



Colac Otway Shire Council

Amendment C116cola

Birregurra Flood and Drainage Strategy – Response to Submissions

April 2022

V2013_008-REP-001-0

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Rev	Date	Description	Author	Reviewer	Project Mgr.	Approver
0	13/04/2022	Client Issue	Scott Dunn	Glenn Ottrey	Scott Dunn	Glenn Ottrey
Signatures						
						

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1 INTRODUCTION

1.1 REPORT DETAILS

This report has been commissioned by Colac Otway Shire Council.

1.2 REPORT AUTHOR DETAILS

The details of the report author are provided below.

Names and Address of the Author

Scott Matthew Dunn

Suite 5, Level 34

360 Elizabeth Street,

Melbourne VIC 3000

Qualifications

Scott Matthew Dunn has the following qualifications and professional memberships:

Education

Bachelor of Engineering (Civil and Environmental) Honours and Bachelor of Economics, Adelaide University, 2004

Registrations / Affiliations

Member, Institution of Engineers, Australia and Chartered Professional Engineer

Member, College of Civil Engineers, I.E. Aust.

Member, Stormwater Victoria and Past Committee Member

Experience and Expertise of the Author

Scott Dunn is a Principal Engineer, General Manager (Victoria) and Director in the Melbourne office of Engeny. Scott is highly skilled and experienced in urban drainage and flood modelling, and Water Sensitive Urban Design (WSUD). Scott's skills and experience include 1 and 2 dimensional modelling of existing drainage systems for numerous Councils and other clients in Victoria and around Australia. This has included extensive hydrologic and hydraulic modelling and verification to actual flood behaviour. Scott is a leading user of RORB hydrologic models and TUFLOW hydraulic models to replicate the performance of urban drainage systems and overland flow patterns.

A CV with more details regarding Scott's experience is included in **Appendix A**.

Glenn Ottrey is a Principal Civil Engineer with Engeny in Melbourne. Glenn has over 13 years' experience in surface water engineering. Glenn has reviewed this report as part of the Engeny Quality Assurance system.

2 INSTRUCTIONS

I have been instructed by Colac Otway Shire Council (Council) to review the following submissions received in response to Amendment C116cola relating to the proposed amendment of flood overlays across the Birregurra township:

- 42 Strachan Street and 47 Main Street
- 43 Roadknight Street and 21 – 27 Anderson St

This report summarises the flood modelling undertaken as part of the Birregurra Flood and Drainage Strategy and the evidence to demonstrate why these properties are considered flood prone.

Figure 3-2 presents a flow chart to summarise the methodology adopted for the study and Figure 3-3 summarises the hydrologic and hydraulic model development.

