Transport for NSW

M1 Pacific Motorway extension to Raymond Terrace

Submissions Report - Appendix G

June 2022

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M1 Pacific Motorway extension to Raymond Terrace

Appendix G

Supplementary report - Additional flood assessment for Hunter and Williams rivers

June 2022

Executive summary

Transport for New South Wales (Transport) proposes to construct the M1 Pacific Motorway extension to Raymond Terrace (the project). Approval is sought under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* and Part 9, Division 1 of the *Environment Protection and Biodiversity Conservation Act 19*99.

In accordance with the Secretary's Environmental Assessment Requirements (SEARs), an environmental impact statement (EIS) was prepared by Transport in July 2021 (*M1 Pacific Motorway extension to Raymond Terrace Environmental Impact Statement* (Transport for NSW 2021)) to assess the potential impacts of the project. The EIS was exhibited by the Department of Planning, Industry and Environment (DPIE) for 28 days from 28 July 2021 to 24 August 2021.

The *M1 Pacific Motorway extension to Raymond Terrace Hydrology and Flooding Working Paper* (Jacobs 2021) was prepared in support of the EIS for the project. The purpose of the assessment was to assess potential hydrology and flooding impacts from the project operation and construction, and where required, identify mitigation measures. The assessment was prepared to address the SEARs issued by DPIE for the project.

Following exhibition of the EIS, receipt of submissions and further consultation with stakeholders a number of refinements have been made to the project. The main refinements that potentially influence flooding impacts include:

- Reducing the size, height and location of ancillary facilities to improve hydraulic performance in the flood plain
- Lowering the height of the access track for construction and operation of the viaduct to improve the hydraulic performance in the flood plain.

This supplementary flooding assessment report has been prepared to respond to respond to submissions received during the exhibition of the EIS. This assessment shoud be read in conjunction with the *M1 Pacific Motorway extension to Raymond Terrace Hydrology and Flooding Working Paper* (Jacobs 2021), and *Appendix F of the M1 Pacific Motorway extension to Raymond Terract Submissions Report.*

The operation impacts of the refinements have been assessed, and no additional environmental management measures have been identified as a result of these refinements.

For the Hunter River no properties were newly flooded above floor level, four properties were impacted above floor level and four properties were impacted below floor level. For the Williams River no properties were newly flooded above floor level, ten properties were impacted above floor level and seven properties were impacted below floor level.

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Glossary of terms and abbreviations

Term/ Acronym	Description
AEP	Annual Exceedence Probability
ARTC	Australian Rail Track Corporation
DPIE	The NSW Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
HPC	Heavily Parallelised Compute
GPU	Graphics Processing Unit
LGA	Local Government Area
LiDAR	Light Detection and Ranging
LoS	Level of Service
NEH	New England Highway
NSW	New South Wales
Transport	Transport for NSW

1 Introduction and background

1.1 The project

Transport for New South Wales (Transport) proposes to construct the M1 Pacific Motorway extension to Raymond Terrace (the project). The project would connect the existing M1 Pacific Motorway at Black Hill and the Pacific Highway at Raymond Terrace within the City of Newcastle and Port Stephens Council local government areas (LGAs). The project location is shown in **Figure 1-1**.

The project would include the following key features (see **Figure 1-2**):

- A 15 kilometre motorway comprised of a four lane divided road (two lanes in each direction)
- Motorway access from the existing road network via four new interchanges at:
  - Black Hill: connection to the M1 Pacific Motorway
  - Tarro: connection and upgrade (six lanes) to the New England Highway between John Renshaw Drive and the existing Tarro interchange at Anderson Drive
  - Tomago: connection to the Pacific Highway and Old Punt Road
  - Raymond Terrace: connection to the Pacific Highway.
- A 2.6 kilometre viaduct over the Hunter River flood plain including new bridge crossings over the Hunter River, the Main North Rail Line, and the New England Highway
- Bridge structures over local waterways at Tarro and Raymond Terrace, and an overpass for Masonite Road in Heatherbrae
- Connections and modifications to the adjoining local road network
- Traffic management facilities and features
- Roadside furniture including safety barriers, signage, fauna fencing and crossings and street lighting
- Adjustment of waterways, including Purgatory Creek at Tarro and a tributary of Viney Creek
- Environmental management measures including surface water quality control measures
- Adjustment, protection and/or relocation of existing utilities
- Walking and cycling considerations, allowing for existing and proposed cycleway route access
- Permanent and temporary property adjustments and property access refinements
- Construction activities, including the establishment and use of temporary ancillary facilities, temporary access tracks, haul roads, batching plants, temporary wharves, soil treatment and environmental controls.

A more detailed description of the project incorporating the refinements identified in **Section 1.2** is presented in Appendix A of the *M1 Pacific Motorway extension to Raymond Terrace Submissions Report* (Transport for NSW, 2022).

