

Waioeka Otara Floodplain Management Strategy

2007 Review



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Environment Bay of Plenty
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*Working with our communities for a better environment
E mahi ngatahi e pai ake ai te taiao*

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Chapter 1: Introduction

The Waioeka-Otara Floodplain Management Strategy (FMS) was adopted by Environment Bay of Plenty and Opotiki District Council in September 2001. It outlines the commitment of these two organisations to managing the flood risk to the Waioeka and Otara floodplain. The strategy is a non-statutory document that pulls together various measures, broadly covering stopbank and river works, upper catchment management, statutory plans and emergency management. Although it is a non-statutory document, it references some statutory plans; for example various regional plans and the Opotiki District Plan.

The strategy contains a summary of each measure, and states who is responsible for implementing each, and when. The strategy therefore can be seen as an action plan.

The strategy also includes a monitoring and review process. The initial review was to be completed within five years of its adoption. What follows here is the first such review.

Chapter 2: Relevant events and projects since adoption of the Strategy

In addition to that intent stated in the strategy that it be reviewed about now, other events have occurred that make the review particularly timely.

In 2004 two major flood events occurred in New Zealand: in February in the lower North Island and then July in the eastern Bay of Plenty. These focussed national attention on the issue of flood risk and how it was managed in New Zealand. That attention has been maintained by subsequent flood events in Matata and Tauranga in May 2005 and Northland in March and July 2007.

As a result, two overlapping national projects were initiated. One has been the development of a draft New Zealand protocol on managing flood risk by a group of local and central government officials and IPENZ. This draft was completed in 2005. The current intention is to develop a New Zealand Standard from the protocol.

The second project is a central government review of flood risk management within New Zealand, led by the Ministry for the Environment. That review commenced in 2005 and is due for completion in mid-2007. In the meantime, Cabinet has agreed to the Ministry giving consideration to developing a National Policy Statement.

These two projects may have implications for the Waioeka-Otara FMS, although at this stage the FMS appears consistent with direction the two projects are taking.

Finally, since 2001 interest in the issue of climate change has gathered momentum, particularly with the release of the latest IPCC reports in 2007 (issued approximately every five years) and the 2006 Stern Report on the economic impact of climate change. It is now generally accepted that climate change is likely to impact upon flood risk. Together with specific flood events such as the ones mentioned above, and events such as Hurricane Katrina in New Orleans, this is further generating awareness of flood risk amongst local and central government, insurers and the general public. One of the direct results of this awareness has been a set of MfE guidelines for incorporating climate change into flood design work.

Chapter 3: Structure of this report

This report needs to be read in conjunction with the FMS. Each of the measures described in the FMS and their current status is summarised in Table 1. This table is an update of the timetable presented on page 6 of the FMS. In the text that follows, the key commitments made in the FMS for each measure are reproduced. Comment is then given on the progress made in implementing the measure. Finally, general conclusions from the review are presented.

Locations and river cross-sections referred to are shown in Figures 1 and 2.

Table 1 Summary and Status Update of FMS Measures

What the FMS said (2001)			Current status (2007)
What	When	Who	
Modify Flood Event			
Urban stopbank raising and widening	2001/02	Environment B-O-P	Completed
Rural stopbank Raising and widening	1999/00-2003/04?	Environment B-O-P	Mostly completed
Waioeka River realignment upstream of SH2	2000/01-2002/03	Environment B-O-P	Partially completed
Investigate property purchase if stopbank dimensions or maintenance constrained	June 2002	Environment B-O-P, ODC	Other than in individual cases, not done. Suggest review river morphology first
Further consideration of Waioeka-Otara Rivers confluence realignment	Ongoing	Environment B-O-P	No change - no need at this stage
Bridge Investigations - SH2	Jun-02	Environment B-O-P, ODC, TransitNZ	Not followed up
Additional specific river works	2000/01-2002/03	Environment B-O-P	Some works completed, otherwise ongoing as required
Waioeka Otara Rivers Scheme - maintenance (general)	Ongoing	Environment B-O-P	Ongoing, AMP updated 2007
Stopbank bylaws	Draft December 2003	Environment B-O-P	Adopted 2003
Berm management	Ongoing	Environment B-O-P, ODC	Ongoing, no significant change
Stormwater system improvements	Ongoing (Annual)	ODC	Ongoing
Enlargement of the river mouth	2001/02, ongoing	ODC	Investigations proceeding
Soil conservation	Ongoing	Environment B-O-P, GDC, ODC	Ongoing, GDC and EnvBOP Plans do specifically address
Pest management (upper catchment)	2001/02	DOC	Continuing
Upper catchment stability monitoring	Ongoing (Annual)	Environment B-O-P	Some monitoring initiated, but not followed up.
Gravel Extraction	Ongoing	Environment B-O-P	Little extraction in Otara
Restrict infilling and structures in channel	Ongoing	Environment B-O-P	Ongoing, Regional Plan rules operative
Modify Vulnerability			
Minimum floor level 3.6m for new buildings in the township	2000/2001	ODC	Maintained
Variation to the proposed district plan	2001	ODC	Not followed up
Flood forecasting model development & improvement	2001 & ongoing	Environment B-O-P	Model development continued
Flood warning manual update	Ongoing	Environment B-O-P	Updated June 2007
Civil Defence exercise - flood scenario	2001, 2001/02	ODC	2001, none subsequently
Civil Defence	Ongoing	ODC, Environment B-O-P	Ongoing, revised plans
Education	Ongoing	Environment B-O-P, ODC	Flood risk an issue nationally & regionally. Nothing specific to Waioeka-Otara
Floodproofing advice	from 2002	Environment B-O-P, ODC	Manual prepared 2002
Modify Flood Loss Burden			
Provision of welfare services	Ongoing	ODC, Others	Ongoing
Strategy Review	2006	Environment B-O-P, ODC	2007

