

Trustpower Ltd
Motukawa HEP Scheme
Monitoring Programme
Annual Report
2014-2015

Technical Report 2015-38

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Executive summary

Trustpower Limited (Trustpower) operates the Motukawa hydroelectric power (HEP) scheme in the Manganui River and Waitara River catchment. Trustpower draws water from behind a weir on the Manganui River near Tariki and diverts this water through a race to Lake Ratapiko and then through penstocks to the Motukawa Power Station. The power station discharges into the Makara Stream, a tributary of the Waitara River. Consents for the Motukawa HEP scheme allow Taranaki Generation Ltd to maintain structures, to take, divert and discharge water, and to disturb the bed of Lake Ratapiko. This report for the period July 2014-June 2015 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess Trustpower's environmental performance during the period under review, and the results and environmental effects of their activities.

Trustpower holds a total of 23 resource consents, which include a total of 186 conditions setting out the requirements that the Company must satisfy. The Company holds five consents to allow it to take and use water, five consents to discharge water or sediment into the Makara, Mangaotea, and Mako streams, one consent to discharge wastes to land around Lake Ratapiko and four land use permits for bed disturbance and structures in the Manganui River, Mangaotea Stream and Lake Ratapiko. Seven additional consents allow Trustpower to abstract water, and construct and maintain structures in the Mangaotea Stream.

During the period under review, Trustpower demonstrated a good level of environmental performance at the Motukawa power scheme.

The Council's monitoring for the period under review included nine inspections of fish passage and residual flow facilities, continuous river monitoring at two sites between November and April each year, a biomonitoring survey, and review of abstraction, discharge, and lake and race water level data forwarded by the Company, as well as elver transfer data.

The monitoring showed that during the period under review, the management of abstraction rates, race and lake water levels were generally good. With regard to the management and recording of flows within the diversion race, performance has improved significantly compared to previous monitoring years, with few significant losses of data. There was only one occasion when the maximum water levels within the race and lake were breached during the reported period. This occurred during the flood event of late June 2015, which affected much of eastern Taranaki. A special investigation into this flood event (detailed herein) found that Trustpower had taken all practical steps to minimise flooding, and that the significant flooding that occurred was primarily due to the extremely heavy rain that fell in the area at this time.

Water temperature differences appear to have reduced between natural flows and those in the residual flow reach since the establishment of the 400 litre per second residual flow limit. Over the reported period, there was a slight increase in the number of days that water temperatures in the residual flow reach exceeded 25°C, all occurring in January 2015. However, the temperature differences between upstream and downstream of the weir were lower than the average.

Macroinvertebrate monitoring indicates improvement at some sites since the increased residual flow was implemented, however elevated water temperatures and denser periphyton substrate cover have affected macroinvertebrate communities of the residual flow reach in more recent

surveys. In terms of the current report, it is considered that the communities sampled were representative of more 'natural' conditions, as the surveys were preceded by flushing flows. The results indicate that the MCI scores at these sites were higher than most previous surveys, as were the SQMCIs scores, which were almost all significantly higher than their respective medians. However, a similar result was recorded at the control site indicating that there is a catchment wide improvement also.

Overall, the results indicate that the invertebrate community supported by a residual flow of 400 L/s, with regards to presence/absence of taxa, and their respective abundances, is not significantly different to that supported by natural flows. The principal difference between the two flows is that there is a greater amount of invertebrate habitat available under natural flow conditions due to the increased amount of wetted riverbed width.

A significant result of fish monitoring undertaken to date, was the presence of the key indicator species redfin bully, shortjaw kokopu and inanga upstream of the weir. Although no fish monitoring was undertaken in the reported period, previous results indicate that with respect to the management objectives for which the residual flow was developed:

- reasonable water quality is being maintained;
- passage for trout is probably being achieved through the residual flow reach and past the weir;
- passage for some (but not all) native fish is being achieved in the residual flow reach and it would appear through the fish pass;
- habitat of native fish has improved but fish diversity is similar to that recorded prior to the 400 L/s residual flow and may suggest that the objective of 'some native fish habitat' is not being achieved for torrentfish, although redfin bullies and inanga have been recorded in the residual flow reach.

Eel and elver passage requirements were generally fulfilled with the elver transfer system at the power station working well. Electric fields have been installed at the intake and forebay and testing indicates that these are successful in deterring fish from these areas. Transfer of adult eels was attempted during each migration season, although due to low numbers only one longfin eel was transferred in the most recent migration season.

During the reported period, Trustpower's performance was generally maintained at a high level. There were no incidents that warranted enforcement action. There were a number of minor incidents, but due to the swift response of the consent holder, they remained minor, and it is likely no environmental impact resulted.

The improved environmental performance of the consent holder is a result of efforts to improve their internal systems and monitoring of this highly complex scheme. Trustpower has maintained a good level of communication with the Council, including notifying the Council of any breach of consent, no matter how minor. Overall, it is considered that Trustpower was able to demonstrate a good level of environmental performance and compliance with the resource consents, and compliance with the administrative requirements of the consents was high. The reason that the scheme did not achieve a high rating relates to the effects of the flooding that were observed in June 2015. However, it is acknowledged that there was little that Trustpower could have done different at the time to avoid or minimise this flooding and the associated impacts.

This report includes recommendations for the 2015-2016 year.

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1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is the Monitoring Report for the period July 2014-June 2015 by the Taranaki Regional Council (The Council) describing the monitoring programme associated with resource consents held by Trustpower Limited (Trustpower) for the Motukawa hydroelectric power [HEP] scheme. This scheme diverts water from the Manganui River and Mangaotea Stream to Lake Ratapiko and then onto the Motukawa Power Station on Motukawa Road.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by Trustpower that relate to abstractions and discharges of water in the Waitara catchment. This is the 20th report to be prepared by the Council to cover the Motukawa HEP scheme activities and their effects.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about compliance monitoring under the *Resource Management Act (RMA)* and the Council's obligations and general approach to monitoring sites through annual programmes, the relevant resource consents held by Trustpower, the nature of the monitoring programme in place for the period under review, and a description of the activities and operations conducted in the Manganui and Waitara River catchments in relation to the Motukawa HEP scheme.

Section 2 presents the results of monitoring during the period under review, including scientific and technical data.

Section 3 discusses the results, their interpretations, and their significance for the environment.

Section 4 presents recommendations to be implemented in the 2015-2016 monitoring year.

A glossary of common abbreviations and scientific terms, and a bibliography, are presented at the end of the report.

1.1.3 The Resource Management Act 1991 and monitoring

The RMA primarily addresses environmental 'effects' which are defined as positive or adverse, temporary or permanent, past, present or future, or cumulative. Effects may arise in relation to:

- (a) the neighbourhood or the wider community around an activity, and may include cultural and social-economic effects;
- (b) physical effects on the locality, including landscape, amenity and visual effects;

- (c) ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
- (d) natural and physical resources having special significance (for example recreational, cultural, or aesthetic);
- (e) risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Council is recognising the comprehensive meaning of 'effects' inasmuch as is appropriate for each activity. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the RMA to assess the effects of the exercise of consents. In accordance with section 35 of the RMA, the Council undertakes compliance monitoring for consents and rules in regional plans, and maintains an overview of the performance of resource users and consent holders. Compliance monitoring, including both activity and impact monitoring, enables the Council to continually re-evaluate its approach and that of consent holders to resource management and, ultimately, through the refinement of methods and considered responsible resource utilisation, to move closer to achieving sustainable development of the region's resources.

1.1.4 Evaluation of environmental and administrative performance

Besides discussing the various details of the performance and extent of compliance by the consent holder/s during the period under review, this report also assigns a rating as to each Company's environmental and administrative performance.

Environmental performance is concerned with actual or likely effects on the receiving environment from the activities during the monitoring year. **Administrative performance** is concerned with the Company's approach to demonstrating consent compliance in site operations and management including the timely provision of information to Council (such as contingency plans and water take data) in accordance with consent conditions.

Events that were beyond the control of the consent holder and unforeseeable (that is a defence under the provisions of the RMA can be established) may be excluded with regard to the performance rating applied. For example loss of data due to a flood destroying deployed field equipment.

The categories used by the Council for this monitoring period, and their interpretation, are as follows:

Environmental Performance

- **High:** No or inconsequential (short-term duration, less than minor in severity) breaches of consent or regional plan parameters resulting from the activity; no adverse effects of significance noted or likely in the receiving environment .The Council did not record any verified unauthorised incidents involving significant environmental impacts and was not obliged to issue any abatement notices or infringement notices in relation to such impacts.
- **Good:** Likely or actual adverse effects of activities on the receiving environment were negligible or minor at most. There were some such issues noted during

monitoring, from self reports, or in response to unauthorised incident reports, but these items were not critical, and follow-up inspections showed they have been dealt with. These minor issues were resolved positively, co-operatively, and quickly. The Council was not obliged to issue any abatement notices or infringement notices in relation to the minor non-compliant effects; however abatement notices may have been issued to mitigate an identified potential for an environmental effect to occur.

For example:

- High suspended solid values recorded in discharge samples, however the discharge was to land or to receiving waters that were in high flow at the time;
- Strong odour beyond boundary but no residential properties or other recipient nearby.
- **Improvement required:** Likely or actual adverse effects of activities on the receiving environment were more than minor, but not substantial. There were some issues noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent minor non-compliant activity could elevate a minor issue to this level. Abatement notices and infringement notices may have been issued in respect of effects.
- **Poor:** Likely or actual adverse effects of activities on the receiving environment were significant. There were some items noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent moderate non-compliant activity could elevate an ‘improvement required’ issue to this level. Typically there were grounds for either a prosecution or an infringement notice in respect of effects.

Administrative performance

- **High:** The administrative requirements of the resource consents were met, or any failure to do this had trivial consequences and were addressed promptly and co-operatively.
- **Good:** Perhaps some administrative requirements of the resource consents were not met at a particular time, however this was addressed without repeated interventions from the Council staff. Alternatively adequate reason was provided for matters such as the no or late provision of information, interpretation of ‘best practical option’ for avoiding potential effects, etc.
- **Improvement required:** Repeated interventions to meet the administrative requirements of the resource consents were made by Council staff. These matters took some time to resolve, or remained unresolved at the end of the period under review. The Council may have issued an abatement notice to attain compliance.
- **Poor:** Material failings to meet the administrative requirements of the resource consents. Significant intervention by the Council was required. Typically there were grounds for an infringement notice.

For reference, in the 2014-2015 year, 75% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 22% demonstrated a good level of environmental performance and compliance with their consents.

1.2 Process description

The Motukawa HEP scheme first generated electricity in January 1927 and has been modified over the years to improve efficiency. Previous monitoring reports provide additional detail on the scheme's history. Trustpower currently owns and operates the scheme, which was formerly operated by Powerco Ltd and also by Taranaki Energy. The main elements of the scheme are shown in Figure 1.

Trustpower draws water from behind a weir on the Manganui River near Tariki and diverts this water through a settling pond (Aylings Pond) and then via a water race into Lake Ratapiko, an artificial storage lake resulting from the damming of the Mako Stream. About half way along, the race crosses the Mangaotea Stream. At this location, water is pumped from the Mangaotea Stream, and discharged to the water race to supplement the Manganui River take. From Lake Ratapiko the water is piped through penstocks to the Motukawa Power Station, used to generate electricity, and discharged into the Makara Stream, a tributary of the Waitara River.

Trustpower have also installed an in-race generator. By constructing a small dam in the Motukawa Race and diverting water through a generator, it allowed Trustpower to utilise the natural head in the race at this point. A 200 KW generator now produces about 0.9 gigawatt/hours of electricity per year.

Except when the Tariki weir is overtopping, the bed of the Manganui River carries a residual flow of at least 400 litres per second (L/s) for five km between the weir and the confluence with the Mangaotea Stream. The confluence with the next major tributary, the Mangamawhete Stream, is a further eight km downstream. This residual flow has been implemented following the renewal of consent 3369, and the construction of a new fish pass on the true right bank, which carries approximately 300 L/s of the residual flow past the weir (constructed in 2002). The remaining residual flow passes through an old (and mostly ineffective) fish pass on the true left bank of the weir.

Much of the scheme is monitored and operated remotely. Through a computerised water level sensor system, Trustpower can monitor the residual flows in the Manganui River and Mangaotea Stream, water levels in the race and lake and how much rain is falling locally. This has allowed Trustpower to manage race flows to minimise flooding, and has greatly improved Trustpower's compliance with residual flow requirements.

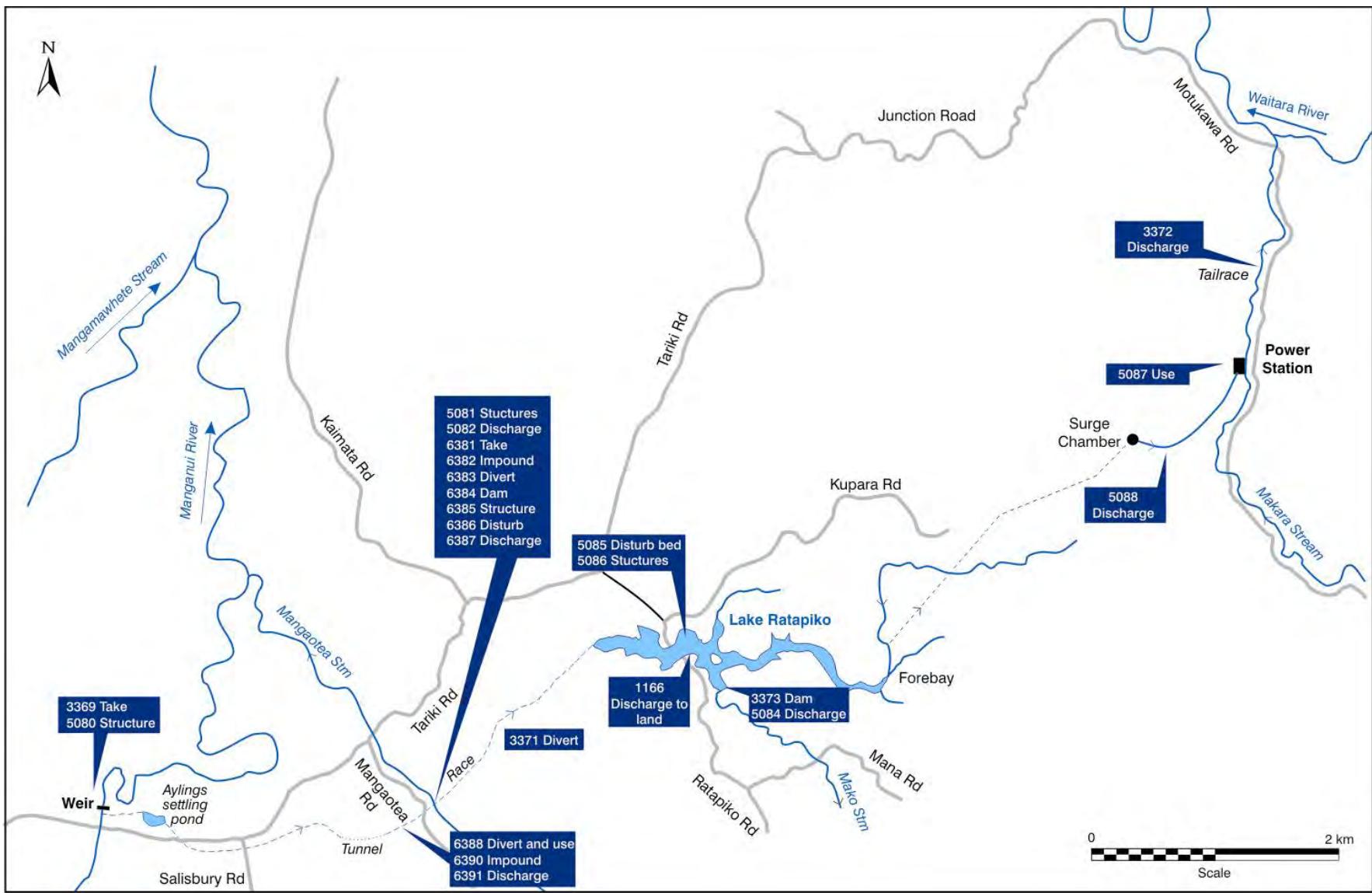


Figure 1 Main features of the Trustpower Motukawa HEP Scheme including relevant consents

1.3 Resource consents

1.3.1 Water abstraction permit

Section 14 of the RMA stipulates that no person may take, use, dam or divert any water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or it falls within some particular categories set out in Section 14.

Trustpower holds water permit **3369-2** to cover the abstraction of up to 5200 L/s of water from the Manganui River in the Waitara Catchment for HEP generation. This permit was issued by the Council on 19 September 2001 under Section 87(d) of the RMA. It is due to expire on 1 June 2022.

Five special conditions relate to residual flow requirements ensuring:

- a residual flow of no less than 400 L/s is maintained in the Manganui River below the weir at all times. This is to provide for the passage of fish and reasonable water quality in the Manganui River downstream of the weir. This residual flow is to be passed through the fish pass [special conditions 1 and 2].
- residual flows required when the weir had not naturally overtopped for 30 days or the flow of the Waitara River is less than or equal to 5,000 L/s. This provides flushing flows to mitigate effects during periods of extended low flow [special conditions 4 and 5].
- a residual flow of 150 L/s is required in the race during maintenance periods. This ensures fish will not be stranded in the race during maintenance periods. If this residual flow is unpractical, a fish salvage operation to relocate stranded fish should be arranged by the consent holder [special condition 7].

Two conditions relate to monitoring and measurement of abstraction rates and race water levels within a water level control system, data from which should be forwarded to the Council every three months. This ensures that compliance with the conditions of this and other consents can be assessed, and that flooding of farmland adjacent to the race as a result of the activities of the consent holder is avoided [special conditions 3 and 6].

Special condition eight allows for the mitigation of the effects of the abstraction by donating to the Taranaki Tree Trust for the purpose of providing riparian management in the Manganui River catchment.

Special condition nine requires the consent holder to meet with interested submitters to the consent to discuss any matter relating to the exercise of the consent with particular reference to the monitoring programme design, implementation and interpretation. This condition is present throughout all consents for the Motukawa HEP scheme.

The last two conditions are review provisions.

Trustpower holds water permit **3371-2** to cover the diversion and use of up to 8,000 L/s of stormwater runoff and the entire flow of various unnamed watercourses draining into the race and into Lake Ratapiko for HEP supply purposes. This permit

was issued by the Council on 19 September 2001 under Section 87(d) of the RMA. It is due to expire on 1 June 2022.

Seven special conditions relate to the prevention of flooding of the adjacent farmland as a result of the activities of the consent holder and include:

- monitoring and measurement via a race water level control system and stage boards [special conditions 1, 3 & 5];
- maximum race water levels at four sites along the race [special condition 2];
- five yearly surveys of the race to ensure race capacity is maintained [special condition 4];
- a bond to be entered into until such time as specified improvement works have been completed if flooding occurs within a specified period [special condition 7 & 8].

Special condition six requires the consent holder to meet with interested submitters to the consent to discuss any matter relating to the exercise of the consent with particular reference to the monitoring programme design, implementation and interpretation. This condition is present throughout all consents for the Motukawa HEP scheme.

The last two conditions are review provisions.

Trustpower holds water permit **3373-2** to cover the damming of the Mako Stream to form Lake Ratapiko for HEP generation purposes, including the spillway structure. This permit was issued by the Council on 19 September 2001 under Section 87(d) of the RMA. It is due to expire on 1 June 2022.

The first two special conditions relate to the safety of the dam structure.

Special conditions three to seven relate to the spillway and lake levels. This is to ensure that lake levels do not cause flooding of land adjacent to the lake and race. Water levels shall be monitored as per special condition nine.

Special condition eight requires the consent holder to install and monitor a facility to enable the passage of elvers and adult eels over the spillway. Monitoring information is to be forwarded to the Council every 12 months.

Special condition nine requires the consent holder to meet with interested submitters to the consent to discuss any matter relating to the exercise of the consent with particular reference to the monitoring programme design, implementation and interpretation. This condition is present throughout all consents for the Motukawa HEP scheme.

The last two conditions are review provisions.

Trustpower holds water permit **5087-1** to cover the taking and use of up to 7,787 L/s of water from Lake Ratapiko for HEP generation purposes.

This permit was issued by the Council on 19 September 2001 under Section 87(d) of the RMA. It is due to expire on 1 June 2022.

Special conditions one to four relate to the management of lake water levels during normal operation and maintenance periods so as to avoid or minimise fish stranding and the potential for flooding of land adjoining the lake and race.

Special condition nine requires the consent holder to meet with interested submitters to the consent to discuss any matter relating to the exercise of the consent with particular reference to the monitoring programme design, implementation and interpretation. This condition is present throughout all consents for the Motukawa HEP scheme.

The last two conditions are review provisions.

Trustpower holds water permit **6388-1** to cover the diversion and use of water in the Motukawa Race for HEP generation purposes. This permit was issued by the Council on 27 July 2004 under Section 87(d) of the RMA. It is due to expire on 1 June 2022.

Special conditions one and two relate to the adoption of the best practical option, and that the consent should be carried out generally in accordance with the information submitted with the application.

Special condition three requires that the Council be notified prior to the exercise of the consent.

Special condition four relates to the lapse period if the consent is not exercised and the last condition is a review provision.

Trustpower holds water permit **6390-1** to cover the impoundment of water behind a dam in the Motukawa Race for HEP generation purposes. This permit was issued by the Council on 27 July 2004 under Section 87(d) of the RMA. It is due to expire on 1 June 2022.

Special conditions one and two relate to the adoption of the best practical option, and that the consent should be carried out generally in accordance with the information submitted with the application.

Special condition three requires that the Council and Fish and Game New Zealand be notified prior to the construction of the dam and turbine.

Special conditions four to seven provide for the protection and monitoring of freshwater fauna, including trout, in the race.

Special condition eight provides maximum race water levels to avoid flooding of adjacent farmland as a result of the consent holder's activities and is consistent with other existing consents for the scheme.

The last two conditions relate to the lapse period if the consent is not exercised and a review provision.

Trustpower holds water permit **6381-1** to take and use water from the Mangaotea Stream, a tributary of the Manganui River, for HEP generation purposes. This permit

was issued by the Council on 7 December 2005 under Section 87(d) of the RMA. It is due to expire on 1 June 2022.

Special condition one requires that the consent is carried out generally in accordance with the information submitted with the application.

Special condition two requires that the Council is notified prior to the exercising of this consent.

Special condition three limits the amount and the rate of abstraction.

Special condition four sets a residual flow for two points in the Mangaotea Stream.

Special condition six provides for flushing flows in the Mangaotea Stream

Special condition seven requires the consent holder to install and operate measuring devices to measure a range of flows, and provide the data to the Council.

Special condition eight requires the consent holder to commission and implement a monitoring programme to determine the hydrological and ecological effects of the abstraction.

Special condition ten requires the consent holder to meet with interested submitters to the consent to discuss any matter relating to the exercise of the consent with particular reference to the monitoring programme design, implementation and interpretation. This condition is present throughout all consents for the Motukawa HEP scheme.

Special condition eleven relate to the lapse period if the consent is not exercised.

Special conditions five, nine and twelve all relate to the review of the consent, should the residual flow be found to not be appropriate, or other issues arise.

Trustpower holds water permit **6382-1** to impound water behind a temporary dam within the Mangaotea Stream, for the purposes of constructing a water intake structure for HEP generation purposes. This permit was issued by the Council on 7 December 2005 under Section 87(d) of the RMA. It is due to expire on 1 June 2022.

Special condition one requires that the consent is carried out generally in accordance with the information submitted with the application.

Special condition two requires that the Council is notified prior to the exercising of this consent.

Special condition three places a restriction as to what time of the year the consent can be exercised.

Special condition four requires the consent holder to minimise the area and volume of riverbed disturbed.

Special condition five states that the impoundment shall not cause an obstruction to fish passage.

The last two conditions relate to the lapse period if the consent is not exercised and a review provision.

Trustpower holds water permit **6383-1** to divert water around a temporary dam within the Mangaotea Stream for the purposes of constructing a water intake structure for HEP generation purposes. This permit was issued by the Council on 7 December 2005 under Section 87(d) of the RMA. It is due to expire on 1 June 2022.

Special condition one requires that the consent is carried out generally in accordance with the information submitted with the application.

Special conditions two and three requires that the Council is notified prior to the exercising of this consent or prior to and subsequent maintenance works.

Special condition four places a restriction as to what time of the year the consent can be exercised.

Special condition five requires the consent holder to minimise the area and volume of riverbed disturbed.

Special condition six states that the impoundment shall not cause an obstruction to fish passage.

The last two conditions relate to the lapse period if the consent is not exercised and a review provision.

The permits are attached to this report in Appendix I.

1.3.2 Water discharge permit

Section 15(1)(a) of the RMA stipulates that no person may discharge any contaminant into water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or by national regulations.

Trustpower holds water discharge permit **3372-2** to cover the discharge of up to 7,787 L/s of water from the Motukawa HEP station in to the Makara Stream. This permit was issued by the Council on 19 September 2001 under Section 87(e) of the RMA. It is due to expire on 1 June 2022.

The first special condition relates to flushing flow requirements during extended periods of low flow in the Waitara River in order to mitigate the effects of low flows in the Waitara River.

Special condition two relates to the measurement and monitoring of discharge rates into the Makara Stream, records of which are to be forwarded to the Council every three months.

The third special condition relates to the provision for the passage of elvers over the dam, including maintenance and monitoring of an elver pass.

The fourth condition requires the consent holder to meet with interested submitters once per year as in other consents related to this power generation scheme.

The last two conditions are review provisions.

Trustpower holds water discharge permit **5082-1** to cover the discharge, under emergency conditions, of up to 2,000 L/s of water from the Mangaotea Aqueduct into the Mangaotea Stream. This permit was issued by the Council on 19 August 1999 under Section 87(e) of the RMA. It is due to expire on 1 June 2022.

The first condition states that the discharge shall occur after compliance with condition two of consent 5081 (land use permit) is achieved. This condition (5081) requires the lowering of the northern side of the aqueduct and installing a gate.

Special conditions two to four relate to the avoidance of flooding of farmland adjacent to the race and downstream of the aqueduct and defines emergency conditions, as well as setting aside money for maintenance if there are adverse effects from the discharge.

The sixth condition requires the consent holder to meet with interested submitters once per year as in other consents related to this power generation scheme.

Two conditions are review provisions [conditions 5 & 7].

Trustpower holds water discharge permit **5084-1** to cover the discharge of up to 55,000 L/s of hydroelectric generation water, during adverse weather conditions, via spillways and lake drainage valves from Lake Ratapiko into the Mako Stream. This permit was issued by the Council on 19 September 2001 under Section 87(e) of the RMA. It is due to expire on 1 June 2022.

Special conditions one and two relate to the preparation of a contingency plan for the purpose of managing the discharge so as to avoid or minimise damage to property downstream, within six months of the granting of the consent.

The third condition requires the consent holder to meet with interested submitters once per year as in other consents related to this power generation scheme.

The last two special conditions are review provisions.

Trustpower holds water discharge permit **5088-1** to cover the discharge of up to 2,000 L/s of water, from the surge chamber of the Motukawa HEP station during maintenance periods into an unnamed tributary of the Makara Stream. This permit was issued by the Council on 19 September 2001 under Section 87(e) of the RMA. It is due to expire on 1 June 2022.

The first two special conditions require the consent holder to provide and act in accordance with a contingency plan for the purpose of managing the discharge so as to avoid or minimise the potential for damage to property downstream.

Special condition three requires the Council to be notified at least 48 hours prior to the discharge and also the adoption of the best practicable option to prevent or minimise any actual or likely effect on the environment arising from the discharge.

Special condition four requires the consent holder to meet with interested submitters once per year as in other consents related to this power generation scheme.

The last two special conditions are review provisions.

Trustpower holds water discharge permit **6391-1** to cover the discharge of sediment during earthworks associated with the construction of a generator structure into the Motukawa Race. This permit was issued by the Council on 27 July 2004 under Section 87(e) of the RMA. It is due to expire on 1 June 2022.

Special conditions one and two relate to the adoption of the best practical option, and that the consent be exercised generally in accordance with the information submitted with the application.

Special conditions three, four and six require the Council to be notified prior to and on completion of any works associated with this consent, as well as approval of a site erosion and sediment control management plan, including rehabilitation of the site after construction. This ensures adverse effects will be minimised during construction periods and that works can be monitored by the Council.

The fifth condition defines mixing zones downstream of the works, and effects that should not result from the works.

The last two special conditions are define lapse periods and review provisions.

Trustpower holds water discharge permit **6387-1** to cover the discharge of sediment during earthworks associated with the construction of an intake structure into the Mangaotea Stream. This is a new permit and was issued by the Council on 7 December 2005 under Section 87(e) of the RMA. It is due to expire on 1 June 2022.

Special conditions one and two relate to the adoption of the best practical option, and that the consent be exercised generally in accordance with the information submitted with the application.

Special conditions three, four and five require the Council to be notified prior to and on completion of any works associated with this consent, specifies the timing of the works, and requires approval of a site erosion and sediment control management plan, including rehabilitation of the site after construction. This ensures adverse effects will be minimised during construction periods and that works can be monitored by the Council.

The sixth condition defines mixing zones downstream of the works, and effects that should not result from the works.

Special condition seven requires all earthwork areas to be stabilised vegetatively or otherwise as soon as practicable after soil disturbance and reinstatement, to reduce the potential for sediment entrainment during rain.

The last two special conditions are define lapse periods and review provisions.

The permits are attached to this report in Appendix I.

1.3.3 Discharges of wastes to land

Sections 15(1)(b) and (d) of the RMA stipulate that no person may discharge any contaminant onto land if it may then enter water, or from any industrial or trade premises onto land under any circumstances, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

Trustpower holds discharge permit **1166-3** to cover the discharge of up to 4,000 cubic metres/day of dredgings from maintenance of Lake Ratapiko onto land above the one-metre mark around the lake margin. This permit was issued by the Council on 19 September 2001 under Section 87(e) of the RMA. It is due to expire on 1 June 2022.

The first two special conditions require the consent holder to notify the Council at least 48 hours prior to the commencement of the discharge and to adopt the best practicable option to avoid or minimise the discharge of silt or other contaminants onto land arising from the discharge.

The third condition requires the consent holder to meet with interested submitters once per year as in other consents related to this power generation scheme.

The last two special conditions provide review provisions.

The permit is attached to this report in Appendix I.

1.3.4 Land use permits

Sections 13(1)(a) of the RMA stipulates that no person may, in relation to the bed of any lake or river, use, erect, reconstruct, place, alter, extend, remove or demolish any structure or part of any structure in, on, under, or over the bed unless the activity is expressly allowed for by a rule in a regional plan and any relevant proposed regional plan, or a resource consent.

Trustpower holds land use permit **5080-1** to cover the erection, placement, use and maintenance of the weir and various structures associated with HEP generation activities in the Manganui River. This permit was issued by the Council on 19 September 2001 under Section 87(a) of the RMA. It is due to expire on 1 June 2022.

Special conditions one to three relate to the passage of fish including the installation, maintenance and monitoring of a structure to allow for the passage of eels, native fish, juvenile and adult trout.

The fourth special condition requires the consent holder to meet with interested submitters once per year as in other consents related to this power generation scheme.

Special conditions five and six are review provisions.

Trustpower holds land use permit **5081-1** to cover the erection, placement, use and maintenance of the Mangaotea Aqueduct associated with HEP generation activities in the Mangaotea Stream. This permit was issued by the Council on 19 August 1999 under Section 87(a) of the RMA. It is due to expire on 1 June 2022.

The first special condition requires the consent holder to install and survey a stage board in the race at the Mangaotea Aqueduct, for the purpose of providing a visual check on race water levels.

Special condition two requires the consent holder to lower the northern side of the aqueduct by 300 mm to provide for a flow of 2,000 L/s and shall install a gate in the lowered section which shall be controlled by the race water level control system.

The third special condition requires the consent holder to meet with interested submitters once per year as in other consents related to this power generation scheme.

Special conditions four and five are review provisions.

Trustpower holds land use permit **5085-1** to cover the disturbance of the bed of Lake Ratapiko for maintenance and repairs associated with HEP generation. This permit was issued by the Council on 19 September 2001 under Section 87(a) of the RMA. It is due to expire on 1 June 2022.

The first special condition requires the consent holder to notify the Council at least 48 hours prior to the commencement of any disturbance activities.

The second condition requires the consent holder to adopt the best practicable option to prevent or minimise any actual or potential effect on the environment arising from any disturbance activities.

The third special condition requires the consent holder to meet with interested submitters once per year as in other consents related to this power generation scheme.

Special conditions four and five are review provisions.

Trustpower holds land use permit **5086-1** to cover the erection, placement, use and maintenance of various structures in, on and over the bed of Lake Ratapiko for HEP generation purposes. This permit was issued by the Council on 19 September 2001 under Section 87(a) of the RMA. It is due to expire on 1 June 2022.

The first two conditions relate to the passage of fish including preventing entrapment in the penstock intake structure.

Special condition three requires the installation of a stage board in the lake to provide a visual check on lake water levels.