Figure 1-1 Regional context of the project

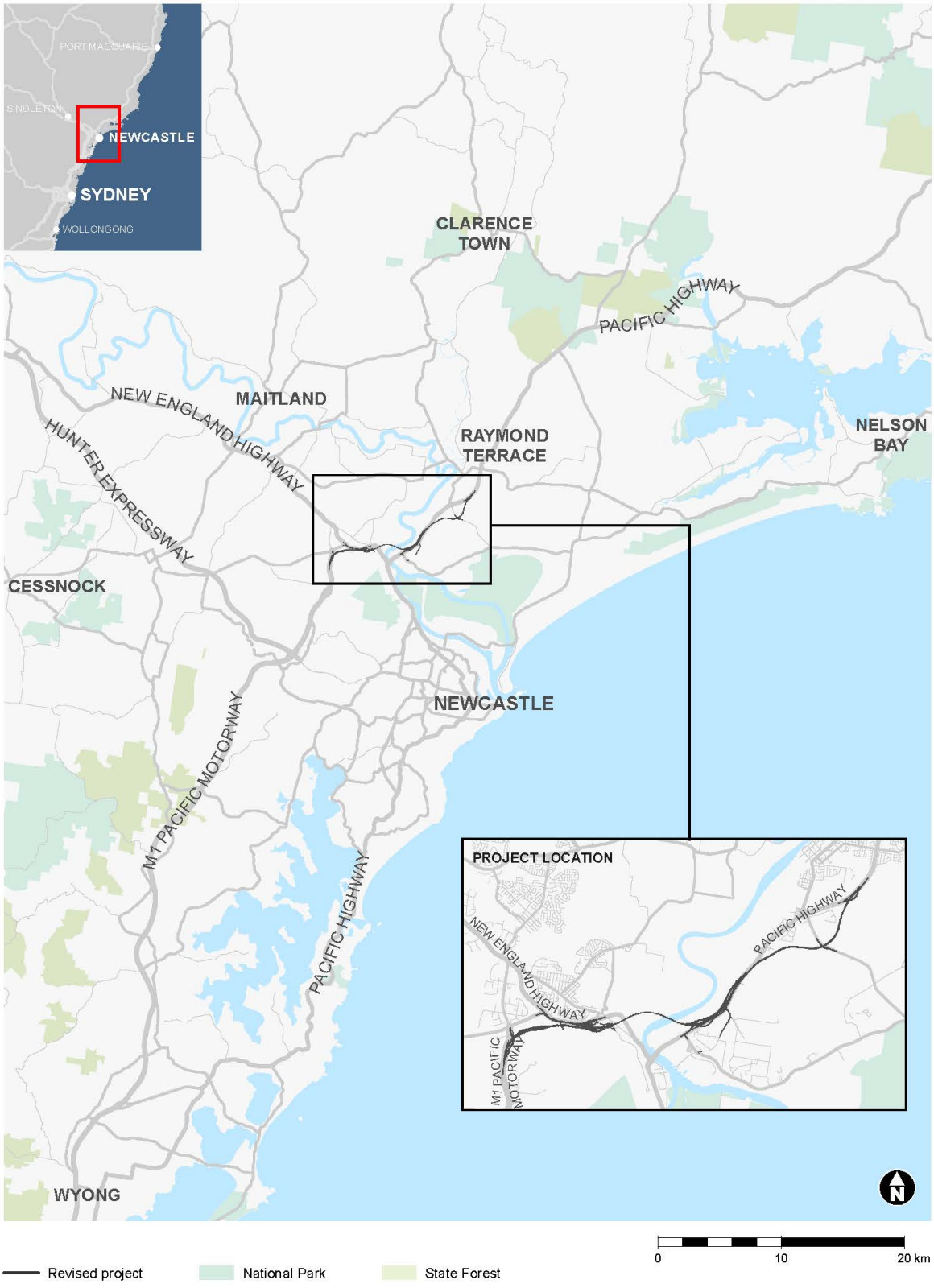

Figure 1-2 Project key features

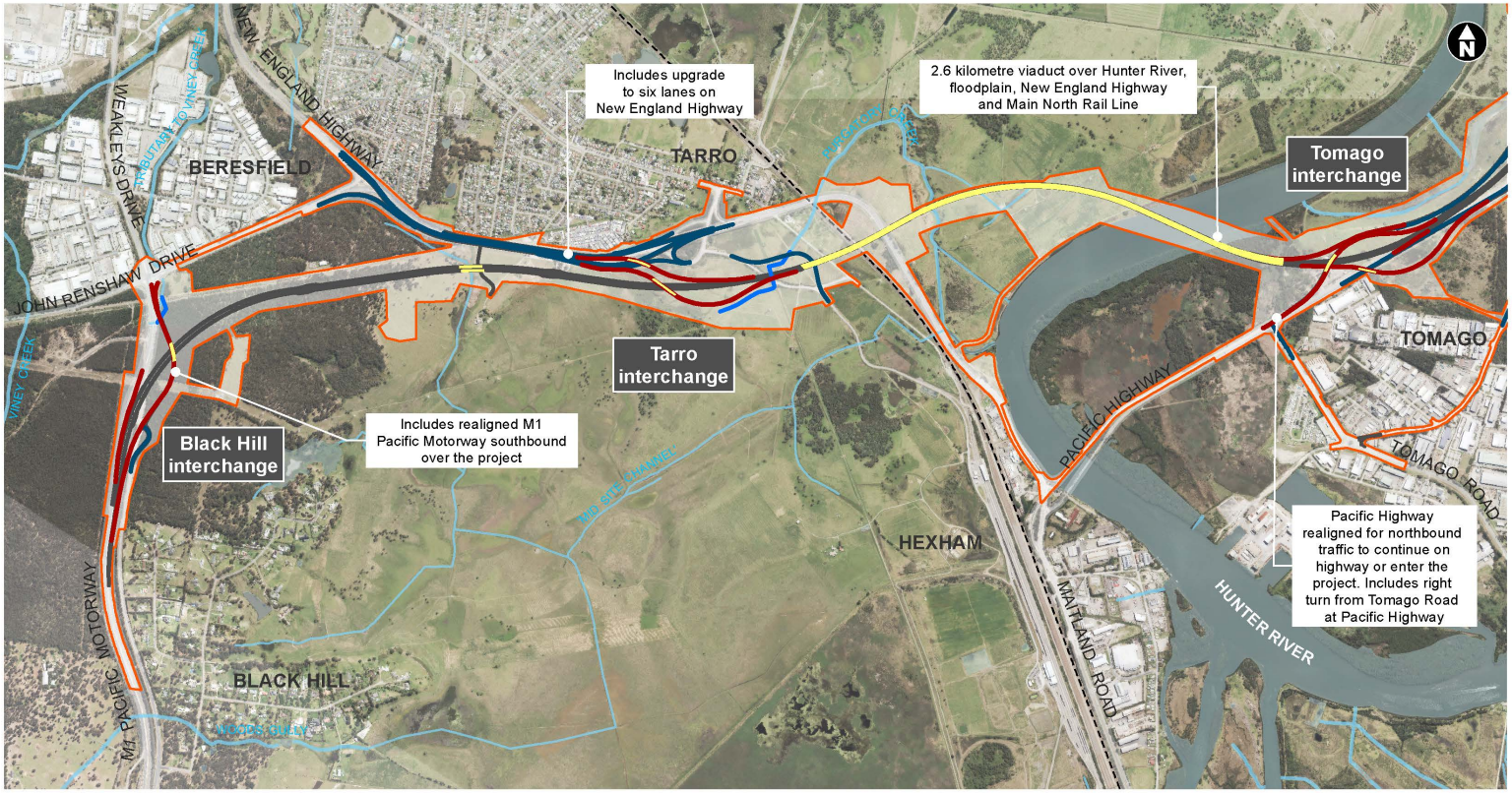

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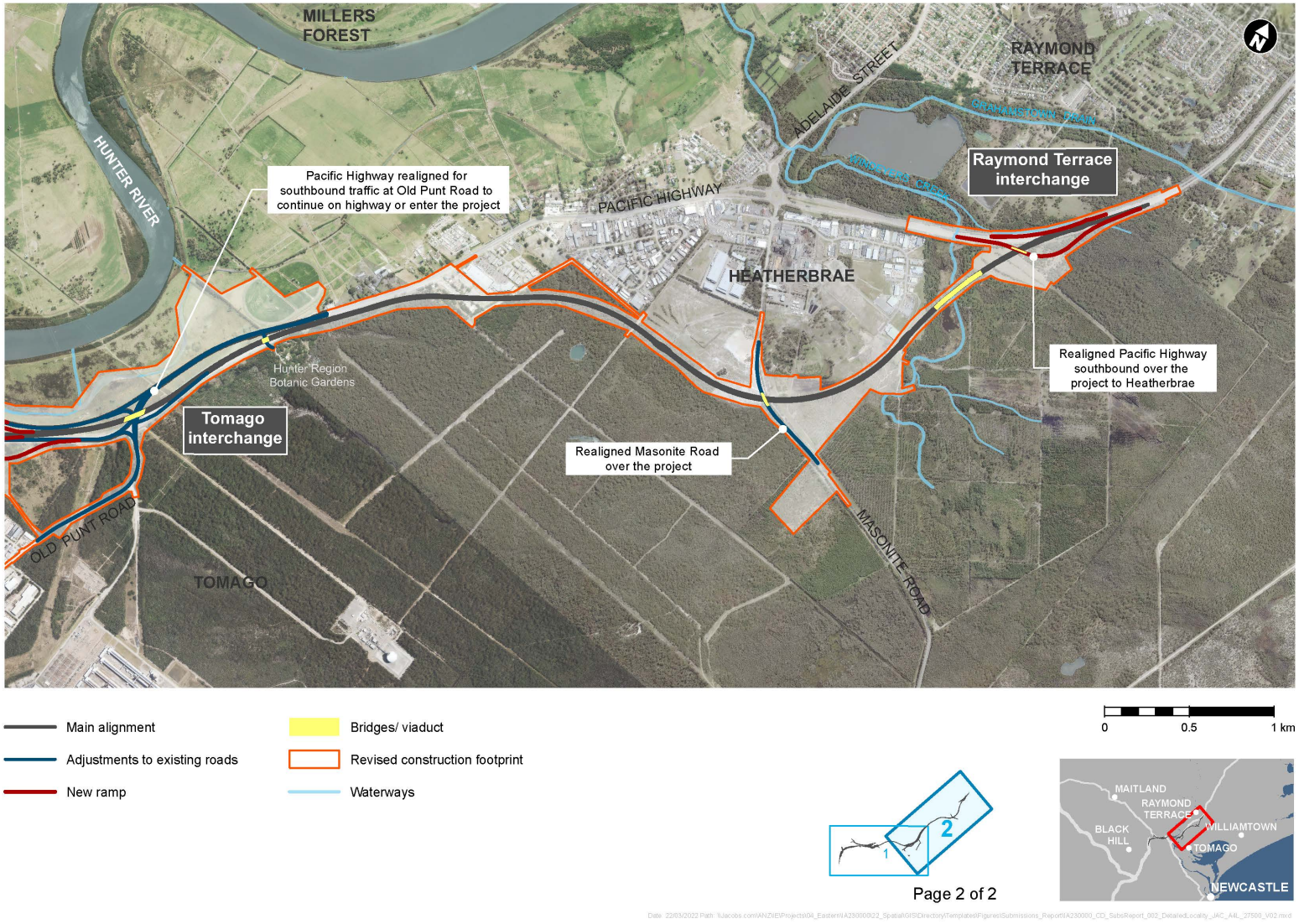
Figure 1-2 Project key features



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1.2 Project refinements

Transport has refined a number of aspects of the project as exhibited in the environmental impact statement (EIS). These refinements have arisen through the ongoing review of the concept design and construction methodology, identification of opportunities to reduce environmental impact, consultation with landowners and government agencies, and in response to issues raised during the EIS exhibition period. The project refinements are described below.

1.2.1 Design refinements

- Southbound M1 Pacific Motorway merge – a 200 metre extension of the merge lane for southbound traffic from the John Renshaw Drive/Weakleys Drive intersection to allow for improved capacity and safety
- Utilities strategy – key changes include grouping of utilities at Tarro and Tomago into utility corridors and extension of the construction footprint at Beresfield and Hexham to accommodate utility relocations
