

# Tongariro River and Catchment Mangement Plan

Prepared in compliance with Condition 22 of Resource

Consent 110223 to: *Undertake works, including gravel abstraction, debris/vegetation removal, soil disturbance and other bed disturbance associated with construction and maintenance of stop banks on the Tongariro River & its floodplain*

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December 2006

Document #: 1023376



# Preface

The Tongariro River and Catchment Management Plan has been prepared in accordance with the requirements of resource consents granted to the River and Catchment Services Group of Environment Waikato in 2004 for the removal of gravel from the Tongariro River. The reasoning behind this requirement (recorded in the hearing committees decision report) was that submitters at the hearing had expressed concerns that Environment Waikato appeared to be undertaking flood management works throughout the river on a seemingly site specific and ad hoc basis and that there was no apparent long term or holistic plan for the river. The relevant consent condition requires that:

*Within 6 months of the commencement of this consent, the consent holder shall establish a process for the development of a Tongariro River Catchment Management Plan. The details of the process shall be provided in writing to the Waikato Regional Council (Resource Use Group) for their information. The Plan shall address as a minimum the **management of nuisance riparian vegetation** that may fall into the river where river bank erosion occurs, the **removal of vegetative debris from the river bed** where that debris would increase the risk of flooding in the Turangi urban area, and the **gravel management and extraction** regime required to ensure the ongoing functionality of the stop banks and floodwalls authorised by this consent.*

*Note: The consent holder should use their best endeavours to complete the Plan within two years of the commencement of this consent.*

Notwithstanding the minimum requirements set out in the consent condition above, the management plan also seeks to identify (but not address) the broader context within which the Waikato Regional Council's management of the Tongariro River sits.

Through the consultation process and development of this plan it became apparent that the community are interested in developing a management plan with a significantly wider scope than has been attempted here. In order to address this desire, the Tongariro River Management Forum, a community representative group set up to provide a consultative and advisory forum for Environment Waikato's management of the river, concluded that a separate and more community focused plan should be developed. Further, the Forum concluded that the development of the plan should proceed with Environment Waikato as a community participant rather than the responsible agency. This wider plan development process is therefore to be lead initially by Genesis Power with assistance from the members of the Tongariro River Management Forum.



# Table of Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
1.1	Objectives/purpose of the Plan	1
1.2	River management background	1
1.3	Stakeholder parties	3
<b>2</b>	<b>River and catchment description</b>	<b>4</b>
2.1	Catchment and river characteristics	5
2.1.1	Human environment	5
2.1.2	Cultural heritage	6
2.1.3	Geology and river morphology	6
2.1.4	Natural characteristics	7
2.1.5	Flood history	8
2.1.6	Human influences	8
2.2	The River environment	9
2.2.1	Upper river (upstream of the Puketarata confluence)	9
2.2.2	Middle river 1 (Puketarata confluence to Hydro Pool)	9
2.2.3	Middle river 2 (Hydro Pool to State Highway 1 bridge)	10
2.2.4	Lower river (State Highway 1 BRIDGE to de Latours Pool)	10
2.2.5	Delta reach (de Latours Pool to Lake Taupo)	11
2.3	Future evolution of the Tongariro River (Smart 2005)	11
<b>3</b>	<b>Summary of stakeholder values and outcomes</b>	<b>12</b>
<b>4</b>	<b>Management assumptions</b>	<b>14</b>
4.1	National park status & development	14
4.2	Land use change	15
4.3	Turangi township – location & development	15
4.4	SH1 Bridge	15
4.5	Tongariro power development & MRP lake levels	15
<b>5</b>	<b>Future river management – The way forward</b>	<b>16</b>
5.1	River management philosophy	16
5.2	Flood risk management	16
5.3	Specific management measures - upper river (upstream of the Puketarata confluence)	17
	Managing nuisance riparian vegetation	17
5.4	Specific management measures - Middle river 1 (Puketarata confluence to Hydro Pool)	17
	Managing nuisance riparian vegetation and in channel vegetation debris	18
	Managing gravel and gravel extraction	18
5.4.1	Gravel extraction	18
5.4.2	Gravel management plan	20
5.5	Specific management measures - Middle river 2 (Hydro Pool to State Highway 1 bridge)	20
	Managing nuisance riparian vegetation and in channel vegetation debris	20

Managing gravel and gravel extraction	20
5.6 Specific management measures - Lower river (State Highway 1 bridge to de Latours Pool)	21
Managing gravel and gravel extraction	21
5.7 Specific management measures - Delta reach (de Latours Pool to Lake Taupo)	22
Managing nuisance riparian vegetation	23
Managing in channel vegetation debris	23
Managing gravel and gravel extraction	24
<b>6 Catchment wide management options</b>	<b>24</b>
6.1 Land use planning and controls	24
6.2 Nga whenua rahui	24
<b>7 River and flood management funding</b>	<b>25</b>
7.1 Benefit area and flood protection works	25
7.2 Differential rating system	25
7.3 Benefits	25
7.4 Issues	26
7.5 Land classes	26
7.5.1 LPT1 Ratio 100	27
7.5.2 LPT2 Ratio 60	27
7.5.3 LPT3 Ratio 40	27
7.5.4 LPT4 Ratio 35	27
7.5.5 LPT5 Ratio 20	27
7.5.6 LPT6 Ratio 10	28
7.5.7 LPT7 Ratio 5	28

## Tables

Table 1 Tongariro River – major stakeholders & interest groups	3
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## Figures

Figure 1 Tongariro River catchment extent	5
Figure 2 Land classes for protection works rating purposes – Tongariro River	28

# 1 Introduction

## 1.1 Objectives/purpose of the Plan

A management plan is a strategic guide for the future management of a defined area, in this case the Tongariro River Catchment. As a strategic and long term guide, a management plan looks into the future in a broad scale. Its primary goal is to ensure that there is a clearly defined and understood direction upon which operational decisions around river and catchment management are predicated.

The Tongariro River Catchment Management Plan is intended to meet the requirements of resource consent number 110223 and provide a clear description of the intended management approach / regime of three significant issues on the Tongariro River:

- ***nuisance riparian vegetation that may fall into the river where river bank erosion occurs,***
- ***removal of vegetative debris from the river bed where that debris would increase the risk of flooding in the Turangi urban area,***
- ***gravel management and extraction to the extent necessary to ensure the ongoing functionality of the stop banks and floodwalls authorised by this consent***

The plan is intended to place the Waikato Regional Council's future management of these issues on the Tongariro River in the context of the greater catchment and the outcomes the community and other management agencies wish to achieve for the river and its catchment. The process to deliver on these wider outcomes is not addressed in this management plan as Environment Waikato does not have control over these but is rather a community stakeholder.

It is anticipated that the plan will be reviewed at time appropriate to coincide with reviews of council's LTCCP, changes to the Waikato Regional Plan (or policy statement) or as part of a consent review. It is also anticipated that the operational actions required to give effect to the outcomes expressed in this plan will be developed through the LTCCP process and the councils annual plan. This will allow for robust community consultation and debate with respect to specific management actions and the costs associated with them.

## 1.2 River management background

Environment Waikato (Waikato Regional Council) is responsible for the overall management of rivers and catchments in the Waikato Region. Environment Waikato manages rivers and catchments through soil conservation, river management and flood protection works. River and catchment management aims to control flooding and erosion, and help maintain stable rivers and streams.

Flooding and erosion threaten people and property, access and communications via highways, roads, bridges and rail, and limit the productive capacity of land. Rivers also hold cultural, recreational and aesthetic value, serving as water sources and sustaining aquatic ecosystems and native and introduced fisheries. By managing rivers and streams we help protect and enhance our quality of life.

Environment Waikato:

- Provides advice and information to land owners on good river and catchment management practices and riverbank erosion management, and can coordinate activities of contracted work

- Removes major blockages and obstructions beyond normal landowner maintenance capabilities
- Undertakes the construction and maintenance of major river and catchment works.

The Tongariro River has a long history of river management practices undertaken by various Central and Local Government agencies. Much of this has been undertaken on a relatively ad-hoc basis with maintenance and large capital projects initiated in response to specific flooding events. In recent years river management throughout the Waikato Region has occurred in a more coordinated, proactive and integrated fashion. This is in part due to the development of the Project Watershed funding policy.

Project Watershed involved extensive consultation over a two year period to develop a rating system for the greater Waikato catchment. The project focused on soil conservation, river management and flood protection.

For each of these issues information was collected from Environment Waikato, other agencies and the community to determine what works were needed and where. Based upon what was required and what communities were prepared to pay, the Project Watershed - Level of Service and Funding Policy was adopted by Council on June 27, 2002.

Since then a capital works programme has been planned for the Tongariro River, much of which has been completed. This includes:

- Vegetation clearance and willow management in the lower river (in association with Ngati Turangitukua)
- Bank protection and stopbank construction in the vicinity of the Tongariro Lodge, Bridge Lodge and Herekieke Street
- Bank closure at the end of Awamate Road
- Gravel extraction below the State Highway 1 (SH1) bridge
- River training works in the lower river
- Obtaining Resource Consents for and undertaking further gravel extraction.

During the process of obtaining Resource Consents for the above work it was decided that a River Management Forum be established to assist with consultation and to facilitate the integrated management philosophy prescribed in the Project Watershed Policy. The Tongariro River Management Forum (TRMF) was therefore established with representatives from the following stakeholders:

- Environment Waikato
- Department of Conservation
- Ngati Turangitukua
- Mighty River Power
- Genesis Energy
- Advocates for the Tongariro River
- Taupo District Council.

Following recent flooding, members of the TRMF and the Turangi community voiced serious concerns over the perceived high level of the lower river and the frequency of flooding. As a result Environment Waikato commissioned a study from Dr Graeme Smart of NIWA to provide:

- An explanation of the general state of the Tongariro River from Rangipo to the mouth, noting changes over the last 40 years
- An assessment of the likely scenarios for the future evolution of the river
- A list of possible countermeasures to manage future evolution of the river from Turangi to the mouth
- Identification of any gaps in current knowledge requiring investigation before implementation of countermeasures.



