Consent Holder Annual Report on Okere Gates and Ohau Weir

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Bay of Plenty Regional Council
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Bay of Plenty
REGIONAL COUNCIL

Consent Holder Annual Report on Okere Gates (Consent 65979) and Ohau Weir (Consent 65980) – 14 September 2012

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Cover photo: Gisborne Point Staff Gauge

Acknowledgements

Bay of Plenty Regional Council's (BOPRC's) Survey and Environmental Data Services Teams are acknowledged for their invaluable contributions.

Their work in ground water monitoring, asset capture, cross section surveys, velocity monitoring and software support has contributed to the findings of this report.

Executive summary

As consent holder, Bay of Plenty Regional Council's 'Natural Hazard Group' is required to submit an annual report on the operation and performance of the Okere Gates and Ōhau Channel Weir in accordance with resource consent (RC) 65979 condition 15 and RC 65980 condition 12.

Resource consents 65979 and 65980 approve the continued placement, operation and maintenance of the Okere Gates and the Ōhau Channel Weir structures that are located at the outlets of Lake Rotoiti and Rotorua respectively and were approved by Consent Order signed on 21 March 2012.

This report covers the period from the Consent approval date of 21 March 2012 to a cut off-date of 31 July 2012 (four months).

Lake level target distributions and flow rates were within target distributions except for a few minor incidences during the four month period from March 2012 to July 2012.

Good communication was maintained across the various interest groups and the establishment of two Kaitiaki Groups and a liaison group was facilitated. There was also communication with Rotorua Tourism, Kaituna River Rafting, Fish and Game and various lakeside residents over this period. Media were also kept informed at various times when needed.

This report discusses:

- Actual distribution of lake levels compared to the target distributions.
- Actual flow rates compared to minimum flow rates.
- Operational difficulties.
- Stakeholder consultation.
- Complaints and investigations.
- Conclusions

The consent holder requests that the reporting period be changed to run from 1 April to 31 March the following year for future reporting, with the annual report provided to the liaison and Kaitiaki groups by 1 June each year.

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Part 1: Introduction

1.1 Background

Lake Rotoiti and Lake Rotorua levels are controlled by the operation of the Okere Radial Rates and the Ohau Channel Weir respectively. The gates also regulate the rate of discharge from Lake Rotoiti to the Kaituna River.

The Okere radial gates and Ohau weir are Bay of Plenty Regional Council assets and are part of the Kaituna Catchment Control Scheme. They are operated by the Natural Hazards Group, in accordance with their existing resource consents.

The purpose of the Okere Gates is to increase the outflows from Lake Rotoiti to permit floodwater to be discharged when required, and to reduce outflows to prevent undesirable low lake levels. The impacts of Okere Gates operation on Lake Rotorua levels are generally minor.

The purpose of the Ohau Weir is to control the level of Lake Rotorua, predominantly to prevent undesirable low levels.

The Ohau Channel Weir was constructed in 1989 as a simple weir structure with stop logs.

The Okere Gates structure, constructed in 1982, is a substantial radial triple gate structure.

Prior to the construction of the Okere Gates in 1982, there was a natural rock ledge (at approximatley RL 278.5 m) about 35 m downstream of the existing gates, which naturally controlled Lake Rotoiti levels.

Both control structures were put in place as part of the Kaituna Catchment Control Scheme. Pre-scheme, there was no lake level control on either Lake Rotoiti or Lake Rotorua (apart from the natural rock ledge), with the result that lake levels fluctuated considerably with rainfall, inflow and climate. The structures were designed so that the lake level ranges could be managed within the range set by the former National Water and Soil Conservation Authority (NWSCA), in 1975. These levels were included in BOPRC's Transitional Regional Plan, and are referred to in the existing consents granted for damming the outlets of both lakes.

The Ohau Weir and Okere Gates are operated and maintained as part of the Rivers and Drainage Asset Management Plan (AMP). The AMP outlines the requirements to inspect and maintain the structures over their expected life cycle.

1.2 Reporting

It is a requirement of Bay of Plenty Regional Council Resource Consents 65979 and 65980 to report annually as follows.

Resource consent condition/s state:

(i) RC 65979 – Condition 15 (Okere Gates – Lake Rotoiti).

ANNUAL REPORTING

By 31 August each year for the term of this consent, the consent holder shall provide a report to the Chief Executive of the Bay of Plenty Regional Council or delegate, the Rotorua Te Arawa Operational Liaison Group (RTALOLG) and the Ohau ki Rotoiti Kaitiaki Group setting out:

a) the actual distribution of lake levels compared to the target distribution;

b) the actual flow rates of the Okere Gates compared to the minimum flow rates;

c) any difficulties experienced by the consent holder in achieving the target lake level ranges and minimum Okere Gate flow rates;

d) a summary of any consultation undertaken with stakeholders in accordance with Conditions 9, 10, 11 and 14 of this consent;

e) a summary of any investigations undertaken as a result of complaints about the adverse effects of the lakes;

f) methods for how any difficulties in achieving target level ranges and Okere Gate minimum flows have and will be resolved and how any complaints about the adverse effects of lake levels have been responded to; and

g) Methods proposed to resolve any issues that may have risen including operational difficulties, water quality, and extreme weather events, and any changes required to the Operational Management Plan.

