

ITEM 7 COLLINS CREEK FLOOD STUDY 2019

The Collins Creek Flood Study (2019) has been finalised following public exhibition between 17 June 2019 to 19 July 2019. It is recommended Council adopt the Collins Creek 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 combined Collins Creek Catchment. This catchment includes the sub-catchments of Collins Creek, Bellambi Lake, Bellambi Gully, Farrahars Creek, and Whartons Creek.

The reports and flood models for the Collins Creek 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

- 1. That the Collins Creek Flood Study (2019) be adopted.
- 2. Persons who made submissions be thanked and advised of Council's decision.

REPORT AUTHORISATIONS

Report of:Mike Dowd, Manager Infrastructure Strategy + Planning

Authorised by: Andrew Carfield, Director Infrastructure + Works

ATTACHMENTS

- 1 Executive summary Collins Creek Flood Study 2019
- 2 Community Engagement report Collins Creek Flood study 2019
- 3 Submissions key themes and Council's responses

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 floodplain management plan implementation exist that warrant a review.



Collins Creek Flood Study

In 2017, Catchment Simulation Solutions was commissioned by Wollongong City Council (WCC) to review the Collins Creek Flood Study (2011) 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, and additional development within the catchment.

The results show that the revised 1% AEP flood levels are very similar to the 2011 Flood

Study levels across most of the floodplain. There are negligible (i.e. within 0.1m) flood level differences across 60% of the floodplain, higher flood levels across 15% of the floodplain, and lower flood levels across 25% of the floodplain. In areas where there are more significant differences (i.e. not within 0.1m), the revised 1% AEP flood levels are more commonly lower than higher than the 2011 Flood Study levels.

Attachment 1 to this report provides an executive summary of the final report recommended for adoption by Council.

PROPOSAL

The Collins Creek 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

On the 28th of May 2019, the draft flood study was presented to the Northern Floodplain Risk Management Committee who recommended public exhibition of the draft report.

The final draft Flood Study report went on public exhibition between 17 June 2019 to 19 July 2019. A weekend community drop-in session at the Bulli Senior Citizens Centre on Saturday 22 June from 9:30am – 11am was attended by 55 community members. A second drop-in session was held at the Bulli Surf Lifesaving Club on Tuesday 25 June from 4pm – 5:30pm and was attended by 39 community members.

A letter to over 5,300 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.

Notices of the public exhibition were published in the local newspaper on 19 and 26 June 2019. 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. 96 people downloaded the documents from the Website. There were a total of 30 submissions throughout the exhibition period.

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

- Perceived causes of flooding
- Flooding impacts on property
- Flood mitigation options
- Flood mitigation work in the catchment
- Creek maintenance
- Development
- Responsibility for managing flood risk
- Insurance premiums



Persons who made a submission were thanked and advised of this matter being reported to Council for adoption.

A community engagement report is provided in attachment 2 and outlines in more detail the process and outcomes of the consultation.

Attachment 3 provides responses to all key themes raised during the consultation.

The comments provided can be addressed through on-going education on floodplain management, or considered as part of the future review of the floodplain risk management study and plan for the catchment, they do not have any direct relation to the draft flood study report and did not result in changes to the draft report that was presented to the Northern Floodplain Risk Management Committee.

The committee has been advised of the outcomes of the public exhibition and has not raised any objection to Council adopting 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 2019-20 Operational Plan Actions	
Strategy		3 Year Action		
	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 Collins Creek Flood Study (2019) has cost \$107,628 excl. GST

CONCLUSION

The Collins Creek Flood Study (2019) was prepared with the cooperation, assistance and support of many stakeholders, including community members and State government representatives and the Northern Floodplain Risk Management Committee.

The study improves the accuracy and reliability of flood levels and flood behaviour in the Collins Creek Catchment. The reports and flood models for the Collins Creek 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.







Collins Creek Flood Study

Final Report Volume 1 of 2: Report & Appendices



Revision 4 September 2019

Catchment Simulation Solutions



EXECUTIVE SUMMARY

Introduction

The Collins Creek Flood Study area is located within the Wollongong City Council Local Government Area and covers a total area of 14 km². As shown in **Figure E1**, the study area incorporates five major catchments, namely:

- Bellambi Lake;
- Bellambi Gully;
- Farrahars Creek;
- Collins Creek; and
- Whartons Creek.

Flooding across the study area has been experienced on a number of occasions with the most notable floods occurring on 20 October 1987, 30 April 1988 and 17 August 1998. The August 1998 flood, in particular, inundated a number of properties and caused significant damage to public and private property.

In recognition of the significant impact that flooding has had on the community, Wollongong City Council prepared the 'Combined Catchment of Whartons, Collins and Farrahars Creeks, Bellambi Gully and Bellambi Lake Flood Study' (Lyall & Associates) in 2011. The 2011 flood study defined design flood behaviour for a range of design floods based upon catchment conditions and Council policy at that time.

However, since the flood study was prepared in 2011, Council has adopted a revised blockage policy (referred to as the 2016 blockage policy) and additional development has also occurred across each of the catchments. These changes have prompted Council to review and update the flood study for the Collins Creek area. This report documents the outcomes of the flood study review.

Flood Models

The flood results documented in the 2011 Flood Study were based upon hydrologic and hydraulic computer models of each catchment that were developed specifically for the flood study. Each model was reviewed as part of the current study to ensure they were developed in accordance with modern best practice and would provide the best possible description of flood behaviour across the full study area.

In general, the models were found to be suitable. However, some updates were completed as part of the current study to improve the definition of flood behaviour provided by the models. This included a reduced grid size in the hydraulic model as well as a more detailed description of the variation in land use in both the hydrologic and hydraulic models. In addition, sections of the hydraulic model were expanded to include areas that were omitted



from the 2011 flood study. It was these updated flood models that formed the basis for this flood study.

Impact of Catchment Development and 2016 Blockage Policy

A range of "scenarios" were developed as part of this flood study to quantify the impact of catchment and policy updates on flood behaviour (as defined in the 2011 Flood Study). The scenarios included:

- <u>Scenario ID Base:</u> reflects 2011 catchment conditions and Council's 2009 blockage policy (i.e., what was adopted as part of the 2011 flood study)
- Scenario ID 1: includes updates to reflect the 2016 blockage policy;
- Scenario ID 2A and 2B: includes updates to reflect catchment development since 2011.

Table E1 summarises each of the scenarios that were investigated as part of this flood study.**Table E1** also highlights which variable was altered as part of each scenario.

SCENARIO ID	CATCHMENT DEVELOPMENT SCENARIO	TOPOGRAPHIC DATASET	BLOCKAGE POLICY	CLIMATE CHANGE CONDITIONS
BASE ¹	2011	2005/2007 ALS	2009	-
1	2011	2005/2007 ALS	2016	-
2A 2013		2013 LiDAR	2016	-
2B	2017	2013 LiDAR + additional ground survey for individual developments	2016	-
3	To be considered as part of the future Floodplain Risk Management Study			

Table E1 Summary of Modelled Scenarios

Note:

¹ "BASE" case reflects catchment development and blockage as defined in the 2011 Flood Study

Scenario ID: 3 was originally intended to address the potential impacts of the 2016 version of Australian Rainfall and Runoff (ARR2016). However, additional ARR2016 information that was to inform this component were not sufficiently advanced to allow this assessment to be included in the current study. As a result, the ARR2016 assessment is to be considered as part of the future Floodplain Risk Management Study.

The flood models were used to simulate a range of design floods for each scenario. This included the 20%, 10%, 5%, 2%, 1%, 0.5% and 0.2% AEP floods as well as the PMF. A range of flood maps were prepared for each scenario to illustrate the flood results for each scenario. A selection of flood maps for Scenario 2B are included at the end of this Executive Summary for the 20% AEP flood, 1% AEP flood and the probable maximum flood (PMF):

- Figures ES2 to ES4 show peak flood levels;
- Figures ES5 to ES7 show peak floodwater depths;
- Figures ES8 to ES10 show peak flow velocities;
- Figures ES11 to ES12 show flood hazard.

Collins Creek Flood Study

As outlined above, Scenario ID: 2B reflects 2017 catchment conditions and Council's 2016 blockage policy. Accordingly, the results presented in **Figures ES2** to **ES12** reflect the updated, best description of design flood behaviour across the Collins Creek study area. However, it should be noted that the 2016 Blockage Policy makes provision for two different blockage scenarios (i.e., "design" and "risk management" blockage scenarios). **Figures ES2** to **ES12** reflect the results from the "risk management" blockage scenario.

The results from each of the scenarios were compared so the impact of each variable could be quantified. The outcomes of this review determined that:

- Scenario ID1 (2016 blockage policy). The 2016 blockage policy results in reductions in flood levels relative to the previous (i.e., 2009) blockage policy upstream of most hydraulic structures (e.g., bridges and culverts). The magnitude of the differences varies based on the size of the structure opening and the height of the overlying road/rail embankment but is most commonly between 0.1 and 0.5 metres. Flood levels downstream of most structures remain largely unchanged.
- Scenario ID2 (catchment development). Catchment development that has occurred since the 2011 flood study produce changes in flood behaviour that are typically very localised (i.e., contained in close proximity to the development areas) and do not have a significant and/or widespread impact on flood levels. The lack of sensitivity is considered to be associated with the fact that large scale developments have included appropriate stormwater management systems to help ensure there are no adverse floods impacts.

As noted above, the 2016 blockage policy includes two different blockage scenarios. A review of the flood level results from the "design" blockage and "risk management" blockage simulations showed that the flood level differences were most commonly less than 0.15 metres and were concentrated upstream of hydraulic structures. Due to the relatively small and localised differences between the flood level results and the significant number of additional flood simulations and flood maps that need to be documented, it is recommended that Council assess the merit of having two sets of blockage factors.

As shown in **Figure ES11**, areas of high hazard flood (e.g., \geq H4) are typically concentrated in defined watercourses during the 1% AEP flood. The flood hazard across most "built up" areas is estimated to be less than H3 during the 1% AEP flood indicating that floodwaters are unlikely to pose a significant hazard to people across most of the study area (however, there is still potential for floodwaters to mobilise cars). Nevertheless, there are some localised areas where higher hazard conditions are estimated during the 1% AEP flood including several streets where high velocity flood flows are anticipated. Furthermore, **Figure ES12** shows that during the PMF, a much larger area would be exposed to H4 or higher hazard indicating that floodwaters during particularly large floods are likely to pose a significant risk to vehicles, people and, in some cases, buildings/structures.

Climate Change

A range of additional scenarios were also developed to assess the potential impact of climate change (refer **Table E2**). This included scenarios to assess the impact of increases in rainfall intensity (Scenario ID: 4A), increases in sea level (Scenario ID: 4B and 4C) as well as increases





in rainfall intensity <u>and</u> sea level (Scenario ID: 4D and 4E). All climate change simulations employed the Scenario 2B model as the "base".

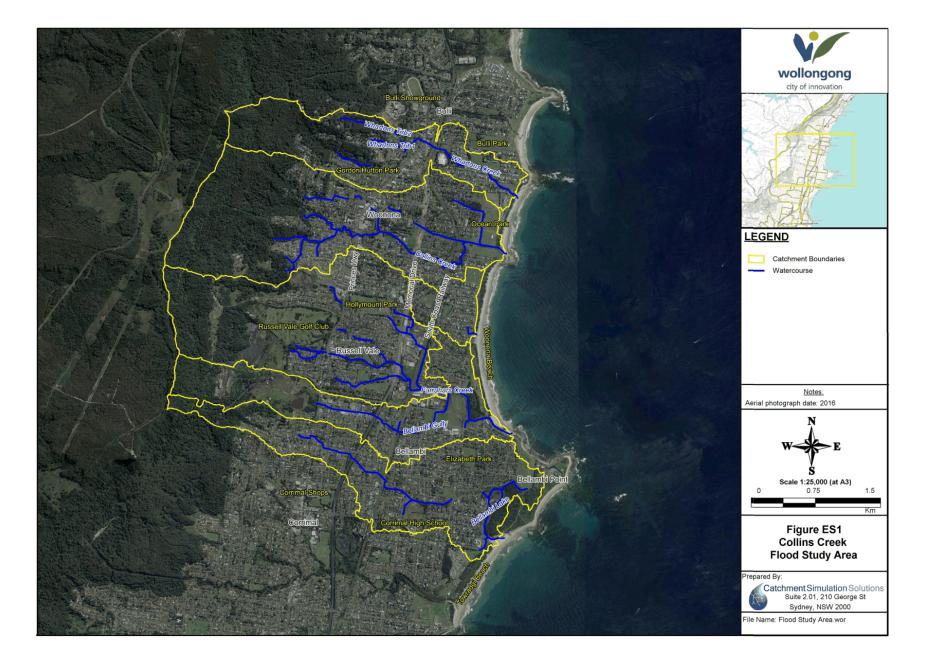
SCENARIO ID	CATCHMENT DEVELOPMENT SCENARIO	TOPOGRAPHIC DATASET	BLOCKAGE POLICY	CLIMATE CHANGE CONDITIONS	
4A	2017	2013 LiDAR + additional ground survey for individual developments	2016	20% increase in rainfall intensity	
4B	2017	2013 LiDAR + additional ground survey for individual developments	2016	0.4m Sea Level Rise	
4C	2017	2013 LiDAR + additional ground survey for individual developments	2016	0.9m Sea Level Rise	
4D	2017	2013 LiDAR + additional ground survey for individual developments	2016	20% increase in rainfall intensity <i>plus</i> 0.4m Sea Level Rise	
4E	2017	2013 LiDAR + additional ground survey for individual developments	2016	20% increase in rainfall intensity <i>plus</i> 0.9m Sea Level Rise	