The report titled 'The higher Lower Tongariro', was completed in January 2005 and concluded that the Tongariro River is close to breaking out of its present channel and finding a new course to Lake Taupo. Smart (2005) states that there is a significant amount of water being lost from the main river channel even during moderate flows and floodwaters are spilling west into Deep Creek in the vicinity of Downs Pool and east into Stump Bay. The most likely future break out route is from Downs Pool into Tokaanu Bay, adjacent to the Tokaanu Tailrace.

The report was presented to the Ngati Turangitukua Environment Committee on 28 February 2005 and the TRMF on 22 March 2005. It was resolved at both meetings that further information needs to be provided on the various countermeasures or management options proposed in the report, with a view to better enabling people to assess the advantages and disadvantages of each. This was completed by Cheal Consultants Limited in May 2005 and the findings have been discussed at length with the stakeholders listed above and with Environment Waikato's Taupo Liaison subcommittee and Catchment Services Committee. The outcomes of these discussions with respect to the future management of the Tongariro River by the Waikato Regional Council are reflected in this management plan.

## 1.3 Stakeholder parties

The major parties (excluding individuals) with an interest in the ongoing management of the river include:

**Table 1 Tongariro River – major stakeholders & interest groups**

Stakeholder	Nature of Interest
The Tuwharetoa Maori Trust Board	Tuwharetoa Maori Trust Board hold 'title' of the river as Kaitiaki on behalf of the owners of the river bed. They are also Regional ratepayers
Taupo-nui-a-Tia Management Board	
The Department of Conservation	Managers of the crown conservation land within the Tongariro River Catchment and also have responsibility for management of the Tongariro River trout fishery.
Tongariro River Catchment Landowners & Community Groups (Including Advocates for the Tongariro River)	A River Management Forum has been set up in an attempt to provide better communication with major interest groups such as the Advocates for the Tongariro River.
Ngati Turangitukua	Owners of the riverbed holding manawhenua from the SH 1 Bridge downstream, Ratepayers, Beneficiaries of river works
Ngati Karauia, Ngati Rongomai, Ngati Waewae, Ngati Hine	Hapu holding manawhenua status of various reaches on the riverbed upstream of SH 1
Taupo District Council	Territorial Local Authority with various statutory responsibilities within Turangi and surrounding areas
Genesis Power	Hydro generators using the flow of the Tongariro River. Generation activities are controlled by consents from Environment Waikato and Horizons Regional Councils
Mighty River Power	Hydro generators using the flow of water from Lake Taupo. MRP also regulate the levels of lake Taupo to maximise hydro capacity in the Waikato river. Generation activities and lake levels are controlled by consents from Environment Waikato – these are currently under appeal to the environment court.

Environment Waikato	Regional Authority with various statutory responsibilities for river management, emergency management, environmental management and hazard management
Transit New Zealand	National Roding infrastructure (SH1)

## 2 River and catchment description

The Tongariro river (Figure 1 and Appendix 1) originates on the slopes of Mt Ruapehu and in the Kaimanawa Ranges. The river is 92 km long and has a catchment of 791 km<sup>2</sup> (Bowler 2002). The rivers sediment consists of andestic lava, pumice, and volcanic ash brought from the eastern slopes of the volcanoes of the central North Island and greywacke, argillite and ash from the Kaimanawa Range (Smart, 2002)

Turangi Township is located at the head of the alluvial fan which the river is developing as a delta into Lake Taupo. The primary bed material before the river enters the alluvial fan is coarse cobbles and boulders. This material tends to be deposited in the reach upstream of the fan and the river bed material through the delta reach the fan is largely sandy and silty in nature. The deposition of material in the delta is part of the rivers natural fan building process, it does however in the long term create lateral instability of the channel. Aerial photography reveals that the channel in the delta area has had a number of different courses in recent geological history.

The natural hydrology of the river has been significantly altered by the Tongariro Power Development (TPD). The average flow in the Tongariro River at Turangi has been reduced 45% by the TPD (Bowler 2002). Peak flood discharges are not effected greatly though flood recessions are strongly curtailed by the modifications This has the potential to impact on the natural sediment mobilisation and deposition processes in the river.

A key aspect of the natural environment of the Tongariro River is the world-renowned trout fishery that the river supports. As well as supporting resident and lake migrant rainbow ( *Oncorhynchus mykiss*) and brown trout ( *Salmo trutta*) populations, the river provides an important spawning and nursery area and hence is an integral component of the Taupo trout fishery.

As well as the trout fishery, the lower Tongariro also supports native fish species, including the galaxiid koaro ( *Galaxias brevipinnis*), the common bully ( *Gobiomorphus cotidianus*), and common smelt ( *Retropinna retropinna*) (NZFFD, 2002).

The upper Tongariro River is also very valuable from a conservation and native biodiversity view point as one of the remaining habitats for the endangered Blue Duck (or whio; *Hymenolanius malacorhynchos*) which is a unique threatened species of waterfowl endemic to New Zealand. It is the only member of its genus and has no close relative anywhere in the world.

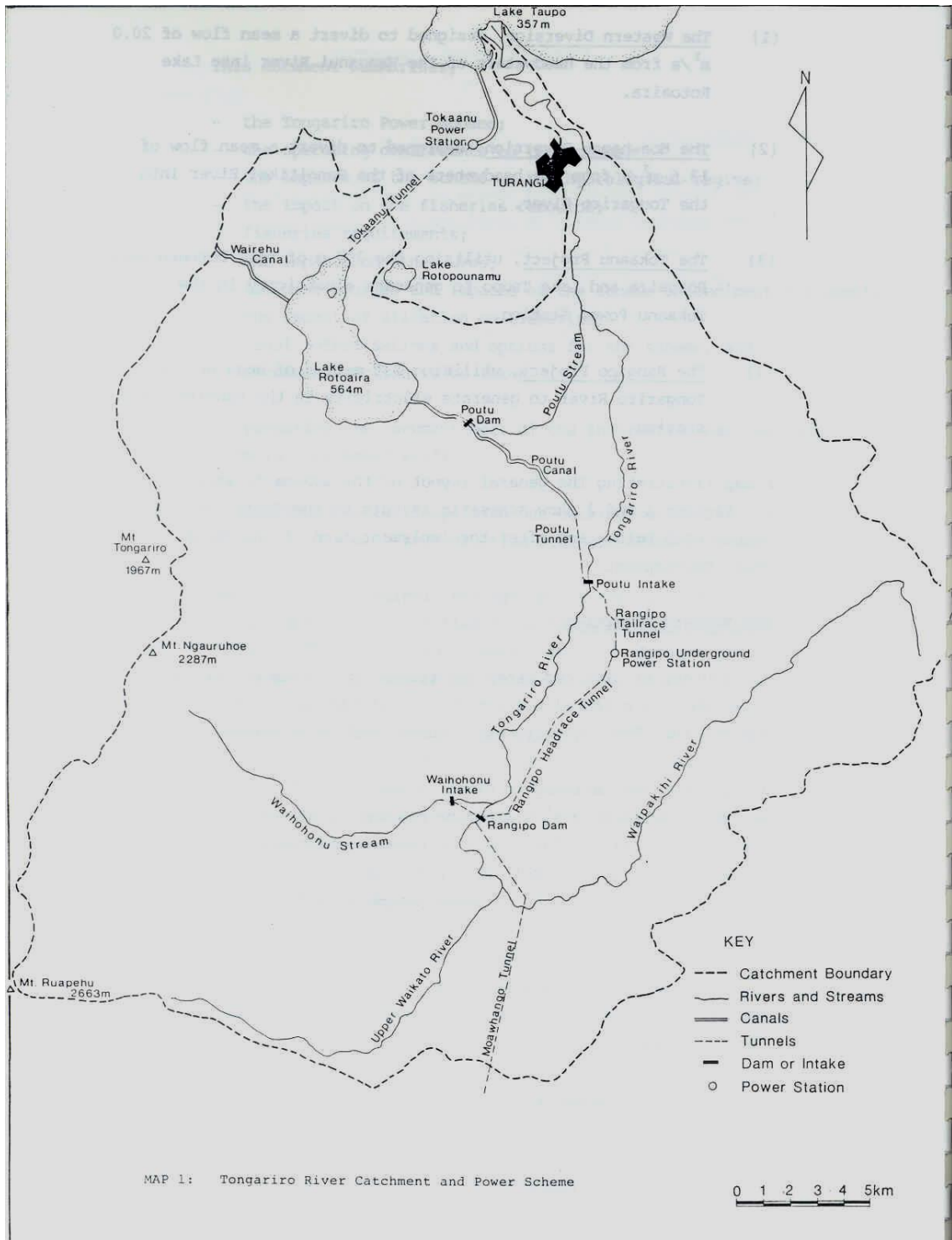


Figure 1 Tongariro River catchment extent

## 2.1 Catchment and river characteristics

### 2.1.1 Human environment

#### 2.1.1.1 Turangi township

Turangi Township is located on the margins of the Lower Tongariro River. The township was developed by the Ministry of Works in the mid 1960s during the construction of the Tongariro Power Scheme. The township is now the service centre for the local tourism and agriculture industries and supports a total population of about 3500 people and approximately 230 businesses.

The developed area of the township is focussed on the left bank of the Tongariro River, with the town centre being located about 1 km from the river margin. The residential area to the east of State Highway 1 represents the original settlement area of the township. Residential development on the right bank is centred around Herekieke Street, to the west of State Highway 1, and a cluster of houses immediately to the north of the State Highway bridge on the eastern side of the road.

Turangi represents the focal population concentration on the Tongariro River flood plain and in terms of the flood protection scheme this area is the primary focus for protection.

