BMT WBM

Manor Estate Harrington Flood Impact Assessment

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Final Report

Manor Estate Harrington Flood Impact Assessment

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Synopsis: **Flood Impact Assessment for the proposed Manor Estate development at Harrington. This report details the model development, establishment of existing flood conditions and the assessment of flood impacts associated with the proposed development.**

REVISION/CHECKING HISTORY

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Contents

List of Figures

List of Tables

1 Introduction

1.1 Background

Bayline Investments is currently in the process of planning a potential residential development for a site at Manor Road, Harrington, which is located within the Manning River estuary. BMT WBM has been engaged by Bayline Investments to assist in undertaking a flood impact assessment for the proposed development.

The Review and Update of the Manning River Flood Study was completed by BMT WBM for Greater Taree City Council (subsequently amalgamated into Midcoast Council) in April 2016 and currently forms the basis for floodplain risk management and flood planning by Council in the Manning River estuary.

1.2 Study Area

The study site is situated within the Manning River estuary and is adjacent to the Manning River, just upstream of Harrington, as shown in Figure 1-1. The upstream catchment area at this location is over 8000 km^2.

Downstream of Taree, the Manning River splits into two arms and enters the ocean at two locations; Harrington and Farquhar Inlet, which is located just north of the Old Bar township. Both entrances are dynamic. Farquhar Inlet can become severely restricted and is known to have closed on many occasions historically. The entrance at Harrington is a permanently open but can become significantly shoaled, particularly in periods between large floods.

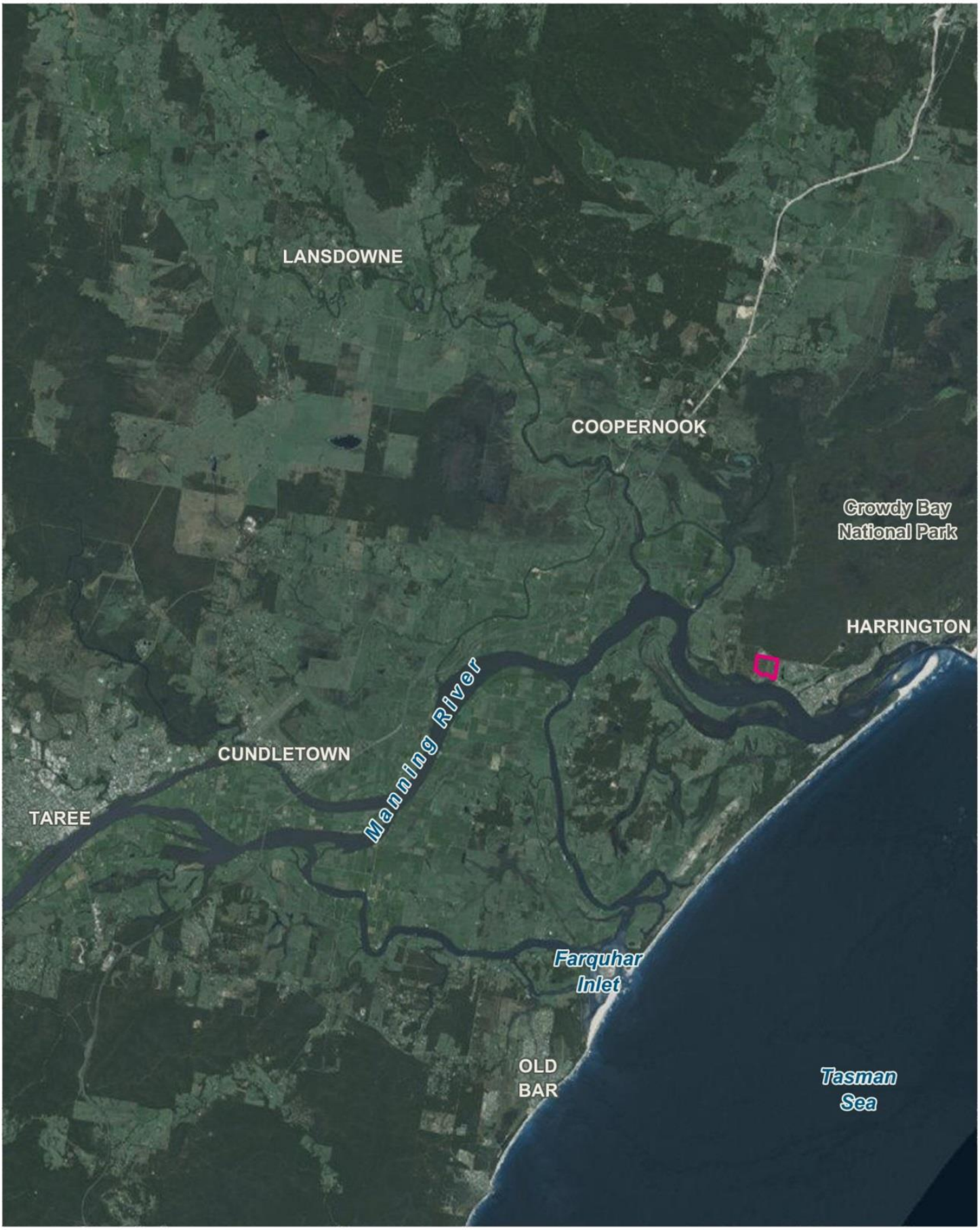
The Great Dividing Range forms the upper limit of the Manning River catchment, where elevations of around 1200 m AHD are typical. The Barrington Tops, located in the south-west of the catchment, peaks at just below 1600 m AHD. The Manning River spills onto a vast, low-lying floodplain (elevated to less than 2m AHD) area downstream of Taree.

