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ITEM 1 WOLLONGONG CITY FLOOD STUDY (2019)

The Wollongong City Flood Study (2019) has been finalised following public exhibition between 20 May 2019 to18 June 2019. It is recommended Council adopt the Wollongong City Flood Study (2019) which will inform land use planning and planning certificates.

The study improves the accuracy and reliability of flood levels and flood behaviour in the Wollongong City Catchment. The reports and flood models for the Wollongong City Flood Study (2019) will be placed on the NSW Flood data portal so that they can be publicly accessed. This will lead to a greater understanding of flood behaviour and risk and wiser decision making.

RECOMMENDATION

That the Wollongong Flood Study (2019) be adopted.

REPORT AUTHORISATIONS

Report of: Mike Dowd, Manager Infrastructure Strategy + Planning
Authorised by: Andrew Carfield, Director Infrastructure + Works

ATTACHMENTS

1 Wollongong City Flood Study (2019) - Executive summary
2 Wollongong City Flood Study Engagement Report
3 Council Response to Community Feedback

BACKGROUND

The NSW Government's Floodplain Development Manual provides a framework to ensure the sustainable use of floodplain environments and incorporates the NSW Flood Prone Policy. Under the Policy, the management of flood liable land remains the responsibility of Local Government with State Government subsidising flood mitigation works to alleviate existing problems and providing specialist technical advice to assist Councils in performing their floodplain management responsibilities.

The Policy provides for technical and financial support by the State Government through five stages -

1 Flood Study –Determines the nature and extent of flooding.

2 Floodplain Risk Management Study – Evaluates risks and management options for the floodplain in respect of both existing and proposed development.

3 Floodplain Risk Management Plan – Involves formal adoption by Council of a plan of management for the floodplain.

4 Implementation of the Plan – voluntary house purchase, flood readiness and response plans, construction of flood mitigation works to protect existing development and use of planning controls (LEP, DCP) to ensure new development is compatible with the flood hazard.

5 Review – reviews are recommended on average every 5 years and are also generally recommended after significant flood events, policy changes, or land use changes and where impediments to flood management plan implementation exist that warrant a review.

Wollongong City Flood Study

In 2017 Jacobs Pty Ltd was commissioned by Wollongong City Council (WCC) to review the Wollongong City Flood Study (2013) to take into consideration Council's updated Conduit Blockage Policy (2016). The review incorporates new survey data, more detailed modelling techniques, the updated blockage factors, impact of new development within the catchment, the lowering of the Gurungaty Causeway and increased vegetation in the Gurungaty waterway.

The results of the study revised the design flood levels to be generally 100mm-200mm higher than the 2013 study in the lower catchment. There are also locations with minor decreases in flood levels, mainly as a result of the less conservative blockage policy, mainly in the upper parts of the catchment. Due to the nature of the Wollongong City floodplain, the flood extents are mostly unchanged.

PROPOSAL

The Wollongong City Flood Study (2019) be adopted. After adoption, the following actions will be undertaken -

- Update the flood planning levels – Planning and Environment.
- Update of the relevant Section 10.7 planning certificate – Planning and Environment.
- Provide Flood level information advice in accordance with the new study results – Infrastructure + Works.

CONSULTATION AND COMMUNICATION

The final draft report went on public exhibition from 20 May 2019 to 18 June 2019. A mid-week drop in session at the Wollongong Art Gallery on Thursday 30 May from 4pm – 6pm was attended by 25 community members. A weekend drop in session was held at JJ Kelly Park on Saturday 1 June from 10am to 12pm and was attended by 37 community members.

A newsletter to over 7500 residents and property owners in flood affected areas (all properties within the extent of the probable maximum flood) was mailed out to advise of the public exhibition process and seek feedback on the document.

A notification of the public exhibition was also placed in the local newspaper. Hard copies of the Flood Study were placed in the Library and PDFs were available through Council's "Have Your Say" page. 148 people viewed the Website's project page. 88 people downloaded the documents from the Website. There were a total of 7 submissions throughout the 6 weeks exhibition period.

A media briefing took place on 21st May 2019 and a presentation was delivered at the neighbourhood forum by Manager Infrastructure Strategy and Planning.

Comments from the submissions and at drop in sessions related to -

- General support of Council's flood risk management work for the catchment
- Concerns or misunderstandings about new development perceived to be causing sewer overflow, flooding and increased run-off
- Concerns or misunderstandings as to why some areas had been mapped as being flood affected, even though some people hadn't witnessed flooding in these areas
- Interest in finding out what the flood risk is for property they own or live in, or if it had changed since the last Study
- Requests for improvements or maintenance for stormwater drainage
- Interest in floodplain risk management and mitigation works in other catchments
- Concern about the potential impacts of the updated modelling on flood insurance premiums
- Interpreting the Study as having contradictory information to what was stated in the Frequently Asked Questions and at information sessions

Most comments do not have any direct relation with the draft flood study report and can be addressed through on-going education on floodplain management. The final report was revised to consider and address potential contradictory information between the FAQ and the report.

The outcomes of the public exhibition were reported to the Central Area Floodplain Risk Management Committee on 26 June 2019 who recommended that council adopt the final report.

PLANNING AND POLICY IMPACT

This report contributes to the delivery of Our Wollongong 2028 goal "We value and protect our environment". It specifically delivers on the following:

Community Strategic Plan	Delivery Program 2018-2021	Operational Plan 2018-19
Strategy	3 Year Action	Operational Plan Actions
1.1.3 The potential impacts of natural disasters, such as those related to flood and landslips are managed and risks are reduced to protect life, property and the environment	1.1.3.2 Establish effective urban stormwater and floodplain management programs	Develop and implement Floodplain Risk Management Plans

FINANCIAL IMPLICATIONS

The Wollongong City Flood Study (2019) has cost $72,336.

CONCLUSION

The Wollongong City Flood Study (2019) was prepared with the cooperation, assistance and support of many stakeholders, including community members and State government representatives.

The study improves the accuracy and reliability of flood levels and flood behaviour in the Wollongong City Catchment. The reports and flood models for the Wollongong City Flood Study (2019) will be placed on the NSW Flood data portal so that they can be publicly accessed. This will lead to a greater understanding of flood behaviour and risk and wiser decision making.

Executive Summary

Introduction

A review of the Wollongong City Flood study has been conducted on behalf of Wollongong City Council ("Council") for the Wollongong City study area. The purpose of this review was to define the flood behaviour within the study area incorporating Wollongong City Council's revised culvert blockage policy, recent urban developments and changes to the channel characteristics of the Gurungaty Waterway. The flood behaviour at Swan Street and the southern parts of Church Street, Evans Street, Kembla Street and Corrimal Street have been investigated in detail. An assessment of the impact of future flood risks associated with sea level rise was also undertaken.

Study area

The Wollongong City study area is an urbanised catchment which includes the suburbs of Wollongong (south of Crown Street), Coniston, and northern Port Kembla. The urban areas consist of a mixture of low to medium density residential housing to higher density residential and commercial development within Wollongong. The south of the study area is dominated by the BlueScope steel works site occupies a large portion of land at Port Kembla. Large open space land use includes Wollongong Golf Club and JJ Kelly Park.

The study area is drained by a combination of pit and pipe networks, overland flow paths and open channel reaches. Most of the study area drains towards the Gurungaty Waterway which discharges into Tom Thumbs Lagoon and ultimately into the Tasman Sea. Overland flooding is the dominant flood mechanism in areas west of the railway line. Overland flow occurs both along roadways as well as along remnant natural flow paths through the back of private properties. East of the railway line, the relatively flat topography, low elevations and low channel gradients results in significant ponding of flood water. Flooding in this area can also occur via backwater from tidal action within Tom Thumbs Lagoon, and flooding from storm water can be exacerbated by coincident high tides.

Data collection and review

A range of data was obtained by Jacobs, their sub-contractors or provided by Council and other agencies. The data includes reports of studies that have been undertaken in the area; spatial data including aerial photographs and surveyed cross sections and other GIS layers; recorded rainfall data, wet weather overflow data, tide data; and existing hydraulic and hydrological models of the study area. Additional topographic survey was collected at selected cross section locations along the Gurungaty Waterway and at recent urban developments. The features surveyed were selected based on the review of available data and gaps analysis.

Community consultation

Community consultation undertaken for the study included an announcement of the commencement of the project on Councils website, a community newsletter and questionnaire mailed out to the community and public exhibition and consultation of this review report. A total of 320 responses were received to the questionnaire which represents a 5.7% response rate. Based on the responses, 19% of respondents experienced flooding at their property, while approximately 30% experienced flooding on their streets. Feedback from the consultation provided valuable information for the validation of the flood models for flood events in June 2016 and March 2017.

Flood model

The TUFLOW hydraulic model and WBNM hydrological models developed as part of the 2013 Flood Study have formed the basis for this review. The flood models were developed using the latest available technologies and catchment data available in 2013. A review of the hydraulic model developed as part of the 2013 Flood Study was undertaken to check that the model schematisation and model parameters have been based on industry standards and best practice. The hydraulic model review identified several areas for improvement which were incorporated into an updated hydraulic model.

The updated hydraulic model was validated using data from two recent flood events, namely June 2016 and March 2017. The validation process involved simulating the historic events in the flood model and comparing the hydraulic model results to observed flood data provided by the community. There was generally a good correlation between the observed flood depths and the modelled flood depths for both flood events. Flood depth data was limited to Swan Street and adjoining streets and anecdotal evidence of flooding, for example reference to flooding on a street or at a property, was used to validate the model results elsewhere in the study area. The anecdotal evidence of flooding also correlated well with the model results for both flood events.

Hydraulic model scenarios

A total of three scenarios were assessed to determine the impact on design flood behaviour as a result of the changes in policy, catchment conditions and improvements identified in the hydraulic model review:

- Scenario ID 1. Design flood events for 2013 catchment conditions with Councils revised blockage policy;
- Scenario ID 2. Design flood events for current catchment conditions with Councils revised blockage policy; and
- Scenario ID 3. Climate change (sea level rise and increases in rainfall intensity) analysis.

Scenario ID 1 focused on understanding the influence of Council's revised blockage policy on the design flood information presented in the 2013 Flood Study. The hydraulic structure data of the hydraulic model developed as part of the 2013 Flood Study was updated to reflect the "Design" blockage factors and "Risk Management" blockage factors detailed in the Review of Conduit Blockage Policy (WMAwater, 2016). The results from Scenario ID 1 were compared to the 2013 Flood Study results for the 1% annual exceedance probability (AEP) and probable maximum flood (PMF) design flood events to determine the relative impacts of the changes in the blockage policy on flood levels and flows in the study area. The comparison indicated a reduction in flood levels along a number of the waterways for both the "Design" and "Risk Management" blockage factors. The degree of reductions in flood levels in the 1% AEP event in the range of 0.01m to 0.8m. The reductions in flood levels are expected as the revised blockage policy generally results in a reduced blockage potential at the structures across the watercourses when compared to the original conduit blockage policy adopted in the 2013 Flood Study.

Scenario ID 2 involved updating the Scenario ID1 hydraulic model to incorporate recommendations identified in the hydraulic model review and information gathered during the data collection. This scenario represents catchment conditions at the commencement of this project (i.e. May 2017). An assessment of the impact of these updates was undertaken by comparing the scenario ID 2 results to the Scenario ID 1 results for the 1% AEP and PMF design flood events. The results of this comparison showed changes in flood behaviour across most of study area. Flood levels generally decreased towards the southern extent of the study area because of updates to the downstream model boundary and the lowering of the Gurungaty Causeway. Across the remainder of the study area, flood levels generally increased, with increases in flood levels typically in the range of 0.1m to 0.2m in the 1% AEP event. The model updates at the Gurungaty Waterway had the largest impact on the area impacted by flood level increases, with flood impacts extending from JJ Kelly Park to the Wollongong central business district (CBD). The changes at the Gurungaty Waterway included enabling a deactivated model layer representing the mangroves in the hydraulic model, increasing the Manning's n value used to represent the mangroves, updating the extent of the mangroves and other dense vegetation along the Gurungaty Waterway, reducing the cross-sectional area of the Gurungaty Waterway based on survey data captured in 2017 and changes to the representation of the footbridge at Greenhouse Park. The blockages in the pit and pipe network were updated in accordance with the Wollongong Development Control Plan (DCP) 2009 (Chapter E14). The changes to the approach to modelling the pit and pipe drainage network and the percentage blockage applied to this network also had a large impact on flooding, particularly in the upstream catchment areas which are dominated by overland flow mechanisms.

A separate comparison between the "Design" and "Risk Management" blockage factors results shows that there are generally negligible differences in flood behaviour between the two blockage factors.

Scenario ID 2 was adopted for preparing design flood event data. Design flood events including the 20%, 10%, 5%, 2% and 1% AEP and PMF events have been analysed. Flood mapping of depth, flood level, and velocity has been undertaken for all the design event AEPs. Peak flood depth, level and velocity maps for the 1% AEP and PMF events with "Risk Management" blockage factors are presented in Figures ES1 to ES11.

Scenario ID 3 involved the analysis of the impacts of sea level rise and increase in rainfall intensity on flood levels within the study area. The analysis involved an assessment of a 0.4m and 0.9m rise in sea levels in accordance with the Flood Risk Management Guide: Incorporating sea level rise benchmarks in flood risk assessments (NSW State Government, 2009). A 20% increase in rainfall intensity was used to assess the impacts of potential increases in extreme rainfall associated with climate change. The combined impacts of increases in seal level rise and increases in rainfall intensity was also assessed. The assessment was undertaken for the 1% AEP and PMF events and the results compared to scenario ID 2.

The model results for the 1% AEP event indicate that a 0.4m sea level rise scenario results in flood level increases in the range of 0.01m to 0.13m primarily along the Gurungaty Waterway and Eastern Branch. Flood level increases extend across an area north of JJ Kelly Park to Wollongong CBD including Swan Street, Beach Street, Evan Street, Kembla Street, Beatson Street and Corrimal Street. For the 0.9m sea level rise scenario, the pattern of flood level impacts is broadly similar to the 0.4m sea level rise scenario. However, the degree of flood level increases is greater, and the extent of the impacts affects a larger area. Flood level increases are typically in the range of 0.1m to 0.2m. A 20% increase in rainfall intensity for a 1% AEP event results in increases in flood levels across the study area. These increases in levels are typically in the range of 0.01m to 0.05m with higher increases in flood levels primarily along the Gurungaty Waterway and Eastern Branch. These higher increases extend across an area north of JJ Kelly Park to Wollongong CBD with flood level increases typically in the range of 0.1m to 0.2m. The combined impact of both sea level rise and increases in rainfall intensity indicate flood level increases across the study area. The largest extent and degree of flood level increases are along the Gurungaty Waterway and Eastern Branch where increases extend across an area north of JJ Kelly Park to Wollongong CBD.

Provisional flood hazard mapping (***Scenario ID 4***) was generated in accordance with Australian Emergency Management Handbook Series, AEM Handbook 7 to map the flood hazard in the study area. Figures ES19 to ES22 presents the flood hazard for the 1% AEP and PMF events with separate maps prepared for the "Design" and "Risk Management" blockage factors.

Review of flooding at Swan Street

Several residents at Swan Street and adjoining streets have raised concerns with Council regarding the frequency of flooding at their properties. Residents have noted that there has been an increase in the number of flood events at Swan Street over the last ten years and have identified a number of potential reasons for this including the build-up of debris in the Gurungaty Waterway and increases in the extent and density of vegetation along the waterway. An analysis of the rainfall data, a review of Sydney Water wet weather overflows and the impacts of changes in the dimensions and extent of vegetation along the Gurungaty Waterway was undertaken as part of a review of flooding at Swan Street.

The analysis of rainfall data focussed on potential changes in rainfall patterns over time. Cumulative rainfall totals were assessed for several gauges across the Wollongong region. The results indicate that for the most part, there have been no long-term changes in rainfall patterns in the study area or across the region in general.

An analysis of the mean number of days of rain in a year ≥ 25 mm and ≥ 100 mm was undertaken for Station 068131 in Port Kembla. This station is in close proximity to the study area and has 54 years of observations (from 1963 to 2017). The analysis indicates that the number of days annually with rainfall ≥ 25 mm and ≥ 100 mm in the last 7 years was greater than the preceding 10 years. In terms of the long-term average, the number of days annually with rainfall ≥ 25 mm and ≥ 100 mm over the last 7 years is average for the period of record.

For the Sydney Water STP gauge located within the study area, total yearly rainfall totals were compared to the average rainfall totals for the period of recorded data, i.e. 17 years. The results of this analysis indicate that the annual rainfall totals in the last 7 years are higher than the average rainfall total for the short period of record. An assessment of the number of rainfall events which had an equivalent or greater rainfall depth to the March

2017 flood event, i.e. 100mm, was also undertaken. Analysis of rainfall data for the March 2017 flood event shows that it generally tracks between a 63.2% AEP and a 50% AEP event. A total of 10 storm events with a total rainfall depth equivalent or greater than the March 2017 occurred between May 2003 and March 2017. The events typically occurred either annually or every two years with no recorded events exceeding 100mm in rainfall depth recorded between 1998 and 2002.