(ii) RC 65980 – Condition 12 (Ōhau Channel Weir – Lake Rotorua)

By 31 August each year for the term of this consent, the consent holder shall provide a report to the Chief Executive of the Bay of Plenty Regional Council or delegate, the Rotorua Te Arawa Operational Liaison Group (RTALOLG), the Ohau ki Rotoiti Kaitiaki Group and the Okere ki Kaituna Kaitiaki Group setting out:

a) the actual distribution of lake levels compared to the target distribution;

b) any difficulties experienced by the consent holder in achieving the target lake level ranges and minimum Okere Gate flow rates;

c) a summary of any consultation undertaken with stakeholders in accordance with Conditions 10 and 11 of this consent;

d) a summary of any investigations undertaken as a result of complaints about the adverse effects of the lakes;

e) methods for how any difficulties in achieving target level ranges and Okere Gate minimum flows have and will be resolved and how many complaints about the adverse effects of lake levels have been responded to; and

f) Methods proposed to resolve any issues that may have risen including operational difficulties, water quality, and extreme weather events, and any changes required to the Operational Management Plan.

Part 2: Actual distribution of lake levels against target distribution

2.1 Lake Rotoiti Lake Level Distributions

Lake level distributions are determined by consent number 65979 Condition 7.4 a. – c. *(Operational Limits)* and are best expressed in the graphical envelope shown in Figure 1 below.

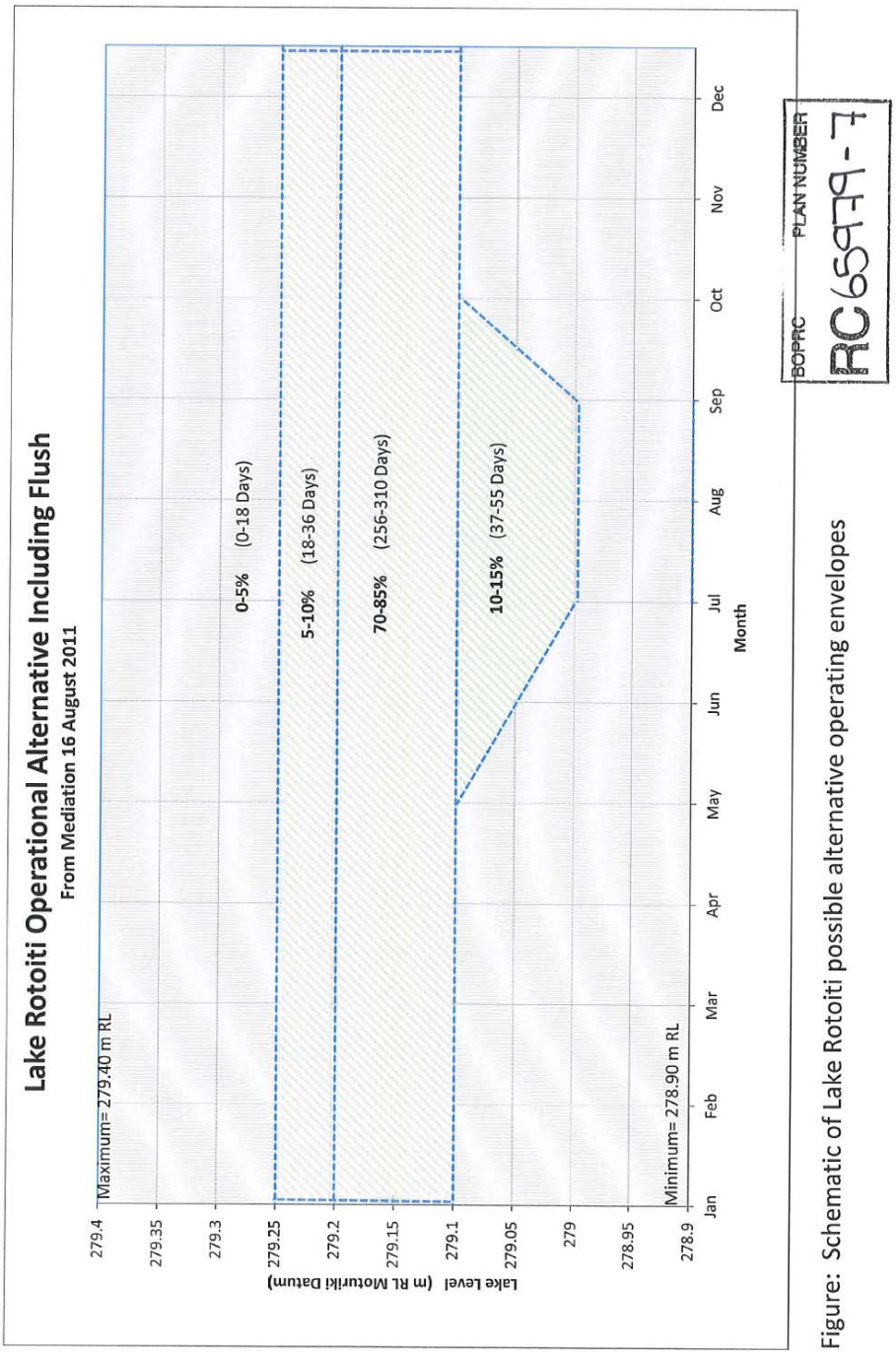

Figure: Schematic of Lake Rotoiti possible alternative operating envelopes

Figure 1 Lake Rotoiti Operational Envelope – Target Distributions.

