Colac Otway
SHIRE

MEETING OF SPECIAL COUNCIL

AGENDA

WEDNESDAY 20 MARCH 2019

AT 4:00 PM

COPACC

COLAC OTWAY SHIRE COUNCIL SPECIAL MEETING

20 MARCH 2019

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OFFICER REPORTS

COLAC OTWAY SHIRE COUNCIL SPECIAL MEETING

NOTICE is hereby given that the next **SPECIAL MEETING OF THE COLAC OTWAY SHIRE COUNCIL** will be held at COPACC on 20 March 2019 at 4:00pm.

AGENDA

1. I DECLARE THIS MEETING OPEN

OPENING PRAYER

Almighty God, we seek your
blessing and guidance in our
deliberations on behalf of the
people of the Colac Otway Shire.
Enable this Council's decisions to be
those that contribute to the true
welfare and betterment of our community.

AMEN

2. PRESENT

3. APOLOGIES AND LEAVE OF ABSENCE

4. WELCOME AND ACKNOWLEDGEMENT OF COUNTRY

Colac Otway Shire acknowledges the original custodians and law makers of this land, their elders past and present and welcomes any descendants here today.

I ask that we all show respect to each other and respect for the office of an elected representative.

All Council and Committee meetings are audio recorded, with the exception of matters identified as confidential items in the Agenda. This includes the public participation sections of the meetings.

Audio recordings of meetings are taken to facilitate the preparation of the minutes of open Council and Committee meetings and to ensure their accuracy.

In some circumstances a recording will be disclosed to a third party. Those circumstances include, but are not limited to, circumstances, such as where Council is compelled to disclose an audio recording because it is required by law, such as the Freedom of Information Act 1982, or by court order, warrant, or subpoena or to assist in an investigation undertaken by the Ombudsman or the Independent Broad-based Anti-corruption Commission.

Council will not use or disclose the recordings for any other purpose. It is an offence to make an unauthorised recording of the meeting.

The sole purpose of the Special Council Meeting is to consider submissions regarding:

- Colac Stormwater Development Strategy; and
- Amendment C97 – Colac 2050 Growth Plan.

5. QUESTION TIME

At every Special Council Meeting, a public question time not exceeding 30 minutes will be held to enable any member of the public to question Council but only on items included in the Agenda of that Special Council Meeting.

Please remember, you must ask a question. If you do not ask a question you will be asked to sit down and the next person will be invited to ask a question.

1. Questions received in writing prior to the meeting (subject to attendance and time).

2. Questions from the floor.

6. DECLARATIONS OF INTEREST

SPECIAL COUNCIL MEETING

COLAC STORMWATER DEVELOPMENT STRATEGY - CONSIDERATION OF SUBMISSIONS

SC192003-1

LOCATION / ADDRESS	Colac	**GENERAL MANAGER**	Tony McGann
OFFICER	Jeremy Rudd	**DIVISION**	Infrastructure & Leisure Services
TRIM FILE	F15/10336	**CONFIDENTIAL**	No
ATTACHMENTS	1. OM Council Report - Stormwater Development Strategy - July 2018 2. Colac Stormwater Development Strategy - Submission Table with Officer Response Name Removed for Council Report pdf 3. Colac Stormwater Development Strategy_Engeny_Rev0 Final March 2019 pdf 4. Colac Stormwater Development Strategy Combined Letter and Information Brochure for Print 16 October 2018 spread FINAL		
PURPOSE	To consider submissions received to the exhibition of the draft Colac Stormwater Development Strategy.		

1. LOCATION PLAN / AERIAL PHOTO

2. EXECUTIVE SUMMARY

The draft Colac Stormwater Development Strategy is an important document, which will assist Council identify drainage problems and solutions in Colac, as well as facilitate urban expansion of the town with appropriate stormwater management infrastructure.

The Strategy underwent a six week public exhibition process from November to mid-December 2018. Eleven submissions were received from ten parties. Many of the submissions related to local flooding or stormwater issues and inadequacy of current drainage infrastructure or maintenance. The Infrastructure Unit have been investigating the issues raised with the view to alleviate the issues through local cost effective works.

No substantive issues were raised which would require substantial changes to the Strategy. In the opinion of officers, it is considered that Council should adopt the Strategy subject to the minor changes identified in this report.

3. RECOMMENDATION

That Council adopts the Colac Stormwater Development Strategy.

4. BACKGROUND / KEY INFORMATION

BACKGROUND

As reported at the July 2018 Council meeting (**attachment 1**), Council has prepared a draft Colac Stormwater Development Strategy for two main reasons:

- to identify drainage problem areas in Colac that require mitigation to improve the overall drainage system throughout the town; and
- to facilitate the development of land in and close to Colac as part of the planned implementation of the draft Colac 2050 Growth Plan.

The Strategy is a critical input into the draft Colac 2050 Growth Plan (the Growth Plan), and has formed a background document as part of Amendment C97 to implement the Growth Plan's key land use directions. It also identifies a series of structural and non-structural measures to improve the management and performance of Colac's drainage system.

At the July Council meeting, Council resolved to commence a public exhibition process. This report documents the outcomes of that process.

KEY INFORMATION

Council has undertaken a joint public exhibition process of the draft Colac Stormwater Development Strategy and Amendment C97 – Colac 2050 Growth Plan, as noted in Section 5 of this paper. Eleven submissions were received from ten parties.

Matters raised in submissions were broadly as follows:

- impact on insurance premiums
- impact of localised flooding, and risk of building damage, impact on property infrastructure
- lack of maintenance
- localised flooding and inadequate infrastructure
- constructed waterway shown on map through property
- request for flooding and inundation to be shown as indicative only and subject to detailed analysis on a case by case basis
- a property owner raised concerns about the location of a retarding basin on site
- suggestion to create a wetland at the end of Stoddard Street
- impact on water quality in Lake Colac from future development areas.

Many of the submissions that raised concerns about localised flooding / stormwater management are being investigated by the infrastructure unit, with the view to considering localised small-scale improvements as part of the ongoing capital works program.

Detail responses to the submissions are provided in **attachment 2**.

No matters were raised which require significant amendments to the draft Strategy, in the opinion of officers. Officers therefore recommend that the Strategy as attached (**attachment 3**) is adopted which includes the minor change from the exhibited draft version as noted in attachment 3 and summarised below:

- The legend on the plan for the Trinity College site has been amended to show a "constructed wetland" rather than a "retarding basin", with an additional note that the size and configuration of the wetland is subject to detailed design.
- Wording on p 59 of the report (section 7.2.1) has been amended to replace the word 'retarding basin' with 'constructed wetland or similar', with additional words to identify the opportunity to negotiate the construction and funding of the facility as part of future development of the land, subject to detailed design.

FURTHER SUPPORTING INFORMATION

5. COMMUNITY CONSULTATION & ENGAGEMENT

Engagement of key stakeholders and the local Colac community was a key input to the development of the Draft Strategy which included two community consultation sessions on 19 April 2016 and 2 May 2017.

The draft Strategy was placed on joint public exhibition with Amendment C97 – Colac 2050 Growth Plan for a 6 week period in accordance with Council's Community Engagement Policy, from the beginning of November to mid-December 2018. Submissions closed 14 December 2018.

Letters of notice with an information brochure were posted to all residents and non-resident ratepayers in Colac and surrounds (**attachment 4**). Notices were also published in local media including the Colac Herald, and Council's Facebook page. Information was also provided on Council's website.

Three drop in information sessions were held across different days and times as follows:

- 11am – 1pm, Wednesday 7 November 2018, Murray Street, Colac (near laneway and Marc's furniture)
- 3pm – 6pm, Wednesday 7 November 2018, COPACC,
- 10am – 1pm, Sunday 18 November 2018, Colac Sunday Market

People were also invited to book an appointment to discuss what is proposed with Council's Infrastructure Unit, or phone for further information.

Submitters have been invited to the Special Council and provided an opportunity to briefly present to Council.

6. ANALYSIS

ALIGNMENT TO COUNCIL PLAN OR COUNCIL POLICY

The Draft Colac Stormwater Development Strategy is a vital input to Colac 2050, which is a key action in the 2017-2022 Council Plan.

ENVIRONMENTAL IMPLICATIONS

Works recommended in the report will significantly reduce environmental issues and impacts by treating runoff and reducing uncontrolled stormwater.

SOCIAL & CULTURAL IMPLICATIONS

Works recommended in the report will benefit the whole of Colac and Elliminyt.

ECONOMIC IMPLICATIONS

The implementation of actions within the Draft Strategy would allow for further development of parts of Colac/Elliminyt, offering expansion opportunities. This would assist in stimulating residential development and growing our local economy.

LEGAL AND RISK IMPLICATIONS

Legal and risk implications associated with localised flooding caused by inadequate drainage infrastructure are expected to reduce upon implementation of the Strategy's recommendations.

RESOURCE IMPLICATIONS (FINANCIAL ETC)

The cost for the waterway corridors and wetlands is estimated at:

- $42.9 million for the Deans Creek catchment => $68,600/developable hectare
- $26 million for Barongarook catchment => $62,800/developable hectare

These costs will be mostly borne by the developers of land as it is rezoned for new residential development following the completion of the Colac 2050 Growth Plan, through infrastructure contribution plans that need to be developed in conjunction with any rezoning that occurs.

The cost of mitigation works for identified existing problem areas totals $14.6 million (in five schemes ranging from $800,000 to $5.3 million) to be considered through Council's budget processes. Consistent allocation of Council funds from its budget will be necessary to achieve these drainage improvements.

7. IMPLEMENTATION STRATEGY

DETAILS

The Colac Stormwater Development Strategy provides the mechanism for sustainable residential development and manageable drainage facilities. Upon approval the Strategy will be made available to Developers and their Consultants. The waterway corridors and wetlands will be constructed over time mainly by developers during the course of developing the land for residential use. Further work to implement development contributions mechanisms which would include stormwater management measures outlined in the Strategy will be undertaken by the Strategic to guide future rezoning of land for urban growth.

Mitigation works recommended for existing drainage networks shall be programmed over the next ten years subject to funding availability.

COMMUNICATION

The approved Strategy will be made available on Council's website and provided to residents or developers on request.

TIMELINE

Subject to a Council resolution, the following timeline applies:

- Adopt Strategy at Special Council meeting in March 2019

8. OFFICER DIRECT OR INDIRECT INTEREST

No officer declared an interest under the *Local Government Act 1989* in the preparation of this report.

Colac Otway
SHIRE

ORDINARY COUNCIL MEETING

COLAC STORMWATER DEVELOPMENT STRATEGY

OM182507-2

LOCATION / ADDRESS	Colac	**GENERAL MANAGER**	Tony McGann
OFFICER	Jeremy Rudd	**DIVISION**	Infrastructure & Leisure Services
TRIM FILE	F15/10336	**CONFIDENTIAL**	No
ATTACHMENTS	1. Colac Stormwater Development Strategy Engeny_RevB_July		
PURPOSE	Council to endorse it going out on public exhibition for comment		

1. LOCATION PLAN / AERIAL PHOTO

2. EXECUTIVE SUMMARY

The Colac Stormwater Development Strategy (the 'Strategy') has been developed to:

- identify areas in Colac that experience stormwater management challenges and which require mitigation to improve the overall drainage system throughout the town; and
- facilitate the development of land in and close to Colac as part of the planned implementation of the draft Colac 2050 Growth Plan.

The scope of the Strategy was to prepare flood modelling for Colac & Elliminyt, utilising the 2017 Department of Environment Land Water & Planning (DELWP) Flood Study prepared for the Deans Creek and Barongarook Creek catchments, and developing further modelling of the capacity of the current urban stormwater drainage system.

The study has identified opportunities to improve the current urban stormwater drainage network to improve its performance and reduce the extent of overland flows affecting private land, including areas for future drainage lines, waterway corridors and stormwater treatment/retarding basins which can be used as major drainage lines to cater for the additional runoff from future development areas. These works will also reduce flooding to areas that are currently subject to inundation, both within existing urban areas and in the lower density rural living areas at Elliminyt, increasing the amount of land potentially available for development.

Implementation of actions specified to improve drainage would occur over the long term, requiring significant funding from Council and other sources, as well as contributions from developers as land is rezoned and developed for residential and commercial purposes.

3. RECOMMENDATION

That Council:

a) Endorses the draft Colac Stormwater Development Strategy to be placed on public exhibition for six weeks in accordance with Council's Community Engagement Policy.

b) Following the close of the public consultation period, considers submissions at a future meeting, and if considered appropriate, amends the Strategy.

4. BACKGROUND / KEY INFORMATION

BACKGROUND

Prior to the development of the Strategy, Council's knowledge of the overall performance of the existing drainage catchments in Colac was limited, as it had never previously been hydraulically assessed and it was not known what storm events the drainage system is capable of handling.

The study catchment covers multiple suburbs including Colac, Colac West, Colac East and Elliminyt, totalling an area of approximately 131km^2. The western side of Colac is drained by Deans Creek and the eastern side by Barongarook Creek before discharging into Lake Colac on the northern face of the township. These two waterway catchments are divided by a well-defined ridge running north-south, leaving a small urban catchment which directly drains into Lake Colac.

The combined Deans Creek and Barongarook Creek catchment make up approximately 60% of the overall Lake Colac catchment and therefore contribute the majority of inflow into the lake.

Within the Colac township, a formal underground drainage network collects runoff from residential properties and streets and conveys flow to the creeks or the lake.

The Strategy is required for two main reasons:

- to identify drainage problem areas in Colac that require mitigation to improve the overall drainage system throughout the town; and
- to facilitate the development of land in and close to Colac as part of the planned implementation of the draft Colac 2050 Growth Plan.

The Strategy is a critical input into the draft Colac 2050 Growth Plan (the Growth Plan). The Growth Plan is a long term planning project that aims to facilitate the expansion of Colac's residential, business and industry areas into the future. To approve areas for urban expansion, a comprehensive understanding of the existing and future flood planning, drainage and stormwater treatment constraints and opportunities is required.

KEY INFORMATION

Development of the Draft Strategy included detailed flood modelling of the Colac Township and surrounding suburbs, including future growth areas, which has been undertaken to assess the performance of Council's existing drainage infrastructure and to define the extent of overland flooding for a range of rainfall intensities. The 5 year Average Recurrence Interval (ARI), 10 year ARI and 100 year ARI events have been modelled to define flooding for minor and major storm events for existing catchment conditions. Climate change conditions have been assessed for the 5 year and 100 year ARIs.

The flood model developed for the Draft Strategy utilised previous flood models developed for the Department of Environment, Land, Water and Planning (DELWP) as part of the Deans Creek and Barongarook Creek Regional Flood Mapping Project in 2016 which was delivered in partnership with the Corangamite Catchment Management Authority (CCMA).

The following tasks have been undertaken to meet the project objectives:

- Collation of existing information on the drainage system and obtain further information to fill gaps in the existing data set.
- Detailed hydraulic modelling to assess the performance of the existing drainage network.
- Production of flood inundation maps for various rainfall and development scenarios.
- Consultation and sharing of information with the Colac community and other key stakeholders.
- Assessment of the feasibility of increasing development within Colac and identification of the key stormwater infrastructure required to facilitate this development.
- Provide technical information available for improved planning of future development.

Engagement of key stakeholders and the local Colac community was a key input to the development of the Draft Strategy. This engagement was successful in gathering local knowledge to influence and ensure the flood modelling is representative of what happens during flood events and to gain community support for the Draft Strategy itself.

The impact of climate change was assessed within the flood model developed for the Draft Strategy to help inform climate change adaption planning decisions. The increase in rainfall intensity predicted as a result of climate change has been shown to increase peak flood depths. The magnitude of this increase varies across the study area.

A series of structural and non-structural measures have been identified that aim to improve the management and performance of the drainage system. The model can also be used to assess the feasibility of future development in Colac and to identify works to control the impact of development within the catchment. The key recommendations made by this study are:

1. Consider the use of Special Building Overlays (SBO) across the catchment to manage future infill development in existing urban areas and to reduce the flood risk for new buildings. The use of SBOs is recommended as they do not have any capital cost and would result in an effective measure across the study area.
2. Structural mitigation works should be considered to be constructed to reduce the impacts of flooding in existing development areas.
3. Make provision for waterway corridors through proposed new development areas to cost effectively contain flood flows within the waterways, to improve waterway health, to allow for more development and to provide environmental and open space corridors.
4. Make provision for stormwater wetlands within proposed new development areas to treat stormwater to remove pollutants, thus meeting planning scheme requirements. The wetlands will also provide valuable habitat, green space and public amenity as well as peak flow attenuation.

SBO (Special Building Overlay)

An SBO is a State planning control generally placed over an area where there is inadequate drainage and there is risk of flood damage. Areas with a SBO will have special requirements when there is a proposed development such as a subdivision, multi-unit or building a house. The requirement may be as simple as setting the floor level higher than the surrounding flood water mitigating the risk of damage to internal buildings. With an SBO there would be no cost to Council in upgrading the existing drainage system because the onus is placed on the development. This type of overlay has been used by Melbourne Water for many years. There is no proposal at this time for the overlay to be introduced. The Strategy simply recommends that further work occur to determine whether there are areas not included in other flood overlays such as the Land Subject to Inundation Overlay

(LSIO) or Flood Overlay (FO) (as amended by Amendment C90) which should be considered for this control. The LSIO and FO are focussed on addressing riverine flooding, as opposed to flooding in existing urban areas which arises from the drainage system itself.

Structural mitigation works.
Six locations have been identified as being the most flood prone areas referred to as "Hot Spots". Recommendations for mitigation works have been made and cost estimates provided. The mitigation works address flooding for up to 100 Year ARI. The six "Hot Spots" identified are:

- Location 1 – Railway Line to the intersection of Princes Highway and Armstrong Street.
- Location 2 – Gravesend Street to Hart Street.
- Location 3 – Hart Street to Armstrong Street.
- Location 4 – Lawrence Court to Wilson Street.
- Location 5 – Railway Line to the intersection of Chapel Street and Bruce Street.
- Location 6 – Hill Street to Wallace Street.

These "Hot Spots" have been prioritised per the following table:

Location	Priority
Douglas Street	1
Gravesend Street	2
Wilson Street *	3
Lawrence Court	4
Mahoney Court *	5

*Note: if climate change predictions are considered the prioritisation ranking for Wilson St & Mahoney Court switch rankings.

The strategy isn't intended to provide a detailed design for construction of each scheme. Further investigation and planning will be required including community consultation underground service proving, geotechnical investigations, detailed design, flood modelling to confirm the design.

Waterway corridors
The intent of constructed Waterway Corridors through proposed development areas is to effectively contain flood flows within the waterways, to improve waterway health, to allow for development and to provide environmental and open space corridors.

Under existing conditions there are significant areas of the proposed development areas that are flood prone. These areas are flood prone due to one or a combination of the following reasons:

- Limited capacity of existing waterways (that are typically man-made open rural drains through the proposed development areas).
- Wide flat valleys adjacent to the existing waterways / man-made open drains.
- Sheet flow across paddocks.
- Flood flows from existing upstream rural catchments.

Provision of constructed waterways for the local waterways / man-made open drains for the proposed Colac development areas is expected to have the following benefits.

- The proposed waterways are designed to be excavated to cater for the 100 year ARI peak flow, with freeboard to surrounding land, enabling development and drainage of land.

- The waterways will provide environmental values, habitat, riparian zones, open space corridors and visual and public amenity.

Melbourne Water has a well-developed set of guidelines for the design of constructed waterways in urban areas. The proposed modified/constructed waterways through the development areas are shown on the plans in the Draft Strategy's Appendices. The proposed waterways are designated within the two catchment areas, Deans Creek and Barongarook Creek.

The cost for provision of the waterways is intended to be largely met by developers as a prerequisite to making the land available for new development. Detailed cost estimates have been included within the Draft Strategy. In summary the estimated average cost per lot within each catchment is summarised in the following table:

Catchment	5 lots / hectare	10 lots / hectare	15 lots / hectare
Deans Creek	$13,720 / lot	$6,860 / lot	$4,570 / lot
Barongarook Creek	$12,560 / lot	$6,280 / lot	$4,190 / lot

The following factors should be considered by Council with respect to the proposed scheme of waterways, culverts and wetlands:

- The amount of developable area made available by the proposed waterways and wetlands.
- That the proposed waterways provide 100 year ARI flood protection to areas of proposed development.
- That the stormwater treatment will meet the planning scheme requirements to treat runoff to meet Best Practice targets for pollutant removal.
- The cost of the proposed works (as compared to similar schemes in Melton, Wyndham, Ballarat and Armstrong Creek.
- The synergies between the proposed scheme of drainage, wetlands and waterways and the Colac 2050 plan.

Stormwater wetlands

Construction of stormwater treatment wetlands within the proposed development areas will treat stormwater to remove pollutants and thus meeting planning scheme requirements. The wetlands will also provide valuable habitat, green space and public amenity as well as peak flow attenuation.

For the proposed Colac development areas wetlands have been proposed with consideration of the following points:

- All proposed urban areas to have their stormwater treated prior to discharge to a waterway.
- Runoff from the proposed development areas must overall meet the Clause 56.07-4 pollutant removal targets prior to discharge to Deans Creek / Barongarook Creek.
- Wetlands have been located at the lowest point for each catchment, often on flood prone land and / or upstream of a road embankment.
- Catchment areas draining to wetlands should typically be in the range of 20 to 50 hectares.
- The wetland areas include the approximate total land take for the wetlands, including provision for sediment basins, sediment drying areas, access tracks, batter slopes and the wetland.
- The wetlands are proposed to be excavated to provide additional stormwater treatment and flood storage and also to remove the need for embankments and embankment risk assessments.

The Draft Strategy doesn't cover all areas which may have water contained on properties. Any areas with water ponding less than 50mm in a 100 year ARI event have been removed from the maps. These areas are considered more of a nuisance rather than a problem.

FURTHER SUPPORTING INFORMATION

5. COMMUNITY CONSULTATION & ENGAGEMENT

Two community consultation sessions were undertaken during the study on 19 April 2016 and 2 May 2017. Information was collected from residents and stakeholders for use and this informed the strategy. The Draft Strategy was presented to the Colac 2050 Citizen's Jury for its consideration.

A 6 week public consultation period in accordance with Council's Community Engagement Policy will proceed following Council's endorsement of the Draft Strategy. Council officers will reply to every submission and consider amendment if necessary.

6. ANALYSIS

ALIGNMENT TO COUNCIL PLAN OR COUNCIL POLICY

The Draft Colac Stormwater Development Strategy is a vital input to Colac 2050, which is a key action in the 2017-2022 Council Plan.

ENVIRONMENTAL IMPLICATIONS

Works recommended in the report will significantly reduce environmental issues and impacts by treating runoff and reducing uncontrolled stormwater.

SOCIAL & CULTURAL IMPLICATIONS

Works recommended in the report will benefit the whole of Colac and Elliminyt.

ECONOMIC IMPLICATIONS

The implementation of actions within the Draft Strategy would allow for further development of parts of Colac/Elliminyt, offering expansion opportunities. This would assist in stimulating residential development and growing our local economy.

LEGAL & RISK IMPLICATIONS

Legal and risk implications are expected to reduce upon implementation of the strategy recommendations.

RESOURCE IMPLICATIONS (FINANCIAL ETC)

The cost for the waterway corridors and wetlands is estimated at:

- $42.9 million for the Deans Creek catchment => $68,600/developable hectare
- $26 million for Barongarook catchment => $62,800/developable hectare

These costs will be mostly borne by the developers of land as it is rezoned for new residential development following the completion of the Colac 2050 Growth Plan, through infrastructure contribution plans that need to be developed in conjunction with any rezoning that occurs.

The cost of mitigation works for identified existing problem areas totals $14.6 million (in five schemes ranging from $800 thousand to $5.3 million) to be considered through Council's budget processes. Consistent allocation of Council funds from its budget will be necessary to achieve these drainage improvements.

7. IMPLEMENTATION STRATEGY

DETAILS

The Colac Stormwater Development Strategy provides the mechanism for sustainable residential development and manageable drainage facilities. Upon approval the Strategy will be made available to Developers and their Consultants. The waterway corridors and wetlands will be constructed over time mainly by developers during the course of developing the land for residential use.

Mitigation works recommended for existing drainage networks shall be programmed over the next 10 years subject to funding availability.

COMMUNICATION

Upon endorsement by Council the Colac Stormwater Development Strategy will be opened for a 6 week public consultation period in accordance with Council's Community Engagement Policy.

Community engagement will be sought via a range of mechanisms including Council's website, social media and print media.

The approved Strategy will be made available on Council's website and provided to residents or developers on request.

TIMELINE

If endorsed the following timeline applies:

- Invite public submissions: August 2018
- Close submissions: September 2018
- Council Committee to consider public submissions: October 2018
- Report to Council: November OCM

8. OFFICER DIRECT OR INDIRECT INTEREST

No officer declared an interest under the *Local Government Act 1989* in the preparation of this report.

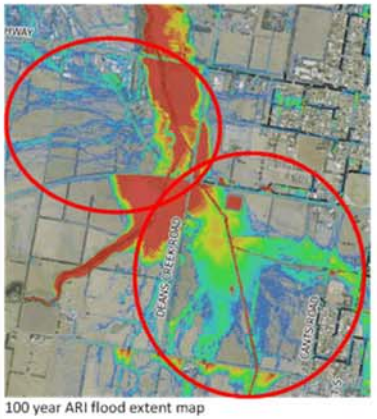
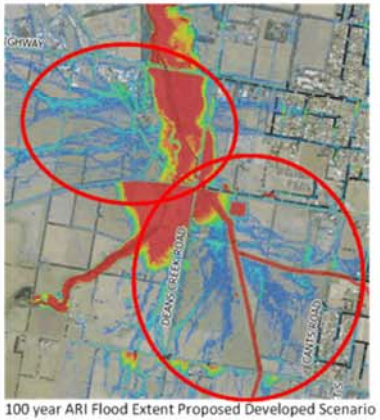
No.	Property	Submission Overview	Officer Response	Map with location of property
S/1	280 Queen Street, Elliminyt	**Supportive submission** My family have owned the land boarded by Queen St and Slater St Elliminyt (280 Queen St) since 1961. The ARI Flood Extent Catchment Wide maps (5, 10, 100 Years) that are presented in the Colac Stormwater Development Strategy correlate with my knowledge of inundation levels and flows over our property. In the rain event in November 2016 there was no inundation across the property mentioned above. We have never seen water across our parcel of land.	Submission noted. The mapping for the site in the stormwater strategy indicates reduced flood extent compared with the existing LSIO mapping. No change required.	 100 year ARI flood extent map
S/2	65 Calvert Street, Colac	**Issues:** • **need for information session** • **impact on insurance premiums** Questions the need for information sessions when they have expressed their views already. States that they have been assured that property will be exempt from insurance premiums because of elevated position.	Submission noted. Information sessions were held to enable the wider public an opportunity to ask questions and seek information about the Strategy. The submitter's property is located next to the Barongarook Creek in an elevated position. Matters in relation to insurance are beyond the scope of this Strategy. **No change required.**	 Zone map with location

S/3	11 Lawrence Court, Colac	**Issue – localised flooding and risk of building damage, lack of maintenance.** Over the years we have had multiple storm events that have resulted in stormwater run-off building up and overflowing into our property resulting, on at least one occasion, water accumulation in our back yard of some 250mm depth. Our concern is that without sufficient drainage in our area, a one-in-a-hundred-year storm could have the potential to inundate our home. There is a stormwater pit outside our property and one directly opposite, in the North-East corner of the open-space park. The Westerly wind blows leaves and bark from the large 'stringy-bark' gum tree in the above-mentioned corner causing the debris to partially block the stormwater pit (on the park side). It is therefore our belief that this causes the stormwater system in Lawrence Court to have a reduced capacity. In view of the prohibitive cost of enlarging the existing stormwater system, we would like to submit some suggestions to alleviate the exposure to the risk of major flooding in the future: • Carry out thorough annual inspections of both the stormwater pits mentioned above and the connecting under-road culvert. • Clear out any debris from the above to allow maximum water flow. • Regular collection of bark and leaves off the ground from the above-mentioned gum tree. • Install 'speed-humps' at both entrances to Lawrence Court (from Stewart Street) to reduce the amount of stormwater run-off from Stewart Street flowing into Lawrence Court.	Submission noted. The Strategy identifies the opportunity to install improved drainage infrastructure albeit at significant expense. There is an opportunity to investigate more cost effective options as proposed in the submission. Infrastructure Unit to investigate further, including improved maintenance regime across the town and cleaning drainage infrastructure at specific times of year (e.g. Autumn). Also infrastructure will investigate option of installing water diversion or retention infrastructure to protect housing in Lawrence Court and surrounds from overland flows. **No change required.**	 100 year ARI flood extent map  Zone map with location  Mitigation Location 4 map – existing conditions

S/4	13 McAdam Cres, Colac	**Issue: onsite flooding resulting in loss of use of land and impact on property infrastructure** Advised of the flooding problem on the property. Has lived at this property for 24 years and have started to have this problem in the last 10 years. In the winter months three quarters of the backyard is unusable due to it being six inches under water. Garden sheds are full of water, with impacts on property infrastructure (back gate inoperable, rotting posts, lack of play space, trees dying, boggy ground making mowing and maintenance difficult). There is no longer any benefit from running drains out to the easement at the rear because the lane is also flooded and there is nowhere for the water to escape so it just lays in my yard and surrounding properties. Is seeking the problem rectified to enable full use of the property.	Submission noted. The Strategy does not identify any specific intervention in this area, although it does recognise flooding generally. There is an opportunity to investigate cost effective options to assist with the overland flow and underground stormwater management. Infrastructure Unit to investigate further, including investigating option for installing water diversion infrastructure or upgrading local drainage infrastructure. **No change required.**	 100 year ARI flood extent map  Location map

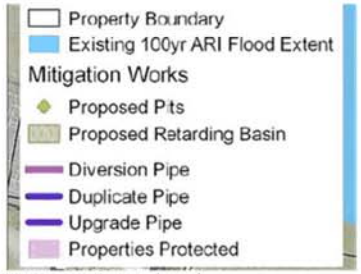
S/5	130-154 Sinclair Street, South Colac	**Issue: constructed waterway shown on map through property.** As part of our client's planning permit application for the subject site (PP105/2016-1), our client engaged Engeny to undertake detailed stormwater drainage analysis of the site and it was found that the site can be developed without the need for a constructed waterway through the site. The detailed Engeny report found that the stormwater can be appropriately mitigated by the following measures: • The allowance of a 35m road reserve that provides sufficient capacity to convey peak 1% AEP flows. • Temporary retarding basin located on Lots 7-13 that provides storage of 3000m3 and ensures no increases to flood depth downstream. • 2 KL rainwater tank to each lot. • Bioretention swales. We request that the draft Colac Stormwater Development Strategy be updated to remove the constructed waterway through our client's land to enable the land subdivision.	The physical form of the proposed constructed waterway is not prescribed and could be realised utilising different cross sections, which are to be determined as part of future planning stages. The land in question has a major drainage line traversing through the site which is currently identified by a Land Subject to Inundation Overlay in the Colac Otway Planning Scheme. It is also identified in the Colac 2050 Framework Plan as part of a strategic corridor for open space to provide connected paths for community benefit. It is not considered appropriate to remove the identification of 'constructed waterway' from the plan given that it would disconnect two sections of a drainage corridor and impede the delivery of the strategic vision for overall stormwater management. **Change not supported.**	 Location map  100 year ARI flood extent map

				 Waterway and wetland layout plan
S/5a	95 Cants Road, Elliminyt 315 Princes Highway, Colac 85 Deans Creek Road, Elliminyt 60 Deans Creek Road Colac 315 Pound Road,	**Issue: Request that the draft Colac Stormwater Development Strategy (April 2018) be updated to show the flooding and inundation as indicative only and subject to detailed analysis on a case by case basis** **Note: identical submission to Amendment C97** The draft Strategy indicates that the above sites are recommended for re-zoning to Residential Zone Subject to a Development Plan. While we are generally supportive of this land zoning allocation, we are concerned by the extent of land shown as being subject to Flooding and subject to Inundation. While we respect that this is a high level document, we request that appropriate safeguards are put in place within the approved report under Amendment C97 to allow for future investigations to take place on	Large areas of the land in question are currently affected by the Land Subject to Inundation Overlay, which is also reflected on the current Colac Framework Plan. A key aim of preparing the Growth Plan and Colac Stormwater Development Strategy at the same time was to consider the feasibility of developing parts of the land subject to inundation for residential purposes having regard to the shallow depth of inundation in some sections and also the ability to mitigate inundation through stormwater management measures such as constructed wetlands, for example. The Strategy identifies current flooding (5 year, 10 year and 100 year ARI flood extent) and inundation conditions as well as a post development scenario for the land.	 Zone / Overlay map with property area

	Elliminyt	the land to enable a reduction in the areas shown for flooding/inundation. Having such extensive areas of flooding ultimately become a burden for Council and the CCMA with regard to maintenance, as such it is in the best interests of all parties to work collectively to maximise the developable area while appropriately addressing the flooding issues using the latest and most cost-effective solutions. As such, we request that the draft Colac Stormwater Development Strategy (April 2018) be updated to show the flooding and inundation as indicative only and subject to detailed analysis on a case by case basis.	The post development scenario shows significantly less areas of land subject to inundation with the implementation of stormwater management measures (e.g. constructed wetlands / retarding basins). Thus, both the Strategy and Growth Plan acknowledge the ability to develop some of this land subject to stormwater management infrastructure improvements. It is considered that any further change is not required. **Change not supported.**	 100 year ARI flood extent map  100 year ARI Flood Extent Proposed Developed Scenario

				 Waterway and Wetland Layout Plan with proposed constructed waterways and treatment assets
S/6	474 Murray Street, Colac	**Issue: localised flooding and inadequate infrastructure** Notes the flooding hotspot at the corner of Cants Road and Murray Street as shown on 100 year ARI flood event map with water levels between 20 and 40 cm which extend west in front of their property. Have received independent advice that drainage system is inadequate and that there need to be new storm water pits installed in the area. Request advice regarding this matter.	Submission noted. The Strategy does not identify any specific intervention in this area, although it does recognise flooding generally. The Infrastructure Unit has investigated and have devised a scheme to address localised flooding through retention within the wide road reserve. **No change required.**	 Location map  100 year ARI flood extent map

S/7	Trinity College, 119-243 Hart Street, Colac	**Issue: location of retarding basin on site.** We are concerned that Trinity College has been specifically identified as a site for a retarding basin in Section 7.2.1 under Proposed Works and the implications this has on future plans of the College. Given the impact that the proposed retarding basin will have on land that the report has identified as Trinity College, we do not support the Proposed Structural Mitigation Works to Address 'Hot Spots'. Further, we seek clarification on what this means for the College and what options the College has re these proposed works and any proposed timeline if they in fact proceed.	Submission noted. The site is an area which has localised flooding, and has been identified for a retarding basin to assist with flooding on the site, and more broadly. The site is adjacent to Trinity College, and is owned by the Parish. Section 7.2.1 of the report also discusses the site, and notes the potential for acquisition and a provision of a retarding basin to manage flooding issues to the east of the site. The Infrastructure Unit met with Trinity College and the Parish to discuss their concerns. It is acknowledged that the exact location and shape of the basin could be modified subject to detailed design, however would need to remain in the general location to function as a stormwater retention and water treatment facility. The plan is indicative and should be noted as such. It is envisioned that the infrastructure would take the form of a constructed wetland rather than a conventional retarding basin which could potentially be used for educational purposes if located next to the school. If the balance of the land were to be developed for residential purposes as allowed by the zoning, stormwater management would need to be provided on site as part of the requirements of the Colac Otway Planning Scheme for the subdivision of land. Unencumbered public open space would also be required either as a payment or provided on site. Both the public open space and stormwater management facility would be handed over to Council as a normal part of that process for broader community benefit and to	 Location map  100 year ARI flood extent map

			oversee ongoing maintenance. The stormwater facility, whilst serving that purpose, would however also benefit part of the wider catchment, and as such, would need to be partly funded by Council. The exact mechanics of this would need to be worked through as part of the future development of the land. **Suggested change:** It is suggested, in order to make it clear that the proposed retarding basin is envisioned to be a constructed wetland, the wording on the legend on the plan with the Trinity site should be amended to reflect this, and to note that the size and configuration is subject to detailed design. It is also suggested to amend the wording on 59 of the report (section 7.2.1) to replace the word 'retarding basin' with 'constructed wetland or similar', and to add words to discuss the opportunity to negotiate the construction and funding of the facility as part of future development of the land, subject to detailed design.	 Mitigation Location Map  Mitigation Location map legend
S/8	1-59 Rifle Butts Road, Colac	**Issue: Suggestion to create wetland at the end of Stoddard Street.** I would like to propose that stormwater currently running into the Lake at the west end of Stoddart St be diverted to supply water to the adjacent wetland at the Lake's edge. My wife and I own land along the Lakes edge north of the old Colac High School. We appreciate in time this land will be developed leading to additional stormwater runoff which could	Submission noted. The submission suggests a worthy stormwater intervention which could be explored as part of development plan currently under preparation for Colac west. It is not specifically identified in the strategy, and is considered beyond its scope. The Strategy does not preclude localised stormwater interventions as part of the future development. **No change required.**	 Location map

		also be diverted to the wetland. We believe that over time the wetland could be expanded to resemble that on the eastern side of Colac north of William St. I have submitted a proposal for development of our land west of Rifle Butts Rd, as per the 2050 submission guidelines, and with the assistance of the planning department I'm sure both proposals could be creatively linked.		 ARI 100 year flood extend map
S/9	Colac	Questions whether Council is going to upgrade drainage in the urban areas to cater for additional home and business run off, and use for cleaning solar panels. States that stormwater drainage needs to be upgraded prior to any areas being developed for industrial or residential purposes.	Submission noted. It is a requirement of subdivision and development to ensure stormwater is adequately managed. Also, it is considered that the use of water to clean solar panels can be accommodated with standard drainage infrastructure. Not change required.	
S/10		**Issue: impact on water quality entering Lake Colac from future development areas.** At our recent meeting on 9 May 2017, the membership voted to make a submission to the Colac Storm Water Development Strategy expressing their grave concerns about possible future development on vulnerable flood plains situated along Forest Street, Colac and Dean's Creek Road, Colac West. The membership believes any resultant run off or drainage into these flood plains may have an adverse effect on the water health of Lake Colac. Please register our concerns regarding development on, or adjacent to, these flood plains and the need to	Submission noted. It is a requirement of the Colac Otway Planning Scheme, in particular the provisions as Clause 19.03-3 to ensure that the quality of stormwater runoff associated with development. It specifically seeks to that 'ensure that development protects and improves the health of water bodies including creeks, rivers, wetlands, estuaries and bays by: - Minimising stormwater quality and quantity related impacts - Filtering sediment and waste from stormwater prior to discharge from a site	

		effectively manage stormwater to ensure it does not negatively impact on the water quality flowing into Lake Colac.	- Managing industrial and commercial toxicants in an appropriate way. - Requiring appropriate measures to mitigate litter, sediment and other discharges from construction sites. Furthermore, the Colac 2050 Growth Plan which will facilitate the future development of areas along the Deans Creek and Barongarook Creek discusses extensively the need to ensure best practice WSUD approaches to stormwater management. Future planning will require further detail in relation to how this is delivered. Future development will be required to meet these standards and may in many instances improve the quality of water entering Lake Colac by transforming degraded agricultural flood prone land with the introduction of constructed wetlands and other stormwater quality measures. **No change required.**	

Colac Otway SHIRE

ENGENY WATER MANAGEMENT

Colac Otway Shire Council

Colac Stormwater Development Strategy

March 2019

V2013_001

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JOB NO. AND PROJECT NAME: V2013_001 – Colac Stormwater Development Strategy					
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Signatures					

EXECUTIVE SUMMARY

The Colac Stormwater Development Strategy (CSDS) is a vital input to Colac 2050, a long range planning project that will cater for growth in Colac's population over the next 33 years.

This strategy, through detailed hydraulic modelling of Council's drainage network has identified sustainable and economic solutions to address areas of poor drainage performance within Colac and its surrounds and to identify the surface water requirements to enable future urban growth in Colac. The impact of climate change has also been assessed and the findings will assist Council in their climate change adaptation planning.

A key input to the development of the Strategy has been the engagement of the local Colac community. The purpose of this engagement has been to gather local knowledge to influence and ensure the flood modelling is representative of what happens during flood events and to gain community support for the Strategy itself.

The following tasks have been undertaken to meet the project objectives:

- Collation of existing information on the drainage system and obtain further information to fill gaps in the existing data set
- Detailed hydraulic modelling to assess the performance of the existing drainage network
- Production of flood inundation maps for various rainfall and development scenarios
- Consultation and sharing of information with the Colac community and other key stakeholders
- Assessment of the feasibility of increasing development within Colac and identify the key stormwater infrastructure required to facilitate this development
- Provide technical information available for improved planning of future development.

The hydraulic model created as part of this study has enabled a comprehensive analysis of the drainage system as well as the production of flood inundation maps. Consultation with the Colac community and other key stakeholders and a comprehensive collation and review of drainage data have formed vital inputs to the flood modelling undertaken and subsequent study outcomes.

A series of structural and non-structural measures have been identified that aim to improve the management and performance of the drainage system within Colac. The flood model has also been used to assess the feasibility of future development in Colac and to identify works to control the impact of development within the catchment.

The key recommendations made by this study are (as summarised in the short term and long term action plan presented in Section 10):

- Consider the use of Special Building Overlays (SBO) across the catchment to manage future infill development in existing urban areas and to reduce the flood risk for new buildings. The use of SBOs is recommended as they do not have any capital cost and will result in an effective measure across the study area
- Structural mitigation works should be considered to be constructed to reduce the impacts of flooding in existing development areas
- Make provision for waterway corridors through the proposed development areas to cost effectively contain flood flows within the waterways, to improve waterway health, to allow for more development and to provide environmental and open space corridors
- Make provision for stormwater wetlands within the proposed development areas to treat stormwater to remove pollutants, thus meeting planning scheme requirements. The wetlands will also provide valuable habitat, green space and public amenity as well as peak flow attenuation.

It is important to note that the CSDS is not intended to be used as a design document, it is intended to be used a strategic document to better understand flooding for existing conditions and to assist with consultation and future planning of any proposed development. Further assessment of any works documented in the Strategy is required before construction is undertaken.

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ABBREVIATIONS AND TERMS

The following abbreviations and terms are used and referenced in the Strategy

Abbreviation / Term	Explanation
Annual Exceedance Probability (AEP)	Refers to the probability or risk of a rainfall event of a given magnitude (intensity and duration) occurring or being exceeded in any given year. A 90 % AEP event has a high probability of occurring or being exceeded; it would occur quite often and would be a relatively minor rainfall event. A 1 % AEP event has a low probability of occurrence or being exceeded; but is likely to cause extensive damage.
Australian Height Datum (AHD)	A common national surface level datum approximately corresponding to mean sea level. Introduced in 1971 to eventually supersede all earlier datums.
Average Recurrence Interval (ARI)	Refers to the average time interval between a given flood magnitude occurring or being exceeded. For instance a 100 year ARI flood is expected to be exceeded on average once every 100 years. The AEP is the ARI expressed as a percentage.
Colac Stormwater Development Strategy (CSDS)	This document.
Development Contribution Plan (DCP)	A DCP is a levy for developments that are proposing to increase the number of dwellings on a site.
Freeboard	A factor of safety above design flood levels typically used in relation to the setting of floor levels or crest heights of flood levees. It is usually expressed as a height above the level of the design flood event.
Hydraulics	The term given to the study of water flow in a river, channel or pipe, in particular, the evaluation of flow parameters such as depth and velocity.
Flooding 'Hot Spot'	An area which has a history of repeat flooding highlighted through flood modelling, anecdotal information and / or customer complaints.
Hydrograph	A graph that shows how the discharge changes with time at any particular location.
Hydrology	The term given to the study of the rainfall and runoff process as it relates to the derivation of hydrographs.
Intensity Frequency Duration (IFD)	Statistical analysis of rainfall, describing the rainfall intensity (mm/hr), frequency (probability measured by the AEP), duration (hrs). This analysis is used to generate design rainfall estimates.
TUFLOW	Hydraulic modelling software used in this study to simulate the flow of flood water through the study area. The model uses numerical equations to describe the water movement.
RORB	Hydrological modelling software used in this study to calculate the runoff generated for rainfall events.

1. INTRODUCTION

The Colac Stormwater Development Strategy (CSDS) is a vital input to Colac 2050, a long range planning project that will cater for growth in Colac's population over the next 33 years. Colac 2050 will establish a plan for the expansion of Colac's residential housing footprint, business and industry sectors. A strong understanding of the existing and future flood planning, drainage and stormwater treatment constraints and opportunities is required to facilitate appropriate future development. A copy of the layout plan highlighting development investigation areas for this Strategy, as identified in Colac 2050, is attached in **Appendix A**. The Colac 2050 plan highlights existing Farming / Low Density Residential / Rural Living land targeted for higher density levels of development to accommodate growth in Colac's population.

Prior to the development of this stormwater, flooding and development strategy Council's knowledge of the overall performance of the existing drainage system was limited as it had never been hydraulically assessed and it was not known what frequency of storm event the drainage system was capable of handling.

A key input to the development of the Strategy has been the engagement of the local Colac community. The purpose of this engagement has been to gather local knowledge to influence and ensure the flood modelling is representative of what happens during flood events and to gain community support for the Strategy itself.

To inform the development of the Strategy detailed flood modelling of the Colac Township and surrounding suburbs, including future growth areas, has been undertaken to assess the performance of Council's existing drainage infrastructure and to define the extent of overland flooding for a range of rainfall intensities. The 5 year Average Recurrence Interval (ARI), 10 year ARI and 100 year ARI events have been modelled to define flooding for minor and major storm events for existing catchment conditions. Climate change conditions have been assessed for the 5 year and 100 year ARIs. It is important to note that the flood model developed for the Strategy utilised previous flood models developed for the Department of Environment, Land, Water and Planning (DELWP) as part of the Deans Creek and Barongarook Creek Regional Flood Mapping Project in 2016 which was delivered in partnership with the Corangamite Catchment Management Authority (CCMA). The existing DELWP 2016 flood models for the two major creeks were used as a starting point and the remainder of the study area was input to the model.

Other key inputs to the model developed as part of the Strategy included the following:

- Aerial survey (LiDAR) data captured at the beginning of 2016 to define the existing topography
- Council drainage asset data (including pipe sizes), with confirmation of numerous assets during site visits
- Existing land use information confirmed during site visits and latest aerial photography.

At the time of preparing this report CCMA is proposing changes to the existing Land Subject to Inundation Overlay (LSIO) in response to the findings of the 2016 Regional Flood Mapping project. As part of this work it is understood that the further calibration of the flood models developed for DEWLP will be undertaken during 2017 and as a result it is possible that small differences may exist between the modelling undertaken for DELWP and the modelling undertaken to inform Council's Stormwater Development Strategy. For flooding associated with Deans Creek and Barongarook Creek the modelling undertaken for DELWP will take precedence.

In the future it is possible that the flood modelling undertaken as part of the development of the Strategy could be used to develop flood overlays (e.g. Special Building Overlay (SBO)) for other areas across Colac, areas that are located outside of the LSIO being developed by CCMA in 2017. A recommendation of the Strategy is that Council consider this further as a means of controlling development in flood prone areas of Colac.

1.1 Study Background and Objectives

The key tasks in developing the Strategy were to:

- Collate existing information on the drainage system and obtain further information, as required, to fill gaps in the existing data set
- Detailed hydraulic modelling to assess the performance of the existing drainage network
- Produce flood inundation maps for various rainfall and development scenarios
- Consult and share information with the Colac community and other key stakeholders
- Develop options to mitigate a number of existing flooding issues
- Assess the feasibility of increasing development within Colac and identify the key stormwater infrastructure required to facilitate this development
- Provide technical information available for improved planning of future development.

1.1.1 Climate Change Assessment

During the development of the Strategy Council identified the opportunity to use the flood model developed as part of the Strategy to assess the impacts of climate change with respect to flooding to help inform climate change adaptation planning. As part of this assessment the following tasks were included in the scope of the Strategy:

- Determine the likely increase in rainfall under the latest climate change predictions for the study area and to rerun the hydrology models (with consideration for latest Australian Rainfall and Runoff (ARR 2016) guidelines)

- Run the flood model for the study area for the 5 and 100 year ARI events allowing for the influence of climate change
- Create flood maps, showing the predicted climate change flood extents
- Summarise work within the CSDS to provide Council with one consolidated 'flooding and drainage report'
- Identify locations within Colac which are most vulnerable to climate change. This task included the production of a flood depth difference plot to clearly show the changes in flooding between existing conditions and climate change conditions to quantify the impact of climate change with respect to flooding
- Assess the incremental increase in infrastructure sizing that would be needed at identified hotspots to construct a solution which also addresses the added impact of climate change.

The outcomes of the climate change assessment will assist Council in answering the following key question as part of any planning decisions for improved climate change resilience:

- What incremental increase in capital cost is required to size flood mitigation infrastructure to mitigate an area of flooding under climate change conditions compared to current climate conditions?

The answer to this question is provided within the Strategy.

1.2 Catchment Description

The study catchment covers multiple suburbs including Colac, Colac West, Colac East and Elliminyt totalling an area of approximately 131 square kilometres. The population within these suburbs was estimated at approximately 12,000 at the time of the 2016 census (Australian Bureau of Statistics).

The western side of Colac is drained by Deans Creek and the eastern side by Barongarook Creek before discharging into Lake Colac on the northern face of the township. These two major waterway catchments are divided by a well-defined ridge running north south leaving a small urban catchment which directly drains into Lake Colac. Figure 1.1 provides a layout plan showing key features of the township.

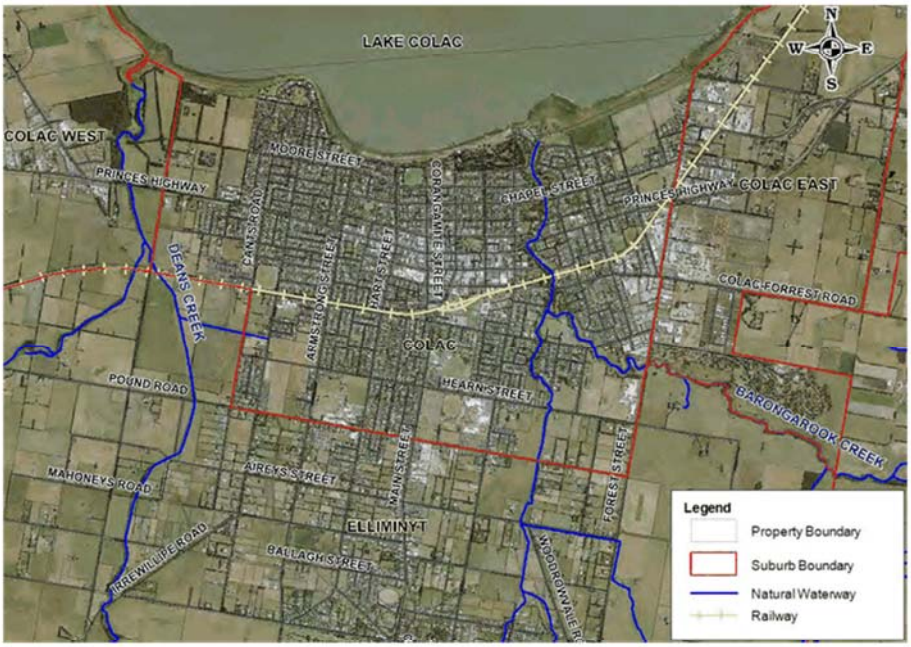


Figure 1.1 Key features of Colac and surrounds

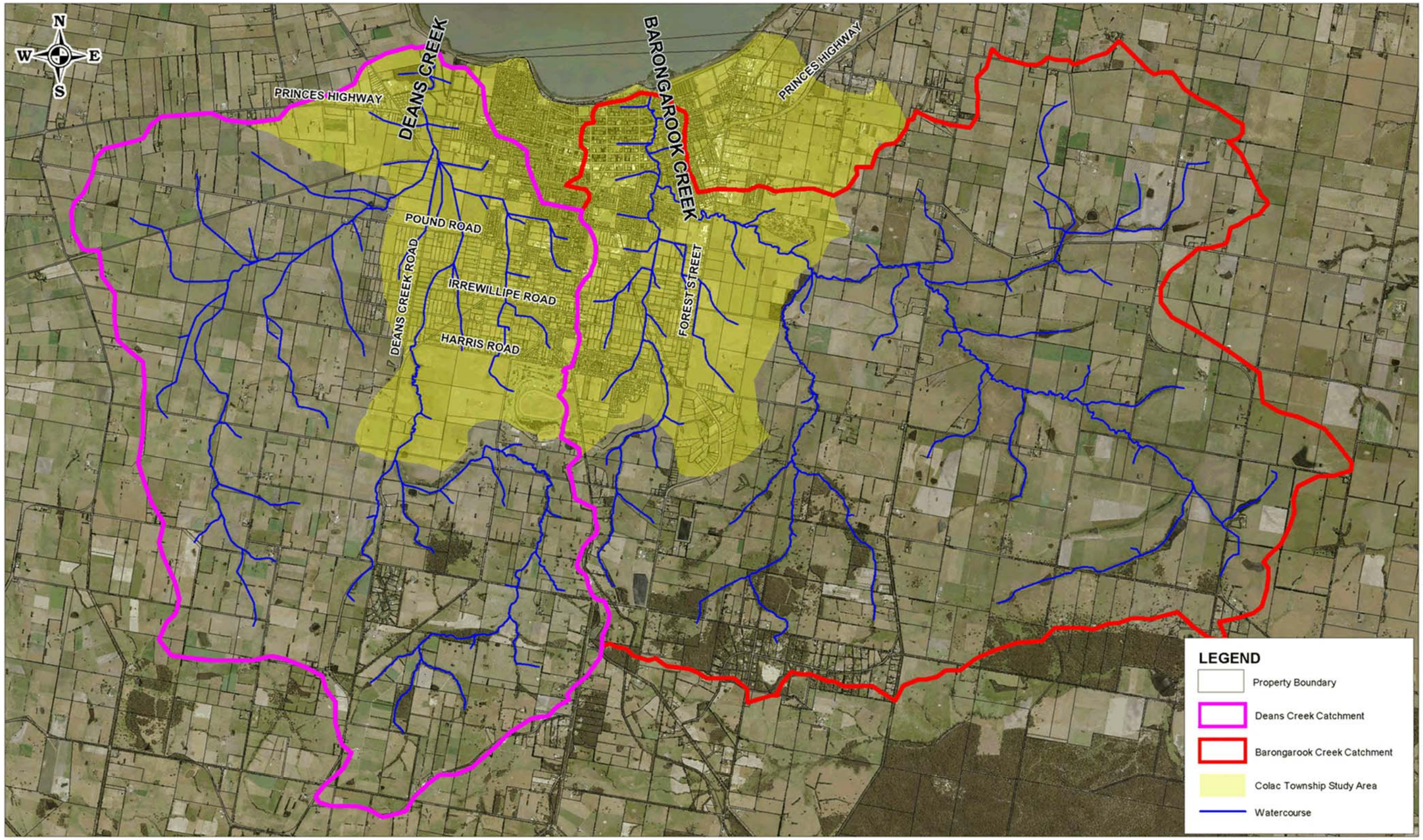
The overall catchment drains through a series of large culverts which convey flows within the waterways under the Princes Highway, the Railway line and other significant road embankments. Within the Colac Township a formal underground drainage network collects runoff from residential properties and streets and conveys flow to the waterways or Lake Colac.