Under special condition four, the consent holder shall upgrade the Ratapiko Road causeway, so as not to restrict the flow of water between the two parts of Lake Ratapiko. This is to avoid flooding of the land adjoining the race.

The sixth special condition requires the consent holder to meet with interested submitters once per year as in other consents related to this power generation scheme.

Special conditions five and seven are review provisions.

Trustpower holds land use permit **6384-1** to cover the erection, placement, use and maintenance of a temporary dam within the Mangaotea Stream, for the purposes of constructing a water intake structure for HEP generation purposes. This permit was issued by the Council on 7 December 2005 under Section 87(a) of the RMA. It is due to expire on 1 June 2022.

Special conditions one and two relate to the adoption of the best practical option, and that the consent be exercised generally in accordance with the information submitted with the application.

Special conditions three and four require the Council to be notified prior to and on completion of any works associated with this consent including subsequent maintenance works, and specifies the timing of the works. This ensures adverse effects will be minimised during construction periods and that works can be monitored by the Council.

Special condition five requires the consent holder to minimise the area and volume of streambed disturbance, and to reinstate any disturbed areas where practicable.

The sixth condition requires that the diversion and impoundment does not obstruct fish passage.

The last two special conditions define lapse periods and review provisions.

Trustpower holds land use permit **6385-1** to erect, place and maintain an intake structure including pumps in the bed of the Mangaotea Stream for the purposes of abstracting water for HEP generation purposes. A variation to this permit was issued by the Council on 9 February 2007 under Section 87(a) of the RMA. It is due to expire on 1 June 2022.

Special conditions one and two relate to the adoption of the best practical option, and that the consent be exercised generally in accordance with the information submitted with the application.

Special conditions three and four require the Council to be notified prior to and on completion of any works associated with this consent including subsequent maintenance works, and specifies the timing of the works. This ensures adverse effects will be minimised during construction periods and that works can be monitored by the Council.

Special condition five requires the consent holder to minimise the area and volume of streambed disturbance, and to reinstate any disturbed areas where practicable.

The sixth condition requires that the diversion and impoundment does not obstruct fish passage and the seventh condition requires that the intake is appropriately screened to avoid the entrapment of freshwater fauna.

Condition eight requires that the structure be removed if and when it is no longer required.

The last two special conditions define lapse periods and review provisions.

Trustpower holds land use permit **6386-1** to disturb and modify the bed and banks of the Mangaotea Stream in association with the construction of an intake structure for HEP generation purposes. This permit was issued by the Council on 7 December 2005 under Section 87(a) of the RMA. It is due to expire on 1 June 2022.

Special conditions one and two relate to the adoption of the best practical option, and that the consent be exercised generally in accordance with the information submitted with the application.

Special conditions three and four require the Council to be notified prior to and on completion of any works associated with this consent including subsequent maintenance works, and specifies the timing of the works. This ensures adverse effects will be minimised during construction periods and that works can be monitored by the Council.

Special condition five requires the consent holder to minimise the area and volume of streambed disturbance, and to reinstate any disturbed areas where practicable.

The sixth condition requires that the streambed works do not obstruct fish passage.

The last two special conditions are define lapse periods and review provisions.

Special condition five requires the consent holder to minimise the area and volume of streambed disturbance, and to reinstate any disturbed areas where practicable.

The permits are attached to this report in Appendix I.

1.4 Monitoring programme

1.4.1 Introduction

Section 35 of the RMA sets out obligations upon the Council to gather information, monitor, and conduct research on the exercise of resource consents, and the effects arising, within the Taranaki region and report upon these.

The Council may therefore make and record measurements of physical and chemical parameters, take samples for analysis, carry out surveys and inspections, conduct investigations, and seek information from consent holders. The monitoring programme for the Motukawa HEP scheme consisted of six primary components.

1.4.2 Programme liaison and management

There is generally a significant investment of time and resources by the Council in:

- ongoing liaison with resource consent holders over consent conditions and their interpretation and application;

- in discussion over monitoring requirements;
- preparation for any reviews;
- renewals;
- new consents;
- advice on the Council's environmental management strategies and content of regional plans and;
- consultation on associated matters.

1.4.3 Site inspections

The scheme was visited nine times during the reported period, including three hydrological inspections and six site inspections. With regard to consents for the abstraction of water, the main points of interest were:

- whether or not the old fish pass was free of blockages and to assess the flow over the old pass;
- to assess the flow and condition of the new fish pass (Photo 1);
- to assess residual flow compliance;
- to document whether the weir was overtopping,
- to assess water levels in the race and lake; and
- to monitor maintenance work where appropriate.

Sources of data being collected by Trustpower were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council.

1.4.4 Water temperature monitoring

Water temperature was identified in past monitoring years as the water quality parameter of most concern in the residual flow reach (consent 3369), other than the obvious lack of submerged habitat below the weir.

The impact of the diversion of water at the weir upon water temperatures in the Manganui River was assessed using continuous monitoring over the summer period (November to May) of the monitoring year. Two temperature recorders were used, one being located immediately upstream of the Tariki weir (T1) and the second recorder located 2.3 km downstream of the Tariki weir (T2). A third location (T3), located downstream of the confluence with the Mangaotea Stream, was monitored for summer water temperatures from 2007 and 2013. The locations of the recorders are illustrated in Figure 2.

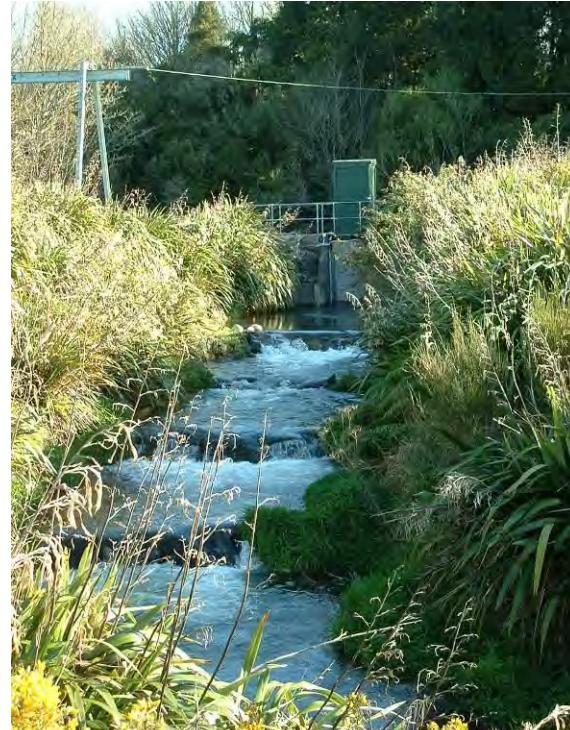


Photo 1 The new fish pass (8 September 2010)

1.4.5 Data audit

Trustpower provided the Council with data on water abstraction from numerous locations, including the Manganui River and Mangaotea Stream. Data for race and lake water levels, river flows (including residual flows) and discharge rates to the Makara Stream were also provided. The Council assessed the abstraction and discharge data to determine whether or not the abstraction/discharge rates exceeded the consented rates. The lake level data were assessed to determine whether or not the range in water levels in Lake Ratapiko was within the range expressed in the consent conditions. The fish pass flows and Mangaotea Stream flows were compared with required residual flows, for consent compliance assessment, while race water levels were also assessed to determine whether water levels exceeded maximum levels specified in consents. The locations of these water level monitoring sites are shown in Figure 3.

1.4.6 Biomonitoring surveys

Riverbed macroinvertebrate communities provide useful information relating to habitat quality because they are relatively sessile (attached to the bed), they can be easily sampled, and they form distinctive community structures that reflect certain physical and chemical conditions. There is also considerable past data for the Manganui River catchment for comparison with new results.

During the discussed period, biological surveys were performed on one occasion in the Manganui River to determine whether or not residual flows below the Tariki weir were sufficient to maintain healthy water quality and macroinvertebrate communities in the river. Four sites were sampled and their locations are shown in Figure 4.

1.4.7 Fish monitoring

The Council has been monitoring fish species distribution in the Manganui River catchment since 1990. Electric fishing techniques and spotlighting at night have been used for this purpose.

Although two surveys were programmed for the 2014-15 period, one in the Manganui River, the other in the Mangaotea Stream, no surveys were completed.

The elver trap and transfer system continued to operate over the reported period. Inspections of the system were conducted during the transfer season and results of the transfers are reviewed in the current report (consents 3372, 3373).

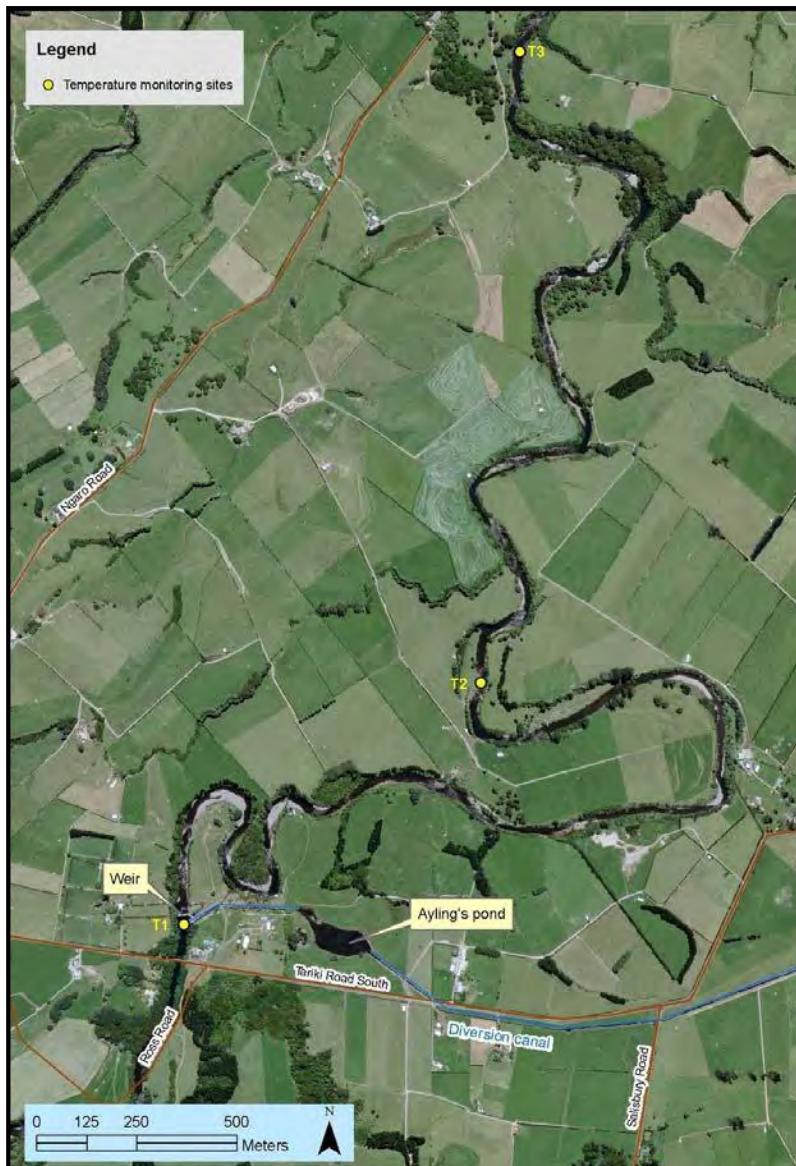


Figure 2 Continuous water temperature monitoring sites in the Manganui River in relation to the Motukawa HEP scheme



Figure 3 Location of water abstraction, discharge and water level monitoring sites for the Motukawa HEP scheme (limits in brackets)



Figure 4 Macroinvertebrate monitoring sites in the Manganui River in relation to the Motukawa HEP scheme

2. Results

2.1 Water

2.1.1 Inspections

Each inspection undertaken of the Motukawa HEP Scheme essentially followed the same format, including checking water levels, fish passage and making notes of general observations. As a result, the vast majority of inspection comments are very similar and as such, there is little value in repeating them in detail here. However, a full inspection record is available on request. Some notable observations made during the reported period are included below.

The first two compliance monitoring inspections, completed on 15 August and 3 November 2014 found the Manganui River in high flow, with water spilling over the weir on each occasion. During these inspections water was being abstracted from the Mangaotea Stream (Photo 2, Photo 3), and a visual assessment of the residual flow in the Mangaotea Stream found it to be adequate.

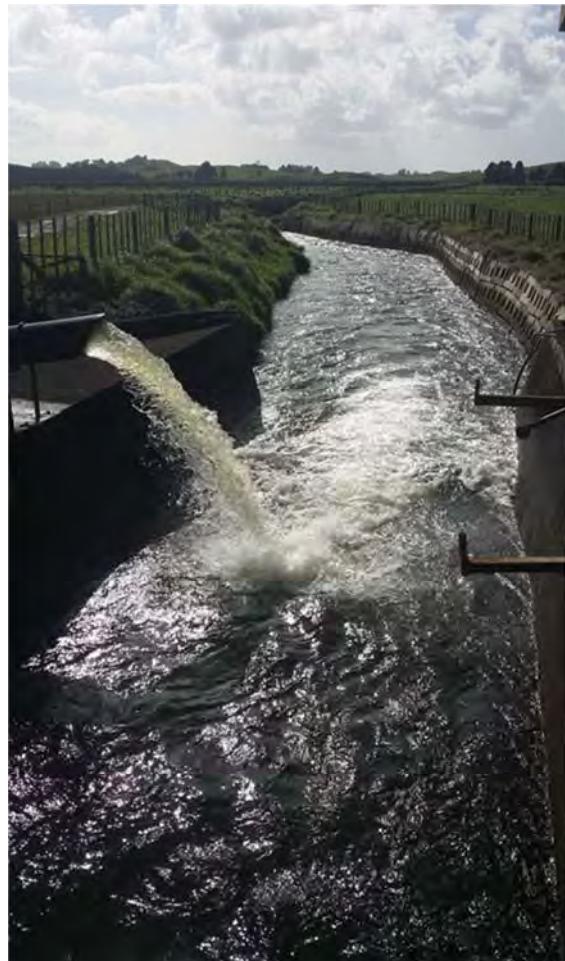


Photo 2 The abstraction from the Mangaotea Stream entering the race (right)

Photo 3 The Mangaotea Stream intake with the screen cleaner operating (below)



The third compliance monitoring inspection was performed on 5 January 2015 during fine weather. The Manganui River had a clear, moderate flow, with multiple trout observed in the intake race and headpond. The elver trap at the station was operating and contained some elvers and the elver pass at the Mako Dam was flowing. However, it was noted that due to a high lake level there was a small amount of flow leaking from the spillway which provided much more attractant flow, and would likely result in most elver swimming past the elver pass entrance. There were a number of pleasure boats operating on Lake Ratapiko.

During the inspection done on 27 March 2015, there was no water being taken from the Mangaotea Stream, but due to a very high lake level water was backed up to this point in the race. This high lake level was as a result of maintenance at the station, preventing generation. Also at this time, maintenance was being undertaken on Aylings Pond, with the settling pond being dredged (Photo 4). These works resulted in discolouration of the flow in the race, with this discolouration extending past Mangaotea Road. As this is a water race, it is not subject to the same rules as a natural stream, but the consent holder was advised that if this pond was to be dredged on a regular basis, it would likely require resource consent, considering the potential for downstream discolouration.

The penultimate compliance monitoring inspection, completed on 4 May 2015, found that maintenance at Aylings pond was ongoing, but not causing any discolouration of the flow. It was noted during this inspection that the staff gauge at the aqueduct had broken off and needed to be repaired. There was a small rate of abstraction at the Mangaotea Pumps, and it was observed that leaves that were in suspension were floating over the screen without becoming impinged, which is a good sign for fish trying to swim over the screen. The in-race generator was not operating, with water going through the bypass. Lake Ratapiko was lower than normal, and as a result the Mako Dam elver pass did not have any flow. The consent holder was advised that this was acceptable while the lake level was down, but that flow would need to be restored as soon as the lake level has been restored.



Photo 4 Dredging activities at Aylings Pond.

The final inspection of the monitoring period was undertaken on 22 June 2015, following an extreme weather event that caused flooding damage throughout Taranaki, including around the Motukawa HEP scheme. During this inspection it was noted that the water race had overflowed around the Mangaotea Aqueduct, and also that Mangaotea Stream had broken its banks upstream and downstream of the Mangaotea Aqueduct. At Lake Ratapiko, there was evidence that the caravans at the campground had been flooded, and that the water had flowed over the emergency spillway. This flood incident is discussed in greater detail in section 2.4.

2.1.2 Hydrological inspections

Special condition 1 of consent 3368-1 sets the residual flow that the operator needs to comply with in the Manganui River. The consent holder needed to comply with the following:

“That the abstraction shall be managed to ensure that a residual flow of not less than 400 L/s is maintained at all times in the Manganui River below the weir”.

The consent holder provides this residual flow by passing flow through the new fish pass, located on the true right bank of the weir, and supplementing the flow through the old fish pass, located on the true left of the weir. When this residual flow is assessed for compliance purposes, a gauging is undertaken at each fish pass, with the total flow compared against the required amount of 400 L/s.

Table 1 shows that three hydrological inspections were undertaken in relation to the Manganui River residual flow. These inspections found that the residual flow was being provided as required during each inspection. At no stage was the gauged flow less than 400 L/s, with the average gauged residual flow being just over 474 L/s.

Table 1 Gauging results for gaugings undertaken in relation to the Manganui River residual flow

Date	New fish pass flow (L/s)	Old fish pass flow (L/s)	Total residual flow (L/s)	Compliant?
27/11/14	464	131	595	Yes
22/04/15	307	142	449	Yes
30-06-15	-	-	>400L/s	Yes*

* On this occasion the weir was spilling, with a visual assessment finding sufficient residual flow

Special condition 4 and 5 of consent 6381-1 set out the residual flow requirements of the Mangaotea Pumps intake, in the Mangaotea Stream. These conditions state the following:

4. For the first two years following the exercise of this consent the abstraction authorised by this consent shall cease when the flow in the Mangaotea Stream immediately downstream of the confluence with the Little Mangaotea Stream located at Q19: 227-201 (GPS E2622779 N6220149) is equal to or less than 94 L/s. If at this site flows are greater than 94 L/s, the abstraction shall cease when the flow in the Mangaotea Stream immediately downstream of the abstraction point (GPS E2622836 N6220071) is equal to or less than 35 L/s.
5. Two years after the exercise of this consent, and following assessment of monitoring conducted as per special conditions 8, if a review of the residual flows

detailed in special condition 4 is required (as per condition 9), residual flows shall be based on 55% of the median flow immediately downstream of the confluence with the Little Mangaotea Stream, and at the point of abstraction shall be 35 L/s or mean annual low flow whichever is higher.

This assessment of monitoring was completed in 2012 and it was concluded that no review was warranted, and therefore the residual flows in the Mangaotea Stream are as follows:

- 35 L/s immediately downstream of the abstraction point; and
- 94 L/s immediately downstream of the confluence with the Little Mangaotea Stream.

Three inspections were undertaken while the pumps were operating, and on each occasion, all gaugings indicated compliance with the residual flow requirements (Table 2).

Table 2 Gauging results for gaugings undertaken in relation to the Mangaotea Stream residual flow

Abstraction Occurring?	Flow downstream of intake	Flow downstream of confluence	Compliant?
Yes	1,121	2,031	Yes
Yes	1,291	2,311	Yes
Yes	1,241	2,071	Yes

2.1.3 Results of abstraction and discharge monitoring

Trustpower holds several consents which, through various special conditions, require them to record abstraction rates, discharge rates and water levels, and provide these records to the Council on a three-monthly basis. The details of these consent requirements are shown in Table 3. Locations of the water level monitoring stations are shown in Figure 3. Once these records are submitted, they are audited so as to assess compliance with the relevant consent conditions.

There are two aspects of compliance at play here, being the actual recording of data, and also staying within particular limits set by consents. These will be dealt with separately.

Previous reports for this scheme have reported the number of occasions where data was either lost or not recorded. Only notable periods were included, being greater than 24 hours for one site, or greater than 12 hours for two or more sites. In the 2014-2015 monitoring period, there were five separate occasions when notable loss of data occurred, and the race level recorder had numerous gaps in the data record in March. For each of these occasions, Trustpower were proactive in attempting to find a cause and resolve it as quickly as possible. This was evident in March 2015, when during an inspection of the site Trustpower staff were observed attempting to resolve telecommunication issues with the race level recorder.

Table 3 Details of consents and special conditions in relation to abstraction rates, discharge rates and water levels, and the recording thereof

	Special Condition	Detail	Limit/Requirement
3369 – Abstraction from Manganui River	3	Measuring rate of abstraction	Measuring abstraction rate from the Manganui River (not to exceed 5,200 L/s ± 5% (logger error))
	5	Flushing flows if weir has not overtopped for 30 days	Release 400 L/s for 3 hours daily
	4	If Waitara River drops below 5,000 L/s	Cease abstraction or pass water continuously through power station
	7	Residual flow in race	Retain a flow of at least 150 L/s, or a fish salvage is to be undertaken
3371 - Diversion of water into race and Lake Ratapiko	2	Maximum race water levels	Race water level: Coxhead's bridge: 205.20 m a.s.l Mangaotea Rd culvert: 199.30 m a.s.l Mangaotea Aqueduct: 199.25 m a.s.l Berryman's bridge: 199.15 m a.s.l
	5	Recording of water levels and rainfall	Water levels at the above sites to be recorded, with the inclusion of rainfall at the Mangaotea Aqueduct
3372 – Discharge to Makara Stream	2	Recording of discharge rate	Record the rate of water discharged to the Makara Stream (not to exceed 7,787 L/s)
3373 – To dam the Mako Stream	5	Minimum lake level	Minimum level: 194 m a.s.l (except during maintenance)
	6	Maximum lake level	Maximum level: 198.7 m a.s.l
	8	Recording data	Record the lake level at the spillway
	3	Abstraction rate	Abstraction rate not to exceed 450 L/s
6381 - Take water from Mangaotea Stream	4	Residual flows	94 L/s downstream of Little Mangaotea confluence If this is exceeded, then 35 L/s at point of take
	6	If a flushing flow (three-times median flow) has not occurred for 20 days	Cease abstraction for 8 hours
	7	Recording of flows	Abstraction rate, residual flow at point of take and flow downstream of Little Mangaotea Confluence all to be recorded.

The only recorder which experienced a significant delay in repair was the Berryman's recorder. Water level in the race was not recorded at this location for the first five and a half months of the reporting period. This delay occurred in consultation with the Council, who are satisfied that over this time race levels at this location were maintained below the maximum level. This is illustrated by Figure 5, which shows that the water levels upstream (Mangaotea Aqueduct) and downstream (Lake Ratapiko) did not exceed their respective maximums over this time.

None of the five occasions of lost data were deemed to be incidents of non-compliance. Due to the efforts made by the Company over the last nine years, they are now aware sooner when problems with data recording occur, and are able to respond quicker. Over the last eight years, the Company has made significant efforts to improve this scheme's equipment and systems used for measuring and recording the required data.

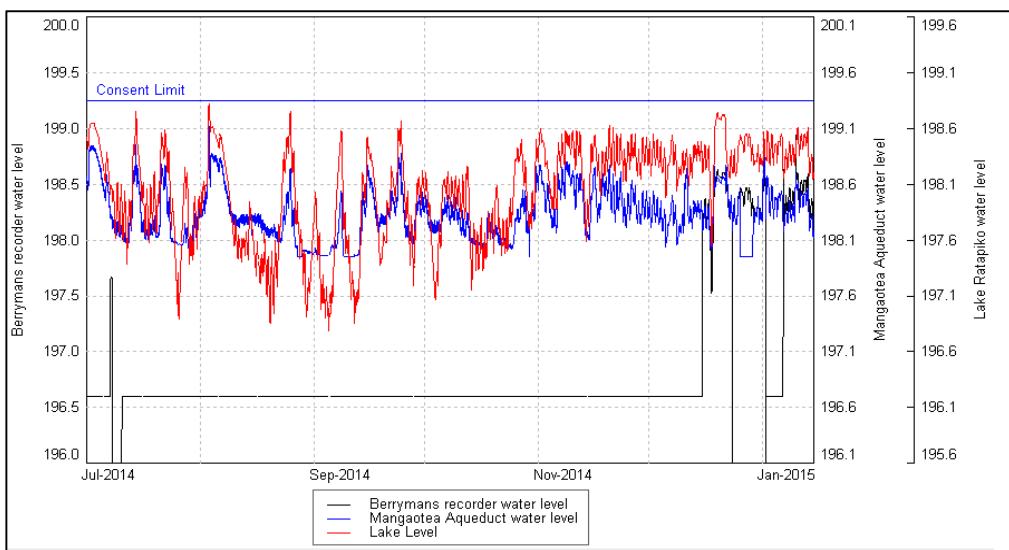


Figure 5 Data recorded by the Berryman's recorder presented with water levels at Mangaotea Aqueduct and in Lake Ratapiko from 1 July 2014 to 15 January 2015.

This improvement in management is also evident in the management of flows and levels within consent limits. Table 4 provides a summary of the number of recorded instances where flows were outside of their respective limits set by special conditions of the relevant resource consent(s). Only those incidents of one hour or longer are included, as such incidents of a shorter timeframe are unlikely to cause any notable effects. It should also be noted that Table 4 does not include any instance where flows or levels were outside of but within 5% of a limit. This is because the data recorded is allowed a 5% margin of error, to provide for the error associated with the recording equipment. However, this is not to say that all such incidents will be treated as such. Should flows frequently exceed the limits, but stay within the 5% margin of error, Trustpower may still need to determine the cause and undertake remedial action.

In the 2014-2015 period there was only one occasion where such limits were breached, and this occasion was related to the severe weather event that occurred around 20 June 2015. During this event the maximum race level was exceeded at three locations and the maximum lake level was exceeded. This was not dealt with as a non-compliance incident, as it was principally due to the severe weather event. However, due to the degree of exceedance and associated flooding, Council undertook an investigation into this event to ensure Trustpower did everything possible to comply with their consents and to minimise flooding. This investigation is discussed in section 2.4.

The data provided by Trustpower shows that with regards to the residual flow in the Manganui River, that there were no instances where flow dropped below the limit by more than 5%, for over one hour. This is an improvement from the 2013-2014 period, when an infringement notice was issued. In addition, on no occasion did the race water level drop below the low flow limit of 150 L/s.

During the reported period, the abstraction rate from the Mangaotea pumps remained within the maximum allowable rate of take and the records indicate compliance with the Mangaotea Stream residual flows. Although there were times when the flow in the Mangaotea Stream dropped below the residual flow, no abstraction occurred at this time (Figure 6).

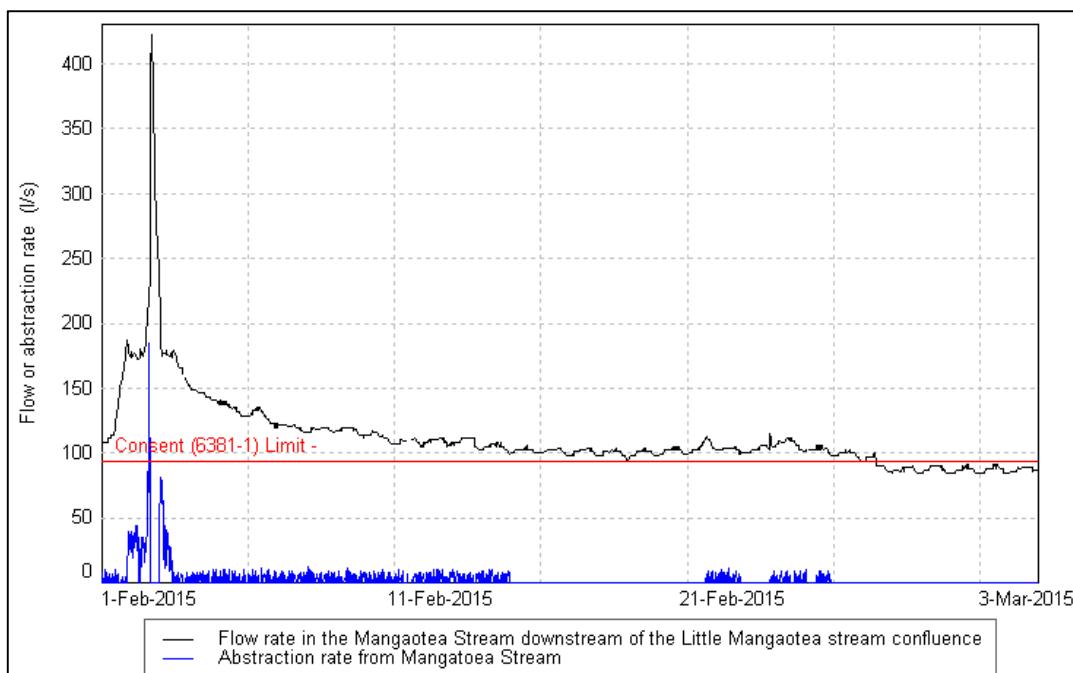


Figure 6 Flow rate in the Mangaotea Stream downstream of the Little Mangaotea Stream confluence and the rate of water abstracted from the Mangaotea Stream between 1 February and 5 March 2015.

Records of the discharge to the Makara Stream show that there were no occasions during the 2014-2015 monitoring period where the discharge rate exceeded the consent limit. Past compliance has been high with only one exceedance recorded since the beginning of the 2002-2003 monitoring year (May 2002).

The lower lake water level has not been breached since records began, on 1 July 2002. The fact that so few limits were breached, including those related to the Mangaotea Stream abstraction, indicates that the strong improvement noted in the last monitoring report has continued into the 2014-2015 period.

There are certain operational requirements also set by consents, which require flushing flows of 400 L/s to be released down the residual flow reach once the Tariki Weir has not naturally overtopped for 30 days, and that once flows in the Waitara River at the Bertrand Road bridge drop below 5,000 L/s that either the abstracted water is passed continuously through the lake, or that abstraction cease (with regard to the 150 L/s residual flow in the race).

At no stage in the reporting period were Trustpower required to pass all abstracted water continuously through the lake, or to cease abstraction, due to the flow in the Waitara River dropping below 5,000 L/s. In March 2015 flows in the Waitara River dropped to below 5,000 L/s, on Saturday 6 March between 4 and 10 am. In this case Trustpower were not required to alter their activities, as flows recovered before any notification to Trustpower could be made. The consent indicates that Council needed to inform Trustpower of the low flow, and only then are they required to comply with the special condition. Therefore no consent non-compliance occurred in relation to this low flow event in the Waitara River.

Table 4 Incidents where recorded flows/water levels did not meet consent requirements. Includes only those incidents of one hour or longer that exceeded the 5% margin of error. Table includes the extent of non-compliance, and total duration in brackets.

The data has also been assessed to determine when the Tariki Weir was not naturally overtopped for a period of 30 days in this time, requiring the release of flushing flows. This assessment identified no periods when flushing flows were required, as the weir overtapped frequently. Even during the driest period, the longest time the weir went without overtapping was 28 days, from 6 February to 6 March 2015.

The abstraction from the Mangaotea Stream is also required to provide flushing flows, although the criteria that defines when is different to that for the Manganui River. Condition 6 of consent 6381-1 states that:

“if a flushing flow (defined as three times the median flow) has not occurred within a continuous period of 20 days, the consent holder shall cease abstraction for 8 hours during the next naturally occurring flushing flow, so as to enhance water quality downstream of the abstraction point.”

The hydrological analysis undertaken in relation to condition 8 of this consent (discussed in the 2010-14 report), determined that a flushing flow as per this definition was 366 L/s. In analysing the data, there were five occasions where these flushing flows were required, and on each occasion they were provided. One of these occasions is illustrated in Figure 7. This shows that Trustpower successfully altered the control system following liaison with Council, as the previous monitoring report found that the condition had not been interpreted quite as intended.

Figure 8 shows how the fish pass flow responds to floods. Flows are reduced to protect the fish pass from damage, and remains so for most of the duration of the flood.

Previously the pass has been completely closed, which created some issues, where elevated flows can remain for a number of days, as it meant the fish pass would stay closed for that time. More recently, the pass has been kept slightly open during floods, to continue providing attractant flow and potentially passage.

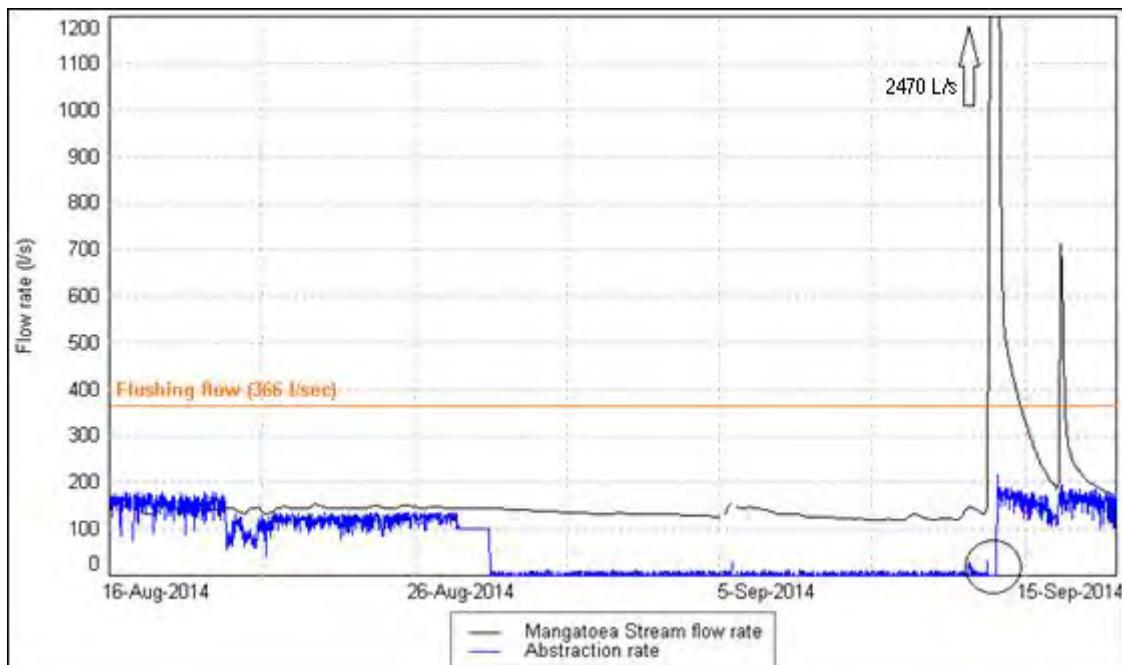


Figure 7 Flow rate in the Mangaotea Stream immediately downstream of the intake, and the abstraction rate from the Mangaotea Stream between 16 August and 17 September 2015. The circle marks the required 8 hour break in abstraction to allow for the flushing flow.

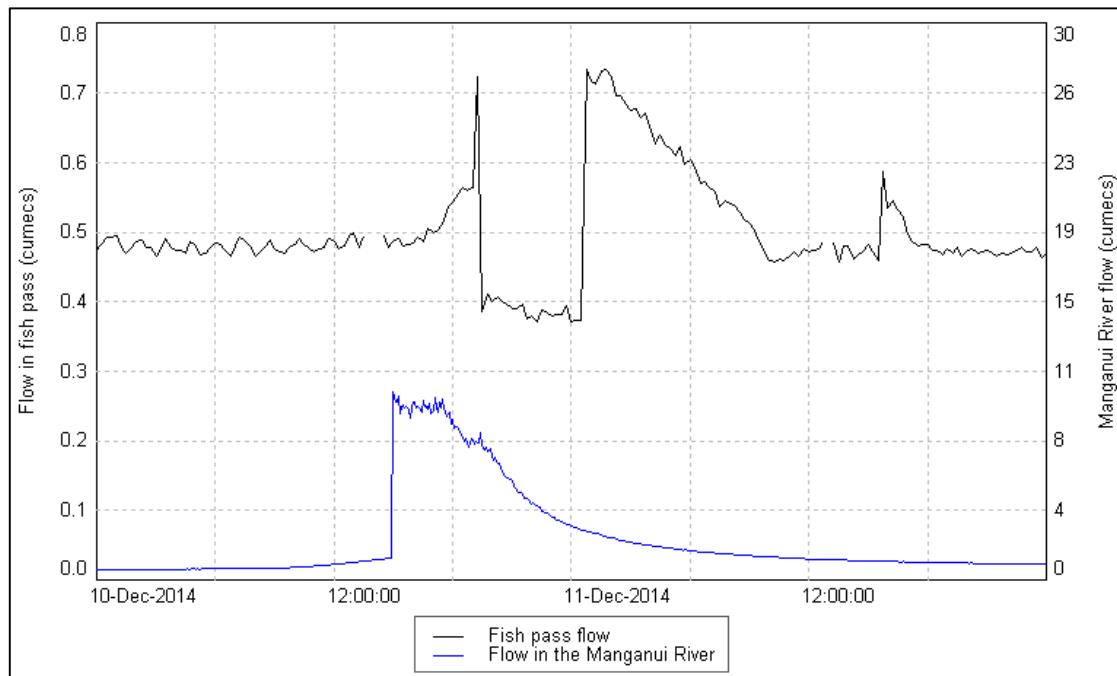


Figure 8 Combined fish pass flows and flow records for the Manganui River at SH3 for 10 -11 December 2014.

2.1.3.1 Other submitted data

Special condition 4 of consent 3371-2, which relates to the diversion of water into the race, requires that a five-yearly monitoring survey of the race be completed by the consent holder to identify any maintenance requirements in order to maintain a race capacity of 8,000 L/s, for the purpose of avoiding flooding adjacent farmland. It also requires that any required maintenance shall occur within 12 months of the completion of the survey. This survey was last completed on 28 October 2011, with the next survey expected to be undertaken prior to 2017.

2.1.4 Results of receiving environment monitoring

2.1.4.1 Water temperature monitoring

Data loggers were used for continuous monitoring of river water temperatures at two sites (Figure 2). One logger was located immediately upstream of the weir at Tariki Road while the second logger was located 2.3 km downstream of the weir. These data have been collated and a monthly statistical summary presented in Table 5 together with data from the ten years (1992-2002) prior to the residual flow increase to 400 L/s, and the thirteen years (July 2002 to June 2015) since the residual flow increase.

During the 2014-2015 period, the highest monthly mean water temperature upstream of the weir was recorded in January, and this was also the case for the downstream site (Table 5). The lowest monthly means was recorded in November for the upstream site and in April for the downstream site. When comparing the sites, the downstream site had a higher mean monthly water temperature in all months monitored, when compared with that recorded upstream (0.4 to 1.3 °C higher).

Table 5 Summary of summer Manganui River daily water temperatures (°C) prior to the increase in residual flow to 400 L/s (1992-2002) and for the years since, upstream and downstream of the Motukawa HEP weir

Period	Month	Month											
		November		December		January		February		March		April	
		Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
Upstream (T1)	1992-2002 (pre 400 L/s)	7.9-20.2	13.9	10.4-22.8	16.2	11.1-24.6	17.1	11.3-23.7*	17.7*	9.4-21.7	16.2	8.3-17.0	12.9
	2002-2014 (post 400 L/s)	8.4-23.5	14.7	9.7-23.1	16.3	10.7-25.4	17.7	11.3-25.6	18.1	9.6-22.3	15.8	6.7-17.8	12.9
	Reported period 2014-2015	9.2-19.2	13.3	11.3-21.3	16.9	13.8-23.7	19.6	14.0-21.4	18.0	11.3-21.4	16.2	9.6-16.8	13.6
2.3 Km Downstream (T2)	1992-2002 (pre 400 L/s)	8.4-22.7	15.2	11.0-24.6	17.6	12.0-28.3	19.2	12.0-25.8*	19.0*	11.0-22.4	17.5	9.3-20.4	13.9
	2002-2014 (post 400 L/s)	8.6-25.8	15.9	10.6-25.4	17.5	10.5-28.2	19.0	12.6-27.8	19.2	10.3-24.1	16.6	7.8-19.0	13.5
	Reported period 2014-2015	9.5-21.6	14.5	12.3-24.5	18.1	14.1-25.8	20.9	15.4-23.1	19.1	12.3-22.8	16.7	9.8-17.2	14.0

* These periods are missing data, preventing a complete assessment for these periods.

Maximum temperatures both upstream and downstream of the abstraction occurred in January 2015. The maximum upstream temperature for the reporting period was 23.7 °C, within the range for this site. This temperature was recorded on 29 January 2015, and was 1.9 °C cooler than the maximum recorded on 7 February 2005. On the same day, site T2 recorded a maximum temperature of 25.8 °C, which was also the highest temperature recorded at this sites for the reported period. Of note, is that for the reported period, the upstream site recorded annual maximum temperatures less than the high temperatures recorded in 2008 and 2009, and similar to that recorded in the last two years (Figure 9).

However, they were higher than 23 °C, which has been the trend over the last ten years. Whether this is a reflection of climate change, or a change in upstream land use is unclear, although it does indicate that water temperature monitoring is a worthwhile component of the monitoring.

Temperatures over 25 °C can significantly adversely affect trout and other freshwater fish communities, as well as being outside the tolerance range of some sensitive macroinvertebrate taxa. Prior to the 2005-2006 monitoring period, 25 °C had only ever been exceeded in the residual flow reach (Figure 9). However, in February 2005 and January 2008, the maximum daily temperature at the upstream site exceeded 25 °C, on a total of three days. Because conditions were generally cooler during the currently reported period, the upstream site never exceeded 25 °C (Table 6), and the first downstream site (site T2) only exceeded 25 °C on seven days in the reported period, all during January 2015 (Figure 10).

The 2014-2015 period experienced a slightly cooler November and warmer January than normal, with both months recording a mean temperature more than one degree different to the respective monthly means recorded between 2002 and 2014 (Table 5). However no months recorded any new maximum or minimum temperatures,

indicating that the 2014-2015 period was relatively normal, with no extreme water temperatures recorded.

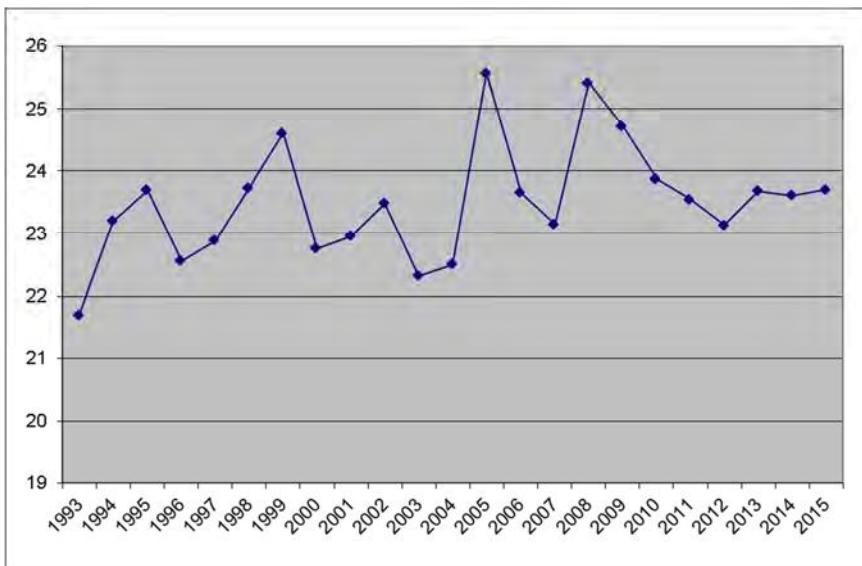


Figure 9 Annual maximum water temperatures recorded upstream of the abstraction (Site T1)

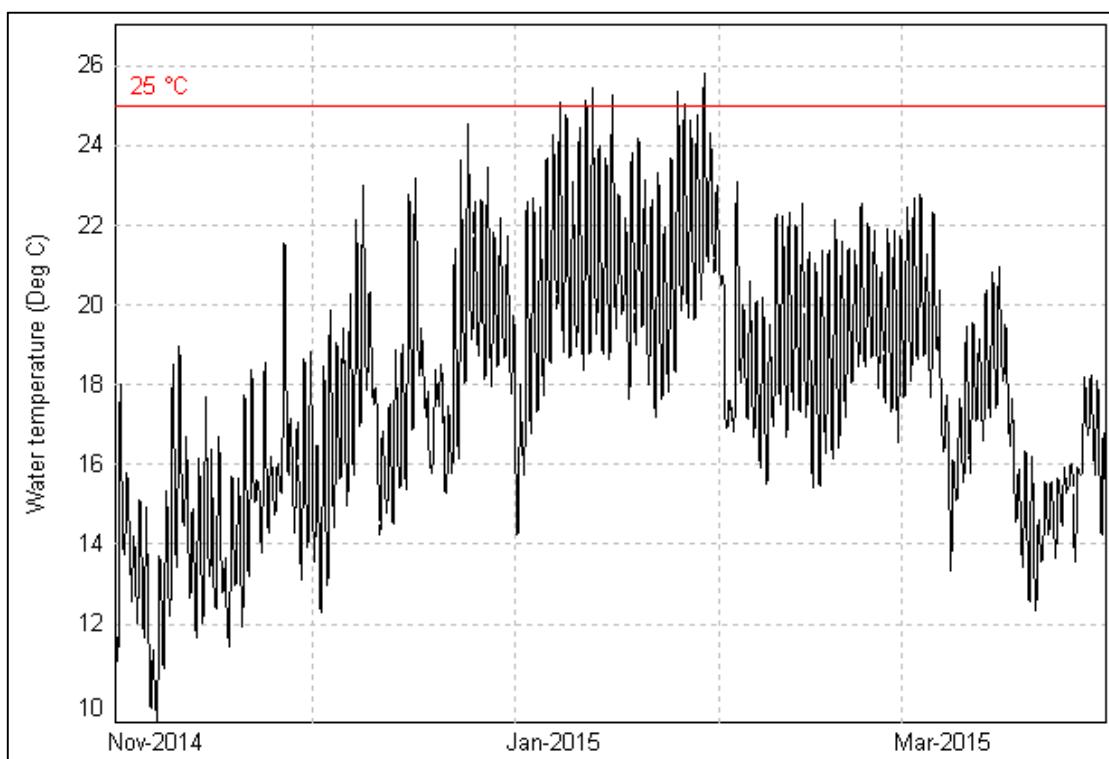


Figure 10 Water temperatures in the Manganui River, 2.3 km downstream of the Tariki Weir.
1 November 2014–1 April 2015

The most extreme time period for water temperatures in the residual flow reach during the reported period came during January. The average daily water temperature in January was 20.9 °C at site T2, 1.9 degrees higher than the long term average (Table 5). Seven days recorded a maximum water temperature in excess of 25°C, while this temperature was not exceeded upstream of the weir. This occurred over two periods,

from 7 to 15 January and 25 to 29 January (Figure 10). Temperature extremes of this nature have the potential to cause fish kills, although none were reported to Council during this period. Although this period was not as warm as the worst period, reported in the 2006-2008 period (TRC, 2009), it is still an indication that water temperatures have the potential to rise to lethal levels in the residual flow reach. Table 6 presents a summary of maximum daily water temperatures for the reported period from January to March, generally the most important time period for warm water temperatures. This table shows that the majority of days over this time recorded a maximum temperature in excess of 20 °C at both site T1 and T2, although site T2 had a much higher number of days that experienced a maximum daily temperature in excess of 20 °C (17 days).

When water temperatures above 20 °C occur for long periods of time, conditions can become stressful for fish, therefore the duration of time that water temperatures exceed this temperature is also important. In the 2014-2015 reporting period, the percentage of time water temperatures exceeded 20 °C downstream of the weir (site T2) was almost double that recorded in the natural flow regime upstream of the weir (Table 7). This is a similar result to that recorded since the 400 L/s residual flow was implemented, but in the case of the 2014-2015 period, the percentage of time for both sites was higher by 4-5%. Comparing the percentage exceedance times for all data pre 400 L/s residual flow, with all data post 400 L/s residual flow, indicates that temperatures greater than 20 °C have still occurred more downstream, but are marginally less frequent than occurred prior to the 400 L/s being released down the river (16% of time following the residual flow compared to 18% of the time prior). This compares well with the upstream temperatures, which have actually seen an increase in the percentage exceedance of 20 °C, from 6% prior to, to 7% following the residual flow increase.

The key purpose of the water temperature monitoring is to assess whether the 400 L/s residual flow has reduced the mean and peak temperatures, and differences in water temperature, between the natural flow and residual flow reaches. Table 7 compares all data prior to the residual flow of 400 L/s (10 years of data) with all data following the residual flow implementation (12 years of data). Upstream of the weir under natural flows, pre and post residual flow water temperature data are comparable; although it appears that there may be a very subtle warming trend. Because of this slight warming trend it can be difficult to compare the raw temperature data, with that from prior the 400 litre/sec residual flow.

Table 6 Summary of maximum daily water temperatures in the Manganui River, upstream and downstream of the weir, between 1 January and 31 March, inclusive

		No. days monitored	% of maximum temperatures in this range (no. of days)			
			10-15 °C	15-20 °C	20-25 °C	25+ °C
Upstream	1992- 2002 (pre 400 L/s residual flow)	855	5.3	63.4	31.3	0.0
	2002-2014 (post 400 L/s residual flow)	1,077	4.0	64.3	31.4	0.3
	2014-2015	90	4.4 (4)	43.3 (39)	52.2 (47)	0.0 (0)
Downstream	1992- 2002 (pre 400 L/s residual flow)	895	1.8	43.1	52.1	3.0
	2002-2014 (post 400 L/s residual flow)	1,081	1.9	43.3	50.0	4.7
	2014-2015	90	1.1 (1)	27.8 (25)	63.3 (57)	7.8 (7)

Table 7 Exceedance time (%) for Manganui River water temperatures recorded in the period prior to (1992-2002) and post residual flow increase (2002-2014) for comparison at both sites (1 November – 30 April)

Site	Period	Temperature (°C)											
		4	6	8	10	12	14	16	18	20	22	24	26
Upstream	1992-2002	100	100	99	99	93	73	47	21	6	<1	<1	0
	2002-2014	100	100	99	99	93	75	48	23	7	1	<1	0
	2014-2015	100	100	100	99	93	74	51	30	11	<1	0	0
2.3Km Downstream	1992-2002	100	100	100	99	97	84	64	40	18	5	<1	<1
	2002-2014	100	100	99	99	95	83	60	36	16	5	1	<1
	2014-2015	100	100	100	99	96	83	60	41	21	7	1	0

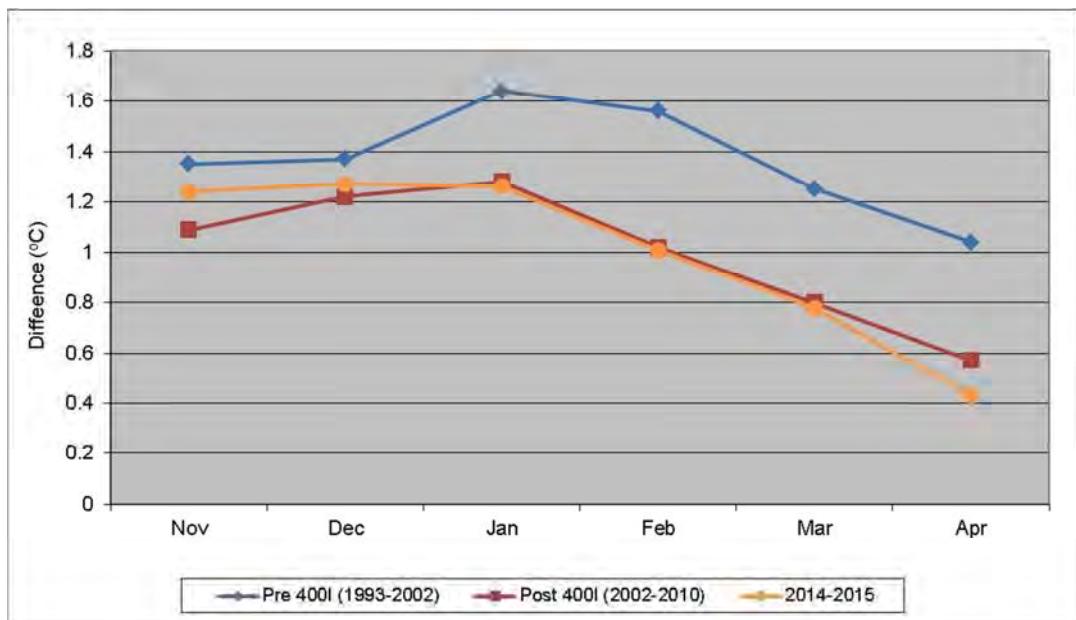


Figure 11 The average difference in mean monthly water temperatures between upstream and downstream, pre and post 400 litre per second residual flow implementation, and during the reported period

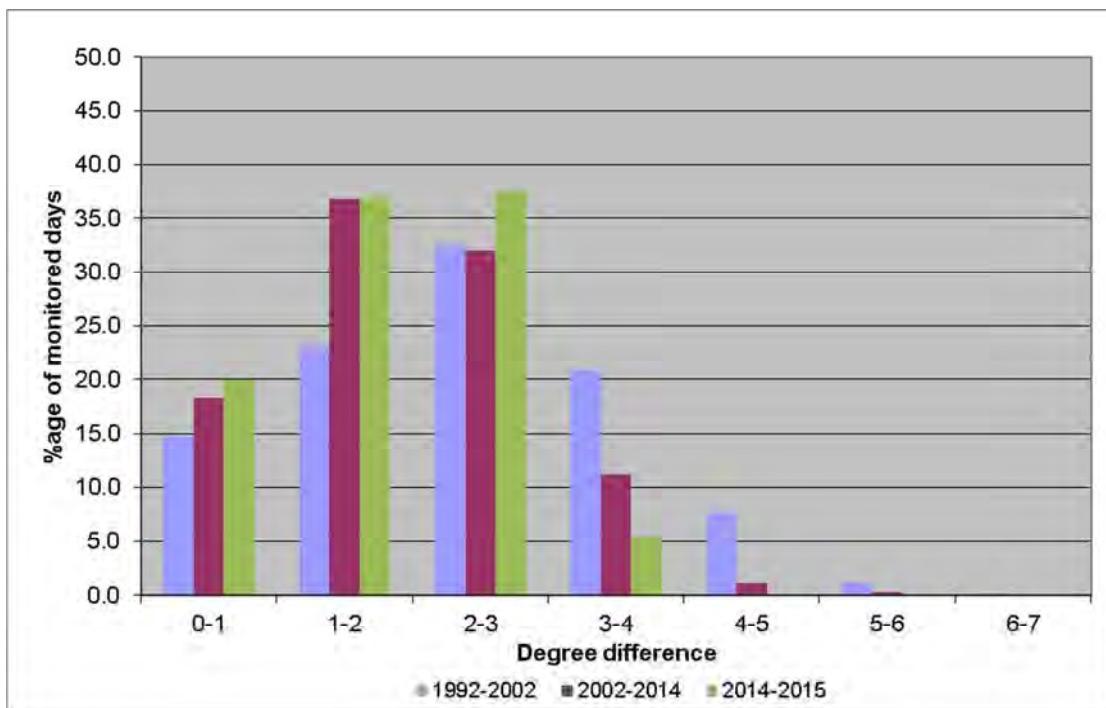


Figure 12 The distribution of maximum daily temperature differences (downstream minus upstream), displayed as a percentage of total days monitored. Data has been split into pre-400L/s residual flow (1992-2002) and post 400 L/s residual flow (2002-2014)

A comparison of temperature differences can prove more useful. The temperature differences between the natural and residual flow reaches have changed markedly, since the 400 L/s has been implemented (Figure 11, Figure 12). Figure 11 presents the average difference in mean monthly temperatures between site T1 (upstream) and site T2 (downstream), separated into pre 400 L/s and post 400 L/s. It is clear from this data that the increased residual flow has led to a reduced average monthly temperature difference, with this effect being particularly noticeable during the months most critical for temperature (January to March). Figure 11 also shows that the temperature difference is greatest from November to January, which is most likely related to the upstream reach only beginning to warm in the latter half of the summer. Included in Figure 11 is data for the reported period. This shows that the average daily difference in November for the reported period was higher than typical, despite this month being slightly wetter than normal¹. With the exception of April, the remaining months had average daily differences similar to that previously recorded since the residual flow was increased to 400 L/s. The April differences were smaller than normal, reflecting the fact that this month was very wet².

Prior to the 400 L/s, the most frequent maximum temperature difference was between two and three degrees, with almost 30% of the days experiencing a maximum difference of more than three degrees. In the twelve years following the increased residual flow, the most frequent maximum daily temperature difference has reduced to 1-2 °C, with the number of days experiencing a maximum daily difference of more than 3 °C dropping to 12.8%, less than half that recorded prior to the 400 L/s. When data

¹ Taranaki Regional Council Monthly Rainfall and River Report for November 2014. Doc#1440147.

² Taranaki Regional Council Monthly Rainfall and River Report for April 2015. Doc#1504392.

from the reported period is compared with this historical summary (Figure 12), it can be seen that temperature differences reduced further. The proportion of time that maximum daily temperature differences were between 0-1 °C increased from 18.3% in the 2002-2010 period to 20.0% over the reported period. In addition, the proportion of time that the maximum daily temperature difference exceeded 3 °C dropped to 5.5%.

Instantaneous differences in river water temperatures between the two temperature monitoring sites are illustrated together with the flow record for the Manganui River at Everett Park in Figure 13, for a flood event that occurred in early 2015. As in previous years, this figure illustrates that the greatest differences in water temperature occur between the two sites during recession flows. During freshes, the differences in water temperature between the two sites are close to zero.

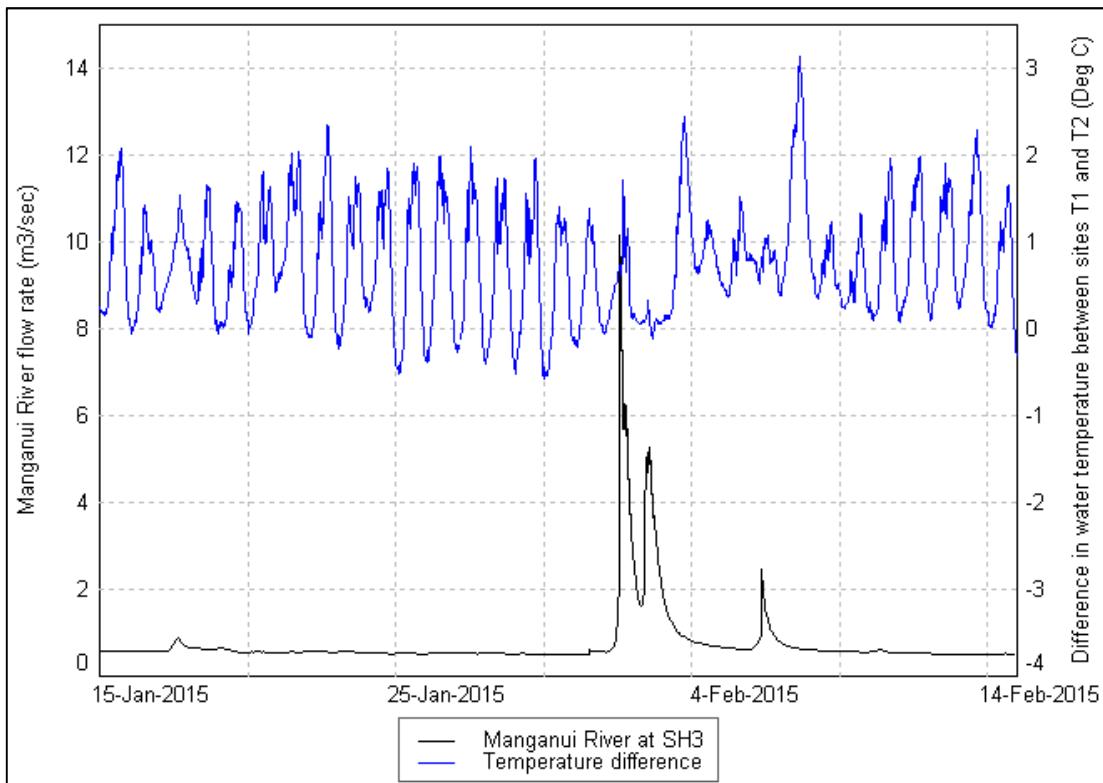


Figure 13 Manganui River water temperature differences between sites upstream and downstream of the Motukawa HEP weir compared with the flow in the Manganui River at State Highway 3 from 15 January to 15 February 2015.

Schedule 3 of the RMA (1991) sets standards for water temperatures, for a range of waterways with specific values. It is acknowledged that the residual flow downstream of the weir is designed to primarily provide passage for trout, with some native fish habitat also provided. However, it follows that in order to provide passage, some aspects of habitat also need to be provided, such as a hospitable water temperature. Clauses 1 and 2 of schedule three, which respectively relate to water being managed for ecosystem and fishery purposes, state that the natural temperature should not be changed by more than 3 °C, while clause 2 also states that the natural temperature of the water should not exceed 25 °C. It is clear from the results given above, that the increased residual flow has significantly improved water temperatures, with regard to the number of days that have a maximum temperature difference greater than 3 °C. However, there is still a large increase in the number of days where water temperatures

downstream of the weir exceed 25 °C (Table 6). It should be noted that it is rare to record little to no temperature increase in a downstream direction, as there will usually be warming attributable to the natural increase in water temperature with a drop in altitude.

2.1.4.2 Biological monitoring

When the consents for the Motukawa HEP scheme were renewed in 2001, part of the basis for determining the residual flow was to ensure the management objective for the reach to maintain reasonable water quality was achieved. The biological monitoring for this scheme is conducted to help assess whether this is being attained.

Biological monitoring was conducted in relation to the Motukawa HEP scheme on one occasion during the monitoring period under review, to determine if the residual flow below the weir has had any adverse effects on the water quality and macroinvertebrate habitat. The Council's standard 'kick-sampling' technique was used at four established sites (Figure 4) to collect streambed macroinvertebrates from the Manganui River. Samples were processed to provide number of taxa (richness), MCI and SQMCIs scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The SQMCIs takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities. It may be the more appropriate index if non-organic impacts are occurring. Significant differences in either the MCI or the SQMCIs between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

This survey was conducted on 18 February 2015, when the scheme was operating normally, with stable, low flows occurring in the twelve days prior to this survey. The river had last naturally overtopped the weir on 6 February, with a larger flood occurring on the first and second of February.

This survey recorded taxonomic richness (number of taxa) similar to the median numbers of taxa previously recorded at these sites. MCI values were relatively similar in a downstream direction, with the exception of site 5, which recorded a lower MCI score. Previous surveys generally found MCI values to steadily decrease in a downstream direction, and this was attributed to changes in habitat downstream (including increased water temperatures and algal growth), associated with the reduction in flow downstream of the weir. The fact that the current survey did not record such deterioration is a positive indication that the impacts of the diversion were not as severe as expected during this summer low flow period. This may reflect the effects of the relatively recent flushing flow, which occurred just over two weeks prior. The current survey recorded warm temperatures (around 19 °C), and patchy growths of periphyton mats and filaments at all downstream sites. The upstream sites also supported such patchy growths, but they were not as extensive. Under a residual flow regime, such prolific growths may not be flushed away by floods on a regular basis, as might happen under a more natural flow regime and they can become particularly prolific under lengthy periods of stable low flow conditions. Such proliferations were

not as apparent during the current survey, a reflection of the moderate flow conditions which occurred over summer 2015.

There were few changes in invertebrate abundance noted between the sites, with the most obvious differences being two 'moderately sensitive' taxa reducing in abundance from site 2, and one such taxon becoming abundant at sites 4, 5, and 6, after only being recorded as common at site 2. This is likely to be related to the slight increase in algal biomass observed downstream of the weir. Overall, the current survey indicated that the habitat limitation that appeared to be present in some previous surveys (especially at site 5) was no longer present. This conclusion is also supported by the moderate taxa richnesses recorded downstream of the weir.

In general, all sites were dominated by similar taxa, despite the summer low flow conditions. Only subtle changes in abundance were noted, reflecting a change in periphyton biomass, although this only had a small effect on the SQMCIs scores, which although not significantly different to each other, reduced gradually in a downstream direction. In addition, all sites contained moderate proportions of 'sensitive' taxa, and the communities downstream of the abstraction weir were more generally dominated by these 'sensitive' taxa, which was in contrast to most previous survey results, which usually found 'tolerant' taxa to be generally dominant.

The presence of a number of 'highly sensitive' taxa at all sites indicated generally good preceding physicochemical water quality although individual abundances within these taxa tended to vary across sites. *Deleatidium* mayflies, considered 'highly sensitive', were well represented at all sites. MCI scores indicated that the stream communities were of fair to good 'health', while the SQMCIs scores indicated they were in moderate but above average health, when compared to their respective medians. This is an encouraging result, as the higher temperatures usually experienced in the residual flow reach, would be expected to reduce these scores. Water temperatures were as high as 25.8 °C in the month prior to this survey.

Since the new residual flow has been operating, some improvement in communities have been observed particularly at site 5, 1.7 km downstream of the weir, where MCI values have generally been above the historical median. The habitat at this site prior to the establishment of the new residual flow was generally poor due to smothering by iron oxide deposits, which has been significantly reduced since the new residual flow has been implemented. This result was not repeated in the current survey, with the MCI score at site 5 only being equal to the median, and the SQMCIs score being only 0.6 unit higher than the median, neither being statistically significant improvements. The overall improvement in macroinvertebrate communities at this site is likely to have been a direct result of the increased residual flow, although there also appears to be a general overall improvement in the catchment, as demonstrated at site 2, upstream of the affected reach. However, elevated water temperatures and more dense periphyton cover have affected macroinvertebrate communities of the residual flow reach in more recent summer surveys.

When the results for each site are compared over time, it is clear that the control site (site 2) is more stable in both taxa number and MCI score than recorded at the three downstream sites. This reflects the 'buffering' effect of the higher flow upstream, which protects the community from extremes such as elevated temperatures. The reduced flow downstream of the weir does not provide as great a buffer and therefore there is more

variation in the macroinvertebrate communities recorded at sites in the residual flow reach.

In terms of the current survey, it is considered that the communities of the residual flow reach represent what would be typical of a low flow community. However, they were reduced from that recorded in the previous survey (especially the SQMCIs scores), and this may reflect the fact that the previous survey was undertaken during frequent but small scale flushing flows. The results indicate that the MCI scores at these sites were higher than most previous surveys, as were the SQMCIs scores, which were almost all significantly higher than their respective medians. However, a similar result was recorded at the control site indicating that there is a catchment wide improvement also. Overall, the results indicate that the invertebrate community supported by a residual flow of 400 L/s, with regards to presence/absence of taxa, and their respective abundances, is not significantly different to that supported by natural flows. The principal difference between the two flows is that there is a greater amount of invertebrate habitat available under natural flow conditions due to the increased amount of wetted riverbed width. The current results, when compared with the previous surveys results, also suggest that the small scale flushing flows required at times by consent may be reducing the degree of impacts caused by the diversion of water during summer low flow conditions.

2.1.4.3 Fish monitoring

No fish monitoring was undertaken in the 2014-2015 period. However, Trustpower continued to trap and transfer elvers at the station, and adult eels from the intake area in Lake Ratapiko.

Adult eel and elver transfers

Special conditions in consents 3372 (condition 3) and 3373 (condition 8) require the consent holder to provide for the passage of elvers (both consents) and adult eels (consent 3373). An elver pass using a trap and transfer system similar to that implemented successfully at the Patea Dam was installed at the power station (consent 3372) late in the 2001-2002 summer. Following modifications, this trap has operated successfully since the 2002-2003 elver migration period, with elvers transferred to either the Manganui River upstream of the weir or into Lake Ratapiko.

Photo 5 shows the elver trap. Elvers enter a pipe carrying the attractant flow, which leads to the trap. These elvers are then transferred to an area above the Manganui River head works.

The consent holder provided records in terms of weight of elvers and



Photo 5 Elver trap at the base of the tail race at the power station

dates of transferral. These are presented for the 2014-2015 elver migration season (December to February) in Figure 14 and along with previous years' data in Table 8. Normally, elvers begin to appear at the tail race at the start of December and this was the case during the reported period (Figure 14).

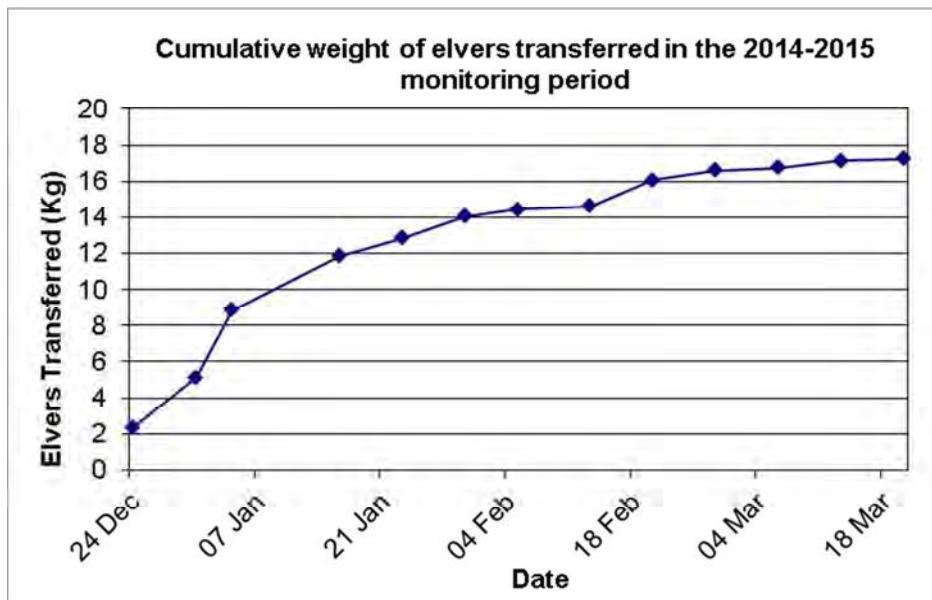


Figure 14 Cumulative weight of elvers transferred from the Motukawa Power Station during the 2014-2015 period

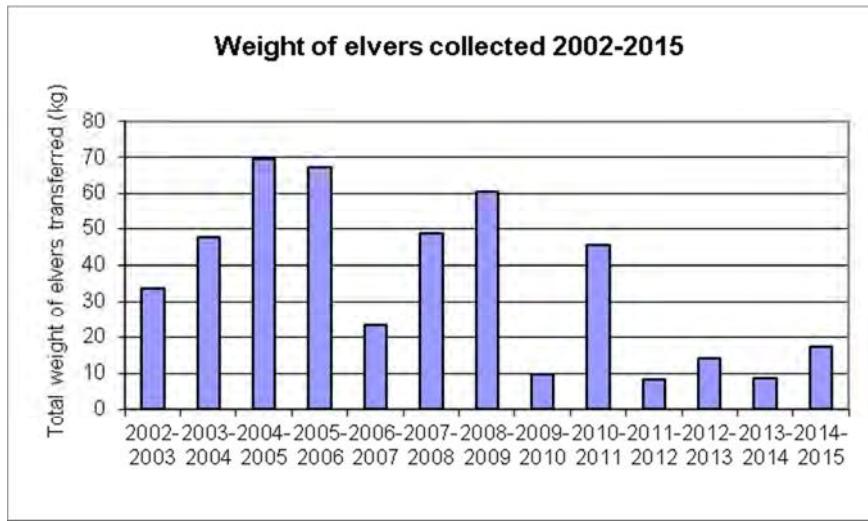


Figure 15 Elver transfer data for the monitoring years to date

The elver run in the 2014-2015 period started relatively late, with the first transfer occurring on 24 December 2015. The first four transfers were the largest for the season, with the run tapering off after 16 January 2015 (Figure 14). The last transfer was undertaken on 20 March 2015, which is when the elver run typically finishes, and the total weight of elvers transferred during this period totalled 17.23 kg (Figure 15).

Although the total transferred is larger than that transferred in the last three periods, it is the fifth lowest total transferred since transfers began. It appears that the number of elvers arriving at the trap is highly variable, but it is clear that, with the exception of the 2010-2011 season, the last six years have been poor in terms of weights

transferred. The elver run usually finishes in March, and this pattern continued in the reported period.

With regard to the numbers of elvers transferred, it can be difficult to accurately calculate the total number, from the recorded weight, as the average weight of the individual elvers appears to vary between years. Subsamples of elvers from the Motukawa elver trap have been weighed and counted during two separate years, with one count finding 1350 elvers per kg, and the other finding 950 elvers per kg. Table 8 shows how many elvers were transferred during the reported period, using both weights, compared with previous years.

The elver trap was visited by Council staff on one occasion during the reported period. Undertaken in January 2015, this inspection observed that the trap was operating and contained elvers.

Table 8 Elver transfer data for the four monitoring years to date

Monitoring year	Total weight of elvers transferred (kg)	Estimated number of elvers transferred (1 kg = 1350 elvers (2003 count))	Estimated number of elvers transferred (1 kg = 950 elvers (2006 count))
2002-2003	33.7	45,495	-
2003-2004	47.7	64,395	-
2004-2005	69.5	93,825	-
2005-2006	67.5	91,125	64,125
2006-2007	23.18	31,293	22,021
2007-2008	48.55	65,542	46,122
2008-2009	60.65	81,878	57,618
2009-2010	9.71	13,109	9,225
2010-2011	45.57	61,520	43,291
2011-2012	8.35	11,273	7,932
2012-2013	14.15	19,103	13,442
2013-2014	8.61	11,624	8,179
2014-2015	17.23	23,261	16,368

During the 2005-2006 monitoring period, a number of sub samples of elvers were collected and identified, to assess what proportion of the elvers were longfin, and what proportion were shortfin eels. The results are summarised in Table 9. A relatively consistent ratio of longfin eels to shortfin eels was found on each occasion with the majority being shortfin eels.

As per special condition 8 of consent 3373 an elver pass also needs to be installed at the spillway and dam on the Mako Stream (which forms Lake Ratapiko), within 6 months of the granting of this consent. The Company requested that this be delayed until March 2003, to allow works on the spillway to be completed during suitable weather in the summer of 2002-2003. This work was subsequently delayed, but was

completed during the 2003-2004 monitoring period. Night spotting of the Mako Stream spillway has been conducted at times, although the most recent such visit was conducted in January 2006 and no elvers were observed accumulating at the dam, although there was no water flowing down the pass at the time of the monitoring. It is considered worthwhile to either try and trap at the head of this pass, or to conduct some monitoring later in the elver migration season (possibly late February or March) as this site is some distance inland from the coast (88.5 km).

Table 9 Proportion of elvers as longfin and shortfin eels for elvers trapped at Motukawa Power Station

Date	Number of longfin eels	Proportion of longfin eels	Number of shortfin eels	Proportion of shortfin eels
27-Jan-06	11	24%	35	76%
8-Feb-06	19	26%	55	74%
17-Feb-06	24	22%	85	78%

Adult eels migrate down rivers to the sea in autumn and have been known to congregate at the Ratapiko Dam which dams the Mako Stream and at the penstocks leading to the power station. The facilitation of passage for adult eels over the Mako dam is required under special condition eight of consent 3373. During the period under review, Trustpower staff attempted to transfer adult eels from the lake. However this was relatively unsuccessful, with only one longfin eel transferred.

It is hoped that Trustpower will eventually have a net in place each year at the start of the migrating season (autumn) and removed at the end of it. While the net is in place it will be checked and emptied regularly and the eels transferred downstream. Currently, the nets are shared between this scheme and the Mangorei HEP, which includes Lake Mangamahoe.

Consent 5086 also has a special condition (1) relating to the penstock intake screens, maintaining the screens with spaces of no larger than 30 mm. Screens of this size were installed at the power station, complying with this condition. However, a monitoring inspection undertaken during the 2008-2010 reporting period did observe an eel that appeared to have passed through the turbines, so it is recommended that the required screen spaces be revisited at some stage.

Special conditions in consents 5080 (3) and 5086 (2) require the consent holder to install, maintain and operate a light barrier, within six months of the granting of this consent, for the purpose of diverting fish from the intake gate at the abstraction point from the Manganui River and the intake gate from the power station. During the 2001-2002 monitoring year, the Company purchased light sticks to comply with these consent conditions and requested that installation of the light sticks be delayed pending trials by Mr Jacques Boubee of NIWA. The Council agreed that this would be appropriate and acknowledged that installation would not be conducted within the six months specified in consent conditions. Research to date has found these lights to be ineffective, however eels appeared to have a strong avoidance to 12 volt electrical fields. This option has been investigated, and electrical field devices had been installed at the intake gates at the Tariki weir and at the penstocks in the forebay.

These were removed however for further testing, but have since been reinstalled and are operational.

2.2 Riparian planting

As per special condition 8 of consent 3369, the consent holder donates annually to the Taranaki Tree Trust (\$6,000) to mitigate the effects of the abstraction from the Manganui River. Funding on the Manganui Catchment was initially targeted at Lake Ratapiko and the Rumkeg Creek. It was then expanded to include plantings on the wider Manganui Catchment.

At the time of compiling this report, nineteen landholders in the Manganui catchment had applied for the subsidy in the 2014-2015 period, which covers 50% of the cost of plants planted within the catchment for riparian protection. To date, Trustpower have provided \$84,000 towards subsidising riparian planting in this catchment, of which every dollar has been allocated.

2.3 Stakeholders' meeting

As a requirement under a special condition in all the Motukawa HEP scheme consents, an annual meeting of interested stakeholders is held to discuss any matters relating to the exercise of these consents, but particularly monitoring programme design, implementation and interpretation, in order to facilitate ongoing consultation.

With the agreement of Council, no stakeholder meeting was held in the 2014-2015 period, as there were no issues that warranted a round table discussion. However, considering the flooding that occurred in June 2015, it may be worthwhile to hold a stakeholders meeting in the 2015-2016 period. It is suggested that Trustpower canvas the submitters, to determine whether such a meeting is required.

2.4 Investigations, interventions, and incidents

The monitoring programme for the year was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with the consent holder. During the year matters may arise which require additional activity by the Council, for example provision of advice and information, or investigation of potential or actual courses of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

The Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The Incident Register (IR) includes events where the Company concerned has itself notified the Council. The register contains details of any investigation and corrective action taken.

Complaints may be alleged to be associated with a particular site. If there is potentially an issue of legal liability, the Council must be able to prove by investigation that the identified company is indeed the source of the incident (or that the allegation cannot be proven).

In the 2014-2015 period, the Council was not required to record any incidents in association with the Company's conditions in resource consents or provisions in Regional Plans. However, Council did undertake an additional investigation in relation to the flood event that occurred at the end of June.

On 19 and 20 June 2015 Taranaki experienced a severe weather event. Over this time, most rainfall recorders monitoring by Council recorded over half of their average June rainfall³. The data provided by Trustpower indicated that where Mangaotea Rd crosses the Motukawa Race, 144 mm of rain fell over this time, with 30mm falling between 8am and 11am on the 20th, 19 mm of which fell in a 60 minute period (Figure 16).

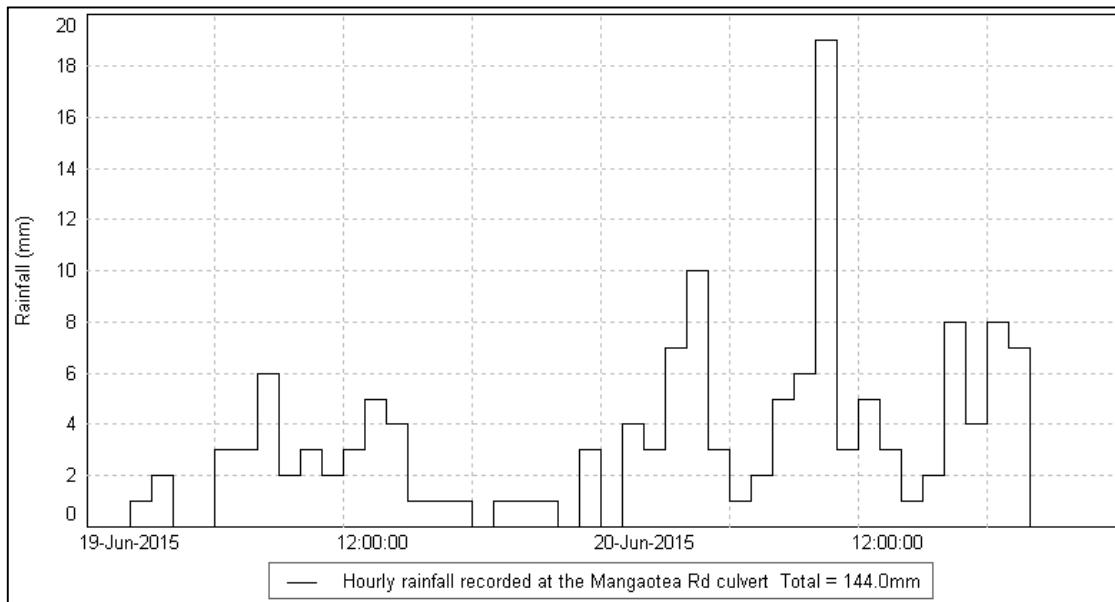


Figure 16 Rainfall recorded at the Mangaotea Rd culvert on 19 & 20 June 2015.

As a result of this event, the level of Lake Ratapiko significantly exceeded its maximum level (by 0.5 m) and the maximum race level was exceeded at three locations, with records indicating that the level at Berryman's recorder exceeded the limit by 0.69 m.

Although no complaints were received regarding these high water levels, an inspection was undertaken on 22 June, to see how well the scheme handled this severe weather event. From the top of the race to the in-race generator there was no indication that there had been any flooding, although it was obvious that there had been significant preceding rainfall and surface runoff, as evident by flattened grass (Photo 6).

³ Taranaki Regional Council Monthly Rainfall and River Report for June 2015. Document#1532924



Photo 6 Evidence of recent surface runoff leading to the race just upstream of the in-race generator, 22 June 2015

Further downstream, water appeared to have escaped the Mangaotea Stream channel upstream of the Mangaotea Aqueduct, to the point where it had over flowed into the race. It was also evident that the race had then overflowed back into the Mangaotea Stream at the aqueduct and also to land further downstream. At one point where the water had escaped the race it had flowed over a farm access race causing scouring. It was likely that the flow escaped the channel upstream of the aqueduct primarily due to insufficient capacity in the Mangaotea Stream, rather than the Mangaotea Aqueduct causing a restriction in flow. It is unknown to what extent (if any) the aqueduct contributed to the upstream flooding.

During this inspection, a local farmer arrived and explained that there was little velocity in the race at the time of the flooding, and this indicated that the race overflowed primarily due to a high lake level, rather than due to too much flow in the race. This farmer and Trustpower provided some photos of this flooding, and a selection is presented below. It should be noted that much of the surrounding countryside drains to the race, and this contributed to the high race level.

Alongside Lake Ratapiko, it was clear that the New Plymouth Water Ski Club campground had been flooded, and that flood water had entered some of the caravans.

There had been a significant amount of water spilled over the spillway, and the emergency spillway had begun to scour away, as intended during extremely high lake levels. This resulted in a very high flow in the Mako Stream, which receives this spillflow.

The Mako Stream was checked at the bridge on Makara Rd, and it was apparent that the recent water level had been very high, resulting in damage to a pump shed. The water level appeared to have almost reached the bottom of the bridge and overall it appeared that the water level at this point had been about three to four metres above the bed level (Photo 10).

From the observations made during this inspection, combined with the photos and descriptions provided by Trustpower and locals, the following can be concluded:

- At its peak, the level of Lake Ratapiko was very high which resulted in flooding of the campground and contributed to flooding of areas adjacent to the race downstream of the Mangaotea Culvert;
- The capacity of the Mangaotea Stream channel was not sufficient to prevent flooding of the land around Mangaotea Rd between the Mangaotea Aqueduct and Tariki Rd;
- The primary cause of flooding upstream of the Mangaotea Aqueduct was insufficient capacity in the stream; and
- It is unknown whether the Mangaotea Aqueduct contributed to the flooding upstream.



Photo 7 The Motukawa Race looking downstream from the Mangaotea Rd culvert, 20 June 2015.



Photo 8 The Mangaotea Aqueduct, 20 June 2015.



Photo 9 The Motukawa water race overflowing downstream of the Mangaotea Aqueduct, 20 June 2015.

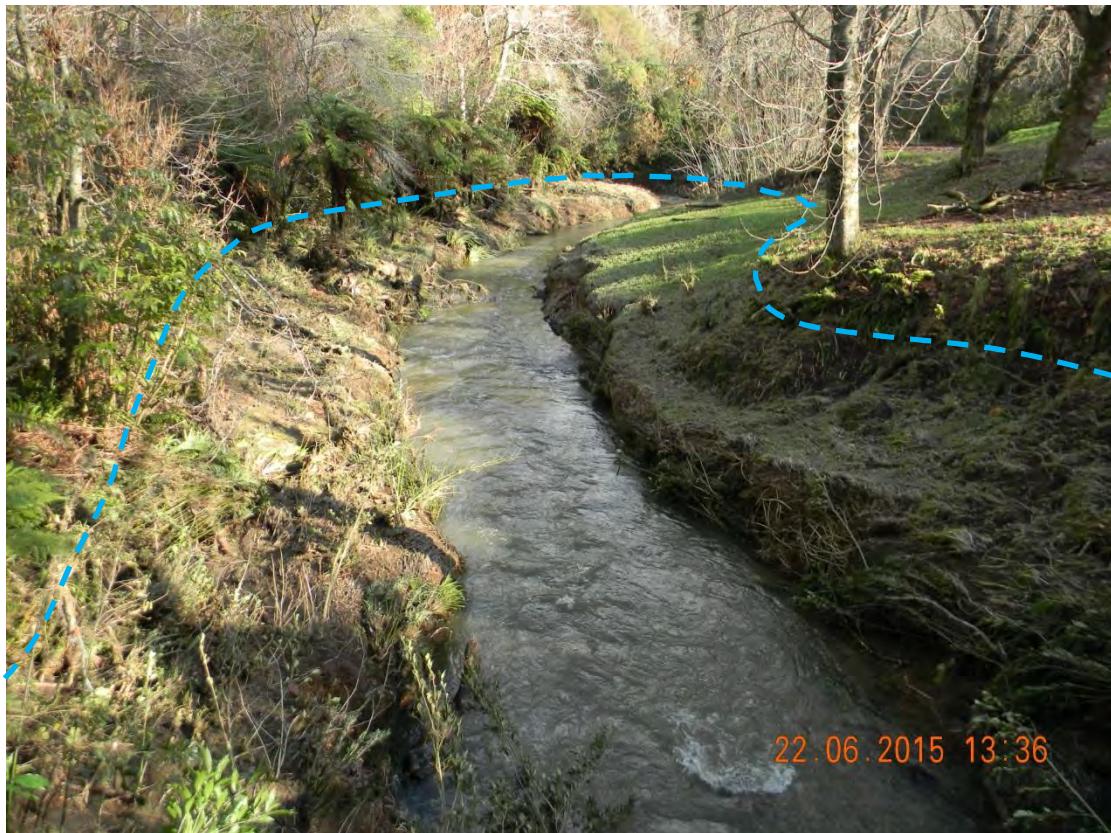


Photo 10 The Mako Stream bridge, Makara Rd, 22 June 2015. The blue line indicates the approximate flood height.

From a compliance perspective, it is important to understand whether Trustpower undertook all the necessary and practical steps to avoid flooding of the lake and land adjoining the race. During the more typical heavy rain events, the only steps that need to be taken involve closing the main intake gates on the Manganui River, while generating at maximum capacity. During more extreme events they also have the option of opening a gate at the Mangaotea Aqueduct, in an effort to reduce the water level in the race at this point. This discharge is covered under consent 5082-1, while the discharges from the spillways are covered under consent 5084-1.

The data provided by Trustpower shows that abstraction from the river stopped four hours prior to the lake exceeding the maximum level, and that generation was maximised for the majority of the time. However, due to the extremely heavy rain that occurred between 10 and 11am, debris from a tree felling operation near the intake was mobilised and caused blockages at the station intake. In addition, the station itself was experiencing flooding issues, and as a result one generation unit was shut down for safety reasons. This resulted in a break in generation of about four hours, which coincided with the peak lake level. This data is presented in Figure 17.



Photo 11 Flooding in the Mangaotea Stream valley, 20 June 2015. The blue line marks the approximate location of the Motukawa water race, with the arrow indicating the direction of flow, towards Lake Ratapiko

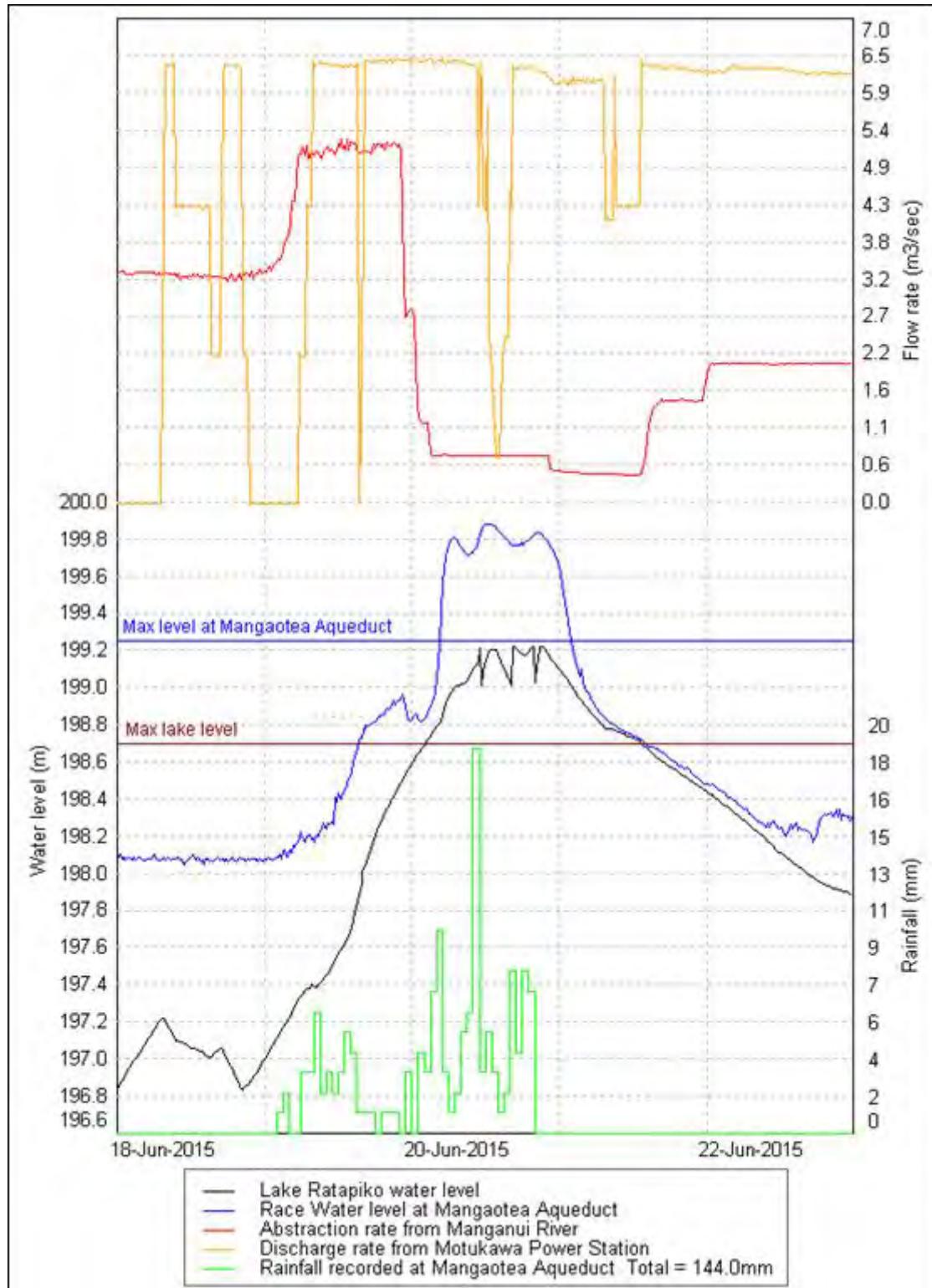


Figure 17 Lake level, race water level, abstraction rate, generation rate and rainfall for the period 18 – 23 June 2015.

With regards to utilising the gate on the Mangaotea Aqueduct, the Company decided not to utilise this option, as it was considered unlikely to significantly alleviate the high lake level, while it would have added to the already significant flooding present

around the Mangaotea Stream downstream of the aqueduct. Photo 8 indicates that this was a reasonable decision.

This investigation found that the flooding around Lake Ratapiko and the water race was primarily due to the significant rain that fell in the area. However, it is possible that the water race contributed to this flooding upstream of the Mangaotea Aqueduct, although it is unlikely that this significantly increased the total area flooded, as had this water not backed up behind the aqueduct, it would likely have backed up behind the Tariki Rd culvert. In addition, it is possible that the level at which the emergency spillway begins to scour away is too high, and that water may already be escaping the race when the emergency spillway is overtopped. This can only be confirmed through surveying the relative levels, and may be a worthwhile component of the next race survey, required by special condition 4 of consent 3371-1.

The only remaining aspect of this event that could warrant further investigation is the ability of the Mangaotea Stream to deal with significant rain events without causing flooding in the area. It is noted that condition 4 of consent 5082-1 requires Trustpower to set aside \$600 annually (adjusted to reflect changes in the Cost Construction Index), for the maintenance of the flood capacity of the Mangaotea Stream below the aqueduct. This money continues to be made available each year (but is not accumulated from year to year). It is unknown if this funding has ever been accessed, but it may be worthwhile for an interested party to access this fund, and improve the efficiency of the Mangaotea Stream. It is important to note however that no consent currently exists that allows modification of the Mangaotea Stream beyond that allowed by the permitted activity rules of the Regional Freshwater Plan.

3. Discussion

3.1 National perspective

In July 2006, the Parliamentary Commissioner for the Environment (PCE) released a report entitled *Electricity, energy, and the environment: environmental performance assessment 1 July 2004-30 June 2005 (PCE, May 2006)*. The report examines the present and future environmental performance and effects of the electricity generation and transmission sector in New Zealand. It includes a focus upon the environmental performance and resource consent compliance of generators.

One of the recommendations in the PCE report is as follows:

'13. Improve the transparency in reporting of resource consent compliance and monitoring

At present there is a lack of transparency in the monitoring and reporting of resource consent compliance by electricity generators...

Based on the information provided by the large electricity generators in their environmental and sustainability reports, most companies breach their resource consent conditions several times a year. These breaches are often reported as minor, or as having no detrimental environmental effects. It is impossible to verify the actual effects of these breaches from the available reporting methods.

The PCE recommends that MFE work with electricity generators to develop a robust, transparent, and verifiable system of reporting on resource consent compliance and the environmental effects of electricity generation.'

The report comments on possible roles for the Ministry for the Environment. It states:

'MFE has limited involvement in the electricity sector, but the PCE believes it should have a broader role in the development of energy policy. Key areas where MFE could play an important role are:

- establishing a nationally consistent method for electricity generators to report on compliance with resource consent conditions and the environmental impacts of electricity generation;
- working with electricity generators to reduce the number of breaches of resource consent conditions;....

In many cases these national-level environmental issues are not effectively dealt with by regional councils or territorial authorities.'

The report also examines the consent compliance reporting record of each company. It concludes:

'General comments on sustainability reporting

With the exception of Trustpower, none of the electricity generators detail the number of times they breach their agreed resource consent conditions. Some

generators argue that compliance may not be a reasonable measure of their environmental performance. In general, it seems that it is not uncommon for electricity generators to breach their agreed resource consent conditions several times a year.

The PCE is seeking to quantify the number of non-compliance events in order to compare numbers for different generation plant and generators. The purpose is to identify any trends, which may be relevant.

Resource consent conditions for some plants are significantly more onerous than others, and sometimes this difference is based on the timing of the last resource consent rather than the local environmental effects.

National consistency in categorizing the breaches would be useful for this assessment report and for other purposes. We intend to look at this area in more detail in the next assessment period. This will include the extent to which these companies are reporting what they are doing to promote a robust demand-side sector in the electricity market, at both the wholesale and retail levels. (See Recommendation 13.)'

The Council notes that it is the long-standing practice of the Council to report publicly on environmental performance and consent compliance (including non-compliance events) in each annual compliance report. It has done so since compliance reports were first prepared. In the case of Trustpower's HEP facility at Motukawa, the record of reporting covers 26 years (13 years while in Trustpower ownership). The reader is referred particularly to sections 2.4, 3.2, 3.3 and 3.4 in this report for more information.

3.2 Discussion of site performance

Several consents contain special conditions requiring Trustpower to monitor and forward abstraction, discharge and water level data at three monthly intervals. This data was forwarded as required during the monitoring year under review and checked for continuity of the data record, and compliance with their respective limits. During the monitoring period under review, there were five occasions on which notable loss of data occurred. These were related primarily to equipment failure and remedied immediately. The only exception to this was the Berrymans recorder, which took some time to repair. Council were kept apprised of this, and as a result, none of these occasions of lost data were deemed to be incidents of non-compliance.

There was also good compliance with set flows and levels, with no incidents occurring that warranted enforcement action. It should be noted that only those incidents of one hour or longer are discussed, provided the limit was breached by at least 5%, to allow for errors associated with recording equipment. In the 2014-15 period there was only one occasion where such limits were breached, and this occasion was related to the severe weather event that occurred around 20 June 2015.

This compliance with flows and levels was also confirmed through inspections, including hydrological gaugings where appropriate. These inspections also confirmed compliance with other requirements such as the operation of an elver trap at the station and elver pass at the Mako Dam spillway.

Special condition 4 of consent 3371-2, which relates to the diversion of water into the race, requires that a five-yearly monitoring survey of the race be completed by the consent holder to identify any maintenance requirements in order to maintain a race capacity of 8,000 L/s, for the purpose of avoiding flooding adjacent farmland. It also requires that any required maintenance shall occur within 12 months of the completion of the survey. This survey was last undertaken in 2011, and with the next survey expected to be undertaken prior to 2017.

Consent 5082 allows the discharge of water into the Mangaotea Stream in emergency conditions. Special condition 4 of this consent requires the consent holder to put aside \$600 per year for flood management, and to make this available to landowners downstream of the race in the Mangaotea Stream catchment. This money continues to be made available each year (but is not accumulated from year to year).

A draft contingency plan had been received in 2002 to cover conditions in consents 5084 and 5088. This was to be reviewed by the Company once work on the spillway and Ratapiko Road culvert has been completed in the 2002-2003 monitoring year. A reviewed plan was received on 27 May 2010.

Management of most aspects of the Motukawa HEP scheme over the period being reported has generally been excellent with the significant improvements undertaken in previous years contributing to this. It is clear that Trustpower takes compliance with consent conditions seriously, and this is reflected in their self notification of any breaches they become aware of, and their swift response in each case. No incidents were recorded in relation to this scheme in the 2014-2015 period. Throughout the reported period, Trustpower and Council have continued to work closely with one another.

3.3 Environmental effects of exercise of consents

Continuous water temperature monitoring was performed in the Manganui River upstream and downstream of the Tariki Road weir from November to May in each monitoring year. This monitoring indicated that over the reported period, water temperatures were relatively typical, being similar to that recorded previously. The upstream site still indicated some natural warming. Average monthly water temperatures were generally similar to the long term average, although the average January temperature was above average upstream and downstream of the weir. In addition, the number of days that experienced a maximum temperature in excess of 25 °C was slightly above average, with the downstream site experiencing a water temperature in excess of 25 °C on seven days in January 2015. The upstream site did not exceed 25 °C over this time. Temperatures over 25 °C can significantly adversely affect trout and other freshwater fish communities as well as being outside the tolerance range of some sensitive macroinvertebrate taxa. Furthermore, temperatures over 20 °C, for extended periods, can put stress on fish. No fish kills were reported in the residual flow reach of the Manganui River and no dead trout were observed.

A comparison of the water temperatures prior to the new residual flow of 400 L/s against those once the new residual flow was implemented indicated that water temperature differences had generally decreased between the two water temperature monitoring sites some 2.3 km apart. The proportion of days that had a maximum temperature difference of 1 – 2 °C since the 400 L/s was almost double that recorded

prior, with the difference coming from a reduction in the proportion of days that experienced a maximum temperature difference of more than 3 °C. The temperature differences recorded in the 2014-15 period were lower than the average.

Because of an extended period of natural to near natural flows in the residual flow reach in early 2010 (previous reporting period), it was possible to assess what impact the main abstraction has on the water temperatures in this reach. This showed that even though the Manganui River was running slightly warmer at that time than was typical, the temperatures in the residual flow reach were reduced by this natural flow. It was also clear that temperatures which can negatively affect stream biota (>20 °C) are less likely to occur under the more natural flow, and that their increased occurrence in the residual flow reach is directly related to the reduced flow.

The macroinvertebrate survey conducted in the reported period indicated that the residual flow from the Motukawa HEP scheme was maintaining reasonable water quality and some habitat for macroinvertebrate communities downstream of the diversion weir.

Previous surveys have found a general trend of decreasing MCI scores in a downstream direction which was more likely related to the natural changes in habitat downstream, than due to the reduced flow downstream of the weir. The current survey did not record such deterioration, and this is a positive indication that the impacts of the diversion were not as severe as expected during this summer low flow period.

Since the new residual flow has been operating, some improvement in communities have been observed particularly at site 5, 1.7 km downstream of the weir, where MCI values have been above the historical median, since the new residual flow was implemented. This result was not repeated in the current survey, with both the MCI SQMCIs scores not being statistically significantly different to their respective median.

Overall, the results indicate that the invertebrate community supported by a residual flow of 400 L/s, with regards to presence/absence of taxa, and their respective abundances, is not significantly different to that supported by natural flows. The principal difference between the two flows is that there is a greater amount of invertebrate habitat available under natural flow conditions due to the increased amount of wetted riverbed width.

The macroinvertebrate monitoring continues to show that water quality in the residual flow reach is maintained, indicating that the objective of maintaining water quality (which was used to determine an appropriate residual flow of 400 L/s), is being achieved, and has improved physical macroinvertebrate habitat and physicochemical water quality conditions when compared to previous residual flows of less than 100 L/s.

Improved fish diversity and abundance are key aspects for determining the success of the fish pass and residual flow with respect to fish passage in the residual flow reach as well as providing some native fish habitat. Key native indicator species, including the redfin bully and torrentfish, also provide important information on the successful passage through the residual flow reach and past the weir.

Electric fishing surveys in the Manganui catchment prior to the installation of the new fish pass in 2002, and increased residual flow, indicated that redfinned bullies and torrentfish did not swim to the base of the Motukawa diversion weir, at an altitude of 210 metres (Taranaki Regional Council, 1999a and 2000). The minimal residual flow downstream of the weir was insufficient to attract these fish up the river as far as the weir. Redfinned bullies swim well above an altitude of 200 m in the Ngatoro-iti, Ngatoro-nui, Waitepuke and Mangamawhete streams, all tributaries of the Manganui River (which enter the Manganui River downstream of the Tariki weir).

Fish surveys were conducted during the 2010-2014 period, coupled with that undertaken in previous monitoring years, found that fish were beginning to move through the residual flow reach and fish pass. This is indicated by the presence of redfin bully, inanga and shortjaw kokopu upstream of the weir, and the improved abundance of redfin bully upstream and downstream of the weir. Torrentfish were recorded in the fish pass in the previous period. This species occurs sporadically in the residual flow reach, and has never been recorded upstream of the lower weir in the pass. This is likely to be related to the residual flow being insufficient to attract significant numbers of torrentfish, and those that do make it to the fish pass may not be able to negotiate the weirs in the fish pass.

Although no fish monitoring was undertaken in the reported period, previous results indicate that with respect to the management objectives for which the residual flow was developed:

- reasonable water quality is being maintained;
- passage for trout is probably being achieved through the residual flow reach and past the weir;
- passage for some (but not all) native fish is being achieved in the residual flow reach and it would appear through the fish pass; and
- habitat of native fish has improved but fish diversity is similar to that recorded prior to the 400 L/s residual flow and may suggest that the objective of 'some native fish habitat' is not being achieved for torrentfish, although redfin bullies and inanga have been recorded in the residual flow reach.

Fish monitoring has previously been undertaken in the Mangaotea Stream, to assess how the fish communities in this stream compared to communities present prior to the abstraction at the Mangaotea Pumps. In general, the results did not indicate any issue with fish passage at the intake, or with the reduced flows downstream of the intake.

With regards to flooding associated with the scheme, a significant weather event that occurred in late June 2015 resulted in large areas of farm land being flooded in the vicinity of the Mangaotea Stream, and around Lake Rotorangi. Although the scheme partly contributed to this flooding, it is considered that Trustpower undertook all practical steps to reduce this flooding, and that the primary cause of this flooding was the extremely heavy rain that fell in the area at this time, coupled with insufficient flow capacity in the Mangaotea Stream.

3.4 Evaluation of performance

A tabular summary of the Company's compliance record for the year under review is set out in Table 10 to Table 32. Three consents are not included in this tabular summary

(6382-1, 6383-1 & 6384-1), as these were for temporary activities associated with the installation of an intake structure, and these activities are no longer being undertaken.

Table 10 Summary of performance for Consent 3369-2 to take and use up to 5,200 L/s of water from the Manganui River

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Maintenance of residual flow of 400 L/s	Inspections fish pass, including water levels in pass; gaugings. Where non-compliance was found, Company rectified it immediately	Yes
2. Residual flow passes through fish pass within 12 months of the granting of this consent	Inspection; Implemented in 2002	Yes
3. Install and operate measuring device for monitoring abstraction rate and forward to Council	Receipt and review of Company data every three months	Yes
4. Cease abstraction if flow in Waitara is ≤ 5000 L/s	Council to notify if Waitara flow is less than threshold	Yes
5. Pulse flows released if weir has not overtopped for 30 days	One such period of low flows occurred	Not required
6. (a) Install race water level control system to manage inflow from Manganui River (b) Avoid flooding of farmland (c) Emergency power source	Receipt and review of Company data every three months	Yes
7. Maintain 150 L/s in race during maintenance	Notification by Company	Yes
8. Donation to Taranaki Tree Trust	Confirmation with Council finance dept that donation received	Yes
9. Meeting with stakeholders annually	One meeting conducted, with agreement of Council	Yes
10. Optional change/cancellation of conditions by consent holder	Not exercised	N/A
12. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 11 Summary of performance for Consent 3371-2 to divert and use up to 8,000 L/s of stormwater runoff and tributaries draining in to race and Lake Ratapiko

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. (a) Install race water level control system (b) Emergency power source	Installed in 1998	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
2. Management of maximum race water levels at 4 sites to avoid flooding of farmland	Receipt and review of Company data every three months	Yes, with the exception of the June 2015 event
3. Install and survey stage boards for visual check on race levels	Installed in 1995; Inspections of race	Yes
4. Five yearly survey of race to identify maintenance requirements	Next report due prior to 2017	Yes
5. Install and operate measuring device to measure water levels and forward to Council	Receipt and review of Company data every three months	Yes
6. Meeting with stakeholders annually	No meeting conducted, with agreement of Council	Yes
7. Bond required if flooding occurs between May 1999 and April 2000		N/A
8. Review of conditions if there is flooding of adjacent farmland	Not exercised	N/A
9. Optional change/cancellation of conditions by consent holder	Not exercised	N/A
10. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		High

Table 12 Summary of performance for Consent 3372-2 to discharge up to 7,787 L/s of water from the Motukawa HEP into the Makara Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Cease abstraction if flow in Waitara is ≤ 5000 L/s	Council to notify if Waitara flow is less than threshold	Yes
2. Install and operate measuring device to measure discharge of water to Makara St and forward to Council	Receipt and review of Company data every three months	Yes
3. Install, maintain & monitor elver passage facility within 6 months of granting of consent	Installed in 2001-2002 monitoring year; Inspections; receipt and review of Company data	Yes
4. Meeting with stakeholders annually	No meeting conducted, with agreement of Council	Yes
9. Optional change/cancellation of conditions by consent holder	Not exercised	N/A
10. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 13 Summary of performance for Consent 3373-2 to dam the Mako Stream to form Lake Ratapiko

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Within 6 months of granting consent, provide a SEED review	Received in 2002	Yes
2. Maintain & operate a safe dam		Yes
3. Place & maintain structure on top of lowered spillway crest to increase lake storage	Upgrade in 2003-2004 with spring tip flashboard	Yes
4. Manage structure in condition 4 and lake level so as to avoid flooding of farmland	Receipt and review of Company data every three months	Yes, with the exception of the June 2015 event
5. Minimum lake water level of 194 m a.s.l. except during maintenance	Receipt and review of Company data every three months	Yes
6. Maximum lake water level of 198.7 m a.s.l.	Receipt and review of Company data every three months	Yes, with the exception of the June 2015 event
7. Install, maintain & monitor elver /eel passage facility over spillway within 6 months of granting of consent	Inspections Installed in 2003-2004; Delays approved by Council	Yes
8. Install and operate measuring device to measure lake water level and forward to Council	Receipt and review of Company data every three months	Yes
9. Meeting with stakeholders annually	No meeting conducted, with agreement of Council	Yes
10. Optional change/cancellation of conditions by consent holder	Not exercised	N/A
11. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		High

Table 14 Summary of performance for Consent 1166-3 to discharge up to 4,000 m³/day of dredgings from maintenance of Lake Ratapiko

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notify Council at least 48 hours prior to commencement of discharge	No notification received. No maintenance undertaken	N/A
2. Adopt best practicable option		N/A
3. Meeting with stakeholders annually	No meeting conducted, with agreement of Council	Yes
4. Optional change/cancellation of conditions by consent holder	Not exercised	N/A
5. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
Overall assessment of administrative performance in respect of this consent		High

Table 15 Summary of performance for Consent 5080-1 to erect, place, use and maintain the weir and various structures in Manganui River

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Design, install, maintain & monitor structure at weir for fish passage	Inspections; biological monitoring	Yes
2. Fish pass to be constructed within 12 months	Completed in 2002	Yes
3. Install & operate a light barrier within 6 months to divert fish from intake	Research found light barrier to be ineffective. Electric fields have been reinstalled at intake and forebay in 2010-2014 period. Extension of time limit approved.	Yes
4. Meeting with stakeholders annually	No meeting conducted, with agreement of Council	Yes
5. Optional change/cancellation of conditions by consent holder	Not exercised	N/A
6. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 16 Summary of performance for Consent 5081-1 to erect, place, use and maintain the Mangaotea Aqueduct in and above the Mangaotea Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Install and survey a stage board for visual check on race levels	Installed in 1995; Inspections of race	Yes
2. Lower northern side of aqueduct by 300 mm to provide a flow of 2,000 L/s & install gate controlled by race water level control system	Conducted in 2000	Yes
3. Meeting with stakeholders annually	No meeting conducted, with agreement of Council	Yes
4. Optional change/cancellation of conditions by consent holder	Not exercised	N/A
5. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 17 Summary of performance for Consent 5082-1 to discharge, under emergency conditions, up to 2,000 L/s of overflow water from the Mangaotea Aqueduct into the Mangaotea Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. That the discharge shall occur after compliance with condition 2 of 5081 is achieved	No discharges in the 2014-2015 monitoring period	N/A
2. Definition of emergency conditions	When local stormwater runoff to the race is required to be discharged to Mangaotea Stream in order to avoid the race flooding adjoining land	N/A
3. Manage discharge to avoid or minimise flooding of farmland and roads below discharge		Yes
4. Set aside \$600 annually for maintenance of the flood capacity of the Mangaotea Stream below the discharge, and make funds available to landowners for works.	Money continues to be made available each year	Yes
5. Optional change/cancellation of conditions by consent holder	Not exercised	N/A
6. Meeting with stakeholders annually	No meeting conducted, with agreement of Council	Yes
7. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 18 Summary of performance for Consent 5084-1 to discharge up to 55,000 L/s of HEP generation water, during adverse weather conditions, from Lake Ratapiko into the Mako Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Prepare a contingency plan for managing discharge so as to avoid or minimise damage to property downstream	Reviewed contingency plan received in 2004-2005 monitoring year	Yes
2. Exercise consent in accordance with contingency plan		Yes
3. Meeting with stakeholders annually	No meeting conducted, with agreement of Council	Yes
4. Optional change/cancellation of conditions by consent holder	Not exercised	N/A
5. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 19 Summary of performance for Consent 5085-1 to disturb the bed of Lake Ratapiko for maintenance and repairs associated with HEP generation

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notify the Council 48 hours prior to commencement of disturbance activities	No notifications received. No disturbance undertaken	Yes
2. Best practicable option		N/A
3. Meeting with stakeholders annually	No meeting conducted, with agreement of Council	Yes
4. Optional change/cancellation of conditions by consent holder	Not exercised	N/A
5. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		N/A
Overall assessment of administrative performance in respect of this consent		High

Table 20 Summary of performance for Consent 5086-1 to erect, place, use and maintain various structures in, on and over the bed of Lake Ratapiko

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Maintain penstock intake screens with spaces no larger than 30 mm in order to minimise eel & fish entrapment		Yes
2. Install & operate a light barrier within 6 months to divert fish from intake	Research found light barrier to be ineffective. Electric fields have been reinstalled at intake and forebay in 2010-2014 period. Extension of time limit approved.	Yes
3. Install and survey a stage board for visual check on lake water levels	Installed in 1995; Inspections	Yes
4. Upgrade Ratapiko Road causeway	Completed in 2003	Yes
5. Optional change/cancellation of conditions by consent holder	Not exercised	N/A
6. Meeting with stakeholders annually	No meeting conducted, with agreement of Council	Yes
7. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 21 Summary of performance for Consent 5087-1 to take and use up to 7,787 L/s of water from Lake Ratapiko

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Minimum lake water level of 194 m a.s.l.	Receipt and review of Company data every three months	Yes
2. For lake maintenance, the draw down of the level will occur gradually over 7 days & notify the Council and Fish and Game	No such works undertaken	N/A
3. Maximum lake water level under normal operating conditions does not exceed 198.7 m a.s.l.	Receipt and review of Company data every three months	Yes, with the exception of the June 2015 event
4. Manage lake levels to avoid or minimise flooding of land		Yes, with the exception of the June 2015 event
5. Meeting with stakeholders annually	No meeting conducted, with agreement of Council	Yes
6. Optional change/cancellation of conditions by consent holder	Not exercised	N/A
7. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 22 Summary of performance for Consent 5088-1 to discharge up to 2,000 L/s of water from the surge chamber of the Motukawa power station during maintenance periods into an unnamed tributary of the Makara Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Prepare contingency plan within 6 months	Reviewed contingency plan received in 2004-2005 monitoring year	Yes
2. Exercise consent in accordance with contingency plan		Yes
3. Notify the Council 48 hours prior to the discharge and adopt best practicable option	No notifications received	Yes
4. Meeting with stakeholders annually	No meeting conducted, with agreement of Council	Yes
5. Optional change/cancellation of conditions by consent holder	Not exercised	N/A
6. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 23 Summary of performance for Consent 6388-1 to divert and use water in the Motukawa Race

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practicable option	Inspections	Yes
2. Exercise of consent shall be undertaken generally in accordance with documentation submitted with application	Inspections	Yes
3. Notify the Council 7 days prior to the exercise of consent	Notification received 21 February 2006	Yes
4. Consent lapse period of 10 years	Consent has been exercised	N/A
5. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 24 Summary of performance for Consent 6390-1 to impound water behind a dam on the Motukawa Race

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practicable option	Inspections	Yes
2. Exercise of consent shall be undertaken generally in accordance with documentation submitted with application	Inspections	Yes
3. Notify the Council 14 days prior to the construction of dam and turbine unit in the race	Notification received 13 October 2005	Yes
4. The intake is appropriately screened to avoid entrapment of freshwater fauna	Screens used found to be too narrow for operation. Change of consent conditions granted and new screens installed in July 2006	Yes
5. On 3 occasions between Nov and Feb, cease generation and open bypass valve for 12 hours to allow trout passage	It has been agreed by Council and Fish and Game that this is no longer required, as the bypass valve has been removed, and is permanently running.	N/A
6. Company must monitor effectiveness of bypass valve for first 6 bypass events and forward information to Council and Fish and Game.	It has been agreed by Council and Fish and Game that this is no longer required, as the bypass valve has been removed, and is permanently running.	Yes
7. Review conditions of consent if monitoring of bypass events show a significant trout accumulation	Not exercised	N/A
8. Management of race water level to avoid or minimise flooding of adjacent farmland	Receipt and review of Company data every three months	Yes
9. Consent lapse period of 10 years	Consent has been exercised	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
10. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 25 Summary of performance for Consent 6391-1 to discharge sediment during earthworks associated with the construction of a generator structure into the Motukawa Race

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practicable option	Works completed	N/A
2. Exercise of consent shall be undertaken generally in accordance with documentation submitted with application	Works completed	N/A
3. Notify the Council 48 hours prior to the commencement and upon completion of the initial installation and again on any subsequent maintenance works	Notification to commence received 28 February 2005 and subsequently for each stage of works. No subsequent maintenance works undertaken as yet	N/A
4. Site erosion and sediment control management plan	Received 28 February 2005	N/A
5. Discharge shall not give rise to adverse effects on surface water body after reasonable mixing	Works completed	N/A
6. All earthworks shall be stabilised vegetatively or otherwise as soon as practicable following completion of activities	Works completed	N/A
7. Consent lapse period of 10 years	Consent has been exercised	N/A
8. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		N/A
Overall assessment of administrative performance in respect of this consent		N/A

Table 26 Summary of performance for Consent 6381-1 to take and use water from the Mangaotea Stream, for HEP generation purposes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Exercise of consent shall be undertaken generally in accordance with documentation submitted with application	Inspections, data review	Yes
2. Notify the Council 48 hours prior to the exercise of this consent	Notification received	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
3. Restriction of abstraction rate and daily volume	Data review	Yes
4. Maintenance of residual flows within the Mangaotea Stream	Data review, gaugings	Yes
5. Specifies aspects of the review, should one be required as per special condition 9	Review not considered necessary	N/A
6. Flushing flow requirement	Data review, inspections	No
7. Requires the recording of abstraction rate, residual flow downstream of abstraction and flow downstream of Little Mangaotea Stream confluence	Data review	Yes
8. Consent holder to undertake a two year monitoring programme of hydrological and ecological effects in the Mangaotea Stream and Manganui River	Monitoring completed in 2012	Yes
9. Review provision should the residual flow and/or flow regime be considered not appropriate	Review not considered necessary	N/A
10. Meeting with stakeholders annually	No meeting conducted, with agreement of Council	Yes
11. Consent lapse period of 10 years	Consent has been exercised	N/A
12. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 27 Summary of performance for Consent 6385-1 to erect, place and maintain an intake structure including pumps in the bed of the Mangaotea Stream, for the purposes of abstracting water for HEP generation

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practicable option	No maintenance works undertaken	N/A
2. Exercise of consent shall be undertaken generally in accordance with documentation submitted with application	No maintenance works undertaken	N/A
3. Notify the Council 48 hours prior to the commencement and upon completion of the initial installation and again on any subsequent maintenance works	No notifications received	N/A
4. Timing of works restricted to 1 November – 30 April , unless waived by Council	No maintenance works undertaken	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
5. Must ensure that the area and volume of streambed disturbance is minimised so far as practicable	No maintenance works undertaken	N/A
6. The diversion and impoundment shall not obstruct fish passage	No maintenance works undertaken	Yes
7. The intake shall be appropriately screened to prevent entrapment of freshwater fauna	Inspections	No
8. The structure shall be removed and area reinstated should it no longer be required	Structure still required	N/A
9. Consent lapse period of 10 years	Consent has been exercised	N/A
10. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 28 Summary of performance for Consent 6386-1 to disturb and modify the bed and banks of the Mangaotea Stream, associated with the construction of an intake structure for hydroelectric generation purposes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practicable option	No maintenance works undertaken	N/A
2. Exercise of consent shall be undertaken generally in accordance with documentation submitted with application	No maintenance works undertaken	N/A
3. Notify the Council 48 hours prior to the commencement and upon completion of the initial installation and again on any subsequent maintenance works	No notifications received	N/A
4. Timing of works restricted to 1 November – 30 April , unless waived by Council	No maintenance works undertaken	N/A
5. Must ensure that the area and volume of streambed disturbance is minimised so far as practicable	No maintenance works undertaken	N/A
6. The diversion and impoundment shall not obstruct fish passage	Inspections	Yes
7. Consent lapse period of 10 years	Consent has been exercised	N/A
8. Optional review provision re environmental effects	No review undertaken	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 29 Summary of performance for Consent 6387-1 to discharge sediments from earthworks into the Mangaotea Stream, associated with the construction of an intake structure, for HEP generation purposes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practicable option	No maintenance works undertaken	N/A
2. Exercise of consent shall be undertaken generally in accordance with documentation submitted with application	No maintenance works undertaken	N/A
3. Notify the Council 48 hours prior to the commencement and upon completion of the initial installation and again on any subsequent maintenance works	No notifications received	N/A
4. Site erosion and sediment control management plan	Received March 2007	N/A
5. Timing of works restricted to 1 November – 30 April , unless waived by Council	No maintenance works undertaken	N/A
6. Discharge shall not give rise to adverse effects on surface water body after reasonable mixing	No maintenance works undertaken	N/A
7. All earthworks shall be stabilised vegetatively or otherwise as soon as practicable following completion of activities	No maintenance works undertaken	N/A
8. Consent lapse period of 10 years	Consent has been exercised	N/A
9. Optional review provision re environmental effects	No review undertaken	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

During the reported period, the Company's performance was maintained at a high level. There were no incidents that warranted enforcement action, and the only area that caused some concern was the flooding event of June 2015. There were a number of minor incidents, but due to the swift response of the consent holder, they remained minor, and it is likely no environmental impact resulted.

This is a reflection of the consent holder's improved systems, and thorough monitoring of a highly complex scheme. The Company has maintained a good level of communication with the Council, including notifying Council of any breach of consent, no matter how minor. Using the environmental performance classifications as defined in section 1.1.4, Trustpower's performance for the 2014-2015 period is 'good'. The

reason that the scheme did not achieve a ‘high’ rating relates to the effects of the flooding that were observed in June 2015. However, it is acknowledged that there was little that Trustpower could have done different at the time to avoid or minimise this flooding and the associated impacts.

3.5 Recommendations from the 2013-2014 Annual Report

In the 2013-2014 Annual Report, it was recommended:

1. THAT monitoring of consents relating to the Motukawa HEP scheme in the 2014-2015 year continues at the same level as in 2013-2014.
2. THAT review of those consents that contain a review provision for June 2015 is not undertaken.
3. THAT the Council notes the review of consent 1795-4 may lapse.

3.6 Alterations to monitoring programmes for 2015-2016

In designing and implementing the monitoring programmes for air/water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA, its obligations to monitor emissions/discharges and effects under the RMA, and report to the regional community. The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki emitting to the atmosphere/discharging to the environment.

It is proposed that for 2015-2016 the intensity of the fish monitoring component is reduced, so that one survey is undertaken per year, alternating between the Manganui River catchment and Mangaotea Stream. In addition, due to the high level of compliance with residual flows, the hydrological inspections are proposed to be reduced from four to three visits. All other monitoring components are to remain largely the same.

3.7 Exercise of optional review of consent

There are no consents held by the company that allow for an optional review of consent in June 2016.

4. Recommendations

1. THAT monitoring of fish communities be amended from that undertaken in 2014-2015, so that one survey is undertaken per year, alternating between the Manganui River catchment and Mangaotea Stream.
2. THAT the hydrological inspections component of the monitoring be amended from that undertaken in 2014-2015, by reducing the frequency of inspections from four to three per year.
3. THAT monitoring of all other components of the Motukawa HEPS continues at the same level as in 2014-2015.

Glossary of common terms and abbreviations

The following abbreviations and terms may be used within this report:

Al*	Aluminium.
As*	Arsenic.
Biomonitoring	Assessing the health of the environment using aquatic organisms.
BOD	Biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate.
BODF	Biochemical oxygen demand of a filtered sample.
Bund	A wall around a tank to contain its contents in the case of a leak.
CBOD	Carbonaceous biochemical oxygen demand. A measure of the presence of degradable organic matter, excluding the biological conversion of ammonia to nitrate.
cfu	Colony forming units. A measure of the concentration of bacteria usually expressed as per 100 millilitre sample.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
Cu*	Copper.
Cumec	A volumetric measure of flow- 1 cubic metre per second ($1\text{ m}^3\text{s}^{-1}$).
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
E.coli	Escherichia coli, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre of sample.
F	Fluoride.
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
g/m ² /day	grams/metre ² /day.
g/m ³	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.

Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
IR	The Incident Register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
m ²	Square Metres.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NH ₄	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH ₃	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
NO ₃	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
Pb*	Lead.
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
PM ₁₀	Relatively fine airborne particles (less than 10 micrometre diameter).
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	<i>Resource Management Act 1991</i> and including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
UI	Unauthorised Incident.

Zn*

Zinc.

*an abbreviation for a metal or other analyte may be followed by the letters 'As', to denote the amount of metal recoverable in acidic conditions. This is taken as indicating the total amount of metal that might be solubilised under extreme environmental conditions. The abbreviation may alternatively be followed by the letter 'D', denoting the amount of the metal present in dissolved form rather than in particulate or solid form.

For further information on analytical methods, contact the Council's laboratory.

Bibliography and references

- Baker CF, & Hicks BJ, 2003: Attraction of migratory inanga (*Galaxias maculatus*) and koaro (*Galaxias brevipinnis*) juveniles to adult galaxiid odours *New Zealand Journal of Marine and Freshwater Research* 37: 291–299
- Jowett IG, 1982: The incremental approach to studying stream flows. NZ case studies. In McColl, R H S ed., River low flows: conflicts of water use. *Water and Soil Miscellaneous Publication* 47:9-15.
- Jowett IG, 1991: A method of predicting brown trout abundance in rivers. *Freshwater Catch* 45:3-6.
- Joy MK and Death RG, 2000: Development and application of a predictive model of riverine fish community assemblages in the Taranaki region of the North Island, New Zealand. *New Zealand Journal of Marine and Freshwater Research* 34: 241-252.
- McDowall R M, 1978: New Zealand Freshwater Fishes, A natural history and guide. *Heinemann Educational Books (NZ) Ltd, Auckland.*
- Mitchell C, 1993: Fish Passage Problems in Taranaki. Report prepared for the Taranaki Regional Council.
- Moore S, 1992: Fish Kill - Complete Draining of Lake Ratapiko 12-14 February 1992. Report SM326.
- Stark JD, 1985: A macroinvertebrate community index of water quality for stony streams. *Water and Soil Miscellaneous Publication No. 87.*
- Stark JD, 1998: SQMCI: a biotic index for freshwater macroinvertebrate coded abundance data. *New Zealand Journal of Marine and Freshwater Research* 32(1): 55-66.
- Stark JD, 1999: An evaluation of Taranaki Regional Council's SQMCI biomonitoring index Cawthon Institute, Nelson. Cawthon Report No. 472.
- Stark JD, Boothroyd IKG, Harding JS, Maxted JR, Scarsbrook MR, 2001: Protocols for sampling macroinvertebrates in wadeable streams. New Zealand Macroinvertebrate Working Group Report No. 1. Prepared for the Ministry for the Environment. Sustainable Management Fund Project No. 5103. 57p.
- Taranaki Regional Council, 1990: Taranaki Electricity Manganui Diversion Race Monitoring 1989/90. Technical Report 90-39.
- Taranaki Regional Council, 1991: Taranaki Electricity Manganui River diversion, biological and race water level monitoring 1990/91. Technical Report 91-9.
- Taranaki Regional Council, 1992: Taranaki Electricity Motukawa Power Scheme Monitoring Annual Report 1991/92. Report SM352.
- Taranaki Regional Council, 1993: Taranaki Energy Motukawa Power Scheme Monitoring Annual Report 1992/93. Technical Report 93-9.

Taranaki Regional Council, 1994: Taranaki Energy Motukawa Power Scheme Monitoring Annual Report 1993/94. Technical Report 94-3.

Taranaki Regional Council, 1995: Taranaki Energy Motukawa Power Scheme Monitoring Annual Report 1994/95. Technical Report 95-7.

Taranaki Regional Council, 1996: Taranaki Energy (A Division of Powerco Ltd) Motukawa Power Scheme Monitoring Programme Annual Report 1995-1996. Technical Report 96-31.

Taranaki Regional Council, 1997: Taranaki Energy (A Division of Powerco Ltd) Motukawa Power Scheme Monitoring Programme Annual Report 1996-97. Technical Report 97-29.

Taranaki Regional Council, 1998: Powerco Ltd Motukawa Power Scheme Monitoring Programme Annual Report 1997-98. Technical Report 98-22.

Taranaki Regional Council, 1999a: Taranaki Generation Ltd Motukawa Power Scheme Monitoring Programme Annual Report 1998-99. Technical Report 99-13.

Taranaki Regional Council, 1999b: Hearing Committee Report on an application by Taranaki Generation Limited [formerly Powerco Limited] for 13 consents relating to the Motukawa Hydroelectric Power Scheme.

Taranaki Regional Council, 1999c: Taranaki Generation Limited [formally Powerco Limited] Motukawa Hydroelectric Scheme Application for Resource Consents. Officers Report 26 July 1999.

Taranaki Regional Council, 2000: Taranaki Generation Ltd Motukawa Power Scheme Monitoring Programme Annual Report 1999-2000. Technical Report 2000-14.

Taranaki Regional Council, 2001: Taranaki Generation Ltd Motukawa HEP Scheme Monitoring Programme Annual Report 2000-2001. Technical Report 2001-09.

Taranaki Regional Council, 2003: TrustPower - Taranaki Generation Ltd Motukawa Power Scheme Monitoring Programme Annual Report 2001-2002. Technical Report 2002-54.

Taranaki Regional Council, 2004: TrustPower - Taranaki Generation Ltd Motukawa HEP Scheme Monitoring Programme Annual Report 2002-2003. Technical Report 2003-98.

Taranaki Regional Council, 2005: TrustPower - Taranaki Generation Ltd Motukawa HEP Scheme Monitoring Programme Annual Report 2003-2004. Technical Report 2004-81.

Taranaki Regional Council, 2006: TrustPower - Taranaki Generation Ltd Motukawa HEP Scheme Monitoring Programme Annual Report 2004-2005. Technical Report 2005-43.

Taranaki Regional Council, 2006: TrustPower - Taranaki Generation Ltd Motukawa HEP Scheme Monitoring Programme Annual Report 2005-2006. Technical Report 2006-58.

Taranaki Regional Council, 2009: TrustPower - Taranaki Generation Ltd Motukawa HEP Scheme Monitoring Programme Biennial Report 2006-2008. Technical Report 2008-06.

Taranaki Regional Council, 2010: TrustPower – Taranaki Generation Ltd Motukawa HEP Scheme Monitoring Programme Biennial Report 2008-2010. Technical Report 2010-20.

Taranaki Regional Council, 2015: Trustpower Ltd Motukawa HEP Scheme Monitoring Programme Monitoring Report 2010-2014. Technical Report 2014-79

Appendix I

Resource consents held by Trustpower Ltd Motukawa HEP Scheme



**Water Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council**

CHIEF EXECUTIVE
PRIVATE BAG 713
47 CLOTH ROAD
STRATFORD
NEW ZEALAND
PHONE 06-765 7127
FAX 06-765 5097

Please quote our file number
on all correspondence

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted 27 July 2004
Date:

Conditions of Consent

Consent Granted: To divert and use water in the Motukawa Race for hydroelectric power generation purposes at or about GR: Q19:228-200

Expiry Date: 1 June 2022

Review Date(s): June 2009, June 2015

Site Location: Motukawa Race, Mangaotea Road, Ratapiko

Legal Description: Subdivision 2-3 Sec 2 Blk V Huiroa SD, Subdivision 1-2 Section 25 Blk VI Huiroa SD, and Subdivision 2-3 Section 27 Blk VI Huiroa SD

Catchment: Waitara

Tributary: Manganui
Lake Ratapiko
Motukawa Race

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this resource consent.
2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 3058. In the case of any contradiction between the documentation submitted in support of application 3058 and the conditions of this consent, the conditions of this consent shall prevail.
3. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least seven days prior to the exercise of this consent.
4. This consent shall lapse on the expiry of ten years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.
5. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 27 July 2004

For and on behalf of
Taranaki Regional Council



Director - Resource Management



Discharge Permit

**Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council**

CHIEF EXECUTIVE
PRIVATE BAG 713
47 CLOTH ROAD
STRATFORD
NEW ZEALAND
PHONE 06-765 7127
FAX 06-765 5097

Please quote our file number
on all correspondence

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 27 July 2004

Conditions of Consent

Consent Granted: To discharge sediment during earthworks associated with the construction of a generator structure into the Motukawa Race at or about GR: Q19:228-200

Expiry Date: 1 June 2022

Review Date(s): June 2009, June 2015

Site Location: Motukawa Race, Mangaotea Road, Ratapiko

Legal Description: Subdivision 2-3 Sec 2 Blk V Huiroa SD, Subdivision 1-2 Section 25 Blk VI Huiroa SD, and Subdivision 2-3 Section 27 Blk VI Huiroa SD

Catchment: Waitara

Tributary: Manganui
Lake Ratapiko
Motukawa Race

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document
www.trc.govt.nz*

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

- 1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this resource consent.
- 2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 3061. In the case of any contradiction between the documentation submitted in support of application 3061 and the conditions of this consent, the conditions of this consent shall prevail.
- 3. The consent holder shall notify the Chief Executive, Taranaki Regional Council in writing at least 48 hours prior to the commencement and upon completion of the initial installation and again at least 48 hours prior to and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the river bed or discharges to water.
- 4. Prior to the exercise of this consent, the consent holder shall provide for the written approval of the Chief Executive, Taranaki Regional Council, a site erosion and sediment control management plan.
- 5. After allowing for reasonable mixing, being a mixing zone extending seven times the width of the surface water body at the point of discharge, the discharge shall not give rise to any of the following effects in any surface water body:
 - a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - b) any conspicuous change in the colour or visual clarity;
 - c) any emission of objectionable odour;
 - d) the rendering of fresh water unsuitable for consumption by farm animals;
 - e) any significant adverse effects on aquatic life.
- 6. All earthwork areas shall be stabilised vegetatively or otherwise as soon as is practicable immediately following completion of soil disturbance activities to the satisfaction of the Chief Executive, Taranaki Regional Council.

Consent 6391-1

7. This consent shall lapse on the expiry of ten years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.
8. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 27 July 2004

For and on behalf of
Taranaki Regional Council



~~Director Resource Management~~

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 7 December 2005

Conditions of Consent

Consent Granted: To discharge sediments from earthworks into the Mangaotea Stream, a tributary of the Manganui River in the Waitara catchment, associated with the construction of an intake structure, for hydroelectric power generation purposes at or about GR: Q19:228-200

Expiry Date: 1 June 2022

Review Date(s): June 2007, June 2009, June 2015

Site Location: Downstream of Mangaotea Aquaduct, Mangaotea Road, Ratapiko

Legal Description: Pt Secs 32-34 Blk VI Huiroa SD, Lots 2-3 Lot 5 DP 7088
Lot 2 DP 16055

Catchment: Waitara

Tributary: Manganui
Mangaotea

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this resource consent.
2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 3057. In the case of any contradiction between the documentation submitted in support of application 3057 and the conditions of this consent, the conditions of this consent shall prevail.
3. The consent holder shall notify the Chief Executive, Taranaki Regional Council in writing at least 14 days prior to the commencement and upon completion of the initial installation and again at least 48 hours prior to and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the streambed or discharges to water.
4. Prior to the exercise of this consent, the consent holder shall provide for the written approval of the Chief Executive, Taranaki Regional Council, a site erosion and sediment control management plan.
5. The instream works authorised by this consent shall take place only between 1 November and 30 April inclusive, except where this requirement is waived in writing by the Chief Executive, Taranaki Regional Council.
6. After allowing for reasonable mixing, being a mixing zone extending seven times the width of the stream at the point of discharge, the discharge shall not give rise to any of the following effects in the stream:
 - a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - b) any conspicuous change in the colour or visual clarity;
 - c) any emission of objectionable odour;
 - d) the rendering of fresh water unsuitable for consumption by farm animals;

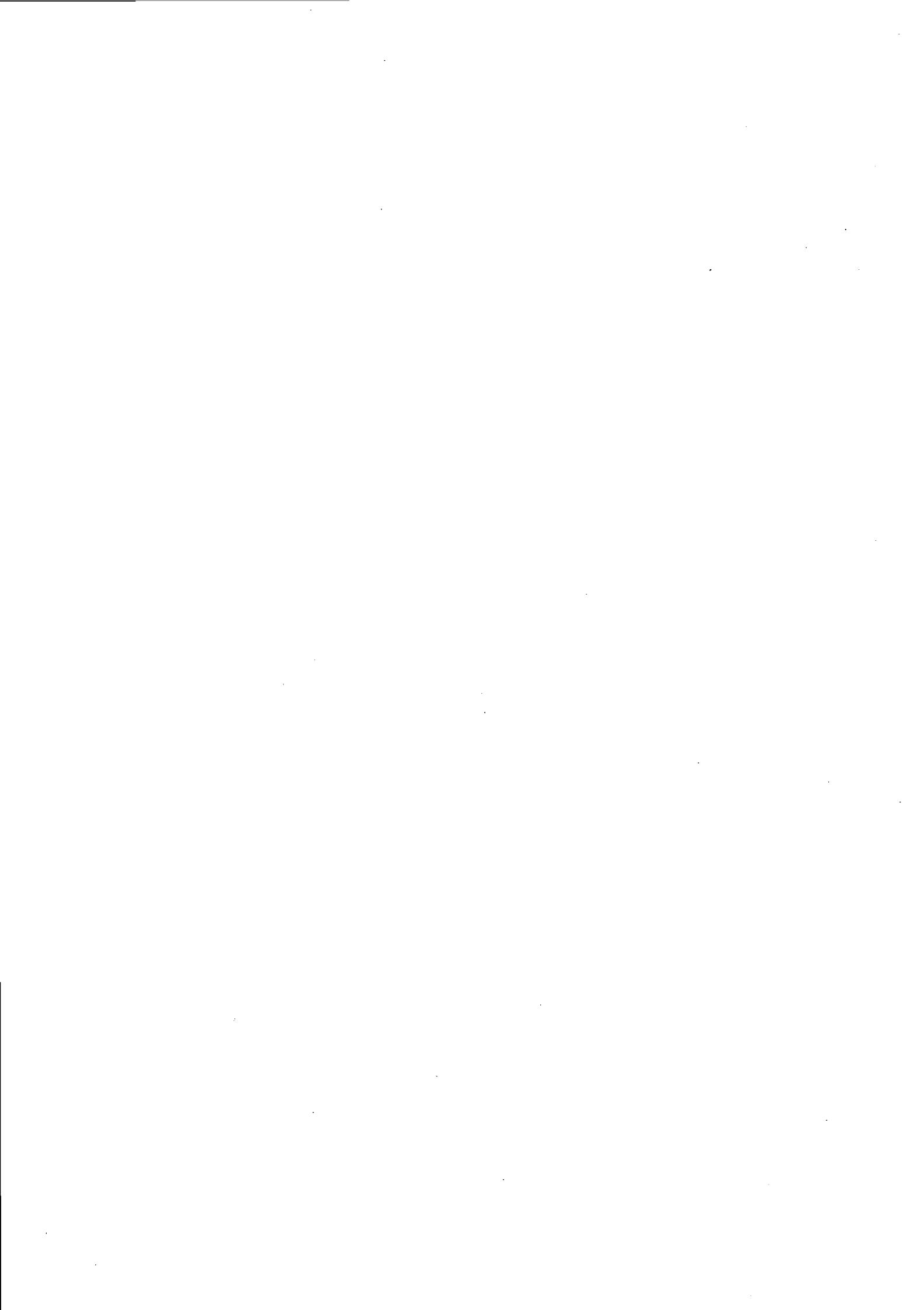
Consent 6387-1

- e) any significant adverse effects on aquatic life.
- 7. All earthwork areas shall be stabilised vegetatively or otherwise as soon as is practicable immediately following completion of soil disturbance activities, and all areas disturbed shall be reinstated, to the satisfaction of the Chief Executive, Taranaki Regional Council.
- 8. This consent shall lapse on the expiry of ten years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.
- 9. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2007 and/or June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 7 December 2005

For and on behalf of
Taranaki Regional Council

Director-Resource Management



Land Use Consent
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 7 December 2005

Conditions of Consent

Consent Granted: To disturb and modify the bed and banks of the Mangaotea Stream, a tributary of the Manganui River in the Waitara catchment, associated with the construction of an intake structure for hydroelectric power generation purposes at or about GR: Q19:228-200

Expiry Date: 1 June 2022

Review Date(s): June 2007, June 2009, June 2015

Site Location: Downstream of Mangaotea Aquaduct, Mangaotea Road, Ratapiko

Legal Description: Pt Secs 32-34 Blk VI Huiroa SD, Lots 2-3 Lot 5 DP 7088
Lot 2 DP 16055

Catchment: Waitara

Tributary: Manganui
Mangaotea

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this resource consent.
2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 3056. In the case of any contradiction between the documentation submitted in support of application 3056 and the conditions of this consent, the conditions of this consent shall prevail.
3. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least 14 days prior to the exercise of this consent and then 48 hours upon completion of the initial activity, and again at least 48 hours prior to and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the riverbed or discharges to water.
4. The instream works authorised by this consent shall take place only between 1 November and 30 April inclusive, except where this requirement is waived in writing by the Chief Executive, Taranaki Regional Council.
5. The consent holder shall ensure that the area and volume of riverbed disturbance shall, so far as practicable, be minimised and any areas which are disturbed shall, so far as practicable, be reinstated.
6. The streambed works which are the subject of this consent shall not obstruct fish passage.
7. This consent shall lapse on the expiry of ten years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

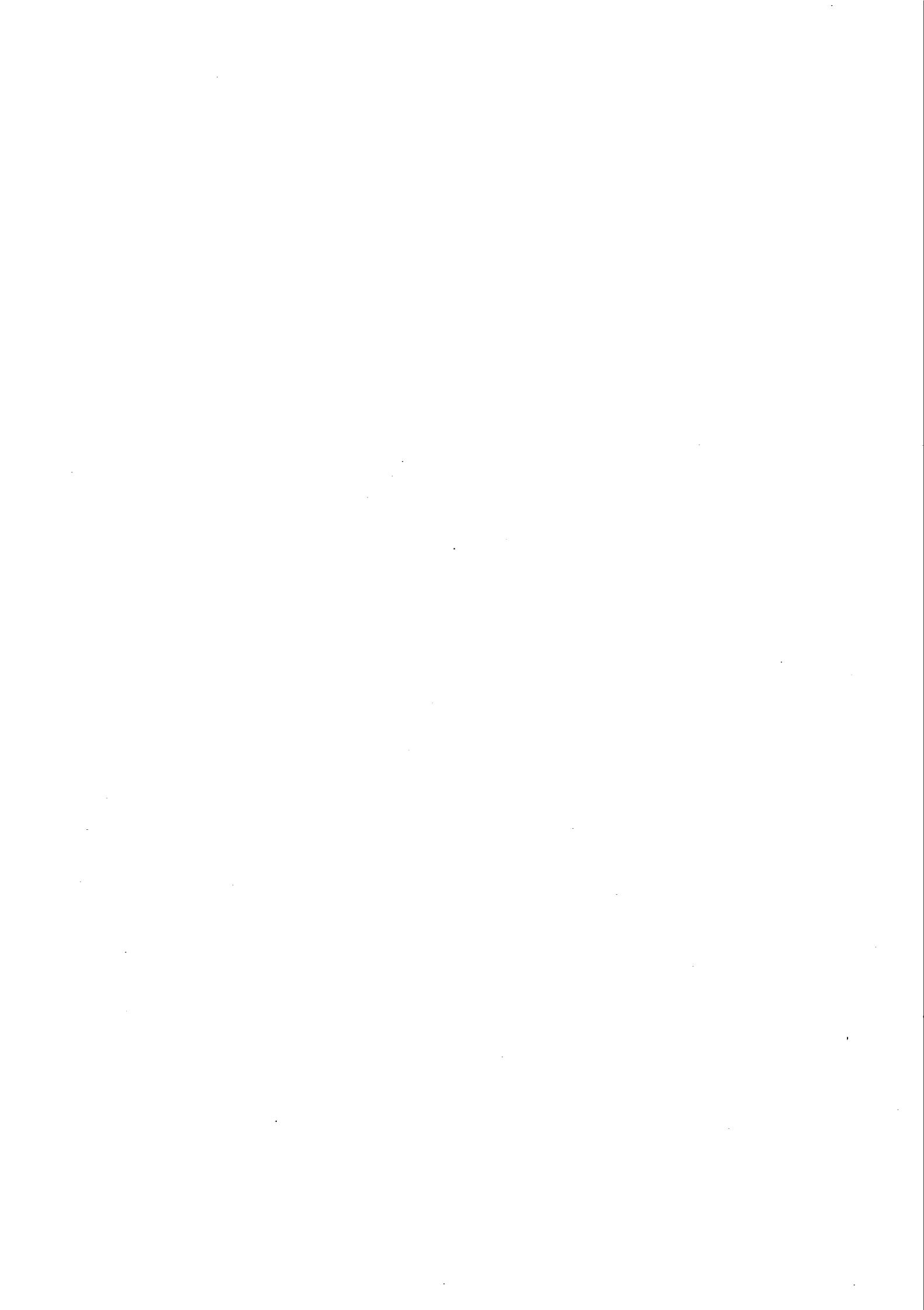
Consent 6386-1

8. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2007 and/or June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 7 December 2005

For and on behalf of
Taranaki Regional Council

Director-Resource Management



Land Use Consent
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 7 December 2005

Conditions of Consent

Consent Granted: To erect, place and maintain a temporary dam within the Mangaotea Stream, a tributary of the Manganui River in the Waitara catchment, for the purposes of constructing a water intake structure for hydroelectric power generation purposes at or about GR: Q19:228-200

Expiry Date: 1 June 2022

Review Date(s): June 2007, June 2009, June 2015

Site Location: Downstream of Mangaotea Aquaduct, Mangaotea Road, Ratapiko

Legal Description: Pt Secs 32-34 Blk VI Huiroa SD, Lots 2-3 Lot 5 DP 7088
Lot 2 DP 16055

Catchment: Waitara

Tributary: Manganui
Mangaotea

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this resource consent.
2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 3054. In the case of any contradiction between the documentation submitted in support of application 3054 and the conditions of this consent, the conditions of this consent shall prevail.
3. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least 14 days prior to the exercise of this consent and then 48 hours upon completion of the initial activity, and again at least 48 hours prior to and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the riverbed or discharges to water.
4. The instream works authorised by this consent shall take place only between 1 November and 30 April inclusive, except where this requirement is waived in writing by the Chief Executive, Taranaki Regional Council.
5. The consent holder shall ensure that the area and volume of streambed disturbance shall, so far as practicable, be minimised and any areas which are disturbed shall, so far as practicable, be reinstated.
6. The diversion and impoundment which is the subject of this consent shall not obstruct fish passage.
7. This consent shall lapse on the expiry of ten years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

Consent 6384-1

8. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2007 and/or June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 7 December 2005

For and on behalf of
Taranaki Regional Council

Director-Resource Management



Water Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 7 December 2005

Conditions of Consent

Consent Granted: To divert water around a temporary dam within the Mangaotea Stream, a tributary of the Manganui River in the Waitara catchment, for the purposes of constructing a water intake structure for hydroelectric power generation purposes at or about GR: Q19:228-200

Expiry Date: 1 June 2022

Review Date(s): June 2007, June 2009, June 2015

Site Location: Downstream of Mangaotea Aquaduct, Mangaotea Road, Ratapiko

Legal Description: Pt Secs 32-34 Blk VI Huiroa SD, Lots 2-3 Lot 5 DP 7088
Lot 2 DP 16055

Catchment: Waitara

Tributary: Manganui
Mangaotea

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

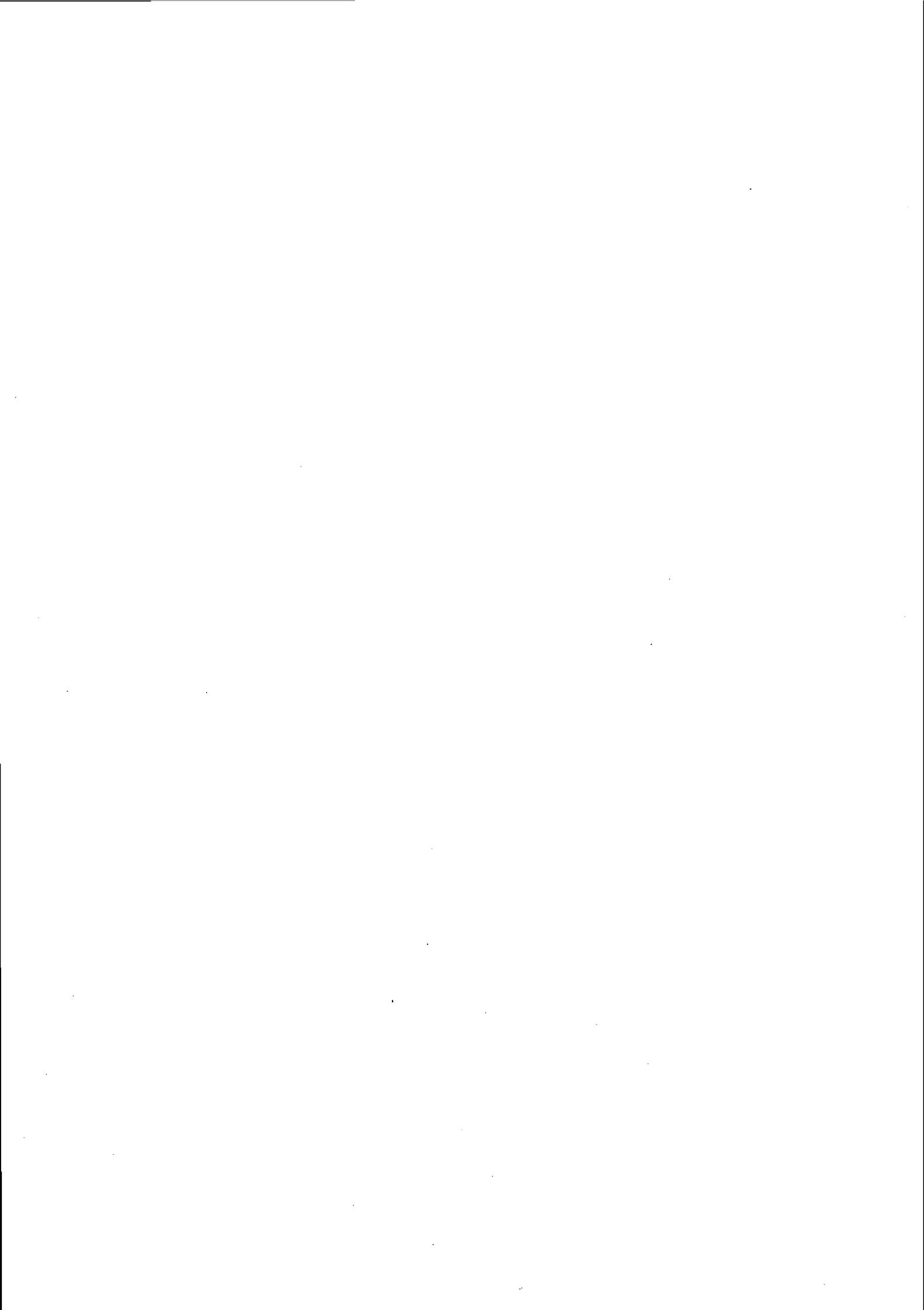
1. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 3053. In the case of any contradiction between the documentation submitted in support of application 3053 and the conditions of this consent, the conditions of this consent shall prevail.
2. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least 14 days prior to the exercise of this consent and then 48 hours upon completion of the activity.
3. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least 48 hours prior to the commencement and upon completion of the initial activity and again at least 48 hours prior to and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the riverbed or discharges to water.
4. The instream works authorised by this consent shall take place only between 1 November and 30 April inclusive, except where this requirement is waived in writing by the Chief Executive, Taranaki Regional Council.
5. The consent holder shall ensure that the area and volume of streambed disturbance shall, so far as practicable, be minimised and any areas which are disturbed shall, so far as practicable, be reinstated.
6. The diversion and impoundment which is the subject of this consent shall not obstruct fish passage.
7. This consent shall lapse on the expiry of ten years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

8. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2007 and/or June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 7 December 2005

For and on behalf of
Taranaki Regional Council

Director-Resource Management



Water Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 7 December 2005

Conditions of Consent

Consent Granted: To impound water behind a temporary dam within the Mangaotea Stream a tributary of the Manganui River in the Waitara catchment, for the purposes of constructing a water intake structure for hydroelectric power generation purposes at or about GR: Q19:228-200

Expiry Date: 1 June 2022

Review Date(s): June 2007, June 2009, June 2015

Site Location: Downstream of Mangaotea Aquaduct, Mangaotea Road, Ratapiko

Legal Description: Pt Secs 32-34 Blk VI Huiroa SD, Lots 2-3 Lot 5 DP 7088
Lot 2 DP 16055

Catchment: Waitara

Tributary: Manganui
Mangaotea

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 3052. In the case of any contradiction between the documentation submitted in support of application 3052 and the conditions of this consent, the conditions of this consent shall prevail.
2. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least 14 days prior to the exercise of this consent and then 48 hours upon completion of the activity.
3. The instream works authorised by this consent shall take place only between 1 November and 30 April inclusive, except where this requirement is waived in writing by the Chief Executive, Taranaki Regional Council.
4. The consent holder shall ensure that the area and volume of streambed disturbance shall, so far as practicable, be minimised and any areas which are disturbed shall, so far as practicable, be reinstated.
5. The diversion and impoundment which is the subject of this consent shall not obstruct fish passage.
6. This consent shall lapse on the expiry of ten years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

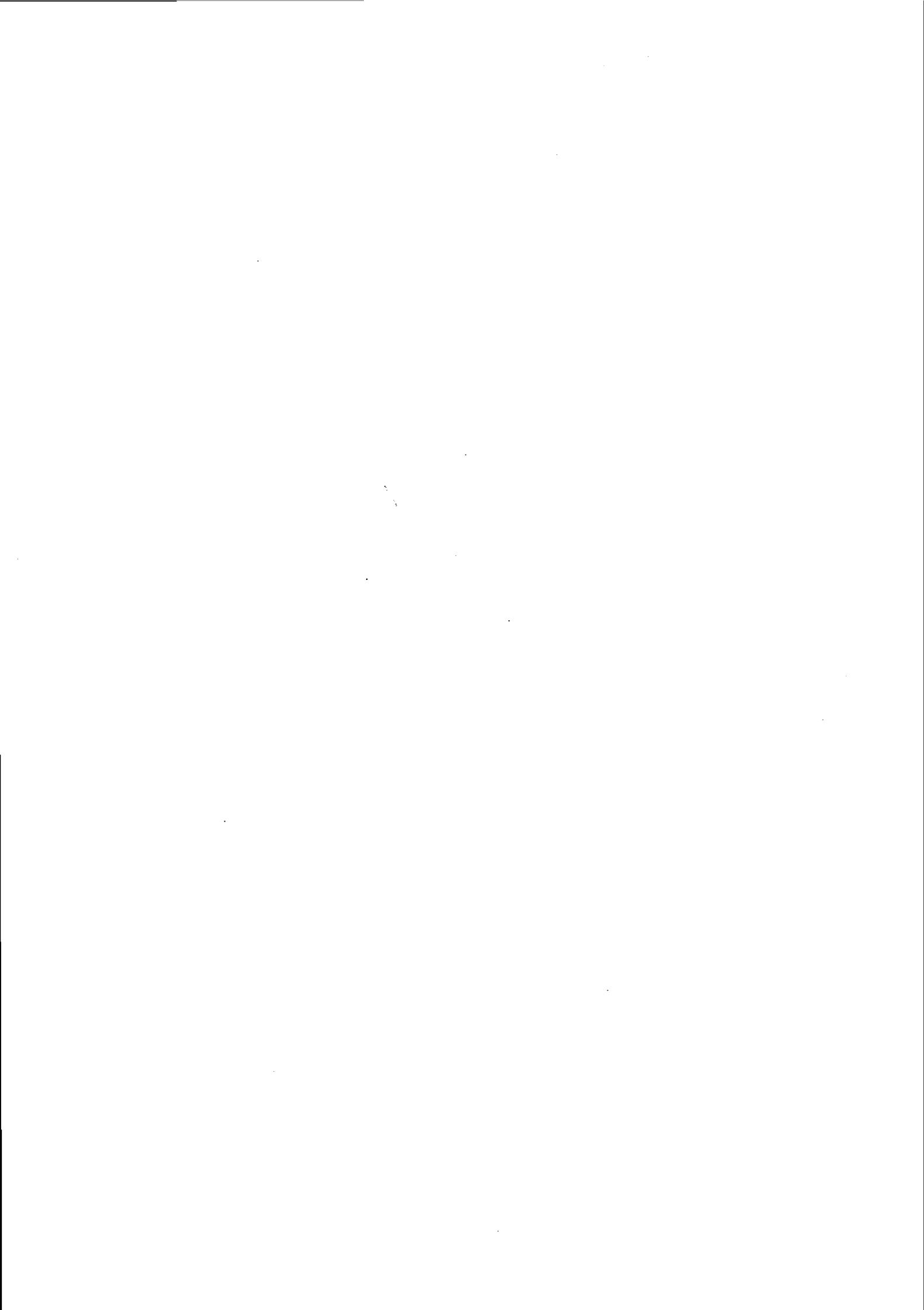
Consent 6382-1

7. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2007 and/or June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 7 December 2005

For and on behalf of
Taranaki Regional Council

Director-Resource Management



Water Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 7 December 2005

Conditions of Consent

Consent Granted: To take and use water from the Mangaotea Stream, a tributary of the Manganui River in the Waitara catchment, for hydroelectric power generation purposes at or about GR: Q19:228-200

Expiry Date: 1 June 2022

Review Date(s): June 2007, June 2009, June 2015

Site Location: Downstream of Mangaotea Aquaduct, Mangaotea Road, Ratapiko,

Legal Description: Pt Secs 32-34 Blk VI Huiroa SD, Lots 2-3 Lot 5 DP 7088
Lot 2 DP 16055

Catchment: Waitara

Tributary: Manganui
Mangaotea

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

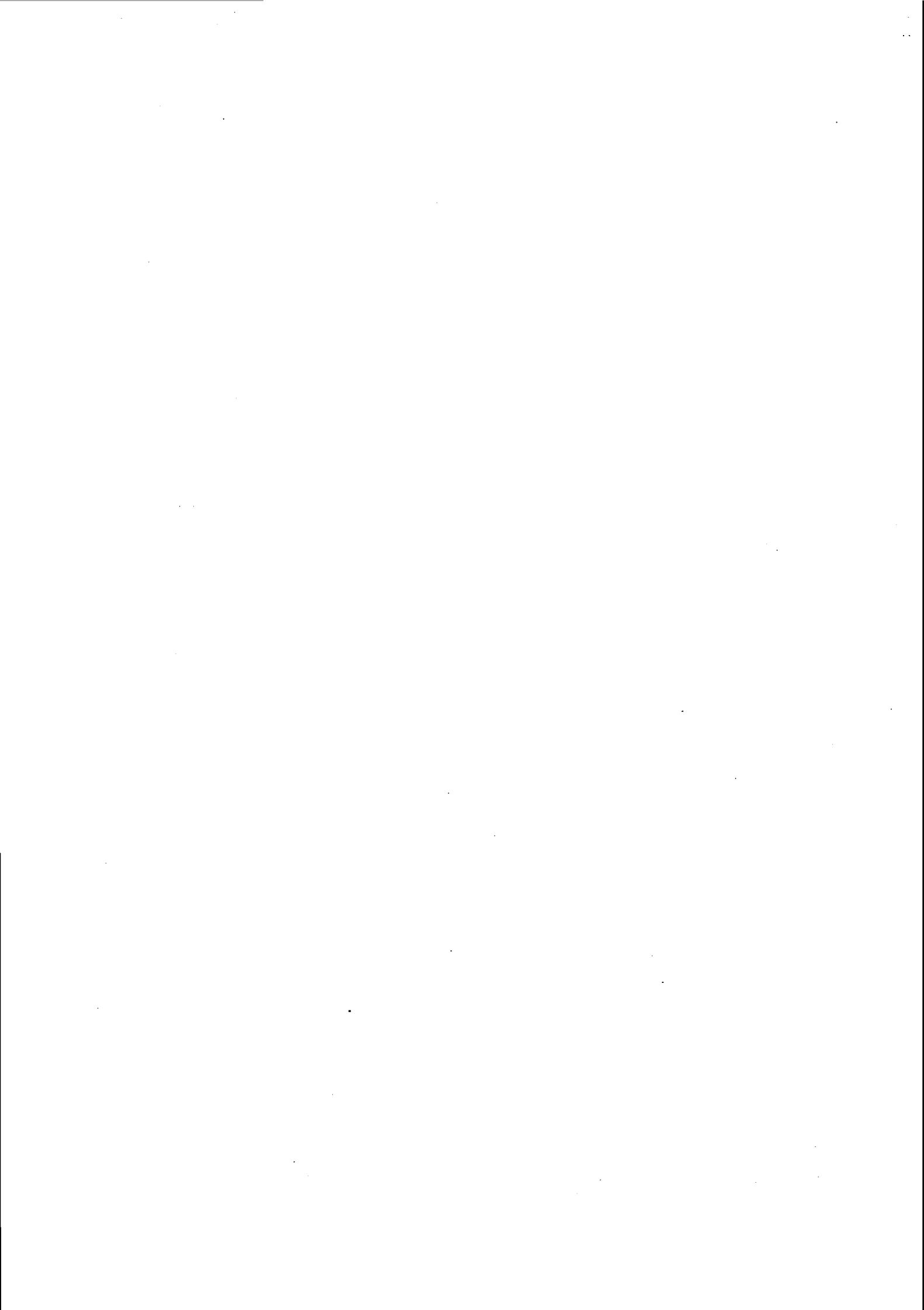
1. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 3051. In the case of any contradiction between the documentation submitted in support of application 3051 and the conditions of this consent, the conditions of this consent shall prevail.
2. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least seven days prior to the exercise of this consent.
3. The volume of water abstracted shall not exceed 38,880 cubic metres per day at a rate not exceeding 450 litres per second.
4. For the first two years following the exercise of this consent the abstraction authorised by this consent shall cease when the flow in the Mangaotea Stream immediately downstream of the confluence with the Little Mangaotea Stream located at Q19: 227-201 (GPS E2622779 N6220149) is equal to or less than 94 litres per second. If at this site flows are greater than 94 litres per second, the abstraction shall cease when the flow in the Mangaotea Stream immediately downstream of the abstraction point (GPS E2622836 N6220071) is equal to or less than 35 L/s.
5. Two years after the exercise of this consent, and following assessment of monitoring conducted as per special conditions 8, if a review of the residual flows detailed in special condition 4 is required (as per condition 9), residual flows shall be based on 55% of the median flow immediately downstream of the confluence with the Little Mangaotea Stream, and at the point of abstraction shall be 35 L/s or mean annual low flow whichever is higher.
6. That if a flushing flow (defined as three times the median flow) has not occurred within a continuous period of 20 days, the consent holder shall cease abstraction for 8 hours during the next naturally occurring flushing flow, so as to enhance water quality downstream of the abstraction point.

Consent 6381-1

7. Prior to the operation of this consent, the consent holder shall install and operate measuring devices capable of measuring, at a minimum of 15 minute intervals the:
 - abstraction rate of water from the Mangaotea Stream;
 - residual flow in the Mangaotea Stream immediately downstream of the abstraction point; and
 - flow downstream of the confluence with the Little Mangaotea Stream;and shall make records of such measurements available to the Chief Executive, Taranaki Regional Council, at three monthly intervals.
8. In the first two years following the exercise of this consent, a monitoring programme designed in consultation with submitters and the Taranaki Regional Council, shall be commissioned and implemented by the consent holder to determine hydrological and ecological effects on the Mangaotea Stream and Manganui River downstream of the Mangaotea Stream confluence, and whether the residual flow is appropriate. Following the completion of monitoring, the consent holder shall forward the report(s) of these investigations to the Taranaki Regional Council and submitters within 6 weeks.
9. In accordance with section 128 of the Resource Management Act 1991, the Taranaki Regional Council may review the conditions of this consent if, after the completion of the residual flow monitoring and ecological assessments, two years following the exercise of this consent, and in consultation with submitters, it is found that the residual flow and/or flow regime is not appropriate.
10. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate and at least once per year, with interested submitters to the consent, to discuss any matter relating to the exercise of this resource consent, particularly the monitoring programme design, implementation and interpretation, in order to facilitate ongoing consultation.
11. This consent shall lapse on the expiry of ten years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.
12. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2007 and/or June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 7 December 2005

For and on behalf of
Taranaki Regional Council



Water Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Change To
Conditions Date: 23 June 2006 [Granted: 27 July 2004]

Conditions of Consent

Consent Granted: To impound water behind a dam on the Motukawa Race for hydroelectric power generation purposes at or about GR: Q19:228-200

Expiry Date: 1 June 2022

Review Date(s): June 2009, June 2015

Site Location: Motukawa Race, Mangaotea Road, Ratapiko, Inglewood

Legal Description: Subdivision 2-3 Sec 2 Blk V Huiroa SD, Subdivision 1-2 Section 25 Blk VI Huiroa SD, and Subdivision 2-3 Section 27 Blk VI Huiroa SD

Catchment: Waitara

Tributary: Manganui
Lake Ratapiko
Motukawa Race

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

Condition 1 – unchanged

- 1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this resource consent.

Condition 2 – changed

- 2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 3060 and 4257. In the case of any contradiction between the documentation submitted in support of application 3060, 4257, and the conditions of this consent, the conditions of this consent shall prevail.

Conditions 3 to 6 – unchanged

- 3. The consent holder shall notify the Chief Executive, Taranaki Regional Council, and Fish and Game New Zealand [Taranaki Region], in writing at least 14 days prior to the construction of the dam and turbine unit in the Motukawa Race.
- 4. The consent holder shall ensure that the intake is appropriately screened to avoid the entrapment of freshwater fauna.

5. The consent holder shall, on three occasions during November to February each year, cease generation from the turbine unit and open the bypass valve for 12 hours in order to enable trout to pass through the dam.
6. The consent holder shall monitor the effectiveness of the bypass valve as a fish passage device for the first six [6] bypass events, and shall provide monitoring data to the Chief Executive, Taranaki Regional Council, and Fish and Game New Zealand [Taranaki Region], as soon as practicable after the sixth monitoring event. Monitoring shall include:
 - (a) A visual inspection of the section of the Motukawa Race from the outlet of Coxhead Tunnel to the dam site prior to the first six [6] bypass events in order to determine whether trout are accumulating in the head pond; and
 - (b) A survey of trout in the 100 metre section of the Motukawa Race downstream of the dam, prior to and immediately following the completion of each of the first six [6] bypass events.

Condition 7 – changed

7. In accordance with section 128 of the Resource Management Act 1991, the Taranaki Regional Council may review the conditions of this consent if, after the completion of the first six [6] bypass events, the monitoring shows that a significant number of trout accumulate in the generator head pond and are not being passed by the bypass valve, or there are a significant number of trout mortalities caused by passage through the turbine.

Conditions 8 to 10 – unchanged

8. The consent holder shall manage the water in the race so as to avoid or minimise the potential for flooding of adjacent farmland attributable to the activities of the consent holder by ensuring a maximum race water level [metres], above mean sea-level of:
 - 205.20 at Coxhead's Bridge [GR Q20:219 198];
 - 199.30 upstream of Mangaotea Road culvert [GR Q19:227 201];
 - 199.25 at the Mangaotea Aqueduct [GR Q19:228 201]; and
 - 199.15 at Berryman's Bridge [GR Q9:239-213].
9. This consent shall lapse on the expiry of ten years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

10. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 23 June 2006

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Land Use Consent
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Change To
Conditions Date: 9 February 2007 [Granted: 7 December 2005]

Conditions of Consent

Consent Granted: To erect, place and maintain an intake structure including pumps in the bed of the Mangaotea Stream for the purposes of abstracting water for hydroelectric power generation purposes at or about GR: Q19:228-200

Expiry Date: 1 June 2022

Review Date(s): June 2007, June 2009, June 2015

Site Location: Downstream of Mangaotea Aqueduct, Mangaotea Road, Ratapiko

Legal Description: Pt Secs 32-34 Blk VI Huiroa SD, Lots 2-3 Lot 5 DP 7088
Lot 2 DP 16055

Catchment: Waitara

Tributary: Manganui
Mangaotea

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

Condition 1 – unchanged

- 1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this resource consent.

Condition 2 - changed

- 2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of applications 3055 & 4338. In the case of any contradiction between the documentation submitted in support of applications 3055 & 4338 and the conditions of this consent, the conditions of this consent shall prevail.

Conditions 3 – 10 – unchanged

- 3. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least 14 days prior to the exercise of this consent and then 48 hours upon completion of the initial activity, and again at least 48 hours prior to and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the streambed or discharges to water.
- 4. The instream works authorised by this consent shall take place only between 1 November and 30 April inclusive, except where this requirement is waived in writing by the Chief Executive, Taranaki Regional Council.
- 5. The consent holder shall ensure that the area and volume of streambed disturbance shall, so far as practicable, be minimised and any areas which are disturbed shall, so far as practicable, be reinstated.
- 6. The structure which is the subject of this consent shall not obstruct fish passage.

Consent 6385-1

7. The consent holder shall ensure that the intake is appropriately screened to avoid the entrapment of freshwater fauna.
8. The structure[s] authorised by this consent shall be removed and the area reinstated, if and when the structure[s] are no longer required. The consent holder shall notify the Taranaki Regional Council at least 48 hours prior to structure[s] removal and reinstatement.
9. This consent shall lapse on the expiry of ten years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.
10. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2007 and/or June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 9 February 2007

For and on behalf of
Taranaki Regional Council

Director-Resource Management



Land Use Consent
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 19 September 2001

Conditions of Consent

Consent Granted: To disturb the bed of Lake Ratapiko in the Waitara catchment for maintenance and repairs associated with hydroelectric power generation purposes at or about 2624800E-6221300N

Expiry Date: 1 June 2022

Review Date(s): June 2001, June 2003, June 2009, June 2015

Site Location: Ratapiko Road, Ratapiko, Inglewood

Legal Description: Pt 51-52, 54-55 Blk VI Huiroa SD

Catchment: Waitara

Tributary: Lake Ratapiko

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. That the consent holder shall notify the Taranaki Regional Council at least 48 hours prior to the commencement of any disturbance activities.
2. That the consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or potential effect on the environment arising from any disturbance activities.
3. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with interested submitters to the consent, to discuss any matter relating to the exercise of this resource consent, particularly the monitoring programme design, implementation and interpretation, in order to facilitate ongoing consultation.
4. That the consent holder may apply to the Taranaki Regional Council for a change or cancellation of the conditions of their consent, in accordance with section 127(1)(a) of the Resource Management Act 1991, to take account of operational requirements or the results of the monitoring, provided that such application may not be made more than once in any twelve month period.
5. That the Taranaki Regional Council may review any or all of the conditions of this consent, pursuant to section 128 of the Resource Management Act 1991, by giving notice of review during the month of June 2001, June 2003, June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 31 July 2007

For and on behalf of
Taranaki Regional Council

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 19 September 2001

Conditions of Consent

Consent Granted: To discharge up to 55,000 litres/second of hydroelectric power generation water, during adverse weather conditions, via spillways and lake drainage valves from Lake Ratapiko into the Mako Stream a tributary of the Makino Stream in the Waitara catchment at or about 2625100E-6220900N

Expiry Date: 1 June 2022

Review Date(s): June 2001, June 2003, June 2009, June 2015

Site Location: Ratapiko Road, Ratapiko, Inglewood

Legal Description: Sub 4 Pt Sec 54 Blk VI Huiroa SD

Catchment: Waitara

Tributary: Makino
Mako

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

- 1. That the consent holder shall, within 6 months of the granting of this consent, prepare a contingency plan for the purpose of managing the discharge so as to avoid or minimise damage to property downstream. The contingency plan shall include reporting the exercise of the consent.
- 2. That the consent holder shall exercise the consent in accordance with the contingency plan.
- 3. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with interested submitters to the consent, to discuss any matter relating to the exercise of this resource consent, particularly the monitoring programme design, implementation and interpretation, in order to facilitate ongoing consultation.
- 4. That the consent holder may apply to the Taranaki Regional Council for a change or cancellation of the conditions of their consent, in accordance with section 127(1)(a) of the Resource Management Act 1991, to take account of operational requirements or the results of the monitoring, provided that such application may not be made more than once in any twelve month period.

Consent 5084-1

5. That the Taranaki Regional Council may review any or all of the conditions of this consent, pursuant to section 128 of the Resource Management Act 1991, by giving notice of review during the month of June 2001, June 2003, June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 31 July 2007

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted 19 August 1999
Date:

Conditions of Consent

Consent Granted: To discharge, under emergency conditions, up to 2000 litres/second of overflow water from the Mangaotea Aqueduct into the Mangaotea Stream a tributary of the Manganui River in the Waitara catchment at or about 2622800E-6220100N

Expiry Date: 1 June 2022

Review Date(s): June 2001, June 2003, June 2009, June 2015

Site Location: Mangaotea Aqueduct Mangaotea Road, Ratapiko, Inglewood

Legal Description: Lot 3 D P 11327 Pt Sec 33 Blk VI Huiroa SD

Catchment: Waitara

Tributary: Manganui
Mangaotea

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. That the discharge shall occur after compliance with condition 2 of consent TRK995081 is achieved.
2. That emergency conditions constitute a period when local stormwater runoff to the race is required to be discharged to the Mangaotea Stream in order to avoid the race flooding adjoining land.
3. That the consent holder shall manage the discharge so as to avoid or minimise the flooding of farmland and roads below the discharge, as may be attributable to the activities of the consent holder.
4. That by the agreement of the consent holder, the consent holder shall set aside \$600 annually, [adjusted annually to reflect changes in the Cost Construction Index as published by the Department of Statistics or its succeeding organisation], for the maintenance of the flood capacity of the Mangaotea Stream below the discharge to mitigate the effects of the discharge and shall make the funds available to landowners for such works, to the reasonable satisfaction of the General Manager, Taranaki Regional Council, upon request.
5. That the consent holder may apply to the Taranaki Regional Council for a change or cancellation of the conditions of their consent, in accordance with section 127(1)(a) of the Resource Management Act 1991, to take account of operational requirements or the results of the monitoring, provided that such application may not be made more than once in any twelve month period.
6. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with interested submitters to the consent, to discuss any matter relating to the exercise of this resource consent, particularly the monitoring programme design, implementation and interpretation, in order to facilitate ongoing consultation.

Consent 5082-1

7. That the Taranaki Regional Council may review any or all of the conditions of this consent, pursuant to section 128 of the Resource Management Act 1991, by giving notice of review during the month of June 2001, June 2003, June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 31 July 2007

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Land Use Consent
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted 19 August 1999
Date:

Conditions of Consent

Consent Granted: To erect, place, use and maintain the Mangaotea Aqueduct associated with hydroelectric power generation activities in and above the Mangaotea Stream a tributary of the Manganui River in the Waitara catchment at or about 2622800E-6220100N

Expiry Date: 1 June 2022

Review Date(s): June 2001, June 2003, June 2009, June 2015

Site Location: Mangaotea Stream Aqueduct, Mangaotea Road, Ratapiko, Inglewood

Legal Description: Pt sec 25, 27, 31,32, 33, 51, 52, 54, 55 Blk IV Huiroa SD

Catchment: Waitara

Tributary: Manganui
Mangaotea

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

- 1. That the consent holder shall, within 1 month of the granting of this consent, install and survey a stage board in the race at the Mangaotea Aqueduct, for the purpose of providing a visual check on race water levels, to the satisfaction of the Chief Executive.
- 2. That the consent holder shall, within 12 months of the granting of this consent, lower the northern side of the aqueduct by 300 mm to provide for a flow of 2 000 litres/second and shall install a gate in the lowered section which shall be controlled by the race water level control system.
- 3. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with interested submitters to the consent, to discuss any matter relating to the exercise of this resource consent, particularly the monitoring programme design, implementation and interpretation, in order to facilitate ongoing consultation.
- 4. That the consent holder may apply to the Taranaki Regional Council for a change or cancellation of the conditions of their consent, in accordance with section 127(1)(a) of the Resource Management Act 1991, to take account of operational requirements or the results of the monitoring, provided that such application may not be made more than once in any twelve month period.

Consent 5081-1

5. That the Taranaki Regional Council may review any or all of the conditions of this consent, pursuant to section 128 of the Resource Management Act 1991, by giving notice of review during the month of June 2001, June 2003, June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 31 July 2007

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 19 September 2001

Conditions of Consent

Consent Granted: To discharge up to 4000 cubic metres/day [10000 cubic metres/year] of dredgings from maintenance of Lake Ratapiko in the Waitara catchment onto land above the one-metre mark around the lake margin at or about 2625100E-6221500N

Expiry Date: 1 June 2022

Review Date(s): June 2001, June 2003, June 2009, June 2015

Site Location: Lake Ratapiko, Ratapiko Road, Ratapiko

Legal Description: Pt 51-52, 54-55 Blk VI Huiroa SD

Catchment: Waitara

Tributary: Lake Ratapiko

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. That the consent holder shall notify the Taranaki Regional Council at least 48 hours prior to the commencement of the discharge.
2. That the consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to avoid or minimise the discharge of silt or other contaminants onto land arising from the discharge.
3. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with interested submitters to the consent, to discuss any matter relating to the exercise of this resource consent, particularly the monitoring programme design, implementation and interpretation, in order to facilitate ongoing consultation.
4. That the consent holder may apply to the Taranaki Regional Council for a change or cancellation of the conditions of their consent, in accordance with section 127(1)(a) of the Resource Management Act 1991, to take account of operational requirements or the results of the monitoring, provided that such application may not be made more than once in any twelve month period.
5. That the Taranaki Regional Council may review any or all of the conditions of this consent, pursuant to section 128 of the Resource Management Act 1991, by giving notice of review during the month of June 2001, June 2003, June 2009, and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 31 July 2007

For and on behalf of
Taranaki Regional Council

Land Use Consent
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 19 September 2001

Conditions of Consent

Consent Granted: To erect, place, use and maintain the weir and various structures associated with hydroelectric power generation activities in the Manganui River in the Waitara catchment at or about 2620200E-6220100N

Expiry Date: 1 June 2022

Review Date(s): June 2001, June 2003, June 2009, June 2015

Site Location: Manganui River, Tariki Road, Ratapiko, Inglewood

Legal Description: Pt Sec 25, 27, 31-33, 51-52, 54-55 Huiroa SD

Catchment: Waitara

Tributary: Manganui

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. That the consent holder shall design, install, maintain and monitor a structure at the weir to enable the passage of eels, native fish, juvenile and adult trout.
2. That the fish pass structure, required by condition 1, shall be constructed within 12 months of the granting of this consent, according to sheets 1, 2 and 3 of drawing 4-1007-2-7804 supplied with the application. The consent holder shall notify the Taranaki Regional Council at least 48 hours prior to the commencement of fish pass construction.
3. That the consent holder shall install, maintain and operate a light barrier, within 6 months of the granting of this consent, for the purpose of diverting fish from the intake gate.
4. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with interested submitters to the consent, to discuss any matter relating to the exercise of this resource consent, particularly the monitoring programme design, implementation and interpretation, in order to facilitate ongoing consultation.
5. That the consent holder may apply to the Taranaki Regional Council for a change or cancellation of the conditions of their consent, in accordance with section 127(1)(a) of the Resource Management Act 1991, to take account of operational requirements or the results of the monitoring, provided that such application may not be made more than once in any twelve month period.

Consent 5080-1

6. That the Taranaki Regional Council may review any or all of the conditions of this consent, pursuant to section 128 of the Resource Management Act 1991, by giving notice of review during the month of June 2001, June 2003, June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 31 July 2007

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Land Use Consent
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 19 September 2001

Conditions of Consent

Consent Granted: To erect, place, use and maintain various structures in, on and over the bed of Lake Ratapiko in the Waitara catchment for hydroelectric power generation purposes at or about 2624800E-6221300N

Expiry Date: 1 June 2022

Review Date(s): June 2001, June 2003, June 2009, June 2015

Site Location: Ratapiko Road, Ratapiko, Inglewood

Legal Description: Pt 51-52, 54-55 Blk VI Huiroa SD

Catchment: Waitara

Tributary: Lake Ratapiko

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

- 1. That the consent holder shall maintain the penstock intake screens with spaces no larger than 30 mm in order to minimise eel and fish entrapment.
- 2. That the consent holder shall install, maintain and operate a light barrier, within 6 months of the granting of this consent, for the purpose of diverting fish from the penstock intake screens.
- 3. That the consent holder shall, within 1 month of the granting of this consent, install and survey a stage board in the lake, for the purpose of providing a visual check on lake water levels, to the satisfaction of the Chief Executive.
- 4. That the consent holder shall, within 13 months of the granting of this consent, upgrade the Ratapiko Road causeway, so as not to restrict the flow of water between the two parts of Lake Ratapiko, for the purpose of avoiding flooding land adjoining the race.
- 5. That the consent holder may apply to the Taranaki Regional Council for a change or cancellation of the conditions of this consent in accordance with section 127(1)(a) of the Resource Management Act 1991, to take account of operational requirements, or the results of monitoring, or to assess the appropriateness of condition 4, provided that such application may not be made more than once in any twelve month period.
- 6. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with interested submitters to the consent, to discuss any matter relating to the exercise of this resource consent, particularly the monitoring programme design, implementation and interpretation, in order to facilitate ongoing consultation.

Consent 5086-1

7. That the Taranaki Regional Council may review any or all of the conditions of this consent, pursuant to section 128 of the Resource Management Act 1991, by giving notice of review during the month of June 2001, June 2003, June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 31 July 2007

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Water Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 19 September 2001

Conditions of Consent

Consent Granted: To take and use up to 7787 litres/second of water from Lake Ratapiko in the Waitara catchment for hydroelectric power generation purposes at or about 2626600E-6221300N

Expiry Date: 1 June 2022

Review Date(s): June 2001, June 2003, June 2009, June 2015

Site Location: Ratapiko Road, Ratapiko, Inglewood

Legal Description: Pt 51-52, 54-55 Blk VI Huiroa SD

Catchment: Waitara

Tributary: Lake Ratapiko

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. That the consent holder shall ensure that a minimum lake water level of 194 metres above mean sea level is retained at all times, except during periods of maintenance, for the purpose of maintaining aquatic habitat.
2. That the consent holder shall, for lake maintenance purposes, draw the level of Lake Ratapiko down gradually, over a 7-day period, in order to avoid or minimise fish stranding, and shall notify the Taranaki Regional Council and Fish and Game New Zealand at the commencement of the draw down period.
3. That the consent holder shall ensure that the maximum level, under normal operating conditions, of Lake Ratapiko does not exceed 198.7 metres above mean sea level.
4. That the consent holder shall manage lake levels so as to avoid or minimise the potential for the flooding of land adjoining the lake and race attributable to the activities of the consent holder.
5. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with interested submitters to the consent, to discuss any matter relating to the exercise of this resource consent, particularly the monitoring programme design, implementation and interpretation, in order to facilitate ongoing consultation.
6. That the consent holder may apply to the Taranaki Regional Council for a change or cancellation of the conditions of their consent, in accordance with section 127(1)(a) of the Resource Management Act 1991, to take account of operational requirements or the results of the monitoring, provided that such application may not be made more than once in any twelve month period.

Consent 5087-1

7. That the Taranaki Regional Council may review any or all of the conditions of this consent, pursuant to section 128 of the Resource Management Act 1991, by giving notice of review during the month of June 2001, June 2003, June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 31 July 2007

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 19 September 2001

Conditions of Consent

Consent Granted: To discharge up to 2000 litres/second of water from the surge chamber of the Motukawa hydroelectric power station during maintenance periods into an unnamed tributary of the Makara Stream in the Waitara catchment at or about 2628500E-6222900N

Expiry Date: 1 June 2022

Review Date(s): June 2001, June 2003, June 2009, June 2015

Site Location: Motukawa Road, Ratapiko, Inglewood

Legal Description: Sub 5 Pt Sec 14 Blk VII Huiroa SD

Catchment: Waitara

Tributary: Makara

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. That the consent holder shall, within 6 months of the granting of this consent, prepare a contingency plan for the purpose of managing the discharge so as to avoid or minimise the potential for damage to property downstream.
2. The consent holder shall exercise the consent in accordance with the contingency plan.
3. That the consent holder shall notify the Taranaki Regional Council at least 48 hours prior to the discharge and shall adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or likely effect on the environment arising from the discharge.
4. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with interested submitters to the consent, to discuss any matter relating to the exercise of this resource consent, particularly the monitoring programme design, implementation and interpretation, in order to facilitate ongoing consultation.
5. That the consent holder may apply to the Taranaki Regional Council for a change or cancellation of the conditions of their consent, in accordance with section 127(1)(a) of the Resource Management Act 1991, to take account of operational requirements or the results of the monitoring, provided that such application may not be made more than once in any twelve month period.

Consent 5088-1

6. That the Taranaki Regional Council may review any or all of the conditions of this consent, pursuant to section 128 of the Resource Management Act 1991, by giving notice of review during the month of June 2001, June 2003, June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 31 July 2007

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 19 September 2001

Conditions of Consent

Consent Granted: To discharge up to 7787 litres/second of water from the Motukawa hydroelectric power station into the Makara Stream in the Waitara catchment at or about 2629400E-6223600N

Expiry Date: 1 June 2022

Review Date(s): June 2001, June 2003, June 2009, June 2015

Site Location: Motukawa Power Station, Motukawa Road, Ratapiko, Inglewood

Legal Description: Sub 5 Pt Sec 14 Blk VII Huiroa SD

Catchment: Waitara

Tributary: Makara

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

- 1. That the discharge shall be managed so as to ensure that when the flow in the Waitara River, as measured at the Bertrand Road hydrology gauging site, is less than or equal to 5000 litres/second, the flow in the upper Manganui River, above the weir will either:
 - (a) pass directly over the weir into the Manganui River; or
 - (b) pass continuously through Lake Ratapiko [with provision for the residual flow in the Manganui River] and the power station into the Makara Stream, and thence the lower Waitara River;in order to mitigate the effects of low flows in the Waitara River. The Taranaki Regional Council shall notify the consent holder when flows at the Bertrand Road site are equal to 5000 litres/second.
- 2. That the consent holder shall install and operate a measuring device capable of measuring, at a minimum of 15 minutes intervals, the discharge rate of water into the Makara Stream and shall make records of such measurements available to the Chief Executive, at three monthly intervals.
- 3. That the consent holder shall design, install, maintain and monitor a facility to enable the passage of elvers over the dam within six months of the granting of this consent. The monitoring information is to be forwarded to the Chief Executive, Taranaki Regional Council, at twelve monthly intervals
- 4. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with interested submitters to the consent, to discuss any matter relating to the exercise of this resource consent, particularly the monitoring programme design, implementation and interpretation, in order to facilitate ongoing consultation.

Consent 3372-2

5. That the consent holder may apply to the Taranaki Regional Council for a change or cancellation of the conditions of this consent, in accordance with section 127(1)(a) of the Resource Management Act 1991, to take account of operational requirements or the results of monitoring, provided that such application may not be made more than once in any twelve month period.
6. That the Taranaki Regional Council may review any or all of the conditions of this consent, pursuant to section 128 of the Resource Management Act 1991, by giving notice of review during the month of June 2001, June 2003, June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 31 July 2007

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Land Use Consent
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Change To
Conditions Date: 4 November 2002 [Granted: 19 September 2001]

Conditions of Consent

Consent Granted: To dam the Mako Stream a tributary of the Makino Stream in the Waitara catchment to form Lake Ratapiko for hydroelectric power generation purposes, including the spillway structure at or about 2625100E-6220900N

Expiry Date: 1 June 2022

Review Date(s): June 2001, June 2003, June 2009, June 2015

Site Location: Motukawa Hydroelectric Power Scheme, Lake Ratapiko, Ratapiko Road, Ratapiko, Inglewood

Legal Description: Sub 4 Pt Sec 54 Blk VI Huiroa SD

Catchment: Waitara

Tributary: Makino
Mako
Lake Ratapiko

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. That the consent holder shall, within 6 months of the granting of this consent, provide a SEED [Survey Evaluation of Existing Dams] review from a registered engineer, experienced in the design and safety of dams.
2. That it is the responsibility of the consent holder to maintain and operate a safe dam and the Taranaki Regional Council accepts no responsibility in this regard.
3. The consent holder may construct, place and maintain a structure on top of the spillway crest for the purpose of increasing lake storage.
4. That the consent holder shall manage the structure in condition 3 and the lake level so as to avoid flooding of land adjacent to the lake and race as may be attributable to the activities of the consent holder.
5. That the consent holder shall ensure that a minimum lake water level of 194 metres above mean sea level, is retained at all times, except during periods of maintenance, for the purpose of maintaining aquatic habitat.
6. That the consent holder shall ensure the maximum level, under normal operating conditions, of Lake Ratapiko does not exceed 198.7 metres above mean sea level.
7. That the consent holder shall design, install, maintain and monitor a facility to enable the passage of elvers and adult eels over the spillway within six months of the granting of this consent. The monitoring information is to be forwarded to the Chief Executive, Taranaki Regional Council, at twelve monthly intervals.
8. That the consent holder shall install and operate a measuring device capable of measuring the lake water level, at a minimum of 15 minute intervals, at the spillway, and shall make records of such measurements available to the Chief Executive, at three monthly intervals.

Consent 3373-2

9. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with interested submitters to the consent, to discuss any matter relating to the exercise of this resource consent, particularly the monitoring programme design, implementation and interpretation, in order to facilitate ongoing consultation.
10. That the consent holder may apply to the Taranaki Regional Council for a change or cancellation of the conditions of their consent, in accordance with section 127(1)(a) of the Resource Management Act 1991, to take account of operational requirements or the results of the monitoring, provided that such application may not be made more than once in any twelve month period.
11. That the Taranaki Regional Council may review any or all of the conditions of this consent, pursuant to section 128 of the Resource Management Act 1991, by giving notice of review during the month of June 2001, June 2003, June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 31 July 2007

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Water Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 19 September 2001

Conditions of Consent

Consent Granted: To divert and use up to 8000 litres/second of stormwater run-off and the entire flow of various unnamed watercourses draining into the race and into Lake Ratapiko in the Waitara catchment for hydroelectric power supply purposes between 2620200E-6220100N and 2626512E-6221308N

Expiry Date: 1 June 2022

Review Date(s): June 2001, June 2003, June 2009, June 2015

Site Location: Motukawa Hydro Race and Lake Ratapiko, Ratapiko Road, Ratapiko, Inglewood

Legal Description: Pt Sec 25, 27, 31-33, 51-52, 54-55 Huiroa SD

Catchment: Waitara

Tributary: Lake Ratapiko

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

- 1. That the consent holder shall design, install, maintain and monitor a race water level control system, within 2 months of the granting of this consent, for the purpose of achieving compliance with condition 2. The control system shall have an emergency power source capable of monitoring the system for up to 48 hours and shutting the race intake gate.
- 2. That the consent holder shall manage the water in the race so as to avoid or minimise the potential for flooding of adjacent farmland attributable to the activities of the consent holder by ensuring a maximum race water level [metres], above mean sea-level, of:
 - 205.20 at Coxhead's Bridge [GR Q20:219 198];
 - 199.30 upstream of Mangaotea Road culvert [GR Q19:227 201];
 - 199.25 at the Mangaotea Aqueduct [GR Q19:228 201]; and
 - 199.15 at Berryman's Bridge [GR Q19:239 213].
- 3. That the consent holder shall, within 1 month of granting of this consent, install and survey stage boards at the sites noted in condition 2 for the purpose of providing a visual check of race water levels, to the satisfaction of the Chief Executive.
- 4. That a five-yearly monitoring survey of the race be completed by the consent holder to identify any maintenance requirements in order to maintain a race capacity of 8000 litres/second, for the purpose of avoiding flooding adjacent farmland, any required maintenance shall occur within 12 months of the completion of the survey.
- 5. That the consent holder shall install and operate measuring devices capable of measuring the water level, at a minimum of 15 minute intervals, in the race at the locations specified in condition 2, and shall make records of such measurements available to the Chief Executive at three monthly intervals. The records supplied are also to include the rainfall data at hourly intervals from the station established at the Mangaotea Road culvert.

Consent 3371-2

6. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with interested submitters to the consent, to discuss any matter relating to the exercise of this resource consent particularly the monitoring programme design, implementation and interpretation, in order to facilitate ongoing consultation.
7. That:
 - a) In order to ensure compliance with conditions 1 to 2 of this consent or to remedy any adverse environmental effects caused by the acts or omissions of the consent holder in carrying out activities pursuant to these conditions, the Taranaki Regional Council requires the consent holder to enter into a bond with a financial institution of good repute to be provided as surety to the reasonable satisfaction of the Chief Executive;
 - b) The bond shall be in the sum of \$150,000;
 - c) The consent holder shall complete such work requested, in respect of which any bond is held, within the time period nominated by the Taranaki Regional Council's written request;
 - d) If the bond is raised and required pursuant to paragraph 7(b) it shall be held or remain in full force and effect throughout the term of the consent and until all requirements of the bond have been performed;
 - e) The form of the bond is to be prepared by the Taranaki Regional Council's solicitors and the consent holder is to pay the Taranaki Regional Council's costs on preparation and execution of the bond;
 - f) If the consent is transferred in part or whole to another party or person, the bond shall continue until any outstanding work at the date of transfer is completed to ensure compliance with the conditions of this consent, unless the Taranaki Regional Council is satisfied adequate provisions have been made to transfer the liability to the new consent holder;
 - g) In the event of any such transfer of the consent, the consent holder shall ensure that the transferee forthwith provides a replacement bond to the Taranaki Regional Council on the terms required by condition 7(a) to 7(f);
- provided that this condition shall only take effect if flooding of land adjoining the race attributable to the activities of the consent holder occurs within the period 1 May 1999 to 30 April 2000. For the avoidance of doubt, the consent holder shall not be required to establish such a bond unless such flooding occurs within that period.
8. That the Taranaki Regional Council may review, under section 128 of the Resource Management Act 1991, the conditions of this consent if, at any time after the race water level control system is installed, there is flooding of adjoining of the Motukawa Power Scheme attributable to the activities of the consent holder.

Consent 3371-2

9. That the consent holder may apply to the Taranaki Regional Council for a change or cancellation of the conditions of this consent, in accordance with section 127(1)(a) of the Resource Management Act 1991, to take account to operational requirements or the results of monitoring provided that such an application may not be made more than once in any twelve month period.
10. That the Taranaki Regional Council may review any or all of the conditions of this consent, pursuant to section 128 of the Resource Management Act 1991, by giving notice of review during the month of June 2001, June 2003, June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 31 July 2007

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Water Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: TrustPower Limited
Private Bag 12023
TAURANGA

Consent Granted
Date: 19 September 2001

Conditions of Consent

Consent Granted: To take and use up to 5200 litres/second of water from the Manganui River in the Waitara catchment for hydroelectric power generation purposes at or about 2620200E-6220100N

Expiry Date: 1 June 2022

Review Date(s): June 2001, June 2003, June 2009, June 2015

Site Location: Manganui River, Downstream Of Tariki Road Bridge, Ratapiko, Inglewood

Legal Description: Pt Sec 25, 27, 31-33, 51-52, 54-55 Huiroa SD

Catchment: Waitara

Tributary: Manganui

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. That the abstraction shall be managed to ensure that a residual flow of not less than 400 litres/second is maintained, at all times in the Manganui River below the weir situated at grid reference 2620200E-6220100N.
2. That the residual flow shall be passed through the fish pass, within 12 months of the granting of this consent, subject to conditions 1 and 2 of consent 5080.
3. That the consent holder shall install and operate a measuring device capable of measuring, at a minimum of 15 minute intervals, the abstraction rate of water from the Manganui River and shall make records of such measurements available to the Chief Executive, at three monthly intervals.
4. That the abstraction shall be managed so as to ensure that when the flow in the Waitara River, as measured at the Bertrand Road hydrology gauging site, is less than or equal to 5000 litres/second, the flow in the upper Manganui River, above the weir will either:
 - (a) pass directly over the weir into the Manganui River; or
 - (b) pass continuously through Lake Ratapiko [with provision for the residual flow in the Manganui River] and the power station into the Makara Stream, and thence the lower Waitara River;in order to mitigate the effects of low flows in the Waitara River. The Taranaki Regional Council shall notify the consent holder when flows at the Bertrand Road site are equal to 5000 litres/second.
5. That the consent holder shall pass 400 litres/second for three hours daily over the weir, if the weir licensed by consent 5080 is not naturally overtopped by flows in the Manganui River, of the same or larger volume, for a continuous period of 30 days.

