greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

Code of Practice

For river management activities

FMPL-5-36
(Version v17)

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1. Introduction

1.1 Overview

This Code of Practice (Code) guides all river management activities[1] undertaken by GWRC for the purposes of flood and erosion protection across the Wellington Region, irrespective of funding, location or whether an activity requires resource consent. This means it applies to permitted activities as well as those activities for which resource consent is required by the relevant regional plan or plans.

River management activities are undertaken by Greater Wellington Regional Council (GWRC) to meet its statutory responsibilities for both flood protection and erosion control, and the avoidance or mitigation of flooding hazards. These activities contribute to community safety and well-being, and enable sustainable economic development on river margins and floodplains. In undertaking this work, GWRC seeks to minimise the adverse effects of its activities on the environment and on important cultural values.

Rivers are dynamic features which constantly change and evolve according to the influences acting on them. The form and behaviour of the Region's rivers observed today represent a legacy of the complex interactions of past geological, climatic and human influences that have acted on the rivers and their catchments. This legacy, together with the needs of current communities and the choices in the way rivers are to be managed to meet these needs, are key determinants of each river's current character, form, behaviour and ecology. They also determine the way that these river features will develop and evolve into the future.

The Code aims to achieve:

- greater awareness of the effect of river management decisions and activities on a river's natural character and other significant river values, at both broad (whole of river) scale and detailed (reach or specific site) scale
- greater consistency of river management practice across the rivers that GWRC administers and manages
- good management of the environmental and cultural impacts of river management activities.

This is done through the use of a structured framework that requires river management planning and decision making to understand and consider the inherent behaviour and values of river systems in conjunction with the needs and requirements of the community. It also contains review and reflection mechanisms to encourage and allow practices to change so as to improve environmental outcomes over time.

The Code applies to work at a number of levels. In the first instance, it provides guidance for the planning of river management activities that occurs in the floodplain management planning process. Floodplain management plans (FMPs) and the processes that are used to develop them, are the places where high level decisions are made about the direction of and priorities for flood protection services. These decisions in turn are key determinants of the future character of the river, the

[1] See Section 7 for the full list of activities included in river management

amount and type of intervention and on-going river maintenance work that is needed to deliver on the agreed services. In addressing the environmental effects of this work, it is important that recognition and consideration of opportunities to bring about changes in river character, that may be associated with ecological, social and cultural benefits, occur in conjunction with the FMP process (rather than after interventions to address flooding and erosion have been decided upon).

In the first instance, therefore, the Code encourages river managers to utilise FMP reviews as an opportunity to challenge past practices, within the context of a sound understanding of river science, in their identification of future pathway options for river development. As part of this approach, the Code promotes the idea that the river's inherent requirements, in terms of its ability to express its own character and identity (and in cultural terms, its mauri[2]), should be considered along with the community's needs in floodplain management planning.

At a more detailed level, the Code promotes development of Operational Management Plans for every river, that provide further guidance on the most appropriate river management methods to be used. This requires division of the river into 'management reaches' based on homogeneity of form and character, and identification of a 'design channel' that allows the river adequate space to move and express its natural form. These factors can then be considered in conjunction with FMP directions and constraints, and the significant values pertaining specifically to those reaches, to develop work practice recommendations and guidelines.

At the most detailed level, the Code gives a description of all individual river management methods that make up GWRC's river management 'toolbox', and outlines general good work practices that apply to each. Further protection of environmental values during works programmes are afforded via a set of prescribed activity and/or time constraints and restrictions that apply generally, and also via the requirement for specific site environmental management plans where warranted by the level of potential impact.

An important part of the Code is the provision for a programme of ongoing baseline data recording and collection of further information from monitoring, details of which will be included in Environmental Monitoring Plan(s) and Kaitiaki Monitoring Plans[3]. This will help to develop a better understanding of the effects of river management activities and their significance (both in the short and long term), which can be used either to endorse continuance of current practice or inform modifications to practices so that they better align with intended FMP directions and constraints.

Finally, the Code defines a regular review process that allows for reflection on works programmes and consideration of the results of monitoring, together with the views of mana whenua and stakeholders, and assisted by an Independent Review Panel (IRP). The IRP is charged with reviewing this information within the context of the Code's purposes, and advising GWRC on improvements to practice and changes to the Code that will better meet these purposes. A regular but less frequent,

[2] According to the definition included in the PNRP, mauri is an energy or life force that mana whenua considers exists in all things in the natural world.
[3] Environmental Monitoring Plans are commissioned by the Flood Protection Department in conjunction with river management work; Kaitiaki Monitoring Plans are a wider Council initiative not under FP Department management.

independent review of the Code itself, with reference to its overall objectives, is also proposed.

The rivers and watercourses that GWRC actively manages for flood protection are shown in Appendix 1. This Code replaces the Environmental Code of Practice dated March 1999.

1.2 Objectives

The Code of Practice is a living document that assists GWRC to undertake its flood protection, erosion control and hazard risk management functions, while also maintaining and enhancing the natural and cultural values associated with our rivers and river margins.

The Code is operating as intended when:

- Staff understand the intentions of the Code and are actively using it to guide their work
- Decisions relating to flood protection, erosion control and flood risk management at all levels of river management planning are made in conjunction with decisions relating to the maintenance and enhancement of natural and cultural values of rivers
- There is consistency in river management practice throughout the Region
- The links between river management philosophy, management practice and management of environmental effects are clear and explicit. FMP (or in their absence, flood scheme plan) directions and constraints are carried into Operational Management Plans where they are developed further into guidelines which, in turn, inform the development of lower level work and activity plans
- Mana whenua and stakeholders are actively engaged in river management activities and programmes, according to clearly defined protocols
- Environmental and Kaitiaki monitoring delivers meaningful and timely information to enable assessment of the effects of river management activities and their significance
- The Code document is actively managed so that it reflects current practice
- On-going improvements in the natural and cultural values of the river systems managed by GWRC are demonstrated over time through the use of specified measures.

1.3 Purposes

The specific purposes of the Code are to:

- Specify a process for how the amount of space adequate for the river to express its natural form and to behave as a 'healthy river' is to be identified and considered in river management work

- Specify processes for how the important values of a river system, including the views of mana whenua and stakeholders, are to be identified and considered in river management work
- Produce actions at all levels of river management planning and operation that will improve the effects of river management activities on environmental values
- Identify and describe all activities currently used by GWRC in river management. For each activity describe what is considered good practice, and what is expected from management and operational staff, and council contractors, when undertaking these activities
- Provide for a monitoring programme to allow for the collection of information that will be used to assess the effects of river management activities and their significance on the river system and its values
- Specify processes for regular self-evaluation of the appropriateness of work programmes, activities and procedures within the Code
- Specify processes for regular independent oversight and feedback on Code operation
- Specify processes to ensure that suggestions for improvements that may be desirable or necessary to better achieve the Code's objectives, arising from monitoring and review, or other relevant sources, are considered by GWRC and transferred into the Code.

1.4 Who is the Code for?

The Code has been developed by GWRC primarily as a tool to assist staff involved in planning and delivery of flood protection services to carry out this work in an environmentally and culturally sensitive manner, in accordance with GWRC's statutory responsibilities.

Through the stated objectives and purposes, the Code also sets the context to guide personnel undertaking both self-review and independent reviews of river management work, on an on-going basis.

The Code is available also as a resource for people other than Council staff to enable them to understand GWRC's river management philosophy and management practices, and to identify and engage with the opportunities that are provided within this management framework for input and involvement.

2. Approach to River Management

2.1 Fundamental Concepts

Sustainable and effective river management relies on understanding of three key principles:

- Rivers are dynamic, rather than static, systems that will change their form over time. At any particular instant, the physical expression of a river will reflect the influence and interaction of all the physical, climatic and human processes (both past and present) occurring in the catchment. This is referred to as the 'hydromorphology' of the river system.
- A river that is able to move its channel or channels within a wider active bed is a healthy river. Rivers that have adequate room to move can give greater expression to their mauri and natural form. This is reflected in the development of a diversity of aquatic and riparian habitats, which can in turn support greater ecological diversity.

Since river morphology and ecology are dynamic, river management must be capable of anticipating, responding and adapting to change.

2.2 Key River Management Tools

2.2.1 Design channel and buffer zone

To characterise the natural character of a river, it is necessary to first divide the river into reaches that have recognisable homogeneity in terms of the channel form and the physical processes (such as sediment transport) occurring in those reaches (this is referred to as the river's hydromorphology).

Against this background it is possible to define a favoured course in terms of width and alignment for the river within a reach, based on engineering assessment of river flow dynamics and scientific understanding of river behaviour for the particular channel type occurring in the reach. Other important factors influencing the behaviour and form of the river also need to be taken into consideration in this determination, such as existing structural elements in the landscape (both natural and man-made) and sediment movement along the bed of the river system. This favoured course includes two key elements:

- a design channel or design fairway, and
- buffer zones

The design channel that has been determined from these principles defines a possible location and width for the active river bed in a reach, within which the low flow channel or channels can meander. The buffer zones are vegetated strips lying on the margins of the design channel, which are intended to hold the shape of the channel banks during normal river flows and act as a sacrificial erosion zone to help absorb the river's energy during floods.

When the design channel and buffer zones are compared with the existing river channel morphology and capacity the resultant information can be used to inform the floodplain management planning process to:

- identify changes that may be required to the current river form and to land use practice adjacent to the river if the river is to be given sufficient space to express its natural form and provide for the passage of floods, and/or
- identify structural elements (i.e. capital works such as stopbanks) necessary to provide protection from a defined level of flood risk, within the context of the constraints and requirements that are to be imposed on the river by the communities residing beside it
- recognise where conflicts between objectives exist, so as to articulate the choices that the community must make.

NOTE: The design channel/fairway and buffer zones are intended to be treated as guidelines only, and not forms that have to be established and maintained as designed at all costs. An important principle is to work with the river to achieve a stable form, rather than force the river to conform to a pre-determined pattern wherever possible (i.e. "don't fight the site").

Within the design channel, it is important to understand that unless artificially constrained, the meandering low flow channel or channels will tend to migrate downstream over time. This will lead to erosion and aggradation of the buffer zone over time, which should be allowed for in the overall management regime. Allowing the river to behave in this way, rather than constraining it to a position that is fixed in space and time approximates as much as possible the natural channel sinuosity and variety of channel form that might exist if the river were allowed to flow in a fully unconstrained way, and enhances the ability of the river to form a diversity of aquatic habitats associated with its natural form.

2.2.2 Design bed levels

As noted above, understanding of river capacity involves consideration of the river in both planform and profile. The design channel and buffer are used to address the former; profile is determined through survey of bed levels. Bed level surveys are conducted on a regular five yearly cycle and from this, patterns of sediment transport through the river system can be determined. This enables identification of reaches where aggradation and degradation are occurring. This information is used to inform decisions about the need or otherwise for gravel extraction as a means of maintaining channel capacity.

2.2.3 Methods to maintain design channel and buffer

Understanding of the purposes of a buffered design channel and the behaviour of the river flow within it is essential for effective and responsive river management, as it provides a rationale for the type and amount of work that is required to establish and maintain it. Note that it is assumed that rivers managed for flood and erosion protection will require some levels of channel and riparian intervention and modification.

Work practices used to maintain a design channel and buffer can include:

- Recontouring of the channels and beaches/bars of the active river bed
- Clearance of vegetation in the active river bed (mechanically or using agrichemicals)
- Recontouring or reinstatement of eroded bank edges

- Installation (planting) and rejuvenation of vegetative bank edge protection
- Installation and repairs of erosion control structures
- Gravel extraction to address aggradation of the bed or to assist with channel alignment.

General practice, once an overall design channel and buffer zone has been established, is to focus much of the routine river management work on maintenance of clear fairways for the active working of the river bed material, and of dense vegetation margins to buffer and absorb river energy during high flows. The overall aim is to do only as much work as is needed to minimise channel distortions, of whatever type or cause, while allowing the natural processes of bed scour/deposition and bank erosion/accretion associated with meander migration to take place with the least interference. Repairs to structural works and eroded banks may be required following flood damage or where buffer zones are not wide enough to allow the river meanders full expression of their natural form.

In relation to management of bed levels, the overall aim is to maintain bed levels within the bounds of defined minimum and maximum levels (referred to as a 'design envelope'). Design envelopes have been developed for the Hutt and Waikanae rivers, and it is intended to develop them for all actively managed rivers over time.

2.3 Flood Protection Department

The Flood Protection Department's principal functions are to carry out GWRC's responsibilities to the community in terms of:

- Understanding, managing, and communicating flood risk
- Improving security from flood hazard
- Establishing and maintaining flood protection and control works.

The following guiding documents sit alongside the Code to set the strategic direction for the work undertaken by GWRC FP department. These are:

1. GWRC's Long Term Plan (LTP): outlines the community outcomes and services to be provided over the next 10 years. The current community outcomes[4] for the region are "strong economy, connected community, resilient community, healthy environment and quality of life". In achieving these community outcomes, flood protection is a key activity. The funding allocated by the Council for flood protection work is prescribed in the LTP.

2. Floodplain Management Plans (FMPs): are high-level strategic planning tools, through which GWRC seeks to work with other key decision-makers and the community within a specific river catchment to identify and agree policies and options for sustainable flood risk management. Not all rivers managed for flood protection have FMP's in place; in such cases the policy direction for river management work derives from the individual flood or erosion protection scheme agreements with landowners and the Asset Management Plan (see below).

[4] As described in Part 1 of the GWRC Long Term Plan 2012 -2022

3. The FP Asset Management Plan (AMP): provides more detail on the levels of services and strategies required to meet a defined level of risk management (as might be determined in an FMP) on a sustainable and cost-effective basis, and the expenditure and funding needed to achieve this.

4. The Code complements these documents, by providing more specific guidance on the methods to be employed in achieving the outcomes of these plans. It is intended to be a living document that will change over time to reflect current understanding of good practice. It is important to note that no methods included in the Code may contravene the requirements of any regional plan or over-ride the requirements of any resource consents issued pursuant to those plans.

2.4 Floodplain Management Plans

A FMP prescribes the management objectives for a particular river including the flood risks to be addressed, and all significant capital works (e.g. stopbanks), together with other channel management measures, required to deliver an agreed level of flood protection and/or erosion control and flood hazard management. A FMP is an important determinant of what a river will look like in the future.

Most managed rivers in the Wellington Region either have a FMP in operation or have one under development. FMPs are developed through a consultative floodplain management planning process, through which GWRC works with other key decision-makers and the community within a specific river catchment to understand the flood risks, quantify the flood hazard, develop options for its management, determine costs associated with those options and finally agree on the mix of management objectives, policies and actions that will be adopted for that river system.

This process recognises that management of flood and erosion hazards can be achieved through a variety of responses involving both direct intervention and alterations to the river system and also in changes to the way the community uses land in the river catchment, floodplain and riparian zones. The process also acknowledges that river management must also respond effectively to the requirement to maintain or improve natural ecosystems and give expression to important cultural and community values associated with the river.

To deliver an effective FMP (in terms of addressing both flood protection/erosion control and environmental enhancement objectives) the planning process must take account of the fundamental concepts noted in Section 2.1 above. This means that in particular, the process must be based on a sound understanding of:

- The inherent character of the river, its form and processes (i.e. the river's natural requirements)
- The morphological and ecological differences between the existing river and what might be expected in a healthy natural river of a similar type
- The catchment influences and controls on river behaviour (both natural and human-induced)
- Possible pathways or 'trajectories' for future changes in river form over time, due to natural processes occurring in the catchment and human interventions, recognising that these trajectories may be different from what is currently occurring or what occurred in the past

- The compromises, risks and costs (both economic and environmental) associated with allowing the river sufficient room in which to permit appropriate conveyance of flood waters and express its natural form, in comparison with those associated with greater levels of constraint of the river system.

In order to allow river management to evolve, the floodplain management planning process must be prepared to challenge and re-evaluate current assumptions, strategies and methodologies.

A FMP is a long term plan, with a timeframe of several decades; the intention is that it should be reviewed and updated every 10 years.

2.5 Operational Management Plans

The directions of a FMP are at a reasonably high level, and are insufficient to provide comprehensive or specific guidance on the mix of methods and types of work practices that may most effectively be used to deliver FMP objectives at every location, or may be most appropriate for the specific values of a reach or site. In addition, some FMP's are relatively old and may not reflect changes in current thinking.

Operational Management Plans will be developed and maintained for each river managed for flood protection or erosion control to ensure alignment of FMP directions (or flood protection scheme agreements where there is no FMP) with the need to consider important ecological recreational, cultural and social values in work planning, at a more detailed level.

Operational Management Plans identify management reaches and the key river management elements (as noted in Section 2.2 above) within a river as a method of translating high level directions into work programmes for each managed river. They contain detailed guidelines for the specific management of each reach, including advice on the most appropriate methods and tools to be used in each reach. Full guidelines for the contents of Operational Management Plans are contained in Appendix 3.

2.6 Annual Work Programmes

The development of annual works programmes and plans must be consistent with the directives of the relevant Operational Management Plans.

In developing work plans, river managers must also take account of:

- the necessity of intervention and the consequences of doing nothing
- the urgency of the work and consequences of not undertaking it at the proposed time
- the effectiveness of the proposed works to address the identified flood protection, erosion or hazard issue
- the environmental effects of the work and available alternatives to achieving the desired outcomes
- if the required works are allowed, either by rules in regional plans or by granted resource consents

- the conditions attached to any relevant resource consents
- the availability of funding to achieve the proposed work.

The annual river management work planning process is shown in Figure 1 below. Work planning and budgeting commences in January and is confirmed in August. Routine vegetative works on river banks (such as planting and willow layering) commence in winter; instream and bank edge works are generally undertaken in the spring and summer periods.

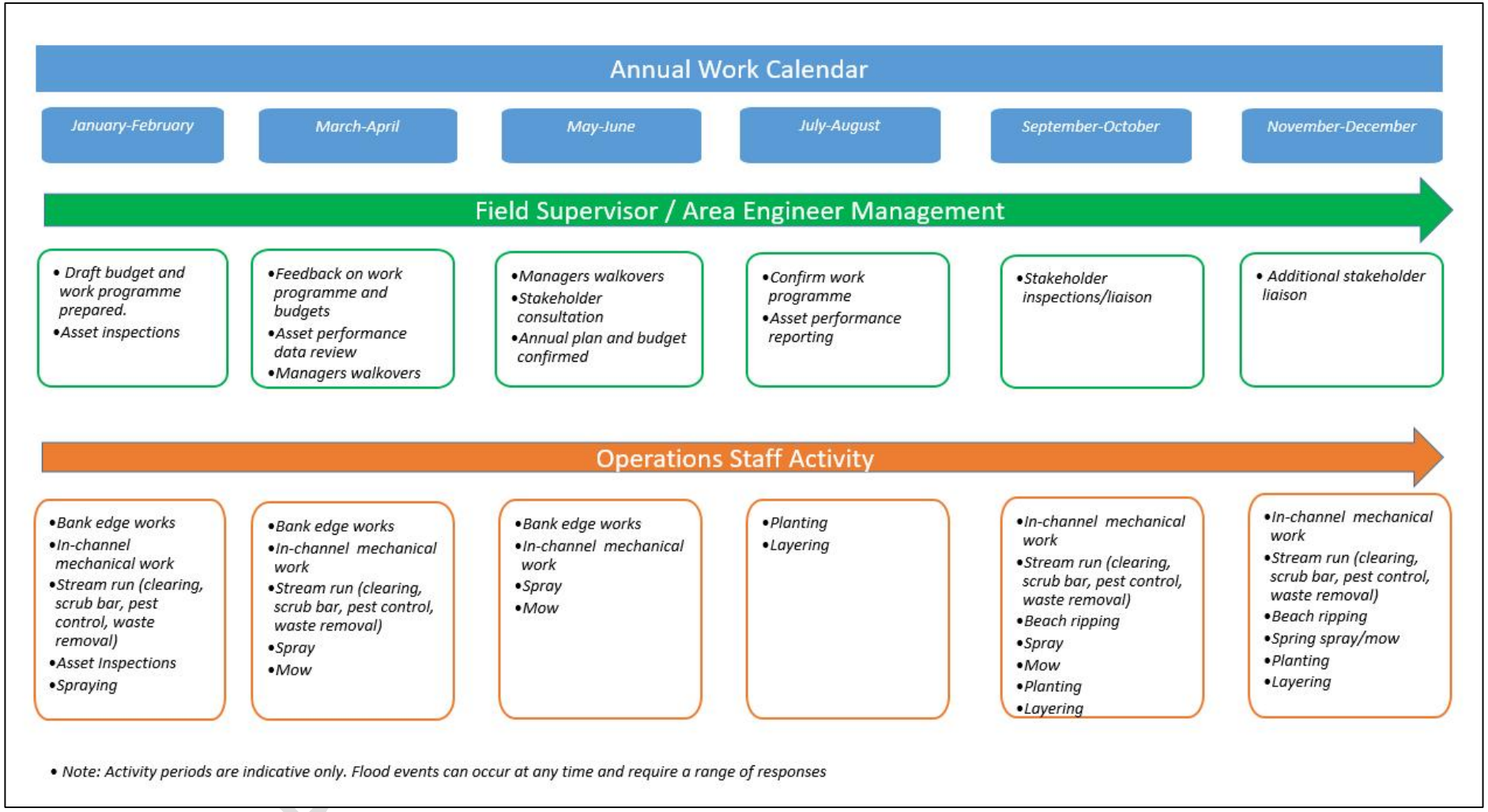
2.7 Capital Works Planning

Capital works are large structural works (such as stop-banks) that require levels of investment beyond the annual river operations and maintenance budget.

The capital works programme, which is driven from the FMP directives and included in GWRC's LTP, is a separate workstream from the annual operations and maintenance work. The development of Operational Management Plans will enable stronger links to be made between these two work-streams in the context of environmental outcomes sought by the Code.

In particular, this work will provide clearer guidance on the actions and mitigation that are appropriate according to the size and effects of specific works.

Figure 1: Annual Work Planning Process



3. Management of Effects on River Values

3.1 Overview

Communities living beside rivers and on the river floodplains value the flood protection/erosion control systems that GWRC have in place, which allow them to conduct their lives without the risk or fear of frequent flooding and its associated risks to life and property.

The rivers managed by GWRC also have many other values associated with them, relating to such things as:

- adjacent land use
- natural physical river form
- water quality
- plants and animals (both aquatic and terrestrial) associated with the river, and the habitats they occupy
- aesthetic qualities of the river and adjacent landscape
- recreational uses of the river and river corridor
- the relationship of the mana whenua to the river, and their uses and guardianship of it.

Every river, and reach within that river, has its own unique set of values. The challenge for the Code is to ensure that in the provision and maintenance of flood and erosion protection systems the importance of understanding and considering these values is recognised. Practical guidelines to assist effective consideration of these values are an important aspect of the Code.

It is not the role of the Code to describe the values relating to the Wellington Region rivers. The key sources of this information are the Natural Resources Plan and FMPs for individual rivers. Other published ecological or recreational studies or cultural impact assessments can also assist in understanding values pertaining to specific rivers or reaches. This information is transferred into Operational Management Plan guidelines (see Appendix 3) to be considered in conjunction with the potential for adverse effects of proposed activities at particular sites, to inform work programming.

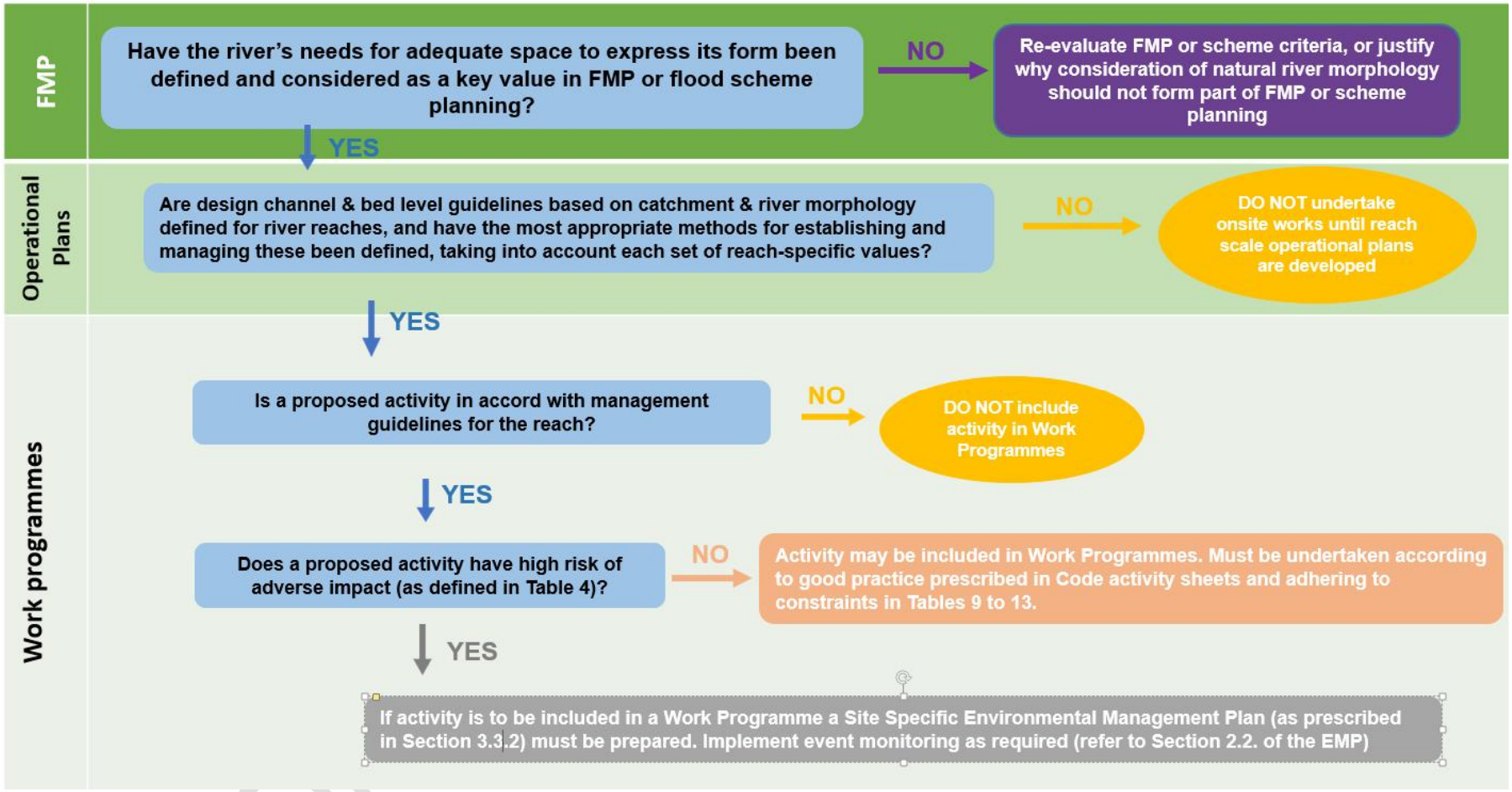
The effects of river management activities are managed:

- through work planning at all levels – from high level strategy to day-to-day programming. High level strategic planning sets the general pathway for the types of activities that will occur, and thus determines the overall nature and extent of effects that may be generated. Day-to-day work planning controls the choice of individual activity methods.
- by site specific management, where necessary because of the scale of the work and/or the sensitivity of the values of the site or reach.
- via regular analysis of data from environmental monitoring (as set out in the EMP) which is considered through the review process described in Section 4 and results in recommendations for changes to practice where necessary.

Effects that are unavoidable, and which cannot be fully mitigated on site are addressed through applications of the Ecological Enhancement Fund which aims to achieve real and meaningful environmental improvements in other parts of a river system, or other rivers in the Region.

The following sections provide further details.

Figure 2: Process for management of effects arising from river management activities



3.2 Effects Management Through General Work Planning

Figure 2 outlines a set of steps to be carried out at all levels of management planning to ensure that the effects of river management activities are appropriately considered and addressed.

FMP level

First, as has been noted previously, decisions made at the FMP planning level have a fundamental influence in determining the types of activities that will be undertaken in rivers to deliver flood protection services. Hence choices made at the FMP level have a significant influence on the types of environmental and cultural effects arising from river management. Inclusion of the river's voice, in terms of the space that is required for the river to adequately express its natural form, as an important consideration in FMP planning is one way in which the protection and enhancement of a river's natural character can be effectively addressed at a high level. This will ensure that the needs of the river environment are recognised and considered alongside the needs of the community from the outset in floodplain management planning.

Operational Management Plan level

Second, once the direction of river management has been set by the FMP, the formulation of an Operational Management Plan for a river on a reach by reach scale, allows for more detailed management of effects. It enables this by first, requiring there to be a design framework in place that is based principally on river morphology and behaviour, to provide a context within which river management decisions can be taken. This is because use of the design channel approach, based on the natural character of a river system, offers important opportunities for mitigation of the adverse effects of river management activities. This occurs through focus on the creation and maintenance of a consistent and sustainable river form, which allows for the natural development and migration of habitat diversity associated with the natural river form.

The Operational Management Plans also identify reach-specific values that must be considered in decisions relating to river management activities in those reaches, and provides general guidance on appropriate methods and work practices used to deliver flood protection services in each management reach.

Work programme level

In the development of individual work programmes, only individual activities that are in accordance with guidelines in the Operational Management Plan may be considered for use.

All chosen activities must comply with:

- the general activity good practice methods contained in Section 7.3, and
- the general activity constraints calendar contained in Table 11 to Table 15, and
- the individual activity good practice methods in Section 7.4
- requirements for site specific effects management as described in Section 3.3.

3.3 Site Specific Effects Management

Many river management activities have the potential for some short term adverse impacts, but the significance of this needs to be considered in the context of the naturally dynamic river environment (where form and habitat are constantly changing and re-forming). The significance of effects also depends on factors such as the scale of disturbance, the values of a particular site, their sensitivity, and the time for recovery to pre-disturbance levels.

If a proposed activity or set of activities which is not generally restricted by an Operational Management Plan but has the potential to generate significant adverse effects in the river environment at a specific site or in a specific reach, it most likely will need to be conducted in accordance with a more detailed, site specific environmental management plan (SSEMP), in addition to following good practice methods.

3.3.1 Five-step method for determining when site-specific effects management is required

The following five-step method outlines a process to determine when site-specific management of effects is necessary, and to specify what it should include.

The method combines:

- the potential risk for adverse effect
- the sensitivity of the site and
- the scale of the proposed work

to determine whether:

a) if it is sufficient for it to be undertaken according to the general practice guidelines contained in the Code for that activity, or

b) the level of potential impact of the activity at the specific location is such that further specific management, by way of a specific site management plan (SSEMP) and on-site monitoring of that activity, is warranted, or

c) whether the level of potential impact of the activity is such that further specific management will not be capable of appropriately minimising adverse effects, and consequently the activity should not proceed.

Step 1 – Identify activities with high potential for adverse impact

Activities classified as having high potential for adverse impacts are those where it is recognised that recovery of river habitat that is altered by those activities may take months or possibly years (or possibly not at all). These include all the activities that cause extensive mechanical disturbance of the wetted riverbed, as listed in Table 1.