T F 0	6	C CIT	C 1	c :
Table E2	Summary	of Climate	Change	Scenarios

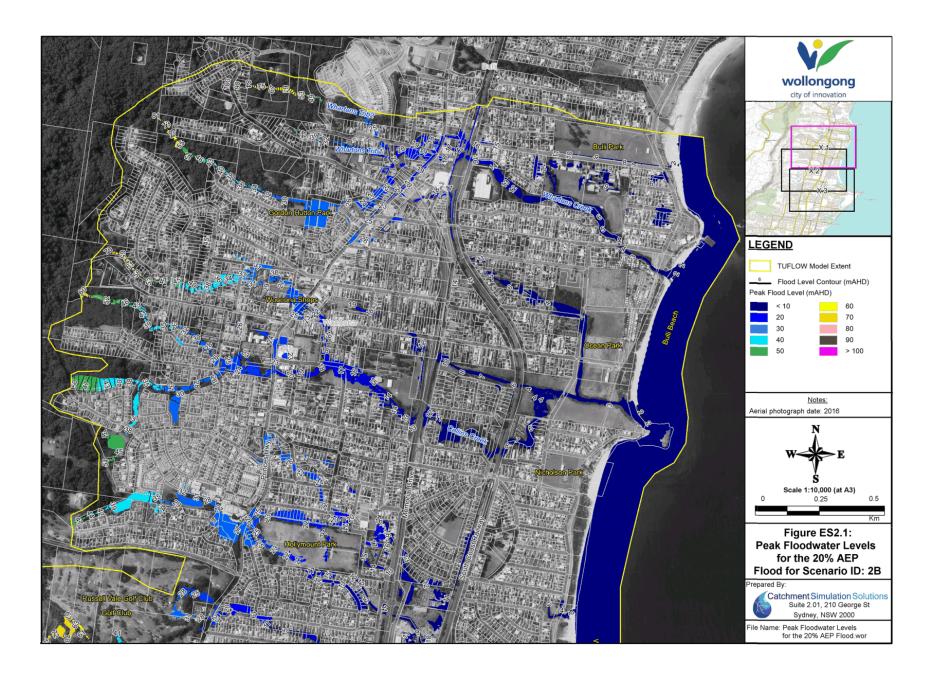
The results of the climate change simulations showed that climate change is predicted to increase flood levels across the study area. More specifically:

- Sea level increases are predicted to increase flood levels along the coastal foreshore areas as well as across some estuarine areas. Sea level increases are not predicted to increase the flood affectation across the more elevated sections of each catchment (i.e., the majority of the study area).
- Increases in rainfall intensity are predicted to increase flood levels along most major waterways including the more elevated sections of the study area. Flood levels are predicted to increase by more than 0.1 metres at most locations. However, more significant increases are predicted in the vicinity of major hydraulic structures.