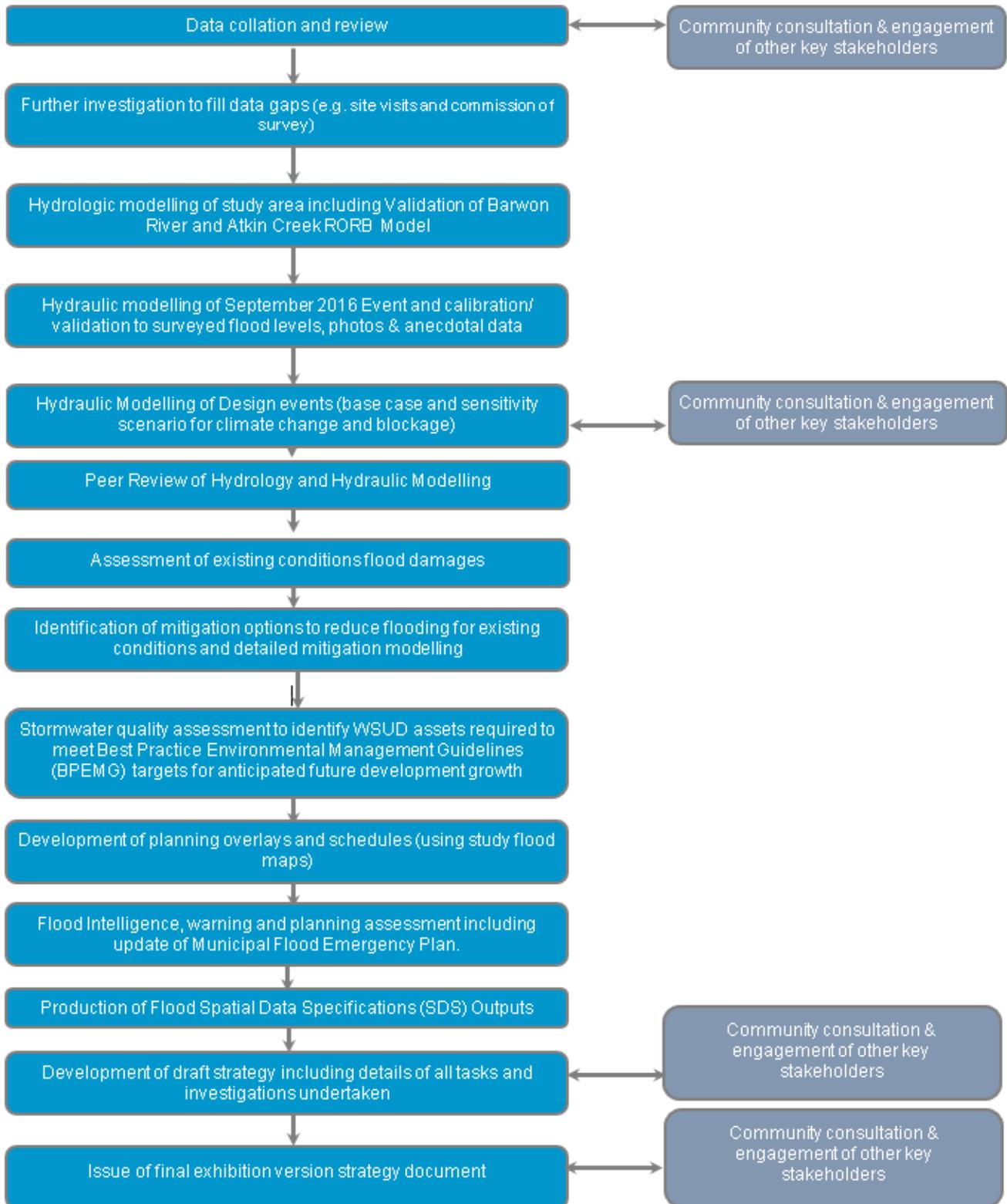


Figure 3-2: Study Methodology Flow Chart

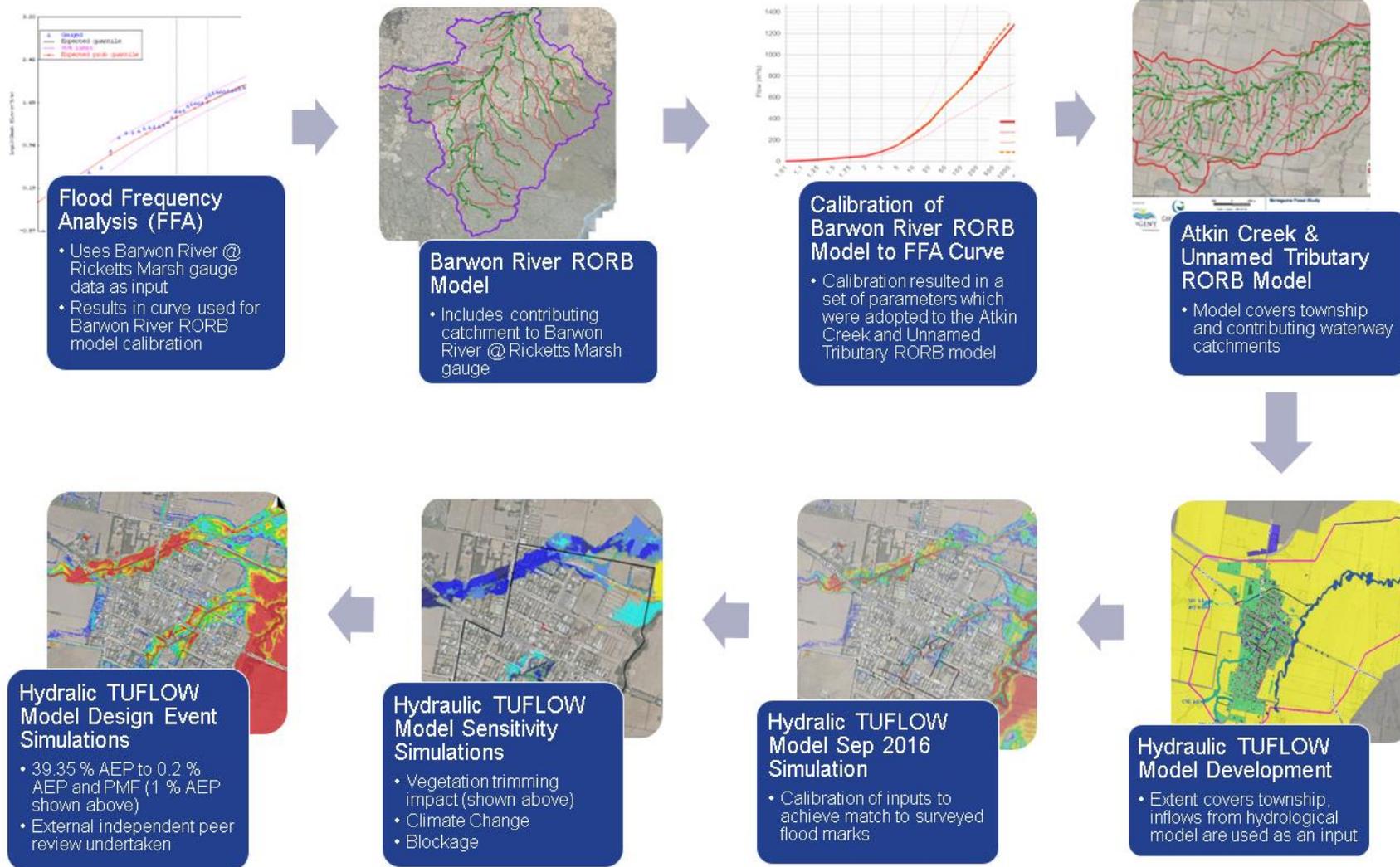


Figure 3-3: Hydrologic and Hydraulic Modelling Approach

3.1 FIELD SURVEY

Particular emphasis was put on accurately representing cross-sections at the key drainage structures along Atkin Creek and Unnamed Tributary. A large number of those assets were inspected and measured during the site visit conducted by Engeny and/ or by the engaged surveyors.

Z-shapes were used in the hydraulic model to represent channel invert levels as shown in the survey plans and to address inaccuracies with the LiDAR data at drainage structure surface levels and densely vegetated areas where appropriate. Figure 3-4 displays the location of the model's terrain modifications including:

- The yellow highlighted areas which were informed by the survey obtained at the upstream and downstream end of key drainage structures along the waterways.
- The green highlighted areas were interpolated from the known surveyed locations ensuring the waterway's slope (defined by the LiDAR data) was maintained.



Figure 3-4: Location of Model's Terrain Modifications Informed by Survey Cross-Sections

3.2 SEPTEMBER 2016 EVENT MODEL CALIBRATION

The September 2016 event which affected the Birregurra township was estimated to be between a 10 % AEP event and a 20 % AEP flood event. Figure 3-5 below presents the location of the surveyed flood marks overlaid on the flood depth results for the September 2016 event.

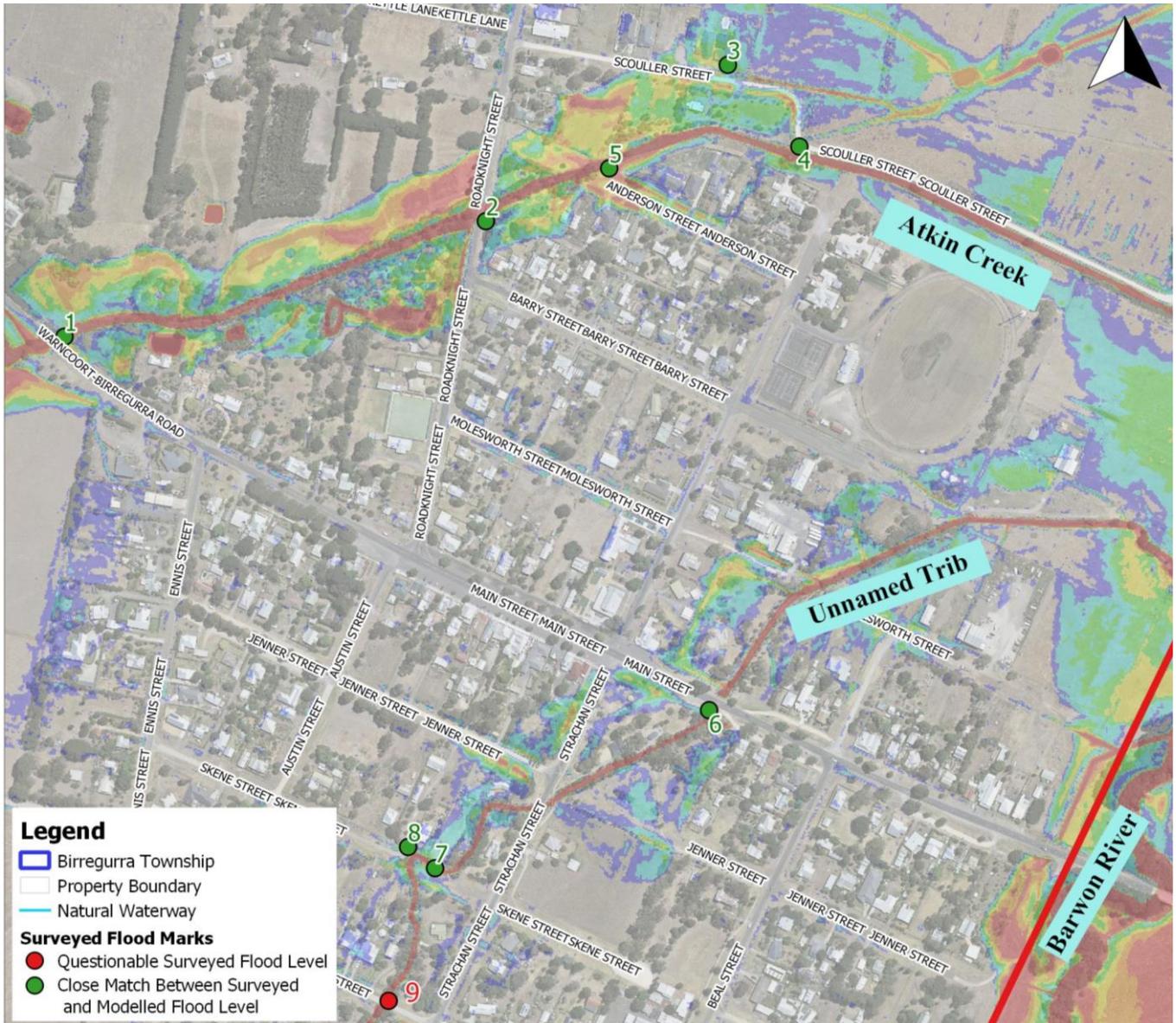


Figure 3-5: September 2016 Event Flood Depth Results and Location of Surveyed Flood Marks

Table 3-1 provides a summary of comparisons between the modelled flood depths and the captured September 2016 event photographs. The locations of relevance to the submissions are highlighted in yellow. These comparisons provide confidence that the hydraulic modelling results are a good match to the levels surveyed across the township.

Table 3-1: Comparison of Surveyed to Modelled Flood Levels for September 2016 Event

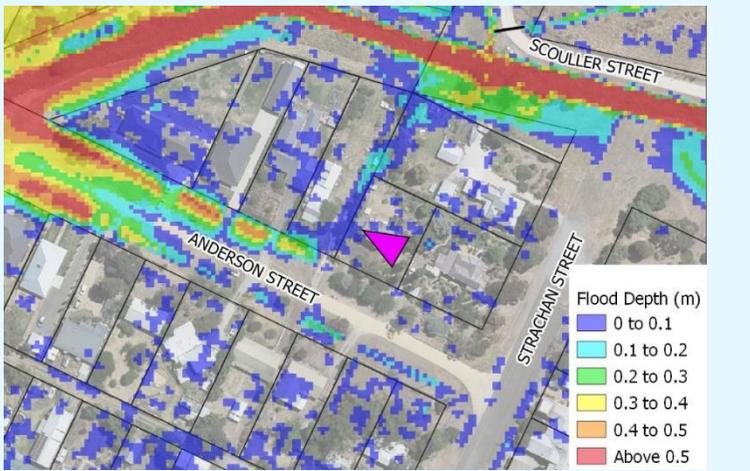
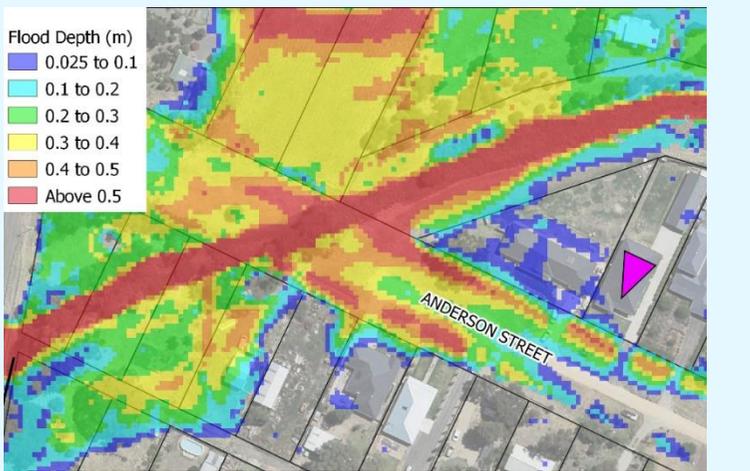
Location	Description	Surveyed Flood Level	Modelled Flood Level
1	Warncoort-Birregurra Rd (Fence line)	113.44	113.3
2	Roadknight Street	111.61	111.6
3	Scouller St (Side of Shed)	Unable to access property (approx. 200 mm from shed base @ Lidar level 110.4 m AHD)	110.63
4	Scouller St (Sewer pit)	110.49	110.34
5	Anderson St (Fence post)	111.3	111.12
6	Main Street (US left bank bridge abutment)	109.89	109.98
7	Skene St (Top of crossing)	112.4	112.3
8	Skene St (Base of letter box)	112.63	112.65
9	Bridge abutment (DS Right bank)	114.3	113.94