Land use within the catchment largely consists of forested areas or pastureland and other cultivated areas. There is little urban development within the catchment.

1.3 Report Purpose

This report documents the flood impact assessment in relation to the proposed Manor Estate development. The flooding assessment incudes consideration of the following:

- existing design flood conditions (to be used as the baseline for impact assessment);
- the current plans for the development concept;
- design flood simulations for a range of return period events; and
- estimation of pre- and post- design flood conditions and the impacts of the proposed development.



Title:
Study Locality

Figure: **1-1**

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BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

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2 Model Development

2.1 Model Background

The Review and Update of the Manning River Flood Study was completed by BMT WBM for Council in 2016 and currently forms the basis for floodplain risk management and flood planning by Council in the study catchment.

The TUFLOW model developed by BMT WBM for the Manning River was utilised in this assessment. However, due to the detailed nature of local hydraulic controls and the required model representation of the proposed works, the TUFLOW model was reviewed and further developed specifically for this assessment.

2.2 Model Development

A number of model development tasks were undertaken in order to update the existing Manning River TUFLOW model, including:

- improved representation of Crowdy Bay National Park ground surface elevations
- improved definition of the Harrington Road crest elevations
- addition of a 1D model domain to enable the representation of flow between Manor Estate and Harrington Waters

The principal model development task was the improved representation of the ground surface elevations within Crowdy Bay National Park. The Flood Study model was developed using the LPI LiDAR survey data for the representation of the floodplain topography. Whilst this data generally provides a good representation of the broader floodplain, it can suffer from a loss of accuracy in areas of dense wetland vegetation commonly found in estuarine environments. The algorithms employed to filter out vegetative cover struggle to perform effectively in such areas and remnant vegetation influences can clearly be seen in the elevation data.

Initial model results showed that for the largest simulated flood events the Manning River breaks its banks upstream at Mamboo Island, with water then flowing in a generally south-easterly direction through both Crowdy Bay National Park and the Manor Estate site. However, a disproportionately high proportion of this flood flow was traversing the Manor Estate site, rather than flowing eastwards through the National Park. This was identified as a potential issue for the flood impact assessment and Bayline Investments sought to acquire some topographic ground survey to validate the LiDAR elevations in the known areas of uncertainty.

Figure 2-1 presents the LiDAR Elevation Digital Elevation Model (DEM) for the Crowdy Bay National Park area. An area of uncertainty was identified, where it was known that the vegetation was impacting the elevation data. This can be observed through the rough “speckled” nature of the DEM. One area just to the north of Harrington was identified as being particularly badly affected by vegetation.

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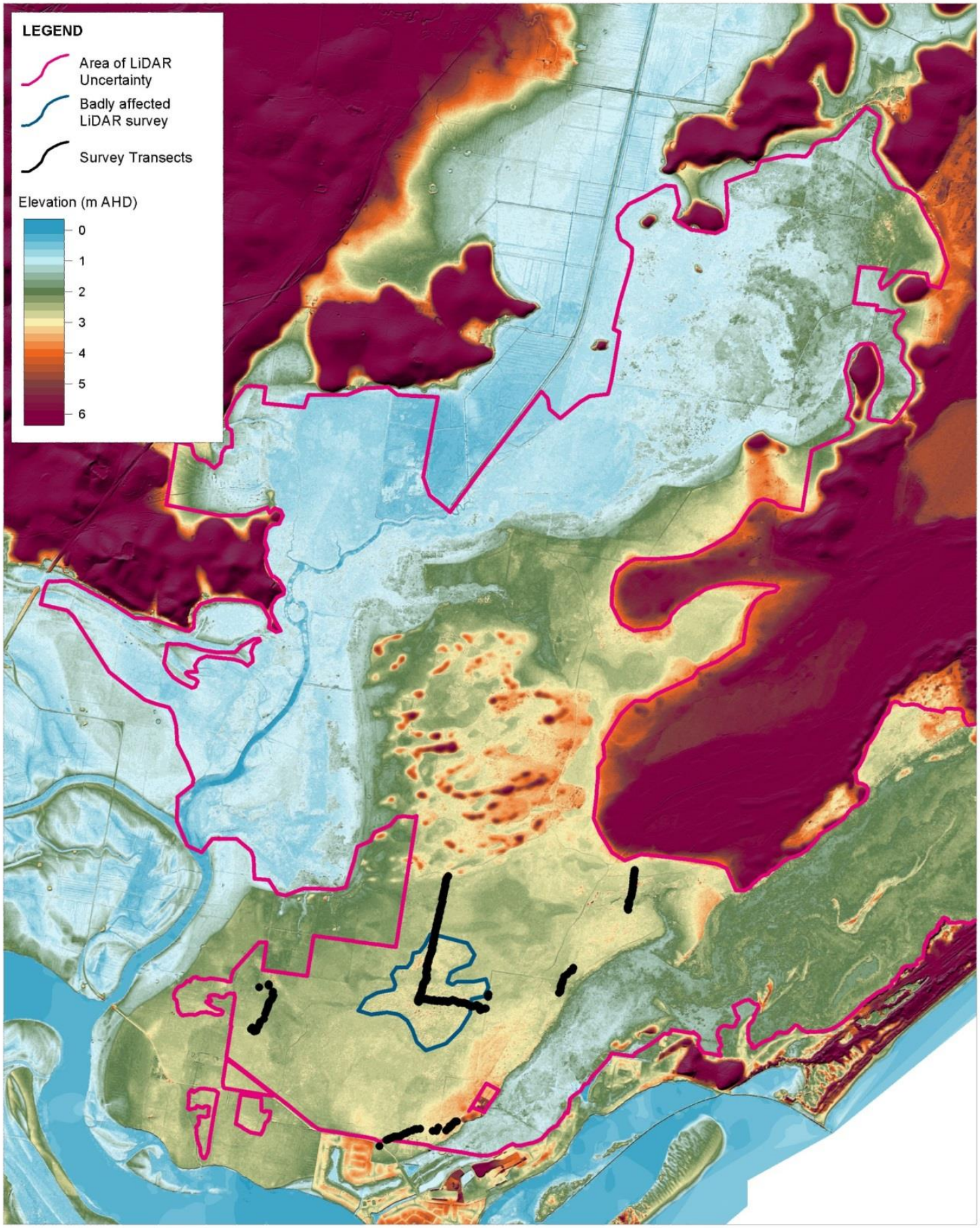

