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**Committee**        **Hutt River Advisory**  
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## **Hutt River gravel analysis report**

### **1. Purpose**

- To inform the Advisory Committee of the results of the analysis the latest river survey, conducted between December 2003 and April 2004.
- To obtain Advisory Committee endorsement of the proposed gravel management policies for the period 2004-2009.

### **2. Background**

Regular surveys of the Hutt River cross sections provides us with information to monitor gravel bed movement and lateral erosion. This information influences policies on gravel extraction and general river management.

Regular surveys of the Hutt River have been undertaken since 1987, with the latest survey completed during the summer of 2003/2004.

The *Hutt River Gravel Analysis 1987-1998 Report* (Minson, 1998) looked at the survey data available and historic assessments, made assessments of the gravel movement trends in the Hutt River, and recommended gravel management policies. The assessments made in the 1998 report have now been updated based on the 2003/04 survey data and a full technical report has been prepared.

### **3. Summary of Gravel Analysis Results**

#### **3.1 Bed Level Changes**

Bed level changes are calculated by comparing the average bed level over the active river channel at each cross section. Attachment 1 shows the changes in bed level between 1998 and 2004 over the length of the river. On this graph, values above zero represent a bed level rise between 1998 and 2004, while values below zero show a drop in the bed level.

Bed levels through the reach from Ava Railway Bridge to Nash Street have increased by an average of 0.30m, with a maximum bed level increase of 0.61m at Section 720 in Belmont. This rise in bed levels has caused river levels to increase, resulting in areas such as Harcourt-Werry Drive, Block Road, and Riverbank Carpark flooding earlier and more frequently. However, these increases do not have any significant effect on the total floodway capacity.

In the reaches from Pomare Railway Bridge to Barton's Bush and from Moonshine Bridge to Section 2440 upstream of Maoribank Corner, there has been degradation, which is undermining edge protection works and causing considerable lateral erosion of the river banks.

There has been considerable public interest in the gravel beaches between the Whakatiki Confluence (Section 1930) and Totara Park Bridge (Section 2150), due to the proximity of the main road to the river at this point.

Cross-sections through this area show that a number of these beaches have increased in size and would benefit from either cross-blading or limited extraction.

Our bed level management policies aim to keep the Hutt River bed levels within an envelope of maximum and minimum bed levels. Attachment 2 shows the 2004 bed levels in relation to this envelope. It can be seen that the bed levels are generally within the envelope, but are greater in the reach from Ava Railway Bridge to Belmont, and lower at the Whakatiki River confluence and between Maoribank Corner and the Akatarawa Bridge.

### **3.2 Gravel Volume Changes**

Attachment 3 shows the changes in gravel volumes over the length of the river between 1998 and 2004. The gravel volume at a cross-section is the change in volume between that section and the downstream section.

The total volume change over the river is a deposition of 210,170 m<sup>3</sup>. Table 1 shows details of where this gravel movement has occurred. It can be seen that considerably more aggradation has occurred in the 1998 to 2004 period than in the previous two survey periods combined.

The reach from Ava Railway Bridge to Nash Street continues to aggrade significantly, and the change between aggradation and degradation around Nash Street is moving slowly upstream.

Table 1. Gravel Volume Changes

Reach	Cross-section Range	Volume Change (m <sup>3</sup> )			
		1987-1993	1993-1998	1998-2004	1987-2004
Mouth to Ava Railway Bridge	0010-0210	9340	-23530	11937.7	<b>-2252.3</b>
Ava Railway Bridge to Nash Street	0220-0930	112380	160930	202220.4	<b>475530.4</b>
Nash Street to Barton's Bush	0940-1580	-88620	-28880	-14186.4	<b>-131686.4</b>
Barton's Bush to Memorial Park	1590-1710	16590	16660	-3512.7	<b>29737.3</b>
Memorial Park to Whakatiki River	1720-1920	-16520	-26330	-8528	<b>-51378</b>
Whakatiki River to Gibbons Street	1930-2040	10500	18480	-6016	<b>22964</b>
Gibbons Street to Birchville Gorge	2050-2440	-31660	-47120	-8550.7	<b>-87330.7</b>
Birchville Gorge to the Hutt Gorge	2450-3050	40740	-2800	36803.7	<b>74743.7</b>
<b>Total</b>	<b>0010-3050</b>	<b>52750</b>	<b>67410</b>	<b>210168</b>	<b>330328</b>

A total volume of approximately 123,300 m<sup>3</sup> of soil and gravel has been lost through lateral erosion between 1998 and 2004. This corresponds to an average of 20,550 m<sup>3</sup> per year. Estimated lateral erosion during the 1987-1998 period is 25,500 m<sup>3</sup> per year. Much of the eroded material will have been deposited in the lower reaches of the river.

