



OPUHA WATER LTD
Enabling | Sustainable | Growth

Consent Self-Monitoring Annual Report

April 2013 to March 2014

Report Submitted to

Environment Canterbury
June 2014

Prepared By

Opuha Water Ltd
Environmental Consultancy Services Ltd

Contents

Background	1
Summary table of self-monitoring consents (March 2001).....	1
Review of Annual Highlights.....	2
Results of Self-monitoring of Consents	3
CRC950567.1, CRC950568. CRC950569 – Dam Structure and Downstream Weir Surveillance and Monitoring	3
CRC950570 – Dam Construction Discharge of Contaminants	3
CRC950571, CRC950572 – Power Station Cooling Water and Sump Discharges	3
CRC950575 – Use Water for Hydro Generation	3
CRC950576 – Discharges from Construction Activities.....	3
CRC950577, CRC950578, CRC950579 – Discharges from the Dam and Downstream Weir into Opuha River	4
Lake Level and Downstream Weir Flows	4
Opihi River Flow at Saleyards Bridge	5
River Surveys.....	5
Lake Inflows	6
Dam Monitoring.....	7
Lake Water Monitoring.....	8
Downstream Weir Water Monitoring.....	11
CRC950580 – Downstream Weir Eel Passage	13
Other Relevant Information	13
South Canterbury Water Enhancement Group	13
Opihi Environmental Flow River Advisory Group (OEFrag).....	13
Hydrology Re-Truth.....	13
Opuha Monitoring Equipment Maintenance Log Summary (ECS).....	14
Fox Peak Raingauge	14
Mt Dobson Raingauge.....	14
Nth Opuha Flow site	14
Nth Opuha Temperature.....	14
Sth Opuha Flow Site.....	14
Sth Opuha Temperature	15
Downstream Weir Flow Site	15
Downstream weir water quality probes.....	15
Seepage Water Level	15

Seepage Turbidity	15
Opihi at Saleyards Bridge	15
Lake Opuha Water Level	15
Lake Opuha Rainfall	15
Lake Opuha 5 metre sensors (buoy) and 25m (tower) sensors.....	15
Lake Opuha Quarterly sampling	15

Appendix 1

Annual Dam Safety Inspection Report (2014)

Appendix 2

In-stream Biota Survey

Annual Report (March 2014) - Opuha Consent Self-Monitoring

Background

This report is the 13th annual self-monitoring review of Opuha Dam Consents. Opuha Water Ltd (OWL) hold resource consents for the operation of the Opuha Dam. Conditions appended to the consents require self-monitoring by the consent holder, which are briefly described below:

Summary table of self-monitoring consents (March 2001).

Consent	Description	Monitoring Required (condition number in brackets)
CRC950567	Place dam on Opuha River	Annual Inspection Report (7) Maintain structure & erosion control (12)
CRC950568	Place weir on Opuha River	Annual Inspection Report (7) Maintain structure & erosion control (12)
CRC950569	Work on land <20° slope	None
CRC950570	Discharge sediment from weir	None
CRC950571	Discharge Cooling Water	Temperature <20° C, TPH < 21.6 gm/m ³ (2) Receiving water temp change < 3° C (3) Quarterly WQ sampling (4) Copy results to CRC, notify if non-compliance (5.6)
CRC950572	Discharge Sump Drainage	Temperature <25° C, TPH < 21.6 gm/m ³ (2) Receiving water temp change < 3° C (3) Monthly for 1 st 6 months, then quarterly WQ sampling for temperature & TPH (4) Copy results to CRC, notify if non-compliance (5.6)
CRC950575	Use water for power generation	None
CRC950576	Discharge sediment from Dam	None
CRC950577	Discharge water from Dam	Monitor flows (1,2,4,5,6) Notify CRC if spillway is used (7) Monitor Opuha above Raincliff for bed changes (9) Notify CRC & MDC of likely Dam failure (10) Quarterly WQ sampling (11)
CRC950578	Discharge water from weir	Monitor flows (1,2,4,5) Notify CRC of non-compliance of condition 4 (6)
CRC950579	Dam the Opuha to create a Lake	Monitor lake levels and river flows (1,2) N&S Opuha WQ Temp sampling (3) Annual monitoring program (4) Continuous & Quarterly WQ sampling (5) WQ Trigger Level reporting (6) Operate aeration system & mitigation (9) Report on annual monitoring to CRC (10)
CRC950580	Dam Opuha with a weir	Maximum operating level (1) Elver passage (2,3)

Review of Annual Highlights

Opuha Water Limited (OWL) is the sole owner of the Opuha Dam. OWL has approximately 220 downstream irrigators and water abstractors including community water supplies for Timaru District Council. There are three irrigation schemes supplied by OWL – Kakahu, Totara Valley and Levels Plain.

TrustPower continues to be engaged by Opuha Water Limited to manage the operations and maintenance of the Opuha Power Station. TrustPower operate the Power Station and Downstream Weir remotely from their main operations base at Te Maunga, near Tauranga. Maintenance services are provided from TrustPower's Canterbury base at Lake Coleridge with additional specialist support available from their national staff resource.

Tonkin & Taylor Ltd continue to be retained to provide specialist dam safety advice.

No major floods occurred over the reporting period of this report.

Irrigation demand was relatively steady at moderate levels for the majority of the season, with major rainfall events in November and the end of December resulting in significant reductions in demand during these periods. Acceptable storage levels were maintained throughout the season, with high irrigation demand and increased environmental requirements drawing the lake level down towards the end of the reporting period.

Following on from the flushing flow modelling work completed by NIWA in May 2012, and the flushing flow released on the 13th of February 2013, another flush was released from the Downstream Weir on the 27th of February 2014. A flush of greater than 25 cumecs was achieved for 4 hours, with a peak flow of 38 cumecs being reached. NIWA's preliminary report on the trial concluded the flush resulted in a reduction of 76%, 85% and 89% in didymo SCI at the Below Dam, Skipton and Confluence sites, respectively. In comparison, the flushing flow of 13 February 2013 achieved reductions of 41%, 11.5% and 40% at the three sites. In 2013, pre-flush SCI was about the same as in 2014 at Skipton and was higher at the Below Dam and Confluence sites. OWL is continuing to explore options to improve river health through the management of our release operations, including taking the opportunity on 2 occasions (14th October 2013 and 18th April 2014) to release flushing flows from the Downstream Weir to coincide with rainfall events resulting in elevated river flows across the Opihi/Opuha catchment.

An additional cluster of water quality sensors were installed on the Lake tower platform on the 29th of October 2013 to measure Dissolved Oxygen, Electrical Conductivity and Temperature at a fixed RL of 378mRL. The new cluster was installed to provide OWL with additional information on the water quality in the middle of the lake.

Summary of Events: April 1 2013 - March 31 2014

- 14th October 2013 Flush released from the DSW to coincide with elevated flows across the catchment from rainfall event.
- 29th October 2013 Additional Temperature, Electrical Conductivity and Dissolved Oxygen probes installed in a new cluster at a fixed RL of 378m.
- 27th February 2014 Flushing flow trial undertaken by OWL and NIWA.

- 14th March 2014 Benthic Organism Survey was undertaken.
- 1st April 2014 Annual Safety Review – site inspection.
- 18th April 2014 Flush released from the DSW to coincide with elevated flows across the catchment from rainfall.

Results of Self-monitoring of Consents

CRC950567.1, CRC950568. CRC950569 – Dam Structure and Downstream Weir Surveillance and Monitoring

The 13th Annual Dam Safety Inspection for the 2013-2014 period was undertaken by Tonkin and Taylor and Opuha Water Ltd in April 2014. The Annual Dam Safety Inspection Report covers the civil engineering aspects of the dam and its appurtenant structures. A copy of the report is attached in Appendix 1.

