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Report to the Hutt River Floodplain Management Advisory Committee
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Hutt River Floodplain Management Plan : “Design Standard” (Options for Consultation with the Public)

1. Purpose

To provide a recommendation to the Landcare Committee on the options for long term flood protection for the Hutt Valley. These options will provide the basis for consultation with the community.

2. Background

In December 1996 the Wellington Regional Council (Council) produced the report *Living with the River*. The report identified that, although a large part of the Hutt River flood protection system provided a high and acceptable level of protection, there are a number of areas that are inadequate. The Hutt River Board/Government review of the scheme in the 1940s and 1950s had determined a design standard of 2,800 cumecs (100,000 cusecs in imperial terms). Their view, based on the development potential of the Hutt Valley, was that the Hutt Valley should “never” flood.

Following strong submissions to Council’s 1998/99 Annual Plan the Policy and Finance Sub-committee resolved to “*review the timing priorities and resources allocated to the planned flood protection management programme across the western part of the region*”. At separate workshops held on 18 August and 9 September 1998 officers presented to the Wellington Regional Council and to Councillors and officers from Upper Hutt and Hutt City Councils proposals for accelerating the Hutt River Floodplain Management Plan (HRFMP). The programme would bring forward completion of the plan by one year and achieve a “Design Standard” by 30 June 1999, three years ahead of programme. The latter would allow a programme of works for the Hutt River to be considered by Council for its Long-term Financial Strategy 2000/2010.

This report confirms the “Design Standard” options presented to the Hutt River Floodplain Management Advisory Committee (HRFMAC) at a workshop held on 16 June 1999. Advisory Committee members are referred to the workshop material supplied to them on 16 June. The material records the wide range of issues that were discussed. Report 99.____ on this order paper summarises workshop outcomes. Some of the key issues identified for Councillors, to assist them in arriving at a decision on “Design Standard”, are:

- the delicate balance between the standard of structural protection provided
- the residual risk on the floodplain (that the community must manage)
- the cost and affordability of the structural measures.

Other information relevant to the “Design Standard” and residual risk decision is the:

- potential for climate change
- likelihood of experiencing each design option over a chosen 100 years
- consequences of a breach or overtop of the flood defences at various locations
- “non-structural” measures which are used to manage residual risk
- Standard and Poors analogy used to describe the level of protection provided (A for 1,900 cumecs, A+ for 2,300 cumecs and A++ for 2,800 cumecs) and
- ability to engineer the structural solutions (A++ for 1,900 cumecs, A+ for 2,300 cumecs and A for 2,800 cumecs for the same Standard and Poors rating).

The next sections summarise the outcome of investigations into the 1,900, 2,300 and 2,800 cumec “Design Standard” options and their refinement.

3. The “Technical” Design Standard Options

The “Design Standard” investigations involved looking at three options which would provide an even and consistent level of protection over the scheme. The levels of protection are:

- 1,900 cumecs - the “100 year” level, an arbitrary but common level of protection adopted where recovery from overtop or failure would be practical and expedient
- 2,300 cumecs - a high level of protection appropriate to approximately \$5 billion of floodplain assets and where loss of life is not an issue (this is the approximate standard adopted for the Ewen Floodway Project)
- 2,800 cumecs – an appropriate standard where failure of engineering works may result in loss of life and where a slow recovery would affect the local and regional economies (this is the nominal standard for the existing scheme).

These options were subsequently named the “Technical” Design Options and their respective costs are:

- \$70.8 million for 1,900 cumecs
- \$82.0 million for 2,300 cumecs (with alternative of \$90.1 million)
- \$107.2 million for 2,800 cumecs.

A breakdown of the costs is contained in **Attachment 1**. In order to provide alternatives that can provide “appropriate” protection at a lower cost, the “technical” design options were reviewed under risk based criteria. The risk based approach is discussed in the next section of this report.

Further structural options were investigated as part of the “Design Standard”. Detention dams were considered because they have the potential to lower flood peaks and reduce the cost of stopbanks that protect the Hutt Valley. Report 99.--- on this order paper deals with the elimination, from immediate contention, of detention dams.