The assessment of changes in the dimensions and vegetation along the Gurungaty Waterway involved developing a model scenario representing 2010 study area conditions. 2010 was selected as the previous topographical survey of the Gurungaty Waterway was completed in 2010 and the extent of vegetation along the Gurungaty Waterway was significantly less extensive than current catchment conditions. The model results indicate that changes to the channel profile and vegetation along the Gurungaty Waterway from 2010 to 2017 has resulted flood level increases in the vicinity of Swan Street and adjoining streets. These flood level increases were typically in the range of 0.04m to 0.07m in a 1% AEP design flood event. Given the topography is relatively flat, low lying and prone to flooding, a small increase in flood levels can have a corresponding increase in flood frequency. Furthermore, the degree of impacts may be higher for more frequent flood events as the head of water driving flood water along the Gurungaty Waterway is reduced which may worsen the flood impacts of vegetation and channel profile changes. When combined with the higher than average rainfall totals in the last 7 years when compared to the preceding 10 years, the degree of flooding at Swan Street and adjoining streets may be further exacerbated when compared to long term averages.

A review of the Sydney Water wet weather overflow data was undertaken to determine if the volume of the wet weather overflows could be contributing to flooding at Swan Street and adjoining streets. Wet weather overflows occur when the waste water system becomes overloaded during heavy rainfall and discharges into the local environment. Overloading of the waste water system is typically due to infiltration of groundwater into the sewer system and/or illegal stormwater connections to the waste water system. No information was available on the extent of the wastewater network, and for the purpose of the analysis it was assumed that there are cross catchment inflows to the wastewater system. The volume of the wet weather overflows was analysed for the June 2016 and March 2017 flood events to determine how the volume of the wet weather overflows compared to the volume of flow in the Gurungaty Waterway near Swan Street. The results of this analysis indicate that the volume of the wet weather overflow as a percentage of the overall flow volume was approximately 3% for the March 2017 event and approximately 6% for the June 2016 flood event. The volume of the wet weather overflows is relatively small when compared to the overall volume of the flood event. However, the cumulative impact of the wet weather overflows, when combined with the impacts of changes in the vegetation and channel profile of the Gurungaty Waterway, may further exacerbate the flooding issues at Swan Street and adjoining streets.

Conclusions and recommendations

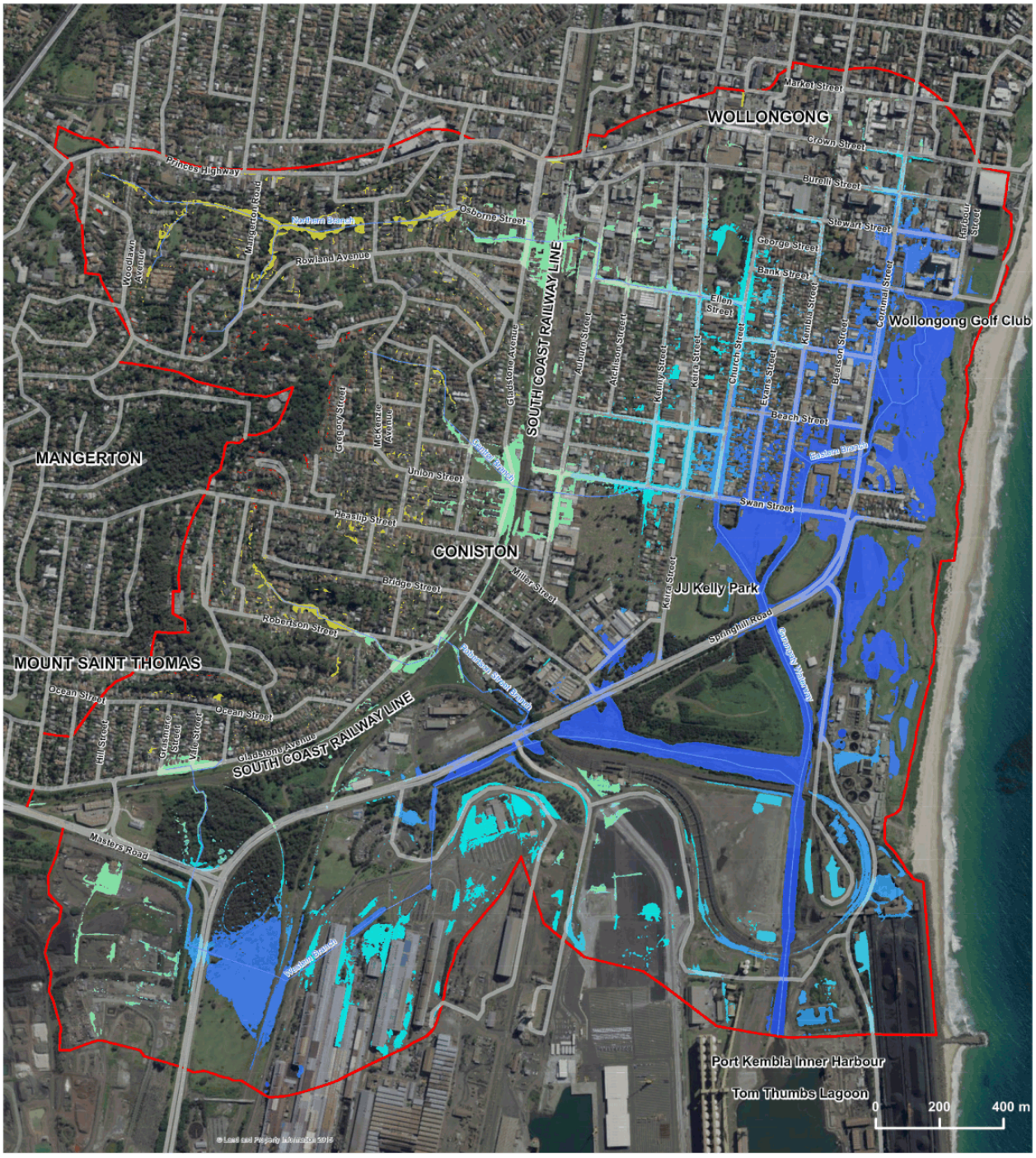
At the time of preparing this report, updated national guidelines for determining design rainfall were available through Australian Rainfall and Runoff (ARR) 2016. It is recommended that the implication of ARR 2016 on flood behaviour are assessed during the next stage of the floodplain management process, i.e. the Floodplain Risk Management Study.

The Floodplain Risk Management Guide, Modelling the Interaction of Catchment Flooding and Oceanic Inundation in Coastal Waterways (OEH, 2015) provides advice on approaches that can be used to derive ocean boundary conditions and design flood levels. It is recommended that this guide is considered for determining design ocean boundary conditions as part of the Floodplain Risk Management Study, in combination with the ARR 2016 rainfall analysis.

It is recommended that additional analysis is undertaken as part of the Floodplain Risk Management Study to further assess the impacts of the changes in the characteristics of the Gurungaty Waterway and to model the impact of the wet weather overflows on flood behaviour. Consideration should be given to assessing the flood impacts of changes in the Gurungaty Waterway in a flood event with low tide conditions and for more frequent design flood events where the impacts may be greater than the 1% AEP design flood event. As part of the Floodplain Risk Management Study, it is recommended that vegetation management measures are considered to improve the conveyance along the Gurungaty Waterway.

The representation of buildings is based on digitising building footprints from aerial photographs which may not capture local lot scale flood mitigation measures such as defined overland flow paths. It is recommended that that information specific to lot scale flood mitigation measures is captured and included in future iterations of the model. Councils local knowledge of the catchment will be important is determining the location of these lots.

The model results indicate that there is a relatively small difference in flood behaviour between the “Design” and Risk Management” blockage factors. It is recommended that Council to re-assess the value of having two sets of blockage factors in view of the results.



Legend

- Wollongong City Study Area
- Roads
- Flow Paths

Flood Levels (mAHD)

0 - 1	6 - 8	35 - 40
1 - 2	8 - 10	40 - 45
2 - 3	10 - 15	45 - 50
3 - 4	15 - 20	50 - 55
4 - 5	20 - 25	55 - 60
5 - 6	25 - 30	> 60
	30 - 35	

A3

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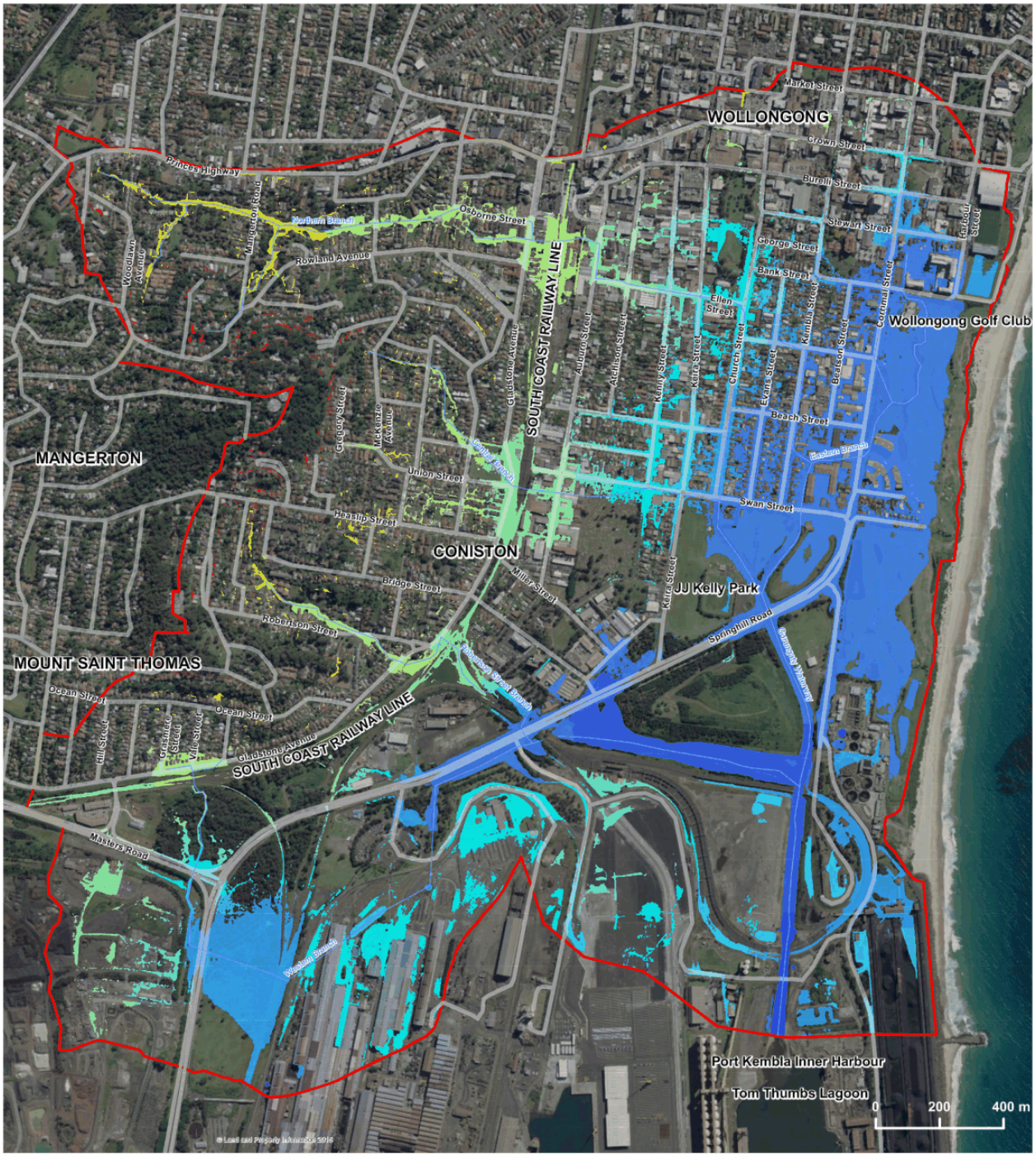
Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES1 | Scenario ID2 "Risk Management" blockage factor peak flood level – 20% AEP event



Legend

Wollongong City Study Area
Roads
Flow Paths

Flood Levels (mAHD)

0 - 1	6 - 8	35 - 40
1 - 2	8 - 10	40 - 45
2 - 3	10 - 15	45 - 50
3 - 4	15 - 20	50 - 55
4 - 5	20 - 25	55 - 60
5 - 6	25 - 30	> 60
	30 - 35	

A3
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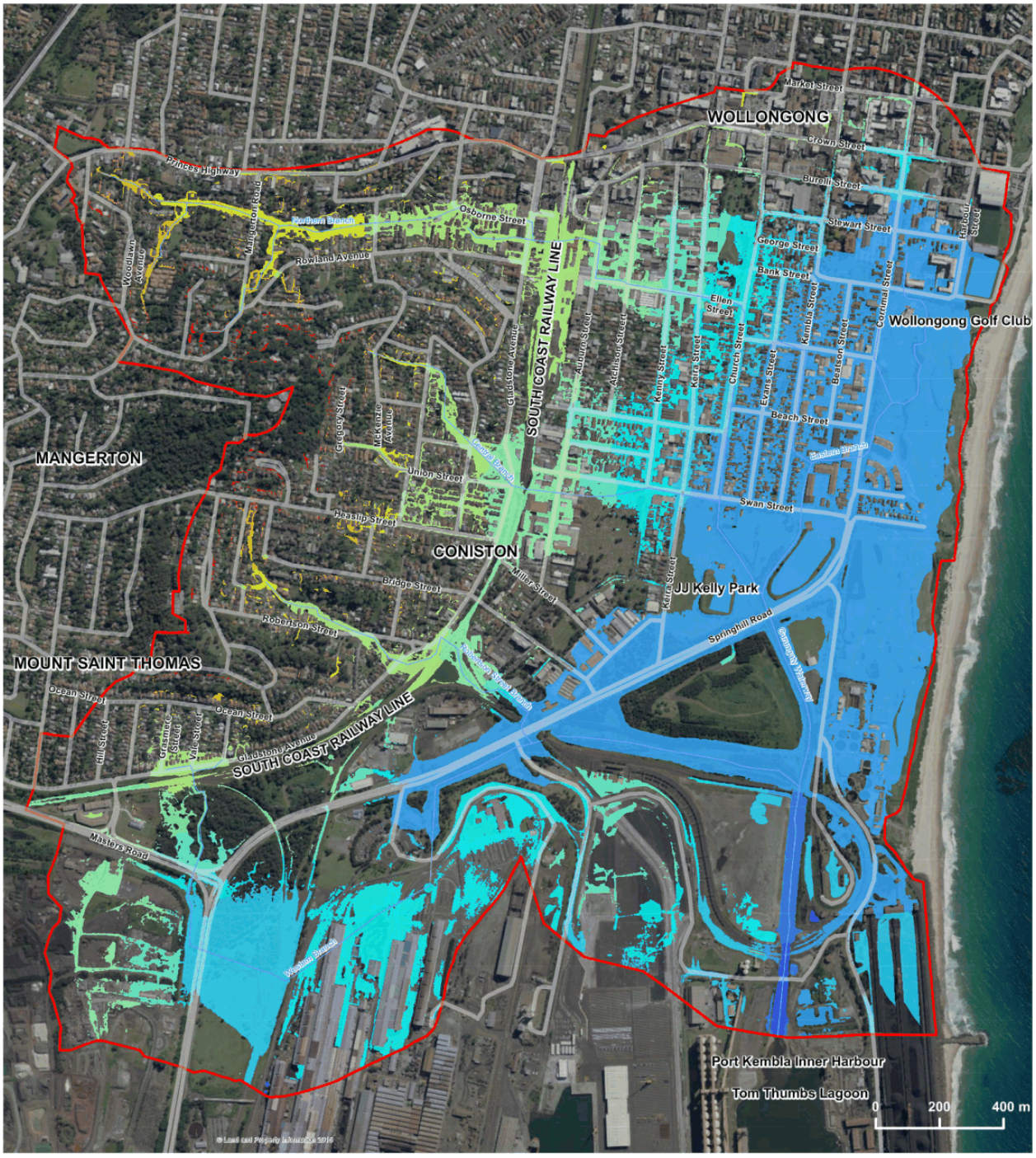
Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES2 | Scenario ID2 "Risk Management" blockage factor peak flood level – 1% AEP event



Legend

- Wollongong City Study Area
- Roads
- Flow Paths

Flood Levels (mAHD)

0 - 1	6 - 8	35 - 40
1 - 2	8 - 10	40 - 45
2 - 3	10 - 15	45 - 50
3 - 4	15 - 20	50 - 55
4 - 5	20 - 25	55 - 60
5 - 6	25 - 30	> 60
	30 - 35	

