BEFORE A HEARINGS PANEL OF THE GREATER WELLINGTON REGIONAL COUNCIL AND MASTERTON DISTRICT COUNCIL

[GWRC Ref: WAR 070077]

IN THE MATTER	of resource consent applications to Greater Wellington Regional Council pursuant to section 88 of the Resource Management Act 1991
AND	
IN THE MATTER	of a Notice of Requirement to Masterton District Council pursuant to section 168, 168A and 181 of the Resource Management Act 1991
BY	Masterton District Council
FOR	the proposed upgrade of the Masterton Wastewater Treatment Plant

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STATEMENT OF EVIDENCE OF GARY WILLIAMS ON BEHALF OF MASTERTON DISTRICT COUNCIL

Subject Area: Flooding and erosion control

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1. INTRODUCTION

1.1 My name is Gary John Williams. I practice as a consulting engineer specialising in the field of water and soil engineering. I hold the qualifications of Bachelor of Engineering, Bachelor of Science and Master of Commerce. I am a member of the Institution of Professional Engineers New Zealand. I have worked for the Water and Soil Division of the Ministry of Works and catchment authorities in New Zealand, as well as overseas.

1.2 Since 1987 I have practised as a private consultant, providing advice, investigation, design and construction supervision services to regional and district councils, commercial firms and private individuals, as well as providing expert evidence.

1.3 Over the last 30 years I have had extensive experience on many rivers throughout New Zealand, covering all aspects of river management and flood mitigation, including comprehensive investigations, design work, construction supervision, and reviews, and I have undertaken bridge waterway investigations on many bridges and culverts.

1.4 In recent years, as a consultant, I have carried out comprehensive investigations of river behaviour and river management practices, and undertaken final design and construction supervision for major works on many rivers, including the Waitara, Whanganui, Manawatu, Waikanae, Otaki, Hutt and Ruamahanga rivers. I have also carried out many investigations as well as reviews of flood mitigation measures, including stopbanks.

1.5 I have recently undertaken reviews of flood hazard management in New Zealand, for the Ministry for the Environment, including asset management, hazard identification, infrastructure exposure and training.

1.6 My professional involvement with the Ruamahanga River started in the 1970s, when I worked for the Wairarapa Catchment Board. Since becoming an independent consultant I have done a number of studies and investigations of the Ruamahanga River, including the reach above Wardells Bridge, for both the Greater Wellington Regional Council and Masterton District Council.

1.7 In this matter, I have undertaken investigations of the river flooding and erosion potential at the Masterton Wastewater Treatment Plant (MWTP) site. This has included the design of bank protection and river management works for the project. As part of this

design, I have reviewed and made use of output from the hydraulic modelling of the river reach from Wardells Bridge upstream.

1.8 I have read the Code of Conduct for Expert Witnesses issued as part of the Environment Court Practice Notes. I agree to comply with the code and am satisfied the matters I address in my evidence are within by expertise. I am not aware of any material facts that I have omitted or might alter or detract from the opinions I express in my evidence.

1.9 My evidence is structured as follows:

(a) scope of evidence;
(b) the site and surrounding environment;
(c) flooding and erosion risks;
(d) the proposed erosion control and river works;
(e) submitters' concerns; and
(f) conclusion.

2. SCOPE OF EVIDENCE

2.1 My evidence will address the nature of the MWTP environment, with respect to the adjacent Ruamahanga River, and flooding and erosion hazards. I will describe the proposed works or alterations to reduce the risks of flooding and erosion. I will also respond to specific concerns that have been raised by submitters that relate to the river hazards.

3. THE SITE AND SURROUNDING ENVIRONMENT

3.1 The MWTP is located beside the Ruamahanga River. I have set out a brief summary of the nature of the river at the site and the flooding and erosion hazards below. They are described in more detail in sections 5.3.4 and 8.6.2 of the AEE.

3.2 Immediately upstream of the MWTP, the Ruamahanga River is sharply deflected by a cliff formed in terrace materials (refer to the aerial photos of the river in Appendix E of the AEE). This cliff is slowly retreating because of the river attack at the bottom of the cliff. The MWTP itself is located across an old loop of the river, which was cut off in the 1960s by the river authority of the time (refer Figure 4 in the AEE).

3.3 The river reach has been actively managed over many decades, under a river management scheme and to protect the ponds of the MWTP. At present, the river has a relatively well-defined channel and well-shaped natural meander form along the reach from the cliff upstream of the MWTP down to Wardells Bridge.