Table 1: High potential impact activities

Activities with high potential for adverse impact	
In the wet channel	On banks and berms
· wet gravel extraction · bed recontouring · channel diversion cuts · ripping in the wet channel · construction of impermeable structures · mechanical clearance of silt and vegetation	· clearance of areas of riparian vegetation identifies as having significant ecological values

Step 2 – Assign a magnitude to the proposed disturbance

For activities identified in Step 1, Table 2 assigns a magnitude to the proposed disturbance, based on the length of river bed affected and/or the amount of time involved.

Table 2: Magnitude of activity disturbance

Amount of proposed disturbance	Assigned Magnitude
> 800m wetted riverbed length, and/or > 8 days in river works at one site or more than 15 days per 10 km reach over several sites, and/or > 100 m2 bank or berm area	Large
175m - 800m wetted riverbed length, and/or 3 to 8 days of in-river works at one site or no more than 15 days per 10 km reach over several sites, and/or 100 m2 bank or berm area	Moderate
< 175m wetted riverbed length, and/or no more than 3 days in river works at one site or no more than 15 days per 10 km reach over several sites, and/or < 100 m2 bank or berm area	Small

Step 3 – Define sensitivity of habitat

Important habitats in terms of river ecology are defined as:

- inanga spawning habitat from 1 March to 31 May (i.e. during inanga spawning season)
- trout spawning habitat from 1 May to 31 July (i.e. during trout spawning season)
- riparian vegetation identified as having high ecological or conservation value
- bottom-rooted plant communities in low gradient streams (i.e. silty/muddy bedded channels and 'drains')
- native fish migration routes , particularly between 1 Sept and 31 December
- riverbed bird nesting habitat from 1 August to 28 February (i.e. during nesting season).

Table 3 assigns a relative sensitivity to disturbance ranking to these habitats.

Table 3: Habitat sensitivity ranking

Riverine habitat	Relative Sensitivity to disturbance
· inanga spawning habitat from 1 March to 31 May · trout spawning habitat from 1 May to 31 July · riparian vegetation identified as having high ecological or conservation value · low flow channels during minimum low flows (1200 l/s at Birchville Recorder)	Most
· inanga spawning habitat from 1 June to 28 February · the wetted channel utilised by migrating fish from 1 Sept to 31 Dec · riparian vegetation which benefits the stream ecology (shade, cover, woody debris) · bottom rooted plant community in low gradient streams	Intermediate
· other riverine habitats	Least

Step 4 – Determine risk of adverse impact

Table 4 can be used to determine the level of risk of adverse impact (high, medium or low) arising from river management activities at a specific site, based on a combination of the magnitude of disturbance proposed (determined from Table 2) and from the relative sensitivity of the work site (determined from Table 3).

Table 4: Level of risk of adverse impact

Risk of adverse impact		Sensitivity of work site from Table 3)		
		Most § inanga spawning habitat from 1 March to 31 May § trout spawning habitat from 1 May to 31 July § riparian vegetation identified as having high ecological or conservation value § low flow channels during minimum low flows (1200 l/s at Birchville)	**Intermediate** § inanga spawning habitat from 1 June to 28 February § the wetted channel utilised by migrating fish from 1 Sept to 31 Dec § riparian vegetation which benefits the stream ecology (shade, cover, woody debris) § bottom rooted plant community in low gradient streams	**Least** § other riverine habitats
Magnitude of disturbance (from Table 2)	**Large** > 800m wetted riverbed length, *and/or* > 8 days in river works at one site or 15+ days per 10 km reach, *and/or* > 100 m^2 bank or berm area	***High***	***High***	***High***
	Moderate 175m - 800m wetted riverbed length, *and/or* 3 to 8 days of in-river works at one site or <15 days per 10 km reach, *and/or* 100 m^2 bank or berm area	***High***	***Medium***	***Low***
	Small <175m wetted riverbed length, *and/or* no more than 3 days in river works at one site or <15 days per 10 km reach, *and/or* <100 m^2 bank or berm area	***High***	***Low***	***Low***

Step 5 – Determine response based on risk of adverse impact

Table 5 below summarises the appropriate management responses applying according to the determined risk of adverse impact.

Table 5: Required management responses based on risk of adverse impact

	Risk of adverse impact (from Table 4)		
	High	Medium	Low
Management Response	· A site specific before/after habitat assessment undertaken at each work site by the operations supervisor using the habitat assessment template[5] included in Appendix A of the EMP, and · Preparation of a site specific management plan (SSEMP), and · Works to follow all General & Individual Activity Good Practice Methods of the Code (unless otherwise prescribed in the SSEMP).	· Works to follow all the General and Individual Activity Good Practice Methods of the Code · A site specific before/after habitat assessment undertaken at each work site by the operations supervisor using the habitat assessment template included in Appendix A of the EMP.	· No specific site management, over and above the need for works to follow all the General and Individual Activity Good Practice Methods of the Code.

3.3.2 Scope of SSEMP

The scope of the SSEMP must cover the following matters:

- Timing of works and length of work programme
- Any special restrictions or requirements concerning machinery
- Any special restrictions or requirements access to site
- Any special restrictions or requirements relating to hours of operation
- Any special requirements around communication with identified groups
- Requirements for design of the final form of the river post-works
- Any special requirements for habitat protection or restoration
- Any special requirements relating to cultural aspects or concerns
- Requirements for site monitoring.

The SSEMP is prepared by FP staff, and must include communication with relevant parties (who will be dependent on the particular values identified for the site). Also,

[5] The applicability of the habitat assessment form as a monitoring tool is still under development.

advice will be sought from a suitably trained or qualified ecological expert. The scope of the site monitoring is described in Section 3 of the Environmental Monitoring Plan.

3.4 Management Response to Monitoring Information

Provision for a programme of environmental data collection and monitoring is a key part of the Code[6], as it informs the on-going understanding and management of effects. It proposes regular collection of a range of physical parameters that can be used as indicators of the effects of river management activities on selected environmental values. It also defines 'triggers' for further investigation and response. The details of the data collection and monitoring programme are included in the Environmental Monitoring Plan (EMP). Triggers related to this monitoring are described in Section 3.4.1 below.

Like the Code, the EMP is intended to be a living document that is adapted over time to ensure it remains useful and relevant. The database of information that will be accumulated over time is intended to deliver a useful resource than can act as a basis for objective assessment of the effects of river management activities, which will be conducted according to a defined review process (see Section 4).

The specific parameters chosen for monitoring and included in the EMP at any one time depend on which values are considered to be the most appropriate for particular attention at that time. The EMP identifies the monitoring requirements in respect of methods and reporting that must be taken into account in the development of work programmes.

3.4.1 Baseline monitoring triggers and responses

If monitoring shows changes of significance in any of the parameters, it is appropriate that further investigation is warranted to determine its cause. If any recorded changes can be clearly linked to the effect of river management activities, then more immediate action to change river management practices may be necessary. The triggers for each parameter included in the current EMP, and the appropriate response when those triggers are activated by survey findings, are listed in Table 6 below.

Table 6: Monitoring triggers and management responses

Parameter (as per Section 2.2 of the EMP)	Trigger (activated by monitoring data)	Response or action
Deposited Sediment	Statistically significant changes in the proportion of bed substrate covered by fine sediment or re-suspendible sediment	In the event that the cause of the change is not obvious, the appropriate response would be to initiate a more targeted investigation into potential causes. If the recorded decrease is, or is likely to be, attributable to river management activities, a modification of those activities via a review of the Code should be undertaken.
Riverbank Undercutting & Overhanging Vegetation	A statistically significant decline in the length of undercut banks or overhanging vegetation in any management reach	If the recorded decrease is, or is likely to be attributable to river management activities, then: a) restoration of that area or offsetting of the loss would be given priority under potential applications of the Environmental

[6] At this stage, data collection is limited to physical and ecological parameters, however, expansion and linkages to cultural monitoring is envisaged in future as those methodologies are developed by Council and mana whenua.

		Enhancement Fund (see Section 3.5); b) a review of the Code would be undertaken to identify changes that could be made in future to mitigate the observed effects.
Trout abundance	A statistically significant decline in trout abundance, based on a comprehensive analysis of the long term (20 year) data record for brown trout	An independent suitably qualified expert carries out a study and reports to FP within 3 months identifying the most likely causes of the decline If the most likely cause is identified as river management activities, the report will recommend measures to mitigate or remedy the effects, which may include changes to the Good Practice methods in the Code (as relevant) or applications of the Environmental Enhancement Fund (see Section 3.5). FP must implement those recommendations, or explain in the Annual Report (see Section 4) why implementation was not practicable. If river management activities are identified by the expert as part of a wider number of causes then FP shall have regard to any recommendations in the report to mitigate or remedy the effect or river management activities on the remaining population.
Riparian vegetation	A statistically significant change in the 'high value areas' defined by survey & mapping	Further investigation as to whether there is any likelihood that river management activities are contributing to the observed change. If it is evident that river management is negatively impacting the extent or diversity of high value riparian areas, the necessity of undertaking that work and available alternatives should be identified and evaluated as to their feasibility. This information should also be provided to the IRP (see Section 4) for consideration.
River birds	For the Hutt, Otaki, Ruamahanga, Waingawa and Tauherenikau rivers: a decline in the average number of breeding pairs detected between one 3-year set of surveys and the next that exceeds any of the trigger values in Table 7.	An independent suitably qualified expert carries out a study and reports to FP within 3 months on the possible causes of the decline. If the most likely cause is identified as river management activities (e.g. a major increase in the proportion of dry gravel habitats being disturbed between August and February), the report will recommend measures to mitigate or remedy the effects, which may include changes to the Good Practice methods in the Code (as relevant) or applications of the Environmental Enhancement Fund (see Section 3.5). FP must implement those recommendations, or explain in the Annual Review Report (see Section 4) why implementation was not practicable or achieved. If river management activities are identified by the expert as part of a wider number of causes then FP shall have regard to any recommendations in the report to mitigate or remedy the effect or river management activities on the remaining population. If the cause of the riverbird population decline is not apparent, an investigation to identify this cause shall be initiated. If the cause is subsequently found to be linked to an activity, then a review of the Code will be triggered to identify changes that can be made to halt or reverse the observed population

		decline.
Native fish communities	Any recorded decline in the number of indigenous fish species present in a river management reach or stream system detected between one 3-yearly survey and the next.	An independent suitably qualified expert carries out a study and reports to FP within 3 months identifying the most likely causes of the decline. If the most likely cause of the decline in the number of indigenous fish species can be clearly linked to any river management activity (e.g. reduction in the availability of good quality habitat), then the report will recommend changes to the Good Practice methods in the Code (as relevant), or applications of the Environmental Enhancement Fund (see Section 3.5) to mitigate or remedy the adverse effects. FP must implement those recommendations, or explain in the Annual Report (see Section 4) why implementation was not practicable or achieved. If river management activities are identified by the expert as part of a wider number of causes then FP shall have regard to any recommendations in the report to mitigate or remedy the effect or river management activities on the remaining population.
Aerial photography	Changes in actual channel alignment compared with the design channel alignment over a reach (of 10 cross sections or more) that give rise to significant channel distortions, and channel alignment that aggravates bank erosion and effects bed material processes.	Investigations of options to address changes, in the context of management objectives and river design philosophy. This may include re-alignment of the channel, or widening of buffer zones. This would necessitate an update of the design guidelines in Operational Management Plans and a re-evaluation of these taking the significant values of the reach into account.
Pool and Riffle Counts	A decrease in the total number of pool/riffle counts detected between one survey and the next that exceeds trigger levels contained in Table 8.	In the event that the cause of the change is not obvious, the appropriate response would be to initiate a more targeted investigation into potential causes. If the recorded decrease is, or is likely to be attributable to river management activities, a modification of those activities via a review of the Code should be undertaken.
River Bed Levels	Changes in mean riverbed levels outside of design riverbed level envelopes over more than three consecutive cross sections	The principal response would be to review the design bed level envelope and/or any gravel extraction programme (sites and volumes), taking into account both flood hazard risk and environmental implications.
Inanga spawning habitat	A statistically significant reduction in inanga spawning habitat	Further investigation as to whether there is any likelihood that river management activities were contributing to the observed change. If it is evident that river management is negatively impacting the extent or health of inanga spawning habitat, the necessity of undertaking that work and available alternatives should be identified and evaluated as to their feasibility. This information should also be provided to the IRP (see Section 4) for consideration.
NCI	Under development	Under development

Table 7: River birds - triggers for further investigative work

Species	Trigger level				
	Otaki River	Hutt River	Ruamahanga River	Waingawa River	Tauherenikau River
Banded dotterel	25% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	Not applicable	A 12% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	A 35% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	Not applicable (no banded dotterels were detected on this river during the 2010-2012 surveys).
Pied stilt	25% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	50% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	A 15% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	A 15% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	Not applicable (numbers of birds detected during the 2010-2012 surveys were too low to enable measurable trigger levels to be devised).
Black-fronted dotterel	50% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	Not applicable	An 8% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	A 42% or more decline in the average number of breeding pairs detected between one 3-year set of surveys and the next.	Not applicable (numbers of birds detected during the 2010-2012 surveys were too low to enable measurable trigger levels to be devised).

Table 8: Pools & riffles – triggers for further investigative work

River	Trigger level	
	No of pools	No. of riffles
Hutt River	48	38
Waikanae River	To be determined	To be determined
Otaki River	To be determined	To be determined
Ruamahanga River	To be determined	To be determined
Waingawa River	To be determined	To be determined
Waipoua River	To be determined	To be determined

3.5 Environmental Enhancement Fund

In order to address effects from river management activities that cannot be mitigated, GWRC will allocate specific budget annually for areas of work that will contribute in a meaningful and long-term way to enhancement of the natural character of the river environments. Identification of potential projects qualifying for this funding will draw on recommendations by the Independent Review Panel and the Maori Consultative Group (see Section 4). The focus on natural character enhancement reflects the understanding that if a river has sufficient space to express its natural form then this will increase the potential for enhancement of habitat diversity and ecological health. It should also contribute to improved management of river values from a cultural perspective. Applications of the fund will be reported on as part of the Annual Report (see Section 4).

4. Review and Reporting

For the Code to achieve the outcomes listed in Section 1, it must be responsive to:

- Evidence gathered from monitoring in accordance with the EMP and SSEMPs, and any field trials conducted in accordance with Section 7.7 of the Code
- Feedback from staff involved in implementation of the Code
- The views of iwi and key stakeholders
- New information and research from other reputable sources
- Changes in technology
- Changes in values

Review of river management work will be undertaken according to processes that draw significantly on the results of the EMP and use them to inform both changes to on-going environmental monitoring data collection and individual work practices, and also overall modification of the Code over time.

GWRC proposes the appointment of an Independent Review Panel (IRP) made up of technical experts and a cultural expert to assist, inform and challenge its review of work. It also proposes the appointment of a 'Maori Consultative Group' (MCG)[7] to assist its review of work with respect to cultural values and perspectives.

4.1 Annual Report

Review will involve preparation of an Annual Report (AR) by FP, containing:

- a summary of river management work undertaken (as described in FP annual work programme reports)
- reporting on the results of baseline monitoring (as outlined in reports produced as part of the EMP outputs), and any event monitoring undertaken as part of a SSEMP. (For further guidance on analysis of this information, see Section 4.2 below)
- an assessment of whether the actions and methods prescribed in the Operational Management Plans are achieving their purpose and whether or not the actions are in accordance with good practice as defined by the Code
- any recommendations as to changes in Individual or General Good practice methods in the Code that may be necessary for improved environmental outcomes
- any actions taken as a result of recommendations by the IRP and/or MCG made in the previous year's AR
- the results of any Kaitiaki Monitoring of relevance to river management activities received over the past 12 month period, and FP's response to them
- any allocation(s) of the Ecological Enhancement Fund, including a description of the work and its intended outcomes, and any further requests for additional allocations
- any other recommendations considered necessary to achieve the purposes of the Code.

[7] The term MCG is an interim working title for this consultation group until an appropriate title has been determined by the group itself.

The purposes of this annual review are to:

- act as a check that the collection of environmental monitoring data is being undertaken as indicated in the EMP
- to evaluate the effectiveness of the collected data in providing meaningful understanding of effects of flood protection/river management work
- to check if any 'triggers' in the data indicate the need for further investigation of individual practices or changes in work practices (see Section 3.4)
- to allow a mechanism for the introduction and consideration of new information (including cultural recommendations) in a structured way
- to either endorse current practice as described in the Code and EMP, or identify changes to the EMP necessary to better inform understanding of effects, and/or identify modifications to work practices described in the Code to ensure Code objectives are fully satisfied.

The AR will be provided in draft to the IRP, who will seek input from the MCG and respond with a Recommendations Report. Following receipt of these recommendations, FP will finalise its AR and include its response to the recommendations of the IRP. All this information is then provided to the GWRC Environment Committee, GWRC Consents Manager, the IRP and the MCG. This process is summarised in Table 9, along with an indicative timeframe.

If through the annual review the need for changes to Code work practices or environmental monitoring is confirmed then these modifications will be written into the Code or EMP.

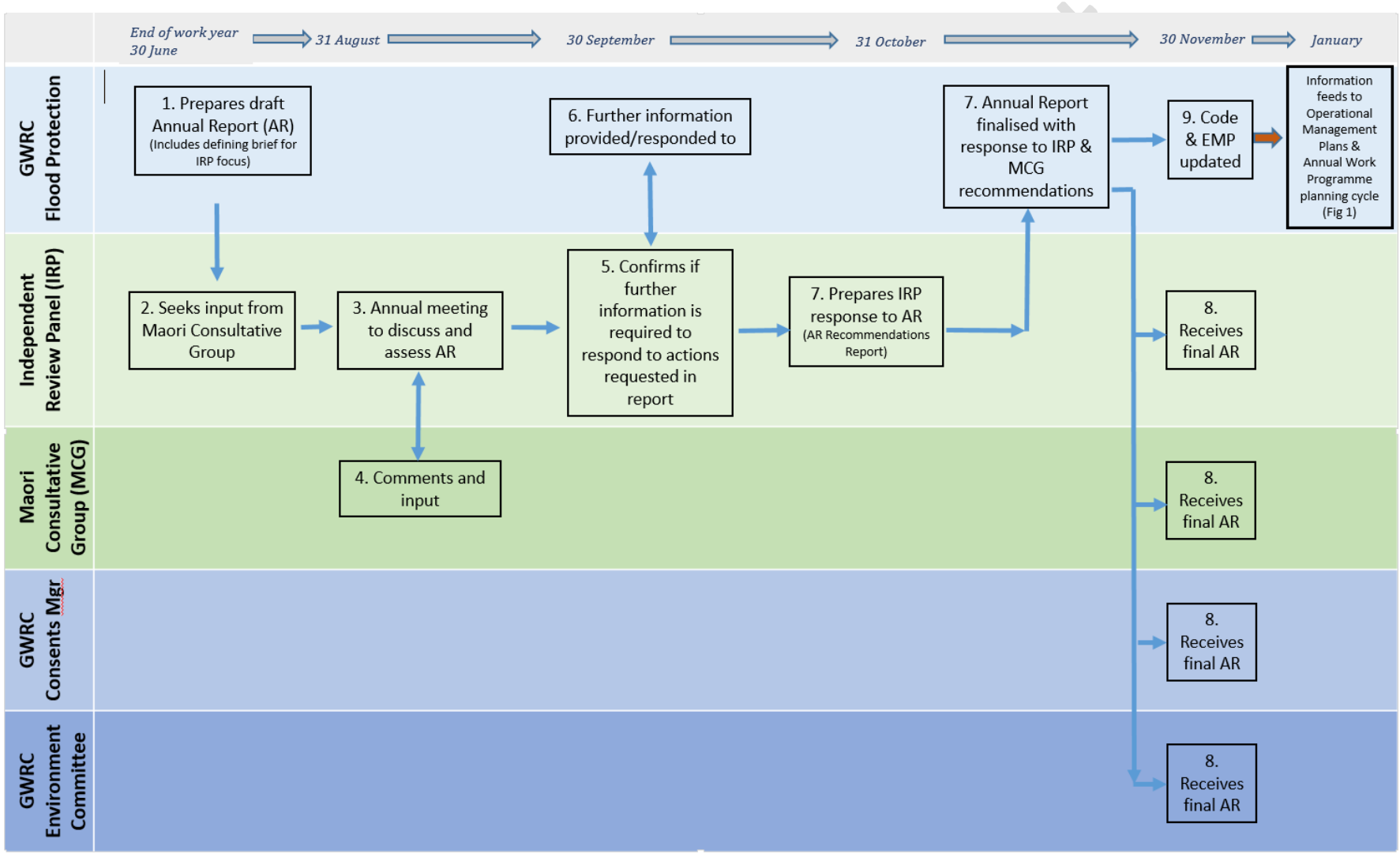
Every 10 years a high level review of the Code will be undertaken by an independent auditor appointed by GWRC to evaluate:

a) if progress in achieving the Code vision and desired outcomes is occurring

b) if the Code outcomes and objectives are still relevant or require modification

c) if the mechanisms within the Code for response to monitoring and review are effective.

Table 9: Process for annual review & reporting



4.2 Reporting on Monitoring Information in the Annual Review Process

The AR to the IRP (prepared as part of the Annual Review process outlined in Section 4.1 above) will consider data arising from monitoring (undertaken under the EMP and any SSEMP) as it becomes available. In particular, the following matters should be considered as part of preparation of the review report:

i. If any of the identified triggers in Table 6 have been activated by monitoring results
ii. Any other changes of potential interest in the data between surveys in any reach or reaches
iii. The likelihood that such changes might be attributable to river management activities
iv. Possible changes in river management practices (as outlined in Operational Management Plans and the Code) that might be necessary, or which may provide solutions to any identified issues
v. Any conflicts or constraints that may be associated with making changes to management practices
vi. Any remedial actions that are necessary or desirable
vii. The need or otherwise to continue with monitoring each parameter identified in the EMP, based on the value of the data to enabling understanding of the effects of river management activities
viii. Further information needs and changes that might be needed to the EMP, such as the inclusion of new monitoring parameters, or changes to monitoring frequency of any particular parameter
ix. Refinements to trigger levels
x. Any recommendations for potential applications of the Environmental Enhancement Fund (see Section 3.5)
xi. Progress on any actions identified in the previous year's annual report.

5. Opportunities for Consultation and Input

5.1 Mana Whenua

Formal interaction between tangata whenua and GWRC is currently based on a Memorandum of Partnership (MOP) between the tangata whenua of Te Upoko o te Ika a Maui and Wellington Regional Council (2013). This agreement sets out the principles for conduct of the relationship between tangata whenua and GWRC that stems from the Treaty of Waitangi and is prescribed in legislation including the Treaty of Waitangi Act (1975) and the Resource Management Act (1991).

The tangata whenua tribes with mana whenua status in the Wellington Region are identified in the MOP as:

- Taranaki Whanui ki te Upoko o te Ika a Maui, represented by Port Nicholson Block Settlement Trust
- Ngāti Toa Rangatira, represented by Te Rūnanga o Toa Rangātira Inc.
- Te Atiawa ki Whakarongotai, represented by Ati Awa ki Whakarongotai Charitable Trust
- Ngāti Raukawa ki te Tonga represented by Nga Hapu o Otaki
- Ngāti Kahungunu ki Wairarapa, represented by Ngāti Kahungunu ki Wairarapa Trust
- Rangitane o Wairarapa, represented by Rangitāne ō Wairarapa Inc.

The MOP acknowledges that GWRC and mana whenua have a common goal of supporting the environmental, social, cultural and economic wellbeing of the region for the benefit of the regional community, both now and in the future. It also acknowledges that the relationship between mana whenua and GWRC is one of long standing and is on-going. It operates concurrently at governance, executive and operational levels.

The MOP states that the partnership will manifest both on a one-to-one basis between mana whenua and GWRC and within the collective forum of all the parties (see below). The partnership between the GWRC and individual mana whenua is the pre-eminent relationship.

The agreement states that the following principles will apply:

d) The relationship will be mutually beneficial.

e) The relationship is based on good faith, cooperation and understanding.

f) There is commitment to work towards solutions with reasonableness and honesty of purpose.

g) Both parties will seek opportunities to develop new expressions of partnership and to share skills and knowledge.

h) Both parties will seek opportunities to utilise tikanga Māori wherever possible in the conduct of the relationship.

Also in operation is the Wairarapa River Management Agreement (2011) – an agreement between tangata whenua and GWRC (Flood Protection Department), Department of Conservation and Fish & Game NZ – to provide for an agreed way of working to support the monitoring and improvement of recreation, cultural and wildlife values of the Waiohine, Waingawa, Waipoua and Upper Ruamahanga Rivers while providing also for ongoing flood and erosion protection work through their scheme reaches.

The following Council committees or groups provide opportunities for expression and manifestation of these agreements:

- Ara Tahi Leadership Committee – a formal partnership of tangata whenua and council leaders, dealing with high level and strategic issues
- Te Upoko Taiao – Natural Resource Management Committee – consisting of an equal number of iwi nominated members and councillors, providing oversight of the development and monitoring of regional plans and regulatory matters
- Whaitua – five catchment based 'whaitua' or 'zone' groups set up in response to the National Policy Statement on Freshwater Management 2011, to identify water quality and flow limits and develop recommendations for their achievement.
- The Te Kauru and Waiohine Floodplain Management Committees (which include iwi representatives).

The work planning and review processes defined in the Code (see Sections 3.2 and 4) and the requirement for SSEMPs for high impact work (Section 3.3) provide further opportunity for GWRC and individual mana whenua to work together to further their collective aims, in relation to river management specifically. In particular, the creation of a Maori Consultative Group (MCG) - see Section 4 - provides a vehicle for the sharing of knowledge and exploration of the ways in which tikanga Māori may be directly incorporated into GWRC work practices. The Code provides tangible evidence of GWRC commitment that works will be undertaken in a manner which reflects mana whenua values.

5.2 Key Stakeholders

The work planning and review processes defined in the Code (see Sections 3.2 and 4) and the requirement for specific environmental management plans for high impact work (Section 3.3) provide opportunity for GWRC to engage directly with key stakeholder groups with interests in river management generally, or in relation to interests in specific rivers or river reaches.

6. General guidelines for GWRC staff using the Code

For the Code to be a 'living document', i.e. one that continues to reflect good practice over time and is actively used by GWRC to guide its work practices, there are a number of actions, processes and protocols that must be established. These are outlined below.

6.1 A Code Culture

This Code is an integral part of decision-making at both management and operational levels in much the same way that health and safety is incorporated into everyday decision making.

A Code culture has at its heart the following principles:

- Understanding the purpose of the Code and the outcomes it aims to achieve.
- Understanding the actions required to enable the Code to deliver the desired outcomes.
- A willingness and commitment to implement, use and develop the Code.

The Code is part of "business as usual". To achieve this, all staff and contractors will be introduced to the use of the Code. This will include specific identification of the actions required of individual staff members. Annual 'refresher' sessions on the use of the Code, to keep relevance for staff alive and 'top of mind', will be held, and training in use of the Code will be included as part of induction of new staff members (in the same way as health and safety practice is addressed).

6.1.1 Flood Protection Department work planning

- Specific consideration of the Code requirements will be an agenda item in all work planning meetings.
- Staff will refer to the Code prior to consideration/design or commencement of any works on the ground.

6.1.2 Documenting work

For the Code to be sustainable and remain effective, it is essential for records of work practices to be kept, and provision made for GWRC staff to record any observations where practice is not achieving the desired outcomes or could be improved.

Other relevant information that may be used to improve work practices over time, such as complaints that may be received from the public, should also be recorded.

6.2 Document Ownership and Management

The Code has been created by GWRC for its own use. To that extent, GWRC has sole responsibility for the administration of the Code documentation.

As explained in Section 5, mana whenua, key stakeholders and advisers, community groups and landowners are involved in reviewing and updating the Code.

Active management of the Code document is necessary to keep it up to date and to ensure that all staff and the public have access to the latest copy. This will require:

- Appointment of a staff member with primary responsibility for management of the Code document.
- Establishment of a protocol around the management of the Code document, including:
    - The master copy of the Code is held by GWRC, FP and this is the only copy to which approved amendments may be made.
    - The number of hard copies of the Code on issue will be recorded, to ensure all are updated when required.
    - GWRC, FP is responsible for ensuring that updates to the Code are made as agreed by the parties involved in the review process following the review, and that updated copies of the Code are made available to all parties and posted on the GWRC website.

6.3 Distribution and Availability

- All staff shall have access to a copy of the Code and refer to the Code when designing and formulating plans for flood protection and erosion control work.
- All staff (including contractors) shall have access to a copy of the Code and should refer to it before undertaking any work on the ground.
- The Code shall be available for public inspection on the GWRC website and (in hard copy) at all GWRC offices and depots.

7. Good Practice Methods

7.1 Definition of Good Practice

In the context of this Code good practice means selecting an appropriate action or group of actions to address an erosion or flood issue, which takes account of the identified values associated with that river and site to provide an appropriate and acceptable outcome.

7.2 Structure of this Section

Section 7.3 contains a list of General Good Practice Methods that apply to all river management activities. These standards reflect good practice that has been derived through general consideration of effects on environmental and cultural values.

Section 7.4 describes the Specific Methods that apply to individual activities, and any specific locational restrictions on those activities. Again, these methods reflect good practice that has been derived, and will continue to evolve, through more specific consideration of the values identified in Section 3 as they apply to individual rivers, or parts of rivers.

Section 7.5 covers agrichemical spraying.

Section 7.6 contains a protocol for Urgent works.

Section 7.7 contains a protocol for trialling of new activities or methods of undertaking activities.

NOTE: the Code does not authorise any activity to be undertaken; rather, it describes how that activity should be undertaken. For ease of reference, some guidance is given as to whether individual activities may or may not be undertaken without resource consent under current regional plans.

7.3 General Good Practice Methods

There are several actions or practices that apply to many, or all, river management activities. Rather than specifying these for every individual activity, they have been combined into a list of general practices that will apply as appropriate in every situation where river management works are undertaken, as detailed below.

Table 10: General Good Practice Methods

Work Phase	Section	Action/practice	Personnel responsible
Pre-works Planning	7.3.1	Work Plan communication	Area Engineer/Site supervisors
Works Implementation	7.3.2	Onsite works planning & checks	Area Engineer/Site supervisors
	7.3.3	Work recording	
	7.3.4	Recording of complaints & concerns	
	7.3.5	Operation & maintenance of machinery	
	7.3.6	Construction material storage & stockpiling	
	7.3.7	Sediment control	
	7.3.8	Formation of access from the banks to the river bed	
	7.3.9	Management of noise, dust, odour, traffic	
	7.3.10	Management of safety	
	7.3.11	Maintenance and protection of ecological values	
	7.3.12	Consideration of opportunities for environmental enhancement	
	7.3.13	Maintenance & protection of recreational values	
	7.3.14	Maintenance & protection of cultural values	
	7.3.15	Discovery of artefacts or koiwi (historic human remains)	

7.3.1 Work Plan communication

Description

Many works are routine and will not involve the need for any formal consultation prior to their implementation. If works are of such a scale that consultation with outside parties is required, then this would be undertaken prior to, or in conjunction with, the development of work programmes.

