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AUDIT OF WAIRARAPA RIVER MANAGEMENT ASSET MAINTENANCE STANDARDS

- Audit of:** River Schemes managed by the Operations Department, Wairarapa Division of WRC.
- Inspected by:** Brendan Paul, an independent reviewer, and Jeff Evans of the Flood Protection Group, Landcare Division.
- Guides:** Ian Heslop, Widana Gamage, Murray Mackenzie and Maia Kawana of the Operations Department, Wairarapa Division. Ian Gunn (Manager Operations) joined the afternoon inspection.
- Inspection Date:** 18 July 2002
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1. Introduction

Annual reciprocal peer reviews are undertaken of river asset management programmes in the Wellington Regional Council's Wairarapa and Western Regions. The peer reviews provide an audit of maintenance standards and procedures. The reviews are undertaken by inspections of sites selected by the peer reviewers in conjunction with the river managers.

This year's inspection of Wairarapa river sites included three sites on the central section of the Ruamahanga River, three sites on the Waipoua, and four sites on the Waingawa.

2. Executive Summary

The peer review inspection did not identify any major maintenance or river management issues of concern; a number of less critical actions, issues and suggestions are covered in the report. The scheme managers have reached a position where they can be proactive in their management. The reviewers recommend that they now adopt a renewed focus for enhancing willow and other vegetative protections. A footnote on page 3 covers this recommendation.

It is worth noting that both reviewers observe significant improvement and consolidation at all sites that they had visited previously. These changes can be attributed to:

- The review and rationalisation of a number of the rating schemes, allowing work within the area to be better targeted to beneficiary needs.

- Improved maintenance budget provision, in some cases resulting from the rating scheme reviews. The increased budgets allow the managers to be proactive in their approach to river management.
- The review of associated management plans for the respective rivers in conjunction with the rating scheme reviews.
- The availability of flood damage funds and reserves to both facilitate and expedite repairs after flood events.

The reviewers suggest that the annual inspection should be designed to give, over say a five year period, a systematic and comprehensive coverage (and follow up review) of all rivers and streams. A suggestion from the Wairarapa river managers is that the annual inspection could be spread over two days to allow better coverage of the schemes and the associated exchange of ideas and views. This suggestion should be given consideration before the next review cycle.

3. Upper Ruamahanga River (Central Rating Area)

This is the first inspection since the old rating scheme for the Ruamahanga River was disestablished, and three new schemes put in place. The respective schemes cover:

- from the Waiohine River confluence to Wardells Bridge – a length of 24 kilometres.
- from Wardells to Te Ore Ore Bridge – a length of 9 kilometres.
- from Te Ore Ore to Hidden Lake – a length of 16 kilometres.

The river managers note that the review of the rating scheme and its outcomes better reflect the wishes of the respective communities, in terms of the level of maintenance they require, the corresponding budgets available for river management and their direct contribution to that budget. As part of the review scheme management plans were prepared for each of the three sections of the river. The managers believe that a significant benefit of the review is that maintenance expenditure is now far better targeted.

The previous maintenance budget for the entire Ruamahanga scheme was \$160,000 (a maintained length of 58 kilometres). The total budget for the three separated schemes is now \$264,000, and the budget for this nine kilometre central rating area has moved from \$22,000 to \$110,000. This central section of the scheme protects a number of key community assets owned by Masterton District Council, who supported the opportunity to enhance maintenance and corresponding security in the reach. Current budget provision enables the managers to be more strategic and proactive in their maintenance programmes.

Sites visited in the central rating area were:

- River Road.
- The Masterton Cemetery / Landfill area.
- Dew / Blakemore / Percy frontage.

3.1 River Road

Edge Protections – right bank

The site lies immediately below the confluence where the flatter grade Waipoua meets the steep grade of the Ruamahanga; the works are located on the outside of an exposed bend. Following the October 2000 flood events erosion of the bank edge threatened houses on River Road. A short, low profile, gravel core rock groyne was constructed and funded through flood damage repair provisions. The groyne was part of a flexible strategy to extend the protections downstream when required. Tethered, cabled and trenched willow protections were constructed at the erosion site directly below the rock groyne.