2.1.1 Data collection and management

Lake levels, Okere Gate settings and flow rates are interrogated each morning from HydroTel - (BOPRC Telementary and Data Management Software). HydroTel data is usually recorded at 15 minute intervals and from this the 0800hrs dataset is extracted as a spot reading and recorded in an 'Operational spread sheet' along with flows, weather conditions, rainfall and general commentary.

Figure 2 below shows a 12 month trace of levels for Lake Rotoiti from 1 August 2011 to 31 July 2012. The consent was issued on 21 March 2012 so levels since that date are reported against requirements of this consent.

Observations under old consent:

- A 'pre-consent" trial drawdown was undertaken in September 2011 to investigate low lake level effects.
- There was extreme wet weather in January 2012 which resulted in high lake levels of up to RL 279.38 m.

Observations under new consent:

- The consent required drawdown of Lake Rotoiti and flushing of Ōhau Channel between 1 May and 30 September commenced on 13 June and went to 16 July 2012 (33 days or 9%). Target allocation 10-15%.
- Successive rain events in July 2012 resulted in rapid recovery in lake levels from the required flush/drawdown.

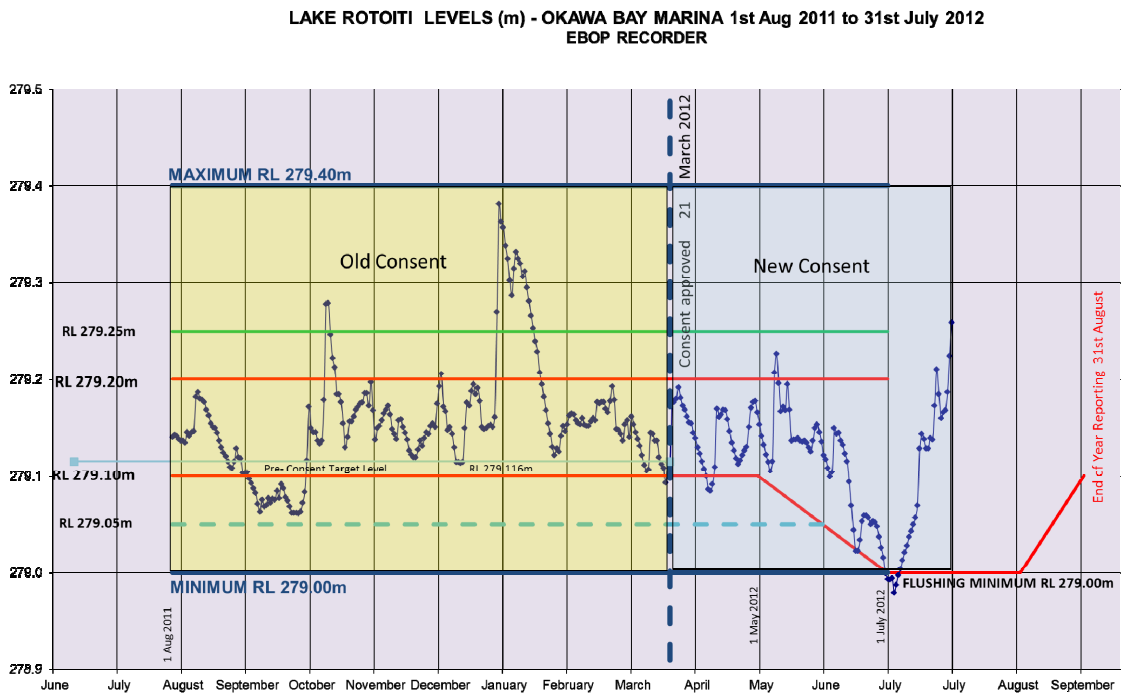

Figure 2 Lake Rotoiti levels measured at Okawa Bay Marina from 1 August 2011 to 31 July 2012.

Table 1 below shows the distributions against the consent target distributions. Since the consent started on 21 March 2012 the period from that date to 31 July 2012 is used for reporting the target distribution.

Table 1 Lake level target distributions verses actual distributions.