4. **The Risk Based Approach for 2,300 cumecs and 2,800 cumecs**

The philosophy of the risk based approach is to provide an appropriate level(s) of protection to the principal floodplains of the Hutt River, which are:

- Upper Hutt Valley, left (or south) bank from Maoribank to Wellington Golf Club
- Lower Valley, left (or east) bank from Pomare to Estuary Bridge
- Lower Valley, right or (west) bank from Melling to Estuary Bridge.

and to use risk criteria to assess whether a different level of protection is appropriate to other areas of the floodplain (which may also be constrained by existing circumstances).

For the principal floodplains the “workshop” of 16 June 1999 rejected the 1,900 cumec option because:

- recovery from overtop or failure would not be practical and expedient and
- the likelihood of experiencing overtop over a 100 year period (63% current climate up to 87% in a 30 year climate change scenario) was too high.

The criteria used to develop the “Risk Refined” options are contained in **Attachment 2**. The key criteria are summarised:

Flood Defences

- flood defences must be failsafe structures where the protected area cannot be evacuated and failures can lead to loss of life (not applied for 2,300 cumec risk refined standard, lower valley)
- a residual risk of overtop is acceptable where failure of flood defences is not life threatening

Floodplain Management

- flood defences need not be upgraded where a reasonable level of protection is provided and current risks are not life threatening (the assumption is that redevelopment will provide opportunities to utilise non-structural measures at little cost to the community)
- structural measures comprising the scheme will not be extended to protect new or greenfield development. Appropriate non-structural measures must be integral to new development

- occupiers of flood prone areas are expected to implement preparedness measures to protect their life and property (with support of Councils).

Bridges

- bridge waterways are to be improved at the time the bridge owner decides to replace the structure, and will be improved to the 2,800 cumec standard
- early improvement of sub-standard bridge waterways should be encouraged through joint venture arrangements where Council facilitates the river works improvements.

Services

- services are to be removed from stopbanks at the end of their useful life, or at the time the flood defences are upgraded, whichever is first, at the cost of the service provider
- ongoing protection of services in the river corridor is the service owner's responsibility, Council will provide the level of protection specified to safeguard its flood protection assets
- new services (except stormwater outlets) will in general not be permitted to be laid in, through or under stopbanks.

Land

- land purchase is to be avoided
- a positive economic efficiency should in general be met for integrated upgrading proposals for each reach.

The 2,300 cumec and 2,800 cumec risk refined options presented to the workshop are contained in **Attachment 3**. An initial priority schedule of works for each of these options is contained in **Attachment 4** (costs slightly modified from Attachment 3), and a clear statement of the inclusions and exclusions for each option is contained in **Attachments 5(a) and 5(b)**.

Economic analysis of the "Risk Refined" options indicated that all proposals showed acceptable economic returns (when the factor for "intangible" damages is applied), which are consistent with other flood protection schemes at this stage of development. It was suggested that the decision on whether to improve the scheme and to what standard could largely be based on the balance between "Design Standard", residual risk, cost and affordability.

The "workshop" identified the need to not constrain future flood protection potential, and agreed a 2,800 cumec standard should be adopted for the replacement of bridges and other critical long-term structures. The life of a bridge or other structures may be in the order of 100 years, much longer than the 40 year life of the floodplain management plan.

5. **Protection Standards : Other Urban Developments**

Councillor Baird made an enquiry at the workshop about the standards of flood protection provided by other schemes within New Zealand and throughout the world. Information on New Zealand schemes is contained in **Attachment 6**, and a comparison for schemes similar in size and importance to the Hutt is given below. Information on schemes in other parts of the world will be collated in due course.

Of the schemes noted in Attachment 6, the Waimakariri (which protects greater Christchurch, along with large lifestyle and rural areas) and the Manawatu (which protects the city of Palmerston North, many rural towns and a large rural area) are appropriate comparisons.

The Waimakariri scheme provides a “500 year” standard of protection through its stopbanks. In addition the scheme contains a number of “return” banks which, in the event of a failure or overtop of the main stopbanks, return breach flows or overflows to the main channel. The return banks principally protect greater Christchurch and the philosophy for the scheme is that greater Christchurch must never flood.

The Manawatu scheme provides a “2000 year” standard of protection, through stopbanks, to Palmerston North City. The remainder of the scheme provides “100 year” protection to rural towns and rural land.

Although not on the same scale as the Hutt Valley the Whakatane scheme is designed to provide “100 year” protection to Whakatane town, but with fail safe overflow paths. The latter allow floodwaters in excess of the “100 year” flow to spill out on the opposite bank and bypass the town. The net effect is that exposure of the town is effectively limited to the “100 year” event through the whole range of extreme events.

Unfortunately neither the Waimakariri return bank or the Whakatane overflow spillway principles are viable for the Hutt scheme.

6. **Options for the Committee**

After input is received through the public consultation process the Advisory Committee will have a number of considerations in relation to the “Design Standard” decision. These may include:

- adopt a “Technical” 1,900, 2,300 or 2,800 cumec “Design Standard” of protection for the whole scheme (each provides an “even” standard of protection)
- adopt a “Risk Refined” suite of works for a 2,300 cumec or 2,800 cumec “Design Standard” (a varied but appropriate standard of protection)
- adopt either one of the “Risk Refined” 2,300 cumec or 2,800 cumec standards with a financial cap on expenditure (this would follow a critical comparison between the two options which may indicate that for the same amount of money the higher standard of protection may be provided with minimal overall loss of security).

Other options or ideas may well emerge through the consultation process. It is worth noting that the preference of the “workshop” held on 16 June was for a “Risk Refined” 2,300 cumec “Design Standard”, with a requirement that all bridges and other key structures be upgraded or replaced to the 2,800 cumec standard.

7. Direction From Here

Consultation on the options will commence, assuming adoption of the Advisory Committee recommendations, soon after the Landcare Committee meeting on 8 July. Report 99.--- on this order paper sets out the strategy and timeline proposed for consultation. Achieving the “Design Standard” is the first of the milestones towards completion of the Hutt River Floodplain Management Plan. Other milestones include the “Non-Structural” measures including the “River Corridor” strategy, the “Environmental Strategy” and drafting of the plan.

8. Recommendations

That the Hutt River Floodplain Management Advisory Committee:

- (1) *Recommend to the Landcare Committee that the Community be advised of the outcomes of the investigations on the “Design Standard”, for long term flood protection for the Hutt Valley, specifically the 1,900 cumec, 2,300 cumec and 2,800 cumec design options.*
- (2) *Recommend to the Landcare Committee that the 2,300 cumec and 2,800 cumec design options, modified by risk based criteria at a number of locations, be used as the basis to consult with the public on their preference for a Risk Refined “Design Standard”.*
- (3) *Recommend to the Landcare Committee that it believes the 1,900 cumec option is not a standard generally appropriate for protection of the major developments on the principal floodplains of the Hutt Valley, and recommend that this standard not be considered further for them. This matter to be included in the consultation strategy.*
- (4) *Request the Landcare Committee note that at this stage the Advisory Committee has a preference for a Risk Refined 2,300 cumec “Design Standard”, with a requirement that all bridges and other key structures are upgraded or replaced to the 2,800 cumec standard.*
- (5) *Request the Landcare Committee note the aim to have a “Design Standard” adopted at its meeting on 23 November 1999, a significant milestone in the preparation of the Hutt River Floodplain Management Plan.*

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Attachment 1 : “Technical” Design Option Costs
Attachment 2 : Criteria for the Design of Upgrading Works
Attachment 3 : Risk Adjusted Total Costs
Attachment 4 : Priority Schedule of Works for 2,800 cumec and 2,300 cumec Options
Attachment 5(a) : Risk Based Inclusions/Exclusions for 2,800 cumec Design Option
Attachment 5(b) : Risk Based Inclusions/Exclusions for 2,300 cumec Design Option
Attachment 6 : Flood Protection Schemes : Standard of Protection