- Cycleway strategy – improvements to facilitate incorporation with the Richmond Vale Rail Trail and removal of the shared user path on the new Masonite Road bridge (bridge at Heatherbrae
- Drainage design at Heatherbrae – minor changes to basin locations and extension of drainage lines to minimise property and drainage impacts on adjacent properties
- Water quality basins – lining of temporary and permanent water quality basins which interface with ground water.

1.2.2 Construction refinements

- Ancillary facilities and site access – minor changes to the size, location and access arrangements of some ancillary facilities
- Earthworks management – identification of a borrow pit and sites for beneficial reuse of materials within the construction footprint.

1.2.3 Construction staging

- Staged project opening - the project would be delivered via two packages of work, the Southern (Black Hill to Tomago) and Northern (Heatherbrae bypass) works. The Northern section would likely have a shorter construction duration and could potentially be opened to traffic before the Southern section.

1.2.4 Project footprint refinements

- Consultation with landowners and the design and construction refinements to reduce property and biodiversity impacts have resulted in minor changes to the construction and operational project footprint.

1.3 Purpose of the document

This supplementary flooding assessment has been prepared to assess sections of the Hunter River and Williams River catchments that were outside of what was assessed in *M1 Pacific Motorway extension to Raymond Terrace Hydrology and Hydrology and Flooding Working Paper* (Transport for NSW, 2021a).

During the exhibition of the EIS several submissions were made in relation to flooding matters. These submissions have been addressed in the *M1 Pacific Motorway extension to Raymond Terrace Submissions Report (*Transport for NSW, 2022).

This supplementary flood assessment for Hunter and Williams rivers has been prepared to also assess the potential impacts from project refinements identified in **Section 1.2.** Where further clarification or additional information is required to provide a detailed response to the submission, these matters have been included in this supplementary report and an overview is presented in **Chapter 2**.The assessment of potential flooding impacts resulting from these project refinements is presented in **Chapter 3** (assessment of potential operational impacts).