Consent number 65979 OKERE GATES			**Consent Approved 21 March 2012 (4 months)**	
Condition	**Range** (RL m)	**Target Distribution** (per calendar year)	**Consent Evaluation Period** 21 March to 31 July 2012 (Achieved)	
			Days	**%**
7.4 a	279.00 - 279.40	100%	133	**100**
7.4 b. i.	279.05 - 279.25	91%	111	**83.5**
7.4 b. i. (a) Drawdown Zone from 1 May to 1 October 2012	279.00 - 279.10	10-15%	33	**9.0**
7.4 b. i. (b)	279.10 - 279.20	70-85%	91	**68.4**
7.4 b. i. (c)	279.20 - 279.25	5% - 10%	4	**3.0**
7.4 c	>279.25	5%	1	**0.8**

2.1.2 Discussion

The percentage of time for the target distributions in Table 1 are a percentage of the 133 day period from 21 March 2012 to 31 July 2012. They are therefore not a reflection of the distribution over a full year which will be reported on in future. It is expected that except for condition 7.4 (b) (i) (a) which is already reported on as a percentage of the full year, the other distributions will change and be within their target ranges

The required drawdown began 13 June 2012 and concluded 16 July 2012 (33 days or 9% of 365 days). Target distribution for this drawdown was 10-15% and was narrowly missed due to a rapid refill following heavy rain in July 2012.

2.2 Lake Rotorua

Figure 3 below shows the 12 month lake level trace for Lake Rotorua from 1 August 2011 to 31 July 2012. Notable observations are:

- Installed stop logs on 9 September 2011 – Lake Level RL 279.840 m. Installed before lake reached trigger level (to install) because low lake level concerns reported at Rotorua Town Wharf.

- Remove stop logs 30 December 2011.

- Successive rain events in July 2012 caused lake level to rise above the consented maximum.

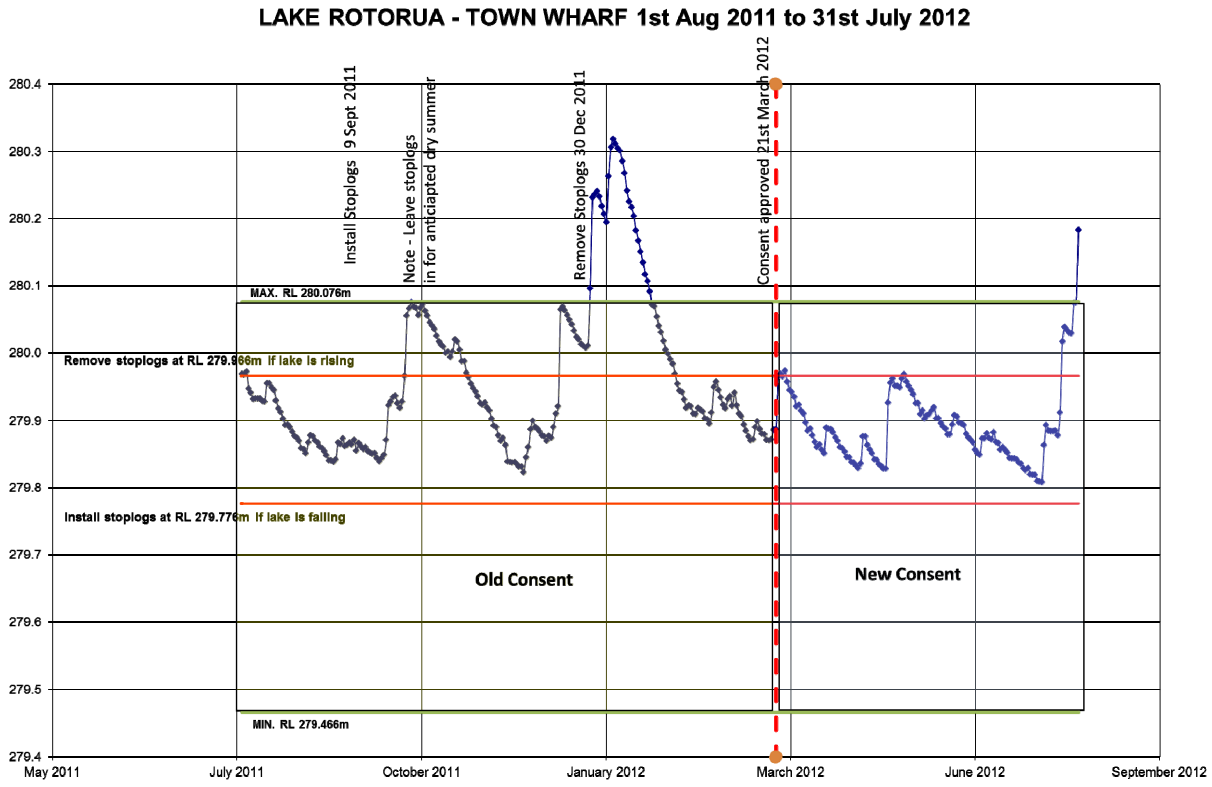

Figure 3 *Lake Rotorua levels measured at Town Wharf from 1 August 2011 to 31 July 2012.*

2.2.1 Discussion

For the period from 21 March to 31 July 2012, lake levels were below the maximum level of RL 280.076 m for 99.25% of the time. Lake levels exceeded maximum levels on 31 July (last day of assessment period) following 67.5 mm of rain.

Since the old and new consents for Lake Rotorua are essentially the same, comment is made on the entire year. For the 12 month period, Lake Rotorua levels were held below the maximum level of RL 280.076 m for 338 days or 92.3% of the time.

This compares with 276 days or 75.6% for the previous 12 month period from 1 August 2010 to 31 July 2011.

Lake level minimums and maximums may be exceeded but only as a result of extreme drought or rain as was the case in the January 2012 and more recently July 2012.

It should be noted that the Ōhau Channel Weir provides minimal flood relief once maximum lake levels occur as the outflows are marginally increased when the stop logs are removed. The stop logs perform best during low lake levels to decrease outflows and prevent very low lake levels.

The attached photos show the stop logs stored on the channel berm and removal during high lake levels.

Figure 4 *Ōhau Weir Stop logs (x3) stored onsite after removal (dimensions 6m x 0.3 m).*

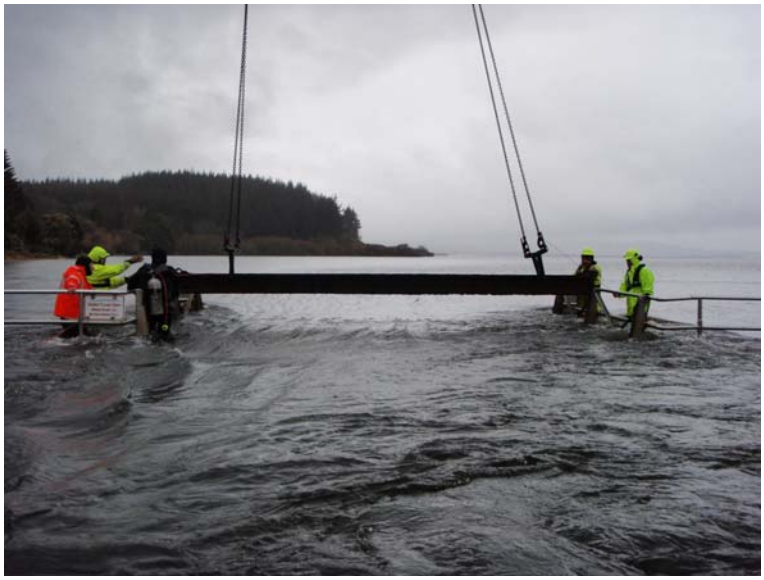

Figure 5 *Ohau Weir Stop log removal in progress (12 August 2008).*

Part 3: Actual flow rates versus minimum flow rates

3.1 Consent number 65979 flow rate conditions

Operational Limits 7.4 (f) to (l) related to flow through the Okere Gates are specified in conditions of consent 65979. In summary these conditions require that except under extreme droughts or an emergency:

- A minimum river flow (7.9 cumecs) with a seven day minimum of 9.84 cumecs.
- Greater outflows (Okere Gates) than inflows (Ōhau Channel) assisting to preserve water quality of Lake Rotoiti.
- Limited Okere Gate ramping rates - closing (-5 cumecs/hr) or opening (+10 cumecs/hr) in consideration of river bank stability downstream when flows fluctuate.
- Recreational river flows for rafting and kayaking to be provided wherever possible within the other limits of the consent.

3.2 Monitoring

Flow rates on the Ōhau Channel and Okere Gates are monitored by telemetry using NIWA's lake level recorder at Mission Bay on Lake Rotorua and the Taaheke River Gauge Station on the Kaituna River, located approximately 3 km downstream of the Okere Gates.

A consent priority is maintaining greater outflow (Okere Gates) than inflow (Ōhau Channel) to prevent reflux around the downstream end of the Ohau Diversion Wall. This measure assists in maintaining the water quality of Lake Rotoiti.

3.3 Results

Flow rates at Taaheke and Ohau Channel are shown in Figure 6 below.

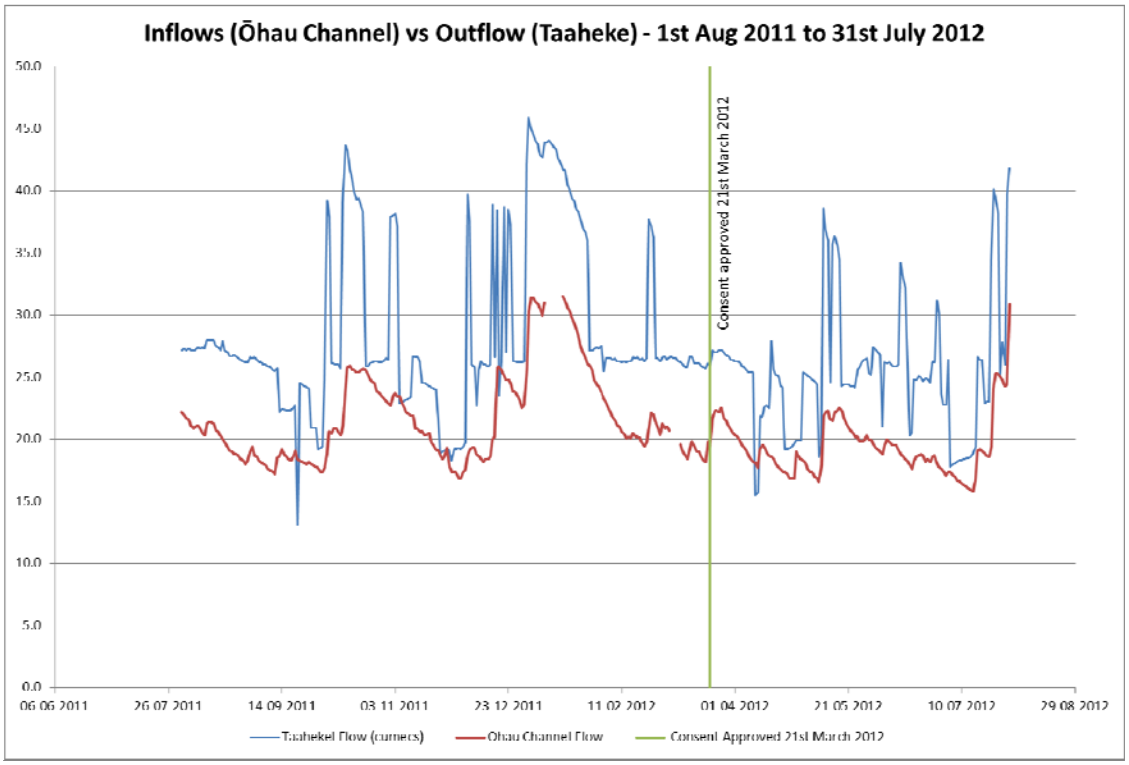

Figure 6 *Lake Rotoiti inflow through Ōhau Channel (red) and outflow through Okere Gates (blue) from 1 Aug 2011 to 31 July 2012*

See Table 2 below for performance summary of flow and Okere Gate ramping rates for the consent period 21 March to 31 July 2012.

Table 2 Okere Gate Flow Distributions from 21 March to 31 July 2012.

Consent #65979 OKERE GATES			**Consent Approved 21 March 2012 (4 months or 133 days)**		**Variation from requirement**	
Condition	**Flow Requirement** (m^3/s)	**Target Distribution** (per calendar year)	**Consent Evaluation Period** 21 March to 31 July 2012			
			Days	**%**	***Incident date***	***Comment***
7.4 f. i.	6 hourly average flow of 7.9 m^3/s	100%	133	**100**	-	-
7.4 f. ii.	7 day rolling average flow of 9.84 m^3/s	100%	133	**100**	-	-
7.4 i	6 hourly average outflow through gates > 6 hourly average inflow from Ohau Channel	100%	131	**98.5**	*10-11 April 2012*	Over-shot 'operating minimum' lake level of RL 279.10 m by 0.016 m (16 mm) in response to Met Service Warning. Closed gates down to recover lake level but outflows were < inflows. When realised, opened gates further.
7.4 j. i.	When opening the gates, a maximum flow increment of 10 m^3/s per hour	100%	133	**100**	-	-
7.4 j. ii. (a)	When closing the gates, a maximum flow decrement of 5 m^3/s per hour when operating the Okere Gates below 30 m^3/s	100%	132	**99.2**	*17May 2012*	Missed interim gate setting of 3@650 in morning. Rafters on river at 1025hrs waiting for settings of 3@500 to facilitate rafting. Operator error!
7.4 j. ii. (b)	a maximum flow decrement of 10 m^3/s per hour when operating the Okere Gates at or above	100%	-	**100**	-	-

	30 m^3/s					

3.3.1 Discussion

Minimum flow rates often occur during the latter summer months when lake levels and inflows are low. The extreme wet weather event in January 2012 left both lakes full and above maximum levels therefore avoiding low summer lake levels when compared to previous summers.

The minimum river flow recorded for the entire year was 13.1 cumecs on the 21 September 2011 after the Okere Gates were closed down briefly to facilitate the removal of a fallen tree from the Kaituna River.

Okere Gates outflow was greater than inflows through Ōhau Channel for 99% for the 12 month period and 98.5% for the 4 month period. Reasons for not achieving 100% are commented in Table 2.

An opening ramping rate increment of 100% was achieved while the ramping decrement of 5 m^3/s was achieved 99.2% of the time with one occurrence of a rapid closing to facilitate recreational river activity.

Recreational flows – Kaituna River.

- It is a requirement of the consent to facilitate recreational flows for Kaituna River activities where ever practical.
- Rafting flows are satisfied inside the 13-26 cumec range or at gate settings of 3@200 – 3@500 respectively. These 'safe' flows have been determined by Maritime NZ.
- Every reasonable effort is made to accommodate rafting flows but this is ultimately determined by consent and environmental conditions. Frequent communications are made to advise and assist the rafting community with planning.
- There were 117 rafting days or 88.0% for the 4 month period.
- There were 301 rafting days or 82.2% for the 12 month period.
- There were 27 days lost during January 2012 following heavy rain and full lakes.

Part 4: Operational Difficulties

4.1 Discussion

The challenges each year will be satisfying the upper and lower lake level ranges depending on environmental conditions. These ranges were generally achieved this year through diligent gate operations by sometimes releasing or storing lake water to maintain % ranges in response to weather forecasts. The new consents are flexible enough to allow 'operator discretion' to pre-empt gate settings (within reason) to manage drought or extreme rain events and therefor plan for desired outcomes.

Rotorua maximum lake levels were exceeded in July 2012 due to excessive rain fall. A difficulty in operating Lake Rotorua has been in installing stop logs early (September 2011) due to complaints of low lake levels and perhaps not removing stop logs soon enough when the trigger level was reached. Greater attention will be paid to this in future.

There is difficulty in reporting the distribution within operation limits for each calendar year as required by conditions 7.4 of consent 65979. This does not match the Annual Reporting requirement (condition 15) of providing a report by 31 August each year.

The consent holder proposes that in future annual reporting covers the period 1 April to 31 March the following year, rather than the calendar year. This will allow reporting consistent with issue of the consent (21 March 2012) and allow for a report that does not fall within the drawdown period from 1 May to 30 September.

The annual report would be provided to the consent authority (Chief Executive of Bay of Plenty Regional Council) and the liaison and Kaitiaki groups by 1 June each year prior to the Consent Holder convening an annual meeting with each liaison or Kaitiaki group by 31 August each year.

Part 5: Consultation with stakeholders

5.1 Establishment of Liaison and Kaitiaki Groups

Under the conditions of these consents, the consent holder has been tasked with facilitating the establishment of a liaison group and two kaitiaki groups within three months of the commencement of the consent. The purpose of the groups is to essentially facilitate discussion and free flow of information between the consent holder and the community.

These groups represent are:

- Rotorua Te Arawa Lakes Operational Liaison Group (RTALOLG).
- Ohau Ki Rotoiti Kaitiaki Group (OKRKG).
- Okere Ki Kaituna Kaitiaki Group (OKKKG).

All these groups have been established with initial meetings held as follows:

- RTALOLG 8 June 2012
- Ohau Ki Rotoiti Kaitiaki Group 7 August 2012
- Okere Ki Kaituna Kaitiaki Group 29 August 2012

Each group has elected a chair and all are in the process of developing, refining and producing their respective terms of reference. The meetings have been tape recorded and the notes of the meetings completed. These are available on request.

5.2 Community Communication

Every effort has been made to maintain regular communication with all stakeholders.

This communication includes:

- Iwi – Response to inquiries and establishment of Kaitiaki Groups.
- BOPRC Flood Managers – Lake level and flow conditions.
- Residents – Response to enquiries.
- NIWA – Review and adjust flow rating curves.
- Rotorua Tourism Operators – Lake front issues.
- Rafters – Gate settings and river flows.
- Media – Situation Reports.

Part 6: Complaints and Investigations

6.1 Complaint summary – 21 March 2012 to 31 July 2012

Note – No complaints were received by BOPRC's Compliance Section.

Concerns and complaints received by the consent holder are recorded and summarized in Table 3 below.

Table 3 Summary of complaints and concerns regarding lake levels.

Complaint or concern	Date	By	Issue	Actioned
Complaint	8/4/12	Email	Low lake level over Easter Weekend	Close gates to recover lake level while maintaining greater outflows. Follows forecast rain from Met Service that did not materialize. Lake levels recovered within three days.
Concern	11/4/12	Email	Low lake level – trouble with boat sheds	Follows low lake level over Easter weekend. Lake Level now back with operating range.
Concern	11/4/12	Phone	Kaituna River flows low	Follows low lake level over Easter weekend. Lake Level now back with operating range.
Concern	9/5/12	Phone	Kaituna River flows too high for rafting	Gates opened in response to high lake levels and consent conditions
Concern	9/5/12	Phone	Hinehopu flooding	Okere Gates are fully open in effort to reduce lake levels following heavy rain
Concern	14/5/12	Phone	Okere Gates fully opened when should be closed	BOPRC server failure – email failed to advise rafters gates to remain fully open following Met Service warning.
Concern	11/6/12	Email	Loss of rafting days during drawdown	Rafters seeking formal explanation from Consent holder over loss of rafting opportunity resulting from drawdown. Explanation completed.
Concern	12/6/12	Email	Loss of rafting days during drawdown	As above
Concern	5/7/12	Email	Low Lake Levels and poor communication over drawdown	Advised that public notifications completed in respect to drawdown and expected low lake levels.

Total number of complaints = 1, Total number of concerns = 8.

6.2 Investigations and Monitoring

Investigations completed or currently underway to meet conditions of these consents are shown in Table 4 below:

Table 4 Investigations and monitoring completed or in progress.

INVESTIGATION	Consent Condition # 65979 Condition:	LOCATION	ISSUE	PROGRESS
Flood Monitoring	12 -	Mourea/Ōhau Channel Otaramarae homestead	Flooding Flooding	In progress In progress
Velocity Monitoring	13.2	Ōhau Channel	Maintain fish migration during flush (F&G)	Report completed by BOPRC - EDS Section 17 July 2012. Submit to Consent Authority and others by 31 October
Water Table Monitoring	14	Hinehopu	Flooding	In progress
Beach Width Monitoring	-	Hinehopu Te Ruato Bay Lake Rotorua @ Ohau Weir	Narrow beaches	In progress
Lake level / Staff Gauge Monitoring and settlement	-	Hinehopu Gisborne Point Okawa Bay Te Akau Bay	Monitor settlement	In progress

6.2.1 Discussion

Hinehopu Water Table Monitoring

Consent condition 14 states that - the consent holder is tasked to investigate the correlation between lake levels and ground water following a 12 month monitoring period. This is in progress.

Ohau Channel Cross Section and Velocity Monitoring

Ōhau Channel Cross Sections are undertaken annually at locations shown in Figure 8 below to monitor bed levels prior to and after channel flush each year.

Figure 7 Ohau Channel Cross Section Locations.

At this stage, there is little evidence from cross section data to suggest deepening of the channel through perceived increases in velocities during flush times.

Figure 9 below shows a typical channel cross section at site number 13 prior to the flush on 12 June 2012 (red) followed by a post flush cross section on 12 June 2012 (black) indicating little change in cross section shape apart from minor aggradation on the left side of the channel.

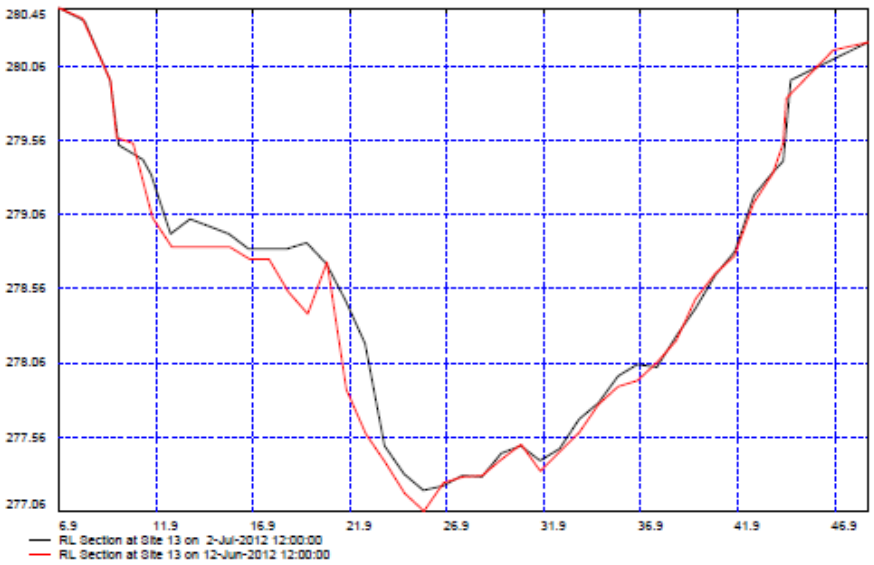

Figure 8 Cross Section number 13 – Pre-flush 12 June 2012 and post-flush 12 July 2012.

A new staff gauge shown in Figure 10 below has been installed on the Ohau Channel/State Highway 33 Bridge to replace temporary water level monitoring pegs.

Figure 9 *New Ohau Channel/State Highway 33 Staff Gauge located on pillars of State Highway 33 Bridge at Mourea.*

Velocity Monitoring

Velocity measurements have been made at several locations along the Ohau Channel before and during the flush test to assess any changes in velocities. This monitoring was required to address concerns by Fish and Game to determine any effects of the flush on Ōhau Channel velocities and fish migration.

The monitoring concluded no significant change in velocities during the flush.

Part 7: Conclusion

This 2012 report satisfies Consent requirements to report annually on the Ohau Weir and Okere Gates consents.

These consents have now been 'operational' since the consent order was signed on 21 March 2012.

Key achievements during this period were successful lake level and flow management through the various operating ranges and the establishment of the liaison and Kaitiaki groups.

Monitoring and investigation programmes are in place that will provide measurements that will contribute to and facilitate the free flow of information between Consent holder and stake holders

The biggest driver for lake level management today is water quality followed by water levels. The operational regime of these consents compliments the Rotorua Lakes Programme to improve water quality by ensuring outflows through the Okere Gates are always greater than inflows from the Ohau Channel.

During the four months that the structures have been operated according to the new consents, there were a few occasions when Lake Rotoiti was operated outside of its target ranges for a very short time and one occurrence of Lake Rotorua being above its maximum level due to extreme wet weather in July 2012.

There was one instance when inflow to Lake Rotoiti briefly exceeded outflow and one instance when maximum flow rate decrement was exceeded. These were a result of operator error and greater attention will be paid to avoid these types of instances in future.

The Consent Holder requests that the reporting period be changed to run from 1 April to 31 March the following year. The consent holder report would be made available to liaison and Kaitiaki groups by 1 June each year prior to annual meetings with each group.

There are no recommendations for other changes to the consents or to the Operational Management Plan at this stage.