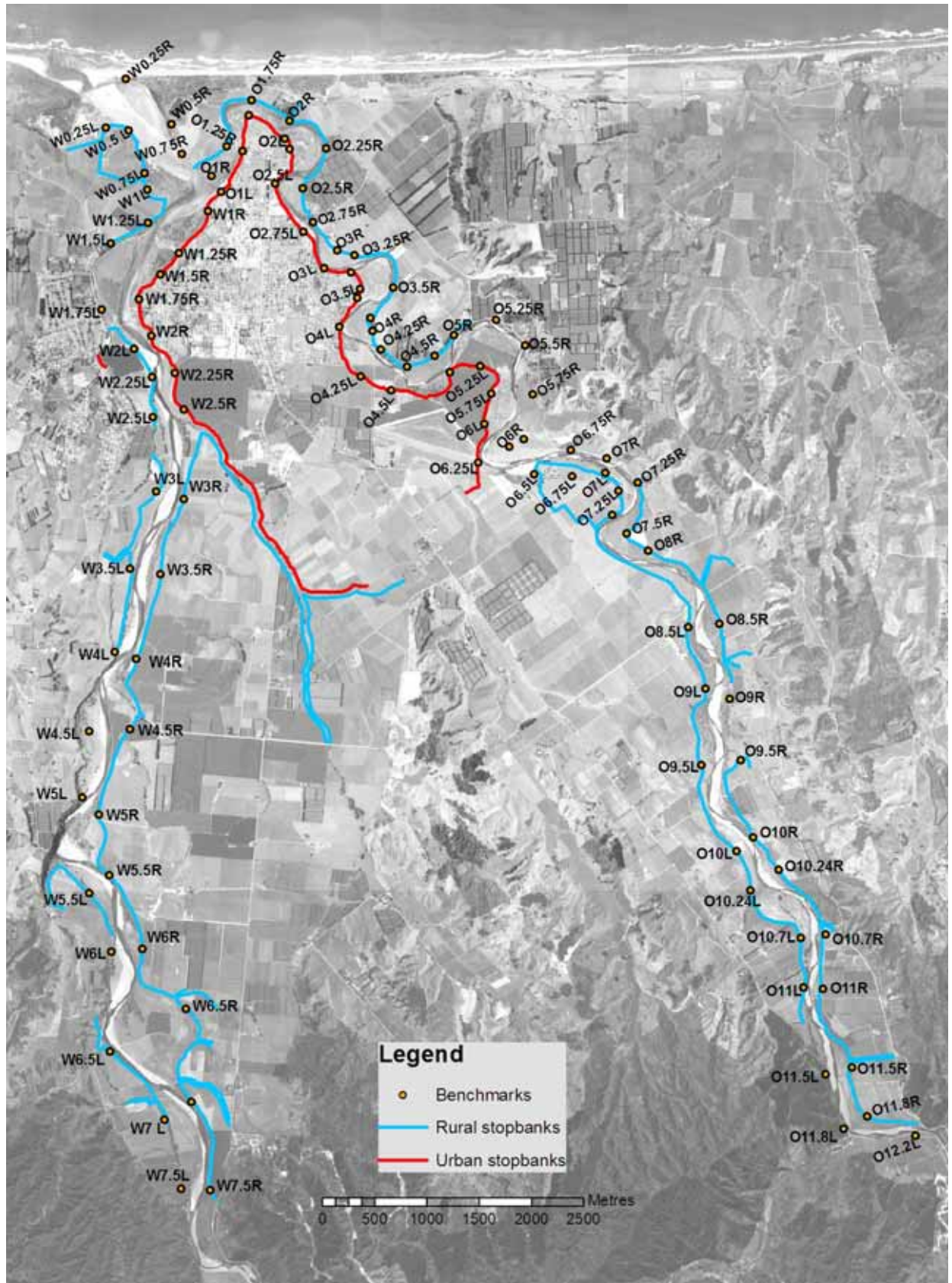


Figure 1 Location Map

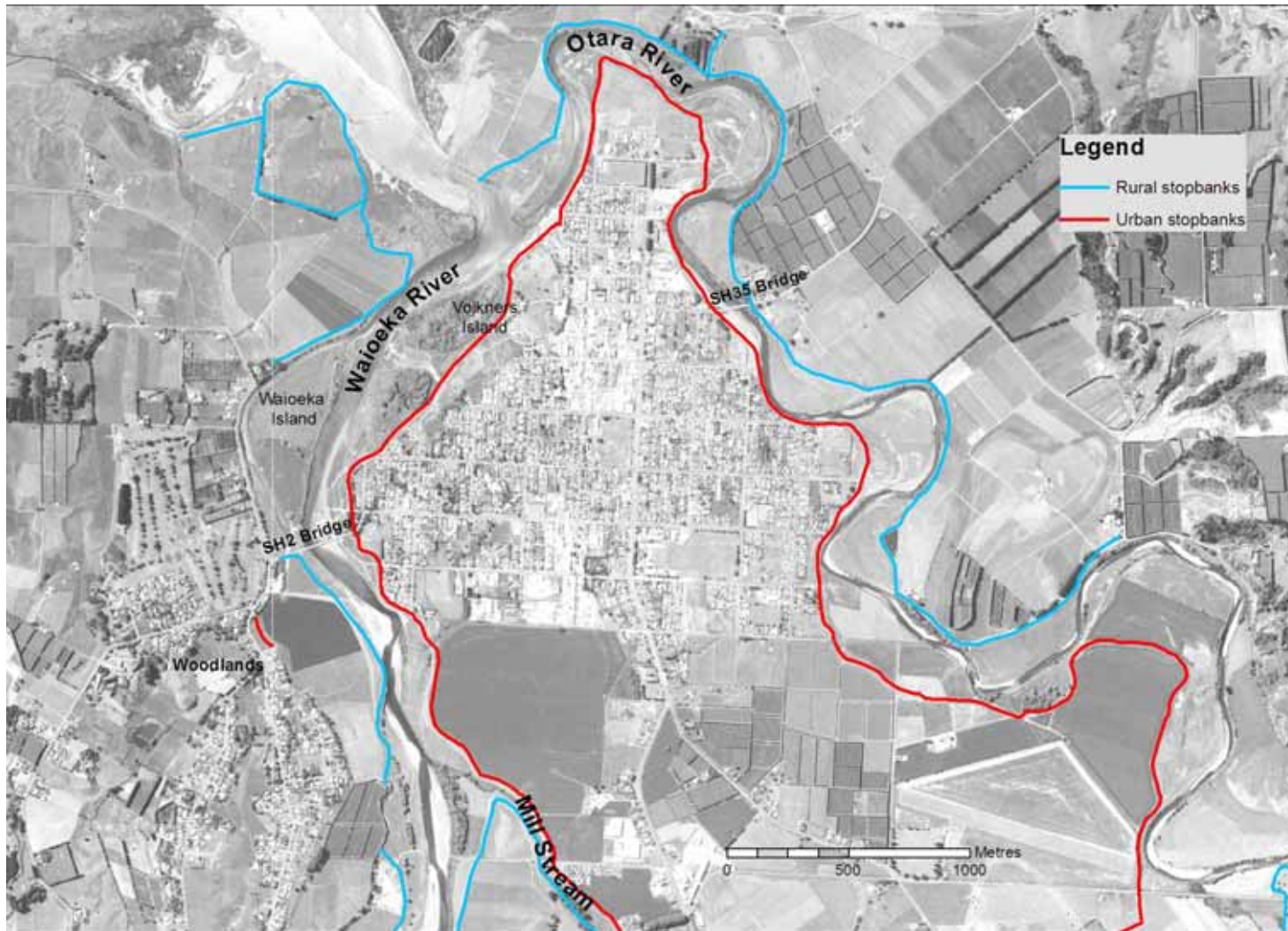


Figure 2 Location Map, Urban Area

3.1 **Measure I-1: urban stopbank raising and widening**

What the FMS said: *Urban stopbanks to be raised in 2001/02 to provide protection against a 1% AEP (“100 year”) flood*

Also regular topping up of banks back to design standards to cope with settlement of stopbanks over time, as provided for in Asset Management Plan.

Comment

The urban stopbank raising work was completed in 2002. (This work included raising floodwall at the Opotiki Wharf.)

In addition, a new length of urban stopbank was built in 2007 to protect several low-lying houses in the Woodlands Road area from a 1% AEP Waioeka flood. This was not identified in the FMS, but the area was unprotected previously, relying only on the crest of Woodlands Road to prevent overflow.

Recent investigations have confirmed that SH2 does not provide complete protection to the properties to the west of the road in a 2% AEP flood. How this is to be addressed has yet to be determined.