Notwithstanding this, good practice demands that river management works programmes are undertaken on a 'no surprises' basis with stakeholders. This means that even though no formal consultation may be required, advance notice of planned works should be given to these people. Stakeholders may include:

- Regulators (e.g. GWRC Environmental Regulation Department, district councils)
- Other statutory bodies (e.g. NZ Fish & Game – where the river is identified as having values for trout, and DOC – where the river has native fish values)
- Iwi
- Landowners/land owner committees, scheme liaison committees
- Owners or occupiers of neighbouring properties
- Community groups, river care groups
- Owners or operators of infrastructure in the river corridors
- Recreational users
- Staff or consultants responsible for environmental monitoring associated with flood protection or other river work
- GWRC Biodiversity department staff (where works are within or adjacent to areas identified as having high biodiversity values)

The form and content of notification and the length of advance notice that might be given will be driven by the scale and nature of the works, whether the affected area is in public or private ownership, and any agreements that have been made with stakeholders. GWRC staff are expected to use their judgement as to who should be notified prior to the undertaking of on-site works, taking into account both formal obligations and actions that would be expected of a good operator.

Actions

- Scheme Managers will produce a weekly work plan outlining scheduled works and affected areas/sites for the following week. This will be emailed to the Manager, GWRC Environmental Regulation Department and any other stakeholders or interested parties prior to works scheduled for the following week. This notification will also be posted on the GWRC website.
- Any significant changes or updates to the work plan made after notice has been given shall be emailed to all parties and posted on the website as soon as possible.

7.3.2 On-site works planning & checks

Description

All staff carrying out work on-site have primary responsibility for ensuring that all works are undertaken in accordance with environmental good practice methods. On-site staff must apply their judgement in the implementation of all works programmes. As part of this, a number of final checks should be carried out before any works commence.

Actions

- Prior to any works commencing, the person responsible for supervising the on-site work will:
  - Ø make a final check of available information (including local knowledge) relating to any identified site specific values and make changes to the scheduled work programme if necessary or seek further advice, as appropriate
  - Ø check all appropriate notifications have been actioned (refer to Work Plan Communication General Good Practice sheet)
  - Ø ensure that any contractors involved in the work have been fully briefed and understand their obligations to abide by the requirements of the Code

7.3.3 Work recording

Description

An accurate record must be kept of work undertaken. This information is important for asset management purposes, compliance monitoring and to inform the on-going development and evolution of the Code. The detail of the records should be appropriate to the nature and scale of the work, the sensitivity of any values affected by the work, and the purpose or purposes for which the information will be used, including any specific requirements of the Environmental Monitoring Plan.

Actions

- The person responsible for supervising the on-site work will record work undertaken. In particular, the following should be specifically noted:
  - the location, number and size of groynes or other structures
  - the location and length of rock lining
  - construction duration and hours of work, including time in wet river channel
  - the location and lineal length of river bed recontouring
  - details of any river diversion work
  - the number of willow poles or stakes, or native plants planted and total planted area
  - details of any habitat enhancement work undertaken
  - anything relating to the work or the site that is prescribed by the Environmental Monitoring Plan
  - photographs should be taken, where appropriate, to assist with recording of work undertaken
- Where records of on-site work are made, they should be recorded in digital form on a GIS database
- The person responsible for recording work undertaken will ensure that all records, photographs and other data collected is appropriately filed.

7.3.4 Recording of complaints & concerns

Description

An accurate record of complaints or concerns about river management works or work practices, and of any actions taken to resolve them, must be kept. This information is relevant in alerting staff to potential problems with work practices and provides an opportunity to review practices where complaints have arisen to see if any changes are required. Complaints records need to be accessible to managers and will be reconsidered in the regular reviews of work practices by GWRC managers and in reviews of the Code.

Actions

- All staff (both management and operational) will record all complaints received and ensure that the records are appropriately filed.
- Staff will respond to complaints as appropriate, either directly or by elevation to a higher management level for response. In all cases the intended action will be communicated to the complainant and appropriately recorded.
- Flood Protection Department managers will include a review of the records of complaints and concerns in regular internal management reviews of work practice and will ensure that this information is carried into reviews of the Code.

7.3.5 Operation & maintenance of machinery

Description

The presence of machinery in the river bed creates the potential for accidental discharges of contaminants such as lubricants, hydraulic fluids or fuel to the river environment.

The operation of machinery in river beds also creates the potential for transfer of organisms and pest plants from catchment to catchment, through the entrainment of organisms, seeds, spores or pieces of vegetation in the wheels and body of machinery. This risk is greater when machinery that may have been used in many different locations, or in other regions or islands, is supplied by contractors. In particular, there is potential for the transfer of the exotic alga *Didymosphenia geminata* (Didymo) where machinery may have previously been used in South Island waterways.

These issues can be minimised through the actions noted below.

Actions

- The person responsible for supervising the on-site work must ensure that:
  - Ø prior to the commencement of any work, any contractor operating machinery in the river bed on behalf of GWRC is aware of the obligation on them to adhere to the requirements of this Code
  - Ø any machinery that has transferred from a different waterway will be delivered on-site in a clean condition, to avoid the spread of unwanted pests and organisms. The standard to achieve is: no visible soil or plant matter. For guidance on how this may be achieved refer to the National Pest Control Agencies machinery hygiene guidelines (2013), which can be found at: http://www.waikatoregion.govt.nz/Documents/Keepitclean.pdf
  - Ø machinery that has been used in South Island Waterways will be cleaned in accordance with MPI policy prior to use in another waterway. For details, refer to: www.biosecurity.govt.nz/pests/didymo/cleaning
  - Ø all machinery used for river management work is fit for purpose and well maintained
  - Ø prior to commencement of any in-river works, all machinery is checked to ensure that there are no obvious oil, fuel or other leaks
  - Ø no equipment or machinery will be cleaned in a river or stream bed, or at a location where runoff from cleaning activities can enter a waterway
  - Ø machinery is not re-fuelled, either within the river bed, on the foreshore or seabed, or within 10 metres of a waterway.
  - Ø fuel is not stored at any location where it could enter a waterway
  - Ø all machinery is removed from the riverbed or foreshore at the end of each day and stored above the anticipated flood level when unattended, to avoid the possibility of floodwaters damaging and/or washing it away
  - Ø in the event that a spill of fuel, hydraulic fluid or other potential liquid contaminants occurs, immediate steps shall be taken to contain the spilt contaminant. The spilt contaminants and any material used to contain it shall be removed from the site where practicable, and disposed of at an authorised landfill. A record shall be kept of the spill and actions taken.

Cleaning machinery in a wash bay

7.3.6 Construction material storage & stockpiling

Description

FP will store a range of construction materials in readiness for both programmed construction works and to allow immediate repairs following flood events. The amount and types of stockpiled materials will be dependent on the size and scale of existing and planned infrastructure. While it is desirable for stockpiled materials to be readily accessible, it is also important that they are not located so as to cause constrictions to the flood carrying capacity of the river, potential hazards or a reduction in amenity value of the river environment. As a general rule, construction materials will be stored on the river berms, although small stockpiles of materials may be left on the river bed temporarily during active construction work.

Actions

- The person responsible for supervising construction work must ensure that:
  - Ø stockpiles of construction materials used during active construction works are only located in the river bed for the duration of the work
  - Ø stockpiles of construction materials are not located so as to unduly constrict the capacity of the river channel or deflect the flow of the river and cause erosion problems further downstream
  - Ø all materials associated with construction and maintenance of structures are removed from the river bed at the end of construction works and stored or disposed of at an appropriate site
  - Ø stockpiles of construction materials on the river berms are maintained in a tidy state and are fenced or otherwise isolated, where necessary, to limit public access to them and ensure public safety.

Good stockpile management during groyne construction

7.3.7 Sediment control

Description

Some river management works have the potential to generate elevated suspended sediment levels in the river (i.e. increase turbidity). This can lead to reductions in water quality, which can have adverse effects on aquatic fauna, flora and ecosystems. Increases in turbidity can arise through both direct disturbance of the river bed in the wet channel, and indirectly, via sediment entrainment in stormwater runoff from areas on the banks and berms that have been disturbed by earthworks. In both cases, ground disturbance should be avoided as far as is practicable, and where it is unavoidable, measures must to be undertaken to minimise the extent of disturbance and the potential for mobilisation of sediment.

Actions

In-river works

- The person responsible for supervising the on-site work must:
  - Ø review the weather forecast prior to the commencement of works and only undertake works during suitable weather and river flow conditions
  - Ø divert the waterway around the work site, or if that is not practicable (e.g. due to the size or configuration of the waterway, land tenure constraints, or adverse effects arising from such diversion), ensure that all work is carried out in a way that minimises the operation of machinery in the wet channel
  - Ø plan works to minimise the number of river crossings made by machinery and ensure that each river crossing has a single entry and exit point
  - Ø plan works to ensure that the amount of time machinery operates in the wet channel is minimised

Out of river works

- The person responsible for supervising the on-site work must:
  - Ø review the weather forecast and undertake the work during suitable weather conditions, so that run-off from disturbed areas is minimised
  - Ø minimise the amount of ground disturbance by ensuring that only the areas necessary for access and the work are cleared
  - Ø stage work so as to minimise the work area exposed to erosion. Rather than opening up the whole site, it may be appropriate to work the site in smaller, discrete areas on a progressive basis
  - Ø apply appropriate erosion and sediment control measures suitable to the work and work location; this may include installing silt fencing and settling ponds to intercept runoff
  - Ø stabilise the site as soon as possible by applying mulch and/or replanting
  - Ø protect stormwater inlets by wrapping geotextile cloth around or across the sump grate. A coarse aggregate may be placed on top of the geotextile cloth to act as a filter and hold the geotextile in place. This is a secondary control measures and must be used in conjunction with other control measures unless no other option exists
  - Ø inspect sediment control measures regularly and after rain fall events to ensure their continued effectiveness until the site has been stabilised and revegetated.
  - Ø in relation to berm-reduction earthworks, consider the formation of temporary gravel bunds at the river edge to act as a buffer to sediment runoff into the river, where it is practicable to do so.

Other

Further information for out of river works can be found in the Erosion and Sediment Control Guidelines for the Wellington Region (GWRC 2002).

Silt fencing adjacent to earthworks on berm

Silt fencing and ground stabilisation around newly installed wingwall

7.3.8 Formation of access from the banks to the river bed

Description

Preliminary works may be necessary to enable access to a site and/or to facilitate flood and erosion protection activities.

This may include clearance of vegetation & formation of tracks on river berms; formation of access across bank edges onto the river bed by mechanical disturbance of the bank edge and/or mechanical shifting and shaping of gravel on the river bed at specific sites. Minor recontouring (shaping) of the river bed may also be necessary to create a suitable working platform for construction works.

Actions

¨ The person responsible for supervising the on-site work must:

- Ø ensure that all machine operators use existing access points to the river bed wherever possible
- Ø limit the creation of new access points as far as is practicable, but consider also whether this may lead to significant additional tracking in the river bed which could otherwise be avoided
- Ø select the location of any new access points carefully, so as to limit the amount of disturbance to the river bed and banks
- Ø note that where material is required to form access from the river bed to the bank it is preferable to source it from the local river bed, to avoid introduction of foreign material to the river environment
- Ø ensure that where foreign material is used to create an accessway, it is clean and compatible with the river environment
- Ø ensure that any access ways do not constrict the flow or capacity of the river channel
- Ø limit the amount of any vegetation clearance and bank disturbance to the minimum necessary
- Ø in particular, avoid vegetation clearance adjacent to Key Native Ecosystems (as identified by GW's KNE programme)
- Ø where practicable, undertake remedial treatment and/or replanting of any disturbed bank and berm areas following works completion, particularly if the access point is not permanently required.

Temporary vehicle access track on river bed, formed by blading with a bulldozer

Site clearance for access – vegetation removal

7.3.9 Management of noise, dust, odour, traffic

Description

Activities involving machinery have the potential to generate noise, dust, unpleasant odours and additional traffic, which may adversely affect nearby residents or members of the public who use the area. With careful management such effects can be avoided, minimised or appropriately mitigated. Good management of such effects will help to ensure that the work is completed efficiently while maintaining relationships with regulators, landowners, and the community.

Larger projects are likely to have a specific Environmental Management Plan containing specific details of how any adverse effects arising from the project are to be managed. For small projects and routine operations, the actions below provide an outline of good practice.

Actions

- The person responsible for supervising the on-site work must:
  - Ø adopt a 'no surprises approach' – consider who is likely to be affected by the works and follow pre-works communication protocols.
  - Ø consider the type of construction machinery to be used. Is a quieter machine available? Would muffling of machinery be appropriate?
  - Ø manage the movement of construction machinery on and off site, liaising with contractors as necessary. Are there sectors of the community that are more sensitive than others? Is there a school in the neighbourhood and do you need to avoid the use of public roads during school pick up and drop off? Is there recreational use of the area that needs special consideration?
  - Ø manage the hours of operation, including start up and close down of machinery, taking account of the proximity of residential areas, any noise sensitive facilities, and the requirements of other users of the river corridor. Unless urgent:
    - o All works conducted on weekdays should not start any earlier than 7 am and should cease by 7.00 pm
    - o All works conducted on Saturdays should not start any earlier than 8 am and should cease by 3.00 pm
    - o No works should be conducted on Sundays or public holidays
  - Ø consider applying water to exposed surfaces during dry or windy conditions to manage dust. Exposed surfaces may include the work area, internal haul roads, and public roads.
  - Ø consider halting dust producing activities in dry or windy conditions such as stripping or spreading topsoil.

Restrictions

- Q Transpower transmission lines prior notification must be given to the Environmental Manager, Transpower. Mitigation measures such as the use of water carts and/or hosing facilities to control dust emissions in the vicinity of transmission lines should be used where appropriate.
- Q There will be no use of oil for dust control.

Watering road to minimise dust from truck movements

7.3.10 Management of safety

Description

The safety of operational staff and the general public must be considered in the undertaking of all river management activities. In addition, the safety of all users of the river corridor must be considered when flood protection and erosion control works are designed and constructed. Users may include swimmers, canoeists, rafters, anglers, walkers, cyclists.

Actions

- All Flood Protection Department staff must adhere to all GWRC Health & Safety Standard Operating Procedures (SOPs) when undertaking any river management works or operations
- The person responsible for supervising on-site work must ensure that:
  - Ø all works comply with the New Zealand Electrical Code of Practice for Electrical Safe Distances (NZCEP 34:2001) – in particular, Section 2 and the restrictions on earthworks, and Section 5 which relates to the maintenance of safe distances between mobile plant and electricity lines.
  - Ø prior to any excavation works are undertaken, a check is made for the presence of any underground services. This may involve the use of a service such as beforeUdig http://www.beforeudig.co.nz/
  - Ø where possible, and it is safe to do so, public access is maintained for the duration of the work. Barriers and signage to advise the public of the work and to direct them around the work area should be used as appropriate. If work is of such a scale to cause major disruption advice is sought from GWRC's communications team
- River managers must ensure that if any structure becomes unsafe or poses a significant threat to public safety, it is made safe as soon as the hazard becomes known, and the structure is repaired or removed as soon as possible.

Safety fencing around work site

7.3.11 Maintenance and protection of ecological values

Description

Instream fauna & habitat

Streams and rivers contain a variety of habitats, which provide shelter and sustenance for a wide variety of species, including fish (both native and introduced) aquatic invertebrates, and aquatic plants. These habitats are closely linked to those on the riparian margin, and the vegetation surrounding a stream has a large impact and interaction with habitat diversity in-stream. For example, the root structures of large trees are ideal habitats for eel, a culturally and economically valuable species. Overhanging riparian vegetation provides shade over the water (which helps to lower water temperatures), and contributes leaf and twig litter that is a food source for aquatic microbes and invertebrates. Woody material in a stream helps trap leaf and twig matter and provides shelter and spawning habitat for fish.

River management activities have the potential to alter ecosystems in a number of ways, including:

- Removal of vegetation from stream banks, which can lead to increased erosion, sedimentation, and increase the temperature of the stream by removing shade trees
- Reducing the diversity of instream habitats, which include pool, riffle and run environments. Each of these habitat types is important for different species
- Changing the flow regime, which might restrict fish movement or habitat suitability for fish or invertebrates
- Changing the substrate or material of the stream bed, either by direct disruption, compaction, or deposition of suspended sediment from released from instream works further upstream. Different substrate types are important for different species and change of substrate may interfere with the ability of organisms within it to feed and reproduce

Many New Zealand fish migrate between salt and freshwater environments at certain times of the year, and are especially vulnerable to disturbance at these times. In addition, fish passage can be blocked by structures like culverts, weirs and fords. This may prevent them from breeding and feeding, which can lead to adverse impacts on their population numbers. It is a legal responsibility to provide for fish passage under both the Conservation Act 1987 (Freshwater Fisheries Regulations) and the Resource Management Act (sections 14 & 17), and this must be considered in planning for works involving construction and maintenance of structures such as floodgates or culverts.

In general, in-stream works should be managed so that the amount of time machinery operates in the river is kept to a minimum. This will involve the need for judgement from works managers, taking into consideration such things as:

- The desirability of using larger machinery to enable faster completion of the work
- Managing work hours so that disturbance can be limited to one twelve hour period, rather than over separate time periods

In-stream works are generally not undertaken in extreme low flow situations (i.e. when flows recede below the minimum flows specified in the GWRC Regional Freshwater Plan), as this can place additional stress (e.g. from siltation, habitat removal) on aquatic ecosystems at a time when they are already under stress.

Birds and bird habitat

Beaches on the gravel beds provide potential habitat for riverbed nesting birds. Three species – banded dotterels, black-fronted dotterels and pied stilts – are particularly important in some rivers in the Wellington Region, notably the Otaki River and some Wairarapa rivers. Studies to date have identified the timing of floods, invasion of woody weeds and the presence of predators as key factors that impact on the nesting success of these birds. The effects of river management activities are less certain, but it is important that works involving the operation of machinery on river beds consider factors such as timing to avoid key breeding times and the maintenance of separation distances from any known nests. Scalping of beaches to keep them clear of vegetation contributes in a positive way to maintenance of bird habitat (provided it is not undertaken during the breeding season).

Actions

¨ River management works must be undertaken in a manner that ensures that impacts on instream ecology are minimised and ecosystem diversity is maintained as much as is practicable. To achieve this the person responsible for supervision of on-site works must:

- Ø take all reasonable steps to minimise sediment loadings and increased turbidity during the implementation of all activities requiring excavation of the river bed
- Ø use sediment and erosion control measures to make sure that impacts of work undertaken instream and on the river banks are contained within the work area as far as is practicable
- Ø limit the amount of tracking of machinery in the wet channel and the number of times stream crossings are made. Use a single crossing point where practicable.
- Ø manage hours of operation to ensure instream habitat has at least 12 hours of recovery time in every 24 hours, during which there is no in-river work. For work that extends over a longer timeframe, provide two consecutive work-free days in every seven to allow for ecosystem recovery wherever possible
- Ø retain vegetation cover and shading over streams as much as possible while not constraining the channel capacity by:
  - o limiting the amount of trimming of riparian vegetation to the minimum necessary
  - o rather than mowing river berms right to the bank edges, consider establishing appropriate vegetation on bank edges, or at least allow grass to grow longer at the bank edge
- Ø bund any areas where pouring of concrete is undertaken to prevent any runoff containing cement entering the watercourse
- Ø in soft-bedded streams where weed or silt removal is required, where practicable, consider staggering the removal programme so as to maintain some areas of vegetation at intervals along the stream, or on one bank of a stream, so as to maintain a minimum level of fish habitat
- Ø ensure that there is adequate provision for fish passage at all times during construction and maintenance work. In particular:
  - o in relation to culverts, it is important to ensure that there is continuous access up and down the culvert, and that water is of an adequate depth and of low velocity for fish to pass through
  - o any fish entrapped by works should be captured and relocated upstream to clear water as soon as possible

Restrictions

Q Observe the constraints on works in the areas specified for individual rivers as noted in Table 11 to Table 15 at the end of this section.

7.3.12 Consideration of opportunities for environmental enhancement

Description

River management works offer an opportunity for enhancement of both instream habitat and the adjacent river corridor to be undertaken in conjunction with the works. Any enhancement of the adjacent river corridor must be undertaken in the context of, and in accordance with, the objectives of any FMP, Environmental Strategy or Operational Management Plan for the river or watercourse in question.

Actions

¨ Managers will consider opportunities for enhancement, during the design of all river management works programmes (taking into account any recommendations from the IRP and the MCG arising from the annual review process – see Section 3.3) and incorporate them as appropriate into the works programme and budget. This may include:
- Ø increasing the width of buffer zones to give the river sufficient room to adequately express its natural form
- Ø incorporating the creation natural meander forms as appropriate to the specific river, in conjunction with in-channel works
- Ø fencing of riparian margins to facilitate vegetation establishment
- Ø native planting in the river corridor (in accordance with the directions of any FMP, Ecological or Environmental Strategy or Operational Management Plan)
- Ø retention or enhancement of native vegetation adjacent to any identified Key Native Ecosystems (as identified by GW's KNE programme), seeking advice from GWRC Biodiversity staff on appropriate species and location of planting where necessary
- Ø track/trail development
- Ø provision of amenities and facilities (if appropriate)

¨ The person responsible for supervising on-site works shall endeavour to create opportunities for the maintenance of aquatic and terrestrial ecological habitats wherever possible. This may include:
- Ø removal of any barriers to fish passage (e.g. perched culverts) or enhancement of fish passage (e.g. use of rock ramps)
- Ø creating additional refuges for fish within rock lining
- Ø leaving or creating backwater areas in the active river bed
- Ø leaving woody debris in the river bed where it does not pose an undue flood risk
- Ø riffle and pool creation (as appropriate for the river type and meander pattern).

Community planting on the banks of the Opahu Stream to re-establish inanga habitat

GWRC staff planting natives in the Hutt River corridor

Newly formed trail on the Hutt River

7.3.13 Maintenance & protection of recreational values & use

Description

Recreational users on the river and river edge environment include swimmers, rafters, anglers, walkers, cyclists and horse-riders.

River management works have the potential to affect recreational values and recreational use in a number of ways.

The presence of machinery in or adjacent to the river can restrict other uses of the river and generate noise disturbance which can interfere with recreational use of a site. Re-shaping and realignment of the channel can alter channel morphology and lead to a loss of recreational features such as rapids or pools, if not managed carefully.

Any works involving bed disturbance can increase turbidity in the water which can also reduce the quality of recreational enjoyment at a site.

Actions

- River management works must be undertaken in a manner that ensures that adverse effects on recreational users are avoided or minimised as much as is practicable. To achieve this the person responsible for supervision of on-site works must:
  - Ø adopt a 'no surprises approach' – consider who is likely to be affected by the works and follow pre-works communication protocols
  - Ø take all reasonable steps to minimise sediment loadings and increased turbidity during the implementation of all activities requiring excavation of the river bed
  - Ø only restrict access to the river or access along the flowing channel as necessary for public safety
  - Ø take account of any specific directions included in Operational Management Plans to maintain or protect recreational features and values

Restrictions

Q Avoid activities in the flowing channel or on berms on Saturdays, Sundays or public holidays during the summer months (December – February). This is shown in Table 11 to Table 15 .

7.3.14 Maintenance & protection of cultural values

Description

Mana whenua cultural values as they pertain to a river environment are specific to that river and reflect its association with the iwi and hapu who have kaitiaki interests and responsibilities in that river.

As such, it is important that:

- determination of the important cultural values relating to a river, and
- determination of how these values will be recognised and taken into account in river management works

is conducted in discussion with the relevant mana whenua group or groups, rather than being prescribed by river managers.

Cultural values arise from the traditional relationship of mana whenua to a river, and can include special sites of occupation (e.g. pa, kainga, urupa, wahi tapu), sites of historic incidents, and traditional uses and practices (e.g. mahinga kai). Some key concepts that underpin cultural values include:

Mauri: the life force that exists in all aspects of the natural world. It applies to both animate and inanimate objects; plants, rivers and mountains all have a life force, as well as people. Mauri is preserved and nurtured through customary concepts of whakapapa, tapu, and tikanga. When environmental health and natural balances are sustained mauri is enhanced. When environmental degradation and destruction occurs in any form, mauri is weakened or extinguished. As tangata whenua or people of the land, Maori perceive themselves as part of the natural world, and hence the mauri of the people is inseparable from that of the environment.

Kaitiakitanga: this refers to guardianship, the primary objective of which is to protect and enhance mauri for environmental sustainability.

Kaitiakitanga encompasses a system of environmental management to ensure spiritual and physical wellbeing through the sustainable use of natural resources, and the protection of natural systems (including freshwater systems) and endemic wildlife species.

Wai ora: refers to water, both as a resource and as an essential part of the environment that provides sustenance for life. Maori regard freshwater systems as highly valued taonga, possessing individual mauri and often protected by ancestral guardians or taniwha. The welfare of the people is intimately connected to freshwater systems and their capacity to support life. Freshwater habitats provide vital breeding ground for native fish populations and bird populations in addition to many resources used for medicine, arts and construction.

Many of the practices relating to the protection of ecological values included in the General and Individual Activity Good Practice Methods and in Section 3.3 relating to site specific management of effects will also provide for maintenance and protection of some cultural values.

However, cultural values can be addressed at a more detailed and comprehensive level through the use of Operational Management Plans which will identify all significant sites and values at a reach by reach scale, and provide further specific guidance on appropriate ways (which may include restrictions on the use of certain methods) to address these values when conducting river management activities at or near these sites or in these reaches. This guidance will be developed by GWRC in discussion with the MCG.

Actions

- Operational Management Plans must include all identified cultural sites and values of significance to mana whenua and include guidance as to how these will be taken into consideration in river management work.

- Managers and operational staff must take account of any specific directions included in Operational Management Plans to maintain or protect cultural sites, features and values.

7.3.15 Discovery of artefacts or koiwi (historic human remains)

Description

Although archaeological sites will generally be avoided where they are known to exist, any river management works involving ground disturbance and excavation have the potential to disturb unidentified archaeological sites or human remains. Where river management work needs to be undertaken in the vicinity of known archaeological sites, appropriate consultation will be undertaken and an appropriate course of action agreed prior to the commencement of any works.

Evidence of archaeological sites can include charcoal, oven stones, shell middens, ditches, banks, pits, old building foundations, artefacts of Maori or European origin or human remains (koiwi).

If river management works result in an isolated discovery of any archaeological items, work will cease immediately and will not be re-started until the appropriate consultation and an agreed course of action for further work developed.

Actions

- Where river management work is likely to affect a known historic or archaeological site, work plan managers will seek advice from an appropriately qualified archaeologist prior to any work commencing.
- Site supervisors will ensure that:
  - Ø in the event of finding any archaeological sites, artefacts, koiwi, all work affecting the area will cease immediately, management staff are informed
- Management staff will ensure that where any archaeological site, artefact or koiwi is discovered:
  - Ø advice is sought from a suitably qualified archaeologist
  - Ø notification is given, as appropriate to:
    - o The Wellington Tenths Trust and the Port Nicholson Block Settlement Trust (in relation to the Hutt & Wainuiomata Rivers)
    - o Te Runanga o Toa Rangatira (in relation to the Hutt and Wainuiomata Rivers and Porirua Stream)
    - o Te Runanga Ati Awa ki Whakarongotai Inc (Waikanae River)
    - o Ngati Raukawa - Nga Hapu o Otaki (in relation to the Otaki River)
    - o Kahungungu ki Wairarapa (in relation to Wairarapa rivers)
    - o Rangitane (in relation to Wairarapa rivers)
    - o Heritage New Zealand
    - o The NZ Police

Restrictions

Q Work shall not be re-commenced in the affected area until the appropriate group or groups have been consulted and a plan of action agreed upon.

