

**COVER REPORT - COMMITTEE MEETING**

<b>Title of Report:</b>		<b>Tidal Barrier Pre-Feasibility Study Delivery</b>		
<b>Meeting of:</b>		Infrastructure, Transport and Environmental Committee		
<b>Date of Meeting:</b>		6 August 2015		
<b>Date Required by Democracy Services:</b>		20 July 2015		
<b>Community Board Consultation:</b>		<b>Needed:</b>	N	<b>Complete:</b> Y
<b>Public Excluded</b>		N if <b>PUBLIC EXCLUDED</b> the section below <b>MUST</b> be completed		
<b>REASON UNDER ACT</b>	<b>SECTION</b>	<b>PLAIN ENGLISH REASON</b>		<b>WHEN REPORT CAN BE RELEASED</b>

**No of Attachments (must be cited in report) : None**

**Description of Attachments:**

**Confirmation of Statutory Compliance**

Compliance with Statutory Decision-making Requirements (ss 76 - 81 Local Government Act 2002).

(a) This report contains:

- (i) sufficient information about all reasonably practicable options identified and assessed in terms of their advantages and disadvantages; and
- (ii) adequate consideration of the views and preferences of affected and interested persons bearing in mind any proposed or previous community engagement.

(b) The information reflects the level of significance of the matters covered by the report, as determined in accordance with the Council's significance and engagement policy.

	<b>Name and title of signatories</b>	<b>Signature</b>	<b>Date</b>
<b>Prepared by</b>	Sylvia Maclaren Project Manager		28 July 2015
<b>Approved by Finance Manager</b>	Peter Langbein		28 July 2015
<b>Approved by Storm water and Land Drainage Rebuild</b>	Keith Davison		28 July 2015
<b>Approved by Executive Leadership Team Member</b>	David Adamson		28 July 2015

## Tidal Barrier Pre-Feasibility Study Delivery

**Reference:** TRIM 15/863988

**Contact:** Keith Davison

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### 1. Purpose of Report

- 1.1. The Avon-Heathcote Tidal Barrier Pre-Feasibility Study was delivered to Council on 27 July 2015 and will be available to committee members prior to the meeting. This report was to present the preliminary findings of the pre-feasibility study and seek a decision as to whether to proceed to a full feasibility study.
- 1.2. In summary, the study acknowledges that a tidal barrier is technically feasible, but suggests the costs for a barrier are greater than other potential flood management options in the current-day scenario when compared at a preliminary level against alternatives.
- 1.3. The study states that further work would be required to determine the degree of sea level rise at which a tidal barrier option would be a cost effective.

### 2. Background

- 2.1. A tidal barrier can work by artificially holding back the advancing tide during high river flows, allowing the rivers to drain more freely into the estuary. A barrier can also be used to hold back exceptionally high tides to protect low lying land. A tidal barrier is usually kept open, apart from when required to prevent flooding.
- 2.2. The Avon-Heathcote Tidal Barrier Pre-Feasibility Study was commissioned in late 2014 at the direction of the Horizontal Infrastructure Governance Group (HIGG) as part of the cost share optimisation work. The study was paid for under the Land Drainage Recovery Programme, which is part funded through the cost share agreement.
- 2.3. A tender process was held and international consultancy GHD Limited was selected in February 2015 to carry out the pre-feasibility study. GHD contracted Dutch experts from Royal HaskoningDHV and NIWA to assist with the study.
- 2.4. The purpose of the pre-feasibility study was to understand whether a tidal barrier was worthy of further consideration as a flood mitigation measure for Christchurch and if the Council would be justified in conducting a full feasibility assessment.
- 2.5. The study was just one of a number of flood management options the Land Drainage Recovery Programme and Council Strategy and Planning Group are investigating.
- 2.6. While the barrier investigation was being undertaken, it became clear that the economic evaluation would require further work on the design and costs of the Avon-Heathcote Estuary and Avon River stopbanks in scenarios with and without a barrier. The scope of the investigations was extended to incorporate this and are included in the final barrier report.

### 3. Commentary

- 3.1. The study states that a barrier is technically feasible, and would be within the capabilities of New Zealand contractors.
- 3.2. The cost of a barrier is likely in the range of \$300 - \$350M. Operations and maintenance could be in the range of \$2 - \$7M per year.