3.4 Some rock protection works have been placed along the river bank in front of the ponds (on the right bank) and at the cliff and immediately downstream (on the left bank).

3.5 A flood excluding stopbank has been constructed along the right side of the river, from Masterton down to the MWTP ponds. This stopbank provides protection to a substantial amount of land in the Homebush area. The design standard of the stopbank is not known, but crest levels are above the currently estimated 100 year return period flood flow, except for a short length immediately upstream of the ponds.

3.6 There is no stopbank along the left side, and this is partly because of the difficulties that arise from the Whangaehu River confluence. An area of land on the Te Ore Ore plains can be flooded from both the Whangaehu and Ruamahanga rivers, and any stopbanking must allow for the outflow of Whangaehu River flood waters to the Ruamahanga River.

4. FLOODING AND EROSION RISKS

4.1 The Ruamahanga River channel in the area of the MWTP is well defined and readily contains the flows of small flood events. When flood levels increase above the defined channel, floodwaters spill onto the adjacent floodplain land. As there is no artificial containment of floodwaters, by stopbanks or other such measures, along the left side of the river larger flood flows spill onto the immediately adjoining flood plain. On the right side, however, overflow floodwaters are confined by a stopbank north of the pond embankments, and then by the pond embankments themselves. These banks protect a considerable amount of low-lying land in the Homebush area.

4.2 The floodable berm areas alongside the river are relatively wide, and in larger events considerable floodwater spills onto this land. However, most of the flood flow is still within the main channel, with its fast flowing waters and high forward velocities.

4.3 The narrowest section of river is around the tight bend by the existing Pond 1, where the embankment around the pond restricts flows across the inner side of the bend. With the construction of the new ponds, most of the existing pond embankments will be cut down to the 2 year flood level to allow floodwater to spread over the area of the

decommissioned ponds (refer to Beca Drawings C602, C608, C616 to C623). This significantly widens the width of the flood plain, which will result in lower flood levels.

4.4 The existing northern stopbank will be retained to provide flood protection to the new ponds that will be located behind this stopbank. Floodwaters will be quite strong on the berm land and concentrated at the northern stopbank.

4.5 It is proposed to upgrade the stopbank on the true right side of the river upstream of the existing ponds and adjacent to the proposed ponds, to provide protection against the 1 in 100 year return period event (a peak flood flow of 955 m^3/s), which is considered an appropriate level of protection for the type and value of the asset being protected (refer to Beca Drawings C602 and C621). The details of the proposed upgrade are described in more detail in section 5 of my evidence.

4.6 The flood risk has been estimated by flood frequency analyses carried out by Greater Wellington Regional Council (GW), and the flood capacity of the river channel has been calculated by hydraulic modelling.

4.7 A re-assessment of the flood risk that takes into account predicted climate change has been undertaken for this project. Assessments of the impacts of climate change on flood risks in New Zealand are only just beginning to be undertaken. NIWA has provided scenarios with estimates of the likely increase in rainfall over time due to predicted climate changes. These increases in rainfall must be converted into increased flood flows, by flood hydrology analyses, and then into increases in flood levels through hydraulic modeling.

4.8 GW calibrated a flood forecasting model of the Ruamahanga River, using the October 1998 flood event, and then used estimated increases in rainfall intensities (over a 12 – 24 hour period) to model increases in 100 year return period flood flows, and then increases in flood levels. For the mid-range and high scenarios, rainfall increases by the year 2080 (of 13% and 25%), gave flood flow increases at Wardells Bridge (of 14.5 % and 28%), and this gave increases in maximum flood levels (of 0.2 m and 0.4 m respectively).

4.9 The hydraulic modelling of the Ruamahanga River, undertaken for this project, compared flood levels for the pre and post upgrade of the stopbank upstream of the existing pond. This shows that the estimated increases in river levels for a 100 year flood are 60 mm near the oxidation ponds, and increase to 80-90 mm downstream of the

oxidation ponds to Wardells Bridge, under present conditions. This modelling used the most recent cross sections of the river channel with no gravel extraction (Wallace 2007). The hydraulic model was not updated for the proposed conditions, with the decommissioned ponds, and the removal of the existing ponds will reduce flood levels in the vicinity of the ponds and downstream.

4.10 The proposed upgrade of the stopbank is along a short length upstream of the existing ponds of the MWTP, and in front of the proposed ponds. At present, overflows can occur along this relatively low length of stopbank at infrequent intervals, with overflows commencing at flood flows with an estimated return period (without any adjustment for climate change) of around 20 years. For all floods up to this level, that is, in events more frequent than a 20 year return period, flood levels would be unaltered with or without the stopbank upgrade. Given any effects are restricted to this range of flood frequencies (20 to 100 year), and the small increase in river levels at the 100 year frequency, the stopbank upgrade will have a negligible impact on the flood hazard.