Title:
LiDAR Elevations and Ground Survey Locations

Figure: 2-1

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The ground survey data was provided to BMT WBM by Bayline Investments and was assessed against the LiDAR DEM elevations. Firstly the LiDAR DEM was “smoothed” to remove the local variation within the vegetation “noise”. The resultant elevations were then compared to those captured by the ground survey and it was found that on average the LiDAR elevations were 412 mm too high. The smoothed DEM was therefore lowered by 412 mm and applied to the TUFLOW model within the affected areas.

Analysis of the LiDAR against the ground survey data within the badly affected area found that on average the LiDAR elevations were 575 mm too high. The model elevations were therefore lowered by a further 163 mm in this location.

In addition to the modification of the LiDAR elevations, further topographic changes were made to the TUFLOW model along Harrington Road, with the road crest being enforced as a 3D breakline based on data in both the LiDAR DEM and site survey for Manor Estate.

Finally, it was necessary to add 1D functionality to the TUFLOW model, in order to represent flows between Harrington Waters and the proposed Manor Estate. The proposed easement between the fill pads is some 7.5 m wide. As the TUFLOW 2D domain is at a 20 m resolution, flows between the two sites cannot be represented accurately without the inclusion of 1D model elements.

The above model developments did not significantly alter the overall regional flood behaviour, with only minor changes to the simulated peak flood levels. However, they do have a significant impact for the Manor Estate flood impact assessment, as they result in reduced flood flows traversing the site.

3 Existing Conditions and Constraints

3.1 Existing Conditions

The establishment of existing design flood conditions provides for description of the:

- general flood behaviour throughout the study area
- existing flooding conditions based on design flood events
- constraints and limitations to potential works with respect to flooding regimes.

Design flood modelling results are shown for the 1% AEP, 0.5% AEP, 0.2% AEP and 1% AEP climate change flood events in Appendix A, and are used as a baseline for the assessment of the proposed works in Section 4. The 1% AEP future climate change scenario adopted by Council considers the present day 0.5% AEP flood flow condition (representing around a 10% increase in design rainfall) and a 0.98 m increase in sea level (representing an estimated 2100 condition).

The mainstream flooding at the study site is driven principally from floodplain flows from Cattai Creek flowing in an easterly direction through Crowdy Bay National Park and then spilling across Harrington Road – flowing in a southerly direction and returning to the Manning River. This flood flow path is not active during the present day 1% AEP event and is relatively minor at the 0.5% AEP event. However, for the modelled 0.2% AEP and the 1% AEP climate change events the flood flow path becomes more significant.

Modelled peak flood levels in the vicinity of the site are around:

- 2.6 m AHD for the 1% AEP event
- 2.6 m AHD for the 0.5% AEP event
- 3.0 m AHD for the 0.2% AEP event
- 3.1 m AHD for the 1% AEP climate change event.

Modelled peak velocities are typically less than 0.2 m/s across the floodplain in the vicinity of the site and between 2 m/s to 3 m/s within the Manning River channel.

3.2 Flooding Constraints

The proposed works have the potential to impact on the existing flooding regime for the 0.2% AEP and 1% AEP climate change events, with the introduction of fill material potentially increasing local peak flood levels as floodplain flows are locally redistributed. The required level of the proposed fill pad and finished floor levels will also need to satisfy Council's requirements for the proposed development type.

4 Assessment of Proposed Development

4.1 Details of Proposed Works

The proposed development is a new seniors living complex, for which the client provided BMT WBM with masterplan drawings. In terms of potential hydraulic controls to be considered within the flood impact assessment the proposed development essentially comprises:

- a raised fill pad on which the development will be constructed
- a 7.5 m wide clearway between the proposed fill pad and the retaining wall of the adjacent Harrington Waters site.