The Asset Management Plan still provides for regular topping up of banks back to design standards (i.e. maintenance rather than capital expenditure). Environment Bay of Plenty also regularly reviews the capacity of the stopbanks following river cross-section and stopbank crest surveys. Cross-section surveys were carried out in 2007, and the next capacity review is due in 2009/10. The 2007 survey results suggest that, within the urban reaches, there will have been little change in the Waioeka capacity since 2000, but that the capacity of the Otara will have been reduced by channel aggradation.

Environment Bay of Plenty has planned a condition assessment of the Waioeka-Otara stopbanks in 2007/08 and a detailed seepage and stability analysis in 2008/09. These investigations will focus on the urban stopbanks.

3.2 **Measure I-2: rural stopbank raising and widening**

What the FMS said: *An investigation into options for rural stopbank works is being carried out during 2001, and a report will be released for public consultation later in 2001. Any major works resulting can be expected to commence in 2003/04, although a detailed programme will be developed by Environment Bay of Plenty following the consultation.*

More generally, stopbank top-ups to design standards are also provided for regularly as part of Asset Management Plan, to cope with settlement of stopbanks over time.

Comment

Although the report was never finalised, the 2002 draft has provided a guide to requirements. The report recommended revised standards for the various

sections of rural stopbank and works were outlined to meet those standards. A subsequent amendment, following further consultation with landowners, was made in 2004.

Works on several sections of bank have been completed since 2001 in line with these recommendations. Works are still to be completed on four sections of stopbank. The first section is the ring bank on the Waioeka left bank at $\frac{1}{4}$ L to $\frac{3}{4}$ L ("Peterson's stopbank") is very vulnerable to river erosion and provides inadequate protection to the house there. Options for this area are currently being considered.

The second section is immediately upstream: on the Waioeka left bank around $1\frac{1}{4}$ L, where the recommendation was to realign the bank further back from the river. The landowner is opposed to these works, and they have not been pursued.

The final two sections are on the Waioeka right bank, near $4\frac{1}{2}$ R, and on the Otara left bank between $8\frac{3}{4}$ L and 9L. Only minor works are required in these locations, and they are programmed for 2008/09.

Table 2 summarises the recommendations of the amended report and progress made to date in implementing the recommendations.

Note that the design standards for the banks alongside the Mill Stream actually refer to backwater from the Waioeka River, not to flows from the Mill Stream catchment.

The draft revision of the Asset Management Plan has adopted the recommended standards of Table 2. However, Environment Bay of Plenty's Annual Plan and recent Annual Reports indicate rural stopbank standards that are different:

- To provide security from floods up to the 3.3% Annual Exceedance Probability level (1 in 30 year flood) to most rural areas adjoining the Waioeka River rural right bank and Otara River rural left bank.
- To provide security from floods up to the 5% Annual Exceedance Probability level (1 in 20 year flood) to identified rural land on the Otara River rural right bank and the Waioeka River rural left bank.

This discrepancy needs to be addressed. Table 2 are the later standards and assuming that they are not altered in the meantime, they should replace the standards in subsequent annual plans. (Environment Bay of Plenty's 10 Year Plan is less specific and is generally not inconsistent with Table 2.)

The 2002 report also indicated that in some areas the stopbank widths and batter slopes were less than ideal, even where the crest heights were adequate, but that it would be excessively expensive to remedy this. Thus the programme of works only included widening where the banks also needed raising.

Stopbank works on the Otara right bank just downstream of the SH35 bridge were undertaken in 2003/04 to address seepage issues that became apparent in the October 2003 flood event. The bank itself was not raised as it met the identified 5%AEP + 300mm freeboard standard. However, given that Thornton

Rest Home complex sits behind the stopbank, and that the buildings are not elevated, the protection standard should be reconsidered. The current estimate of actual capacity is approximately 1% AEP without freeboard, or 2%AEP with 300mm freeboard. To be given the same standard as the rest of the town, i.e. 1% AEP + 450mm freeboard, the bank would need to be raised by approximately 400mm. Some analysis would be needed to confirm this and estimate how far upstream and downstream any top-up works would need to go to prevent flow into the site.

The Asset Management Plan still provides for regular topping up of banks back to design standards. Environment Bay of Plenty also regularly reviews the capacity of the stopbanks following river cross-section and stopbank crest surveys. Cross-section surveys were carried out in 2007, and the next capacity review is due in 2009/10. The 2007 survey results suggest that there will have been little change in the Waioeka capacity since 2000, but that the capacity of the Otara will have been reduced by channel aggradation at least in its lower and mid-reaches.

Table 1 Summary and Status of FMS Measures

River/Bank	Section Cross-section (and MIKE 11 model chainage)	Recommended Standard	Recommended Works (2002 draft report)	Current Status (June 2007)
Waioeka Left Bank				
	Adjacent to Huntress Creek	No recommendation	No works	
	W ¼ L - W ¼ L (13630 – 12750) Ring Bank	No recommendation	Assess condition of trees on the southern end of the ring bank, and remove if necessary. No other works at this stage, but the erosion threat will need continual monitoring. Reconsider if confluence realignment option is approved.	Options being considered to protect the house (lower than previously realised) (Petersens) Work due in 2007/08
	¼ L – 1 ½ L (12750 – 11340 m)	50%AEP +300 mm freeboard	Realign approximately 300 m length of stopbank	not done (landowner opposition)
	SH2 Bridge – 2 ½ L (10 750 m – 9 680 m)	20%AEP +300 mm freeboard	No further works (works complete).	completed
	3 L – 3.5 L (9000 m – 8100 m)	5%AEP +300 mm freeboard	No works.	
	3 ½ L – 4 L (8050 m – 7205 m)	5%AEP +300 mm freeboard	No works, although some maintenance needed at cattle crossing.	
	5 ¼ L – 6 L (6000 m – 3755 m)	5%AEP +300 mm freeboard	Raise to standard.	completed
	6 ½ L – 7 L (2760 m – 1900 m)	5%AEP +300 mm freeboard	No works.	
Mill Stream Left Bank				
	SH2 – Waioeka River	5%AEP (Waioeka) +300 mm freeboard	No works, other than maintenance works at isolated low spots. Undertake hydraulic analysis of Mill Stream flood hazard.	(investigations/works upstream, Warrington Rd etc)
Waioeka Right Bank:				
	Mill Stream Confluence to 4 ½ R (9500 m – 6400 m)	5%AEP +300 mm freeboard	No works.	Some minor top-ups required at Nicolls, near 4.5 R Work due in 2008/09
	4 ½ R – 6 ½ R (6400 m – 2800 m)	5%AEP +300 mm freeboard	Raise to standard.	completed
	6 ½ R – 7 R (2800 m – 2000 m)	5%AEP +300 mm freeboard	No works.	
	7 R – 7 ½ R (2000 m – 1020 m)	5%AEP +300 mm freeboard	No works.	
	6 ½ L - 7 ½ L (Ring Bank) (9880 m – 8340 m)	5%AEP +300 mm freeboard	No works.	
Otara Left Bank				
	6 ½ L - 7 ½ L (Ring Bank) (9880 m – 8340 m)	2%AEP +450 mm freeboard	No works	Works to revised design standard (Gaults).
	7 ½ L – 11 L (8340 m – 2400 m)	10%AEP +300 mm freeboard	Raise banks to standard.	Mostly complete except between 8.75 - 9L (Don Browns). Work due in 2008/09
Otara Right Bank				
	1 R – 2 R (19005 m – 17500 m)	No recommendation	No stopbank works. Options for protection of land from erosion to be considered	
	2 R – 5.25 R (17500 m – 11980 m)	5%AEP +300 mm freeboard	Raise banks to standard.	Completed in 2007/08 (Snells)
	7.25 R – 8.25 R (8790 m – 7000 m)	10%AEP +300 mm freeboard	Resurvey the stopbank profile where it passes over the Otara East Road.	works completed, raised to recommended standard
	8.25 R – 8.75 R (7000 m – 6500 m)	10%AEP +300 mm freeboard	Resurvey the stopbank profile.	works completed, raised to recommended standard
	9.5 R (5205 m – 4800 m)	5%AEP +300 mm freeboard	No works.	
	9.75 R – 10.7 R (4600 m – 3000 m)	10%AEP +300 mm freeboard	No works.	
	10.7 R – 11.5 R (3000 m – 1650 m)	10%AEP +300 mm freeboard	No works.	
	11.5 R – 12.2 R (1650 m – 300 m)	10%AEP +300 mm freeboard	No works.	