With respect to existing planning zones the following zones characterise Colac:

- Large residential zone within the Township
- Extensive area of commercial zone in the Township's inner centre
- Agricultural farmland and rural living zones on the outer eastern and western boundaries
- Industrial zoned land on the eastern side of Barongarook Creek.

The Princes Highway and the railway line running east west are the major road and rail infrastructures present, enabling access to these different land use types.

The combined Deans Creek and Barongarook Creek catchment make up approximately 60 % of the overall Lake Colac catchment and therefore contribute the majority of the inflow into Lake Colac. Figure 1.2 highlights the Deans Creek and Barongarook Creek catchment boundaries.



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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

0 1000 2000

Scale in metres (1:50,000 @ A3)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994. (GDA94)
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

Colac Stormwater Development Strategy

Figure 1.2

Catchment Layout PLan

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 15 Sep 2017

1.3 Drainage Stakeholders within Study Area

The following stakeholders own / manage drainage and waterway assets across Colac:

- Colac Otway Shire Council (Council);
- Corangamite Catchment Management Authority;
- VicRoads;
- VicTrack
- Property owners.

The roles and responsibilities of each of these stakeholders is summarised in the following sub-sections.

1.3.1 Colac Otway Shire Council

Councils are not flood management authorities under the Water Act. Councils are local government authorities under the Local Government Act and are Planning Authorities under the Planning and Environment Act. These Acts include roles to provide local drainage services and to provide planning advice.

Councils provide roads and drainage systems to collect and convey stormwater to creeks and rivers; they also maintain the stormwater mains owned by Council on private property. Across Colac and its surrounds Colac Otway Shire Council is the drainage authority and the responsible authority for managing stormwater drainage assets and any overland flooding resulting from the stormwater drainage network. This includes provision of advice for development in areas at risk of flooding from the stormwater drainage network. Prior to the development of this strategy knowledge of areas at risk of stormwater flooding were not as well understood or documented and the outputs generated from the development of this strategy, including the attached flood maps, will assist Council in their drainage authority role.

In 2005 the Victorian State Government recognised that the functions of Melbourne based Councils and Melbourne Water in managing drainage and flooding should be reviewed. A study was commissioned by the Victorian Auditor General's Office (VAGO). VAGO recommended that both Melbourne Water and Councils should manage flood risks associated with their systems and that this should be done on a risk based approach under two headings:

- Structural Measures
- Non-Structural Measures.

Structural Measures include physical works to reduce flooding such as retarding basins, floodways and larger drains. Non-structural measures include flood mapping, planning and building controls, public education and operational tasks.

Flood mapping of Council's drainage system, undertaken as part of the development of this strategy, is a non-structural measure and could lead to introduction of Special Building Overlay controls that could be used to set conditions on development, including the floor levels of habitable buildings.

1.3.2 Corangamite Catchment Management Authority

In Victoria the flood management authorities are the various Catchment Management Authorities. In Colac the Corangamite Catchment Management Authority (CCMA) is the flood management authority as defined in the Water Act.

Under Part 10 of the Water Act 1989, CMAs are designated with responsibility for the management of waterways and floodplains and have the lead role in developing and delivering regional programs for waterway management. The Water Act outlines their functions and powers in relation to waterway management, floodplain management and regional drainage. Within Colac and surrounds key functions of the CCMA include:

- Declaration of flood levels and flood fringe areas
- Declaration of building lines
- Controlling developments that have occurred or that may be proposed for land adjoining waterways
- Taking any action necessary to minimise flooding and flood damage
- Provision of advice about flooding and controls on development to local councils, the Secretary for Planning and Environment and the Community.

In its statutory role CCMA co-ordinates the process for permitting works on designated Corangamite waterways and on floodplains. Within Colac and surrounds this applies to Deans Creek and Barongarook Creek and their respective floodplains. CCMA no longer provides advice in relation to stormwater flooding including areas identified by any Special Building Overlay (SBO) in Councils Planning Scheme or land liable to flooding under the Building Regulations, of which none exist within Colac and surrounds.

The CCMA is currently preparing the Corangamite Regional Floodplain Management Strategy, this is discussed further in Section 2.2.4.

1.3.3 VicRoads

VicRoads is responsible for the overall management (including construction, maintenance, inspection and repair) of a network of freeways and arterial roads (the major connecting roads) throughout Victoria. VicRoads is responsible for the management of the following roads within Colac and surrounds (note these road names are as defined by VicRoads and may be referred to differently to the Colac community):

- Princes Highway
- Colac-Lavers Hill Road
- Carlisle-Colac Road
- Colac-Forrest Road.

The responsibilities of VicRoads within Colac and surrounds extends to the drainage assets, including culverts and bridges, which have been constructed as part of those roads managed by VicRoads.

1.3.4 VicTrack

VicTrack is responsible for the overall management (including construction, maintenance, inspection and repair) of a network of railway lines throughout Victoria. The responsibilities of VicTrack extend to the drainage assets, including culverts and bridges, which have been constructed as part of the railway line which traverses through Colac.

1.3.5 Property Owners

Under the Water Act 1989 (Section 16), residents and property owners:

- are liable for flow of water from their land
- have a duty of care not to interfere with the flow of water
- must not participate in negligent conduct that will interfere with the flow of water onto any land.

Property owners are required by law to maintain the stormwater pipes, gutters, downpipes, stormwater pits and any other components of their approved stormwater drainage system in good condition and in compliance with any Council requirements. Property owners are also required to accept natural overland flow from adjoining properties or public land and must not divert or redirect the flow from its natural path onto neighbouring properties.

Under the Road Management Act 2004, the responsibility for the maintenance of vehicle and culvert crossings that service private property rests with the owner of the property to

which they serve. It is incumbent on the property owner to ensure that water flow through their culvert crossing is not impeded in any way.

A few examples of behaviours that may have a detrimental impact on the performance of the overall drainage system:

- Poor maintenance of private drains may result in premature blockage, reduced pipe capacity and/or prevention of stormwater runoff entering the system. This may result in localised flooding and/or increased overland flows
- Increasing the proportion of impervious surfaces within a property (such as driveways and paths) will result in increased overland flows onto adjacent properties and / or public roads, as the existing private drain may no longer have adequate capacity. When constructing hardstand (hard surfaced) areas e.g. driveways, concrete and paved areas, landscaping and any other impervious surfaces or drains owners must control the stormwater in order to prevent concentrated flows onto the adjacent property
- The erection of a physical barrier, such as a fence, across an overland flow path may divert stormwater runoff from its flow path and possibly put other properties at risk
- Easements in private backyards are generally located to minimise impact on surrounding buildings. Sheds, paths, driveway edging and other landscaping are common improvements that are sometimes placed over easements
- The planting of trees that develop large invasive root systems may lead to burst or blocked pipes.

While each property may only have a minor influence on the performance of the overall drainage network, the cumulative effects of poor maintenance and other activities may become significant.

1.4 Study Methodology

Figure 1.3 illustrates the key steps undertaken to achieve the objectives of this study.

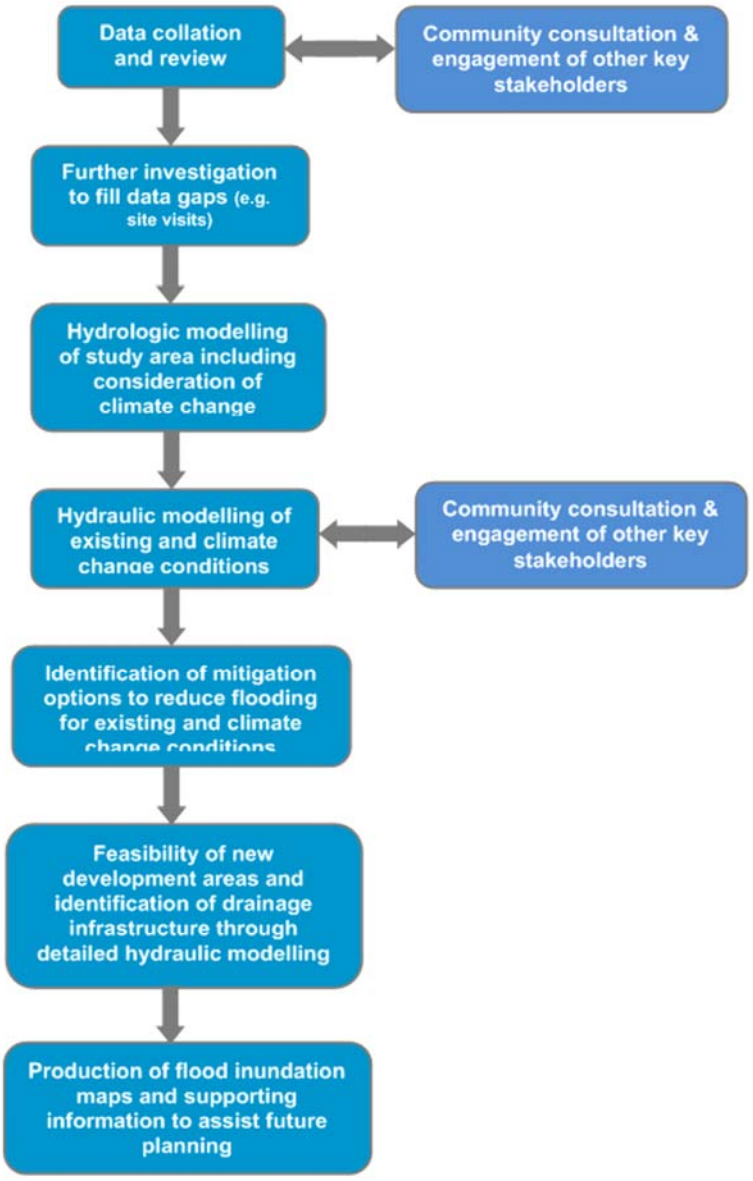


Figure 1.3 Study methodology flow chart

2. DATA COLLATION AND REVIEW

2.1 Sources of data

Council provided a combination of GIS and other technical data for the study area. This data included the following relevant information:

- Aerial photography
- Drainage (pit and pipe) asset data
- Planning schemes and overlays
- Watercourse alignments and water bodies
- Cadastral boundaries, easement boundaries and road alignments
- Colac Integrated Water Cycle Management Plan (2014).

Information provided by others for use in the study included:

- Deans Creek and Barongarook Creek Regional Flood Mapping Report and Models – provided by Department of Environment, Land, Water and Planning (DELWP, 2016).

In several instances, the above sources of data were insufficient to adequately define the drainage system to the level required for input to the flood model developed for the Strategy. For these areas, field investigations were conducted to provide the necessary information as described in Section 2.2.

2.2 Review of Data

2.2.1 Drainage Data

A thorough review of the existing pipe and culvert diameters and connectivity provided in Council's drainage asset database was undertaken. This assessment identified some areas in the study area where diameters were missing or connectivity was uncertain. Missing data was a particular issue for drainage assets crossing under roads and discharging into road side channels or swales.

To rectify this Council staff conducted site investigations to collect missing data or verify existing data. Engeny also conducted site visits to verify the connectivity and sizes of some assets.

The outcome of the drainage data collation and review is a comprehensive drainage asset database available for this study that has been utilised to conduct a detailed analysis of the existing drainage system across Colac and surrounds.

2.2.2 Aerial Photography

Aerial photography of the study area captured on the 28th of November 2014 was supplied by Council. This photography was supplemented with the latest www.nearmap.com aerial photography which highlighted some small changes across the study area. The date of the latest aerial photography on Nearmap is unknown. Whilst it is listed as being captured on the 1st of January 2005 it is clearly more recent than the 28th of November 2014. This is demonstrated by the fact that the recent development of 153 Pound Road is captured.

2.2.3 Topography

Council provided LiDAR (Light Detection And Ranging) covering the study area which was captured in 2015/16. LiDAR is an airborne surveying technology that provides a regularly spaced grid (one metre horizontal interval in this case) of ground levels. This data was used to produce a Digital Terrain Model (DTM), which allows for the waterways and other key topographical features across the study area to be defined in a flood model.

The LiDAR data was captured as part of the 2015-16 Colac-Otway and Surf Coast Towns Photography and Elevation Project (DELWP, Volume 25671A03NOB). This project captured 10cm photography and LiDAR within the shires of Colac-Otway and Surf Coast. Airborne LiDAR was acquired on the 11th and 13th of January 2016. With respect to accuracy of the LiDAR the data report shows that after processing and comparison to field survey that the following level of accuracy was achieved:

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

It is important to note that there have been some small alterations to topographical features since the LiDAR was flown in early 2016. Their influence on the results of the flood modelling is expected to be minor.

Figure 2.1 shows the DTM developed for the study area with the CSDS hydraulic model extent overlaid.

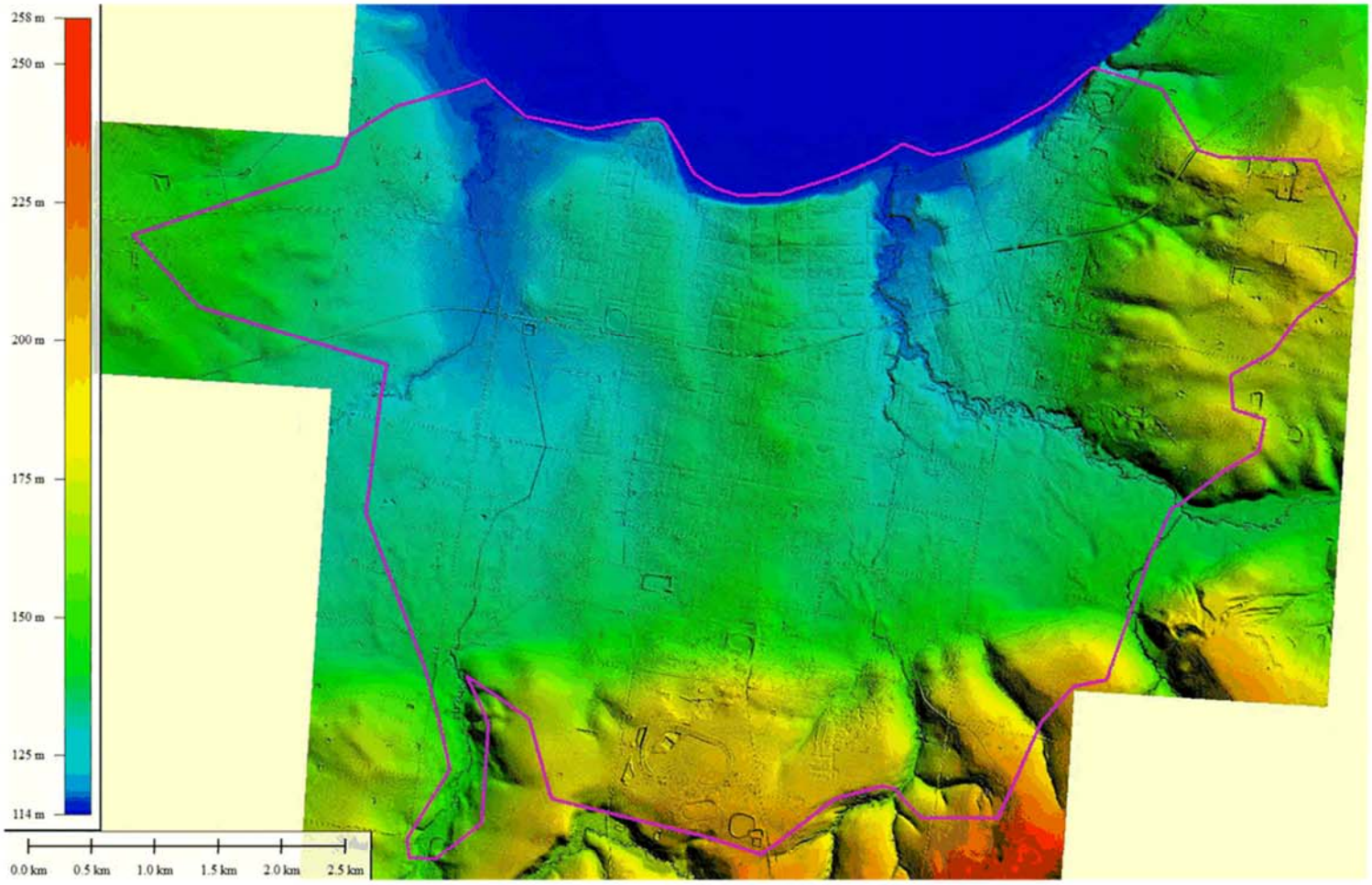


Figure 2.1 Digital Terrain Model

2.2.4 Previous / Current Studies and Reports

Summaries of previous investigations of the Colac area are provided below.

Deans Creek and Barongarook Creek Regional Flood Mapping (2016)

The scope of this study was to prepare flood mapping outputs for the Deans Creek and Barongarook Creek Catchments. The hydraulic modelling undertaken as part of this study included significant culvert crossings along Deans Creek and Barongarook Creek. Due to the objective of this project being on mapping riverine flooding, the areas of Colac draining to Lake Colac, and Council's underground drainage network draining the major waterways were not assessed or mapped.

The modelling and report produced from this study have provided valuable inputs to this project as discussed throughout this report. At the time of preparing this report CCMA is proposing changes to the existing Land Subject to Inundation Overlay (LSIO) in response to the findings of the 2016 Regional Flood Mapping project. As part of this work it is understood that the further calibration of the flood models developed for DEWLP will be undertaken and as a result it is possible that small differences may exist between the modelling undertaken for DELWP and the modelling undertaken to inform Council's Stormwater Development Strategy. For flooding associated with Deans Creek and Barongarook Creek the modelling undertaken for DELWP will take precedence.

For flood mapping outputs produced from the Deans Creek and Barongarook Creek Regional Flood Mapping study refer to the associated study report.

Colac Integrated Water Management Plan (2014)

The Integrated Water Management Plan (IWMP) is a strategic blueprint for how the urban water cycle can make a positive contribution to Colac's liveability. The IWMP was developed by the following four key water cycle authorities:

- Colac Otway Shire Council
- Barwon Water
- Southern Rural Water
- Corangamite Catchment Management Authority.

The IWMP recognises that the Colac Township has always had a strong connection to the water cycle through its location on the shores of Lake Colac, close urban waterways, extensive areas of green open space and wide tree-lined streets, many of which retain traditional grassed swale drains for stormwater. The IWMP recognises that the urban water cycle will continue to have an important role in shaping the characteristics of Colac as it transforms. As such the IWMP is an important consideration and input to Colac 2050.

The IWMP acknowledges that Council has a direct controlling role in the planning and operation of urban water cycle assets and services including:

- strategic, statutory and municipal planning for areas of new and infill urban development
- a strategic and operational planning role for open space, roads and streetscapes
- managing stormwater, localised flooding and driving water sensitive urban design
- regulatory role to ensure appropriate management of private septic tanks.

Council also can have an influence on the urban water cycle including:

- as a major user of drinking water and potential user of alternative water
- as a driver for best practice in urban development design and construction
- to represent and engage with its local community on community aspirations.

The most significant issues for Colac's water cycle system as identified in the IWMP which were considered important for consideration in the development of the Stormwater Development Strategy included:

- Degraded and un-connected urban waterways
- Extensive land subject to inundation that impedes development to the west of the city.

The IWMP provides a prioritised implementation plan for a range of actions and initiatives. Actions from the IWMP that have been considered in the development of the Stormwater Development Strategy include:

- Improve urban amenity through natural water assets
- Plan to use water locally including consideration of an upgrade of the Irrewillipe Road retarding basin to include a stormwater harvesting system
- Reduce the adverse impacts of stormwater on waterways
- Protect Colac's catchments and waterways.

Corangamite Waterway Strategy 2014-2022

The Corangamite Waterway Strategy (CWS) provides an evidence based framework and regional works program for the CMA to implement, in partnership with community groups, landholders, other agencies and industry, to maintain or improve the condition of priority rivers, estuaries and wetlands so they can continue to support environmental, social, cultural and economic values.

A number of threats to waterway health have been identified in the CWS and those that relate to Colac have been considered in the development of the Stormwater Development Strategy include:

- Deans Creek
  - There is an absence of large trees from the riparian zone and the riparian zone is a narrow strip
  - 25-75 % of waterway is affected by livestock access.
- Barongarook Creek
  - The riparian zone is patchy with limited large trees and areas of native vegetation with low connectivity
  - Stream flows in the catchment are affected by farm dams
  - 25-75 % of waterway is affected by livestock access.

A number of goals identified within the CWS relate to Colac and have been considered in the development of the Stormwater Development Strategy include:

- Goal ENV2 – Maintain or improve the resilience of other threatened waterway dependent species
- Goal S1 – Maintain or improve waterway conditions where it supports high social values.

Actions within the CWS Works Programs that relate to Colac that have been considered in the development of the Stormwater Development Strategy include:

- Implementation of Colac Integrated Water Cycle Management Plan
- Establishment of native indigenous vegetation.

Existing Flood Related Planning Scheme Overlays

There are existing flood overlays (Flood Overlay (FO) and Land Subject to Inundation Overlay (LSIO)) for Deans Creek and Barongarook Creek, which are part of the Colac Planning Scheme. The overlays are based on the expected area of inundation during a 100 year ARI rainfall event. The existing flood overlays are shown in Figure 2.2 and are overlaid on a layout plan of development investigation areas, highlighting areas targeted for future development as identified in Colac 2050. It can be seen that a large portion of the development investigation areas are covered by the existing FO / LSIO, particularly along Deans Creek on the western side of Colac.

The CCMA is proposing changes to the existing LSIO in response to the findings of the 2016 Regional Flood Mapping project. It is expected that these changes will be finalised in late 2017.

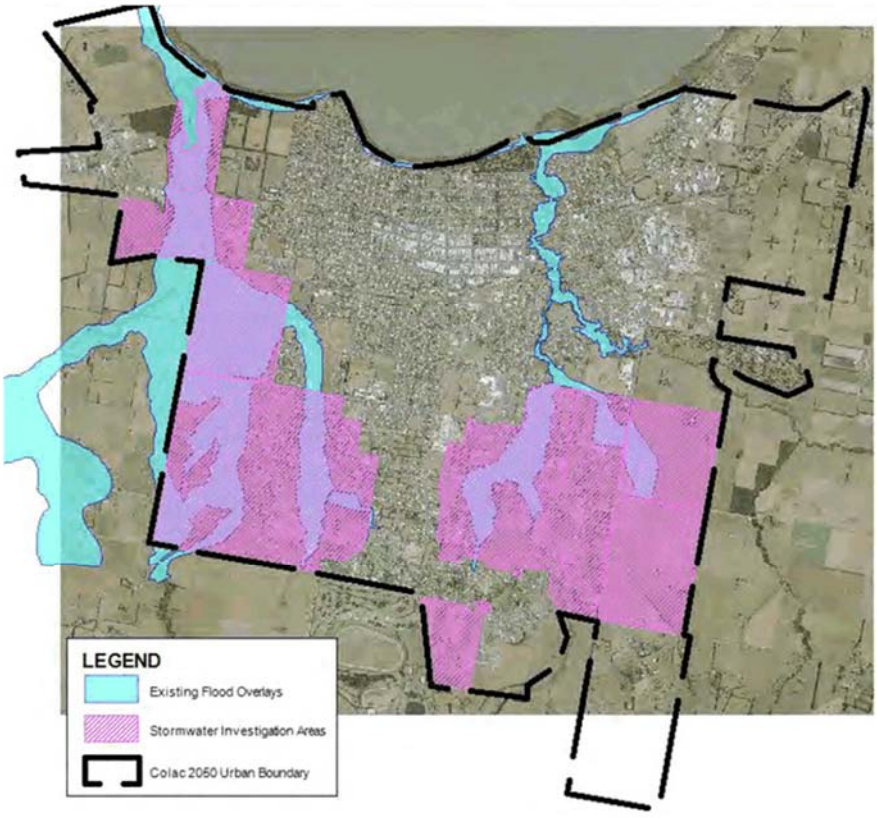


Figure 2.2 Existing Flood Overlay (FO) and Land Subject to Inundation Overlay (LSIO) within study area

Corangamite Regional Floodplain Management Strategy (estimated completion early 2018)

In late 2016 CCMA began the first stages of preparing the Corangamite Regional Floodplain Management Strategy (RFMS). In preparing this strategy CCMA is working with the Victorian SES and the nine local governments in the Corangamite region to develop the RFMS which through community consultation will set regional and local priorities for flood management.

The Corangamite RFMS will provide a single, regional planning document for floodplain management and a high level regional work program to guide future investment priorities for the CCMA region. It will provide the starting point for councils (including Colac Otway Shire Council) and other stakeholders to identify priority flood management activities, which may include flood warning systems and flood emergency response to local needs, improving flood overlays in land use planning schemes, and dealing with riverine, coastal and urban storm water flooding issues. It aims to align the efforts of various agencies and communities to deliver the outcomes called for by the Victorian Floodplain Management Strategy.

The development of the regional strategy will ensure the following key outcomes:

- That roles and responsibilities for floodplain management are clear and that stakeholders and communities are aware of their flood risks and actively managing them appropriately
- That all agencies with flood emergency management functions have aligned priorities. This will enable agencies to align their potential to source and allocate funds towards priority actions
- That communities are empowered by being aware of their flood risks
- That local knowledge has informed the development of the strategy.

The RFMS is a high level strategic document. The strategy will not develop individual or localised projects (e.g. flood studies, planning scheme amendments, structural works), these will form actions out of the strategy. Rural drainage issues will also not be included in the regional works program, and are out of the scope of the regional strategy.

The outcomes of the RFMS will be an important consideration for the CSDS in the near future as the RFMS is expected to be finalised in early 2018.

2.2.5 History of Flooding within Colac and Surrounds

The Deans Creek and Barongarook Creek Regional Flood Mapping Project (2016) notes that "*there is little recorded information regarding flooding from Deans Creek and Barongarook Creek, resulting in an incomplete understanding of flooding within the study area. Historically, flooding has occurred in the Lake Colac region during 1951-1952, 1975, the late 1980s, the early 1990s and most recently in August 2010. This incomplete understanding of flooding within the region, combined with development pressures within the Colac Township have resulted in the study being undertaken*"

The Deans Creek and Barongarook Creek Regional Flood Mapping Project has categorised the Average Recurrence Interval (ARI) of a number of historical flood events including the following significant events:

- April 1980: Between 50 and 100 year ARI
- April 1992 / January 1991 / April 2001: Between 20 and 50 year ARI.

Figure 2.3 below presents a number of newspaper articles collated as part of the development of this Strategy documenting some historical flooding events in Colac and surrounds.

COLAC

From Our Correspondent.

Last week's heavy rain did an enormous amount of harm to crops and roadways throughout the shire. There have been three consecutive floods at the Dean's Creek crossing and a good deal of metal was washed away. In other parts of the shire, however, the metalled roads have suffered more severely. The most serious position is in regard to the crops. Some were ready to cut, but the rain beat them to the ground. Grubs are to them and as there was another flood on Monday, the majority of the crops are likely to rot. The position is serious, and as the rain appears general the people should prepare for bad times.

Mr M. O'Connor is having bad luck in his contract for making an extra basin for the Waterworks Trust. He has been flooded out time after time, and is likely to be a heavy loser on the work.

December 1916

FLOODS NEAR COLAC.

COLAC, Monday.

Four inches of rain fell between Dean's Marsh and Lorne on Friday. All the low lying ground was flooded, and crops of potatoes were washed out of the ground in some places. It is the biggest flood for 15 years at this time of the year.

April 1899

Colac flooding more serious

November 1953

Figure 2.3 Historical newspaper articles documenting flooding in Colac and surrounds

2.2.6 Site Visits

Throughout this study Engeny conducted multiple site visits of key areas of the catchment in order to gain an appreciation for the site conditions and verify some sections of the drainage network. Some of the photos taken during these site visits are provided in **Appendix B**.

2.3 Stakeholder and Community Engagement

2.3.1 Community Consultation

Council and Engeny facilitated two community consultations sessions during the study, which were conducted on 19 April 2016 and 2 May 2017.

The first consultation session was attended by Council's project manager, members of the Engeny project team, members of the local VICSES and approximately 13 members of the Colac community. The key objectives of the first community consultation session were to:

- Share information on the scope and objectives of the study with the community
- Obtain historical flood observations from the community to assist in the development and validation of the flood model developed to inform the Strategy.

During this session aerial maps were on display for participants to engage with and mark where they had noted previous flooding across the study area. After this session was completed VICSES took the maps and engaged further with the community in the main shopping district of Colac to gather further responses. The resultant maps are presented in **Appendix C** and were considered in the validation of the flood model which is discussed further in Section 6.3 of this report.

The second consultation session was attended by Council's project manager, members of the Engeny project team and approximately 30 members of the Colac community. The key objectives of the second community consultation session were to:

- Present draft flood modelling results and allow members of the community to view and annotate hard copy flood maps and ask questions
- Obtain any further historical flood observations from the community to assist in a final validation of the flood modelling results.

At each of the community consultation sessions a questionnaire was made available for attendees to complete. The questionnaire for the second consultation session is attached in **Appendix C** along with a Frequently Asked Questions document that was made available at the session. The questionnaire was also available for the community to complete as an online survey via Survey Monkey. The online survey generated six responses.

Responses of most significance to the Strategy that were generated from the community sessions were feedback regarding results of the draft flood modelling. A large percentage of consultation participants were in general agreement with the results of the flood modelling. Some questionnaire responses queried the modelling results and Section 6.3 of this report outlines how these responses were considered and addressed during the model validation stage.

2.3.2 Engagement of other Stakeholders

Other key stakeholders have been consulted during this study to obtain other information and ensure that the study allowed for a coordinated approach. Corangamite Catchment Management Authority (CCMA) and VicRoads have attended project meetings and provided valuable input to the study. VicTrack were invited to meetings, however were unable to attend.

3. PLANNING SCHEME

Engeny has obtained and reviewed planning scheme zone and overlay information from Planning Schemes On Line (http://planningschemes.dpcd.vic.gov.au) for consideration in the development of the Strategy.

3.1 Colac Otway Planning Scheme

There are a number of Policies within the Colac Otway Planning Scheme which relate to catchment and stormwater management and are relevant to this Strategy for Colac. These are:-

- Clause 14.02-1 (Water – Catchment Management)
  - Objective – To assist the protection and, where possible, restoration of catchments, waterways, water bodies, groundwater, and the marine environment
    - Consider the impacts of catchment management on downstream water quality and freshwater, coastal and marine environments
    - Retain natural drainage corridors with vegetated buffer zones at least 30 m wide along each side of a waterway to maintain the natural drainage function, stream habitat and wildlife corridors and landscape values, to minimise erosion of stream banks and verges and to reduce polluted surface runoff from adjacent land uses
    - Undertake measures to minimise the quantity and retard the flow of stormwater runoff from developed areas.
- Clause 14.02-2 (Water – Water Quality)
  - Objective – To protect water quality
    - Ensure that land use activities potentially discharging contaminated runoff or wastes to waterways are sited and managed to minimise such discharges and to protect the quality of surface water and groundwater resources, rivers, streams, wetlands, estuaries and marine environments
    - Discourage incompatible land use activities in areas subject to flooding, severe soil degradation, groundwater salinity or geotechnical hazards where the land cannot be sustainably managed to ensure minimum impact on downstream water quality or flow volumes.
- Clause 14.02-3 (Water – Water Conservation)
  - Objective – To ensure that water resources are managed in a sustainable way
    - Encourage the use of alternative water sources such as rainwater tanks, stormwater and recycled water by governments, developers and households.

- Clause 19.03-2 (Development Infrastructure – Water Supply, Sewerage and Drainage)
  - Objective – To plan for the provision of drainage services that efficiently and effectively meet State and community needs and protect the environment
    - Plan urban stormwater drainage systems to:
      - Coordinate with adjacent municipalities and take into account the catchment context
      - Include measures to reduce peak flows and assist screening, filtering and treatment of stormwater, to enhance flood protection and minimise impacts on water quality in receiving waters
      - Prevent, where practicable, the intrusion of litter.

- Clause 19.03-3 (Development Infrastructure – Stormwater)
  - Objective – To reduce the impact of stormwater on bays and catchments
    - Support integrated planning of stormwater quality through a mix of on-site measures and developer contributions
    - Mitigate stormwater pollution from construction sites
    - Ensure stormwater and groundwater entering wetlands do not have a detrimental effect on wetlands and estuaries
    - Incorporate water-sensitive urban design techniques into developments to:
      - Protect and enhance natural water systems
      - Integrate stormwater treatment into the landscape
      - Protect quality of water
      - Reduce run-off and peak flows
      - Minimise drainage and infrastructure costs.

- Clause 21.04-2 (Environment – Water)

  Water quality in Lake Colac has been identified as a major issue for a number of years, and this has been evident through indicators such as blue-green algal blooms and sediment build up.

  - Objectives – To protect water catchments and to retain and improve water quality and water yield
    - Ensure water quality standards and impact on water yields are considered in the assessment of planning permit applications
    - Ensure that the maintenance in natural condition of watercourses is considered in the assessment of use and development proposals
    - Encourage the use of "constructed wetlands" as a means of storing floodwater, improving water quality and adding to natural habitats.

- Clause 21.04-6 (Environment – Flooding)
  - Objective – To minimise environmental hazards.
    - Promote floodplain management policies, which minimise loss and damage, maintain the function of the floodway to convey and store floodwater and protect areas of environmental significance
    - Encourage the use of "constructed wetlands" as a means of storing floodwater, improving water quality and adding to natural habitats.
- Clause 21.06 (General Implementation)
  - Undertaking Further Strategic Work
    - Update the Land Subject to Inundation Overlay and schedule to align with revised data and mapping when available from the Corangamite Catchment Management Authority.
- Clause 56.07-2 (Integrated Water Management – Urban Runoff Management)

  This clause relates to the design management of the urban stormwater system.
  - Objectives:
    - To minimise damage to properties and inconvenience to residents from urban run-off
    - To ensure that the street operates adequately during major storm events and provides for public safety
    - To minimise increases in stormwater run-off and protect the environmental values and physical characteristics of receiving waters from degradation by urban run-off.

4. DRAINAGE DESIGN GUIDELINES

Council has adopted the Infrastructure Design Manual (IDM) to define the standards of design and construction for various types of infrastructure including drainage. The IDM is a joint initiative which recognises the benefits of municipalities working together towards consistent requirements and standards for the design and development of infrastructure.

A number of objectives / specifications within the IDM have been considered in the preparation of the Strategy, those specifications of most relevance include:

- **Urban Drainage**

  The standard objectives of urban drainage are:

  - to collect and control all stormwater generated within the subdivision or development
  - to collect and control all stormwater entering a subdivision from the water shed outside the subdivision
  - to provide an effective outlet for all collected stormwater, from the subdivision or development to a natural watercourse, relevant authority's drain or approved outfall
  - to achieve these objectives without detrimentally affecting the environment generally, surface and subsurface water quality, groundwater infiltration characteristics, the adjoining landowners and other landowners.

- **Major and Minor Drainage Systems**

  The IDM specifies that the urban drainage system must be designed to satisfy the 'major / minor' approach as outlined in Australian Rainfall and Runoff. The following definitions are provided in the Manual:

  - The minor system generally refers to a pipeline network with sufficient capacity to collect and convey the flows from a 5 year Average Recurrence Interval (ARI) storm event. These pipelines prevent stormwater damage to properties and also limit the frequency and quantity of surface water to a level that is acceptable to the community
  - A major drainage system caters for the runoff from storms of higher intensity than for which the minor drainage system has been designed. The major drainage system is designed to handle flows resulting from storms with a 100 year ARI. These flows must follow a designated overland flow path, which must be:
    - A road if the catchment area is small and / or
    - A drainage / waterway corridor reserve if it is impractical or unsafe for a road to carry the excess flows.

  The finished floor level of buildings must be at least 300 mm above the 100 year ARI flood level or in accordance with the requirements of the relevant authority and codes.

- **Stormwater Treatment**

  Section 20.1 of the IDM lists the objectives for stormwater treatment. These objectives are:

  - to ensure that all stormwater discharged to natural watercourses and other drainage authority's drains meet the requirements of the Environment Protection Act 1970 and the water quality performance objectives for individual drainage catchments as provided in the State Environment Protection Policies (SEPPs)
  - to implement the design requirements of the Council's Stormwater Management Plan
  - to ensure all designs incorporate consistent best practice WSUD measures and principles
  - to ensure treatment methods and associated structures are cost effective from a maintenance and operational perspective and that the risk to the public is minimised as far as practicable
  - protect and enhance natural water systems within urban environments
  - integrate stormwater treatment into the landscape, maximizing the visual and recreational amenity of Developments
  - improve the quality of water draining from urban Developments into receiving environments.

  The IDM objectives refer to best practice, which is currently defined in Clause 56.07 of the Victorian Planning Provisions and in the current Urban Stormwater: Best Practice Environmental Management Guide (BPEMG) produced by CSIRO. Clause 56.07 applies to new residential subdivisions. The BPEMG targets can be considered as aspirational targets when seeking to retrofit existing residential areas, with achievement of the targets subject to physical constraints, the sensitivity of receiving environments and available funding to treat stormwater.

4.1.1 Changes in Drainage Design Standards

Over time there have been a number of changes to drainage design standards, the most significant being the adoption of the "major / minor" drainage system. The "major / minor" drainage system concept, as outlined above, was first specified in Australian Rainfall and Runoff in 1987. A large portion of Council's drainage system in Colac and surrounds was designed and constructed prior to 1987 and therefore does not meet current drainage standards which is common for Councils across Victoria. There is no obligation on Council to upgrade existing infrastructure when standards alter over time. This view was confirmed by the Victorian Auditor General in the VAGO 2005 report into managing urban flood risks within Melbourne.

In areas that don't meet current drainage standards Council may choose to undertake structural flood mitigation works to achieve current flood protection standards (or at least to reduce the flood risk). To achieve the current drainage design standard for every property could represent a significantly high cost.

4.1.2 Stormwater Quality Contribution Payments

Some Councils across Victoria are giving thought to implementing an alternative arrangement for developers to meet stormwater quality management obligations.

Currently the business as usual approach if for developers to provide stormwater treatment measures on-site as part of development sites, however Councils are increasingly becoming aware that this approach is giving rise to a large number of treatment assets that ultimately become the responsibility of Council requiring increasing budgets to provide adequate maintenance regimes.

An alternative option to the business as usual approach is for the developer to pay a fixed contribution towards Council managed off-site stormwater projects with the stormwater quality contribution payment being based on the total impervious area within each development. The thought behind this approach is that the contributions will enable Council to construct larger / strategic stormwater treatment assets that have the potential to achieve BPEMG targets leading to a reduction in the number of assets. With less assets maintenance times are also reduced.

In determining the requirements for stormwater treatment as part of the future development areas consideration has been given to limiting the number of assets.

Melbourne Water administers a stormwater quality contribution system within their area.

5. HYDROLOGIC MODELLING

5.1 Purpose

The purpose of creating a hydrological model for the study area was to generate sub-catchment hydrographs for use as an input to the hydraulic model. The hydraulic model can then be used for flood mapping.

5.2 Model Development

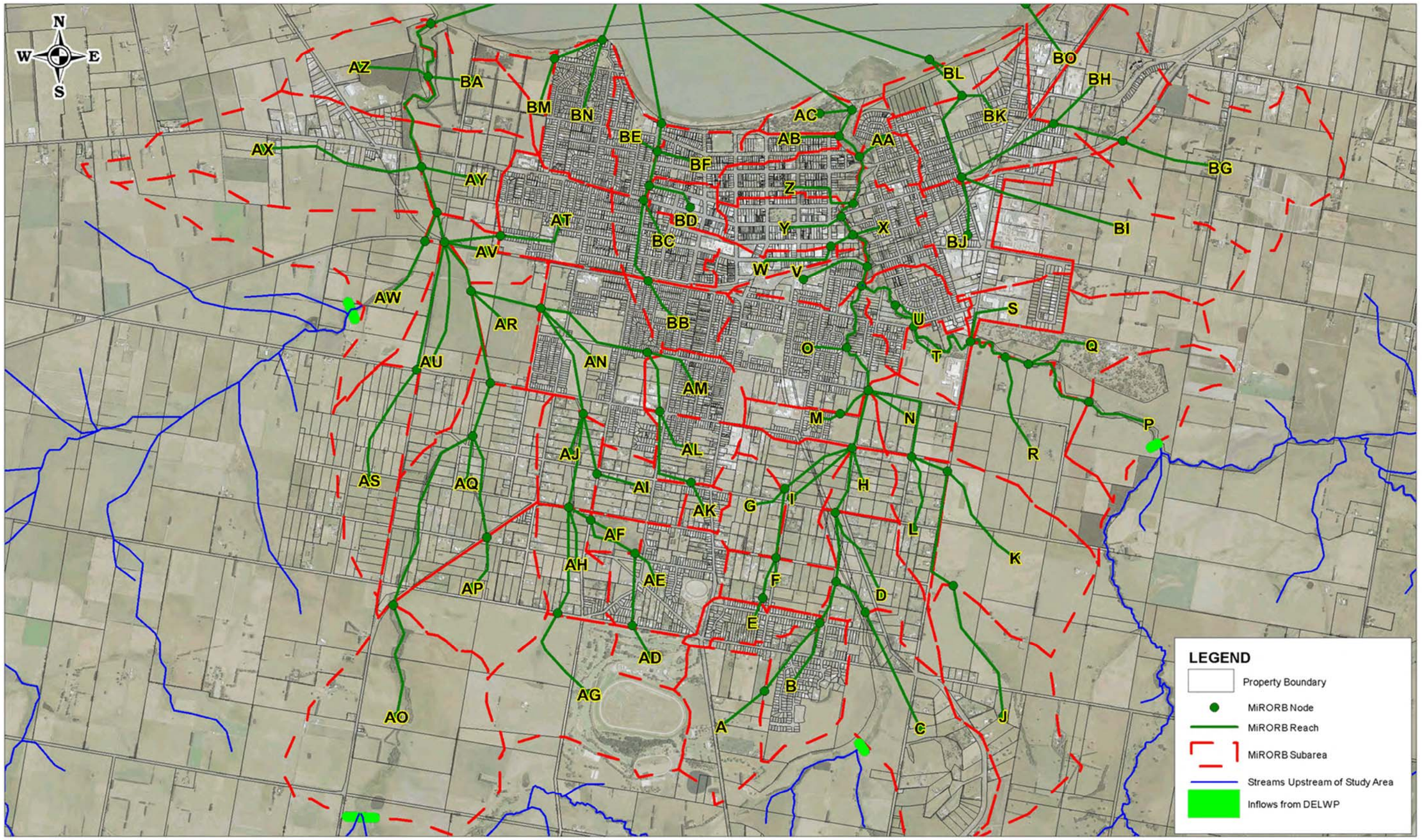
5.2.1 Methodology

Utilising the RORB model layers provided by DELWP (developed as part of the Deans Creek and Barongarook Creek Regional Flood Mapping project) as a basis, a hydrologic model was constructed covering the entire study area using RORB hydrologic modelling software. RORB is industry standard software and is one of Australia's leading flood hydrograph modelling tools.

5.2.2 Catchment Boundary

The catchment boundary for the Deans Creek and Barongarook Creek catchments was defined as part of the DELWP Regional Flood Mapping project for these waterways.

Figure 5.1 provides the overall catchment boundary and structure of the RORB model for the CSDS study area.



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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

0 520 1040

Scale in metres (1:26,000 @ A3)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994. (GDA94)
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

Colac Stormwater Development Strategy

Figure 5.1

RORB Model with Inflow Locations
Layout Plan

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 15 Sep 2017

5.2.3 Sub-catchment Boundaries

The sub-catchments defined in the DELWP RORB models were largely used in the development of a RORB model for the CSDS. In the rural parts of the study area sub-catchment boundaries were unchanged whilst in the urban parts of the study area sub-catchment boundaries were refined to ensure accurate application of inflows at the drainage pit level. This is discussed further in Section 6.2.7 of this report. In some areas new sub-catchments were required to be defined to ensure that the all flows across the entire study area were appropriately defined and allowed for in the model. This was required for the central Colac area and parts of Colac East which drain directly to Lake Colac and thus were not included in the DELWP modelling.

5.2.4 Fraction Impervious

Fraction impervious is a vital component of the hydrological model as it is a key parameter in the process of converting rainfall into runoff. Engeny assigned a fraction impervious value to RORB sub-catchments based on typical fraction impervious values for the various land use types across the study area. The typical values are based on fraction impervious provided in Melbourne Water's MUSIC Modelling Guidelines (2016). Model for Urban Stormwater Improvement Conceptualisation (MUSIC) is software that simulates rainfall, stormwater runoff and pollution.

Fraction impervious values applied for typical land uses within the catchment include:

- General Residential Zone – 60 % impervious
- Rural Living Zone – 20 % impervious
- Farming Zone – 5 % impervious
- Commercial Zone – 90 % impervious
- Industrial Zone – 90 % impervious
- Public Park and Recreation Zone – 10 % impervious
- Local roads & car parks - 60 % impervious
- Major roads - 70 % impervious
- Railway - 50 % impervious.

The fraction impervious value for a sub-catchment was obtained by calculating a weighted average of the fraction imperviousness of land types within the sub-catchment. These results were then checked using aerial photography and some adjustments made where necessary.

5.3 Intensity-Frequency-Duration (IFD) Data

Intensity-Frequency-Duration (IFD) data for Colac was sourced from the Bureau of Meteorology. The IFD variables shown in Table 5.1 were provided in this data. The resultant IFD table that these factors produced is shown in Table 5.2.

Table 5.1 Colac IFD Parameters

Parameter	Value
Intensity - 1 hour duration, ARI = 2 years ($^{2}I_{1}$)	16.20
Intensity - 12 hour duration, ARI = 2 years ($^{2}I_{12}$)	3.27
Intensity - 72 hour duration, ARI = 2 years ($^{2}I_{72}$)	0.89
Intensity - 1 hour duration, ARI = 50 years ($^{50}I_{1}$)	33.9
Intensity - 12 hour duration, ARI = 50 years ($^{50}I_{12}$)	5.7
Intensity - 72 hour duration, ARI = 50 years ($^{50}I_{72}$)	1.7
Skew (G)	0.49
F2	4.29
F50	14.73

Table 5.2 IFD Table for Colac

Rainfall event duration	Average rainfall intensity for each ARI				
	2 years	5 years	10 years	20 years	100 years
10 mins	40.9	57.3	69.1	85	129
20 mins	29.3	40.5	48.4	59.2	88.6
30 mins	23.5	32.2	38.4	46.7	69.5
1 hour	15.6	21.1	24.9	30.1	44
2 hours	10.1	13.4	15.6	18.6	26.7
3 hours	7.8	10.2	11.8	13.9	19.7
6 hours	4.98	6.34	7.23	8.46	11.7
12 hours	3.17	3.97	4.49	5.22	7.09
24 hours	1.98	2.49	2.83	3.3	4.51
48 hours	1.19	1.53	1.76	2.08	2.9
72 hours	0.86	1.12	1.29	1.53	2.15

5.3.1 Consideration of ARR 2016

During the development of the Strategy Australian Rainfall and Runoff (ARR) was updated to ARR 2016. ARR 2016 represents the most significant update to ARR since 1987 and takes advantage of the significant advancements in computer technology, techniques and understanding of rainfall-runoff processes since 1987 and introduces changes to current

practice. It is also based on Australian data, when previously it was partly based on USA data. Figure 5.2 below outlines some of the key changes in ARR 2016 when compared to ARR 1987. Given that this study was well underway before ARR 2016 was adopted, IFD data from ARR 1987 was used and is consistent with the IFD data used in the Deans Creek and Barongarook Creek Regional Flood Mapping project. It is also important to note that Melbourne Water and CMA's are managing flood studies in this manner also, i.e. if a flood study was undertaken prior to implementation of ARR 2016 there is no need to update it based on the new data and approaches documented in ARR 2016 at the time of preparing this Strategy

Key changes in ARR 2016

Design Input	ARR 1987	ARR 2016
Intensity Frequency Duration (IFD)	Used BoM rainfall gauges Presented as static A2 maps	Uses BoM and other agency gauges Online
Areal Reduction Factors (ARF)	Based on USA data Not available for long durations	Based on Australian data
Losses	Based on jurisdictional based advice (personal communication only)	National Advice for rural and urban catchments
Baseflow	Methods but no ungauged catchment advice	Australia wide advice
Temporal Patterns	Average Variability Method Peak Burst Patterns for less than 30 year average recurrence interval (ARI) and rarer than 30 year ARI	Temporal patterns based on historic records, multi pattern for each design quantile and complete storms, with pre burst considered.

Figure 5.2 Key Changes in ARR 2016

5.4 RORB Model Validation

A key step in the development of the hydrologic model is the validation process. This process ensures that appropriate model parameters are adopted to reflect how runoff is routed through the catchment.

The hydrologic model was jointly calibrated with the hydraulic model to ensure a good match of flood levels against the DELWP flood modelling was achieved.

Other key RORB parameters adopted in the model (based on Melbourne Water's Guidelines and Technical Specifications (November 2016)) are:

- m = 0.8
- Initial loss = 10 mm. This value was determined as part of the joint calibration process. The initial loss parameter was varied and run through the hydraulic model to

determine a value that provides a good fit with the flood levels produced by the DELWP model. Further discussion is provided in Section 6.3.1 of this report

- k_c – not applicable as excess rainfall hydrographs have been applied to the hydraulic model and therefore the RORB model has not been used to rout flows through the study area, as routing has been accounted for in the hydraulic model
- Runoff coefficients:
  - 100 year ARI runoff coefficient = 0.60
  - 10 year ARI runoff coefficient = 0.35
  - 5 year ARI runoff coefficient = 0.25

5.5 Climate Change Scenario

A review of current literature identified the latest version of Australian Rainfall and Runoff (ARR 2016) to provide the most relevant resource in determining alterations in rainfall Intensity Frequency Duration (IFD) relationships due to climate change. Chapter 6 of Book 1 of ARR 2016 highlights the large level of uncertainty in predicting climate change impacts and provides interim guidance on accounting for potential climate hazards in flood estimation. The following provides a synopsis of the methodology recommended by ARR 2016 and discusses its application within the climate change scenario modelled for Colac.

Climate change considerations utilised within ARR 2016 are based on the output of the Climate Futures web tool developed by CSIRO. The projections have focussed on 11 natural resource management (NRM) 'clusters'. Figure 5.3 provides an overview of these locations, with the Colac study area lying within the Southern Slopes Mainland NRM region.

