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Pages:		5 + Attachment
cc.		Tony Harris <tonyharris55@gmail.com>

September 12, 2016

Planning Ingenuity
Attn: Jeff Mead
By Email

Dear Jeff,

RE: ENGINEERING CONSTRAINTS ASSESSMENT: 52 COOYONG ROAD, TERREY HILLS

Constraints outlined below have been identified following a review of Council's engineering controls relating to stormwater quality and quantity, flooding and the NSW Office of Water's requirements relating to works within and adjacent to riparian zones.

Constraints in relation to servicing the proposed development will be addressed by a future Servicing Assessment report by Martens once the development layout and associated demands rates are known.

1. REVIEW OF COUNCIL CONTROLS

1.1. Stormwater Quantity

Warringah Council 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 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 the development, for all storm durations for the 5 year, 20 year and 100 year ARI storm event."*

Preliminary OSD modelling, assuming the developed site consists of 70% impervious area indicates that an OSD volume of approximately 750m^3 would be required (subject to development layout). This OSD volume could be provided by either a buried tank or a landscaped basin. Based on a buried OSD tank of 2.5m deep, the required footprint area would be approximately 315m^2.

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 carparks used for OSD are not to exceed 200 mm under.

Based on the above the proposed development would require a basin with a surface area of approximately 4,000m^2.

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.

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 (1999) are as follows:

Table 1: Warringah Council's Stormwater Pollutant Reduction Objectives

Pollutants	Reduction objectives
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	45%
Total Nitrogen (TN)	45%
Gross Pollutants (litter)	Refer Note 1

Notes

[1.] Retention of sediment coarser than 0.125mm for flows up to 25% of the 1 year ARI peak flow.

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 gross pollutant trap (GPT) (approx. 4m^2 footprint).

2. Pit inserts to provide primary treatment upstream of the GPT.

3. Raingardens and/or bioremediation swale(s).

Water quality modelling with the MUSIC software package will provide assessment of water quality treatment train effectiveness to achieve the required stormwater pollutant reduction objectives.

1.3. Flooding

Neverfail Creek is located immediately west of the site. The Creek flows generally south under Cooyong Road at the south west corner of the site via 3 x 1050mm diameter concrete pipes.

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 western (lower) portion of the site. Assuming site access for vehicles and pedestrians are located above and away from the 1 in 100yr ARI and PMF flood liable areas, flood evacuation is likely to be adequately addressed by an appropriate development layout.

A minimum freeboard of 0.5m is to be provided between the 1 in 100yr ARI flood level and floor levels. Floor levels are to be at or above the PMF flood level.

Refer to engineering constraints mapping plan (attached) for preliminary 1 in 100yr ARI and Probable Maximum Flood levels (PMF) across the site. Preliminary flood levels were calculated based on assumed creek geometry (no detailed survey) with flow depths calculated using Manning's equation for open channel flow. This preliminary method is approximate only and gives no consideration to detailed creek geometry, or culvert flow. Calculated flow depths assumed culverts were fully blocked (no flow) with all creek flows assumed to cross Cooyong Road as overland flow.

Detailed flood modelling will be required by Council to assess the flooding impacts of the development at DA stage. We recommend detailed flood modelling of at least the existing (pre developed) conditions be undertaken during the architectural concept design stage to inform the design process if works are expected near the creek. Post developed flood modelling will be required by Council if any works are proposed in the flooded areas to assess offsite flooding impacts.

1.4. Riparian zone

Considering elements of the proposed development is likely to be located within 40m of Neverfail Creek, Council is likely to require a Waterway Impact Statement be prepared in accordance with the following documents:

- *Guidelines for Preparing a Waterway Impact Statement* (undated).
- *Creek Management Study* (2004).
- Policy No PL 740 Waterways: *Protection of Waterways and Riparian Land Policy* (2010) as the proposed works are within 40m of Neverfail Creek.

Council will likely require the following as was the case for a similar approved development upstream of Neverfail creek:

- An average width of 10m riparian zone is required either side of the creek from top of bank.
- No riparian buffer required.
- All development must be located outside of the riparian zone.

Based on Warringah Council's *Creek Management Study* (2004) the following comments on Kierans Creek are made:

- Upper Kierans Creek has a low ecological, recreational and landscape value. Based on recent site inspections Martens concurs with this assessment.
- The creek is classified as a Group B creek which is characterised by: *some degradation in the upper catchments, but high ecological value downstream; generally 10-15% connected impervious area.*
- Riparian vegetation is mostly exotic and native fauna habitat is relatively poor.
- The water quality of upper reaches is poor and impacts the recreational value of potential swimming areas downstream.
- The Kierans Creek catchment has been significantly modified leading to weed invasion, increased bank erosion, sedimentation of lower reaches and increased pollutant loads.

It is recommended a more detailed creek investigation and riparian zone mapping be carried out by a suitably qualified environmental engineer to determine:

1. Creek bed and bank locations to confirm riparian zone as a Controlled Activity Approval (CAA) from NSW Office of Water will be required prior to commencement of site works to cover all works within 40m of the watercourse.
2. Waterway analysis of the existing creek and riparian environment in the vicinity of the site.
3. The most appropriate location for the site stormwater discharge associated with the proposed development (OSD discharge) which requires the approval of both Council and the NSW office of water.