These details (as presented in Figure 4-1) have been incorporated into the TUFLOW model by raising elevations within the fill pad above the flood levels. The clearway is beyond the resolution afforded by the 2D model domain and so has been represented as a 1D channel structure (7.5 m wide), enabling flow to be conveyed from the floodplain area to the north (via the 15 m buffer from Manor Road) through to the Manning River.

4.2 Assessment of Flood Impacts

The impact of the proposed development is effectively negligible for the 1% AEP and 0.5% AEP events, due to the absence of significant floodplain conveyance across the site. However, for the 0.2% AEP and 1% AEP climate change events the introduction of the proposed fill pad to the floodplain results in a localised redistribution of flood flows and some level of increase in modelled peak flood levels, as presented in Figure 4-2 and Figure 4-3 respectively.

The impact to modelled peak flood levels on neighbouring lots is summarised in Table 4-1.

Table 4-1 Summary of Modelled Peak Flood Level Impacts

Lot	0.2% AEP Event	1% AEP 2100 Event
Lot 1 DP34304	40 mm – 90 mm	30 mm – 90 mm
Lot 1 DP1219123	30 mm – 60 mm	0 mm – 30 mm
Lot 1 DP34303	30 mm – 40 mm	0 mm – 30 mm
Lot 4 DP706110	20 mm – 30 mm	0 mm – 30 mm
Lot 3 DP706110	0 mm – 20 mm	0 mm – 15 mm

Title:

Proposed Development Details

Figure: **4-1**

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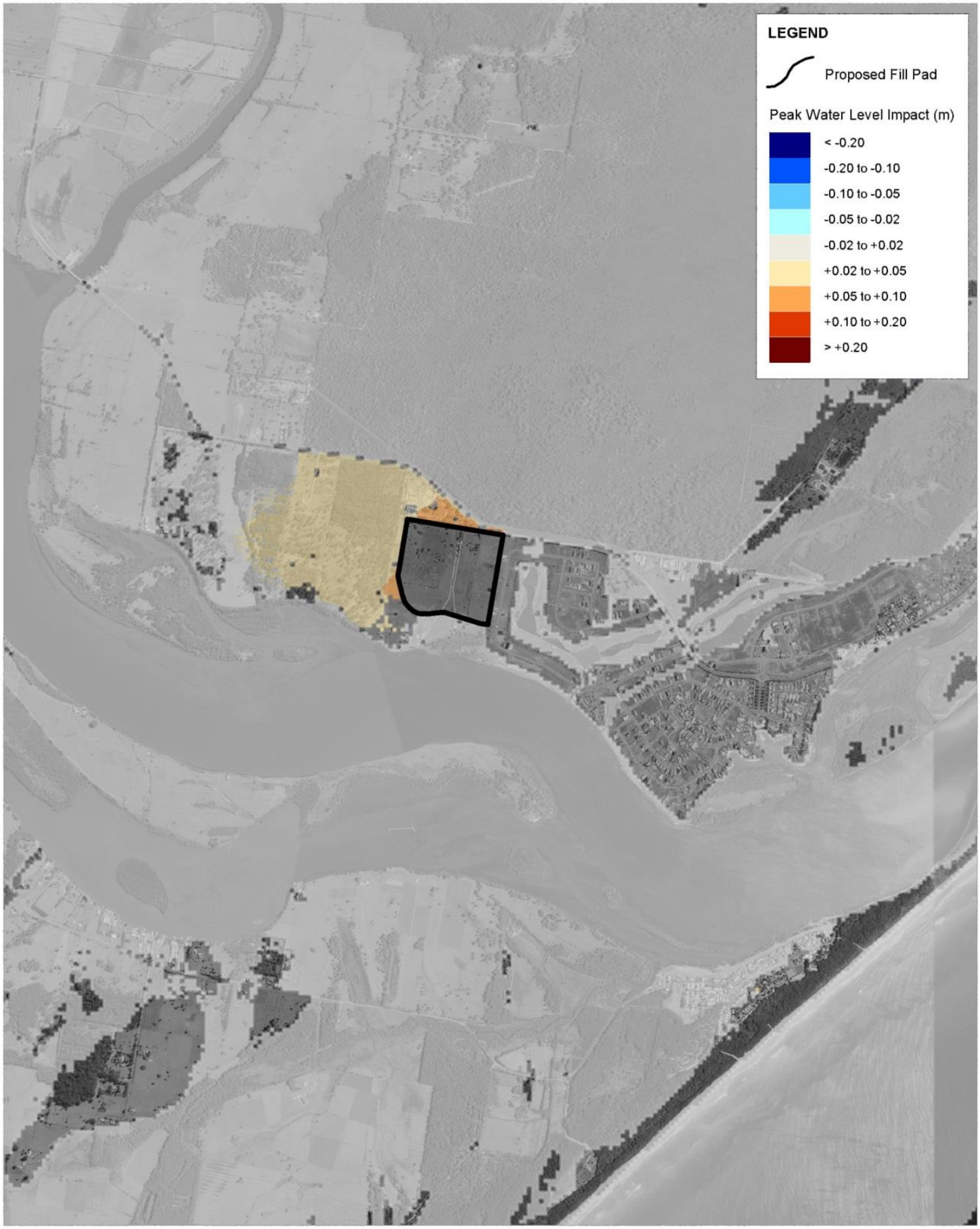

