Option C – Bundaberg North levee and floodway

Option C involves constructing a levee around most of Bundaberg North. Lakes and widening of the rail bridge at Hanbury Street would also be required to improve conveyance through Bundaberg North.

Stage 2 of the Bundaberg flood protection study involves assessing 11 flood mitigation options, including those identified through consultation with the Bundaberg community in late 2015.

Option overview

Option C aims to direct floodwaters to the west of Bundaberg North through the construction of a levee and floodway system. It would involve:

- Construction of a levee around parts of Bundaberg North, comprising both concrete and earth levees.
- Construction of floodgates at intersections of the levee route with roads.
- Construction of a floodway (lakes) between the Burnett River and Hinkler Park, replacing the flow capacity lost through Bundaberg North.
- Lowering of ground levels between the Burnett River and proposed lakes, widening of the railway bridge near Hanbury Street and regrading of Thomhill Road to improve the flow of floodwater through the floodway.

The southern part of the levee would be constructed to the 1% AEP flood level (with a freeboard). The northern part of the levee would be constructed to the 1.5% AEP flood level. In large events, this would allow initial overtopping of the levee to occur along the northern (earth) sections, rather than a sudden overtopping, allowing safer evacuation. Construction of this option would require some property acquisitions.

Figure 1: Option layout
Technical Discussion Paper

What would this option achieve?

Construction of the levee would prevent any flood water to enter the area surrounded by the levee during flood events up to and including the 1.5% AEP flood event. This option:

- Avoids over-floor flooding for about 150 properties in Bundaberg in a 1% AEP flood event, all of which are located in Bundaberg North.
- Avoids over-floor flooding for up to 175 properties in Bundaberg North for flood events smaller than the 1.5% AEP flood event, such as the 1942 and 2010 flood events.
- Reduces peak 1% AEP flood levels for properties within the levee by 0.3m to 1.2m.
- Increases flood levels generally around 0.2 m for some properties outside the levee.

For floods rarer/larger than the 1.5% AEP flood, the levee would be designed to overtop in a controlled manner along the northern earth section of the levee. This would result in back-up flooding from the north prior to overtopping of the southern (concrete) levee section.

Overtopping of the levee would pose a risk for the community within the levee in relation to emergency evacuation. In particular, evacuation may be hindered and become dangerous due to changes in flood behaviour, the velocity and depth of rising floodwater, and peoples’ response to the flood threat.

Changes to flood levels for the 1% AEP flood event are shown in Figure 2.

Figure 2: 1% AEP Flood Afflux (m)

Note: The outcome depicted is a potential only of the implications associated with this option – and this outcome may not occur or eventuate

DISCLAIMER: Jacobs has implemented reasonable, current commercial and technical measures using the usual care and thoroughness of a professional firm in the creation of these maps from the spatial data, information and products provided to Jacobs by the Department of Infrastructure, Local Government and Planning (DILGP), Bundaberg Regional Council (BRC), GHD and other consultants; and data custodians including Department of Natural Resources and Mines (DNRM) and data obtained from the Queensland Spatial Catalogue (Q Spatial) under the Creative Commons Attribution 3.0 Australia licence. Jacobs has not independently verified the quality, content, accuracy or completeness of the Data. Jacobs is not responsible or liable for any costs, losses and/or damages suffered as a result of reliance on these maps. All information shown on these maps (including the nature, alignment and extent of any works) is preliminary and provided only for discussion purposes.

1 1% AEP flood is the name given to a flood event which has a 1 in 100 or 1% chance of occurring in any year.

2 1.5% AEP flood is the name given to a flood event which has about a 1 in 70 or 1.5% chance of occurring in any year.
### Viability

A key step in the options assessment involves identifying issues that may mean construction or implementation of the option is not viable. These relate to matters such as:

- The likelihood of obtaining environmental approvals, due to unacceptable environmental impacts
- Significant or unaffordable costs of construction or ongoing maintenance
- Potential for unacceptable impacts on other areas.

An option is considered to be unviable where the assessment identifies one or more of these matters are ‘unlikely to be achieved’.

The assessment of Option C found that this option may be viable with modifications to reduce costs and impacts to areas outside of the benefited area. However any modifications are likely to decrease the reduction of flood damages achieved.

### Costs and benefits

Initial cost estimates indicate that construction of Option C would be approximately $85 million. This would include about $20 to $30 million for the levee and about $50 to $60 million for construction of the floodway (including property acquisitions). The total cost of the option including ongoing maintenance is estimated at $100 million.

Estimated reduction in flood damages (i.e. the tangible benefits) would be in the order of about $11 million.

### Summary of assessment against key criteria

Each option has been assessed against a set of 16 criteria. These criteria, if achieved by an option, indicate a strong link between the option and the overall objectives of the Bundaberg Flood Protection Study. The performance of this option against the 16 criteria is presented on the next page. These assessments will be used to derive an overall multi-criteria analysis score for this option. This score is then used in conjunction with other assessments to compare this option against the other options.

