



Job Number: 170038
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Dear Mr De Angelis,

Re: Flood Hydrology of 13 Park Road – Public comments at IPC Hearing March 27th 2019

PRE-AMBLE

Following the consultation event referenced above approximately twelve comments related to flooding. A common theme in questions was the lack of inclusion of Nepean River flooding in development planning. Responses to specific community comments have been included in the group letter presented by Urbis (2019). Herein more detail is presented in order to clarify the flood affectation of the subject site and the rationale for the proposed layout of interment areas.

Further since the meeting, public feedback has been incorporated via inclusion of an additional buffer between interment sites and Jerry's Creek. This is as per advice of Dr Dent (2019) who specialises in the ground water characteristics of lawn cemeteries.

CRITICAL EVENT SELECTION

Jerry's Creek which traverses the western third of the subject site is liable to flooding due to two mechanisms. These are:

- Local catchment flooding (upstream catchment area of 6 km²); and
- Nepean River flooding (1,795 km² as per Worley Parsons 2015).

The effect of the two 1% AEP events is quite different with the local event causing relatively fast flows and varying flood levels on the subject site (between ~ 39 mAHD and 36 mAHD) and the Nepean River event causing a flat backwater driven flood level of 45.8 mAHD. Differences between the two events are as follows:

- Flow Velocity - Local event has a significant slope across the subject site which indicates flow with velocity and indeed velocities of up to 2 m/s do occur (see attached figure in Annex A). In contrast the Nepean River event slowly fills the Jerry's Creek area over a period of days and velocities less than 0.5 m/s are expected;
- Effective Warning Time - Local event will closely follow rainfall and there is no effective warning time. Nepean River flooding will occur with significant effective warning time (days);
- Inundation Duration – Local event will dissipate in hours or less, Nepean Event may occur over several days.

The purpose of GRC's analysis is to:

- Assess whether or not proposed works lead to impacts on up or downstream flood behaviour; and to
- Identify the extent of local event flood flows so that interment places can be kept away from areas at risk of erosion/scour.

The pertinent event in regard to both issues is the local Jerry's Creek event as impacts pertain to conveyance not flood storage and scour correlates to velocity as per Figure 1 attached.

LAYOUT AMENDMENT

Based on community concerns evident on March 27th 2019, the proposed interment layout has been altered. Previously, the Grave Exclusion Zone (GEZ) was based on the following:

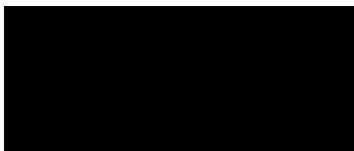
- 1% AEP local Jerry's Creek flood event;
- Riparian zone as per State Government advice; and
- 50 m minimum buffer applicable to Jerry's Creek as minimum.

Dr Dent (2019) now recommends the inclusion of Grave Invert Protection (GIP). The methodology followed to define the revised GEZ as per Dr Dent's advice was as follows:

- Utilise local Jerry's Creek 1% AEP extent;
- Add the GIP value to the extent and move the GEZ outwards, away from creek centreline so that new extent is at an elevation such that "1% AEP flood level plus GIP = GEZ extent height". So for example the 1% AEP level at Park Road (based on the local Jerry's Creek flood event) is ~ 39 mAHD. If we add 2.1 m to this as grave invert protection then the new extent starts not at 39 mAHD but at 41.1 mAHD.

The net effect of this is an enhanced buffer area between interment places and Jerry's Creek which as per Dr Dent's advice ensures good water quality outcomes. So to summarise the layout revision has increased the area around Jerry's Creek which will be free from interment sites.