A3

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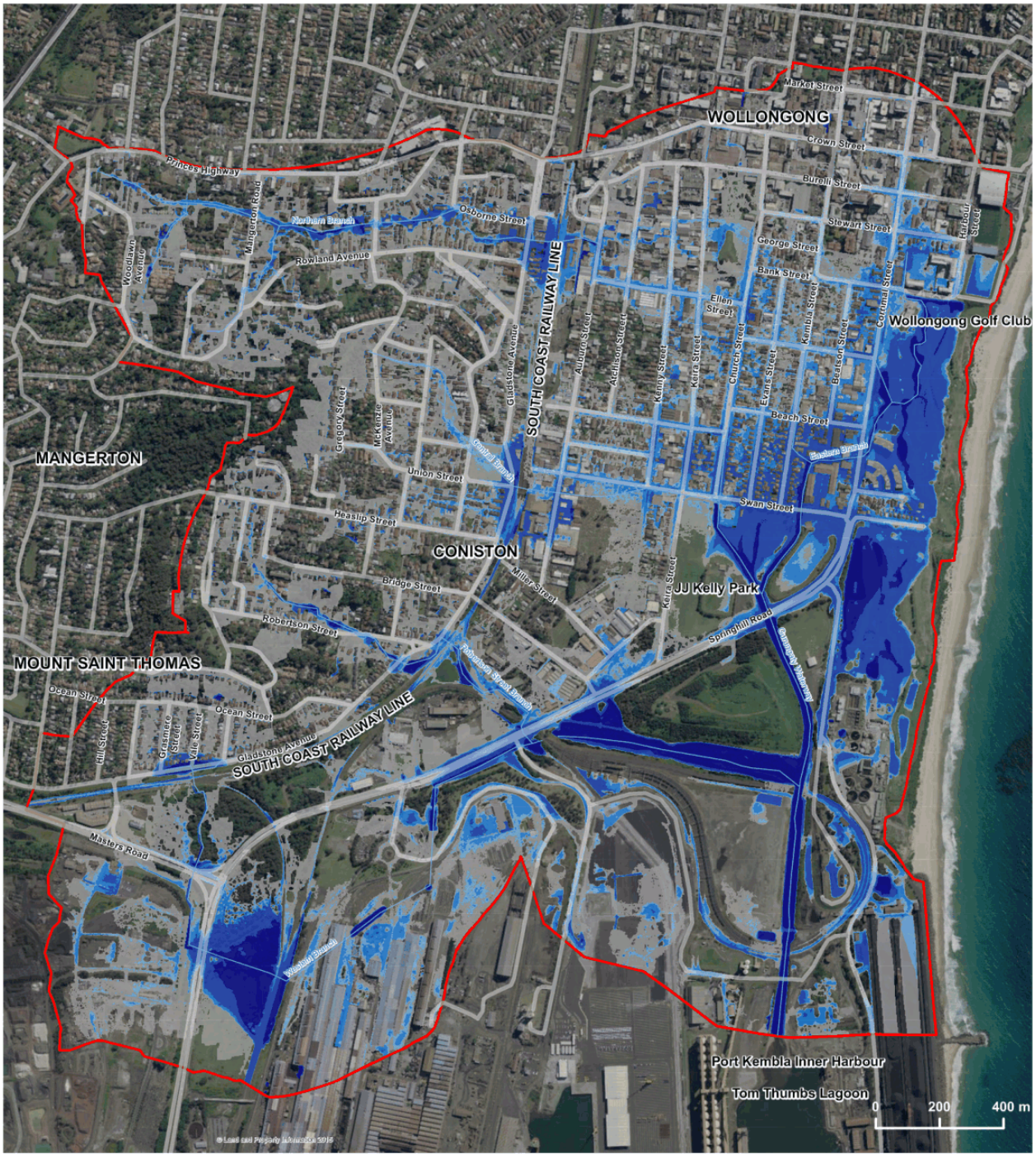
Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES3 | Scenario ID2 "Risk Management" blockage factor peak flood level – PMF event

Figure ES4 | Scenario ID2 "Risk Management" blockage factor peak flood depth – 20% AEP event



Legend

- Wollongong City Study Area
- Roads
- Flow Paths

Flood depths (m)

- < 0.15
- 0.15 - 0.25
- 0.25 - 0.5
- 0.5 - 1.5
- > 1.5

A3

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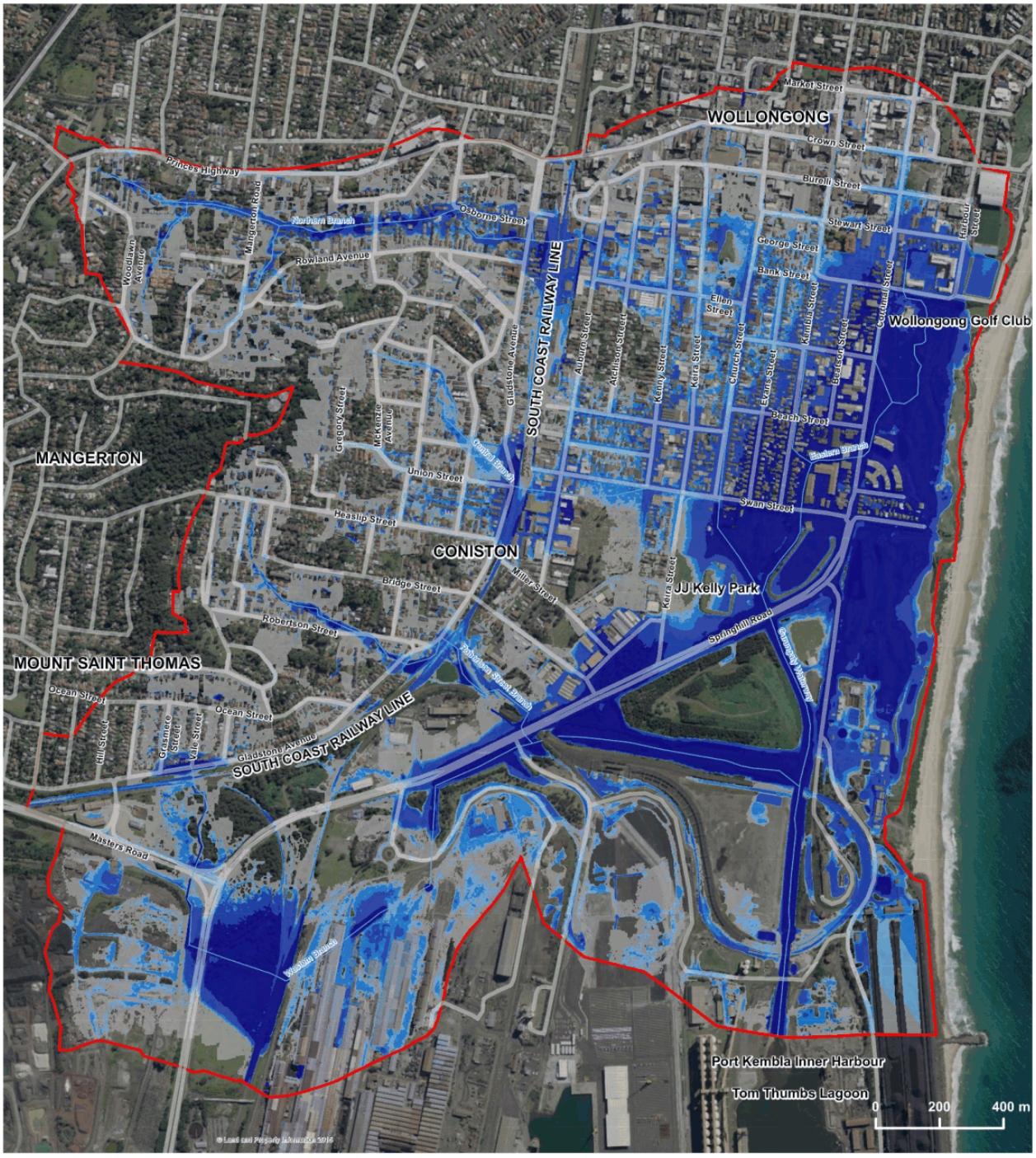
Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES5 | Scenario ID2 "Risk Management" blockage factor peak flood depth – 1% AEP event



Legend

- Wollongong City Study Area
- Roads
- Flow Paths

Flood depths (m)

- < 0.15
- 0.15 - 0.25
- 0.25 - 0.5
- 0.5 - 1.5
- > 1.5

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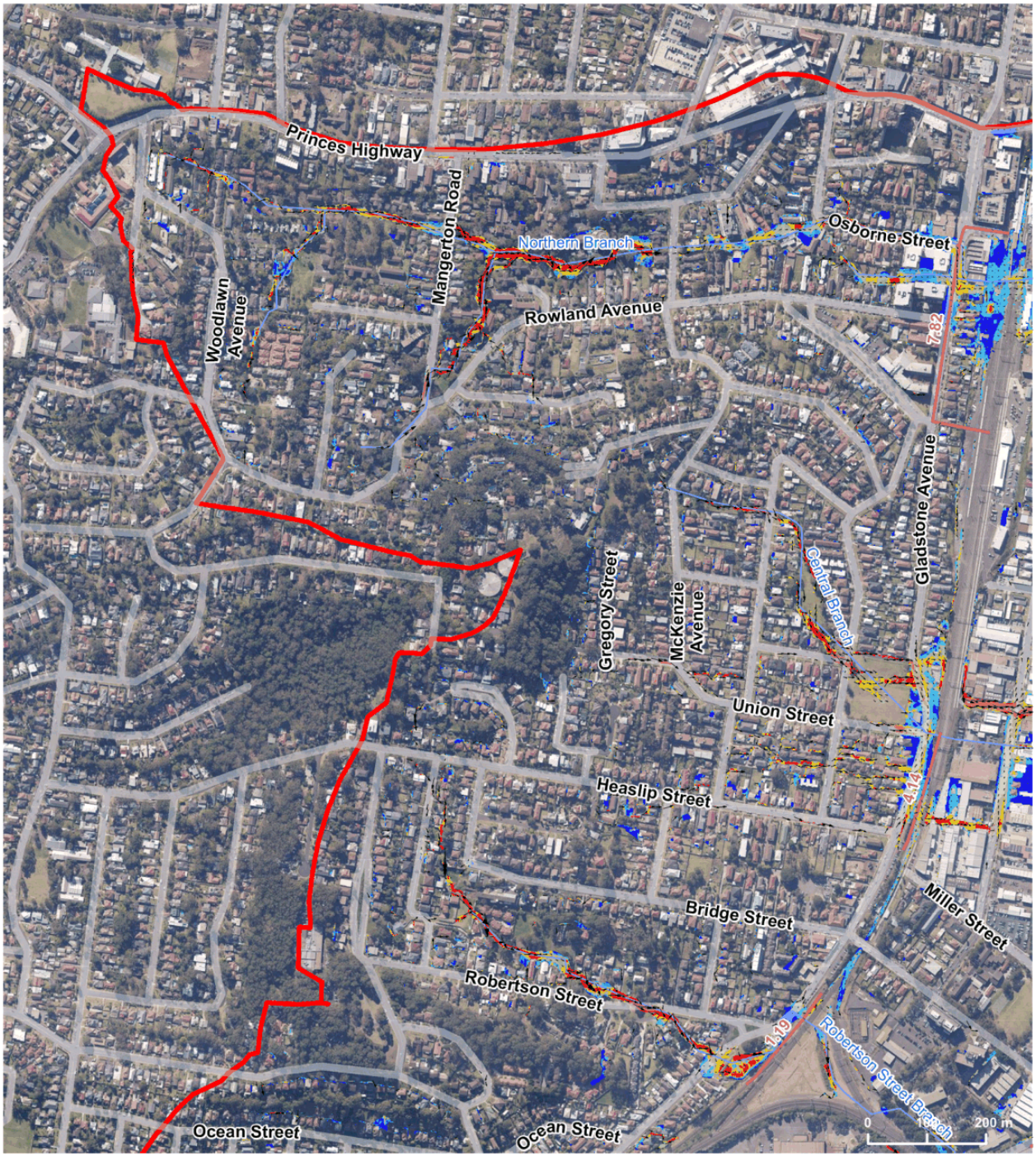
Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES6 | Scenario ID2 "Risk Management" blockage factor peak flood depth – PMF event



Legend

- Wollongong City Study Area
- Roads
- Flow Paths
- Peak flows
- Velocity Vectors

Velocity (m/s)

- 0 - 0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- > 1

A3

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Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES7-A | Scenario ID2 "Risk Management" blockage factor peak flood velocity – 20% AEP event

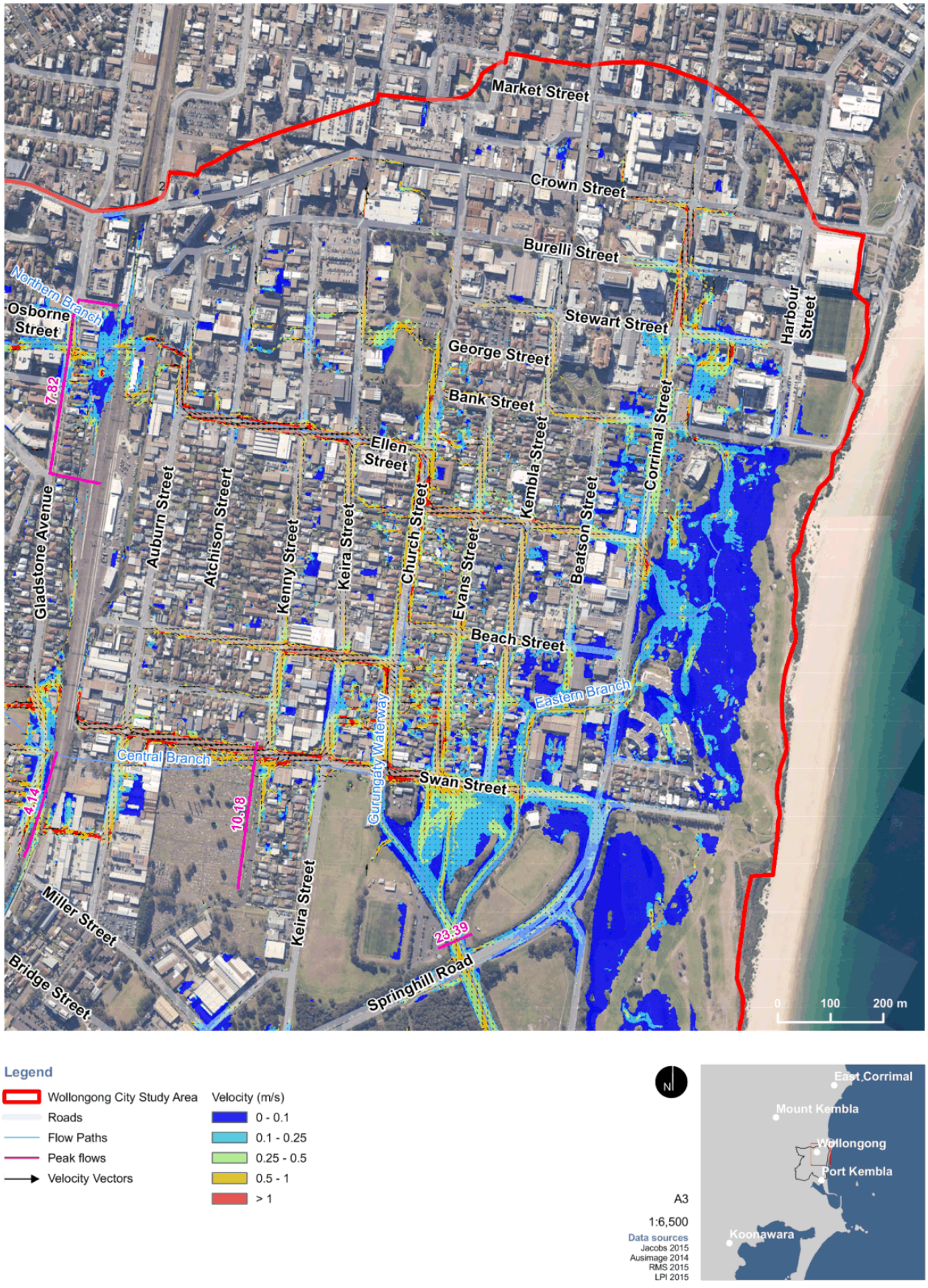
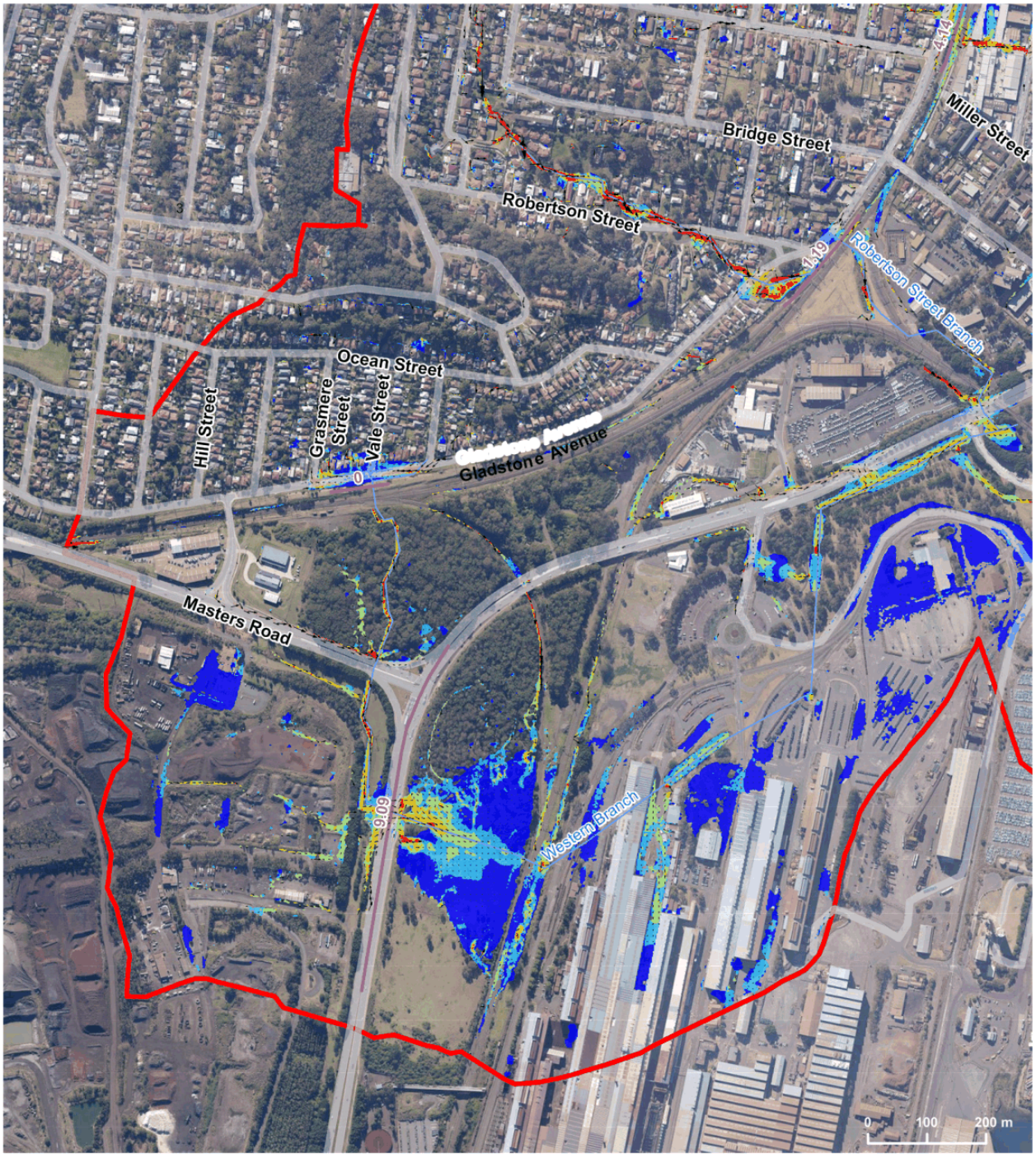