Title:

0.2% AEP Modelled Peak Flood Level Impacts

Figure: **4-2**

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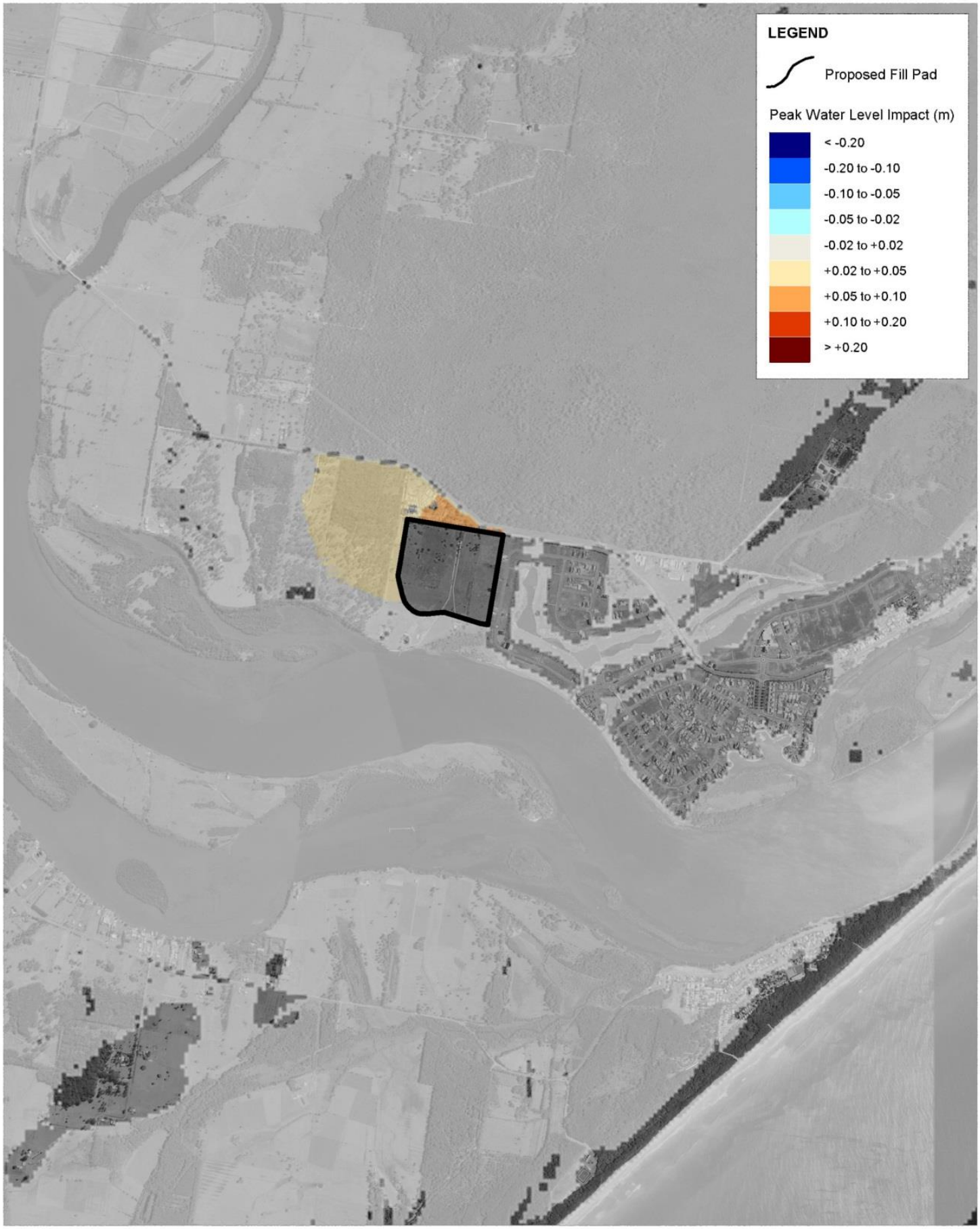

Title:

1% AEP 2100 Modelled Peak Flood Level Impacts

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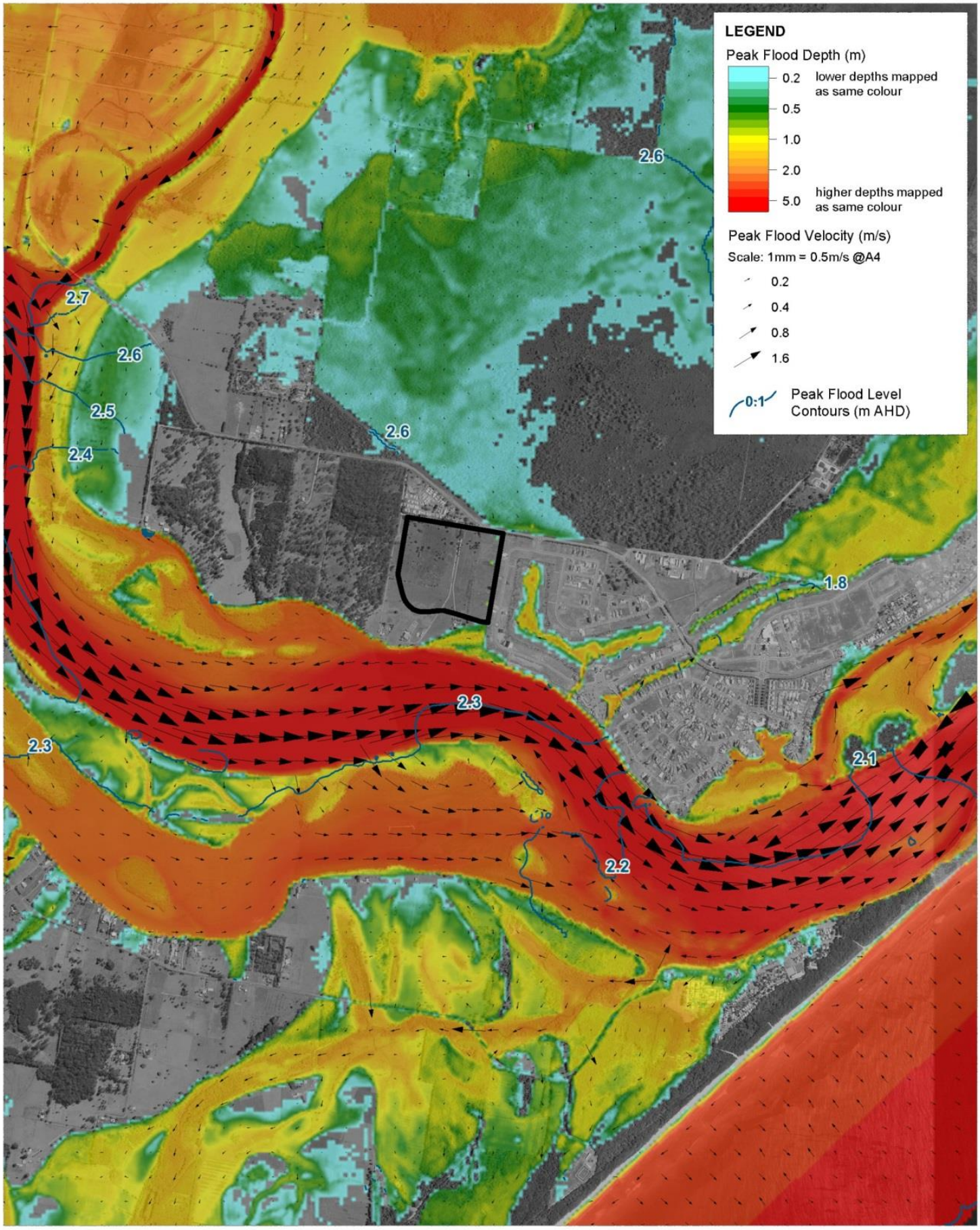
5 Conclusion

This Flood Impact Assessment has included the refinement of an existing TUFLOW hydraulic model developed by BMT WBM for the Manning River Flood Study (2016). The refined model has then been used to define existing flood conditions for a range of flood magnitudes and form a baseline with which to assess potential flood impacts associated with the proposed development.

The modelled flood impacts associated with the proposed works are essentially negligible for events up to and including the 0.5% AEP, with some minor flood level impacts modelled at the 0.2% AEP and 1% AEP climate change events.

The existing design flood conditions for a range of flood event magnitudes are presented in Appendix A through a flood mapping series, incorporating peak flood extents, levels, depth and velocity distribution. The impacts of the proposed development were presented in terms of relative change from the existing peak flood level, as presented in Figure 4-2 and Figure 4-3 and summarised in Table 4-1. The impacts are relatively minor, given that they are limited to flood event magnitudes above the 0.5% AEP, are less than 100 mm and are relatively localised in extent.

Appendix A Existing Design Flood Mapping



Title:

1% AEP Modelled Peak Flood Conditions

Figure: **A-1**

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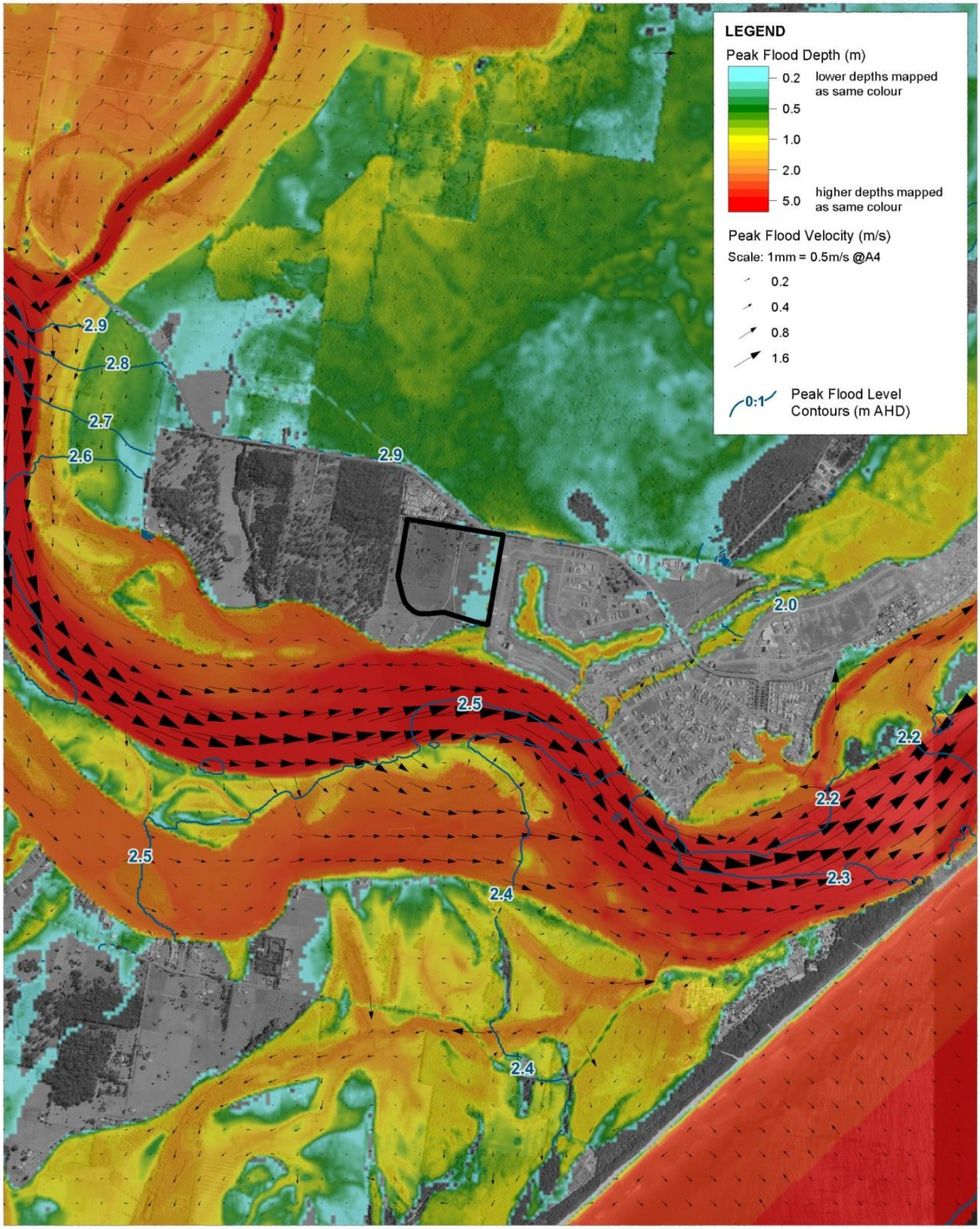

Title:

0.5% AEP Modelled Peak Flood Conditions

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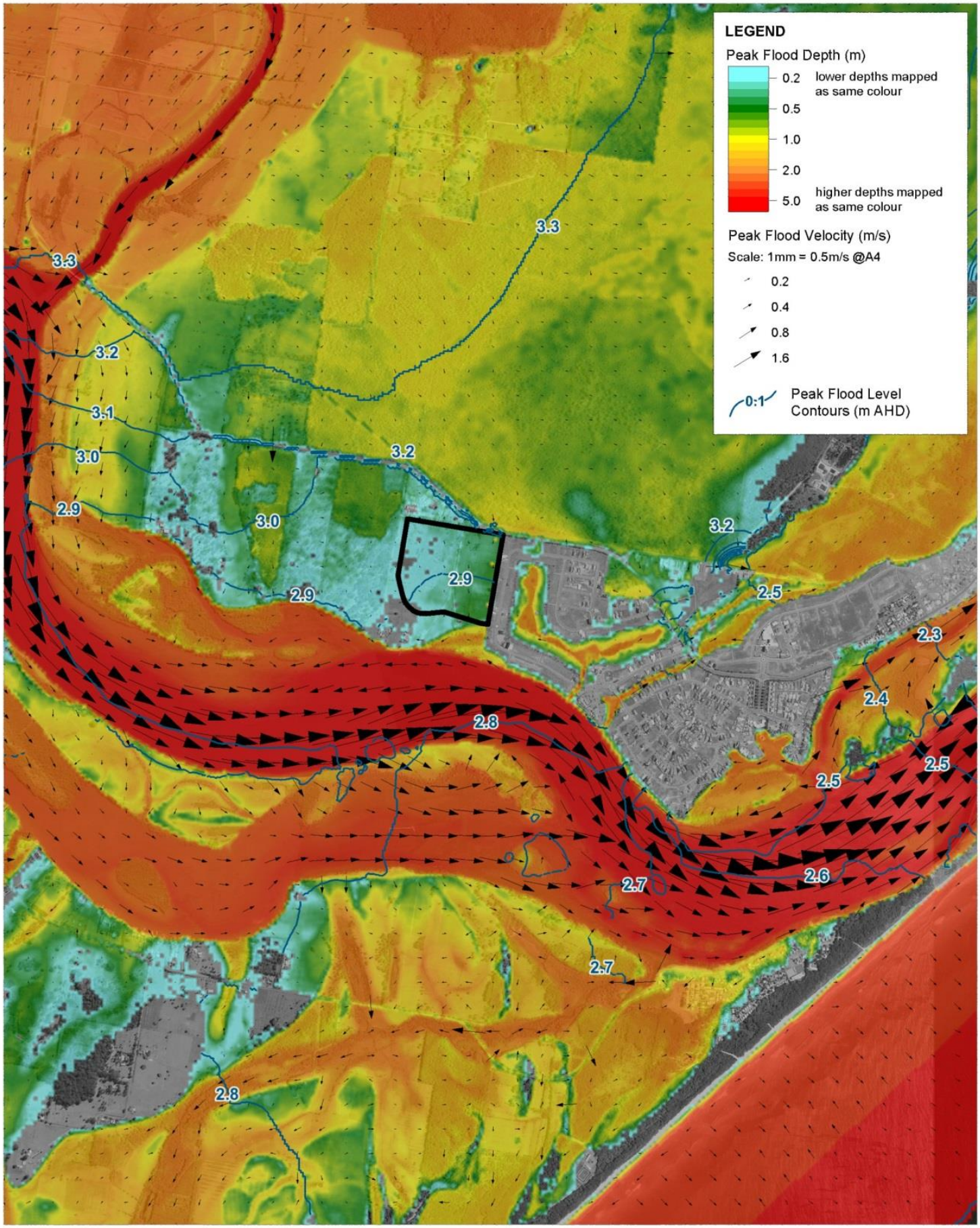