Table 11 General Activity Constraints Calendar

General Activity Constraints Calendar - Hutt River (including parts of Akatarawa, Stokes Valley, Speedy's and Te Mome Streams)														
Value to be protected	Affected areas	Summer			Autumn			Winter			Spring			
		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
Inanga spawning (refer Sheet 7.3.11)	Tidal estuary edge vegetation on: • Hutt River between XS100 and XS210	*Follow general good practice*			Key sensitivity period 1 March to 31 May Preferably avoid disturbance of vegetation on bed or bank edges at these times, or if unavoidable, follow requirements for site-specific effects management as per Section 3.3			*Follow general good practice*						
Trout spawning (refer Sheet 7.3.11)	Actively flowing channel of: • Akatarawa River	*Follow general good practice*					Key sensitivity period 1 May to 31 July Preferably avoid disturbance of the bed at these times, or if unavoidable, follow requirements for site-specific effects management as per Section 3.3			*Follow general good practice*				
Peak native fish migration (refer Sheet 7.3.11)	Actively flowing channel	→	*Follow general good practice*								Key sensitivity period 1 September to 31 December → Limit activities that disturb the wetted channel at these times to no more than 3 days at any work site or 15 days per 10 km reach, or if unavoidable, follow requirements for site-specific effects management as per Section 3.3			
Instream ecology at times of low flow (refer Sheet 7.3.11)	Actively flowing channel	As far as is practicable avoid work in the actively flowing channel during periods when the river flow recedes below the minimum flow specified in GWRC's Natural Resources Plan												
River bird nesting (refer Sheet 7.3.11)	Dry beaches of Hutt River between: • XS310 and XS2270 and • XS2731 and XS2900	→			*Follow general good practice*						Key sensitivity period (nesting) 1 August to 28 February → Preferably avoid work on dry gravel beaches at these times. Where not practicable, works should be preceded by a survey carried out by an appropriately experienced person to identify the presence of shorebird nests or chicks. If nests or chicks are found during pre-works surveys, exclusion zones should be maintained at 75 metres from nests and 50 metres from chicks during activities causing continuous disturbance to habitat (e.g. beach contouring or gravel extraction) Exclusion zones can be reduced to 25 metres for both nests and chicks for any activity causing periodic disturbance (e.g. passing machinery)			
Lizards (refer Sheet 7.3.11)	River terrace manuka or kanuka scrub Native grassland Scree or boulder fields	If more than 100 m^2 of habitat type noted is to be disturbed, a suitably qualified prson MUST undertake a prior works survey to check for the presence of Ngahere gecko, barking gecko or any other herpetofauna with a "Threatened or At Risk classification (Newman 2013) within the affected site. IF any threatened gecko species is identified in the survey, works may not proceed until the species are trapped and relocated to any of the habitats noted which are unaffected by the works.												
Safe machine operation (refer Sheets 7.3.7 & 7.3.10)	Actively flowing channel & berms	→ For safety, activities in actively flowing channel should avoid periods of high flow whenever possible. For control of turbidity in runoff, operation of machinery on berms should avoid times when ground conditions are extremely wet, whenever practicable						Activities in actively flowing channel and on berms should be programmed outside this period whenever possible, for both safety reasons & control of sediment in runoff			→			
Peak instream recreational use (refer Sheet 7.3.13)	Active bed & berms	Key sensitivity period 1 December to 28 February Avoid activities in the flowing channel and on berms on Saturdays, Sundays or public holidays at these times			*Follow general good practice*									
Significant cultural values (Refer Sheet 7.3.14)	River corridor	*Operational Plans must identify significant cultural values and sites to be taken into account in work planning and method selection for each management reach*												

Table 12 General Activity Constraints Calendar

General Activity Constraints Calendar - Hutt River (including parts of Akatarawa, Stokes Valley, Speedy's and Te Mome Streams)														
Value to be protected	Affected areas	Summer			Autumn			Winter			Spring			
		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
Inanga spawning (refer Sheet 7.3.11)	Tidal estuary edge vegetation on: • Hutt River between XS100 and XS210	*Follow general good practice*			Key sensitivity period 1 March to 31 May Preferably avoid disturbance of vegetation on bed or bank edges at these times, or if unavoidable, follow requirements for site-specific effects management as per Section 3.3			*Follow general good practice*						
Trout spawning (refer Sheet 7.3.11)	Actively flowing channel of: • Akatarawa River	*Follow general good practice*					Key sensitivity period 1 May to 31 July Preferably avoid disturbance of the bed at these times, or if unavoidable, follow requirements for site-specific effects management as per Section 3.3			*Follow general good practice*				
Peak native fish migration (refer Sheet 7.3.11)	Actively flowing channel	→	*Follow general good practice*								Key sensitivity period 1 September to 31 December → Limit activities that disturb the wetted channel at these times to no more than 3 days at any work site or 15 days per 10 km reach, or if unavoidable, follow requirements for site-specific effects management as per Section 3.3			
Instream ecology at times of low flow (refer Sheet 7.3.11)	Actively flowing channel	As far as is practicable avoid work in the actively flowing channel during periods when the river flow recedes below the minimum flow specified in GWRC's Natural Resources Plan												
River bird nesting (refer Sheet 7.3.11)	Dry beaches of Hutt River between: • XS310 and XS2270 and • XS2731 and XS2900	→			*Follow general good practice*						Key sensitivity period (nesting) 1 August to 28 February → Preferably avoid work on dry gravel beaches at these times. Where not practicable, works should be preceded by a survey carried out by an appropriately experienced person to identify the presence of shorebird nests or chicks. If nests or chicks are found during pre-works surveys, exclusion zones should be maintained at 75 metres from nests and 50 metres from chicks during activities causing continuous disturbance to habitat (e.g. beach contouring or gravel extraction) Exclusion zones can be reduced to 25 metres for both nests and chicks for any activity causing periodic disturbance (e.g. passing machinery)			
Lizards (refer Sheet 7.3.11)	River terrace manuka or kanuka scrub Native grassland Scree or boulder fields	If more than 100 m^2 of habitat type noted is to be disturbed, a suitably qualified prson MUST undertake a prior works survey to check for the presence of Ngahere gecko, barking gecko or any other herpetofauna with a "Threatened or At Risk classification (Newman 2013) within the affected site. IF any threatened gecko species is identified in the survey, works may not proceed until the species are trapped and relocated to any of the habitats noted which are unaffected by the works.												
Safe machine operation (refer Sheets 7.3.7 & 7.3.10)	Actively flowing channel & berms	→ For safety, activities in actively flowing channel should avoid periods of high flow whenever possible. For control of turbidity in runoff, operation of machinery on berms should avoid times when ground conditions are extremely wet, whenever practicable						Activities in actively flowing channel and on berms should be programmed outside this period whenever possible, for both safety reasons & control of sediment in runoff			→			
Peak instream recreational use (refer Sheet 7.3.13)	Active bed & berms	Key sensitivity period 1 December to 28 February Avoid activities in the flowing channel and on berms on Saturdays, Sundays or public holidays at these times			*Follow general good practice*									
Significant cultural values (Refer Sheet 7.3.14)	River corridor	*Operational Plans must identify significant cultural values and sites to be taken into account in work planning and method selection for each management reach*												

Table 13 General Activity Constraints Calendar

General Activity Constraints Calendar - Otaki River (including Rangiuru/Ngatoko Streams and Katihiku/Pahiko Drains)														
Value to be protected	Affected areas	Summer			Autumn			Winter			Spring			
		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
Inanga spawning (refer Sheet 7.3.11)	Tidal estuary edge vegetation on: · Otaki River XS20 to XS120, · Rangiuru/Ngatoko Streams, and · Katihiku/Pahiko Drains)	*Follow general good practice*			Key sensitivity period 1 March to 31 May Preferably avoid disturbance of vegetation on bed or bank edges at these times, or if unavoidable, follow requirements for site-specific effects management as per Section 3.3			*Follow general good practice*			*Follow general good practice*			
Peak native fish migration (refer Sheet 7.3.11)	Actively flowing channel	→	*Follow general good practice*		*Follow general good practice*			*Follow general good practice*			Key sensitivity period 1 September to 31 December → Limit activities that disturb the wetted channel at these times to no more than 3 days at any work site or 10 days in total or if unavoidable, follow requirements for site-specific effects management as per Section 3.3			
Instream ecology at times of low flow (refer Sheet 7.3.11)	Actively flowing channel	As far as is practicable avoid work in the actively flowing channel during periods when the river flow recedes below the minimum flow specified in GWRC's Natural Resources Plan												
River bird nesting (refer Sheet 7.3.11)	Dry beaches	→			*Follow general good practice*			*Follow general good practice*		Key sensitivity period (nesting) 1 August to 28 February → Preferably avoid work on dry gravel beaches at these times. Where not practicable, works should be preceded by a survey carried out by an appropriately experienced person to identify the presence of shorebird nests or chicks. If nests or chicks are found during pre-works surveys, exclusion zones should be maintained at 75 metres from nests and 50 metres from chicks during activities causing continuous disturbance to habitat (e.g. beach contouring or gravel extraction) Exclusion zones can be reduced to 25 metres for both nests and chicks for any activity causing periodic disturbance (e.g. passing machinery)				
Lizards (refer Sheet 7.3.11)	River terrace manuka or kanuka scrub Native grassland Scree or boulder fields	If more than 100 m² of habitat type noted is to be disturbed, a suitably qualified prson MUST undertake a prior works survey to check for the presence of Ngahere gecko, barking gecko or any other herpetofauna with a "Threatenedor At Risk classification (Newman 2013) within the affected site. IF any threatened gecko species is identified in the survey, works may not proceed until the species are trapped and relocated to any of the habitats noted which are unaffected by the works.												
Safe machine operation (refer Sheets 7.3.7 & 7.3.10)	Actively flowing channel & berms	→ For safety reasons, activities in actively flowing channel should avoid periods of high flow whenever possible. For control of turbidity in runoff operation of machinery on berms should avoid times when ground conditions are extremely wet, whenever practicable						Activities in actively flowing channel and on berms should be programmed outside this period whenever possible, for both safety reasons & control of sediment in runoff			→			
Peak instream recreational use (refer Sheet 7.3.13)	Active bed & berms	Key sensitivity period 1 December to 28 February Avoid activities in the flowing channel and on berms on Saturdays, Sundays or public holidays at these times			*Follow general good practice*			*Follow general good practice*			*Follow general good practice*			
Significant cultural values (Refer Sheet 7.3.14)	River corridor	*Operational Plans must identify significant cultural values and sites to be taken into account in work planning and method selection for each management reach*												

Table 14 General Activity Constraints Calendar

General Activity Constraints Calendar - Rivers in the Wairarapa Valley													
Value to be protected	Affected areas	Summer			Autumn			Winter			Spring		
		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Inanga spawning (refer Sheet 7.3.11)	Tidal estuary edge vegetation on: · Otaki River XS20 to XS120, · Rangiuru/Ngatoko Streams, and · Katihiku/Pahiko Drains)	*Follow general good practice*			Key sensitivity period 1 March to 31 May Preferably avoid disturbance of vegetation on bed or bank edges at these times, or if unavoidable, follow requirements for site-specific effects management as per Section 3.3			*Follow general good practice*			*Follow general good practice*		
Trout spawning (refer Sheet 7.3.11)	Actively flowing channels of the: · Mangatarere, · Kaipatangata, · Enaki, · Waipoua, · Kopuaranga, · Huangarua · Tauherenikau rivers	*Follow general good practice*			*Follow general good practice*		Key sensitivity period 1 May to 31 July Preferably avoid disturbance of the bed at these times, or if unavoidable, follow requirements for site-specific effects management as per Section 3.3			*Follow general good practice*	*Follow general good practice*		
Peak native fish migration (refer Sheet 7.3.11)	Actively flowing channel	→	*Follow general good practice*		*Follow general good practice*			*Follow general good practice*			Key sensitivity period 1 September to 31 December → Limit activities that disturb the wetted channel at these times to no more than 3 days at any work site or 15 days over any 10 km reach or if unavoidable, follow requirements for site-specific effects management as per Section 3.3		
Instream ecology at times of low flow (refer Sheet 7.3.11)	Actively flowing channel	As far as is practicable avoid work in the actively flowing channel during periods when the river flow recedes below the minimum flow specified in GWRC's Natural Resources Plan											
River bird nesting (refer Sheet 7.3.11)	Dry beaches	→			*Follow general good practice*			*Follow general good practice*			Key sensitivity period (nesting) 1 August to 28 February → Preferably avoid work on dry gravel beaches at these times. Where not practicable, works should be preceded by a survey carried out by an appropriately experienced person to identify the presence of shorebird nests or chicks. If nests or chicks are found during pre-works surveys, exclusion zones should be maintained at 75 metres from nests and 50 metres from chicks during activities causing continuous disturbance to habitat (e.g. beach contouring or gravel extraction) Exclusion zones can be reduced to 25 metres for both nests and chicks for any activity causing periodic disturbance (e.g. passing machinery)		
Lizards (refer Sheet 7.3.11)	River terrace manuka or kanuka scrub Native grassland Scree or boulder fields	If more than 100 m^2 of habitat type noted is to be disturbed, a suitably qualified prson MUST undertake a prior works survey to check for the presence of Ngahere gecko, barking gecko or any other herpetofauna with a "Threatenedor At Risk classification (Newman 2013) within the affected site. IF any threatened gecko species is identified in the survey, works may not proceed until the species are trapped and relocated to any of the habitats noted which are unaffected by the works.												
Safe machine operation (refer Sheets 7.3.7 & 7.3.10)	Actively flowing channel & berms	→ For safety reasons, activities in actively flowing channel should avoid periods of high flow whenever possible. For management of turbidity in runoff, operation of machinery on berms should avoid times when ground conditions are extremely wet, whenever practicable						Activities in actively flowing channel and on berms should be programmed outside this period whenever possible, for both safety reasons & control of sediment in runoff		→			
Peak instream recreational use (refer Sheet 7.3.13)	Active bed & berms	Key sensitivity period 1 December to 28 February Avoid activities in the flowing channel and on berms on Saturdays, Sundays or public holidays at these times			*Follow general good practice*			*Follow general good practice*		*Follow general good practice*			
Significant cultural values (Refer Sheet 7.3.14)	River corridor	*Operational Plans must identify significant cultural values and sites to be taken into account in work planning and method selection for each management reach*											

Table 15 General Activity Constraints Calendar

General Activity Constraints Calendar – Wainuiomata River & other watercourses not specifically identified in Table 11 to Table 14													
Value to be protected	Affected areas	Summer			Autumn			Winter			Spring		
		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Inanga spawning (refer Sheet 7.3.11)	Tidal estuary edge vegetation	*Follow general good practice*			Key sensitivity period 1 March to 31 May Preferably avoid disturbance of vegetation on bed or bank edges at these times, or if unavoidable, carefully manage to minimise adverse effects			*Follow general good practice*			*Follow general good practice*		
Trout spawning (refer Sheet 7.3.11)	Spawning habitat in the actively flowing channel	*Follow general good practice*			*Follow general good practice*		Key sensitivity period 1 May to 31 July Preferably avoid disturbance of the bed at these times, or if unavoidable, carefully manage to minimise adverse effects			*Follow general good practice*	*Follow general good practice*		
Peak native fish migration (refer Sheet 7.3.11)	Actively flowing channel	→	*Follow general good practice*		*Follow general good practice*			*Follow general good practice*			Key sensitivity period 1 September to 31 December → Limit activities that disturb the wetted channel at these times to no more than 3 days at any work site or 15 days over any 10 km reach or if unavoidable, follow requirements for site-specific effects management as per Section 3.3		
Instream ecology at times of low flow (refer Sheet 7.3.11)	Actively flowing channel	As far as is practicable avoid work in the actively flowing channel during periods when the river flow recedes below the minimum flow specified in GWRC's Natural Resources Plan											
River bird nesting (refer Sheet 7.3.11)	Dry beaches	→			*Follow general good practice*			*Follow general good practice*		Key sensitivity period (nesting) 1 August to 28 February → Preferably avoid work on dry gravel beaches at these times. Where not practicable, works should be preceded by a survey carried out by an appropriately experienced person to identify the presence of shorebird nests or chicks. If nests or chicks are found during pre-works surveys, exclusion zones should be maintained at 75 metres from nests and 50 metres from chicks during activities causing continuous disturbance to habitat (e.g. beach contouring or gravel extraction) Exclusion zones can be reduced to 25 metres for both nests and chicks for any activity causing periodic disturbance (e.g. passing machinery)				
Lizards (refer Sheet 7.3.11)	River terrace manuka or kanuka scrub Native grassland Scree or boulder fields	If more than 100 m² of habitat type noted is to be disturbed, a suitably qualified prson MUST undertake a prior works survey to check for the presence of Ngahere gecko, barking gecko or any other herpetofauna with a "Threatenedor At Risk classification (Newman 2013) within the affected site. IF any threatened gecko species is identified in the survey, works may not proceed until the species are trapped and relocated to any of the habitats noted which are unaffected by the works.											
Safe machine operation (refer Sheets 7.3.7 & 7.3.10)	Actively flowing channel & berms	→ For safety and accessibility reasons, activities in actively flowing channel should avoid periods of high flow whenever possible. Operation of machinery on berms should avoid times when ground conditions are extremely wet, whenever practicable						Activities in actively flowing channel and on berms should be programmed outside this period whenever possible, for both safety reasons & control of sediment in runoff			→		
Peak instream recreational use (refer Sheet 7.3.13)	Active bed & berms	Key sensitivity period 1 December to 28 February Avoid activities in the flowing channel and on berms on Saturdays, Sundays or public holidays at these times			*Follow general good practice*			*Follow general good practice*			*Follow general good practice*		
Significant cultural values (Refer Sheet 7.3.14)	River corridor	*Operational Plans must identify significant cultural values and sites to be taken into account in work planning and method selection for each management reach*											

7.4 Individual Activity Good Practice Methods

The river management activities covered by the Code are listed in the table below. The practice applying to each is described in the corresponding good practice sheet. Activities are primarily classified according to whether they occur in/on the river bed, or outside the river bed, to align with the distinctions made between such activities in the RMA and the Wellington regional plans.

Table 16: Individual Activity Good Practice Methods

Activity Location	General Activity Type	Individual River Management Activities	Section
In or on the river bed	Construction & maintenance of "Impermeable"[8] Erosion Protection Structures	· Rock & Block groynes · Gravel groynes · Rock lining (rockline, rip-rap, toe rock) · Gabion baskets,structures, Reno mattresses · Grade control structures	7.4.1 7.4.2 7.4.3 7.4.4 7.4.5
	Construction & maintenance of "Permeable" Erosion Protection	· Debris fences, permeable groynes · Debris arrester	7.4.6 7.4.7
	Demolition and removal of existing structures	· Impermeable& permeable structures	7.4.8
	Maintenance of existing outlet structures	Structural repairs to, cleaning and clearance of: · Existing culverts and floodgate structures that discharge directly to the river/waterbody	7.4.9
	Channel shaping or realignment	Mechanical: · Beach ripping · Beach recontouring	7.4.10 7.4.11 7.4.12

[8] Erosion protection structures are classified as either 'impermeable' and 'permeable', but this is largely arbitrary because some so-called 'impermeable' structures are not impermeable in the true sense of the word. 'Impermeable' structures are constructed of hard materials and are generally designed to give long-term protection to the river banks. Permeable structures are of lower structural strength than the 'impermeable' works, and can be semi-permanent in nature or designed as temporary measures giving protection to willow plantings while they are established.

Activity Location	General Activity Type	Individual River Management Activities	Section
		· Channel diversion cut · Ripping in the active (flowing) channel · Bed recontouring · Bank contouring & reconstruction	7.4.13 7.4.14 7.4.15
	Channel capacity maintenance	· Beach scalping · Removal of flood debris · Gravel extraction from 'dry' beaches · Gravel extraction from the active (flowing) channel · Mechanical clearing of minor watercourses & 'drains' · Mechanical clearing – Opahu Stream (Hutt River) · Mechanical clearing – Chrystalls Lagoon	7.4.16 7.4.17 7.4.18 7.4.19 7.4.20 7.4.21 7.4.22
	Planting	· Willow poles & stakes	7.4.23
	Construction & maintenance of vegetative structures	· Layered willows, Tree groynes, Tethered willows	7.4.24
	Maintenance of riparian vegetation	· Mechanical mowing of banks & berms from the river bed · Trimming & mulching of bankside vegetation (while operating from the river bed)	7.4.25 7.4.26
Outside the river bed	Construction of structures and tracks on berms	Construction of: · Floodwalls · Footbridges · Fences · Access ways · Cycleways · Walkways and associated new stormwater drains and culverts	7.4.27
	Maintenance of berms, structures and tracks	Structural repairs to, and maintenance of:	

Activity Location	General Activity Type	Individual River Management Activities	Section
		· Berms · Stopbanks & training banks · Floodwalls · Footbridges · Fences · Access ways, cycleways, walkways · Stormwater drains · Stormwater culverts (including clearance of debris)	7.4.28
	Planting on berms	· Tree planting – natives & willows	7.4.29
	Maintenance of riparian vegetation	· Trimming and mulching of trees (from outside the river bed) · Removal of old trees · Mowing stopbanks & berms (not involving machinery in river bed)	7.4.30
River mouths and Coastal Marine Area	Management of river mouths	· Excavation, disturbance of, and deposition on, beach areas above Mean High Water Springs (MHWS) water level · Excavation of foreshore (i.e. areas between MHWS and MLWS) · Movement and re-deposition of excavated material onto the foreshore	7.4.31
	Maintenance of existing structures	· Repairs to groynes, rock lining, training walls, debris arrester	7.4.32

7.4.1 Construction and maintenance: Rock & Block Groynes

Description

Groynes are used to maintain channel alignment or to remedy or prevent bank erosion where softer methods such as layered or tethered willows are not effective or need to be supported with hard structural work. Groynes project out from the bank edge over the river bed to deflect the direction of the flow of water. They slow flow velocities and gravel movement in the vicinity of the river bank, thus reducing the erosive power of the water at the bank edge and/or encouraging gravel deposition. They can be constructed entirely from rock boulders, or have a gravel or concrete block core. Occasionally gravel may be used in conjunction with rock, particularly in situations where construction of the groyne is deemed to be relatively urgent and/or rock supply is limited.

Typical dimensions for concrete blocks used in such work are 1.6m x 0.8m x 1 m, with a weight of approximately 3 tonnes. They have no exposed reinforcing steel and have a cast-in lifting eye to allow them to be cabled together.

Construction typically involves using a hydraulic excavator to excavate a trench 1.0 -3.0 m deep. Rocks (and/or concrete blocks or gravel) are placed in the trench and keyed into the adjacent bank to form the base of the groyne. Additional rock is then placed as a capping to shape the groyne.

Generally an area of less than 100 m² of river bed would be disturbed in the construction of a groyne.

Preliminary activities, including formation of access to the river bed, diversion of the wet channel and minor bed recontouring to form a suitable working platform for machinery, may need to be undertaken ahead of groyne construction works.

Maintenance would include repairs to damage, top-up of capping rock or upgrading of all or part of the structure.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, construction & maintenance of impermeable erosion protection structures (including rock and block groynes) must be authorised by resource consent.

The pNRP requires that construction and extension of such structures must be authorised by resource consent (Rule R129), but their maintenance and use is a permitted activity (provided it complies with certain conditions) under Rule R112.

Key Potential Benefits

- Lateral bank erosion is prevented, protecting adjacent property and infrastructure
- Channel alignment is maintained
- River bed habitat stability is maintained
- River habitat diversity may be enhanced by the creation of scour pools and sheltered embayments

Key Potential Adverse Effects

- During construction:
  - disturbance of river bed habitat
  - release of suspended sediment to the river
  - deposition of sediment downstream
  - loss of riparian vegetation
  - disturbance of recreational use

- Long term:
  - Ø reduction in the overall natural appearance of the river bank and river corridor
  - Ø reduction in suitable habitat for fish and invertebrates at the bank edge

Required Actions

- Prior to a decision to undertake groyne construction, managers will assess whether the work is necessary, taking into account:
  - Ø the urgency of the work and consequences of not undertaking it
  - Ø the degree of digression of the channel from its design alignment and/or desired plan form as set out in the relevant Operational Management Plan
  - Ø the state of the buffer zone, including its stability and the extent of any erosion
  - Ø the stability and strength of the banks, including the severity of any undercutting
  - Ø the environmental effects of the work and available alternatives to achieving the desired outcomes
- PRIOR TO CONSTRUCTION the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.
- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Structures must be designed and approved by a suitably qualified person to ensure in particular that:
  - Ø they do not constrict flows or reduce the channel capacity
  - Ø they are aligned on the design channel alignment. If a design channel alignment does not exist then the structure is placed to fit the natural meander curvature of the channel
  - Ø construction materials are compatible with the river environment and are clean and free of soil, mud, clay or other soluble debris
  - Ø rock is suitably sized, founded and suitably keyed into bank edges to prevent the structure being outflanked by the river
  - Ø if a series of groynes is to be installed, the spacing is suitable for the site.
  - Ø future maintenance and access requirements are considered with a view to minimising on-going disturbance of the river bank and riparian zone
- Construction should be supervised by a suitably experienced person to ensure that:
  - Ø all works are undertaken in accordance with the actions and design requirements noted above
  - Ø machinery is located and operated from the bank where practicable, or from a dry working platform formed on the river bed as far as possible
  - Ø prior to creation of bunds in the river channel around the working area, an assessment is made of (a) the necessity of bunding, (b) the relative merits of full bunding vs bunding only on the upstream side of the works, (c) the effects associated with disturbance of the bed associated with bund creation vs the effects of operating machinery in the wet channel
  - Ø areas used for stockpiling of construction materials are reinstated at the completion of works
- Annual/regular inspections of all groynes will be undertaken to check that the structures are performing their intended function and are well maintained

Restrictions

Q Concrete rubble will not be used to construct these structures

Q To protect aquatic ecology and habitat, works should not be undertaken in the actively flowing channel at the times specified in Table 11 to Table 15

Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15.

Other

- Drawing RL-5317/21[9] in Appendix A provides further guidance.

Groyne construction, showing use of bunding to protect works from flowing water and use of a formed working platform to elevate machinery out of flowing water

Typical rock groyne – Otaki River

[9] To be included.

Foundation excavated and groyne core of concrete blocks placed out of flowing water

Groyne placement. Machinery working close to bank edge to minimise disturbance to the riverbed

Completed rock groynes – Waipoua River

7.4.2 Construction and maintenance: Gravel Groynes

Description

Construction of gravel groynes may sometimes be undertaken in conjunction with bed recontouring to afford temporary protection to eroding river banks or to riverside plantings by acting as a sacrificial buffer. Gravel groynes may also be used a means of temporarily deflecting river flow, or for storing excess gravel deposits in order to maintain channel capacity (particularly in Wairarapa rivers in the latter case).

Groynes are formed by using a bulldozer and/or excavator and truck to re-position bed material into a bank edge, or onto a beach, and shape it into the desired form and alignment. Gravel groynes are easier and less expensive to construct than groynes constructed from rock, but they provide a less permanent or short-term solution as they are more likely to be eroded by floodwaters.

Maintenance would include mechanical re-shaping of the structure.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, construction & maintenance of impermeable erosion protection structures (including gravel groynes) requires resource consent.

The pNRP requires that construction and extension of such structures must be authorised by resource consent (Rule R129), but their maintenance and use is a permitted activity (provided it complies with certain conditions) under Rule R112.

Key Potential Benefits

- Lateral bank erosion is prevented, protecting adjacent property and infrastructure
- Protection is afforded to riverside planting, to allow it to become established
- Channel alignment is maintained
- Channel capacity is maintained
- May contribute to localised channel scour and creation of pools, adding to aquatic habitat diversity

Key Potential Adverse Effects

- Disturbance of river bed habitat
- Release of suspended sediment to the river
- Deposition of sediment downstream
- Disturbance of recreational use
- Reduction in the overall natural appearance of the river bank and river corridor

Required Actions

- Prior to a decision to undertake groyne construction, managers will assess whether the work is necessary, taking into account:
  - the urgency of the work and consequences of not undertaking it
  - the environmental effects of the work and available alternatives to achieving the desired outcomes
- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.

- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Structures must be designed and approved by a suitably qualified person to ensure in particular that:
  - Ø they do not constrict flows or reduce the channel capacity
  - Ø they are aligned on the design channel alignment
  - Ø they have a plan and cross-sectional profile suited to the natural form of the river
- Construction should be supervised by a suitably experienced person to ensure that:
  - Ø all works are undertaken in accordance with the actions and design requirements noted above

Restrictions

- Q To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in Table 11 to Table 15
- Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15.

Gravel groynes- Waingawa River

7.4.3 Construction & maintenance: Rock Lining

Description

Can also be referred to as:

- Rockline
- Rip rap
- Toe rock

Rip-rap consists of rock boulders placed against a section of river bank to form a longitudinal wall that armours and protects the softer bank material behind it from scouring and slumping. Rip-rap thus also affords protection to the river berms and infrastructure located alongside the river channel.

Construction involves using hydraulic excavators to shape a section of river bank to a specified slope and to excavate a trench in the river bed to a design scour depth.

Filter cloth or a filter material (usually gravel sourced in-situ) can be placed on the prepared slope prior to placement of the rock in the trench and up the slope batter. A full rock wall typically extends up to a height equivalent to a 2 year return period flood.

Toe rock linings are constructed in a similar way but do not extend higher than approximately 1 m above low flow water levels.

Preliminary activities, including formation of access to the river bed, diversion of the wet channel and minor bed recontouring to form a suitable working platform for machinery, may need to be undertaken ahead of construction works.

Maintenance would include repairs to damage, topping-up of rock or upgrading of all or part of the structure.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, construction & maintenance of rock lining must be authorised by resource consent.

The pNRP requires that construction and extension of such structures must be authorised by resource consent (Rule R129), but their maintenance and use is a permitted activity (provided it complies with certain conditions) under Rule R112.

Key Potential Benefits

- Lateral bank erosion is prevented, protecting adjacent property and infrastructure
- Channel alignment is maintained
- River bed habitat stability is maintained
- River habitat diversity may be enhanced by the creation of opportunities for riparian planting behind the rock lining; also by the creation of scour pools in situations where lining is placed on the outside of bends.

Key Potential Adverse Effects

- During construction:
  - disturbance of river bed habitat
  - release of suspended sediment to the river
  - deposition of sediment downstream
  - removal of riparian vegetation
  - disturbance of recreational use

- Long term:
  - Ø reduction in the overall natural appearance of the river bank and river corridor
  - Ø separation of channel from floodplain, with consequent limitation of sediment supply from banks
  - Ø enhanced scouring of the adjacent river bed (as banks no longer absorb river energy)
  - Ø reduction in riparian vegetation and habitat

Required Actions

- Prior to a decision to undertake rock line construction, managers will assess whether the work is necessary, taking into account:
  - Ø the urgency of the work and consequences of not undertaking it
  - Ø the degree of digression of the channel from its design alignment and/or desired plan form as set out in the relevant Operational Management Plan
  - Ø the state of the buffer zone, including its stability and the extent of any erosion
  - Ø the stability and strength of the banks, including the severity of any undercutting
  - Ø the environmental effects of the work and available alternatives to achieving the desired outcomes
- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.
- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Structures must be designed and approved by a suitably qualified person to ensure in particular that:
  - Ø the slope batter is suitable; generally 1.5:1 or 2:1
  - Ø they are aligned on the design channel alignment. If a design channel alignment does not exist then the structure is placed to fit the natural meander curvature of the channel
  - Ø construction materials are compatible with the river environment and are clean and free of soil, mud, clay or other soluble debris
  - Ø rock is suitably sized, founded and keyed into bank edges to prevent undermining or outflanking
  - Ø future maintenance and access requirements are considered with a view to minimising on-going disturbance of the river bank and riparian zone
- Construction should be supervised by a suitably experienced person to ensure that:
  - Ø all works are undertaken in accordance with the design requirements and actions noted above
  - Ø preparation of the batter, excavation of the foundation and placement of rock is done by a machine operating from the river bank, where practicable
  - Ø areas used for stockpiling of construction materials are reinstated at the completion of works
- Annual/regular inspections of all rock lined areas will be undertaken to check that the structures are performing their intended function and are well maintained

Restrictions

- Q Concrete rubble will not be used to construct these structures
- Q To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in Table 11 to Table 15

Q Areas of rock lining will not be constructed in identified inanga spawning areas[10] unless absolutely necessary and an off-set plan is developed in conjunction with a suitably qualified ecologist

Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15.

Other

¨ Drawing RL-5317/2411 provides further guidance

Battering of bank being done from the top of the bank edge

Excavating trench for foundation rock with machine located out of flowing water

Placement of rock; machine working from the bank

[10] As per the 2001 report
[11] To be included.

Maintenance – repairs to rock lining. Note platform formed in riverbed as machine is unable to work from the bank edge to rebuild this section of lining

7.4.4 Construction and maintenance: Gabion baskets, Gabion structures, Reno mattresses

Description

Gabions are wire mesh baskets (typically 2m x 1m x 1m) filled with rock (either quarry rock or locally sourced riverbed material). They are generally used to provide isolated protection for banks and services such as stormwater outlets, service crossings, bridge abutments or access tracks.

Construction involves excavation of a trench at the toe of the bank to a depth of one basket. Baskets are lowered into the trench, and filled with rock. Empty baskets are then placed on top laced together and filled to form the required protection structure. Sometimes the baskets are anchored to driven railway irons concealed in the bank.

Construction is undertaken in the dry and thus preliminary activities, including formation of access to the river bed, diversion of the wet channel and minor bed recontouring to form a suitable working platform for machinery, may need to be undertaken ahead of construction works.

Gabion structures are formed using railway irons, wire cables and mesh, and are used to protect and stabilise bank edges. Willows are normally planted behind the back irons and over time the willow roots extend through the structure and assist in binding it together, while the willows grow over the works and hide the irons and basket work.

Construction involves driving of railway iron piles at 1 m spacings along the inner (river-side) edge of the structure, and typically an iron is also driven 1 – 1.5 m behind these irons at 3 m spacings (to provide a back anchor). Piles normally only extend 1 -1.5 m above low flow level. Longitudinal cables are strung along the piles to create a 'fence'. Gabion or chain link mesh is then laid behind the irons and wired to the longitudinal cables. A flap is left at the base to form the bottom of the basket work. Gravels are then placed in the baskets and mesh is usually placed to cap the structure. The main limitation of the work is the difficulty in founding to an adequate depth to avoid undermining.

Reno mattresses are wire mesh baskets that have wider and thinner dimensions than the more blocky gabions. They are filled with stones generally derived from the in-situ bed material but quarry rock may also be used; they can be used for both bank protection and channel linings. Construction generally requires preparation of the ground surface, which may involve minor earthworks on berm areas, or minor excavation or recontouring of the river channel. In the latter case temporary diversion of the river flow may be required

Maintenance to all the above structures would include repairs to damage, or upgrading of all or part of the structure.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, construction & maintenance of impermeable erosion protection structures must be authorised by resource consent.

According to the pNRP, construction of small structures (covering less than 10 m^2 of the bed) is a permitted activity, provided it also complies with other conditions (Rule R117); generally however construction and extension of any such structures must be authorised by resource consent (Rule R129). Maintenance and use is a permitted activity (provided it complies with certain conditions) under Rule R112.