3.3 Measure I-3: Waioeka River alignment upstream of SH2

What the FMS said: Works from SH2 bridge to Mill Stream – widening and slightly realigning the river, associated bank protection works.

First stage of work (realign left stopbank) completed July 2001. Remainder to be completed by the end of 2002/03 financial year.

Comment

Partially completed. The left stopbank was realigned in 2001, as indicated in the strategy. Rock bank protection has been placed along sections of both banks, along the alignment indicated. It has also been placed behind the recommended alignment at the base of the Union St stopbank, as shown in Figure 2. More rock is also needed further upstream of this location.

Some of left berm marked for removal has been lowered, but in general the channel has not been excavated to the blue alignment. On the right bank, the area marked for reclamation has not been actively reclaimed, but the area is starting to infill naturally.

Figure 3 is a reproduction of the diagram in the FMS, showing the river alignment in background image in the late 1990s and the planned works. Figure 4 shows the river, at low flow, in 2003. Figure 5 shows the 2007 alignment with the late 1990s alignment overlaid.

While the channel is gradually infilling on the right bank, the right bank in particular remains one of the most likely places on the Waioeka where a breach might occur and further work to complete the design alignment is required. Before such work, the proposed alignment should however be reviewed with the aid of more recent aerial photographs and data (see also Measure I-4).

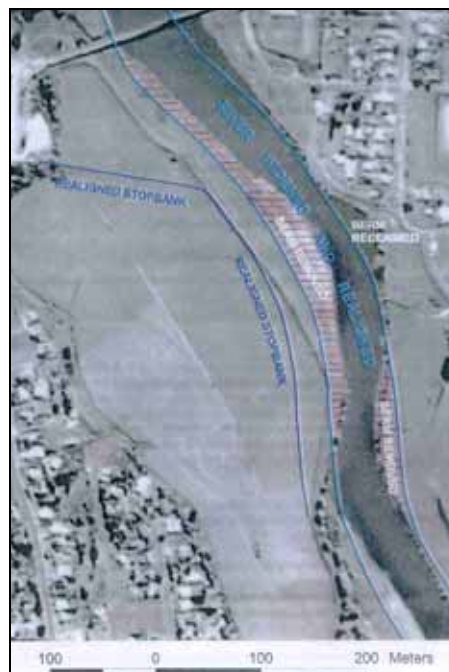


Figure 3 Reproduction of FMS Diagram (late 1990s photo)



Figure 4 2003 Alignment



Figure 5 2007 Alignment, with late 1990s Alignment Overlaid

3.4 **Measure I-4: investigate purchase of properties adjacent to stopbank**

What the FMS said: *Where those properties restrict stopbank works or pose risk to stopbank stability. Report on desirability and feasibility of purchase to be prepared by June 2002.*

Comment

No such report has been prepared. There has been some consideration of purchasing individual properties but no purchases have eventuated.

The issues that gave rise to this measure - compromised stopbank dimensions and maintenance difficulties - still exist. In some places it is debatable whether the river corridor and stopbank alignments are sustainable in the long-term or whether continuing to maintain them is economic.

The investigation therefore should still be undertaken. However in the first instance, further effort should be made into determining appropriate river and stopbank alignments (including maintenance strips). That work would be consistent with one of the key elements of the draft Flood Protocol (and which is likely to end up in a NZ Standard): the consideration of natural river processes. The review of the proposed alignment of Measure I-3 suggested above would also fit into this work.

Following that, various options for providing for these alignments could be investigated. Ownership and control of the land does have management advantages, and so land purchase would be one of the possible options. Others could include District or Regional Plan controls, bylaws, or even designation. The analysis could link to the review of district and regional plan controls suggested under Measure II-2 below.

3.5 **Measure I-5: further consideration of Waioeka-Otara Rivers confluence realignment**

What the FMS said: *This measure will only proceed if and when the community provides a clear mandate for it.*

Comment

At this stage, there is no change from 2001 in the status of this measure. If in future the standard of flood protection given to the urban area is to be increased, or if climate change, channel aggradation or harbour entrance works reduce the capacity below the current standard of 1%, then realignment will need to be considered again.

Regardless, advanced investigations into harbour entrance proposals will need to at least consider the possibility of the realignment.

3.6 **Measure I-6: bridge investigations – SH2**

***What the FMS said:** Preparation of strategy for dealing with the risk posed by the bridge. Strategy to be drawn up identifying short, medium, long term management measures by June 2002.*

Comment

The bridge strategy intended has not been prepared.

However, with the aid of comments received from Transit NZ on the then draft FMS in 2001, a relatively simple bridge strategy could be easily prepared. In effect it would be an understanding between Transit NZ, ODC and Environment Bay of Plenty, with short-term, medium-term and long-term measures as discussed in the strategy.

It should be noted that at a national level, Transit NZ and Land Transport NZ are participating in the flood review. Discussions on the flood risk posed by the bridge, and the flood risk to the bridge itself, should be renewed with these organisations.

Currently, progress within the three groups of measures includes:

- Short term – Transit NZ has been included in flood warning contact list in Environment Bay of Plenty's Flood Warning Manual.
- Medium term – Some silt has been cleared from under the bridge for use in the Woodlands Rd stopbank completed recently, although this has probably not improved the bridge capacity significantly. Nonetheless, the silt clearance of 2001 is still relatively effective.
- Long term – No change; bridge upgrade or replacement does not feature in Transit NZ's 10 year forecast.

The capacity review of the river channels planned for 2009/10 will need to include a reassessment of the bridge capacity and the impact of the bridge on upstream water levels. Results would be used to refine or update the bridge strategy.

3.7 **Measure I-7: additional specific river works**

***What the FMS said:** Capital works (i.e. other than maintenance) additional to those identified elsewhere in this strategy. In particular, new bank protection works on the Otara left bank.*

Comment

Since the adoption of the strategy, additional rock riprap bank protection works have been completed, on both the Otara and Waioeka Rivers.