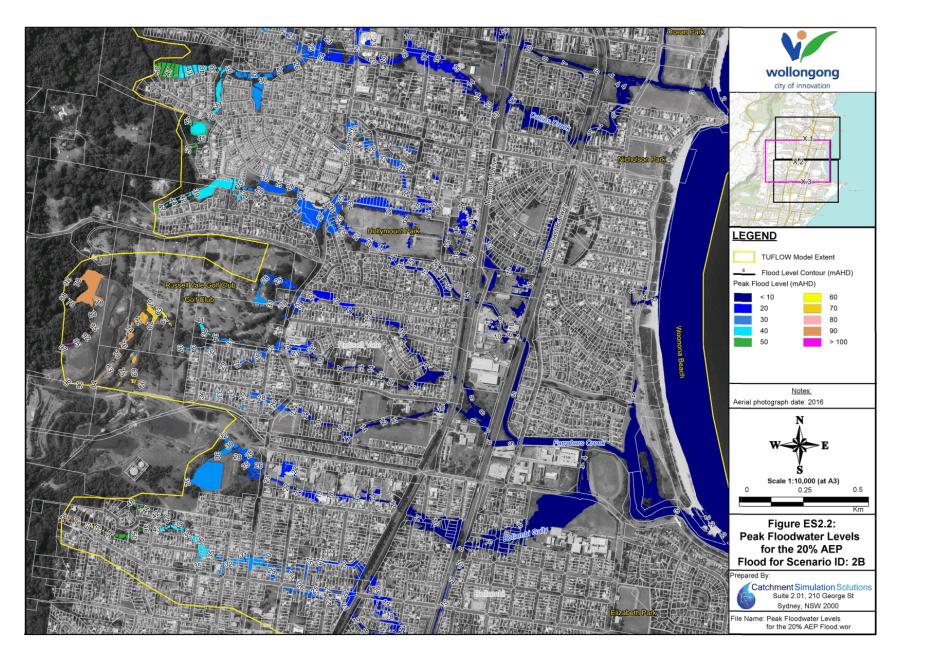




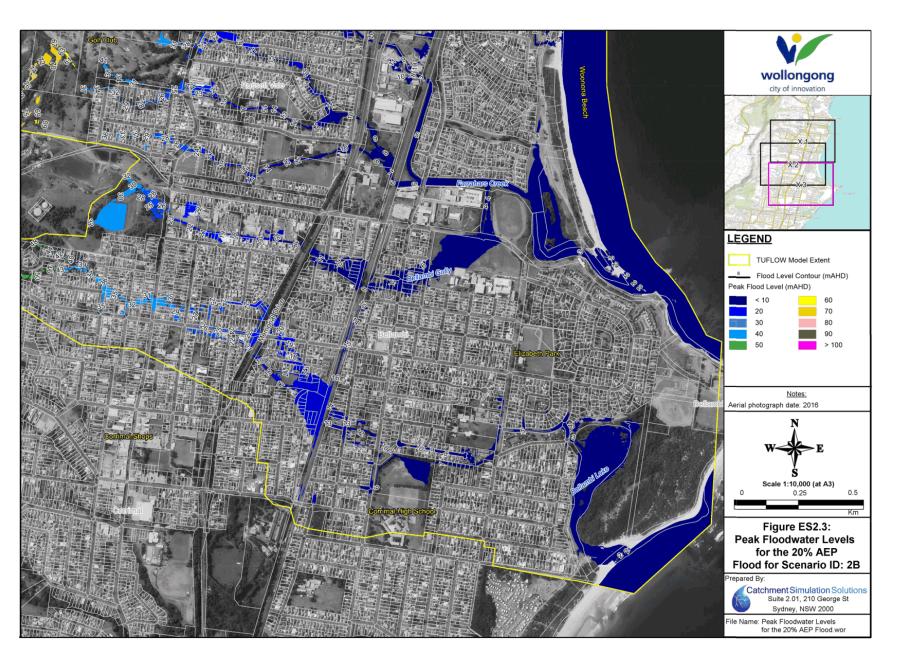




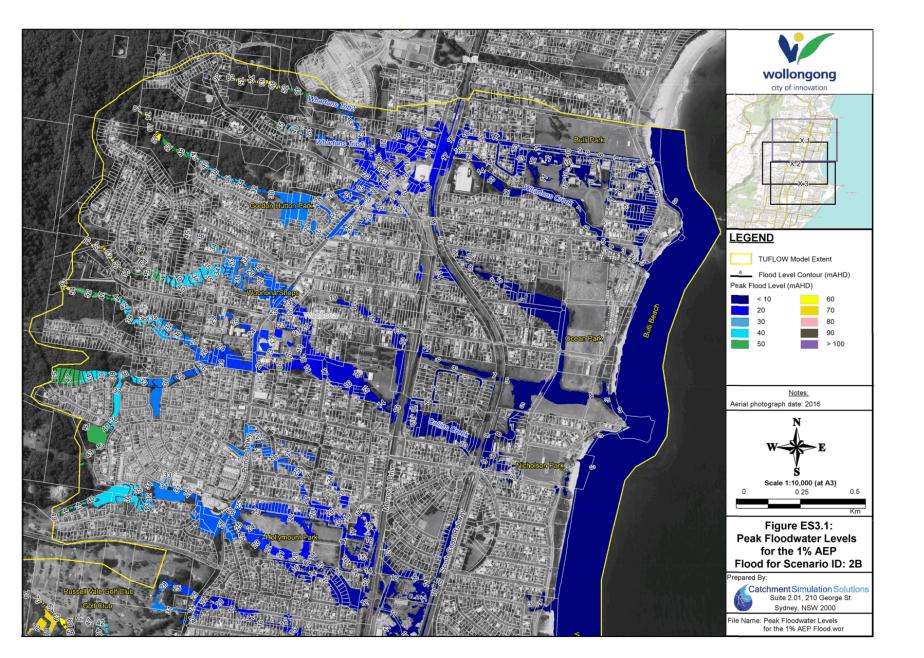




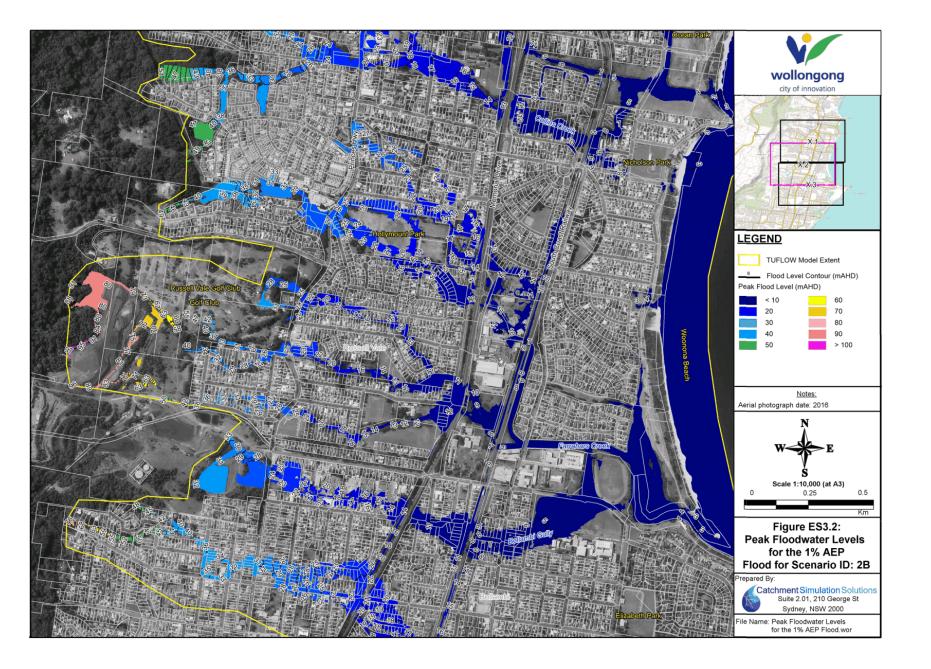




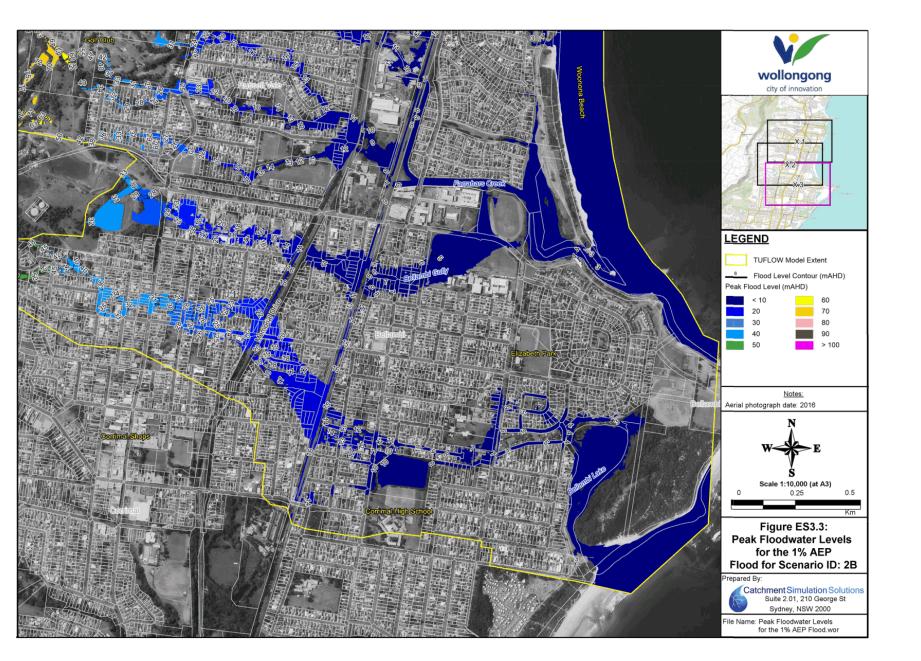






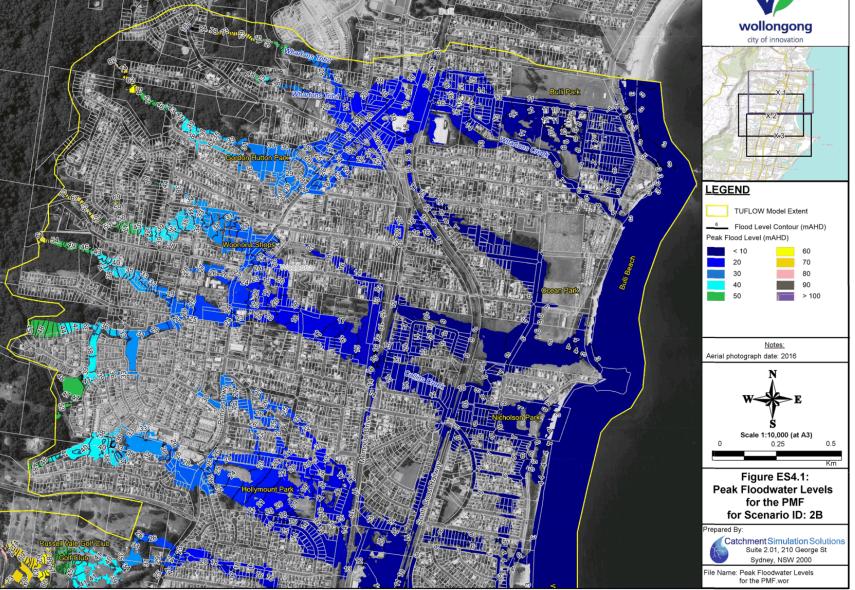




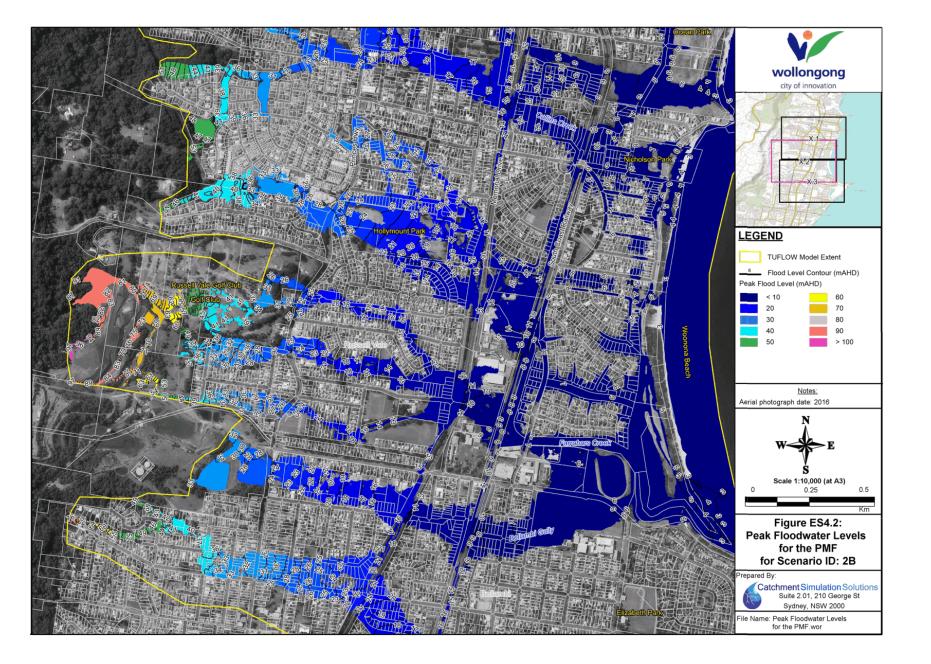




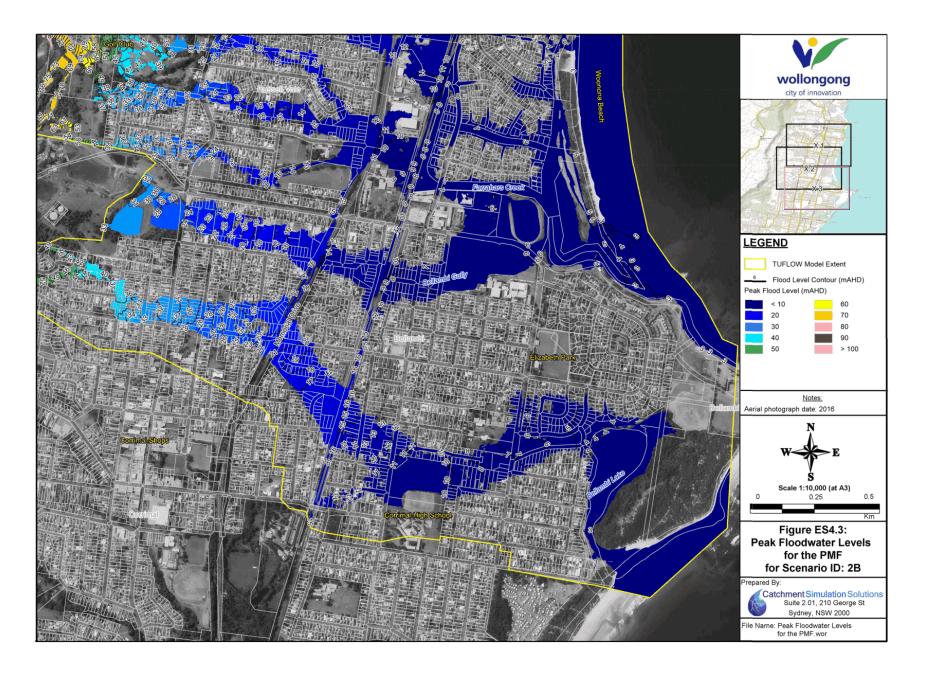




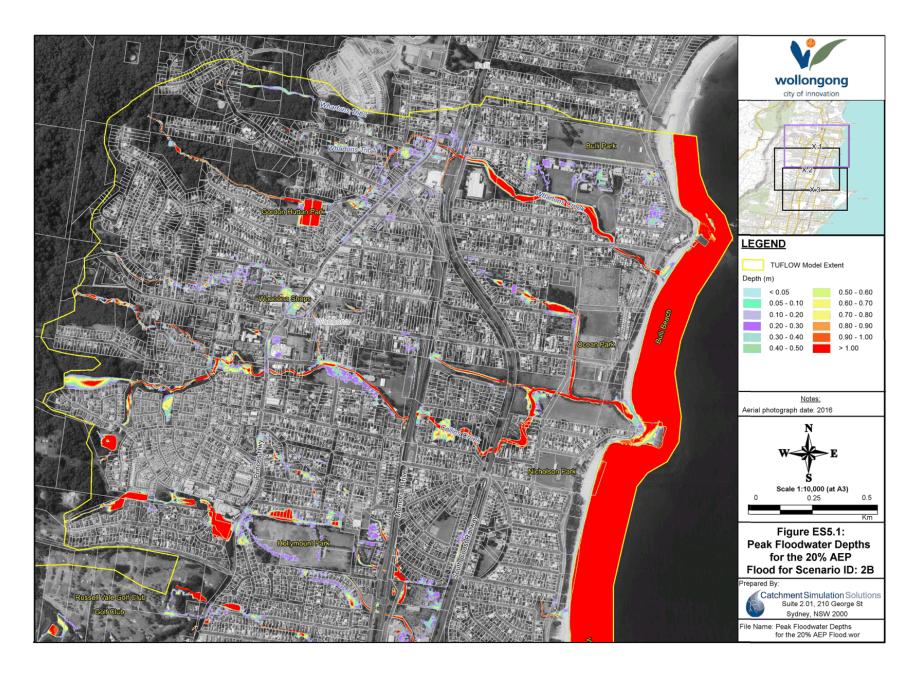




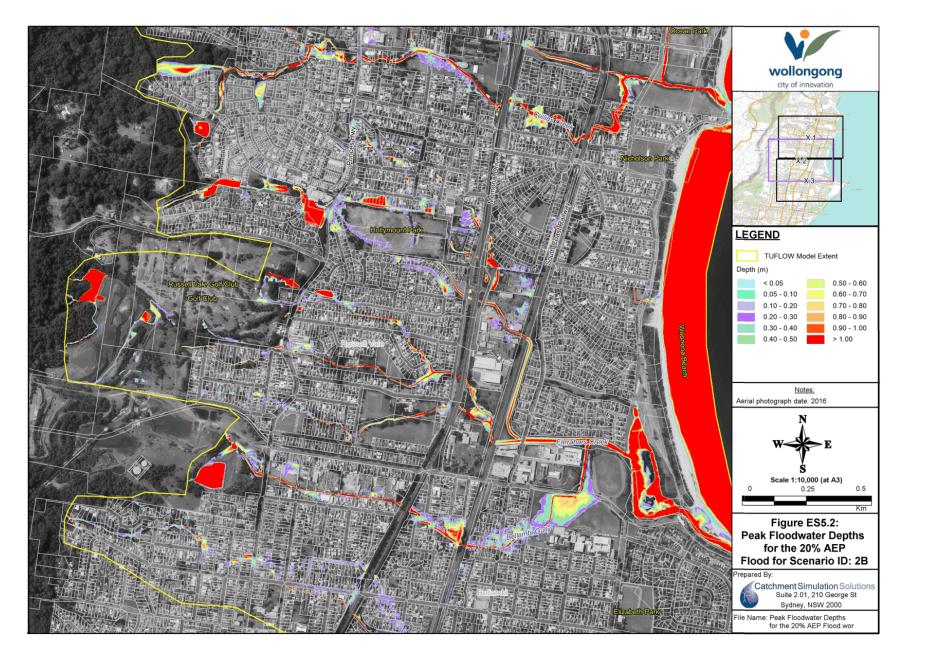