### 3.3 Mouth and Harbour Survey

Major surveys of the mouth and harbour areas have been performed in 1989, 1998, and 2004. These surveys show a drop in gravel volume of approximately 100,940 m<sup>3</sup> between 1998 and 2004, which corresponds to an average drop in bed level of 0.22m. The total bed level drop between 1989 and 2004 is 0.44m. Investigation of the effects of this continued degradation should be undertaken, with a view to decreasing the amount of material excavated if necessary.

### 3.4 Gravel Extraction

Gravel extraction was reinstated in the Hutt River in 2001, with extraction limited to the reach between Ava Railway Bridge and just upstream of Kennedy Good Bridge. A total of 47,380 m<sup>3</sup> was extracted from this reach between 2001 and 2004. Extraction at the mouth continued at a regular rate, with a total of 262,384 m<sup>3</sup> extracted since March 1998.

### **3.5 Gravel Balances**

#### **3.5.1 Hutt River Gravel Inflow Rate**

The inclusion of gravel extraction volumes and an estimated volume of gravel used for the Belmont Edge Protection Improvement Works gives a total volume of approximately 263,170 m<sup>3</sup> of gravel deposited throughout the Hutt River between 1998 and 2004. This corresponds to an average of 43,860 m<sup>3</sup> per year. The amount of soil and gravel entering the system through lateral erosion must be removed from this value, giving an inferred inflow rate of 29,470 to 33,580 m<sup>3</sup> of gravel per year entering the river system.

#### **3.5.2 Extraction Reach Gravel Supply Rate.**

An additional gravel balance of the extraction reach from Ewen Bridge (Section 290) to upstream of Belmont (Section 800) gives a total deposition volume of 205,990 m<sup>3</sup>, which corresponds to an annual supply rate to this reach of 34,330 m<sup>3</sup>/year. This value will include material from lateral erosion occurring upstream of the reach, as well as the general inflow rate of gravel to the river calculated above.

The supply rate to this reach is well above the current extraction rate of 10,000 m<sup>3</sup>/year. Bed levels have risen marginally above the maximum recommended levels. A higher extraction rate of 30,000 m<sup>3</sup>/year is recommended for this reach to lower the bed levels. However, this should be closely monitored to avoid any adverse effects to the river channel.

## **4. Proposed Gravel Management Policies 2004-2009**

The following are the proposed gravel management policies for the Hutt River over the next five years:

1. That extraction continues from Ewen Bridge to upstream of Belmont to manage bed levels and maintain the capacity of the river channel. An extraction rate of 30,000 m<sup>3</sup>/year is recommended, subject to ongoing monitoring (see below).
2. That the extraction reach be surveyed annually and partial gravel analyses conducted to assess that the increased gravel extraction rate remains appropriate.
3. That the gravel beaches upstream of the Silverstream bridges, and between the Whakatiki Confluence and Totara Park Bridge be actively managed by limited extraction, cross-blading, and relocation of material to other river reaches.
4. That options for bed level control structures between Maoribank Bend (Section 2300) and Section 2440 be investigated immediately, to prevent further bed level drops.
5. That the extraction rate of up to 50,000 m<sup>3</sup>/year, at the Hutt River mouth be reviewed within the next two years to ensure it's sustainability.

6. That the regular 5-yearly cross-section surveys and gravel analyses continue as programmed.

## 5. Recommendations

*That the committee:*

1. *receives this report and notes its contents.*
2. *endorses the gravel management policies contained in Section 4 above.*

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**Attachment 1:** Bed Level Changes 1998-2004.

**Attachment 2:** Recommended Bed Level Envelope with 2004 Bed Levels.

**Attachment 3:** Gravel Volume Changes 1998-2004.