#### **2.1.1.2 Rural land**

Agricultural land exists in areas on the right and left banks of the Tongariro River downstream of Turangi. This land is accessed from Awamate Road on the left bank and Grace Road on the right bank. A small number of residential dwellings are located on this rural land.

#### **2.1.2 Cultural heritage**

The Turangi and lower Tongariro River area is the ancestral land of the Ngati Turangitukua, a hapu of the Ngati Tuwharetoa. The principal marae of Ngati Turangitukua is Hirangi Marae, located in the township of Turangi. Tuwharetoa are the iwi of the wider Taupo and Tongariro River area.

Ownership of the Tongariro River was vested in the Tuwharetoa Maori Trust Board in 1999 pursuant to the Te Ture Whenua Maori Act of 1993. The Trust Board hold title of the riverbed on behalf of the members of the hapu adjoining the river, and also in trust for the common use and benefit of all the peoples of New Zealand as far upstream as the junction with Whitikau Stream.

Turangitukua are the hapu that is resident in the lower reaches of the Tongariro, effectively from the township to the river mouth(s), and as such have manawhenua and claim ownership status, of which title is held by the Trust Board on behalf, to the bed of the Tongariro. They regard themselves as Kaitiaki and take an active role in promoting their aspirations for the management of the Tongariro. It should be noted that four other hapu have manawhenua in the upper reaches of the Tongariro; these are:

Ngati Waewae (Foxton based)  
Ngati Karauia (Tokaanu based)  
Ngati Hine (Korohe based)  
Ngati Rongomai (Waiotaka based)

Large areas of land within and adjacent to the Tongariro floodplain are also owned by Maori whanau where title is in multiple ownership.

Environment Waikato and Ngati Turangitukua established a Memorandum of Understanding signed on May 4<sup>th</sup> 2004 regarding the management of the Tongariro River. The MOU sets down objectives and protocols in a clear, amenable and jointly agreed manner.

The river delta and sites on the river margin are recognised to be of very high cultural significance to Maori. Waitahanui pa site, located in the Stump Bay area of Lake Taupo and now partly submerged by water, was a significant pa of the early nineteenth century. Significant historic burial sites are located within the delta area of the Tongariro River.

#### **2.1.3 Geology and river morphology**

The Tongariro River is the largest of the eastern Taupo rivers. The upper river is bounded by the Kaimanawa Ranges to the east and the volcanoes of Mts Ruapehu, Ngauruhoe and Tongariro to the west. The lower Tongariro River passes over an

actively aggrading delta, predominantly formed since Lake Taupo approached its present level, but with evidence of earlier delta formations (Smart, 1992).

The river's natural tendency to continue to build the delta fan, both horizontally and vertically through Turangi, is limited by various constraints. The constraints include topography, the SH1 Bridge and bank and flood protection works, which encourage the movement of sediment downstream.

The geology of the area is generally sedimentary origin greywacke overlain by pumiceous ignimbrite. Soils in the catchment are classified as yellow brown pumice soils.

- The river can be divided into 5 distinct reaches which are described in detail in following sections.

## **2.1.4 Natural characteristics**

### **2.1.4.1 Sediment transport**

Sediment load in the river, which strongly influences its regime and behaviour, is a mix of volcanically derived ash, sand, and mainly greywacke gravels and boulders derived from the Kaimanawa Ranges with some "volcanic" stones from the Tongariro ranges. The gravels, which dominate in the river sediments, are flushed downstream in pulses during freshes and minor floods (although this movement is significantly influenced by the operation of the TPD). The river is noted for its clarity in lower flows but also carries a high load of fine sediments after rainfall events. This phenomenon has been particularly noticeable since the Mt Ruapehu ash eruptions of 1995 and 1996.

Gravel within the river system generally moves downstream to below the SH1 Bridge, with some local deposition above it, and significant deposition down to Smallman's Reach and Grace's Pool. Below Grace's Pool the reduction in river bed gradient means that sediment transport is limited to the finer sand and ash.

Over recent decades, on average about 11,700 tons of gravel and larger sized sediment has been carried past Turangi each year. For sand and finer sized material the rate of transport is at least ten times greater. The river-borne sediment is eventually deposited on the Tongariro delta.

The process of gravel deposition described above has been masked to some extent in recent decades by the large scale gravel extraction that took place in the 1960's and 70's. It is only in recent years that the gravel deficit created during this time has been filled and that the natural gravel deposition process has become apparent again. The obvious consequence of this deposition is that the river has started to rise and the river has started to actively erode sideways on both banks.

### **2.1.4.2 Recent changes**

Prior to gravel extraction in the 1960's the Tongariro River was in a semi-braided state with a strong meander pattern below de Latours Pool. There was little change to this pattern since the first survey in the 19th Century

The substantial recent increase in finer sediments following the 1995 and 1996 eruptions appears to have had little effect on the braided section of the river apart from minor ash/sand deposits in side channels and back eddies, but it has resulted in a depth reduction in the lower meander section, and caused the delta to advance into the lake. Significant shallowing of the delta has also occurred. As noted by Smart (2005). When this has happened in the past, the river has eventually broken out of its elevated channel to take a new course to Lake Taupo. This happened many times in previous centuries. Each new river course usually followed the lowest lying land and this low lying reach then built up, over the years, until the river again changed course.

### **2.1.4.3 Influences of Lake Taupo**

Under the management of Mighty River Power, Lake Taupo levels typically range from 356.5 m to a winter maximum of around 357.25 m. The backwater effect of high levels can extend some 3 km upstream into the Tongariro River to around the location of Poplar Pool in normal flow conditions, but not so far in flood conditions or during low lake levels.

### **2.1.5 Flood history**

River flows have been measured at Turangi since January 1957. The largest recorded flood peak had 1,470 cubic meters of water per second in February 1958. The second largest had 1,440 cubic meters per second at 3.50am on 29 February 2004. A peak of 1,040 cubic meters per second occurred in March 1964 and there were two floods in early July 1998, the highest peaking at 920 cubic meters per second.

Prior to the recent February 2004 flood, the expected frequency for a flood of this size was approximately 1 in a 100 years. However, since there have now been two such floods within 50 years it is necessary to revise flood return period estimates and the February 2004 event is now considered closer to a 1 in 60 year event.

Moderate floods also can cause changes in the river morphology. In the 11 years from 1957-1967 there were 5 significant floods (i.e. 5 floods bigger than the 5 -year flood level). For the 18 years from 1968 -1985 there were no significant floods. In the 19 years from 1986 – 2004 there were 13 significant floods. Major changes in the Tongariro River can be expected during periods with frequent floods.

### **2.1.6 Human influences**

#### **2.1.6.1 River works**

Apart from a series of short groynes near Kutai St, earlier principal works upstream of SH1 Bridge have been stopbanks tied into SH1 Bridge left abutment to prevent flooding across Taupahi Rd properties and SH1, and associated rockfill bank protection. The most recent works on the left bank have been in the Tahawai St area and around Kutai St. Bank erosion protection in the form of a rock revetment and an associated stopbank have been constructed to provide flood protection to a number of properties that are vulnerable to events greater than about a 1 in 20 year flood.

Downstream of the bridge, bank protection was provided on both banks in the 1970's: more recently with river focus on the right bank, bank erosion protection has been extended to Herekieke St, and installed along the frontage of Tongariro Lodge.

A short length of stopbank between the right hand (northern) abutment of SH1 Bridge and Herekieke St was formed to prevent floods entering the gravel extraction area between Herekieke St and SH1.

On the left bank downstream of Turangi, stop banking is in place to protect the town's oxidation ponds and discourage the river from breaking out in flood towards the Tokaanu tailrace.

The overall effect of these works has been to confine the river in varying degrees and to prevent flow over the "natural" flood plain in urban areas.

#### **2.1.6.2 Gravel extraction**

For construction of the Tongariro Power Development (TPD) and associated infrastructure works, substantial quantities of river gravel totalling some 800,000 m<sup>3</sup>, were taken from the lower Tongariro River floodplain, over the years 1964-1972. The largest extraction was on the right bank between the Bluff (swirl pool) and what is now

Tongariro Lodge. Lesser amounts were taken from the left bank above and below SH1 Bridge, and off-channel from between Herekieke St and SH1.

The effects of this extraction, particularly between the Bluff and Tongariro Lodge, appear to have been two fold:

- to focus flow towards the right bank, progressively confining it to a narrow semi-braided channel;
- to form a trap for gravel bed load movement, progressively filling up over the intervening years since extraction ceased, and hence potentially interrupting natural fan building and attendant aggradation.

### **2.1.6.3 Tongariro power development**

The Tongariro Power Development (TPD) involves the diversion of water from the Wanganui, Whangaehu and Rangitikei catchments into the Waikato River catchment to supplement the generation flow at 8 Waikato River hydro stations. In the process, electricity is generated at two power stations at Rangipo and Tokaanu.

The principal structures of the TPD that influence the regime of the lower Tongariro River are Rangipo Dam and Poutu Intake. Rangipo dam head-pond intercepts gravels and coarser sediments, which are periodically flushed downstream. The material is released in slugs into the river, and some then gets stranded in shoals and is less readily mobilised. The result is that the downstream supply of gravels is likely to have been less constant and more episodic since Rangipo was built.

## **2.2 The River environment**

### **2.2.1 Upper river (upstream of the Puketarata confluence)**

The upper reaches of the river are generally steep and the river is constrained within deep bedrock gorges with large boulder and cobble substrate.

The upper river, with its steep fast flowing character provides habitat for the threatened blue duck and also has significant natural character, recreational and amenity values and has previously been listed as a river of national importance for its wild and scenic nature.