Figure ES7-B | Scenario ID2 "Risk Management" blockage factor peak flood velocity – 20% AEP event



Legend

- Wollongong City Study Area
- Roads
- Flow Paths
- Peak flows
- Velocity Vectors

Velocity (m/s)

- 0 - 0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- > 1

A3

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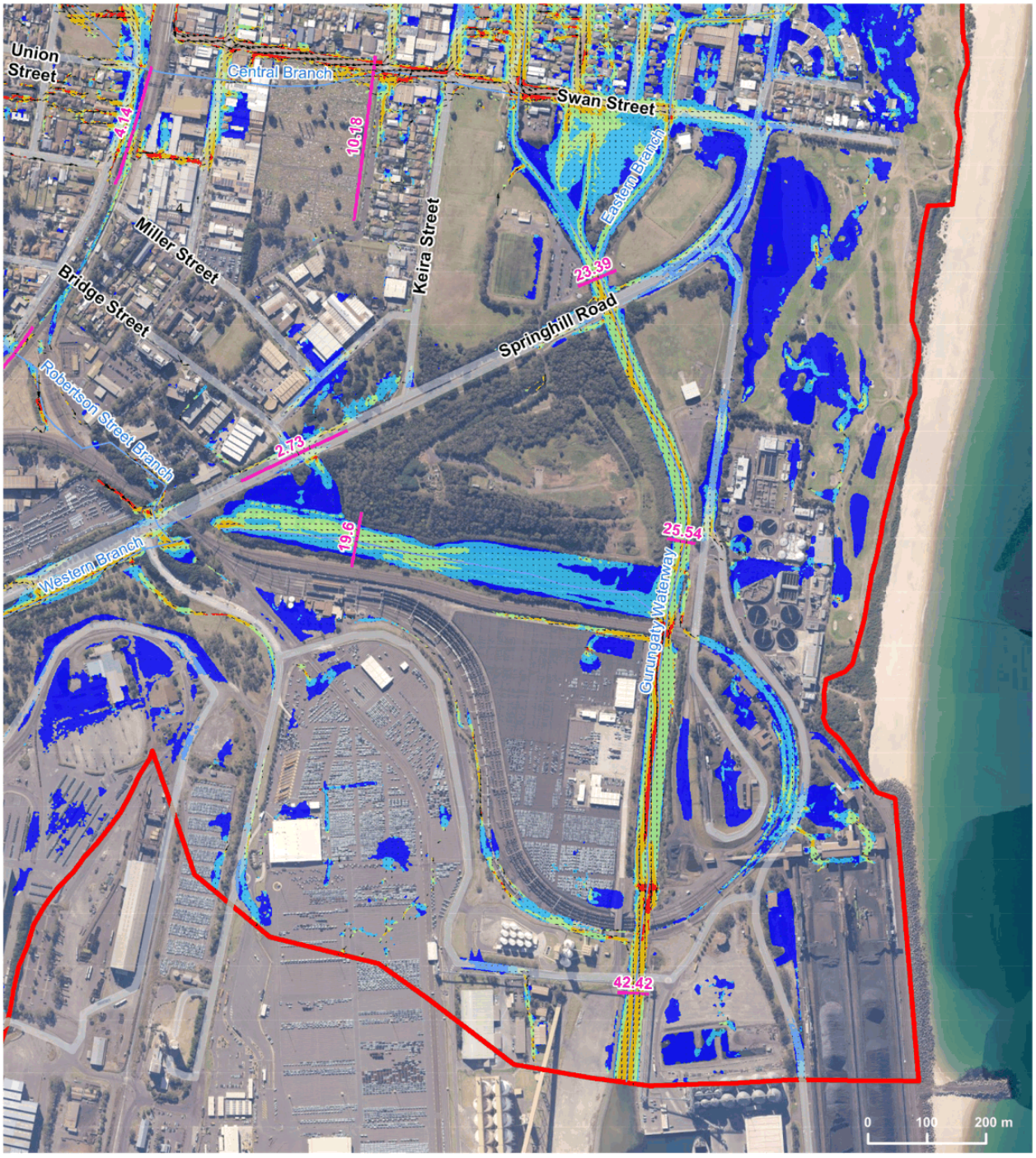
Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES7-C | Scenario ID2 "Risk Management" blockage factor peak flood velocity – 20% AEP event



Legend

- Wollongong City Study Area
- Roads
- Flow Paths
- Peak flows
- Velocity Vectors

Velocity (m/s)

- 0 - 0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- > 1

A3

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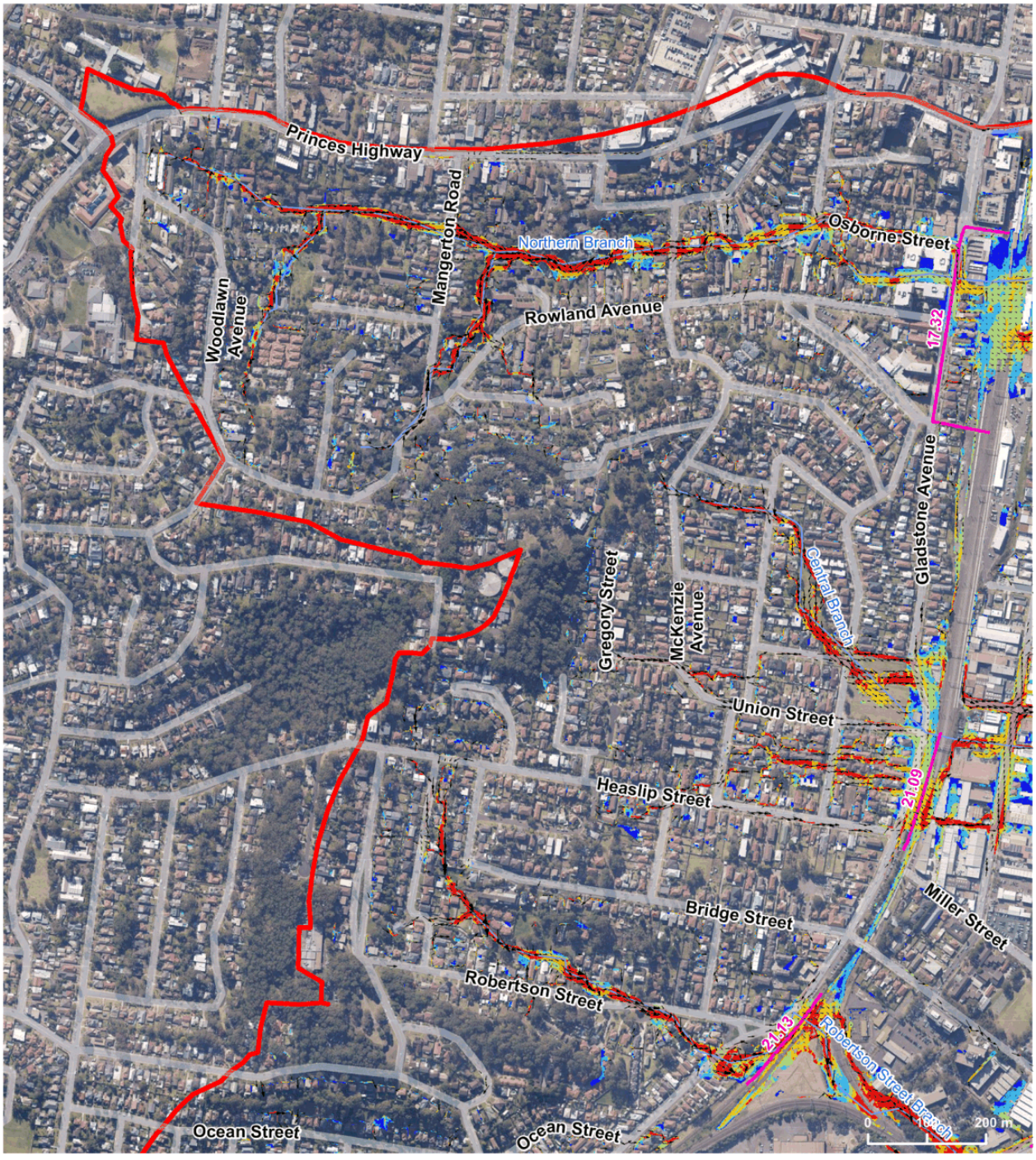
Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES7-D | Scenario ID2 "Risk Management" blockage factor peak flood velocity – 20% AEP event



Legend

- Wollongong City Study Area
- Roads
- Flow Paths
- Peak flows
- Velocity Vectors

Velocity (m/s)

- 0 - 0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- > 1

A3

1:6,500

Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES8-A | Scenario ID2 "Risk Management" blockage factor peak flood velocity – 1% AEP event

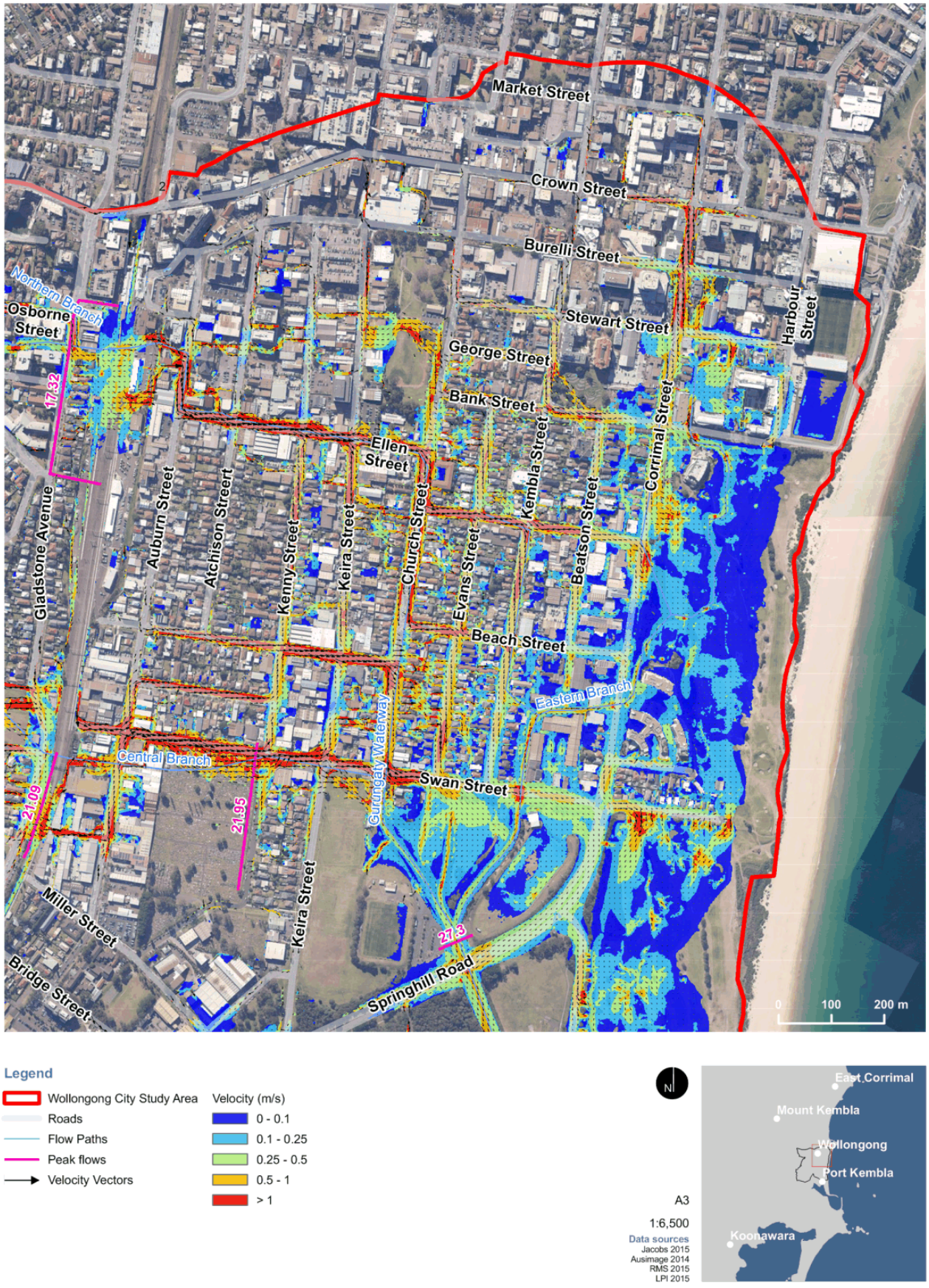
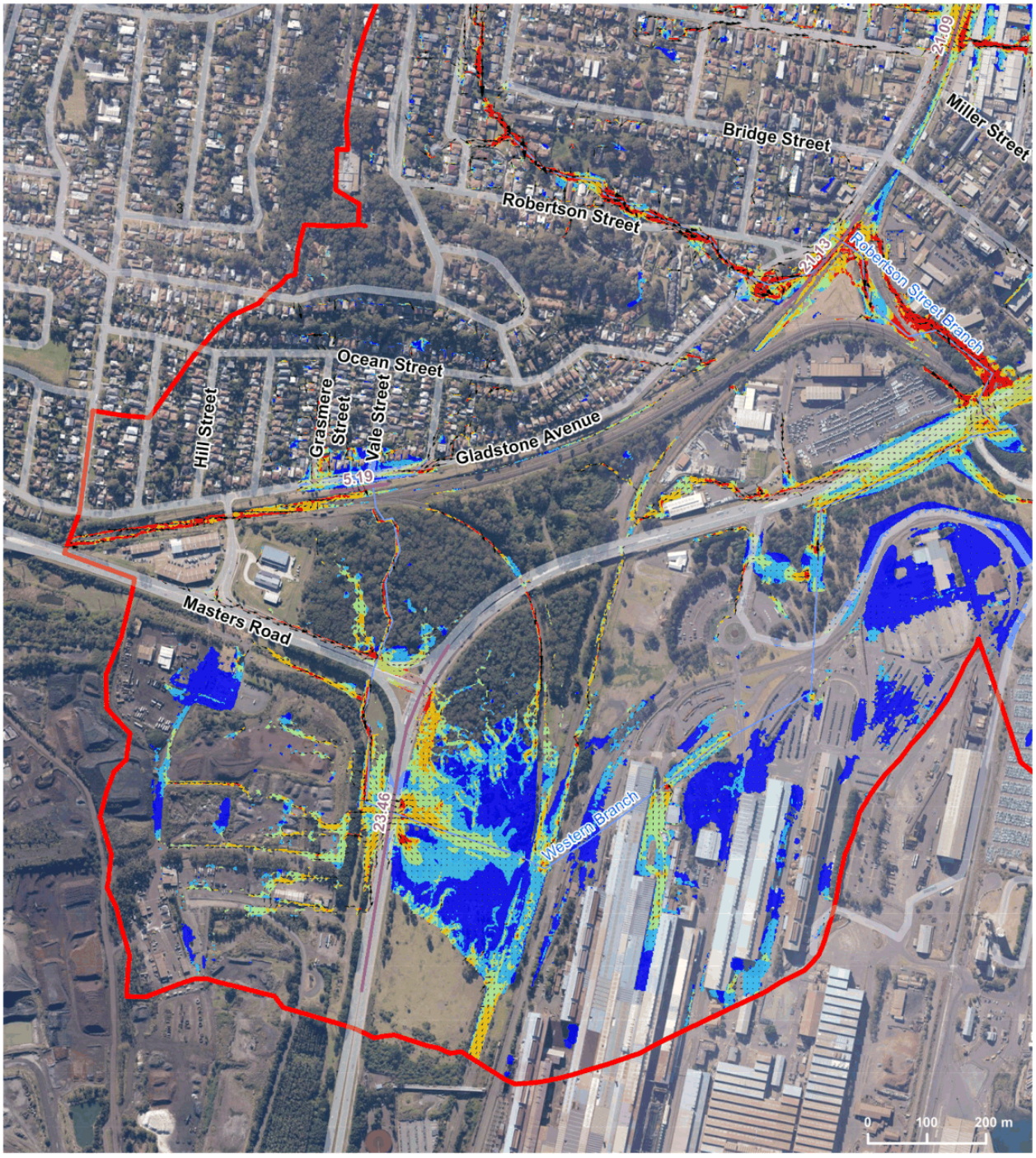