Key Potential Benefits

- Lateral bank erosion is prevented, protecting adjacent property and infrastructure
- Channel alignment is maintained
- River bed habitat stability is maintained
- River habitat diversity may be enhanced by the creation of opportunities for riparian planting behind the rock lining

Key Potential Adverse Effects

- During construction:
  - disturbance of river bed habitat
  - release of suspended sediment to the river
  - deposition of sediment downstream
  - removal of riparian vegetation
  - disturbance of recreational use
- Long term:
  - reduction in the overall natural appearance of the river bank and river corridor
  - reduction in riparian vegetation and habitat

Required Actions

- Prior to a decision to construction, managers will assess whether the work is necessary, taking into account:
  - the urgency of the work and consequences of not undertaking it
  - the environmental effects of the work and available alternatives to achieving the desired outcomes
- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.
- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Structures must be designed and approved by a suitably qualified person to ensure in particular that:
  - diversion works are undertaken as appropriate
  - they do not constrict flows or reduce the channel capacity
  - they are appropriately founded and keyed into the river bank
  - construction materials are compatible with the river environment and are clean and free of soil, mud, clay or other soluble debris
  - future maintenance and access requirements are considered with a view to minimising on-going disturbance of the river bank and riparian zone
- Construction should be supervised by a suitably experienced person to ensure that:
  - all works are undertaken in accordance with the design requirements noted above
  - preparation of the bank, excavation of the foundation and placement of rock is done by a machine operating from the river bank, where practicable

Restrictions

- Q Concrete rubble will not be used to construct these structures
- Q To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in Table 11 to Table 15
- Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15.

Formation of gabion structure; note separation of works from flowing channel and machine operating out of the water

7.4.5 Construction and maintenance: Grade Control Structures

Description

Grade control structures are low rock, rock and concrete or concrete block barriers constructed across the width of a watercourse to raise or maintain the river bed level and thereby reduce the channel gradient and flow velocity. They are used to prevent bed scour and encourage gravel deposition with the goal of maintaining the river bed level, generally in areas where there is a need to protect infrastructure such as bridge piles and river management structures. Grade control structures can vary in scale from major structures in large waterways, to a few blocks placed in the bed of small watercourses.

Maintenance would include repairs to damage, or upgrading of all or part of the structure.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, construction & maintenance of impermeable structures in the river bed must be authorised by resource consent.

According to the pNRP, construction of small structures (covering less than 10 m^2 of the bed) is a permitted activity, provided it also complies with other conditions (Rule R117); generally however construction and extension of any such structures must be authorised by resource consent (Rule R129). Maintenance and use is a permitted activity (provided it complies with certain conditions) under Rule R112.

Key Potential Benefits

- Bed erosion and scour is reduced or prevented, protecting the integrity of property and infrastructure
- Channel alignment is maintained
- River bed habitat stability is maintained
- River bed sedimentation may be reduced

Key Potential Adverse Effects

- During construction:
  - Ø disturbance of river bed habitat
  - Ø release of suspended sediment to the river
  - Ø deposition of sediment downstream
  - Ø disturbance of recreational use
- Long term:
  - Ø loss of amenity or recreational access
  - Ø reduction or loss of fish passage may become a significant barrier across the watercourse if the sediment supply regime changes significantly, and structure becomes exposed

Required Actions

- Prior to a decision to undertake construction, managers will assess whether the work is necessary, taking into account:
  - Ø the urgency of the work and consequences of not undertaking it
  - Ø the sediment transport regime in the river
  - Ø the presence and severity of any existing bed scour
  - Ø the environmental effects of the work and available alternatives to achieving the desired outcomes
- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.

- Managers and on-site works supervisors must implement all general good practice (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Structures must be designed and approved by a suitably qualified person to ensure in particular that:
  - the design is appropriate to the site and takes into account the fishery or recreational values of the river
  - diversion works are undertaken as appropriate
  - they do not constrict flows or reduce the cross sectional area of the channel
  - they are properly founded and keyed into the river bed and banks
  - construction materials are compatible with the river environment and are clean and free of soil, mud, clay or other soluble debris
  - fish passage is maintained
  - future maintenance and access requirements are considered with a view to minimising on-going disturbance of the river bank and riparian zone
- Construction should be supervised by a suitably experienced person to ensure that all works are undertaken in accordance with the design requirements noted above.

Restrictions

- No concrete blocks, rails or timber are to be used for construction of new grade control structures
- To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in Table 11 to Table 15
- To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15.

7.4.6 Construction and maintenance: Permeable Structures

Description

Debris fences are iron and cable fences that extend from the bank into the river channel. They are used to support the creation or re-establishment of a willow buffer zone along the edge of the river channel, and so maintain channel alignment.

They are interplanted with willows and afford protection to these by trapping flood debris and slowing flows (and gravel movement). Willows planted in a river bed without debris fences are very vulnerable to flood damage and are much less likely to establish than those planted with fences.

Fences are constructed by driving railway iron posts (or similar) 3 -5 metres apart into the river bed in a series of discrete lines generally at a 45º angle from the channel alignment. The posts stand approximately 1.2 m above the bed. Three to four steel cables are strung through the posts to form the fence. Rock or concrete blocks may be placed at the tip for additional stability.

It is usually necessary to contour the site with a bulldozer to create a smooth construction platform and also to divert the flowing channel away from the works site. The irons are driven with a hydraulic hammer mounted on a large excavator.

The placement of debris fences has, in some instances, been of some concern where vegetation fails to become properly established and the channel subsequently shifts so that the fence lies in the main river flow. In such cases, they can pose a significant threat to rafters and canoeists in high flows.

Permeable groynes act in a similar way to debris fences but are more robust and give greater control of flow direction and edge protection. A variety of construction materials have been used in the past; either timber (post and rail) or a combination of rail irons and timber.

Maintenance would include cleaning and removal of debris, repairs to damage, or upgrading of all or part of the structures.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, construction & maintenance of permeable erosion protection structures must be authorised by resource consent.

The pNRP requires that construction and extension of such structures must be authorised by resource consent (Rule R129), but their maintenance and use is a permitted activity (provided it complies with certain conditions) under Rule R112.

Key Potential Benefits

- Lateral bank erosion is prevented, protecting adjacent property and infrastructure
- Channel alignment is maintained
- River bed habitat stability is maintained
- River habitat diversity may be enhanced by the creation of scour pools and sheltered embayments

Key Potential Adverse Effects

- During construction:
  - disturbance of river bed habitat
  - release of suspended sediment to the river
  - deposition of sediment downstream
  - loss of riparian vegetation

- Ø disturbance of recreational use

¨ Long term:
- Ø cumulative effect of reduction in the overall natural appearance of the river bank and river corridor associated with willow use
- Ø reduction in suitable habitat for fish and invertebrates at the bank edge

Required Actions

¨ Prior to a decision to undertake construction, managers will assess whether the work is necessary, taking into account:
- Ø the urgency of the work and consequences of not undertaking it
- Ø the environmental effects of the work and available alternatives to achieving the desired outcomes

¨ PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.

¨ Managers and on-site works supervisors must implement all general good practice (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)

¨ Structures must be designed and approved by a suitably qualified person to ensure in particular that:
- Ø diversion works are undertaken as appropriate
- Ø they do not constrict flows or reduce the channel capacity
- Ø future maintenance and access requirements are considered with a view to minimising on-going disturbance of the river bank and riparian zone
- Ø the safety of recreational users is taken into account

¨ Construction should be supervised by a suitably experienced person to ensure that all works are undertaken in accordance with the design requirements and actions noted above

¨ Debris fences will be maintained on a regular basis to ensure that they perform their intended function and do not create undue risks to the safety of recreational users. This may include:
- Ø structural maintenance, including tightening of cables, replacement of posts or cross members
- Ø replacement or replanting of willows associated with the debris fence
- Ø recontouring of the adjacent beach or river bed

¨ Where debris fences are continuously outflanked by the river, consideration will be given to their removal and adoption of a more permanent solution to maintaining the river alignment

Restrictions

Q To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in Table 11 to Table 15

Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15.

Debris fence construction (driving irons) – Otaki River

Repairs to timber permeable groynes on the Wainuiomata River. Note the separation of the work area from the wet channel through the use of bunding

Debris fences interplanted with willow poles - Otaki River

7.4.7 Construction and maintenance: Debris arrester

Description

A debris arrester can be constructed from railway irons, steel beams, or pipes that are driven into the bed and tied together with horizontal irons, or it may consist of discrete concrete or wooden posts that are placed at intervals across the river bed. More robust than a debris fence, an arrester is designed to catch flood debris and prevent it from travelling downstream where it may cause damage to bridges or other structures.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, construction & maintenance of permeable erosion protection structures (including debris arresters) must be authorised by resource consent.

According to the pNRP, construction of small structures (covering less than 10 m^2 of the bed) is a permitted activity, provided it also complies with other conditions (Rule R117); generally however construction and extension of any such structures must be authorised by resource consent (Rule R129). Maintenance and use is a permitted activity (provided it complies with certain conditions) under Rule R112.

Key Potential Benefits

- Protection of downstream structures from damage

Key Potential Adverse Effects

- During construction:
  - disturbance of river bed habitat
  - release of suspended sediment to the river
  - loss of riparian vegetation
  - disturbance of recreational use
- Long term:
  - reduction in the overall natural appearance of the river bank and river corridor
  - creation of navigational hazard to recreational users
  - reduction of channel capacity, disruption of channel alignment and ecological habitat if not designed properly or regularly clear of trapped debris
  - removal of material that provides food and habitat for aquatic organisms

Required Actions

- Prior to a decision to construction, managers will assess whether the work is necessary, taking into account:
  - the likely benefits of the work and the consequences of not undertaking it
  - the environmental effects of the work and available alternatives to achieving the desired outcome
- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.
- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Structures must be designed and approved by a suitably qualified person to ensure in particular that:
  - they do not constrict flows or reduce the channel capacity
  - they are appropriately founded and keyed into the river bed
  - construction materials are compatible with the river environment and are clean and free of soil, mud, clay or other soluble debris

- Ø future maintenance and access requirements are considered with a view to minimising on-going disturbance of the river bank and riparian zone

¨ Construction should be supervised by a suitably experienced person to ensure that all works are undertaken in accordance with the design requirements and actions noted above

¨ Debris arresters must be regularly maintained and cleared of debris to ensure that they perform their intended function effectively and do not constrict the channel

Restrictions

Q To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in Table 11 to Table 15

Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15

Debris arrester (timber poles) across Waimeha Stream

Debris arrester at Maoribank bend on the Hutt River

Debris arrester across Speedy's Stream

Debris arrester across the Porirua Stream

7.4.8 Demolition and removal: Existing Structures

Description

Structures are most likely to be removed following partial or total failure, and a decision being taken not to reconstruct. Removal is necessary to prevent creation or aggravation of erosion of the adjacent river banks, to remove danger to river users, and for visual reasons.

Preliminary works, including creation of access to the site and/or formation of a suitable working platform for machinery may be required ahead of demolition works.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, demolition and removal of structures from the river bed must be authorised by resource consent.

According to the pNRP, small structures or parts of structures could be removed as a permitted activity (Rule R118), but generally removal of flood and erosion protection structures must be authorised by resource consent (Rule R129).

Key Potential Benefits

- Maintenance of the channel carrying capacity
- Removal of potential hazard to navigation and recreational use
- Improvement to the overall natural appearance and amenity value of the river bank and river corridor

Key Potential Adverse Effects

- Disturbance of river bed habitat
- Release of suspended sediment to the river
- Disturbance of recreational use

Required Actions

- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.
- If a structure has become damaged or partially destroyed, and a decision is made that it will not be repaired, then it will be removed from the waterway as soon as practicable
- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- All material associated with the structure will be removed from the river or stream and disposed of, or stockpiled at an appropriate location.

Restrictions

Q To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in Table 11 to Table 15

Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15.

7.4.9 Maintenance: Existing Outlet Structures

Description

This includes structural repairs to, and maintenance of existing head walls, wingwalls, culverts, and steel grilles, flap gates and any other features associated with outlet structures discharging to the river. Maintenance can include upgrade of part or all of the structure, clearance of debris, water blasting and painting.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, maintenance of structures in the river bed may need to be authorised by resource consent, depending on the extent of the proposed maintenance work.

According to the pNRP, maintenance and repair of existing outlet structures is a permitted activity, provided it complies with certain conditions under Rule R112. If it cannot meet these conditions then it must be authorised by resource consent (Rule R129).

Key Potential Benefits

- The functionality of flood protection works is maintained
- Effective management of community flood protection assets and investment

Key Potential Adverse Effects

- Disturbance of river bed habitat
- Release of suspended sediment or other contaminants to the river
- Loss of riparian vegetation
- Disturbance of recreational use

Required Actions

- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.
- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Undertake works from the bank, rather than from within the active channel wherever possible
- Where work must be undertaken in the river, undertake diversion works as appropriate

Restrictions

Q To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in Table 11 to Table 15

Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15.

Repairs to floodgates

Repairs to floodgates

7.4.10 Channel shaping: Beach Ripping

Description

Beach ripping is involves dragging a tine behind a bulldozer or tractor to loosen the upper surface layer (armour) of the beach. Undertaken on beaches above the wet channel, the purpose of the activity is to loosen gravels and thus encourage mobility and more consistent movement of the bed material during future freshes and floods when the beach is inundated. In this way, ripping helps to prevent formation of channel distortions and reduces lateral bank erosion.

Ripping is a low impact activity that promotes further natural recontouring of the bed by the river. It is undertaken with the ultimate aim of lessening the need for more extensive channel shaping works at a later stage.

Beach ripping may be undertaken as a discrete activity, or may be undertaken in conjunction with other activities such as beach recontouring. Although beach ripping is undertaken out of flowing water, the constraints of a site may require that machinery undertaking the work will need to enter the wetted channel to gain access to the site (and to turn around, for example), in order to complete the required work effectively.

Resource Management Act 1991

Disturbance of dry beaches is a permitted activity under the current Regional Freshwater Plan for the Wellington Region, provided it complies with the prescribed permitted activity conditions.

According to the pNRP, beach ripping is a permitted activity, provided it complies with certain conditions under Rule R119. If it cannot meet these conditions then it must be authorised by resource consent (Rule R129).

Key Potential Benefits

- Prevention of the formation of an armoured top layer on the gravel bed, and maintenance of mobility of the river bed gravels
- Facilitation of gravel movement during floods
- Prevention of channel distortions and bank erosion
- Can reduce the need for more invasive bed recontouring

Key Potential Adverse Effects

- Temporary disturbance of bird nesting habitat
- Release of suspended sediment to the river in the first fresh following the work
- Temporary disturbance of recreational use
- Temporary reduction in amenity values

Required Actions

- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.
- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Work is undertaken out of the wetted channel. If any ripping work is to be undertaken in the wet, then refer to the good practice sheet for 'Ripping in the active (flowing) channel'
- A 5 m buffer strip should be left at the bank edge of the beach to avoid disturbance of the bank and any riparian vegetation

Restrictions

Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15.

Beach ripping – Hutt River

7.4.11 Channel shaping: Beach Recontouring

Description

Beach recontouring involves the mechanical movement and redistribution of sands and gravels on areas of dry bed, above the wetted channel and away from flowing water. Carried out as a discrete activity, its purpose is to streamline and shape a beach to avoid any future obstructions to flow, and to thus establish pre-conditions that will act to reduce channel distortions and bank erosion in future flood events. Beach recontouring involves a level of disturbance of the bed that has more impact than ripping, but less effects than bed recontouring or cutting of diversion channels.

It can also be undertaken as part of site preparation associated with establishment of structures or planting, in conjunction with beach ripping or bed recontouring, or as a part of gravel extraction operations.

Although beach recontouring is an activity undertaken out of flowing water, it should be noted that the constraints of a site may require that machinery undertaking recontouring work will need to enter the wetted channel to gain access to the site and to effectively the required work effectively.

Resource Management Act 1991

This is a permitted activity under the current Regional Freshwater Plan for the Wellington Region, provided it complies with the prescribed permitted activity conditions.

According to the pNRP, beach recontouring is a permitted activity, provided it complies with certain conditions under Rule R119. If it cannot meet these conditions then it must be authorised by resource consent (Rule R129).

Key Potential Benefits

- Removes obstructions to flow
- Helps to maintain channel alignment, reduce bank erosion and prevents the river bed profile from becoming flattened out during floods
- Helps to reduce the need for bed recontouring in the wet channel
- Enhancement of bird nesting habitat on the river bed

Key Potential Adverse Effects

- Disturbance of bird nesting habitat
- Release of suspended sediment to the river in the first fresh following the works
- Disturbance of recreational use
- Temporary loss of amenity due to noise and dust

Required Actions

- Prior to a decision to undertake beach recontouring, managers will assess whether the work is necessary, taking into account:
  - Ø the urgency of the work and consequences of not undertaking it
  - Ø the degree of digression of the channel from its design alignment and/or desired plan form as set out in the relevant Operational Management Plan
  - Ø the state of the buffer zone, including its stability and the extent of any erosion
  - Ø the stability and strength of the banks, including the severity of any undercutting
  - Ø the environmental effects of the work and available alternatives to achieving the desired outcomes

- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.
- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- The work is planned and approved by a suitably qualified person to ensure in particular that:
  - flows are not constricted or the capacity of the channel reduced
  - the works are in accordance with any design alignment requirements for the river as set out in the relevant Operational Management Plan
- Construction should be supervised by a suitably experienced person to ensure that all works (including the final bed profile) are undertaken in accordance with the design requirements and actions noted above
- A 5 m buffer strip should be left at the bank edge of the beach to avoid disturbance of the bank and any riparian vegetation

Restrictions

- To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15

7.4.12 Channel shaping: Channel Diversion Cut

Description

Diversion cuts through a beach area may be undertaken to realign the low flow channel where it has moved too far from its design alignment, or to resolve a bank erosion problem. In braided river systems, diversion cuts may be used to assist the development of secondary braids in order to maintain channel capacity, or to divert a dominant braid which may be eroding the lateral buffer zone. Undertaken either as a discrete activity or in conjunction with other works, a diversion cut assists in establishment and maintenance of a more uniform and better aligned channel form.

Diversion cuts through beach areas are mainly undertaken away from the wet channel, and are more commonly used in wider, semi-braided or braided rivers, rather than in single channel rivers. In single channel rivers the preference would be to use bed recontouring to maintain channel alignment; diversion cuts would generally only be undertaken in a single channel river where a major channel distortion had occurred, which could not easily be addressed solely by bed recontouring.

Establishment of the diversion cut involves mechanical excavation of a new channel on the desired new alignment through an area of the river bed outside the wet channel. The excavated material may be placed between the side of the newly created channel and the wet channel which is to be realigned or it may be removed to another location in the river bed.

The excavation cut is bunded at the upstream end and a flow restriction barrier placed at the downstream end while excavation work proceeds to minimise silt discharges. When the new channel is completed, the end bunds are removed to allow diversion of the wet channel into the newly formed channel (this may either be done immediately by mechanical means or may be done naturally by the river over time). Some bed recontouring, to push excavated material across the old channel alignment (if it is not to be retained as a backwater habitat area) may also be required to achieve the finished profile.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, the cutting of channel diversions in the active river channel must be authorised by resource consent.

According to the pNRP, channel diversion cuts (involving both excavation of the bed and diversion of water) must be authorised by resource consent under Rule R129 (and Rule ??).

Key Potential Benefits

- Lateral bank erosion is prevented or remedied, protecting adjacent property and infrastructure
- Channel alignment is maintained or re-established
- Channel capacity is maintained
- The need for permanent structures may be reduced or avoided
- River habitat diversity may be enhanced by the creation of a design meander pattern and provision of backwater areas in the channel, where appropriate

Key Potential Adverse Effects

- During construction:
  - disturbance of dry river bed habitat
  - release of suspended sediment to the river (once water is diverted into the completed channel)
  - deposition of sediment downstream
  - disturbance of recreational use

Required Actions

- Prior to a decision to form a diversion cut, managers will assess whether the work is necessary, taking into account:
  - the urgency of the work and consequences of not undertaking it
  - the degree of digression of the channel from its design alignment and/or desired plan form as set out in the relevant Operational Management Plan
  - the state of the buffer zone, including its stability and the extent of any erosion
  - the stability and strength of the banks, including the severity of any undercutting
  - the environmental effects of the work and available alternatives to achieving the desired outcomes
- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.
- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Diversion cuts are planned and approved by a suitably qualified person to ensure in particular that:
  - flows are not constricted or the capacity of the channel reduced
  - the works are in accordance with any design alignment requirements for the river as set out in the relevant Operational Management Plan
- Construction should be supervised by a suitably experienced person to ensure that all works (including the final bed profile) are undertaken in accordance with the design requirements and actions noted above
- A 5 m buffer strip should be left at the bank edge of the beach to avoid disturbance of the bank and any riparian vegetation

Restrictions

- To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in Table 11 to Table 15
- To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15.

7.4.13 Channel shaping: Ripping in active (flowing) channel

Description

Ripping of the bed in the wet channel is a technique used in some rivers to improve the low flow channel form and alignment through riffle zones in particular.

The activity involves dragging a tine that is mounted on a bulldozer or excavator through riffle sections of the wet channel, in order to loosen the bed material and encourage its mobility. The intention is to mitigate any sharp directional changes in the channel at such points and thus maintain a more regular channel meander pattern.

Although the activity involves mechanical disturbance of the bed, with associated aquatic habitat disturbance and temporary release of sediment to the water column, the activity is less invasive and less extensive than bed recontouring and thus the scale of these effects is relatively less than with bed recontouring.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, disturbance of the active river channel must be authorised by resource consent.

According to the pNRP, ripping in the wet channel must be authorised by resource consent under Rule R129.

Key Potential Benefits

- Lateral bank erosion is prevented or remedied, protecting adjacent property and infrastructure
- Channel alignment is maintained
- The need for more invasive and extensive bed recontouring may be reduced or avoided
- River habitat diversity may be maintained

Key Potential Adverse Effects

- Disturbance of river bed habitat
- Minor release of suspended sediment to the river
- Disturbance of recreational use

Required Actions

- Prior to a decision to undertake ripping in the wet channel, managers will assess whether the work is necessary, taking into account:
  - Ø the urgency of the work and consequences of not undertaking it
  - Ø the degree of digression of the channel from its design alignment and/or desired plan form as set out in the relevant Operational Management Plan
  - Ø the environmental effects of the work and available alternatives to achieving the desired outcomes
- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.
- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Work is planned and approved by a suitably qualified person to ensure in particular that:
  - Ø flows are not constricted or the capacity of the channel reduced
  - Ø the works are in accordance with any design alignment requirements for the river as set out in the relevant Operational Management Plan

¨ Construction should be supervised by a suitably experienced person to ensure that all works (including the final bed profile) are undertaken in accordance with the design requirements and actions noted above

Restrictions

Q To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in Table 11 to Table 15.

7.4.14 Channel shaping: Bed recontouring

Description

Bed recontouring (formerly referred to as 'cross-blading') is mechanical shaping or realignment of a section of the active bed to establish or maintain a design alignment, and/or to reduce erosion (typically at the outside of a bend). It is another tool for management of the channel form in order to establish preconditions that will effectively accommodate future flood events and reduce the amount of future remedial work.

It is used in situations where channel realignment cannot be effectively achieved by a diversion cut or in-river ripping of riffles. It may be used as an alternative to the construction of permanent protection structures in the first instance.

Bed recontouring can be undertaken as a discrete activity for these purposes, but may also be undertaken on a lesser scale as part of preparation of the river bed for construction works or in association with 'wet' gravel extraction.

Bed recontouring may involve direct pushing of material from dry beach areas across the wet channel, and/or pushing of material from the wet channel onto beach areas, to achieve a new channel form.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, recontouring of the active river channel must be authorised by resource consent.

According to the pNRP, bed recontouring (involving both disturbance of the bed and diversion of water) must be authorised by resource consent under Rule R129 (and Rule ??).

Key Potential Benefits

- Lateral bank erosion is prevented or remedied, protecting adjacent property and infrastructure
- Channel alignment is maintained or re-established
- The need for permanent structures may be reduced or avoided
- River habitat diversity may be enhanced by the creation of a design meander pattern and provision of backwater areas in the channel, where appropriate

Key Potential Adverse Effects

- During construction:
  - Ø Significant local disturbance of river bed habitat
  - Ø release of suspended sediment to the river
  - Ø deposition of sediment downstream
  - Ø accidental fish mortality
  - Ø loss of riparian vegetation
  - Ø disturbance of recreational use

Required Actions

- Prior to a decision to undertake bed recontouring, managers will assess whether the work is necessary, taking into account:
  - Ø the urgency of the work and consequences of not undertaking it
  - Ø the degree of digression of the channel from its design alignment and/or desired plan form as set out in the relevant Operational Management Plan
  - Ø the state of the buffer zone, including its stability and the extent of any erosion

- Ø the stability and strength of the banks, including the severity of any undercutting
- Ø the environmental effects of the work and available alternatives to achieving the desired outcomes

¨ PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.

¨ Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)

¨ The person responsible for on-site supervision must ensure that:

- Ø the minimum amount of bed recontouring necessary is undertaken
- Ø bed recontouring will generally proceed in an upstream direction from the downstream end of the reach being worked to allow fish disturbed by the activity to escape downstream. However, any filling in of old channels cut off as a result of the works should proceed from the upstream end in a downstream direction, for the same reason
- Ø at the completion of bed recontouring work flows are not constricted or channel capacity is not reduced
- Ø the works are in accordance with any design alignment, channel plan form and finished bed profile requirements as set out in the relevant Operational Management Plan
- Ø future maintenance and access requirements are considered with a view to minimising on-going disturbance of the river bank and riparian zone
- Ø a 5 m buffer strip is left at the bank edge of any beaches to avoid disturbance of the bank and any riparian vegetation

¨ If repeated bed recontouring is required at a particular site then consideration will be given to a more permanent solution, such as the use of groynes or rock lining.

Restrictions

Q To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in Table 11 to Table 15

Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15.

Bed recontouring in Otaki River – Upper Wallaces (XS 750 -780 approx)

Bed recontouring in Waikanae R – Blakes corner XS 220

Bed recontouring in Hutt River – near Bridge Road

Bed recontouring in Wainuiomata River – near Wood Street

7.4.15 Channel shaping: Bank contouring or reconstruction

Description

Shaping or reconstruction of bank edges and berms will normally occur following flood damage. The intention of this work is generally to reinstate the bank or berm to its original height and alignment, although some adjustments may be made to the alignment and slope of the bank to improve stability or to make provision for planting.

It may be necessary to divert the river away from the affected bank, and to remove some riparian vegetation, to allow reconstruction work. Generally, the bank edge will be rebuilt by placing fill in layers. Fill can be sourced from a suitable adjacent beach where available; otherwise weathered overburden sourced from a quarry would be used.

Following reconstruction, the new bank edge will be stabilised by construction of one or more appropriate bank protection works.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region any shaping of the river bank edges or berms where the work affects the river bed requires resource consent.

According to the pNRP, any shaping of the river bank edges or berms where the work affects the river bed must be authorised by resource consent under Rule R129 and also Rule 101 (if earthworks areas are >3000 m^2).

Key Potential Benefits

- Lateral bank erosion is prevented, protecting adjacent property and infrastructure
- Channel alignment is maintained or re-established
- River bed habitat stability is maintained

Key Potential Adverse Effects

- During construction:
  - disturbance of river bed habitat
  - release of suspended sediment to the river
  - deposition of sediment downstream
  - loss of riparian vegetation
  - disturbance of recreational use

Required Actions

- Prior to a decision to bank contouring or reconstruction, managers will assess whether the work is necessary, taking into account:
  - the urgency of the work and consequences of not undertaking it
  - adjustments to the bank alignment or slope that may result in improved stability or assist with preparation for planting works
  - other channel alignment work adjacent to the bank that may be required to remove any on-going erosive pressure on the re-instated bank
  - the environmental effects of the work and available alternatives to achieving the desired outcomes
- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.
- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Works should be undertaken from the bank, rather than from within the active channel, wherever possible

Restrictions

- Q To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified Table 11 to Table 15
- Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15

7.4.16 Channel maintenance: Beach Scalping

Description

Beach scalping involves mechanical clearance of woody and herbaceous weeds and grasses from gravel beaches. This is necessary to prevent a reduction in flood flow velocities which in turn encourages gravel aggradation and a reduction in channel capacity. Vegetation if left can also result in well established and stable beaches that can give rise to channel distortions and bank erosion.

Mechanical clearance is typically performed using a bulldozer, large excavator or front end loader to strip the vegetation and loosen the armouring layer. The vegetation is crushed and left to break down or become light flood debris. The activity involves excavation or disturbance of bed material but does not typically result in a discharge of sediment to the flowing channel.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region the removal of vegetation from the river bed is a permitted activity, provided the activity complies with the prescribed permitted activity conditions.

According to the pNRP, removal of vegetation from the river bed is a permitted activity under Rule R122, provided certain conditions relating to protection of birds and size of material to be removed, are complied with.

Key Potential Benefits

- Lateral bank erosion is prevented or remedied, protecting adjacent property and infrastructure
- Channel alignment is maintained
- Channel capacity is maintained
- Reduces potential for gravel and sediment aggradation
- Habitat for river bed nesting birds is maintained

Key Potential Adverse Effects

- Disturbance of bird nesting activity
- Disturbance of recreational use

Required Actions

- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.
- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- In order to minimise disturbance of the river bed this work should be undertaken at the same time as other activities such as beach ripping, where practicable
- A 5 m buffer strip should be left at the bank edge of the beach to avoid disturbance of the bank and any riparian vegetation

Restrictions

Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15.

7.4.17 Channel maintenance: Removal of flood debris

Description

Flood debris is defined in the RFP as 'material deposited on the river bed as a result of wreckage or destruction resulting from flooding', and it can include trees, slip debris, collapsed banks, the remains of structures, and other foreign material including abandoned vehicles, but does not include the normal fluvial build-up of gravel.

Removal of flood debris is necessary because blockages reduce channel cross-sectional area which result in higher flood levels. In addition, if allowed to occur, build-up of obstacles may deflect flood flows into banks, causing lateral erosion.

Removal of flood debris covers only the minimal amount of work needed to clear the bed or structures within the bed of flood debris; any beach or bed contouring completed at a location where debris removal occurs is accounted for as beach or bed recontouring.

It is important to note that flood debris in the channel can provide and enhance the variety of available aquatic habitat for macroinvertebrates and fish. Debris should therefore only be removed where necessary to manage flood or erosion risks.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region the removal of flood debris from the river bed is a permitted activity, provided the activity complies with the prescribed permitted activity conditions.

According to the pNRP, removal of flood debris is a permitted activity, provided it complies with certain conditions under Rule R119. If it cannot meet these conditions then it must be authorised by resource consent (Rule R129).

Key Potential Benefits

- Channel capacity is maintained
- The risk of erosion is reduced
- Risks to the safety of recreational users are reduced
- The amenity value of the river is maintained

Key Potential Adverse Effects

- Loss of shelter or spawning sites for fish or aquatic invertebrates

Required Actions

- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.
- Managers and on-site works supervisors must implement all general good practice methods (refer to relevant sheets)
- Large logs or other debris should not be from the channel unless necessary to maintain channel capacity, in order to provide for maintenance of aquatic habitat for fish and invertebrates
- If large logs are to be removed from the channel, and where it is appropriate to do so (i.e. land is not in private ownership), iwi are to be notified, to allow for potential use of those logs

Restrictions

Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15.

