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9th October 2019

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Dear Rowan

RE: 20&21 Boorea Ave Lakemba – Flooding Assessment Addendum

Introduction

Council has requested "*expanded flood modelling that assesses upstream and downstream impact of making changes to the site*". It is well understood that the proposed development increases the flood width which is expected to decrease or maintain existing flood levels however Council seeks proof by way of modelling. This letter describes the assessment undertaken and the key assumptions adopted.

Council has subsequently requested comment on the potential ponding on Boorea Avenue during a 1% AEP event with the possibility of emergency vehicles needing to access the site.

Hydraulic Modelling

The 1-dimensional hydraulic model has been conducted for Coxs Creek channel using a HEC-RAS which is commonly used for these types of assessments. HEC-RAS is a computer program for modelling water flowing through systems of open channels and computing water surface profiles. A peak flow rate is applied to the model comprising of multiple cross-sections with appropriate roughness coefficients.

The flood levels and flow rate for 1% AEP event in Coxs Creek channel have been sourced from Canterbury-Bankstown Council. The flowrate provided by Council and subsequently adopted is 63.52m^3/s. The flooding levels of the existing were compared to the flood levels provided by Council to verify the model including roughness coefficients.

The cross sections are extracted using combination of LiDAR, survey completed by Craig & Rhodes, Google Map and Nearmap. The cross sections are created for the existing conditions and future development condition. The location of the cross sections and the comparison of existing and future development cross sections for the site (cross sections C and D) are presented in Figures 1 and 2. The model has been calibrated to match the existing flood levels provided by Council at cross sections A and E.

The schematic of the developed model is shown in Figure 3.