The existing groyne is in good condition and the river managers advise that it has functioned well. A flat gravel beach has aggraded immediately below the groyne, indicating its effectiveness. The groyne requires routine top-up (with 0.5 to 3 tonne boulders), and occasionally loose rocks at the groyne head need to be pulled in from the river thalweg. Top up and maintenance of the groyne is now due. The managers' principal concern with the work is that the gravel core of the groyne may become exposed in an extended event and the work will be lost. The managers plan to extend the protections downstream this year with another gravel core rock groyne. The tethered willows have established well.

The reviewers endorse the flexible strategy adopted for the site and support the proposed extension of the protections (before they are made necessary and more expensive by a further flood event). We recommend that planned maintenance for the groyne be implemented in the near future. The reviewers experience with flat rock groynes is that a larger rock particle size is more effective and recommend that the upper end of the range noted be used. The reviewers recommend a persistent approach to willow management in this area.¹

3.2 Cemetery / Landfill Site

Edge Protections – right bank

This site is approximately 500 metres downstream from River Road, and again the river grade is steep. There are 11 short gravel core rock groynes in total at approximately 20–25 metre spacing; nine were constructed following the 1994 floods and two further groynes following erosion at the upstream end in the October 2000 floods. Each groyne was constructed with 100 to 150 tonnes of rock. At the bottom end of this reach where the early groynes were constructed, low rail iron groynes with netting infill were installed alternately between the rock groynes. The front of these groynes dips below the low flow water line to reduce exposure at high stages.

¹ Successful willow management is a key activity in preventing erosion and maintaining security in most flood protection schemes. A proactive and persistent approach to planting, interplanting, reinforcing, extending, thickening and layering of willows can minimise the need to reconstruct works. These are all standard willow management practises but often receive lower priority. At some locations interim protection, to allow vegetative protections to better establish, can be provided by blading or depositing river gravels in front of the vegetation. The latter may be required several times when the aim is to move a river alignment away from the bank.

The rock and rail iron groynes appear to be in good condition. Routine maintenance for the rock groynes has involved occasional top-up (estimated by the managers at approximately 20%) and pulling loose rock back into the head of the groynes. The original groynes were constructed using soft limestone, requiring higher than normal top-up.

The various combinations of groynes and willow planting have been effective both in training the river and protecting the bank. Vegetation growth between the older groynes has been excellent, even though the river is running against the bank. These willows have reached a stage where they are ready to be layered. There has been some difficulty getting the willow plantings to establish between the top few groynes, and growth is patchy at several other locations. As for the cemetery site the managers note that their focus here is now to ensure willow growth and its subsequent management.

River Management

The beach opposite the groynes on the left bank appears to be high when in fact the river is cutting down into the bed gravels giving the illusion of build up (the same situation is occurring in all of the major western region rivers, above the estuarine reaches). The river managers have been very successful in moving gravel from the edge of the beach and taking pressure off the groynes. The approach involves deep raking and loosening 15–20 metres of the riverside edge of the beach and allowing river flows (one to two year return period minimum) to move the gravel. An element of luck is required with this technique, as the flood must follow before the beach surface has tightened up again.

3.3 Dew / Blakemore / Percy Site

Edge Protections – right bank

This site is a further 1000 metres downstream from the landfill. Edge protections comprise 17 short gravel core rock groynes constructed at approximately 20–25m spacing. Seven groynes were constructed after the 1994 floods. A further 10 groynes were constructed at the bottom end of the reach after the October 2000 flood events; there was the also loss of a section of stopbank in the eroded area. Again the groynes were constructed with 100 to 150 tonnes of rock per groyne, with the more recent groynes nearer 150 tonnes. The groynes are performing well, although willow plantings are not as well established at this location

The management and maintenance comments given for the rock groynes at the landfill reach apply to this site

Stopbank – right bank

The eroded section of stopbank was reconstructed to a 50 year level, an appropriate standard for the assets protected. The bank is constructed with a gravel core capped with topsoil. The new alignment is set back further from the river and links up to a low bank adjacent to the Blakemore property. The security of this stopbank is important as it protects not only the adjacent rural land and associated houses, but also the oxidation ponds managed by Masterton District Council, for the town sewerage disposal.

The stopbank which runs behind the groynes is rough and the grass is relatively long and rank; however, the managers would rather the owner did not graze the stopbank with the associated risk of stock damage to both the stopbank and the riverside willow plantings. This is, by default, the best management option available to them.