7.4.18 Channel maintenance: Gravel Extraction from beaches (dry extraction)

Description

Gravel bed material is currently extracted to maintain the flood carrying capacity of the channel (which is reduced when aggradation raises the level of the river bed) and to protect lateral erosion protection works that may be threatened by localised gravel build-ups that confine and direct the channel.

Material can be excavated from both the beaches (i.e. above the flowing channel) and/or from the flowing channel within the river bed, depending on the management objectives for the particular river and river reaches in question. Removal of gravel from beaches above the normal low flow water level, where there is no extraction activity in the flowing channel, is referred to as 'dry' extraction'. In this case, all works are undertaken out of running water, except for any river crossings for access or for transport of extracted gravel and minor shaping of the beach at the water edge to ensure a smooth profile.

Extraction is usually carried out using either hydraulic excavators or front end loaders which load onto trucks (either road trucks or large off-road dumpers). Extraction proceeds in uniform strips parallel to the river channel, to a depth no lower than 0.2 m above the normal level of the adjacent flow. Small stockpiles of the extracted gravel may be formed on a daily basis, but would not normally be left in the floodway for longer than the working day. The extracted gravel is transported to the processing plant using existing access tracks and/or public roads wherever possible. For remote beaches trucks may need to travel along the dry river bed, and may need to cross the river. Such crossings should be kept to a minimum, and restricted to a single point of entry and exit.

At the end of extraction, beaches are to be left with an even surface and profile sloping down towards the channel, to ensure that there are no major discontinuities that could divert future floodwaters. The next flood will then re-work the bed to a more natural form.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region gravel extraction requires resource consent.

According to the pNRP, any gravel extraction from the river bed for river management purposes must be authorised by resource consent under Rule R129.

Key Potential Benefits

- Maintenance of flood carrying capacity of channel
- Maintenance of stable channel alignment and optimum bed levels
- Protection of infrastructure and assets located in the floodplain

Key Potential Adverse Effects

- Disturbance of river bed nesting birds and bird nesting habitat
- Temporary disturbance of recreational access and use

Required Actions

- Prior to approval of a gravel extraction programme, managers will assess whether the work is necessary, taking into account:
  - Ø the results of the most recent bed level surveys and gravel volume analyses
  - Ø available information on short and long term trends in aggradation and degradation in the river bed

- Ø any other available information on factors affecting the long term sediment supply; such as changes in catchment hydrology, land cover and slope stability etc.
- Ø the environmental effects of the work and available alternatives to achieving the desired outcomes

¨ Gravel extraction work plans must be planned and approved by a suitably qualified person to ensure in particular that:

- Ø the works are in accordance with any design envelope and design alignment requirements as set out in the relevant Operational Management Plan
- Ø all contractors undertaking gravel extraction work for GWRC are appropriately briefed and have a proven track record of undertaking works in accordance with the requirements of this Code

¨ PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.

¨ Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)

¨ No excavation is to be undertaken lower than 0.2 m above the adjacent water level

¨ A 5 m buffer strip should be left at the bank edge of the beach to avoid disturbance of the bank and any riparian vegetation

¨ Extraction works must be supervised by a suitably experienced person to ensure that:

- Ø all works are undertaken in accordance with the design requirements and actions noted above
- Ø access to beaches is via single entry and exit points
- Ø tracking of machinery in the river is kept to a minimum
- Ø the final surface of the beach is left in a tidy state and with a profile suited to the design objectives for the channel (which may include a smooth profile at the water's edge)

Restrictions

Q In any one financial year (1 July – 30 June) the amount of gravel extracted shall not exceed that required to maintain the flood carrying capacity of the channel. This shall be determined by regular bed level surveys and gravel volume assessments. Where a design envelope has been developed for a river, the amount of gravel extracted will be in accordance with maintenance of river bed levels within this envelope

Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15.

Dry gravel extraction – Waikanae River

Dry gravel extraction – Hutt River

7.4.19 Channel maintenance: Gravel Extraction from the flowing channel (wet extraction)

Description

Gravel bed material is currently extracted to maintain the flood carrying capacity of the channel (which is reduced when aggradation raises the level of the river bed) and to protect lateral erosion protection works that may be threatened by localised gravel build-ups that confine and direct the channel.

Gravel extraction may also be used as tool to maintain channel alignment – particularly in Wairarapa rivers.

Material can be excavated from both the beaches (i.e. above the flowing channel) and/or from the flowing channel within the river bed, depending on the management objectives for the particular river and river reaches in question. Removal of gravel from the flowing channel is referred to as 'wet' extraction'. In this case, machinery is required to work in the water to move gravel from the channel onto the adjacent beaches, from where it can be extracted. This method is an important tool in reaches which are subject to aggradation which cannot be managed effectively by dry extraction alone.

Although wet gravel extraction involves short-term disturbance to the river bed habitat, it also affords more opportunities than dry extraction to establish and maintain a well-defined low flow channel with a 'natural' slope up to the beach, and to enhance the meander pattern of the river channel and consequent habitat diversity in the longer term.

Extracted gravel may be removed from the river bed for off-site uses elsewhere, or it may be placed to other locations within the river bed – either for storage or for use in river management activities.

Where possible, gravel extraction operations should be combined with any programmed channel alignment activities for efficiency and effective river management, and to minimise overall disturbance of the ecology and ecological habitat at the affected site.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region gravel extraction requires resource consent.

According to the pNRP, any gravel extraction from the river bed for river management purposes must be authorised by resource consent under Rule R129.

Key Potential Benefits

- Maintenance of flood carrying capacity of channel
- Maintenance of stable channel alignment and optimum bed level
- Protection of infrastructure and assets located in the floodplain
- Provides opportunity to enhance instream habitat diversity in the longer term by alteration of channel form to a new design meander

Key Potential Adverse Effects

- Short term reduction in water quality due to release of sediment
- Alteration of downstream habitat due to sedimentation
- Short-term loss of invertebrate habitat and invertebrate populations
- Accidental fish mortality
- Release of nutrients trapped in sediment, resulting in adverse effects on water quality downstream
- Removal of habitat and food sources for fish, which may result in population decline

- Disturbance of birds and disturbance or removal of bird nesting habitat
- Temporary disturbance of recreational access and use

Required Actions

- Prior to approval of a gravel extraction programme, managers will assess whether the work is necessary, taking into account:
  - Ø the results of the most recent bed level surveys and gravel volume analyses
  - Ø available information on short and long term trends in aggradation and degradation in the river bed
  - Ø any other available information on factors affecting the long term sediment supply; such as changes in catchment hydrology, land cover and slope stability etc.
  - Ø the environmental effects of the work and available alternatives to achieving the desired outcome
- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Gravel extraction work plans must be planned and approved by a suitably qualified person to ensure in particular that:
  - Ø the works are in accordance with any design envelope and design alignment (including design meander and pool-run-riffle sequence) requirements as set out in the relevant Operational Management Plan
  - Ø the works are undertaken in accordance with the methodology detailed below
  - Ø PRIOR TO WORKS COMMENCEMENT the need for a SSEMP and any specific environmental monitoring as per Section 3.3 is actioned.
  - Ø all contractors undertaking work for GWRC are appropriately briefed and have a proven track record of undertaking works in accordance with the requirements of this Code.
- Construction must be supervised by a suitably experienced person to ensure that:
  - Ø all works are undertaken in accordance with the design requirements and actions noted above
  - Ø all works are undertaken in accordance with the work methodology described below
  - Ø appropriate communication is undertaken with personnel responsible for management of any environmental monitoring associated with the work
  - Ø a 5 m buffer strip is left at the bank edge of beaches to avoid disturbance of the bank and any riparian vegetation

Restrictions

- Q In any one financial year (1 July – 30 June) the amount of gravel extracted shall not exceed that required to maintain the flood carrying capacity of the channel. This shall be determined by regular bed level surveys and gravel volume assessments. Where a design envelope has been developed for a river, the amount of gravel extracted will be in accordance with maintenance of river bed levels within this envelope
- Q To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in Table 11 to Table 15
- Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with the restrictions specified in Table 11 to Table 15.

Wet Gravel Extraction Methodology

The current extraction methodology has been used in the Hutt River since 2006, following consultation and agreement with key stakeholders (Fish & Game NZ, DOC and some iwi representatives). This methodology, which is dependent upon the development of a 'design meander' for the river or reach, is now being extended into other rivers.

Preparatory works

Prior to commencement of works, the person responsible for design and approval of the work plan will refer to the Environmental Monitoring Plan to ensure that any monitoring requirements, communication or other actions relating to the activity are incorporated into the work plan as appropriate.

The most recent cross section surveys will be compared with the design profile and cross sections to determine cut and fill depths and to accurately calculate available gravel volumes (see Figure 1). From this, a detailed extraction plan will be prepared for use by the operator(s) – see Figure 2. This plan should show the specific extent of the works for each operational stage, and the finished form of the river channel, including the low flow channel centre line (thalweg) and an indicative active channel width.

In addition to the extraction plan, the work plan should also identify specific actions that will be undertaken to minimise the time that operations in the active channel will occur, and to avoid other adverse effects as far as practicable. In particular, and will include items such as:

- The extraction methods to be used
- The machinery to be used
- Operation timing, taking account of any requirements to manage noise and effect on recreational use
- Access routes to be used
- Requirements around plant condition
- Requirements around repairs and refuelling of machinery
- Health and safety requirements, including management of public health and safety
- A complaints procedure

In-channel works

The low flow channel is deepened by pushing gravel material from the low flow channel up onto the adjacent beach, to form a temporary stockpile. This work is carried out by one or more D9 bulldozers, depending on the size of the beaches. At some smaller beaches where the low flow channel is relatively deeper and well-defined (generally in the downstream end of the reach) an excavator located on the beach, rather than in the channel, can be used. In some instances it may be necessary to cut a new channel through an existing beach to achieve the design meander pattern.

Work commences at the downstream end of each beach with a lowering and re-shaping of the riffle; the machine will then continue shaping the low flow channel, moving in an upstream direction to create a lowered pool.

Upon completion of the pool deepening some re-shaping of the riffle may be required to ensure the desired cross-over has been achieved.

As the river reworks the altered meander pattern and lowered riverbed, the adjoining willow stands and bank edges may become exposed and vulnerable to erosion. This may require further re-shaping of riffles (either by re-contouring or ripping) and re-establishment of the beach shape to maintain the design meander, which in turn protects the willows and bank edge. This additional channel shaping is most likely to happen

after a flood. It may also be necessary to use additional vegetative protection measures (e.g. willow layering, tree groynes and tethered willows) to protect the most vulnerable willow stands and bank edges.

Gravel removal

The temporary gravel stockpiles are allowed to drain sufficiently before gravel removal commences. The raised beach can then be lowered progressively by the contractor.

Work commences at the downstream end of the beach and proceeds upstream. Gravel is extracted in strips parallel to the river flow, working from the front of the beach to the rear. This stage of the operation takes place above normal water levels, and no further re-working of the low flow channel is required. The raised beach also remains largely intact during flood events.

A front end loader is used to load the gravel onto either road trucks or large off-road dump trucks, which then transport it offsite via existing haul roads for processing (see photograph).

Beach re-contouring

At the completion of the gravel extraction operation the remaining beach may be re-contoured to give a smooth profile, with a central rise, downward slope to the low flow channel, and a well-defined water edge (where possible). Where the low flow channel is shaped with a bulldozer, there may be the need to further shape the beach edge with an excavator to achieve this. The purpose of this is to ensure a minimum of re-working by the river is required to re-establish a 'natural' channel form and shape.

Front-end loader loading an off-road dumper truck

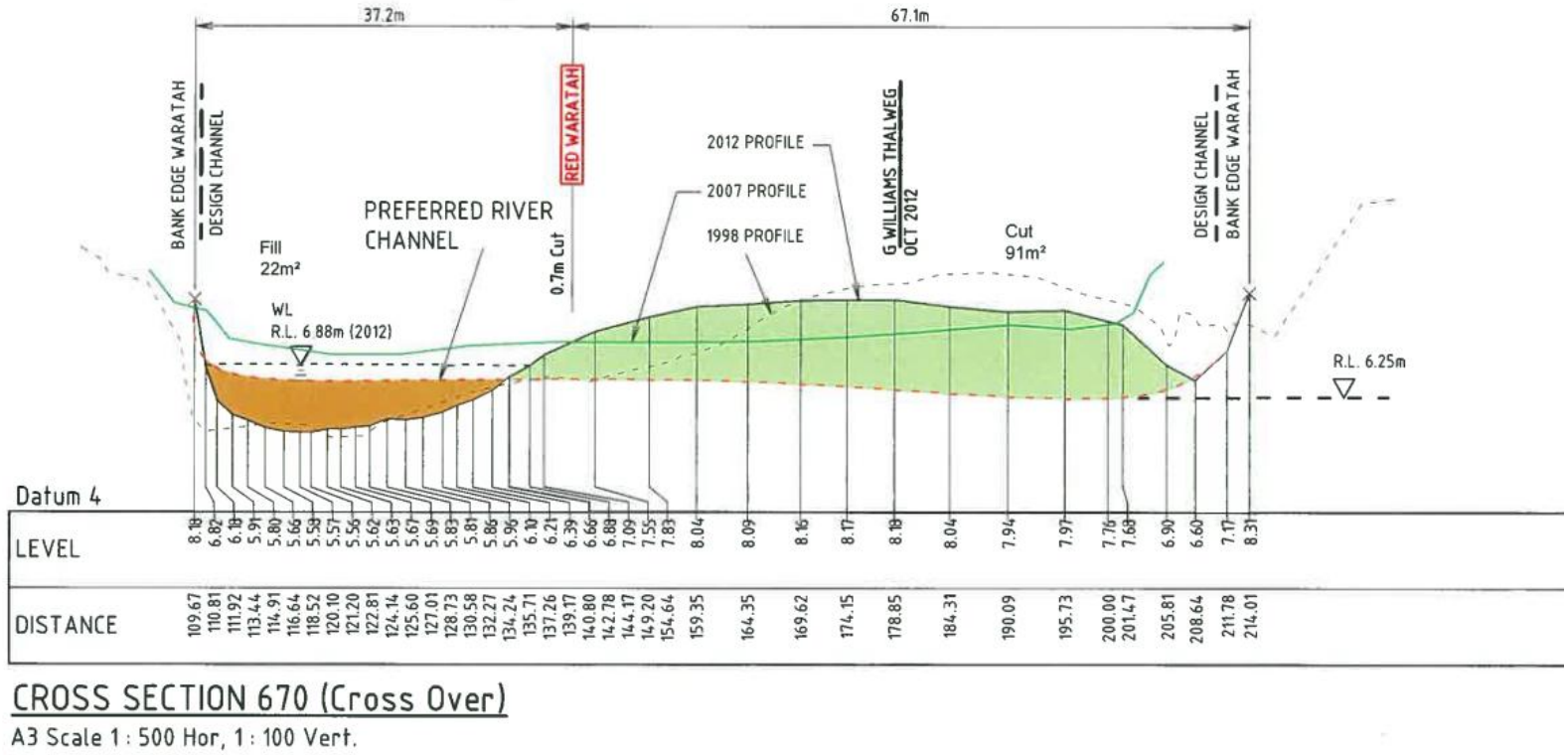


Figure 3: A typical channel cross section

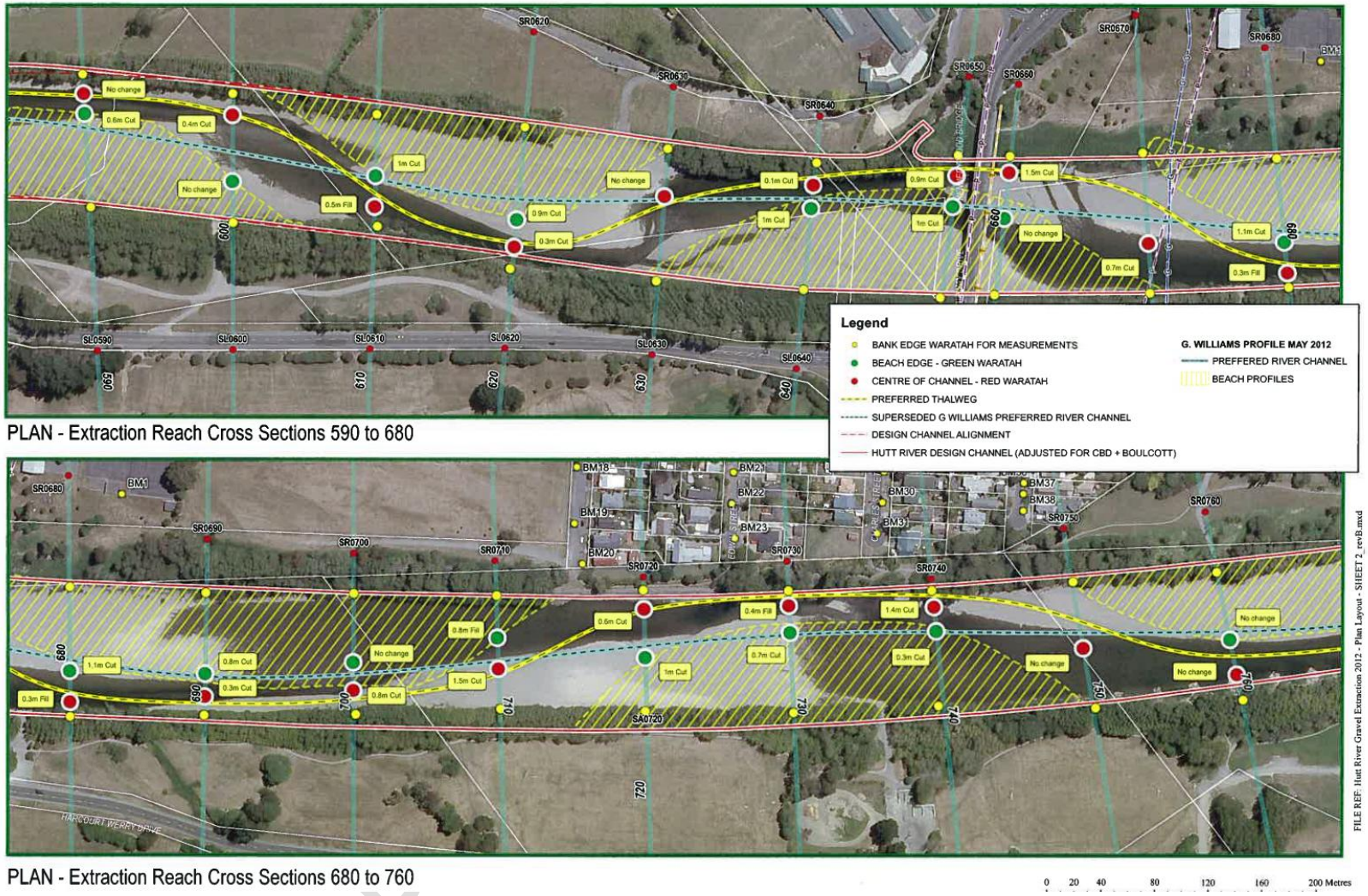


Figure 4: A typical gravel extraction plan

7.4.20 Channel maintenance: Mechanical clearing of minor watercourses

Description

Minor watercourses include some waterways that are referred to colloquially as 'drains'. They do not include minor channels constructed across berms for the purpose of carrying intermittent stormwater flows.

Aquatic weed and sediment is extracted periodically from some smaller watercourses to maintain their bed levels and flood carrying capacity. The aim is to maintain a balance between flood capacity (reduced by higher bed levels) and the threat of undermining the river banks and any bank protection works (increased by lower bed levels).

The activity involves excavation using a cleaning bucket mounted on a hydraulic excavator. The excavator operates from the river bank, and excavated material is placed on the bank where it cannot re-enter the channel, or may be removed from the site altogether.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region removal of vegetation and associated disturbance of the river bed is generally a permitted activity, while extraction of sediment from the river bed, particularly from the wet channel, would generally require resource consent.

According to the pNRP, clearance of vegetation and sediment from 'drains' is a permitted activity under Rule R121, provided certain conditions are complied with. In all other minor watercourses, removal of weed and sediment must be authorised by a resource consent.

Key Potential Benefits

- Maintenance of effective land drainage, productivity & use of adjacent land
- Maintenance of flood carrying capacity of channel
- Protection of infrastructure and assets on adjacent land
- Enhancement of aquatic habitat by improvement of oxygen levels, control of pest plants, improved fish passage

Key Potential Adverse Effects

- Short term reduction in water quality due to release of sediment
- Loss of vegetation cover and spawning vegetation for fish and invertebrates
- Accidental fish mortality
- Release of nutrients trapped in sediment, resulting in adverse effects on water quality downstream
- Removal of habitat and food sources for benthic invertebrates and fish
- Short-term reduction in visual/amenity values and unpleasant odour effects

Required Actions

- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.
- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- The frequency of clearance is no more than is required to maintain flows and flood conveyance capacity

¨ Works should be supervised by a suitably experienced person to ensure that:

- Ø machinery is operated from the side of the watercourse, rather than from within it wherever possible
- Ø works proceed from the upstream end of the reach to the downstream end, to minimise the release of sediment and debris downstream
- Ø a self-draining 'weed bucket', that permits easy drainage of water and any entrapped fish back into the watercourse, is used in gravel bedded waterways
- Ø a conventional bucket, rather than a 'weed bucket', is used where large amounts of sediment are present
- Ø when fish are observed in the extraction area, encourage the digger operator to keep the bucket submerged at the end of each cut to give fish an opportunity to escape
- Ø examination of excavated material is undertaken and any fish trapped by the works are recovered and relocated to clear water upstream of the works
- Ø at least one observer, in addition to the digger operator, is present to assist with finding, capturing and relocating of trapped fish
- Ø in general, 10% of the aquatic vegetation within the cleared watercourse is retained to assist re-colonisation of aquatic organisms and plants
- Ø additionally, where practicable, selected ecological refuge areas are left in the channel at intervals to assist re-colonisation of the invertebrate and fish populations present in the watercourse
- Ø leave part of the waterway un-cleared each year (for instance, divide the watercourse into areas A, B and C; clear area A in year 1, area B in year and area C in year 3).

Restrictions

- Q Machinery will not be operated in stream channels unless absolutely necessary
- Q To protect aquatic fauna and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in Table 11 to Table 15.

Channel clearance - Pahiko Drain (Otaki)

7.4.21 Channel maintenance: Mechanical clearing – Opahu Stream (Hutt River)

Description

The lower Opahu Stream channel forms an isolated arm, 750 m long, on the true left bank of the Hutt River, downstream of the Ava Rail Bridge. The arm forms a sheltered low energy environment alongside the main channel of the Hutt River, and the riparian vegetation established within it provides inanga spawning habitat. Silt and tidal debris gets washed into this channel, and needs to be removed periodically, principally for aesthetic reasons.

This work is undertaken by a long reach excavator from the river banks. The excavated silts and organic debris are loaded onto trucks for disposal off site. The channel adjacent to the training bank would generally require maintenance dredging over the full 750 m length approximately every 5 years.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region this activity requires resource consent. The activity is authorised under the granted resource consent for river management activities held by GWRC for the Hutt River.

According to the pNRP, excavation of sediment from the bed of a river must be authorised by a resource consent.

Key Potential Benefits

- Maintenance of flood carrying capacity of channel
- Protection of infrastructure and assets on adjacent land
- Enhancement of aquatic habitat by improvement of oxygen levels, provision of suitable spawning habitat for inanga and other fish species

Key Potential Adverse Effects

- Short term reduction in water quality due to release of sediment
- Loss of vegetation cover and spawning vegetation for fish and invertebrates
- Accidental fish mortality
- Release of nutrients trapped in sediment, resulting in adverse effects on water quality downstream
- Removal of habitat and food sources for benthic invertebrates and fish

Required Actions

- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.
- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- The frequency of clearance is no more than is required to maintain design flows and water levels
- Works should be supervised by a suitably experienced person to ensure that:
  - works proceed from the upstream end of the reach to the downstream end, to minimise the release of sediment and debris downstream
  - an appropriate free-draining bucket is used
  - examination of excavated material is undertaken and any fish removed from the stream by the works are recovered and relocated to clear water upstream of the works
  - where possible, at least one observer, in addition to the digger operator, is present to assist with finding, capturing and relocating of trapped fish

Restrictions

- Q No work to be undertaken during inanga spawning – refer to Table 11 to Table 15
- Q No removal of riparian vegetation.

7.4.22 Channel maintenance: Mechanical clearing – Chrystalls Lagoon (Otaki River)

Description

The Waimanu Stream drains an area of foothills and river terrace lying in the vicinity of Rahui Rd, on the eastern side of the Otaki River upstream of SH 1. In its lower reaches the stream flows through Chrystalls Lagoon on the true right bank of the river within the floodplain in an area known as Chrystalls Bend. The lagoon is a man-made structure formed during construction of the river management works at Chystalls Bend. Waimanu Stream flows for a further 200 m (approximately) after exiting the lagoon before entering the main channel of the Otaki River at the downstream end of the bend.

Silt transported by the Waimanu Stream, and also carried into the lagoon during higher flows in the Otaki River is trapped by weed within the lagoon. This results in a gradual in-filling of the lagoon, and period excavation of silt is required approximately every 5 years in order to maintain it.

Diversion of Waimanu Stream and draining of the lagoon is necessary prior to excavation operations. Excavation is undertaken by a large excavator, and silt is loaded onto dumper trucks for transport to an off-site location for disposal.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region this activity requires resource consent. The activity is authorised under the granted resource consent for river management activities held by GWRC for the Otaki River.

Under the pNRP, this activity would require resource consent.

Key Potential Benefits

- Maintenance of flood carrying capacity of channel
- Maintenance of the aquatic habitat within the lagoon
- Maintenance of the amenity values associated with the lagoon

Key Potential Adverse Effects

- Short term loss of aquatic habitat by reduction of water levels and removal of substrate
- Removal of habitat and food sources for benthic invertebrates and fish
- Loss of vegetation cover and spawning vegetation for fish and invertebrates
- Accidental fish mortality
- Potential for release of nutrients trapped in sediment, resulting in adverse effects on water quality

Required Actions

- PRIOR TO COMMENCEMENT OF WORKS the need for a SSEMP and any site specific environmental monitoring as per Section 3.3 is assessed, and if necessary, actioned.
- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- The frequency of clearance is no more than is required to maintain the lagoon
- Works should be supervised by a suitably experienced person to ensure that:
  - diversion works ensure that the Waimanu Stream cannot enter the lagoon while excavation works are in progress, in order to minimise the release of sediment and debris downstream

- Ø an appropriate free-draining bucket is used
- Ø examination of excavated material is undertaken and any fish trapped by the works are recovered and relocated to clear water upstream of the works
- Ø where possible, at least one observer, in addition to the digger operator, is present to assist with finding, capturing and relocating of trapped fish
- Ø suspended sediment in the excavated pond is allowed to settle before the diversion of the Waimanu Stream through the lagoon is reinstated

Restrictions

Q To minimise adverse effects on fish, works should not be undertaken at any times specified in Table 11 to Table 15.

Silt excavation in Chrystalls Lagoon. Note use of self-draining weed bucket

7.4.23 Planting in the river bed: Willow poles and stakes

Description

This involves planting willow stakes or poles along the edges of river banks in the river bed and generally within the prescribed buffer zone adjacent to the design low flow channel, in order to bind and support the bank edge and so maintain a stable river alignment.

Branch growth also reduces water velocities at the bank edge which assists in erosion protection. For this reason trees may also be planted in association with other structural works (groynes or debris fences) to further reinforce these works.

Currently willow trees are the species considered most suitable for 'front-line' river edge river management, and willow planting forms an essential part of current river protection work nationwide. Willows are easy to establish, grow rapidly and form an intricate root system that is ideal for binding and strengthening river banks and structural measures such as permeable groynes and debris fences. They can also be 'layered' (i.e. cut and anchored in place on the river bank where they will re-grow). Generally, the same results cannot be achieved using native species. This means the most realistic alternatives to willows are likely to be structural works (e.g. rock lining), which involves higher costs and arguably increased environmental impact.

Planting is generally carried out between June and September. Four planting methods are used:

- By hand, using a crow bar. Willow stakes are cuttings 1 – 1.5 m long and approximately 2.5 cm in diameter. Stakes or poles (i.e. large cuttings more than 3 m long) are usually cut from existing stands.
- 'Rip planting' using an excavator or planting tine. The tine is dragged through the river bed at up to 1 m depth and the stakes/poles or rooted stock planted behind the moving tine. This is most commonly used where large areas of planting are required.
- 'Trench planting' using a digger. Willow poles are planted in a trench dug and backfilled by the excavator. This method is used where willows are planted in very dry areas or immediately adjacent to fast flowing water.
- Planting using a mechanical auger to prepare holes for stakes or poles.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region planting of crack and grey willow on the margins of rivers is a permitted activity, provided there is compliance with the prescribed permitted activity conditions.

According to the pNRP, planting of willows is a permitted activity, provided there is compliance with permitted activity conditions. The planting of crack and grey willow is permitted only in areas where these types are already predominant and which are not named as exclusion areas in the Plan.

Key Potential Benefits

- Improved stability and strength of buffer zone adjacent to active channels
- Maintenance of stable channel alignment
- Protection of infrastructure and assets located in the floodplain

Key Potential Adverse Effects

- Disturbance of river bed nesting birds and bird nesting habitat
- Temporary disturbance of recreational access and use

Required Actions

- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Sterile cultivars are to be use in all western rivers

- Sterile cultivars are to be used in Wairarapa Rivers.
- Planting works should be supervised by a suitably experienced person to ensure that:
  - Ø spacing and alignment of plantings is appropriate for the specific river and site
  - Ø a smooth river bed profile is left following planting, to ensure that flood flows are not constricted

Restrictions

- Q Planting works are not to be undertaken in the wet channel. (Note that on occasion planting does occur in areas of river bed that are covered with water by seepage and/or back flow. This does not include anywhere in the flowing channel and where work is undertaken in such wet areas, measures must be taken to minimise sediment entering the wet channel)
- Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with restrictions specified in Table 11 to Table 15.

Trench planting – Hutt River

Willow poles and stakes and layered willows – Hutt River

7.4.24 Construction & maintenance: Vegetative structures

Description

Vegetative structures include:

- Layered willows
- Tree groynes or 'clumps', which project out from the bank
- Tethered willows, placed along a bank edge

Willow layering involves felling large willows growing at the river edge (or bending and snapping using a digger) so that they lie obliquely towards the river in a downstream direction. The intent is to allow the willows to sucker from branches on the ground once they are covered in silt and gravel. The tree is wired to its stump to prevent it breaking off in a flood.

Tree groynes perform the same purpose as layered willows, but are constructed where there are no available trees at the bank edge. In this case, large willow or poplar trees are cut from a nearby source and placed in a shallow trench that has been excavated at the desired location. The trees are bundled with wire rope and securely fixed to driven railway irons and/or buried concrete block weights. The base of the trees are covered with gravel to encourage root growth, and willow poles are planted between the groynes.

Tethered willows are similar to tree groynes, but are placed alongside the bank edge to be protected, rather than jutting out into the river channel. Again, they may be held in place with wire ropes and concrete blocks.

Some initial site preparation is usually associated with construction of vegetative structures. Typically it may involve some excavation and/or mechanical disturbance of the river bed and bank, to provide access to the working area and to facilitate construction works.

Willow poles would normally be planted behind the tethered willows to facilitate the establishment of the buffer layer.