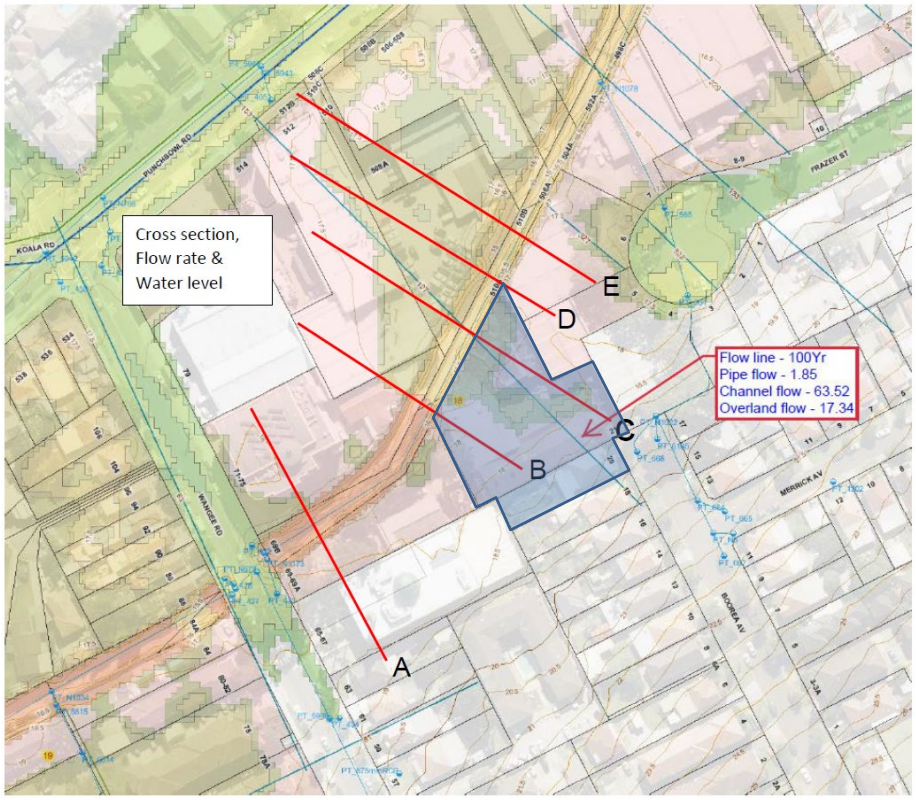

Figure 1: Locations of the cross sections

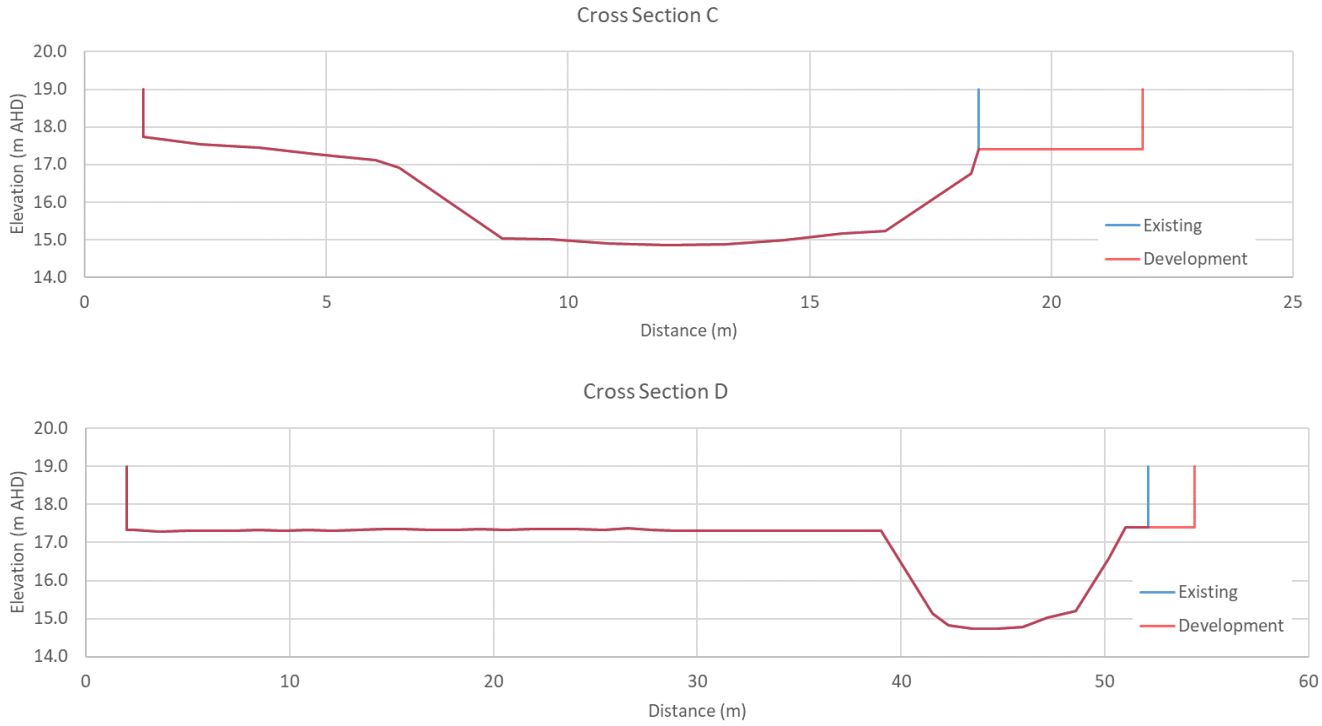

Figure 2: Existing and future development cross sections

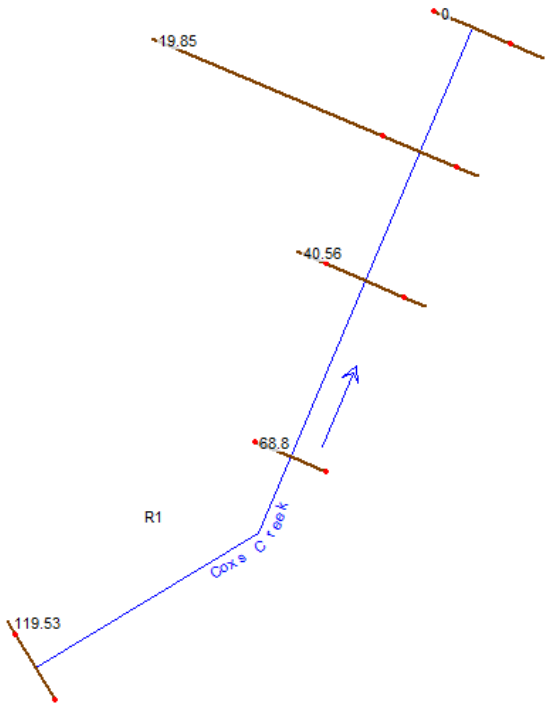

Figure 3: Schematic of the model in HEC-RAS

Modelling Results

The model was calibrated for the existing condition and subsequently re-run for the proposed development condition. The flood levels were then compared to calculate the flood afflux. The results show that the flood levels at the five cross section locations are reduced between 0 to 7mm.

