



*caring about you & your environment*

## **Report 01.613**

20 August 2001

File: N/3/17/3

kls-m:\flood protection\report\2001 LCC Reports\01.613

Report to the Landcare Committee  
from Daya Atapattu, Project Leader, Flood Protection Group

### **Hutt River Floodplain Management Plan (HRFMP) : Implementation Proposed Ava to Ewen Upgrade Works**

#### **1. Purpose**

- To update the Landcare Committee on the status of the proposed Ava to Ewen upgrade works.
- To seek Landcare Committee endorsement to negotiate with Tranz Rail to construct a new Ava Railway Bridge or, if this fails to agree with Tranz Rail on an upgrade option, that retains the existing bridge.
- To seek Landcare Committee agreement to the detailed design of the Ava to Ewen reach on the basis that the existing Ava Railway Bridge will be retained.

#### **2. Background**

The Ava to Ewen reach upgrade is the highest priority HRFMP implementation. The Council's ten year plan (2000-2010) provides a total budget of \$14.6 million for completing:

- Ava Railway crossing waterway improvements (\$5.0 million).
- Ava to Ewen channel realignment and stopbank upgrades (\$9.6 million).

Investigations for the proposed upgrade works in the Ava to Ewen reach started in the 2000/01 financial year. Construction is programmed to commence in late 2002. Decisions on the way forward need to be made before:

- furthering discussions with Tranz Rail.
- applying for resource consents and commencing detailed design for the Ava to Ewen channel and stopbank upgrade works.

### 3. Design Standard

In December 1999, the Regional Council adopted a “2300 cumec risk based” design standard for the Hutt River. A component of the adopted design standard requires new bridges to meet a 2800 cumec standard and principal stopbanks to contain a 2800 cumec flood. This design standard will be applied to the Ava to Ewen reach.

### 4. Ava to Ewen Reach Needs Major Improvements

The Ava to Ewen reach extends from the downstream side of the Ava Bridge to the upstream edge of the Ewen Bridge. **Attachment 1** shows the layout. Extensive residential development in this reach is protected by stopbanks, which are currently very close to the river edge on the right bank. Failure or overtopping of these stopbanks would lead to serious flooding in the residential areas of Alicetown and Woburn.

The Ava Railway Bridge was constructed in the mid 1920s. It has a relatively low flood capacity and constricts the floodway at the bridge. The piers are closely spaced and badly aligned to the river. The bridge has a “no-debris” capacity of about 1600 cumecs (<50 year return period), which reduces to about 900 cumecs (<5 year return period) once the effects of debris build up are included. The eastern stopbank, just upstream of the Ava Bridge, has little or no berm and high flood velocities due to the bridge constriction could lead to failure of this section of the stopbank.

The existing channel alignment through Tama Bend exposes the Alicetown stopbank to the risk of erosion. The existing berm width at Tama bend is less than 10 metres, while the minimum berm width required to ensure the stopbank's security is 20 metres.

The existing stopbanks are of variable quality and flood capacity, though are generally high enough to contain a 100 year (1900 cumec) flood. However, structural failure could occur before reaching this level.

The flood defences in this reach are well below the HRFMP standard, hence their high upgrade priority. The Ava Railway Bridge makes the situation worse, and overall there is a serious risk of failure in a larger flood event.

### 5. Ava to Ewen Upgrade Investigations Started in 2000/01

To meet the adopted design standard, we propose to:

- improve the Ava Railway Bridge waterway capacity.
- realign the river to provide security to the Alicetown stopbank.
- raise and strengthen the Alicetown and Woburn stopbanks.

The investigations in this reach commenced in the 2000/01 financial year. Consultants were engaged to undertake:

- a feasibility study on improvement options for the Ava railway crossing, and
- preliminary design and draft resource consent application for Ava to Ewen.

## 6. **Ava Railway Crossing Feasibility Study**

The Ava Railway crossing feasibility study was completed in two stages. Stage 1 of the study involved investigating and evaluating a wide range of options and recommending preferred options. Stage 2 of the study involved refining the preferred options and recommending an option for implementation. The decision making process is outlined in **Attachment 2**.

### **Stage 1**

Stage 1 of the Ava Railway crossing feasibility study considered options including:

- **New Bridge Options**, where a new bridge would be constructed to replace the existing bridge. A new bridge would cost around \$20 million.
- **Existing Bridge – Widening and Raising Options**, where the bridge structure would be raised and the waterway widened. Costs ranged from \$10–20 million.
- **Existing Bridge – Stopbank Strengthening Options**, where the eastern stopbank would be strengthened to minimise risk to this stopbank. Costs ranged from \$5–7 million.

The “existing bridge widening and raising” options were rejected because of:

- Relatively high costs.
- Inability to achieve the full 2800 cumec design standard for a new or substantially improved bridge.

### **Stage 2**

A new bridge option and an “Existing Bridge – Stopbank Strengthening” option were looked at in more detail in Stage 2.