Layering is normally completed in the August – December period following completion of planting work.

Maintenance of existing layered and tethered trees usually involves strengthening by cabling-in additional tree material, and inter-planting with additional poles.

If existing vegetative structures (cabled willows & tree groynes) start to show signs of failure a decision may be made to remove them to reduce the potential for them to create a hazard during future floods. This would involve excavation using a hydraulic excavator, and removal from the river bed.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, layering and tethering of willows is a permitted activity, provided that it:

'(1) is not in a river, or part of a river, identified by Policy 4.2.10 (Appendix 2 – water bodies with a high degree of natural character); and

(2) extends into the available river bed width from the bank no more than whichever is the lesser of:
- 10% of the width of the water body; or
- 5 metres; and

(3) does not use crack willow, Salix fragilis, or grey willow, Salix cinerea, except on the margins of rivers where they are already predominant'

and provided that it complies with the prescribed permitted activity conditions. Any work not complying with these requirements would need resource consent.

Under the pNRP, placement and maintenance of structures associated with vegetative bank edge protection is a permitted activity, provided that prescribed permitted activity conditions (Rules R112 & R117) are complied with.

Key Potential Benefits

- Bank stability is enhanced and risk of erosion is reduced, protecting adjacent property and infrastructure
- Channel alignment is maintained
- River bed habitat stability is maintained
- River habitat diversity may be enhanced by shading afforded by overhanging vegetation, woody inputs to the stream, and shelter afforded by tree roots at the bank edge

Key Potential Adverse Effects

- During construction:
  - Ø disturbance of river bed habitat
  - Ø release of suspended sediment to the river
  - Ø deposition of sediment downstream
  - Ø temporary loss of riparian vegetation
  - Ø disturbance of recreational use
- Long term:
  - Ø cumulative effect of reduction in the overall natural appearance of the river bank and river corridor associated with willow use

Required Actions

- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- The person responsible for supervising on-site works must ensure:
  - Ø all staff are aware of the risks involved in this work and the safety practices that must be observed
  - Ø only the minimum area needed to complete the work is disturbed
  - Ø tether anchors are tied with wire rope extending in a downstream direction (as this prevents willows from shifting; if ties are placed extending in an upstream direction there is the potential for slack in the tie to remain)
- Hybrid stock will be planted in areas where crack willows are removed, to provide sterile stock for future use.

Restrictions

- Q Crack willows will not be used in areas where they do not already occur.
- Q To protect aquatic ecology and habitat, works should not be undertaken in the actively flowing channel at any sites or at any times specified in Table 11 to Table 15
- Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with restrictions specified in Table 11 to Table 15.

Tethered willows and tree groynes – Hutt River

Tethered willows and tree groynes – Hutt River

7.4.25 Maintenance of riparian vegetation: Mowing from the river bed

Description

Mowing of river berms is generally done from the bank, and does not require the operation of machinery in the river bed. However, in a few places where access is restricted, mowing of the river berms may need to be undertaken from the river bed. In such instances, it may also be necessary to gain site access via the river bed – refer to general good practice sheet on formation of access for further guidelines.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, entry or passage across the river bed is a permitted activity.

Under the pNRP, entry or passage across the river bed is a permitted activity provided that the prescribed permitted activity conditions are complied with (Rule 124).

Key Potential Benefits

- Channel capacity is maintained
- Amenity values and recreational access is maintained

Key Potential Adverse Effects

- Disturbance of river bed and river bed habitat
- Reduction or removal of bankside vegetation providing shade to the adjacent aquatic habitat
- Minor release of suspended sediment to the river
- Disturbance of recreational use

Required Actions

- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Only a rubber-tyred machine will be used, to minimise disturbance of the stream bed

Restrictions

Q Mowing from the stream channel will only be done in the following locations:
  - o Stokes Valley Stream
  - o Porirua Stream

Mowing – Stokes Valley Stream

7.4.26 Maintenance of riparian vegetation: Trimming & mulching of bankside vegetation from the river bed

Description

Maintenance of willow plantings on the river edge would generally involve removal of unstable trees and mulching to:

- maintain channel capacity by preventing the lateral spread of edge plantings into the channel
- clear survey sight lines
- maintain recreational access to the river

Mulching of standing willows in the buffer zone can be used as an alternative to layering, to prevent the trees becoming too large and unstable. Although initially this may be visually unsightly, the effects are short-lived as willow rejuvenation proceeds.

Mulching is also used to prepare areas for planting.

Clearance may be done by a mower/mulcher mounted on an excavator and/or by hand.

Resource Management Act 1991

Under the current Regional Freshwater Plan for the Wellington Region, entry or passage across the river bed, and removal of vegetation from the river bed are permitted activities.

Under the pNRP, entry or passage across the river bed, and removal of vegetation from the river bed are permitted activities provided that the prescribed permitted activity conditions are complied with (Rule 122).

Key Potential Benefits

¨ Channel capacity is maintained
¨ Bank stability is maintained
¨ Accurate survey of the bank edges is facilitated
¨ Access for recreation is maintained

Key Potential Adverse Effects

¨ Loss of riparian vegetation and consequently, inputs of woody material, leaves and insects to the aquatic environment
¨ Reduction in riparian shading of the river
¨ Loss of shelter or spawning sites for fish or aquatic invertebrates
¨ Disturbance of recreational use
¨ Reduction in amenity values until vegetation re-grows

Required Actions

¨ Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
¨ Ideally mulching should be undertaken when trees are dormant (i.e. before spring growth is occurring)
¨ Works should be undertaken from the bank, or from dry beaches, rather than from within the active channel wherever possible
¨ Trimmed vegetation should be mulched on-site, or disposed of in a suitable location away from the river, where they will not be washed into the channel and create obstructions downstream

Restrictions

Q To protect river bed nesting birds and nesting habitat, works undertaken on dry river beds must comply with restrictions specified in Table 11 to Table 15.

7.4.27 Construction of structures and tracks on berms

Description

Construction works are mostly associated with development of the river trails and implementation of works on the river berms and stopbanks, in accordance with specific environmental strategies for particular rivers.

Minor works associated with management or improvement of the riparian margins are also included; this may include erection of footbridges, boundary fences.
Associated with this work there may be a requirement for new stormwater culverts under trails, and drainage channels constructed across the river berms to carry stormwater to the river.

Resource Management Act 1991

The current Regional Freshwater Plan for the Wellington Region does not apply to activities undertaken outside the river bed.
The Regional Soil Plan for the Wellington Region applies to land disturbance on areas lying outside of the river bed. In this situation, the activities are generally permitted, provided any earthworks fall within the limits prescribed.
Under the pNRP, disturbance of land outside of river beds is a permitted activity, provided it complies with the permitted activity conditions relating to earthworks (Rule 99).

Key Potential Benefits

- Access for recreation or other purposes is improved
- Amenity values are improved

Key Potential Adverse Effects

- Short-term disturbance of recreational use while works are undertaken
- Ground disturbance and associated sediment entrainment in stormwater runoff
- Reduction in the natural appearance of the river corridor

Required Actions

- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Structures must be designed and approved by a suitably qualified person to ensure in particular that:
  - Ø the works are in accordance with any FMP, Environmental or Ecological Strategy, or Operational Management Plan
  - Ø construction materials are compatible with the river environment and are clean and free of soil, mud, clay or other soluble debris that could be washed into the river
  - Ø future maintenance and access requirements are considered with a view to minimising on-going disturbance of the river bank and riparian zone
- Construction should be supervised by a suitably experienced person to ensure that:
  - Ø all works are undertaken in accordance with the design requirements noted above.

Constructing fences on the Hutt River berm

7.4.28 Maintenance of berms, stopbanks, structures and tracks on berms

Description

Includes:

- Reinstatement of damage to stopbanks & berms that may have been caused by flooding, rainfall runoff or vandalism. The intention of this work is to reinstate the berm or stopbank to its original height/profile
- Minor repairs to and general maintenance of footbridges, fences, culverts and other minor structures
- Mechanical cleaning of stormwater channels

Generally, repairs of berms or stopbanks will involve the placement of suitable fill in layers. Fill may be sourced either from beaches on the river bed or from elsewhere, depending on design requirements. The intention is to reconstruct the berm to a similar height and alignment prior to erosion. Following reconstruction, the berm will be replanted as appropriate, and stopbanks will be topsoiled and re-grassed.

Resource Management Act 1991

The current Regional Freshwater Plan for the Wellington Region does not apply to activities undertaken outside the river bed.
The Regional Soil Plan for the Wellington Region applies to land disturbance on areas lying outside of the river bed. In this situation, the activities are generally permitted, provided any earthworks fall within the limits prescribed.
Under the pNRP, disturbance of land outside of river beds is a permitted activity, provided it complies with the permitted activity conditions relating to earthworks (Rule 99).

Key Potential Benefits

- Flood protection assets are maintained in good order
- The risks of damage to berms and stopbanks from storm events are reduced
- Amenity values are maintained

Key Potential Adverse Effects

- Short-term disturbance of recreational use while works are undertaken
- Ground disturbance and associated sediment entrainment in stormwater runoff

Required Actions

- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Works should be supervised by a suitably experienced person to ensure that:
  - all works are undertaken in accordance with any specific design requirements (where repairs involving earthworks are to be undertaken)
  - sediment and erosion control measures are put in place where earthworks are to be undertaken
  - any trimmed vegetation is mulched on-site or disposed of away from the river to ensure it cannot be carried away by future flooding
  - stormwater drains are cleared when dry, wherever possible, to minimise discharges of sediment to the river.

Grading river trail – Hutt River

Stormwater channel clearance – Hutt River

7.4.29 Planting on berms

Description

Planting is undertaken on river berms to complement erosion protection structures and river edge plantings, and to establish a suitable vegetative buffer to support the bank edges and assist in maintenance of a stable river alignment.

Generally willows will only be used within the 20 - 30 m wide buffer zone closest to the river. Behind this buffer, native trees can also be used to supplement or replace willow plantings, and for any amenity or other planting undertaken in accordance with the FMP, Environmental or Ecological Strategy, or Operational Management Plan for the river.
Planting is generally carried out between June and September. For willows, four planting methods are used:

- By hand, using a crow bar.
- 'Rip planting' using an excavator or planting tine. The tine is dragged through the river bed at up to 1 m depth and the stock planted behind the moving tine. This is most commonly used where large areas of planting are required.
- 'Trench planting' using a digger. Willow poles or rooted plant stock are planted in a trench dug and backfilled by the excavator.
- Planting using a mechanical auger to prepare holes for stakes/poles or rooted stock.

Native trees are planted either by hand using a spade, or mechanically, with the use of a small digger – depending on plant size.
Site preparation, in the form of spraying or mulching may also be required.

Resource Management Act 1991

The current Regional Freshwater Plan for the Wellington Region does not apply to activities undertaken outside the river bed.

The Regional Soil Plan for the Wellington Region applies to land disturbance on areas lying outside of the river bed. In this situation, the activities are generally permitted, provided any earthworks fall within the limits prescribed.
Under the pNRP, disturbance of land outside of river beds is a permitted activity, provided it complies with the permitted activity conditions relating to earthworks (Rule 99).

Key Potential Benefits

- Improved stability and strength of berms
- Maintenance of stable channel alignment
- Protection of infrastructure and assets located in the floodplain

Key Potential Adverse Effects

- Temporary disturbance of recreational access and use
- Reduction in natural biodiversity associated with use of willow

Required Actions

- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Prior to approval of any planting plan, managers or site supervisors should assess both the necessity for the planting and the suitability of the proposed plant types in relation to the objectives and directions of any relevant FMP, Environmental or Ecological Strategy, or Operational Management Plan for both the river corridor and the affected site

- Restrict willow planting to the buffer zone at the river edge. This is generally 20 – 30 m wide.
- Only use sterile willow cultivars for willow planting in western rivers
- Use sterile willow cultivars wherever possible in Wairarapa rivers
- Consider the use of native trees behind frontline plantings wherever practicable. Assessment of practicability includes consideration of:
  - Ø the availability of a care group to assist with establishment of the plantings
  - Ø the need for spray release of native plants, and the cost of this work
  - Ø the availability of suitable stock (plants in keeping with any ecological objectives for the river corridor and eco-sourced)
  - Ø the need for fencing
- Construction should be supervised by a suitably experienced person to ensure that:
  - Ø all works are undertaken in accordance with the design requirements noted above

Planted willows above river bed – Waikanae River

Rip planting on berm – Hutt River

Trench planting on berm – Wainuiomata River

Planting willow poles in buffer zone; native planting in foreground

School children planting native trees

7.4.30 Maintenance of riparian vegetation

Description

This includes:

- Mulching of vegetation
- Removal of damaged or dead trees
- Mowing of berms

where machinery is operated on the banks, away from the river bed.
Also see the relevant good practice sheet for Agricultural Chemical Spraying (Sheet 7.6).

Resource Management Act 1991

The current Regional Freshwater Plan for the Wellington Region does not apply to activities undertaken outside the river bed.
The Regional Soil Plan for the Wellington Region applies to the removal of vegetation from areas lying outside of the river bed. In this situation, the activities are generally permitted, provided the total amount of vegetation removed falls within the limits prescribed.
Under the pNRP, clearance of vegetation is a permitted activity, provided that prescribed permitted activity conditions are complied with.
Spraying may require a resource consent depending on the method of application (to be clarified).

Key Potential Benefits

- Flood protection assets are maintained in good order
- Amenity values are maintained in the longer term

Key Potential Adverse Effects

- Short-term disturbance of recreational use while works are undertaken
- Ground disturbance and associated sediment entrainment in stormwater runoff
- Short-term reduction in visual amenity

Required Actions

- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)

Mulching scrubby vegetation

Mowing of berms – Hutt River

7.4.31 River mouth cutting

Description

This involves periodic cutting of a new opening at the mouth of specific rivers, including excavation and redistribution of sand on the foreshore and seabed (i.e. within the Coastal Marine Area). Areas of beach (i.e. above the MHWS water level, and thus outside the Coastal Marine Area) may also be disturbed, both by vehicle tracking, excavation and redistribution of sand.

Resource Management Act 1991

River mouth cutting is permitted by the Regional Coastal Plan for the Wellington Region provided that it is undertaken in accordance with defined trigger levels in the following watercourses:

- Waitohu Stream
- Otaki River
- Mangaone Stream
- Hadfield Drain
- Waimeha Stream
- Tikotu Stream
- Wharemauku Stream
- Whareroa stream
- Wainui Stream
- Waikakariki Stream
- Makara Stream
- Lake Onoke
- Unnamed Stream, approximately 190 m south of the seaward end of Sunrise Way, Riversdale
- Unnamed Stream, approximately 145 m north of the seaward end of Sunrise Way, Riversdale
- Unnamed Stream at the seaward end of Karaka Drive, Riversdale
- Motuwaireka Stream
- Castlepoint Stream

GWRC holds resource consent for river mouth cutting in the Waikanae River. Under the pNRP, cutting of the mouth of the above-named rivers and streams is a permitted activity provided prescribed permitted activity cconditions are complied with, and the following are also included: Motuwaireka Stream, Castlepoint Stream, Whakataki River, Tikotu Stream, Waikanae River, Lake Kohangapiripiri, and Lake Kohangatera.

Key Potential Benefits

- River mouth alignment is maintained
- Capacity to safely convey flood waters is maintained or improved
- Assets, infrastructure and property adjacent to the river mouth are protected from erosion

Key Potential Adverse Effects

- Short-term disturbance of foreshore and seabed and associated habitat
- Short-term reduction in visual clarity in adjacent coastal water due to entrained fine sediment
- Short-term reduction in recreational access
- Short-term reduction of estuarine habitat and associated ecological values

Required Actions

- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Undertake works in accordance with the methodology described below

Restrictions

Q No sand or other material is to be removed from beach or foreshore areas or the sea bed

Methodology

- The new alignment is positioned directly downstream of the centre of the design channel alignment. A trench is excavated to form a pilot channel, and the excavated sand is used to block off the wet channel. The pilot channel is not connected to the main channel at this stage. This work is undertaken at low tide when the sand is firmer and the machinery does not need to work in water
- Water ponds in the upstream channel until the following low tide, when the block in the pilot channel is removed, releasing the ponded water upstream into the new channel. The new channel is then deepened and widened naturally by the river flow.
- The material excavated during the cutting of the new channel is to be spread on the foreshore to assist in the realignment of the river outlet and/or erosion control at the outlet.
- Generally the work will involve the use of hydraulic excavators, loaders and a dump truck.
- Ideally the operation should be undertaken during low flows and at spring tides when tidal variation is largest. The operation should be completed over a single 24 hour period.

Otaki River mouth – pilot channel formation

Otaki River mouth – cut under construction

Otaki River mouth – releasing bund

Otaki River – Cut completed

Waimeha Stream mouth – formation of bund to block mouth

Waimeha Stream mouth – pilot channel under construction

Waimeha Stream mouth – completed channel, diversion open

Waikanae River mouth cut

7.4.32 Maintenance of structures in the CMA

Description

This may involve repairs to:

- rock groynes
- rock lining
- training walls

and

- clearance and repair of debris arresters

which are located in the CMA at the mouths of rivers.

Typically, it involves replacement of rock that has been moved or eroded out by flood action. Such work can generally be undertaken without the need to operate machinery in the flowing channel. Occasionally structures may need to be partially reconstructed, which may require more extensive work, including the operation of machinery in the flowing channel.

Resource Management Act 1991

Under the current Regional Coastal Plan, minor repairs, maintenance or alteration to existing structures in the CMA, and also demolition of structures are permitted activities, subject to prescribed permitted activity conditions. Resource consent is required for more extensive repairs and maintenance that cannot comply with the permitted activity conditions.
Under the pNRP, minor repairs, maintenance or alteration to existing structures in the CMA, and also demolition of structures are permitted activities, subject to prescribed permitted activity conditions. Resource consent is required for more extensive repairs and maintenance that cannot comply with the permitted activity conditions.

Key Potential Benefits

- River mouth alignment is maintained
- Capacity to safely convey flood waters is maintained or improved
- Assets, infrastructure and property adjacent to the river mouth are protected from erosion

Key Potential Adverse Effects

- Short-term reduction in recreational access
- If machinery is operated in the flowing channel:
  - disturbance of foreshore and seabed and associated habitat
  - reduction in visual clarity in adjacent coastal water due to entrained fine sediment
  - loss of riparian vegetation and associated habitat

Required Actions

- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Construction materials used in repairs should be compatible with the existing structure
- All surplus materials will be removed from the site at the end of works, and the structure and works area will be left in a tidy and safe state

Restrictions

- Any in-river works must comply with the restrictions noted in Table 11 to Table 15.

7.5 Agricultural Chemical Spraying

Description

Spraying with agricultural chemicals (agrichemicals) is one method of controlling and removing weeds and other unwanted vegetation on river beds, banks and berms.

Key Potential Benefits

- The capacity of the river corridor to safely convey flood waters is maintained or improved
- Control of weeds facilitates access to, and maintenance of, river management assets and infrastructure
- Control of weeds contributes to reduction of the costs, nuisance and problems of weed invasion on privately owned property adjacent to the river

Key Potential Adverse Effects

- Short-term reduction in recreational access while spraying is occurring
- Possible adverse effects on aquatic ecology if not effectively managed

Resource Management Act 1991

Weed control on river banks, berms, and areas of river bed by agrichemical spraying has the potential to release droplets to the air which can affect human and aquatic ecosystem health and surface water quality. The controls on this activity required to manage such adverse effects are outlined as follows:

Agrichemicals are defined as follows:

- in the operative Regional Air Quality Management Plan (AQMP) as *any substance, whether inorganic or organic, manufactured or naturally occurring, modified or in its original state, that is used in any agriculture, horticulture, forestry, management of public amenity areas, or related activity, to eradicate, or control flora or fauna. Fertilisers are explicitly excluded from this definition*.

The relevant regional rule requirements are in Rule 1 of the AQMP (Rule 1).

Rule 1 - Air Quality Management Plan

[Note that the AQMP was developed before the National Environmental Standards for Air Quality came into effect in 2004, and prior to development of industry best practice guidelines for activities such as the use of agrichemicals].

According to Rule 1, the discharge of contaminants into air in connection with land-based application of agrichemical spray and powder by various methods, outside of adjacent private properties and areas of public assembly, is a permitted activity.

Rule 1 sets out eleven conditions ((i)-(xi)), which variously apply according to each of four defined methods for land-based agrichemical application. The four methods and the applicable conditions are:

1) application with a hand operated and manually pumped knapsack containing < 20 litres: *Conditions (i)-(vi)*
2) application with anything other than (1), and where the site is not located within 50 metres of adjacent property or places of common public assembly: *Conditions (i)-(vi)*

3) application with anything other than (1), and where the site is located within 50 metres of adjacent property or places of common public assembly: *Conditions (i)-(viii)*
4) application by any method in public areas and along public roadways: *Conditions (i)-(vi), and (ix)-(xi)*

Method 1) is often used in river management in the western part of Wellington Region; whereas Method 3) is used for the majority of all river and drainage scheme spray maintenance work in eastern parts of the Region; in these circumstances agrichemical is applied with a hand-held hose and nozzle applicator supplied from a vehicle-mounted spray container of about 350 litre capacity. Method 4), also more common in eastern areas, is used where segments of drainage schemes lie adjacent to public roadways.

Required Actions

- Managers and on-site works supervisors must implement all general good practice methods (Sheets 7.3.1 to 7.3.15 and Table 11 to Table 15)
- Undertake works in accordance with the methodology described below

Methodology

In general, river management spraying activities must be aligned with industry best practice, as documented in NZS 8409:2004 Management of Agrichemicals, and prescribed in Flood Protection Department's SOP 16 - Agrichemical Spraying.

7.6 Urgent Works

Urgent works are measures taken to address an immediate river management issue or problem where erosion or flooding is placing flood protection structures, other infrastructure or property under direct threat of damage.

Urgent works are often temporary measures, such as placement of rock, or diversion of the wet channel, to provide a 'stop-gap' solution until a more permanent solution to the problem is put in place.

In such cases, it may not be possible to adhere to all the good practice guidelines of the Code of Practice. However, the following will still apply:

- GWRC will notify iwi and ensure appropriate action is taken as soon as possible if sites of significance to them are affected.
- Construction materials used for urgent works will be compatible with the environment (i.e. no concrete rubble or car bodies or other foreign material)
- It is still expected that machinery used for urgent works will comply with the guidelines relating to operation of machinery contained in the Code
- It is expected that all FP staff will comply with the guidelines relating to safety contained in the Code.

7.7 New Method Trials

- The Flood Protection Department will wish to trial new methods, activities or strategies for river management from time to time as those methods are developed.
- Before any new method or activity is considered for inclusion in the Code of Practice it will undergo a full appraisal and reporting by the Flood Protection Department via an established process that has been agreed in advance with the Environmental Regulation Department. The appraisal process may include on-site trials of the new method or activity.
- Prior to undertaking any trial of a new method or activity, the Flood Protection Department will determine:
- The purpose of the trial
- The site or sites at which the trial will be undertaken
- The times when the trial will be undertaken and the total length of time expected to undertake the trial
- The expected effects or outcomes of the trial
- The parameters by which any outcomes of the trial will be measured
- Any environmental monitoring that will be required to measure the progress or success of the trial
- The people who will be responsible for evaluating the trial and any specialist expertise that may be required
- The results of any new method or activity trials will be included in the Annual Review process (see Section 4), and any decision to include the new method or activity in the Code will be made according to that review process.

8. Glossary

Active channel Active bed	The area of river bed which is affected by the river processes of flows, sediment transport and the alteration of bed form during flood events. This area is extended and reduced by these processes. A river may have a single well-defined active channel, or the river bed may be made up of a number or many interconnected active channels within an overall active bed area. Hence the active area is referred to either as an active channel or active bed depending on the type of river. Outside of flood events, the active channel is normally only partially covered by flowing water, which is contained in low flow channels (see below).
Accretion	A deposition of material on the river bed or adjacent berm land, caused by the movement of bed material by river flows, or from the settling out of material suspended in flood flows.
Aggradation	An increase in the general level of the active river bed through a build-up of bed material sediments. This may arise because a pulse of bed material is moving through a reach or due to changes in river processes affecting the transport of bed material.
Armouring	A surface layer of larger sized particles within the active bed which arises from the selective transport and deposition of bed material on the recession of flood events. This surface layer is packed in a downstream direction, and is more resistant to removal and entrainment by subsequent flood flows.
Bank	A defined feature at the edge of a channel, generally with a steep slope, that contains flood flows. There is generally a well-defined bank at the edge of the active channel or bed.
Bar	An elevated area of bed material that is formed from sediment deposition and movement. It may be a point bar formed by progressive deposition on the inside of a bend, or a lateral bar formed along the channel by downstream deposition.
Beach	A general term for areas of deposited bed material within the active bed that are relatively clear of vegetation, often lying between the low flow channel(s) and the banks.
Berm	An area of relatively low lying land within a waterway beyond the active channel or bed areas, and generally from a bank landwards to a higher natural feature, or flood-containing stopbank. Berms generally have some form of vegetative cover. They are flooded relatively frequently and provide additional flood capacity, while accommodating erosion embayments and active channel migration.

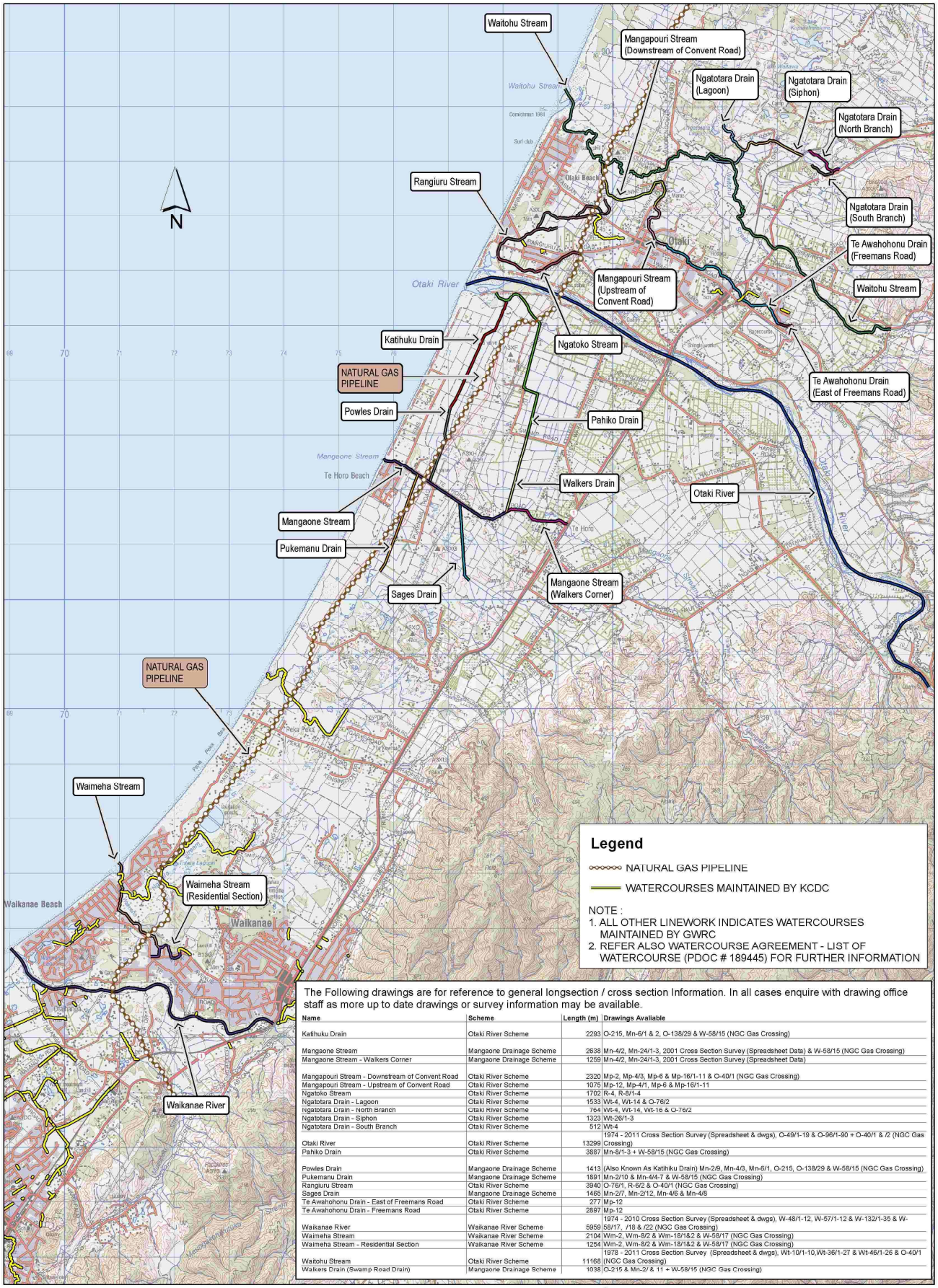
Braided river	A gravel bed river which has multiple channels in the active bed area that continually shift and re-form in flood events. The channels in this type of river are generally shallow and highly mobile, and hence the active river bed area is kept relatively clear of vegetation.
Buffer zone	A management term referring to vegetation zones on berm land extending landward from the outer edge of the active channel or bed, and within a wider river corridor. The buffer zone provides for diffuse containment of flood flows, and a flexible edge that allows for some movement of active channels as scour and deposition takes place in flood events. The vegetation gives rise to some resistance to erosion, but still allows for channel migration. The inner edge of the buffer is a flexible boundary of the active river channel or bed, allowing a give and take of the active bed as river channels meander and migrate. Generally the buffer zone vegetation includes trees that can be maintained and replaced through a management programme. Buffers may also be strengthened by the construction of various erosion mitigation structures (groynes, debris fences, bank edge protection) depending on management objectives at a particular site or reach.
Channel distortion	A tight or contorted channel form associated with disrupted sediment transport, caused by constrictions, sharp deflections and compressed meandering from natural features or human constructions.
Cross-over	Generally a riffle or run area, where the low flow channel crosses over from one side of a channel to the other. When the channel is narrow or constraining this crossing over can be at a sharp angle to the channel banks.
Degradation	A decrease in the general level of the active river bed through a removal of bed material sediments. This may arise because a pulse of bed material has moved through a reach or due to changes in river processes affecting the transport of bed material.
Design channel Design fairway	A management term referring to a defined alignment and width for the active channel or bed of a river reach. The design channel or bed width is derived from an understanding of the particular form and behaviour of the river along a given reach. It is based on the actual form and behaviour of the reach over time, and relationships between flood flows, channel slope and bed material size. The layout of a design channel or fairway within a river corridor is guided by an understanding of channel migration and meander wave forms, taking account of natural and artificial controls and constraints on the existing (actual) bed width and alignment. The outer boundaries of the design channel or fairway are intended to provide a guideline for management of the river, while allowing for changes in the river bed from channel migration and meandering. The term fairway is used when flow channels can migrate, split and re-form within the defined active bed area. Generally, braided and semi-braided river reaches would have design fairways, while meandering and alternating bar reaches would have design channels. The design width and alignment should be re-examined if there are significant changes to the river form following flood events.