Extra drains have been added to the drain network in the Te Rere Pa Road area and some additional weirs/overflow structures installed in the watercourses leading to the Duke Street pump station.

Hydraulic improvements to Mill Stream upstream of Matchett Road will be carried out in 2007/08, to reduce overland flow from the Stream.

Other than that, at this stage there is no identified need for further additional capital works.

3.8 **Measure I-8: Waioeka Otara Rivers Scheme – maintenance (general)**

What the FMS said: *Ongoing. Specific programme given in Asset Management Plan. The Plan is due to be revised in 2001/02.*

Comment

A draft revision of the Plan has been completed in 2007. Scheme ratepayers have been consulted and the draft is due to be presented to the council of Environment Bay of Plenty in November 2007. After any resulting amendments it will be put before the council again for formal adoption in June 2008.

3.9 **Measure I-9: Stopbank Bylaws**

What the FMS said: *Bylaws to protect stopbanks from damage, e.g. to reduce stock damage, unnecessary crossings and structures on, over and through the banks. A draft set of bylaws will be prepared and released for public comment late in 2001.*

Comment

The Bay of Plenty Regional Council Floodway and Drainage Bylaw 2002 was adopted by Environment Bay of Plenty in 2003. The Bylaw is potentially a powerful tool in maintaining the integrity of flood defences, with Environment Bay of Plenty having the power to prevent, for example:

- constructing any structure, planting or growing shrubs and trees etc, between the river edge to 12m beyond the landward toe of a stopbank or floodwall
- excavating or undertaking earthworks within 20m of a stopbank or floodwall
- overgrazing of stopbanks
- other interference with stopbanks and floodwalls
-

However this power has not yet been tested, nor has there been any significant educational or promotional campaign on the existence of the bylaw. An upcoming exercise to address encroachments, structures and plantings on the Whakatane stopbanks will show in practice how well the bylaw works.

One mechanism for promoting the bylaw would be to make a note in a LIM where a property is within 20m of a stopbank or floodwall. That would require a GIS overlay of such areas to be created and given to the District Councils.

3.10 **Measure I-10: berm management**

What the FMS said: *Keep berms clear of dense vegetation in lower end of town – Volkners Island and Waioeka Island in particular. Ongoing. Has been undertaken for a number of years – the right bank below the bridge for instance is gradually being cleared. Regular mowing of some of the berms in the urban area is undertaken.*

Comment: On the Waioeka, the left bank island (Waioeka Island) has been clear of dense vegetation since 2001. It has been grazed since 2000 and thus is kept clear.

There is little interest in grazing the land on the right bank downstream of the SH2 Bridge and dense vegetation (willows) remains over a large portion of it (Volkners Island). Of the more open areas on the right berm, much of it is too rough to mow. However, with a small investment in machine time, it could be smoothed sufficiently for the District Council to mow. Sufficient budget is allowed in the Rivers Scheme Asset Management Plan for this smoothing.

Grazing of the Otara berms is currently carried out in several areas. However, this has been quite controversial because of concerns about interference with recreational activity on the river banks.

An agreement between Environment Bay of Plenty (as River Scheme managers) and the District Council is required to confirm the areas to be mowed and how that will be funded.

3.11 **Measure I-11: stormwater system improvements**

What the FMS said: *Ongoing – programme identified in the Opotiki District Council Long-Term Financial Strategy (LTFS).*

Comment

Since 2001, additional stormwater pumps have been installed in Opotiki, so that there are now five in total. Although they are not designed to cope with such large volumes of water, these along with the Duke Street pump maintained by Environment Bay of Plenty will at least contribute to the drainage of the town following an overdesign flood event.

Recent analysis by Opotiki District Council suggests that the defined ponding areas within the town are still required to deal with stormwater overflows.

3.12 **Measure I-12: enlargement of the river mouth**

What the FMS said: *Further investigations into keeping the river mouth open – e.g. fluidisation trials. Preliminary investigations in 2001/02.*

Comment

This measure ultimately is aimed at keeping the mouth navigable for a much greater proportion time than is the case now, rather than for flood mitigation benefits. In general the mouth is expected to scour out during a large event (as indicated by mouth cross-section measurements taken around the time of a flood event in October 2003). Nonetheless, the behaviour of the mouth opening can impact upon flood levels upstream and the project is of great relevance to the flooding issue.

The investigations have proceeded, to the stage where the ODC intends to apply for resource consents in 2007/08 and to complete construction by 2012. Fluidisation is no longer favoured as an option, investigations now focusing on the use of groynes at the river mouth.

Modelling to date by ODC's consultants has confirmed that the mouth configuration (groyne layout and spacing) will have an effect on flood levels. Detailed design work will further investigate the effects, both positive and negative, and the final design will be required to have insignificant negative impacts on upstream flood levels.

3.13 Measure I-13: soil conservation

What the FMS said: Various promotional and education programmes, incentives and regulatory measures aimed at sustainably managing the soils of the riparian zone and the catchment. Primarily via the Draft Regional Water and Land Plan prepared by Environment Bay of Plenty, and the Gisborne District Council Combined Regional Land and District Plan.

Many of the non-regulatory measures discussed in the plans have been implemented and will continue to be. Regulatory measures will come into effect when the relevant plans are made operative. However, where particular rules have not been appealed, those rules are considered effectively operative once the plan reaches the "proposed" stage.

Environment Bay of Plenty's Regional Water and Land Plan is due to become proposed late in 2001 or early in 2002, and to become operative in 2004. In the meantime, many of the rules relating to soil conservation have been taken from Environment Bay of Plenty's Proposed Regional Land Plan, and so are in effect now. (The Land Plan is due to be made operative and then to be withdrawn once the Water and Land Plan is made operative).

The Gisborne District Council Combined Regional Land and District Plan reached the proposed stage in 1997. It will be made operative chapter by chapter.

Comment

Environment Bay of Plenty's Regional Land Management Plan was made Operative in February 2002. However, its Regional Water and Land Plan is now at the Proposed stage and rules regarding Land and Soil Disturbance by Vegetation Clearance are operative under s19 of the Resource Management Act. These rules now override those of the Regional Land Management Plan.

Nonetheless, as a large portion of the upper catchment within Environment Bay of Plenty's area is DoC estate, the Plan has only a limited impact on soil conservation in the upper Waioeka-Otara catchment.

Gisborne District Council's Combined Regional Land and District Plan remains proposed. A proposed variation to chapter 6 (Soil Conservation: Policies / Objectives / Rules relating to Land disturbance and vegetation clearance) was notified in December 2006. That chapter of the plan draws upon the land use capability (LUC) assessment of the New Zealand Land Resource Inventory. Much of the upper Waioeka-Otara catchment is in Classes VII and VIII, the most susceptible to erosion, sediment generation and soil loss.

3.14 **Measure I-14: pest management (upper catchment)**

What the FMS said: The Department of Conservation has commenced a goat control programme in the 2001/02 financial year. Ongoing control in future years is dependent on DoC obtaining the necessary funds.

Comment

Goat control is continuing, with the assistance of Environment Bay of Plenty. A 2005 report on the strategic management of goats in the eastern Bay of Plenty is guiding the control efforts of both the Department of Conservation and Environment Bay of Plenty. Areas on the true left bank of the Waioeka have been cleared, and goat numbers in the east of the Waioeka catchment have been reduced to low numbers. Within the Otara catchment, areas are systematically being hunted.