Figure ES8-B | Scenario ID2 "Risk Management" blockage factor peak flood velocity – 1% AEP event



Legend

- Wollongong City Study Area
- Roads
- Flow Paths
- Peak flows
- Velocity Vectors

Velocity (m/s)

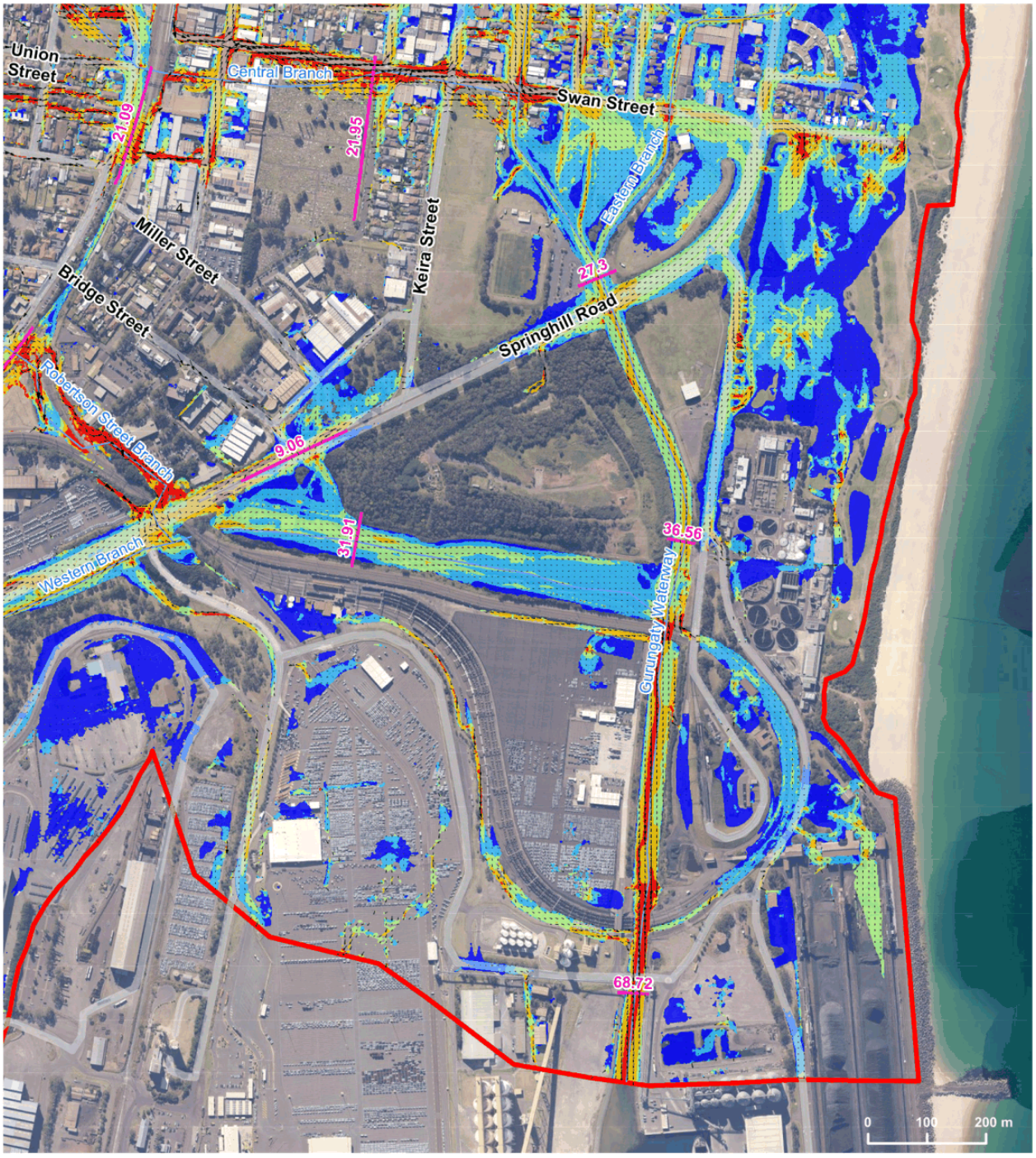
- 0 - 0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- > 1

A3

1:6,500

Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES8-C | Scenario ID2 "Risk Management" blockage factor peak flood velocity – 1% AEP event



Legend

- Wollongong City Study Area
- Roads
- Flow Paths
- Peak flows
- Velocity Vectors

Velocity (m/s)

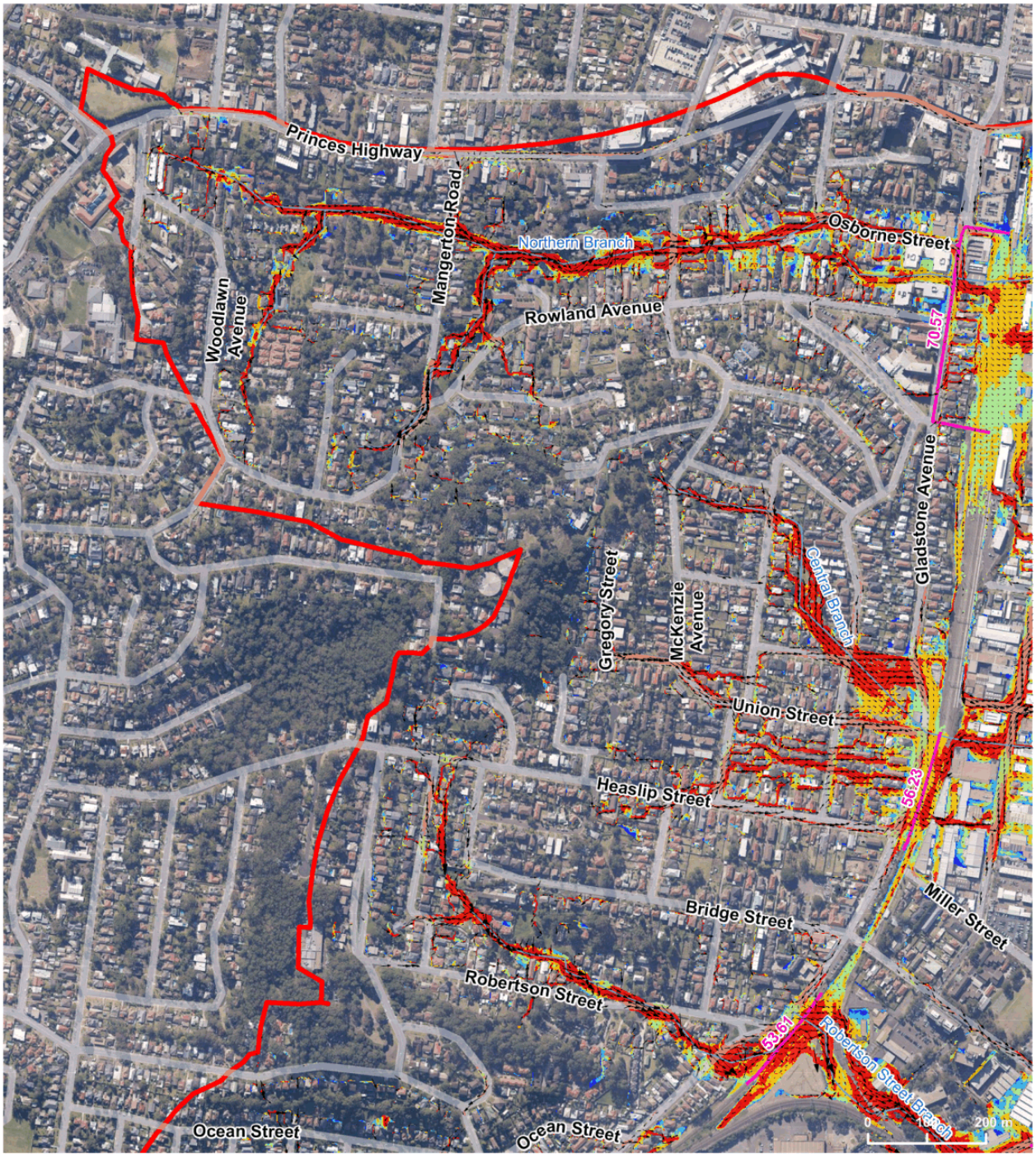
- 0 - 0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- > 1

A3

1:6,500

Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES8-D | Scenario ID2 "Risk Management" blockage factor peak flood velocity – 1% AEP event



Legend

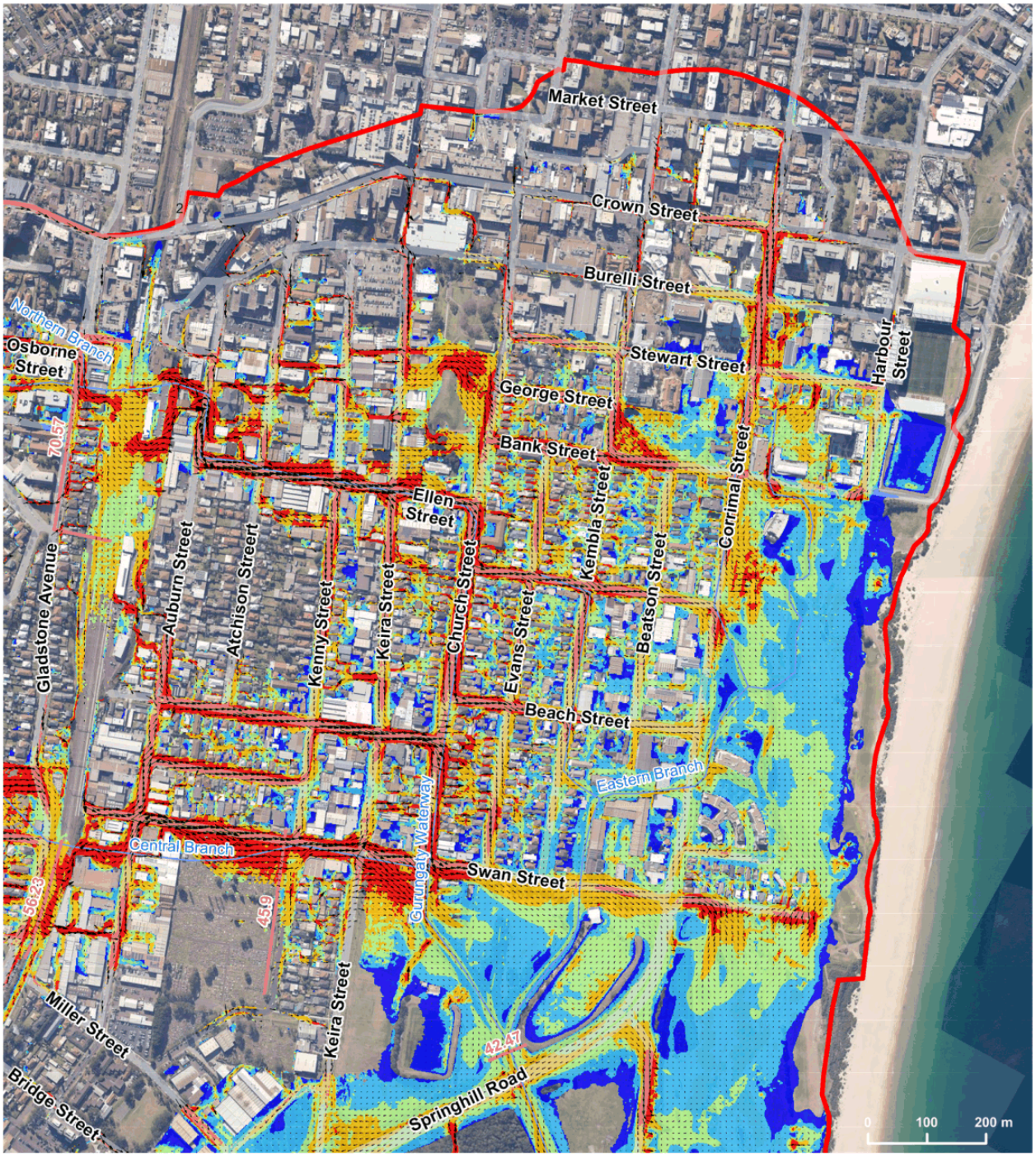
Wollongong City Study Area	Velocity (m/s)
Roads	0 - 0.1
Flow Paths	0.1 - 0.25
Peak flows	0.25 - 0.5
Velocity Vectors	0.5 - 1
	> 1

A3

1:6,500

Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES9-A | Scenario ID2 "Risk Management" blockage factor peak flood velocity – PMF event



Legend

- Wollongong City Study Area
- Roads
- Flow Paths
- Peak flows
- Velocity Vectors

Velocity (m/s)

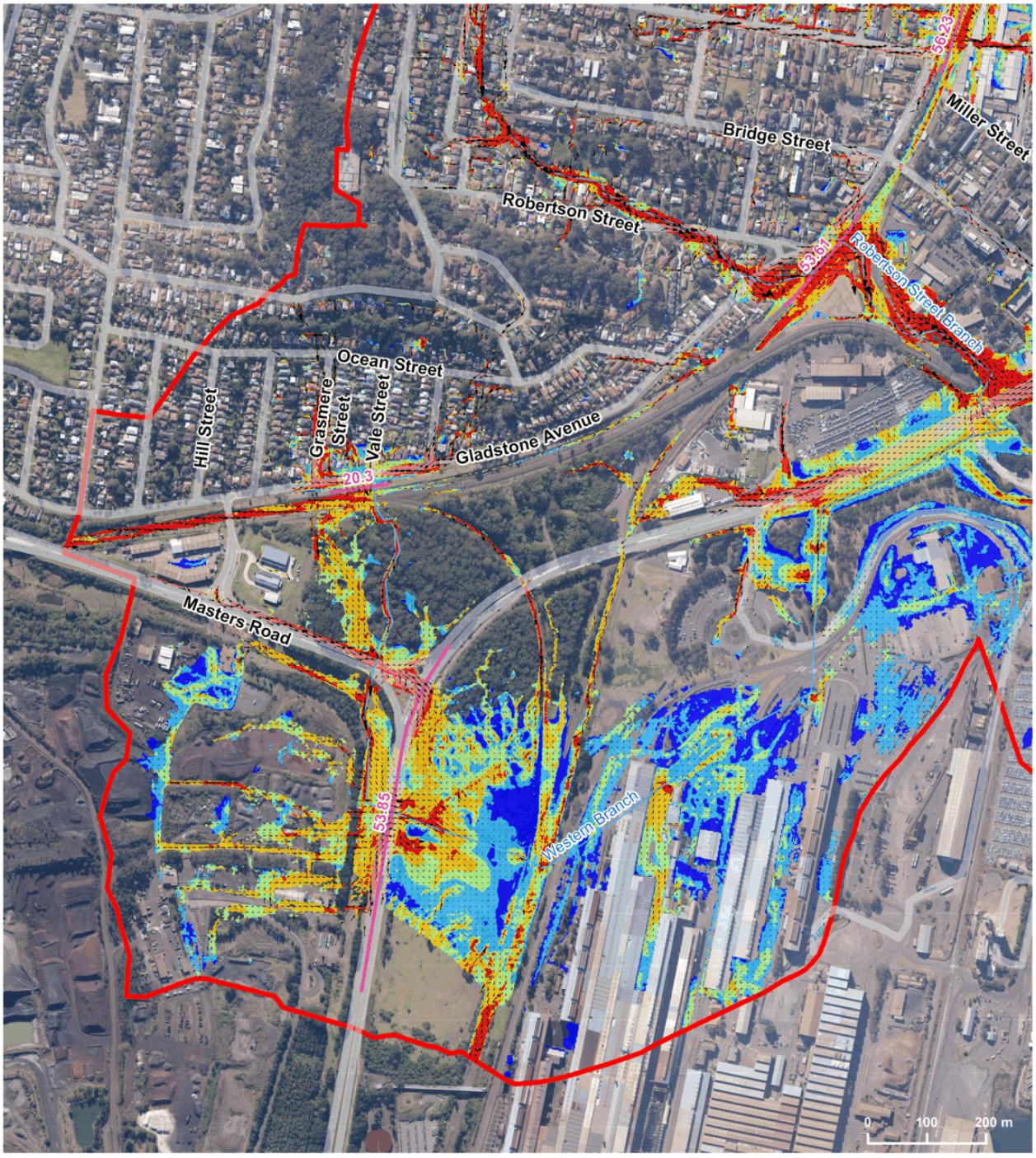
- 0 - 0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- > 1

A3

1:6,500

Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES9-B | Scenario ID2 "Risk Management" blockage factor peak flood velocity – PMF event



Legend

- Wollongong City Study Area
- Roads
- Flow Paths
- Peak flows
- Velocity Vectors

Velocity (m/s)

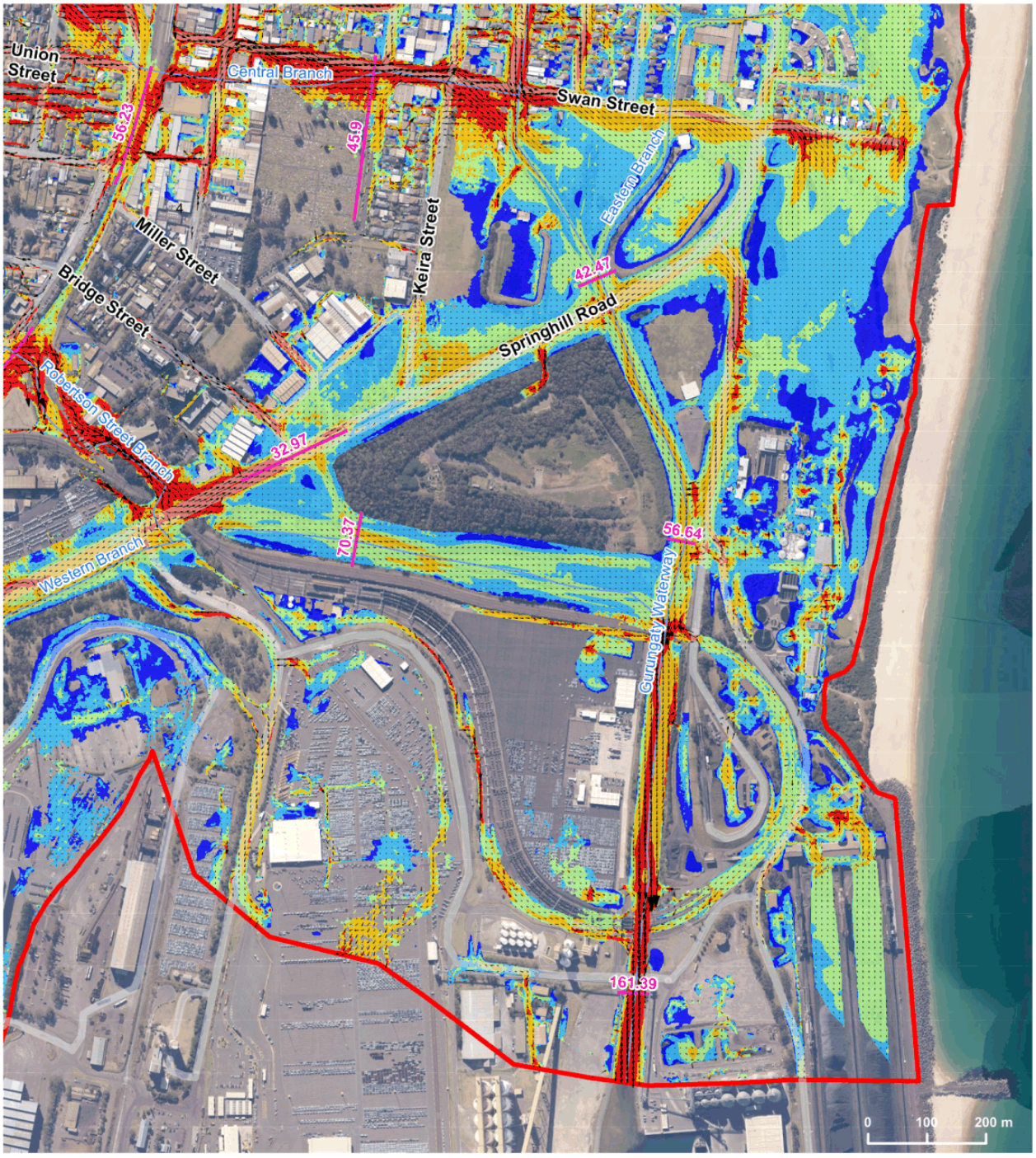
- 0 - 0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- > 1

A3

1:6,500

Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES9-C | Scenario ID2 "Risk Management" blockage factor peak flood velocity – PMF event



Legend

- Wollongong City Study Area
- Roads
- Flow Paths
- Peak flows
- Velocity Vectors

Velocity (m/s)

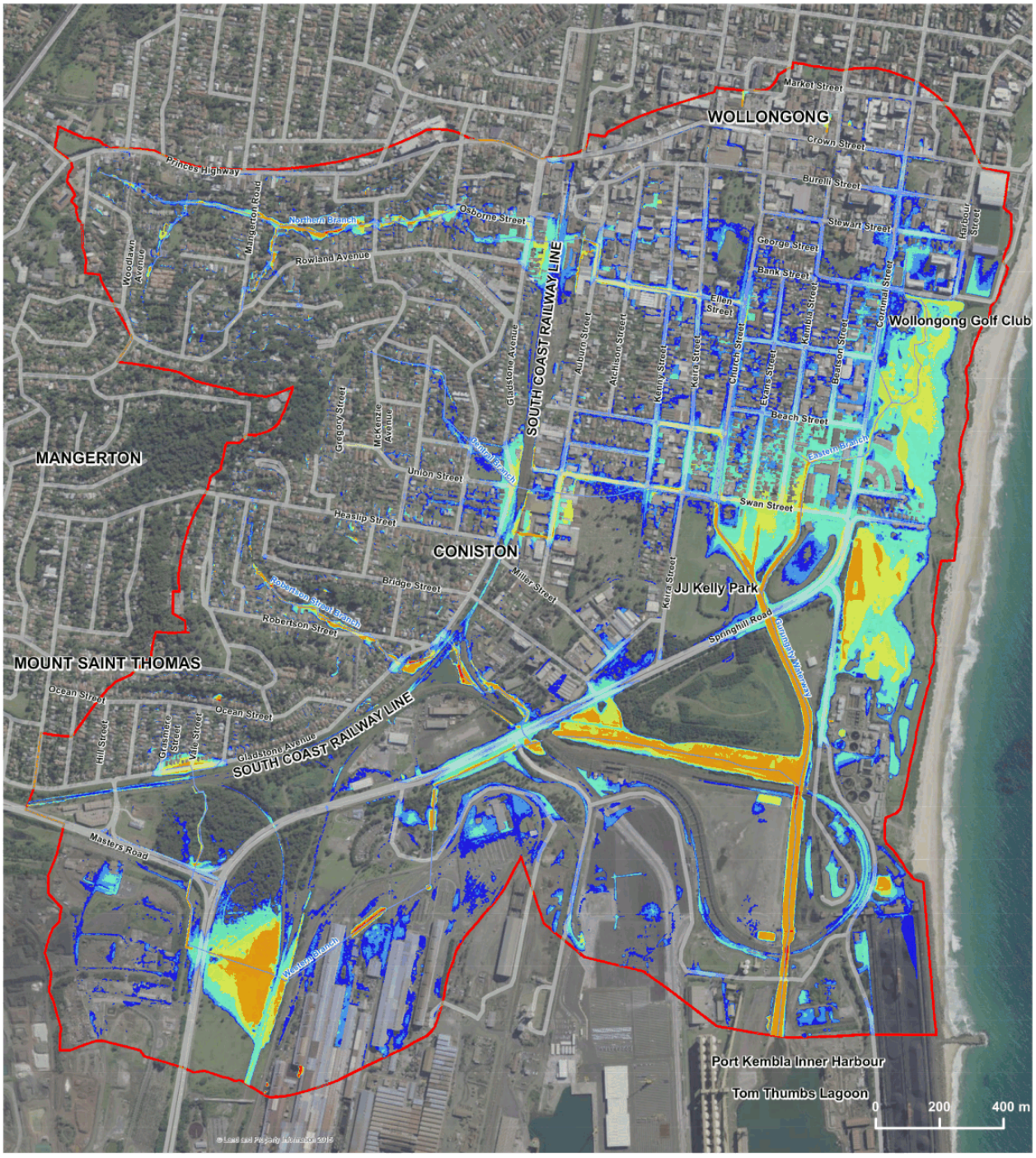
- 0 - 0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- > 1

A3

1:6,500

Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES9-D | Scenario ID2 "Risk Management" blockage factor peak flood velocity – PMF event



Legend

- Wollongong City Study Area
- Roads
- Flow Paths

Provisional Flood Hazard

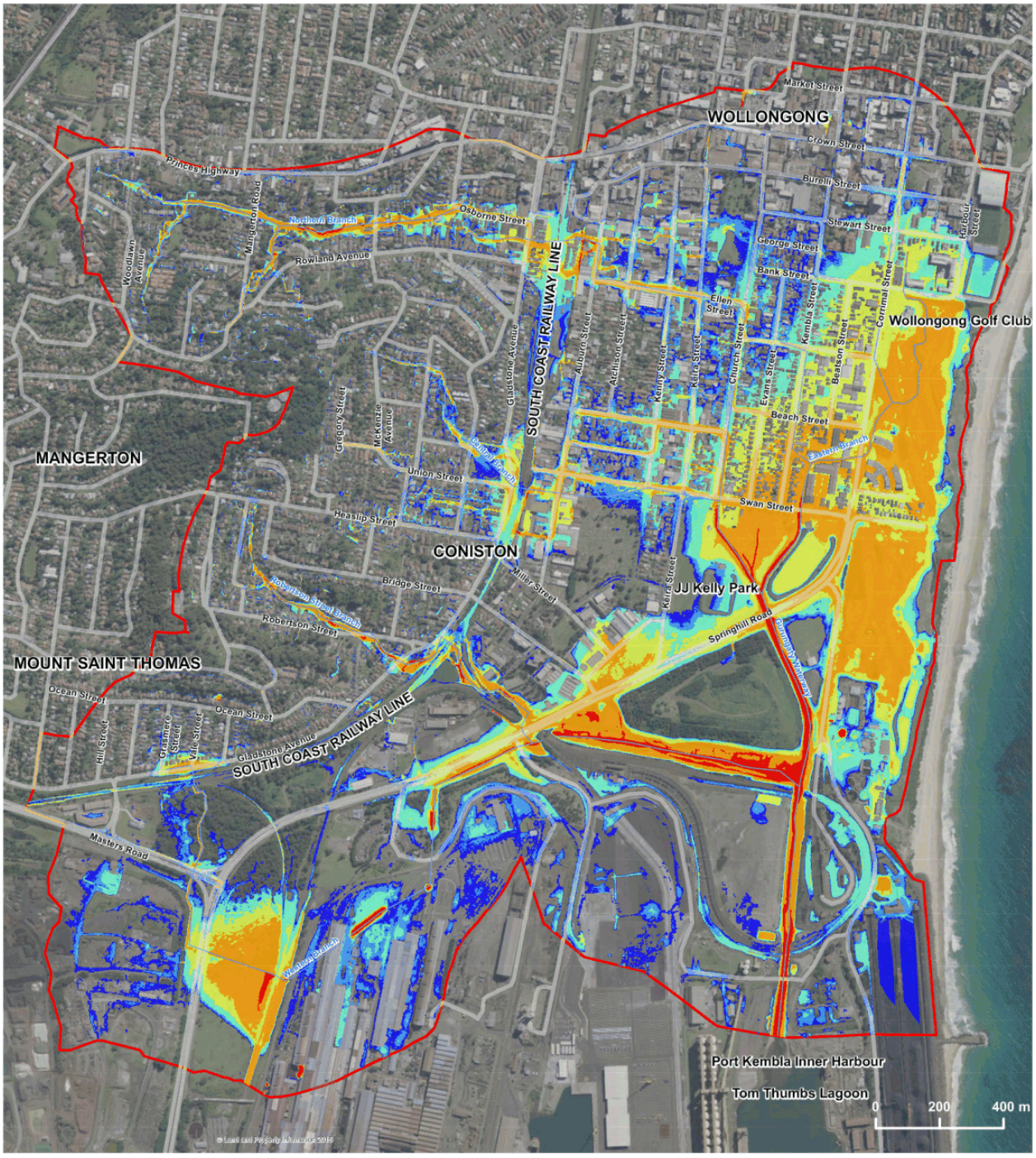
- H1 - No restrictions
- H2 - Unsafe for small vehicles
- H3 - Unsafe for vehicles, children and the elderly
- H4 - Unsafe for people and vehicles
- H5 - Unsafe for people or vehicles. Buildings require special engineering design and construction
- H6 - Not suitable for people, vehicles or buildings

A3

1:12,000

Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES10 | Scenario ID2 "Risk Management" blockage factor provisional flood hazard – 1% AEP event



Legend

- Wollongong City Study Area
- Roads
- Flow Paths

Provisional Flood Hazard

- H1 - No restrictions
- H2 - Unsafe for small vehicles
- H3 - Unsafe for vehicles, children and the elderly
- H4 - Unsafe for people and vehicles
- H5 - Unsafe for people or vehicles. Buildings require special engineering design and construction
- H6 - Not suitable for people, vehicles or buildings

A3

1:12,000

Data sources
Jacobs 2015
Ausimage 2014
RMS 2015
LPI 2015

Figure ES11 | Scenario ID2 "Risk Management" blockage factor provisional flood hazard – PMF event

Important note about this report

The sole purpose of this report and the associated services performed by Jacobs was to undertake a review of the Wollongong City Flood in accordance with the scope of services set out in the contract between Jacobs and Wollongong City Council (the Client). That scope of services, as described in this report, was agreed with the Client.

Jacobs derived the data in this report from information sourced from the Client, third parties, and/or available in the public domain at the time or times outlined in this report. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

This report has been prepared on behalf of, and for the exclusive use of, Jacobs' Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

WOLLONGONG CITY FLOOD STUDY REVIEW

ENGAGEMENT REPORT

JUNE 2019

Z19/133207

wollongong
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Table of Contents

Executive Summary

Council is responsible for planning and managing flood prone lands in our area. In 2017, the community contributed valuable information to the review of the Wollongong City Flood Study, with Council receiving hundreds of submissions about the flooding and drainage problems they'd experienced on their properties. A report on the draft Flood Study was prepared with information on how it was updated and what the results are. The updated Study explains the ways flooding happens in the Wollongong City catchment. It uses Council's revised Blockage Policy, which was updated in 2016. The Study considers recent urban developments, changes to the Gurungaty waterway and information collected after recent flood events. It also answered questions from the community about the flooding experienced in recent years.

Council's engagement team worked collaboratively with a technical consultant to share the updated Study with the community and key stakeholders. During the engagement period, 20 May – 18 June 2019, Council sent letters to more than 7,600 residents and property owners in the catchment area (Appendix A) inviting them to learn more about the review. Emails with this information were sent to community, education, Register of Interest (flood), business, government and emergency services' stakeholders. The information was also available at Council's Customer Service Centre. Copies of the draft report (Appendix E), a Frequently Asked Questions sheet (Appendix B) and Feedback Form (Appendix C) were made available at an information session at Wollongong Art Gallery on 30 May 2019 and at a community information stand held at JJ Kelly Park on 1 June 2019. They were also included on the project webpage (Appendix D). Notices of the exhibition were published in the Advertiser on 22 May and 5 June 2019. The community were invited to provide feedback via Council's website, Customer Service Centre and at the community information sessions.

There were a total of seven submissions. Some comments were provided at the drop-in information sessions which were attended by a total of 62 community members. Comments related to:

- General support of Council's flood risk management work for the catchment
- Interpreting the draft Study as having contradictory information to what was stated in the Frequently Asked Questions and at information sessions
- Concerns or misunderstandings about new development perceived to be causing sewer overflow, flooding and increased run-off
- Concerns or misunderstandings as to why some areas had been mapped as being flood affected, even though some people hadn't witnessed flooding in these areas
- Interest in finding out what the flood risk is for property they own or live in, or if it had changed since the last Study
- Requests for improvements or maintenance for stormwater drainage
- Interest in floodplain risk management and mitigation works in other catchments
- Concern about the potential impacts of the updated modelling on flood insurance premiums

Background

Wollongong City Council is committed to finding solutions to reduce the social and economic damages of flooding. In 2016, new national guidelines (Australian Rainfall and Runoff 2016) were released to better inform flood modelling, with a particular focus on estimating rainfall data. Council also updated its Blockage Policy, and the combination of the updated policy and guidelines saw Council resolve to review and update its flood studies. Wollongong City Flood Study is one of 10 studies to undergo review. For the Wollongong City Catchment Flood Study Review, Council asked consultants to expand their scope and look at whether development and environmental changes in this area have changed flooding behaviour.

The Wollongong City Catchment Flood Study and Floodplain Risk Management Study and Plan were completed by Council in 2013 and 2015 respectively. These studies identified the risk within the Wollongong City catchment and the steps that can be taken to manage this risk now and into the future.

Since these studies, Council has explored a number of flood mitigation measures, and new developments have seen the catchment's land use change. The combination of these factors along with Council's updated Blockage Policy meant there was a possibility that there could be changes to the behaviour of flooding.

Community engagement to gather reports on residents' flooding and drainage problems over the previous 5 years was conducted in July 2017, along with the collection and review of rainfall data to determine historic rainfall patterns in the catchment. Over 200 people completed a survey questionnaire. This work also provided a better understanding of the most recent flood events. A detailed survey of the Gurungaty Waterway was undertaken to determine if the shape of the channel has changed since the last detailed survey in 2010. This information was used to update the computer models used to simulate the flooding in the catchment, and to update flood maps which provide a visual illustration of the flood risk in the catchment.

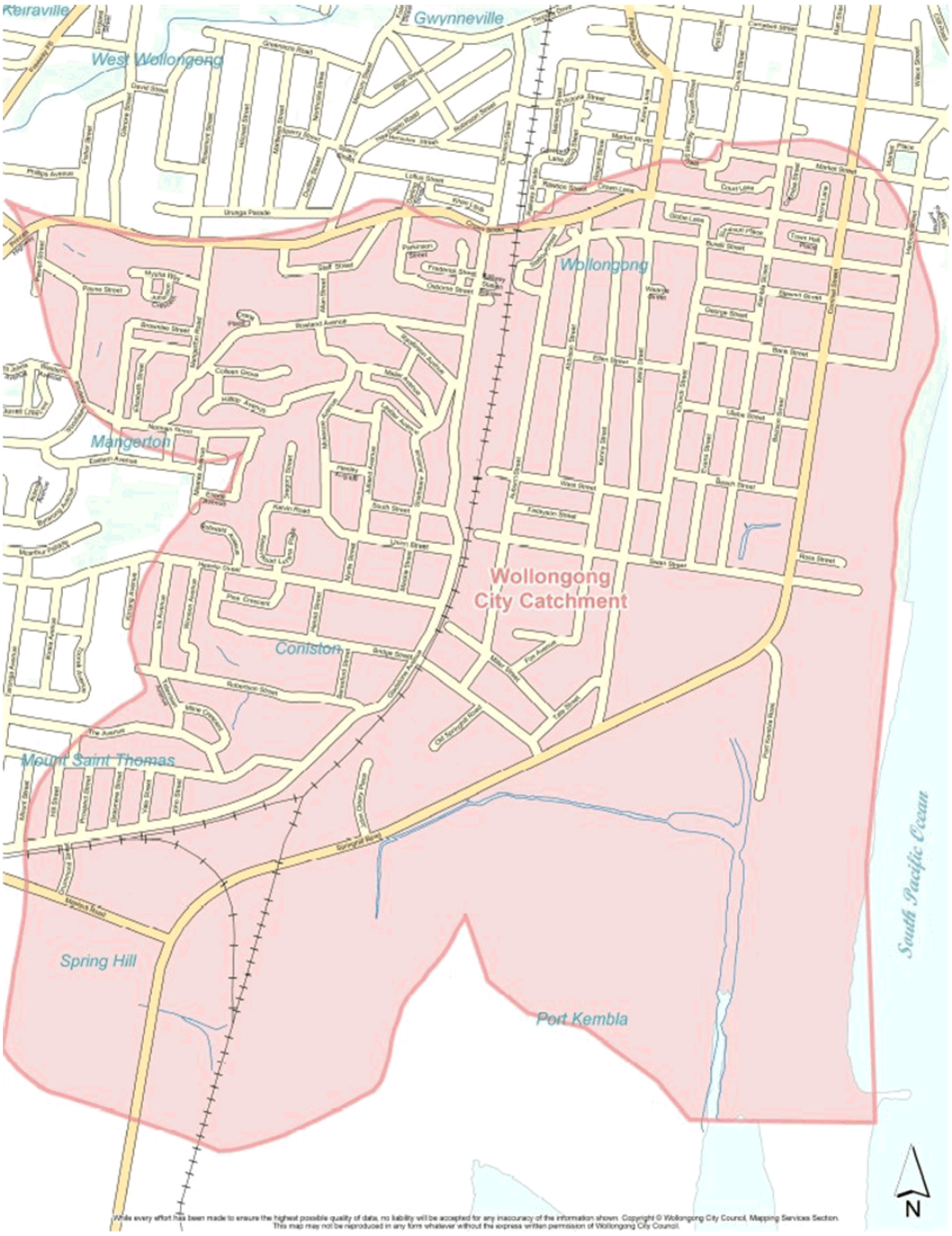
Stakeholder engagement was undertaken throughout the development of the flood study. This involved:

- Engaging agency and industry stakeholders to obtain details of historical flooding, survey data and other relevant data sets. Stakeholders were invited to provide feedback on the draft flood study during public exhibition.
- Community engagement through the questionnaire mail out.
- The Flood Study was overseen by the Central Floodplain Risk Management Committee, which includes representatives from community groups and state agencies.

At the Central Floodplain Risk Management Committee meeting on 16 April 2019, the public exhibition of the Wollongong City Flood Study Review was unanimously supported.

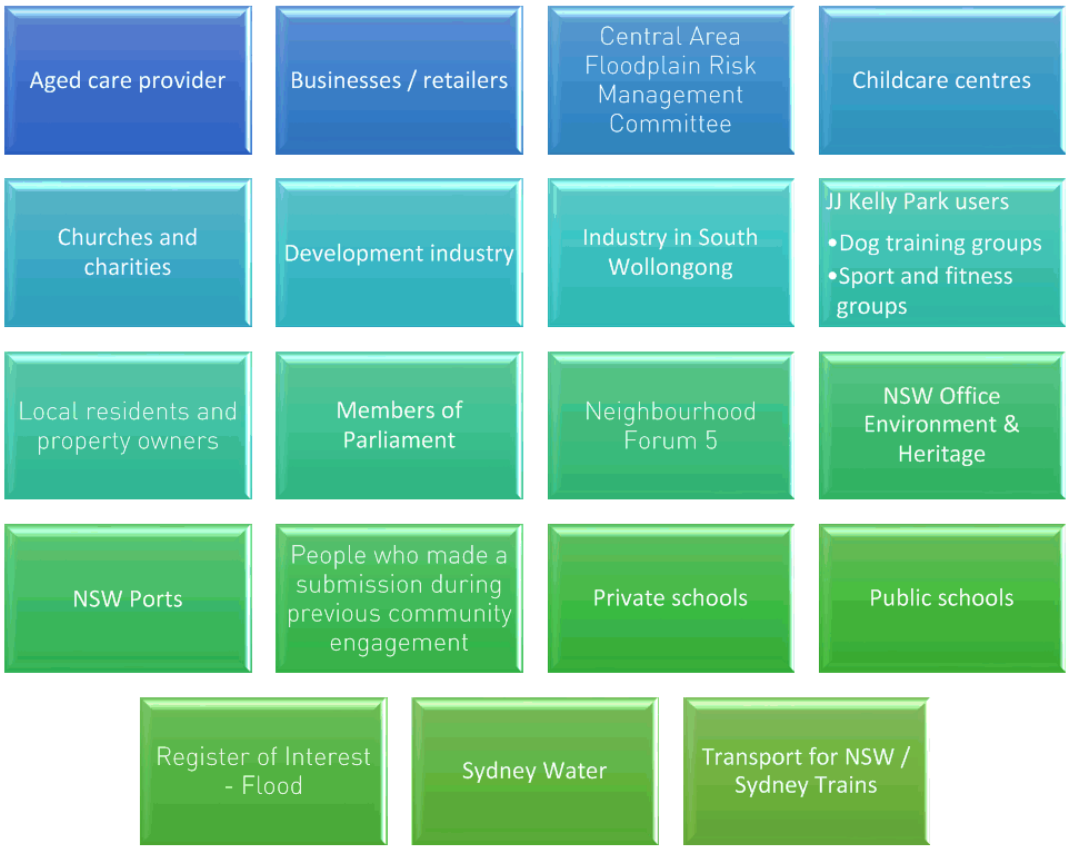
The outcomes of the exhibition and resulting amendments to the Study will be reported to the Central Floodplain Risk Management Committee and Council in view of adopting it in 2019.

Figure 1 Wollongong City Catchment



Methods

Our Stakeholders



Our Methods

Table 1: Details of methods and distribution

Methods	Details of Methods
Meeting	Information about the proposal was presented at the Floodplain Risk Management Committee (Central) meeting on 16 April 2019 which was also attended by NSW Ports, and also at the Neighbourhood Forum 5 meeting on 5 June 2019.
Letter	A letter about the public exhibition, information sessions and how to submit feedback (via phone, email, in person or post) was mailed to local residents and property owners
Emails and phone calls	Correspondence about the public exhibition, information session and ways to provide comment (via phone, email, in person or post) was distributed to stakeholders.
Frequently Asked Questions	Responses to questions about updates to the Study and floodplain risk management were distributed with the letter and emails, published on the project webpage and distributed at the information sessions.
Advertiser	Notices were published in the 22 May and 5 June Advertiser to promote the exhibition
Media	A media release with the information was distributed by Council's Media team. Two articles were published in local news media: • *Council seeking public comment on Wollongong City Flood Study Review*, 22 May 2019 https://www.illawarramercury.com.au/story/6147832/flood-levels-in-wollongong-city-rise-slightly-report/ • *Wollongong City flood study review blames it on the rain, not development or stormwater overflow*, 26 May 2019 https://www.illawarramercury.com.au/story/6180551/flooding-blame-it-on-the-rain-not-development-study-says/
Community Information Sessions	Two drop-in sessions were held to provide the community with information on the work undertaken to date and findings of the Report. The Report, flood modelling maps, flood modelling video and images of flood mitigation work taking place in the catchment were displayed along with the FAQ and feedback forms. Floodplain management engineers working on the Study were on hand to answer questions.

Methods	Details of Methods
Engagement HQ Website	All stakeholders were notified of the project webpage which hosted the following: • Survey for providing general comments on the updated flood study • Frequently Asked Questions with information on the Study and flood risk management • News Feed for updates on project progress • Document Library with the Report Flooding in Wollongong video
Video	The Flooding in Wollongong video was used on the Engagement HQ webpage and a flood modelling video was screened at the community information sessions.

Results

All stakeholders and the wider community were invited to provide feedback on the draft Study. This section provides details on the participation at engagement activities (Table 2), and the feedback received during the exhibition period.

Engagement Participation

Details of the number of participants for each engagement activity are presented in Table 2.

Table 2: Engagement participation results

Engagement Activities	Participation
Central Floodplain Risk Management Committee Meeting	10
Drop-in Community Information Session at Wollongong Art Gallery	25
Drop-in Community Information Stand at JJ Kelly Park	37
Online Participation • Aware – Total number of users who viewed the project page • Informed – Total number of users who clicked a hyperlink, e.g. to download a document • Engaged – Total number of users who actively contributed to the project, e.g. submitted feedback via the online form	 148 88 3

Submission Results

There were a total of 7 submissions; 1 email, 3 online forms and 3 letters. Discussions from drop-in sessions are also presented in this section.

The feedback themes were:

Support for Council's flood risk management

Most feedback was generally supportive of Council's flood risk mitigation work for the catchment.

> It is pleasing to note that building new structures such as detention basins and swales, or improving existing ones to better manage stormwater and floods, is part of the plan and this is being carried out.

Impact of new developments on sewer

There were some concerns or misunderstandings about new development perceived to be causing sewer overflow, more flooding and increased run off.

Stormwater drainage

Requests were made for improvements or maintenance for stormwater drainage.

> When will the blocked stormwater drain near my house be fixed?

Areas mapped as flood affected

There were some concerns or misunderstandings about why some areas had been mapped as being affected by the Probable Maximum Flood (PMF - the largest flood that could conceivably occur at a location), even though they hadn't witnessed flooding in these areas.

> My property in South Wollongong has been in my family since 1976 and in that time we have not experienced flooding.

Flood risk to individual properties

Most people were interested in finding out what the flood risk for their property was, or if it had changed since the last Study.

> Has the flood study been revised in regard to our property, and if so, is what is the flood risk for our property?

Floodplain risk management in other catchments

There was some interest in floodplain risk management and mitigation works in other catchments.

> Thank you for the [flood mitigation] work happening in Cabbage Tree Lane [Fairy Meadow]. Looks good.

Flood insurance premiums

There were concerns about potential impacts of the updated modelling on flood insurance premiums.

Contradictory information

A comment was made that the Study was perceived to have contradictory information to what was stated in the Frequently Asked Questions and at information sessions, relating to rainfall patterns, impacts of urban development, changes in Gurungaty waterway and increase in vegetation.

Figure 2: Community information stand at JJ Kelly Park

Appendix A: Stakeholder Letter

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WOLLONGONG CITY COUNCIL

Address 41 Burelli Street Wollongong • **Post** Locked Bag 8821 Wollongong DC NSW 2500
Phone (02) 4227 7111 • **Fax** (02) 4227 7277 • **Email** council@wollongong.nsw.gov.au
Web www.wollongong.nsw.gov.au • ABN 63 139 525 939 - GST Registered

«PAFBSP»

«Owner»
«StreetNoandAddress»
«SuburbStatePostcode»

Our Ref Z19/90402
File CCE-040.010.01.295
Date 16 May 2019

Dear Sir/Madam

WOLLONGONG CITY FLOOD STUDY REVIEW

I'm writing to provide you with an update on our review of the Wollongong City Flood Study. The community contributed valuable information to the review, with Council receiving hundreds of submissions about the flooding and drainage problems they'd experienced on their properties. There is now a draft addition to the Flood Study with information on how the review was done and what the results are.

The updated Study explains the ways flooding happens in the Wollongong City catchment (see catchment map overleaf). It uses Council's revised Blockage Policy, which was updated in 2016. This Policy helps us to work out how the blockage of stormwater structures might affect flooding. The Study considers recent urban developments, changes to the Gurungaty waterway and information collected after recent flood events. It also answers questions from the community about the flooding experienced in recent years. Enclosed is a Frequently Asked Questions sheet that provides more information about this and other updates to the Study.

We'd like to share the updated Study with the community. Come along to one of our drop-in community information sessions for a chat with the floodplain engineers working on the review. These are drop-in sessions, so you can come in at any time.

Mid-week Session Thursday 30 May 2019, drop in anytime between 4pm – 6pm
BlueScope Gallery, Level 3, Wollongong Art Gallery
46 Burelli St, Wollongong

Weekend Session Saturday 1 June 2019, drop in anytime between 10am – 12pm
JJ Kelly Park (near the playground)
Corner of Swan & Keira St, Wollongong
(If the weather is bad, we'll relocate to the Level 9 Function Room in Council's Admin building, 41 Burelli St, Wollongong)

If you'd like to attend and have accessibility or mobility requirements, or need an interpreter, please contact me to let me know how we can support your attendance. If you'd like to learn more but are unable to attend a session, information and a form to provide feedback online will be available on our website www.wollongong.nsw.gov.au until 5pm Tuesday 18 June 2019.

Please contact me should you require further information.

This letter is authorised by

Jen Lysle-van Dyk
Engagement Officer
Wollongong City Council
Telephone (02) 4227 7111

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Map showing the Wollongong City Catchment

Page 2 of 2

Appendix B: Frequently Asked Questions

OUR PLACE our voice OUR FUTURE

Wollongong City Flood Study Review

As part of our commitment to managing flood and stormwater risks in our region, we've updated the Wollongong City Flood Study and are letting the community know what's changed.

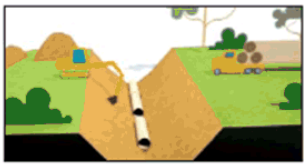
Please let us know if you have comments or questions by 5pm Tuesday 18 June 2019

How does Council manage flood risk?

Each year, Council spends millions of dollars on stormwater and floodplain management. Our team of flood experts prepare flood studies and floodplain risk management studies that help us understand the flood behaviour for a particular catchment and see if there are any ways of reducing flooding risk in an area.

Floodplain risk management studies include a plan of potential solutions aimed at reducing the existing and future flood risk. Examples of these solutions include:

- Emergency response plans based on detailed understanding of flood behaviour
- Building new structures that collect and carry stormwater into drains or creeks, such as detention basins and swales, or improving existing ones to better manage stormwater and floods
- Land zoning that says what can and can't be built on flood-prone land
- Voluntary purchase of houses built in high flood risk areas



Installing a stormwater drain

What is a '1 in 100 year' flood?