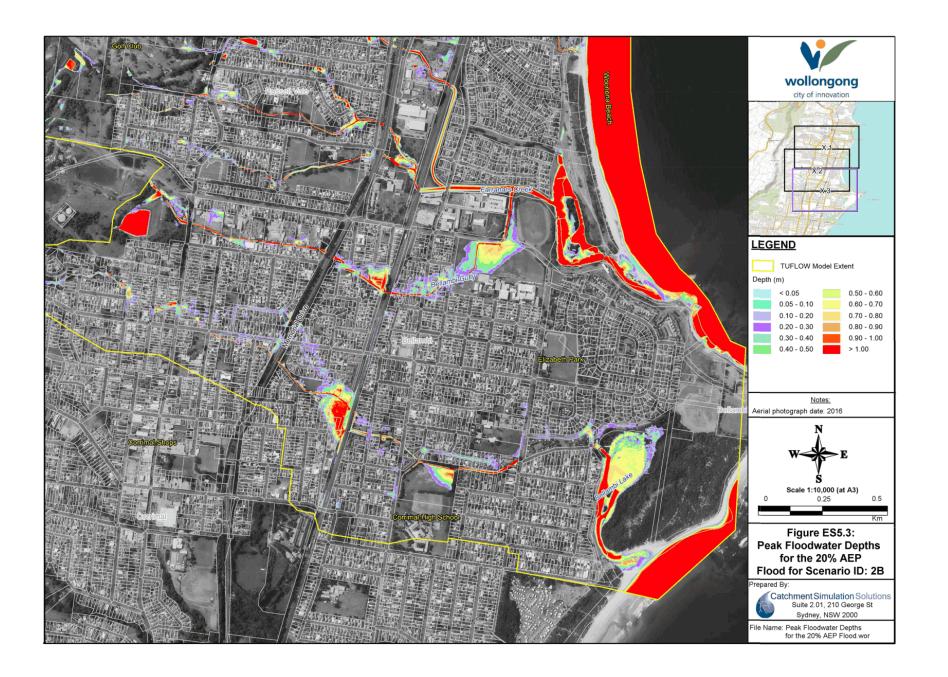






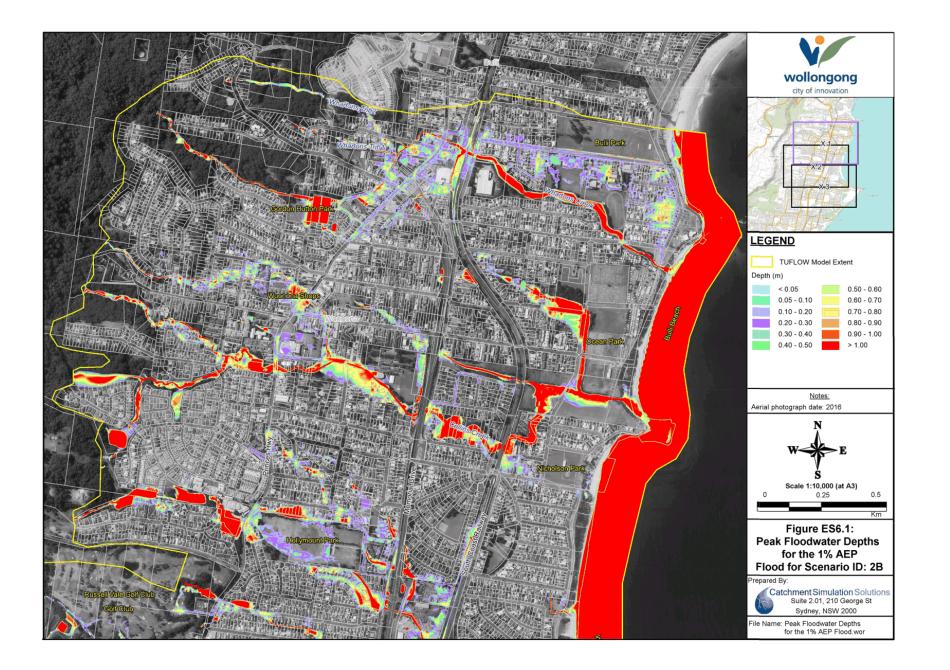




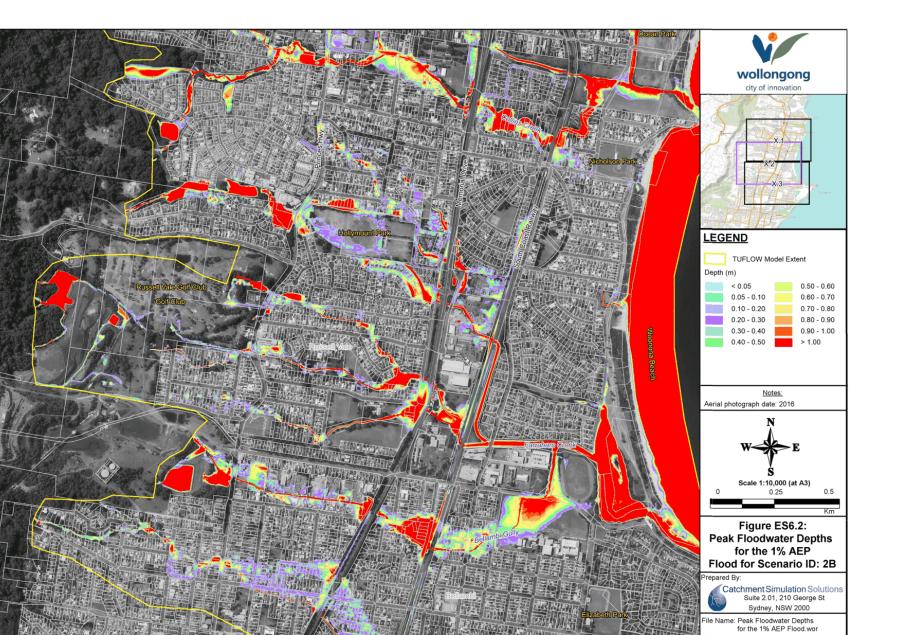




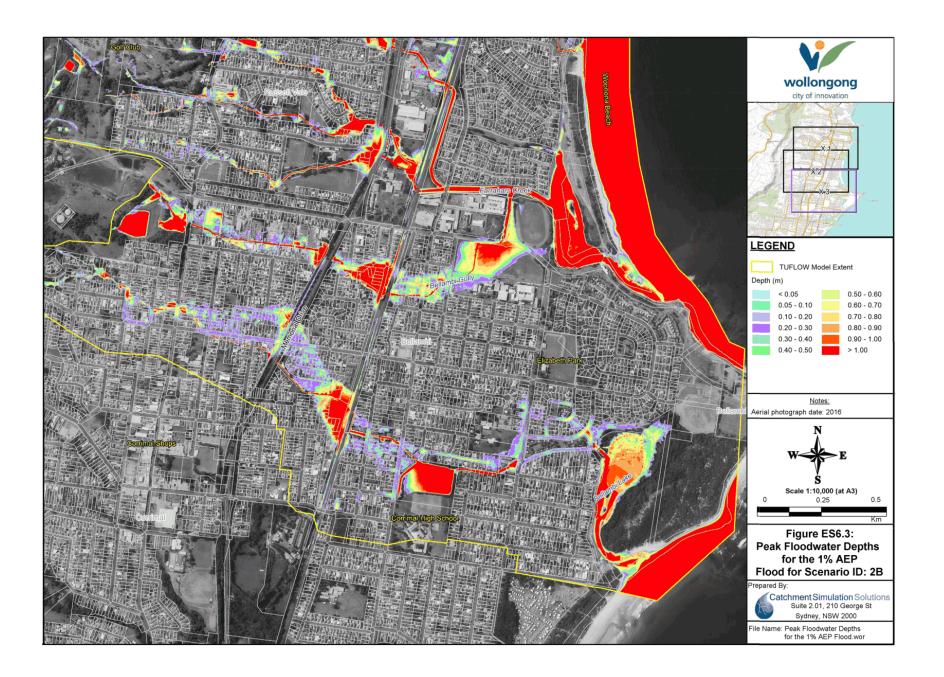






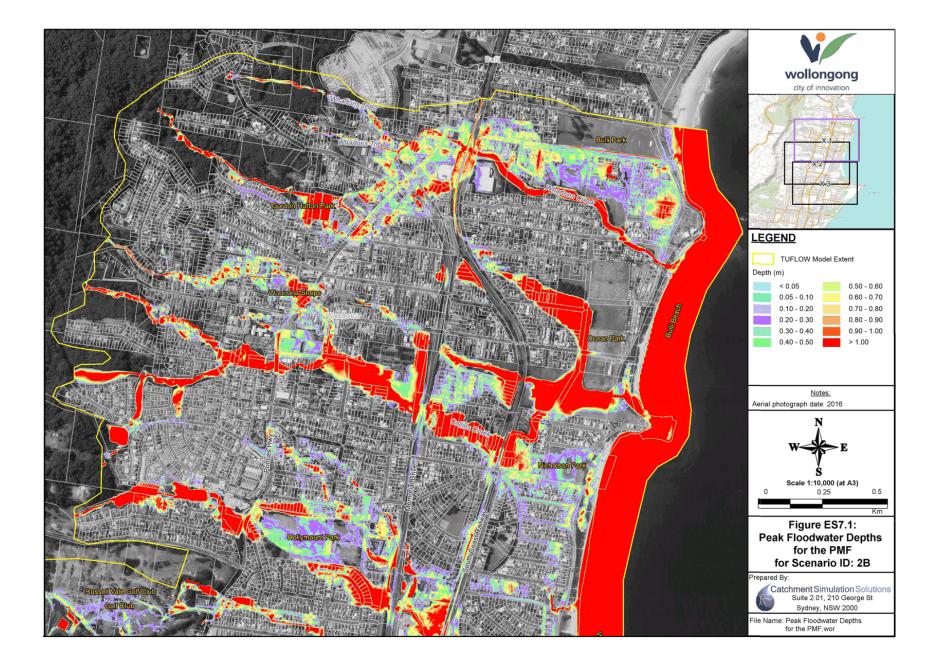




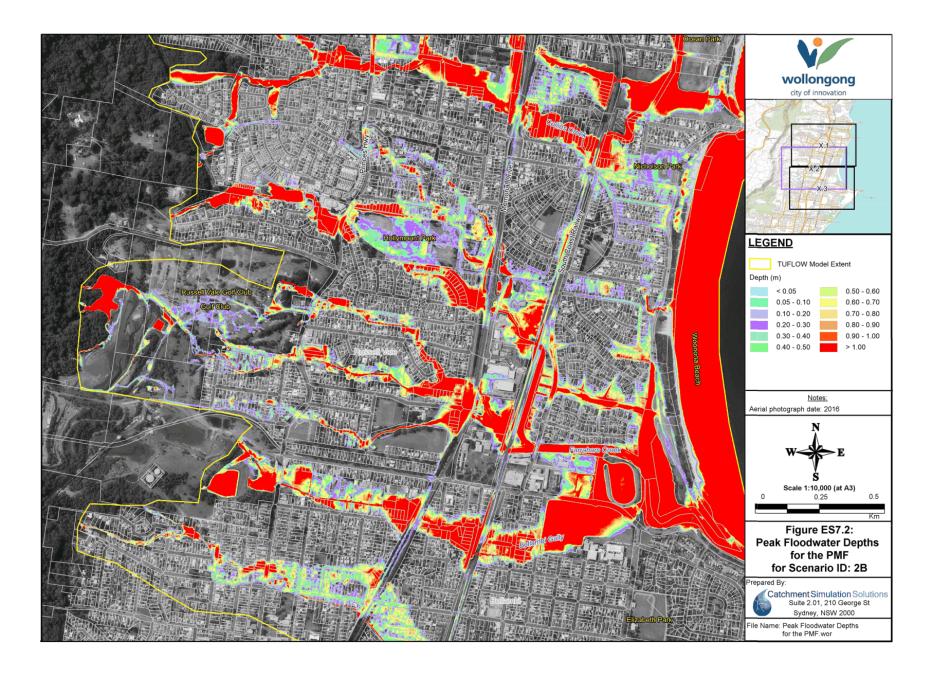




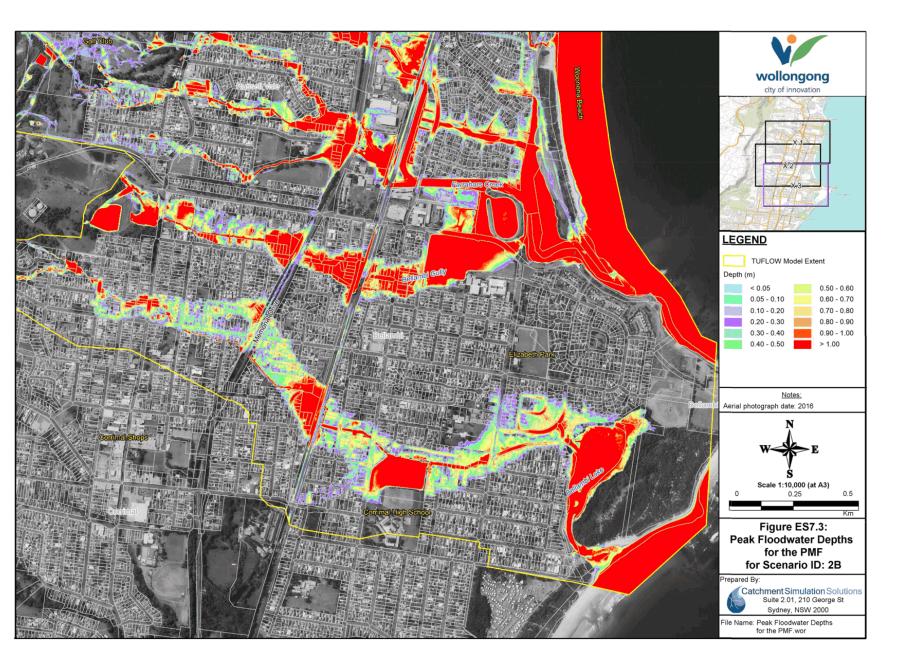




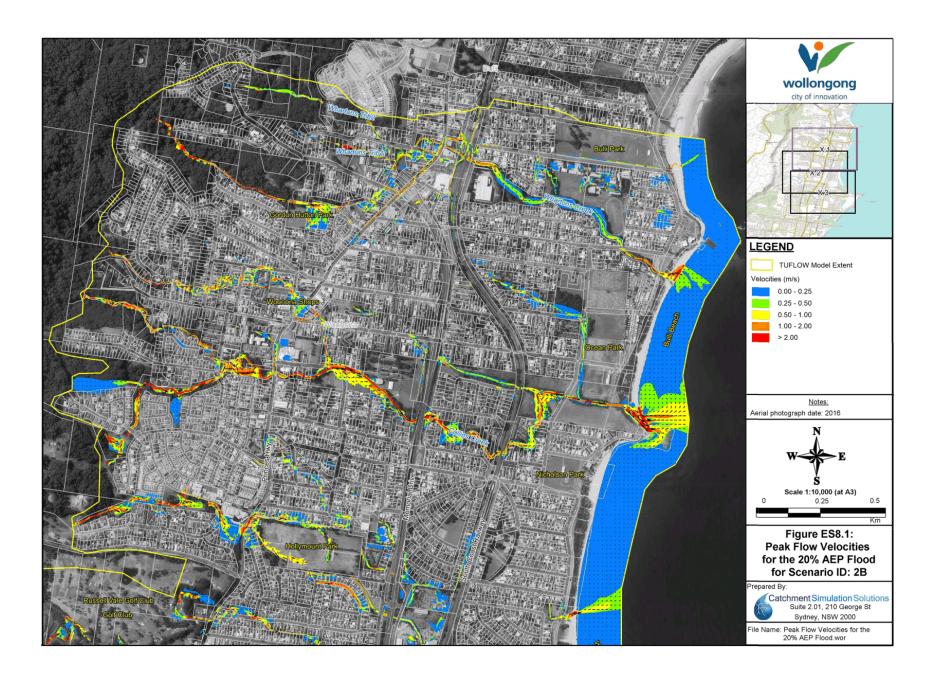




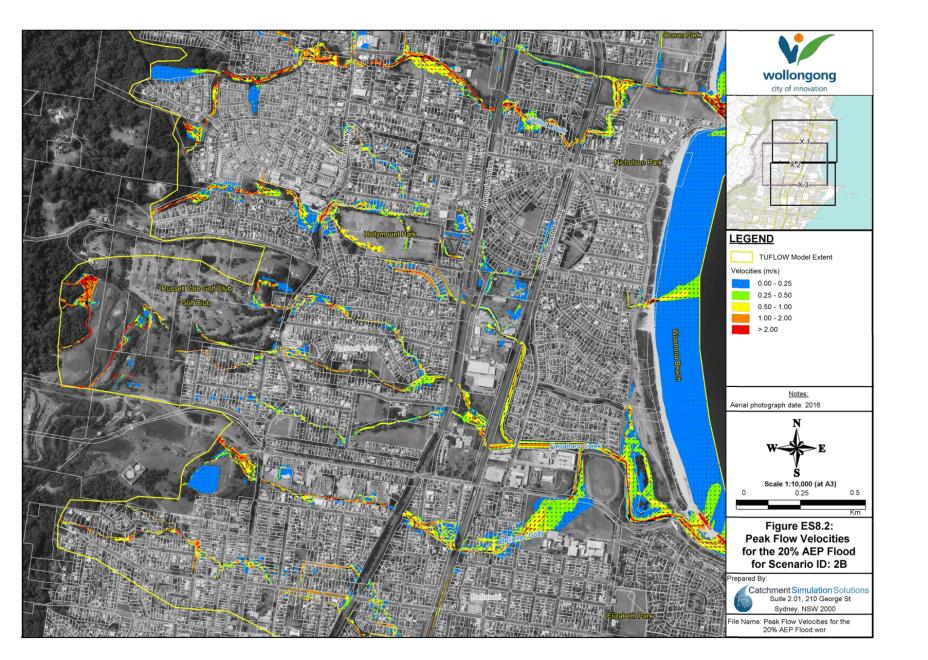




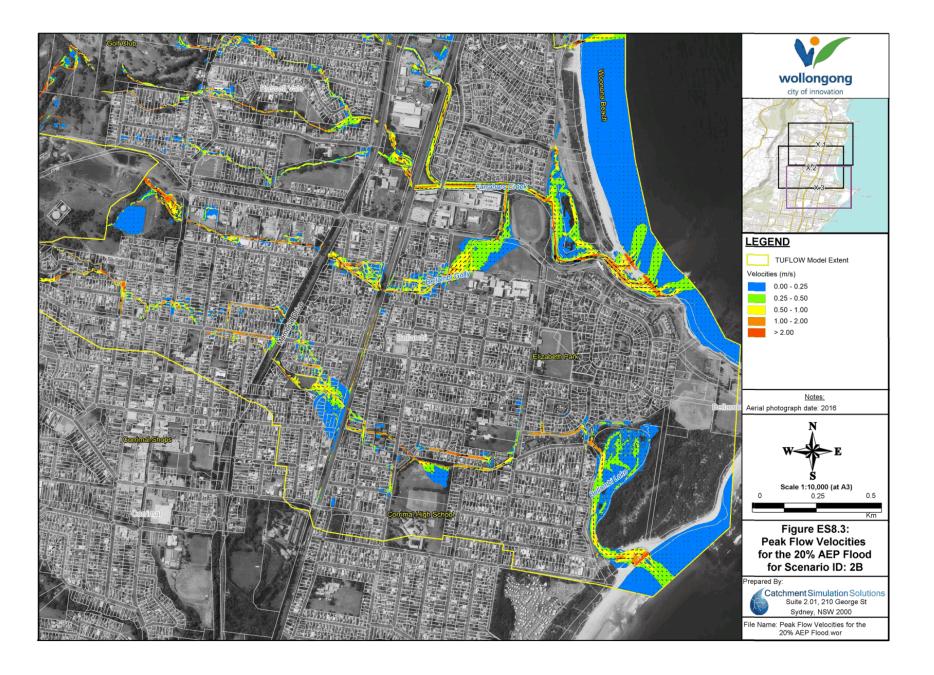




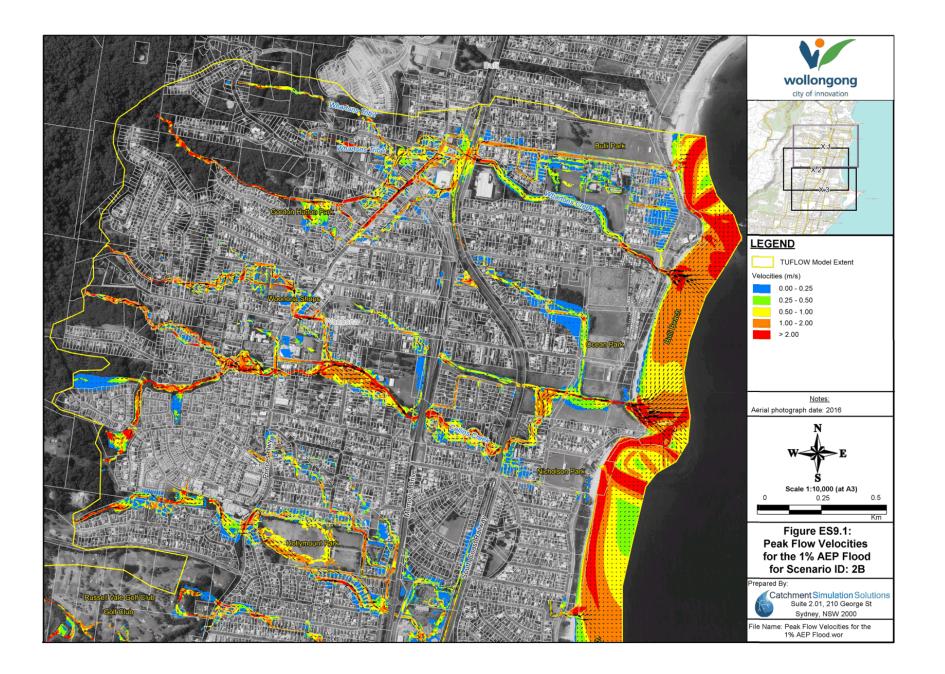