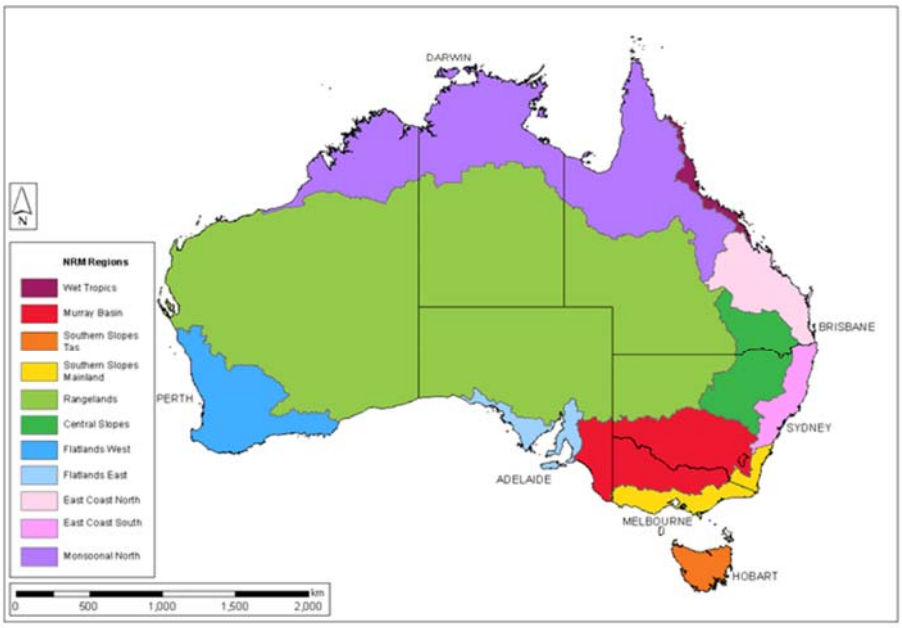


Figure 5.3 Locations of Natural Resource Management Clusters (AR&R 2016)

Climate Futures records projected changes from Global Climate Models (GCMs), for four Representative Concentration Pathways (RCPs). As discussed within the Australian Climate Futures website, the RCPs detail future pathways as based on greenhouse gas and aerosol concentration, along with land use change and are characterised by the radiative forcing (the extra heat retained by the lower atmosphere due to additional greenhouse gases in watts per square metre) produced by 2100. The four RCPs, in order of increasing severity are:

- RCP2.6 (ambitious mitigation including active removal of carbon dioxide from the atmosphere, with emissions peaking around 2020 at 440 ppm and reducing to 420 ppm by 2100)
- RCP4.5 (some mitigation employed with emission peaking around 2040 and 2100 concentration of 540 ppm)
- RCP6.0 (some mitigation employed with 660 ppm of carbon dioxide by 2100 and radiative forcing stabilising shortly after 2100)
- RCP8.5 (little mitigation employed with 940 ppm of carbon dioxide concentration by 2100).

Based on these, ARR 2016 recommends RCP4.5 and RCP8.5 are utilised as the low and high concentration scenarios for impact assessment (RCP4.5 being selected as the low emission scenario given that RCP2.6 requires the rapid implementation of ambitious, global emission reduction measures).

The Guidelines provide a six-stage process in determining the incorporation of climate change in flood design, as summarised in Figure 5.4.

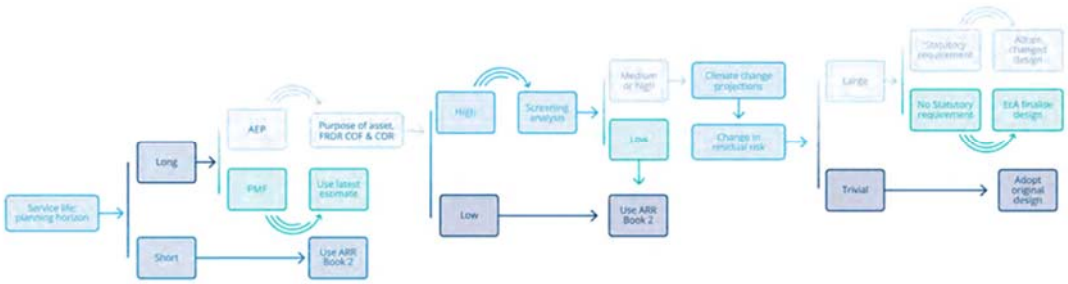


Figure 5.4 Decision Tree for Incorporating Climate Change in Flood Design (ARR 2016)

5.5.1 Rainfall Intensity Projections

Projected changes detailed within Climate Futures are divided into the two climate variables of temperature and rainfall. ARR 2016 acknowledges that for current projections of climate change impacts, there is generally more confidence in simulations of temperature than rainfall. Consequently, ARR 2016 recommends that adjustment of IFD curves is informed by temperature projections alone. In combining these temperature projections with current local and international understanding of changes to extreme rainfall intensities, the expected change in rainfall is between 2 % and 15 % per degree Celsius of warming. Given regional variability and uncertainty in rainfall projections, ARR 2016 consequently recommends a 5 % increase in rainfall per degree Celsius of local temperature warming.

Equation 5.1 denotes the method for determining projected rainfall intensity or equivalent rainfall depth (I_p) as a function of design rainfall intensity ($I_{AR\&R}$) and the midpoint or median temperature of the selected temperature class interval (T_m).

$$I_p = I_{AR\&R} \times 1.05^{T_m}$$

Equation 5.1 Projected Rainfall Intensity Equation

For use with the newly released 2016 IFDs, ARR provides interim climate change factors for RCP4.5, RCP6 and RCP8.5 in the form of temperature increase in degrees Celsius and percentage increase in rainfall. Table 5.3 summarises the interim climate change factors for the planning timeline of 2090, as sourced from the Australian Rainfall and Runoff Data Hub for Colac (longitude 143.5855 and latitude -38.3410).

Table 5.3 Interim Climate Change Factors for 2016 IFDs (AR&R 2016)

Year	Temperature increase in °C (% increase in rainfall)		
	RCP4.5	RCP6.0	RCP8.5
2090	1.527 (7.6 %)	2.009 (10.0 %)	3.21 (16.1 %)

These values are applicable to the new ARR 2016 IFDs which were released in November 2016. As discussed in Section 5.3.1 given that this study was begun prior to the adoption of ARR 2016, IFD data from ARR 1987 has been used.

As agreed with Council the most conservative value was chosen to represent the upper end of climate change predictions and thus a 16.1 % increase in rainfall intensity was selected. The existing conditions RORB model was re-run accounting for 16.1 % increase in rainfall intensity to produce hydrographs for input to the hydraulic model. Section 6.5 describes the climate change assessment undertaken as part of the development of this Strategy further and summarises the results produced by the hydraulic model.

6. HYDRAULIC MODELLING

6.1 Purpose

The purpose of creating a hydraulic model for the study area was to produce a tool that enables a comprehensive analysis of the drainage system to be undertaken. The hydraulic model uses the outputs from the hydrologic model and other inputs (as detailed in this Section) to determine the inundation due to the various rainfall events.

TUFLOW software was utilised as the hydraulic modelling software to undertake this task. TUFLOW was the model used for the DELWP Regional Flood Mapping project and is Melbourne Water's preferred 2D hydraulic modelling package. TUFLOW allows for flows in pipes to be modelled (in the 1-D domain) and overland flows to be modelled (in the 2-D domain) as part of a combined model.

The hydraulic modelling undertaken as part of this study allowed for the following tasks to be undertaken to inform the Strategy:

- Production of flood maps for a range of ARIs
- Identification of properties at risk of flooding
- Identification of opportunities to mitigate existing flood risk within the catchment for existing and future development scenarios.

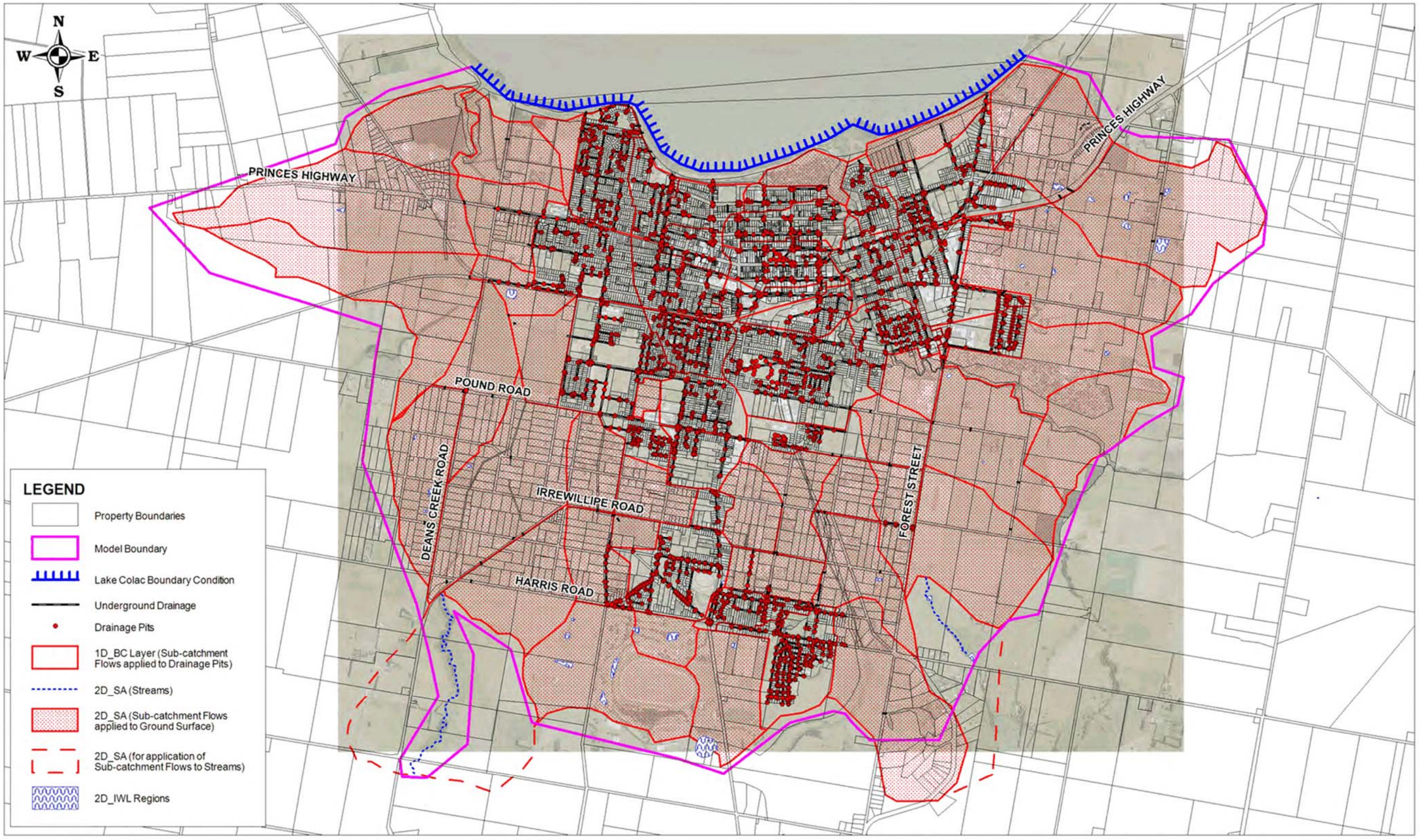
6.2 Model Development

6.2.1 Model Extent

The extent of the hydraulic model is based on enabling the key topographical features of the catchment (such as waterways and open drains) to be modelled at a high level of resolution. It was not necessary to model the entire hydrologic catchment, use of inflow boundaries from the TUFLOW flood model developed for the Deans Creek and Barongarook Creek Regional Flood Mapping project assisted to limit the required extent of the TUFLOW model used for this project.

The extent of the TUFLOW hydraulic model is sufficient to ensure that runoff through Colac and surrounds is accurately modelled, as well as being able to identify key flooding hotspots.

Figure 6.1 shows the extent of the hydraulic model and depicts some of the key inputs to the model which are described further in the following sections of this report.



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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

0 600 1,200
Scale in metres (1:30,000 @ A3)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994. (GDA94)
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 55

Colac Stormwater Development Strategy

Figure 6.1

Hydraulic Model Layout Plan

Job Number: V2013_001
Revision: 0
Drawn: SD
Checked: AP
Date: 1 May 2017

6.2.2 Topography

The hydraulic model uses the Digital Terrain Model (refer to Section 2.2.3) to assign elevations throughout the flood model. A model resolution (grid size) of three metres has been sued, resulting in definition of elevation every 3 horizontal metres in the model. This grid size is in accordance with recommendations in Melbourne Water's Guidelines and Technical Specifications (November 2016) and allows for key catchment features such as waterways, retarding basins, the railway line and roads to be defined in the model.

6.2.3 Drainage Assets

All assets identified in Council's Geographic Information System (GIS) database have been included in the model and considerable effort has gone into the capture of additional drainage assets missing from the GIS database so that they can be included in the model. Particular emphasis was placed on accurately modelling the drainage assets that convey significant overland flow paths under roads and the railway line, a large number of those assets being inspected and measured during site visits by Engeny and / or Council. A number of assets were extracted from the DEWLP model, largely for VicRoads and VicTrack drainage assets. The data captured as part of this study was shared with CCMA to ensure that they are used in the updated DELWP modelling (2017).

The hydraulic model requires invert levels at upstream and downstream ends of all pipes and culverts. This information is not available for most pipes within Council's GIS database (as is the case for most Councils across Victoria). Invert levels were estimated by adopting the following formula:

- Invert level = Ground level RL – 600 mm (pipe cover) – pipe diameter.

The estimated invert levels were then checked to ensure that they were connected appropriately with the inverts of upstream and downstream pipes adjusted where necessary to produce a downward grade.

6.2.4 Waterways and Open Drains

The study area includes numerous waterways and open drains that run through farmland or alongside roads. The LiDAR provides a satisfactory definition of these waterways and open drains and as such it was deemed acceptable that they can be modelled in the 2-D domain. Several culverts have been included in the model along the waterways, with the culverts modelled as pipes in the 1-D domain.

6.2.5 Retarding Basins

A large existing retarding basin is located at the intersection of Irrewillipe Road and Armstrong Road. Engeny visited the basin and gathered the required data, particularly the outlet, to ensure it is accurately represented in the hydraulic model. The outlet structure is shown in Figure 6.2 below, as well as in other photographs in **Appendix B**.

Figure 6.2 **Irrewillipe Road Retarding basin outlet structure**

A number of other smaller retarding basins have been appropriately represented in the hydraulic model.

6.2.6 Surface Roughness

The hydraulic model includes a land use (materials) layer that reflects the surface roughness (Manning's 'n') throughout of the catchment. The surface roughness defines how much resistance there is to runoff / overland flow passing over different land use types. For instance, high surface roughness values are found in residential properties due to the presence of buildings, fences and other structures that impede the flow of water, while flow through a paddock will have a lower surface roughness value.

Table 6.1 summarises the Manning's 'n' roughness values applied to the hydraulic model. These values are based on Melbourne Water's Guidelines and Technical Specifications (November 2016) and were verified on our site visits and from aerial photographs.

Table 6.1 Hydraulic model surface roughness values

Land Use	Manning's n
Standard density residential property (GRZ1)	0.25
Low density residential property (LDRZ, RLZ, TZ)	0.045
Remainder of parcel (Residential)	0.08
Commercial or industrial (C1Z, C2Z, IN1Z, IN3Z)	0.40
Remainder of parcel (Commercial and Industrial)	0.12
Public Use-Services, Education, Health, Community (PUZ1, PUZ2, PUZ3, PUZ7, SUZ4)	0.20
Public Use-Local Government / Cemetery (PUZ5, PUZ6)	0.045
Farm Zone (FZ)	0.04
Parks, Recreational, Public Conservation and Resource Zone (PCRZ, PPRZ, SUZ3))	0.035
Waterway / Parks – minimal / scattered vegetation	0.06
Waterway / Parks – moderate vegetation	0.09
Waterway / Parks – high density vegetation	0.12
Railway line (PUZ4)	0.035
Car parks and roads (RDZ1, RDZ2)	0.02
Concrete (for culvert modelled in 2D domain)	0.013

6.2.7 Boundary Conditions and Model Inflows

The TUFLOW model includes a series of boundary conditions to control points where flow enters or leaves the model. A HT (head versus time) boundary was drawn at the catchment outlet, Lake Colac, in order to allow water to leave the model. This boundary was based on a peak water level in Lake Colac of 117.4 m as per the DELWP flood model. As part of the development of the DELWP flood model sensitivity testing of varying lake levels found that the lake level resulted in negligible increases in flood level upstream of the foreshore.

A series of QT (flow versus time) boundaries were also placed at the upstream extents of the model in order represent the inflows from Deans Creek and Barongarook Creek in addition to some associated tributaries. These relationships were set up to reference the plot outputs of flow versus time results from the DELWP flood model and enabled the DELWP TUFLOW model extent to be reduced to focus on the study area and provide greater resolution.

Inflows to the underground drainage were input to the model in the 1-D boundary conditions layer which applies the rainfall excess hydrographs for sub-catchments across the drainage inlets within each sub-catchment. In sub-catchments where there is no

drainage network the 2-D source area layer was used to apply rainfall excess hydrographs directly to the ground surface for those sub-catchments.

6.2.8 Simulation Parameters

The hydraulic model has been simulated with a 1-D time step of 0.25 seconds and 2-D time step of 1 second. Melbourne Water guidelines recommend that the 2-D time step should generally be one quarter to one half of the TUFLOW grid size. As the grid size of the model is three metres, the model satisfies this recommendation.

6.3 Model Validation

The hydraulic model has been validated by checking that flows and depths produced by the TUFLOW model are reasonable and accord with observed flooding. Any unexpectedly large or small flow results were investigated to understand whether or not they were reasonable.

Model result files were used to check that pipes are flowing full in the 5 year ARI event and if not flowing full then to confirm that the level of overland flow was minor. The pipe flows in the 100 year event were also checked to ensure that the network had been modelled correctly and that there were no 'brick walls' where pipes had not been correctly connected to the next pipe downstream. Results were also checked to ensure that TUFLOW was not producing high velocities or depths where they are not expected.

The TUFLOW model was reviewed internally at different stages of its development using Quality Assurance (QA) processes developed by Engeny to ensure that consistent best practice modelling has been applied and that the model is as accurate as reasonably possible.

Joint calibration of the hydraulic and hydrologic model has been undertaken to ensure a good match was achieved to the results predicted by the model developed for the Deans Creek and Barongarook Creek Regional Flood Mapping Project. Section 6.3.1 outlines the key results of this process.

Information gained from the community consultation sessions (via completed questionnaire forms) and from photos / anecdotal evidence provided by Council has also been used to validate the result of the hydraulic model. A description and visual comparison of how historical flooding at the following addresses compares to the results produced by the flood model is provided in the following sub-sections:

- 142 Hart Street
- 18 Hearn Street
- 40 - 42 Balnagowan Avenue
- 11 Lawrence Court
- 177 Aireys Street

- 24 Dowling Street.

The areas that have been considered are scattered across the study area, thus successful validation at these locations has provided high confidence in the modelling results.

Many of the photos presented were taken by local residents during the September 2016 storm event which CCMA advised was classified as a 50 year ARI storm event. The Bureau of Meteorology rainfall station at Colac (Mt Gellibrand) recorded 45.8 mm in the 24 hours to 9 am on the 14th of September. The rainfall station also indicates there were several days of wet weather leading up to this event, resulting in an already wet catchment prior to the onset of rainfall. In the 24 hours to 9 am on the 9th of September 18.6 mm of rain was recorded, whilst 14 mm was recorded in the 24 hours to 9 am on the 12th of September and 11.8 mm in the 24 hours to 9 am on the 13th of September.

6.3.1 Joint Calibration / Validation Results

It is important to consider all available information to ensure that flood modelling provides the best possible match to actual flooding behaviour. Therefore this study has considered information from actual flood events and other flood modelling in the area.

Table 6.2 below documents the results of a comparison between the flood modelling results predicted by the DELWP model and the model developed for the CSDS at Deans Creek and Barongarook Creek. Given that there are some significant differences in the model setup between the two models the results show that a close match was achieved providing confidence in the current modelling to enable decisions regarding future development to be appropriately made using the CSDS hydraulic model.

Table 6.2 Comparisons between DELWP Model and CSDS Model

Location	DELWP Model Flood Level (m AHD) (5 year ARI)	CSDS Model (5 year ARI)	DELWP Model (100 year ARI)	CSDS Model (100 year ARI)
Deans Creek Gauge located just north of railway line ~320 m	120.22	120.19	120.64	120.63
Barongarook Creek @ Princes Highway	17.35 (12hr)	17.44 (12hr)	95.07 (9hr)	92.00 (9hr)

In some areas overland flows predicted by the CSDS model were found to be lower than those predicted by the DELWP model, this is believed to include, but not limited to:

- Differences in LiDAR data used
- Differences in drainage assets used.

It is important to note that the flood extents predicted by the DELWP hydraulic model are based on the assumption that development across the study area is in line with development allowed by the respective planning zones. The result of this assumption is

the use of standard density residential surface roughness values (see Section 6.2.6) in GRZ1 zoned areas even if some of the properties within that zone have not yet developed.

The objective of the validation of Engeny's modelling with the DELWP modelling was to ensure that Engeny's modelling of the riverine flooding within the floodplains of Deans and Barongarook Creeks closely matched the behaviour predicted by the DELWP model and to ensure that flooding was appropriately mapped in the residential areas of Colac and surrounds. Engeny believes this has been achieved according to the numbers produced in Table 6.2 above and consideration of noted historical flooding at locations described in the following sub-sections.

It is also important to note that calibration of the DELWP hydraulic model was undertaken to closely match the results of the hydraulic results for flooding along Deans Creek and Barongarook Creek associated with a rainfall event in August 2010. Recorded streamflow from the Deans Creek gauge and other information was used in calibration of the DELWP model.

Engeny used anecdotal evidence supported by photographs supplied by the community to ensure a close match between the results of the hydraulic model and the flooding witnessed and documented in the study area, particularly for locations associated with the local drainage system. A number of these examples are discussed on the following pages.

The flood modelling results depicted in all images below, except where noted, have been produced using the filtering criteria outlined in Section 6.4 (e.g. depth ≥ 0.05 m).

6.3.2 142 Hart Street

Engeny understands that the resident of 142 Hart Street provided Council with a range of photos to document flooding within the property that occurred during the September 2016 storm event. Figure 6.3 below presents three photos supplied by the resident;

a) taken along the southern boundary of the project

b) taken along the eastern boundary of the neighbouring property (144 Hart Street)

c) at the front of the property looking south along Hart Street.

This pattern of flooding is well represented by the flood model with Figure 6.4 highlighting the flooding that can be expected to arise from a 10 year ARI event which is less than the 50 year ARI event that the September 2016 event has been classified as being. As such Engeny believes that the flood model provides a good match to the flooding reported at this location given that the September 2016 flooding pattern is replicated in the 10 year ARI results but not as deep in terms of flood depth. The cause of this flow is breakaway flow from the Martin Street and Batson Crescent drainage system which does not have capacity for 10 year ARI flows or greater.

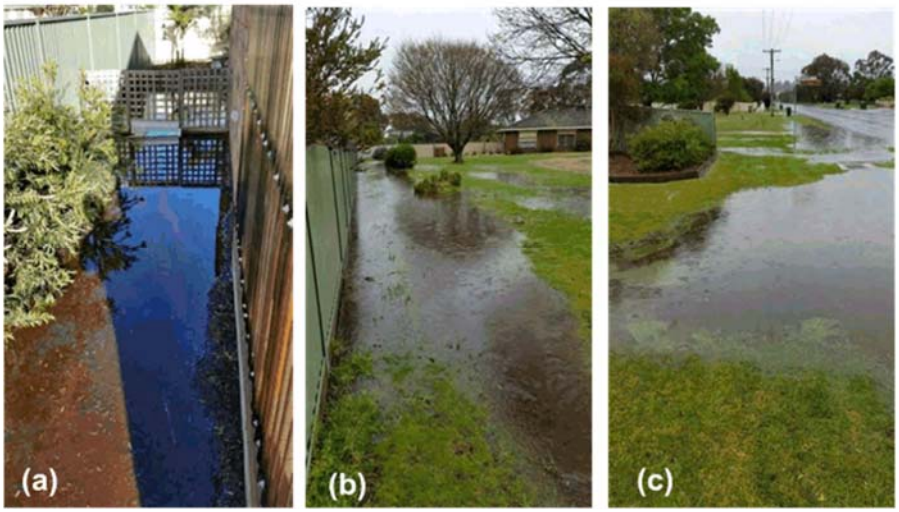


Figure 6.3 Flooding at 142 Hart Street as captured by resident in September 2016

Figure 6.4 Flooding at 142 Hart Street as predicted by flood model (10 year ARI)

6.3.3 18 Hearn Street

At the second community consultation session a member of the Colac community who had documented flooding in the vicinity of Pound Road / Egan Street / Hearn Street during the September 2016 storm event provided a range of photos. The person noted that flooding in the vicinity of 18 Hearn Street was prominent and had encroached into the property as shown in Figure 6.5 below. Figure 6.6 presents the 10 year ARI flood extent predicted by the flood model and Engeny believes this is a good fit to the flooding experienced at this property.

Figure 6.5 Flooding at 18 Hearn Street

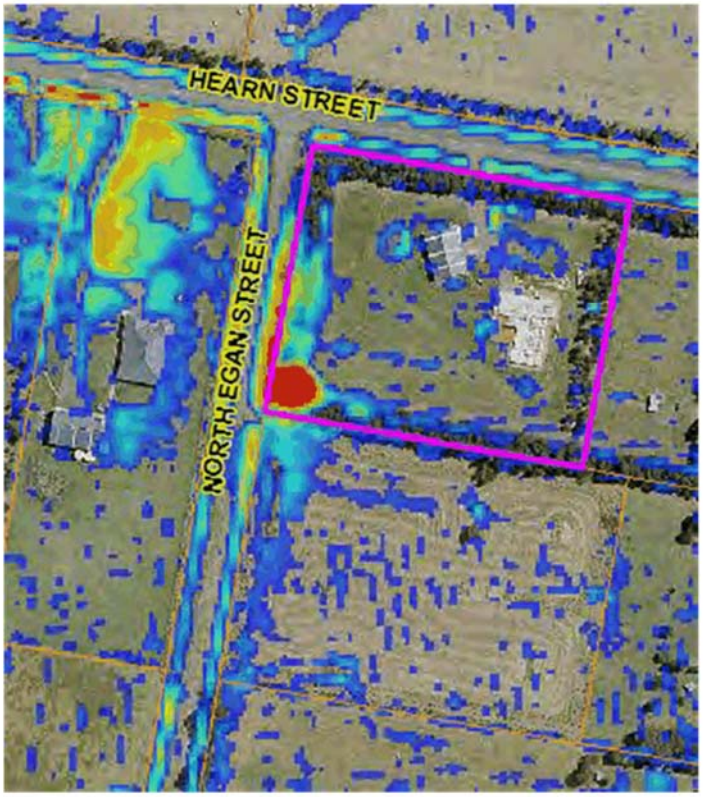


Figure 6.6 Flooding at 18 Hearn Street as predicted by flood model (10 year ARI)

6.3.4 40-42 Balnagowan Avenue

It is understood that the residents of this property highlighted previous flooding within the road in front of the property to Council. The residents noted that whilst the house has not previously been flooded above floor level they are concerned that this could happen in the future if a large storm event was to occur. The flood modelling results, shown in Figure 6.7 below, clearly depicts a low point in the road in front of the property and the results show that in a 100 year ARI event the existing underground network has insufficient capacity to prevent runoff from overtopping the kerb. Note that for the 5 and 10 year ARI events flows do not overtop the kerb if the existing drainage system is not blocked.

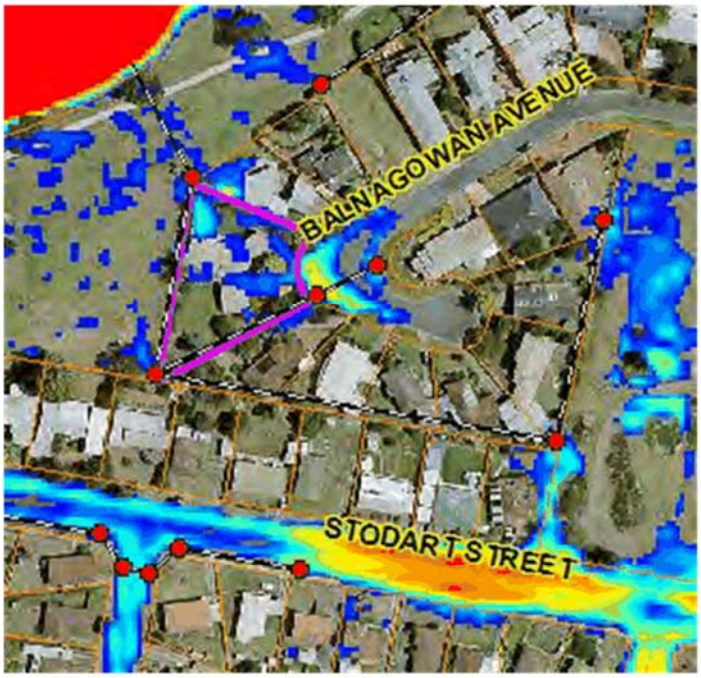


Figure 6.7 Flooding at 40-42 Balnagowan Avenue as predicted by flood model (100 year ARI)

6.3.5 11 Lawrence Court

The following is an extract from an email to Council from the resident of this property documenting that some historical storm events had caused runoff to flow through the property:

"About 20 odd years ago we had a huge downpour and although our house wasn't flooded, we were very worried that it was going to be, and around 5-10 years ago a similar thing happened to a lesser degree, with parts of our back yard being 20-25cm under water."

No photos were provided by the resident but Figure 6.8 below highlights that in a 5 year ARI event flows are sufficient to overtop the kerb and flow through the property. Whilst it is not possible to determine the ARI of the historical flooding events Engeny believes that the modelling is realistically representing what happens at this location during storm events.

Figure 6.8 Flooding at 11 Lawrence Street as predicted by flood model (5 year ARI)

6.3.6 177 Aireys Street

The resident of this property attended the second community consultation session, completed the questionnaire and provided a range of photos highlighting runoff through the front of the property associated with the September 2016 storm event. Figure 6.9 is a photo supplied by the resident and Figure 6.10 highlights flood modelling results for the 10 year ARI event (note that no filtering of flood depths is used in this figure to capture the shallow nature of flows through the driveway). The modelling results appear to highlight the pattern of flooding well noting that the September 2016 storm event was a 50 year ARI event and thus greater depths could reasonably be expected than those represented .

Figure 6.9 Flooding at 177 Aireys Street as captured by resident in September 2016

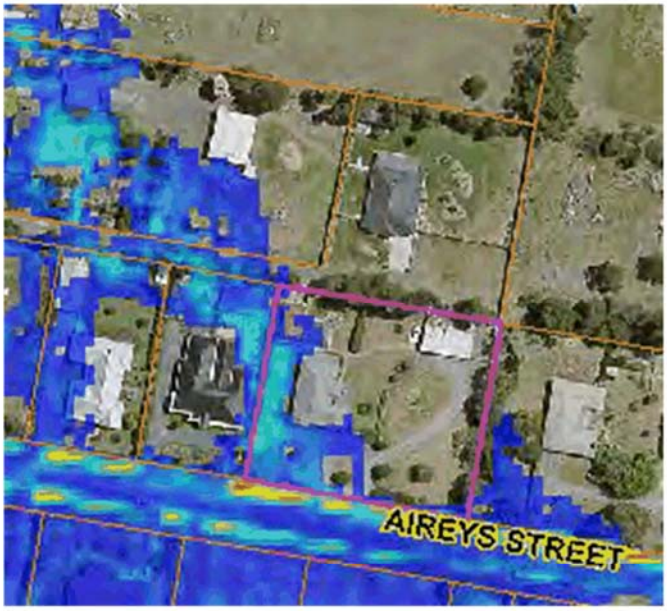


Figure 6.10 Flooding at 177 Aireys Street as predicted by flood model (10 year ARI)

6.3.7 24 Dowling Street

The resident of this property provided Council with a range of photos to highlight runoff across the property. Figure 6.11 below is a photo supplied by the resident, taken during the September 2016 storm event, and Figure 6.12 presents the results of the flood modelling for the 10 year ARI event. Based on the evidence presented in the photos Engeny believes that the flood modelling provides a good match.

Figure 6.11 Flooding at 24 Dowling Street on 14th September 2016

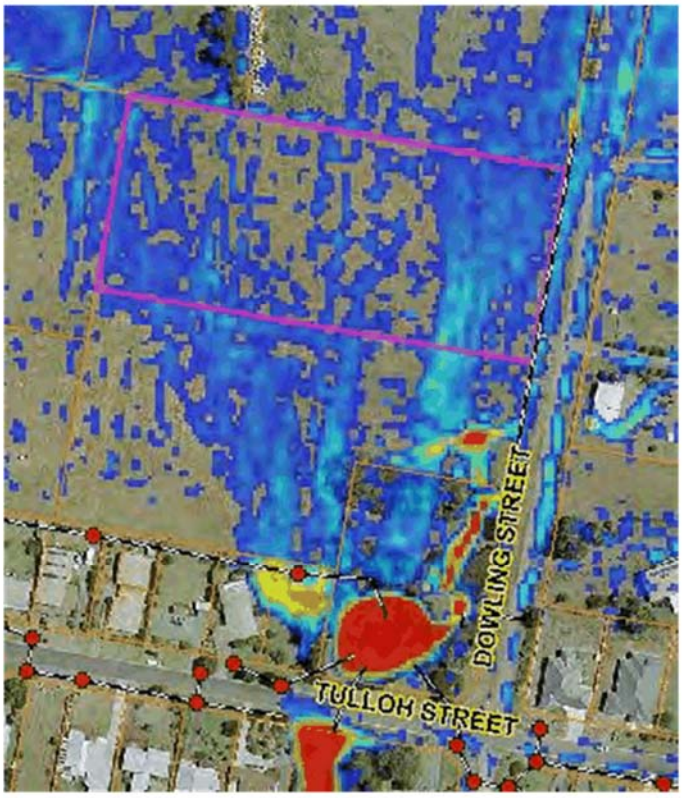


Figure 6.12 Flooding at 24 Dowling Street as predicted by flood model (10 year ARI)

6.3.8 Reported Flooding Incidences from September 2016 Storm Event

A number of flooding incidences were reported by the local community to Council during the September 2016 storm event. Council collated these reports from which Engeny made comparisons to the flood modelling results. This comparison also showed a close match between the modelling results and what really happened during the storm event for the majority of locations. In a small number of areas where blockage of drainage assets were noted the modelling results did not fully represent the flooding noted during the September 2016 storm event and that is due to the fact that the hydraulic model has not been run with the degree of blockage that may have been present at the time of the storm event. It is important to note that these locations are not identified as being located within the highest risk areas across the study area.

6.3.9 Photos supplied by Corangamite Catchment Management Authority

The CCMA provided Engeny with a range of photos captured during the September 2016 storm event including Figures 6.13 and 6.14 which highlight flooding at Wallace Street at the crossing of Barongarook Creek. The 10 year ARI event flood modelling results indicate that the event does not result in overtopping of Wallace Street whilst the 100 year

ARI event results shown in Figure 6.15 indicate that the 100 year ARI event is significant enough to cause overtopping. The photos not only provide validation that the flood modelling results are realistic, they also confirm that the September 2016 rainfall event was in the order of a 50 year ARI event.

Survey marks were also captured by CCMA and at the time of preparing this report are being used to undertake further calibration of the flood models developed for DEWLP to finalise proposed changes to the existing Land Subject to Inundation Overlay (LSIO) in response to the findings of the 2016 Regional Flood Mapping project.

Figure 6.13 Flooding across Wallace Street

Figure 6.14 Flooding between Wallace Street and the Railway Line

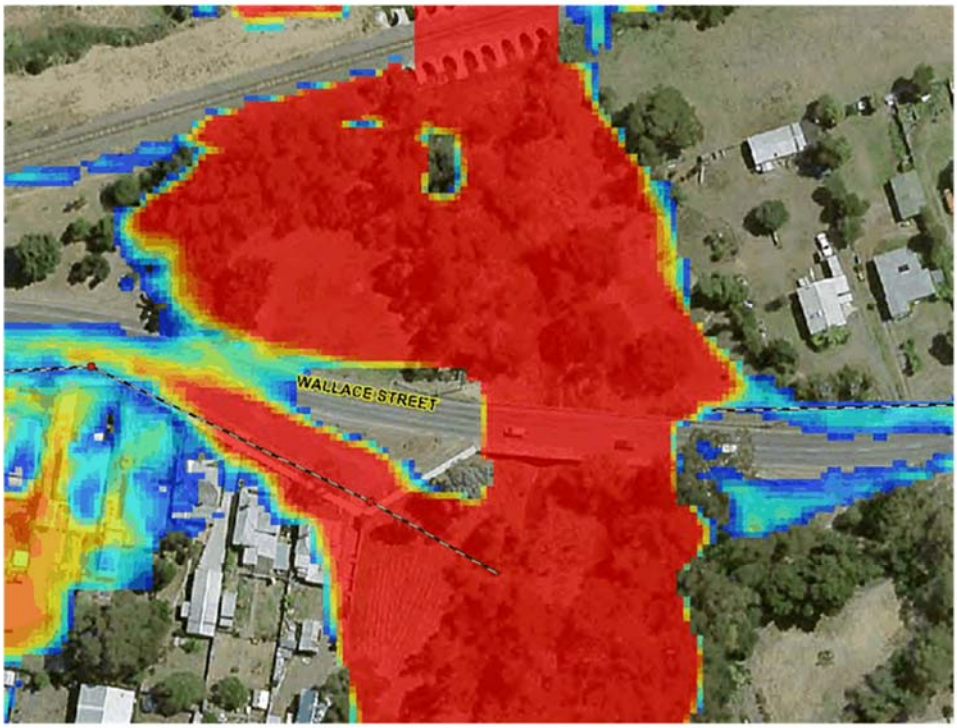


Figure 6.15 Flood modelling results at Wallace Street

6.4 Flood Mapping

For each modelled ARI a flood extent has been produced, with data included in the flood inundation map if it meets the following condition:

- Depth ≥ 0.05 m.

The flood inundation maps for each ARI are a combination of the critical results from all modelled rainfall event durations for the particular ARI.

Appendix D provides flood inundation maps for the 5,10 and 100 year ARI events for existing development conditions.

The flood inundation maps highlight the following with respect across the existing developed areas of Colac and surrounds for the minor and major storm events:

- 5 year ARI (minor event)
  - Flooding largely contained within road reserves, some overtopping of low points in road reserves noted with overland flow directed through some private properties.

- 100 year ARI (major event)
  - Higher number of private properties impacted by overland flows, largely as a result of a change in drainage design standards. As outlined in Section 4.1.1 there have been a number of changes to drainage design standards over time, the most significant being the adoption of the "major / minor" drainage system. The "major / minor" drainage system concept, as outlined above, was first specified in Australian Rainfall and Runoff in 1987. A large portion of Council's drainage system in Colac and surrounds was designed and constructed prior to 1987 and therefore does not meet current drainage standards which is common for Councils across Victoria.

6.5 Flood Warning

The Bureau of Meteorology (BoM) provides flood warning services for major waterways around Australia. In Victoria these flood warnings enable the Victorian SES to co-ordinate flood emergency responses and to assist the community. There are no major waterways in Colac that have flood warning systems provided by BoM.

Some local authorities have local flood warning systems to assist their communities. The types of local warning systems vary, depending on the resources available and the warning time that can be provided.

Outputs from the flood modelling, either undertaken as part of the development of the CSDS or as part of the Deans Creek and Barongarook Creek Regional Flood Mapping Project, could be used to develop a flood warning system and/or provide input to a Flood Emergency Response Plan for Colac and surrounds.

The Deans Creek and Barongarook Creek Regional Flood Mapping Project notes that overall catchment response is highly dependent on the antecedent conditions which is important to note for any future flood intelligence and warning systems, the design and development of which is beyond the scope of this Strategy.

6.6 Flood Impacts on Transport

The flood modelling results have been used to determine the impact of flooding on key transport infrastructure across Colac and surrounds. Table 6.3 below summarises the results of this assessment noting if the Princes Highway or the railway line are overtopped for the various ARI events.

Flooding of the main roads and / or railway line could restrict access due to closures during floods. Overtopping of road or rail embankments could also lead to damage of the embankments and significant costs and disruptions to transport.

Table 6.3 Summary of impact on key transport infrastructure

Location	5 Year ARI - overtopping?	10 Year ARI - overtopping?	100 Year ARI - overtopping?
Princes Highway @ Barongarook Creek	No	No	No
Railway Line @ Barongarook Creek	No	No	No
Princes Highway @ Deans Creek	Yes (depths up to ~ 80 mm)	Yes (depths up to ~ 200 mm, depths above 100 mm for 3.5 hrs)	Yes (depths up to 650 mm, depths above 100 mm for 9.5 hrs)
Railway Line @ Deans Creek	No	No	Yes (just overtops)

6.7 Climate Change Modelling and Results

To help inform climate change adaption planning decisions the impacts of climate changes has been assessed within the flood model developed for the CSDS.

Section 5.5 of the Strategy outlines the methodology and assumptions adopted to arrive at a prediction of 16.1 % rainfall intensity increase under climate change conditions. Having arrived at this prediction the hydraulic model was run for the 5 and 100 year ARI events including the influence of climate change. Flood inundation maps for climate change conditions are presented in **Appendix E**.

6.7.1 Impact of Climate Change

The increase in rainfall intensity predicted as a result of climate change has been shown to increase peak flood depths event throughout the study area. A flood depth difference plot is presented in **Appendix E** to clearly show the impact on flood depths across the study area when comparing existing catchment conditions with climate change conditions.

The flood depth difference plot highlights that climate change will lead to increased flooding across the study area. The increase in peak depth, however, is not uniform throughout the catchment. The increase experienced in each location depends on a number of factors including:

- Existing drainage capacity and capacity of overland flow paths
- Topography
- Position within the catchment (upstream vs downstream).

The greatest impacts on flooding across the study as a result of climate change are located along Deans Creek and Barongarook Creek as a result of those waterways carrying greater volumes of runoff generated from increased rainfall intensities. Across the existing development areas of Colac and surrounds the majority of locations where increased flood depths are noted in climate change conditions are located at low lying areas of the topography. These areas are also most are risk from a blockage of drainage assets (including pits and pipes) and are also at risk of significant flooding should an event larger than the 100 year ARI storm occur.

7. EXISTING DRAINAGE SYSTEM PERFORMANCE AND MITIGATION OPPORTUNITIES

7.1 Existing Flooding 'Hot Spot' Locations

Detailed hydraulic modelling has enabled the capacity of the drainage network within existing residential areas to be assessed in detail. In consultation with Council the following locations have been identified as flooding 'hot spots' based on the extent (number of properties impacted) and depth of flooding. Each of these locations are highlighted in Figure 7.1 and summarised in the following sub-sections.

7.1.1 Location 1 – Railway Line to the intersection of Princes Highway and Armstrong Street

Several properties are located in a well-defined valley which exists between the Princes Highway and Armstrong Street, are impacted by flooding in various ARI storm events. This is due to limits on the capacity of the existing drainage network. Flows in excess of the drainage capacity will pond in the low points of Jennings Street and Farrington Street before being directed into properties.

7.1.2 Location 2 – Gravesend Street to Hart Street

The existing drainage network running from Gravesend Street to Hart Street appears to have capacity to convey 5 year ARI flows. For rainfall events larger than the 5 year ARI event drainage capacity is exceeded with a number of adjacent properties impacted. There are a number of low points within the streets where flows in excess of the drainage capacity will pond before being directed into properties.

7.1.3 Location 3 – Hart Street to Armstrong Street

During rainfall events in excess of the 5 year ARI properties located along Deans Court, Mahoney Court, Petjuli Street and Jakaranda Street are affected by flooding mainly due to insufficient pipe of the existing drainage system.

Properties located on the northern side of Deans Court and Mahoney Court, are affected by flooding primarily due to insufficient pipe and pit capacity of the existing drainage system.

7.1.4 Location 4 – Lawrence Court to Wilson Street

The existing 300 mm drain at the north-eastern corner of Lawrence has capacity to convey close to the 5 year ARI flows. For rainfall events larger than the 20 % event drainage capacity is exceeded and a number of properties are impacted through to Wilson Street.

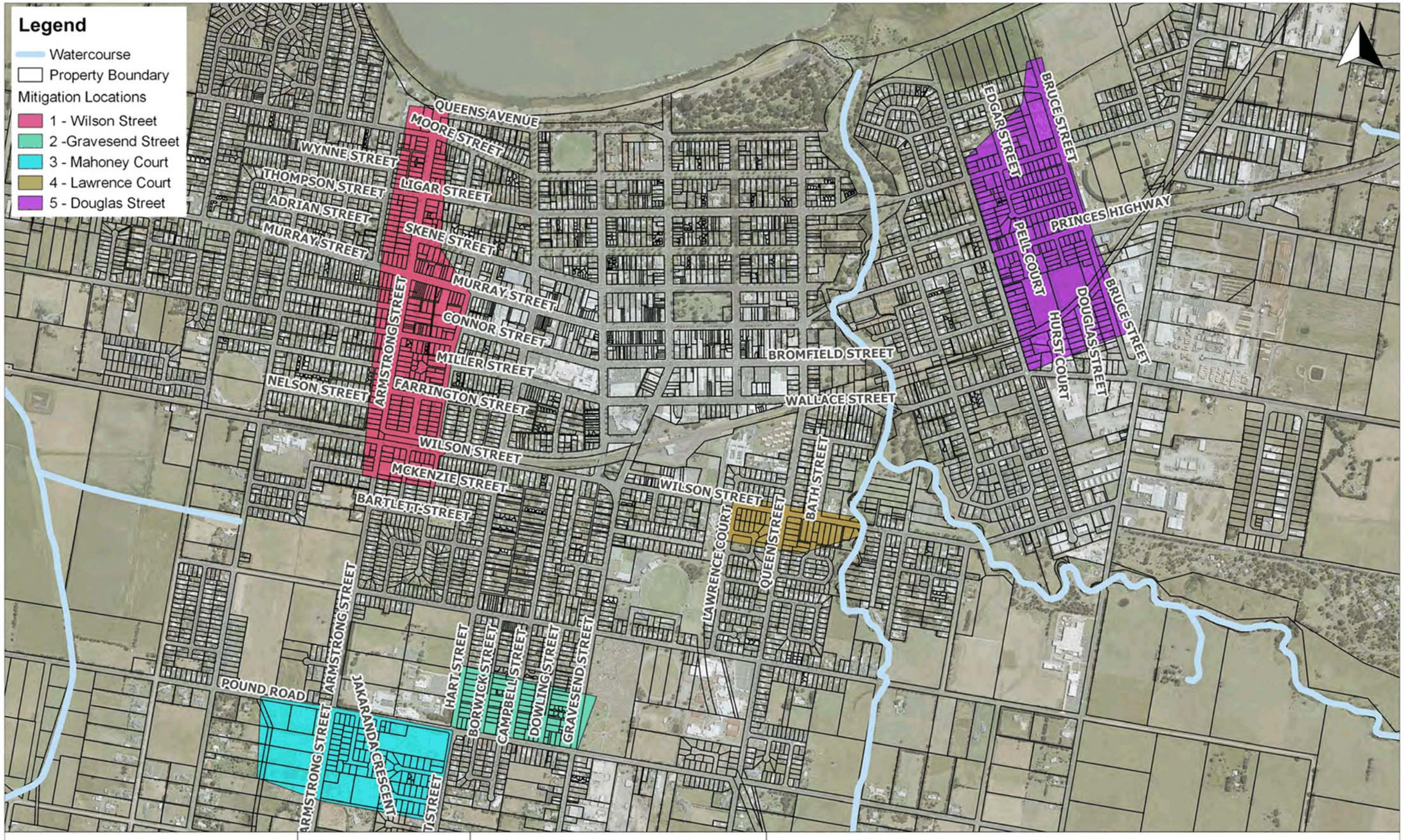
7.1.5 Location 5 – Railway Line to the intersection of Chapel Street and Bruce Street

The existing 675 mm drain located beneath the railway line between Burst Court and Douglas Street does not have capacity to cater for flows in excess of the 5 year ARI event. As a result during larger rainfall events flows in excess of the drainage capacity pond on the south side of the railway line before overtopping the railway line and impacting numerous properties through to the intersection of Chapel Street and Bruce Street. Properties north of the railway line are positioned in a well-defined valley which follows the alignment of the existing drainage network.

7.1.6 Location 6 – Hill Street to Wallace Street

The existing 375 mm diameter pipe running from Hill Street to Wallace Street does not have capacity to convey 5 year ARI flows and as a result a number of properties are impacted during minor and major storm events. The valley which follows the alignment of this 375 mm pipe conveys the overland flow through the properties where additional water is also directed into this impacted area from Queen Street also as a result of limits on drainage capacity. In larger ARI events the tailwater levels of Barongarook Creek act to reduce the capacity of the drainage system at this location.

It is difficult to address flooding up to the 100 year ARI event at this location without lowering the flood level within Barongarook Creek. Provision of underground storage would assist, however a large volume of storage, thousands of cubic metres, would be required and the available space to fit such volume of storage is limited. Due to the inherent constraints at this location a detailed mitigation assessment for this location has not been undertaken and is not described further or presented on Figure 7.1.



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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

100 0 100 200 300 400 m

At A3 1:12,000

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

Colac Stormwater Development Strategy

Figure 7.1

Mitigation Locations Layout Plan

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 18/9/2017

7.2 Possible Structural Mitigation Works to Address 'Hot Spots'

7.2.1 Proposed Works

For each location summarised in Section 7.1 structural works have been identified to address flooding for up to the 100 year ARI event. The extent and sizing of works are presented in **Appendix F**. The sizing of works was undertaken utilising the results of the existing conditions flood modelling and utilising spreadsheet calculations to determine appropriate pipe sizes for the peak 100 year ARI event.

At all locations, except for Location 2, underground drainage upgrades are proposed as a result of lack of open space which could be utilised for retardation of piped flows to reduce the extent and sizing of drainage upgrades.

As part of the works identified at Location 2 a constructed wetland with flood storage provision is proposed as there is undeveloped land within the Trinity College (Parish) property which could possibly be acquired or used for stormwater management as part of future development of the balance of the land. The existing conditions flood modelling results highlight that a large portion of the undeveloped area in the north eastern corner of the property is subject to flooding approximately 200-400 mm deep for the 100 year ARI event. Any future development in this area should consider the extent of flooding for existing conditions (the implementation of a Special Building Overlay (SBO) would ensure this was the case) to appropriately set floor levels for any development and ensure that it does not obstruct overland flows. This could result in a more expensive development design and construction (e.g. structural footings). As such the construction of a wetland with flood storage within a portion of the property presents an opportunity to appropriately retard catchment flows that would reduce the constraints on any future development within that part of the property. An opportunity exists to negotiate the construction and funding of the asset as part of the future development of the land, subject to detailed design.

An assessment on the sizing of proposed mitigation works as a result of predicted climate change conditions was also undertaken. This enabled the percentage increase in capital cost to address the impacts of climate change, relative to those works required to address existing conditions, to be determined. This is discussed further in Section 7.2.4. The extent and sizing of works required to address flooding for the 100 year ARI climate change condition are presented in **Appendix G**.

7.2.2 Costing

The proposed works for each location have been costed according to industry rates as defined by Melbourne Water's standard rates for Developer Services Schemes. At each location the number of properties that would likely benefit from the works has been calculated in order to compare and prioritise the works at each location based on the cost per property likely to benefit. Table 7.1 below summarises the cost (including 40 % allowance survey, design and contingencies), the number of properties likely to benefit from the proposed works and the cost per property likely to benefit from the works for both existing conditions and climate change conditions.

Table 7.1 Summary of capital costs for proposed mitigation works at all five flooding 'hot spot' locations

Mitigation Location		No. Properties likely to benefit	Existing Peak 100 year ARI Flows		Climate Change Peak 100 year ARI Flows		% Cost Increase for Climate Change Mitigation Works
			Cost (incl 40 %)	Cost Per Property	Cost (incl 40 %)	Cost Per Property	
1	Wilson Street	73	$4,854,045	$66,494	$5,325,415	$72,950.90	8.9 %
2	Gravesend Street	34	$1,323,425	$38,924	$1,441,219	$42,389	8.2 %
3	Mahoney Court	48	$3,314,339	$69,049	$3,332,305	$69,423	0.5 %
4	Lawrence Court	12	$813,949	$67,829	$839,509	$69,959	3.0 %
5	Douglas Street	90	$3,373,414	$37,482	$3,647,620	$40,529	7.5 %

7.2.3 Prioritisation

The works at all five locations have been compared based on their respective cost per property likely to benefit, summarised in Table 7.1. The result of this comparison is summarised in Table 7.2 below for both existing conditions and climate change conditions.

Table 7.2 Prioritisation of mitigation works across all five flooding 'hot spot' locations

Mitigation Location		Prioritisation Ranking for Existing Conditions	Prioritisation Ranking for Climate Change Conditions
1	Wilson Street	3	5
2	Gravesend Street	2	2
3	Mahoney Court	5	3
4	Lawrence Court	4	4
5	Douglas Street	1	1

7.2.4 Impact of Mitigation Options due to Climate Change

The assessment of mitigation works required to address flooding associated with predicted climate change has highlighted the following:

- The prioritisation of mitigation works across various locations is different when compared to the prioritisation of mitigation works for existing conditions

- The incremental increase in infrastructure sizing that is needed to address the impact of climate change across the five locations investigated as part this assessment equates to on average a 5.62 % increase in capital cost. The increase in cost varied between 0.5 and 8.9 % across the five locations.

This information will help inform Council's climate change adaptation planning.

7.2.5 Further Work / Assessment

The mitigation works presented in this Strategy are high level concepts only and a number of tasks are needed to further assess their feasibility and constructability. These tasks are likely to include the following:

- Underground service proving, as part of the concept assessment Dial Before You Dig (DBYD) information was acquired and at all locations a number of possible clashes with existing sewer and water assets were noted

- Geotechnical investigation (to confirm soil properties and / or undertake a contaminated land assessment)

- Flood modelling to confirm benefit of the works (as described in Section 7.2.1 spreadsheet calculations have been used in this concept level assessment and to confirm the benefits of the proposed works it is possible to input the works into the flood model to enable a comparison to existing conditions.

  Floor level survey of those properties predicted to be impacted by flooding would assist with this task and an Average Annual Damages (AAD) assessment could be undertaken. The objective of an AAD assessment is to determine the financial impact of flooding, in terms of the average cost of flood damages due to flooding per year. This assessment calculates the flood damage costs for a range of ARI storm events and uses this information to calculate the average cost of flood damages in any given year. It also enables the financial benefits of the proposed works to be analysed.

- Community engagement.

It is possible that these further works could change the priority order of mitigation works at the five locations. It is also possible that some works may be proven to not be feasible.

When looking to mitigate areas subject to flooding Council should consider if the cost of providing additional drainage capacity is justified for the reduction in flooding risk that it provides. In some areas it may be justified to construct infrastructure capable of conveying flow in excess of a 100 year ARI event in order to reduce the risk of flooding either as a result of climate change or in an event larger than a 100 year ARI. An example of this may be if a pipe upgrade is being planned and by increasing the pipe diameter by one or two standard sizes may significantly increase the flow capacity but

may not significantly increase the cost of construction. In other areas it may only be practical to convey a certain flow rate of water away and in these areas Council (and by extension the community) may have to accept a lower level of service which would mean that flooding may occur more frequently. Other controls on development may need to apply in these areas to help manage the risk that flooding poses to the community.

7.3 Drainage Maintenance

Maintenance of urban drainage systems is important to ensure their continued efficient operation.

Blockage of drainage inlets and culverts can exacerbate flooding. On some occasions the blockage can be due to a lack of maintenance where blockages that have existed for some time have not yet been cleared. In other cases the drainage system can be free of blockage immediately before a flood event and debris can be swept down the drainage system with the flood flows and create blockages.

Typically Council drainage systems have inlets that are designed to allow for a certain blockage factor to protect the pipe capacity.

It should be noted that flooding can occur due to the occurrence of a storm event that exceeds the rainfall intensity used to design the system and that blockage or lack of maintenance in these situations may not have played a part in the flooding that occurs.

The results of the hydraulic modelling will assist Council to prioritise their periodic inspections and maintenance of drainage systems at key locations, particularly those locations documented in Section 7.1.

7.3.1 Opportunities to Improve Irrewillipe Road Retarding Basin

An action contained within Colac Integrated Water Management Plan (IWMP) is to upgrade the existing Irrewillipe Road Retarding Basin, largely to serve a stormwater treatment function from which treated water could be harvested and reused. As summarised in Colac IWMP:

"This initiative proposes to upgrade an existing but under-performing retarding basin to be a showpiece of what can be achieved through waters sensitive urban design. The Irrewillipe Road Retarding Basin is a drainage asset reserve of approximately 7.7ha. The function and management of this basin is currently not well understood (COS, pers comm.). The basin retains stormwater from a catchment of 150ha, of which approximately 45ha is residential land. However the basin is not performing its hydraulic function effectively, has become weed infested and provides no public amenity value.

Under this initiative, the basin would be transformed into a fully functional, valued urban water asset which provides drainage retardation, recreation and amenity values, conservation values and treated stormwater to service the nearby Colac Golf Course. Proposed components of the upgrade include:

- *Incorporate WSUD with a sedimentation pond and wetland*
- *Re-engineer the outlet to ensure peak flows are managed, including provision for growth and associated increased runoff*
- *Investigate utilising the storage as a stormwater harvesting and treatment system for reuse within the Golf Club precinct*
- *Extensive upgrade of the surrounding landscape to enhance the recreation and amenity value of the asset*
- *Investigate utilising the water body as a 'put-and-take' fishery.*

A number of tasks undertaken as part of the development of this Strategy have highlighted the following with respect to the Irrewillipe Road retarding basin:

- Drainage catchment to the basin is in the order of 70 hectares
- Peak inflow to basin estimated to be in the order of 5 m^3/s for the 100 year ARI event
- Provides a good level of retardation with downstream flows restricted to the capacity of the 600 mm pipe outlet, the hydraulic model predicts a peak flow of 0.45 m^3/s for the peak 100 year ARI event
- There appears to be scope, based on review of topographical data, to lower the base of the basin to include a sedimentation pond and wetland.

If the basin was to be improved / upgraded there are only likely to be small, relatively insignificant, gains that could be made with respect to flood management. Under existing conditions there is approximately 1 metre of freeboard between the peak 1% AEP flood level and the basin embankment. An upgrade to the outlet is recommended as part of any works as the outlet configuration was noted during site visits to be in poor condition.

The increase in runoff directed to the basin for future development conditions is unlikely to change the risk profile of the basin (e.g. embankment failure) due to the amount of freeboard above the 1% AEP flood level for existing conditions.

The works proposed in the IWMP for Colac will achieve significant water quality and integrated water management benefits, however the works are not strictly required from a flood management perspective. As such there is no recommendation as part of this Strategy to undertake works on the basin to either assist with flood protection of existing development areas or to reduce the extent of works to manage flooding in the future development areas.

The opportunity to improve the Irrewillipe Road retarding basin as presented in the IWMP for Colac is certainly an opportunity worth progressing further and is understood to be being considered further by Council at the time of preparing this Strategy.

7.4 Non-Structural Measures

Council could also consider the use of planning scheme overlays to control development in areas subject to flooding. In these areas minimum floor levels could be set based on a current 100 year ARI flood level and a freeboard applied to that flood level which provides for some allowance for expected future increases in flooding along with the usual uncertainties associated with flood modelling. This could involve adopting a freeboard of 500 or 600 mm above a flood level rather than a more standard 300 mm for flooding associated with a drainage network. Planning scheme controls will not stop properties from flooding but will significantly limit the financial damages when flooding occurs and also significantly reduce the risk to human safety if floors are kept above flood levels during flood events.

Non-structural measures are a cost effective way to improve drainage management. The following non-structural measures are recommended in this Strategy:

- Special Building Overlays (SBOs) are appropriate for identifying overland flow paths for 100 year ARI storms. Use of SBOs across Colac and surrounds is recommended to manage future development and to reduce the flood risk for new buildings. The use of SBOs are considered a high priority for the catchment as they do not have any capital cost and will result in an effective measure across the catchment.

A number of Melbourne based Councils have / are implementing Special Building Overlays (SBOs) to control development in existing development areas. They are noting that to undertake capital works to address flooding for up to the 100 year ARI event (the major storm event as defined by Australian Rainfall and Runoff) would be extremely costly and would take several decades to implement successfully. The use of SBOs allow Councils to prioritise and strategically implement their capital works with the understanding that the SBO will assist in providing satisfactory flooding outcomes in other areas if development is proposed.

8. STRATEGY FOR ULTIMATE DEVELOPMENT CONDITIONS

8.1 Development Areas

Council provided information detailing the areas and type of future development that may occur in Colac and surrounds as part of future rezoning. The feasibility of developing these areas from a drainage perspective has been assessed as part of this assessment the objectives of the Colac Planning Scheme, outlined in Section 3, have been considered.

A copy of the layout plan highlighting development investigation areas, as identified in Colac 2050, is attached in **Appendix A**.

8.2 Drainage Objectives

The key objective Engeny has assessed for each of the development areas is whether it is possible to develop each area without increasing flooding downstream of the development as a result of urbanisation. This objective is in line with the peak flow control requirement which is set out in Clause 56 of the Victorian Planning Provisions.

The objectives in the proposed development areas have been grouped as follows:

- Flood reduction and waterway corridor objectives to maximise development potential
- Stormwater treatment objectives to treat runoff from new development areas
- Peak flow control objectives to ensure new development areas do not increase downstream flooding.

Each of these topics are discussed in the following sub sections of this report. The overall strategy has been designed to make provision for:

- Waterway corridors through the proposed development areas to cost effectively contain flood flows within the waterways, to improve waterway health, to allow for more development and to provide environmental and open space corridors
- Stormwater treatment wetlands within the proposed development areas to treat stormwater to remove pollutants, thus meeting planning scheme requirements. The wetlands will also provide valuable habitat, green space and public amenity as well as peak flow attenuation.

This strategy has prepared layout plans and cost estimates for waterways, major culverts and wetlands within the proposed development areas. Internal sizing of drainage pipe assets has not been done, as this will occur at a later date, once the zonings and layout have been finalised and designs are required.

8.3 Waterway Corridors and Flood Management

Under existing conditions there are significant areas of the proposed development areas that are flood prone. These areas are flood prone due to one or a combination of the following reasons:

- Limited capacity of existing waterways (that are typically man-made open rural drains through the proposed development areas)
- Wide flat valleys adjacent to the existing waterways / man-made open drains
- Sheet flow across paddocks
- Flood flows from existing upstream rural catchments.

There is also the potential for urbanisation to increase peak flows and increase the total area of flooding. Urbanisation typically results in the construction of roads and underground drains that are likely to be too deep to be able to drain to the existing waterways / man-made open drains.

A solution to all of the issues described above that is commonly applied in urban development areas is to provide modified / constructed waterways. This requires the excavation of a waterway corridor. An example of a constructed waterway in an urban environment is provided in Figure 8.1 below.

Figure 8.1 **Example of modified / constructed waterway (Melbourne Water Constructed Waterways Guidelines)**

Melbourne Water has developed guidelines for the design of constructed waterways in urban areas. A typical constructed waterway cross section from these guidelines is provided in Figure 8.2 below.

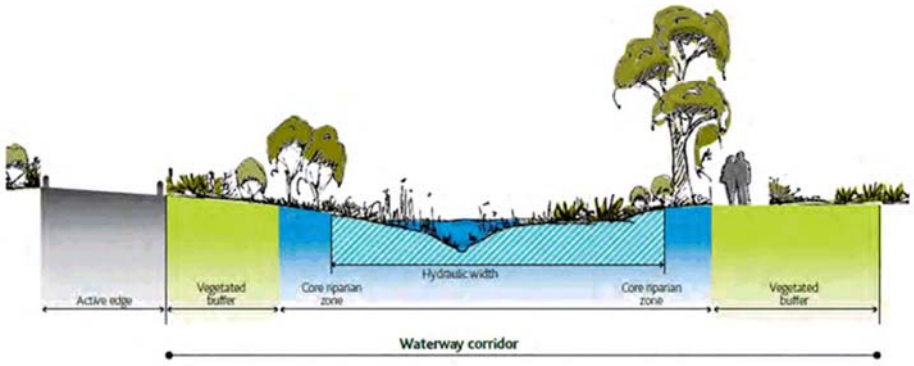

Figure 4. Example of setback sub-zones for constructed waterways

Figure 8.2 Constructed waterway corridor typical cross section

Provision of constructed waterways for the local waterways / man-made open drains for the proposed Colac development areas is expected to have the following benefits.

- The proposed waterways are designed to be excavated to cater for the 100 year ARI peak flow, with freeboard to surrounding land, enabling development and drainage of land
- The waterways will provide environmental values, habitat, riparian zones, open space corridors and visual and public amenity.

Urban development in the proposed growth areas would increase peak flows and flooding due to increased runoff from the extra impervious areas. Works can be undertaken within the development areas to offset the increased flows and mitigate the increase in flood flows. The proposed works include excavation to provide flood storage to offset the increased flows. The excavation to provide flood storage to offset the increased flows from development is proposed:

- Within the waterway corridors to increase flood conveyance and flood storage
- Within the proposed wetland sites. The proposed wetlands have been designed with an average total depth of 1.2 m to allow suitable depth for drainage pipes to discharge into the wetlands. For stormwater treatment the required storage is only 350 mm deep, leaving 300 mm for freeboard and 550 mm for flood storage.

Provision of flood storage and constructed waterways to contain 100 year ARI flows could enable the removal of flooding overlays from the Planning Scheme subject to CCMA approval and completion of planning scheme amendments.

8.4 Stormwater Treatment Objectives

Stormwater treatment is required in all new residential developments in Victoria to meet the requirements of Clause 56.07-4 of the Victorian Planning Provisions. These provisions require stormwater treatment to meet Best Practice targets for the removal of sediment, gross pollutants and nutrients.

To meet the legislated stormwater treatment targets the most common and effective method is to provide stormwater treatment wetlands. Stormwater treatment wetlands have a number of other benefits in addition to stormwater treatment, including:

- Provision of valuable habitat
- Provision of open green space
- Provision of public amenity
- Peak flow attenuation of flows from the proposed development areas.

An example of stormwater treatment wetland with combined retardation storage is shown in Figure 8.3 below.

Figure 8.3 Example of retarding basin (including permanent pond / wetland)

For the proposed Colac development areas wetlands have been proposed with consideration of the following points:

- All proposed urban areas to have their stormwater treated prior to discharge to a waterway
- Runoff from the proposed development areas must overall meet the Clause 56.07-4 pollutant removal targets prior to discharge to Deans Creek / Barongarook Creek
- Wetlands have been located at the lowest point for each catchment, often on flood prone land and / or upstream of a road embankment
- Catchment areas draining to wetlands should typically be in the range of 20 to 50 hectares
- The wetland areas include the approximate total land take for the wetlands, including provision for sediment basins, sediment drying areas, access tracks, batter slopes and the wetland
- The wetlands are proposed to be excavated to provide additional stormwater treatment and flood storage and also to remove the need for embankments and ANCOLD embankment risk assessments.

8.5 Stormwater Harvesting / Integrated Water Management Benefits

Urban development increases the volume of surface water runoff due to increases in impervious surfaces. This increased runoff provides a potential source of water for use in the local area.

The proposed development layout has wetlands to treat stormwater prior to discharge to waterways. The wetlands provide an opportunity for treated stormwater from the wetlands to be harvested. The treated stormwater is well suited for use for open space irrigation, including watering of playing fields, parkland and street trees, with stormwater typically able to supply a large portion of the demand for these uses with high reliability.

Rainwater tanks are another source of water that could be provided in Colac. Typically this could be done by providing private rainwater tanks on each urban property to collect roofwater. The water from the rainwater tanks could be plumbed to make the water available for a range of uses, including toilet flushing, washing clothes and garden watering.

Studies have shown that harvesting stormwater and reusing it in the local catchment can have a number of benefits, including:

- Reducing the adverse impact on waterways of urbanisation by removing some of the increase in flows caused by the increase in impervious areas. Harvesting of the increased flows caused by urbanisation is permitted and it has been found to be very unlikely that stormwater harvesting can reduce flows enough to make them less than the rural flows that occurred before development
- Removing some of the pollutants from water being discharged to receiving waterways

- Reducing the demand for potable water
- Greening of open spaces in the urban environment.

8.6 Recommended Works

8.6.1 Waterways

The proposed modified / constructed waterways through the development areas are shown on the plans in **Appendix H**. The waterway corridors will allow for the construction of modified / constructed waterways. The proposed waterways are proposed in the Deans Creek catchment and Barongarook Creek catchment, with plans provided in **Appendix H** for each of these catchments.

From initial site inspections, aerial images and discussions with Council and CCMA no known significant constraints would prevent the proposed modifications. The existing waterways through the development areas appear to be man-made channels constructed for rural drainage purposes. Our expectation is that there may not be any / many significant flora / fauna or heritage constraints to modifying existing local waterways through the development areas. Further study of flora and fauna and heritage issues is likely to be required before the proposed constructed waterways can be adopted as part of the development strategy some of which is understood to be undertaken as part of the development of the Colac 2050.

The waterway corridors have been designed with the following considerations:

- Modified / constructed waterways are proposed along all existing open watercourses. Where the existing open drain does not follow the lowest valley through the catchment it is proposed that the modified / constructed waterway be located to follow the lowest valley through the catchment. This particularly applies for Deans Creek between Irrewillipe Road / Harris Road and Aireys Street. The proposed waterway corridor location is along the valley, but does not follow the existing waterway. It is expected that further significant work will need to be done in relation to consultation with landowners, environmental assessments of the existing Deans Creek and consideration of options prior to adoption of the final waterway and development layout in this area
- Proposed constructed waterways were given total corridor widths based on Melbourne Water's constructed waterway guideline using the calculated hydraulic widths (including freeboard). For the proposed constructed waterways the corridor widths have been based on waterway corridors with "active edges" as described in Melbourne Water's Waterway Corridors guide. This means that waterway corridors are typically provided with roadways along the edges to provide maintenance access, public access and passive surveillance as well as maximising developable area

- The proposed waterways are designed to be excavated to cater for the 100 year ARI peak flow, with freeboard to surrounding land, enabling development and drainage of land
- The waterways will provide environmental values, habitat, riparian zones, open space corridors and visual and public amenity
- Culvert crossings at each location where the constructed waterways cross roads will be required with a 100 year ARI capacity.

8.6.2 Wetlands / Sediment Basins

The proposed wetlands (and sediment ponds) through the development areas are shown on the plans in **Appendix H**. The wetlands and sediment ponds will allow for stormwater treatment from proposed development to be treated to meet the requirements of Clause 56.07 of the planning scheme, in a cost effective manner and without the need for every individual property to set aside potentially inefficient areas for stormwater treatment and on-site detention.

The wetlands have been designed with the following considerations:

- Total wetland areas have been set between 4 and 4.5 % of the catchment area to be serviced by each treatment asset. This is similar to the area required in numerous Structure Plans in southern Victoria and to the areas from modelling for Melbourne Water Development Services Schemes west of Melbourne.
- Wetland areas allow for:
  - Sediment ponds at the inlet area. Sediment pond areas have been set at 5 % of the total wetland land take, with a minimum sediment pond area of 420 m^2 to meet design geometry requirements
  - Sediment drying areas, sized in accordance with Melbourne Water procedures
  - Batter slopes from existing ground level at the perimeter of the site down to Normal Water Level (NWL) of the wetland with allowance for access tracks
  - Wetland areas at Normal Water Level. Normal Water Level of the wetlands has been estimated to be 1.2 metres below natural surface to allow for pipes to drain into the wetlands with suitable cover over the pipes
  - The usual maximum Extended Detention Depth (EDD) of the wetlands for stormwater treatment is expected to be 350 mm
  - Allowing for 300 mm of freeboard from the 100 year ARI Top Water Level (TWL) in the wetland up to the surrounding ground level the typical wetland will have approximately 550 mm depth available for flood retarding (1200 mm total depth, less 350 mm ADD and 300 mm freeboard). This typically allows sufficient flood storage to retard local peak urban flows such that the overall peak flows in the waterways through the development area should not be increased by the development.

- Where the topography doesn't allow for a stormwater treatment wetland sediment basins are proposed to be constructed to protect the local constructed waterway from sediment loads and degradation. It is expected that overall the treatment will need to meet Best Practice targets (to satisfy Clause 56.07) prior to discharge to Deans or Barongarook Creek

- Cost estimates have been prepared for the proposed wetlands / sediment basins using Melbourne Water's DSS cost estimating spreadsheet using rates applicable in the Shire of Melton and City of Wyndham (municipalities considered comparable to Colac).

8.7 Preliminary Costing

The cost of the mitigation works have been estimated using Melbourne Water's standard rates for Developer Services Schemes (drainage schemes). It should be noted that land acquisition costs have not been included in this report.

Table 8.1 and 8.3 summarises the waterway corridor width and estimated construction cost of each reach of proposed constructed / modified waterway.

Tables 8.2 and 8.4 summarise the cross sectional areas and estimated costs of each road culvert along the proposed constructed / modified waterway. Where there is already a substantial width / bridge structure and the waterway is not proposed to be deepened then no additional structure is proposed. The culverts along the waterways have been designed to convey the 100 year ARI flow under the road with a velocity less than or equal to 2 m/s to provide manageable head losses and to minimise the risk of scour of the waterway.

All cost estimates presented in this section of the Strategy allow 40 % on top of the capital costs to account for the following:

- Survey

- Design

- Contingencies.

Table 8.1 Waterways works – Deans Creek catchment

Waterway Reach	Road Description	Waterway corridor width (m)	Estimated Cost (including allowance for survey, design and contingencies)
DCrk1 to DCrk2	Irrewillipe Road - Lawes Street	45	$1,025,000
DCrk2 to DCrk3	Lawes Street - No road	45	$532,000
DCrk3 to DCrk4	No road - Aireys Street	45	$459,000
DCrk4 to DCrk5	Aireys Street - Pound Road	45	$858,000
DCrk5 to DCrk6	Pound Road - No road	45	$1,519,000
DCrk6 to DCrk7	No Road - Railway	45	$833,000
DCrk8 to DCrk9	Harris Road - No road	40	$377,000
DCrk9 to Dcrk10	No road - Irrewillipe Road	40	$265,000
DCrk10 to DCrk11	Irrewillipe Road - Aireys Street	40	$204,000
DCrk11 to DCrk12	Aireys Street - Pound Road	40	$453,000
DCrk12 to DCrk13	Pound Road - Hearn Street	45	$409,000
DCrk13 to DCrk14	Hearn Street - Sinclair Street	45	$217,000
DCrk14 to DCrk15	Sinclair Street - Cants Road	45	$232,000
DCrk15 to DCrk6	Cants Road - No road	45	$670,000
		TOTAL	**$8,053,000**

Table 8.2 Waterway culverts – Deans Creek catchment

Culvert Location	Road Description	Culvert cross section area (m^2)	Estimated Cost (including allowance for survey, design and contingencies)
DCrk1	Irrewillipe Road	Existing structure	zero
DCrk2	Lawes Street	20	$1,089,000
DCrk3	No road	Not required	zero
DCrk4	Aireys Street	20	$1,089,000
DCrk5	Pound Road	20	$1,089,000
DCrk6	No road	Not required	zero
DCrk7	Railway	Existing structure	zero
DCrk8	Harris Road	2.5	$157,000
DCrk9	No road	Not required	zero
DCrk10	Irrewillipe Road	3.5	$185,000
DCrk11	Aireys Street	5	$253,000
DCrk12	Pound Road	5	$253,000
DCrk13	Hearn Street	6.5	$466,000
DCrk14	Sinclair Street	7	$466,000
DCrk15	Cants Road	7	$466,000
		TOTAL	**$5,513,000**

Table 8.3 Waterways works – Barongarook Creek catchment

Waterway Reach	Roads	Waterway corridor width (m)	Estimated Cost (including allowance for survey, design and contingencies)
BCrk1 to BCrk2	No road to Queen Street	45	$735,000
BCrk2 to BCrk3	Queen Street to Aireys Street	45	$532,000
BCrk3 to BCrk4	Aireys Street to Pound Road	45	$863,000
BCrk4 to BCrk5	Pound Road to Hearn Street	45	$722,000
BCrk5 to BCrk6	Hearn Street to No road	45	$238,000
BCrk7 to DCrk8	No road to Pound Road	40	$444,000
BCrk8 to BCrk9	Pound Road to J Barrys Road	45	$485,000
BCrk9 to Bcrk10	J Barrys Road to Barongarook Creek	45	$462,000
		TOTAL	**$4,481,000**

Table 8.4 Waterway culverts – Barongarook Creek catchment

Culvert Location	Road	Culvert cross section area (m^2)	Estimated Cost (including allowance for survey, design and contingencies)
Downstream of BCrk1	No road	Not required	zero
Upstream of BCrk2	No road	Not required	zero
BCrk3	Aireys Street	15	$786,000
BCrk4	Pound Road	15	$786,000
BCrk5	Hearn Street	16	$1,017,000
BCrk7	No road	Not required	zero
BCrk9	J Barrys Road	6	$466,000
		TOTAL	**$3,055,000**

Table 8.5 below summarises the total land area and estimated construction costs for the wetlands proposed in the Deans Creek catchment.

Table 8.5 Proposed wetlands Deans Creek catchment

Wetland number	Wetland site area (ha)	Estimated Cost (including allowance for survey, design and contingencies)
WL1	2.9	$3,110,000
WL2	1.3	$1,227,000
WL5	2.4	$2,515,000
WL6	1.7	$1,766,000
WL7	1.7	$1,679,000
WL8	1.8	$1,862,000
WL19	0.8	$743,000
WL20	1.4	$1,353,000
WL21	2.3	$2,396,000
WL22	1.6	$1,572,000
WL23	0.9	$869,000
WL24	1.8	$1,894,000
WL25	1.8	$1,868,000
WL26	1.6	$1,618,000
WL27	1.3	$1,334,000
WL28	2.1	$2,199,000
WL29	1.4	$1,353,000
	TOTAL	**$29,358,000**

There are a couple of sub-catchments in the Barongarook catchment where due to small catchment size and steep terrain it is not feasible to provide a stormwater treatment wetland. For these sub-catchments a sediment basin is proposed to protect the local receiving waterway from sediment loads. It is expected that the overall combination of sediment basins and wetlands in the Barongarook Creek catchment will be able to

achieve Best Practice treatment targets prior to discharge to Barongarook Creek and Lake Colac.

Table 8.6 below summarises the total land area and estimated construction costs for the wetlands and sediment ponds proposed in the Barongarook Creek catchment.

Table 8.6 Proposed wetlands / sediment basins Barongarook Creek catchment

Wetland number	Wetland/ Sediment Basin site area (ha)	Estimated Cost (including allowance for survey, design and contingencies)
WL3	1.8	$1,865,000
WL4	2.1	$2,135,000
WL9	2.3	$2,435,000
WL10	2.4	$2,548,000
WL11	2.0	$2,067,000
WL12	1.1	$1,110,000
WL13	1.4	$1,417,000
SB14	0.4	$499,000
WL15	1.8	$1,842,000
WL16	0.5	$399,000
WL17	0.8	$752,000
WL18	0.9	$832,000
SB30	0.4	$548,000
	TOTAL	**$18,449,000**

To put the waterway and wetland costs into context the following has been considered:

- The total area of development that will be serviced by the waterways and wetlands
- The cost per hectare to the development of the proposed waterways and wetlands
- How the costs for Colac compare with the costs per hectare for Melbourne Water Development Services Schemes.

The total proposed urban areas of development that will be serviced by the waterways and wetlands are:

- Deans Creek catchment **625.3 ha**
- Barongarook catchment **414.0 ha**
- **TOTAL** **1039.3 ha**

In considering these numbers presented above it is important to note the following numbers to put them into context:

- Total land within future development areas: approximately 1234.6 hectares
- Total land within future development areas covered by an existing flood overlay: approximately 392 hectares (297 hectares of this amount, or 76 %, will become developable as a result of the proposed works)
- Proposed wetlands and waterways contribute to the following land take:
  - Wetlands 80.3 hectares
  - Waterway corridors 45.1 hectares
  - **TOTAL** 125.4 hectares (of which 60 % is located within existing flood prone areas designated by existing flood overlays).
- The amount of land currently covered by an existing LSIO or FO that will remain unchanged: approximately 59.7 hectares. It is not possible to contain all flooding in the development regions within constructed waterways and wetlands. As discussed with Council officers there are some low lying areas along Deans Creek that are currently flood prone that cannot be made flood free in a 100 year ARI event due to topographical and other physical constraints, such as the location of the railway line and highway, downstream flood levels and the expected need to retain existing environmental values in this location.

The total cost of proposed waterways, culverts and wetlands (including sediment basins and retarding effects of wetlands) are:

- Deans Creek catchment **$ 42.9 million**
- Barongarook catchment **$ 26.0 million**.

Therefore the cost in $ / ha for waterways, culverts and wetlands (including sediment basins and retarding effects of wetlands) are:

- Deans Creek catchment **$ 68,600 / ha**
- Barongarook catchment **$ 62,800 / ha**.

To put these costs into context comparisons have been made with:

- Melbourne Water Development Services Scheme (DSS) costs / contributions
- Armstrong Creek East Development Contribution Plan (DCP) costs / contributions
- Ballarat West DCP costs / contributions.

Typical Melbourne Water Development Services Schemes (DSS) in western Melbourne have contribution rates of $85,000 to $150,000 per hectare (the sample selected for comparison had an average rate of **$115,000** per hectare for normal density residential development). Melbourne Water applies factors to various zonings to adjust the contribution rate depending on impervious area. Low density residential areas pay a lower rate per hectare and industrial areas pay a higher rate. Melbourne Water DSS provide for the construction of waterways, wetlands (including retarding) and sediment basins. Melbourne Water DSS also allow for outfall pipes from each property within the DSS and land acquisition for the wetlands, which haven't been included in the above costing for Colac.

The Armstrong Creek East development area is located in the City of Greater Geelong (CoGG). The CoGG has adopted a DCP for the Armstrong Creek East development area that has been approved by the Minister and raises funds for various infrastructure needs to service the development. One of the categories of infrastructure funded by the Armstrong Creek East DCP is for drainage. The current contribution rate for drainage for the Armstrong Creek East DCP is **$70,139.28** per hectare (source http://planning-schemes.delwp.vic.gov.au/schemes/greatergeelong/ordinance/45_06s03_ggee.pdf).

The Ballarat West development area is located in the City of Ballarat. The City of Ballarat has adopted a DCP for the Ballarat West development area that has been approved by the Minister and raises funds for various infrastructure needs to service the development. One of the categories of infrastructure funded by the Ballarat West DCP is for drainage construction, including wetlands, retarding basins, constructed waterways and some drainage pipelines. The current contribution rate for drainage construction for the Ballarat West DCP is **$88,546.11** per hectare (source http://www.ballarat.vic.gov.au/pbs/city-strategy/ballarat-west/ballarat-west-development-contributions-plan.aspx).

The development investigations layout plan highlights that a range of residential zones are proposed for the growth areas of Colac. As a result a range of costs per lot are presented in Table 8.7 for varying development densities.

Table 8.7 Costs per lot for varying development densities

Catchment	5 lots / hectare	10 lots / hectare	15 lots / hectare
Deans Creek	$13,720 / lot	$6,860 / lot	$4,570 / lot
Barongarook Creek	$12,560 / lot	$6,280 / lot	$4,190 / lot

It should be noted that the final costs per lot would be lower than those presented in Table 8.7 where the development density is less than 15 lots/hectare. This would be due to the lower density of development resulting in a reduced impervious area, lower runoff and therefore a lower cost of works. For example Melbourne Water schemes are based on a standard residential rate, with adjustment factors used to calculate contribution rates for other types of development. For example in a Melbourne Water scheme a low density residential area (2,000 to 4,000 m^2 lots) would be charged 0.7 times the residential rate per hectare, whereas an industrial area would be charged 1.3 times the residential rate.

The following factors should be considered by Council with respect to the proposed scheme of waterways, culverts and wetlands:

- the amount of developable area made available by the proposed waterways and wetlands
- that the proposed waterways provide 100 year ARI flood protection to areas of proposed development
- that the stormwater treatment will meet the planning scheme requirements to treat runoff to meet Best Practice targets for pollutant removal
- the cost of the proposed works (as compared to similar schemes in Melton, Wyndham, Ballarat and Armstrong Creek (south of Geelong)
- the synergies between the proposed scheme of drainage, wetlands and waterways and the Colac 2050 plan.

8.7.1 Staging of Works

To provide infrastructure to service urban development requires the funding and timing of works to be co-ordinated with the timing of the development. This co-ordination is "business as usual" when works are funded by a Melbourne Water DSS or a Council run DCP.

In each of these types of schemes the scheme includes a map, listing and estimated costs for the infrastructure that is to be funded by the scheme. When landowners wish to develop then the infrastructure necessary to service the development is identified, including the works that are part of the approved scheme. The contribution due to be paid by the development is also determined. There is then the need to decide on how to best arrange for the design, construction and payment for the works. Often the works would be arranged by the developer and an agreement would be made between Council and the developer in relation to:

- Contribution towards the scheme to be paid by the developer to Council
- The amount that the scheme will reimburse the developer for the works that they have designed and built.

There is an aspect of offsetting contributions against the value of the works with either a net contribution or net reimbursement being paid for each stage of development. Where the works to service a development are wholly contained within the development site then the developer is usually best placed to undertake the works. Where the drainage of the site also requires works outside of the development site then the design and construction of the works should be discussed with Council to facilitate the construction of works.

Details about how this system of implementation and staging operates are provided in the Ballarat West DCP. See Sections 4 and 5 of the Ballarat West Development Contribution Plan, Version 4.2, July 2014 for more details. The Ballarat West document is incorporated into the planning scheme (from amendment C167).

8.7.2 Further Work / Input

To be able to implement the proposed development we expect that it will be necessary for:

- Council to consider the potential development and layout for waterways, wetlands and drainage for the proposed development areas
- Consultation to take place with all affected landowners
- Environmental studies be undertaken to inform the proposed waterway, wetlands and drainage layout
- Adjustments be made to the scheme as informed by the consultation and environmental studies
- Council to consider the method for funding / constructing the infrastructure required
- Council to consider the mechanism for ensuring that the land required for waterways and wetlands is provided
- Council to prepare the required Planning Scheme amendments for the rezoning and the provision of infrastructure.

This process has been followed by other Councils in Victoria to facilitate planned development to address flooding, drainage and water quality requirements.

8.8 Flood Modelling of Proposed Flood Conveyance Assets

Flood modelling of the proposed flood conveyance works (without allowance for wetlands / retarding basins) has been assessed in the hydraulic model. This was undertaken to assess the effectiveness of the proposed waterway corridors. Flood inundation maps generate from the results of this assessment are presented in **Appendix I.** The results highlight that the works are able to meet their objectives in providing sufficient flood conveyance and reducing the extent of overland flooding for the peak 100 year ARI event.

It is important to note the modelling undertaken to assess the effectiveness of the waterway corridors did not allow for any topographical changes external to the waterway corridors. No allowance was also made for the upgrade of existing drainage assets external to the waterway corridors. It is likely that future development of areas adjacent to the proposed waterway corridors will include some degree of earthworks to suit the development needs. As such it is believed that the residual ponding of flows in low lying areas represented on the maps contained in **Appendix I** will be improved as part of future development sites, via earthworks and internal drainage works. Therefore it is expected that the flooding represented on the maps will be improved upon. As development is proposed in the study area it is possible to test any proposed works within the hydraulic model to assess their impact.

9. FUNDING OPTIONS AND REVENUE SOURCES

There are various funding options and sources for projects related to stormwater drainage, flooding and stormwater quality. These options include:

- Special Charge Schemes under the Local Government Act 1989, implemented by Council. Special Charge Schemes raise funds from benefitting landowners

- Development Contributions Plans (DCPs) can be used by Councils to levy a charge on development to be used to provide infrastructure to service the development. DCPs can be implemented in accordance with provisions in the Planning and Environment Act. DCPs require a detailed scheme and cost apportionment and approval by the Planning Minister. DCPs are typically used where new development creates the need for infrastructure, rather than infrastructure being needed to service an existing developed area. Therefore DCPs are less used than Special Charge Schemes as a means to raise funds from benefitting landowners for drainage upgrades in existing urban areas, but are well suited for providing infrastructure in substantial development areas, as shown by their use in areas such as Armstrong Creek and Ballarat West

- Council can use General Revenue to fund capital works through Council's Capital Works Program. This method of funding is typically used by Councils for projects that have wide benefits across significant areas of the municipality such as libraries or civic centres. Funding of local road and drainage construction works is not usually funded from General Revenue for equity and "user pays" reasons

- Funding via Regional Development Victoria (RDV). RDV aims to assist the growth of rural Victoria by providing grants for infrastructure projects that have the potential to stimulate economic activity in rural towns and their surrounding areas. There is potential for some works identified in this strategy to be funded by RDV. Council would need to prepare an application for funding to RDV to obtain any funds

- The Victorian Government can provide grants to local Government for flooding related works where the works contribute to meeting the objectives of the Government's Floodplain Management Strategy. Where areas in Victoria are subject to flooding the State Government would typically contribute up to 50 % of the capital cost of flood mitigation initiatives, including studies and capital works. The Victorian Government, through the Department of Environment, Land, Water and Planning (DELWP) has produced a Floodplain Management Strategy in 2016. The strategy includes examples where flood mitigation works in towns have been funded 50 % by the Victorian Government and 50 % by the Commonwealth Government (NDRGS funding, see below), with the local Council agreeing to take over maintenance responsibility for the work. Further details of the Floodplain Management Strategy can be found online at: https://www.water.vic.gov.au/__data/assets/pdf_file/0017/53711/Victorian-Floodplain-Management-Strategy-Introduction-Section-1.pdf

- The Commonwealth Government provides grants for projects that respond to flooding risks. The funding is provided through the Natural Disaster Resilience Grants Scheme

(NDRGS). Funding can be sought by applying to the Commonwealth Government. Funding is provided for projects that study flooding (including flood mapping), improve community flood resilience or provide capital works for flood mitigation. Funding is typically provide for amounts in the range of $10,000 to $250,000 and requires matching local funding. Further information is provided online at: http://www.emv.vic.gov.au/our-work/current-projects/natural-disaster-resiliencegrants-scheme.

Engeny recommends that Council consider the possible funding arrangements listed above for the drainage works proposed in Colac.

10. ACTION PLAN

The tasks completed as part of the development of the CSDS have identified a number of short terms actions that are recommended for further consideration by Council. These actions once considered further are expected to lead to longer term actions which would involve the implementation of those actions.

10.1 Short Term Actions

A number of actions have been identified that could be implemented in the short term, within say a 5 year timeframe. Some of these action items have little associated cost and could begin immediately. These works have been prioritised and are outlined in Table 10.1 below. The benefit and cost rating system used to determine the priority of actions is summarised as follows and has been used subjectively to compare the inherent benefits and costs of all actions identified:

- Benefits
  - Low (L) – Unlikely to result in immediate noticeable benefits, may lead to longer term benefits
  - Medium (M) – May lead to small immediate benefits with greater influence likely in longer term
  - High (H) – Ability to result in immediate, noticeable, benefits that continue to be noted over the longer term.
- Costs
  - Low (L) – Low cost to responsible stakeholder / authority
  - Medium (M) – Medium cost to responsible stakeholder / authority
  - High (H) – Higher Little cost to responsible stakeholder / authority.

Final prioritisation and adoption of any of these actions would be subject to consideration by Council and other stakeholders / authorities in consultation with the community.

Table 10.1 Summary of short term actions in priority order

Priority	Action	Comments	Benefit	Cost	Responsibility
1	Consider implementing flooding overlays in existing development areas	Council to consider a planning scheme amendment to include a Special Building Overlay (SBO) to control development in existing flood prone development areas.	H	L	Council
2	Consider implications of climate change assessment	Results of climate change assessment to be assessed and considered as part of Council's climate change adaptation planning.	H	L	Council
3	Consider Development Plan for waterways, drainage and stormwater treatment in proposed development areas	Undertake necessary work / consultation to confirm if the drainage works presented in this Strategy are viable for Colac. Council to consider adoption of a DCP for future development areas.	H	M	Council
4	Consider implementation of flood warning system	Flood warning system has the ability to assist the community in planning for and responding to predicted storm events that could result in flooding across Colac and surrounds	H	M	CCMA / DELWP
5	Consider flood mitigation options	Consider the concept level flood mitigation options presented in this Strategy to address flooding 'hot spots' in existing urban areas. Further work to progress the design would include but not limed to survey and underground asset proving. Targeted floor level survey could also be undertaken (See Action 5) to inform an AAD assessment.	H	M	Council
6	Use flood modelling results to assist programming of maintenance activities	All drainage asset owners within study area to assess the flood modelling results presented in this Strategy to help create proactive maintenance regimes.	M	L	All drainage asset owners (Council, VicRoads, VicTrack)

Priority	Action	Comments	Benefit	Cost	Responsibility
7	Survey / condition audit of existing drainage assets	Survey / condition audit of existing assets will assist in asset renewal planning. This data can also be used to update the hydraulic model in the future. The flood modelling results also have the ability to assist in managing drainage assets. An understanding of drainage capacity can assist asset renewal planning and for incorporation into forward estimates.	H	H	Council
8	Floor level survey	Undertake floor level survey of properties shown to impacted by the 100 year ARI event by the flood modelling	M	H	Council

10.2 Long Term Actions

A number of those actions presented in Table 10.1 are expected to result in agreement upon longer term actions between stakeholders. For instance Actions 1-5 in Table 10.1 are short term actions for Council and other stakeholders to firstly consider the merits of progressing those actions further. The implementation of those actions is expected to occur over a longer period of time, especially the implementation of any flood mitigation works given their respective costs and the work required to arrive at designs ready for construction.

As such the longer term actions are expected to be defined upon further consideration of the short term actions.

11. CONCLUSIONS AND RECOMMENDATIONS

The Colac Stormwater Development Strategy (CSDS) is a vital input to Colac 2050, a long range planning project that will cater for growth in Colac's population over the next 33 years. Colac 2050 will establish a plan for the expansion of Colac's residential housing footprint, business and industry sectors.

This strategy, through detailed hydraulic modelling of Council's drainage network has identified opportunities to address areas of poor drainage performance within Colac and its surrounds and to identify the surface water requirements to enable future urban growth. Climate change considerations have also been assessed, the findings of which will assist Council as part of their climate change adaptation planning.

A key input to the development of the Strategy has been the engagement of the local Colac community. The purpose of this engagement has been to gather local knowledge to influence and ensure the flood modelling is representative of what happens during flood events and to gain community support for the Strategy itself.

The flood modelling results highlight that a significant number of existing properties across Colac and surrounds are at risk of overland flooding as a result of a lack of capacity in the underground drainage network for the major (100 year ARI) storm event. It is important to note that over time there have been a number of changes to drainage design standards, the most significant being the adoption of the "major / minor" drainage system. The "major / minor" drainage system concept was first specified in Australian Rainfall and Runoff in 1987. A large portion of Council's drainage system in Colac and surrounds was designed and constructed prior to 1987 and therefore does not meet current drainage standards which is common for Councils across Victoria. There is no obligation on Council to upgrade existing infrastructure when standards alter over time. This view was confirmed by the Victorian Auditor General in the VAGO 2005 report into managing urban flood risks within Melbourne.

Section 7 of this report summarises an assessment of structural mitigation options to potentially address flooding at five of the most significant flooding 'hot spots' across Colac and surrounds. The capital costs and benefits of those works have been calculated and prioritised, the benefits determined by calculating the number of properties likely to benefit from the proposed works. The structural mitigation assessment also included an assessment of the works required to address the impacts of climate change predictions. Key findings from this assessment which will help inform Council's climate change adaptation planning include:

- The prioritisation of mitigation works across various locations is different when compared to the prioritisation of mitigation works for existing conditions
- The incremental increase in infrastructure sizing that is needed to address the impact of climate change across the five locations investigated as part this assessment equates to on average a 5.62 % increase in capital cost. The increase in cost varied between 0.5 and 8.9 % across the five locations.

Section 9 details the recommended stormwater drainage and treatment works to enable the appropriate development of the future development areas. These works have been costed and compared to a number of similar DCPs. The objectives of the works recommended in the future development areas include:

- Flood reduction and waterway corridor objectives to maximise development potential
- Stormwater treatment objectives to treat runoff from new development areas
- Peak flow control objectives to ensure new development areas do not increase downstream flooding.

Flood modelling of the proposed flood conveyance works (without allowance for wetlands / retarding basins) was assessed in the hydraulic model. The results highlight that the works are able to meet their objectives in providing sufficient flood conveyance and reducing the extent of overland flooding for the peak 100 year ARI event.

Section 10 outlines a prioritised action plan for consideration and implementation of various actions to improve flood management across existing and future development areas. The highest priority of this Strategy is for Council to consider implementing flooding overlays within existing development areas across Colac and surrounds. Special Building Overlays (SBOs) are appropriate for identifying overland flow paths for 100 year ARI storms. Use of SBOs is recommended to manage future development and to reduce the flood risk for new buildings. The use of SBOs do not have any capital cost and will result in an effective measure across the catchment given it could take many decades to construct structural works to address flooding across the study area. For many areas across Colac and surrounds it is also not possible to construct mitigation works to address flooding for the major (100 year ARI) storm event highlighting the need for an alternative measure, such as an overlay, to control future development in those areas.

It is recommended that Council consider the findings of the Strategy and determine if the action plan is appropriate and realistic.

12. REFERENCES

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13. QUALIFICATIONS

a. In preparing this document, including all relevant calculation and modelling, Engeny Management Pty Ltd (Engeny) has exercised the degree of skill, care and diligence normally exercised by members of the engineering profession and has acted in accordance with accepted practices of engineering principles.

b. Engeny has used reasonable endeavours to inform itself of the parameters and requirements of the project and has taken reasonable steps to ensure that the works and document is as accurate and comprehensive as possible given the information upon which it has been based including information that may have been provided or obtained by any third party or external sources which has not been independently verified.

c. Engeny reserves the right to review and amend any aspect of the works performed including any opinions and recommendations from the works included or referred to in the works if:

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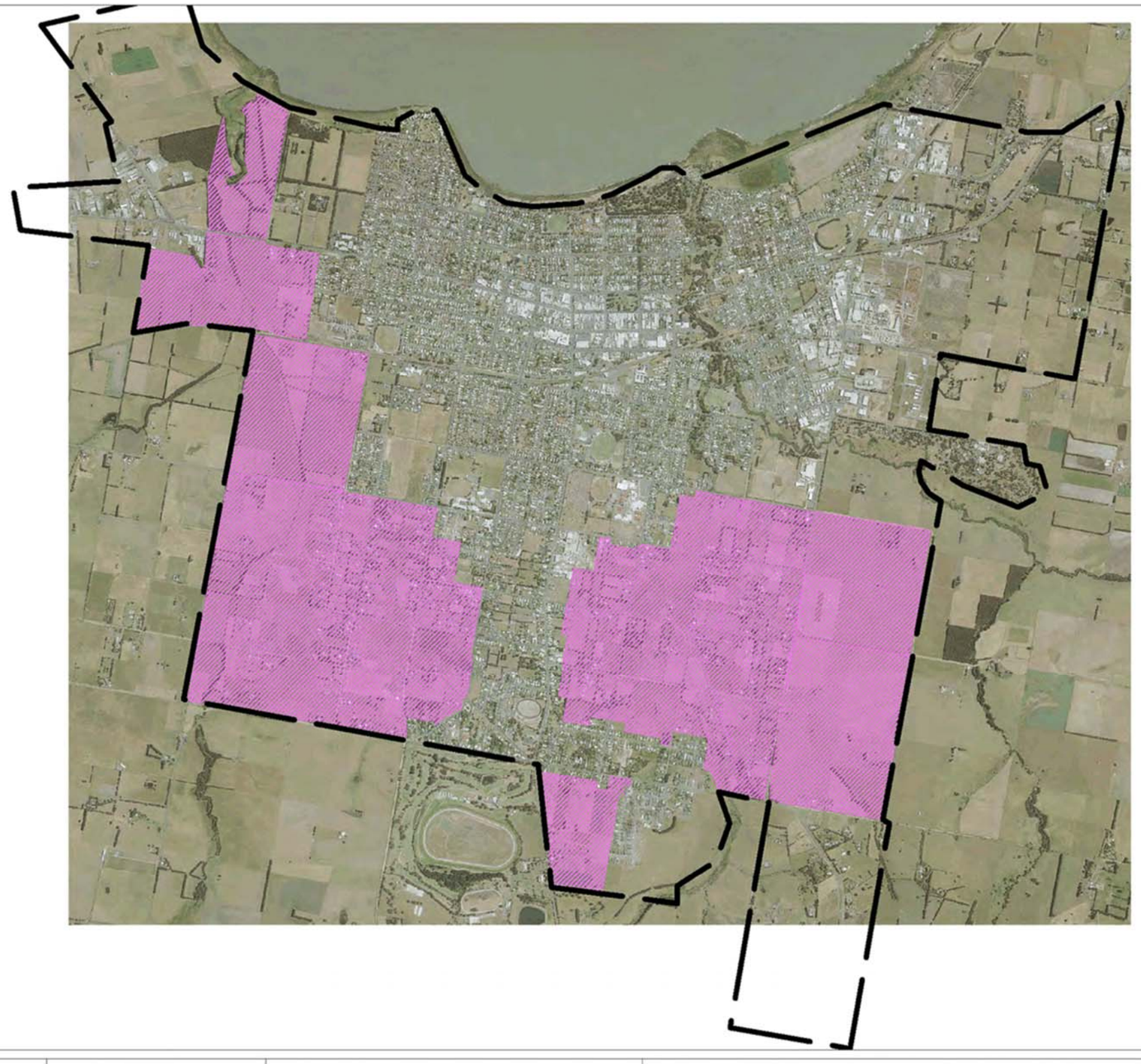
APPENDIX A

Development Investigation Areas Layout Plan



N
W E
S

LEGEND

Stormwater Investigation Areas

Colac 2050 Urban Boundary

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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

0 600 1200

Scale in metres (1:30,000 @ A3)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994. (GDA94)
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 55

Colac Stormwater Development Strategy

Extent of Investigation Areas

Job Number: V2013_001
Revision: 0
Drawn: SD
Checked: AP
Date: 22 April 2018

APPENDIX B

Site Visit Photos

Photo 1 – Stormwater outlet to Lake Colac (near intersection of Queens Ave and Armstrong Street)

Photo 2 – Drainage outlet structure (near intersection of Queens Ave and Armstrong Street)

Photo 3 – Low flow diversion to GPT within drainage outlet structure (near intersection of Queens Ave and Armstrong Street)

Photo 4 – Educational signage within Barongarook Creek Reserve

Photo 5 – Barongarook Creek Reserve

Photo 6 – Barongarook Creek post September 2016 flood event

Photo 7 – Stormwater pit lid indicating Lake Colac as outlet to drainage network

Photo 8 – Drainage inlet structure near intersection of Harris Rd and Scanlan Drive

Photo 9 – Drainage swale alongside Ballagh Street

Photo 10- Flow path from Ballagh Street through to Irrewillipe Road retarding basin

Photo 11 – Outlet from Irrewillipe Road retarding basin

Photo 12 – Outlet structure within Irrewillipe Road retarding basin

Photo 13 – Drainage outlet from Irrewillipe Road retarding basin

Photo 14 – Drainage culvert at intersection of Irrewillipe Road and Armstrong Street

Photo 15 – Lake near intersection of Main Street and Tulloh Street

Photo 16 – Drainage inlet to lake near intersection of Main Street and Tulloh Street

Photo 17 – Overflow path from lake near intersection of Main Street and Tulloh Street

Photo 18 – Drainage outlet at the northern end of Dowling Street

Photo 19 – Drainage along western side of Dowling Street

Photo 20 –Basin near intersection of Tulloh Street and Dowling Street

Photo 21 – Drainage outlet from lake near intersection of Tulloh Street and Dowling Street

Photo 22 – Drainage outlet from Calco Timbers to Colac-Forrest Road

Photo 23 – Looking westwards along Colac-Forrest Road from Calco Timbers drainage outlet

Photo 24 – Deans Creek at Pound Road

Photo 25 – Deans Creek at Princes Highway

Photo 26 – Railway culvert located near Armstrong Street / Railway Street intersection

Photo 27 – Typical roadside channel in Sinclair Street South

APPENDIX C

Community Consultation Questionnaire and Maps

Colac Stormwater Development Strategy FAQs

Q: How were the maps developed?

A: The flood maps have been developed from flood modelling outputs. The flood model developed for the study area utilised previous flood models developed for DELWP as part of the Deans Creek and Barongarook Creek Regional Flood Mapping Project in 2016 which was delivered in partnership with the Corangamite Catchment Management Authority (CCMA). The existing DELWP 2016 flood models for the two major creeks were used as a starting point and the remaining areas of the study area were input to the model including the following:

- Aerial survey (LiDAR) data captured at the beginning of 2016 to define the topography
- Council drainage asset data (including pipe sizes), with confirmation of numerous assets undertaken via site visits during the project.
- Existing land use information confirmed during site visits and latest aerial photography

Q: What are you going to do with this data?

A: The data will be used to identify localised problem areas and therefore assist in identifying possible improvements to the drainage network

Q: Will this affect my land values?

A: There is no evidence to suggest land values would be impacted. Property values are determined by a multitude of factors and are subject to a wide variety of influences. These include:

- Economic considerations (i.e. interest rates, employment levels, income growth, finance availability, consumer confidence, supply and demand);
- Population and demographic trends;
- Suburb, location and street desirability; and
- Dwelling characteristics and features (lot size, style/age of property, internal space, renovation potential, quality of finishes.

In strong housing markets these factors are all considered to be stronger determinants of price than flood notification, which tends to be obscured against these considerations.

Q: Will this affect my insurance premiums?

A: The flood levy incorporated in insurance premiums is based on 'Land Subject to Inundation overlay'. Your premium will only be affected if there is a change to the existing overlay.

Q: Will this result in an overlay over my property?

A: A Land Subject to Inundation (LSIO) overlay already applies in flood prone areas of Colac and Elliminyt associated with flooding from Deans Creek and Barongarook Creek. Corangamite Catchment Management Authority (CCMA) is currently proposing changes to the LSIO in response to the findings of the 2016 Regional Flood Mapping project. Some properties may be removed and some may be added, this is to be finalised later in 2017. In the future it is possible that the flood modelling undertaken as part of the current study could be used to develop overlays for other areas across Colac, this is to be considered further upon completion of this study.

Q: Will this restrict what I can do with my property?

A: If an overlay is placed on your property in the future it may have an impact on what you can do on your property. Flooding behaviour (including depth) within you property as calculated by the modelling will govern the extent to which future development of your property can be undertaken.

Q: Does this mean Council is going to upgrade its drainage network? What happens if you don't?

A: Localised problem areas will be identified to assist in identifying possible improvement measures to the drainage network. Each measure will be assessed on its merits including the consideration of its costs and its relative benefits.

Q: How does climate change fit into this modelling?

A: Currently the modelling is based on existing rainfall data from the Bureau of Meteorology. Modelling of a climate change scenario is being considered currently by Council.

Q: I don't think those maps are right – how can I ensure they're changed?

A: Council will be pleased to hear potential changes. You can e-mail John Furleo from Council (john.furleo@colacotway.vic.gov.au) or Council's flood modelling consultant Scott Dunn (scott.dunn@engeny.com.au)


DEANS CREEK
BARONGAROOK CREEK


DEANS CREEK
BARONGAROOK CREEK

APPENDIX D

Flood Inundation Maps for Existing Conditions

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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

200 0 200 400 600 800 m

At A3 1:25,000

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 55

Colac Stormwater Development Strategy

5 Year ARI Flood Extent
Catchment Wide

Job Number: V2013_001
Revision: 0
Drawn: SD
Checked: AP
Date: 5/1/2017

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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

200 0 200 400 600 800 m

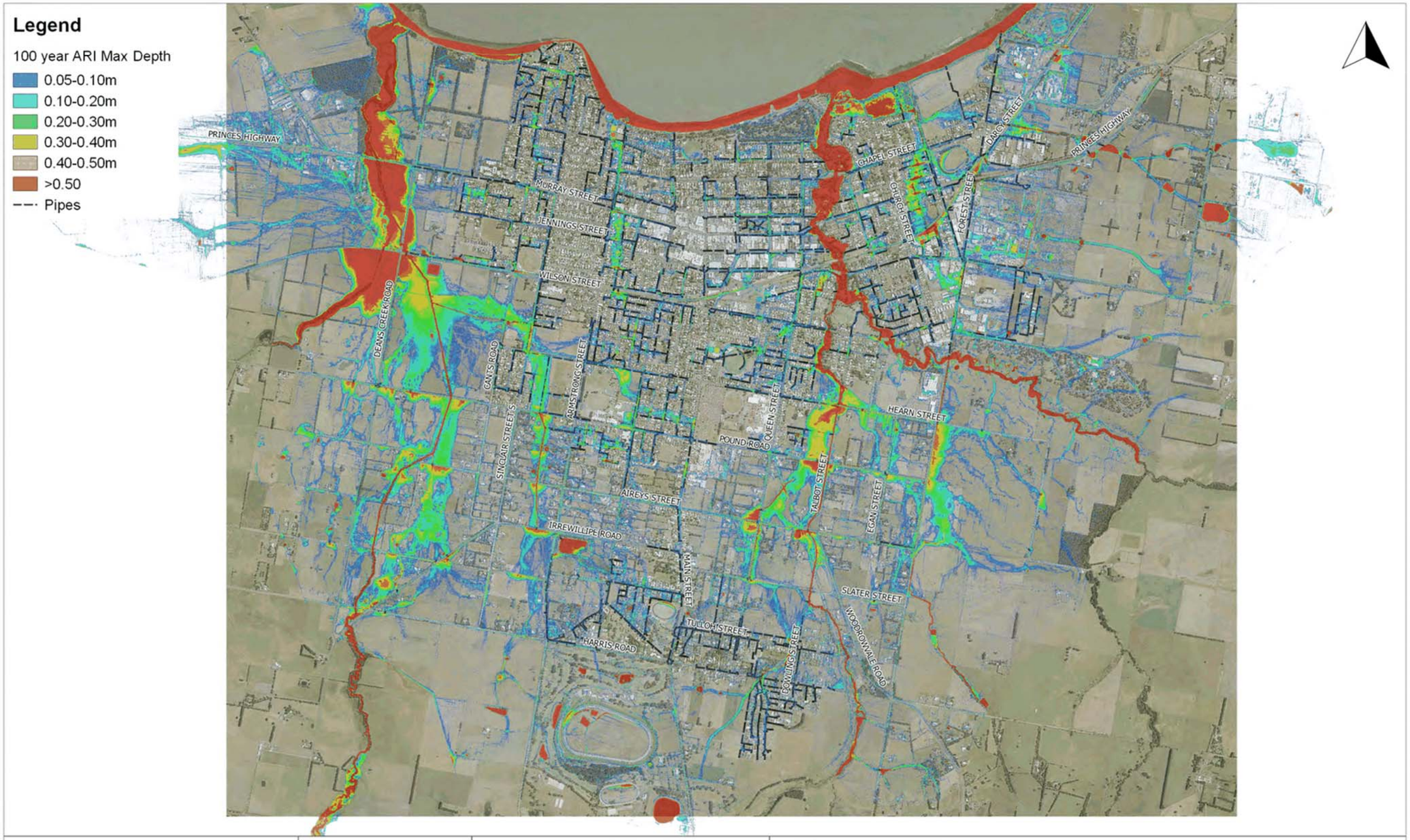
At A3 1:25,000

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 55

Colac Stormwater Development Strategy

10 Year ARI Flood Extent
Catchment Wide

Job Number: V2013_001
Revision: 0
Drawn: SD
Checked: AP
Date: 5/1/2017



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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

200 0 200 400 600 800 m

At A3 1:25,000

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 55

Colac Stormwater Development Strategy

100 Year ARI Flood Extent
Catchment Wide

Job Number: V2013_001
Revision: 0
Drawn: SD
Checked: AP
Date: 5/1/2017

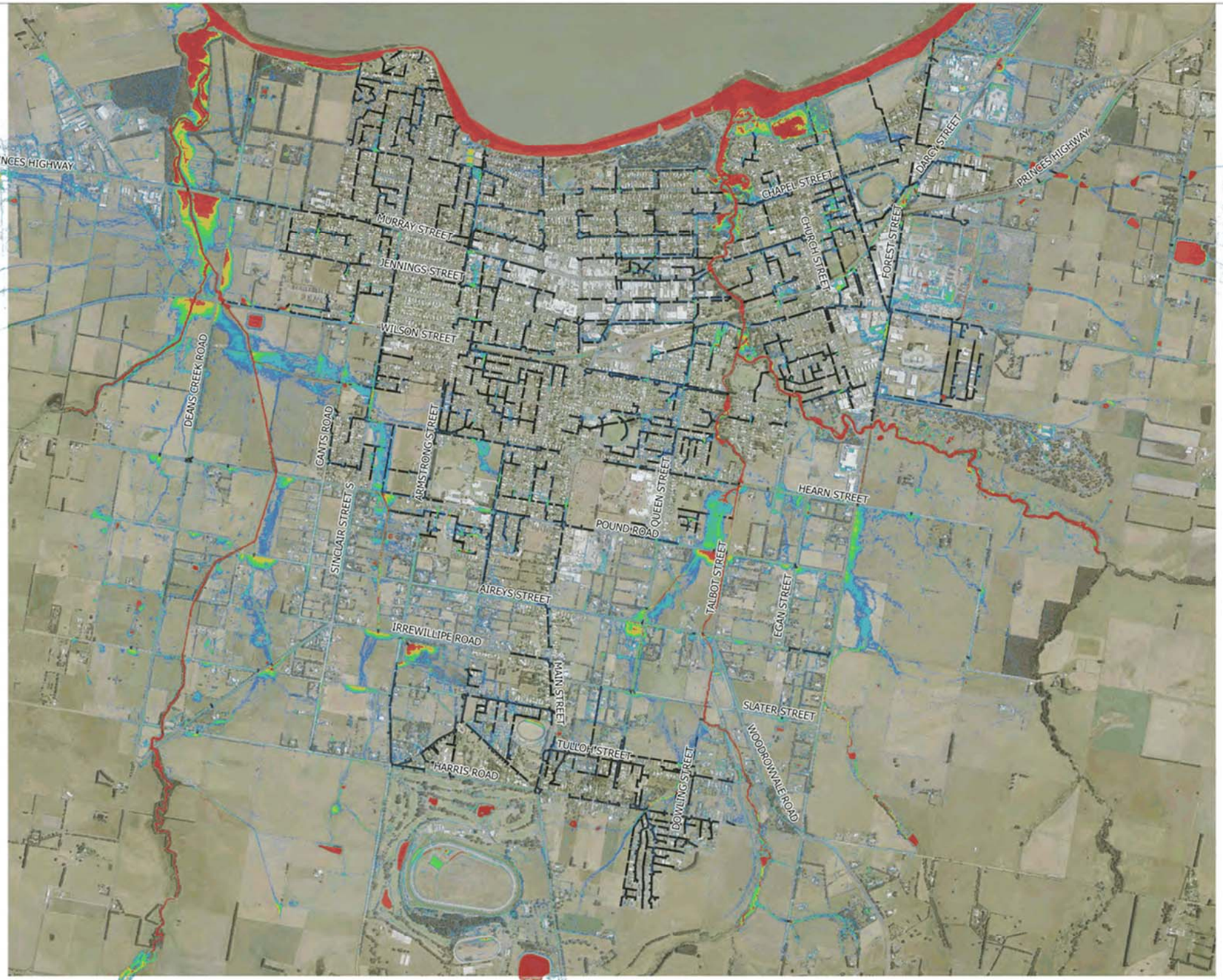
APPENDIX E

Flood Inundation Maps for Climate Change Conditions

Legend

5 year ARI Max Depth

- 0.05-0.10m
- 0.10-0.20m
- 0.20-0.30m
- 0.30-0.40m
- 0.40-0.50m
- >0.50m
- Pipes



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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

200 0 200 400 600 800 m

At A3 1:25,000

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

Colac Stormwater Development Strategy

5 Year ARI Flood Extent
Catchment Wide
Climate Change Scenario
with no development

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 11/4/2018

Legend

Difference (m)

- <-0.03
- -0.03 to -0.01
- 0.01 to 0.03
- 0.03 to 0.05
- >0.05

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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

200 0 200 400 600 800 m

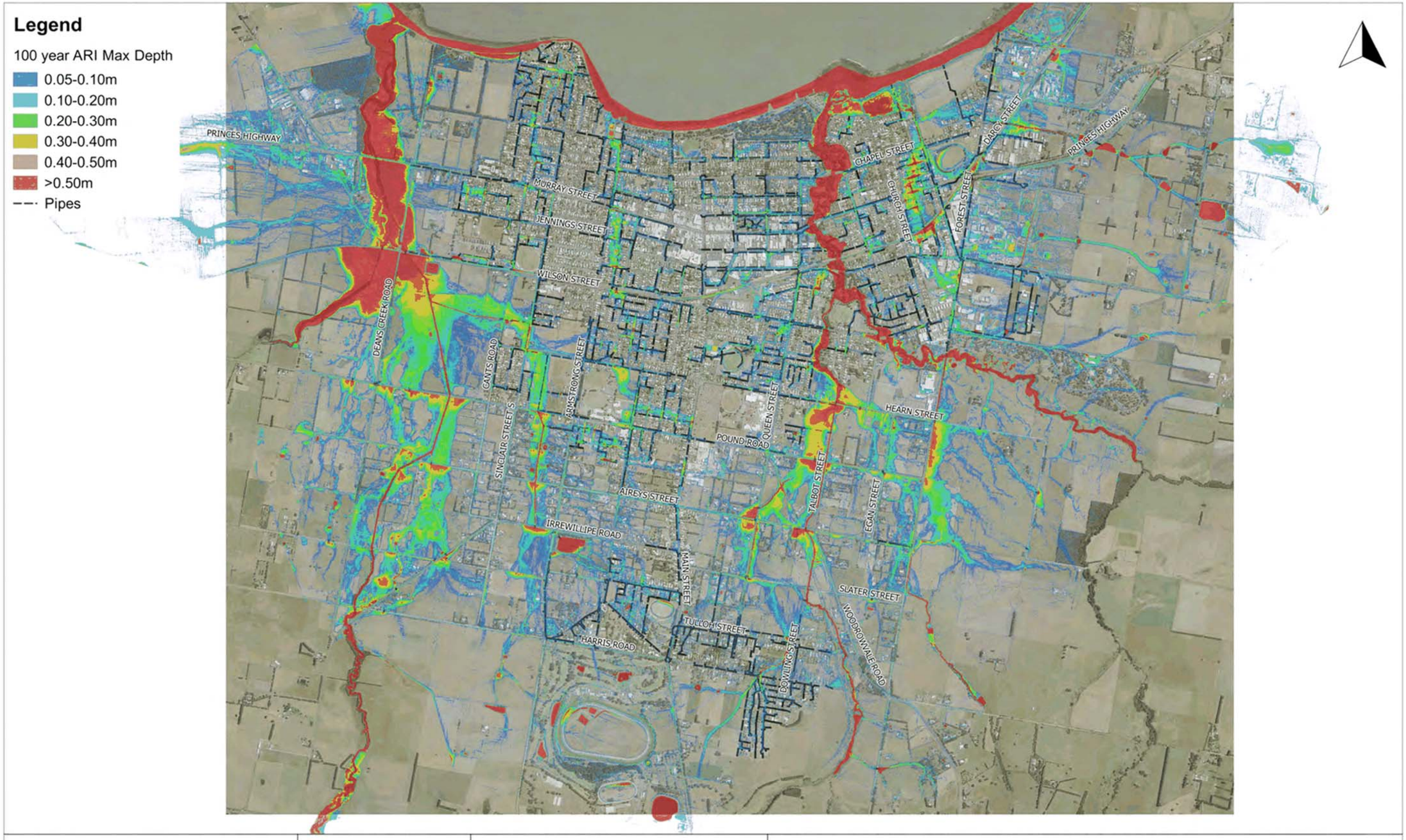
At A3 1:25,000

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

Colac Stormwater Development Strategy

5 Year ARI Flood Depth Difference Plot
Catchment Wide
Climate Change Scenario
(with no development)

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 22/9/2017



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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

200 0 200 400 600 800 m

At A3 1:25,000

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

Colac Stormwater Development Strategy

100 Year ARI Flood Extent
Catchment Wide
Climate Change Scenario
with no development

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 11/4/2018

Legend

Difference (m)

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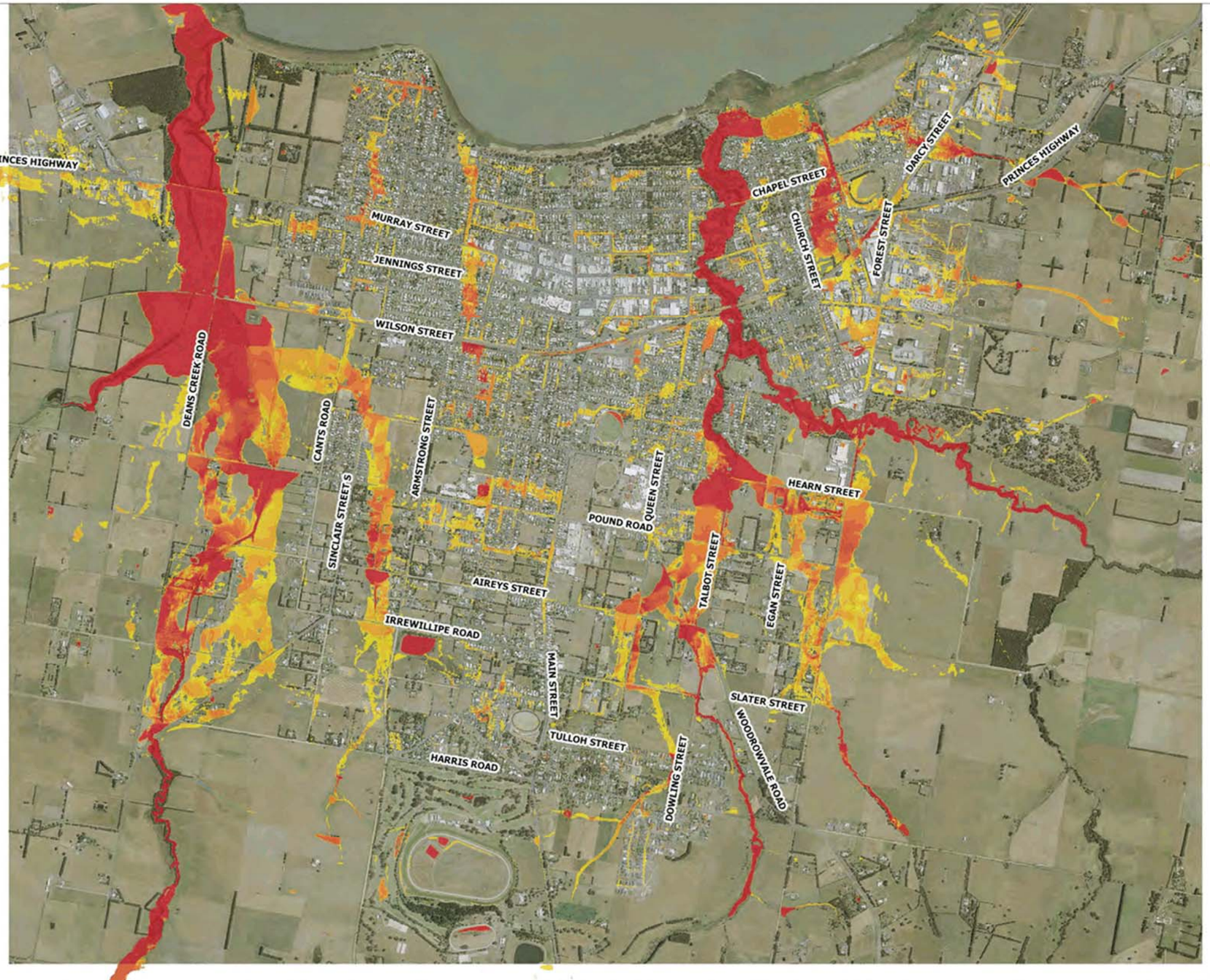
- 0.01 to 0.03
- 0.03 to 0.05
- >0.05



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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

200 0 200 400 600 800 m

At A3 1:25,000

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

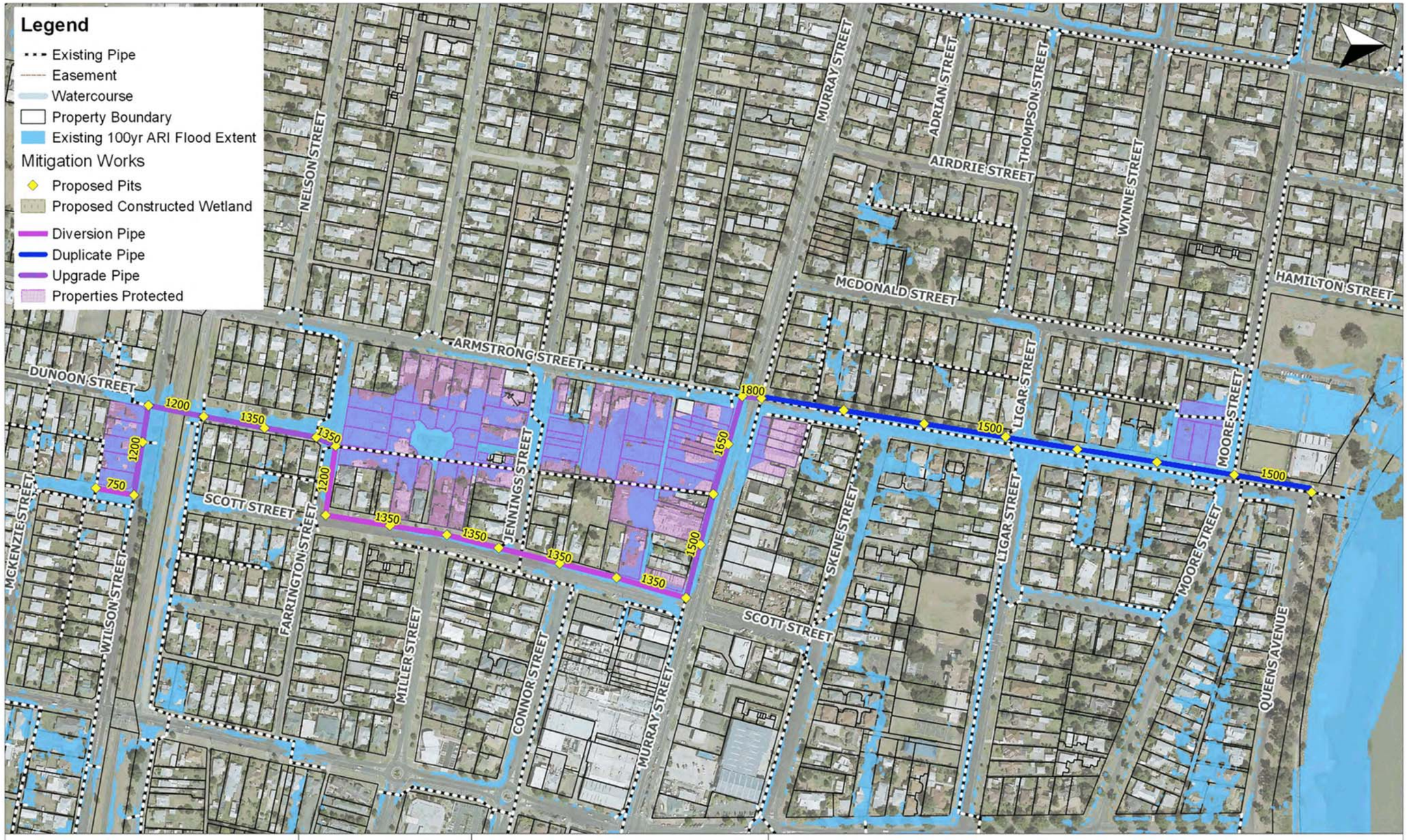
Colac Stormwater Development Strategy

100 Year ARI Flood Depth Difference Plot
Catchment Wide
Climate Change Scenario
(with no development)

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 22/9/2017

APPENDIX F

Possible Flood Mitigation Works for Existing Urban Area (Existing Conditions)



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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

30 0 30 60 90 120 m

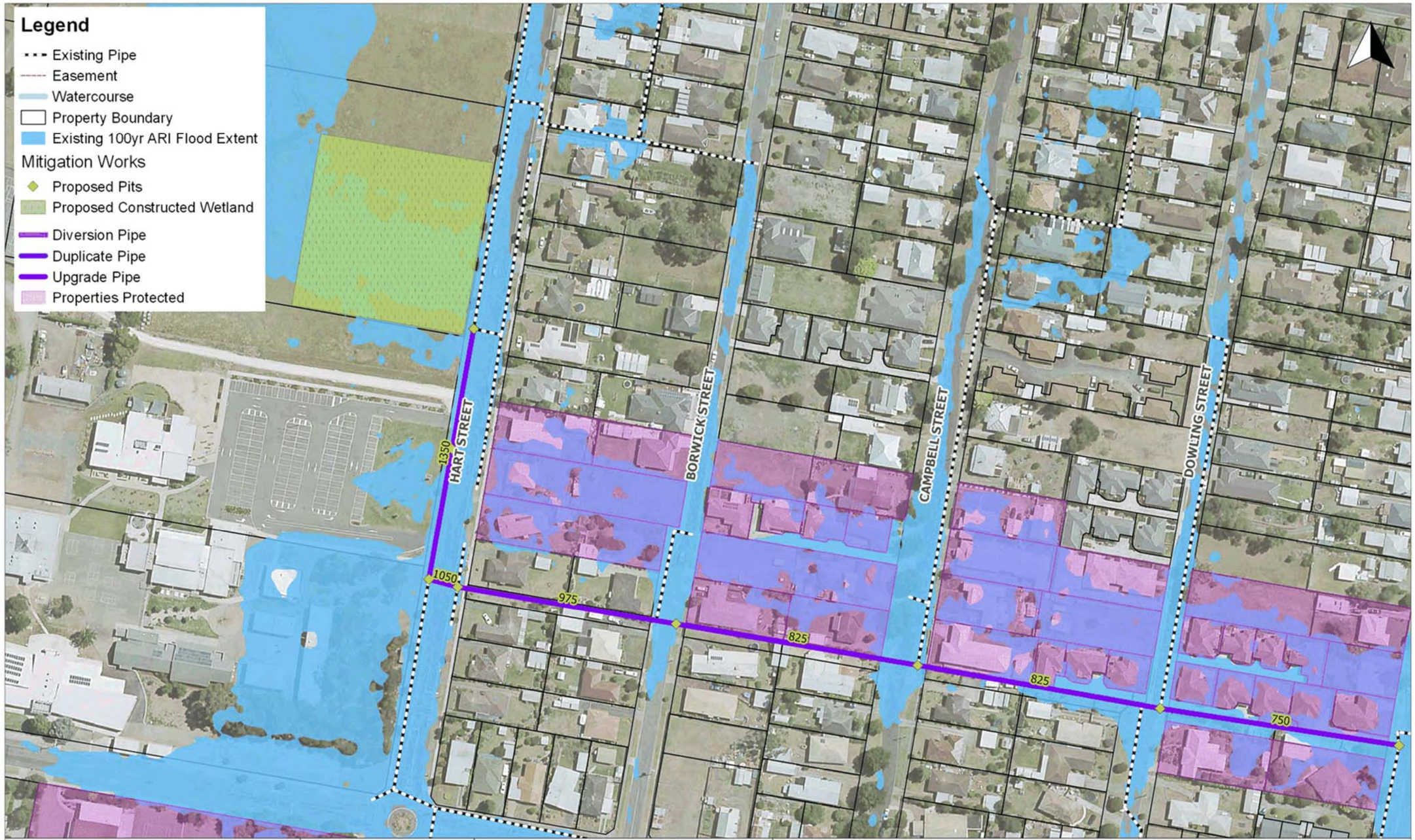
At A3 1:3,500

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

Colac Stormwater Development Strategy

100yr ARI Existing Conditions
Mitigation Location 1
Wilson Street

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 5/3/2019



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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

10 0 10 20 30 40 m

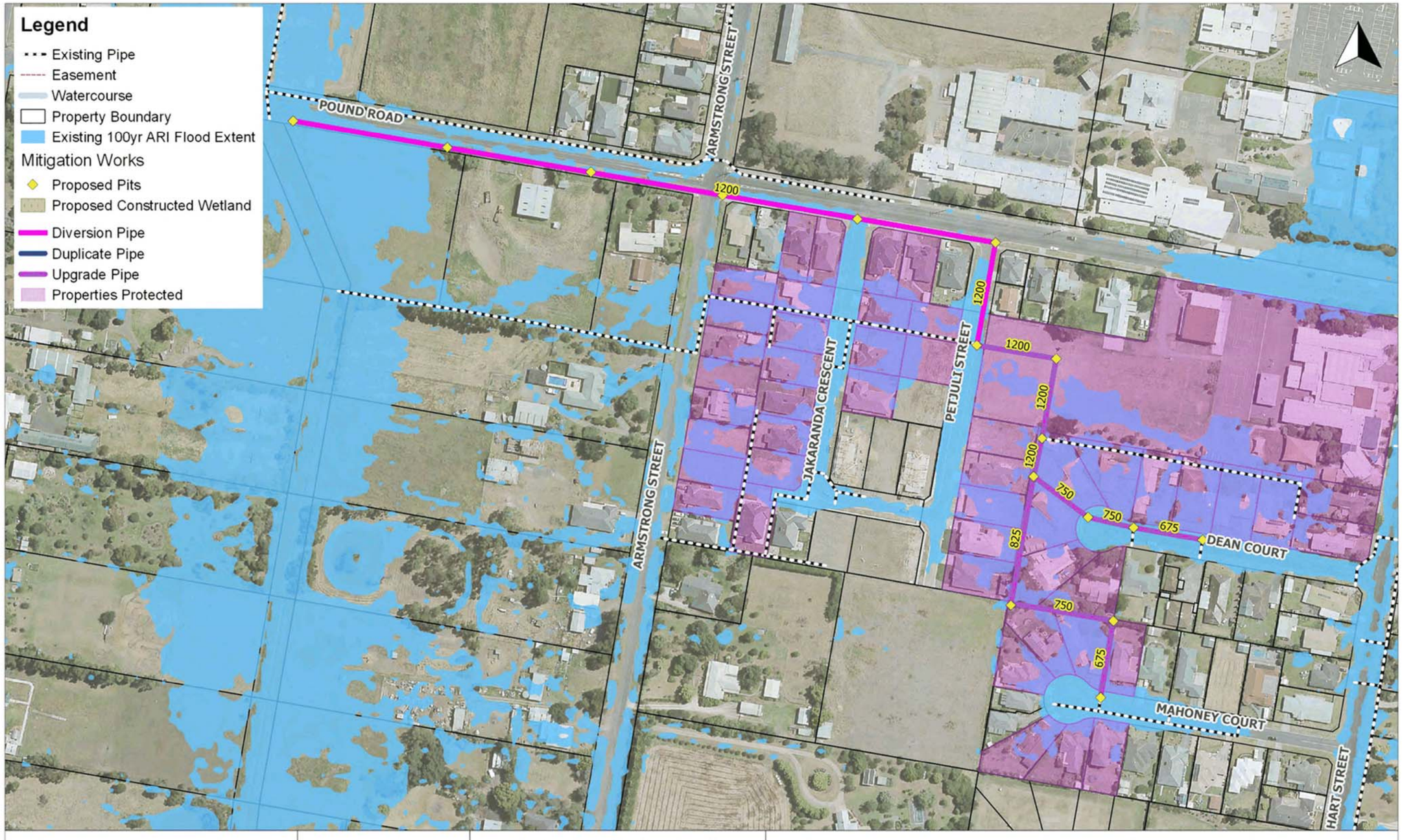
At A3 1:1,500

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

Colac Stormwater Development Strategy

100yr ARI Existing Conditions
Mitigation Location 2
Gravesend Street

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 5/3/2019



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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

19 0 19 38 57 76 m

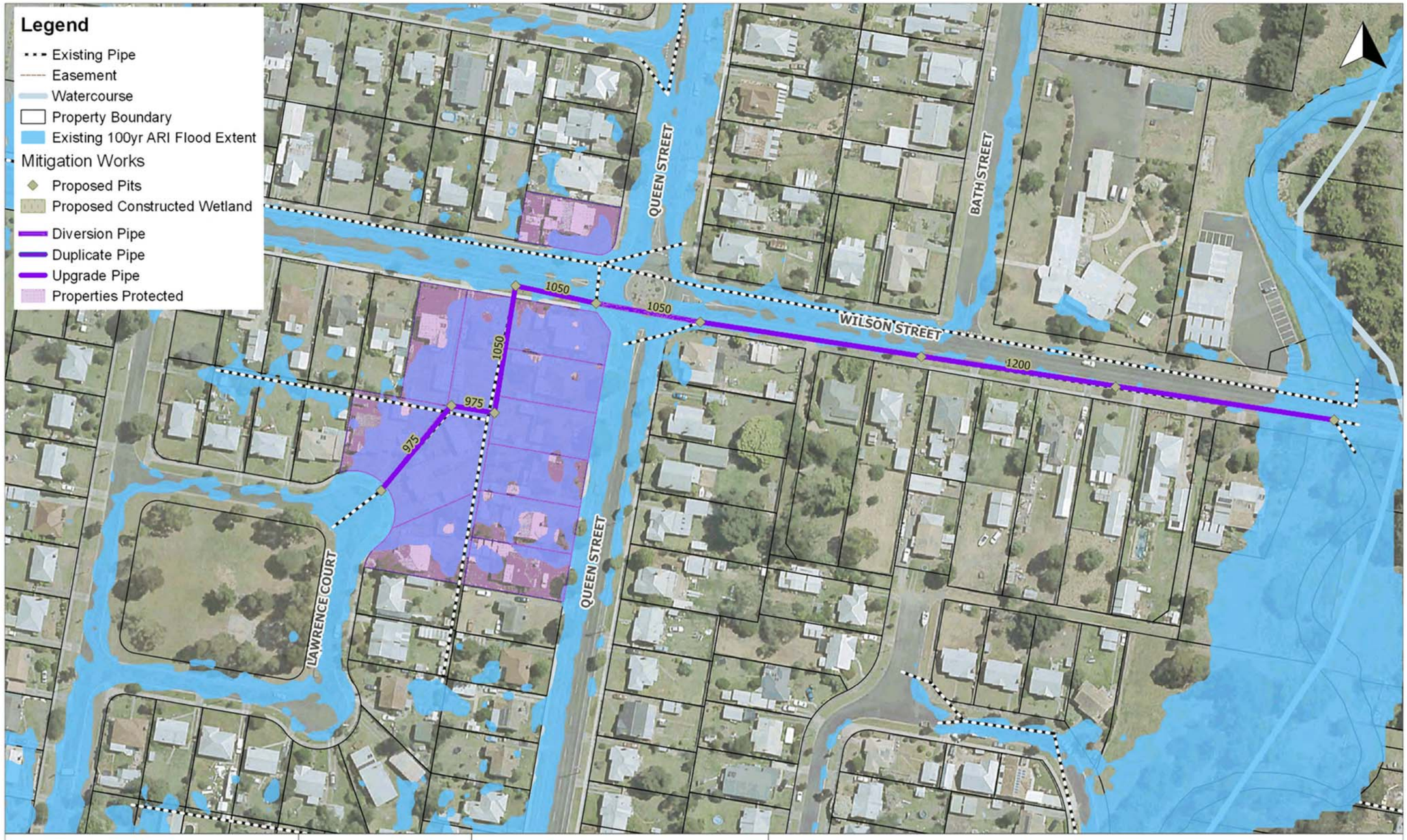
At A3 1:2,000

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

Colac Stormwater Development Strategy

100yr ARI Existing Conditions
Mitigation Location 3
Mahoney Court

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 5/3/2019



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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

10 0 10 20 30 40 m

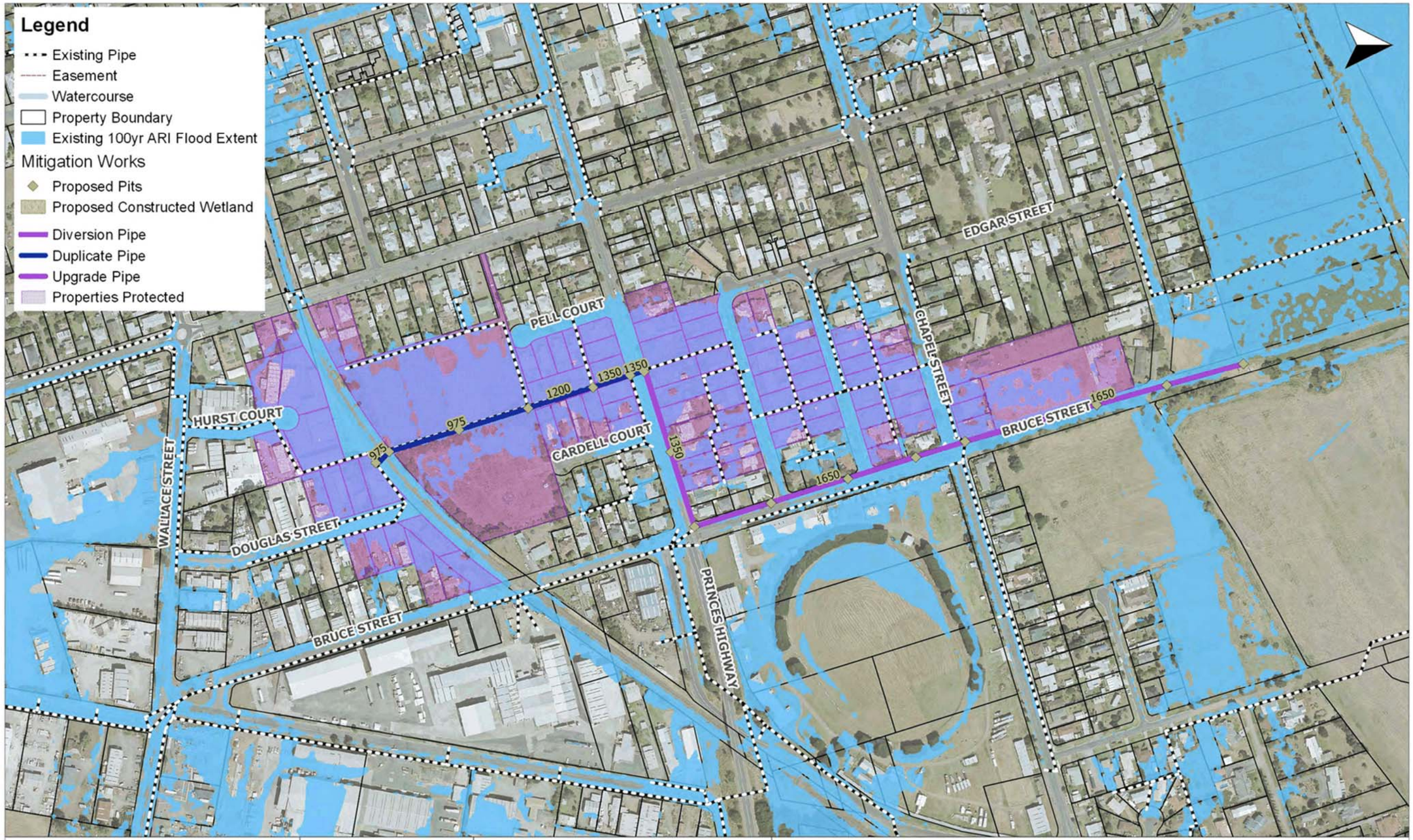
At A3 1:1,250

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

Colac Stormwater Development Strategy

100yr ARI Existing Conditions
Mitigation Location 4
Lawrence Court

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 5/3/2019



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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

30 0 30 60 90 120 m

At A3 1:3,500

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

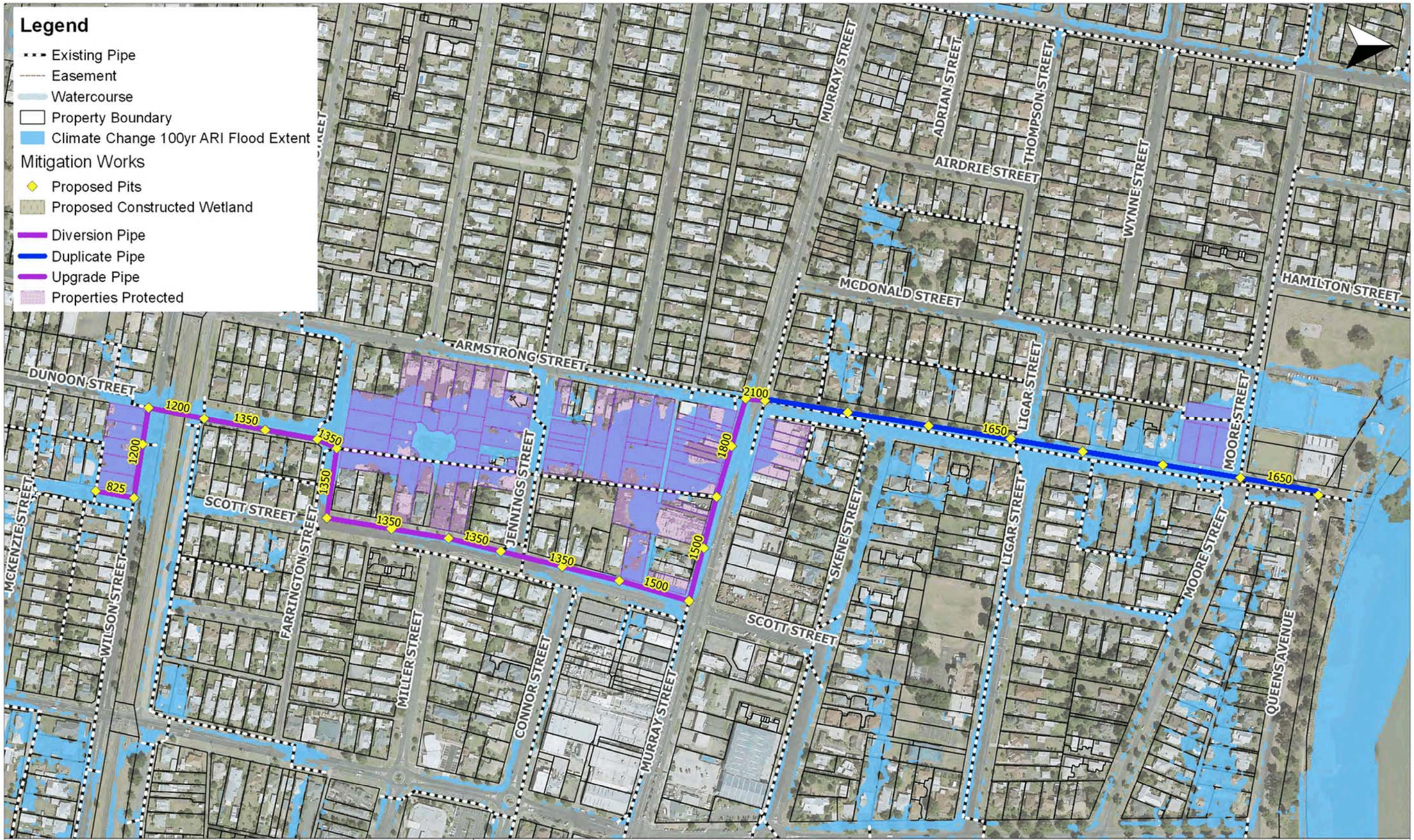
Colac Stormwater Development Strategy

100yr ARI Existing Conditions
Mitigation Location 5
Douglas Street

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 5/3/2019

APPENDIX G

Possible Flood Mitigation Works for Existing Urban Area (Climate Change Conditions)



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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

30 0 30 60 90 120 m

At A3 1:3,500

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

Colac Stormwater Development Strategy

100yr ARI Climate Change Conditions
Mitigation Location 1
Wilson Street

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 5/3/2019

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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

10 0 10 20 30 40 m

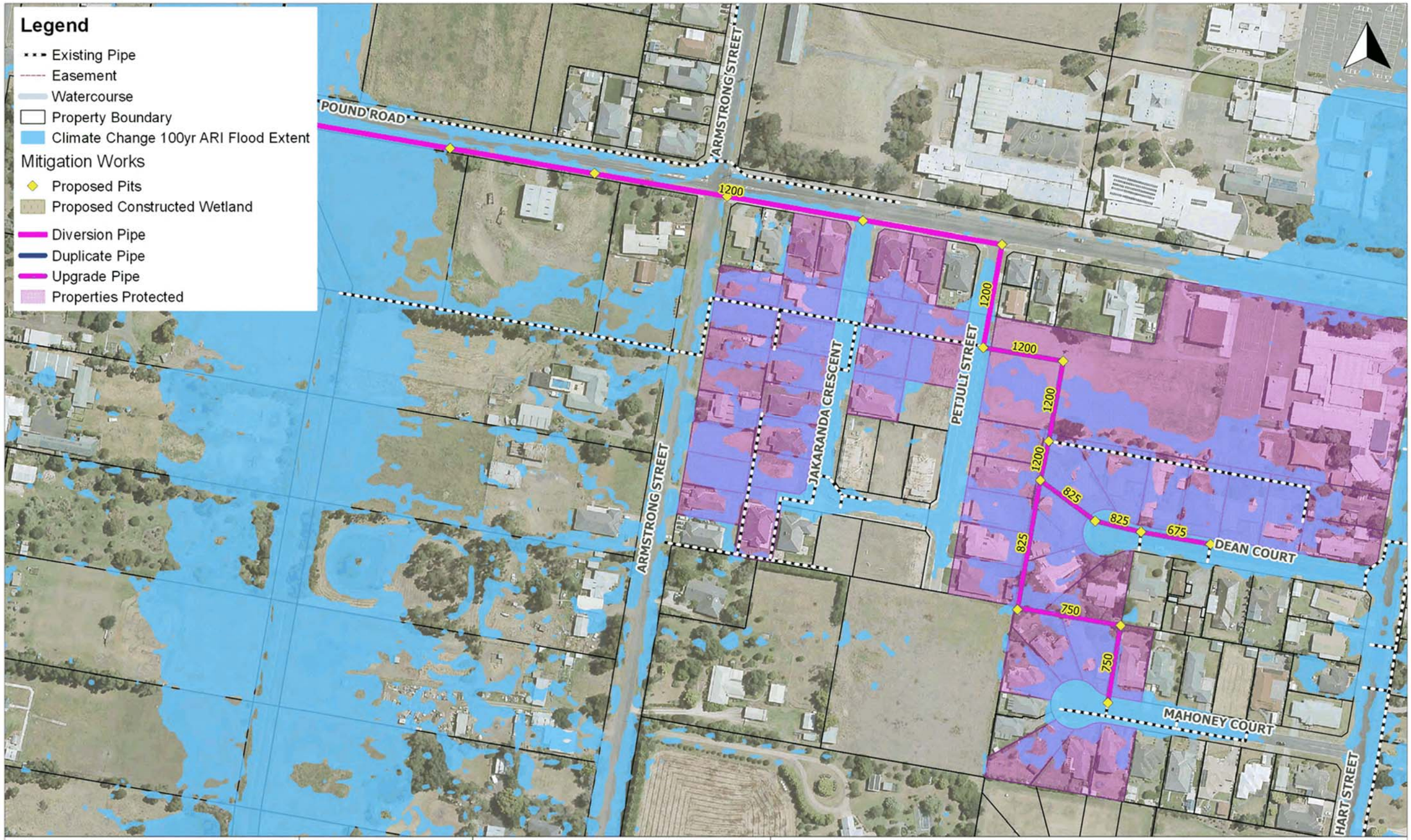
At A3 1:1,500

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

Colac Stormwater Development Strategy

100yr ARI Climate Change Conditions
Mitigation Location 2
Gravesend Street

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 5/3/2019



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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

19 0 19 38 57 76 m

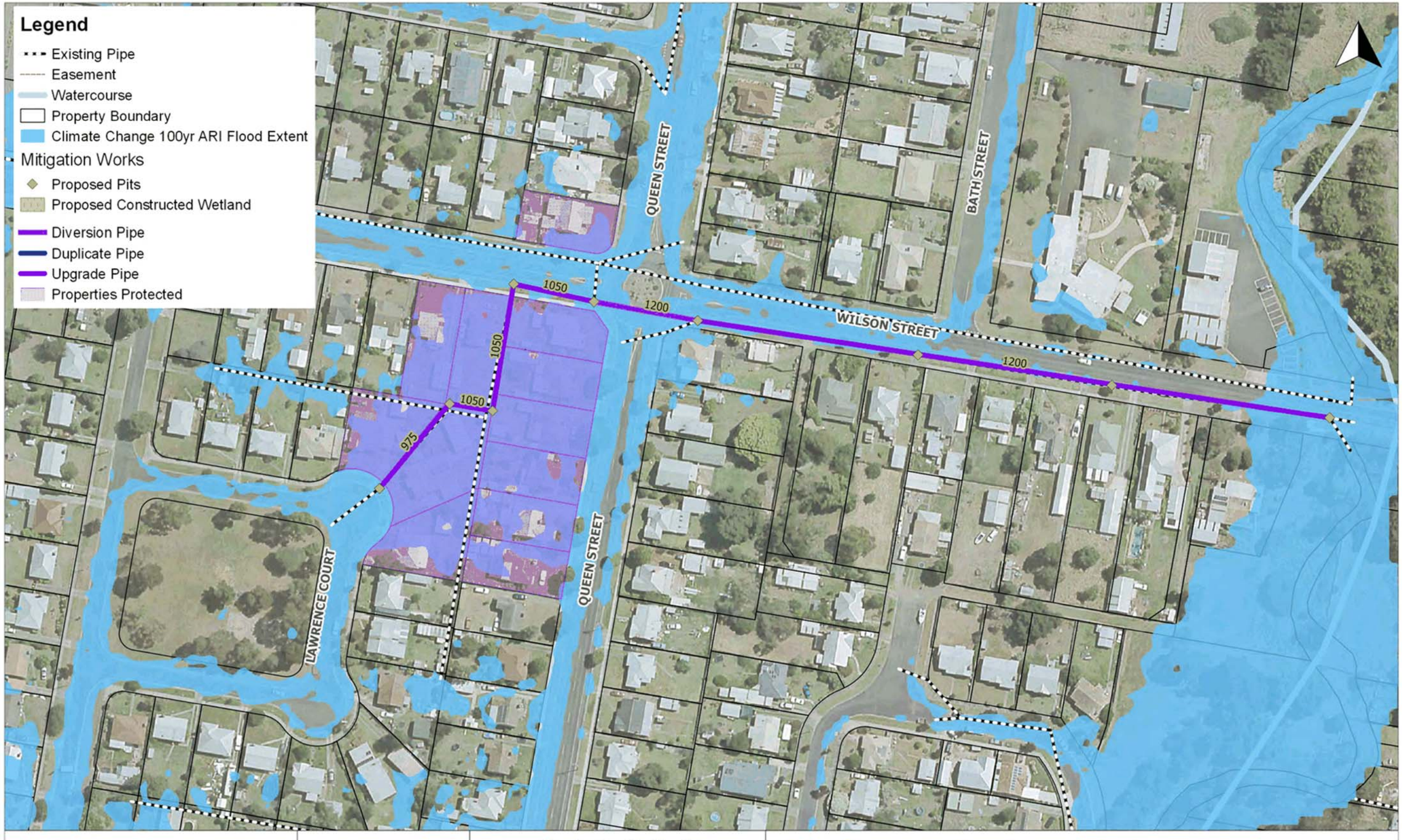
At A3 1:2,000

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

Colac Stormwater Development Strategy

100yr ARI Climate Change Conditions
Mitigation Location 3
Mahoney Court

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 5/3/2019



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www.engeny.com.au
P: 03 9888 6978
F: 03 9830 2601
E: melb@engeny.com.au

ENGENY WATER MANAGEMENT

Colac Otway SHIRE

10 0 10 20 30 40 m

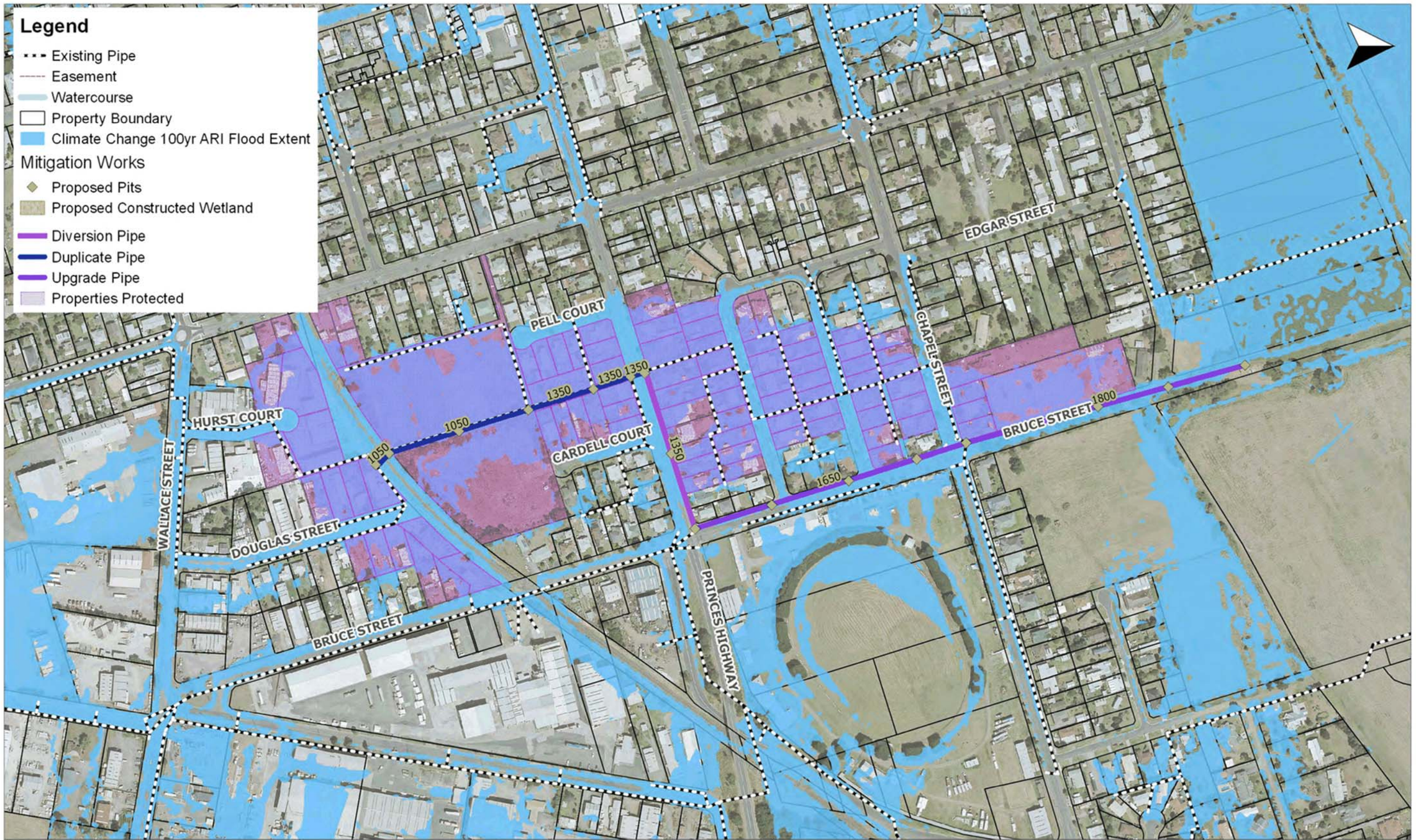
At A3 1:1,250

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

Colac Stormwater Development Strategy

100yr ARI Climate Change Conditions
Mitigation Location 4
Lawrence Court

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 5/3/2019



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P: 03 9888 6978
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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

30 0 30 60 90 120 m

At A3 1:3,500

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

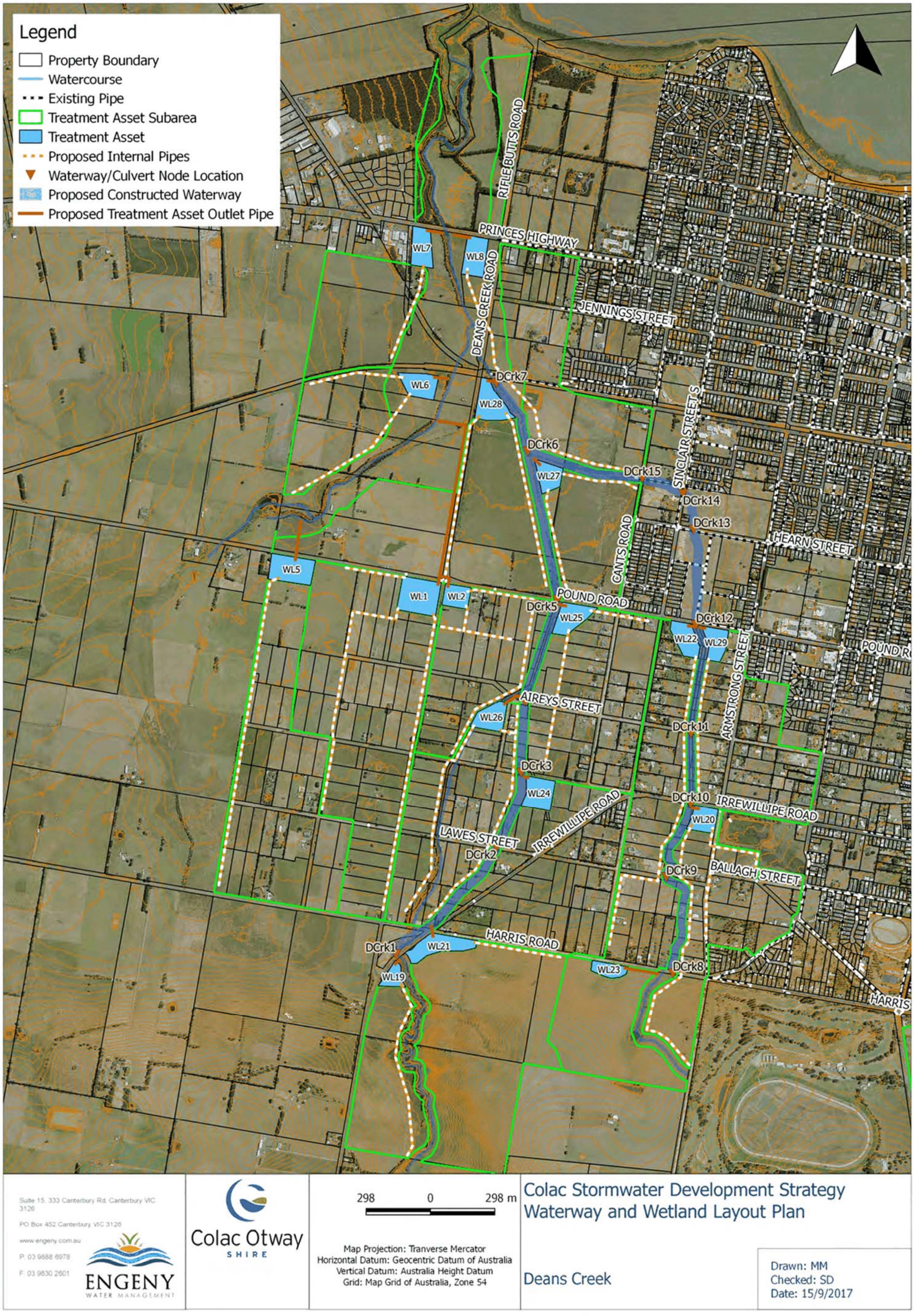
Colac Stormwater Development Strategy

100yr ARI Climate Change Conditions
Mitigation Location 5
Douglas Street

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 5/3/2019

APPENDIX H

Proposed Waterways and Wetlands Plans



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PO Box 452 Canterbury VIC 3126
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F: 03 9830 2601
ENGENY WATER MANAGEMENT

Colac Otway SHIRE

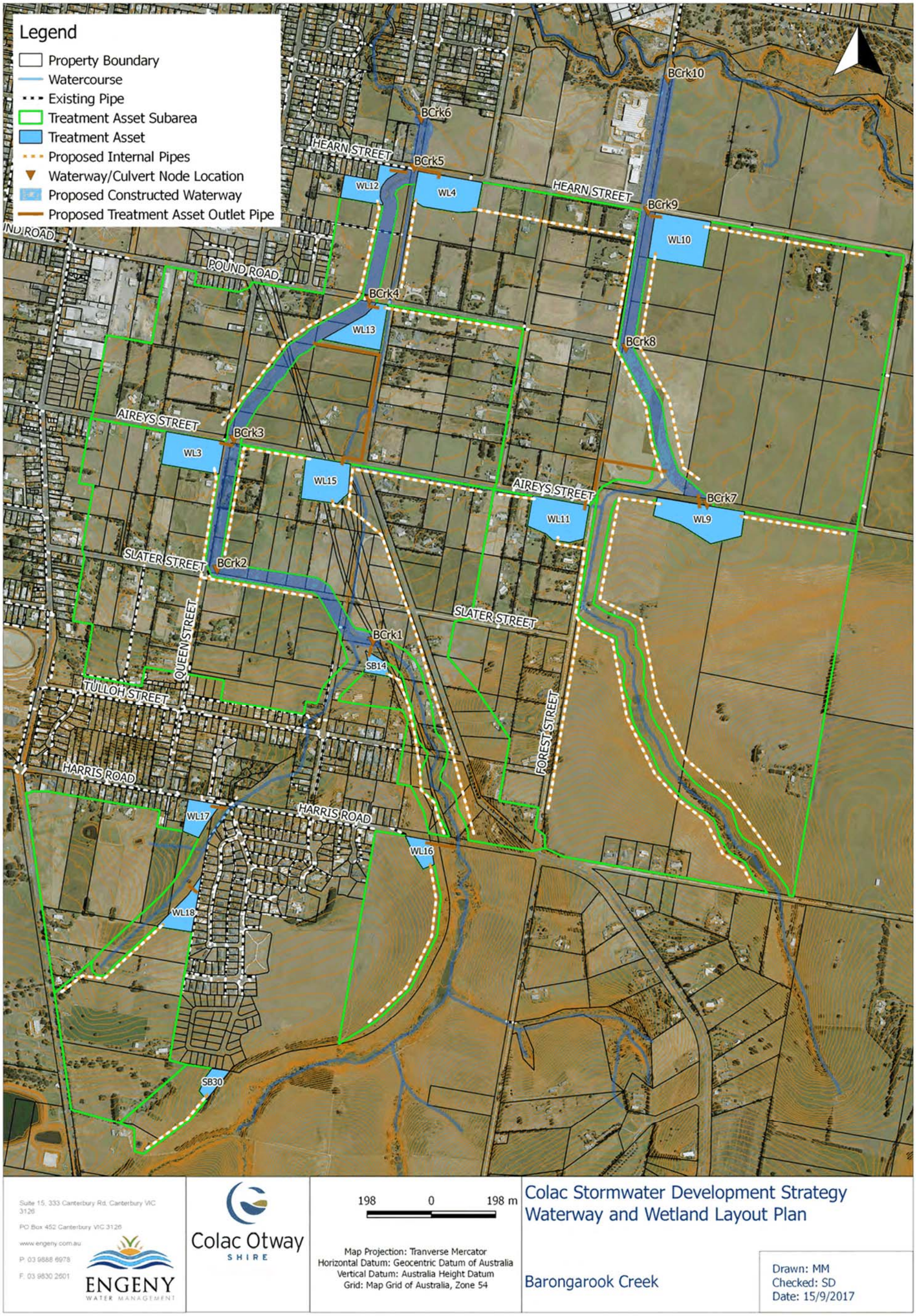
298 0 298 m

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

Colac Stormwater Development Strategy
Waterway and Wetland Layout Plan

Deans Creek

Drawn: MM
Checked: SD
Date: 15/9/2017


Legend
Property Boundary
Watercourse
Existing Pipe
Treatment Asset Subarea
Treatment Asset
Proposed Internal Pipes
Waterway/Culvert Node Location
Proposed Constructed Waterway
Proposed Treatment Asset Outlet Pipe
HEARN STREET
HEARN STREET
POUND ROAD
AIREYS STREET
AIREYS STREET
SLATER STREET
SLATER STREET
QUEEN STREET
FOREST STREET
TULLOH STREET
HARRIS ROAD
HARRIS ROAD
BCrk10
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WL15
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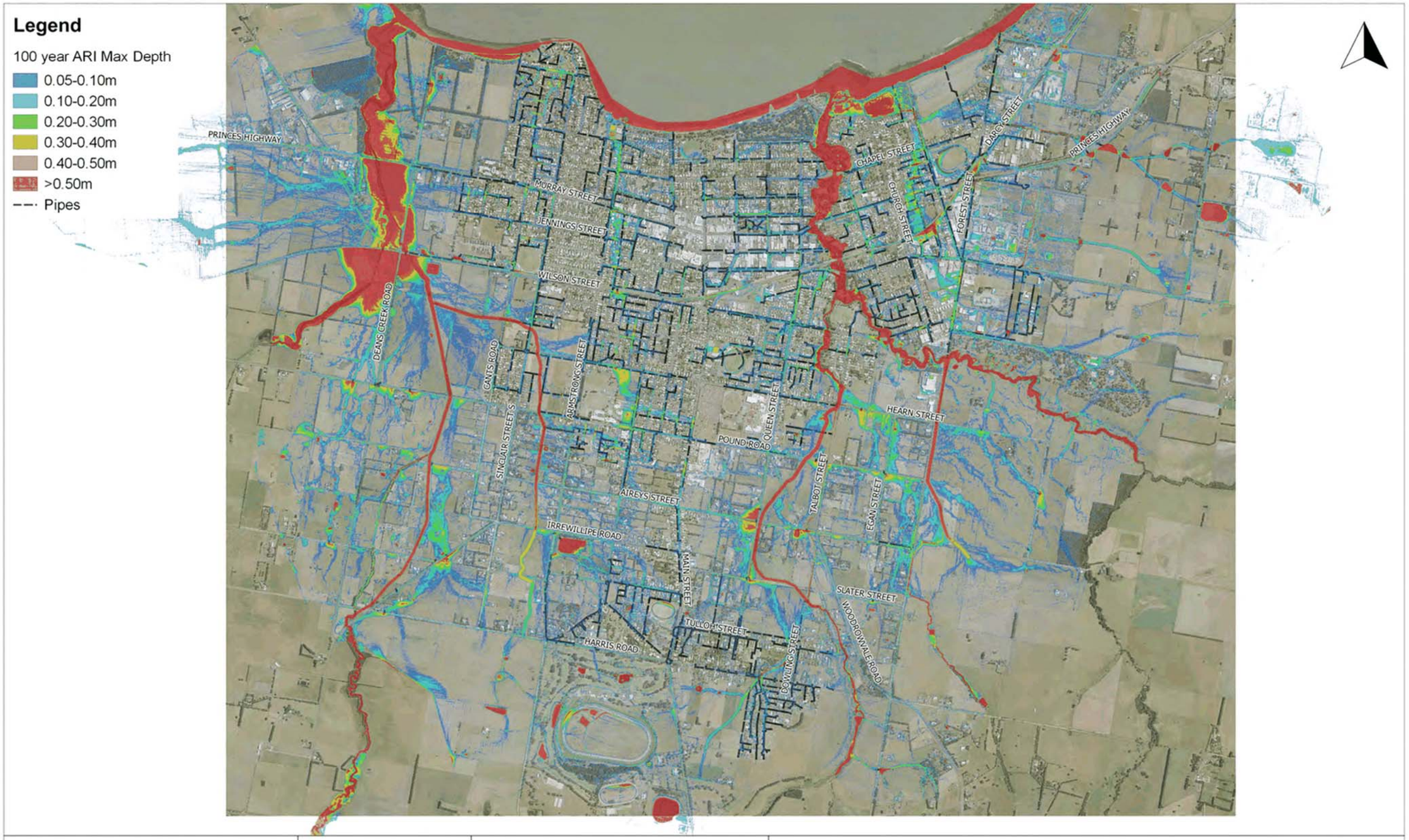
WL16
WL18
SB14
SB30
Suite 15, 333 Canterbury Rd, Canterbury VIC 3126
PO Box 452 Canterbury VIC 3126
www.engeny.com.au
P: 03 9888 6978
F: 03 9830 2601
ENGENY
WATER MANAGEMENT
Colac Otway
SHIRE
198 0 198 m
Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54
Colac Stormwater Development Strategy
Waterway and Wetland Layout Plan
Barongarook Creek
Drawn: MM
Checked: SD
Date: 15/9/2017

APPENDIX I

Flood Inundation Maps for Development Conditions



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ENGENY WATER MANAGEMENT

Colac Otway SHIRE

200 0 200 400 600 800 m

At A3 1:25,000

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 54

Colac Stormwater Development Strategy

100 Year ARI Flood Extent
Catchment Wide

Proposed Developed Scenario

Job Number: V2013_001
Revision: 0
Drawn: MM
Checked: SD
Date: 15/9/2017

Contact
Colac Otway Shire
PO Box 283, Colac VIC 3250
Email: inq@colacotway.vic.gov.au

www.colacotway.vic.gov.au

Colac Otway
SHIRE

Our Ref: D18/100538 SB

29 October 2018

To the owner or occupier

As addressed

Dear Sir/Madam

Notice of Exhibition of draft Colac Stormwater Development Strategy 2018

Colac Otway Shire has recently developed the draft *Colac Stormwater Development Strategy* 2018. Council is seeking to undertake a formal exhibition process of the draft Strategy as part of a process to formally adopt the Strategy.

You are receiving this letter because you may be interested, or could be affected by the changes proposed.

Attached to this letter is an information brochure highlighting the key features of the draft Strategy. Also included is an information brochure and letter about the exhibition of the draft *Colac 2050 Growth Plan*, and Amendment C97. This is included with this notice as both strategies and the Amendment are being concurrently exhibited. It is important to note, that whilst Council is exhibiting these strategies at the same time, they are different projects. If you wish to make a submission, they will need to be made separately.

Further information about the Amendment and draft *Colac Stormwater Development Strategy*, 2018 and how to make a submission, are described in the attached brochure.

If you have any queries concerning this matter please contact Suzanne Barker from the Infrastructure Unit, from Colac Otway Shire Council by email suzanne.barker@colacotway.vic.gov.au or telephone 0410 341 971 during business hours.

Yours Sincerely

Jeremy Rudd

Manager Capital Works

Colac Stormwater Development Strategy

Information Sheet

What is the draft Colac Stormwater Development Strategy and why do we need it?

The draft Colac Stormwater Development Strategy is a vital part of managing Colac's stormwater network into the future. It is also an important input to the Colac 2050 Growth Plan, a long- range planning project that will cater for growth in Colac's population over the coming decades.

Council needs a robust understanding of existing and future flood planning, drainage and stormwater treatment constraints and opportunities. This will allow Council to improve drainage and stormwater infrastructure in existing urban areas of Colac over time, as well as facilitate appropriate future development.

The draft Colac Stormwater Development Strategy (the 'Strategy') has been developed to:

- Identify areas in Colac that experience stormwater management challenges which require mitigation to improve the overall drainage system throughout the town
- Facilitate the development of land in and close to Colac as part of the planned implementation of the *draft Colac 2050 Growth Plan*.

The study identified opportunities to enhance the current urban stormwater drainage network to improve its performance, and reduce the extent of the flow of stormwater overland which currently affects some private land.

The Strategy identifies areas for future drainage lines, waterway corridors and stormwater treatment/retarding basins, that can be used to accommodate the additional stormwater runoff from future development areas (thereby facilitating future development).

These works will also reduce flooding to areas that are currently subject to inundation, both within existing urban areas, and in the lower density rural living areas in Elliminyt, increasing the amount of land potentially available for development.

The implementation of actions specified to improve drainage will occur over the long term, requiring significant funding from Council and other sources, as well as contributions from developers as land is rezoned and developed for residential and commercial purposes.

How to make a Submission?

If you wish to make a written submission in relation to the *draft Colac Stormwater Development Strategy*, please include "**Colac Stormwater Development Strategy Submission**" in the title and email it to

inq@colacotway.vic.gov.au or mail it to:

Infrastructure

Colac Otway Shire Council

PO Box 283

COLAC VIC 3250

You must include your name, postal address and contact telephone number with the submission. Please also provide an email address if you have one. Name and contact details of submitters are required for Council to consider submissions and to notify such persons of the opportunity to attend Council meetings to consider submissions. Anonymous submissions will not be accepted. When making your submission, it is useful to explain what parts of the Strategy you support, do not support, and what changes if any you are seeking. This will help Council to respond to your submission.

Submissions close on Friday 14 December, 2018.

Are you seeking more information? Here is how

You may view the draft *Colac Stormwater Development Strategy*, 2018 at:

- www.colacotway.vic.gov.au or:
- during standard office hours at the Colac Otway Shire offices, 2-6 Rae Street, Colac.

Drop-in information sessions about the *Colac Stormwater Development Strategy*, 2018 will be held at the following times:

- **11am – 1pm, Wednesday 7 November 2018, Murray Street, Colac (near laneway and Marc's furniture)**
- **3pm – 6pm, Wednesday 7 November 2018, COPACC, Gellibrand Street, (opposite Colac train station)**
- **10am – 1pm, Sunday 18 November 2018, Colac Sunday Market at the Showgrounds**

Alternatively, you may wish to book an appointment to discuss what is proposed with Council's Infrastructure Unit. To make an appointment please call Suzanne Barker during business hours on 0410 341 971 or email to: suzanne.barker@colacotway.vic.gov.au

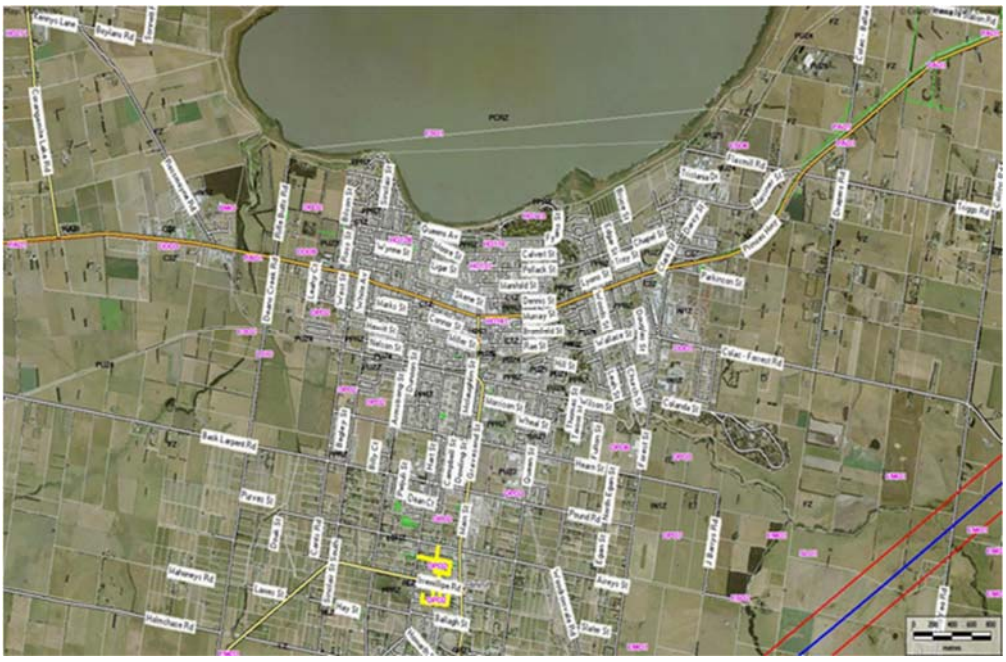
SPECIAL COUNCIL MEETING

COLAC OTWAY AMENDMENT C97 – COLAC 2050 GROWTH PLAN – CONSIDERATION OF SUBMISSIONS

SC192003-2

LOCATION / ADDRESS	Colac	**GENERAL MANAGER**	Ian Seuren
OFFICER	Simon Clarke	**DIVISION**	Development & Community Services
TRIM FILE	F18/8048	**CONFIDENTIAL**	No
ATTACHMENTS	1. Amendment C97 - Colac 2050 - Framework Plan Exhibition Version - Submitter Location map 2. Amendment C97 - Colac 2050 Growth Plan - Submission Table with Officer Response for Council Report No Name 3. Colac Otway Amendment C97 - Clause 21.03 - Post Exhibition Version - For Council Report		
PURPOSE	To consider submissions received as part of the public exhibition of the Amendment		

1. LOCATION PLAN / AERIAL PHOTO



2. EXECUTIVE SUMMARY

Planning Scheme Amendment C97 and the draft Colac 2050 Growth Plan underwent a six week public exhibition process from November to mid-December 2018. 40 submissions were received from 35 submitters. The submissions included:

- 4 public authorities and utilities (DELWP, EPA, Barwon Water, SP AusNet).
- 9 supportive.
- 3 generally supportive with some suggested improvements.
- 6 oppose the future rezoning of land from Rural Living to General Residential clustered generally south of Pound Road, north of Aireys Street, and east and west of Cants Road.
- 3 clustered around the DPO2 land area north of Aireys Street, west of Main Street who raise issues more broadly about the historical process to apply the DPO2, Council's development plan preparation project in 2014, and the extent of the mapped area of the overlay.
- 1 seeking the consideration of a bypass of Colac.
- 3 who suggest that growth should be focussed to the east.
- 3 with site specific issues.

Whilst no change is recommended to the broad direction of the Growth Plan, a number of minor changes to the Colac 2050 Framework Plan and Clause 21.03 are recommended in response to specific issues.

Submissions will be considered by Council and, subject to a Council resolution, will be referred to an independent panel to be appointed by the Minister for Planning, as required by the *Planning and Environment Act, 1987*.

3. RECOMMENDATION

That Council:

1. ***Pursuant to section 22 (1) of the Planning and Environment Act 1987, has considered all submissions received to the Colac Otway Amendment C97.***
2. ***Pursuant to section 23 (1)(a) of the Planning and Environment Act 1987, makes changes to Amendment C97 as noted in this report and attachments.***
3. ***Makes changes to the draft Colac 2050 Growth Plan as noted in this report and attachment.***
4. ***Pursuant to section 23 (1)(b) of the Planning and Environment Act 1987, refers submissions to a panel to be appointed by the Minister for Planning.***
5. ***Authorises officers/suitable persons to represent Council at the Planning Panel hearing generally in accordance with the response to issues outlined in this report and its attachments, and to make minor changes to the Amendment in response to matters raised during the panel process.***

4. BACKGROUND / KEY INFORMATION

BACKGROUND

Council commenced the Colac 2050 project early in 2015 with a key aim to deliver a Growth Plan with a revised Framework Plan suitable for inclusion in the Colac Otway Planning Scheme. The draft Colac 2050 Framework Plan and Growth Plan identify future areas for residential development in Colac and will assist Council to meet its obligations

under the *Planning and Environment Act,* 1987 to ensure the orderly planning of the Shire and to accommodate at least 15 years' supply of appropriately zoned land for residential purposes.

The draft Colac 2050 Growth Plan was prepared in conjunction with the draft Colac Stormwater Development Strategy to help inform future planning of areas which are currently flood prone in Colac.

Amendment C97 was prepared to give the Growth Plan statutory effect. It is proposed to implement the Plan by amending relevant clauses in the Municipal Strategic Statement in the Colac Otway Planning Scheme. Details of the Growth Plan and Amendment were presented to Council in July 2018 where a resolution was passed to seek authorisation from the Minister for Planning to prepare the planning scheme amendment, and to commence public exhibition.

After the July 2018 Council meeting, officers prepared the amendment documentation in line with the explanatory report presented to Council. The exhibited amendment documents are available on Council's website.

Exhibition of the Amendment began early in November 2018 after the Minister's authorisation. There was a minor delay in the exhibition of the amendment due to the gazettal of the Statewide amendment VC148 on 31 July 2018. VC148 implemented major changes to the Victoria Planning Provisions (VPP) and introduced an integrated Planning Policy Framework. This required officers to resolve with the Department of Environment Land Water and Planning (DELWP) the format of the provisions proposed by Amendment C97 prior to authorisation.

This report documents the outcomes of the public exhibition process. It also presents a summary of issues raised and officer responses to those submissions.

KEY INFORMATION

Council undertook a joint public exhibition process of Amendment C97 and the draft Colac 2050 Growth Plan with the draft Colac Stormwater Development Strategy, as noted in Section 5 of this paper.

40 submissions from 35 submitters were received – one submitter lodged 5 submissions. The submissions have been circulated to Councillors separately to the agenda given the need for them to remain confidential for privacy reasons. A map showing the location of areas / properties raised in submissions is attached to the report (**attachment 1**).

The submissions included:

- 4 public authorities and utilities (DELWP, EPA, Barwon Water, SP AusNet).
- 9 supportive.
- 3 generally supportive with some suggested improvements.
- 6 oppose the future rezoning of land from Rural Living to General Residential clustered generally south of Pound Road, north of Aireys Street, and east and west of Cants Road.
- 3 clustered around the DPO2 land area north of Aireys Street, west of Main Street who raise issues more broadly about the historical process to apply the DPO2, Council's development plan preparation project in 2014, and the extent of the mapped area of the overlay.
- 1 seeking the consideration of a bypass of Colac.
- 3 who suggest that growth should be focussed to the east.
- 3 with site specific issues.

A table with a summary of submissions and officer responses is attached (**attachment 2**).

The table also documents a number of proposed changes to the exhibited Clause 21.03 Settlement in response to issues raised in submissions. Specifically, the following changes are recommended:

- Strengthen wording in Clause 21.03 to highlight the need to avoid locating sensitive uses (e.g. housing) within industrial buffer areas or within the buffer area of the Colac wastewater treatment plant (in response to Submission 23 - EPA's submission).
- Amend Clause 21.03-2 Implementation to include a new sentence as future strategic work related to objective 2, to review the extent of the mapped area for the DPO2 north of Aireys Street, and west of Main Street to consider in particular small lots which have been developed, where appropriate, in response to concerns raised about the extent of the mapped area.
- A number of refinements to the Colac 2050 Framework Plan found both in Clause 21.03 and the draft Colac 2050 Growth Plan, specifically:
    - In response to the EPA's submission, clarify that buffer industrial land is intended as Industrial 3 Zone or equivalent.
    - In response to Submission 14, change the notation on the Framework Plan for the area to the east of Colac noted as 'long term rural living' to 'rural living investigation area'.
    - In response to Submission 15 which relates to the eastern entrance to Colac on the Colac-Forrest Road, shifting the location of the symbol for 'enhance town gateways with built form and landscaping' to align with the road; and not the submitter's property.
    - In response to Submission 21 which relates to land on Christies Road, changing the graphics for rezoning to farming to ensure it is clear that it is part of long term residential growth corridor.
    - In response to Submissions 12 and 29 which raise concerns about the timing and use of proposed residential land north of the industrial land in Rossmoyne Road, to amend the annotation on the Framework Plan to identify this area as a 'medium term residential development investigation area' and maintain the 'Urban Boundary'.
    - In response to Submission 8a which relates to the extent of inundation shown on the Framework Plan, insert a note at the bottom of the legend as follows: 'the area of inundation shown on the Framework Plan reflects the extent of existing conditions, and may be subject to further refinement as part of future planning and development processes which consider stormwater management measures'.
    - In response to Submission 30, extend the township boundary to include part of the land identified by the submitter, namely the area which directly abuts the residential land to the east (Wyuna Estate), and identify this as 'rezone to rural living or low density subject to development plan'.

The table also notes the following changes to the draft Colac 2050 Growth Plan:

- Amend p29 of the Growth Plan to include additional reasons that explain previous land owner opposition to the draft development plan such as safety and privacy associated with the open space and walkway, and not wanting to develop (in response to Submission 18).
- Include wording in the Growth Plan, p29 to note the need to review the DPO2 boundary north of Aireys, west of Main Street to consider the extent of the mapping (in response to Submission 18 and 24).
- Include reference in the Growth Plan to investigate in Colac West on the Deans Creek the potential for a focal point with constructed wetland and Aboriginal focus (in response to Submission 25).
- Amend the Framework Plan in line with Clause 21.03 Framework Plan as previously noted.

Attachment 3 is a post-exhibition version of Clause 21.03 which documents the aforementioned changes. Further changes are not recommended.

It should be noted, that Council at this stage of the planning scheme amendment process has three options. Council can:

- refer unresolved submissions to an independent Panel appointed by the Minister for Planning and make changes in accordance with officer recommendations (the recommended option);
- refer unresolved submissions to an independent Panel appointed by the Minister for Planning and make additional changes to those recommended by officers; or
- abandon the Amendment.

Abandoning the Amendment in its entirety would have substantial implications for Council and fulfilling its obligations under the Colac Otway Planning Scheme to have at least 15 years of zoned land available. Colac is nearing the point where new land will be required to be rezoned, and the Growth Plan and Amendment provides this framework to enable this to occur. If Council abandons the Amendment, then this would cause significant delay to future residential development in the town, and potentially result in reduced housing and land supply.

Council may also choose to make additional changes to the Amendment and Growth Plan and suggest alternative responses to submissions. Any additional changes however, will similarly be referred to an independent Panel as the next part in the statutory process.

Further changes are not recommended by officers, and it is important to weigh strategic planning considerations against personal interests put forward by individual land owners. For example, including additional areas in the urban boundary could have implications in relation to achieving the overall vision for enabling a more compact urban structure for the town, and embracing the creeks and Lake as part of an integrated public open space network.

It is considered that 40 submissions is a relatively small number of submissions for such a broad ranging Growth Plan and Amendment, and of the 40 submissions many are supportive. It is considered that the wide ranging consultation which informed the Growth Plan has resulted in a generally supported plan by the community, which is further reflected in this low number.

FURTHER SUPPORTING INFORMATION

5. COMMUNITY CONSULTATION & ENGAGEMENT

The development of the Colac 2050 Growth Plan has undergone two phases of community consultation to date, with included significant engagement with our community. The first phase included consultation with the broader community and sought to inform the opportunities and constraints which influence growth; explore the questions of where and how Colac should grow; and initiate growth scenarios or options.

The second phase involved the Colac 2050 Citizens' Jury whose recommendations were used to inform the development of the draft Framework Plan and Growth Plan.

Public Notice of Amendment C97 – Colac 2050 Growth Plan

Amendment C97 was placed on joint public exhibition with the draft Colac Stormwater Development Strategy for a 6 week period in accordance with Council's Community Engagement Policy, from the beginning of November to mid-December 2018. Submissions closed on 14 December 2018.

Letters of notice with an information brochure were posted to all residents and non-resident ratepayers in Colac and surrounds. Notices were also published in local media including the Colac Herald, and Council's Facebook page, as well as the Government Gazette. Information was also provided on Council's and DELWP's website.

Three drop in information sessions were held across different days and times as follows:

- 11am – 1pm, Wednesday 7 November 2018, Murray Street, Colac (near laneway and Marc's Furniture)
- 3pm – 6pm, Wednesday 7 November 2018, COPACC
- 10am – 1pm, Sunday 18 November 2018, Colac Sunday Market

People were also invited to book an appointment with Council's Strategic Planning Unit.

6. ANALYSIS

ALIGNMENT TO COUNCIL PLAN OR COUNCIL POLICY

The Colac 2050 Growth Plan project is aligned to the Council Plan 2017-2021. It is specifically aligned to: 'Theme 1: Our Prosperity' and its goal to '*plan infrastructure, assets and land use with a long term vision for economic growth*'. It is a named strategy to support this theme.

ENVIRONMENTAL IMPLICATIONS

The exhibition version of the Colac 2050 Growth Plan considers drainage and other environmental implications. In particular, it identifies the opportunity to improve existing inundation and flooding issues along the Barongarook Creek and Deans Creek, to facilitate development, create linear open space corridors and improve water quality into Lake Colac.

SOCIAL & CULTURAL IMPLICATIONS

The exhibition version of the Colac 2050 Growth Plan takes into account a range of social issues including the location and availability of community infrastructure and services, amenity for future residents of growth areas, walkability for new residents in newly developing areas, and the housing needs of different parts of the community. The exhibition

version of the Colac 2050 Growth Plan seeks to create a more compact and sustainable urban form for Colac which will encourage walking, cycling and housing diversity. It also includes recommendations in relation to Colac's Traditional Owners and the need to include them in future planning processes.

ECONOMIC IMPLICATIONS

For Colac to reach its economic potential, an appropriate land use framework is required to support future growth. The exhibition version of the Colac 2050 Growth Plan considers the economic cost of infrastructure provision for new development areas, and the way in which development contributions could be used to fund works such as drainage mitigation for low lying areas. The implementation section of the Growth Plan identifies the importance of Council pursuing development contributions mechanisms as part of the next stage of planning for Colac's growth. The Growth Plan also contains a section on Economic Development to reinforce findings from the *Colac Township: Economic Development, Commercial and Industrial Land Use Strategy* (2017).

LEGAL AND RISK IMPLICATIONS

This project assists Council to fulfil its obligation under the *Planning and Environment Act,* 1987 to ensure the orderly planning of the area and accommodate at least 15 years' supply of appropriately zoned land for residential purposes. The issue of bushfire hazard has also been considered as part of the Growth Plan as required by amended provisions in the Colac Otway Planning Scheme.

RESOURCE IMPLICATIONS (FINANCIAL ETC)

A budget allocation for the Colac 2050 Growth Plan Planning Scheme Amendment has been included within Council's 2018/19 budget. The development of the Growth Plan has largely been funded by the State Government to date.

7. IMPLEMENTATION STRATEGY

DETAILS

Following consideration of submissions and subject to a Council resolution, the Colac 2050 Growth Plan and the submissions will be referred to an Independent Planning Panel to be appointed by the Minister for Planning. This is a requirement under the *Planning and Environment Act 1987*, when submissions are received which cannot be resolved. The Planning Panel will be tasked to consider submissions and convene a public hearing where submitters will be invited to attend and make further representations. The Panel will ultimately prepare a report with recommendations for Council, which can be considered at a future meeting date.

It is important that Council officers and its representatives are authorised to be able to enter into without prejudice discussions during the Hearing which may occur to sort through minor matters which may be vented during the Hearing. The minor matters would not include substantive changes to the intent or policy direction being sought by the Amendment or Growth Plan.

Once this process is completed, then Council will be in a position to adopt the Growth Plan and forward the Amendment to the Minister for Planning for approval, subject to any further changes which may result from the panel process.

Council would reserve the right following the recommendations by the Planning Panel to respond.

COMMUNICATION

Submitters have been invited to the Special Council meeting and will also have the opportunity to be heard by an independent Panel appointed by the Minister for Planning.

TIMELINE

The following is a proposed timeline for the next phases of the Colac 2050 Growth Plan project and planning scheme amendment to implement the Growth Plan's key findings.

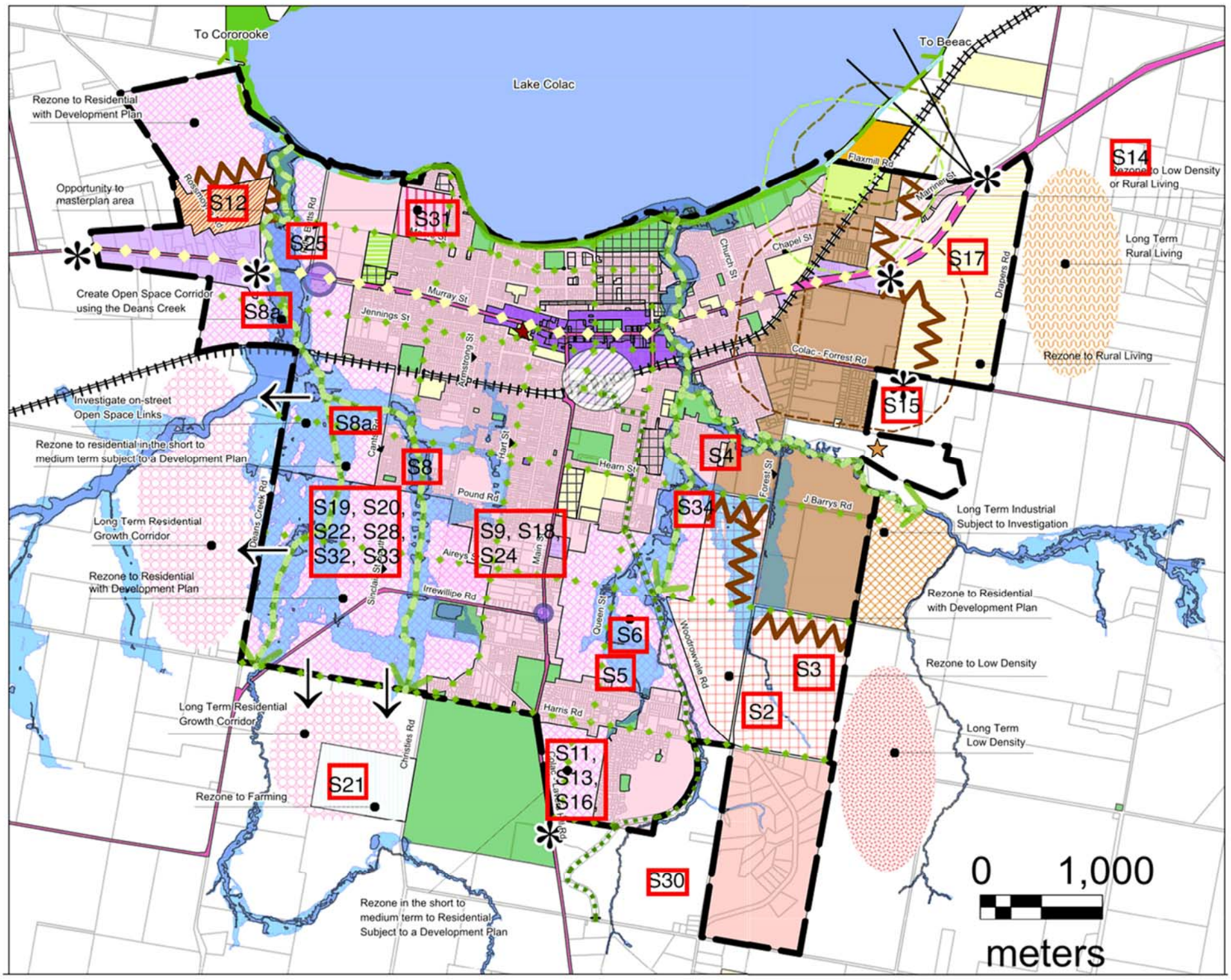
Milestone	Timing
Independent Planning Panel review process	April to May 2019
Report back to Council with Panel Report	July to August 2019
Planning Scheme amendment finalisation	Late 2019

8. OFFICER DIRECT OR INDIRECT INTEREST

No officer declared an interest under the *Local Government Act 1989* in the preparation of this report.

Colac 2050 Framework Plan

Submitter Location Map



LEGEND

- Urban Boundary
- Property Boundary
- Buffer to Industrial Uses to be protected by Development Plan Overlay
- Direction of Long Term Residential Growth
- Enhance town gateways with built form and landscaping
- Protect Views to and from Lake Colac
- Melbourne - Warrnambool Railway Line
- Strategically Important Food Production Plant
- Encourage Botanical Boulevard Treatment for Princes Highway
- Preferred Future use for Employment / Community / Public Use
- Existing Residential Area
- Existing Low Density Residential Area
- Existing Industrial Area
- Existing Non-Core Retail Area
- Existing Retail and Commercial Area
- Existing Public Use
- Existing Open Space
- Heritage Precinct
- Area Subject to Flooding
- Area Subject to Inundation
- Special Use - Abattoir
- Protect 500m Buffer to Abattoir
- Investigate On-road Open Space Links
- Rezone to Farming to Protect Long Term Residential Corridor
- Rezone to Residential Subject to Development Plan
- Rezone to Low Density Subject to Development Plan
- Rezone to Rural Livng subject to a Develoment Plan
- Potential for Infill Housing in Civic, Rail and Health Precinct
- Arterial Road
- Existing Lake Colac Foreshore Open Space Corridor
- Potential Open Space Corridor using Creek and Drainage Lines
- Investigate Open Space Link around the Lake to Cororooke and Beeac
- Investigate extending the Beechy Rail Trail
- Future Rural Living Investigation Area
- Future Residential Investigation Area
- Future Low Density Investigation Residential
- Future Industrial Investigation Area
- Rezone to Rural Living or Low Density subject to Development Plan
- Rezone as Buffer Industrial Zone
- Opportunity to masterplan area near west end of Moore Street
- Potential Local or Neighbourhood Commercial Centre Subject to Investigation
- Water Treatment Plant
- Protect 300m Buffer to Water Treatment Plant
- Protect 500m Buffer to Sawmill
- Potential Regional Open Space and Community Facility

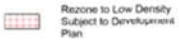
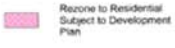
N

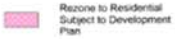
No.	Property	Key Issue / Theme	Submission Overview	Officer Response	Map identifying property location (Zone map and Framework Plan extract)
S/1	N/A	Land affordability	With extension of future residential area into new drained areas under Flood Overlay (FO), questions affordability of land given servicing and construction costs.	The aim of the Colac 2050 Growth Plan is to extend the existing town boundaries to facilitate provision of more residential land over time, including a range of growth area locations with different price point differences. It is considered that this will assist with land supply and affordability. **No change required.**	N/A
S/1a		Impacts associated with building in areas of inundation	Questions: • Ability to locate drainage infrastructure in areas of fill and potential impact of future building foundations and building integrity	The engineering details of drainage works and future construction are matters which are beyond the scope of this Amendment and would be considered as part of future planning and building processes. The general ability to resolve shallow inundation through re-engineering of land has been established through the Colac Stormwater Development Strategy which forms a background document to this Amendment. It is therefore considered technically feasible to locate future housing in some areas which are currently experiencing shallow inundation, subject to further detailed assessment which demonstrates that the land would be flood free.	N/A
		Impact on existing provisions	• impact of Amendment on existing restrictions and planning controls.	The Amendment does not propose any zoning or overlay changes, and is only proposing to change the Framework Plan and relevant local policy framework to support this strategic direction. It is therefore considered that it would not have any specific impacts on existing restrictions or planning controls. **No change required.**	

S/1b	N/A	Greenhouse emissions	Council should consider the greenhouse gas emissions associated with pumping required to service low lying land.	Consideration of greenhouse gas emissions associated with servicing land is not within scope of the Amendment or proposal. **No change required.**	N/A
S/1c	N/A	Timing of drainage works in Deans Creek and Barongarook Creek	Questions how long it will take for Council to complete drainage and fill works in the Deans Creek and Barongarook areas to facilitate the removal of inundation overlays.	The Colac 2050 Growth Plan is a long term strategy which identifies the potential for residential development in some areas subject to inundation associated with the Deans Creek and Barongarook Creek systems. The timing and delivery of drainage works required for future development of land in these areas will be the subject of future stages of planning. It is likely to be delivered over many years, probably a couple of decades, as part of Colac's future growth. Council may or may not be the delivery agent – it is anticipated that most works would be undertaken by developers. **No change required.**	N/A
S/1c	N/A	Use of land by landowners if Council to undertake works	Questions ability of landowners to use land if Council is to undertake works	The details of the location and use of the land is a matter for future detailed design and cannot be determined at this stage of the planning process. It would be anticipated that any works undertaken on private land in Colac would be with the consent of the landowners which would specify details about use of the land at that time. **No change required.**	
S/1c	N/A	Payment of relocation costs	Questions whether Council will pay relocation costs to landowners	This is not a planning matter. **No change required**	
S/1c	N/A	Use of clean fill	• Submits the need for fill to be monitored to ensure that only clean fill is use	This is not a planning matter. **No change required**	

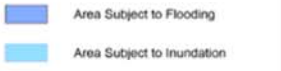
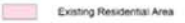
S/1d	N/A	Provision of infrastructure prior to development	Submits Council should ensure that all required infrastructure is provided to areas prior to development and not claim that other authorities will be responsible.	Council cannot deliver infrastructure which is the jurisdiction of other Government departments or agencies. For example, it cannot deliver schools, power, water, or sewerage infrastructure. As part of future stages of planning, detailed assessments of servicing, and infrastructure requirements will be made as well as the requirement / timing of their delivery. **No change required.**	
S/2	286 Forest Street Elliminyt	Proposed rezoning of land to LDRZ in Colac east	Is supportive of the land being rezoned from Farming to Low Density Residential.	Noted. The Amendment seeks to identify the property for future rezoning in the Colac 2050 Framework Plan. No rezoning is proposed as part of this Amendment. Officers to provide submitter with further information. **No change required.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation

S/3	170 J Barry's Road, Elliminyt 3249	Proposed rezoning of land to LDRZ in Colac east	Notes that property is to be changed to Low Density.	Noted. The Amendment seeks to identify the property for future rezoning in the Colac 2050 Framework Plan. No rezoning is proposed as part of this Amendment. Officers to provide submitter with further information. **No change required.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation

S/4	18 Fulton Street Colac	Proposed rezoning of land to LDRZ in Colac east	Supports future rezoning of property to Low Density.	Noted. **No change required.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Rezone to Low Density Subject to Development Plan Colac 2050 Framework Plan annotation
S/5	368 Queen Street, Elliminyt		Supports the decision to rezone land to residential. Plans to subdivide in the future.	Noted. **No change required.** Officers to provide submitter with further information.	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Rezone to Residential Subject to Development Plan  Area Subject to Inundation Colac 2050 Framework Plan annotation

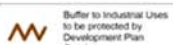
S/6	280 Queen St, Elliminyt		Supports proposal to rezone property from Rural Living Zone to residential and encourage the development plan to be completed as soon as possible.	Noted. **No change required.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation
S/7	Barwon Water		Barwon Water supports amendment C97 and the Colac 2050 Growth Plan.	Noted. **No change required.**	N/A

S/8	130-154 Sinclair St South, Colac	Open space corridor	Request the Colac 2050 Framework Plan be updated to remove the constructed waterway and potential open space corridor on the land to enable subdivision.	The purpose of the dashed green line through the property shown on the Framework Plan is to indicate a potential open space link utilising the creek and major drainage lines. The aim is to enhance the open space network in the town and overall pedestrian and cyclist safety and connectivity, which is part of the overall vision for Colac 2050 to create a highly liveable place with enhanced connectivity and open space. The physical form of the link is not prescribed and could be realised utilising different cross sections, which are to be determined as part of future planning stages. The land in question has a major drainage line traversing through the site, and it is not considered appropriate to remove this from the plan given that it would disconnect two sections of a future corridor and impede the delivery of the strategic vision. **Change not supported.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation
S/8a	95 Cants Road, Elliminyt 315 Princes Highway, Colac 85 Deans Creek Road, Elliminyt 60 Deans Creek Road Colac	Extent of flooding and inundation shown	The draft Strategy indicates that these sites are recommended for re-zoning to Residential Zone subject to a Development Plan. The submitter is generally supportive of this land zoning allocation but is concerned by the extent of land shown as being subject to Flooding and subject to Inundation. The submitter respects that this is a high level document, but requests that appropriate safeguards are put in place within the approved report under Amendment C97 to allow for future investigations to take place on the land to enable a reduction in the areas shown for flooding/inundation. It is submitted that having such extensive areas of flooding ultimately become a burden for Council and the CCMA with regard to maintenance, as such it is in the best	Large areas of the land in question are currently affected by the Land Subject to Inundation Overlay, which is also reflected on the current Colac Framework Plan. The areas of inundation on the Framework Plan and in the Growth Plan similarly use mapping to identify land which is flood or inundation prone under existing conditions. A key aim of preparing the Growth Plan and Colac Stormwater Development Strategy at the same time was to consider the feasibility of developing parts of the land subject to inundation for residential purposes having regard to the shallow depth of inundation in some sections and also the ability to mitigate inundation through stormwater management measures such as constructed wetlands, for example. The Growth Plan acknowledges the ability to develop some of this land	 Zone / Overlay Map with property area

	315 Pound Road, Elliminyt		interests of all parties to work collectively to maximise the developable area while appropriately addressing the flooding issues using the latest and most cost-effective solutions. It is requested that the draft Colac Stormwater Development Strategy (April 2018) be updated to show the flooding and inundation as indicative only and subject to detailed analysis on a case by case basis.	subject to stormwater management measures. However, in order to ensure that this intention is clear on the Framework Plan, it is suggested to include a note on the plan. **Suggested change as follows**: 'the area of inundation shown on the Framework Plan reflects the extent of existing conditions, and may be subject to further refinement as part of future planning and development processes which consider stormwater management measures.'	 Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation
S/9	146 Hart Street, Colac	DPO2 area north of Aireys, west of Main Street	Objects to DPO on land. Acknowledges Growth Plan is important but not when it effects what could happen on your own land. Seeks the removal of the DPO.	The Amendment does not propose to make any change to the existing DPOs in the Colac Otway Planning Scheme – no DPO is proposed to be applied or removed, including DPO2 which currently applies to the submitter's land. The Growth Plan on p28 details existing residential areas which have DPOs in place, including the submitter's property. It notes that no development plan has been approved for this area. It also makes reference to the need to amend the DPO2 in the future to require a shared infrastructure plan and ensure that a development plan is approved prior to subdivision. It is not possible as part of this process to remove the DPO from the property as it would be a transformation of the Amendment (i.e. a change that would substantially alter the planning scheme amendment's purpose). This area still needs a Development Plan Overlay. **Change not supported.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation

S/10	DELWP – Environment	Environmental protection	DELWP strongly encourages the following environmental protection measures be adopted in the amendment: • The creation of substantial vegetation buffers along all waterways to protect and enhance riparian zones. • The use of native vegetation species within riparian zones and along all waterways rather than introduced species. • The use of sediment basins and constructed wetlands for improved management of stormwater and improved water quality of outflows into Lake Colac. • Further flora and fauna assessments to ascertain presence of threatened species, particularly aquatic flora and fauna and zoning to include measures to protect and enhance habitat for these species. • Wide open space corridors or created wetlands along waterways and drainage lines in proposed Residential Zones which are subject to inundation, for example at the entrance of Deans Creek to Lake Colac. • The recommendations contained within Amendment VC154 regarding Water for Victoria - Water Plan, to enable the Victorian planning system to better manage water, stormwater and drainage in urban development be adopted where appropriate regarding planning permit applications that have implications in respect to water, stormwater and drainage management and treatment. This will provide for improved water quality and a reduction in overall nutrient quantities in the water cycle, ultimately benefiting waterways such as Barongarook and Deans Creek (and their tributaries) and waterbodies such as Lake Colac.	Some of the suggested protection measures are already contained within the Colac Otway Planning Scheme and would result in the duplication of provisions. For example, Amendment VC154 was gazetted in October 2018 as part of the Colac Otway Planning Scheme and requires measures to improve stormwater management. Also Clause 12 and 14 in State provisions have similar requirements noted in the DELWP Environment submission. **No change required**.	N/A

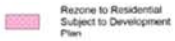
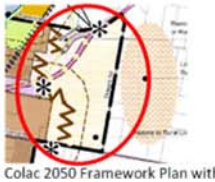
S/11	85 Colac-Lavers Hill Road, Elliminyt	Proposal to rezone to Residential (east of Colac Lavers Hill Road area)	Submits that Colac planning and development needs forward thinking to continue to grow for the future of this diverse area. The submitter strongly agrees with the Amendment C97 as a plan for the future of Colac.	Noted **No change required.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation
S/12	20 Rossmoyne Road, Colac	Rezoning of land in Rossmoyne Road to buffer industrial	The submitter has an interest in the site and opposes proposed rezoning to Industrial 3 Zone (IN3Z), and rezoning of land to north to residential. Submits it will jeopardise their proposed manufacturing investment, which would involve the production of materials which require buffers up to 1km. Notes it is about to contract for purchase of the site. Contends that IN3Z would restrict a number of the proposed uses on their land.	Amendment C97 does not seek to rezone any land as part of this process. The rezoning of the land is likely to be a medium term prospect (5+ years). While a significant investment in Colac would be welcomed, it is also important that strategic planning consider the best future use of the land, particularly if this development does not take place. It is noted that the submitter has not purchased the land to date or lodged any permit application. A permit application would be assessed under the current planning provisions. Initial discussions with the submitter began a number of years ago (2014), and no application has been received to date. It is considered that existing zoning may support the proposed use subject to further detail. It also considered that the Framework Plan is flexible enough to accommodate the proposed use in the short to medium term. This should allow sufficient time for the submitter to lodge an application if the proposal comes	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area 

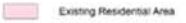
				to fruition. **Change to future rezoning of industrial land not supported.**	 Colac 2050 Framework Plan annotation
S/12	20 Rossmoyne Road, Colac	Rezoning of land in Rossmoyne Road, north of current town boundary	Raises concerns with the rezoning land to the north of the site to residential and the impact on buffer distances to sensitive uses which are likely to be 1km. Proposes that the land immediately to the north could be rezoned to buffer industrial and land further north rezoned to residential.	Amendment C86 which was gazetted in October 2018, implemented the land use outcomes from the *Colac Township: Economic Development, Commercial and Industrial Land Use Strategy*. It undertook a detailed land supply analysis which resulted in the rezoning of 70ha of industrial land in J Barry's Road in the east of Colac. That strategy stated that the main industrial land and growth area for Colac should be to the east next to existing main industrial uses. The addition of industrial land proposed by the submitter is not strategically justified and would result in an excess supply of industrial land at this point in time. The development of the land to the north of the industrial land is considered a long term prospect (15+ given the need to extend services to this area). It is considered that there is merit to identify this area as an investigation area to resolve any need for buffers prior to its formal designation as an area for rezoning (retaining the land in the town boundary). Should the submitter receive planning approval in the short to medium term, rezoning of the land to the north for residential purposes may need to be considered in light of any approved use and buffer requirements. This could be done as part of a future process when there is more certainty in relation to the use and development of the land in this area. **Suggested change as follows:** Amend the Framework Plan in the Colac 2050 Growth Plan and Clause 21.03 Colac 2050 Framework Plan to identify the area identified for residential development in Rossmoyne Road as a 'medium term residential development investigation area'.	

S/13	17 Colac Lavers Hill Road, Elliminyt	Proposal to rezone to Residential (east of Colac Lavers Hill Road area)	Supports the draft Colac 2050 Framework Plan and congratulates Council in identifying the need for land to be rezoned Residential. Considers that it should be a priority by Council to facilitate this rezoning as soon as possible.	Noted. **No change required.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation
S/14	Land bounded by Princes Hwy, Collins Rd, Apollo Bay Rd and Drapers Rd 90 Triggs Road, Irrewarra	Long term rural living in Colac east	Notes that the current proposal for the land is for Long Term rural living. Considers that Council should rezone this, or some of this area, to rural living under the current proposal. Considers that it would be a missed opportunity to rezone an area that is already not viable for traditional farming.	Whilst it is acknowledged that the land in question is used for different purposes and is not generally used for traditional farming, the Framework Plan acknowledges that it may be suitable for long term rural living uses in the long term. It identifies the land west of Drapers Road within an expanded town boundary because of its proximity to the existing town. It is considered poor planning practice to provide for excessive rural living areas because it is generally considered a less efficient use of land. Having said this, it may be that the land is capable of rural living purposes in the medium term subject to further land supply analysis. It is considered that a future strategic planning process can monitor the supply and uptake of rural living land and timing of development in this area, and the timing of the development should not be limited to 'long term'.	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area

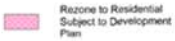
				Change partly supported. Change the Framework Plan notation for the area to the east of Colac noted as 'long term rural living' to 'rural living investigation area'	 Colac 2050 Framework Plan annotation
S/15	70 Colac Forest Road, Yeo	Framework Plan symbol: Town Gateway symbol	Expresses concern that property is directly affected by symbol indicating "Town Gateway", and "Built form and land-scaping" indicated, with no explanation	A number of parts of the existing Colac Framework Plan were carried over into the Colac 2050 Framework Plan including the 'town gateway with built form and landscaping' symbol. It is a symbol in the existing Framework Plan. However the symbol has been applied to other key town entry points on all arterial roads. It could be shifted slightly further north to indicate that it is intended to generally indicate treatment at the town entrance on the arterial road. **Change: Shift location of symbol to align with Colac-Forest Road.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation
S/15	70 Colac Forest Road, Yeo	Framework Plan symbol: Within 500m buffer zone symbol	Property also within 500m buffer zone around the AKD saw mill and explanation for creating such a zone does not appear to be clear.	The 500m buffer visually reflects the buffer distances indicated in the Colac Otway Planning Scheme for sawmills. It is intended to guide the future development of the proposed rural living land to the north of the Colac-Forest Road along with the buffer symbol to industrial uses. The submitter's property is in a farming zone with an existing dwelling and is unlikely to be affected by this notation. **Change not supported.**	 Colac 2050 Framework Plan annotation

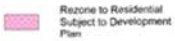
S/15	70 Colac Forest Road, Yeo	Request for residential zoning in Colac east	Submits that the logical direction for long term residential growth should be to the east of Colac, towards Geelong / Melbourne. This would make it easier to commute. Also considers it more amenable than areas to the west.	The Colac 2050 Citizens' Jury considered as part of its deliberation expansion of Colac to the east for residential purposes. They ultimately determined that this area was broadly suitable for rural living land, but not residential. They considered strategic planning principles such as connectivity with the rest of the town, proximity to services, and the need to protect important industrial uses from the encroachment of residential uses and the potential for land use conflict which is associated with this. While it is acknowledged that the submitter's land along with the land to the north is picturesque and closer to the Geelong for commuters, there are other planning considerations which need to be taken into account when considering the land's suitability for residential uses. A major challenge to the east of Colac are the industrial buffers, and also the ability to connect road networks back into town to enable sustainable modes of transport (walking and cycling) for people of all ages and abilities. The submitter's land adjoins land zoned Industrial 1 and could be used for industrial purposes in the long term or could be used for rural living purposes in the long term. It is considered that enough land has been identified as part of the Colac 2050 process to meet supply needs for a number of decades, and that a future process should reconsider the suitability of shifting the boundary at that stage. **Change not supported.**	

S/16	56 Harris Road, Elliminyt	Proposal to rezone to Residential (east of Colac Lavers Hill Road area)	Supports the direction and intent of Planning Scheme Amendment C97 - Colac 2050 Growth Plan, in particular the rezoning of the land on Harris Road to residential, subject to a development plan. The submitter particularly endorses the proposed development for the provision of an essential, safe access road for the existing residential development proximate to the property, as well as for the future liveability and community amenity.	Noted **No change required.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation
S/17	Land bounded by Marriners Street, Triggs Road and Drapers Road	Request for residential zoning in Colac east	Considers the general area noted suitable for residential zoning with great views over Lake Colac and surrounding area, and convenient access to Geelong with new dual highway.	Same response as noted for S14 – request for residential zoning in Colac east.	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area

					 Colac 2050 Framework Plan annotation
S/18	167 Aireys Street, Elliminyt	DPO2 area north of Aireys, west of Main Street – Various references in Growth Plan	Considers the development planning process in this area a waste of resources given the resistance by many landowners in the DPO2 area.	The Growth Plan predominantly refers to facilitating development planning processes in new growth areas (e.g. to assist developing land that is currently rural living). Council does not intend to undertake a development planning process in the submitter's area which was previously attempted but abandoned due to lack of land owner support/agreement. **No change required.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation
S/18	167 Aireys Street, Elliminyt	Description of development plan process	Submits that the Growth Plan on p29 incorrectly reports the reason for resident opposition to the development plan process. States that it was safety and privacy associated with the open space and walkway, and not wanting to develop the land were the primary reasons.	Agree that further explanation could be included in this section of the Growth Plan. **Change supported:** Amend p 29 of Growth Plan to include additional reasons for opposition to the development plan to include safety and privacy associated with the open space and walkway, and not wanting to develop.	

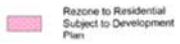
S/18	167 Aireys Street, Elliminyt	Clarification of wording	Refers to Clause 21.03-2 Implementation – Future Strategic Work, and wording in relation to amending DPO2. Considers the wording requires further explanation and is obscure including the words "management of adjoining land uses", "and other requirements as appropriate". Considers the DPO2 area is now out of date given development which has occurred. Requests that a review of the DPO2 boundaries is undertaken, and that the property is removed from the DPO2 area.	The wording of the proposed provisions noted at Clause 21.03-2 relates to amending all DPO2 overlays in areas where no development plan has been approved to ensure that any future development plan process considers matters which are deemed appropriate to assist with the coordination of development across multiple land owners. While it is not supported to change the wording of these provisions, it is acknowledged that the development planning process in the DPO2 area in question was not supported by many of land owners, and that the boundary of this area may need to be revisited as part of any future process. It is therefore considered appropriate to review this particular DPO2 area as part of a future planning process. **Change supported**: Include wording in the Growth Plan, p 29 to note the need to review the DPO2 boundary north of Aireys, west of Main Street to consider the extent of the mapping. Amend Clause 21.03-2 Implementation to include a new line to review the extent of the mapping for the DPO2 area north of Aireys, west of Main Street to consider in particular small lots which have been developed, where appropriate.	
S/18	167 Aireys Street, Elliminyt	Public Notice	Submits that public notice should have been personally addressed as it could have been easily overlooked and binned, and should have been personally addressed rather than to the owner / occupier.	It is a requirement of the *Planning and Environment Act 1987* to provide public notice to land owners if changes are proposed which may affect them. Public notice was undertaken broadly to owners and occupiers as part of this process by direct notice, which goes beyond the statutory requirements under the Act which would normally require a notice in the paper as part of policy change, and not proposed rezoning. While it is understood that personalised mail is preferable, in order to reduce costs associated with the mail delivery to over 12,000 residents, a general addressee was used for owners and occupiers in Colac to assist with the process.	

S/19	194 Sinclair St. Sth, Elliminyt	Proposal to rezone Rural Living / Low Density land in Elliminyt to Residential (west of Main Street area)	Opposes the future subdivision of land near their property for small housing allotments, and would prefer acre lots.	The land in question is considered strategically suitable for future residential over the medium to long term because it is close to existing residential areas and services, and would be serviced with utilities as part of future development (subdivision). The land would only be rezoned to Residential subject to a development plan, and majority land owner consent. The Growth Plan and Framework Plan nominates land to the east of the Colac Lavers Hill Road, as well as land to the north of Pound Road and west of Cants Road as the likely first stage of any future rezoning and residential development. This area noted by the submitter is likely to occur as part of subsequent stages in the medium to long term (15+ years). The Framework Plan and Growth Plan provide the strategic direction and ability for land owners to consider future rezoning, without requiring this. While Council may in the medium term assist with the rezoning process and preparation of a development plan to facilitate the outcome across multiple landowners, the rezoning would be a land-owner led process, and require the general support of land owners to proceed. There is no compulsion to rezone or develop. **Change not supported.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation

S/20	205 Cants Road, Elliminyt	Proposal to rezone Rural Living / Low Density land in Elliminyt to Residential (west of Main Street area)	Submitter opposes the proposal to rezone their area to "Future Residential" in the Colac 2050 Growth Plan and Amendment C97. Purchased their property for lifestyle reasons in an area of similar sized land. Oppose the idea of turning the land opposite their home into a housing estate, and note the lack of sewer connection. Contend that any future rezoning would be met with objections from their street.	Same response as noted for S19- Proposal to rezone Rural Living / Low Density land in Elliminyt to Residential. **Change not supported.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation
S/21	70 Christies Road, Elliminyt	Proposal to rezone to Farming to protect long term residential corridor	Submission notes current Low Density Residential zoning of land, and long history associated with the land including previous application to subdivide land into 69 lots which was refused by Council, , as well as a similar Council refusal for a 19 lot residential subdivision on adjoining land. The refusal for this subsequent application was upheld by VCAT. Considers there is no need to rezone the land given the VCAT decision in 2009, which articulated that the subdivision of the land was premature given the lands relative isolation form other residentially zoned land. Submits that given this situation remains, considers that any application to subdivide the land while the surrounding land is in the Farming Zone would be met with a refusal. Considers that the effects of the VCAT decision are the same as rezoning the land.	The land forms part of a long term growth corridor for residential development. It is currently zoned Low Density Residential, and as a result of the purpose of this zoning, has an expectation that it could be used and subdivided for low density residential purposes. It is therefore considered necessary to rezone to Farming in order to preserve the long term development potential of the land for residential uses. While it is acknowledged that Council and VCAT refused an application to subdivide adjoining land which is part of the land currently zoned low density, this does not mean that an application for less intense development would not be supported given the existing zoning. Rezoning land for residential development is complicated when land is highly fragmented, and it is considered important to preserve the large parcels to facilitate their long term development potential. **Change not supported.** However, it is noted that the graphic on the Framework	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation

			Supports the long term intent for the land to be rezoned for general residential purposes. Request changes to: • Clause 21.03 – delete dot point 1 to rezoned land zoned Low Density residential in Christies Road to Farming Zone to protect its long term use as general residential land. • Amend reference on Framework Plan to "Protect long term residential corridor"	Plan is unclear and should be amended to ensure that it is clear that the land in question is part of the long term residential growth corridor. **Proposed change:** Amend the Framework Plan at Clause 21.03 and in the Colac 2050 Growth Plan, to ensure that it is clear that the land in question is part of the long term residential growth corridor.	

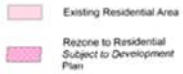
Table continued...

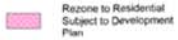
No.	Property	Key Issue / Theme	Submission Overview	Officer Response	Map identifying property location (Zone map and Framework Plan extract)
S/22	248 Pound Road, Elliminyt	Proposal to rezone Rural Living / Low Density land in Elliminyt to Residential (west of Main Street area)	Supports the development of the land to the rear for 8 low density residential lots (for a different zone than recommended in the Framework Plan).	The land in question is proposed to be rezoned for residential purposes, not low density residential. It would be expected as part of any future rezoning that lots would be smaller than one acre, as this would be considered a very large parcel for residential uses, and an underdevelopment of the land given the proximity of the site to the existing residential areas. Same response as noted for S19- Proposal to rezone Rural Living / Low Density land in Elliminyt to Residential. **Change not supported.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation

S/23	EPA	Framework Plan - various symbols and annotations	While EPA provides general support for the Amendment it provides specific comments in relation to the Framework Plan: EPA supports the provision of buffer areas between land used for industrial and residential uses, including low density and rural living zone; but notes that separation distances for industrial uses can vary and depend on the type and scale of activity and the offsite impacts associated with such uses. Care should be taken against providing a 'uniform' buffer via the Development Plan Overlay as this may not capture all risks associated with the use of the land. Planning matters (both permit applications and strategic rezoning) should include a site-specific / localised assessment of local industrial uses and any likely impacts on sensitive uses.	Whilst the Framework Plan shows a symbol to indicate where buffer areas are located, this is reinforced through Clause 21.03-2 Objective 1. It is however recognised that the wording of this objective could be strengthened to reinforce the need to avoid locating sensitive uses within existing industrial buffer areas. **Change recommended**: Amend 21.03-1 Objective 1 to highlight the need to avoid locating sensitive uses within existing industrial and wastewater buffer areas.	 Colac 2050 Framework Plan annotation
S/23	EPA		The Framework Plan indicates that there are existing residential and open space uses located within the buffer of the Abattoir. This is a poor land use planning outcome and while EPA supports recognition of the buffer in the policy, further consideration should be given to what can be done to improve outcomes for residents and open space users. Appropriate planning controls should be applied to ensure that no further sensitive uses are allowed within the buffer zone.	The Framework Plan in relation to the abattoir and adjoining residential use reflects historic land use and development practices. Amendment C86 which was gazetted in October 2018, rezoned the abattoir to Special Use. The Framework Plan symbols reflect the current provisions. Also C86 introduced into Clause 21.03 provisions to discourage the further subdivision of land within the buffer zone area. The current Framework Plan however proposes for Low Density or Rural Living uses within part of this area to the east of the abattoir subject to a development planning process which would explore ways to accommodate the required buffer through means such as building envelopes or the location of non-sensitive uses in this area. This would be explored through a future process. While it is acknowledged that that it is important to avoid locating sensitive uses within these buffer areas, it is also considered important to have a more nuanced approach	 Colac 2050 Framework Plan annotation

				to the development of these areas to avoid their sterilisation through overly onerous planning restrictions. It is considered that a future process should explore via a development planning or master planning process how this area could be developed to accommodate some housing albeit at low densities, and avoid locating sensitive uses in the buffer area. However as noted above Clause 21.03-2 Objective 1 should be strengthened to reinforce the need to avoid locating sensitive uses within buffer areas. The Framework Plan's role is to guide future development and land use and should be read in conjunction with the Growth Plan to provide further clarification.	
S/23	EPA		The long term strategic objective of this notation is unclear. Clarification is needed to set out the intended role of the Farming Zone land having regard to the current and future intended uses of this land and future residential zoned land abutting it.	The land in question in relation to this symbol is detailed in response to submission 21, which proposed to change the reference on the framework plan to improve clarity.	 Colac 2050 Framework Plan annotation
S/23	EPA		The meaning of this notation is unclear, and clarification is needed as to what Council means by 'Buffer Industrial Zone'	The intended zone is IN3Z as a noted in the zone's purpose as a buffer industrial zone. **Change supported**: It is suggested that the Framework Plan annotation be amended to read Industrial 3 Zone or Commercial 2 Zone to avoid confusion.	 Colac 2050 Framework Plan annotation
S/23	EPA		The Framework Plan indicates that there are existing residential and open space uses located within the buffer of the water treatment plant. This is a poor land use planning outcome and while EPA supports recognition of the buffer in the policy, further consideration should be given	The Framework Plan seeks to carry over existing recognition of the buffer to the water treatment as recognised in the current Colac Framework Plan. It is considered an appropriate response to identify the water treatment plant and requirement for the consideration of its buffer. Also, as noted above in response to the	 Colac 2050 Framework Plan annotation

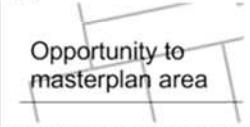
			to what can be done to improve outcomes for residents and open space users. Appropriate planning controls should be applied to ensure that no further sensitive uses are allowed within the buffer zone.	abattoir, the Framework Plan proposes Low Density or Rural Living uses within part of this area subject to the east of the abattoir subject to a development planning process. The same response is provided to this comment as noted above, with regard to the role of the development planning process to consider off site amenity and health impacts as part of this process as a nuanced response to the planning of this area.	
S/23	EPA		Note the proposal to rezone land within the buffer distance to the sawmill (to low density or rural living) and recommend that consideration be given to the potential offsite amenity and health impacts associated with this land use, and whether sensitive uses are appropriate. In principle, it is EPA's position that sensitive uses are not appropriate within buffers to industry that generate offsite impacts and recommend considering non-sensitive uses which may be more suitable in this location.	Response as noted above and the role of the development planning process to consider off site amenity and health impacts as part of this process as a nuanced response to the planning of this area. Also, as noted above Clause 21.03-2 Objective 1 should be strengthened to reinforce the need to avoid locating sensitive uses within buffer areas.	 Colac 2050 Framework Plan annotation
S/24	177 Aireys Street, Elliminyt	DPO2 area north of Aireys, west of Main Street – notice of application of overlay	Submitted that they received no public notice of the application of DPO2 to their land prior to being informed in 2013 when Council undertook the Development Plans Project. Considers that Council should notify landowners of changes to their properties which may affect or impact their land.	It is a requirement of the *Planning and Environment Act 1987* to provide public notice to land owners if changes are proposed which may affect them. No changes are proposed to the zoning or overlay controls as part of this process. Submission is referring to notice of a previous amendment which introduced the DPO in 2008. **Submission noted.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area Colac 2050 Framework Plan annotation

S/24	177 Aireys Street, Elliminyt	DPO2 – Growth Plan Map Reference 5	Submitted they do not benefit from DPO2 because they have road frontage, are not land locked, and could subdivide. Further submit that this would not dis-benefit their neighbours. Request that the boundaries of DPO2 be changed on Map Reference 5 in the Growth Plan to remove their property.	Map Reference 5 in the Growth Plan represents the extent of the existing DPO maps which apply under current planning controls in the Colac Otway Planning Scheme. It would be misleading to change the boundary because it would appear that the overlay did not apply to the land, when in fact it does. However, as noted in response to submission 18, it is recommended that a future process consider the extent of the mapped DPO2 area north of Pound Road and west of Main Street. **Change not supported. However change to Clause 21.03-2 supported as per response to submission 18**	
S/25	290 Princes Highway, Colac west	Future use of land adjacent to Deans Creek & Lake Colac	Owns land north of the Highway and west of Rifle Butts Road. Submits that the low lying land which borders the creek and which is subject to flooding, could be used to create a lake which would become a significant tourist attraction and focal point for Colac. The area covers about 10 acres. Notes that the section of Deans Creek immediately north of the highway was altered back in the 1960's. Suggest this would perhaps restore the low lying land to how it might have been in the early days of Colac's settlement. The surrounding land would be converted into parkland for public use. That part of Deans Creek and adjacent land closer to the Lake is known to have been used by local aboriginal people. Has been in discussion with the State Government and steps are being taken to safeguard those areas of cultural significance. Perhaps in time a facility could be built on elevated land west of the creek which recognizes Colac's Aboriginal history or more broadly, Western Victoria's Aboriginal history. Perhaps a walking track which leads to the middens and the corroboree site could be constructed which could link with the proposed walking track along the foreshore.	Note the proposal and welcome the suggestion to include part of the land for a constructed wetland / lake with parkland for public use. Also welcome the suggestion to explore ways to recognise Aboriginal history, and potential to integrate this with walking tracks. **Change recommended**: Include reference in the Growth Plan to investigate in Colac West on the Deans Creek the potential for a focal point with constructed wetland and Aboriginal focus.	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation

S/26	85 Colac-Lavers Hill Road, Elliminyt	Support proposed rezoning at Ellinyt	Agrees with Amendment C97 as a plan for the future of Colac. Submits that it needs to strengthen and encourage development to provide for Colac's growth and it needs to be delivered in a timely manner	Submission noted. **No change required.**	
S/27	N/A	Bypass of Colac	States that consideration ought to be given to reserving land for a bypass of Colac.	The Colac 2050 Growth Plan was prepared in consultation with VicRoads as the arterial road manager. Council is the statutory authority for local roads, not the arterial road network. As such, it is not Council's role to plan for the expansion of the arterial road network. A bypass of Colac would involve the expansion of the arterial road network. VicRoads have advised that if a bypass were required and funded it would respond to any future direction established by the Colac 2050 Growth Plan at that time. It is not deemed necessary at this stage in planning to identify any potential route. **Change not supported.**	N/A
S/28	250 Pound Road, Elliminyt	Proposal to rezone Rural Living / Low Density land in Elliminyt to Residential (west of Main Street area)	Notes that their property has one acre allotments on either side, and does not support the future rezoning of land to their rear for residential purposes with smaller allotments which could be out of character with the existing and adjoining allotments. Requests that the area remains as low density residential to avoid an eyesore of smaller lots in a lovely area.	Same response as noted for S19- Proposal to rezone Rural Living / Low Density land in Elliminyt to Residential. **Change not supported.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation

S/29		Cost of development in areas of inundation – clarification of 'cost of effective engineering solution'	Submits that currently, land developers are not attracted to Colac due to the high development costs and lower sales prices. Costs for engineering solutions will make developments unfeasible and stifle growth. The plan needs to clearly outline what a "Cost effective engineering solution is", and how these costs can be shared with Council.	It is not the role of the Growth Plan to provide all the detail required to enable growth. The *Colac Stormwater Development Strategy* background document will also become Council adopted Strategy, and provides detail about implementation of stormwater measures. It will be used to inform future shared infrastructure plans or Infrastructure Contribution Plans as part of the next stage of planning. As part of this, Council's role in contributing to any infrastructure upgrades will be explored. Cost effective implies that any financial implications associated with stormwater measures need to be reasonable and within the means of parties to pay as part of the development process. **No change supported.**	N/A
S/29		DPO2 areas and shared infrastructure plans	The plan needs to provide a case study example on how shared infrastructure plans will operate, and clearly outline how Council will contribute. There is currently no expertise in Council around this.	It is not the role of the Growth Plan to include case studies to explain how share infrastructure plans could operate. Council is currently active in assisting with the preparation of development plans in Colac, and will continue to do so. There may be benefit in preparing information about how they operate for publication on Council's web. **Change not supported.**	
S/29		Extent of sewered area	There is an underlying question as to why Barwon Water has not extended the sewer area in response to the 2007 Structure Plan i.e. Colac West. How does this plan trigger change? This is a major constraint that brings much uncertainty.	Barwon Water have advised that they have a system in place in facilitate the servicing of multiple lots where either some or all of the cost of the sewer infrastructure is borne by them. This will be explored in further detail as part of future stages in planning **Change not supported.**	
S/29		Community infrastructure	A clearer link between the increase in population growth and infrastructure requirements in different growth areas is required. i.e. what specific community infrastructure is required in Elliminyt to support the growth in that area?	A community infrastructure plan was prepared as a background document to inform the Colac 2050 Growth Plan. The details of this are documented in the Colac 2050 Background Report, and highlights are also noted in the draft Colac 2050 Growth Plan. Whilst some recommendations were made in relation to the provision of open space, and the consolidation / modernisation of early education facilities, no specific recommendations were made. Further details of this can be explored as	

				part of the implementation of the Growth Plan as it progresses into precinct / growth area plans. **Change not supported.**	
S/29		Urban design and subdivision	Supports a local policy to minimise court bowls and promote connectivity.	Noted.	
S/29		Green corridors	The emphasis is on the "Dean's Creek Corridor". More emphasis should be on the Barongarook Creek corridor and linkages to the garden and lake.	The Framework Plan highlights both creek corridors and more fully calls for the Botanic Link to utilise the creek corridors and lake. Also, the Deans Creek is largely undeveloped, so the Growth Plan identifies this area as a growth corridor to enable the realisation of the vision of the botanic link. It is considered necessary to emphasise this because of the significance of this area to the overall vision, and delivery of future residential land supply. **Change not supported.**	
S/29		Rossmoyne Road area	This proposed development area is isolated and disconnected from the town. Maybe it should be a 'long-term investigation area' rather than a "possibility to rezone." This is contrary to the 'Urban Growth Concluding remarks' that states "all development should integrate with the existing township rather than separate areas."	Whilst it is considered that in the long term this area could be developed, it is conceded that the area is currently isolated from the broader township. As noted in response to submission 12, it is considered that the annotation which relates to this area could be amended in order to this area as a 'medium term residential development investigation area'. **Change supported as noted in response to submission 12.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area

S/29		Housing renewal opportunity	Rather than a introducing a Master Plan at Colac West, consider a transition plan to promote this area as high-end residential. This will link in with the 600+ new homes along the lake to Deans Creek. The existing Commission area could transition to another area identified in the plan.	It is considered that a master planning process with relevant stakeholders and residents could explore different housing options, options to improve amenity and street connections. An implementation could be prepared as part of this process which could assist with some of the matters raised by the submitter. It is not considered necessary to predetermine the details of the master planning process at this point in time as part of the Growth Plan or Amendment. **Change not supported.**	 Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation
S/29		Industrial land in Colac east near Lake	Considers this area prime long-term residential land which could provide for 1000-1500 homes as part of a 100+ year vision to revitalise the town. Acknowledges huge existing capital investment but considers that as a long term vision it should be explored.	It is not considered realistic or feasible to speculate the relocation of the abattoir or waste water treatment plant at this point in time. As recognised by the submitter, their relocation would involve significant capital investment which is unlikely. It is poor planning practice to identify residential development next to areas of industrial activity or important infrastructure where potential land use conflict could occur. **Change not supported.**	
S/29		2050 Implementation plan	Strongly advocate for shared infrastructure plans for existing DPO2 areas with a DP – this is currently absent. The Council needs a dedicated officer for the implementation plan, with expertise in this area, should be pro-active and pro-development, and ensure that Barwon Water extends sewer district, and consider for Council to develop land to put money back into the community and infrastructure projects. .	The implementation of the Colac 2050 is considered a priority for Council, subject to its adoption. **No change to the Amendment or Growth Plan required.**	

S/30	Land between Colac-Lavers Hill Road, Florence Road, and Forest Street South		Supports the idea of further low density and rural living land to the south of Colac. Support the concept of extending the Beechy Rail Trail, and would support the inclusion of this area from their land as public open space. Is seeking the inclusion of their land for rural living purposes between Colac-Lavers Hill Road, Florence Road, and Forest Street South in the Growth Plan. Consider the land has the potential to fill the gap between the existing low density to the east through to the southern border at Holts Road.	It is agreed there is an opportunity to include part of this land to geographically link the low density areas to the east and provide for further extension of the Beechy Rail Trail. It is therefore supported that part of this area be included within the township boundary for rural living or larger low density purposes – the zoning and minimum lot sizes should be considered as part of a future planning process. However the land in question is steep as indicated by the Erosion Management Overlay which applies to the land, and includes the high power transmission line further south. Whilst some additional land is considered justified to include in the Framework Plan, it is not supported to include all of the land put forward in the submission, given that the Framework Plan identifies land to the east for rural living and low density purposes. There is a planning requirement to provide sufficient residential land supply, however there is no similar requirement to provide for low density and rural living areas. Furthermore it is considered poor planning practice to provide excessive areas for these purposes. Whilst the balance of the land may be suitable for rural living or similar purposes in the long term future, it is considered that the balance area identified in the submission should be excluded at this point in time. An analysis in the future as part of a future structure plan process can consider overall lot supply and demand to determine if additional rural living or low density land is warranted. **Change partly supported.** Include part of the submitter's land which directly abuts the residential land to the east and identify this as 'rezone to rural living or low density subject to development plan' (i.e. exclude land which is further south).	 Zone / Overlay Map with property area identified in the submission , also showing high power transmission line easement area in lower part of property.  Colac 2050 Framework Plan with property area identified in the submission.  Part of the area of land supported for inclusion in the urban boundary

S/31	Donaldson Street, Colac	Co-housing and provision of improved open space / community facilities in the Donaldson Street area.	Raises concerns about the street layout and provision of open space in the Donaldson Street area, with the suggestion for improved open space and community facilities, with the potential for housing models such as co-housing in the area to address social and educational issues.	The Growth Plan nominates this area as an area for future master planning in collaboration with the residents and Department of Health and Human Services given the high proportion of public housing in the area. Council is in the process of acquiring land from the State Government for community / open space purposes on the former Colac High School site immediately to the west, and connections into the area will be improved with the development planning of land to the west and extension of Moore Street. It is considered that broader social issues are beyond the scope of the Growth Plan, as are specific housing models such as co-housing which could be explored as part of future stages of planning, in development applications. **No change required.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area  Colac 2050 Framework Plan annotation
S/32	195 Cants Road, Elliminyt	Supports rezoning of rural living land, but not residential density	The submitter supports the development of the land for one acre allotments however does not support the future rezoning of the land in the area for residential development.	Same response as noted for S20- Proposal to rezone Rural Living / Low Density land in Elliminyt to Residential. **Change not supported.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area

					Rezone to Residential Subject to Development Plan Colac 2050 Framework Plan annotation
S/33	200 Cants Road, Elliminyt	Seeking rezoning to LDRZ	Is seeking the site specific rezoning of the land for Low Density Residential, and states the Growth Plan fails to consider the unconstrained nature of this area.	Same response as noted for S20- Proposal to rezone Rural Living / Low Density land in Elliminyt to Residential. **Change not supported.**	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area Rezone to Residential Subject to Development Plan Colac 2050 Framework Plan annotation

S/34	70 Hearn Street, Colac	Supports amendment	The proposed amendment includes the outcome proposed by the submitter in their submission to earlier rounds of consultation and thanks the Council for listening, and incorporating their feedback. Supports Amendment C97.	Noted.	 Zone / Overlay Map with property area  Colac 2050 Framework Plan with property area Rezone to Residential Subject to Development Plan Colac 2050 Framework Plan annotation
S/35			No objection to amendment.	Noted	

21.03 SETTLEMENT

26/10/2017 C86 Proposed C97

21.03-1 General

11/09/2014 C75 Proposed C97

Overview

- Colac is the major regional centre in the Shire for residential, service and manufacturing industry, retail, office services, recreation and education facilities.
- Apollo Bay is the major coastal urban centre in the Shire. It is experiencing high rates of development for both permanent and short-term (tourist) accommodation. It also provides a range of entertainment and recreational related facilities, including swimming, fishing, golf, cafes and restaurants.
- Colac and the coastal townships are experiencing increased rates of development.
- Colac is a targeted growth node in the *G21 Regional Growth Plan.*
- The management of residential, tourism and infrastructure development pressures is required, particularly in coastal areas.
- ~~The development of the major towns in the Shire should take place in accordance with the recently completed Structure Plans for Colac and Apollo Bay.~~
- Smaller coastal settlements occur at Kennett River, Marengo, Separation Creek, Skenes Creek and Wye River, where development is expected to occur within current settlement boundaries due to various environmental constraints to growth.
- Other townships are located at Alvie, Barwon Downs, Beeac, Beech Forest, Birregurra, Carlisle River, Coragulac, Cororooke, Cressy, Forrest, Gellibrand, Lavers Hill, Pirron Yallock, Swan Marsh and Warrion.
- The future development of other townships in the Shire should proceed in a manner that contributes to the economic development of these townships, acknowledges and responds to environmental constraints and protects the broader landscapes within which these townships are located.
- Effluent disposal is a major problem in the smaller settlements, particularly in the peak periods with high tourist numbers.
- Rural residential living provides a desirable lifestyle for a number of residents and if appropriately located can reduce land use conflict in farming areas and contribute toward the economic development of ~~small~~ townships.
- The Rural Living Strategy 2011 ~~has~~ and the Colac 2050 Growth Plan have identified and designated suitable locations for rural living areas which do not take up high quality agricultural land and where an adequate level of services can be provided.
- The Rural Living Strategy highlights the role of small townships in accessing rural living land.
- A number of settlements have been identified with potentially suitable locations for additional rural living and township development subject to further investigation including Beech Forest, Gellibrand, Forrest, Alvie, Cororooke and Beeac.
- A number of de facto rural living areas have developed over a number of years on old subdivisions within the localities of Barongarook – Bushby's Road, Barongarook – Robinson Road, Barongarook – Everett Crescent, Barramunga, Bungador, Cororooke – Langdons Lane, Grey River, Irrewarra – Pyles Road, Johanna, Kawarren, Marengo – Alice Court, Petticoat Creek, Warncoort and Weeaproinah.
- A number of largely undeveloped, old and inappropriate subdivisions unsuitable for development are found within the Shire abutting the township boundaries of Cressy and Pirron Yallock and in the localities of Gerangamete and Irrewillipe – Swan Marsh-Irrewillipe Road.

- There is a need to encourage excellence in the design of new development, including the layout of subdivisions and the recognition of cultural heritage.
- New urban development should be supported by the provision of or upgrade of public open space to meet the needs of the community it is to serve.

Objectives

- To facilitate the development of the various settlements in the Shire in accordance with the needs of each local community.
- To facilitate a range of developments in an environmentally sensitive way to provide greater residential choice.
- To direct rural residential and small town development to preferred locations.
- To provide limited opportunities for rural living development where these do not detract from the key environmental qualities of the region and do not cause land use conflict in farming areas.
- To minimise ad hoc development of unserviced old and inappropriate subdivision in the Farming Zone.
- To provide for and improve public open space to meet the needs of the community.

Strategies

- Develop major towns in the Shire in accordance with relevant structure plans.
- Ensure that there is sufficient fully serviced residential land to meet the needs of the existing and future population.
- Encourage future residential development into existing zoned and serviced areas to avoid an oversupply of residential zoned land and to make the most effective use of infrastructure services.
- Provide opportunities for the provision of a wide range of housing choices for residents, short-term holiday residents and tourists.
- Contain Ddevelopment within rural living areas ~~should be contained within~~to land within the existing Rural Living Zone ~~land~~ or as identified in the Colac 2050 Growth Plan, and discourage further subdivision in areas other than Colac/Elliminyt. ~~other than in Elliminyt, should be discouraged.~~
- Restructure existing lots in old and inappropriate subdivisions in Cressy, Gerangamete, Pirron Yallock and Irrewillipe in order to minimise development, retain the land in agriculture, prevent further servicing problems and avoid ad hoc development outside designated settlement boundaries.
- Ensure that development incorporates Environmentally Sustainable Development (ESD) practises.
- Promote a pattern of settlements in the coastal strip that balances between opportunity for growth and retention of environmental and cultural qualities.
- Restrict the expansion of other coastal settlements in accordance with environmental constraints.
- Ensure that development of the Colac and Apollo Bay airfields is not prejudiced by encroaching urban development.
- Ensure the provision of public open space meets the needs of the communities it is to serve by improving access, facilities and presentation.

21.03-2 Colac

~~26/10/2017 C66~~Proposed C97

Overview

Colac is the main town in the Colac Otway Shire and is identified as a growth town in the *G21 Regional Growth Plan.* It is located on the southern banks of scenic Lake Colac and is

the largest service centre between Geelong and Warrnambool on the Princes Highway, about an hour travel time by either road or rail.

The town is the major provider of regional services in Colac Otway and also has a thriving manufacturing sector with regionally important companies such as AKD, Bulla Dairy, and the Australian Lamb Company.

It has a strong historical character and sits within an important cultural landscape for Aboriginal people. Before European arrival, Colac was known as "Kolak" or "Kolakgnat" which means 'belonging to sand' to the Gulidjan People of the Eastern Maar Nation. Ownership and custodianship of these areas spans thousands of years and is still present today.

Colac is central to a growing tourism industry being located at the gateway to the Otways, Great Southern Coast, and the Volcanic Plains disctrict to the north. It is home to beautiful heritage buildings, tree lined streets, famous Botanic Gardens, and expanding leisure trails including the Beechy Rail Trail. It is planned to develop Colac as a 'Botanic Garden City' with themed tree planting throughout the CBD, linking the Botanic Gardens, Beechy Precinct, and Barangarook and Deans Creek corridors.

Key Issues and Influences

- State and regional policies identify Colac as a population growth node in the Great Ocean Road and G21 regions.
- Colac's rural landscape setting is important and views of Lake Colac, Red Rock, and the foothills of the Otways are significant features of the town.
- Lake Colac is a significant natural feature in Colac and is an important environmental, cultural heritage, aesthetic, and recreational feature for the community. Its protection is paramount.
- The Deans Creek and Barongarook Creek systems have a propensity to flood in low lying areas putting constraints on development in these areas.
- Current climate forecasts suggest that water will be a key challenge for Colac into the future with higher average temperatures, reduced annual rainfall, and more extreme weather events.
- Colac has an ageing population and high levels of relative socio-economic disadvantage.
- Colac lacks diversity in housing type.
- Colac's heritage assets and Aboriginal cultural heritage are highly valued by the community.
- The development of Colac as a 'Botanic Garden City' is a key priority to improve the amenity and liveability of the town.
- The open space network, including the pathway network, lacks quality, diversity and connectivity.
- Open space in parts of Colac is difficult to access, and is poor in parts of west Colac and Elliminyt.
- Active transport opportunities are a priority for Colac.
- The CBD has capacity for consolidation and the development of upper level accommodation, taking into account heritage constraints, which would increase activity and vibrancy in the area.
- Local commercial centres may be required in Elliminyt and west Colac as these areas grow.
- Colac's industrial areas are important economic assets for the town.

Urban Growth, Accommodation and Housing

Objective 1

- To support and manage the growth of Colac consistent with its role as the major urban centre of the Colac Otway Shire and a targeted growth node in the G21 region.

Strategies

- Ensure that the development of Colac is consistent with the strategic directions shown on the Colac Framework Plan.
- Facilitate a more compact urban form for Colac and avoid linear sprawl along the Princes Highway.
- Support applications to rezone land to General Residential, Low Density Residential or Rural Living, only in accordance with the Colac Framework Plan and where accompanied by a Development Plan Overlay which sets out requirements for the orderly staging and development of the land, coordination of infrastructure, a shared infrastructure plan, management of adjoining land uses and ~~the need for~~to avoid locating sensitive uses within existing industrial and wastewater buffer areas ~~buffers~~, and other requirements as appropriate.

Comment [SB1]: In response to EPA submission – S23

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Objective 2

- To ensure future housing and residential subdivision complements the character and population characteristics of Colac, and incorporates principles of sustainabilily, community health and safety.

Strategies

- Encourage medium density development in the Colac CBD, within 400 metres of any other activity centre, and around areas of public open space.
- Encourage the provison of apartments in the Colac CBD to facilitate a wider range of accommodation options.
- Ensure new development incorporates sustainability principles including street connectivity, water conservation, stormwater treatment and reuse, energy conservation, and minimising bushfire risk.
- Require new development to consider principles of Crime Prevention Through Environmental Design (CPTED) and Healthy by Design.
- Encourage urban design treatments in new development to reflect the regional character of Colac including space between buildings.

Implementation

Future strategic work

- Rezone land zoned Low Density Residential in Christies Road to Farming Zone to protect its long term use as general residential land.
- Rezone land zoned Industrial 1 Zone in Colac west to Industrial 3 Zone to facilitate its ongoing use for industrial purposes, and provide a buffer with less intensive industrial uses next to planned residential land to its north.
- Review the extent of the Development Plan Overlay Schedule 2 for the area north of Pound Road and west of Main Street to refine the mapped boundary to exclude small lots which have been developed where appropriate.
- Amend the Development Plan Overlay Schedule 2 in Colac to ensure that it does not allow subdivision prior to the preparation of a development plan, and sets out requirements for the orderly staging and development of the land, coordination of infrastructure, a shared infrastructure plan, management of adjoining land uses and

Comment [SB2]: Proposed insertion in response to Submission 18

the need to avoid locating sensitive uses within ~~for~~ buffer areas~~s~~, and other requirements as appropriate.

- Investigate the need for a neighbourhood activity centre to service new population in Colac west.
- Prepare a precinct plan in collaboration with VicTrack, Colac Area Health, other relevant State Government agencies, and the community for land around the Colac station and Colac Otway Performing Arts and Culture Centre, Colac Area Health facilities for diverse housing, short term accommodation options, and other compatible uses.

Comment [SB3]: In response to EPA Submission S23

Economic Development and Employment

Objective 1

- To encourage investment and foster economic development opportunities in Colac and surrounds.

Strategies

- Retain and further develop existing businesses that meet existing and new market opportunities in retail, commerce and industry.
- Encourage innovative industries and support industry sectors based on the region's strengths.
- Investigate the opportunities and viability for the development of an intermodal freight facility for transport and logistics purposes in the Colac region.
- Designate land in Elliminyt and Colac west for a future commercial node.

Objective 2

- To consolidate the CBD as the primary commercial centre in Colac with a diverse mix of uses and development that enhance its appearance, funcationality and vibrancy.

Strategies

- Ensure major retail and commercial developments locate within the Colac CBD (Commercial 1 Zoned land only) rather than outside the town centre.
- Ensure that the development of the Colac CBD is consistent with the strategic directions shown on the Colac CBD Framework Plan.
- Ensure that those retail and commercial land uses that are essential to a 'town centre' role are located in the CBD.
- Facilitate development that includes short stay accommodation which can service the tourism and visiting worker markets.
- Encourage office accommodation in Colac's commercial areas for small to mid-sized businesses that provide services to the surrounding region.
- Encourage other forms of development in the CBD that contribute to its role as a regional centre including visitor accommodation and community, entertainment and cultural facilities.
- Discourage the development of an out of town neighbourhood centre unless it is required as part of the Deans Creek Growth Area, or the expansion of the existing local centre in Elliminyt.
- Encourage light industrial, transport and logistics operations, bulky goods and restricted retailing located in the CBD, to relocate to land zoned Commercial 2 or industrial areas as appropriate.

- Retain heritage places and areas as significant components of Colac's character and attractiveness and encourage their adaptive re-use and restoration including by supporting innovative uses that attract visitors and customers into disused retail areas.
- Manage the shift in retail focus between Murray Street and Bromfield Street by supporting the development of a permeable network of active pedestrian thoroughfares in the form of laneways and arcades that link these precincts.
- Encourage redevelopment of underused or vacant sites (e.g. surface car parks, vacant land at the rear of buildings, upper levels of single storey buildings) in the CBD.
- Encourage the upgrading of shopfronts and building facades in the CBD, particularly on Murray Street and around Memorial Square.
- Encourage the removal of excessive roof top, above verandah and free standing signs, and other visually dominant signs, as sites are redeveloped.
- Encourage new development to provide an active frontage to the streetscapes and car parks, including the provision of active frontages to Bromfield Street for buildings fronting Murray Street.
- Encourage the reinstatement of verandahs on older buildings and encourage verandahs on new buildings for weather protection.
- Encourage new development within the CBD to incorporate Environmentally Sustainable Design (ESD) initiatives.
- Maintain the 'fine grain' character of inner retail areas.
- Create landscape links between the main activity areas of the CBD and its principal open spaces.
- Support new development that contributes to a pedestrian-focussed, accessible and well-connected public realm, particularly for those with limited mobility.
- Provide adequate car parking to cater for commercial development consistent with the Colac Commercial Centre Parking Precinct Plan 2011, recognising that opportunity exists to take advantage of underutilised street parking and shared off street parking.
- Ensure new development in the hospital precinct of the CBD provides on site parking to meet projected demand and does not contribute further to on street parking pressures.

Objective 3

- To recognise the important economic contribution of Colac's industrial businesses and the need to protect their ongoing viability by ensuring they are appropriately located and clear of encroachment by sensitive uses.

Strategies

- Apply site specific controls for key industrial uses such as Bulla, AKD and ALC to streamline planning processes and encourage investment.
- Provide an open space or landscaped buffer between Colac's industrial areas and Colac's new urban areas to ensure that the ongoing operations of industrial uses are not compromised.
- Identify an area for long term industrial use subject to investigation next to existing industrial land in Colac east.
- Ensure that an adequate supply of large allotments (greater than 5 ha) are available for industrial development to encourage investment and meet the future needs of industry.
- Discourage any additional or new industrial development adjacent to Lake Colac on land which is not zoned industrial.
- Encourage new industrial opportunities in Colac's eastern industrial areas for a diverse range of light to general industrial activities.

- Discourage the subdivision of residential land within any relevant EPA threshold distance of Australian Lamb Company such as noted in EPA Publication 1518 Recommended separation distances for industrial residual air emissions (March 2013) to minimise future amenity conflict issues.
- Discourage further subdivision of land below 5 ha in Colac's eastern industrial areas to ensure sufficient supply of land for large scale industrial development.

Objective 4

- To improve the amenity and appearance of industry from public viewing areas.

Strategies

- Ensure that new industrial development is well designed and will enhance the amenity and visual appearance of industrial areas.
- Improve the appearance of existing industrial development in Colac to provide more attractive and inviting entrances to the town.

Implementation

Future strategic work

- Investigate the opportunities and viability for the future development of an intermodal freight facility for transport and logistics purposes in the Colac region.
- Monitor the rate of retail and office development in Colac to make sure that development opportunities that exist are being realised.
- Undertake urban design improvements for the enhancement of the Colac CBD through implementation of the Colac CBD and Entrances Project.
- Monitor the rate of industrial landdevelopment in Colac to make sure that development opportunities that exist are being realised.

Cultural Heritage, Sustainability and Environment

Objective 1

- To acknowledge, recognise, protect and celebrate Aboriginal culture, story, and areas of cultural significance.

Strategies

- Encourage a strong working relationship and consider the views of the Eastern Maar, Guilidjan and other Aboriginal community members in the planning of Colac.
- Develop and apply best practice approach to engagement and cultural heritage management with Traditional Owners/Registered Aboriginal Party.
- Ensure Aboriginal cultural heritage is appropriately managed, significant places are protected, and important artefacts are returned to the local Aboriginal community.
- Consider opportunities to celebrate and promote Aboriginal language, and celebrate Aboriginal history and stories in the development of Colac's open space network and the naming of future places, street names and infrastructure.

Objective 2

- To recognise and protect key views which form an important feature of Colac's character.

Strategies

- Retain the Farming Zone outside the urban boundary to protect rural land and vistas from urban encroachment.

- Ensure land use activities within the Farming Zone retain an agricultural focus and preserve the rural, environmental and landscape qualities of the area.
- Encourage planting on properties along the eastern and western entrances to Colac, particularly where it has potential to screen industrial activities.
- Improve the outer approaches to Colac with new landscaping, framing views to Lake Colac and reduce the visual clutter of advertising signage.

Objective 3

- To protect, rehabilitate, enhance, and interpret Colac's environmental attributes so that future generations may enjoy them.

Strategies

- Ensure new development will enhance and preserve the health of Lake Colac, Deans Creek, Barongarook Creek and their environs.
- Implement the Colac Stormwater Development Strategy and ensure that stormwater management and drainage solutions are coordinated across developments to improve the flooding situation in Colac and the quality of water entering Lake Colac.
- Require new development in Colac to integrate with the water cycle to enhance stormwater management, ecological values, provision of public open space, and management of cultural heritage values.
- Improve integration between Colac, Lake Colac and key activity areas through design features, recreational linkages and foreshore development.
- Require thematic tree planting consistent with the Botanic Garden City theme, so as to link the CBD, Botanic Gardens, Beechy Precinct, and Barongarook and Deans Creek corridors, for all new development in any of these areas.

Objective 4

- To consider opportunities for climate ready actions and integrate risk based planning in future development proposals to minimise the impacts of climate change.

Strategies

- Consider climate change impacts in future development and explore how carbon neutral status and adaptation can be achieved.
- Strengthen and promote water recycling and reuse.

Implementation

Future strategic work

- Prepare a cultural heritage strategy for the Colac region to improve understanding of local Aboriginal culture and stories, inform future development and management of culturally significant areas.
- Engage with the community to identify important view corridors and landscape elements, including views of Lake Colac and views from Colac's eastern entrance, and protect with appropriate planning controls.
- Implement the Colac Stormwater Development Strategy 2018 to provide guidance for the management of stormwater in Colac.
- Develop concept designs for the 'Botanic Link Pathway' and stormwater facilities identified in the Colac Stormwater Development Strategy 2018 to assist with a future shared infrastructure contributions plan.
- Develop a significant tree register for Colac and protect through appropriate planning controls.

- Revise flood mapping for Colac to reflect changes in flood risk as areas are developed with urban development and flood mitigation measures are installed.
- Undertake and implement a strategy for the co-ordination and design of all signage along the eastern and western entrance corridors to Colac.

Infrastructure

Objective 1

- To provide enhanced levels of unencumbered public open space in the town to cater for passive and active recreation needs of the community.

Strategies

- Support an increase in the amount of usable public open space (both linear and non-linear) to support recreational land uses and linkages between activities.
- Explore the potential of developing a neighbourhood park on the Irrewillipe Road Basin Reserve.
- Improve and enhance the pathways along Barongarook Creek.
- Provide for a minimum additional 8 hectare reserve in the Deans Creek corridor to service lower profile sports.
- Ensure that new pathways and open spaces are delivered as part of the development of the Deans Creek Growth corridor.
- Investigate opportunities to extend the pathway network around Lake Colac to link Cororooke and extend to the east towards Beeac.

Objective 2

To ensure physical and community infrastructure is adequately provided to service population growth and meet the needs of the local and surrounding population to promote well-being.

Strategies

- Ensure that physical and community infrastructure is adequately funded and provided as part of future development by requiring shared infrastructure plans which identify appropriate infrastructure contributions.
- Improve and expand organised sports facilities at the Golf Club/Turf Club site.

Objective 3

- To provide an improved transport and movement network, including pedestrian and cyclist linkages.

Strategies

- Ensure that the the 'Botanic Link Pathway' and on-street shared path sections are delivered as part of future development.
- Provide new and improved bicycle lanes.

Objective 4

- To protect important infrastructure assets from potentially conflicting development.

Strategies

- Ensure that land use and development within the buffer area to the Colac Water Reclamation Plant will not detrimentally affect or restrict the ongoing operations of the Plant.

Implementation

Future strategic work

- Develop concept designs to guide the location and provision of open space corridors and trails as part of the implementation of the "Botanic Link Pathway" network.
- Undertake enhanced recreation and pathway connections particularly around Lake Colac, the Deans and Barongarook Creeks, the Beechy Rail Trail, and connecting important community uses.
- Investigate and identify the alignment of the Old Beechy Rail Trail.
- Investigate opportunities for open space at the former High School site.

Colac Otway Structure Plan, 2007

A Structure Plan for Colac was adopted by Council (February 2007) and articulates the preferred development future for this key centre of the municipality and broader region. Key issues to emerge from the Structure Plan include the need for:

- A township boundary to clearly identify the extent of future development and enable the protection of valuable farming land that surrounds the township.
- Consolidation around the town centre and activity nodes taking into account heritage constraints.
- Provision of a secondary commercial node to cater for the growing area of Elliminyt.
- Retention and enhancement of Colac's heritage assets.
- Protection of Lake Colac from inappropriate industrial development.
- Provision of an adequate supply of industrial land consolidated in east Colac.
- An increase in the amount of public open space (both linear and non-linear) and development of policy direction supporting future open space provision for residential development.
- Better integration between Colac and Lake Colac through design features and foreshore development.
- Increased opportunity for recreational linkages between key activity areas including Lake Colac.
- Urban design improvements for the enhancement of the Colac Town Centre and main street.
- Improved traffic management in Colac.
- Strategies to create a precinct to focus community learning through a multi-purpose education, recreation and community precinct.
- There is a need to identify a heavy vehicle by-pass of the Murray Street retail centre.

Colac CBD and Entrances Project, 2012

The *Colac CBD and Entrances Project (2012)* outlines proposals for the enhancement of Colac's CBD and its eastern and western entrances which focus on the design of buildings and spaces.

The Plan's key recommendations are to:

- Develop Colac as a 'Botanic Garden City' with thematic tree planting throughout the CBD, linking the Botanic Gardens, Beechy Precinct and Barongarook Creek corridor.
- Improve the eastern entrance to the CBD with enhanced landscaping and views to heritage buildings, widened pedestrian pathways over the Barongarook Creek bridge and improved visibility to the Visitor Information Centre.
- Enhance priority streetscapes: Improve Murray Street West's streetscape with tree planting and other works, continuing the design theme of the central part of Murray Street. Improve Bromfield Street's streetscape with new tree planting, improved pedestrian access, bicycle lanes and the redevelopment of underused land at the rear of Murray Street shops with improved pedestrian links through to Murray Street.

~~Upgrade Memorial Square's western edge with refurbished amenities and a shared space where pedestrians have priority which could ultimately be extended around the park and south along Gellibrand Street to the Station. Improve Murray Street East's streetscape with road side tree planting, upgraded footpath pavement, pedestrian crossings and street furniture, and infill planting where gaps exist.~~

- ~~Improve the outer approaches to Colac with new landscaping, framing views to the Lake and emphasis on reducing the visual clutter of advertising signage.~~
- ~~Improve the laneway network.~~
- ~~Provide new and improved bicycle lanes.~~
- ~~Apply built form guidelines to the CBD with emphasis on the inner retail areas to maintain the 'fine grain' character of these areas and to ensure a high quality of new architecture and the protection of heritage buildings.~~

~~Colac Township Economic Development, Commercial and Industrial Land Use Strategy, 2017~~

~~Colac Township Economic Development, Commercial and Industrial Land Use Strategy, 2017 provides guidance on the future economic development opportunities in Colac, and a framework for the future planning of commercial and industrial land in the town.~~

~~The Strategy's key directions seek to:~~

- ~~Retain and further develop existing businesses that meet existing and new market opportunities in retail, commerce and industry.~~
- ~~Attract new investment to Colac with a focus on developing new and sustainable businesses and local jobs.~~
- ~~Attract a skilled and experienced labour force to Colac by promoting the town as a desirable place to live where career opportunities can be pursued.~~
- ~~Provide training and skills development opportunities for the local labour force.~~
- ~~Improve the performance of retail and commercial activities in the Colac town centre in terms of improved levels of service, output and employment.~~
- ~~Build on the competitive advantages of Colac as a place to invest and do business in the retail and commercial sectors.~~
- ~~Recognise the important role played by existing businesses located in industrial areas in Colac.~~
- ~~Investigate and promote opportunities for longer-term industrial land development and the attraction of new industries, their investments and jobs.~~
- ~~Assist local businesses in meeting challenges and opportunities, including developing new markets and addressing new competition.~~

Objectives

- ~~To manage the growth of Colac consistent with its role as the major urban centre of the Shire.~~
- ~~To enhance the built and natural environment of Colac.~~
- ~~To develop a unifying design theme for Colac – 'Colac Botanic Garden City' – as a memorable and identifying feature of the town.~~
- ~~To create landscape links between the main activity areas of the CBD and its principal open spaces.~~
- ~~To improve the amenity and appearance of Colac's main pedestrian streets and town entrances.~~
- ~~To create a pedestrian-focussed, accessible and well-connected public realm, particularly for those with limited mobility.~~
- ~~To promote sustainable methods of transport, supporting walking and cycling as viable alternatives to car travel.~~

- To manage the road network to optimise its safety, efficiency and amenity for all road users.
- To improve the economic performance of the existing commercial and retail areas in Colac.
- To recognise the important economic contribution of existing industries to Colac and the region, and protect these industries from the encroachment of sensitive uses.
- To improve the amenity and appearance of industry from public viewing areas.
- To ensure that an adequate supply of large allotments (greater than 5 ha) are available for industrial development to encourage investment and meet the future needs of industry.
- To encourage investment and foster economic development opportunities in Colac and surrounds.

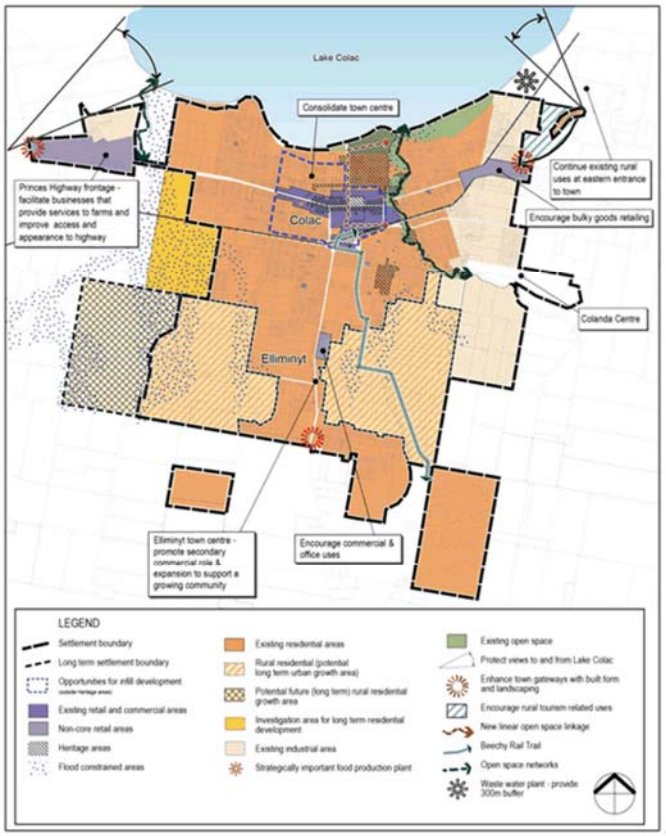
Strategies

- Ensure that the development of Colac occurs generally in accordance with the strategic directions outlined in the Colac Framework Plan and the Colac CBD Framework Plan attached to this Clause.
- Encourage medium density development in the existing Colac town centre and ensure that infill housing proposals demonstrate that they are designed in a manner that is compatible and appropriate for the prevailing character and heritage values of the precinct.
- Create additional residential opportunities close to the Colac town centre.
- Provide adequate car parking to cater for commercial development consistent with the Colac Commercial Centre Parking Precinct Plan 2011, recognising that opportunity exists to take advantage of underutilised street parking and shared off street parking.
- Ensure new development in the hospital precinct of the CBD provides on site parking to meet projected demand and does not contribute further to on street parking pressures.
- Retain heritage places and areas as significant components of Colac's character and attractiveness and encourage their adaptive re-use and restoration including by supporting innovative uses that attract visitors and customers into disused retail areas.
- Maintain the primacy of the CBD as the regional centre serving the Colac Otway Shire and beyond by ensuring that those retail and commercial land uses that are essential to a 'town centre' role are located in the CBD.
- Encourage office accommodation in Colac's commercial areas for small to mid-sized businesses that provide services to the surrounding region.
- Encourage other forms of development in the CBD that contribute to its role as a regional centre including visitor accommodation and community, entertainment and cultural facilities.
- Manage the shift in retail focus between Murray Street and Bromfield Street by supporting the development of a permeable network of active pedestrian thoroughfares in the form of laneways and arcades that link these precincts.
- Encourage bulky goods retailing and restricted retailing to locate in the Commercial 2 Zone land in Colac West.
- Designate areas of rural land between Elliminyt and Colac (east and west of Colac - Lavers Hill Road) as rural lifestyle opportunities.
- Support an increase in the amount of usable public open space (both linear and non-linear) to support recreational land uses and linkages between activities.
- Discourage any additional or new industrial development adjacent to Lake Colac on land which is not zoned industrial.

- ~~Encourage the relocation of existing 'inappropriate' industrial uses out of the town centre.~~
- ~~Encourage new industrial opportunities in Colac's eastern industrial areas for a diverse range of light to general industrial activities.~~
- ~~Ensure that new industrial development is well designed and will enhance the amenity and visual appearance of industrial areas.~~
- ~~Discourage the subdivision of residential land within any relevant EPA threshold distance of Australian Lamb Company such as noted in *EPA Publication 1518 Recommended separation distances for industrial residual air emissions* (March 2013) to minimise future amenity conflict issues.~~
- ~~Manage the balance between industry needs and residential amenity through the use of master planning processes.~~
- ~~Investigate the opportunities and viability for the development of an intermodal freight facility for transport and logistics purposes in the Colac Region.~~
- ~~Discourage further subdivision of land below 5 ha in Colac's eastern industrial areas to ensure sufficient supply of land for large scale industrial development.~~
- ~~Improve the appearance of existing industrial development in Colac to provide more attractive and inviting entrances to the town.~~
- ~~Designate land in Elliminyt for a community / commercial node.~~
- ~~Provide for commercial type uses on Colac-Lavers Hill Road.~~
- ~~Provide opportunities for expansion of the east Colac Highway Commercial area.~~
- ~~Ensure major retail and commercial developments locate within the Colac CBD (Commercial 1 Zoned land only) rather than outside the town centre~~
- ~~Minimise the impact of the Colac Water Reclamation Plant on development on nearby land.~~
- ~~Ensure that future use and development of the Colac Water Reclamation Plant is not detrimentally affected by allowing inconsistent and potentially conflicting development to occur within its buffer area.~~
- ~~Create a multi-purpose education, recreation and community precinct to focus community learning.~~
- ~~Investigate options for a heavy vehicle by-pass of the Murray Street retail centre.~~
- ~~Encourage redevelopment of underused or vacant sites (e.g. surface car parks, vacant land at the rear of buildings, upper levels of single storey buildings) in the CBD.~~
- ~~Encourage the upgrading of shopfronts and building facades in the CBD, particularly on Murray Street and around Memorial Square.~~
- ~~Support innovative uses that attract visitors and customers in disused areas in the Colac CBD.~~
- ~~Encourage the removal of excessive roof top, above verandah and free standing signs, and other visually dominant signs, as sites are redeveloped.~~
- ~~Develop a permeable network of active laneways and arcades in the CBD, including~~
- ~~Improved pedestrian thoroughfares between Murray and Bromfield Streets.~~
- ~~Encourage and facilitate a high quality of architecture within the CBD through the implementation of building design guidelines.~~
- ~~Encourage new development to provide an active frontage to the streetscapes and car parks, including the provision of active frontages to Bromfield Street for buildings fronting Murray Street.~~
- ~~Encourage the reinstatement of verandahs on older buildings and encourage verandahs on new buildings for weather protection.~~

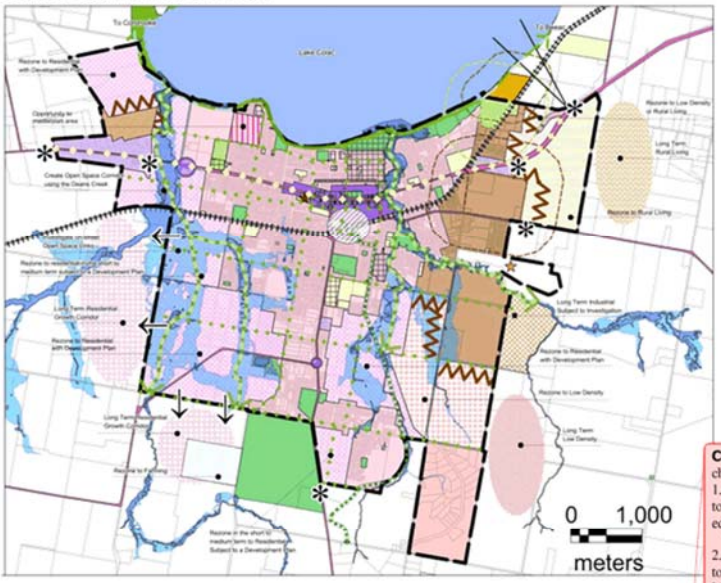
- ~~Encourage planting on properties along the eastern and western entrances to Colac, particularly where it has potential to screen industrial activities.~~
- ~~Undertake and implement a strategy for the co-ordination and design of all signage along the eastern and western entrance corridors to Colac.~~
- ~~Encourage new development within the CBD to incorporate Environmentally Sustainable Design (ESD) initiatives.~~
- ~~Maintain the 'fine grain' character of inner retail areas.~~
- ~~Explore the potential of developing a neighbourhood park on the Irrewillipe Road Basin Reserve.~~
- ~~Improve and enhance the pathways along Barongarook Creek.~~
- ~~Improve and expand organised sports facilities at the Golf Club/Turf Club site.~~
- ~~Investigate opportunities for open space at the former High School site.~~

~~Colac Framework Plan~~



Colac Framework Plan

Colac 2050 Framework Plan



Comment [SB4]: Make the following changes to the Framework Plan:
1.Change 'Rezone to buffer industrial zone' to 'Rezone to Industrial 3 Zone or equivalent' (in response to S23)

2. Shift location of symbol for 'enhance town gateways with built form and landscaping'located on the eastern entrance of Colac on the Colac – Forest Road to align with the road. (in response to S15)

3. Change graphics for rezoning to farming to ensure it is clear that it is part of long term residential growth corridor (in response to S21)

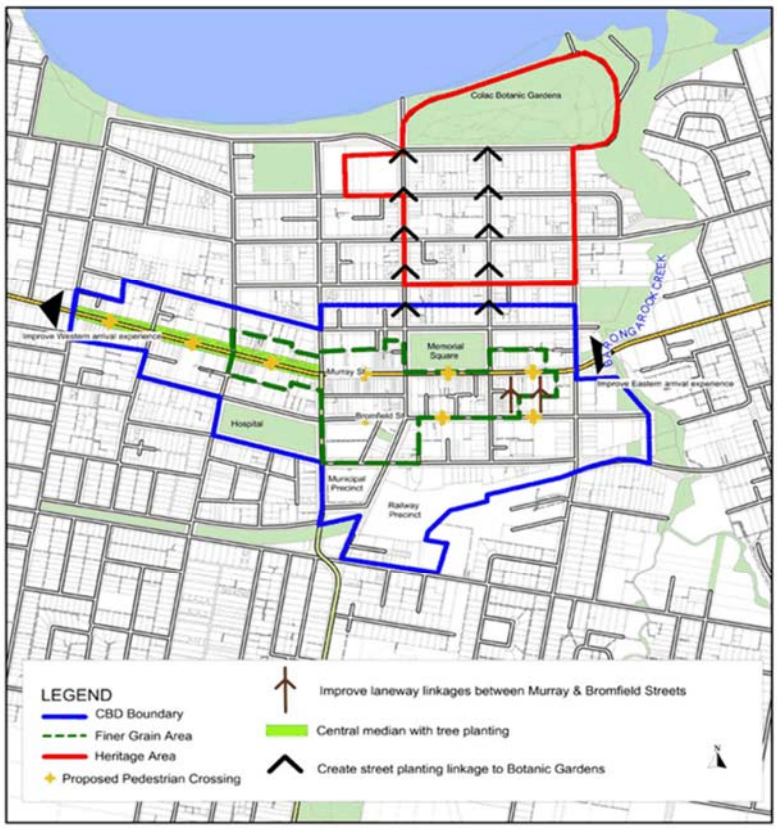
4. Amend annotation for Rossymoyne Rd residential area to 'medium term residential development investigation area. (in response to S12 and S29)

5. Insert note at the bottom of legend as follows: 'the area of inundation shown on the Framework Plan reflects the extent of existing conditions, and may be subject to further refinement as part of future planning and development processes which consider stormwater management measures' (in response to S8a)

6 .Extend the township boundary to include part of the land south of Harris Road and west of Forest Street which directly abuts the residential land to the east (the Wyuna Estate), and identify this as 'rezone to rural living or low density subject to development plan' (in response to S30).

7. Change the Framework Plan notation for the area to the east of Colac noted as 'long term rural living' to 'rural living investigation area' (in response to S14).

Colac CBD Framework Plan



21.03-3 Apollo Bay and Marengo

19/02/2015
C74

Overview

A Structure Plan for Apollo Bay (including Marengo and Skenes Creek) was adopted by Council (April 2007) and articulates the preferred development future for this key coastal centre. Key issues to emerge from the Structure Plan were that:

- Apollo Bay, Marengo and Skenes Creek are to remain as distinct coastal settlements with development to be contained within coastal settlement boundaries.
- Each settlement has a separate identity and local character;
- A key role of Apollo Bay is to provide a diversity of housing opportunities consistent with its identity and local character;

- The natural beauty of the area, with its unspoilt beaches set against a dramatic backdrop of rolling hills, providing the overarching character which unites the settlements, to be reflected in new development;
- The seaside fishing village character of Apollo Bay, focused around a robust working harbour, is highly valued and this character should be preserved and strengthened by new development;
- Change in Apollo Bay, Marengo and Skenes Creek should take place with a demonstrated commitment to healthy lifestyles and ecological sustainability, and be responsive to the natural environment;
- The settlements should continue to provide for high quality living, offering improved community facilities and services, as well as economic development opportunities, for a self sustaining lifestyle.
- Water supply is a potential constraint to the future growth of Apollo Bay which can only proceed subject to the demonstrated availability of an adequate water supply.
- A settlement boundary and urban design review was completed in 2012. This reviewed a number of urban investigation areas. The settlement boundary now allows for sufficient urban development to cater for growth to 2030.

Objectives

- To develop Apollo Bay as an attractive residential community which provides a high quality environment as a significant tourist centre.
- To retain Apollo Bay, Marengo and Skenes Creek as distinct coastal settlements with their own local character.
- To ensure that the natural beauty of the area is reflected in new development.
- To preserve the seaside village character of Apollo Bay.
- To ensure that change demonstrates a commitment to sustainability and is responsive to the natural environment.

Strategies

- Ensure that the development of Apollo Bay and Marengo occurs generally in accordance with the strategic directions outlined in the Apollo Bay Framework Plan attached to this Clause.

Settlement Character and Form

- Consolidate the town centre of Apollo Bay, limit building heights and provide a greater diversity of accommodation at higher densities within and in close proximity to the commercial area.
- Improve pedestrian linkages in the town centre with new mid-block links between the Great Ocean Road and Pascoe Street.
- In the residential areas outside the town centre of Apollo Bay, limit building heights and ensure upper levels are well articulated to respect the character of the area and provide for a more traditional dwelling density to contribute to a diversity of housing choice.
- Require new development and streetscape works in the Apollo Bay town centre to build on and reinforce the fishing village coastal character of the township, and contribute to the creation of a vibrant public realm.
- Reinforce and improve the informal character, accessibility and amenity of streetscapes in the residential areas of Apollo Bay, Marengo and Skenes Creek, reflecting the distinct existing and preferred future character of each settlement in new improvements.

- Achieve excellent architectural quality in new development or improvements to existing buildings in the town centre, drawing on the existing valued qualities of the centre and setting a new direction in the use of innovative, high quality design.
- Promote Apollo Bay and Marengo as leaders in environmental sustainability within the Great Ocean Road Region and improve the ecological integrity of environmental features within and around settlements.
- Conserve and enhance heritage places as a significant factor in developing tourism.
- Upgrade Pascoe Street in the town centre to improve pedestrian and visual amenity and function.

The Size of Settlements

- Utilise natural boundaries, where appropriate, to define settlement edges and set limits to urban expansion.
- Define and maintain a hard edge to the urban area of each of these settlements, particularly when viewed from the Great Ocean Road.
- Ensure that urban development results in the efficient utilisation of existing infrastructure and minimises the requirements for new infrastructure.
- Encourage infill development of medium density housing and accommodation within walking distance of the commercial area of Apollo Bay, to reduce the pressure to expand the urban area, and provide alternative housing choice.

Activities: Business, Tourism, Community and Recreation

- Intensify commercial and business land uses within the commercial area of Apollo Bay and ensure a future supply of Business Zoned land to meet demand.
- Develop the Apollo Bay Harbour Precinct with a tourism, fishing, boating, commercial and recreational focus strengthening links to the town centre of Apollo Bay and providing net community benefits.
- Encourage future recreation facilities to be located together with other community facilities in a central and accessible location.
- Ensure that community, health, education and recreation facilities are provided to meet the needs of current and projected future residents and visitors to the area.
- Support the growth of tourism as a major employer for the region.
- Provide for future industrial development while minimising offsite impacts on surrounding residential uses, the environment (particularly local waterways) and views from residential areas and the Great Ocean Road.
- Improve the provision and quality of neighbourhood parks in the urban residential areas.
- Establish a future use for the Heathland Estate Reserve.

Landscape Setting and Environment

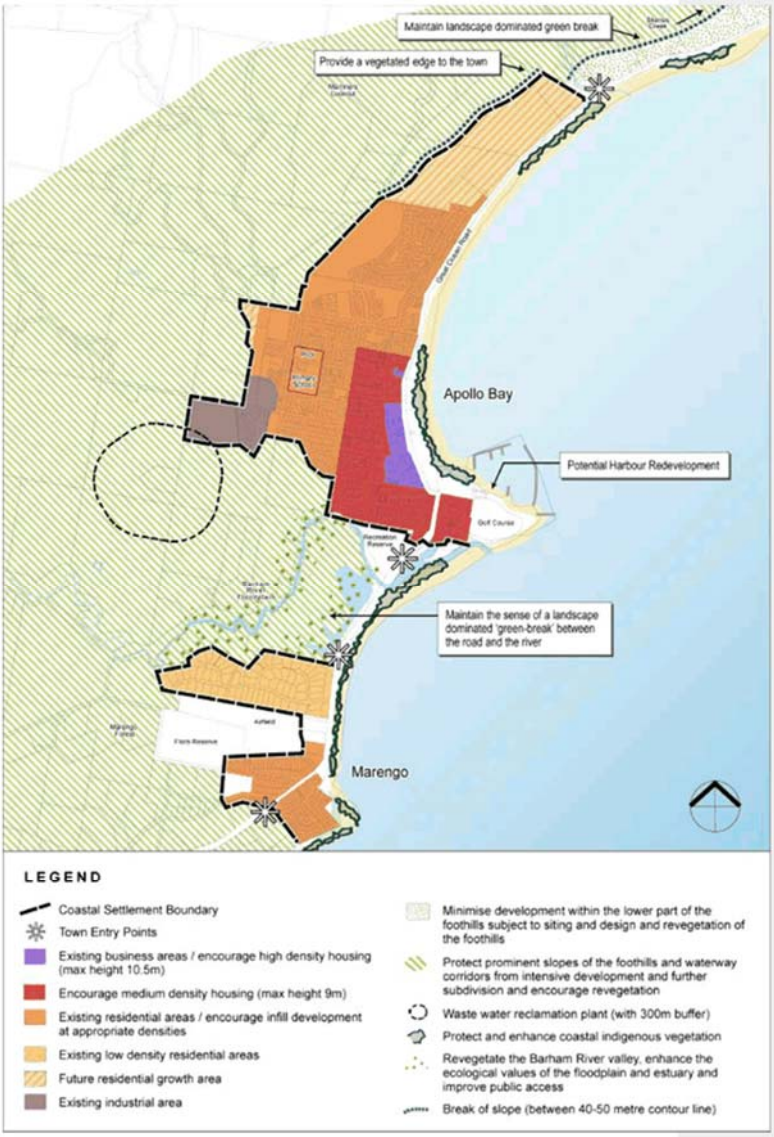
- Maintain the 'green-breaks' and landscape dominance between the settlements to ensure that each settlement remains distinct.
- Protect the Otway foothills as a scenic, undeveloped backdrop to Apollo Bay and Marengo.
- Recognise and protect ecological values and avoid development in areas at risk from the effects of flooding, wildfire, acid sulphate soil disturbance, erosion, landslip and salinity.
- Reinforce and enhance the identity and the sense of arrival and departure at the entrances to Apollo Bay and Marengo.

- Improve the appearance and amenity of the foreshore reserve in Apollo Bay and reduce the impact of the existing and future structures on the naturalness of the setting.
- Achieve improved visual and physical links between the Apollo Bay town centre and the beach.
- Protect and enhance the significant views and vistas available from the settlements, the beach and the harbour, as well as views available from key vantage points in the hills.

Access and Parking

- Strengthen the pedestrian and cyclist connections between Marengo, Apollo Bay and Skenes Creek.
- Create a highly walkable town centre in Apollo Bay with safe and convenient access to shops, community facilities and recreational activities.
- Manage the orderly flow of traffic at all times of the year and enhance pedestrian safety and movement.
- Ensure the future parking needs of Apollo Bay are met and parking congestion in the Great Ocean Road is minimised, with car parking for commercial development in the CBD to comply with the Apollo Bay Parking Precinct Plan (2011).
- Upgrade and provide new mid-block pedestrian linkages in the town centre to improve the utilisation of parking to the rear of shops.
- Consolidate and formalise car parking areas to the rear of the main shops in the town centre.
- Encourage greater use of car parks by improved signage.
- Improve the safety of pedestrian access across the Great Ocean Road to the foreshore reserve at key locations.
- Support, promote and improve public transport.
- Ensure continued and improved air access to the Apollo Bay region.

Apollo Bay, Marengo and Skenes Creek Framework Plan



21.03-4 Birregurra

25/09/2014
C76

Overview

The township of Birregurra is located approximately 20 kilometres east of Colac and approximately 6 kilometres to the south of the Princes Highway. Birregurra is a small town offering a village lifestyle in an attractive rural setting to its diverse and active community The town has a relatively compact urban form based on an attractive and connected network of grid streets and open space links, and sits discretely within its rural surrounds.

Development pressures, high costs of accommodation for tourists and workers and an increase in tourist numbers in Lorne and other coastal communities has seen more people exploring Birregurra for permanent living, holiday accommodation and recreation.

Birregurra is an attractive town for many reasons including for:

- The built form of the town and the many heritage buildings throughout the town and in particular along the south side of Main Street with attractive shop fronts many with verandahs.
- The consolidated commercial town core and community node that provides retail, community and health services that cater for resident's local needs and provides support for surrounding farming areas.The Church precinct located on the elevated land to the south of the town.
- The extent and variety of exotic and native vegetation existing throughout the town. The extent of the vegetation is clearly seen due to the elevated nature of the land, particularly on the southern side of the town.
- The topography of the land surrounding the town including the Barwon River valley and associated tributaries and undulating farming land.

The Birregurra Structure Plan 2013 and Birregurra Neighbourhood Character Study 2012 identify urban design and built form opportunities to improve the presentation of this important centre in the municipality. The Birregurra Structure Plan 2013 encourages infill development to accommodate growth within Birregurra without the need to expand the existing defined township boundary.

Settlement and Housing

Objectives

- To manage modest growth and development in Birregurra in a coordinated and sustainable manner that ensures Birregurra retains its rural township character.
- To retain and protect the township's significant and contributory heritage places and articulate Birregurra's history in the public realm.
- To encourage consolidation of commercial uses in the core town centre of Birregurra on Main Street and broaden the commercial, retail and tourism opportunities in the township.

Strategies

- Contain urban development within the existing defined township boundary.
- Encourage sensitive infill development on vacant lots and support further subdivision of larger developed lots within the existing township boundary.
- Control the density of development and apply development standards as recommended by the Neighbourhood Character Study 2012 to preserve character.
- To encourage a mix of housing types and styles that provide diversity, affordability and respond to the community's life cycle needs.
- Support new commercial uses and re-development of existing premises on both sides of Main Street between Roadknight Street / Austin Street to the west and the unnamed watercourse / Strachan Street to the east and encourage active street frontages.

- Ensure any new commercial development to the rear of properties on Main Street has regard to sensitive residential interfaces.
- Support an increase and diversification of tourist based activities and accommodation in Birregurra.
- Encourage adaption and re-use of heritage buildings, especially in Main Street, and ensure new development provides a sympathetic design response to existing heritage buildings.
- Retain low building heights throughout the township and the single storey built form of Main Street.
- Consolidate civic, community and health facilities in a community node on the north-east edge of the town centre.
- Support retirement/aged care living in proximity to the community and health node, and Main Street.
- Direct any potential petrol station to locate in or close to the town centre, away from the heritage core and identified township gateways.
- Protect the ongoing integrity of industrial activities in the Industrial 1 zoned land and encourage consolidation of industrial uses in this area.
- Ensure any new development in the Industrial 1 Zone reflects the rural township character of Birregurra and has regard to visual amenity.
- New subdivisions should include a grid-based road network that easily integrates with the existing surrounding road network. Avoid cul-de-sacs and battleaxe driveways as a means of providing access to new residential lots.
- Ensure roads provide safe access for all users and that road upgrades retain and enhance the character of Birregurra and the informal nature of road reserves.
- Ensure an efficient and cost effective provision of physical infrastructure that addresses the ongoing needs of the community, whilst protecting the landscape and township character values of Birregurra

Landscape, Environment and Open Space

Objectives

- Protect and extend areas of native vegetation, including endangered EVCs along waterways.
- Protect and enhance the landscape character and view lines of township entrances as defining elements of the north, east and west gateways.
- To preserve and enhance the Barwon River corridor and connected waterways.
- To establish a connected network of accessible public open space and recreation facilities that provide a range of passive and active recreation opportunities.
- To provide safe and improved opportunities for walking and cycling throughout the town and encourage walkable neighbourhood design in new developments.

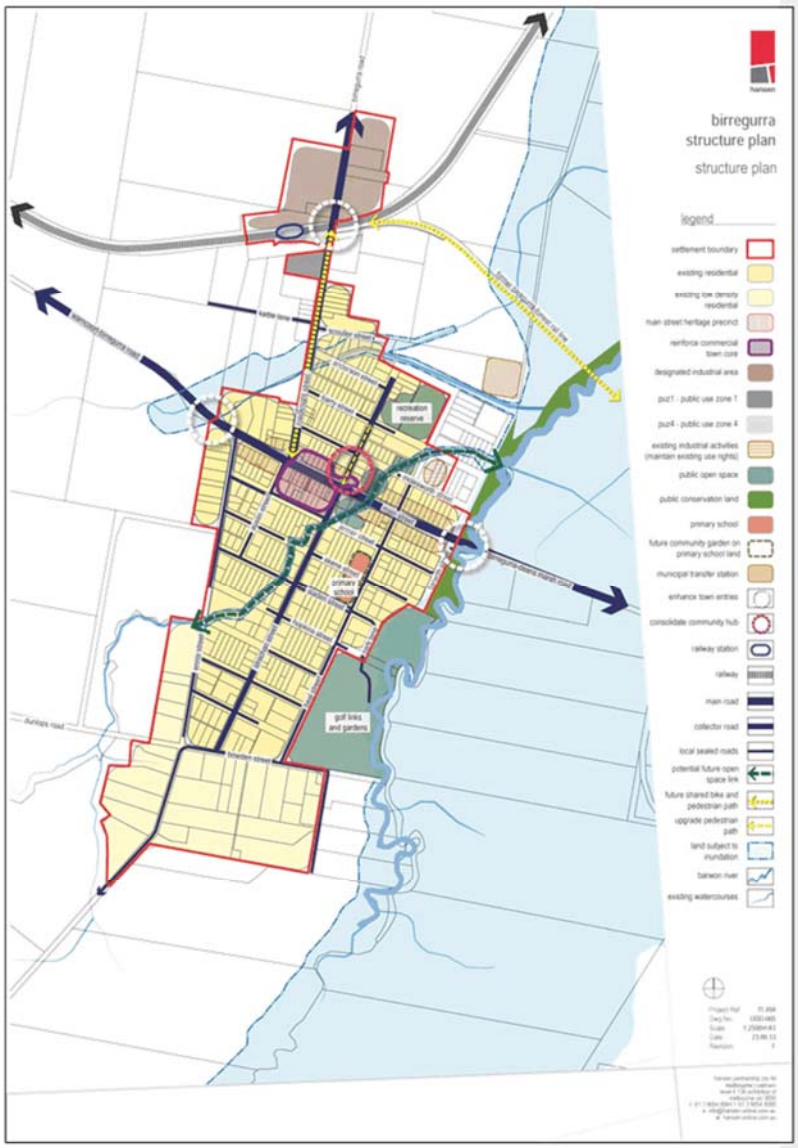
Strategies

- Investigate the potential public open space corridor along the unnamed waterway running south-west to north-east through the middle of the town and the development of a linear shared pedestrian /cycle path connecting to parkland adjoining the Barwon River.
- Encourage built form along this open space corridor to:
    - Be appropriately set back from the waterway in accordance with Corangamite CMA requirements.
    - Provide an active interface through the avoidance of solid fencing to this boundary.

- Provide pedestrian access to the corridor where possible.

- To encourage the retention of trees where possible and the planting of new canopy trees and understorey vegetation.
- Require the use of building envelopes or tree protection zones to protect vegetation on lots that contain significant trees.
- Encourage the dominance of landscape over built form in residential areas.
- Improve open space provision as the community expands and improve linkages between key destinations.
- Investigate development of the Tiger Rail Trail from Birregurra to Barwon Downs and Forrest.

Birregurra Framework Plan



21.03-5 Skenes Creek

18/07/2013
C69

Overview

Skenes Creek is a coastal hamlet set on rolling topography at the base of the Otway Ranges. There is a sense of openness to the town created by the spacious siting of buildings and expansive views to the coast and hillsides. A green wedge corridor through the centre of the township links the town with a vegetated hillside backdrop and is enhanced by regeneration of indigenous and appropriate coastal shrubs around dwellings and public areas.

Objective

- To protect the nationally significant Great Ocean Road Region landscape and the distinctive landscape qualities and coastal setting of Skenes Creek township.

Strategies

- Ensure new development responds to the above key issues and achieves the following Preferred Character Statement for the Character Areas identified at Schedule 4 to Clause 43.02.

Skenes Creek Precinct 1 – Preferred Character Statement

This precinct provides a native 'green wedge' for the whole township, extending from the hill slopes behind the town to the Great Ocean Road. The character of the precinct will be strengthened by the planting and regeneration of indigenous and native vegetation. Dwellings will be set far enough apart to accommodate substantial native bush areas including canopy trees, and will be set substantially below the vegetation canopy. The semi-rural feel of the area will be retained by the lack of fencing and frequent unmade roads. Views to the dwellings will be softened by native vegetation in frontages to major roads and in the public domain along road verges.

Skenes Creek Precinct 2 – Preferred Character Statement

This precinct will continue to be characterised by diverse coastal dwellings set amongst established coastal gardens. The sense of openness will be maintained by setting the buildings apart, minimising intrusive front fencing, and encouraging building forms that respect views to the surrounding hills and coast. The precinct will be united by consistent mature plantings of native and exotic coastal species in the public and private domains.

21.03-6 Kennett River, Wye River and Separation Creek

18/07/2013
C69

Overview

The structure plan for Kennett River, Wye River and Separation Creek articulates the preferred development future for these coastal townships. Key issues to emerge from the structure plan were that:

- Kennett River, Wye River and Separation Creek will remain as distinct coastal townships nestled in the foothills of the Otway Ranges.
- The primary roles of the townships will be to provide housing for permanent and part time residents and to provide a diverse range of holiday accommodation.
- The existing and preferred character of the townships is characterised by low scale buildings which respond to the constraints of the topography in their coastal location and generally sit below the predominant tree canopy height.
- The informal, open and spacious character of the townships is highly valued and should be preserved and strengthened by new development.

- The impact of the townships on the natural environment will be as minimal as possible with water and wastewater being sustainably managed and vegetation acknowledged and valued.
- Future development within the townships should respond appropriately to a range of acknowledged environmental constraints including land slip, wildfire threat, coastal inundation and erosion, storm water management, water supply and effluent disposal.
- The townships have a low growth capacity and all future growth will be contained within existing urban or appropriately zoned land.

Objectives

- To protect and maintain the nationally significant Great Ocean Road Region landscape and the distinctive landscape qualities and coastal setting of Kennett River, Wye River and Separation Creek.
- To support limited tourist, commercial and retail services to the townships.
- To limit the growth of the coastal townships and discourage development outside of existing settlement boundaries.
- To preserve and enhance the environmental qualities of the townships and ensure development responds to the preferred neighbourhood character.
- To ensure that waste water from existing and proposed development is managed in a way that minimises its impact on the environment.
- To ensure that stormwater drainage systems respond to the constraints posed by the townships unique climatic, geological and environmental setting.
- To improve pedestrian access between the hamlets and the foreshores.
- To plan for the impacts of future climate change.

Strategies

- Maintain the existing settlement boundaries as identified on the framework plans forming part of this clause.
- Ensure that future growth of the townships is limited to infill development and renewal contained within existing settlement boundaries.
- Encourage any infill development within the townships, particularly tourist accommodation, to locate in the flatter, less vegetated areas near the centre of the townships (as identified on the framework plans forming part of this clause) but taking into account the need to respond to climate change induced coastal hazards.
- Ensure that any development outside the settlement boundaries is low scale and sensitively sited with minimal impact on the landscape and meets the criteria of the Great Ocean Road Region Landscape Assessment Study.
- Restrict commercial and retail development to small, incremental changes to existing facilities.
- Maintain and preserve the natural setting of the foreshores by minimising new structures in these areas.
- Create or enhance safe pedestrian access from all parts of the townships to the foreshores.
- Encourage opportunities to improve the general store and cafe of Kennett River, including incorporating an outdoor dining area and improved car parking areas to be more landscaped and pedestrian friendly.
- Encourage more diverse accommodation in Separation Creek with small scale projects.
- Collaborate with State Government in developing and implementing new initiatives to manage the impacts of climate change in the future.
- Ensure all new development achieves the following Preferred Character Statement for the Character Precincts identified at Schedule 4 to Clause 43.02:

Kennett River Precinct 1 – Preferred Character Statement

This precinct will be dominated by continuous native bush, with dwellings set below and amongst remnant canopy trees. Frontages will be open and consist of diverse native understorey that screens views of buildings from roads. The low scale dwellings will avoid prominent locations and ridgelines, and will be sited to provide for the reasonable sharing of views to the coast where available. Vegetation will be retained or replaced with any new developments to screen buildings when viewed from the Great Ocean Road. Innovative house styles will be encouraged of a scale, materials and colours that blend with the bush character and follow the topography. The informal bush character of the precinct will be assisted by the streetscape planting and lack of formal kerbing.

Kennett River Precinct 2 – Preferred Character Statement

This precinct will consist of coastal style dwellings set amongst gardens of native species. A spacious garden character will be maintained by setting buildings apart and encouraging landscaping between dwellings. Dwellings will be carefully designed, sited and landscaped to be unobtrusive when viewed from roads and to provide for a sharing of views to the coast where available. Trees in both public and private domains will provide a sense of continuity through the precinct and visually link with the adjacent bushland areas.

Wye River Precinct 1 – Preferred Character Statement

This precinct will continue to be characterised by dominant native bush that forms a consistent canopy, linking to the adjacent bushland. Dwelling scale, bulk and siting will respond to the site and topography, allowing space and setbacks to maintain native bush, both as canopy and understorey. Buildings will be set beneath the canopy, and appropriately sited and designed so as to allow for the sharing of views to the coast where available, and to be hidden from view from the Great Ocean Road. The informality of the streetscapes will be retained by the lack of front fencing, frequent unmade roads and remnant vegetation.

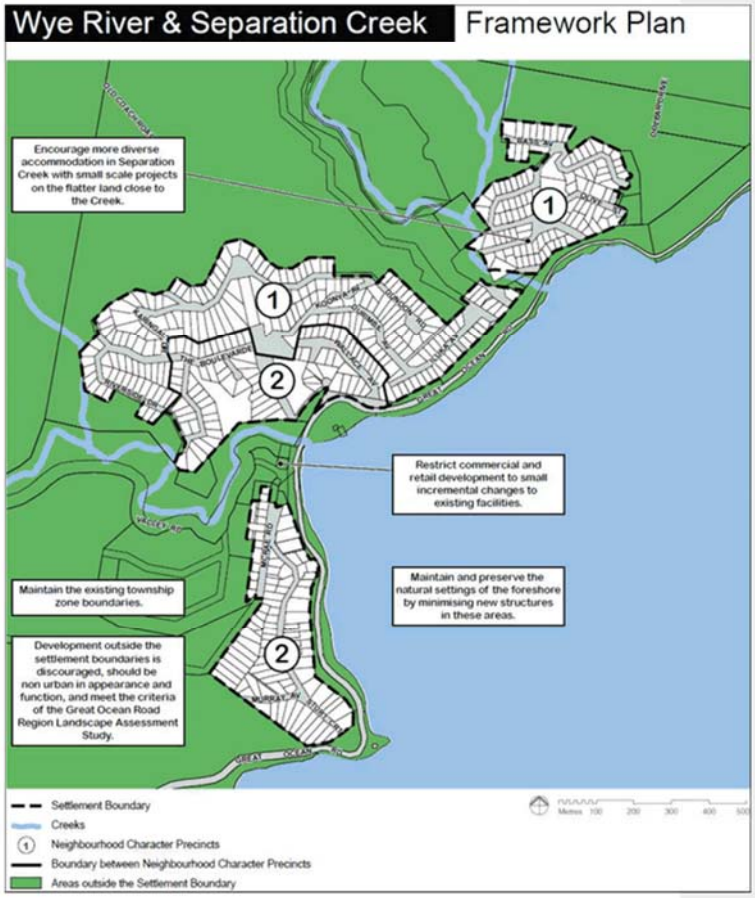
Wye River Precinct 2 – Preferred Character Statement

This precinct will achieve a more consistent native vegetation coverage to provide a unifying feature throughout. Space around dwellings will be sufficient to maintain trees and understorey, and minimises the appearance of building bulk and density. On hill slopes, buildings will relate to topography and be set amongst and beneath a dominant, native tree canopy. Buildings and structures in prominent locations when viewed from the Great Ocean Road will be designed to reduce their visual intrusion. Retention and planting of canopy trees in the public domain and around dwellings will be encouraged to establish a consistent tree canopy.

Separation Creek Precinct 1 – Preferred Character Statement

This precinct will consist of a mix of low, coastal style dwellings and newer coastal styles, in established gardens and amongst native canopy trees in the vegetated hillfaces. Dwellings will be of materials and colours that reflect the coastal setting, and be designed and sited so as to minimise intrusion into views from roads, public spaces and adjacent dwellings and impact on the topography. Establishment of native and coastal trees in public and private gardens will unite the precinct and provide visual links to the surrounding bushland and creek environs.


Kennett River Framework Plan
Maintain the existing township zones boundaries.
Development outside the settlement boundaries is discouraged, should be non urban in appearance and function, and meet the criteria of the Great Ocean Road Region Landscape Assessment Study.
Restrict commercial and retail development to small incremental changes to existing facilities.
Explore opportunities to improve the appearance and functions of the general store and cafe.
Maintain and preserve the natural settings of the foreshore by minimising new structures in these areas.
Caravan Park
1
2
KENNETT RIVER RD
GREAT OCEAN RD
Settlement Boundary
Potential diverse, modest scale tourist accommodation opportunity (8-10 Hawdon Road)
Neighbourhood Character Precincts
Creeks



21.03-7 **Forrest**

18/07/2013
C69

Overview

Forrest is located 32.6 kilometres from Colac and is placed at the foothills of the Otways approximately 161 kilometres from Melbourne and 76 kilometres from Geelong.

A Structure Plan for Forrest was adopted by Council (August 2011) and articulates the preferred development future for Forrest. Key issues to emerge from the Structure Plan were that:

- The role of Forrest as an outdoor recreation and tourism destination has been well established over recent years along with an emerging trend for rural lifestyle residential development.
- Forrest's tourism functions will continue to play a primary role in the town's growth and development into the future.

- There are significant environmental constraints within Forrest including bushfire, flooding and landslip risks that impact on future potential for expansion of the town.

Objectives

- To support Forrest's role within the Otways as a key destination for tourism and recreational pursuits and as a small town with limited potential for residential growth.

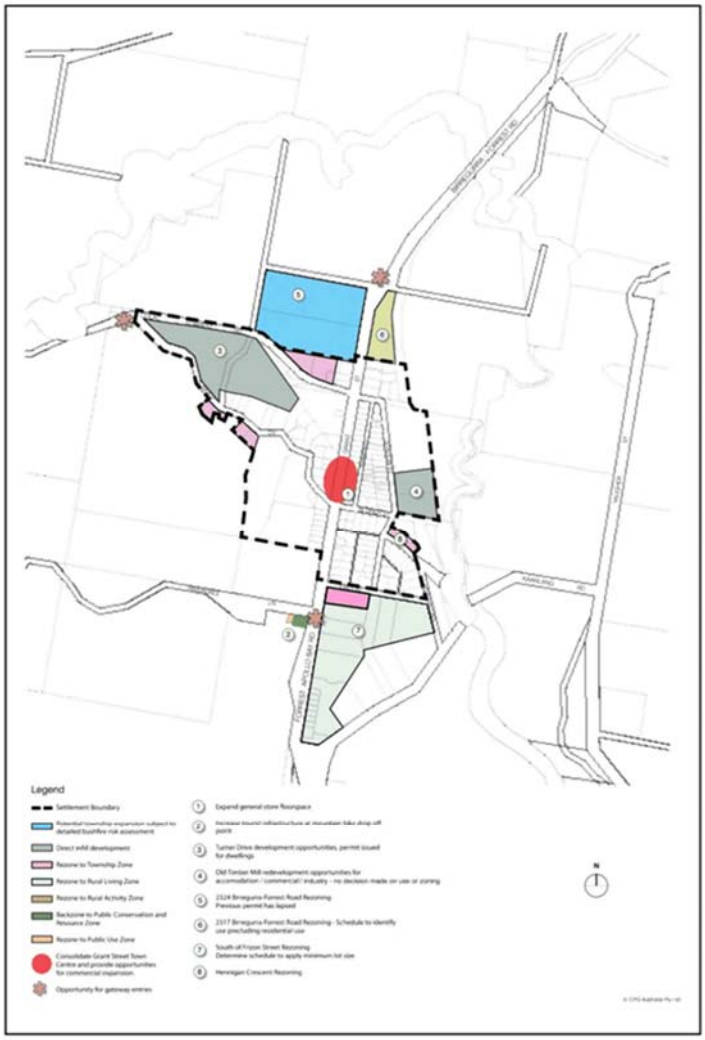
To limit residential development to the existing urban area contained within Forrest's settlement boundary, subject to the outcome of further investigation into the viability of development adjoining the north west edge of the town in accordance with the Forrest Framework Plan attached to this Clause.

- To encourage the development of accommodation facilities which contribute to the viability of tourism and recreation-based activities.
- To promote Grant Street as the primary location for future commercial activities within Forrest.
- To encourage development and activities which add commercial and recreational diversity to the Forrest Township.
- To ensure that the various cultural and environmental heritage assets of the township are protected, maintained and continue to be articulated within Forrest's private and public realm.
- To ensure new residential and commercial development is responsive to the environmental, biodiversity, conservation and landscape values of the local region.
- To ensure that development within Forrest responds to and mitigates any identified bushfire risks.
- To improve pedestrian access and movement along Grant Street.
- To facilitate the provision of community services and social infrastructure within Forrest which promote the town's liveability and increase social equity.

Strategies

- Maintain settlement boundaries shown on the Framework Plan in this Clause pending detailed strategic assessment of bushfire risks and potential measures to manage bushfire risk for the town and broader area.
- Ensure that future growth of the township maximises infill development.
- Concentrate small scale businesses and commercial uses (such as retail premises, shop, restaurant, industry and accommodation) along Grant Street between the Community Hall and Turner Drive/Blundy Street.
- Encourage some commercial development, particularly accommodation, to locate on Rural Activity Zoned land taking into account the need to respond to bushfire risks and the environmental values of the surrounding landscape.
- Encourage the re-development of the existing general store to provide additional floor space, an active street front and expanded provision of commercial services.
- Encourage and consolidate street based retailing in the form of cafes and outdoor seating on the eastern side of Grant Street.
- Upgrade existing pedestrian infrastructure including new footpaths along the eastern side of Grant Street to accommodate pedestrian access, seating and bicycle parking and ensure any new development is designed to activate the streetscape.
- Ensure land use and development does not detrimentally impact upon identified significant flora and fauna habitats, including areas of roadside vegetation.
- Support tourism related use and development within the town boundary taking into account the need to respond to bushfire risks and environmental values and to protect the amenity of nearby residential uses.

Forrest Framework Plan



21.03-8 Smaller Townships

18/07/2013
C69

Overview

It is important to protect the character of the smaller townships within the Shire, particularly those located along the spectacular Great Ocean Road and nestled within the majestic and beautiful Otway Ranges.

Township Master Plans (focussing on public infrastructure improvements) have been prepared for Carlisle River, Gellibrand, Forrest, Barwon Downs and Beech Forest. Urban Design Frameworks have been prepared for Beeac, Cressy, Lavers Hill and Swan Marsh. The Master Plans and Urban Design Frameworks identify urban design and built form opportunities to improve the presentation of these important centres in the municipality.

So as to improve the viability of small townships it is acknowledged that future planning needs to anticipate and respond to the needs of existing and future communities through provision of zoned and serviced land for housing, employment, recreation and open space, community facilities and related infrastructure.

The Rural Living Strategy 2011 highlights the role of small towns and settlements in supporting tourism and rural lifestyle demand.

The Rural Living Strategy 2011 also provides a strategic basis for future land use studies to investigate opportunities for small scale expansion within some of the Shire's small towns, including Alvie, Beeac, Cororooke, Gellibrand and Beech Forest. Gellibrand and Beech Forest's growth potential will be subject to an investigation into fire risk and effluent management issues.

Objectives

- To provide an attractive and safe residential environment within the smaller communities of the Shire.
- To encourage development of smaller townships in the Shire that contributes to their economic development, acknowledges and responds to environmental constraints and protects the broader landscapes within which these townships are located.
- To facilitate the ongoing economic future of small communities.
- To recognise the different roles of smaller townships and centres containing a range of community and other facilities.
- To maintain and enhance the environmental quality of small communities.

Strategies

- Ensure that development of the Shire's small communities occurs generally in accordance with relevant township masterplans, structure plans and other strategies.
- Encourage the development of small-scale economic activity which complements the resources and industries of the region.
- Encourage the location of tourist accommodation facilities within small communities in the region.
- Retain heritage places as significant components of the character and attractiveness of smaller townships.
- Encourage high quality design input to development in small communities.
- Maintain existing township zonings in Alvie, Cororooke and Beeac pending the preparation of town plans.
- Maintain existing township zonings in Gellibrand and Beech Forest pending further strategic assessment of the potential for expansion having regard to bushfire risk and effluent management.
- Otherwise generally restrict the expansion of communities in potable water supply areas and areas subject to or at risk of landslip, high fire risk and flooding.

- Encourage the implementation of landscape features that recognise indigenous flora and fauna.

Specific Implementation

Policy guidance

Assess proposals in townships (other than Colac, Apollo Bay and Marengo) against the following criteria:

- Development should not exceed 8 metres in height, unless special characteristics of the site justify a higher structure and no off-site detriment is caused.
- Building site coverage should not exceed 50 per cent, except on business zoned land.
- The slope of the roof should relate to the topography of the surrounding landform. Dominant or multiple angular roof slopes and designs should be avoided.
- External building material colours should be of muted toning and roofing material should be non-reflective.
- External materials should be in harmony with the surrounding landscape of the settlement.
- Landscaping should enable development to blend into the surrounding area. This may be achieved by:
  - Using a mixture of low, medium and high growing native trees and shrubs, including some species of trees with a growing height above the roof level of the proposed building.
  - Providing replacement planting for vegetation that is removed.

When deciding on the design, siting, mass and scale of new development in townships (other than Colac, Apollo Bay and Marengo) consider, as appropriate:

- Whether it is a major development node or a settlement with limited development potential and only serving the immediate community.
- The visual character of the particular settlement and the likely impact of the development on that visual character.
- The view of the site from the Great Ocean Road and major viewing points in the Otway Ranges and the likely impact of the development on these views.

21.03-9 Rural Living

18/07/2013
C69

Overview

Council prepared and adopted a Rural Land Strategy (September 2007) which identified a range of issues affecting rural land use in the Shire, and has since adopted the Rural Living Strategy 2011. The Rural Living Strategy provides the basis for policy on the use and development of land for dwellings and subdivisions in rural areas. It identified the following in regards to rural living development within the Shire:

- Rural land traditionally used for farming is being used for lifestyle purposes in the absence of land which can accommodate rural lifestyle demand. This is causing problems associated with increasing property values inhibiting farm growth, servicing, provision of infrastructure and conflict with adjoining land uses which has the potential to undermine the objective of protecting the agricultural base of the Shire.
- The greatest opportunities to accommodate rural living development are around Colac where there is greatest supply and fewest constraints for development.
- There are sufficient levels of services and infrastructure to accommodate demand for rural lifestyle development in Coragulac.

- There is scope to conduct investigations into the potential development of some smaller towns in the Shire to accommodate some moderate township expansion, which may contribute to the overall supply of land desirable for rural living purposes.

Objectives – Rural living

- To provide opportunities for rural residential style development in appropriate locations that do not negatively impact on the ability to farm.
- To recognise the function of already-developed old and inappropriate rural subdivisions as 'de facto' rural living developments;
- To restrict the intensification of existing old and inappropriate subdivisions and prevent the further encroachment of rural living development on surrounding farming land.

Strategies – Rural living

- Direct future rural living development to nominated areas where there are fewer economic, environmental, social, land use and servicing constraints for settlement.
- Recognise the function of already-developed old and inappropriate rural subdivisions as 'de facto' rural living developments.
- Restrict the development of existing old and inappropriate subdivisions through the implementation of lot sizes which limit further subdivision and prevent the further encroachment of rural living development on surrounding farming land.