#### ***New Bridge Option***

A new bridge can be built to pass a 2800 cumec flood with room for debris. The cost of a new double track bridge with a raised deck and cylindrical piers is about \$20 million.

Although this is the most desirable option, from a flood protection perspective, Tranz Rail has no programme to replace the bridge. Tranz Rail believes the bridge was built to the waterway standards prevailing at the time of construction and any upgrades necessary for flood protection is not its responsibility.

Currently the maximum flood flow that could be expected to reach the Ava Bridge is about 1900 cumecs. Higher flood flows would be spilled at unprotected areas or weak stopbanks in the Ewen Bridge to Kennedy-Good Bridge reach. It will take about 20 years to complete all upgrade works in this upstream reach, with current funding allocations. This means the full hydraulic capacity of a new bridge would be used only after 20 years.

### ***Existing Bridge – Stopbank Strengthening Option***

This alternative could be adopted if funding for a new bridge is not agreed with Tranz Rail. This alternative option would ensure that the existing high risk of failure of the eastern stopbank is reduced.

Investigations show that by strengthening and raising stopbanks, a 2300 cumec flood could be forced through the existing bridge. A sheet pile wall or a very heavy rock lining could be used to strengthen the eastern stopbank. The bottom of the bridge deck would be submerged and there would be no allowance for debris passage.

The extra waterway area required to pass the 2300 cumec flood is now expected to be partly gained due to scour of the existing Opahu Stream training bank and the berm areas at the two abutments during the flood. This is a reasonable premise, but the extent of scour would need to be confirmed at the final design stage. Generally, scour is not taken into account when designing waterways for new bridges.

If we raise the stopbanks even further and assume a “managed” breach of the western railway approach embankment there is, theoretically, the capacity to pass a 2800 cumec flood. This option assumes the Flood Protection Group would initiate the breach during the flood with large excavators.

In each of the above cases the stopbanks have to be raised above the levels required to pass a 2800 cumec flood under a new bridge by:

- 100 – 200 mm to contain a 2300 cumec flood.
- 200 – 500 mm to contain a 2800 cumec flood.

Damage to bridge piers and abutments, due to the increased velocities and resulting bed scour is also likely to occur. Works for strengthening the bridge structure to withstand the potential scour damage are not included in these proposals.

### ***Selecting the Preferred Option***

There are broadly two options to choose from:

- Build a new bridge, or
- Undertake stopbank strengthening.

The new bridge option will meet the design standard and minimise the risk to the flood defences. The design uncertainties are minimal. The new bridge would cost around \$20 million. Although the most desirable option, no funding for constructing a new bridge in the near future, is available. This issue needs to be discussed further with Tranz Rail.

The stopbank strengthening option ensures that the existing high risk to the flood defences is reduced. This has to be achieved at least by the time Ava to Ewen works are completed (10 years). For this option, provision needs to be made for breaching the western approach embankment or dislodging bridge beams in the event of a large debris build-up. Normal bridge design criteria would not be met.

Overall it is considered that a 2300 cumec flood can be passed through the bridge, thereby meeting the scheme design standard. However, we do not consider that the 2800 cumec stopbank strengthening option is feasible because of high levels of uncertainty. In short, if it is essential to have a 2800 cumec capacity, then we should focus on the new bridge option.

The stopbank strengthening option would cost around \$5–7 million. The Regional Council's ten year plan (2000-2010) provides a budget of \$5 million to upgrade the waterway.

Tranz Rail has insured its Ava Rail Bridge assets, including cover for any potential flood damage. Once all the works upstream are completed (about 20 years), floods exceeding 1900 cumecs could reach the bridge, marginally increasing the risk of flood damage to the bridge. Structural components of the bridge could fail before reaching the increased flood flow of 2300 cumecs.

## 7. Future Discussions with Tranz Rail

Tranz Rail was involved throughout the process of developing and refining options for improving the bridge waterway. Tranz Rail has always maintained that the bridge was constructed to the standards prevailing at the time, so that any waterway upgrades now decided necessary are not their responsibility.

Future discussions with Tranz Rail will be aimed at reaching agreement on an upgrade strategy for the Ava crossing. These discussions would involve:

- presenting the broad upgrade options outlined in this report.
- the advantages and disadvantages of each option, including risks.
- formally requesting Tranz Rail consider the new bridge option, assuming a WRC funding share equivalent to the proposed stopbank strengthening works.
- failing to get agreement for a new bridge, within an acceptable timeframe, seek Tranz Rail's agreement to WRC proceeding with the stopbank strengthening option.

## 8. Ava to Ewen River Realignment and Stopbank Upgrades

Preliminary design for the Ava to Ewen reach river realignment and stopbank upgrade is substantially complete. The preliminary design has confirmed that the upgrade works can be completed without purchasing any residential properties. A part of Strand Park has to be purchased as originally anticipated. The initial estimates show an increase in the total costs for the works, from \$9.6 million to \$12.5 million.