This supplementary flooding assessment has been prepared to assess the potential impacts of the project refinements identified in **Section 1.2**. The proposed environmental management measures identified as part of this report are presented in **Chapter 4**.

This supplementary assessment only includes information that has changed since the submission of the EIS and should be read in conjunction with the the *M1 Pacific Motorway extension to Raymond Terrace Flooding Working Paper* (Appendix J) included in the EIS.

2 Clarifications and additional information

2.1 Clarifications

This section identifies minor errors, discrepancies and general clarifications identified either through further review by Transport or agency sought clarification prior to the receipt of formal submissions.

Clarification was sought by the Department of Planning, Industry and Environment (DPIE) which has been addressed in this supplementary report is due to the presence of afflux at the limits of the Jacobs model (Appendix J of the EIS) being greater than 10mm during the 1% AEP. These additional areas on both the Hunter and Williams rivers form the basis of this report.

2.2 Methodology

The method described in this section refers only to operational impacts only for the Hunter River upstream of Green Rocks and the Williams River to Seaham Weir. Construction impacts have not been considered as part of this study. Only the 1% AEP event is considered as this is used for floor level and planning purposes.

2.2.1 Hunter River Extension

The M1 to Raymond Terrace hydraulic model (Jacobs, 2022) extends from the mouth of the Hunter River to Green Rocks (refer to Figure 2-1). The model shows impacts produced by the project in a 1% AEP event. Impacts are defined as the difference in flood level between the project case and the existing case. The impacts stretch to the upstream boundary of the model. The impacts at the upstream boundary are minor compared to the flood depths and vary from 16mm to 5mm in the 1% AEP event.

The aim of this study was to develop a methodology to map the extent of impacts upstream of the M1 to Raymond Terrace model down to 10mm. This requires the extension of the model past the current M1 to Raymond Terrace model into the Green Rocks to Branxton Model. The Green Rocks to Branxton Model was developed by WMAwater (2011) for Maitland City Council as part of the floodplain risk management process and has its downstream boundary at the upstream end of the M1 to Raymond Terrace hydraulic model (refer to Figure 2-1).

The Green Rocks to Branxton Model uses an older version of TUFLOW. The model was updated to TUFLOW HPC that runs on GPU cards. This allows for faster run times. Significant drawdown of flood levels due to the terrain occur at the boundaries of the Green Rocks to Branxton model.

Originally a rating relationship was developed based on the downstream model but the application of this in both TUFLOW classic (2012 and 2022) and TUFLOW HPC 2022 produced circular flow patterns at the boundary. To over come this and to produce a conservative answer the rating relationship was used to produce a complimentary height versus time boundary. A height versus time boundary was applied as the downstream boundary of the Green Rocks to Branxton Model. The height versus time boundary was increased by 16mm to model the impact of the project.

2.2.2 Gap between the Hunter Models

A gap of 300 metres exist between the M1 to Raymond Terrace Model and the Green Rocks to Branxton Model on the main Hunter River flowpath (refer to Figure 2-1). On the southern overflow path the two models overlap. A water level difference and a natural constriction in the floodplain exists between the two. The 1% AEP flood surface was assumed to be linear between the two models. A conservative 16mm was added to this level.