Dominant flood flow	A flood flow used in meander formulae as a representative flow for the power of flood events. The 2 year return period flood flow is generally used for this flood flow.
Dominant flow meander	Meanders arising from the action of flood flows when the bed material is fully activated by these flood flows. Within the area of these meanders, smaller channels are normally present, that relate to threshold of motion meanders (see below). These smaller channels are formed when the bed material is not fully activated by flood flows, and they form and migrate within the wider dominant flow meanders at lower flows on the recession of flood events.
Erosion	The removal of material from channels, banks and berm land due to river processes during flood events.
Erosion embayment	An erosion bay carved out of a channel bank or berm by the erosive action of flood flows.
Flooding/Flood	Inundation of an area outside the usual low flow channel or channels of a river, due to runoff from a rainfall event or events.
Floodplain	The area of generally flat or low lying land adjacent to a river or stream that is covered by floodwater during periods of high river flow.
Hydromorphology	The study of river form and behaviour, involving consideration of both hydrology and geomorphology of the river and its catchment. The hydromorphology of a river at any particular time represents the legacy of past interactions of geological, climatic and human influences on the river and its catchment, as well as the current climatic and landscape conditions and human land uses and infrastructure. River ecology depends on and is related to the hydromorphological characteristics of river reaches, and the maintenance or enhancement of river habitats is informed by an understanding of both the hydrology and geomorphology of rivers.
Low flow channel	The deeper channel or channels within the overall active channel or river bed that contains the low flows between flood events.
Management intervention	Deliberate actions taken to change some aspect of the form, structure or vegetative cover of river channels, bed and berm areas or buffer zones for the purposes of achieving defined and agreed objectives.
Meander	A curved river channel, in planform, that has a wave form and moves as a whole due to the processes of flood flows, sediment transport and the associated scour and deposition of the channel bed and banks.
Meandering river	A river that has a single channel with a meandering form, which moves as a whole in a downstream direction over time.

Natural character	The form and behaviour of a river reach that arise from the dynamic interaction of the physical and biological processes of waterway systems. Natural character is influenced by the physical form of the river bed and channels, the nature of the sediments making up the bed and banks, the hydrological regime, and the riparian and aquatic ecology associated with the river or river reach. Natural character is not fixed, but varies over time and space, as the influencing factors and their patterns of interaction change.
Pool	An area of the low flow channel where the depth is relatively greater and the velocity of the flow is lower than in the surrounding parts of the river.
Reach	A length or section of a river that has a uniformity or consistency in terms of its physical and biological characteristics, or is delineated by specific river features.
Riffle	An area of the low flow channel that is shallow and steep with higher flow velocities and unbroken standing waves over the bed material of the river. The flow in a rapid is more turbulent, with steep broken standing waves.
River corridor	A management term referring to the space that is set aside within the floodplain for the river to move with the minimum practical intervention. It is generally defined by reference to the natural character of the river reaches and the natural processes that give rise to changes in river beds and their migration over time. The outer boundary of the river corridor defines the separation between the assets and activities of people and the forms and behaviour of the river. It includes the active channel or bed, vegetation buffer zones and reserve areas to accommodate bed widening over time due to changing circumstances. The bed form and river type may change over climatic and sediment supply cycles, and then management practices within the corridor must change in response.
River edge envelope	A management term referring to an area between defined limits within which the outer edge of the active channel is allowed to migrate under different flow conditions, with a minimum of management intervention.
Run	An area of the low flow channel with a relatively fast consistent flow and shallow depths. Runs form downstream of riffles or between pools.
Semi-braided river	A gravel bed river that has a generally defined main channel but also secondary channels that migrate in flood events within the area of gravel bars/beaches and islands. Flows into side or back channels can activate these areas and alter the area of activity and relatively clear gravel bed. The lateral extent of the active bed of this type of river is often difficult to exactly define, due to the variability and types of vegetation on the river bed and adjacent berm land.

Threshold of motion meander	The smallest meandering channels of a gravel-bed river, which form the low flow channels within the wider channel or bed area of the dominant flow meanders (see above). They are formed by the interaction of flood flows with the bed material, and are present where the resistance to movement of the bed material prevents full mobilisation of the bed. They may be the main form of the river channel that migrates slowly in most flood events, or form on the recession of flood events that have fully activated the river bed.
Thalweg	The line of deepest flow along the length of a channel or river bed. It is defined by drawing a line between the lowest points of successive cross-sections along a river channel.

Appendix 1: Watercourses maintained by GWRC



The Following drawings are for reference to general longsection / cross section Information. In all cases enquire with drawing office staff as more up to date drawings or survey information may be available.

Name	Scheme	Length (m)	Drawings Available
Katihuku Drain	Otaki River Scheme	2293	O-215, Mn-6/1 & 2, O-138/29 & W-58/15 (NGC Gas Crossing)
Mangaone Stream	Mangaone Drainage Scheme	2638	Mn-4/2, Mn-24/1-3, 2001 Cross Section Survey (Spreadsheet Data) & W-58/15 (NGC Gas Crossing)
Mangaone Stream - Walkers Corner	Mangaone Drainage Scheme	1259	Mn-4/2, Mn-24/1-3, 2001 Cross Section Survey (Spreadsheet Data)
Mangapouri Stream - Downstream of Convent Road	Otaki River Scheme	2320	Mp-2, Mp-4/3, Mp-6 & Mp-16/1-11 & O-40/1 (NGC Gas Crossing)
Mangapouri Stream - Upstream of Convent Road	Otaki River Scheme	1075	Mp-12, Mp-4/1, Mp-6 & Mp-16/1-11
Ngatoko Stream	Otaki River Scheme	1702	R-4, R-8/1-4
Ngatotara Drain - Lagoon	Otaki River Scheme	1533	Wt-4, Wt-14 & O-76/2
Ngatotara Drain - North Branch	Otaki River Scheme	764	Wt-4, Wt-14, Wt-16 & O-76/2
Ngatotara Drain - Siphon	Otaki River Scheme	1323	Wt-26/1-3
Ngatotara Drain - South Branch	Otaki River Scheme	512	Wt-4
Otaki River	Otaki River Scheme	13299	1974 - 2011 Cross Section Survey (Spreadsheet & dwgs), O-49/1-19 & O-96/1-90 + O-40/1 & /2 (NGC Gas Crossing)
Pahiko Drain	Otaki River Scheme	3887	Mn-8/1-3 + W-58/15 (NGC Gas Crossing)
Powles Drain	Mangaone Drainage Scheme	1413	(Also Known As Katihiku Drain) Mn-2/9, Mn-4/3, Mn-6/1, O-215, O-138/29 & W-58/15 (NGC Gas Crossing)
Pukemanu Drain	Mangaone Drainage Scheme	1891	Mn-2/10 & Mn-4/4-7 & W-58/15 (NGC Gas Crossing)
Rangiuru Stream	Otaki River Scheme	3940	O-76/1, R-6/2 & O-40/1 (NGC Gas Crossing)
Sages Drain	Mangaone Drainage Scheme	1465	Mn-2/7, Mn-2/12, Mn-4/6 & Mn-4/8
Te Awahohonu Drain - East of Freemans Road	Otaki River Scheme	277	Mp-12
Te Awahohonu Drain - Freemans Road	Otaki River Scheme	2897	Mp-12
Waikanae River	Waikanae River Scheme	5959	1974 - 2010 Cross Section Survey (Spreadsheet & dwgs), W-48/1-12, W-57/1-12 & W-132/1-35 & W-58/17, /18 & /22 (NGC Gas Crossing)
Waimeha Stream	Waikanae River Scheme	2104	Wm-2, Wm-8/2 & Wm-18/1&2 & W-58/17 (NGC Gas Crossing)
Waimeha Stream - Residential Section	Waikanae River Scheme	1254	Wm-2, Wm-8/2 & Wm-18/1&2 & W-58/17 (NGC Gas Crossing)
Waitohu Stream	Otaki River Scheme	11168	1978 - 2011 Cross Section Survey (Spreadsheet & dwgs), Wt-10/1-10,Wt-36/1-27 & Wt-46/1-26 & O-40/1 (NGC Gas Crossing)
Walkers Drain (Swamp Road Drain)	Mangaone Drainage Scheme	1038	O-215 & Mn-2/ & 11 + W-58/15 (NGC Gas Crossing)

KAPITI MINOR WATERCOURSES MAINTAINED BY GWRC

DWG File Ref : O-214-01.mxd

A3 Scale 1 : 60,000 0 0.45 0.9 1.8 Kilometers

greater WELLINGTON THE REGIONAL COUNCIL

File Ref : N / 60 / 1 / 1
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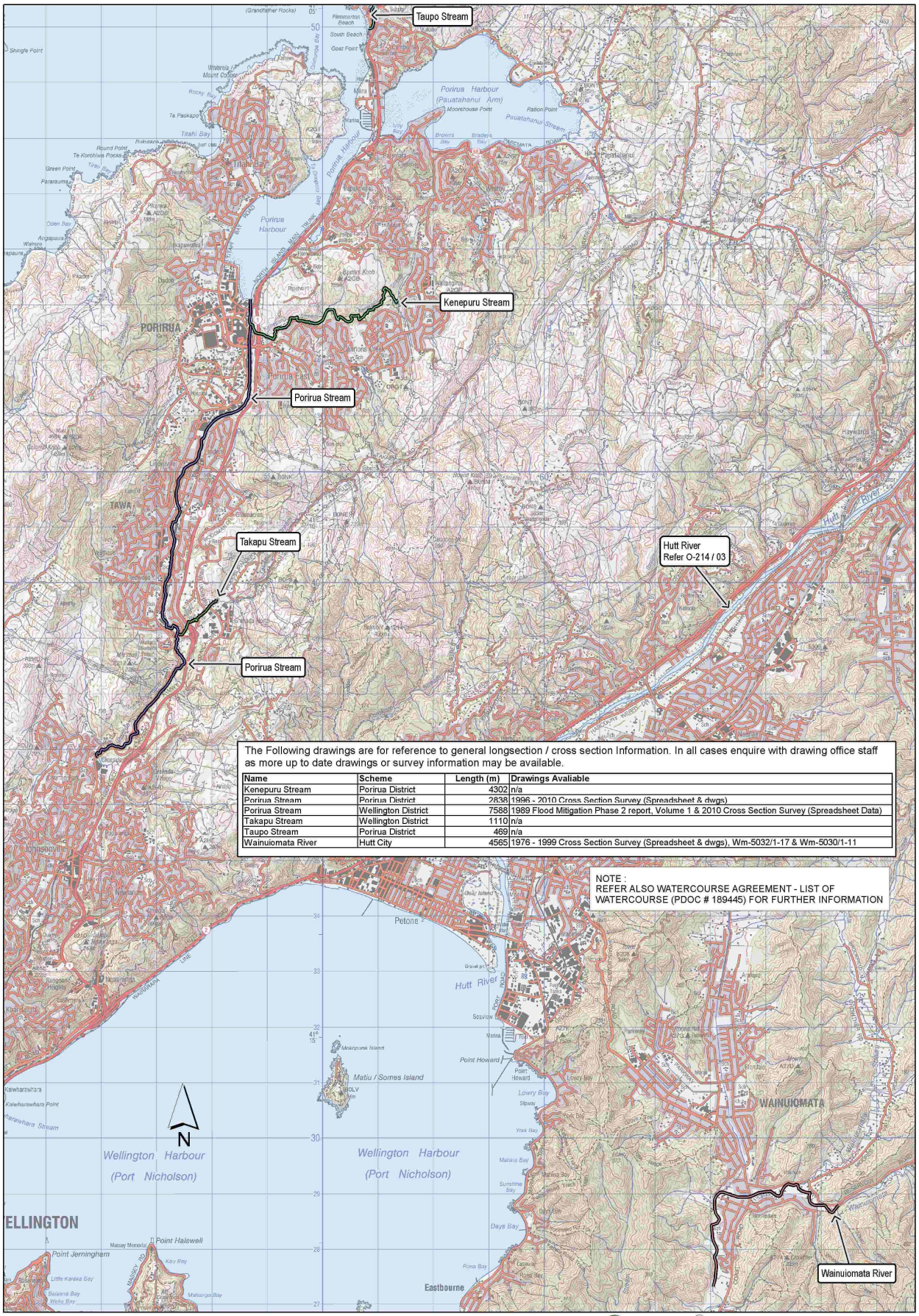

The Following drawings are for reference to general longsection / cross section Information. In all cases enquire with drawing office staff as more up to date drawings or survey information may be available.

Name	Scheme	Length (m)	Drawings Avaliable
Kenepuru Stream	Porirua District	4302	n/a
Porirua Stream	Porirua District	2838	1996 - 2010 Cross Section Survey (Spreadsheet & dwgs)
Porirua Stream	Wellington District	7588	1989 Flood Mitigation Phase 2 report, Volume 1 & 2010 Cross Section Survey (Spreadsheet Data)
Takapu Stream	Wellington District	1110	n/a
Taupo Stream	Porirua District	469	n/a
Wainuiomata River	Hutt City	4565	1976 - 1999 Cross Section Survey (Spreadsheet & dwgs), Wm-5032/1-17 & Wm-5030/1-11

NOTE :
REFER ALSO WATERCOURSE AGREEMENT - LIST OF WATERCOURSE (PDOC # 189445) FOR FURTHER INFORMATION

WELLINGTON MINOR WATERCOURSES MAINTAINED BY GWRC

PORIRUA / WAINUIOMATA

DWG File Ref : O-214-02.mxd
A3 Scale 1 : 60,000

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greater WELLINGTON
THE REGIONAL COUNCIL

File Ref : N / 60 / 1 / 1
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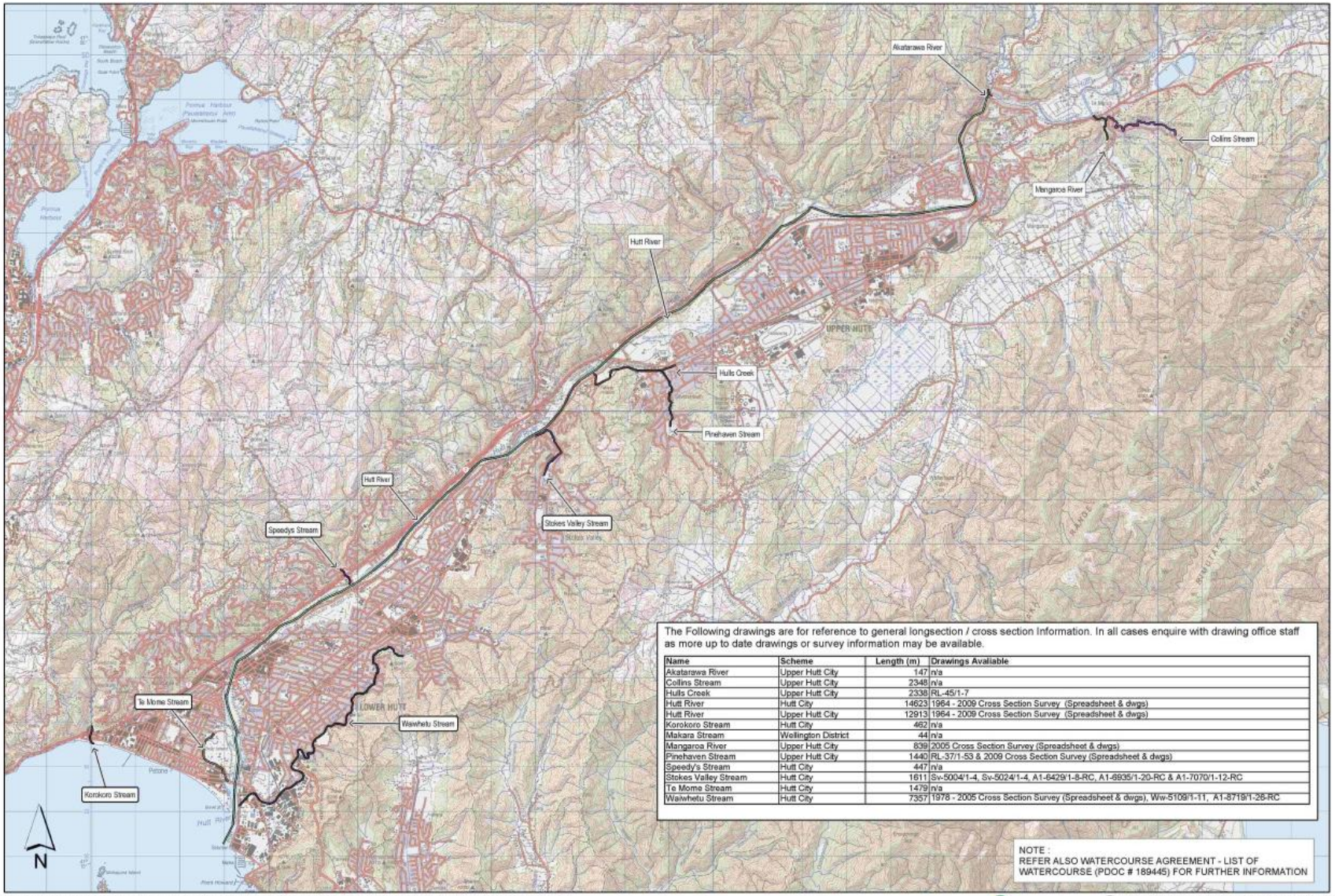


The Following drawings are for reference to general longsection / cross section information. In all cases enquire with drawing office staff as more up to date drawings or survey information may be available.

Name	Scheme	Length (m)	Drawings Available
Akatarawa River	Upper Hutt City	147	n/a
Collins Stream	Upper Hutt City	2348	n/a
Hulls Creek	Upper Hutt City	2338	RL-45/1-7
Hutt River	Hutt City	14623	1964 - 2009 Cross Section Survey (Spreadsheet & dwgs)
Hutt River	Upper Hutt City	12913	1964 - 2009 Cross Section Survey (Spreadsheet & dwgs)
Korokoro Stream	Hutt City	462	n/a
Makara Stream	Wellington District	44	n/a
Mangaroa River	Upper Hutt City	839	2005 Cross Section Survey (Spreadsheet & dwgs)
Pinehaven Stream	Upper Hutt City	1440	RL-37/1-53 & 2009 Cross Section Survey (Spreadsheet & dwgs)
Speedy's Stream	Hutt City	447	n/a
Stokes Valley Stream	Hutt City	1611	Sv-5004/1-4, Sv-5024/1-4, A1-6429/1-8-RC, A1-6935/1-20-RC & A1-7070/1-12-RC
Te Mome Stream	Hutt City	1479	n/a
Waiwhetu Stream	Hutt City	7357	1978 - 2005 Cross Section Survey (Spreadsheet & dwgs), Ww-5109/1-11, A1-8719/1-28-RC

NOTE :
REFER ALSO WATERCOURSE AGREEMENT - LIST OF WATERCOURSE (PDOC # 189445) FOR FURTHER INFORMATION

WELLINGTON MINOR WATERCOURSES MAINTAINED BY GWRC

HUTT VALLEY

DWG File Ref : O-214-03.mxd

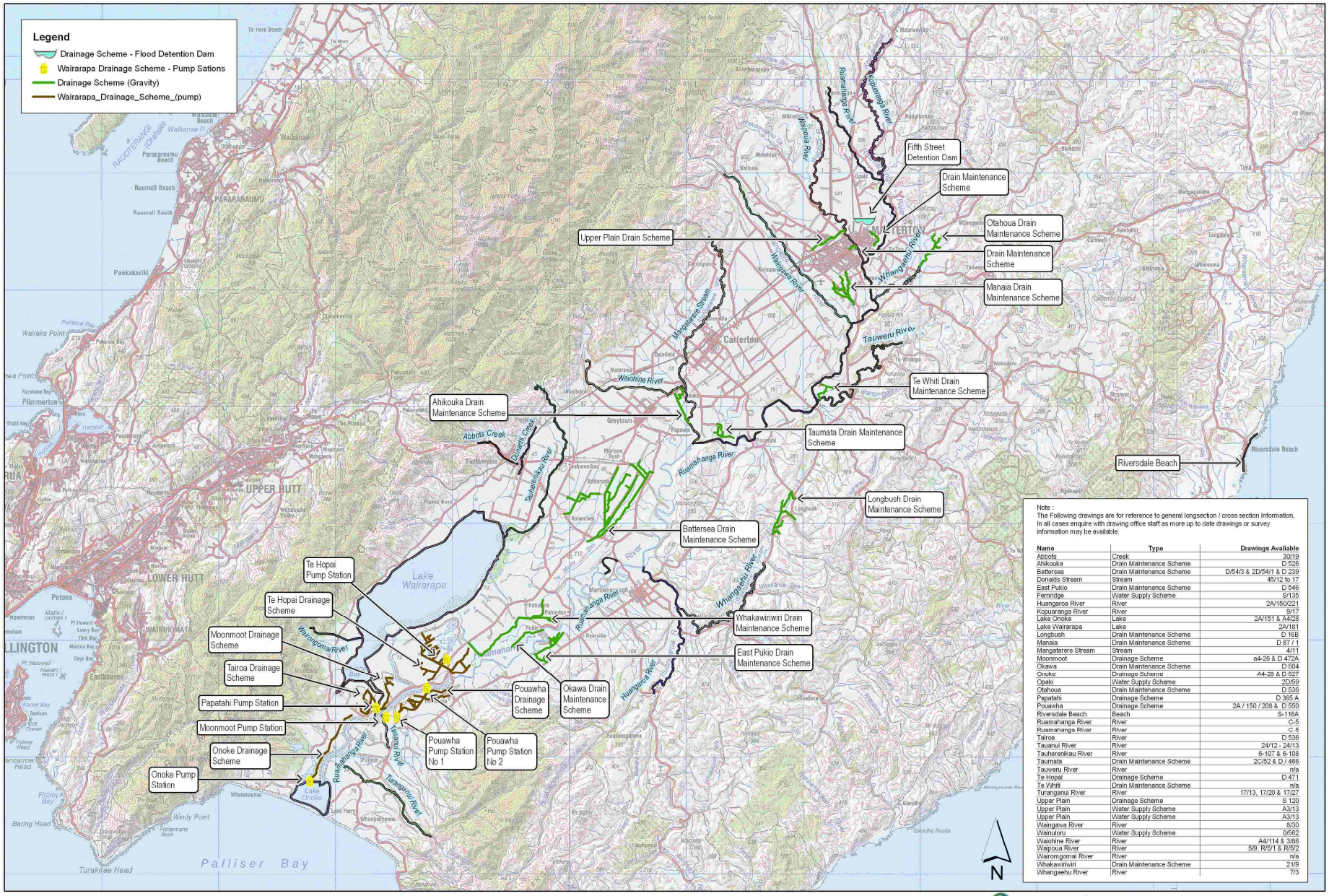
0 1 2 4 Kilometers

A3 Scale 1 : 75,000

greater WELLINGTON THE REGIONAL COUNCIL

File Ref : N / 60 / 1 / 1
DOC # 681583

DRAWING No. **O-214 / 03**



WAIRARAPA RIVERS & DRAINAGE SCHEMES MAINTAINED BY WRC

DWG File Ref : O-214-04.mxd

0 5 10 20 Kilometres

A3 Scale 1 : 280,000

greater WELLINGTON
THE REGIONAL COUNCIL

File Ref : N / 60 / 1 / 1
DOC # 681583

DRAWING No. **O-214 / 04**

Appendix 2: Flood Protection Department Vision and Goals

Flood Protection Department Vision and Goals

The foundation of all work undertaken by GWRC is its overall vision which is:

Greater Wellington Regional Council - Vision

"Greater Wellington promotes Quality for Life by ensuring our environment is protected while meeting the economic, cultural and social needs of the community"

In terms of the Flood Protection Department, a further vision and set of specific goals and objectives have been developed to guide the way in which this work is undertaken. These are as follows:

Flood Protection Department – Vision

"A prosperous community safe from the consequences of flooding with rivers and streams in a natural state providing ecological diversity and recreational opportunities"

Flood Protection – Goals (What do we want to do?)

- *Avoid the loss of life as a consequence of flooding;*
- *Ensure use and development of land is compatible with the flood risk;*
- *Inform and empower communities to take appropriate action about avoiding flood risk;*
- *Contribute to the economic wellbeing of the region through flood risk management;*
- *Recognise the relationship of tangata whenua with water bodies and the cultural values they attribute to rivers and streams;*
- *Enhance the environmental quality of rivers and streams;*
- *Recognise and provide for the recreational use of rivers and streams; and*
- *Encourage best practice in flood risk management.*

Flood Protection Objectives (what can we achieve)

Ø *Avoid the loss of life as a consequence of flooding*
- *Design and maintain flood protection assets so they perform to or above expectation*
- *Advise people of the flood risk*

Ø *Ensure use and development of land is compatible with the flood risk*
- *Communicate and provide advice on flood risk to decision makers and the community, so that appropriate decisions are made about land use in the first instance*

Ø *Inform and empower communities to take appropriate action about flood risk*
- *Help the community avoid and manage flood risks through the provision of information and advice*

- Ø *Contribute to the economic wellbeing of the region through flood risk management*
  - · *Agree levels of service with the community*
  - · *Maintain schemes to the agreed standard*
  - · *Inform landowners about flood risk management through implementation of sustainable land management practices and provision of advice on appropriate flood risk responses*

- Ø *Recognise the relationship of tangata whenua with water bodies and the cultural values they attribute to rivers and streams*
  - · *Engage with tangata whenua to understand the values associated with different rivers and floodplains when investigating and evaluating floodplain management options*
  - · *Consider the role of tangata whenua in the decision-making process*

- Ø *Enhance the environmental quality of rivers and streams*
  - · *Enhance the environment in undertaking flood protection capital, operational and maintenance works*
  - · *Raise public awareness of the important ecological and recreational function that rivers assume*
  - · *Foster a sense of community responsibility for flood protection and the river environment through leading by example, providing education and encouraging active community participation*

- Ø *Recognise and provide for the recreational use of rivers and streams*
  - · *Provide for passive recreation in the river environment.*
  - · *Provide access to rivers in a managed way to support recreational use while protecting the environment and managing flood risks.*
  - · *Work with recreational and community groups to create opportunities for enhanced recreation use and community enjoyment of the river consistent with the identified flood risk and quality of the natural environment.*

- Ø *Encourage best practice in flood risk management*
  - · *Provide national and regional leadership through sound floodplain management planning practice*
  - · *Develop 'best practice' skills, knowledge and culture within the department*
  - · *Ensure departmental work is consistent with the floodplain management guidelines*

These high-level visions, goals and objectives set the overall direction in which floodplain management planning is undertaken by Greater Wellington Regional Council.

Appendix 3: Operational Management Plan Guidelines

An Operational Management Plan for a specific river must contain the following detail.

1. Catchment overview, including the following key characteristics
   - Ø geomorphological
   - Ø geological
   - Ø climatic
   - Ø hydrological (flood and flow variability)
   - Ø sediment transport
   - Ø land cover
   - Ø land use
2. Definition of the management reaches for the river
3. Description of the channel type(s) and key morphological characteristics of each management reach, including any significant physical features that control river form
4. The high level management directions or constraints for each reach, as prescribed by the relevant FMP, scheme plan or other policy decisions
5. Identification of the ecological values of the reach and any significant sites of value
6. Identification of the recreational values of the site and any significant sites of value
7. Identification of particular areas or practices of cultural importance (as identified by the Maori Consultative Group or through cultural health monitoring)
8. Identification of all infrastructure, facilities or utilities that may be affected by river management work
9. Maps showing the following design elements:
   a. river corridor
   b. design channel or design fairway
   c. buffer zones and edge envelopes
   d. bed level envelopes
   e. existing river management infrastructure
10. Guidelines for the recommended numbers of pools and riffles to be maintained in each management reach
11. Identification of land ownership or tenure in the river corridor
12. Identification of methods which may be implemented to effectively achieve intended management outcomes, taking into account the need to address matters in 2-8 above AND the work practice constraints contained in the Code. These methods may include:
    a. Structural improvements
    b. Channel interventions
    c. Buffer management techniques
13. Identification of areas for potential environmental improvement

Appendix 4: Habitat assessment template

Habitat Assessment Template for Consented River Maintenance Work requiring between three and six days work in the wetted river channel Western Rivers

Applicable consent			
□ WGNxxx – Wainuiomata River		□ WGNxxx – Hutt River	
□ WGNxxx – Waikanae River		□ WGNxxx – Otaki River	
Type of Work Proposed			
□ Bed re-contouring; lineal metres_____(m)		□ Groyne construction; lineal metres____(m)	
□ Other:		lineal metres____(m)	
Date of pre-works assessment:		Assessors name:	
Date of work:		Landowners Name:	
Location of assessment:			
River cross section: XS_____; +_____(m) to XS_____; +_____(m)			
□Right Bank	□Left Bank	□Mid Channel	
Pre-works Habitat Assessment			
Site length (definition)	Approximate length of assessment site:_____(m)		Photographic record
Wetted vs. dry channel width	Average wetted width over assessment site:_____(m) Average dry width over assessment site:_____(m)		Pre-works photo date:
Flow conditions	□ Low flow	□ Base flow	□ High flow
Flow types present In linear metres (definition)	Rapid:_____(m)	Deep run:_____(m) Shallow run:_____(m)	Riffle:_____(m) Pools: _____(m) Pools (number):
Maximum depth found within assessment site	Maximum depth:_____(m)	Approximate lineal distance of max depth length: _____(m)	
Wetted bank habitat (definition)	Total length of wetted habitat against bank:_____(m)		
Overhanging vegetation	Total length of overhanging vegetation:_____(m)		
Bank undercut	Total length of undercut:_____(m)		
Channel shape	□ Artificially channelised	□ Straight	□ Weakly sinuous □Strongly sinuous
Braided channel?	□ Single thread channel	□ Split channel	□ Braided channel

Definitions:

Site length is the length of the area being assessed. The area affected by works may be less.

Flow conditions are generalized as low, base or high. For accurate measurement refer to GWRC record on the date of assessment

Deep run is deeper than 0.6m (thigh high)

Rapid habitat is an area of fast moving broken white water

Riffle habitat is an area of fast moving turbulent water

Wetted bank habitat is the total length of wetted channel against a bank edge. This may be greater than the assessment site length (e.g. if wetted bank is on both sides of the site or on an island

Post-works Habitat Assessment				
Date of post-works assessment:		Assessors name:		
Site length (definition)	Approximate length of assessment site:_____(m)			Photographic record
Wetted vs. dry channel width	Average wetted width over assessment site:_____(m) Average dry width over assessment site:_____(m)			Pre-works photo date:
Flow conditions	□ Low flow	□ Base flow		□ High flow
Flow types present In linear metres (definition)	Rapid:_____(m)	Deep run:_____(m) Shallow run_____(m)	Riffle:_____(m)	Pools: _____(m) Pools (number):
Maximum depth found within assessment site	Maximum depth:_____(m)	Approximate lineal distance of run length_____(m)		
Wetted bank habitat (definition)	Total length of wetted habitat against bank:_____(m)			
Overhanging vegetation	Total length of overhanging vegetation:_____(m)			
Bank undercut	Total length of undercut:_____(m)			
Channel shape	☐ Artificially channelised	☐ Straight	☐ Weakly sinuous	☐Strongly sinuous
Braided channel?	☐ Single thread channel	☐ Split channel	☐ Braided channel	

Aerial perspective of work site	
Before work	After work

Flow path
Has the flow trajectory been changed in such a way that it will affect downstream habitat: □yes □no. If yes what are the effects:

Backwater habitat
Has existing backwater habitat at this work site been affected by the works: □yes □no. If yes, provide details: Has new backwater habitat been created at the works site: □yes □no. If yes provide details:

What other 'best practice' methods have been implemented at the site: