominantly pervious with part of the works to be undertaken in steep bush land areas with grades of 10%-15% and dense vegetation and rock. See images 3A to 3D.

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Figure 3: Extents of Civil Works

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Figure 3A: Existing land for proposed residential apartment

Figure 3B: Existing land for proposed residential apartment and access road

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Figure 3C: Existing land for proposed residential apartment and access road

Figure 3D: Existing land for proposed residential apartment and access road

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2.1 Existing Stormwater Service

After undertaking a site visit of Elanora Country Club the following existing stormwater services we found, See Figure 4 below for locations.

P1 from Figure 4 below indicates a 225 diameter pipe discharging stormwater from the existing car parking towards the undeveloped densely vegetated area at the south east of the site. The site currently has 3 existing headwalls (H1, H2 & H3) that conveys a large portion of the south-eastern catchment towards Iluka Avenue, see Figure 4 below.

H1 as indicated in Figure 4 and Figure 5 below takes approximately a 2.0 Ha catchment into the 600 diameter pipe (pipe size to be confirmed by surveyor) before heading towards Iluka Street.

H2 as indicated in Figure 4 and Figure 6 below takes approximately a 1.65 Ha catchment into the 450 diameter pipe (pipe size to be confirmed by surveyor) before heading towards Iluka Street.

H3 as indicated in Figure 4 and Figure 7 below takes approximately a 1.51 Ha catchment into a grassed ditch before discharging into a headwall with the 375 diameter pipe (pipe size to be confirmed by surveyor) before heading towards Iluka Street.

Refer to Figure 2 above for the locations of the various discharge points for the site.

Please note a detailed survey will need to be undertaken to confirm exact size and connection location and depths of the existing stormwater services from the site.

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Figure 4: Extents Stormwater Services

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Figure 5: Headwall One

Figure 6: Headwall Two

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Figure 7: Headwall Three

3.0 Proposed Development

The proposed development as seen in Figure 8 below will include the following:

- 46 residential apartments

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Figure 8: Proposed Works

4.0 Civil Works

4.1 Re-grading and Earthworks

Earthworks cut and fill will be required for the proposed residential area as the grades in that area are approximately 15 %- 17%.

See Figure 9 below indicating areas that will require the above mentioned work.