A flood event that has the probability of occurring, on average, once every 100 years, i.e. there is a 1% chance of a flood of this size or larger occurring at a particular location in any given year. This doesn't mean that if a location floods one year, that it won't flood again for the next 99 years. Some parts of Australia have had several '1 in 100 year' floods within a decade of each other. Within the Floodplain Risk Management Study and Plan, the '1 in 100 year' flood is called the **1% Annual Exceedance Probability (AEP) flood event**.

What is the Flood Planning Level?

The height used to set floor levels for property development in flood-prone areas. It's generally the 1% AEP flood level + an appropriate freeboard. This level may be higher for properties occupied by people who have less capacity to respond to flooding, which may pose evacuation challenges, such as hospitals or schools.

What is a freeboard?

A height above the 1% AEP flood level that's included in the Flood Planning Level to account for factors such as wind, waves, uncertainty in blockages or other factors, and other localised hydraulic effects. Freeboard is usually 0.5m above a flood level.

What is the Flood Planning Area?

The area within which developments may be conditioned with flood-related development controls. The flood planning area is calculated as the area below the Flood Planning Level.

What is a catchment?

An area where water is collected by the natural landscape, usually surrounded by mountains or hills. In a catchment, rainwater run-off eventually flows to a creek, river, dam, lake or ocean.

Why do flood levels need to be reviewed over time?

There's a chance that floods of any size will occur in future. As the size of a flood increases, the chances of it occurring becomes smaller. Some rare types of floods may not have occurred for over 100 years, so we have to predict the height of future floods using computer models. These models produce different flood levels and velocities (speeds) for a variety of different-sized floods. To predict flood levels, Council works with experts to establish and operate the computer models. Council also gets valuable community input on historical floods so we can adjust the model and make sure it copies what's happened in the past.

From time to time, these models are reviewed and predicted levels may change. The reasons why can include:

- New floods occur, providing

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1

additional data to fine-tune the model

- More advanced computer models or methods for estimating flood levels become available
- Changes in the catchment, such as flood mitigation works or new developments
- Changes in policy (such as Council's culvert Blockage Policy)

How are flood affected properties identified?

Council's flood modelling shows the size of flooding throughout the catchment and which properties are partially or fully impacted by flooding.

Example of a flood modelling map

Where can I get information about flood levels on my property?

Council has historical flood level records and/or our completed flood studies for some properties, but not all. Please contact our Drainage Duty Officer on (02) 4227 7111 to find out what's available for your property.

What has changed in the updated Wollongong City Flood Study?

- We've considered Council's revised Blockage Policy
- We have improved information, such as recent data from land and waterway surveying
- The new flood model was checked against the June 2016 and March 2017 events and was able to produce the same flood levels recorded by the community
- The pedestrian bridge across the waterway is modelled as being partly blocked, in line with the updated Blockage Policy
- We've considered the upcoming lowering of the Gurungaty causeway
- The increase in mangrove growth over the last 10 years has been included

The combination of all these changes generally resulted in similar flood levels in some areas, decrease of flood levels in the upper part of the catchment and increase in flood levels mainly in South Wollongong (up to 0.2m)

What does the Study say about flooding in South Wollongong?

We've aimed to respond to residents' concerns about the floods experienced over the last 5 years in South Wollongong. We've found that:

- There has been an increase in intense rainfalls that are causing the floods
- The changes in Gurungaty waterway have only minor impacts
- The volume of wet weather sewer overflows is relatively small and results from stormwater flows from within the catchment. Wet weather sewer overflows are not considered to be a contributing factor to the flooding issues at Swan Street and adjoining streets.
- Sea levels can impact on flooding in the area, as stormwater takes longer to drain out to sea from low-lying coastal areas in high tides
- New developments do not increase flows to this area

The study recommends investigating in more detail the potential impacts of wet-weather sewer overflows and changes in the Gurungaty waterway as part of the floodplain risk management study, which is the next step in our floodplain risk management process.

What other flood mitigation work is Council doing in this catchment?

The detailed design to lower the Gurungaty Causeway is finished and work will start shortly. This will help reduce flood impacts in Swan St for smaller flood events.

We've finished constructing a floodway through JJ Kelly Park that stores additional run-off in mid-sized storms and helps floodwaters drain away faster in larger storm events. We're also working on a study to see if it's possible to lower the ground at JJ Kelly Park so it temporarily stores run-off. We've completed soil sampling, lab testing and initial designs. We're now working on a Cost Benefit Analysis to compare the costs of the project with its benefits. If achievable, it could help reduce flood impacts in Swan St for smaller flood events.

We've completed detailed design on maintenance access for the culvert in Swan St opposite Church St. A culvert is a tunnel or drain structure built under roads, bridges and railways, to allow water to flow underneath. We're also working on a proposal to improve maintenance access to the culvert in Swan St, opposite Kembla St, which is currently limited due to a high pressure pipeline. These improvements will help the culverts work more efficiently in small floods. Works on the culvert access opposite Church St will start later this year.

How can I join the conversation?

There are a number of ways to ask questions or share your feedback with us:

⇒ **Complete an online feedback form on Council's website www.wollongong.nsw.gov.au**

⇒ **Phone (02) 4227 7111**

⇒ **Email engagement@wollongong.nsw.gov.au**

Appendix C: Feedback Form

WOLLONGONG CITY FLOOD STUDY REVIEW

Community Feedback Form

As part of our commitment to managing flood and stormwater risks in our region, we've recently updated the Wollongong City Flood Study and would like your input.

All feedback must be received by 5pm Tuesday 18 June 2019.

Please share your comments about the revised Wollongong City Flood Study.

Please return completed form to:
Wollongong City Council Community Engagement Unit
Locked Bag 8821
Wollongong NSW 2500
Telephone: 02 4427 7111
Facsimile: 02 4227 7580
Email: engagement@wollongong.nsw.gov.au

More overleaf....

www.wollongong.nsw.gov.au

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If there isn't enough room for your comments, please attach additional paper to this form.

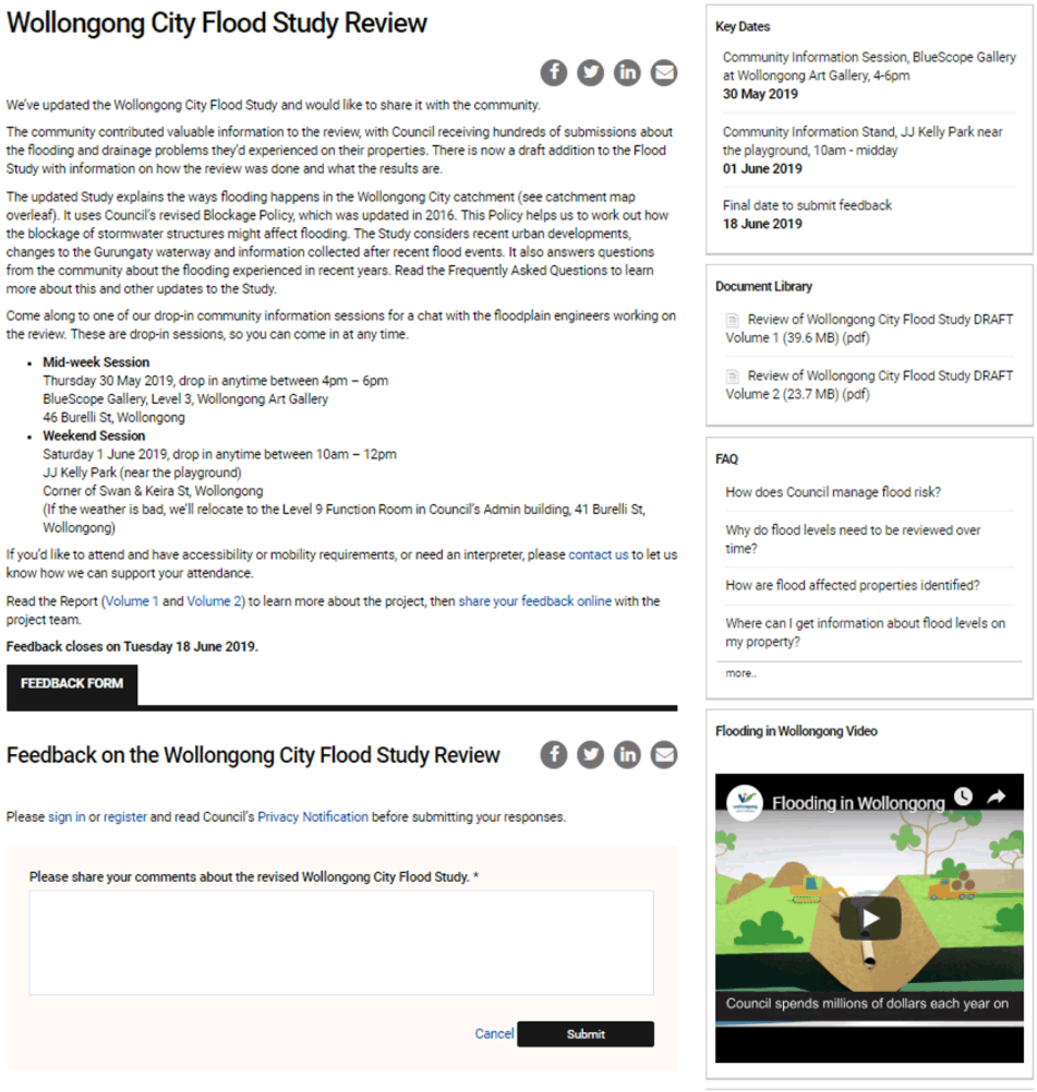
If you'd like a reply to your submission and to be kept informed of progress, please fill in the section below:

Name:	
Address:	
Suburb:	Email:

Privacy Notification:
The purpose for seeking your submission on advertised matters is to better assist Council in its decision making processes.
The intended recipients of your submission are officers within Council and those granted lawful access to the information. Your submission may be exhibited on Council's website and included in publicly accessible registers. If you make an anonymous submission, Council will be unable to contact you further.
If your submission relates to a development proposal or other relevant planning application, Council is required to disclose on its website all relevant details of political donations or gifts made by you, including your name and address.
In limited circumstances, you may apply for suppression of your personal information from a publicly accessible register. Further information is available on Council's website at www.wollongong.nsw.gov.au/pages/privacy.aspx or by phoning Council on (02) 4227 7111

www.wollongong.nsw.gov.au

Appendix D: Webpage



Wollongong City Flood Study Review

We've updated the Wollongong City Flood Study and would like to share it with the community.

The community contributed valuable information to the review, with Council receiving hundreds of submissions about the flooding and drainage problems they'd experienced on their properties. There is now a draft addition to the Flood Study with information on how the review was done and what the results are.

The updated Study explains the ways flooding happens in the Wollongong City catchment (see catchment map overleaf). It uses Council's revised Blockage Policy, which was updated in 2016. This Policy helps us to work out how the blockage of stormwater structures might affect flooding. The Study considers recent urban developments, changes to the Gurungaty waterway and information collected after recent flood events. It also answers questions from the community about the flooding experienced in recent years. Read the Frequently Asked Questions to learn more about this and other updates to the Study.

Come along to one of our drop-in community information sessions for a chat with the floodplain engineers working on the review. These are drop-in sessions, so you can come in at any time.

- **Mid-week Session**
  Thursday 30 May 2019, drop in anytime between 4pm – 6pm
  BlueScope Gallery, Level 3, Wollongong Art Gallery
  46 Burelli St, Wollongong
- **Weekend Session**
  Saturday 1 June 2019, drop in anytime between 10am – 12pm
  JJ Kelly Park (near the playground)
  Corner of Swan & Keira St, Wollongong
  (If the weather is bad, we'll relocate to the Level 9 Function Room in Council's Admin building, 41 Burelli St, Wollongong)

If you'd like to attend and have accessibility or mobility requirements, or need an interpreter, please contact us to let us know how we can support your attendance.

Read the Report (Volume 1 and Volume 2) to learn more about the project, then share your feedback online with the project team.

Feedback closes on Tuesday 18 June 2019.

FEEDBACK FORM

Feedback on the Wollongong City Flood Study Review

Please sign in or register and read Council's Privacy Notification before submitting your responses.

Please share your comments about the revised Wollongong City Flood Study. *

Cancel Submit

Key Dates

Community Information Session, BlueScope Gallery at Wollongong Art Gallery, 4-6pm
30 May 2019

Community Information Stand, JJ Kelly Park near the playground, 10am - midday
01 June 2019

Final date to submit feedback
18 June 2019

Document Library

Review of Wollongong City Flood Study DRAFT Volume 1 (39.6 MB) (pdf)

Review of Wollongong City Flood Study DRAFT Volume 2 (23.7 MB) (pdf)

FAQ

How does Council manage flood risk?

Why do flood levels need to be reviewed over time?

How are flood affected properties identified?

Where can I get information about flood levels on my property?

more..

Flooding in Wollongong Video

Appendix E: Flood Study Report

JACOBS

The Review of Wollongong City Flood Study

Wollongong City Council

Addendum 1 to Wollongong City Flood Study

(To be read in conjunction with the Wollongong City Flood Study, April 2013)

Volume 1 - Report

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08 May 2019

Client Reference

Revision	Date	Description	By	Review	Approved
0	26/10/2018	Draft report for comment	P Dunne	A Hossain	A Hossain
1	29/01/2019	Updated Draft incorporating comments from Wollongong City Council and OEH	P Dunne	A Hossain	A Hossain
2	05/04/2019	Updated Draft incorporating additional comments from Wollongong City Council and OEH. Updated draft flood impact mapping not included.	P Dunne	A Hossain	A Hossain
3	08/05/2019	Final Draft incorporating comments from Wollongong City Council and OEH.	P Dunne	A Hossain	A Hossain

Distribution of copies

Revision	Issue approved	Date issued	Issued to	Comments
0	A Hossain	29/10/2018	P Milevski	Draft Review of Wollongong City Flood Study prepared as an Addendum to the 2013 flood study
1	A Hossain	30/01/2019	P Milevski	Updated Draft incorporating comments from Wollongong City Council and OEH
2	A Hossain	05/04/2019	P Milevski	Updated Draft incorporating additional comments from Wollongong City Council and OEH. Updated draft flood impact mapping not included.
3	A Hossain	08/05/2019	P Milevski	Final Draft incorporating comments from Wollongong City Council and OEH.

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JACOBS

The Review of Wollongong City Flood Study

Wollongong City Council

Addendum 1 to Wollongong City Flood Study

(To be read in conjunction with the Wollongong City Flood Study, April 2013)

Volume 2 – Design event flood maps

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08 May 2019

Attachment 3 - Z19/171974 - Council Response to Community Feedback

Comments from the submissions and at drop in sessions related to -

Key themes	Council's response
General support of Council's flood risk management work for the catchment	• Council has a significant commitment in its Infrastructure Delivery Program for floodplain mitigation and stormwater works • Recent works completed include a swale in JJ Kelly Park next to Swan Street and the lowering of the Gurungaty Causeway.
Concerns or misunderstandings about new development perceived to be causing sewer overflow, flooding and increased run-off	• The draft flood study report analysed and documented the potential impact of new developments and demonstrates that they do not result in increased flows to the south Wollongong catchment, impacts of new developments are minimal and localised. • Sewer overflows volumes have been compared in the draft flood study report to the overall volume of the flood, and found to be insignificant. In addition sewer overflows mainly results from stormwater flows that would anyway contribute to the flood.
Concerns or misunderstandings as to why some areas had been mapped as being flood affected, even though some people hadn't witnessed flooding in these areas	• Areas mapped as flood affected include the 1% AEP Flood and PMF floods. Such floods have a very rare occurrence and haven't been experienced in recent history in this catchment. It is not surprising nor uncommon that some owners see their property mapped as flood affected but they haven't witnessed flooding at this location.
Interest in finding out what the flood risk is for property they own or live in, or if it had changed since the last Study	• The maps in the flood study report that were also displayed at drop in sessions show differences between the previous study and the draft flood study flood levels.
Requests for improvements or maintenance for stormwater drainage	• Those requests were forwarded to the maintenance crews where enough information was provided. It is important to note that maintenance or improvements of the stormwater drainage systems generally results in small benefits during more frequent events. In large flood events the drainage systems are generally 'drowned' and do not contribute to flood mitigation.
Interest in floodplain risk management and mitigation works in other catchments	• Council's website includes information on floodplain risk management and mitigation works in other catchments. • Public exhibition of draft flood study reviews in other catchments is progressing providing an opportunity for residents to find out more flood information for their location of interest.
Concern about the potential impacts of the updated modelling on flood insurance premiums	• Fact sheets on insurance were provided to residents. People were advised that the standard definition of 'flood' for insurance purpose may or may not apply to their properties and that the standard definition does not include overland flows and that overland flows are typically covered as a standard inclusion in home insurance policies. Council doesn't have any say in what and how flood data is used by insurers for setting flood premiums. We recommend that homeowners contact their insurer about the flood premium for their property.
Interpreting the Study as having contradictory information to what was stated in the Frequently Asked Questions and at information sessions	• The final report was revised to consider and address potential contradictory information between the FAQ and the report.