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Southern Regional Planning Panel

Attention: Southern Regional Planning Panel

Dear Sir/Madam

DA-2023/849 – Halcyon Forest Reach Community- Bong Bong Road Huntley

Subject: Preliminary Changes to Water Cycle Management Strategy Outcomes following adoption of the 2023 MCFRMS

Wollongong City Council (Council) have identified that the current Water Cycle Management Study for the proposed Halcyon Forest Reach Community (The Site) is inconsistent with Council latest 2023 Mullet Creek Floodplain Risk Management Study and Plan (FRMSP).

Maker have been engaged to assess the impact of the revised procedures within the FRMSP on the current Water Cycle Management Study (WCMS) utilised to support the development. The 2023 FRMSP represents a significant update to the assessment of the floodplain within the catchment, however, does not consider prior changes within the Forest Reach precinct and surrounds. Accordingly, implementation of these changes at the site, with its complex floodplain interaction and existing management strategies poses a challenge and requires thorough review of the existing modelling to ensure accurate representation of the floodplain. This document aims to highlight initial findings of the ongoing assessment, with that complexity in mind.

KEY CHANGES IN 2023 FRMSP

The key changes to the FRMSP from prior catchment studies undertaken by council are:

- The adoption new hydrological procedures in line with Australian Rainfall and Runoff 2019 (ARR2019), and
- Adoption and assessment of a “Defined Flood Event” (DFE).

Whilst the FRMSP also included updates to the hydraulic component of the flood model - with some updates to the physical characteristics of the wider catchment and the modelling procedures - these are minimal with generally no changes in the hydraulic modelling at Forest Reach and surrounding areas from that in prior studies.

The Defined Flood Event is a combination of the 1% AEP event, with climate change increases, conduit blockages and increased riparian roughness. The DFE as presented in the FRMSP can be seen in **Figure 1** below.

Despite the changes identified above, peak flood depths within the catchment are calibrated against historical flood levels in both the 2023 MCFRMS and prior catchment studies (as utilised within the WCMS). This results in existing peak flood levels throughout the catchment remaining relatively consistent between catchment studies.

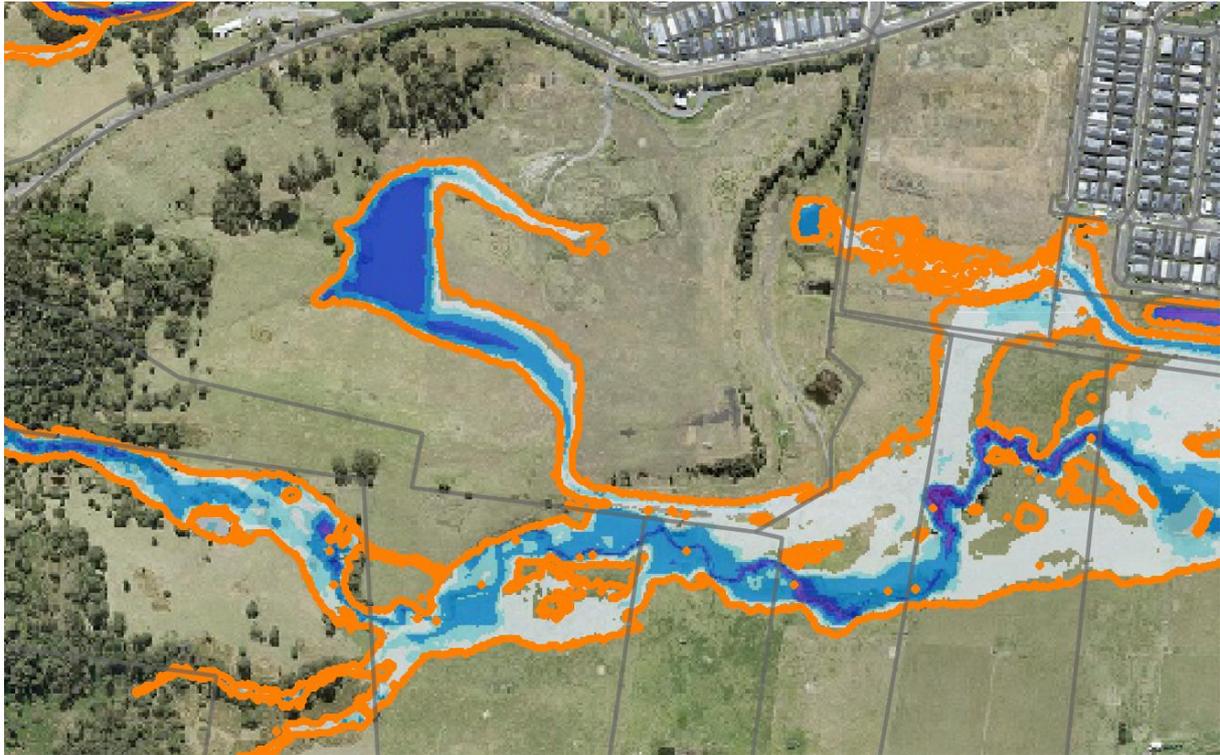


Figure 1 - 2023 FRMSP Defined Flood Event

PRELIMINARY MODELLING OF 2023 FRMSP PROCEDURES AT FOREST REACH

As identified above, peak flood depths within the catchment in the vicinity of Forest Reach remain relatively consistent, if not marginally lower, in the 2023 FRMSP when compared with prior catchment studies and the WCMS.

The key change is the hydrology that produces these results. Adoption of the ARR2019 procedures has resulted in an increase in critical duration of the 1% AEP flood events at the site from approximately 90 to 120 minutes; to 180 minutes and greater, and PMF duration increase from 45 minutes to 60 minutes. Rainfall characteristics also generally differ to those in prior studies due to the varying temporal patterns utilised within ARR2019. Pervious/impervious ratios of the catchment also have a greater impact on generated flows, with much larger losses attributed to pervious surfaces from that previously adopted within the catchment

Whilst these changes are generally negated through calibration as mentioned above, the hydrological models feeding into the respective flood models remain fundamentally different. Where the catchment information within the 2023 FRMSP is outdated, as is the case at Forest Reach (due to the previous and subsequent development of the Northern Precinct and Central Precincts) - this results in changes to flooding regimes missed in the calibration process.

Preliminary modelling of the revised procedures consistent with that presented within the 2023 MCFRMSP has occurred to determine the extent of the effect the changes in hydrology have on the Site. This modelling is preliminary only and should be treated as such, with final outcomes subject to further detailed analysis and review of the relevant studies.

Of particular concern by Council is the results of climate change (captured within the DFE) and PMF flows through the site.

Preliminary results of these scenarios are presented in the following figures below to assist in identifying the effect updating to the 2023 FRMSP might have of flood controls at the site.



Figure 2 – Preliminary DFE results following implementation of 2023 FRMS Procedures

As Figure 2 illustrates, preliminary modelling of the DFE at the site incorporating 2023 FRMSP procedures, results in an increase in flood depths within the wetland and open space upstream of the site, as well as marginal changes to the floodplain surrounding the site compared to that presented within the existing WCMS. This is due to the additional sensitivity testing of riparian roughness and climate change alongside standard blockage policy procedure. Despite this change, the hydraulic control on outflows from the upstream wetland as a result of the large culvert structure remains functional, with minimal effect on flows through the site from that presented within the WCMS.

Preliminary assessment of the PMF event incorporating 2023 FRMSP procedures has also been undertaken with results presented in the following images. Both blocked and unblocked scenarios have been provided separately to provide further clarity around the effect of blockage on the large box culvert.

Results indicate PMF levels to be lower than that previously modelled at the site, with minimal overland flooding within the Site under the revised modelling procedures.

The results presented are reliant on a functional OSD system to attenuate increases in impervious fractions from the site. Preliminary review of the current strategy for OSD at the site indicates minimal augmentation may be required to the current OSD strategy to effectively attenuate the differing storm characteristics of the 2023 FRMSP. There are multiple commonly adopted solutions typical of medium density development within the Wollongong LGA area that could achieve this with no further changes in layout/yield required.



Figure 3 – Preliminary PMF No Blockage results following implementation of 2023 FRMS Procedures



Figure 4 – Preliminary PMF with WCC Blockage Policy results following implementation of 2023 FRMS Procedures



SUMMARY

The latest 2023 Mullet Creek Floodplain Risk Management Study and Plan utilise a fundamentally different approach to the calculation of runoff within the catchment. Whilst different, this approach produces relatively similar, if not lower flood levels at the site to that adopted within previous catchment studies.

Preliminary modelling of this change indicates that flood waters flowing through the site will be relatively consistent, or lower, than that previously modelled in all flood events up to the DFE. This is due to the hydraulic control of the upstream wetland and culvert crossing controlling discharges through the site.

The upstream culvert was originally sized to accommodate PMF flows in the unblocked scenario, an outcome still achieved at the site. In the PMF blockage scenario, flows still overtop the roadway and enter the site via surface flow, however, appear reduced from that previously modelled at the site.

The primary impact to proposed strategy at the site is upon hydraulic structures previously designed and under construction through prior development approvals. This is due to these structures targeting different storm characteristics from that within the current models. Specifically, On site detention structures may require minimal augmentation to ensure alignment with the differing storm characteristics of the 2023 FRMSP if adopted for this site.

CONCLUSION

Analysis of the effect of adopting the 2023 Mullet Creek Floodplain Risk Management Study and Plan procedures within the WCMS for the site is underway, with preliminary data indicating that flood levels will remain generally consistent, or reduced from that previously presented.

Due to the complexity of the changes between the models, further modelling and analysis is recommended to continue to ensure the floodplain is accurately represented in line with best practice at the site and is not under-represented following these changes. Following this, additional mapping can be provided to meet any remaining deficiencies identified by Council or the SRPP.

On site detention structures may require minimal augmentation to ensure alignment with the differing storm characteristics of the 2023 FRMSP if adopted for this site. There are multiple commonly adopted solutions typical of medium density development within the Wollongong LGA area that could achieve this with no further changes in layout/yield required.

In light of these preliminary results, Maker is confident that the requirements for flood management and stormwater can be met at the site following final outcomes of the revised modelling and minor design changes to suit.

Yours faithfully,

Maker ENG.