Bay of Plenty Regional Council

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Ohau Channel Flush Monitoring (Fish & Game Consultation) – Channel Velocities & Depth

1 Introduction

Fish & Game New Zealand have requested that Bay of Plenty Regional Council arrange monitoring of the flow velocity in the Ōhau Channel. Such monitoring shall occur annually between 1 May - 30 June and again between 1 October - 30 November, for the duration of this consent. The purpose of this monitoring is to determine any effects of the flush on the velocities within the Ohau Channel. This report summarises velocity measurements obtained 20 July 2016 – 15 September 2015 and briefly discusses the impact of consented Lake Rotoiti levels on velocities in the Ōhau Channel. This is the sixth set of measurements since June-July 2012.

2 Velocity Measurements – Method

Velocities within the Ōhau Channel were measured at 3 locations:

a) Lake Rotorua Outlet (1m below upstream edge of weir)
b) 50m below Lake Rotorua Outlet (long term BOPRC flow monitoring site)
c) Mourea (SH 33) Bridge

Conditions on 20 July 2016 included waves 0.1-0.2m, with 15-20kts wind from the southwest quarter. The weir site was exposed to the effects of both wind and waves. Conditions on 15 September 2015 were the same. In both instances, the 40% of the weir site was sheltered by trees on the true left bank.

Velocity and depth measurements were recorded while Lake Rotoiti was at the following level:

20 July 2016 ..... 279.011m

15 September 2015 .... 279.110m

Figure 1 - Map of Velocity & Depth Monitoring Sites

A Sontek M9 Acoustic Doppler Current Profiler (ADCP) instrument mounted in an Ocean Sciences trimaran was used at each site.

It should be noted that the purpose of these measurements was to gather velocity data (ie. water speed), rather than total discharge (ie. the volume of water to pass a given point on a stream bank per unit of time, eg. m3/sec). Therefore any reference to total discharge at the weir, or at SH 33, should be ignored. Gauging across the top of a weir or over large weed banks (such as those found at SH 33 Bridge) is not advisable when measuring total discharge.

In regard to the Lake Rotorua Outlet (Weir) site, the ADCP method was only used through the main channel. A rod-mounted Small Oss mechanical current meter was used across the control structure, on either side of the main channel, due to the shallow water depth. The main channel represented two thirds of the flow and the highest velocities in the cross section. This is consistent with previous measurements. The three separate survey sections making up the complete cross section are provided separately for reference, in Section 3.

3 Velocity Measurements – Results

3.1 Ōhau Channel at Lake Rotorua Outlet (1m below upstream edge of weir):

Velocity (Avg.): 1.424 m/sec	Velocity (Max.): 1.709 m/sec	Depth (Max.): 1.66 m

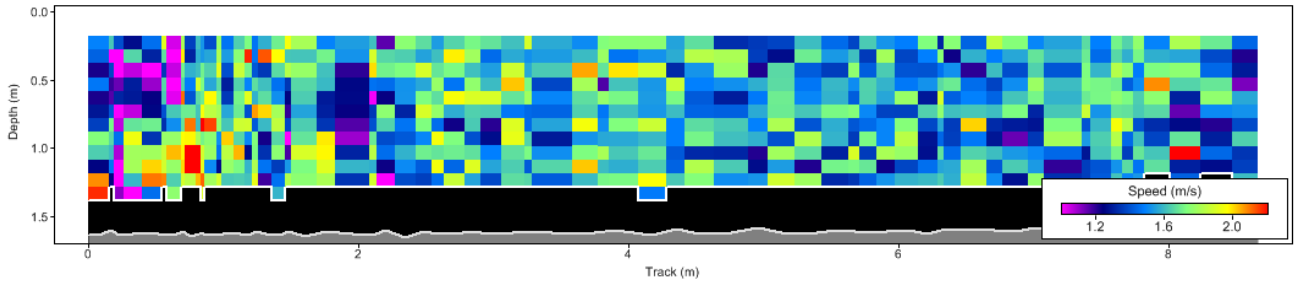

Figure 2 - Water Velocities: Ohau Channel at Lake Rotorua Outlet - Centre of Weir, on 20 July 2016.