CRC950570 – Dam Construction Discharge of Contaminants

No on-going monitoring required

CRC950571, CRC950572 – Power Station Cooling Water and Sump Discharges

Water quality sampling and monitoring has been undertaken by Environmental Consultancy Services with results sent to Environment Canterbury and Opuha Water Limited during the year.

The summary of the results are contained in the following table:

Water Quality Sampling Results Consents CRC950571 & CRC950572 Power Station Discharges						
Date	TPH		Water temperatures			
	Sump water	Cooling water	Lake	Sump	Cooling water	Below Station
7/02/2013	nd	nd	20.9	17.1	22.4	16.5
8/05/2013	nd	nd	13.1	13.6	17.7	10.8
25/09/2013	nd	nd	8.8	9.3	15	8.1
3/12/2013	nd	nd	19	15.1	18.9	15.7
27/02/2014	nd	nd	19.4	18.2	22.4	17.8

Conditions of the above consents were met during the year, with the temperature of the receiving water not being changed by more than 3°C from its natural temperature, and the discharge temperature not exceeding 25°C.

CRC950575 – Use Water for Hydro Generation

No on-going monitoring required

CRC950576 – Discharges from Construction Activities

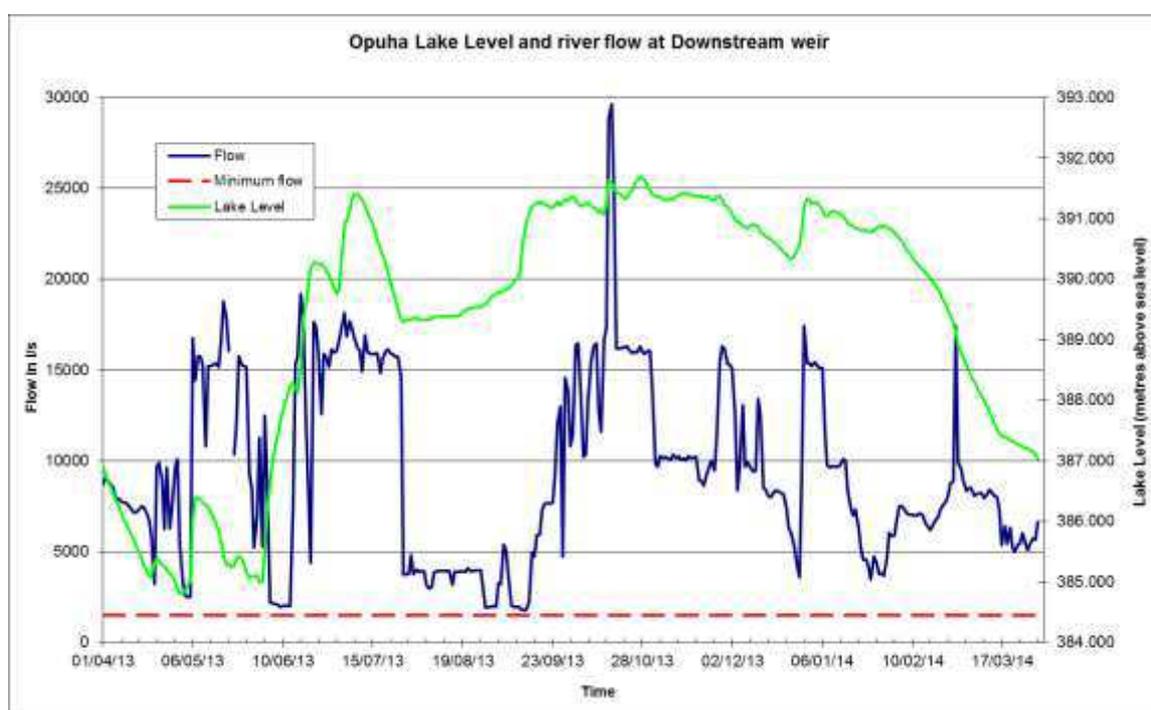
No on-going monitoring required

CRC950577, CRC950578, CRC950579 – Discharges from the Dam and Downstream Weir into Opuha River

- Consent condition 7 of consent CRC950579.3 states “The consent holder shall lodge a copy of the proposed monitoring programme required under Condition (4) with the Canterbury Regional Council before filling of the lake commences.” A revision to that monitoring programme was carried out in September 2010. Consent CRC950579.3 is silent on what notification is to be given to ECan when revisions to the original monitoring programme are undertaken, but a copy of the revised plan was sent to ECan.

Lake Level and Downstream Weir Flows

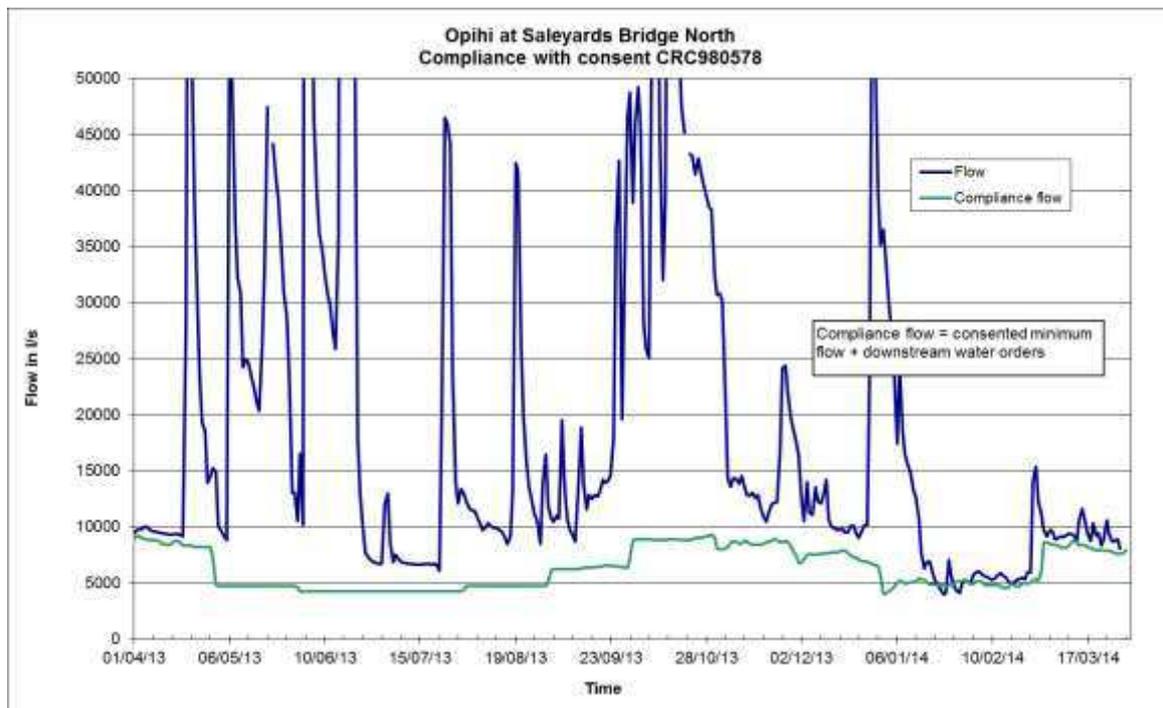
- The following graph indicates the downstream weir flow record and lake levels for the self-monitoring period. Recorder sites were maintained with data supplied to Environment Canterbury on an on-going basis during the period. The minimum permitted flow from the DSW was maintained throughout the monitoring period.