4.11 In summary, the upgrade to the existing stopbank will provide protection to the MWTP site against a 100 year flood (peak flow of 955 m^3/s). Decommissioning the existing ponds will create a wider floodway, reducing flood levels and avoiding the erosion issues associated with the existing ponds.

5. THE PROPOSED EROSION CONTROL AND RIVER WORKS

Flood Protection

5.1 Stopbank protection works will be needed to address the flood hazard risk to the MWTP area and the proposed new ponds. The works required include raising the section of stopbank immediately upstream of existing Pond 1, which currently has protection for only a 20 year flood. The upgraded stopbank will keep flood flows away from the new Pond 1A embankment. This improvement will result in a stopbank top level that has 300 mm of freeboard above the calculated level of the 100 year flood, as estimated from past records.

5.2 The existing pond embankments adjacent to the river and Makoura Stream will be initially cut down to the height of the 2 year flood level to allow major flood flows to go over the area of the decommissioned ponds. They could be cut down to a lower level at a later date to encourage further siltation of this area. The northern embankment of the existing ponds will be removed and the material used to fill the decommissioned ponds

area. Drawings C622 and C623 in Appendix D show longitudinal sections through the proposed and existing ponds, and give design levels.

5.3 The long-section of the river flood levels adjacent to the oxidation ponds is shown in Drawing C621 in Appendix D. This drawing shows the section of the existing stopbank to be raised and the existing stopbank/bund that will be cut down to the 2-year flood level.

Erosion Protection

5.4 The new ponds will be constructed about 270m from the river, which will provide a wide buffer of land between the ponds and the river. Channel meander movements would then be managed and accommodated within a 60 m buffer area adjacent to the Ruamahanga River. The buffer will be planted in willows and other vegetation.[1] Some permeable structures, such as fences and groynes of piles and cabling, could be added to provide some initial strength to the buffer area, and act as on-going strengthening. The steep sections of the river bank adjacent to existing Ponds 2 and 3 will be re-graded to flatter slopes and the existing rock groynes will be repositioned on the upper part of the slope.

5.5 To provide protection for the pond embankment/stopbank from flood flows on the berm land beside the main river channel, a planted zone of poplars, alders and willows will be required in front of the embankment/stopbank, with shrub willows or tall grasses on the embankment face.

5.6 Allowing river channel movements in this location, as opposed to fixing the channel with the major rock works as proposed for retention of the existing ponds, lessens the erosion pressures on the opposite bank. Erosion protection works on the opposite bank, and at the right hand bend adjacent to the existing Pond 1, are not now proposed as part of the wastewater scheme upgrade. While there will be a requirement for ongoing erosion protection works in the reach of the river adjacent to the ponds, this work should be considered as part of the whole river scheme, as managed by the Regional Council.

Construction Methodology & Effects

5.7 The construction of the outfall diffuser will require work within the Ruamahanga River channel. This work would be done in flowing water, as diversions and bunds to isolate

[1] Drawing C602 contained in Appendix D of the AEE shows the location of the buffer.

the banks and allow construction in still water is considered to be more disruptive. The careful placement of the rock that is required minimises disruption of the river bed and increases in the turbidity of the water.

5.8 Construction in the river will not take place within the trout-spawning period (1 June to 30 August) or within the indigenous fish migration period (1 September to 30 November) and I understand there will be no disruption to fish passage. The river disturbance will have some visual and turbidity effects on recreational use of the river for a short period during summer months.

5.9 Mostly the outfall diffuser work will disturb coarse gravel materials and involve the placement of rock units, which will have a relatively low impact on the river water quality. It will be possible to regrade steep sections of the riverbank adjacent to Ponds 2 and 3 without working in the river bed, and therefore there will be minimal river disturbance due to this activity.

5.10 The construction effects of the stopbank upgrade for additional flood protection would be the noise, dust and other impacts of earthmoving equipment. The topsoil on the stopbank and fill borrow areas would be stripped away, stockpiled and re-spread. The upgraded stopbank would be grassed to give the same cover as at present.

5.11 The erosion protection works include the establishment of a planted buffer zone on what would become berm land adjacent to the Ruamahanga River, after the decommissioning of the existing pond. Generally, the planting will be restricted to the berm land, and will not encroach into the main river channel.