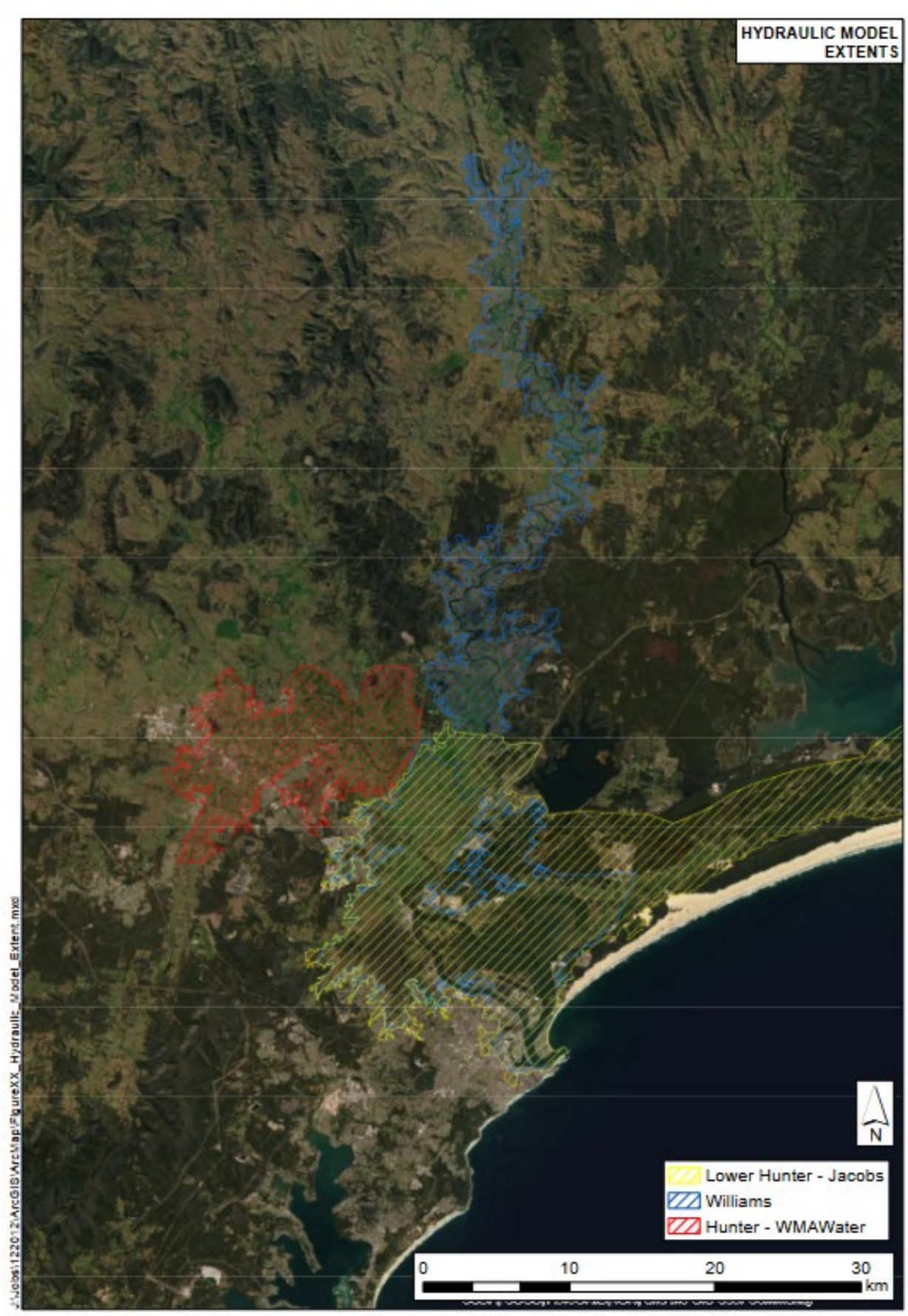

Figure 2–1 Hydraulic model extent

2.2.3 Williams River Extension

The Williams River TUFLOW model was sourced from Port Stephens Council (refer to Figure 2-1 for the model extent) and the 1% AEP event grid was extracted.

On the Williams River the Seaham Weir provides a hydraulic barrier to to the impact of the propagating upstream. A simplified conservative approach was applied to determine the extent of the impact of the project in the Williams River. The 1% AEP flood level was increased by 15mm downstream of Seaham Weir and upstream of the M1 to Raymond Terrace Model. The extent of flooding is shown on Figure 2-3.

2.2.4 Impact Assessment Methodology

Habitable building outline polygons were supplied by Transport for the Hunter River upstream of the Jacobs modele extent. Habitable buildings are defined by the NSW Floodplain Development Manual (2005) as:

- **in a residential situation:** a living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom.

- **in an industrial or commercial situation:** an area used for offices or to store valuable possessions susceptible to flood damage in the event of a flood.

Theses were sourced from government spacial building datasets and filtered to be dwellings only. Jacobs sampled ground levels from the LiDAR and adjusted the values by 2.8m adjustment for two storey dwellings and 5.2m for 3 storey dwellings.

For the Williams River floor level survey of buildings was supplied by Port Stephens Council and filtered to only include properties downstream of Seaham Weir.

The 1% AEP with project grids were sampled by the building outlines. The results were analysed to determine whether afflux would cause below-floor afflux, above-floor afflux or new above floor-afflux.

3 Assessment of potential operational impacts

3.1 Hunter river extension

3.1.1 Impacts

Figure 3-1 depicts the extent of impacts within the Green Rocks to Branxton Model. Impacts greater than 10mm stretch a short distance upstream of the downstream boundary (one kilometre) due to the steep slope of the flood surface.

3.1.2 Assessment

For the 1% AEP flood event 310 properties were assessed within the Green Rocks to Branxton Model. Table 3-1 summarises the outcomes of the impact assessment. No properties were newly flooded above floor level. Four properties were impacted above floor level and four properties were impacted below floor level.

A small number of properties are between the Green Rocks to Branxton Model and M1 to Raymond Terrace model. All floor levels of these dwellings are above the flood level at the downstream end of the Green Rocks to Branxton Model.