The next step is to start the detailed design and lodge the resource consent applications for the Ava to Ewen works. However, the finished levels for the stopbanks and the river alignment at the lower end will be influenced by the upgrade option adopted for the Ava crossing. Therefore, further discussions with Tranz Rail are a high priority.

Detailed design, which will involve physical modelling, must begin now to enable construction to commence in late 2002. We propose to start the detailed design on the basis of the likely “stopbank strengthening” option.

At this stage, the consent application for the Ava to Ewen works will not include the proposed works at the railway crossing. However, the application will assume that the stopbank strengthening option for the Ava crossing will proceed. There is plenty of time to confirm this assumption before the application is due to be lodged.

## 9. Other Services

Investigations for a pump station at the Opanu Stream (Black Creek) outlet are currently underway. While construction of a new bridge or strengthening of the stopbanks can proceed without a pump station, a pump station has the advantages of:

- reducing stormwater flooding in Opanu Stream catchment.
- removing the Opanu stream training bank and reducing scour uncertainties.
- saving costs by incorporating civil works of a pump station during stopbank upgrades.

The Hutt Valley “Trunk Sewer” is currently located within the waterway area of the Ava Railway Bridge. Accordingly it is at high risk from scour damage. Hutt City Council managers are aware of this and recently temporary works were completed to reduce the risk. In the long-term, we recommend that the sewer be shifted before implementing any of the bridge options discussed. The estimated cost of this work is about \$200,000 and we will write to the Hutt City Council accordingly.

## 10. Budget

A summary of the budget and current estimates is given in the table below.

Description	Budget	New Bridge Option	Existing 2800 cumec Option	Existing 2300 cumec Option
Bridge Construction	\$5 million	\$20 million		
Strengthening flood defences at the bridge			\$5.8 million	\$5.0 million
Ava to Ewen channel and stopbank upgrade	\$9.6 million	\$12.5 million	\$12.5 million	\$12.5 million
<b>Total</b>	<b>\$14.6 million</b>	<b>\$32.5 million</b>	<b>\$18.3 million</b>	<b>\$17.5 million</b>

Costs are likely to come down at the final design stage due to;

- retaining the design for stopbank strengthening at the railway crossing.
- lowering the stopbank heights.
- refining the edge protection design through findings from the physical model study.

## 11. Where to from Here?

The programme for the current financial year includes:

- agreeing an upgrade strategy for the Ava Railway crossing with Tranz Rail. We aim to agree on a preferred option with Tanz Rail by November 2001. These discussions should be concluded by signing a Memorandum of Understanding with Tranz Rail by the end of June 2002.
- obtaining resource consents for the proposed Ava to Ewen upgrade works. We propose to lodge the consent applications by early February 2002. A decision could be expected by the end of June 2002.
- completing the detailed designs for river realignment. We propose to undertake a physical model study to assist with the detailed design of the channel alignment and the Ava crossing upgrade. The detailed design for the channel alignment will be completed by the end of June 2002.
- commencing the detailed design for the Alicetown stopbank.

## 12. Communication

Two rounds of public meetings were held with local residents to explain the project, its effects and to seek their input. Project information sheets were distributed in Alicetown and Woburn. The landowners and occupiers of the adjoining properties will be contacted individually. Local residents and major stakeholders will be provided with another opportunity to comment on the resource consent application before it is lodged in February 2002.

## 13. Recommendations

*That the Landcare Committee:*

- (1) *Note the “risk based” design standard for the Hutt River flood protection scheme is 2300 cumecs. However, new bridges and key stopbanks, such as those in the Ava to Ewen reach, will be designed to the 2800 cumec level.*
- (2) *Note that a new bridge to meet the 2800 cumec design standard can be constructed for about \$20 million, and that Tranz Rail currently has no programme for replacing the bridge.*
- (3) *Note that a “stopbank strengthening” option to enable a 2300 cumec flood to pass through the existing bridge is feasible and will cost between \$5 and \$7 million.*
- (4) *Agree that officers formally request Tranz Rail to construct a new bridge with Regional Council assistance.*
- (5) *Supports negotiations with Tranz Rail to reach agreement on a “stopbank strengthening” option to cope with a 2300 cumec flood, in the event that Tranz Rail is unwilling to replace the existing bridge in the near future.*
- (6) *Endorse commencement of detailed design and preparation of the consent application for the Ava to Ewen reach works, on the assumption that the “stopbank strengthening” option for the Ava crossing will be confirmed.*

Report prepared by:

Approved for submission:

DAYA ATAPATTU  
Project Manager

PHILLIP PURVES  
Acting Manager, Flood Protection (Strategy and Assets)

ROB FORLONG  
Divisional Manager, Landcare

**Attachment 1** : Ava to Ewen Layout Plan

**Attachment 2** : Ava Railway Crossing: Feasibility Study, Decision-making Process