Downstream of the new section, the old stopbank is very closely grazed and there are stock tracks running along the riverside batter, however the stopbank is in reasonable condition; again alternative management options are not available.

Alignment and River Management

The river alignment along the groynes is working very effectively, although the managers would prefer reduced curvature, particularly at the upstream end. They propose to continue with the very successful beach reduction techniques, to take pressure off the right bank groynes. Their aim is to ultimately increase willow planting until the ground between the groynes, and preferably in front of them, is reclaimed.

At the bottom end there is also an alignment issue and for that reason cabled and tethered willows are the only protection. The aim is to again reduce river curvature at the crossover thereby reducing erosion pressure on the downstream left bank. The latter is protected with seven small rock groynes. The proposed strategy is for the river to erode to the desired alignment, and at that stage further rock groynes will be constructed.

Again there is an excellent example where the beach opposite the groynes has been ripped and recent flood events have removed the edge of the beach.

The cost for realigning the stopbank and constructing the lower 10 groynes was \$100,000; the managers estimate that approximately \$300,000 has been spent on this reach since 1994.

The reviewers endorse the management strategies being followed by the scheme managers for both the Landfill and Hughes / Blakemore / Percy sites. Specifically the beach management approach to reduce pressure on the opposite bank and edge protections, a strong focus on willow vegetation enhancement as noted earlier, and (when the water levels return to normal) the programmed maintenance on the rock groynes (topping up rip-rap, pulling in loose toe rocks).

4 Waipoua River

The Waipoua rating scheme has also been reviewed and the maintenance budget has risen from \$20,000 to \$54,000, with an additional \$10,000 specifically tagged for the urban scheme (to ensure that “rural money” is not spent in the “enhanced” urban section). As for the Ruamahanga the revised budget allows the managers to be more proactive in their management approach.

Sites visited on the Waipoua were:

- Daniell / Mahunga Golf Course site.
- The grade control weirs in Masterton township.
- The sports bowl stopbank in the same locality.

4.1 Daniell / Mahunga Site

Edge Protections

The site is within a full s-bend on the river and the original concern was a large erosion bay on the right bank at the upstream end, and erosion at the golf course downstream. The solution adopted by the river managers was to move gravel from the opposite bank to form a gravel berm and then to construct seven sloping gravel ramp groynes, with willow planting between. This is an innovative low cost approach, it has the advantage that the low benches between the groynes provide a good environment for establishing willows; the disadvantage is that the gravel groynes are vulnerable until the willows are fully established, and the groynes fully vegetated. At the left bank downstream (a three metre high near vertical bank) adjacent to the golf course, the managers have used large trenched and tethered willows for edge protection, the latter constructed in two phases, after the 1998 and 2000 flood events.

The major erosion took place in the October 2000 floods and the work was constructed in May 2001, the total cost between \$20,000 and \$30,000. Part of this work was funded through flood damage.

The gravel groynes have performed very well over the downstream length, although the willow planting is slow taking hold. A short length at the upstream end has eroded (two groynes), and the managers are considering their options. Their considered approach is to ease the upstream corner (remove 10-20 metres from the opposite and inside left bank) and to reconstruct the two gravel groynes on the opposite right bank, and possibly extend with a further gravel groyne. At the top end of this section, where the river is effectively entering the s-bend, they propose one or perhaps two short rock groynes; one where there is a gap in existing willow planting and perhaps another downstream between the established willows. The tethered willows at the golf club have established very well despite this section of the river being very steep and the bed degrading.

River Management

As noted this is a steep section of river, with high velocities perhaps in the order of 2 or 3 metres per second at low stage. The river managers are of the view that the grade control work in Masterton township has resulted in degradation moving back to this section of the river; whatever the cause local degradation has made bank stabilising more challenging.

The reviewers commend and support the managers' innovative approach at what is a difficult section of the Waipoua. The managers' proposed strategy for addressing current erosion is also supported. Again dense and vigorous willow growth is the key to the success of this work and the reviewers recommend a concerted effort to ensure a good outcome.

4.2 Masterton Township

Grade Control Weirs

There are three structures, one about 200 metres south of the swing bridge, another 150 metres upstream of the swing bridge and the third about 200 metres upstream of the state highway bridge.