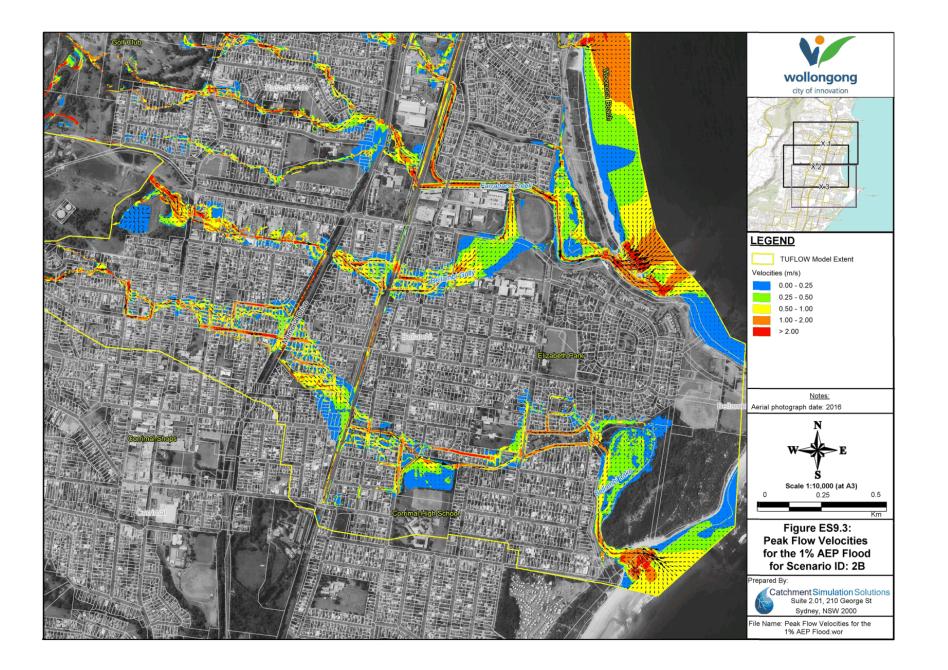




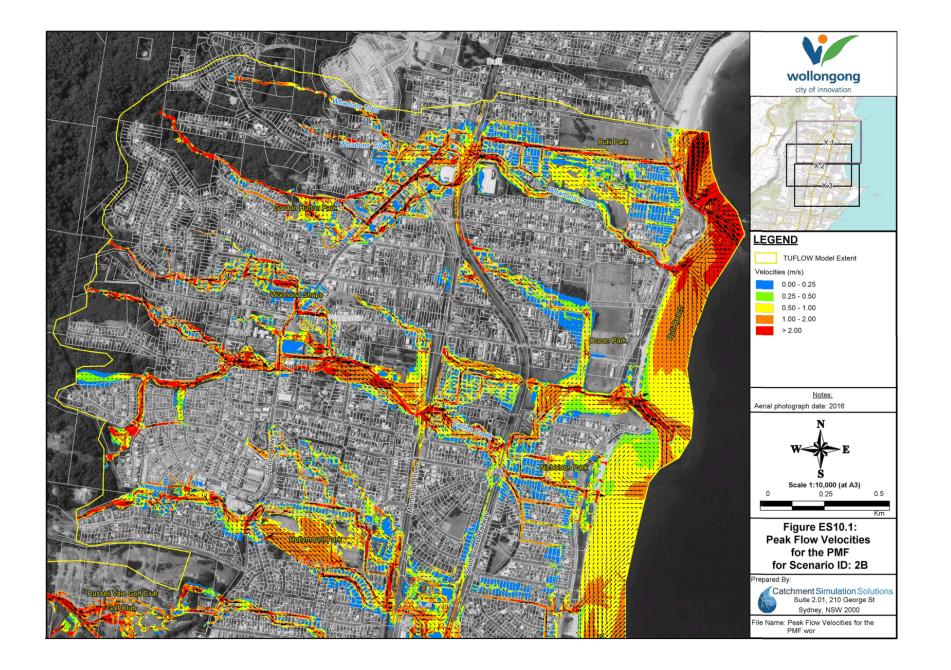




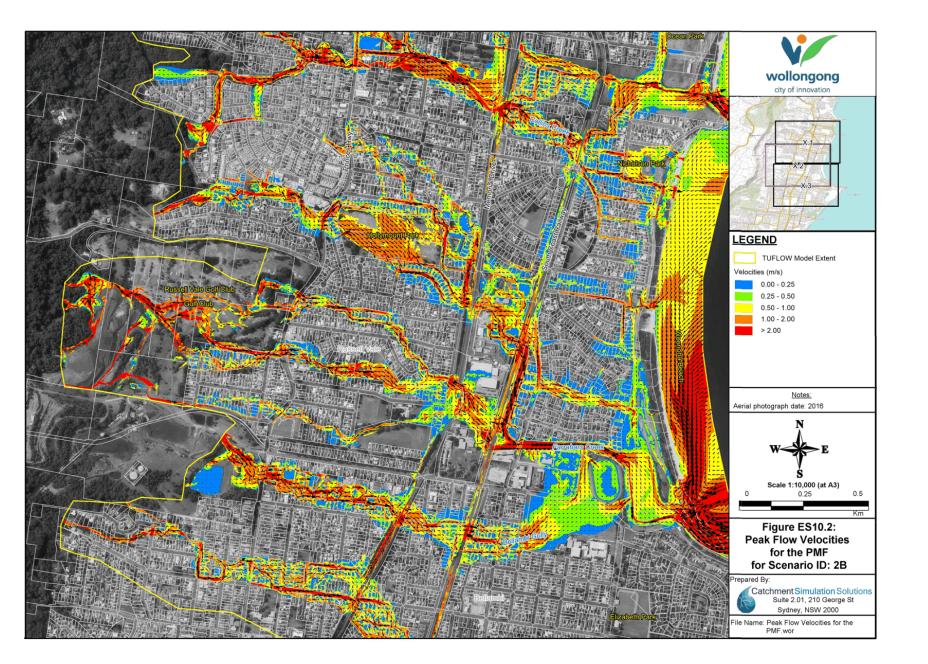




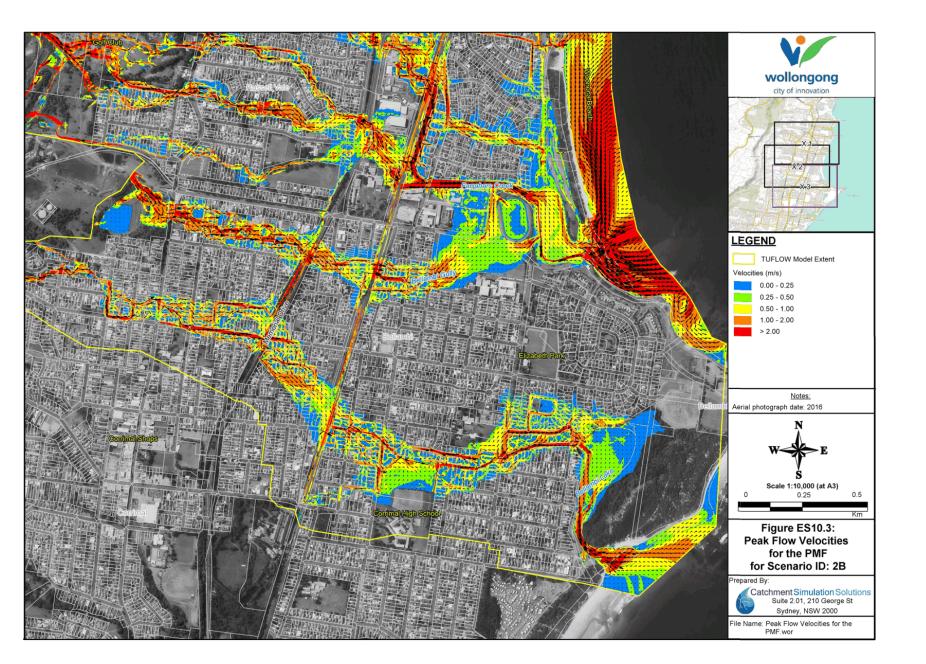




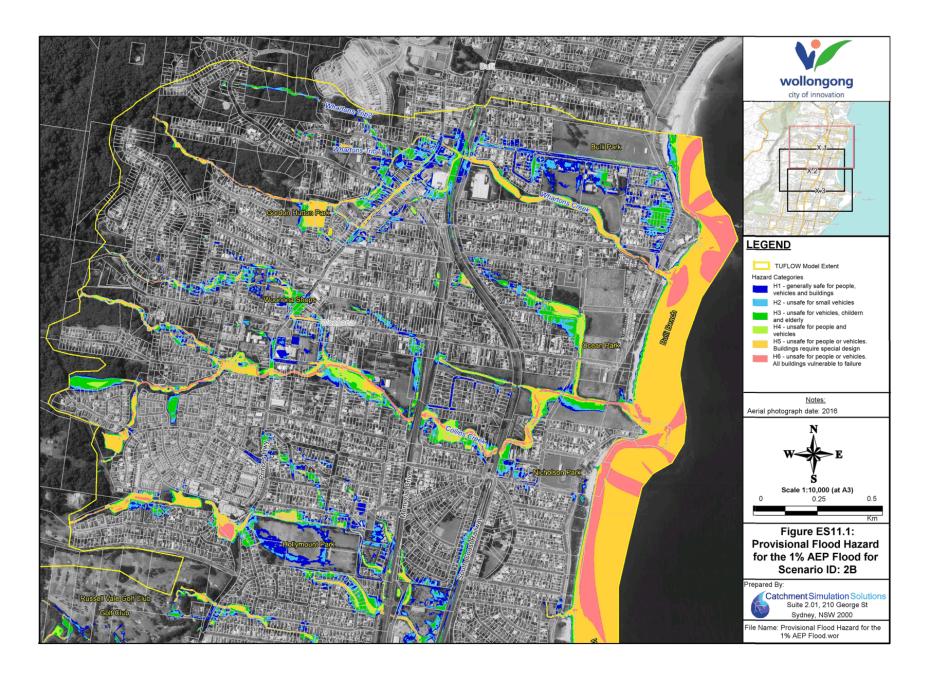






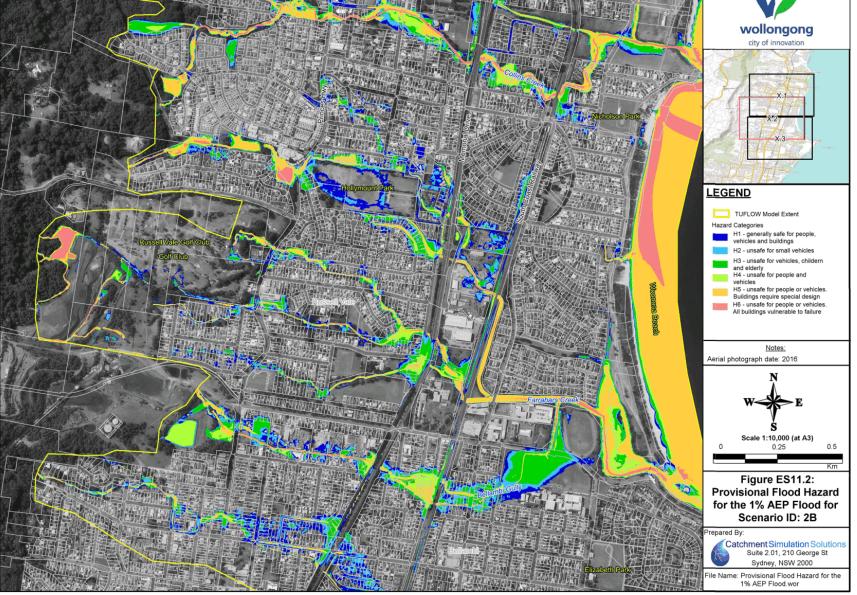






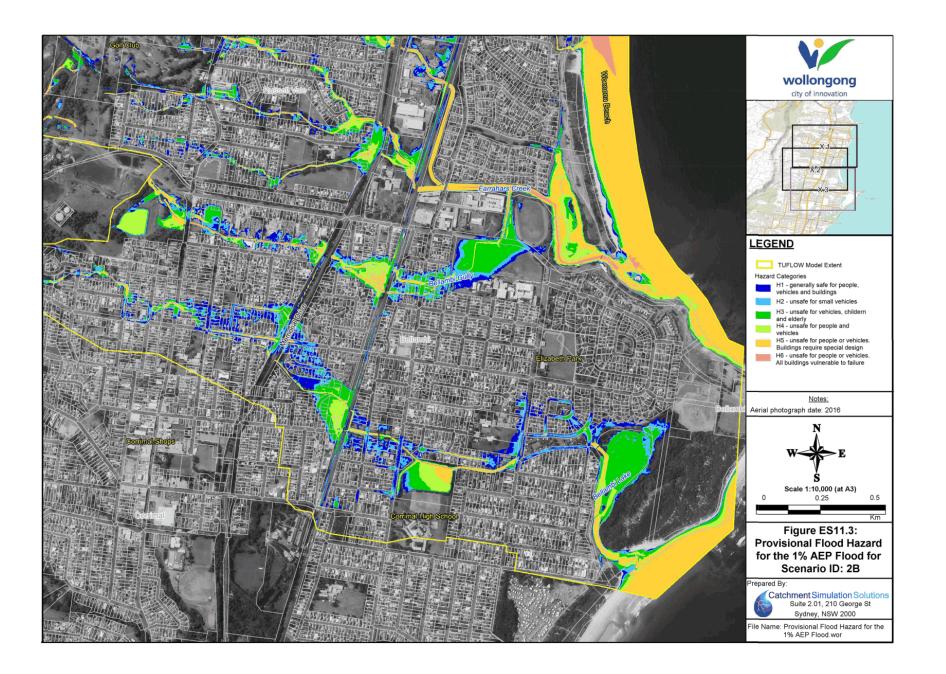






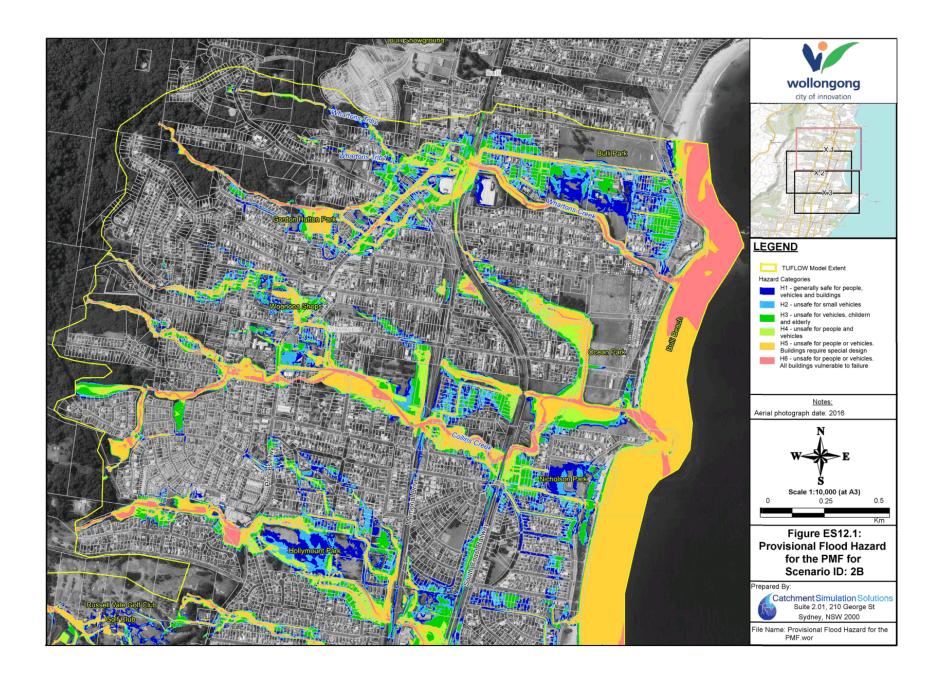






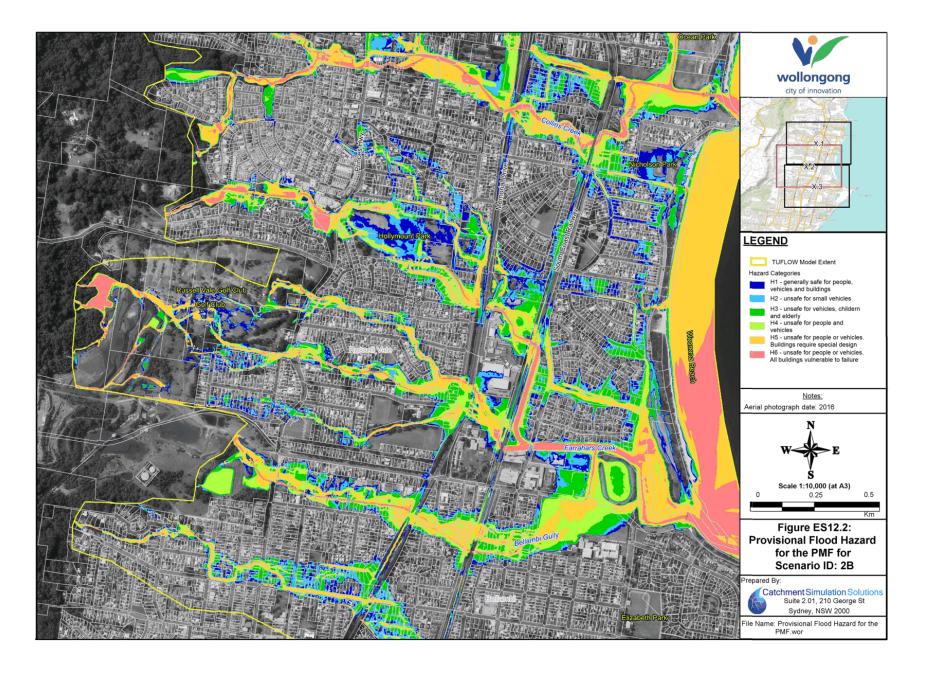




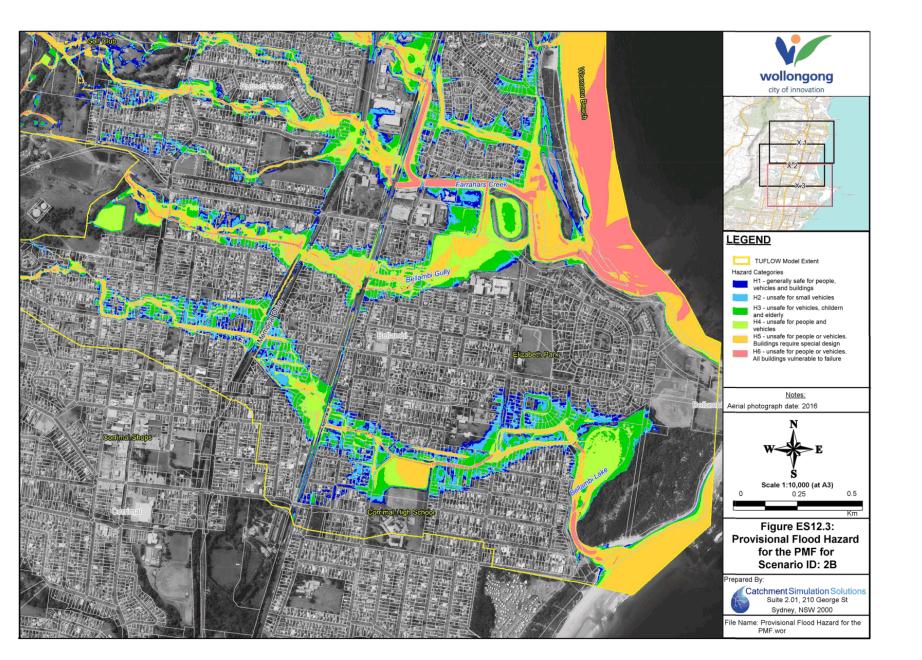


















ENGAGEMENT REPORT AUGUST 2019

Z19/160135





Table of Contents

xecutive Summary	3
ackground	
esults	
ppendix A: Stakeholder Letter1	
ppendix B: Frequently Asked Questions1	4
ppendix C: Feedback Form1	6
ppendix D: Webpage1	8
ppendix E: Flood Study Report1	9

The information in this report is based on data collected from community members who chose to be involved in engagement activities and therefore should not be considered representative.