The primary sections of interest are cross sections C and D and these are provided in Figure 4. The results for all cross sections have been provided in Figure 5 showing the long-section or water surface profile and Table 1 providing the calculated change in flooding levels with the proposed development.

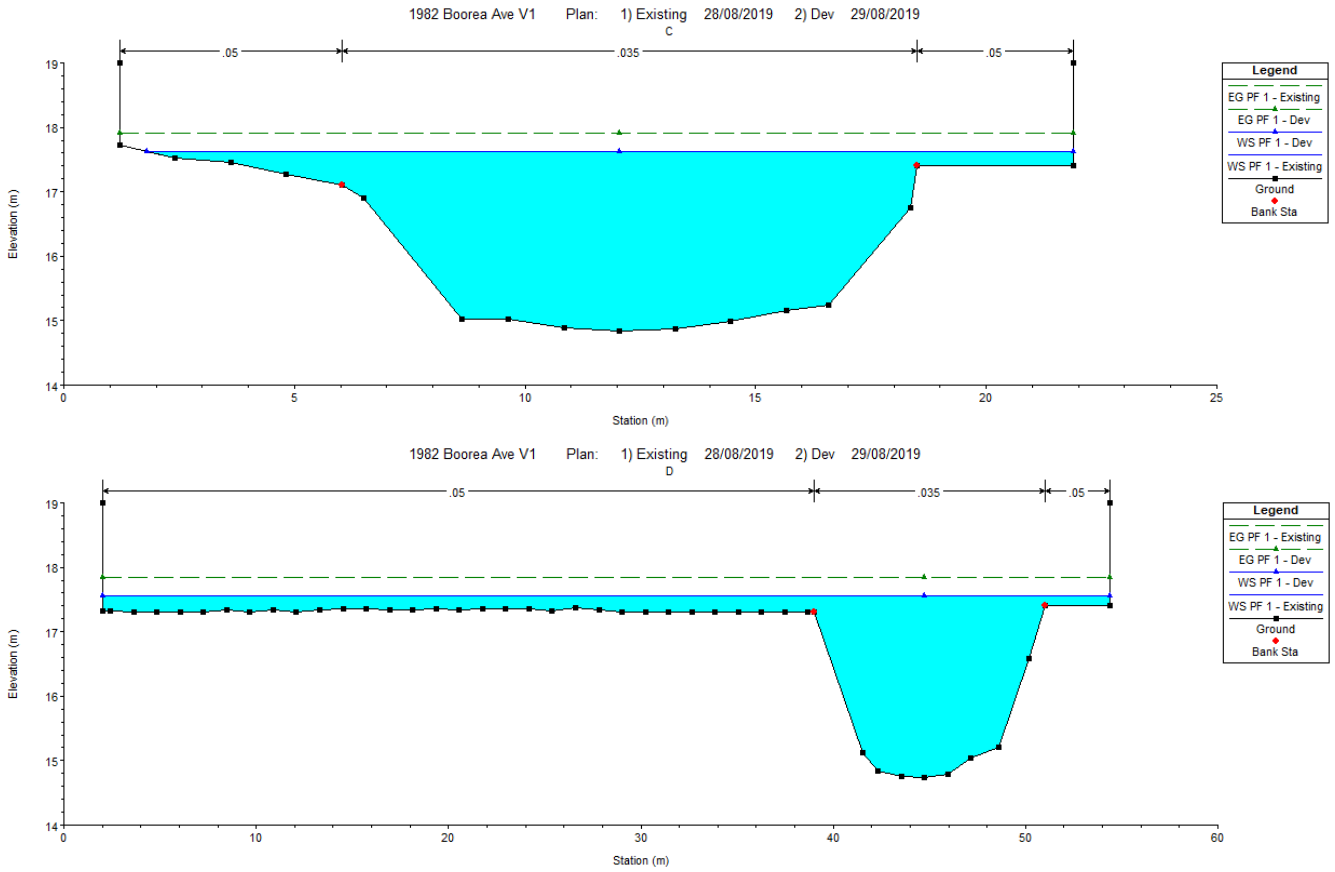

Figure 4: Results from the HEC-RAS model at the cross sections next to the site

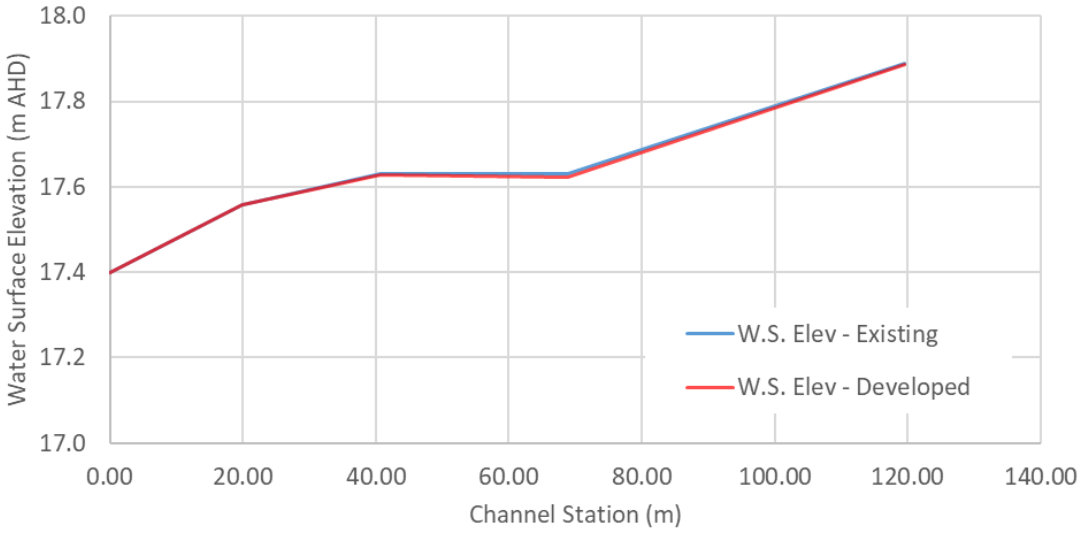

Figure 5: Flood levels for the existing and future conditions for 1% AEP

Table 1: Modelled afflux for the cross sections

Cross section	Afflux (mm)
A	-2
B	-7
C	-3
D	0
E	-1

Ponding in Boorea Avenue Cul-de-sac

Council's Asset Engineer, Mr Dipen Nandodwala, confirmed in an email on 5th April 2019 that there are no overland flows expected down Boorea Ave and into the site during a 1% AEP event. Nevertheless, an overland flow path has been proposed within the site to convey any flows down to Coxs Creek that may emanate from Boorea Ave in a larger event or due to blockage.

Interrogation of the lidar revealed that the lowest identifiable point in the cul-de-sac is 19.274m AHD and the cross-over level is 19.392m AHD. This would create a ponding depth of 118mm before overtopping if the flowrates exceed the capacity of the stormwater system in Boorea Avenue. Raising the driveway to 19.4m AHD increases the ponding to 126mm before overtopping according to the lidar. A velocity depth multiple of 0.6m^2/s (typical for vehicles) would allow a velocity up to 5m/s. This is highly unlikely to occur given the relatively flat grades.

Conclusion

The results of the 1-dimensional hydraulic modelling of the Coxs Creek for 1% AEP flood has shown that the proposed development will slightly reduce the flood levels in the Coxs Creek near the site location between 0 and 7mm which is consistent with previous expectations. Therefore, the proposed development has a small beneficial impact on flood levels experienced by neighbouring properties. The potential ponding on Boorea Avenue is very likely to be navigable by emergency vehicles should the need arise during the relatively short window of time of peak flow occurring in a 1% AEP.

Yours sincerely

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