### **2.2.2 Middle river 1 (Puketarata confluence to Hydro Pool)**

The river reach above the Turangi township is predominantly a single thread channel meandering within its flood plain. The February 2004 flood resulted in some significant changes in the channel and activation of a number of erosion sites. There has been a significant change in channel alignment in the vicinity of the Breakaway Pool where the river has broken through a former loop. Overall it seems that a significant volume of sediment and debris has been mobilised from within this reach during the flood (Tonkin and Taylor). Where erosion scarps have formed trees falling into the river may also result in build-up of gravel and development of gravel islands which may in turn exacerbate existing erosion problems.

The values associated with this reach of the river are predominantly based on its recreational uses and in particular its status as a world renowned trout fishery (indeed Turangi names itself as the trout fishing capital of the world and this is in no small part due to the status of the Tongariro trout fishery). This reach of river also retains significant wild and scenic values and attracts large numbers of outdoor recreationalists all year round.

Within this reach of the river, vegetation on river margins includes isolated patches of regenerating native vegetation (kowhai, kanuka, manuka and five finger associations), urbanised landscape plantings, and various exotic grasses and weeds. Various bird species are present through this section of the river, including a number of the common

forest bird species (e.g. fantail, grey warbler) and most common exotic species. Some areas are seasonally used by kereru, long tailed cuckoo and shining cuckoo, with kowhai providing an important seasonal resource for kereru and tui during spring.

### **2.2.3 Middle river 2 (Hydro Pool to State Highway 1 bridge)**

The river upstream of the SH1 bridge is relatively constrained within a boulder and coarse gravel bed. There are some existing bank protection works within the reach and a significant length of the bank along the left bank has been stop-banked to protect Turangi from flooding. The right bank is confined by high ignimbrite bluffs along much of its length.

As in the upstream reaches, this reach of the river has extremely high value as a trout fishery and recreational area, however, it is also adjacent to the upper part of Turangi township and as such has very high amenity value to Turangi residents and is probably the most visited and well recognised reach of the Tongariro River. Consequently, any river management carried out by the various management agencies in this reach must take account of this relatively higher public profile as well as issues such as public access.

The left bank river margin has undergone development and much of the vegetation now comprises introduced grasses, broom and blackberry. Various bird species are present through this section of the river, including a number of the common forest bird species (e.g. fantail, grey warbler) and most common exotic species. Some areas are seasonally used by kereru, long tailed cuckoo and shining cuckoo, with kowhai providing an important seasonal resource for kereru and tui during spring.

### **2.2.4 Lower river (State Highway 1 BRIDGE to de Latours Pool)**

The reach from the State Highway One bridge down to de Latours pool is confined within an artificially narrowed flood plain (by stopbanking, bank stabilisation structures and urban development into the floodplain and immediately adjacent to the river banks) which extends between Grace Road and Awamate Road and Hirangi roads.

As above, this reach passes through Turangi township and has extremely high value as a trout fishery and recreational area.

The river in this reach is largely a single meandering channel within the confined flood plain with pools on the outside of bends and crossover riffles between bends. The bed consists of cobbles and gravel bars.

In recent times the river has tended to move towards the North East, attacking the river banks on the true right bank along the length of the reach. A number of erosion protection works have been carried out to protect these areas over the years.

Below SH1 Bridge, a range of vegetation types are present, including fragmented kanuka/manuka scrub, introduced grasses and weeds, broom, willow and blackberry. Various bird species are present through this section of the river, including a number of the common forest bird species (e.g. fantail, grey warbler) and most common exotic species. Some areas are seasonally used by kereru, long tailed cuckoo and shining cuckoo, with kowhai providing an important seasonal resource for kereru and tui during spring.

The reach covers the former G6 gravel mining area where approximately 700,000 tons of gravel was extracted in the 1960's and 70's. Since the gravel extraction ceased, the artificially lowered river bed has tended to act as a sink or trap for bedload material entering from upstream during floods, with recent evidence that the bed has been returning towards more "natural" levels. It is likely that this sink area has protected the delta reach from receiving bed load sized material from upstream, and has thus had a stabilising influence on the delta lengthening the life of the current outlet channels significantly.



### 2.2.5 Delta reach (de Latours Pool to Lake Taupo)

This reach is an actively forming alluvial fan, and as such can be expected to be relatively dynamic and unstable on a geomorphologic timescale. The response of the river tends to be determined by moderate to large floods. The bed material is silt and sand, although significant volumes of gravels can be dumped in this reach during a major flood.

The Delta effectively begins just upstream of Turangi. The Delta has significant values ecological values as it supports a large area of highly productive wetland and, as the process of silting up continues, the area will continue to become increasingly wet. Unfortunately, there are large areas of willow and these not only affect the values of the wetland but also exacerbate the siltation occurring in the main channel by accumulating sediment and further constraining the channel.

Ngati Turangitukua have also identified that there are numerous waahi tapu sites within the delta area and that many of these are at risk of being washed out or damaged if a channel breakout occurs. Some of these sites have previously been threatened by river erosion and small river breakouts and remedial measures have been put in place to protect these sites wherever possible. Some private land and at least one house are also threatened by the continued build-up of the delta and the likely breakout of the channel.

The channel has been relatively stable since European times, however there is evidence that two of the secondary channels to Lake Taupo at the mouth are becoming increasingly silted up. The eastern channel of Te Kapua Island has also silted up and the Island is now effectively part of the mainland.

Aerial photography shows that since 1974 a blind mouth channel has grown from the Lake back towards Turangi to a length of approximately one kilometre. It appears that this channel is utilised at flood times and has grown as a result of capturing part of the river flow during floods. There is considered to be potential for permanent breakout from around the de-Latours Bend and Awamate Road area to join up with the new channel and capture all or part of the flow of the river permanently. A breakout of this nature has the potential to threaten a number of waahi tapu sites and, depending on the breakout location, the Turangi sewerage treatment ponds, although this is considered to be a relatively small risk.

The lower reach of the Tongariro River, below de Latours Pools, is considered to hold high/outstanding value in terms of biodiversity and habitat value. The Tokaanu wetland on the western side of the river supports an outstanding wetland habitat and diverse range of associated wetland plant and animal species. A variety of wetland reed and rush communities are present, particularly on the western river margin, including raupo reed-land, *Leptocarpus* rush-land, *Carex-Juncus* sedge-rush-land, submerged aquatic herb field, *Elocharis* sedge-land, manuka scrub, willow, and exotic pasture.

This reach of the river supports outstanding diversity of wetland bird species including important populations of bittern, spotless crane and fernbird, and a wide range of waterfowl which are both seasonal and resident.

## 2.3 Future evolution of the Tongariro River (Smart 2005)

The river channel position has undergone many changes in the past and this can be expected to continue into the future. The timing of these changes will depend on the occurrence of future floods and eruptions.

Upstream of Turangi the bed level appears to be entering a falling phase and, as a mildly degrading river is relatively stable, no severe changes are foreseen in this

section of the river unless a major eruption occurs. The position of the main channel will continue to change, as it has done in the past, and variations in bed level can be expected, especially where the river is adjusting to new channel locations such as have occurred with the split in the island downstream of Puketarata and the cut-off of Breakaway Pool.

Downstream of Turangi the situation is more serious and major changes in the river's position on the delta are likely to occur in the future.

The February 2004 flood was the largest since the 1995-96 eruptions and it is estimated (EW document 922125) that around 95,000 tons of gravel (50,000 cubic metres) was deposited by the Tongariro River between SH1 Bridge and De-Latours pool. The volume of sand and finer sediment brought to the delta is unknown but it could have been ten times greater than the volume of gravel. Because Lake Taupo was high at the time of the flood, less sediment would have flushed into the lake. The lake level increased by about 200mm as a result of the storm.

Overflow channels across Grace Road to Stump Bay and across Awamate Rd towards Deep Stream have become more established following the February 2004 flood and it is only a matter of time before the river will break out of its present course and take a new route to Lake Taupo.

An inspection of the situation in November 2004 showed that the water level in Deep Stream is over a metre lower than the water level in the nearest part of the Tongariro River and Deep Stream is "head-cutting" towards the river as shown in Figure 19.

The large amount of floodwater that is escaping from the main Tongariro channel into Deep Stream is evidenced by erosion of its left bank (which adjoins the Tokaanu tailrace). The small catchment of Deep Stream could not produce sufficient flows to cause such erosion. The erosion of the western bank of Deep Stream is caused by floodwaters from the Tongariro River.

At the exit of Deep Stream there is a large quantity of flood debris deposited into Lake Taupo. This debris has been moved by floodwaters that have escaped from the Tongariro into Deep Stream.

In light of this evidence, unless some form of intervention is engineered, it is considered that the Tongariro will breakout of its present channel during a future flood. The most probable location of the new Tongariro River mouth will be alongside the exit of the Tokaanu tailrace.

### **3 Summary of stakeholder values and outcomes**

The stakeholders of the Tongariro have been approached through consultation to provide their individual values and outcomes regarding the Tongariro River. In the process of developing this management plan the values and outcomes expressed below have been given full consideration by the Waikato Regional Council.

The following is a summary of those values and outcomes:

#### **Customary rights & responsibilities**

- A strong, effective partnership with iwi is developed/maintained
- Turangitukua, as Kaitiaki (and owners) have a prominent role in the management of the Tongariro River
- The principles of Kaitiakianga, matauranga and tikanga are reflected in the management of the resource

- To protect and enhance traditional uses of the resource and to have due regard to the tikanga and traditional uses in any development of the resource commercial use.
- Management of the resource is based on and consistent with the Tikanga, Kaitiakitanga of Ngati Turangitukua having Manawhenua over their resource, and not inconsistent with Ngati Tuwharetoa Tikanga and Kaitiakitanga.
- Management of the resource enables Ngati Turangitukua to obtain long-term sustainable benefits and their customary and intellectual rights are respected
- The current dominant view of Turangitukua is that the Lower Tongariro is not being flushed through due to reduced and unnatural river flow regimes due to flow regulation by the TPD. It is the belief of Turangitukua that the TPD is the main cause of excessive river aggradation in the lower delta.
- Turangitukua are strongly in favour of dredging (as well as willow removal) the lower Tongariro delta in an attempt to reduce the potential of the river to flood the surrounding land and to maintain the current form of the river.