Velocity (Avg.): 1.412 m/sec	Velocity (Max.): 1.730 m/sec	Depth (Max.): 1.63 m

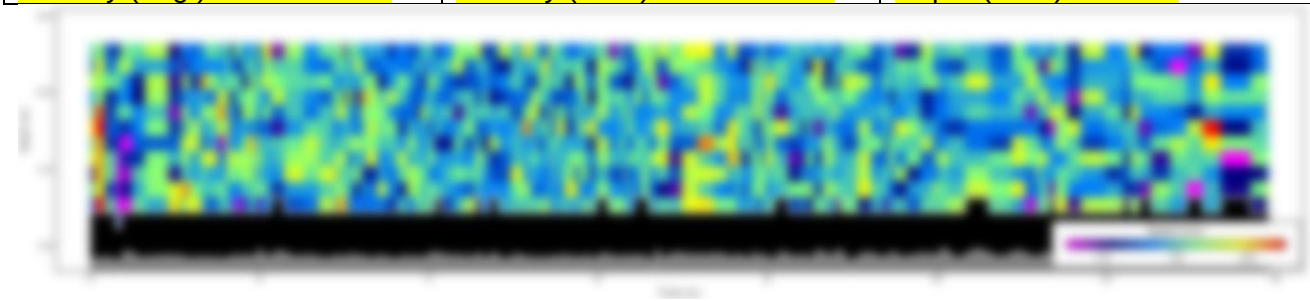

Figure 3 - Water Velocities: Ohau Channel at Lake Rotorua Outlet - Centre of Weir, on 15 September 2015.

Velocity (Avg.): 1.040 m/sec	Velocity (Max.): 1.59 m/sec	Depth (Max.): 0.50 m

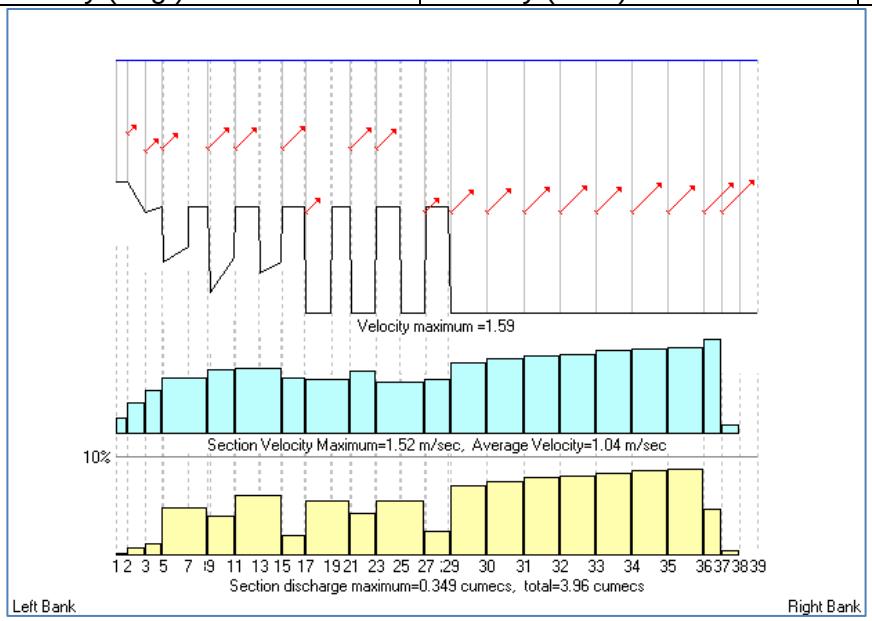

Figure 4 - Water Velocities: Ohau Channel at Lake Rotorua Outlet - True Left Bank Section of Weir, on 20 July 2016.