Volume of earthworks to be confirmed during design stage

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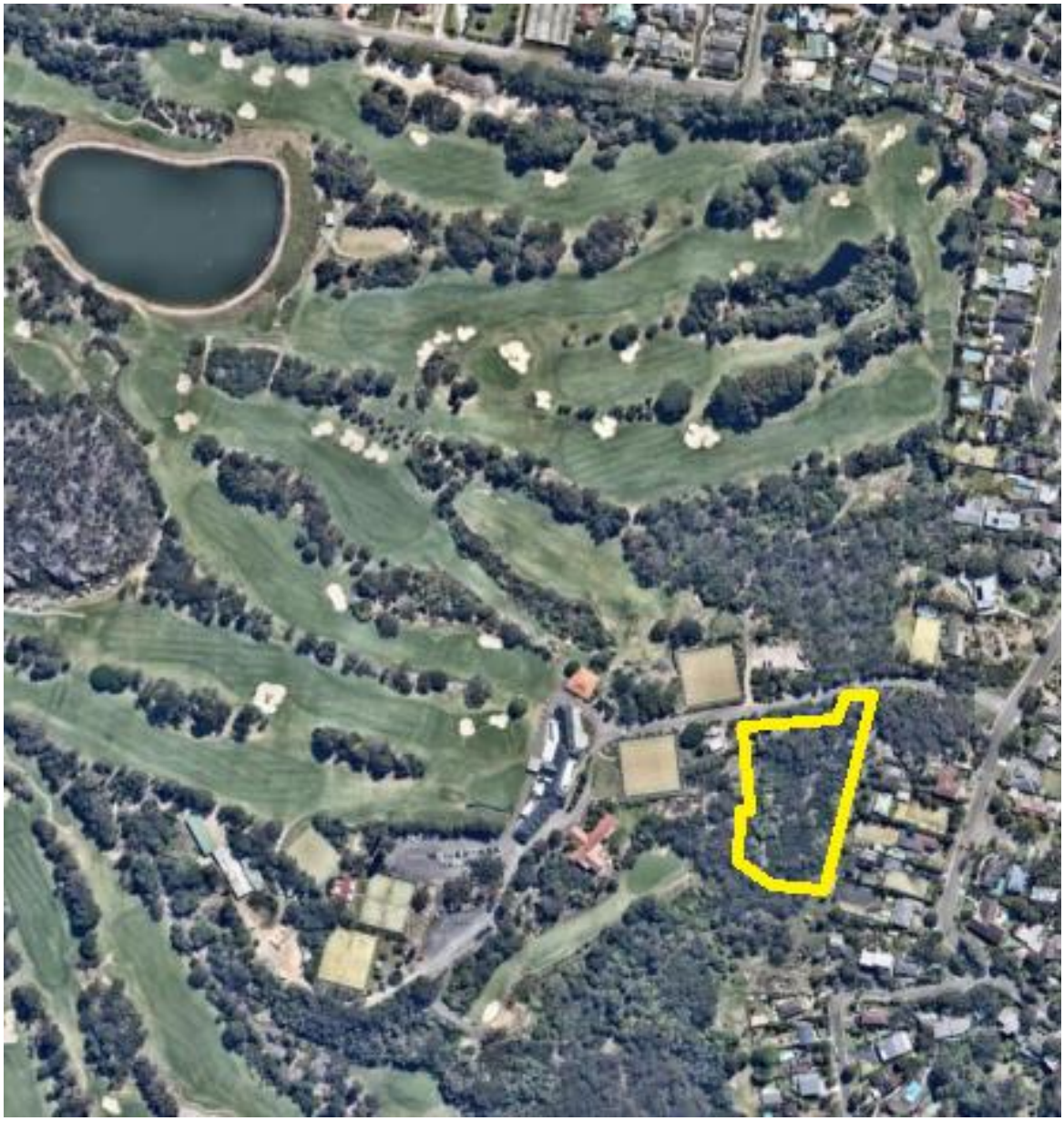

Figure 9: Area that requires earthworks and clearing for proposed development

4.2 Internal Access Road

The access driveway adjacent to the proposed residential apartments is approximately 175 m in length with a grade of 15 % and will link to the club's internal driveway of Elanora Road as indicated by the red line Figure 10 below. The driveway design will be undertaken in accordance with Pittwater Council DCP Section B6.2 and:

Australian Standard AS/NZS 2890.-12004: Parking Facilities Part 1: Off Street Car Parking;

Australian Standard AS/NZS 2890.2-2002: Parking Facilities Part 2: Off-Street Commercial Ve hicle Facilities

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Figure 10: Proposed internal access road

5.0 Proposed Stormwater

5.1 Catchment Analysis

A catchment analysis was undertaken to see what catchments affect the areas where the proposed development will take place and if the areas will be flood affected. As indicated in Figure 11 below the greater catchment flows around the proposed development and eventually runs towards Mullet Creek and Deep Creek from the peak level of 170m (AHD). The catchments that will be affecting the proposed works are indicated in Figure 12 below.

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Figure 11: Greater Catchment

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Figure 12: Catchments affecting area of works

The rational method analysis was undertaken for the 100 year flow for the predevelopment and post development scenarios across the decelopment site. The catchment has been shown in Figure 12 above.

After undertaking a rational method analysis for the additional impervious area to be built the flows for the area will change as follows (Table 1):

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Catchments from Figure 12 above	Q_{100} – Existing(m^3/s)	Q_{100} – Proposed (m^3/s)	Detention Required
A	0.5	0.7	YES

Table 1: Catchment Flow Q_{100}

Note: The n*values are based of Table 1.1 Book 7 of AR&R.