The design of the weirs comprises a 15 metre wide blanket of rock over the full width of the river and extending up both left and right banks. The blankets are graded at 1 to 10 downstream, their thickness is approximately 1.2m and a d50 rip-rap size of approximately 900 millimetres. At the downstream toe the design includes rail irons driven to normal bed level to create a retaining fence for the rock.

The weirs are operating very effectively, there is no significant active erosion on either side of the river in the reach, and bank edge vegetation ranges from good to excellent. There are minor bare or newly replanted areas. The general absence of erosion, and the good bank edge vegetation indicates stable bed levels and uniform flow patterns. Flow over the downstream weir is turbulent, uniform with high velocities. Energy dissipation through the drop is excellent and flow out of the structure is well controlled. The two other weirs were not inspected closely

The weirs required some riprap top up maintenance after the October 1998 flood events, otherwise the structures have been maintenance free. Erosion on the left bank at the swing bridge was repaired with gravel infill and willow plantings. Overall the grade controls are performing very well and the management strategy is working effectively.

The reviewers commend the designers and managers for achieving quality outcomes in what was previously a demanding section of the Waipoua River. Again the reviewers recommend a vigorous approach to bank edge vegetation management

Sports Bowl Stopbank

This is an old stopbank constructed with river gravel in three tiers, which are retained by mortared river boulder walls. The edge of the river is within 8 to 10 metres of the riverside stopbank toe, and an initial appraisal would suggest that it is very vulnerable to failure by erosion of the foundation. However, there are excellent tethered and cabled willow protections which have created a dense vegetated bank edge, and the bed at this location appears stable. The managers have removed vegetation from the right bank to encourage flood outflows onto the right berm, to take pressure off the left bank. With a wide right berm, erosion is not a major issue.

Although security can never be guaranteed, the managers have optimised their management options and short of constructing an expensive heavy bank edge rock line, or reconstructing the stopbank on a set-back alignment there are not many alternatives. There is the opportunity for the managers to layer back across the bare area behind the front line of tethered willows up to the stopbank toe, to increase willow mass and density.

The reviewers endorse the management strategy for this location and believe that this approach is appropriate for the assets protected. We recommend ongoing layering and thickening of the vegetation.

5 Waingawa River

The Waingawa is a relatively low maintenance river system with an annual maintenance budget of \$140,000 over 18 kilometres.

Sites visited on the Waingawa were:

- The aerodrome frontage.
- SH2 and Tranz Rail bridges area.
- Hydes.
- Masterton District Council water supply pipeline area.

5.1 Aerodrome Frontage

This area is located in the average grade, middle reach of the river. The gravel regime is relatively stable, and bank edges are generally well vegetated with large, old willow growth. Where a bank has eroded the normal treatment is to divert the river, place gravel against the eroded bank, and trench and cable large willows. This treatment has been very effective.

In the October 2000 events there was substantial erosion at the airport frontage and the end of the runway was lost. Historically all willow and other vegetation growth had been removed from the flight path over the river corridor, consequently there was little resistance to erosion when the river worked this location. A jointly funded project (between Masterton District Council and the Regional Council) reformed and created an access road around the southern end of the runway, both protected by a heavy rockline about 150 metres long. To prevent the work being outflanked four medium length rock groynes were constructed upstream at a spacing of about 75-100m. The strategy for protecting the airport is sound, though there are some issues over rock quality. A reasonable proportion of the limestone rip-rap is soft and crumbling and will eventually create voids in the rock linings. The river managers will take this up with the quarry supplier.

A key management issue, in maintaining the design channel in the reach, is keeping the beaches clear of regrowth; the managers would like to selectively spray once a year. Spraying must be ground based as aerial application has spray drift consequences. Over the last year there has been a problem with the availability of the only contractor, because of the high rural and pastoral demands. The river managers will obviously need to consider a way of addressing this. This problem applies to beach spraying over the whole length of the Waingawa.

The reviewers commend the project and support the design and management approach to the protection works at the airport frontage. The managers should consider contingency options for beach spraying in the event that their preferred contractor is not available.

5.2 Bridges Section

There has been an historic degradation problem around the SH2 and railway bridges, and the stability of the railway bridge was directly threatened. A 1992 moratorium, and latterly the global consents for river management, has allowed good gravel management. Gravel is now extracted from the vicinity only for river management purposes. An obvious indicator of the success of the gravel management strategy is that the mean bed level is now above the piles on the rail bridge.

There are some substantial gravel shoals that stand out within the bed but, with the effective transport capacity of the semi-braided channel, they will move through the system. Overall management of the reach seems very good. The reach is stable, particularly when compared with its condition 10 years ago.

Upstream and downstream of the SH2 bridge the bank edges are in good condition and in most areas there is well established vegetation cover. There is one raw edge 400 metres downstream on the true right bank; it is hoped that movement of gravel into the section will create sufficient stability to allow this troublesome area to finally be stabilised. Various attempts have been made over the years.

On the left bank above the bridge there is a series of small rock groynes which protect the bank edge and bridge abutment; the bank edge is also the riverside batter of a two metre high stopbank. The structure is considered by the river managers to be an “informal” stopbank, as indicated by its vegetated and rough condition. The bank edge is likely to erode well before the bank would overtop. Masterton District Council has been advised that the area behind the bank is at risk from flooding in the event of a failure.

The reviewers endorse the management approach for the reach, and support the river managers' position that the short left bank stopbank is informal, with any flood protection benefits being fortuitous.

5.3 Hydes

River Management

The key feature of many of the remote sites on the Waingawa is a requirement to manage relatively complex river problems within low budgets. The strategies adopted by the river managers for these areas include:

- minimal interference and encourage the river to train to an alignment through its own processes.
- use low cost vegetative protections and materials from the river bed.
- accept that there may be a need to return and reconstruct the works (this applies to most river projects).

The work was required to protect approximately one kilometre of bank erosion on the left bank upstream of Hydes following progressive erosion since 1994. The river managers formed a gravel bench (diggers and dump trucks) and constructed gravel ramp groynes on the berm, similar to those constructed at Daniels on the Waipoua. The bays between the groynes were planted with willows, the latter yet to establish. Since their construction the groynes show very strong tree lucerne growth (which is a very useful self propagating species) and have held the alignment.

The management approach for the corridor has been to encourage a semi braided river regime, which is more effective in moving the gravel through the reach and minimises undesirable channelisation. An emerging island adjacent to the gravel groynes had initiated channelisation, but it is now being submerged by a gravel shoal. There may be a need in the future to deep rake the edges of the beach to initiate gravel movement. If that doesn't work the managers advise that the top of the island may be removed.

Downstream on the right bank the river had branched into a secondary channel, outside the river alignment, and created a central island. The river managers' response was to excavate a pilot cut on the left side of the island to divert the river away from the secondary right bank channel. The excavated material was used to form a berm on the left bank. The right branch was blocked with an upstream groyne but will require further work to get the secondary channel fully decommissioned; probably using trenched and cabled willow fences. A berm will again be formed on the left bank channel if current erosion worsens.

An integral part of the river managers' approach is to keep the beaches clear of regrowth. The same difficulty noted earlier with ground-based spraying applies to this site. This is evident in the reach where up to 50% of the beach areas are vegetated and require spraying.

The reviewers endorse the pragmatic and soundly based management approach outlined by the river managers for the Hydes site. As noted previously we recommend that the managers consider contingency options for beach spraying, and maintain their efforts to establish and enhance vegetative protections.

5.4.1 Masterton District Council Pipeline

The river at the upper end of Upper Plain Road had eroded into its left bank to a point where it was endangering the Masterton water supply pipeline, and the road. A very deep channel was running close to the pipeline, caused by a central aggrading island. The channel on the other side of the island was eroding the right bank. Erosion was also occurring on the right bank, at the confluence of the two channels below the island.

The strategy adopted by the managers was to cut a pilot channel from the left side of the island so that the main channel could be more centralised, and to remove flow from the channel at the back of the island. The managers achieved this by recovering a berm on the left bank using material excavated from the pilot channel. Diggers and dump trucks were used for earthworks. The excavated material contained a high proportion of large stones (d50 estimate 250 millimetres), as a result the reclaimed berm armoured very effectively and has resisted further erosion. A large gravel groyne was constructed at the top end of the island to divert flows into the excavated channel, speeding up its development.

The reviewers endorse the innovative approach taken by the managers to remedy a difficult erosion problem.

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