Velocity (Avg.): 0.877 m/sec	Velocity (Max.): 1.63 m/sec	Depth (Max.): 0.50 m

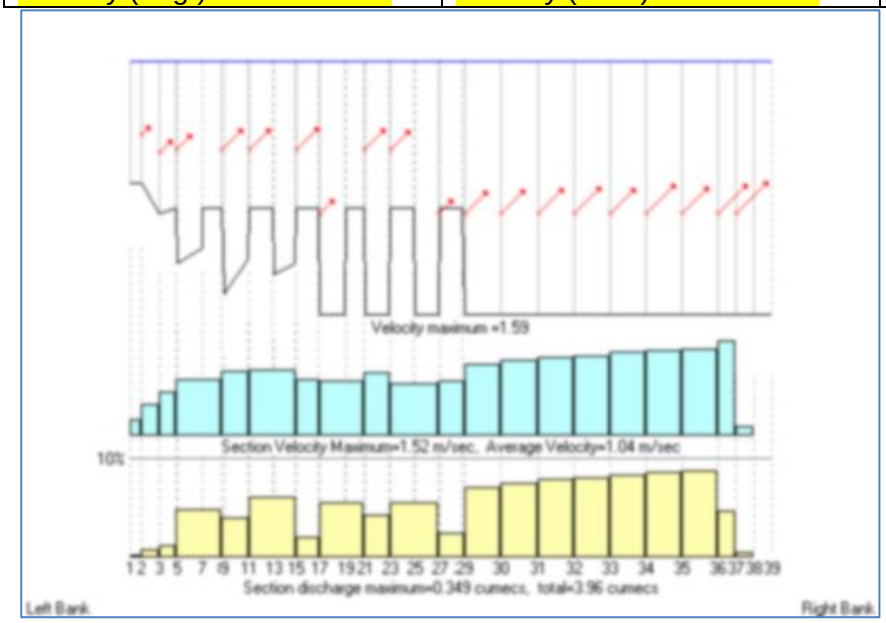

Figure 5 - Water Velocities: Ohau Channel at Lake Rotorua Outlet - True Left Bank Section of Weir, on 15 September 2015.

Velocity (Avg.): 0.877 m/sec	Velocity (Max.): 1.63 m/sec	Depth (Max.): 0.50 m

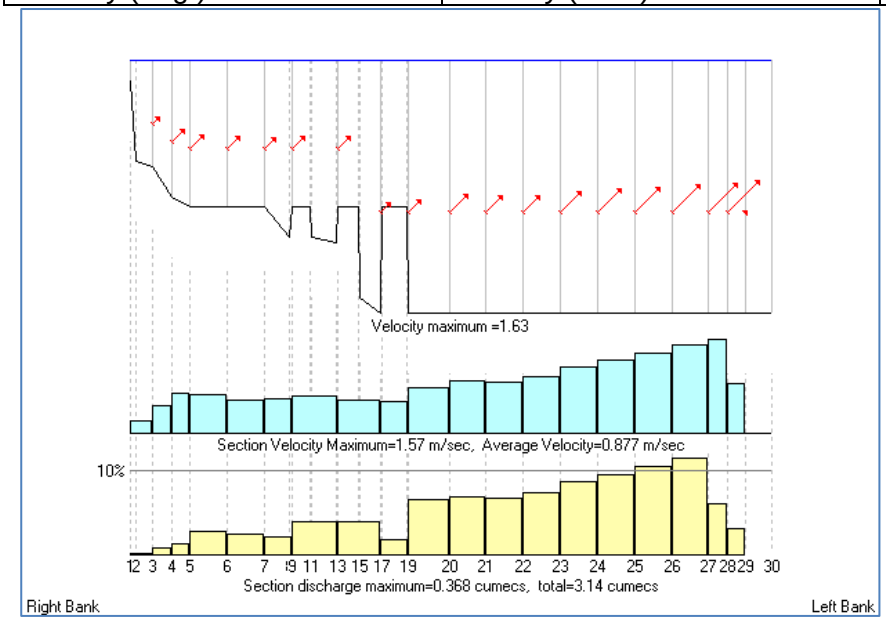

Figure 6 - Water Velocities: Ohau Channel at Lake Rotorua Outlet - True Right Bank Section of Weir, on 20 July 2016.