Refer to the engineering constraints mapping plan (attached) for the approximate 10m and 40m water riparian zones (subject to detailed assessment). A CAA from the NSW Office of Water is required for works within the 40m zone including but not limited to:

1. OSD tank/basin location.
2. Stormwater quality improvement devices such as a GPT.
3. Site stormwater outlet headwall to the creek.
4. Any required creek works.

The stream is classified as a first order water course, based on the Strahler system of stream ordering. The NSW Office of Water recommends riparian corridors of 10m for the vegetated riparian zone (VRZ) and a total riparian corridor (RC) of 20m + creek channel width. The riparian zones noted on the attached constraints plan assumes a uniform creek channel width of 2m which would need to be confirmed by the recommended works outlined above.

Asset protection zones (if required) are allowed in the outer 50% of the VRZ, so long as offsets are provided in accordance with the NSW Office of Water's averaging rule. Detention basins likewise may be constructed in the outer 50% of the VRZ, subject to the NSW office of Waters

requirements, although Council's DCP for Waterways and Riparian lands requires stormwater elements to be located outside land identified by Council as Waterways and Riparian Land.

We recommend further works be undertaken prior to architectural concept design if works are proposed near constraints identified by this assessment. Detailed flood assessment and riparian mapping would inform the design process and may assist in maximising the extent of development. Additional detailed creek survey will be required to enable flood modelling and undertake works as recommended by this assessment.

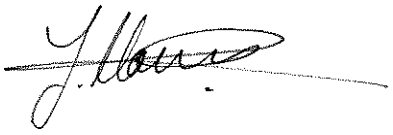
2.0 RECOMMENDATIONS

We recommend that the following engineering works are undertaken following receipt of the concept development layout and for the DA stage of the development:

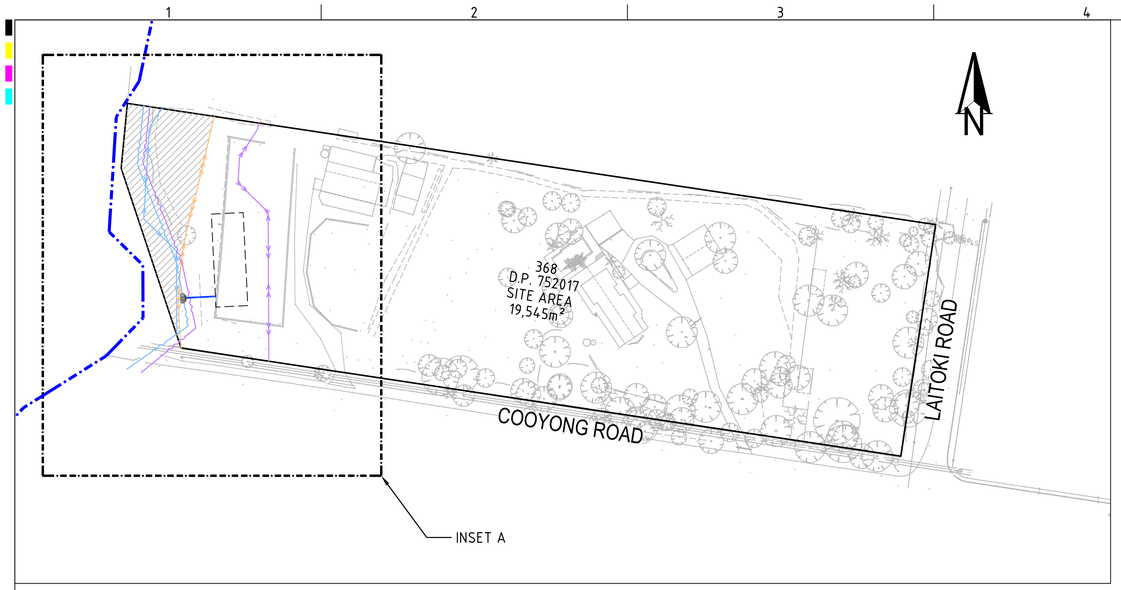
- Pre and post-development detailed flood modelling.
- Water quality analysis and concept stormwater treatment train details.
- Water quantity analysis and OSD requirements.
- Waterway impact statement