- Power generation flows during the period did not exceed 16.5m³/s.

Opihi River Flow at Saleyards Bridge

- The following graph indicates the Saleyards Bridge flow record and minimum consent levels (including downstream water abstractions) for the self-monitoring period. Recorder sites were maintained with data supplied to Environment Canterbury on an on-going basis during the period.
- Minimum flow requirements (including downstream water abstractions) were not achieved on two occasions during the 24th and 27th of January, and the 29th of January and the 4th of February due to inaccurate rating curves retrospectively illustrating failure to achieve minimum flow requirements. ECan were advised accordingly.

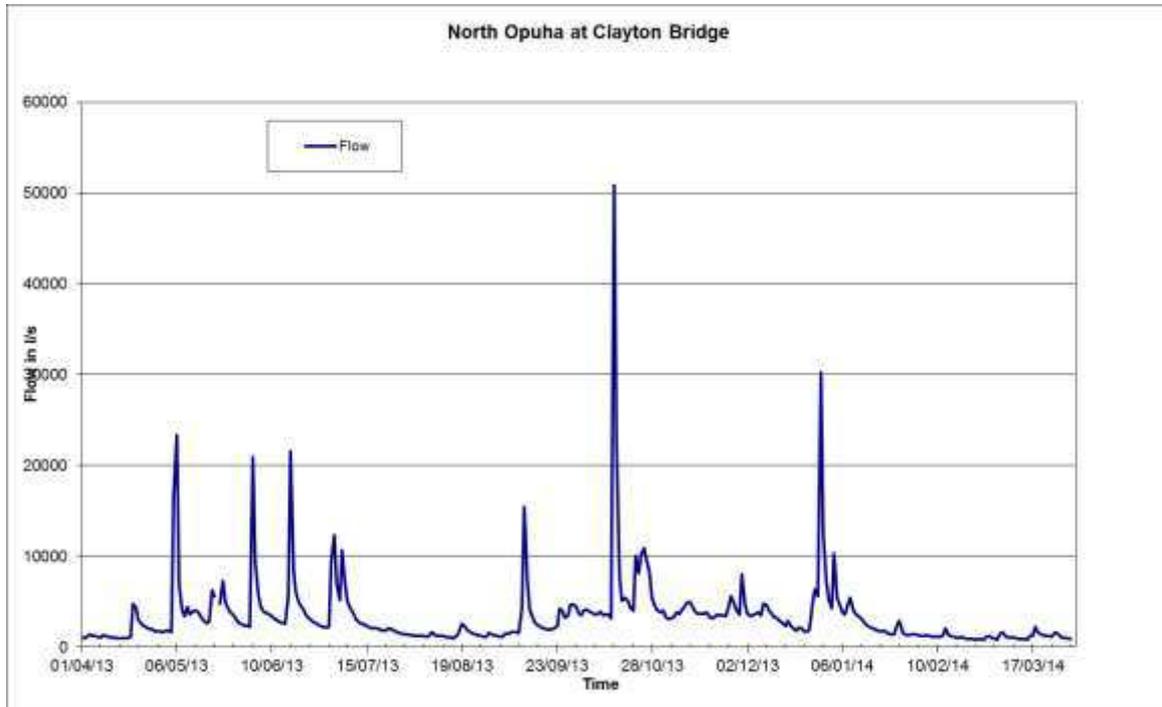


River Surveys

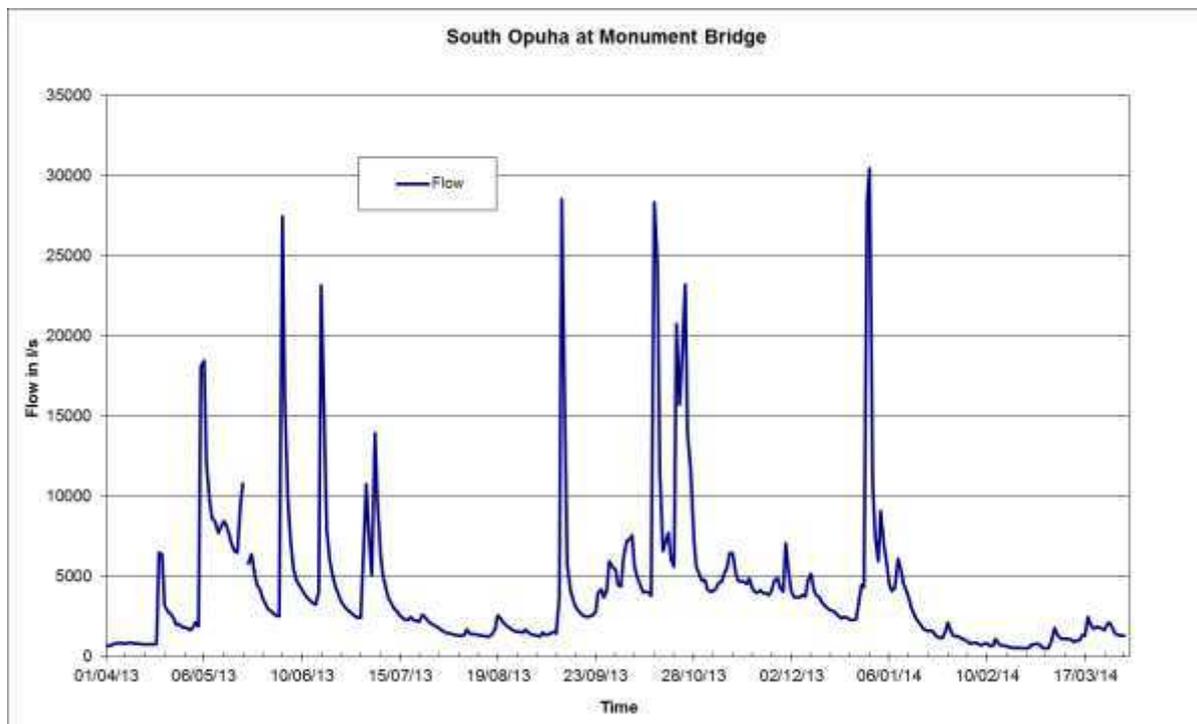
- Two survey sections were undertaken by Rooney Earthmoving Ltd 2.5km below and 7km below Skipton Bridge (above Raincliff).
- A report (Appendix 3) by SJ-R Ltd was received from sampling undertaken on 14th March 2014 to observe macroinvertebrates in the in-stream environment as a base study case for further surveys and analysis. The twelfth survey report (attached Appendix 3) produced very similar results to the previous year and concludes: *“The results indicate limited spatial differences in overall taxa composition and abundance although the results are similar to previous years. The biological metrics used (MCI & SQMCI) indicate waters that are of good to moderate habitat i.e. an ecosystem with affected by mild pollution. The species composition and abundance is a likely result of the velocities present at the sites, a highly armoured bed reducing interstitial space. A recent flushing flow had reduced the algal cover and would have also contributed to the low abundance observed of species being present with many classified as rare abundance. This is similar to last year where similar flushing flows occurred. This is expected as the invertebrates recolonize after a flushing event.*

Lake Inflows

- The following graph indicates the North Opuha River flow record for the self-monitoring period. Recorder sites were maintained with data supplied to Environment Canterbury on an on-going basis.