Velocity (Avg.): 0.782 m/sec	Velocity (Max.): 1.33 m/sec	Depth (Max.): 0.48 m

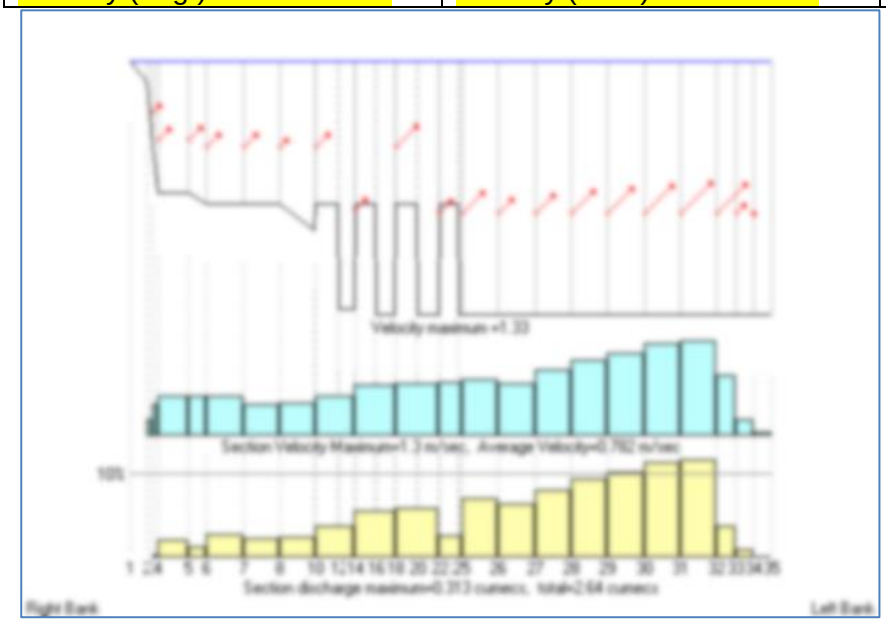

Figure 7 - Water Velocities: Ohau Channel at Lake Rotorua Outlet - True Right Bank Section of Weir, on 15 September 2015.

3.2 Ōhau Channel at 50m below Lake Rotorua Outlet (long-term BOPRC flow monitoring cross section):

Velocity (Avg.): 0.606 m/sec	Velocity (Max.): 0.981 m/sec	Depth (Max.): 2.17 m

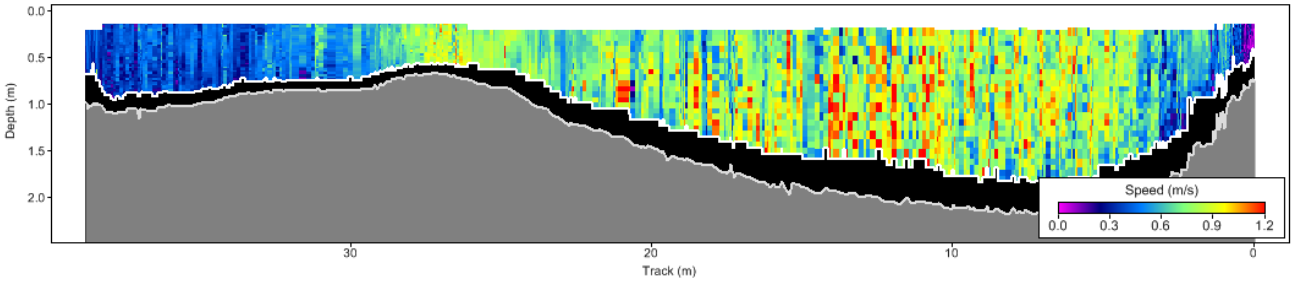

Figure 8 - Water Velocities: Ohau Channel at 50m below Lake Rotorua Outlet, on 20 July 2016.

Velocity (Avg.): 0.593 m/sec	Velocity (Max.): 0.968 m/sec	Depth (Max.): 2.36 m

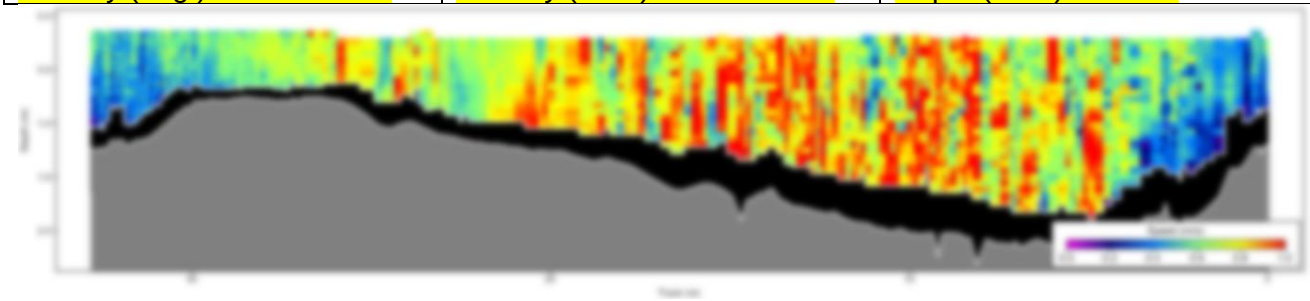

Figure 9 - Water Velocities: Ohau Channel at 50m below Lake Rotorua Outlet, on 15 September 2015.