Table 3-2 below provides a comparison of the modelled flood depths to photographs and anecdotal evidence collated for the September 2016 event in the areas adjacent to the submissions received. Comparisons of anecdotal evidence and photographs has provided further confidence that the hydraulic modelling results for the September 2016 event are a good match to those reported by residents across the township.

3.3 EXTERNAL INDEPENDENT PEER REVIEW

The hydrological and hydraulic modelling analysis was independently reviewed by appropriately qualified engineers to ensure the models and their outputs were fit for purpose. The Quality Assurance (QA) review considered the modelling methodology, assumptions and model input parameters. This phase identified the need to include all underlying assumptions and discussion on the limitations related to the data available (rainfall and calibration data) within the study report but also highlighted the overall suitability of the modelling parameters adopted in producing the resultant close match between the surveyed and modelled flood levels.

Table 3-2: Comparison of September 2016 Event Photograph / Anecdotal Evidence to Modelled Flood Extent

Location	Photograph / Anecdotal Evidence	Modelled Flood Extent
6 Anderson Street	Resident noted that '2016 flood reached their western boundary"	
12 Anderson Street		

Location

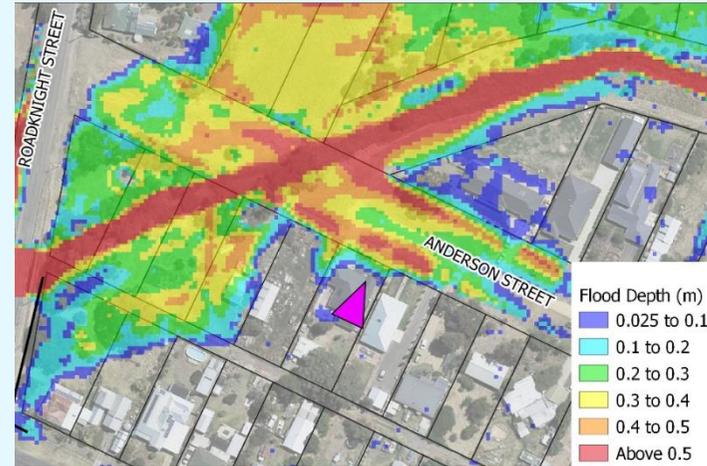
Photograph / Anecdotal Evidence

Modelled Flood Extent

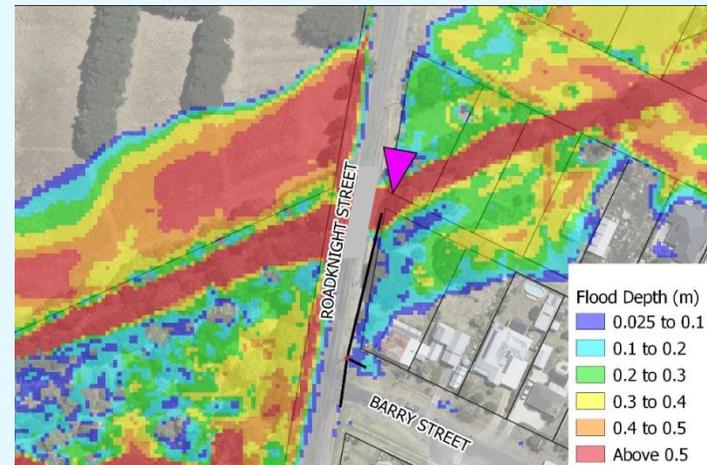
17 Anderson Street

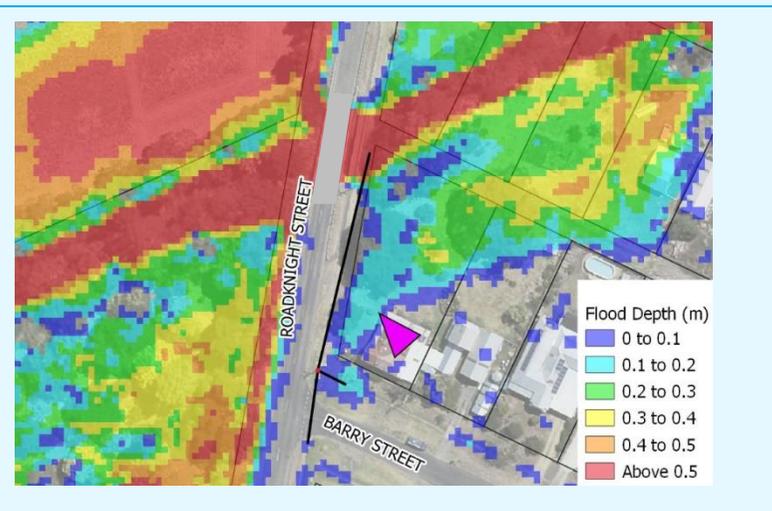
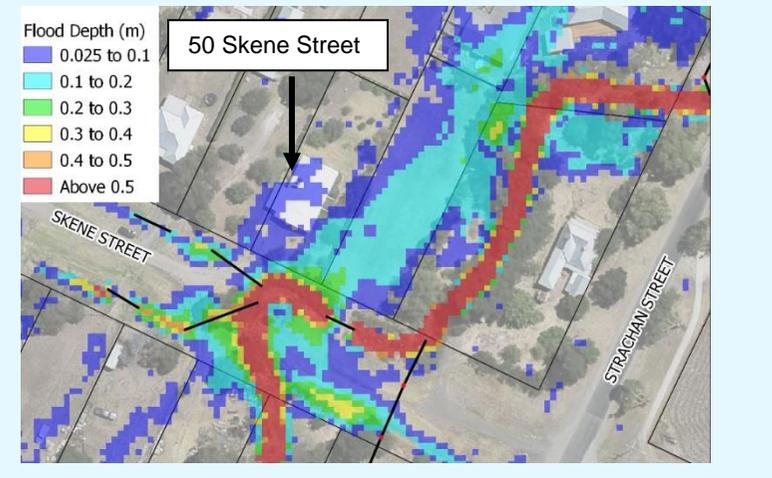


Resident noted that flood waters did not reach above dwelling floor level but were over garage floor in 2016



Roadknight Road looking south towards Main Street



Location	Photograph / Anecdotal Evidence	Modelled Flood Extent
<p>43 Roadknight Street</p> <p>Resident noted:</p> <ul style="list-style-type: none"> House didn't flood in 2016 Flood waters reached bearers of the dwelling 		
<p>50 Skene Street</p>		
<p>64 Strachan Street</p>	<p>Resident noted that "block didn't flood – water stayed within its banks"</p>	<p>Consistent with Modelled September 2016 Event Results</p>

3.4 OVERLAY DELINEATION

The following sections provide a summary of the criteria and approach used to define the extent of each overlay type which have been discussed and agreed upon with Council and CCMA.

3.4.1 FO Delineation

The following approach was adopted to define the draft floodway overlay (FO) extent within the Birregurra township:

1. The vehicle hazard criterion derived from ARR's 'Project 10: Stage 2 Appropriate Safety Criteria for Vehicles' report (ARR, 2011) was adopted. It was used as the initial cutoff and was applied directly to the relevant 1 % AEP Monte Carlo flood mapping output grids used to define critical flooding along Atkin Creek and the Unnamed Tributary;
 - a) Depth greater than 0.3 m.
 - b) Velocity greater than 3 m/s.
 - c) Hazard (Depth times Velocity) greater than 0.3 m²/s.
2. The extent was smoothed using the Feature Manipulation Engine (FME), specified by flood management authorities including Melbourne Water.
3. Judgement calls to exclude isolated areas of flooding from the FO not within the main flow path were made with areas less than 1000 m² and transferred to the land subject to inundation overlay (LSIO) layer discussed below.
4. Small 'high' islands within the flood extent were included within the FO. Even though these areas are dry they still represent a significant flood hazard with the loss of safe access and egress.