3.15 **Measure I-15: upper catchment stability monitoring**

What the FMS said: *Annual Inspections - plus after major storms.*

Comment

This has not been actioned.

Environment Bay of Plenty did begin testing a method for monitoring erosion in the hill county beyond Opotiki, using repeat satellite imagery (EcoSat). This was part of a programme funded by a number of regional councils. However, the funding nation-wide eventually dried up and the programme has been abandoned as a result.

GDC also has begun monitoring catchment soil erosion. The first survey was of over 4000 sites in its district, and repeat surveys of those sites will be carried out every five to ten years.

3.16 **Measure I-16: gravel extraction**

What the FMS said: *Apply for consents for gravel extraction, and consider how to actually encourage it. Apply to renew existing consents that are due to expire in 2002, with extraction volumes as appropriate according to findings of most recent NERMN report.*

Comment

Environment Bay of Plenty has applied for renewal of gravel extraction consents, which it expects to receive shortly.

The most recent gravel monitoring report concludes that extraction in the Waioeka River (downstream of the gorge) in recent years has been almost equal to the estimated supply. However, supply may increase in the future as a result of the 1998 storm damage in the upper Waioeka Catchment. Indeed, visual inspection of the Waioeka Gorge suggests some aggradation. New monitoring cross-sections have been established in the Gorge to monitor this.

In the Otara River, extraction remains low relative to the supply and thus the channel continues to aggrade. The shortfall in extraction is of the order of 20000m³ per annum. The Rivers Scheme is likely to waive extraction fees for the Otara, to encourage extraction. Further efforts to encourage demand for the gravel, and to facilitate its extraction, will need to be made however. While the gravel is not particularly high quality, it is likely to be adequate for roading base course or for sealing chip on roads of light traffic volume.

An "open day", where Environment Bay of Plenty supplied gravel from the Otara River free of charge to the public, was held in 2003. Only a small amount of gravel was removed.

Also since the FMS was adopted, Environment Bay of Plenty's River Gravel Management Plan has been made Operative (on 1 October 2001) and the River Gravel Management Guidelines have been published (November 2003).

3.17 **Measure I-17: restrict infilling and structures in channel**

What the FMS said: *Regulations to control filling of river channel (placing fill, vegetation cuttings) and to control structures in floodways, via the Resource Management Act and the Regional Water and Land Plan. Regulatory measures will come into effect when the relevant plans are made operative Environment Bay of Plenty's Regional Water and Land Plan is due to become proposed late in 2001 or early in 2002, and to become operative in 2004.*

Comment

Environment Bay of Plenty's Regional Water and Land Plan is now at the Proposed stage but is substantially operative under s19 of the Resource Management Act. Rules regarding structures in waterways are amongst those that are operative.

3.18 **Measure II-1: minimum floor level 3.6m for new buildings in the township**

***What the FMS said:** A requirement specified in the Proposed Opotiki District Plan, to apply to residential, town centre, industrial and mixed activity zones. Note that the Building Act requirement that floor levels of residential dwellings be above the 2% AEP flood level is additional to this 3.6m minimum.*

Comment

Now that the urban stopbank works have been completed, and the Woodlands Road stopbank has been built, the town has been given protection to the 1% AEP river flood level. Thus the 3.6m minimum floor level is now the determining level for dwellings. This floor level however does give additional protection in the event of a stopbank breach or a larger than design flood. It will also provide protection to those dwellings from stormwater floods should the stormwater infrastructure (pipes and pumps) not cope.

3.19 **Measure II-2: variation to the proposed district plan**

***What the FMS said:** A range of measures is envisaged in such a variation. These may include creating hazard zones, rezoning areas unsuitably zoned and defining building restriction lines. A variation is to be prepared later in 2001.*

Comment

No progress has been made on this.

The District Plan was made operative in September 2005. It does recognise the flood hazard and contains some useful policies and rules to mitigate the hazard.

With the completion of the urban stopbank works and Woodlands Road stopbank, the urban areas now have a 1% AEP standard of protection, and the need to consider further regulatory measures is perhaps not so urgent now as in 2001.

Nonetheless, growing subdivision and development pressure within the town and surrounding (rural) areas mean that the Plan, along with Environment Bay of Plenty's regional plans and stopbank bylaws, should be reviewed to ensure that there are adequate regulatory measures to prevent inappropriate development. Flood hazard maps, whether or not linked to any rules, might also be usefully incorporated in the Plan.

ODC is also now developing a Growth Management Strategy. This will need to take into consideration flood risk. Unless properly managed, continued growth will lead to increased flood losses in the event that stopbanks are overtopped or breached.

The District Plan must be formally reviewed by 2015 (i.e. 10 years after becoming operative), although the ODC recognises that the findings of the Growth Management Strategy and progress on the harbour mouth and mussel farm developments may lead to the Plan being reviewed within the next five

years. A review of the District Plan's flood hazard mitigation features may therefore form part of this formal review.

In the first instance, the Plan should be assessed against best practice examples within New Zealand on the use of planning measures to mitigate flood risk. From there, if still considered necessary, options for improving the Plan could be identified and the process started for implementing any changes.

3.20 **Measure II-3: flood forecasting model development and improvement**

What the FMS said: *Ongoing. Report to be prepared at the conclusion of the project in 2001/02.*

Comment

A report on the use of the unit hydrograph method for flood forecasting in the Bay of Plenty was completed in 2001. Results were promising for the Waioeka catchment. A hindcast of the July 2004 event showed good results also. Following on from that report, a spreadsheet-based tool has been built to predict flood flows in various catchments in the region, including the Waioeka and Otara. However, it is not used regularly and ideally would require users to refresh themselves on its use, as well as refinements as more flood data is obtained over time.

NIWA has been commissioned to develop an internet-based rainfall and flow forecasting model for the Rangitaiki River. Initially the model will use a 12 km x 12 km grid, but within two years this will be refined to a 4 km x 4km grid. If successful, a similar model could subsequently be built for the Waioeka Otara Catchment.

A further development has been the consideration of rain radar extending to the Bay of Plenty. Funding for a weather radar in the Bay of Plenty has just been confirmed by the government, with an expected installation date of 2010, although it remains to be seen how well radar will work in the hill country.

3.21 **Measure II-4: Flood Warning Manual update**

What the FMS said: *In particular updating the alarm levels (at which warnings are issued to defined people/organisations), and updating list of landowners who need warnings as necessary.*

Comment

The Flood Manual has most recently been updated in June 2007.

Opotiki District Council has made the comment that alarm levels, as notified by Environment Bay of Plenty are in themselves not always useful, and that there would be more value in also indicating whether the levels are expected to rise or fall. (That comment highlights the importance of continuing to develop flood forecasting techniques – Measure II-3.)

3.22 **Measure II-5: Civil Defence Exercise – flood scenario**

What the FMS said: An exercise was held in 2000/01 and another is budgeted for 2001/02. Yearly exercises will be held in the future.

Comment:

No specific exercises with a flood scenario have been carried out by either ODC or Environment Bay of Plenty since 2000. However there have been two actual major events that have activated civil defence procedures within the Bay of Plenty: the July 2004 floods (in which a state of emergency was declared in the Opotiki District) and the May 2005 storm.