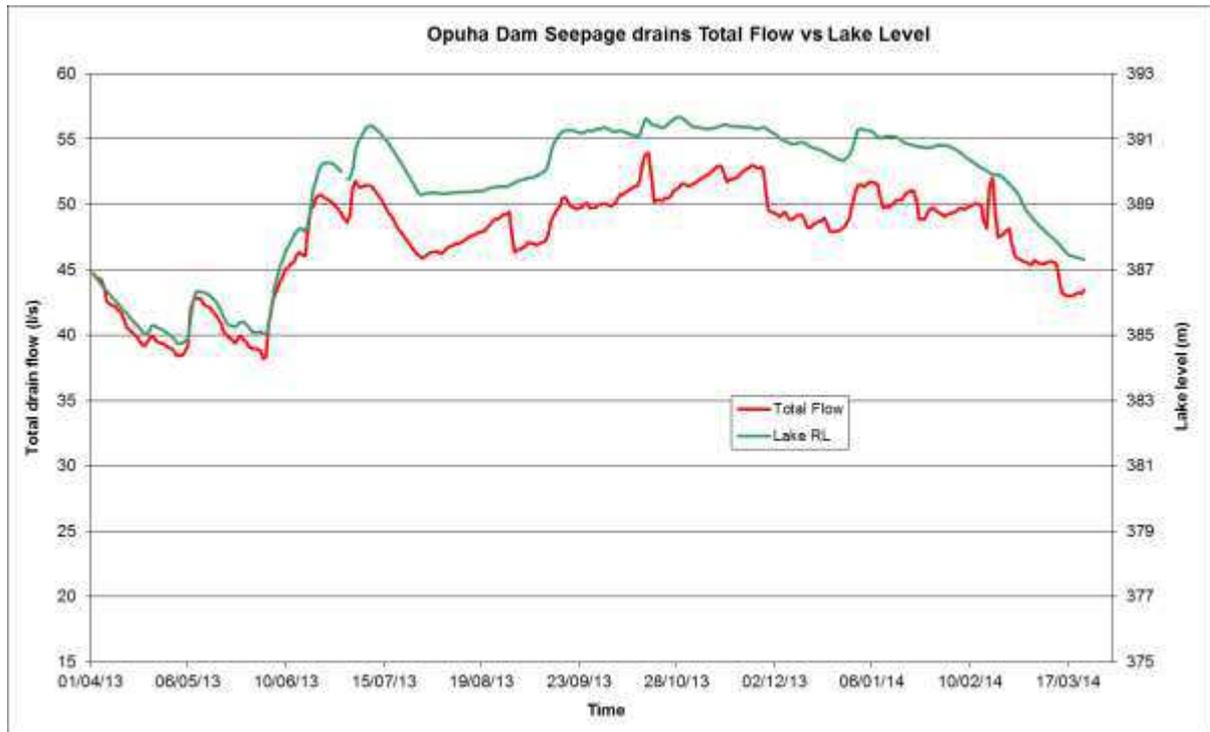
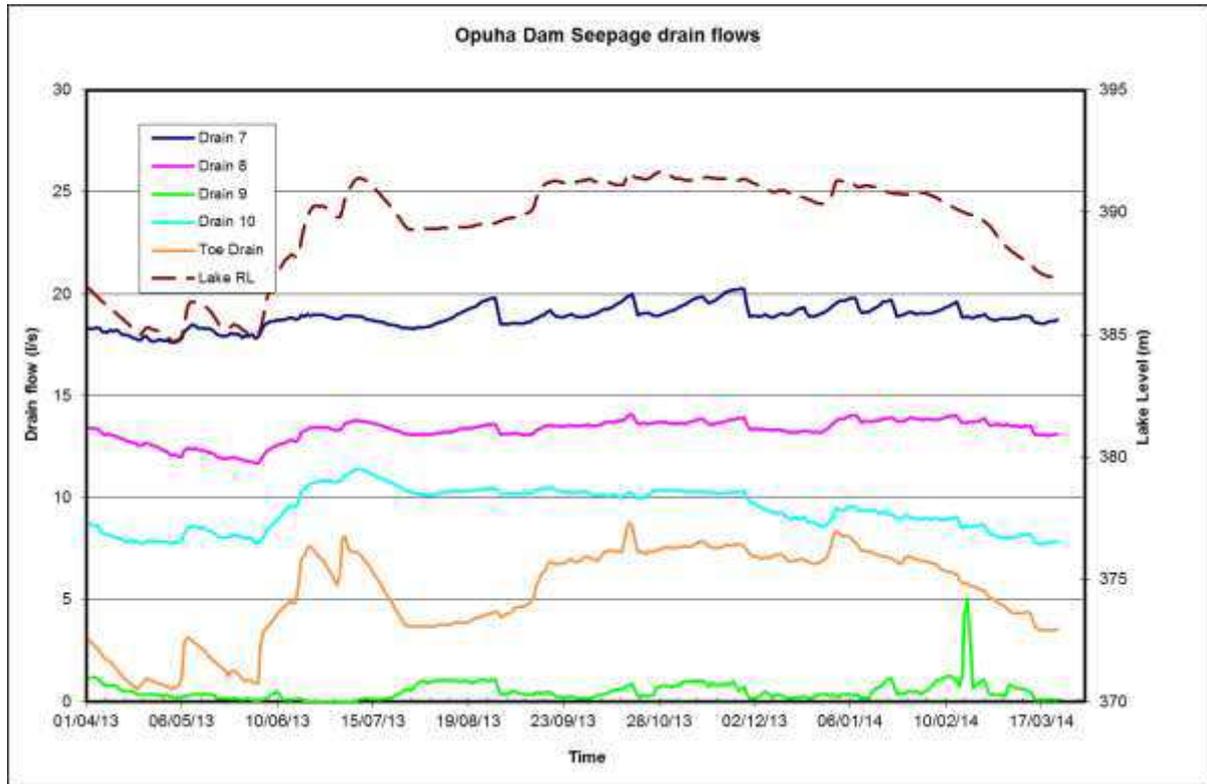


- The following graph indicates the South Opuha River flow record for the self-monitoring period. Recorder sites were maintained with data supplied to Environment Canterbury on an on-going basis.



Dam Monitoring

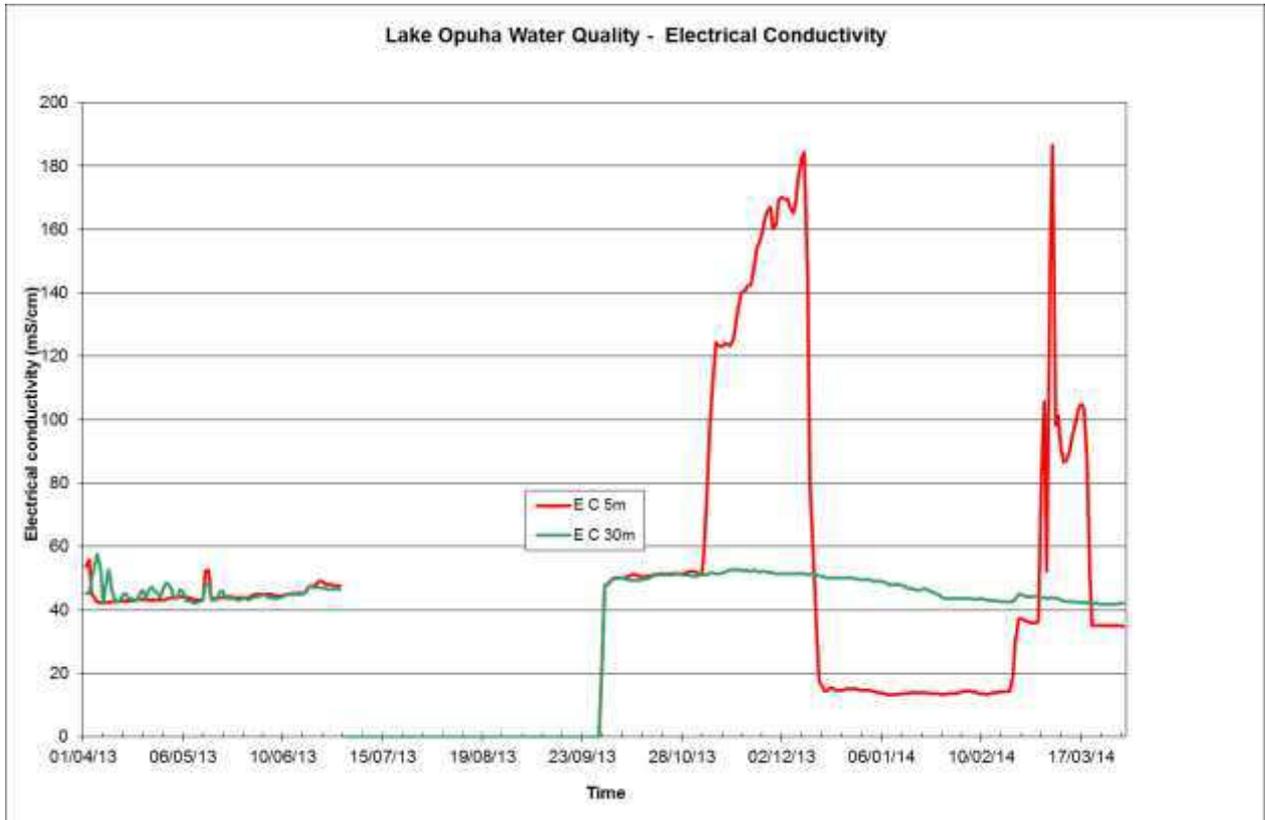
- Flows from the drainage weirs were continuously monitored and are plotted in the two graphs below.



- The drain flow turbidity was continuously monitored for the period and is plotted in the following graph, however due to the constant fouling of the turbidity sensor from algal growth within the V-notch channel, the accuracy of the data recorded became misleading. The graph is therefore not presented.
- No incidences of dust nuisance were experienced during the period.

Lake Water Monitoring

- The following graph indicates the Electrical Conductivity measurements recorded within the Lake at RL 360 and 5m below the lake free surface.



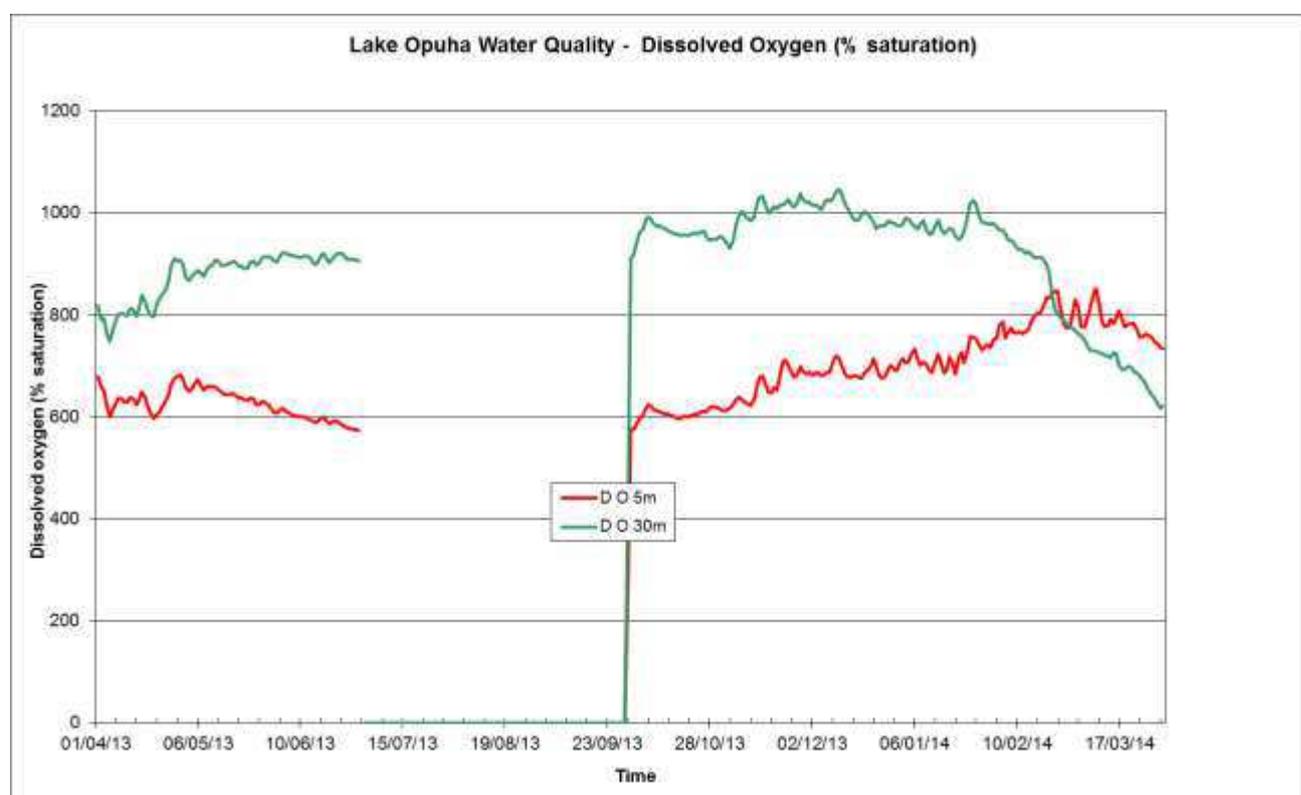
- The missing record between 1st July 2013 and 30th September 2013 due to a failure of the interface caused by an excessive number of sensors connected to a single datalogger. A new interface installed and sensors re-wired on the 30th of September 2013.

- The quarterly surface water quality samples for Lake Opuha are summarised below:

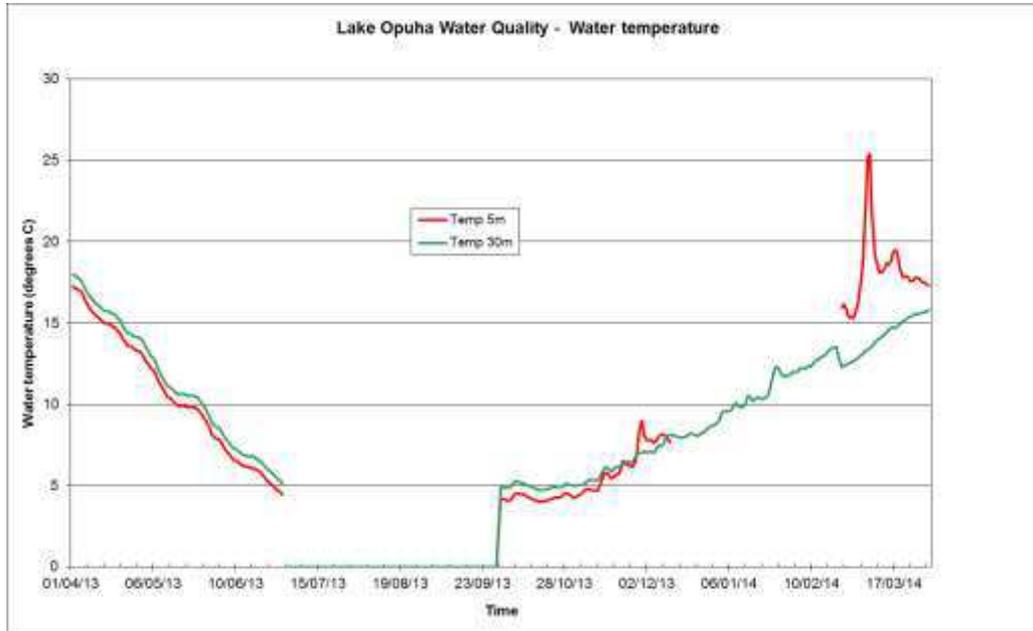
Water Quality Sampling Results Consent CRC950579 Lake Surface Water Quality			
Date	Chlorophyll a (mg/m ³)	Total Nitrogen (g/m ³)	Total Phosphorus (g/m ³)
7/02/2013	<0.003	0.26	0.009
8/05/2013	<0.003	0.41	0.019
25/09/2013	<0.003	0.73	0.009
3/12/2013	0.0025	0.33	0.007
27/02/2014	0.0049	0.15	0.011

Chlorophyll a method changed from 03/12/13 to obtain a greater detection limit of 0.0002 g/m³

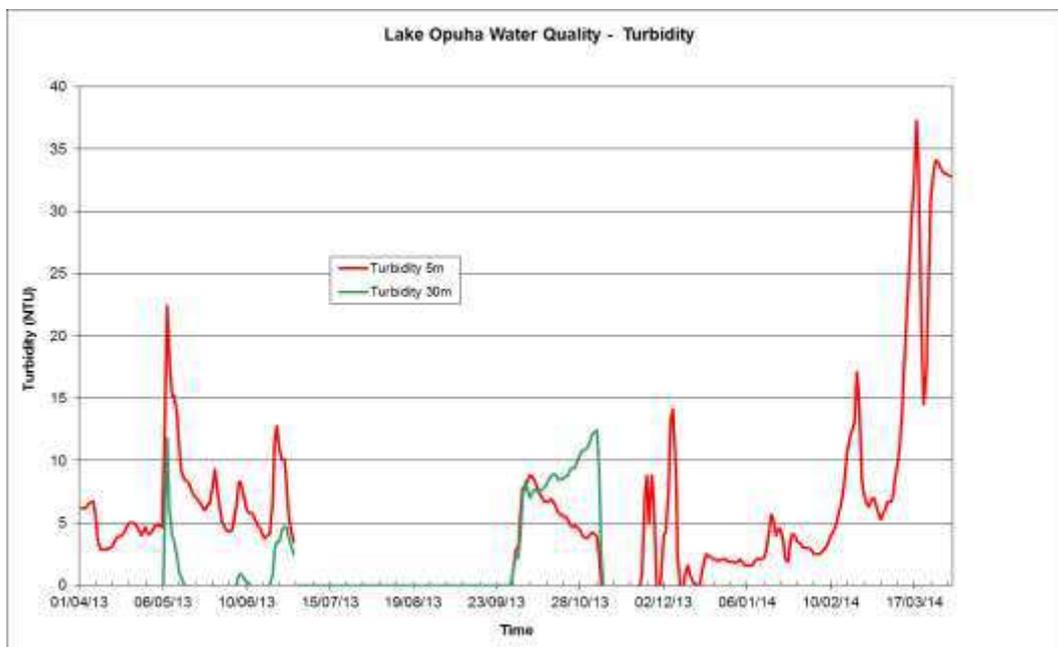
- Dissolved Oxygen Levels within the Lake at RL 360 and 5m below the lake's free surface are recorded in the following graph.
- The missing record between 1st July 2013 and 30th September 2013 due to a failure of the interface caused by an excessive number of sensors connected to a single datalogger. A new interface installed and sensors re-wired on the 30th of September 2013.
- Aeration of the lake was not undertaken during the reporting period.



- The following graph shows Lake Temperature at RL 360 and 5m below the Lake surface.
- The missing record between 1st July 2013 and 30th September 2013 due to a failure of the interface caused by an excessive number of sensors connected to a single datalogger. A new interface installed and sensors re-wired on the 30th of September 2013.

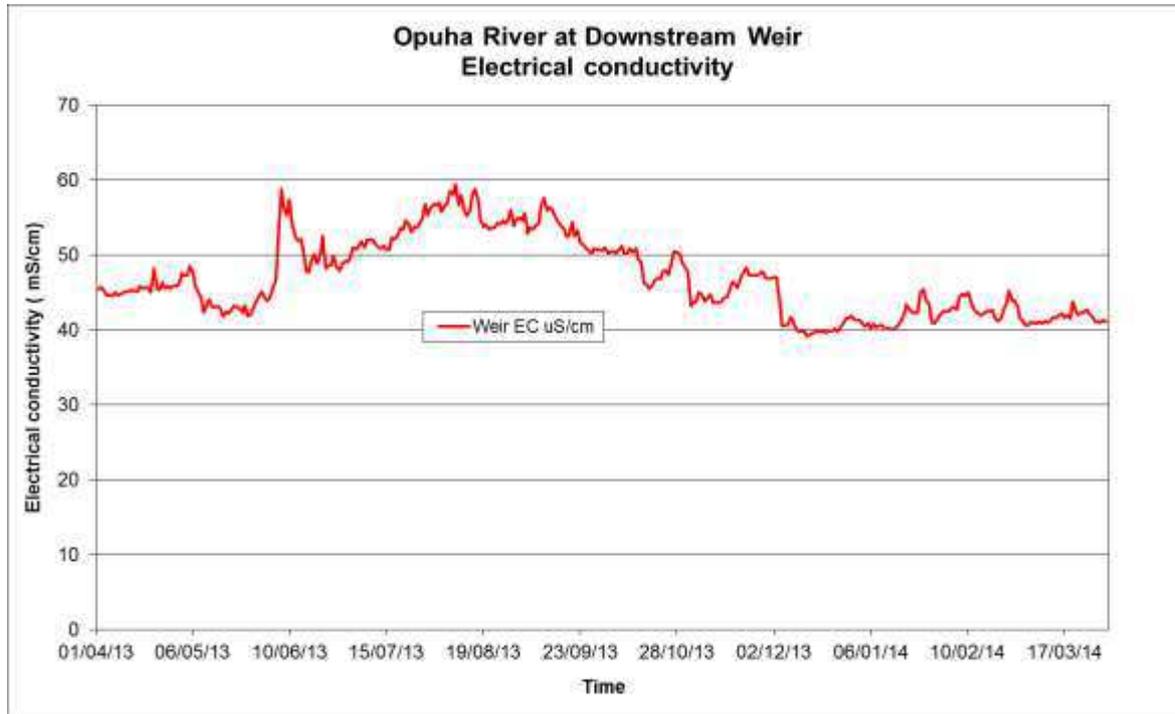


- The following graph shows recorded turbidity at RL 360 and 5m below the Lake surface.
- The missing record between 1st July 2013 and 30th September 2013 due to a failure of the interface caused by an excessive number of sensors connected to a single datalogger. A new interface installed and sensors re-wired on the 30th of September 2013.