### **Plan purpose and process**

- To ensure that the taonga is protected managed and enhanced in accordance with Tikanga, Kaitiakitanga, and other values identified by Ngati Turangitukua for the benefit of current and future generations and that any future use and development of the resource has due regard to those tikanga
- All options for works on and/or adjacent to the river are considered and proposals are not confined to traditional river management practices
- All work done on or adjacent to the river is well designed, financially feasible and effective in terms of the underlying objectives
- The plan should be an all encompassing, strategic and long term document, based on rigorous scientific and ecological assessments of:
  - the likely hydrological and ecological outcome if nothing is done
  - what would need to occur in order to achieve different hydrological outcomes
  - what the likely ecological outcome would be of these changes
- Plan is outcome focused, avoids peoples issues and keeps to the outcomes they seek
- The plan takes a strategic, long term approach to management of the Tongariro River and catchment

### **Conservation and recreation**

- Indigenous biodiversity is protected or enhanced
  - Any disturbed areas are restored to a self-perpetuating, original condition where natural processes can continue as free from human influence as possible
  - Where possible disturbance of the natural environment is prevented so that restoration is not necessary
- Recreation opportunities are maintained or enhanced
- The unique natural character of the river and its environs are maintained or enhanced

### **Trout fishery**

- The quality and extent of habitat for trout and trout food is maintained or enhanced
- Angling opportunity is maintained or enhanced
- The economic importance of the fishery associated with the Tongariro River is recognized

### **Information and education**

- Education opportunities are capitalised upon
- Ongoing research and monitoring is undertaken in order to enhance the management of the Tongariro River catchment
  - Research needs are identified in consultation with stakeholders and interested groups and individuals

- Information gathered is shared with all stakeholders and interested groups and individuals

### **Preservation of sites of significance**

- The South Taupo Wetland is protected in its natural state
- The values of sites (urupa) or features of cultural, spiritual or special significance to Ngati Turangitukua are protected and enhanced

### **Consultation and statutory processes**

- Landowners and others with statutory management responsibilities are fully involved at an early stage in any river management and catchment works
  - Processes are developed whereby landowners are fully informed of any planned works and have an opportunity to provide input into any planned works
  - Landowner approvals for works are sought at an early stage in any planned works
- Weeds are removed where practicable
  - Weeds are controlled, especially larger exotic weeds such as pines and willows
- All proposed works are consistent with the plan

### **Protection of private and community land**

- There is a clear distinction between the impartial scientific advice and the decision making process which concentrates initially on developing a management strategy for the whole river. The strategy identifies the long term goals with respect to what intervention is appropriate, on what scale and why.
- Management of the resource acknowledges and includes the property and access rights of the landowners.

### **Public safety and hazard management**

- Risks to public safety and infrastructure are minimised
  - Risks to the public and damage to infrastructure is minimised by relocating infrastructure away from hazard zones

### **River and lake utility**

- The management of the river and its catchment maintains electricity generation as a viable proposition for the Tongariro River. Provided this is done in the context of maintaining a healthy, functioning river system.

## **4 Management assumptions**

In developing the catchment management plan there are a number of assumptions which have been made in terms of the future of the catchment and what changes are, or are not reasonable to assume. Those assumptions which are considered to be critical are listed and discussed below:

### **4.1 National park status & development**

Much of the catchment area of the Tongariro River is contained within the Tongariro National Park which is administered by the Department of conservation on behalf of the crown. The Departments management of the national park is governed by the Tongariro National Park Management Plan (currently a 2003 draft) prepared under the provisions of the National Parks Act 1980. This document sets out the values and history of the park as well as the conservation philosophy and policy which guide management of the area. There are not considered to be any conflicts between the proposed future management of the Tongariro National Park by the Department of conservation and the management of the Tongariro River proposed in this document.

It has been assumed that the current national park status of much of the catchment area will remain in place indefinitely and that land management practices associated with the national park area will not change markedly. It is also assumed that the Department of Conservation will continue to be the agency charged with the management of the national park area. This assumption also applies to the non national park lands which lie within the catchment and which are currently managed by the Department on behalf of the crown such as the Kaimanawa Forest Park, for which a draft management plan was proposed in December 2005.

## **4.2 Land use change**

In developing the Tongariro River Management Plan and in considering likely future planning and management requirements for the River it has been assumed that there will be minimal land use change in the upper catchment and that any changes in land use in the middle and lower catchments will not have significant effects on river flows or sediment losses to the river. This assumption is based in part on the changes to the PWRP being made by Environment Waikato to manage water quality in the Lake Taupo catchment and the likely effects of this on land use in this catchment.

## **4.3 Turangi township – location & development**

In developing the Tongariro River Management Plan and in considering likely future planning and management requirements for the River it has been assumed that the Township of Tongariro will continue to grow. However, it is also assumed that development will be managed through the Taupo District Plan and that this management will be informed by the flood hazard review to be undertaken by Environment Waikato and TDC for Lake Taupo and its tributaries in 2006.

Providing that appropriate controls are put in place via the Taupo District Plan it is assumed that there will be minimal requirement for new flood protection works on the Tongariro River to protect new growth areas.

## **4.4 SH1 Bridge**

In developing the Tongariro River Management Plan and in considering likely future planning and management requirements for the River it has been assumed that the SH1 bridge at Turangi will not be replaced by Transit New Zealand in the foreseeable future. As a consequence, the current gravel and debris management requirements associated with the bridge and its piers will continue to be a factor in the management of the river in its immediate vicinity.

## **4.5 Tongariro power development & MRP lake levels**

In developing the Tongariro River Management Plan and in considering likely future planning and management requirements for the River it has been assumed that the Tongariro Power Development will continue to operate on the Tongariro River and the operation will not deviate significantly from the currently consented regime into the foreseeable future. It has been assumed that the management of Lake Taupo levels by Mighty River Power for the purposes of power generation will continue under the regime consented by the Waikato Regional Council (notwithstanding that these consents remain under appeal to the environment court at the time of writing).

# 5 Future river management – The way forward

## 5.1 River management philosophy

In developing the river and flood management objectives for the Tongariro River, Environment Waikato has invested a significant effort in establishing the views of the major stakeholder groups and other management agencies in and around the River and its catchment. The management priorities and actions contained in the following section are informed to a great extent by those views.

In achieving its overall river management responsibilities the Waikato Regional Council employ the following philosophy:

### **Outcomes sought**

- Stable, healthy and well managed river systems
- Effects of flooding, erosion, channel congestion etc. minimised
- Infrastructural assets (existing protection schemes) maintained and managed
- Drainage schemes managed so as to maintain productive capacity of land
- Public access and amenity values associated with rivers and streams enhanced
- Economic and social well being of communities protected and enhanced

### **Outcomes will be achieved by (methods):**

- Ongoing management of existing rivers, streams and associated assets
- Promotion of new projects where a need identified
- Working with communities, iwi and agencies
- Provision of information and advisory services

### **Increasing focus will be placed upon:**

- Integrated and comprehensive management of rivers and streams
- Actively seeking opportunities to enhance river system environments
- Promotion of the environmental enhancements associated with river system management
- Demonstration of Best Management Practice by Environment Waikato
- Assessment of the implications of climate change
- Regular river channel assessments
- A pragmatic approach to river works

## 5.2 Flood risk management

The Regional Council has statutory responsibilities under the Soil Conservation and Rivers Control Act 1941 to control erosion and manage floods. Within this context. The underlying approach taken by Environment Waikato has been to manage and minimise, the flooding risks to urban and rural land located on the natural floodplain of the lower Tongariro River. However there is always a residual risk associated with settlements located on a natural river floodplain that cannot be mitigated solely by the construction of physical works.

These measures have been designed and implemented on the basis that flood risk can be alleviated but not eliminated in the catchment of an active river with an aggrading gravel bed and subject to substantial floods from a steep land catchment.

While specific works are part of the approach to managing the river and its risks, these are to be supported by a range of management strategies and other means such as consent and river monitoring programmes. At present the Waikato Regional Council

and Taupo District Council are undertaking a review of Flood Hazard Management and Risk assessment in Lake Taupo and its tributaries. The outcome of this process will be used as a trigger for a review of this management plan to take into account any changes in approach that are identified as being necessary.

### **5.3 Specific management measures - upper river (upstream of the Puketarata confluence)**

The upper reaches of the Tongariro River begin in the Kaimanawa Forest Park and Tongariro National Park, on the slopes of Mount Ruapehu. The river is relatively pristine throughout this stretch with the exception of the Rangipo barrage and Poutu Intake. Throughout this reach the river has undergone relatively few changes in channel position due to its slope and relatively confined channel. Smart (2005) concludes that this section of the river appears to be in a falling phase, and as a mildly degrading river is relatively stable, no severe changes are foreseen unless a major eruption occurs.

On the basis of this conclusion it is believed that there are no current river management options pertaining to this part of the river that will significantly reduce the risk of the river leaving its current channel.

#### **Managing nuisance riparian vegetation**

In some areas along this reach and in downstream reaches of the river there are large trees directly adjacent to the river which may pose a small local erosion risk if they were to fall into the river and cause a build-up of gravel and other debris. These trees may also pose a hazard during flood events.

Where it is considered that such trees pose a risk either in situ or if they were to enter the river channel, Environment Waikato will, as part of routine maintenance activities, seek to either have these trees removed by their owners, or undertake the removal themselves. In general terms the flood and erosion risks associated with these trees are very low provided they are not allowed to fall into the river channel and build up large debris dams or re-direct river flows.

### **5.4 Specific management measures - Middle river 1 (Puketarata confluence to Hydro Pool)**

The reach above Turangi township is similar in nature to the upper river with a single thread channel that meanders within its floodplain. The February 2004 flood resulted in some significant changes in the channel location and reactivated a number of erosion sites. Smart (2005) details the historic changes in channel location throughout this reach, but makes the same conclusion as above, that the river is relatively stable and no significant changes are foreseen.