3.4.2 LSIO Delineation

The following approach was adopted to define the draft LSIO extent within the Birregurra township:

1. The 1 % AEP Monte Carlo flood depth and critical durations source grid was used to inform the initial flood extent associated to flooding from the waterways only.
2. This extent was smoothed using the Feature Manipulation Engine (FME) with no flood depth filter applied.
3. Manual manipulation was undertaken to ensure the delineation of the smoothed LSIO focused on flooding associated to the waterways and rural flow paths only. This manipulation was informed by velocity vectors, flood level contours and engineering judgement calls including:
 - a) Removal of isolated areas of flooding less than 100 m².
 - b) Filling in of small 'high' islands within the flood extent. Even though these areas are dry they still represent a flood hazard with the loss of safe access and egress.
 - c) Joining of flow paths particularly where flows overtop roads to capture very shallow sheet flows which were originally filtered out through results processing functions.
 - d) Judgement calls to remove portions of the LSIO extent which cover less than 2 % of a property parcel where appropriate.
4. Removal of designated FO extent from LSIO extent.

3.4.3 SBO Delineation

The following approach was adopted to define the draft special building overlay (SBO) extent within the Birregurra township:

1. A 50 mm filter was applied to the raw 1 % AEP flood depth grid.
2. The filtered extent was smoothed using the Feature Manipulation Engine (FME).
3. The SBO flow paths were manually manipulated using velocity vectors and flood level contours to ensure continuous flow paths. This included:
 - a) Removal of isolated areas of flooding less than 100 m².
 - b) Filling in of small elevated dry islands within the flood extent.
 - c) Joining of flow paths particularly where flows overtop roads to capture very shallow sheet flows which were originally interpolated out through results processing functions.

d) Judgement call to remove portions of the SBO extent which cover less than 2 % of a parcel where appropriate.

4. Connection of SBO flow paths into the associated waterway / LSIO extent.

3.4.4 Additional Adjustments to Overlays

Following a review by Council of the overlays produced in line with the above criteria, it was noted that there were numerous examples where small areas of land titles were partially impacted by the proposed FO, LSIO or SBO extents. Meetings between the CCMA and Council established a framework where these slivers of overlays could be removed. These included:

- where the overlays encroached into less than 20 m² of a property,
- where the overlay was located at the corner / edge of the front boundary of a property, and access to that property did not require access into a roadway that was abutting a Flood Overlay (to ensure safe escape routes and emergency response access).

The entire FO, LSIO and SBO mapping extents were examined in detail using these parameters, and a conservative approach was taken in reducing the overlay extent. Where land was removed from the FO mapping, it was replaced with the LSIO.

Figure 3-6 below depicts the modelled peak flood depths across the Birregurra township for the 1 % AEP event and **Appendix B** contains the delineated flood overlays.

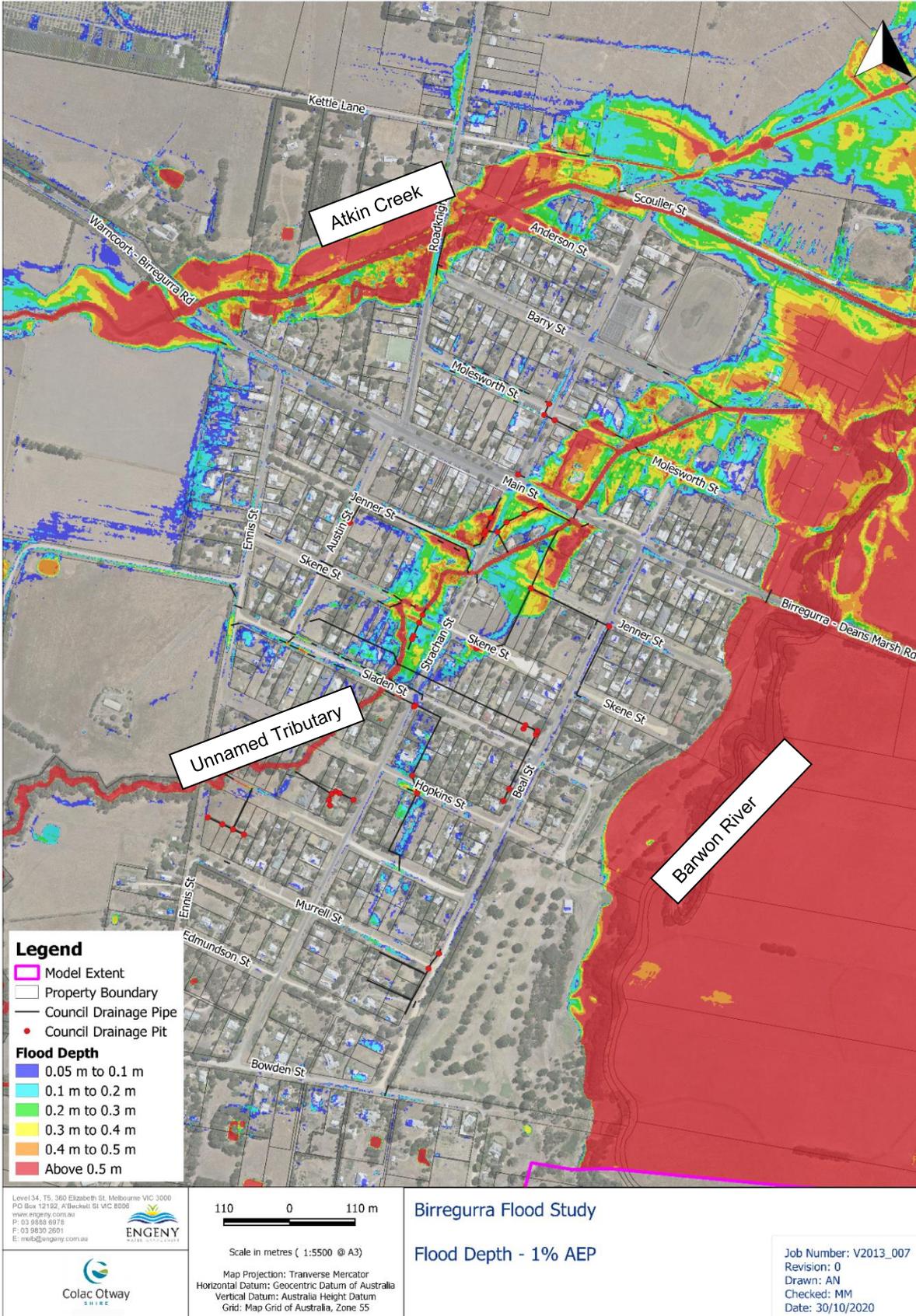


Figure 3-6: Flood Depth Results for 1 % AEP Event

4 RESPONSE TO SUBMISSIONS

4.1 43 ROADKNIGHT STREET AND 21-27 ANDERSON STREET

- The residents state in their submission that they have “endured and survived many floods” during the 36 years they have lived in their family home at 43 Roadknight St from 1985 and that “to date their house has never been inundated”.
- The following notes were captured from the residents during consultation session held on December 7th and 8th 2019 led by Council and the CCMA.

43 Roadknight Street	<ul style="list-style-type: none">• House did not flood in 2016• Flood waters reached bearers• Contends there are issues with reeds in Atkin Creek near its junction with Barwon River which are impeding the flow of flood waters• Roadknight Street is acting as a levy bank• Suggest contacting Barwon Water about the depression created from sewer line construction• Suggest that Atkin Creek should be inspected for obstructions• Many noted obstructions in waterway at the Atkin Ck bridge on Birregurra Warncoort Road down to Roadknight Street and from Anderson Street to the Barwon River.• Resident suggests creek should be cleared with machinery
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- Further evidence from several residents in Anderson Street, as summarised in Table 3-2 provides confidence that the modelling accurately represents flooding as a result of the September 2016 event.

The anecdotal evidence provided in the above statements supports the outcomes of our flood study in particular the calibration of the recorded September 2016 Flood Event. The modelled September 2016 event highlighted that the property at 43 Roadknight St was affected by some flooding but the dwelling itself was not affected by above floor level flooding. These results are consistent with the resident’s observations.

As depicted in Figure 3-5 a surveyed flood mark was captured at the rear of the 43 Roadknight Street (location 2) and as identified in Table 3-1 a very close match was achieved for the September 2016 event (111.61 m AHD surveyed versus 111.60 m AHD modelled). This provides a high level of confidence that the model is appropriate to represent flooding in this area of the township. Figure 4-1 and Figure 4-2 below were taken during my site visit of the study area on Wednesday 26th February 2020.