Title:

0.2% AEP Modelled Peak Flood Conditions

Figure: **A-3**

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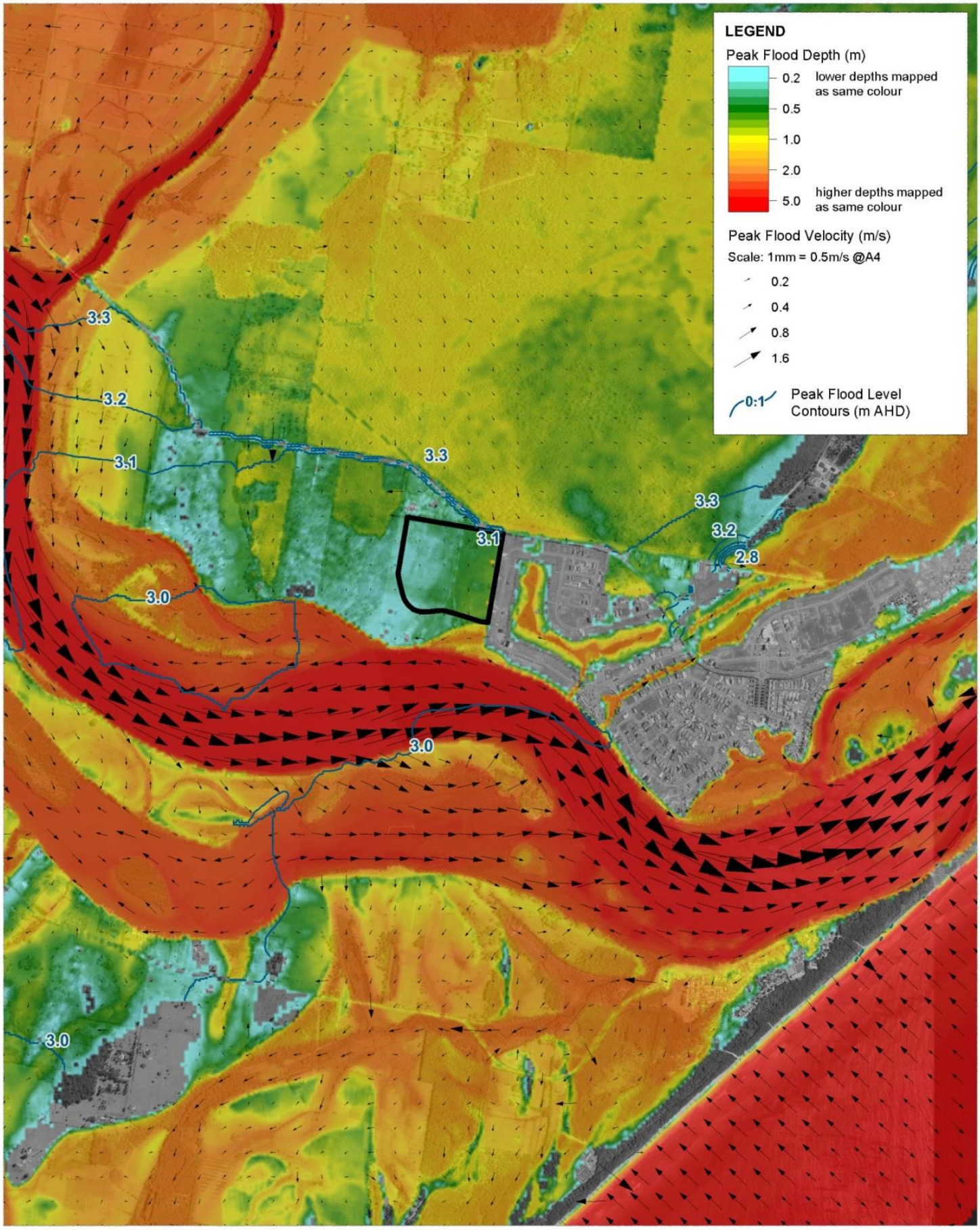

Title:

1% AEP 2100 Modelled Peak Flood Conditions

Figure: **A-4**

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