The following summarises the changes inflow affecting the catchments due to the proposed development:

- Catchment A flow increased by 0.2 m^3/s due to increased impervious area.

5.2 Flooding

After undertaking the above catchment analysis and liaising with Northern Beaches Council, it was found the site is not flood affected and no additional flood studies will be required.

5.3 Drainage

Stormwater drainage in the form of pits, pipes swales and detentions ponds or underground detention tanks and rain water tanks will be required for the site:

- 46 residential apartments

The stormwater from the proposed residential apartments and the access driveway will discharge to existing headwall 3 (H3) with the 375 diameter pipe before connecting to the Council stormwater system on Iluka Avenue to the southeast, see Figure 13 below. A detention pond as indicated by P2 should be built to restrict flows from the existing catchment (Figure 12 above) prior to redirection overflows into headwall 3 (H3). Part of the stormwater works from the proposed area will be restricted by rainwater tanks (RWT) in accordance with Pittwater Council DCP Section 5.4, as discussed below.

As indicated by the red dotted line (W) below a water main currently traverses that part of the land and survey will be required to understand the implications on the proposed stormwater design.

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Figure 13: Proposed Stormwater Discharge to H2 and H3

5.4 Rainwater Tank (RWT)

In accordance with Pittwater Council DCP Section B5.5, rainwater tanks will be required for creating any additional impervious roof area greater than 50 m^2. The following area will require RWT:

- 46 residential apartments (approximate roof area 6610 m^2): minimum RWT requirement 120,000L – tank sized to be confirmed during design development stage.

The RWT will be required to be connected for landscape irrigation and toilet flushing.

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5.5 On-Site Detention (OSD)

In accordance with Pittwater Council DCP Section B5.7, OSD in the form of an underground or aboveground detention will be required for creating any additional impervious area greater than 50 m^2:

The OSD assessment for each part of the development was separately analysed to restrict the flows to the undeveloped scenario. A detailed analysis was undertaken on DRAINS to establish the volume of OSD required for proposed works. All storm events between ARI 5 and ARI 100 was analysed for the pre- development to post- development scenarios.

The preliminary analyses of the following area was undertaken on DRAINS for the 5 to100 Year storm events.

Proposed Area	OSD Volume required (m^3)
46 Residential Apartment + Access Road (Fig 14)	400

TABLE 2: OSD Volume Required.

5.6 Stormwater Quality

In accordance with Pittwater Council DCP Section 5.9, water quality improvement measures will be required for creating any additional impervious area greater than 50 m^2.

The proposed treatments will be required

- Pre- screening of organic: Litter baskets
- Primary treatment in the form of GPTS (Gross Pollutant Traps) and other sediment removal devices
- Secondary treatment in the form of proprietary filtration devices which remove fine sediment particles
- Tertiary Treatment in the form of bio retention systems, rain gardens or wetlands

The detailed requirement for the treatment for each part of the development will be modeled in MUSIC and determined during design planning stage.

6.0 Construction Phase Stormwater Management

Construction works to be carried out in accordance with the “Blue Book” erosion and sediment control requirements. The exact controls will vary depending on construction methodology and timing, but typically consist of:

- Sediment fences;
- A sediment basin;
- Sediment trap;
- Catch Drain;
- Vehicle shaker grid and wash down; and
- Sand bags surrounding existing pits.

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A conceptual erosion and sediment control plan has been included in the civil drawing set (drawing number TBC).

7.0 Conclusion

After undertaking preliminary analysis of the various proposed works to be undertaken the following was established:

- Earthworks cut and fill and clearing will be required for the proposed works
- On- Site Detention (OSD) will be required for the proposed development as indicated in Section 5.5 Table 2 above
- Rainwater tanks will be required for the 46 residential apartments in conjunction to the OSD – Size to be confirmed during detailed design stage

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