Furthermore, a tsunami exercise was held in March 2006, to test the functions of the Group Emergency Operating Centre.

3.23 **Measure II-6: Civil Defence**

What the FMS said: Ongoing: general response systems and procedures.

Comment

Since the FMS was adopted, the Civil Defence Emergency Management Act 2002 has replaced the Civil Defence Act 1983. Nonetheless, the FMS and the process used in developing the strategy are entirely consistent with the purpose of the new act (Appendix 3).

The new act requires all local authorities within a region to combine to create a Civil Defence Emergency Management Group (as a joint standing committee). Each such group is required to produce a plan to manage hazards in the region, and the Bay of Plenty Civil Defence Emergency Management Group Plan was approved in May 2005.

Again the general approach of the Plan is consistent with the FMS, and the two documents should be complementary. However the Plan fails to recognise the FMS and only vaguely refers to the general process of floodplain management planning. The Plan would also be improved by further description of the flood hazard, or at least reference to flood hazard maps.

In further work since the adoption of the FMS, flood maps of an “over-design” flood event were produced in 2006 (a 1 in 500 year event was chosen). The maps take into account the urban stopbank works of 2001-02. They were intended to be used for civil defence planning, including identifying evacuation routes and a suitable meeting point for evacuated residents. (Initially, Opotiki High School was suggested by Environment Bay of Plenty, even though some floodwaters might still reach that area. However note that Welfare Plan (Measure III-1) identifies the Opotiki Dairy Association building and the Woodlands Hall as meeting points.)

Given that once floodwaters overtop or breach the urban stopbanks, water will pond in the town to some depth behind the stopbanks, it is important that such civil defence measures as evacuation routes and the drainage or release of trapped floodwaters be well thought out.

Further, following the eastern Bay of Plenty flood event of 2004, awareness of the importance of route security has been heightened. Road access to Opotiki could potentially be blocked from all directions in a major flood event. Environment Bay of Plenty has a project investigating the issue of route security region-wide.

3.24 **Measure II-7: Education**

What the FMS said: A range of activities and measures including displays, articles, talks and presentations, floodmap availability, internet site, LIMs/PIMs and advisory services. The measures will be ongoing. Annual displays in the Opotiki Public Library will occur.

Comment

Flood awareness in a general sense has been raised by flood events in New Zealand and in the eastern Bay of Plenty in particular since the adoption of the strategy. The issue of climate change and its potential effect on flood risk has also helped raise flood awareness.

However other than regular Waioeka-Otara Rivers scheme newsletters, no further education measures or programmes specific to the Waioeka-Otara have been carried out since the strategy was adopted.

Floodmaps have not been made generally available, either on websites or in hard copy form. In fact, other than the 1 in 500 year (0.2%AEP) floodmaps referred to above, no new floodmaps have been created since the urban and rural stopbank upgrade works. Some thought will need to be given to what flood scenarios are shown, on any updated flood maps.

Nor is the FMS itself available on the Environment Bay of Plenty or ODC websites, despite there being a link to other Environment Bay of Plenty strategies into which this could slot, as well as links into other sections of the website. There is however an outline of what a "floodplain management" approach entails on the Environment Bay of Plenty website, with a statement that FMSs will be developed for major floodplains in the region. Clearly that needs to be updated to state that the Waioeka-Otara FMS has been completed and adopted.

Experience shows that over time people tend to gradually forget about flood hazards, and new residents are often unaware of them. Thus there is a need for ongoing reminders and updates on the risk.

3.25 **Measure II-8: floodproofing advice**

What the FMS said: Dossier of information on how to floodproof buildings to be prepared by Environment Bay of Plenty by 31 December 2001. To be held in Environment Bay of Plenty and Opotiki District Council offices, for public use. To be updated as new information (products, techniques) is received.

Comment

The dossier was completed and copies held by Environment Bay of Plenty and Opotiki District Council. It could be promoted again (it is uncertain as to how much use has been made of it) and it should be checked to ensure the contents are up to date.

3.26 **Measure III-1: provision of welfare services**

What the FMS said: Ongoing. Support (shelter, food, clothing, counselling etc) for individuals, families/households and community during and after a flood event. A Welfare Manager is identified in the Opotiki Civil Defence Plan. Others with roles to play are the Opotiki District Council and various individuals and organisations within the community. Local marae are a further important welfare mechanism.

Comment

Following from the legislative changes in 2002 and the formation of the Bay of Plenty Civil Defence Emergency Management Group, the Group adopted a Welfare Plan adopted in 2006. The plan outlines the arrangements, responsibilities and procedures for the providing welfare services in the event of an emergency in the Bay of Plenty.

Amongst the Plan's items is the identification of two Emergency Welfare Centres: at the Welfare Centre Headquarters at Opotiki Dairy Association building on Waioeka Road and Woodlands Hall.

Chapter 4: Conclusions

Several elements of the FMS have been implemented since it was adopted in 2001. In particular, stopbank upgrades have restored 1% AEP flood protection to the urban area and improved protection to some rural areas. Other parts of the FMS where progress has been made include adoption of regional plan rules and the introduction of bylaws.

Unfortunately other elements of the FMS have not been progressed and the FMS itself has been rather neglected. In part this is due to the pressure of the region's 2004 and 2005 floods (repairs to affected schemes have only now just been finished), but it is also due to staff changes within the two organisations (Environment Bay of Plenty and Opotiki District Council). Perhaps as a result of these changes, there appears to be a lack of corporate buy-in in the FMS – it is not getting picked up widely within the organisations.

However the climate is right for take-up of the FMS. The reviews of flood risk management currently being done nationally, the current awareness of climate change issues, and recent changes to civil defence legislation all show that the FMS was on the right track.

It is recommended that the FMS be updated with revised commitments to action, more or less as outlined in the comments above. That in itself is not a particularly involved task. Following consultation within Environment Bay of Plenty and Opotiki District Council, and with other key players, such as Rivers Scheme ratepayers (via the Liaison Committee) and the Whakatohea Trust Board, an updated FMS should be adopted by the two councils.

While the updated FMS will need to include measures relating to “structural” river works (stopbanks etc), the focus could be less on these now that they have largely been completed. Instead the focus should now be on dealing with the “residual risk” (i.e. in the event of floods greater than the design or in the case of stopbank breaches), by measures such as planning regulations, education and civil defence\emergency management.

Chapter 5: References

- Environment Bay of Plenty (2004); Waioeka-Otara Rivers Scheme: Rural Stopbanks. Operations Report 2001/04.
- Environment Bay of Plenty (2007); Waioeka-Otara Asset Management Plan (Draft). Operations Publication 2007/06.
- Environment Bay of Plenty and Opotiki District Council (2001); Waioeka Otara Floodplain Management Strategy.
- Flood Risk Management Governance Group (2005); Managing Flood Risk: The Case for Change. Centre for Advanced Engineering.
- Flood Risk Management Governance Group (2005); Managing Flood Risk: Draft New Zealand Protocol. Centre for Advanced Engineering.
- Wallace, P. (2007); Waioeka Otara River Scheme: Lower Reaches Rural Stopbanks. Report to Environment Bay of Plenty 18 October 2007.

Appendices

Appendix I..... Central Government Flood Risk Management Review

Appendix II..... Extract from Managing Flood Risk: Draft New Zealand Protocol

Appendix III..... Extracts from the Civil Defence Emergency Management Act 2002

Appendix I – Central Government Flood Risk Management Review

Press release 31/03/05: Flood risk management review underway.

A two-year work programme to improve how New Zealand manages its flood risk has been approved by the Cabinet, Environment Minister Marian Hobbs announced today.

"The review will ensure we have a robust approach to managing flood risk and controlling rivers that works for local communities. It will provide a good picture of this country's current and future flood risk situation. It will also address what the role of local and central government should be in managing flood risk," Marian Hobbs said.

The Ministry for the Environment is leading the review, working closely with local government and other government agencies. Other agencies involved include the Ministry of Civil Defence and Emergency Management, Ministry of Agriculture and Forestry, and the Ministry of Economic Development.

"The risks from flooding and the impacts of flooding are changing. This project takes a timely look at what is being done to manage flood risk and where the gaps are," Marian Hobbs said.

The Manawatu and Bay of Plenty floods last year highlighted the vulnerability that communities face when a major flood hits. About 100 New Zealand cities and towns, along with some of our most productive farmland, are located on floodplains.

The review is wide ranging and will cover: · The adequacy of the current approach to flood risk management · Understanding current and future flood risk and what mitigation is required Best practice flood risk management · Funding and affordability · The legislation around managing flood risk and river control · How to get good information on flood risk and how this information is communicated · The respective roles of local and central government.

Press release 7/09/2004: Government to review flood risk management

The government will review flood risk management and river control in New Zealand to ensure procedures are robust, Environment Minister Marian Hobbs announced today.

The Ministry for the Environment will lead the review, in consultation with regional government and central government agencies including the Department of Prime Minister and Cabinet and the Ministry of Civil Defence and Emergency Management.

"Two major floods this year highlighted the fact that local councils were squeezed between demands to use flood plains for housing and intensive agriculture and the cost of providing enough protection from floods," Marian Hobbs said.

"The review will examine current approaches to river control and flood risk management, identify strengths and weaknesses and determine what changes are required.

"The Manawatu and Bay of Plenty floods in February and July led to major economic losses, social and environmental disruption, and central government providing substantial financial relief," Marian Hobbs said. "It is timely to review how we manage river control and flood risk management, and whether we are focusing our efforts in the right areas."

Responsibility for flood risk management was devolved to regional government in the late 1980s.

"The increasing flood risk suggests that regional councils and unitary authorities could face increasing difficulties and escalating costs to manage flood events in future years," Marian Hobbs said.

Relevant professions including insurance, science, engineering, hydrology, land use and infrastructure design will be consulted on the review's work programme before it goes to the cabinet for approval in a couple of months. A regional council proposal to investigate river management and engineering issues, standards and best practice will be incorporated into the review.

Appendix II – Extract from Managing Flood Risk: Draft New Zealand Protocol

Management Commitments

Risk Management

- 1 Councils adopt a corporate-based risk management system to guide the management of flood risk.

Protocol Framework

- 2 These elements will form the basis of local government's approach to managing flood risk.
- 3 Flood risk management decisions are evolved iteratively through this framework.

Elements and Implementation Principles

Natural river and catchment processes as constraints on river management

- 1 Natural river and catchment processes are the first step in applying the Protocol.
- 2 Returning rivers to their natural pathways in whole or part is an option for consideration.
- 3 Systematic assessments of catchments are the basis for catchment management strategies within which to apply flood risk management.

Interaction of natural and social systems as the basis of floodplain management

- 4 Decisions on flood risk management are made within the wider context of natural and social systems.
- 5 Catchment-based management strategies that integrate consideration of environment, economy, society and culture are the best approach to assessing risk associated with floodplain management planning.

Context-based decision-making

- 6 Each solution will be uniquely defined by how communities seek to manage flood risks, in terms of their interests, the affordability of the risk management solution, and the nature of the risks at the sites being considered.
- 7 Flood risk management is a local decision-making responsibility.

Continuing community engagement

- 8 Communities are engaged in formulating flood risk management solutions.
- 9 Individual and collective right must be balanced.
- 10 A comprehensive risk communications strategy is in place and actively managed.
- 11 Enhancing individual responsibility in managing personal risk.
- 12 Roles and responsibilities amongst individuals, communities, councils and central government are clearly stated.

Appropriate forms and levels of protection

- 13 Data and information, appropriate methodologies and best practice guidance are available.
- 14 A long-term risk assessment of flood risk management solutions is mandatory.
- 15 All options to reduce or mitigate flood risk are considered.
- 16 Impacts and cumulative effects are assessed.
- 17 Enhancing aquatic, land and coastal environments is important.
- 18 Service levels are determined and actively managed.

Recognition and treatment of residual risks.

- 19 Residual risks are identified and addressed.
- 20 Routine risk analyses are undertaken on existing structures.
- 21 Super design events are considered as residual risks.

Changes in natural processes, hazards, exposed values and their vulnerability are anticipated ... adaptive management

- 22 Adaptive management is an integral component of flood risk management.

Table 1: Summary of principles required for implementation of the Protocol elements

Appendix III – Extracts from the Civil Defence Emergency Management Act 2002

2 The purpose of this Act, which repeals and replaces the Civil Defence Act 1983, is to—

- (a) improve and promote the sustainable management of hazards (as that term is
- (b) defined in this Act) in a way that contributes to the social, economic, cultural, and environmental well-being and safety of the public and also to the protection of property; and
- (c) encourage and enable communities to achieve acceptable levels of risk (as that term is defined in this Act), including, without limitation,—
 - (i) identifying, assessing, and managing risks; and
 - (ii) consulting and communicating about risks; and
 - (iii) identifying and implementing cost-effective risk reduction;

17 Functions of Civil Defence Emergency Management Groups

(1) The functions of a Civil Defence Emergency Management Group, and of each member, are to—

- (a) in relation to relevant hazards and risks,—
 - (i) identify, assess, and manage those hazards and risks:
 - (ii) consult and communicate about risks:
 - (iii) identify and implement cost-effective risk reduction:
- (b) take all steps necessary on an ongoing basis to maintain and provide, or to arrange the provision of, or to otherwise make available suitably trained and competent personnel, including volunteers, and an appropriate organisational structure for those personnel, for effective civil defence emergency management in its area:
- (c) take all steps necessary on an ongoing basis to maintain and provide, or to arrange the provision of, or otherwise to make available material, services, information, and any other resources for effective civil defence emergency management in its area:
- (d) respond to and manage the adverse effects of emergencies in its area:
- (e) carry out recovery activities:
- (f) when requested, assist other Groups in the implementation of civil defence emergency management in their areas (having regard to the competing civil defence emergency management demands within the Group's own area and any other requests for assistance from other Groups):
- (g) within its area, promote and raise public awareness of, and compliance with, this Act and legislative provisions relevant to the purpose of this Act:

- (h) monitor and report on compliance within its area with this Act and legislative provisions relevant to the purpose of this Act:
- (i) develop, approve, implement, and monitor a civil defence emergency management group plan and regularly review the plan:
- (j) participate in the development of the national civil defence emergency management strategy and the national civil defence emergency management plan:
- (k) promote civil defence emergency management in its area that is consistent with