



# Physical mitigation

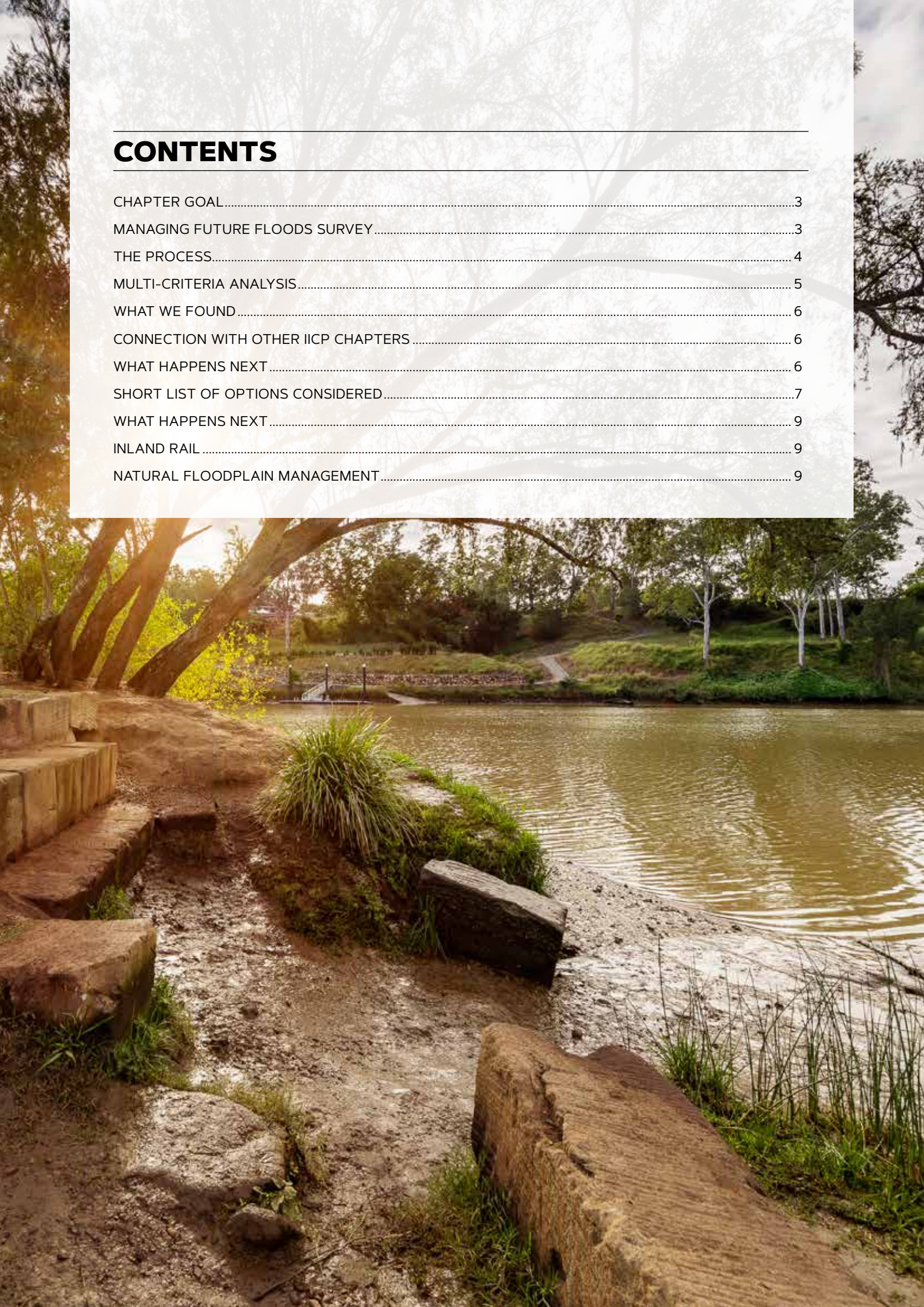
## Discussion paper August 2020

Ipswich Integrated Catchment Plan



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## CHAPTER GOAL

To provide a prioritised list of large-scale options that will potentially reduce flood risk and increase the overall resilience of Ipswich residents and communities.

## MANAGING FUTURE FLOODS SURVEY

The survey had

**190 respondents**

from **51 Ipswich suburbs**  
in late 2019.



When asked about the **most important measures**

for reducing flood risk, more people said

**landscape restoration (51)**  
than **structures (46)**.

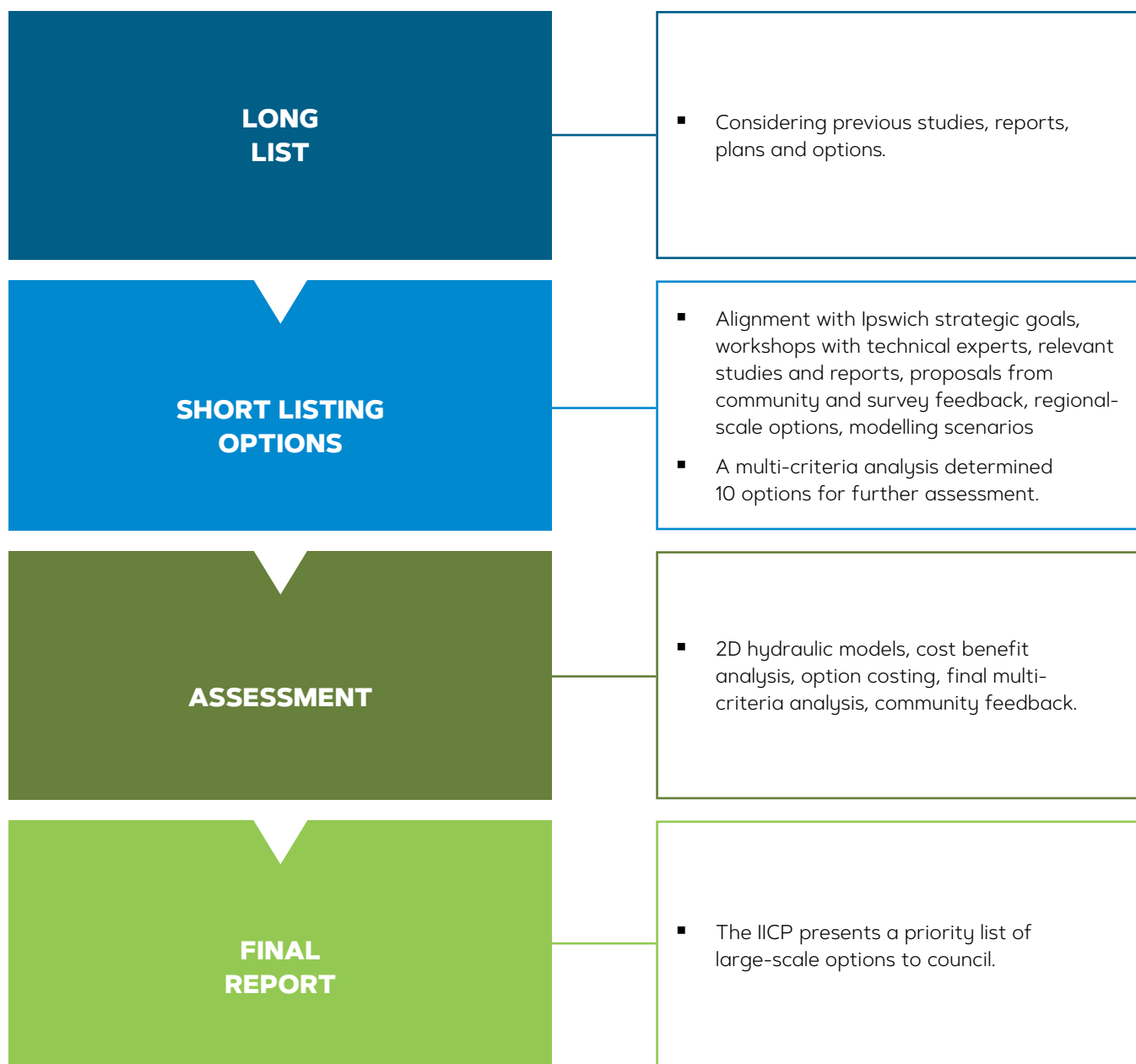
The **top three preferences** for flood mitigation were **dams**, followed by **landscape restoration**, and then **detention basins**.



# THE PROCESS

The Ipswich Integrated Catchment Plan (IICP) has taken a contemporary approach to flood mitigation assessment that makes the health of ecosystems one of the priorities.

This holistic approach ensured multiple perspectives and criteria were applied to assess individual flood mitigation options.



# MULTI-CRITERIA ANALYSIS

Ipswich City Council has been a leader in taking a contemporary approach that included ecosystem health as a criteria when assessing flood mitigation options. This ensured options would be considered from a holistic approach taking into account a range of issues.

However we still confirmed our flood mitigation options met traditional criteria, to ensure accountability in any recommendations made in the IICP final report.

The Managing Future Floods survey asked Ipswich residents what outcomes mattered most when considering how council manages flood. The top response was 'increase community safety'. This has been reflected in the IICP multi-criteria analysis, which gave the strongest weighting to ensuring the safety of people by reducing flood water risk to homes.

Each of the flood mitigation options was evaluated to ensure:

## Does it improve the safety of people?

- reduces hydraulic risk for properties
- improves time for evacuation

## Does it meet social standards?

- targets vulnerable communities
- social health benefits
- stronger community resilience
- recreation and amenity of open space and natural environment areas
- community and cultural heritage connection to watercourse
- community support for option

## Does it provide economic benefit?

- reduces flood damages and costs to residential, business and industrial property
- benefits outweigh costs

## Is it feasible?

- physically/technically possible
- level of approval required
- residual risk and asset management

## Does it impact essential infrastructure?

- impact/improvement on existing or proposed infrastructure
- protection of water supply quality and security

## Does it impact the environment?

- improved water quality
- impact on species, vegetation and habitat
- ecosystem health and connectivity
- reduction in landscape salinity/improved moisture retention and groundwater recharge
- reduction in soil erosion/increase channel stability.



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## WHAT WE FOUND

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Natural floodplain management techniques (see p9) such as large-scale revegetation had multiple benefits, with significant ecological and waterway health outcomes as well as significantly reducing the impact of flooding downstream. The assessment has demonstrated some examples where multiple objectives can be achieved and (in a new approach for Australia) incorporate flooding and waterway health considerations.

‘Hard’ engineering activities such as dams, levees, dredging and the straightening of waterways are a more ‘traditional’ floodplain management practice. There are many examples that have been successful in reducing the impact of flooding. However from the long list of options, only four made it through the initial multi-criteria analysis and on to the shortlist.

The problem with ‘hard’ structures is that they can also have a negative impact on water flows and disconnect floodplains. They also come with the burden of increased asset management, significant residual risk and issues of operating complex structures. They can also increase flooding downstream of concrete lined channels and levees, risking potential failure. Structures may also provide a false sense of security for the community and therefore reduce the community’s overall flood resilience.

Separate to the shortlist options, work undertaken for this chapter also considered the potential for the Inland Rail route to double as a large regional flood mitigation asset. This initial assessment indicated significant flood storage potential that could be further investigated by the Queensland Government to potentially capture cost savings available by providing two key outcomes with one asset.

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## CONNECTION WITH OTHER IICP CHAPTERS

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**Emergency management** – flood mitigation infrastructure may partially reduce flood risk, but Ipswich will always be affected by flood. The emergency management chapter considers how we as a city prepare, respond and recover from flood events when they happen.

**Property specific actions** – with much of the city built on the floodplain, there are areas that will always be affected by flood, no matter what infrastructure is in place. The property specific actions chapter considers what can be done to individual properties to lessen the impact of flood.

**Community awareness and resilience** – Ipswich has a flood risk that can only be partially reduced through flood mitigation measures. The social cost of flooding is enormous, and the community awareness and resilience chapter considers how the community can best prepare for future floods.

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## BE INVOLVED

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Submissions on this and other IICP chapters can be made on the ‘Managing Future Floods’ page of Shape Your Ipswich.

The IICP final report will be provided to Ipswich City Council for consideration in 2021.



# SHORT LIST OF OPTIONS CONSIDERED

**Important note:** these options were evaluated but the final report will recommend whether to progress with further evaluation. Not all options below will be suitable for the floodplain.

## Warrill Creek major natural floodplain management

Opportunities	Constraints
<ul style="list-style-type: none"> <li>Widespread and significant flood mitigation</li> <li>Ecosystem, waterway health outcomes</li> <li>Strategic link to koala corridors</li> <li>Protection of critical infrastructure.</li> </ul>	<ul style="list-style-type: none"> <li>Private land acquisition/compensation</li> <li>Practicality of scale</li> <li>Difficult to establish and maintain</li> <li>Potential increases in probable maximum flood levels.</li> </ul>

## Warrill Creek minor natural floodplain management

Opportunities	Constraints
<ul style="list-style-type: none"> <li>Widespread and significant flood mitigation (although fewer reductions than major option)</li> <li>Ecosystem, waterway health outcomes</li> <li>Strategic link to koala corridors</li> <li>Protection of critical infrastructure.</li> </ul>	<ul style="list-style-type: none"> <li>Private land acquisition/compensation</li> <li>Difficult to establish and maintain (but likely more practical to implement than major option)</li> <li>Potential increase in flood levels within the Purga Creek Catchment and on Cunningham Highway.</li> </ul>

## Bundamba Creek major natural floodplain management

Opportunities	Constraints
<ul style="list-style-type: none"> <li>Significant flood mitigation to downstream communities and Brisbane Road commercial precinct</li> <li>Significant protection of high-value waterway and strategic corridors.</li> </ul>	<ul style="list-style-type: none"> <li>Private land acquisition/compensation</li> <li>Potential increase in flood levels on private property</li> <li>Difficult to establish and maintain.</li> </ul>

## Bundamba Creek minor natural floodplain management

Opportunities	Constraints
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### Marsden Parade flood gate

Opportunities	Constraints
<ul style="list-style-type: none"><li>Flood mitigation to a strategic area of Ipswich City.</li></ul>	<ul style="list-style-type: none"><li>No further consideration given to structural integrity of rail line, complexity of drains/backflow</li><li>Only effective up to a certain flood event</li><li>Asset management and operational issues.</li></ul>

### Black Snake Creek natural floodplain management

Opportunities	Constraints
<ul style="list-style-type: none"><li>Excellent waterway health benefit</li><li>Reduction in salinity to water supply treatment plants</li><li>Aligns to strategies and corridor plans.</li></ul>	<ul style="list-style-type: none"><li>Private land acquisition/compensation</li><li>No noticeable flood benefit downstream.</li></ul>

### Rosewood detention basin

Opportunities	Constraints
<ul style="list-style-type: none"><li>Provides good flood benefit to Rosewood town centre and beyond.</li></ul>	<ul style="list-style-type: none"><li>Private land acquisition</li><li>Asset management and residual risk issues of potentially referable dam</li></ul>

### Goodna Motorway flood gate

Opportunities	Constraints
<ul style="list-style-type: none"><li>Good outcome to provide flood mitigation to a strategic area and vulnerable community of Goodna.</li></ul>	<ul style="list-style-type: none"><li>No further consideration given to structural integrity of motorway</li><li>Only effective up to a certain flood event</li><li>Significant asset management and operational issues</li></ul>

### Thagoona natural floodplain management

Opportunities	Constraints
<ul style="list-style-type: none"><li>Good ecosystem and waterway health outcomes.</li></ul>	<ul style="list-style-type: none"><li>Does not provide sufficient downstream flood reductions</li><li>Difficult to implement due to revegetation across future development areas.</li></ul>

### Thagoona detention basin

Opportunities	Constraints
<ul style="list-style-type: none"><li>Basin provides some benefit to Thagoona township.</li></ul>	<ul style="list-style-type: none"><li>Asset management issues of potential dam</li><li>Potential increase in turbulent water on private property downstream.</li></ul>

## WHAT HAPPENS NEXT

The IICP final report will present more detailed information on these flood mitigation options and will recommend which options should progress to further investigation.

## INLAND RAIL

The proposed Inland Rail route passes through the Ipswich local government area (LGA), crossing both Warrill Creek (near Willowbank) and the Bremer River (near Rosewood).

A component of the IICP is to investigate upstream dams. Potential dam sites were shortlisted by Seqwater in the Warrill Creek and Bremer River catchments.

As part of the IICP, council conducted a high-level assessment of the possibility of using the Inland Rail route as a flood mitigation asset.

Potentially, both proposed crossing sites could provide flood storage and downstream benefit. Combining the proposed Inland Rail with flood storage could provide cost savings compared to creating a new dam.

However it is important to note:

- Inland Rail route is still under development
- flood mitigation of this magnitude would require coordination and implementation at a State level
- modelling carried out was only preliminary and the cost benefit analysis was performed as an estimate.

Therefore the IICP assessment is centred on the potential to recognise opportunity from the Inland Rail route and refer these findings to the State.

Some of the potential opportunities identified in the IICP high-level assessment included:

- potential for storage behind the proposed Warrill Creek crossing that could provide significant downstream benefit
- the Bremer River crossing and rail embankment had potential to provide flood storage similar to the dam options identified by Seqwater
- combining proposed Inland Rail with flood storage could provide cost savings compared to creating a new dam.

Potential issues identified included:

- flood mitigation may require substantial modification to the proposed rail infrastructure

- using the proposed embankment height for flood mitigation could have significant ecosystem issues
- increasing water storage may affect properties and roads in the area.

## NATURAL FLOODPLAIN MANAGEMENT

Natural floodplain management is a relatively new concept in Australia as an alternative to structural flood mitigation. It leverages on the opportunity to halt the degradation of Ipswich's catchments and significantly increase ecosystem health by re-instating some natural functions of the floodplain.

Ipswich City Council has been a regional leader in driving an integrated approach to floodplain management that seamlessly combines landscape actions with flood mitigation to provide multiple benefits. As well as advocating for this approach on a regional level, Ipswich City Council has previously worked collaboratively with the International Water Centre and University of Queensland on field and laboratory testing for natural flood outcomes for the Bremer River.

### Why is it important?

Natural floodplain management has a range of benefits that go above and beyond traditional structural flood mitigation measures; such as flora and fauna conservation, groundwater recharge, carbon sequestration, nitrogen and pollutant offsets and recreational opportunities.

The Bremer River and its tributaries contribute significantly to flooding experienced by communities across Ipswich. But its catchment (22 per cent of which is within Ipswich LGA) is also one of the worst performing for waterway health in South-East Queensland according to the 2019 Healthy Land and Water report card. Major contributors to the poor condition include:

- past land practices including clearing and channel modifications which have led to loss of habitat, erosion, salinity, weeds and declining water quality
- dispersive soils which are highly vulnerable to erosion and generate significant volumes of sediment
- channel modification that has disconnected floodplains such as levees and converting urban streams into concrete stormwater pipes.

Natural floodplain management has the potential to provide both flood mitigation for Ipswich communities, as well as waterway health and ecosystem benefits that flow far beyond our borders.

### What does it involve?

Revegetation – planting trees and other riparian species – is a key strategy of natural floodplain management. It contributes to land-based conservation outcomes and also intercepts rainfall and allows water to soak into the soil. This helps recharge the groundwater table and also prevents excessive runoff. This benefits farmers and other groundwater users because it helps build resilience in the land for dry periods, and reduces salinity.

Planting trees on the floodplain also slows the velocity of water, which reduces peak flows downstream in population centres. Slowing the water also reduces the damage to the waterway bed and banks and allows sediment to disperse on the floodplain – a key process in maintaining productive landscapes. It keeps soil and nutrients on the land where it is beneficial, and not in our rivers or Moreton Bay where it causes significant environmental damage.

Native trees provide deep anchoring of soils and provide critical shade over a waterway to manage water temperatures, reduce algal growth and restrict weeds. Branches and roots also provide habitat for native fish and other species. Groundcovers and rushes provide bank stability and filter water.

### What would it look like?

Natural floodplain management is a contemporary approach within the flood modelling realm so Ipswich City Council undertook model testing across a variety of catchments.

It was important to strike a balance between effective flood mitigation and encouraging suitable ecosystems. The most appropriate vegetation is the ecosystem that was generally present prior to clearing in the Ipswich catchments.

### What are some issues or constraints?

Natural floodplain management may require the acquisition of private land, or compensation for landowners where replanting needs to take place.

It can also take decades of planting and maintenance for the vegetation to establish and provide the flood mitigation benefits.

Like other flood mitigation options, it also needs to be considered whether these actions would potentially increase flood levels or turbulent water in some areas, despite downstream benefits.



Within the riparian corridor, which is the area adjacent to the water, this vegetation consists of a mix of eucalyptus, casuarinas and melaleuca species including numerous shrubs and groundcovers such as lomandra.



Within the floodplain, the vegetation would consist of blue gums and a variety of other canopy trees. To achieve a multi-stage vegetation benefit, more shrubs and ground covers would be introduced to act as a deterrent to invasive weeds such as lantana.





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