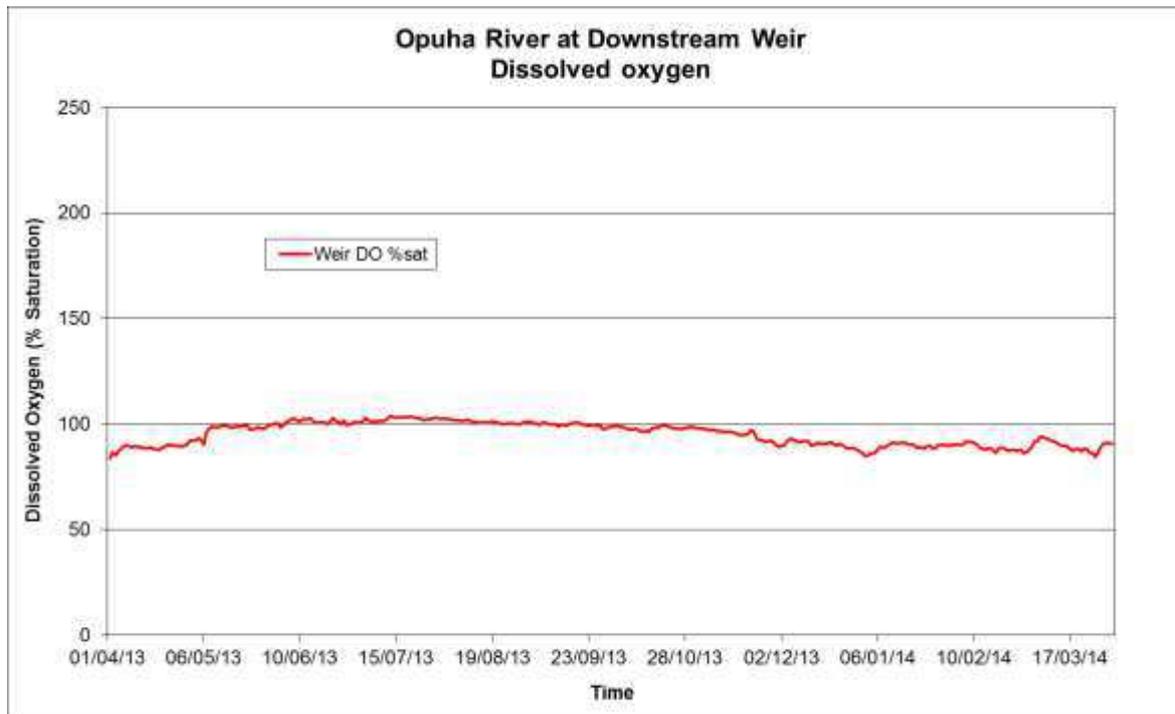


Downstream Weir Water Monitoring

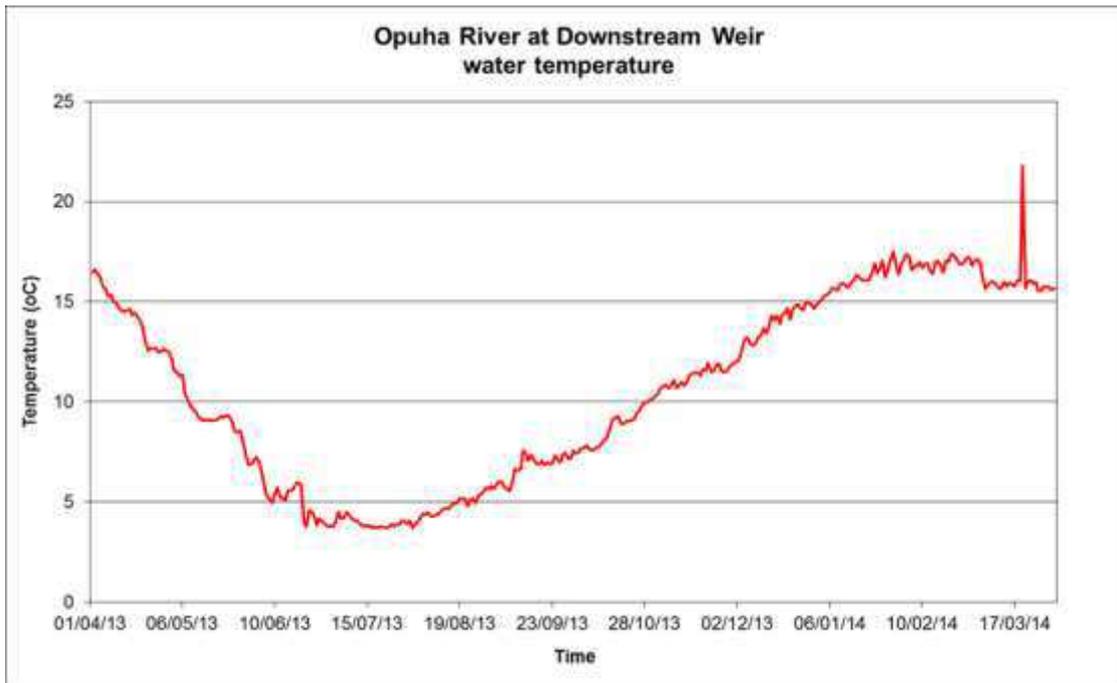
- Electrical Conductivity at the Downstream Weir (DSW) was recorded in the following graph.



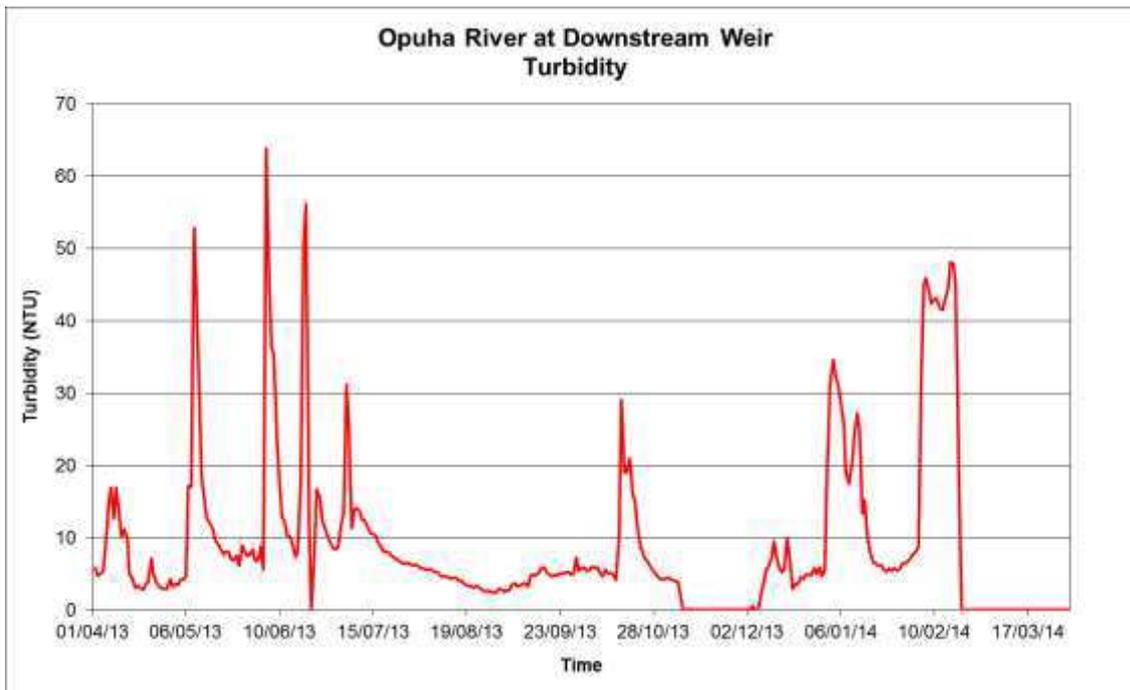
- Dissolved Oxygen at the Downstream Weir (DSW) was recorded and is presented in the following graph.



- The following graph shows the record of the DSW water temperature.



- The following graph shows the record of the DSW turbidity.



CRC950580 – Downstream Weir Eel Passage

Provision of an elver passage both upstream and downstream of the weir was maintained during the season for elver migration between 1st November and 22nd of April 2014

Other Relevant Information

South Canterbury Water Enhancement Group

Opuha Water Limited continues their relationship with this group. It provides a good forum for discussion and information sharing.

Opihi Environmental Flow River Advisory Group (OEFrag)

With the support of this group, Opuha Water Limited has applied (and has been granted) a variation to their consent to lower the lake level for flood buffering. The OEFrag group are consulted when there are high and low levels within the lake as a matter of course. It was expected that the Opihi River Regional Plan would be reviewed in 2011 however this process has now been incorporated within the wider CWMS process with the Opihi Plan now likely to be reviewed 2014-2017.

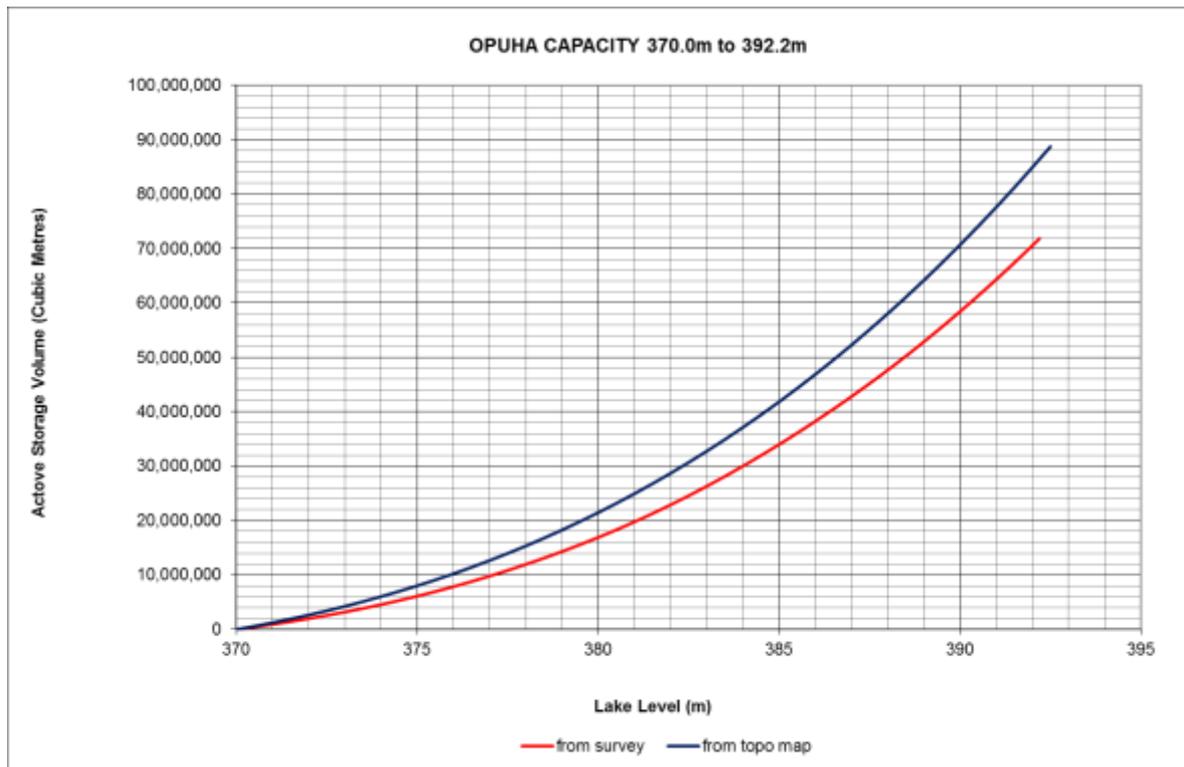
OEFrag continues to be an effective and useful “Trustee” for operational decisions.

Hydrology Re-Truth

OWL has completed the initial part of the study to look at the reliability and accuracy of the hydrological data used in the water model that had been developed during the planning phase of the dam. The objective was to develop a robust model for future operational and strategic planning work by OWL. The study has shown that there is not a strong correlation between the inflow rates on the two gauged tributaries (North and South Opuha) and the total lake inflows.

A detailed bathymetric survey has indicated that generally the stage-storage data for the lake was over estimating stored water volumes and the graph overleaf (also included as Appendix 2) shows the previous and revised lake height to storage volume curves. The new information suggests a total working volume of approximately 72 million m³ compared with the previous assumption of 90 million m³. The very detailed bathymetric information obtained has provided a much more accurate model for operational use, including estimation of total lake inflows based on short term level readings. This is particularly valuable in high inflow, high lake level scenarios.

We have had preliminary discussions with DHI about adapting the catchment flood model they have developed for ECan to provide information specific to Opuha.



Opuha Monitoring Equipment Maintenance Log Summary (ECS)

Fox Peak Raingauge

No missing record, site operating satisfactorily. Raingauge G881 replaced with G799 22 July 2013. Calibrated and checked OK 22 July 2013 and 27 March 2014.

Mt Dobson Raingauge

Site operating satisfactorily. Raingauge G969W replaced with G126 22 July 2013. This raingauge subsequently failed to record rainfall and was replaced on 19 August 2013 with G537. Calibrated and checked OK 19 August 2013 and 27 March 2014.

Nth Opuha Flow site

Site operating well but affected by significant degrading of river bed at the recorder site. Works carried out in December 2013 to restore flow control at the site (ECan). Three rating changes identified during the period.

Nth Opuha Temperature

Sensor now defunct – no record.

Sth Opuha Flow Site

Site operated satisfactorily. River works required during May 2013 and January 2014 to re-align flow control.

Seven rating changes identified during the period.

Sth Opuha Temperature

No record due to complete change in river channel (sensor buried under river gravels).

Downstream Weir Flow Site

Site operating satisfactorily. No missing record.

Downstream weir water quality probes.

Water quality sensors all operative. Turbidity pump failed due to excessive head losses on 28 February 2014 and has been turned off. The sensor is to be re-sited upstream of the flow recorder tower to reduce the excessive pumping head

Seepage Water Level

All five sensors have continued to operate satisfactorily and provide a continuous record of seepage flow.

Seepage Turbidity

Sensor has worked satisfactorily, but has passed its useful life and requires replacing.

Opihi at Saleyards Bridge

Site operating satisfactorily. River works required in July and November 2013. Flows well above the required minimum flow during these times.

Lake Opuha Water Level

No missing record. Lundahl ultrasonic sensor was used periodically as a backup PumpPro sensor and pressure lines were checked and repaired.

Lake Opuha Rainfall

No check gauge at site. Ota raingauge check calibrated 5 August 2013 and shown to be accurate. No missing record.

Lake Opuha 5 metre sensors (buoy) and 25m (tower) sensors

Missing record for all water quality sensors due to interface failure caused by excessive number of sensors connected to a single datalogger. No records from 1 July 2013 until new interface and re-wired sensors installed on 30 September 2013.

Additional set of water quality probes installed to a depth of approximately 23 metres.

Lake Opuha Quarterly sampling

Following discussions with ECan water quality scientists, the method used for analysing Chlorophyll a was changed to allow a detection limit of 0.0002 g/m³ (the previous method provided a detection limit of 0.003 g/m³).

Appendix 1

Opuha Dam

Annual Dam Safety Inspection Report (2014)

Executive Summary (Full Report submitted separately to Environment Canterbury in May 2014)

Tonkin and Taylor Ltd

April 2014

Appendix 2

Opuha Water Limited
Resource Consent Monitoring
In-stream Biota Survey
April 2014