Figure 4-1: Rear of 43 Roadknight Street where CCMA survey mark was captured

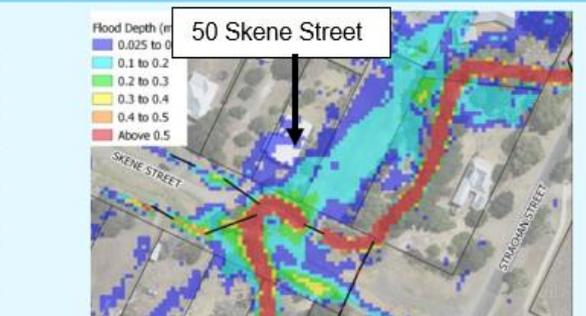


Figure 4-2: Atkin Creek crossing at Roadknight Street

4.2 42 STRACHAN STREET AND 47 MAIN STREET

- Residents state that they have never had any water on their block as a result of overflows from the nearby Unnamed Tributary. The modelling suggests that the property is impacted by flooding which originates from the Unnamed Tributary, at least 150 metres to the south of the subject property due to:
 - The insufficient conveyance capacity of the driveway culvert at 48 Skene Street. This is clearly shown on the provided September 2016 flood photos displaying the flood depths affecting the property at 50 Skene Street (an extract from the Technical Report is presented below).

Table 4.5: Comparison of September 2016 Event Photograph / Anecdotal Evidence to Modelled Flood Extent

Location	Photograph / Anecdotal Evidence	Modelled Flood Extent
50 Skene Street		

- Insufficient conveyance capacity within the Unnamed Tributary itself downstream of the Skene Street culvert structure and upstream of Strachan Street, particularly in the 1% AEP.
- The localised depression within the subject property being drained by a drainage system along the subject property's eastern boundary and the pipes limited ability to drain the subject property due to the downstream tailwater levels at the Unnamed Tributary outfall (east of Strachan Street).

Figure 4-3 below is a plot of velocity vectors pointing in the direction of overland flow, and scaled by magnitude, overlaid on flood depth results for the September 2016 event. This figure clearly identifies / confirms the points listed above.

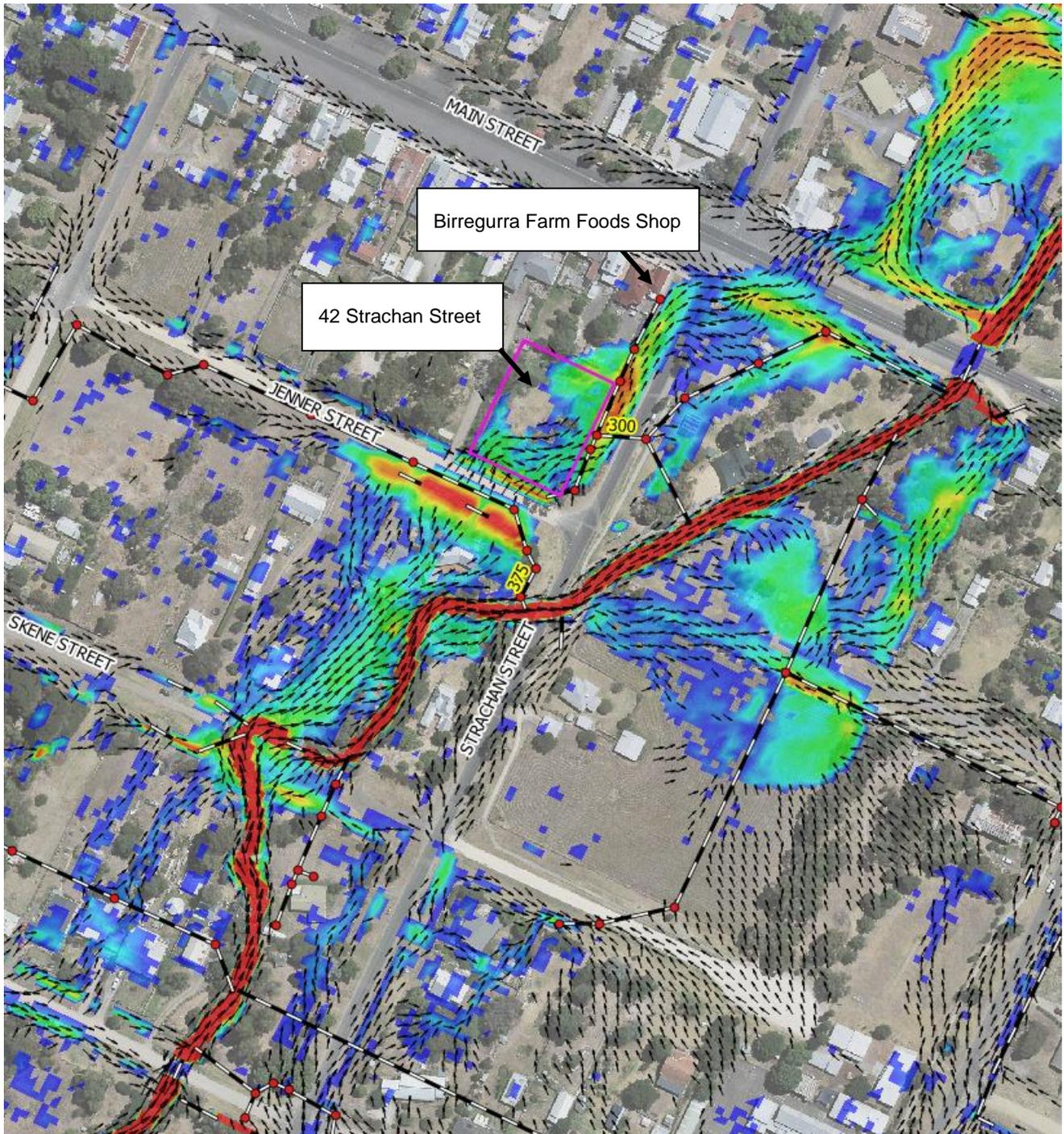


Figure 4-3: September 2016 event flood depth map with velocity vectors overlaid

- The resident suggests that if appropriate maintenance of the waterway and Strachan Street road / foot bridge is regularly undertaken it would take more than a 1 % AEP event to cause inundation damage to any structures on their land. The flood study has assumed no blockage to the road / foot bridge at Strachan Street and it was also demonstrated via a sensitivity analysis that the density of vegetation within the waterway also results in a negligible difference to the waterway's conveyance capacity in the 1% AEP event (the event used to develop the flood overlays). For the sensitivity analysis a lower Manning's roughness value of 0.06, representative of minor density stream vegetation, was used in lieu of a value of 0.09, representative of medium density stream vegetation.

As depicted in Figure 3-5 surveyed flood marks were captured along the Unnamed Tributary (locations 7 and 8) in front of 50 Skene Street and as identified in Table 3-1 a very close match is achieved at this location for the September 2016 event. This provides a high level of confidence that the model is appropriate to represent flooding in this area of the township.

Anecdotal evidence captured from a discussion with a local resident during Engeny's February 2020 site visit suggests that in September 2016 the flood level of ponded water in Strachan Street reached approximately one brick high against the wall of the Birregurra Farm Foods Shop located at 47 Main Street as I have roughly indicated in Figure 4-4 below.

Figure 4-4: Anecdotal flood mark at Birregurra Farm Foods Shop



This suggests that the subject property would have had some ponded water in it due to its lower elevation relative to the level to the shop which is clearly depicted in Figure 4-5 which presents a layout plan of ground elevation levels taken from LiDAR data surrounding 42 Strachan Street. The LiDAR data was commissioned specifically for the Birregurra Flood and Drainage Strategy where the output data report shows that after processing and comparison to field survey, the following level of accuracy was achieved:

- Vertical accuracy +/- 100 mm.
- Horizontal accuracy less than 300 mm.

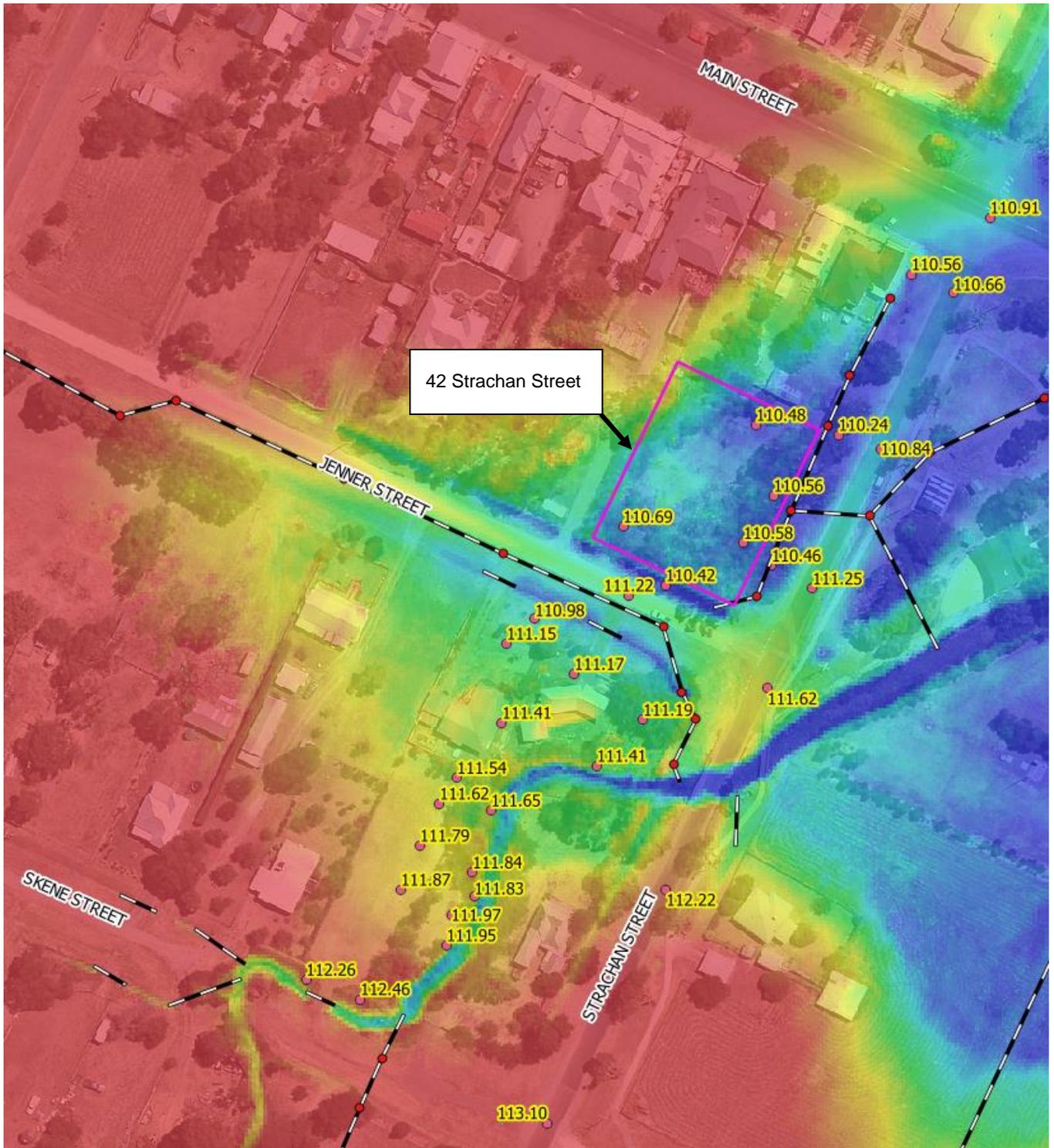


Figure 4-5: Ground levels surrounding 42 Strachan Street

Figure 4-6 to Figure 4-9 below were taken during my site visit of the study area on Wednesday 26th February 2020. These photos clearly show the property being lower lying relative to Strachan Street adjacent to the property's western boundary and Jenner Street adjacent to the property's southern boundary.



Figure 4-6: Looking south along the eastern side of Strachan Street from near Main Street



Figure 4-7: Corner of Jenner Street and Strachan Street looking southwards



Figure 4-8: Open drain in Jenner Street along southern boundary of 42 Strachan Street



Figure 4-9: Bridge Crossing of Unnamed Tributary at Strachan Street

5 RECOMMENATION

I am of the opinion that the flood study undertaken to develop flood overlays for the Birregurra township is of sufficient rigour and accuracy to confidently delineate the properties identified in the two submissions as being flood prone. As a result no change to the proposed amendment is required.

6 STATEMENT

I have made all the inquiries that I believe are desirable and appropriate and that no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel.



Scott Dunn

Appendix A:

Scott Dunn CV

Scott Dunn

General Manager (Victoria), Director, Principal Water Resources Engineer

BEng (Civil) (Hons), BEc, CPEng, MIEAust



SUMMARY

Scott is the General Manager of Engeny's Victorian office and a Director of the business. He is a principal water resources and environmental engineer with over sixteen years' experience in the stormwater industry. Scott's experience and skills cover every aspect of projects including initiation, planning, execution, delivery and implementation. Outside of the office he has had an active role on the committee of Stormwater Victoria. Scott is experienced in all facets of stormwater management including hydraulic and hydrological modelling, drainage design, Water Sensitive Urban Design (WSUD) and Integrated Water Management (IWM). He has provided expert evidence at VCAT hearings, and mediations, and has participated in expert conclaves and public hearings for projects of significance including North East Link. Scott has engaged with all drainage and flood management stakeholders in Victoria including Melbourne Water, Councils, CMA's, DELWP, VICSES, EMV, VicRoads, BOM and property owners. Scott has spoken at numerous industry conferences across a diverse range of topics including flood management, stormwater treatment and impacts / response to climate change. Scott is proficient in the use of TUFLOW, HEC-RAS, DRAINS, MUSIC, XP-RAFTS, RORB, and MIKE FLOOD software. Scott also has vast experience in the use of GIS software including MapInfo, Global Mapper and QGIS.

KEY AREAS OF EXPERTISE

- Floodplain modelling and management
- Mitigation works assessments
- Climate change impact assessments
- Water Sensitive Urban Design
- Stormwater harvesting and reuse
- Drainage, wetland, and retarding basin detailed design
- Development assessment and planning including preparation of stormwater management plans
- Stakeholder engagement and community consultation
- Major Infrastructure Projects Technical Review (Surface Water)
- EES work in relation to surface water

PROFESSIONAL HISTORY

April 2010 - present	Principal Engineer, Engeny Water Management, Melbourne
Feb 2008 – April 2010	Water Resources Engineer, AECOM Australia Pty Ltd (formerly Maunsell Aust Pty Ltd)
Feb 2005 – Jan 2008	Water Resources Engineer, Tonkin Consulting, Adelaide
Dec 2003 – Feb 2004	Vacation Work, SA Water

EDUCATION

2004	Bachelor of Engineering (Civil and Environmental) (Hons), University of Adelaide
2004	Bachelor of Economics, University of Adelaide

REGISTRATIONS / AFFILIATIONS

Member, Institution of Engineers, Australia
Chartered Professional Engineer
Member Stormwater Association Australia

EXPERIENCE

North East Link Project – Surface Water Expert, Maddocks and Harwood Andrews on behalf of Banyule, Whitehorse, Boroondara and Manningham Councils	Scott was originally engaged by Banyule City Council to undertake technical reviews of all surface water related matters relating to the North East Link Project (NELP). Scott's involvement included attendance at Technical Reference Group (TRG) meetings, reviewing flood modelling outputs developed by the project alliance as part of the Environment Effects Statement (EES), identifying opportunities for the project to resolve existing flooding concerns within the project corridor, and preparing comments on Council's behalf upon review of all EES draft documents pertaining to surface water matters. Scott was then engaged to review all surface water aspects relating to NELP on behalf of four local Councils. Scott prepared a detailed expert report, participated in expert conclaves, and presented to the Independent Advisory Committee as part of public hearings held for the project.
Heidelberg to Rosanna Rail Duplication and Lower Plenty Road Level Crossing Removal Expert Drainage Review, Banyule City Council	Scott was entrusted by Banyule City Council to undertake technical reviews of all surface water related matters relating to this project. This included reviewing flood models and outputs developed by the project alliance (NEPA), reviewing all drainage and WSUD asset design drawings, and undertaking a number of site visits during construction to ensure compliance with the design intent. Through his reviews Scott identified numerous drainage improvement opportunities to reduce flooding and reposition of drainage alignments to provide Council with an improved outcome with respect to land management and asset maintenance. Scott helped Council's response to a claim by NEPA that Council's drainage system contributed to damage to newly constructed landscaping during an intense rainfall event. This claim was subsequently withdrawn by NEP.
Knox City Council Flood Modelling and Mapping including SBO development, Knox City Council	Scott managed this project for Engeny and oversaw the development of detailed flood modelling and mapping of all drainage catchments across the Knox municipality. A key output from this study was a draft Special Building Overlay (SBO) suitable for implementation in Council's Planning Scheme. As part of Engeny's work Scott has also investigated the effectiveness of South East Water's 'Talking Tanks' technology within one of Council's sub-catchments. Council presented the findings of this work at the 2019 Stormwater Victoria conference.

Croydon Structure Plan – Stormwater Management Background Report, Maroondah City Council

As a result of Scott's longstanding experience and knowledge of flooding across Croydon, Scott was engaged by Council to summarise the current understanding of stormwater opportunities and constraints within the study area. Scott's recommendations included implementation of flood overlays, potential adoption of a Developer Contributions Plan (DCP) to assist in funding drainage improvement works, and consideration of an in-lieu development contribution scheme with respect to stormwater treatment to provide funding of centralised stormwater treatment assets.

Clancy Road Subdivision Expert Review, Mitchell Shire Council

Scott worked closely with Council to review a claim by the developer of the subdivision that the capacity of Council's downstream drainage network was limiting the development potential of the site. Scott's work was reviewed by an independent expert and it was agreed that the developer did not have a case to pursue further. It is understood that the claim was for several million dollars to compensate for loss of developable land.

Rosewall Court, Wantirna South - expert drainage report for Knox City Council

Scott undertook a review of the capacity of Council's drainage network draining through the subject property and determined that the drainage had an appropriate design standard. This work was undertaken to challenge a local resident who was suggested that flooding of their property was a direct result of the capacity of Council's drainage network. Upon receipt of the work completed by Scott the resident did not proceed further with their claim.

Redmond Court, Bundoora – expert drainage report for property owner

Scott prepared an expert report for the property owner disputing a claim from their neighbour that runoff from landscaping works had resulted in increased runoff being directed on to their property. Scott undertook a site visit and identified the drainage installed as part of the landscaping was appropriate to prevent runoff from entering the neighbouring property. The claim was mediated prior to going to VCAT in favour of the property owner Scott represented.

Kerang / Dingwall Flooding Expert Witness project – Goulburn Murray Water

In 2013 Scott undertook a detailed assessment of complex flooding patterns that occurred in 2011. The flooding was related to the catchments of the Loddon River and Wandella Creek and the interaction of the flood with the large floodplains and various infrastructure including roads, bridges, embankments, irrigation channels and syphons. Scott's work included complex 2D flood modelling of the actual flood behaviour. Upon completion of the modelling the property owner making a claim against Goulburn Murray Water elected not to proceed to VCAT and withdrew their claim.

Rosehill Park Stormwater Treatment and Harvesting Detailed Design, Moonee Valley City Council

Engeny was engaged by Council to prepare construction documentation for this project. Scott reviewed and challenged the original concept and found a number of improvement opportunities to maximise the reliability of the harvesting system whilst managing a number of site constraints including managing possible downstream flooding, presence of hard rock and significant underground services. Construction of the project was completed in late 2020.

Brentwood Park Retarding Basin Detailed Design, Maroondah City Council

Engeny were engaged to undertake a detailed flood mitigation assessment of the Lincoln Road drainage catchment in Croydon. Scott identified an opportunity to provide significant flood mitigation benefit in the catchment by constructing a retarding basin within Brentwood Park immediately upstream of Lincoln Road. Subsequent to the demonstration of its effectiveness via detailed flood modelling Scott oversaw and informed the development of detailed design drawings for construction. The basin was successfully constructed in the summer of 2016/17.

Flood Managements Plans, Melbourne Water

Scott has successfully project managed several Flood Management Plans (FMPs) for Melbourne Water and Nillumbik Shire Council, City of Kingston, City of Maroondah Flood Management Plan, and Mornington Peninsula Shire Council. Each of these plans involved workshops and co-ordination with numerous Council and Melbourne Water departments together with representatives from VICSES, DELWP and VicRoads. The projects all included:

- workshops with all stakeholders, including Melbourne Water, Council and VICSES
- assessment of existing information, flood modelling and planning controls
- identification of flooding hot spots
- consideration of climate change, sea level rise and coastal flooding where appropriate
- preparation of an action plan for the future structural and non-structural management of flooding risks.

Chinamans Creek Levee Detailed Design, Melbourne Water

Scott managed the design of a complex levee and assisted Melbourne Water to finalise all relevant approvals and prepare for the tender process. This included overseeing the development of a Conservation Management Plan (CMP) for the management of Swamp Skinks which inhabit the project area and are a threatened species. Scott helped prepare detailed landscaping plans to improve habitat for the Skinks upon completion of the works. The CMP and landscaping plans were subsequently approved by Council and DELWP and the project is scheduled for construction in early 2021.

Colac Stormwater Development Strategy, Colac Otway Shire Council

Scott project managed this project which included a range of key tasks including detailed flood modelling and development of a stormwater strategy to manage / facilitate future development. Engagement of the local community was also a focus of the Strategy and Scott was involved in all consultation activities including participation in a Citizen's Jury process as part of the development of the Colac 2050 planning strategy. This study also included the assessment of the impacts of climate change with respect to flooding and quantified the increase in cost of mitigation works to address predictions of increased rainfall intensity. Scott presented the findings of this assessment at the South West Climate Change Forum.

Sunset Strip and Smiths Beach Drainage Strategy, Bass Coast Shire Council

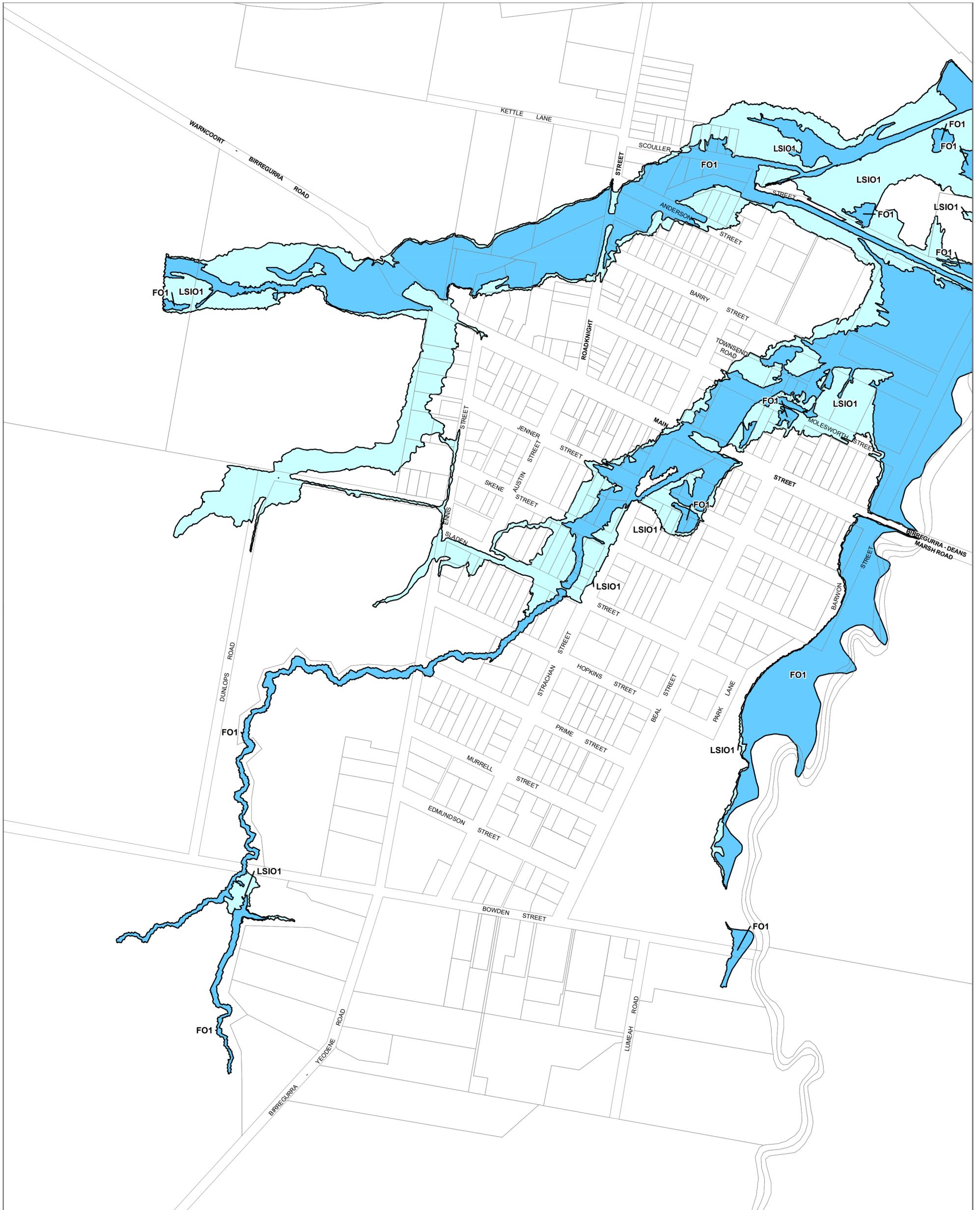
Scott oversaw the development of a drainage strategy which included a wide range of options for managing surface water and providing water quality treatment in the Sunset Strip and Smiths Beach areas. A key deliverable of the project was an Action Plan with a tabulated list of prioritised actions. Each of the actions were costed, assigned a responsibility and a description noted of how the proposed works meet a range of objectives, including road drainage, flood protection, peak flow reduction, stormwater quality treatment and environmental protection.

<p>Pakenham Town Centre Flood Modelling and Planning Scheme Amendment, Cardinia Shire Council / Melbourne Water</p>	<p>Scott oversaw the development of a flood model covering the Pakenham Town Centre and undertook Quality Assurance Reviews in accordance with Melbourne Water's Specifications. Upon completion of the modelling Scott guided the development of new flood overlays for the Town Centre to replace out-dated and overly conservative existing overlays. Council's Planning Scheme was successfully amended to reflect this work.</p>
<p>Wetland Safety Audits, Multiple clients</p>	<p>Scott has prepared a number of safety audits for urban wetlands for new subdivisions. This has included providing design advice to clients as well as preparing reports to enable the wetlands to be approved by Council and/or Melbourne water and to be handed over following completion of the subdivision.</p>
<p>Northern Access Road Project, Qld</p>	<p>This project involved the detailed design of all road drainage for the Northern Access Road (Brisbane Airport). Scott was involved in the hydraulic modelling of bridge and road drainage and in the hydraulic design and water quality modelling of swales and ponds. Scott was also involved in the development of detailed construction drawings for all drainage structures.</p>
<p>Southern Link Upgrade, Vic</p>	<p>This project involved an environmental site supervision role of construction activities along Southern Link as part of the Monash-CityLink-West Gate Freeway upgrade. Scott conducted routine weekly site inspections to ensure appropriate environmental management was being conducted. Water quality monitoring was also undertaken during these inspections to ensure that water quality within Gardiners Creek was not adversely impacted by construction activities. Scott was largely involved in the development of Construction Environmental Management Plans and Environmental Management Plans to ensure contractors were aware of the project's environmental requirements.</p>
<p>Roxby Downs Township Expansion, SA</p>	<p>This project involved a site supervision role of township expansion projects in Roxby Downs. This included the supervision of the construction of residential subdivisions, an industrial subdivision, and effluent lagoon. Scott's role involved liaison with BHP Billiton (the client), Roxby Downs Council (asset owner) and York Civil (Civil contractor). He managed technical queries, site instructions and the various tasks necessary to keep the project on schedule. There was a major focus placed on the environmental impacts of the construction activities. Scott conducted weekly environmental inspections with BHP representatives to ensure the conditions of the environmental approvals were adhered to.</p>
<p>Port Road Floodplain Mapping/Rejuvenation Project, SA</p>	<p>This project firstly involved detailed flood modelling and mapping the Port Road catchment to determine extent of flooding within the catchment using TUFLOW. The flood mapping which Scott undertook highlighted areas of significant flooding and as a result Council commissioned further work to develop a stormwater master plan aimed at prioritising works to address the flooding. Scott developed a DRAINS model of the entire catchment which he used to design stormwater drainage, wetlands, and detention basins. The project is significant given its multi-objective stormwater scheme with water reuse, water quality improvement, environmental enhancements all whilst reducing flood risk. The works form part of the Water Proofing the West Project which won the 2013 Smart Water Resource Management Award presented by the Water Industry Alliance.</p>

Appendix B:

Proposed Flood Overlays

COLAC OTWAY PLANNING SCHEME - LOCAL PROVISION AMENDMENT C116cola

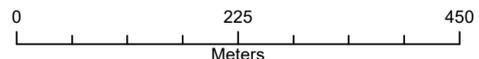


- LEGEND**
- FO1 - Floodway Overlay - Schedule 1
 - LSIO1 - Land Subject to Inundation Overlay - Schedule 1

Municipal Boundary

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Australian Map Grid Zone 54

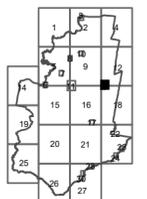


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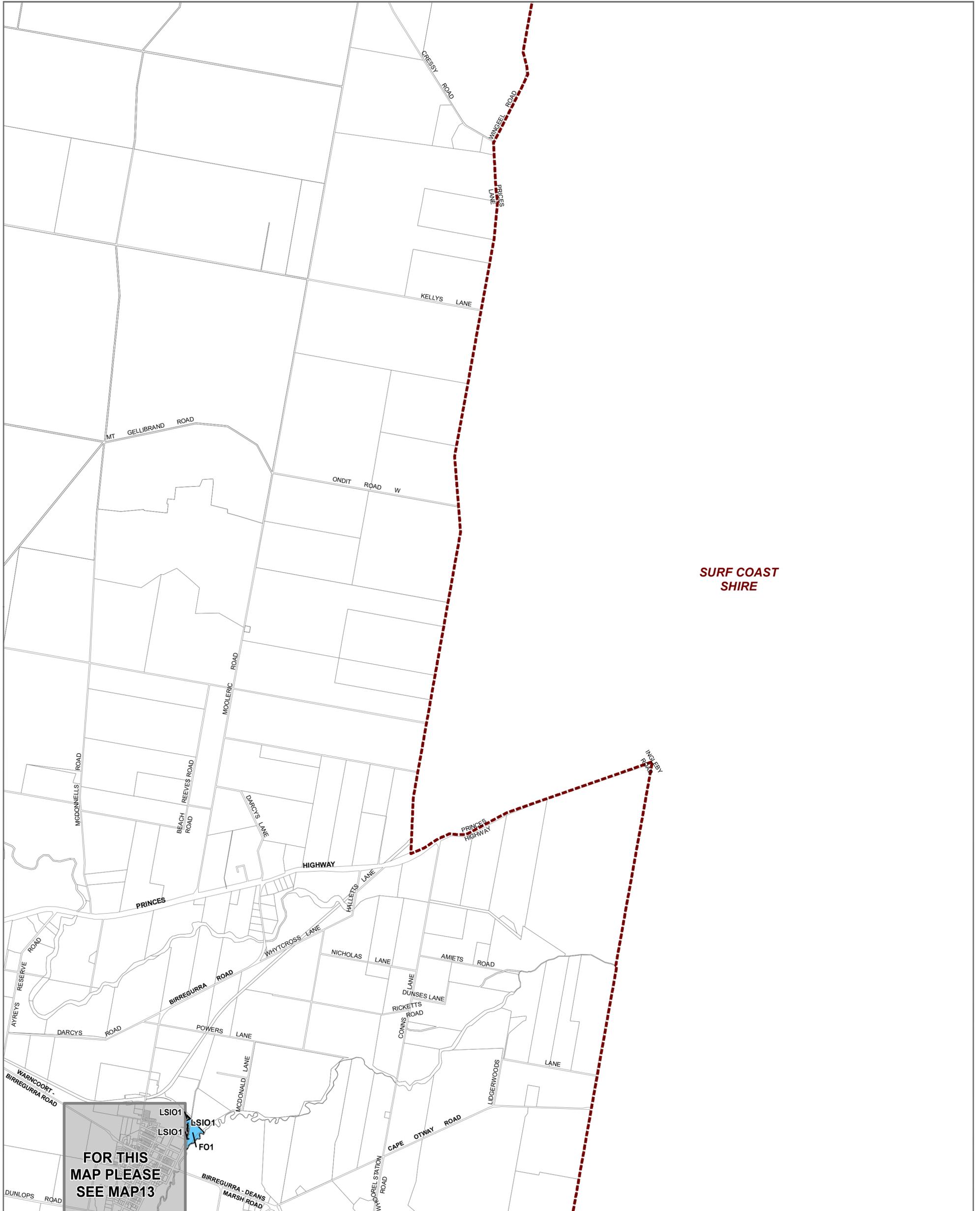


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INDEX TO ADJOINING SCHEME MAPS



COLAC OTWAY PLANNING SCHEME - LOCAL PROVISION AMENDMENT C116cola



**SURF COAST
SHIRE**

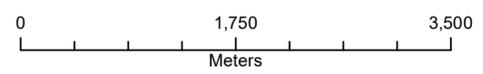
**FOR THIS
MAP PLEASE
SEE MAP13**

- LEGEND**
- FO1 - Floodway Overlay - Schedule 1
 - LSI01 - Land Subject to Inundation Overlay - Schedule 1

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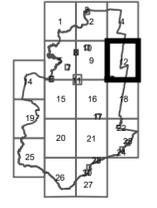
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COLAC OTWAY PLANNING SCHEME - LOCAL PROVISION AMENDMENT C116cola

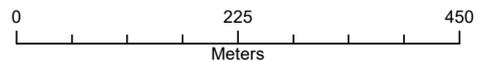


LEGEND
 SBO1 - Special Building Overlay - Schedule 1

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Australian Map Grid Zone 54

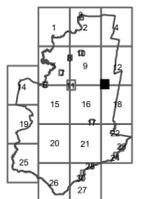


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