This report is intended to provide a high-level analysis of the most prominent themes and issues. While it's not possible to include all the details of feedback we received, feedback that was relevant to the project has been provided to technical experts for review and consideration.



З

Executive Summary

Council is responsible for planning and managing flood prone lands in our area and has updated the Collins Creek Flood Study as part of this commitment. The community contributed valuable information at the start of the study, with Council receiving more than 500 submissions about the flooding and drainage problems they've 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 <u>Collins Creek catchment</u>. It uses Council's revised Blockage Policy, which was updated in 2016. It also uses improved information, such as recent data from land and waterway surveying. We've considered development that has occurred since the previous Flood Study (2011), an extended network of stormwater pits and pipes and used more detailed modelling techniques. We've also extended the mapping to capture additional flood-prone areas that were not previously mapped.

Council's engagement team worked collaboratively with a technical consultant to share the updated Study with the community and key stakeholders. During the public exhibition period, 17 June to 19 July 2019, Council sent letters to more than 5,300 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 Corrimal Library, as well as information sessions at Bulli Senior Citizens Centre on 22 June 2019 and Bulli Surf Lifesaving Club on 25 June 2019. They were also included on the project webpage (Appendix D). Notices of the exhibition were published in the Advertiser on 19 and 26 June 2019. A media release was distributed on 19 June 2019. The community were invited to provide feedback via Council's website, Customer Service Centre and at the community information sessions.

There were 30 submissions. Some comments were provided at the drop-in information sessions which were attended by a total of 94 community members. A suggestion was made about how to make flood modelling easier to understand. A concern was raised that the Study does not extend into the Wollongong Coal Russell Vale mine site and that it should also address water quality, not just quantity. A request was made to correct the way a creek was displayed on the aerial map, as there was a concern this would impact property values.

Other comments related to the perceived causes of flooding, how flooding impacts people's own property, creek maintenance and suggestions for flood mitigation options. Some were unaware of flood mitigation work that has happened, is in progress or planned for the catchment. Concerns were expressed that development has, or may in future, increase flood impacts on people's properties. The potential impact of the Flood Study on insurance premiums, property values and the development potential of privately-owned land was raised. It was commented that development should not be allowed on flood-prone land and



that landowners should bear the responsibility of managing flood risk on their land. Interest was expressed by a property owner in participating in the Voluntary Purchase Scheme.



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 focus on estimating flood behaviour. 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. The Collins Creek Flood Study is one of 10 studies to undergo review. This catchment is located in Woonona, Russell Vale, Bellambi and Corrimal.

The Collins Creek Catchment Flood Study and Floodplain Risk Management Study and Plan were completed by Council in 2011 and 2014 respectively. These studies identified the risk within the Collins Creek catchment and the steps that can be taken to manage this risk now and into the future.

Since these studies, Council has explored several flood mitigation measures, and new developments have seen the catchment's land use change. As part of this review, the study area was extended to capture 2 sub-catchments not included in the previous study. The combination of these factors along with Council's updated Blockage Policy and consideration of an extended stormwater network meant there was a possibility there could be changes to the extent and behaviour of flooding. Council is completing a review of the 2011 study to ensure it is based on the latest available knowledge and information.

Community engagement to gather reports on residents' flooding and drainage problems in recent years was conducted in October - December 2017, which included some collection of historic flood data in the catchment. The community submitted feedback by completing a questionnaire. The collected data 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.

At the Northern Floodplain Risk Management Committee meeting on 28 May 2019, the public exhibition of the draft Collins Creek Flood Study was unanimously supported. The outcomes of the exhibition and resulting amendments to the Study will be reported to the Northern Floodplain Risk Management Committee and Council in view of adopting it in 2019.



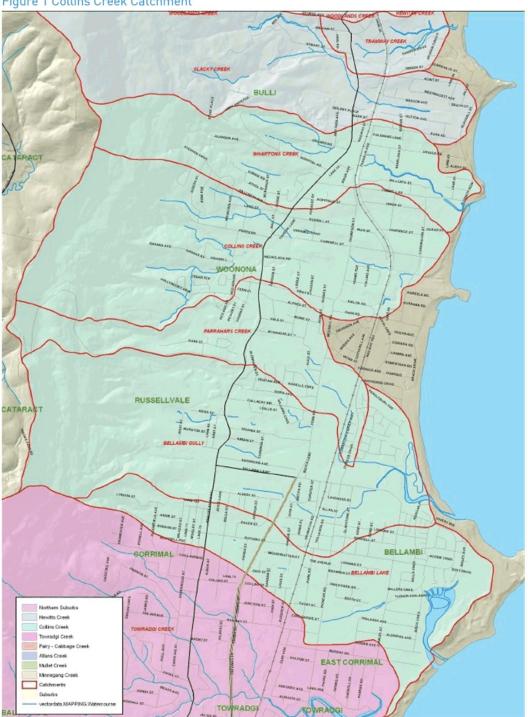


Figure 1 Collins Creek Catchment

Z19/160135 Collins Creek Flood Study – Community Engagement Report



Methods



Our Methods

Table 1: Details of Communication and Engagement Methods

Methods	Details of Methods		
Communicatio	Communication Methods		
Presentation	Information about the proposal was presented at the Floodplain Risk Management Committee (Northern) meeting on 28 May 2019		
The Advertiser	Details of the public exhibition, information sessions and Engagement HQ webpage were included in Council's Community Update pages on 19 & 26 June		
Media release	A media release was made available for media outlets		
Email to key stakeholders	An email and FAQ were sent to key stakeholders identified through an analysis process		
Register of Interest	An email was sent to all participants with registered interest in 'Flood'		
Info packs	Frequently asked question sheets and hardcopy feedback forms were made available at Corrimal Library and Customer Service. Hardcopies of the draft report were also made available at Corrimal Library.		
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		
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.		



Methods	Details of Methods
Video	The Flooding in Wollongong video was used on the Engagement HQ webpage and a flood modelling video was screened at information sessions and on the Engagement HQ webpage
Engagement HQ Website	 An online survey tool was used to capture participant's feedback. The page also hosted background info and supporting documents. Frequently Asked Questions with information on the Study and flood risk management News Feed for updates on project progress Document Library with the Report Flood modelling video Flooding in Wollongong video
Feedback Form	A hard copy feedback form was made available at libraries and engagement activities.
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.



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
Northern Floodplain Risk Management Committee Meeting	10
Drop-in Community Information Session at Bulli Senior Citizens Centre	55
Drop-in Community Information Session at Bulli Surf Lifesaving Club	39
 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 96 3

Submission Results

There were a total of 30 submissions; 9 emails (including 1 group submission from an Owners Corporation committee), 3 online forms and 15 hardcopy forms. Three late submissions were accepted. Discussions from drop-in sessions are also presented in this section.

Feedback relating to the flood study included a suggestion for how to make flood modelling easier to understand. A concern was raised that the Study does not extend into the Wollongong Coal mine site in Russell Vale and that it should also address water quality, not just quantity. There was a concern that the way Collins Creek was displayed on the aerial map would impact property values.

The whole of the Russell Vale mine site should be included in the Study... The Russell Vale mine, Russell Vale slag heap and the Russell Vale Golf Course are large polluting areas that require special attention, or the consequences will be similar to the problems caused in the 1998 floods. Understanding modelling will be easier with select examples e.g 15 min rainfall of half a metre is modelled 1%AEP

> The aerial study or satellite survey shows the Collins Creek above my property and all our neighbourhood properties. Affects property values and needs to be corrected.

Z19/160135 Collins Creek Flood Study – Community Engagement Report



Other feedback themes were:

Perceived causes of flooding

A range of reasons for what people perceived to be the cause of flooding was presented.

At some stage, the course of the creek which comes down the escarpment was altered which seems now to affect this address

Floodwater can't escape through the blocked culvert in Franklin Ave. The supermarket car park sends water down Ursula Rd, through Bulli High and residents' homes. Inadequate culvert design at the rear of my property is causing flood issues at my property

> *The creek can't drain properly because it is choked with weeds and rubbish*

Flooding impacts own property

Examples were shared about how flooding directly impacts resident's own property. There was a focus on what could be done to reduce the impacts.

Could you please send me some flood mitigation information for my actual house? I am interested in knowing what has been done or is planned to be done regarding the inundation during an extremely heavy and consistent deluge affecting my property. Hopefully you have plans to rectify this problem. for the future

Flood mitigation options

A range of potention options for mitigating flood impacts on people's own properties and those adjoining was suggested.

Upgrading the drainage in our street would go a long way in giving peace of mind for the future A detention capability upstream of High Street would be useful to limit impacts on our and adjacent properties

Flood mitigation work in the catchment

Some were unaware of what flood mitigation work has been done, is in progress or was planned for the catchment.

Is there ever to be any attention paid to prevention of the next over-due flooding of Ursula Road to Trinity Row?

I've complained about water coming onto my property in Russell St Woonona from Hopetoun St for 40 years and nothing has been done



Creek maintenance

Requests were made for creek maintenance on private land, Council land or where the landowner was not identified.

Please continue removing creek line exotic species restricting flows such as coral trees and planting with suitable native species.

The privately-owned creek/drainage channel behind my property is full of reeds, plants and rubbish. Can Council help in requiring landowners to clean it up?

The creek at the back of my property needs cleaning. Big trees & noxious weed.

7

Council used to clean the creeks out with a bulldozer once a year. It started flooding when they stopped. If we go back to something as simple as this, it could fix all our problems.

Development

Concerns were expressed about that development has, or may in future, increase flood impacts on people's properties. There was a concern that the study would impact the development potential of privately-owned land.

The creek flows through land that was sold to developers. Residents don't know what's happening. They sprayed poison on weeds last year, but nothing done since.

The Edgewood Estate development has increased flooding on my property.

Council's report has sterilised our lot from being able to build a dual occupancy to help fund our retirement.

Responsibility for managing flood risk

It was commented that development shouldn't be allowed on flood-prone land. It was also suggested that landowners who take the risk of buying or building property on flood-prone land should bear the responsibility for managing flood impacts on their properties.

Historical records show this land was always marked as [flood prone]. People think they can outsmart mother nature, but regardless of what you do, mother nature will wear it down. Build on land that doesn't require extensive works!

 $\overline{}$

People should've done their research before buying flood-prone properties. Council shouldn't have permitted building on these sites but despite this, it's the responsibility of the homeowners and whoever sold them the property.

Insurance premiums

Concerns were raised about the impact of the flood study on home insurance premiums.



Figure 2: Community information session at Bulli Surf Lifesaving Club 25 June 2019

Z19/160135 Collins Creek Flood Study – Community Engagement Report



Appendix A: Stakeholder Letter



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 197525 727 • 65 #Begistered

«Owner» «StreetNoandAddress» «SuburbStatePostcode»

Our Ref

File

Date

Z19/126739 CCE-040.010.01.296 17 June 2019

Dear Sir/Madam

COLLINS CREEK FLOOD STUDY PUBLIC EXHIBITION

I'm writing to provide you with an update on the Collins Creek Flood Study. The community contributed valuable information to the study, with Council receiving hundreds of submissions about the flooding and drainage problems they've experienced on their properties. There is now a draft report of the Flood Study with information on how it was done and what the results are.

«PAFBSP»

The updated Study explains the ways flooding happens in the Collins Creek catchment, located in Woonona, Russell Vale, Bellambi and Corrimal. Enclosed is a Frequently Asked Questions (FAQ) sheet that provides more information about the Study and how we manage flood risk.

We'll be sharing the report with the community during the public exhibition from 17 June to 19 July 2019. Come along to one of our drop-in community information sessions where the floodplain engineers working on the Study will be able to answer your questions. These are drop-in sessions, so you can come in at any time.

Weekend Session	Saturday 22 June 2019, drop in anytime between 9:30am – 11am Bulli Senior Citizens Centre, 8 Hospital Rd, Bulli
Mid wook Cossien	Tuesday 25 June 2010, drap in anytime between 4pm 5:20pm

Mid-week Session Tuesday 25 June 2019, drop in anytime between 4pm – 5:30pm Bulli Surf Lifesaving Club, 1 Trinity Row, Bulli

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 <u>www.wollongong.nsw.gov.au</u> until Friday 19 July 2019. The report will also be available to view at Corrimal Library, with copies of the FAQ, feedback forms and reply-paid envelopes available for people to take.

Following our conversations with the community, the Collins Creek Flood Study will go to Council for adoption. After that, we can start working on a Floodplain Risk Management Study that looks at what the risks and damages from floods might be, and what we could do to mitigate (reduce) those risks. We'll again be inviting the community to contribute to that process when the time comes.

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



Appendix B: Frequently Asked Questions



As part of our commitment to managing flood and stormwater risks in our region, we've updated the Collins Creek Flood Study and are letting the community know what's changed. Let us know your thoughts before Friday 19 July 2019

Why is the Flood Study being reviewed and what's changed?

From time to time, flood models are reviewed and predicted levels may change. For the Collins Creek Flood Study, we've considered Council's revised Blockage Policy. We have improved information, such as recent data from land and waterway surveying. We've considered an extended network of pits and pipes and used more detailed modelling techniques. We've also extended the mapping to capture additional flood-prone areas that were not previously mapped.

We've found that Council's revised blockage policy typically provides lower flood levels upstream of key culverts. The consideration of pits and pipes also resulted in some areas where there was shallow flooding before to no longer be flood affected, as the model recognises that the pits and pipes will carry some of the floodwaters. There are a few new areas that have been captured by the flood mapping, as the model was extended to include additional areas of the catchment. Generally, 60%, of the areas that were identified as flood prone by the last flood studies haven't had a change in flood levels, 25% of the area had reduction in flood levels and about 15% had an increase in flood levels (that includes the newly mapped areas). On the difference maps presented in the report, the areas with reduction are shown in bluish colours and the area of increase are shown with warm colours (yellow, orange).

What about historical floods?

At the start of the Collins Creek Flood study review, we sent out more than 6,000 brochures and questionnaires asking the community about the floods they have experienced in the past. We received over 500 responses. Many people reported having experienced a flood in the past and specifically in August 1998. Those residents that have reported flooding are captured by the flood extend of our flood maps which gives us additional confidence in our results. The 1998 flood in this area was not as big as a 1% Annual Exceedance Probability (AEP) flood, which would explain why some areas are within the mapped flood extent while residents haven't been impacted by a flood to date. A 1% AEP flood means there is a 1% chance of a flood of this size or larger occurring at a particular location in any given year.

What happens next?

After we've completed the flood study, we'll review the Floodplain Risk Management Study to look at what the risks/damages from floods might be and what we could do to mitigate (reduce) those risks. Next, we'll review the Floodplain Risk Management Plan, to give us a prioritised plan of flood mitigation measures proposed for the catchment. Then we'll roll out the Plan! Every 5-10 years, we go back to the beginning of this process and start with a review of the flood study to consider new survey data, policy changes, recent major flood events and changes in the catchment such as flood mitigation works or new development.

www.wollongong.nsw.gov.au



What flood mitigation work is Council doing in this catchment?

We've purchased the two houses that were identified in the Collins Creek Floodplain Risk Management Study and Plan for Voluntary Purchase.

We're progressing the detailed design of structures that help stop debris from blocking drains at Gordon Hutton Park (Woonona) and Albert St (next to Memorial Drive, Bellambi), with construction expected in the next 2 years.

We've progressed the design of a swale in West St (Russell Vale) and are in the process of negotiating access with the owner of the land so that the swale can be constructed.

The Ursula Road Flood Mitigation Scheme in Bulli is progressing well. Investigations have shown that increasing the culverts under Franklin Avenue and/or installing a deflection levee on the northern bank of Whartons Creek would reduce flooding to properties located in this area. We're now assessing other drainage options downstream of this area.

We're progressing flood mitigation investigations in Bellambi around Gladstone Street. We'll soon go out and talk with the community in this area about this project.

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

Join the conversation

Write Locked Bag 8821, Wollongong DC 2500 Email engagement@wollongong.nsw.gov.au Phone [02] 4227 7111 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

How do you predict flood levels?

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.

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.

How will my feedback be used?

At the conclusion of the engagement period, all feedback is read and considered. A report will be produced and provided to Councillors, and they will consider whether to adopt the Flood Study.

Visit www.wollongong.nsw.gov.au

Drop-in Information Sessions:

- Bulli Senior Citizens Centre, Sat 22 June 9:30–11am
- Bulli Surf Club, Tuesday 25 June 4 5:30pm

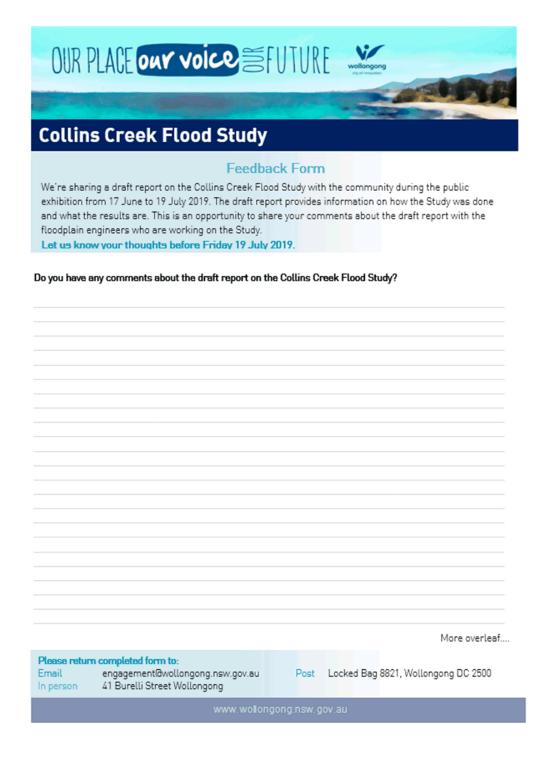
www.wollongong.nsw.gov.au





16

Appendix C: Feedback Form





17

If there is insufficient room for	our comments,	please attach an	y additional sheets to this t	eedback form.

If you would 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 <u>www.wollongong.nsw.gov.au/pages/privacy.aspx</u> or by phoning Council on [02] 4227 7111

www.wollongong.nsw.gov.au



18

Appendix D: Webpage

Collins Creek Flood Study	Key Dates
() () () () () () () () () () () () () (Community Information Session, Bulli Senior Citizeris Centre, 9:30 - 11em 22 June 2019
The community contributed valuable information to the study with Council receiving hundreds of submissions about the flooding and drainage problems they've experienced on their properties. There is now a draft report of the Flood Study with information on how it was done and what the results are.	Community Information Session, Bulli Surf Lifesaving Club, 4 - 5:30pm 25 June 2019
The updated Study explains the ways flooding happens in the Collins Oreak catchment, located in Woonena, Russell Vale, Balambi and Commal. The Study covers the catchments of Balambi Lake, Balambi Guly, Farshara Oreak, Collins Oreak and Whartons Oreak. Read the Frequently Asked Questions (FAQ) to learn more about the Study and how we manage focur sk.	Final date to submit feedback 19 July 2019
We'll be sharing the report with the community during the public exhibition from 17 June to 19 July 2019. Come along to one of our drop-in community information sessions where the floodplain engineers working on the Study will be able to answer your questions. These are drop-in sessions, so you can come in at any time.	Document Library Collins Creak Flood Study Report - Volume 1 (34.7 M8) (pdf)
Weekend Beaslon Saturday 22 June 2010, drop in anytime between 9:30am - 11am Buil Sankor Ottosan Contre, 8 Hoapital Rd, Buill Mid-week Beaslon Tuesday 23 June 2010 drop in anytime between 40m - 5:30om	(24.7 MB) (pat) Collins Creek Flood Study Volume 2 - Figures - Part 1 (56.6 MB) (pat)
Tuessay 25 June 2019, dop in anytime between 4pm - 530pm Bull Surf Lifesaving Club, 1 Trintly Rov, Bull If you'd like to attend and have accessibility or mobility requirements, or need an interpreter, please contact us to let us	Collins Creek Flood Study Volume 2 - Figures - Part 2 (\$7.2 MB) (pdf)
know how we can support your attendance. If you'll like to learn more but are unable to attend a session, the Raport will also be available to view at Continual Ubray, with bogies of the FAC, readback forms and reply-paid a revisions available for people to take.	Collina Creak Flood Study Volume 2 - Figures - Part 3 (61 MB) (pdf)
Read the Report to learn more about the project, then share your feedback online with the project team.	mare
Feedback closes on 19 July 2019.	FAQ
FEEDRACK FORM	Why is the Flood Study being reviewed and what's changed?
Feedback on the Collins Creek Flood Study 6 💿 💿	What about historical floods?
Please sign in or register and read Council's Privacy Notification before submitting your responses.	What flood mitigation work is Council doing in this eatchment?
Please share your comments about the Collins Creek Flood Study. *	more
Cancel	
	Flooding In Wollongong Video
	Flooding in Wollonsong O A



19

Appendix E: Flood Study Report

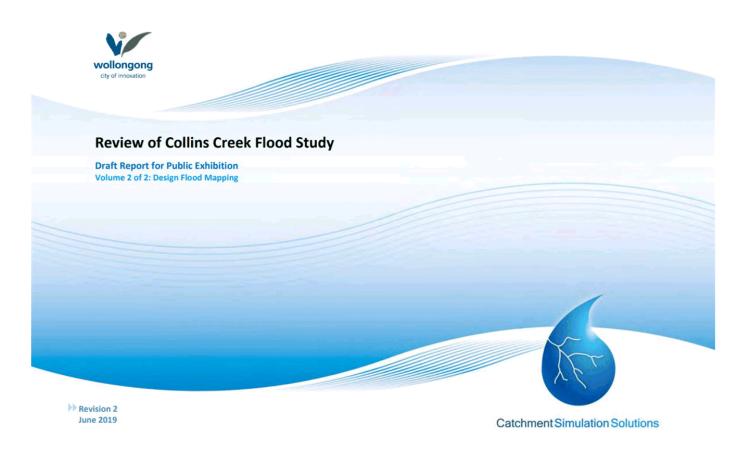


Review of Collins Creek Flood Study

Draft Report for Public Exhibition Volume 1 of 2: Report & Appendices









Collins Creek Flood study 2019

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

Key themes	Council's response
Perceived causes of flooding	The draft flood study takes into consideration factors which may affect flooding such as the alignment and capacity of the existing drainage system (much of which is verified by detailed survey) and the level of vegetation within the waterways. The study also shows that development that has occurred since the 2011 flood study produce changes in flood behaviour that are typically very localised (mostly contained within the developed area) and have a minimal impact on flood levels. The lack of sensitivity is considered to be associated with the flood and stormwater controls placed on developments by Council.
Flooding impacts on residents property	The purpose of a flood study is to describe flood behaviour. Options to reduce flooding on private property will be considered as part of the future review of the floodplain risk management study and plan.
Flood mitigation options	Potential flood mitigation options will be considered as part of the future review of the floodplain risk management study and plan. At that time, consultation will be undertaken with residents to get their thoughts on potential options.
Flood mitigation work in the catchment	Council has undertaken/is currently undertaking various flood mitigation projects in the catchment including the Ursula Road Flood Mitigation Scheme, West Street Flood Mitigation, Bellambi Gully Scheme, debris control structures and the voluntary purchase of severely flood affected properties. Council's website includes information on mitigation works in the catchment.
Requests for creek maintenance	Where maintenance was requested for sections of creek on Council property, they were forwarded to Council's maintenance crews for action. Where it was brought to Council's attention that maintenance was required on private land, residents were advised of their responsibilities in person or by letter.
Potential impacts from existing and future development	The study shows that development that has occurred since the 2011 flood study produce changes in flood behaviour that are typically very localised (mostly contained within the developed area) and have a minimal impact on flood levels. The lack of sensitivity is considered to be associated with the flood and stormwater controls placed on developments by Council. Similar controls would also be applied to future development.
Responsibility for managing flood risk	It was commented that development shouldn't be allowed on flood-prone land, or that the landowner should be responsible for managing their own flood risk. However, 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. Council's policies are consistent with the framework.
Impact of the flood study on home 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 for setting flood premiums. We recommend that homeowners contact their insurer about the flood premium for their property.