3.3 Ōhau Channel at Mourea (SH 33) Bridge:

Velocity (Avg.): 0.496 m/sec	Velocity (Max.): 0.838 m/sec	Depth (Max.): 2.50 m

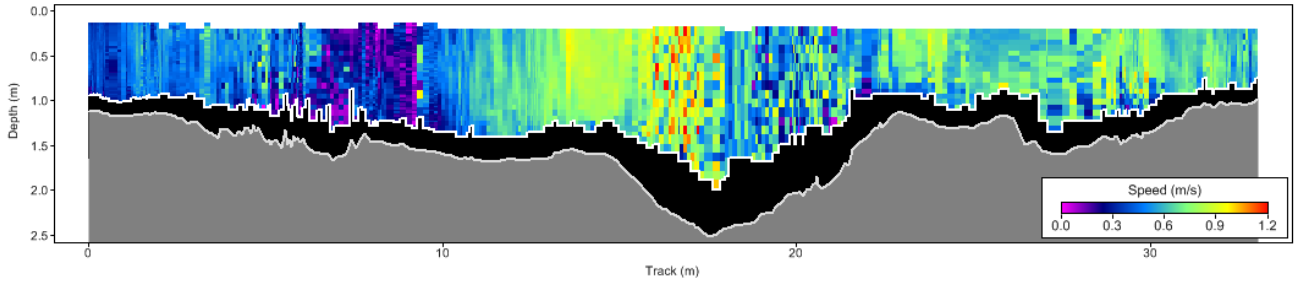

Figure 10 - Water Velocities: Ohau Channel at Mourea (SH 33) Bridge, on 20 July 2016.

Velocity (Avg.): 0.545 m/sec	Velocity (Max.): 0.813 m/sec	Depth (Max.): 1.99 m

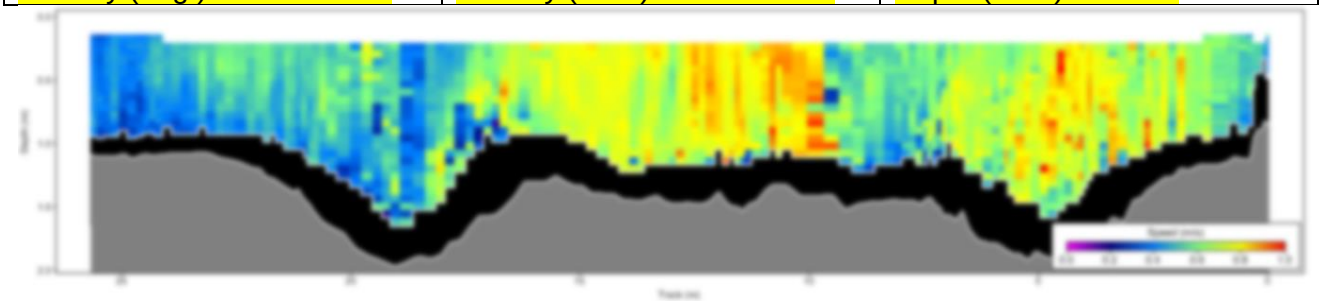

Figure 11 - Water Velocities: Ohau Channel at Mourea (SH 33) Bridge, on 15 September 2015.

4 Ohau Channel Velocity & Depth Measurements – Discussion

Mean and maximum velocities recorded at all sites were consistent with previous measurements (taking into consideration a possible gauging error of +/- 8%).

Mean velocity increased by 0.12m/sec, 50m below the L. Rotorua outlet and by 0.10m/sec at Mourea Bridge. Both sites showed a reduction in channel depth, that would justify the increase in velocity. At the weir, velocities and channel depth remained relatively constant between June 2015 and September 2015 surveys. An increase in velocity was observed on the true left bank section of the weir in September 2015. However, this was countered by a similar decrease in velocity on the opposite bank and is likely to have resulted from the southwesterly wind.

The plots shown above are representative examples taken from a series of 2-8 transects (per site, per day) which are normally averaged to produce an accurate flow measurement. The degree of variation shown between each sampling date is similar to that seen in individual transects collected 5 minutes apart from each other. This includes subtle changes in velocity around stream margins and, in particular, behind the bridge abutments at the SH 33 site.