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

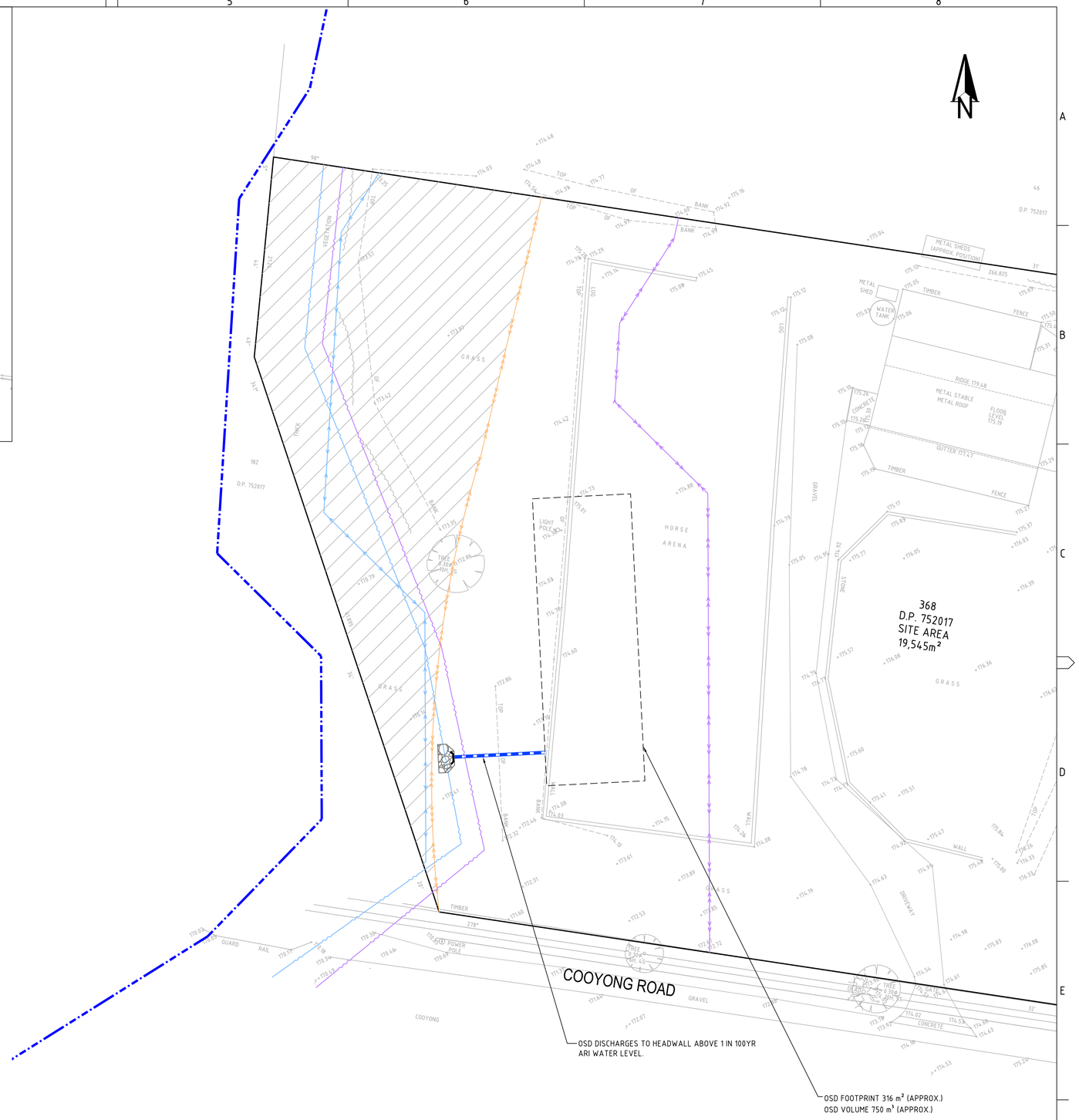
For and on behalf of
MARTENS & ASSOCIATES PTY LTD



Terry Harvey
Senior Engineer



SITE LAYOUT
SCALE: 1:1000



INSET A
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KEY

- NEVERFAIL CREEK CENTRELINE (APPROX)
- 10m VEGETATED RIPARIAN ZONE (VRZ)
- 40m WATERCOURSE (APPROX. CAA LINE)
- COUNCIL'S RIPARIAN LAND EXTENT
- 1 IN 100YR FLOOD EXTENT (APPROX.)
- PMF FLOOD EXTENT (APPROX.)
- OSD FOOTPRINT
- SITE BOUNDARY
- COUNCIL'S RIPARIAN LAND

NOTE:
- FLOODING & RIPARIAN ZONE EXTENTS TO BE CONFIRMED FOLLOWING FUTURE WORKS.
- SIZE OF OSD TANK TO BE CONFIRMED BY FOLLOWING COMPLETION OF CONCEPT STORMWATER MANAGEMENT ASSESSMENT.

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
B	**FOR CLIENT REVIEW**	**12/09/2016**	**RK**	**TH**		
A	FOR CLIENT REVIEW	17/08/2015	RK	TH		

SCALE
A1 (A3) 1:1,000 (1:2,000) 0 10 20 30 40 50 60 70 80 90 100 METRES
A1 (A3) 1:250 (1:500) 0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0 METRES

GRID	DATUM	PROJECT MANAGER
N/A	N/A	GT

CLIENT
TONY HARRIS

PROJECT NAME/PLANSET TITLE
ENGINEERING SERVICES
ENGINEERING CONSTRAINTS ASSESSMENT
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DRAWING TITLE
SITE CONSTRAINTS

PROJECT NO.	PLANSET NO.	ISSUE NO.	DRAWING NO.	REVISION
P1504710	PS01	02	PS01-B200	B

DRAWING ID: P1504710-PS01V02-B200

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A1 / A3 LANDSCAPE (A1LC-V1.1)