5.12 In my view, any construction effects will be minor, being the short term effects of general construction activity, and some localised disturbance of the river channel.

Maintenance of Erosion Protection Works

5.13 The planted buffer on the right bank of the Ruamahanga River will require on-going management, including the layering and re-establishment of willows and other vegetation, to maintain the buffer over time.

6. SUBMITTERS' CONCERNS

6.1 The submissions include just one issue that relates to erosion and flooding hazards. The submissions listed below raise concerns about the use of land on the river side of the stopbank/embankment for border strip irrigation of treated effluent.

Submitter 242514 Riddlesworth Estate Ltd / Forbes

"*A considerable area of the land intended to be used by the applicant lies between two stop banks designated by GWRC as a spillway to the river. The outer stop bank is under the continual threat of erosion from the river. This area of land is unsuitable for use as a dispersal area for effluent as it is exposed to flooding and erosion, and will not take or retain a surface suitable for such use*."

Submitter 242617 Donald KJ Bell

Oppose border strip irrigation to land, and over ponds 1 and 2, and areas at risk from flooding. Reasons are the unacceptable risk in variances, soil loss from flooding, and potential leaching into groundwater.
That plantations be considered in preference to pasture where soils exposed to flood risk.
Potential flood areas be irrigated by SDI methods.

Submitter 242571 David Holmes

Unsuitability of dispersal areas susceptible to flooding.
"*The development and proposed border stripping of the land outside the stopbank is unacceptable because of the flooding factor. This land floods regularly and as late as last week October 8th 2008 experienced a major flood*…."

6.2 I will comment on the flooding and erosion issues raised; the submissions also raised other matters.

6.3 Land treatment is proposed on a strip of land alongside the river on the eastern side of the MWTP. This land is presently in pasture and is good quality farm land. The existing stopbank was set back from the edge of the river channel because of erosion attack and the difficulties of maintaining and protecting a stopbank so close to the river channel.

There is a relatively high flood risk to this land, and natural channel migration gives rise to bank erosion that encroaches into this land.

6.4 However, there is a river management scheme, operated by the Regional Council, to mitigate the erosion risk to this land, and allow ongoing farming of the land. An aim of the scheme is to allow this continued use of the land. The type and quality of the land is also similar to the land protected by the stopbank, where land treatment disposal is proposed as part of the MWTP upgrade. Because of the substantial existing assets of the MDC alongside this reach, stronger bank protection works have been placed including willows adjacent to the berm area and rock groynes in other areas. River works by GWRC have improved the alignment of the river and substantially increased the buffer vegetation at this location in recent years.

6.5 The risk of flooding and erosion is recognised, and the use of this land is really a risk management issue for the MWTP. Floods can damage the irrigation system, but there would be no additional environmental impacts from this, provided the irrigation system is re-instated before disposal re-commences. Sub-mains delivering treated effluent to each set of border-strips in the riverside zone will terminate about 40 m from the existing river edge. If erosion does occur, this setback will provide time for a decision to be made as to whether further rock groynes or other control measures are economically justified in comparison to the lost pasture or sub-main.

6.6 The area of the existing ponds is a somewhat different matter. Future land treatment on this area is proposed following the reclamation of the area (by natural siltation or artificial infilling). The usefulness of the area for land treatment and its vulnerability to floods depends very much on how the area is reclaimed, to what level and with what protection from the river, and the method of disposal. It is accepted that this area will be part of the flood berm and the natural siltation and infilling will have a beneficial effect in providing a silt soil cover for improved treatment and nutrient removal from the wastewater.

7. CONCLUSION

7.1 The existing MWTP is sited beside the Ruamahanga River, and is at risk from river flooding and erosion. The decommissioning of the existing ponds, and the construction of new ponds further away from the river would reduce the vulnerability of the MWTP. It would also mitigate the impacts of the existing ponds, reducing flood levels along the river reach and making channel management easier.

7.2 The decommissioning of the old ponds would give rise to a relatively wide area between the MWTP and the river, and allow a vegetation buffer zone to be established alongside the river channel. This vegetation buffer allows an easier and less expensive management of the river channel, reducing the longer term costs of the river management scheme.

7.3 The proposed upgrade of the exclusion stopbank protecting the Homebush area would have only minor effects on flood levels, and only for flood events between a nominal 20 year and a 100 year return period. The wider berm area downstream would also mitigate any increase.

7.4 The proposed river outfall diffuser and construction effects will be limited to a short period of approximately one month in late summer which will avoid any effects on fish spawning.

Gary Williams
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13 February 2009