A summary of the performance of this option against the criteria as well as the costs, benefits and viability issues is presented below.

- This option would direct floodwaters around Bundaberg North through the construction of a levee and floodway (lake) system.
- This option would provide protection for about 450 properties up to the 1.5% AEP flood event.
- For events rarer/larger than the 1.5% AEP flood event, initial overtopping of the levee would occur along the northern (earth) sections, rather than a sudden overtopping, allowing safer evacuation.
- There is a risk that people inside the levee may become complacent about flood risk and become less resilient during events that overtop the levee.
- The levee would have a major impact on the urban area, restricting access and creating a visual barrier.
- Increased flood levels of up to 0.6m would be experienced by some properties outside of the levee.
- The total cost of construction and ongoing maintenance of this option would be about $100 million.
- The costs for this option would be about 10 times the estimated monetary benefits.
### Technical Discussion Paper

#### Evaluation criteria

<table>
<thead>
<tr>
<th>Objective</th>
<th>Criteria</th>
<th>How does it perform against the criteria?</th>
<th>Preliminary Score</th>
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</thead>
</table>
| Reduce flood risk to life and reduced flood impacts on people | Improves people’s safety during flood events and people’s ability to evacuate | • About 450 properties may not be flooded in the 1.5% AEP event.  
• Evacuation would be required if levee bank was going to be exceeded.  
• Safety decreased – risk of levee or flood gate failure. | ✓ |
| Reducing the occurrence of flood deaths and injury and improving people’s ability to plan for and recover after a flood | Reduces the impacts on people for very large / rare floods (larger than say Jan 2013 flood) | • Levee begins to overtop in the 1.5% AEP flood event.  
• Minor increase in impacts for large events due to lack of preparedness when levee overtops. | ± |
| Increase people’s resilience to flooding by improving their preparation for flood events and ability to recover after flood events | Reduces damages and costs to residential property caused by floods | • Moderate decrease in flood damages. | ✓ |
| Reduce flood risk to property | Reduces damages and costs to business / industry / government caused by floods | • Moderate decrease in flood damages. | ✓ |
| Reducing flood damages and properties and improving the recovery of businesses after floods | Reduces the impacts on property for very large / rare floods (larger than say Jan 2013 flood) | • Minor increase in impacts for large events due to lack of preparedness when levee overtops. | ± |
| Increase a property’s "flood resilience" (improving a property so it is less affected by a flood event and recovery after an event is faster) | Economic benefits (increased confidence leading to economic growth) for the broader region | • Potential for increased confidence due to flood protection of commercial premises, so partially meets criteria. | ± |
| Achieve a balanced investment approach that considers social, economic and environmental issues | Environmental benefits: Terrestrial, aquatic, riverine benefits, effects upon heritage | • No environmental benefits are expected. | ± |
| Considering social, economic and environmental issues (independent of the improvements to flooding) | Social Health benefits: Effects upon mental health, psychological issues, stress | • Reduced stress due to reduced frequency of flooding. | ✓ |
| Community benefits: Effects upon "livability" of the area, urban amenity, social cohesion | Adaptable flood performance with respect to climate change | • Lakes may provide new areas of urban amenity.  
• The levee (particularly the concrete section) could negatively detract from the liveability and amenity of the area.  
• Construction would have noise impacts. | ✗ |
| Long term reduction in flood risk and adaptable levels of protection | Long term benefits | • Benefits realised over the long term. | ✓ |
| A focus on the long-term benefits and adaptability of options and also the impact on future development land | Decreases flood damage to areas of future development | • No decreased flood damage to areas identified as “Emerging Communities” or greenfill urban residential land. | ± |
| Staged benefits with staged construction / investment | Adaptable flood performance with respect to climate change | • Would be difficult to raise levees due to increased obstructions and heights in urban areas. | ✗ |

- ✓ Achieves the criteria  
- ± Partially achieves criteria or has no change to current status  
- ✗ Does not achieve the criteria
Find out more about this option
Community consultation on the flood mitigation options and the findings of the options assessment will take place from **24 October to 20 November 2016**. To find out more about the flood mitigation options and to provide your feedback:

Visit the website
www.qld.gov.au/bundabergfloodstudy
Interactive mapping is available on the website so that you can see how the flood mitigation options would change flooding in your area.

Contact the project team
Email: bundabergfloodprotection@jacobs.com
Telephone: 1800 994 015 (during business hours)

Next steps
The Bundaberg flood protection study is due to be completed later this year. Engagement on the 10-year action plan will occur in 2017. It is important to note that the flood mitigation options have not yet been considered by the State government and are not government policy. No commitment will be made on any of the options until the State government has consulted with the community and stakeholders on the 10-year action plan.
The Queensland Government will continue to engage with the Bundaberg community as the action plan develops.