Table 3-1 Green Rocks to Branxton Model Impacted Properties

	Number of Properties
New Above floor Aflfux	0
Above Floor Afflux	4
Below Floor Afflux	4
Total Properties Assessed	310

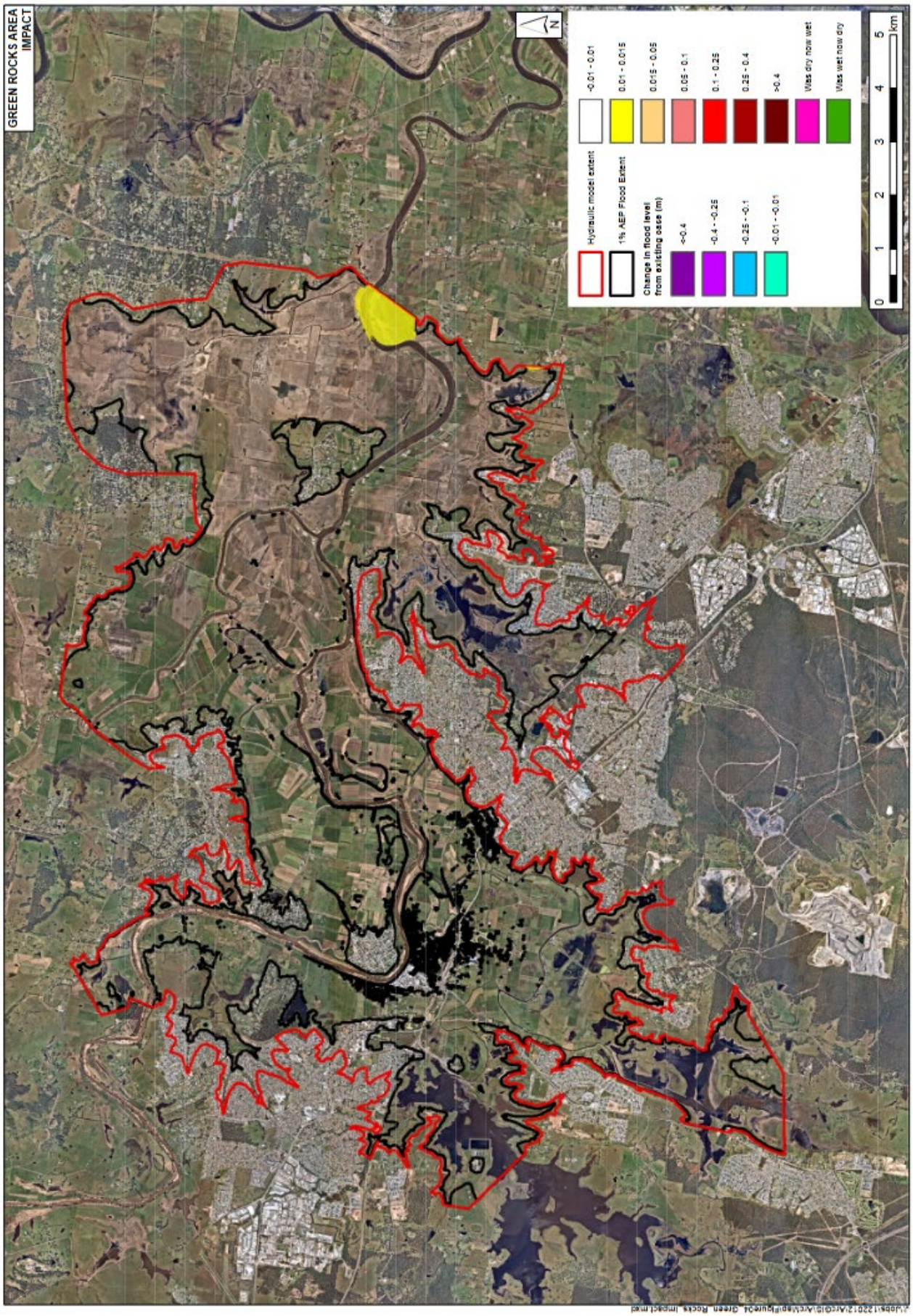

Figure 3-1 Green Rocks to Branxton Model -1% AEP Impacts

3.2 Williams river extension

3.2.1 Impacts

Figure 3-2 depicts the impacts on the Williams River downstream of Seaham Weir.

3.2.2 Assessment

For the 1% AEP flood event 194 properties were assessed within the Williams River Model downstream of Seaham Weir. Table 3-2 summarises the outcomes of the impact assessment. No properties were newly flooded above floor level. No properties were newly flooded above floor level. Ten properties were impacted above floor level and seven properties were impacted below floor level.