Yours Sincerely



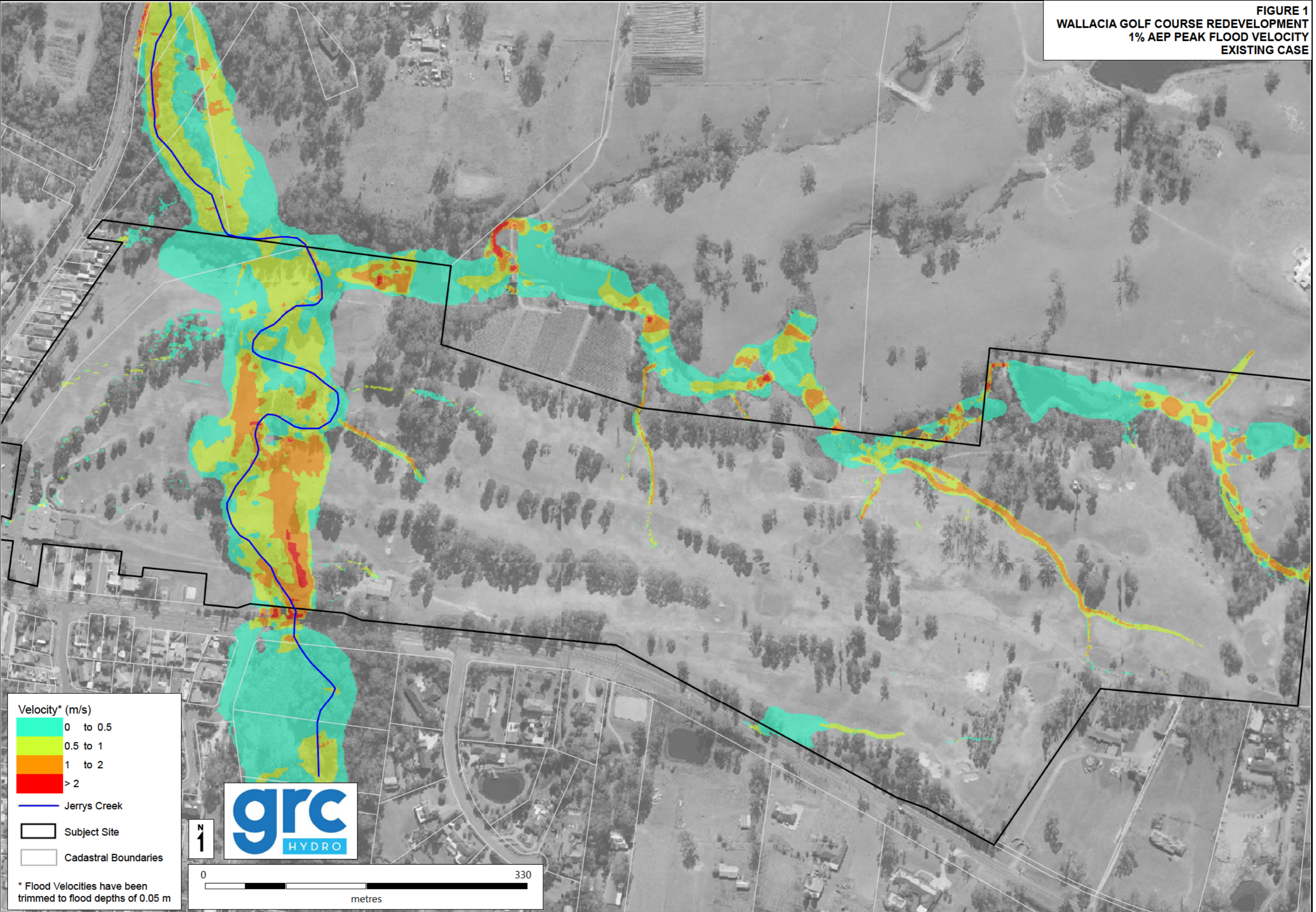
Steve Gray
Director

REFERENCES

- Dr Boyd Dent. April 2019. “REPORT: Review and Considerations - Aspects of Potential Groundwater Contamination and Related Matters Concerning Flooding - Proposed Development of a General Cemetery (Wallacia Memorial Park), Wallacia, NSW”.
- URBIS. April 2019. “Submission to IPC - Wallacia Memorial Park”
- Worley Parsons April 2015 “Nepean River Flood Study”, Camden Council.

ANNEX A

FIGURE 1
WALLACIA GOLF COURSE REDEVELOPMENT
1% AEP PEAK FLOOD VELOCITY
EXISTING CASE



Velocity* (m/s)

- 0 to 0.5
- 0.5 to 1
- 1 to 2
- > 2

— Jerrys Creek

▭ Subject Site

▭ Cadastral Boundaries

* Flood Velocities have been trimmed to flood depths of 0.05 m

grc
HYDRO

N
1

0 330
metres