It is apparent however that this section of the river has recently contributed a large volume of sediment and debris to the river. For example, when the river left its old channel and began flowing around the Breakaway Pool a large volume of sediment and gravel was entrained with extensive areas of vegetation uprooted and deposited throughout the river. The impacts of these events, although very obvious to river users, are relatively insignificant compared to other natural events such as volcanic eruptions.

The ongoing management requirements within this reach are considered to consist of limited, minor edge protection and erosion control works along with localised vegetation clearance such as wilding pine removal (both within and adjacent to the channel) where it is necessary to control excessive sediment input or maintain adequate sediment carrying capacity in the channel. In general the outcomes sought by key stakeholders largely reflect the status quo and assuming that there are no significant changes in land management (the catchment is largely national park and forestry)

there should be no need for a change in Environment Waikato's current approach to managing this part of the river and catchment.

## **Managing nuisance riparian vegetation and in channel vegetation debris**

As noted above there is a requirement for ongoing but minor management of wilding pines in this reach both in the riparian area and within the channel where woody debris has resulted in the build-up of gravel and a consequent re-direction of river flows. This management is also seen as necessary to ensure that high flow events do not result in large accumulations of woody debris in downstream reaches where they have the potential to significantly undermine the SH1 bridge and the flood protection structures in and around Turangi Township.

## **Managing gravel and gravel extraction**

Members of the Tongariro Management Forum (TRMF) have raised the possibility of ongoing gravel extraction from parts of this section of the river (accessible by road) as a useful management option.

In principle Environment Waikato are supportive of this management option and believe that if managed appropriately to account for the natural character and recreational values of this area, there is potential for a commercially viable "self funding" gravel removal operation in this area. Environment Waikato will investigate this management option.

The section below provides an assessment of the costs and benefits of ongoing gravel extraction from the Blue Pool to the Hydro Pool, in locations where vehicular access is available, or easily gained:

### **5.4.1 Gravel extraction**

The potential benefits of gravel extraction relate to its role in maintaining the bed level and therefore the carry capacity of the river. Past gravel extraction, as detailed in Smart (2005) controlled flood levels and bank erosion in the vicinity of Turangi from the 1960's to 1980.

At this time gravel was predominantly extracted from around the Turangi township and for a short time in the upper river in association with the construction of the Tongariro Power Development. While renewed gravel extraction at a significant level would reduce flooding risks to the town it would not reduce the risks of the river creating a new mouth or reduce flooding effects in the lower delta.

#### **5.4.1.1 Potential benefits of gravel extraction**

- Reduce bank erosion and further inputs of gravel
- Intercept gravel before it migrates to Turangi where the risks of a higher bed level are more significant
- Relatively easy access along existing angling tracks
- Large source of gravel, particularly around the Admirals and Breakaway Pool.
- Gravel sources are predominantly located on the true left side of the river providing easy access without the need to construct temporary diversions of the river or culvert crossings
- Given flood history it is likely that a commercially viable source of gravel will be available in these areas – establishing the viability of this resource will require investigation by commercial operators. Environment Waikato will seek to encourage and assist such investigation
- Costs of extraction can be offset by commercial value as a source of roading metal
- Financial rewards would be attributed to the owners of the gravel, which in this case would be members of Ngati Turangitukua.



#### **5.4.1.2 Potential costs of gravel extraction - financial**

- It is estimated that over recent decades 11,700 tonnes of gravel has been carried past Turangi every year. This equates to a total volume of approximately 14000m<sup>3</sup> per year (1 tonne equals approximately 1.2 m<sup>3</sup> in volume.)
- In order to remove sufficient gravel to make a positive difference (allowing for haulage up to 10km) to the bed level it would cost approximately \$130,000 per annum (\$9/m<sup>3</sup>). If enough gravel can be extracted from this reach of the river, there may only be a need to remove small amounts from around Turangi. The proposed monitoring regime would determine this.
- Gravel extraction, of the volumes necessary would require Resource Consent from Environment Waikato. This has been undertaken previously by the River and Catchment Services Group of Environment Waikato and is likely to cost between \$5,000 and \$10,000, depending on whether the consent was subject to notification and a formal hearing.

#### **5.4.1.3 Potential costs of gravel extraction - environmental**

- As previously discussed, much of the gravel available is located on the true left side of the river and would therefore be accessible without any major impact on the river.
- Gravel would only be extracted from the dry river shoals avoiding any impact on instream processes.
- Dry gravel such as this is not recognised as a significant component of habitat for invertebrates or other plants and animals in the area.
- Approval has been obtained to operate a crusher plant near Turangi with the associated environmental effects considered and approved during this process.
- Resource consent would not be required to extract gravel if undertaken for the purposes of managing lawfully established structures such as stopbanks and bank protection
- Resource consent would be required for commercial gravel extraction, however the environmental effects associated with this area are not likely to be significant. On this basis the Resource Consent process is not likely to be a significant barrier to undertaking this work.

#### **5.4.1.4 Potential costs of gravel extraction - social**

- These sections of the river are subject to significant angling pressure over the winter months (May to October). A gravel extraction operation over this period would adversely impact on the experience of those anglers.
- An operation outside these times would have a significantly lower impact, as the number of anglers on the river is minimal. However other people will still be using the walkway network and will need to be considered.
- Heavy vehicles transporting gravel along angling access tracks have the potential to inconvenience other road users and cause minor damage to the road surface. Appropriate signage and a road monitoring and maintenance programme would readily mitigate these effects.

#### **5.4.1.5 Potential costs of gravel extraction - cultural**

- The Tongariro River is an important toanga to Ngati Tuwharetoa and Ngati Turangitukua and other hapu upstream of the SH 1 Bridge. Gravel extraction would be undertaken in conjunction with the tangata whenua to ensure any culturally significant features of the area are managed.
- Ngati Turangitukua have been heavily involved in the management of the river over the past few years and a strong relationship has been established with Environment Waikato which would provide a foundation upon which to base any discussions regarding gravel extraction.

## 5.4.2 Gravel management plan

In order to establish an ongoing gravel management regime in this reach it is envisioned that a Gravel Management plan will be developed and that this will detail:

- Work required to be undertaken to establish a sustainable gravel yield
- Consent requirements to extract gravel from the river on an ongoing basis
- The most cost effective method of ongoing gravel removal
- Potential suitable sites for gravel extraction, based on access and other constraints
- Establishment of river cross sections to act as baselines for monitoring the river bed level in areas of concern. This will allow regular surveying to establish critical sites for extraction and times when extraction is required.
- Appropriate gravel removal methodologies established through consultation with all stakeholders
- Appropriate arrangements with the local Tangata Whenua, recognising the unique rights and responsibilities they have for the river and its bed. This will include the issue of royalties and contract management requirements that may arise.

## 5.5 Specific management measures - Middle river 2 (Hydro Pool to State Highway 1 bridge)

The reach from the Hydro Pool to the SH1 bridge is a critical area in terms of managing the potential impacts of flooding and erosion. This is due to the location of many residential dwellings and related infrastructure such as roads and sewer lines adjacent to the river channel.

This reach has therefore been subject to extensive river management work over the past three to four years including bank protection and stop bank construction.

Smart (2005) identified that this section of river, although at risk of flooding and erosion is relatively stable and suggested that gravel extraction, bank protection and stop banks would assist in reducing the bed level and flooding potential. As with the section of river upstream, these management options would reduce flooding levels in the immediate area, however they would not significantly improve the current level of flooding and risk of break out in the lower river.

For the purposes of this plan, further bank protection and stop bank construction are not being considered as a future management options due to the current level of protection provided.

### **Managing nuisance riparian vegetation and in channel vegetation debris**

Ongoing but relatively small scale management of riparian vegetation is likely to be required in this reach, especially along the right-bank of river above the bridge to prevent trees from entering the river channel and causing debris build-up and consequent river channel constrictions. Some future bank stabilisation will also be considered as it is required, although this is likely to be largely event driven and treated as river channel maintenance. Existing resource consents provide for the management of Instream debris by Environment Waikato provided it is associated with maintaining a stable channel and the capacity of the flood protection scheme.

### **Managing gravel and gravel extraction**

As in the upstream reach gravel management by way of extraction is likely to be required to meet the long term outcomes expressed by stakeholders. However the management of this gravel in the upstream reach should reduce the need for intensive management in this area and it is likely that most gravel management requirements will be event driven rather than routine. There are significant opportunities for collaboration with other management agencies (DOC & TDC in particular) to enhance recreational access to this area in conjunction with works required to manage the river channel.

The gravel and/or sediment management activities likely to be necessary in this reach include minor correction works in the bed resulting from the February 2004 flood, and ongoing maintenance gravel removal of deposits immediately upstream of the bridge which act to reduce its waterway capacity.

### **Other management measures**

A further important consideration in this area is to ensure that inappropriate development of river front and flood prone land does not occur into the future. This will require input by Environment Waikato and other stakeholders into the next District Plan Review and the development of a flood risk management plan for the area (this is currently underway). The issue of managing residual risk from flooding greater than the design standard poses a future challenge (to both Environment Waikato and TDC) for future management of this area and this will also be reflected in the flood risk management plan.

## **5.6 Specific management measures - Lower river (State Highway 1 bridge to de Latours Pool)**

The principal river management issue in this reach is the ongoing management and removal of gravel.

It has been estimated that up to 50,000 m<sup>3</sup> of gravel accumulated in the reach due to the February 2004 flood. Removal of this gravel material by Environment Waikato began in 2005 and will continue into 2006 and possibly 2007. However this will not act to re-establish the “gravel trap” created in the gravel mining era of the 60’s and 70’s. Consequently, ongoing gravel extraction will be required to maintain the bed in this area at its current level and prevent gravel migration into downstream areas. This will be a combination of routine and event driven gravel removal.

### **Managing gravel and gravel extraction**

The requirement for maintenance gravel extraction is based on the bed load capacity of the river in the top end of the reach. By removing all the bed load from within this reach it is hoped to prevent the downstream delta area from suffering further gravel build up.

Graeme Smart (Smart 2002) has estimated that the average bed load transport in the reach is 11.7 kilotons per year, or approximately 8,000 m<sup>3</sup>. The suspended load transport is estimated at around 90,000 m<sup>3</sup>/year, however it is expected that this finer material will largely travel through this reach onto the delta and the lake.

In order to establish an ongoing gravel removal operation it is proposed that a gravel movement and deposition monitoring program would be established. It is likely that this would require regular long and cross section monitoring, use of LIDAR surveys and the establishment of a commercially viable operation to remove and make use of the large quantities of gravel to be removed.

It is anticipated that gravel removal would only occur from dry areas on the outside of bends or from major shoals when river is at normal flow levels.

At present estimates of the annual gravel build-up in this area are not available, however, it is considered that if appropriate access can be developed and that the removal of gravel can be carried out in a way that fits with the recreational and aesthetic outcomes sought by the stakeholders, an ongoing “annual” dry extraction of gravel from the deposit areas could be a viable management option.

The outcomes and management actions expressed by stakeholders for this reach are principally around the management of its trout and recreational values, protection of Turangi from flooding in an appropriate manner (concern has been expressed over the perceived over reliance on stop banks and engineered flood management solutions

and their effect on the natural environment), and minimising sediment losses to the delta reach.

## 5.7 Specific management measures - Delta reach (de Latours Pool to Lake Taupo)

In terms of managing this reach of the river there have been three main, potentially conflicting, outcomes sought by the various stakeholders:

1. Restore and maintain the existing channel to the extent that the farmland around the area remains dry and can be economically farmed, waahi tapu sites are protected from inundation and the risk of future breakout is minimal. There are a number of management techniques that could be used to achieve this outcome either on their own or in combination. Principally, these include ongoing river dredging and/or meander cut offs to increase the channel gradient.
2. allow the area to silt up and manage the effects of any future break-out in the event that it occurs. This would ensure the protection of the wetland values of the area and reflects the natural process of delta development. This could be carried out in conjunction with willow management in the area which would prolong the life of the existing channel and reduce the impact of any future break-out.
3. take pre-emptive action and establish a new channel and mouth through the least sensitive area of the delta by way of excavation and diversion.

In considering these outcomes a number of management options for the delta area have been proposed through the catchment management plan development process. These have all been considered in a cost benefit context and a report was prepared on behalf of Environment Waikato by Cheal Consultants detailing these considerations<sup>1</sup>. This report was presented to the Tongariro River management forum services committee for consideration and comment. On the basis of the comments received from the forum the cost benefit information on the various management options was refined and presented to the Environment Waikato Catchment Services Committee on 10 October 2005 seeking their guidance as to the most appropriate management options for consideration via the councils LTCCP.

Options considered to manage the delta area included:

- Dredging the channel in the delta region to maintain the current channel
- Meander cut-offs' to shorten the current river channel
- Pre-emptive diversion into Stump Bay
- Willow management to maintain current channel
- Managed change, allowing the river to move naturally across the floodplain

On the basis of the cost benefit assessment provided by Cheal Consultants the Catchment Services Committee came to the view that it supported a **Managed Change** approach to managing the lower Tongariro River; this being regarded as the most sustainable long term option.

The Committee consider that managed change is the option which lets the river move naturally over its delta, giving the Tongariro room to live and that in conjunction with this, willow management is considered an appropriate management approach over this length.

The reasons for adopting this approach are:

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<sup>1</sup> Tongariro River Management Options – Costs and Benefits. Discussion Document, May 2005.

- The extent and complexity of physical intervention required to maintain the current channel is extreme.
- The initial and ongoing costs for the physical works and associated consents and investigations at the scale required are unsustainable in terms of the rate paying community of Turangi.
- The movement of the aggrading Tongariro across the floodplain is a natural process and will occur regardless of imposed flow and lake level regimes.

## **Managing nuisance riparian vegetation**

For the more defined river channel below the “Constriction” and De Latours bend, the focus will be on the control of riparian vegetation, mainly willows.

Areas of willow encroachment into the waterway are evident on the outside bends and on shoals on the insides. In some cases, the trees are protecting the banks and should be trimmed, rather than removed.

Nearer to the river mouth, the capacity of the main channel outlet and hence the potential for flushing sediment deposits into the lake (particularly during flood flows and lower lake levels), will be improved by the heavy trimming or selective removal of willows and associated debris. Disposal of willows previously sprayed and killed would be similar to that noted above. There may also be the need for chemical spraying to control willows in some areas and Environment Waikato will liaise closely with the Department of Conservation and Ngati Turangitukua in considering which areas would benefit most from this activity. For biodiversity purposes it may also be appropriate to extend the area of willow control away from the river banks and into the larger wetland area. This will be best achieved in partnership with both of the agencies above and Environment Waikato will seek to develop this option further as part of implementing this management plan.

## **Managing in channel vegetation debris**

Any excavation of river sands and finer gravels from the lower river will be limited to and be focussed on local constrictions and shoals typically on the inside of bends, and prevention or removal of debris accumulations e.g. from shoals. Where this is necessary to protect significant infrastructure or waahi tapu, more significant works will be considered and funded on a case by case basis. The closure of local overflow channels, e.g. towards Grace Rd on the right bank and on Church’s property on the left bank, will use such material coupled with gravels from further upstream.

Selected willows on both banks of the river from the main mouth of the delta to about De Latours Pool will be cleared and the debris removed and stacked and anchored to the flood plain. Poisoning of willow roots may be required. Clearance will involve both hand and mechanical methods and, in the lower reach where access is limited, may require working from a barge. The barge can access and exit the river from the Lake side only.

It should be noted that any such operation will be carried out in the dry areas of the river. The operation areas will be limited to those shown in the Turangitukua Report prepared by Kerry Scott and Bill Byford (2003). As with any removal of blockages caused by willow growth in river channels, there will be associated removal of gravel and sand. Where practical this will be used for the closure of overflow channels into the delta area. This work is not intended to include any significant extraction of riverbed material.

## **Managing gravel and gravel extraction**

On the basis of the cost benefit work undertaken by Cheal consultants no active dredging or gravel / sand removal is proposed for this reach except on a site by site basis where it may be necessary to protect Waahi Tapu or significant infrastructure.

# **6 Catchment wide management options**

There have been two potential management options raised throughout the management plan development process that are not necessarily related to any particular section of the river. Land use planning and controls to minimise the impacts of flooding or the river breaking out of its channel have been evaluated. In addition, the possibility of utilising the Nga Whenua Rahui programme, to protect some of the affected land in Maori ownership and to allow the owners to extract some value from the land.

## **6.1 Land use planning and controls**

Taupo District Council is charged with managing land use in the district. This is achieved through land use provisions of the Proposed District Plan (PDP) and various other Structure Planning documents that must be considered when planning land use activities. Currently, the PDP is the only relevant planning document affecting the Tongariro River catchment.

The land use planning provisions of the PDP deal with Flood Hazards in the Turangi area that were evident at the time of drafting. It is important to note that the plan was notified in July 2000 prior to the current risks associated with flooding and potential river break out arising.

It is possible to incorporate new land use controls into the PDP. Taupo District Council is currently in the process of drafting a Growth Management Strategy (GMS) that will guide growth throughout the district. A draft strategy will be completed in December 2005 for inclusion in the 2006 LTCCP. Recommendations from the GMS will then be incorporated into the relevant statutory document to give the particular issues 'teeth'. Discussions with officers of Council have confirmed their willingness to assist with this process.

Another way of empowering any recommended land use controls is to request their inclusion in the proposed Turangi Structure Plan. This structure plan is scheduled for completion following the completion of the GMS. Ideally the GMS would be the preferred vehicle as it is programmed for completion earlier than the structure plan, but if this is not achievable in the available timeframe, the structure plan could be utilised.

## **6.2 Nga whenua rahui**

The purpose of the Nga Whenua Rahui fund is to protect indigenous ecosystems on Maori land that represent the full range of natural diversity originally present in the landscape, by providing incentives for voluntary conservation. The fund, administered by the Nga Whenua Rahui Committee and serviced by the Department of Conservation, receives an annual allocation of funds from the Government. The fund is geared towards the owners retaining tino rangatiratanga (ownership and control).

The aim of the Nga Whenua Rahui is to recognise and legally protect the conservation values of indigenous ecosystems.

Additional criteria, which might be applied, include:

- Urgency of threats to the area that protection could alleviate.

- The opportunity for protection may not arise again.
- Costs of protection versus the value of protection.
- Opportunity costs of not being able to protect other areas.

In summary it appears as though there may be an opportunity for Maori land owners to further investigate the possibilities of utilising this fund to protect areas of significance to them which are not addressed in the proposed management of the lower river by Environment Waikato.

## **7 River and flood management funding**

### **7.1 Benefit area and flood protection works**

The flood plain and historic delta of the Tongariro River extends from just south of Turangi towards the existing delta and the lake. Turangi township is located on the historic delta however, the actual floodable plain covers a relatively small area.

There are limited areas of stopbanking (or proposed stopbanking) next to some small low lying areas in the old town. Stopbanking on the right bank of the river protects the low lying Herekietie Street/Tongariro Lodge area and the area near the sewage ponds.

A large proportion of the existing river management works are designed to prevent the river from eroding and/or encroaching on land next to the existing river course. Edge protection in the form of boulder riprap is one of the main tools used. This is used in a number of places along the river, particularly where it passes next to and through the Turangi township and past the Tongariro Lodge. Only minor areas of edge protection works exists beyond the Tongariro Lodge.