Table 3-2 Williams River Impacted Properties

	Number of Properties
New Above floor Aflfux	0
Above Floor Afflux	10
Below Floor Afflux	7
Total Properties Assessed	194

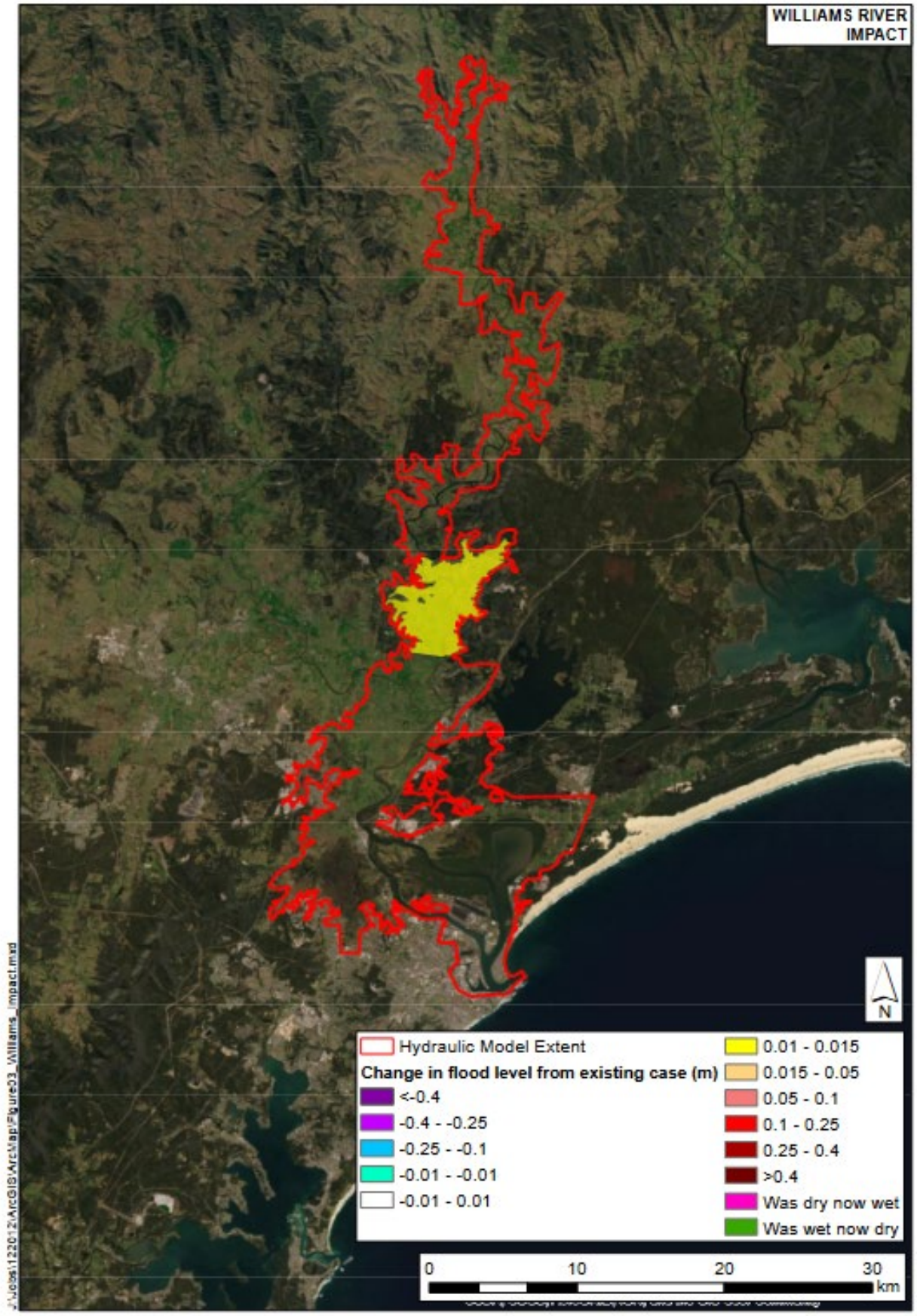

Figure 3-2 Williams River - 1% AEP Impacts

4 Revised environmental management measures

The environmental impact statement for the project identified a range of environmental outcomes and management measures that would be required to avoid or reduce the environmental impacts.

The project refinements assessed in this report do not require any revisions to the environmental management measures in Chapter 6 of the *M1 Pacific Motorway extension to Raymond Terrace Traffic and Transport Working Paper* (Jacobs, 2021) were identified.

5 Conclusion

The M1 to Raymond Terrace hydraulic model shows impacts produced by the project in a 1% AEP event. The impacts stretch to the upstream boundary of the model. The impacts at the upstream boundary are minor compared to the flood depths and vary from 16mm to 5mm in the 1% AEP event.

The aim of this study was to develop a methodology to map the extent of impacts upstream of the M1 to Raymond Terrace model extent. This was undertaken using the Green Rocks to Branxton and the Williams River models. Overall the results show no new above floor flooding.

6 References

BMT WBM, 2009, Williams River Flood Study, Port Stephens Council

Jacobs, 2022, M1 Pacific Motorway extension to Raymond Terrace, Supplementary report – Hydrology and Flooding, Transport for NSW

NSW Government, Floodplain Development Manual: The management of flood liable land, April 2005

WMAwater, 2011, Hunter River: Branxton To Green Rocks Flood Study, Maitland City Council

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