- 3.3. The study had a preference for locating a barrier just back from the mouth of the estuary between Redcliffs and Southshore due to the higher stability of the spit at this location, although this would have to be re-visited if a feasibility study were commissioned.
- 3.4. Of the types of barriers available, the report chose to focus on a vertical lifting gate combined with a dune embankment across to Southshore.
- 3.5. The study considered tidal and storm surge range, sea level rise, navigation requirements, geotechnical considerations, spit and mouth morphology, and ecological, social and consenting constraints.
- 3.6. It is the study's opinion that morphological, geotechnical and resilience concerns can be addressed through engineering design. For example, the study considered that the risk of movement of the sand spit is manageable.
- 3.7. Impacts on landscape and visual amenity would be high and on cultural heritage is likely to be high. Impacts on recreational boating may be high although can be mitigated to some extent through sensitive design allowing passage.
- 3.8. In the current day scenario ecological impacts would be low, however as sea level rises the barrier would have to operate more frequently and the impacts would be greater.
- 3.9. In the current day scenario the barrier would only need to be operated approximately twice per year on average. However, under one metre sea level rise to provide the same level of protection the barrier would need to be closed up to 705 times per year. The barrier could be closed fewer times if a higher level of flood risk were accepted, or if other mitigation measures were put in place.
- 3.10. Construction of a barrier would not remove the need for stopbanks in the Avon-Heathcote Estuary and lower Avon River and other options in the lower Heathcote River. However, these would be reduced in scale.
- 3.11. The study provides a preliminary cost benefit analysis between a tidal barrier and an alternative engineering solution, both of which include stop banking / flood walls alongside the Avon-Heathcote Estuary and Avon River combined with house raising alongside the Heathcote. These are both in the current day scenario and under one metre level sea rise and are summarised in Table 1.

**Table 1. Summary of costs with / without a tidal barrier**

Present day climate		1m sea level rise	
Alternative engineering solution	Tidal barrier	Alternative engineering solution	Tidal barrier
\$211M	\$430M	\$571M	\$545M

- 3.12. The costs of land purchase to build stopbanks in the Residential Red Zone alongside the Avon-Heathcote Estuary and Avon River are significant in comparing the cost effectiveness of a tidal barrier. The study uses three pricing scenarios, all based on the 2007 RV. These are 0%, 50% and 100% of the 2007 RV. CERA have been unable to provide specific guidance as they believe this would be a Cabinet decision.
- 3.13. The pre-feasibility tidal barrier study only considers two climate scenarios, the present day scenario and 1m sea level rise scenario. It has not been determined if there is an intermediate point between these scenarios whereby a tidal barrier becomes cost effective.

- 3.14. Two independent peer reviews were conducted on the first draft of the report. These included a scope review by Jacobs Limited (excluding costs) and a cost-only review by Beca Limited. Peer review comments are largely addressed in the final report.
- 3.15. Environment Canterbury were involved in workshops for early evaluation and issues identification. Information sessions have been held with Te Ngāi Tūāhuriri Rūnanga and the Avon-Heathcote Ihutai Estuary Trust. A memo was sent on 13 July 2015 to the Hagley-Ferrymead and Burwood-Pegasus Community Boards informing them of the study. CERA has been updated with copies of the draft and final report as they have been received. Feedback was also received through the Long Term Plan (LTP) process. Further consultation has not occurred due to the very early project stage and the short project duration.
- 3.16. The study will help inform the decision making around the Residential Red Zone land use, as it provides details on the cost and potential location of stop banks along the Avon River with and without a barrier. CERA have requested more time to consider the findings and implications of the report in this regard.
- 3.17. In summary, the likely costs of the barrier in the present day scenario are more expensive than potential alternatives and will result in substantial impacts on the estuary environment. A tidal barrier could be beneficial in the long term as sea level rise eventuates.

#### 4. Recommendation

- 4.1. That the information in this report be received.
- 4.2. That we seek input from CERA as partner and stakeholder on this technical report and its implications.
- 4.3. That we report back our recommendations to the next ITE meeting.

#### Signatories

<b>Author</b>	Sylvia Maclaren		Project Manager
<b>Approved By</b>	Peter Langbein		Finance Manager
	Keith Davison		Unit Manager
	David Adamson		Director