Rural land protected from flooding by stop banking is only present in a relatively small area at the south-west margin of the town. Here, a length of stop banking mainly protects the sewage ponds, but also provides protection to the neighboring rural area. However, the protected rural area merges with floodable land on both sides of the river's lower reaches.

### **7.2 Differential rating system**

The differential rating system used to fund River Management and flood control works is based on capital value. This is a decision made by Council, and is based on the premise that properties with the greatest value get the greatest benefits from flood protection schemes because they have more to lose in terms of damage to land and improvements.

In a large flood event where property or life were at risk, steps would be taken to mitigate flooding effects in urban areas before rural areas.

The Classification and Benefit Analysis associated with the differential rating system is undertaken in accordance with the provisions of Section 41 of the Rating Powers Act 1988, and in accordance with the Local Government Amendment Act No.3.

### **7.3 Benefits**

This Classification and Benefit Analysis is limited to local benefits. It looks at benefits for properties in the Turangi township and the surrounding rural area on the Tongariro Delta and the adjacent flood plain.

At the primary level, benefits include those derived from stopbanking and associated works designed to prevent flooding of low-lying terraces next to the river. Primary level

benefits also include those areas located reasonably close to the river where overflows and erosion could occur without river management works.

At the secondary level, there are benefits:

- from flood control and river management works where they prevent damage to local infrastructure, especially sewage, watersupply, power reticulation and roading
- for community safety and peace of mind, due to property and infrastructure protection
- for the town's economic activity and the town's residents in general, as a result of protection from flood damage
- for the town's property values, which are able to be maintained or enhanced to a varying degree, depending on where they are within the benefit area.

## 7.4 Issues

The following issues have been taken into account:

- Only a small part of the Turangi urban area has been subject to flooding since residential occupation and stop banking began.
- Most of the work is focused on controlling the river and preventing erosion. This prevents as far as possible any major changes in the river's course and minimises risk to property. However, a large part of the old town that is located next to and runs parallel with the Tongariro River is still considered to be at risk.
- Some properties in Turangi pay higher rates than others. They include properties that have flooded in the past, are in low lying areas or are located close to the river.
- Property values in the old town are generally higher than in the new town residential area. Therefore, there are benefits from river control works in terms of maintaining property values in the old town. These benefits do not apply to the same extent in the new town residential area.

Given the above, there is no justification for averaging rates across the more elevated parts of old town and new town.

Any protection for rural areas as a result of works in the Turangi urban area is largely incidental. Surrounding rural areas have a relatively low land value. Therefore, under a capital value system there is a relatively small rating incidence for surrounding rural land.

Most of the costs associated with river management in Turangi are being met from Project Watershed. This acknowledges that the river is part of a large system, which covers a much greater area than Turangi alone.

A large part of the costs of river flooding control, such as stopbanks and associated works, are also being met by Project Watershed. This recognises the high level of indirect benefits and contributory effects for areas outside of Turangi.

There is no mathematical or measurable data currently available which provides a dollar value to benefits.

## 7.5 Land classes

In establishing the differential rating system, land in the river catchment has been classified according to the level of benefit received from river management and flood



protection works. Figure X shows the distribution of the various land classes which are detailed below in descending order of benefit received.

### **7.5.1 LPT1 Ratio 100**

This class includes land located below or about the flood level as defined by the 1958 flood.

This class benefits from stopbanking and river management works and property values are enhanced due to the land improvements and increased protection. Land in this class also benefits from protection of infrastructural assets, the contribution of protection works to sustaining economic activity, as well as community safety and peace of mind.

### **7.5.2 LPT2 Ratio 60**

This class includes land that lies mainly between the 1958 flood level and the expected outer extent of flooding during a very large flood. This land has protection in the form of stopbanks, edge protection and channel works. It includes more elevated land located close to the river that is likely to be affected by erosion and flooding if river protection works were not present.

Properties in this class share in the benefits from protection of infrastructural assets, and the enhancement of property values created by the protection works. Properties also share in the benefits associated with economic activity, community safety and peace of mind.

### **7.5.3 LPT3 Ratio 40**

This class is made up of rural land divided into two areas. The larger area is made up of developed pasture land, with a variety of residential, smallholding and farming uses. It is protected by stopbanks near the oxidation ponds.

The second area is on the right bank of the river from the State Highway bridge, extending to Herekieke Street. Protection from erosion and potential for the river to erode is provided by substantial rock edge protection works.

### **7.5.4 LPT4 Ratio 35**

This class contains the remaining land in the developed old town residential area that lies above the level likely to be affected by flooding or erosion. This land will benefit more from protection works than the new town due to increased property values. Properties in this area also share in the benefits from infrastructural protection, maintenance of economic activity and the community benefits of safety and peace of mind.

### **7.5.5 LPT5 Ratio 20**

This class contains the rest of the Turangi urban area. It contains most of the new town, including the commercial and industrial areas, along with some major accommodation complexes. This part of Turangi is on relatively high ground and is not considered to be at risk from river flooding or erosion.

Properties in this class benefit from the protection of infrastructural assets and the community benefits of safety and peace of mind. Properties also benefit from the maintenance of economic activity from the works. This applies particularly to the commercial, industrial and accommodation sectors. These benefits are less in the new town residential areas, which mainly contain properties with low values.

Consideration was given to placing the commercial, industrial and accommodation sectors in a separate higher class. However, capital values for these property types are relatively high, and an equitable incidence of rating is considered to result from their inclusion in LPT4.

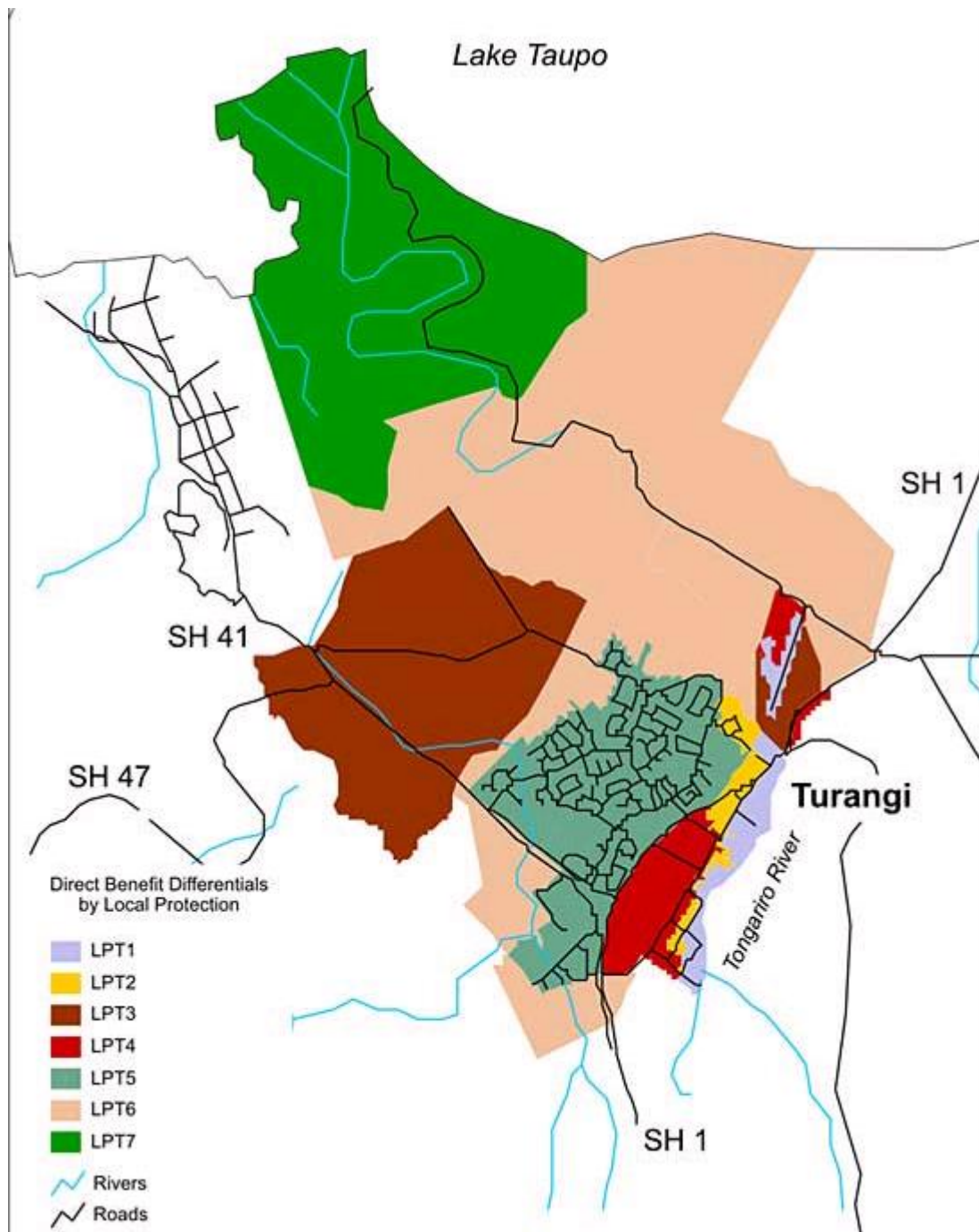
## 7.5.6 LPT6 Ratio 10

This class is made up of the flat land next to and to the north of Turangi. It is mainly in pasture, with some undeveloped and partially developed land. The land receives a small benefit from river management and control of overflows, along with a community benefit from the works as a whole.

## 7.5.7 LPT7 Ratio 5

This class contains the rest of the delta extending from the LPT6 boundary to the river mouth, the lake and the Tokaanu tailrace. Much of the land is undeveloped or semi-developed.

Some river management works are being undertaken in conjunction with Genesis Energy, and there is likely to be a maintenance requirement. There is some community benefit from the works as a whole.



**Figure 2 Land classes for protection works rating purposes – Tongariro River**