

MEMORANDUM

To [REDACTED] | City of Ballarat
From [REDACTED] | Water Technology
Date 18 June 2026
Subject Ballarat 11 Waterways Amendment C217ball – UDIA Response
Our ref 26010601_M01_V01_UDIA.docx

1 SCOPE OF MEMORANDUM

Water Technology was engaged by the City of Ballarat to prepare a response addressing the specific matters raised by Urban Development Institute of Australia (UDIA) that require modeller input, including:

- Confirmation of the flood modelling methodology, data inputs and suitability for municipal-scale flood risk assessment.
- Justification of key modelling assumptions, including drainage infrastructure representation, terrain (LiDAR) resolution and the use of conservative climate change scenarios for inform long-term planning controls.

2 TECHNICAL RESPONSE

Responses to the key issue submitted by Urban Development Institute of Australia (UDIA) relating to Amendment C217ball is as follows.

2.1 Confirmation of the flood modelling methodology, data inputs and suitability for municipal-scale flood risk assessment

Significant work was undertaken to ensure all critical drainage infrastructure was included in the modelling as best practically achievable. This was undertaken through the use of the Council infrastructure database, site investigations and by researching archived plans. To reduce the burden of the gaps in data, the studies focussed on generating flood mapping for the riverine and overland flow paths only. This was completed by using a hydrological model to generate inflow hydrographs that were located within the water corridors or major flow paths/networks. Where more stormwater drainage infrastructure became available, the more expansive the inflow approach could be. This methodology is widely used by flood modellers and have informed numerous flood studies and planning control layers in Victoria.

The methodology adopted for the Ballarat 11 Waterways has also undergone four third-party reviews over the full life of the works, ranging from 2017 to 2024. Details on these reviews are noted in Section 3.3 of the Summary Report.



2.2 Justification of key modelling assumptions, including drainage infrastructure representation, terrain (LiDAR) resolution and the use of conservative climate change scenarios for inform long-term planning controls

Justification of the modelling assumptions, drainage infrastructure representation, terrain resolution are provided in the outcomes of the third-party peer reviews completed between 2017 and 2024.

The recommendation to proceed with RCP8.5 for the design horizon 2100 (as recommended in ARR4.1) was considered carefully in conjunction with the City of Ballarat and the Corangamite Catchment Management Authority. Adoption of this climate change scenario for the proposed planning controls reassures the study's relevance until revised hydrological modelling can be completed.

Under the climate change scenario adopted, the 1% AEP storm event was increased by a factor of 1.184 (18.4%) for the 2100 RCP8.5 scenario. Climate change modelling under the current standard, ARR4.2, requires scaling of rainfall data to reflect current climate levels by accounting for the increase in global warming level since the baseline IFD representation period (1961-1990). Rainfall depths are then subject to further scaling to represent future climate conditions.

As an example, should the ARR4.2 considerations be applied to the Canadian Creek & Tributaries hydrologic model, the current day representation of rainfall IFD's would be comparable to the RCP8.5 2100 event that has been modelled.

Should planning controls be delineated using ARR4.2 recommendations it would be for the year 2100 and would likely entail a 34% to 86% in rainfall intensity.

An overview of IFD factors for ARR4.2 climate scenarios and the adopted climate scenario IFD scaling for the 1% AEP event are provided in Table 1.

Table 1 Climate change IFD scaling

Duration	SSP3		SSP5		RCP8.5
	2030 (current day)	2100 (future climate)	2030 (current day)	2100 (future climate)	Adopted Scaling
<1hr	1.18	1.66	1.20	1.86	1.184
1.5hr	1.17	1.59	1.18	1.77	
2hr	1.16	1.55	1.17	1.71	
3hr	1.14	1.5	1.16	1.64	
4.5hr	1.13	1.45	1.14	1.58	
6hr	1.12	1.42	1.13	1.54	
9hr	1.12	1.39	1.13	1.5	
12hr	1.11	1.37	1.12	1.47	
18hr	1.10	1.34	1.11	1.43	
>24hrs	1.10	1.32	1.11	1.41	



3 CAPABILITY STATEMENT

3.1 Report Authors

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Senior Engineer
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Qualifications:

- Bachelor of Engineer (Civil) (Hons), Deakin University, 2017

Affiliations:

- Member, Institution of Engineers Australia

Area of Expertise:

- Assessment of flood and stormwater management;
- Expert in hydrological and hydraulic modelling;
- Advanced knowledge in application of GIS.

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Senior Principal Engineer
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Qualifications:

- Bachelor of Engineering (Environmental) (hons), RMIT University, 2007
- Graduate Certificate, River Health Management, University of Melbourne, 2009

Affiliations:

- Member, Institution of Engineers Australia, Chartered Professional Engineer
- Member, Water Industry Operators Association of Australia
- Member, National Engineers Register

Area of Expertise:

- Assessment of flood and stormwater management;
- Expert in hydrological and hydraulic modelling;
- Expert witness for drainage and flood related issues at environmental effects panels, planning panels and civil hearings.