Consent 3369-2

6. That the consent holder shall design, install, maintain and monitor a race water level control system to manage the inflow from the Manganui River, within 2 months of the granting of this consent. The purpose of the control system shall be to avoid flooding of farmland attributable to the activities of the consent holder, as a result of the abstraction and the diversion of stormwater under consent 3371. The control system shall have an emergency power source capable of monitoring the system for up to 48 hours and shutting the race intake gate.
7. That the consent holder shall, as far as is practicable, maintain a residual flow of 150 litres/second in the race during maintenance periods. During periods when it is not practicable, the consent holder shall arrange for a fish salvage operation to relocate stranded fish from the race.
8. That by the agreement of the consent holder, the consent holder shall mitigate the effects of the abstraction by donating annually to the Taranaki Tree Trust \$6000 [goods and services tax exclusive] for the purpose of providing riparian management in the Manganui River catchment.
9. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with interested submitters to the consent, to discuss any matter relating to the exercise of this resource consent, particularly the monitoring programme design, implementation and interpretation, in order to facilitate ongoing consultation.
10. That the consent holder may apply to the Taranaki Regional Council for a change or cancellation of the conditions of this consent, in accordance with section 127(1)(a) of the Resource Management Act 1991, to take account of operational requirements or the results of monitoring, provided that such application may not be made more than once in any twelve month period.
11. That the Taranaki Regional Council may review any or all of the conditions of this consent, pursuant to section 128 of the Resource Management Act 1991, by giving notice of review during the month of June 2001, June 2003, June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 31 July 2007

For and on behalf of
Taranaki Regional Council

Director-Resource Management



Appendix II

Biomonitoring reports

To Job Manager, Bart Jansma
From Scientific Officer, Bart Jansma
Report No BJ265
Doc No 1548672
Date 31 July 2015

Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa H.E.P. scheme, February 2015

Introduction

This was the only scheduled biomonitoring survey relating to the Motukawa HEP scheme for the 2014-2015 monitoring year. Reports presenting the results from surveys performed since the 2001-2002 monitoring year are presented in the references in this report. The purpose of this monitoring is to assess the impact the abstraction from the Manganui River has on the macroinvertebrate communities of the river. With regards to the current survey, the scheme was operating normally, with stable, low flows occurring in the twelve days prior to this survey. The river had last naturally overtopped the weir on 6 February, with a larger flood occurring on the first and second of February (Figure 1).

The resource consents for this scheme were renewed in September 2001. Work was completed on the new fish pass at the weir prior to the November 2002 survey and the majority of the 400 l/s residual flow required by consent 3369 is provided through this pass. The remainder of the residual flow (approx 100 l/s) has continued to be released down the old fish pass.

Methods

The standard '400 ml kick-sampling' technique was used to collect streambed macroinvertebrates from four sites in the Manganui River (Table 1, Figure 2) on 18 February 2015, 16 and 17 days after flows in excess of three and seven times the median flow respectively. This 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001).

Due to the high, more natural flows during the 2010 survey, the usual riffle area sampled at site 5 was no longer suitable. Consequently, the nearest suitable riffle area was sampled, being approximately 150m further upstream, and this has now become a permanent change.

Samples were preserved with Kahle's Fluid for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark et al. 2001). Macroinvertebrate taxa found in each sample were recorded as:

R (rare)	= less than 5 individuals;
C (common)	= 5-19 individuals;
A (abundant)	= estimated 20-99 individuals;
VA (very abundant)	= estimated 100-499 individuals;
XA (extremely abundant)	= estimated 500 individuals or more.

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. By averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. More 'sensitive' communities inhabit less polluted waterways.

Table 1 Biomonitoring sites in the Manganui River in relation to the Motukawa HEP scheme

Site No.	Site code	Map reference	Location
2	MGN 000300	Q20: 201 196	400 m upstream of weir (upstream of Tariki Road)
4	MGN 000320	Q19: 203 203	300 m downstream of weir
5	MGN 000360	Q19: 216 206	1700 m downstream of weir
6	MGN 000375	Q19: 209 206	2300 m downstream of Tariki weir

However, the establishment of lengthy historical records of taxa richness, community composition and MCI scores may be useful in assessing trends in the 'health' of macroinvertebrate communities associated with rivers and streams subject to environmental perturbations such as those caused by HEP abstractions.

A semi-quantitative MCI value ($SQMCI_s$) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these products, and dividing by the sum of the loading factors (Stark, 1998 & 1999). The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA). Unlike the MCI, the $SQMCI_s$ is not multiplied by a scaling factor of 20, so that its corresponding values range from 0 to 10.

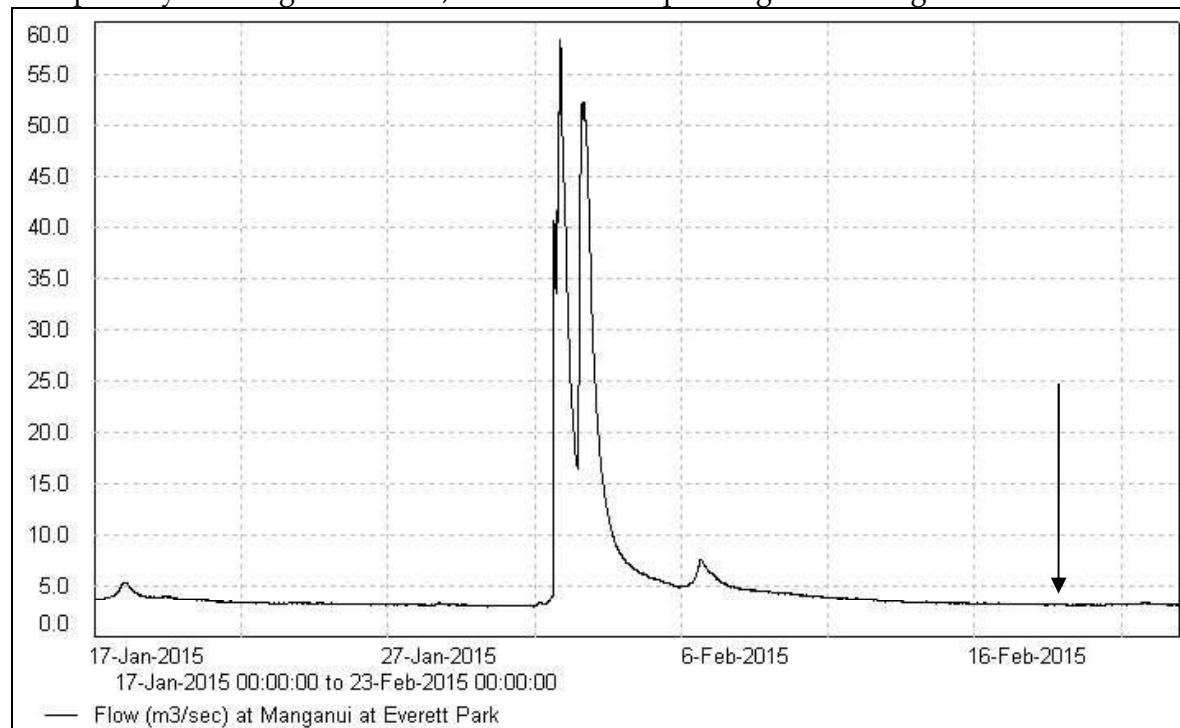


Figure 1 The flow (cubic meters per second) in the Manganui River downstream of the Tariki diversion weir, between 17 Jan 2015 and 23 February 2015. The arrow indicates the time of sampling.



Figure 2 Biological monitoring sites in the Manganui River in relation to the Motukawa Power Scheme

Results and discussion

At the time of this afternoon survey the water temperature in the Manganui River was 20.5°C upstream of the weir, and ranged from 18.0°C to 20.9°C downstream of the weir (Table 2). All sites had a low, clear and uncoloured flow. The flow was swift at all sites. The variation in water temperature was interesting, with the coolest temperature actually recorded at site 4.

The substrate at all sites comprised predominantly gravel, cobbles and boulders, with some sand also being present. Both periphyton mats and filaments were present in patches at all sites, although it was observed that the algal biomass seemed somewhat higher at the three downstream sites, than that observed at site 2 (upstream of the weir).

A notable observation made during this survey was that of a well conditioned brown trout at site 6.

Table 2 Selected environmental parameters monitored on 18 February 2014 in relation to the Motukawa HEP scheme

Site no.	Site code	Time of sampling (NZST)	Water temperature (°C)
2	MGN000300	1430	20.5
4	MGN000320	1355	18.0
5	MGN000360	1325	20.9
6	MGN000375	1250	19.7

Macroinvertebrate communities

A summary of the results from previous macroinvertebrate surveys performed in the Manganui River in relation to the Motukawa HEP scheme is presented in Table 3, together with current results (which are presented in full in Table 4).

Table 3 Summary of previous numbers of taxa and MCI values recorded in surveys performed in the Manganui River in relation to the Motukawa HEP water abstraction, together with current results

Site	N	Numbers of taxa			MCI values			SQMCIs values			
		Median	Range	Current survey	Median	Range	Current survey	N	Median	Range	Current survey
2	38	25	12-35	23	101	86-116	102	22	3.3	2.3-7.0	5.6
4	37	27	14-34	26	102	85-123	109	22	4.6	2.7-7.4	5.5
5	34	24	16-31	23	96	79-119	96	22	4.5	2.2-7.5	5.1
6	20	25	19-30	25	101	81-123	102	20	4.0	2.0-7.4	4.7

Site 2 - upstream of weir (MGN000300)

Twenty-three taxa were recorded at this site, upstream of the Tariki weir. This was two taxa less than the median of numbers recorded by all previous surveys (Table 3). The presence of four 'highly sensitive' taxa was indicative of good preceding physicochemical water quality. The community was characterised by one 'highly sensitive' taxon (mayfly (*Deleatidium*)); seven 'moderately sensitive' taxa (mayfly (*Astroclima* and *Coloburiscus*), elmid beetles, dobsonfly (*Archichauliodes*) and caddisfly (*Costachorema*, *Hydrobiosis* and *Pycnocentrodes*)); and four 'tolerant' taxa (free-living caddisfly (*Hydropsyche-Aoteapsyche*) and midge larvae (*Maoridiamesa*, orthoclads and tanytarsids)). The numerical dominance of the 'highly sensitive' mayfly *Deleatidium* was also indicative of good preceding physicochemical water quality

conditions, but was tempered somewhat by a number of abundant 'tolerant' taxa, resulting in a SQMCIs score of 5.6 units. This was significantly higher than the median SQMCIs for this site (Stark, 1998), but significantly less than the score recorded at this site in the previous survey. Overall, this result reflects the high water quality and habitat conditions at this control site, despite the summer flow conditions at the time.

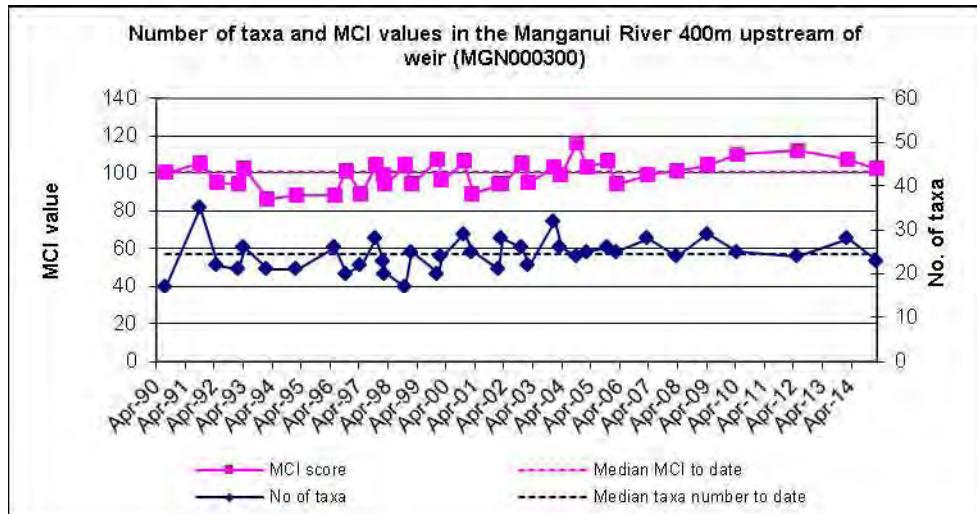


Figure 3 Number of taxa and MCI values since 1990 for the Manganui River upstream of the Tariki weir

The MCI value (102) was similar to the long term median (Table 3, Figure 3) and was due to the relative balance between 'sensitive' (57% of richness) and 'tolerant' taxa. The score was insignificantly less than the predicted score (97 units) for this site 22.0 km downstream of the National Park boundary (Stark and Fowles, 2009). Prior to 2006, results indicated that this site exhibited a strong seasonal pattern, with higher MCI scores in spring than in summer. Seasonal changes are no longer apparent, with the cessation of spring sampling after 2006.

Table 4

Macroinvertebrate fauna of the Manganui River in relation to Motukawa H.E.P scheme sampled on 18 February 2015

Taxa List	Site Number	MCI score	2	4	5	6
	Site Code		MGN000300	MGN000320	MGN000360	MGN000375
	Sample Number		FWB15142	FWB15143	FWB15144	FWB15145
NEMERTEA	<i>Nemertea</i>	3	R	-	-	-
ANNELIDA	<i>Oligochaeta</i>	1	R	C	C	C
MOLLUSCA	<i>Potamopyrgus</i>	4	R	R	C	C
EPHEMEROPTERA	<i>Austroclima</i>	7	A	A	C	A
	<i>Coloburiscus</i>	7	A	C	C	C
	<i>Deleatidium</i>	8	VA	VA	VA	VA
	<i>Nesameletus</i>	9	-	C	-	R
PLECOPTERA	<i>Megaleptoperla</i>	9	-	-	R	-
	<i>Zelandoperla</i>	8	-	R	-	R
COLEOPTERA	<i>Elmidae</i>	6	VA	VA	VA	VA
	<i>Hydraenidae</i>	8	R	R	R	R
MEGALOPTERA	<i>Archichauliodes</i>	7	A	VA	A	A
TRICHOPTERA	<i>Hydropsyche (Aoteapsyche)</i>	4	VA	VA	VA	VA
	<i>Costachorema</i>	7	A	C	C	R
	<i>Hydrobiosis</i>	5	A	A	A	A
	<i>Neurochorema</i>	6	C	C	R	C
	<i>Beraeoptera</i>	8	C	C	-	R
	<i>Olinga</i>	9	R	R	-	-
	<i>Oxyethira</i>	2	-	R	R	C
	<i>Pycnocentria</i>	7	-	R	-	-
	<i>Pycnocentrodes</i>	5	A	C	C	C
DIPTERA	<i>Aphrophila</i>	5	C	A	A	A
	<i>Chironomus</i>	1	-	-	R	-
	<i>Maoridiamesa</i>	3	A	C	C	C
	<i>Orthocladiinae</i>	2	A	A	A	VA
	<i>Tanypodinae</i>	5	-	R	-	-
	<i>Tanytarsini</i>	3	A	VA	VA	VA
	<i>Empididae</i>	3	C	C	C	C
	<i>Muscidae</i>	3	R	C	R	C
	<i>Austrosimilium</i>	3	C	-	-	C
	<i>Tanyderidae</i>	4	-	-	R	R
No of taxa			23	26	23	25
MCI			102	109	96	102
SQMCIs			5.6	5.5	5.1	4.7
EPT (taxa)			10	13	9	11
%EPT (taxa)			43	50	39	44
'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa				

R = Rare

C = Common

A = Abundant

VA = Very Abundant

XA = Extremely Abundant

Site 4 - 300m d/s of weir (MGN000320)

A community richness of 26 taxa was found at this site, 300 metres downstream of the hydro weir. This richness was similar to the long term median number of taxa previously found at this site and that recorded at site 2 upstream of the weir (Table 3). The proportion of 'sensitive' taxa (65% of richness) at this site was slightly higher than that recorded at the upstream site, and resulted in a slightly higher MCI score of 109 units, which was seven units above the long term median for this site. Summer MCI scores appear to be relatively stable at this site, with scores recorded since 2009 ranging from only 105-109 units. This may be attributable to the flow regulation in this reach (and a consequently reduced frequency of flood flows), resulting in more stable communities.

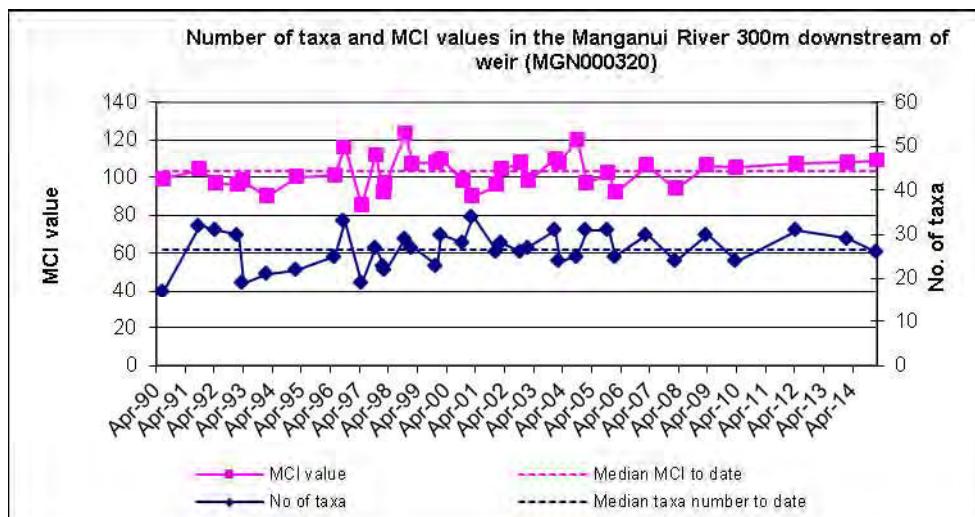


Figure 4 Number of taxa and MCI values since 1990 for the Manganui River 300m downstream of the Tariki weir

The community was characterised by one 'highly sensitive' taxon (mayfly (*Deleatidium*)); five 'moderately sensitive' taxa (mayfly (*Austroclima*), elmid beetles, dobsonfly (*Archichauliodes*), caddisfly (*Hydrobiosis*), and *Aphrophila* cranefly); and two 'tolerant' taxa (caddisfly (*Hydropsyche-Aoteapsyche*) and tanytarsid midge larvae). The numerical dominance of 'moderately sensitive' taxa was responsible for the moderate SQMCI_s value of 5.5 units, similar to that recorded at the upstream 'control' site, but significantly higher than the long term median for this site (Stark, 1998). Eight taxa were present in abundance, and the fact that six of these abundant taxa are recognised as 'sensitive' taxa reflects good preceding physicochemical water quality conditions.

Site 5 - 1.7km d/s of weir (MGN000360)

A community richness of 23 taxa was recorded at this site, 1.7 kilometres downstream of the Tariki weir. This was similar to the median, and that recorded in the previous survey (Table 3, Figure 4). The community consisted of a similar proportion of 'sensitive' taxa (52%) as that recorded at site 2, producing a slightly reduced MCI score of 96 units, which was equal to the long term trend for this site, and within the range previously recorded. The current result shows that there is some variability in MCI scores at this site over time (Figure 4), and that this variation does not appear to have a clear relationship with any environmental variables.

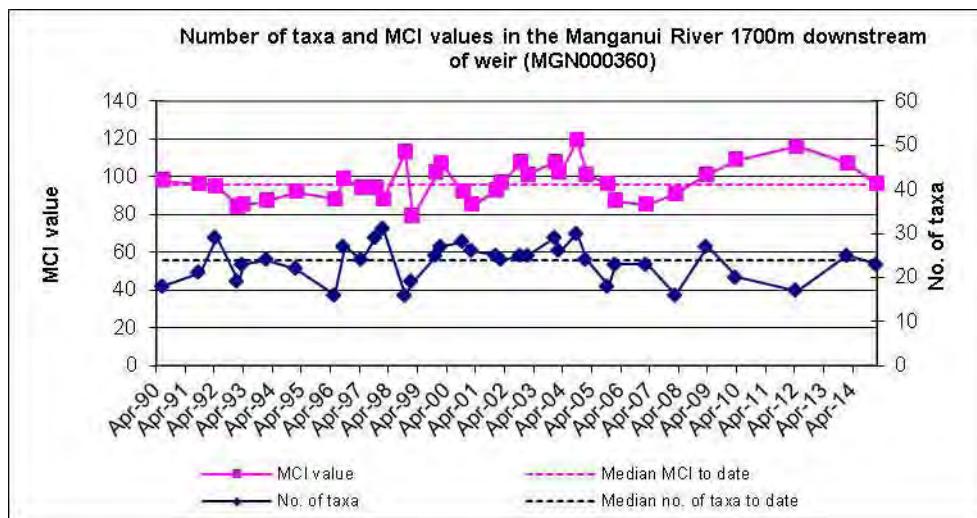


Figure 5 Number of taxa and MCI values since 1990 for the Manganui River 1700m downstream of the Tariki weir

However, these results may suggest a return to the trend of above median values. Such a trend had generally been maintained since the implementation of the 400 L/s residual flow (Figure 5), probably reflecting the effects of improved habitat provided by the increased residual flow downstream of the weir. This site had previously been affected by iron-oxide smothering of the substrate, which had been a feature of the habitat and survey results prior to the release of the increased residual flow. The current survey did not note any such smothering.

The dominant taxa at this site included only one ‘highly sensitive’ taxon (mayfly (*Deleatidium*)), five ‘moderately sensitive’ taxa (mayfly (*Austroclima*), elmid beetles, dobsonfly (*Archichauliodes*), caddisfly (*Hydrobiosis*) and cranefly (*Aphrophila*)) and three ‘tolerant’ taxa (net spinning caddisfly (*Hydropsyche-Aoteapsyche*) and midge larvae (orthoclads and tanytarsids), an improvement from the six taxa recorded in abundance in the previous survey. Similar to the two sites upstream, the numerical dominance of ‘moderately sensitive’ taxa resulted in the moderate SQMCI_s score of 5.1 units at site 5, which was 0.6 units higher than the median for this site (Stark, 1998). This is a moderate result, considering the preceding low flow conditions.

Site 6 - 2.3km d/s of weir (MGN000375)

A moderate richness of 25 taxa was recorded at this site, 2.3 kilometres downstream of the weir. This was equal to the median richness recorded from the 20 previous surveys at this site (Table 3) and within the range of richesses recorded at the other three upstream sites in this survey (Table 3).

A moderately high proportion (44% of richness) of the community were ‘tolerant’ taxa (Table 5), although the presence of five ‘highly sensitive’ taxa (one in abundance) was indicative of good preceding physicochemical water quality. The community was characterised by one ‘highly sensitive taxon (mayfly (*Deleatidium*), five ‘moderately sensitive’ taxa (mayfly (*Austroclima*), elmid beetles, dobsonfly (*Archichauliodes*), caddisfly (*Hydrobiosis*) and *Aphrophila* cranefly); and three ‘tolerant’ taxa (net building caddisfly (*Hydropsyche-Aoteapsyche*) and orthoclad and tanytarsid midge larvae).

Only one taxon exhibited a significant change in numerical abundance from site 5 to site 6, being an increase in abundance of ‘tolerant’ sandfly larvae (*Austrosimilium*). The increased abundance of some less ‘sensitive’ taxa from site 5 upstream resulted in a SQMCI_s score that was slightly lower, at 4.7 units. In terms of this site however, this represents a good SQMCI_s score, being a 0.7 unit higher than the long term median.

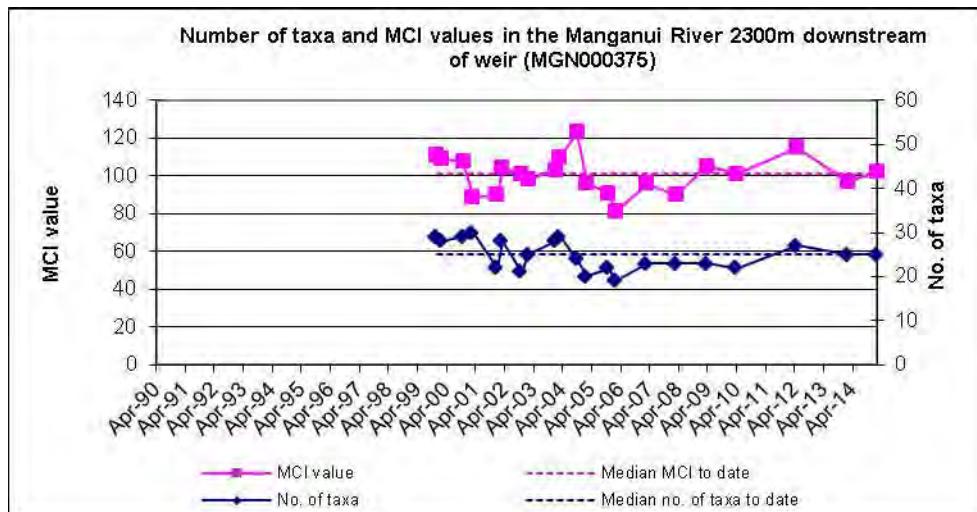


Figure 6 Number of taxa and MCI values since 1999 for the Manganui River 2300m downstream of the Tariki weir

The MCI score for this site (102) was equal to that recorded at site 2, and higher than that recorded at site 5, reflecting the increased proportion of 'sensitive' taxa in the community (56%). This MCI score was similar to the median for this site, and that recorded in the previous survey (Figure 5). These results suggest little deterioration from that recorded at site 2, which is a promising result, as the water temperature would be expected to increase with distance from the weir. However, there is also an indication that the algal biomass had increased at this site, with midge larvae increasing in abundance, as did the algal piercing caddisfly *Oxyethira*.

Summary and Conclusions

The Council's standard 'kick-sampling' technique was used at four established sites to collect streambed macroinvertebrates from the Manganui River. Samples were processed to provide number of taxa (richness), MCI and SQMCIs scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The SQMCIs takes into account taxa abundances as well as sensitivity to pollution. It may indicate subtle changes in communities, and therefore be the more relevant index if non-organic impacts are occurring. Significant differences in either the MCI or the SQMCIs between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

With regards to the current survey conducted on 18 February 2015, the scheme was operating normally, with stable, low flows occurring in the twelve days prior to this survey. The river had last naturally overtopped the weir on 6 February, with a larger flood occurring on the first and second of February (Figure 1).

This survey recorded taxonomic richness (number of taxa) similar to the median numbers of taxa previously recorded at these sites. MCI values were relatively similar in a downstream direction, with the exception of site 5, which recorded a lower MCI score. Previous surveys generally found MCI values to steadily decrease in a downstream direction, and this was attributed to changes in habitat downstream (including increased water temperatures and algal growth), associated with the reduction in flow downstream of the weir. The fact that the

current survey did not record such deterioration is a positive indication that the impacts of the diversion were not as severe as expected during this summer low flow period. This may reflect the effects of the relatively recent flushing flow, which occurred just over two weeks prior. The current survey recorded warm temperatures (around 19 °C), and patchy growths of periphyton mats and filaments at all downstream sites. The upstream sites also supported such patchy growths, but they were not as extensive. Under a residual flow regime, such prolific growths may not be flushed away by floods on a regular basis, as might happen under a more natural flow regime and they can become particularly prolific under lengthy periods of stable low flow conditions. Such proliferations were not as apparent during the current survey, a reflection of the moderate flow conditions which occurred over summer 2015.

There were few changes in invertebrate abundance noted between the sites, with the most obvious differences being two 'moderately sensitive' taxa reducing in abundance from site 2, and one such taxon becoming abundant at sites 4, 5, and 6, after only being recorded as common at site 2. This is likely to be related to the slight increase in algal biomass observed downstream of the weir. Overall, the current survey indicated that the habitat limitation that appeared to be present in some previous surveys (especially at site 5) was no longer present. This conclusion is also supported by the moderate taxa richnesses recorded downstream of the weir.

In general, all sites were dominated by similar taxa, despite the summer low flow conditions. Only subtle changes in abundance were noted, reflecting a change in periphyton biomass, although this only had a small effect on the SQMCIs scores, which although not significantly different to each other, reduced gradually in a downstream direction. In addition, all sites contained moderate proportions of 'sensitive' taxa, and the communities downstream of the abstraction weir were more generally dominated by these 'sensitive' taxa, which was in contrast to most previous survey results, which usually found 'tolerant' taxa to be generally dominant.

The presence of a number of 'highly sensitive' taxa at all sites indicated generally good preceding physicochemical water quality although individual abundances within these taxa tended to vary across sites. *Deleatidium* mayflies, considered 'highly sensitive', were well represented at all sites. MCI scores indicated that the stream communities were of fair to good 'health', while the SQMCIs scores indicated they were in moderate but above average health, when compared to their respective medians. This is an encouraging result, as the higher temperatures usually experienced in the residual flow reach, would be expected to reduce these scores. Water temperatures were as high as 25.8 °C in the month prior to this survey.

Since the new residual flow has been operating, some improvement in communities have been observed particularly at site 5, 1.7 km downstream of the weir, where MCI values have generally been above the historical median. The habitat at this site prior to the establishment of the new residual flow was generally poor due to smothering by iron oxide deposits, which has been significantly reduced since the new residual flow has been implemented. This result was not repeated in the current survey, with the MCI score at site 5 only being equal to the median, and the SQMCIs score being only 0.6 unit higher than the median, neither being statistically significant improvements. The overall improvement in macroinvertebrate communities at this site is likely to have been a direct result of the increased residual flow, although there also appears to be a general overall improvement in the catchment, as demonstrated at site 2, upstream of the affected reach. However, elevated water temperatures and more dense periphyton cover have affected macroinvertebrate communities of the residual flow reach in more recent summer surveys.

When the results for each site are compared over time, it is clear that the control site (site 2) is

more stable in both taxa number and MCI score than recorded at the three downstream sites. This reflects the 'buffering' effect of the higher flow upstream, which protects the community from extremes such as elevated temperatures. The reduced flow downstream of the weir does not provide as great a buffer and therefore there is more variation in the macroinvertebrate communities recorded at sites in the residual flow reach.

In terms of the current survey, it is considered that the communities of the residual flow reach represent what would be typical of a low flow community. However, they were reduced from that recorded in the previous survey (especially the SQMCIs scores), and this may reflect the fact that the previous survey was undertaken during frequent but small scale flushing flows. The results indicate that the MCI scores at these sites were higher than most previous surveys, as were the SQMCIs scores, which were almost all significantly higher than their respective medians. However, a similar result was recorded at the control site indicating that there is a catchment wide improvement also. Overall, the results indicate that the invertebrate community supported by a residual flow of 400 litres per second, with regards to presence/absence of taxa, and their respective abundances, is not significantly different to that supported by natural flows. The principal difference between the two flows is that there is a greater amount of invertebrate habitat available under natural flow conditions due to the increased amount of wetted riverbed width. The current results, when compared with the previous surveys results, also suggest that the small scale flushing flows required at times by consent may be reducing the degree of impacts caused by the diversion of water during summer low flow conditions.

References

- Dunning KJ, 2002a: Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa H.E.P. scheme, January 2002. TRC report KD103.
- Dunning KJ, 2002b: Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa H.E.P. scheme, March 2002. TRC report KD115.
- Dunning KJ & Fowles CR, 2003: Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa HEP scheme, November 2002. TRC report CF283.
- Fowles CR & Colgan BG, 2004: Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa HEP scheme, January 2004. TRC report CF300.
- Fowles CR & Colgan BG, 2004a: Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa HEP scheme, March 2004. TRC report CF323.
- Fowles CR & Colgan BG, 2004b: Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa HEP scheme, October 2004. TRC report CF351.
- Fowles CR & Jansma B, 2008a: Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa HEP scheme, March 2007. TRC report CF452.
- Fowles CR & Jansma B, 2008b: Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa HEP scheme, March 2008. TRC report CF453.
- Hope KJ, 2005: Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa HEP scheme, February 2005. TRC report KH23.
- Hope KJ, 2005b: Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa HEP scheme, November 2005. TRC report KH063.
- Jansma B, 2006: Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa HEP scheme, February 2006. TRC report BJ006.
- Jansma B, 2009: Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa HEP scheme, April 2009. TRC report BJ061.
- Jansma B, 2010: Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa H.E.P. scheme, April 2010. TRC report BJ092.
- Jansma B, 2014: Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa H.E.P. scheme, May 2012. TRC report BJ243.

Jansma B, 2014: Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa H.E.P. scheme, February 2014. TRC report BJ244.

Moore SC and Fowles CR, 2003: Biomonitoring of the Manganui River in relation to the Tariki Road diversion weir for the Motukawa H.E.P. scheme, February 2003. TRC report CF283.

Stark JD, 1985: A macroinvertebrate community index of water quality for stony streams. *Water and Soil* Miscellaneous Publication No. 87.

Stark JD, 1998: SQMCI: a biotic index for freshwater macroinvertebrate coded abundance data. *New Zealand Journal of Marine and Freshwater Research* 32(1): 55-66.

Stark JD, 1999: An evaluation of Taranaki Regional Council's SQMCI biomonitoring index Cawthron Institute, Nelson. Cawthron Report No. 472.

Stark JD, Boothroyd IKG, Harding JS, Maxted JR, Scarsbrook MR, 2001: Protocols for sampling macroinvertebrates in wadeable streams. New Zealand Macroinvertebrate Working Group Report No. 1. Prepared for the Ministry for the Environment. Sustainable Management Fund Project No. 5103. 57p.

Stark JD and Fowles CR, 2009: Relationships between MCI, site altitude, and distance from source for Taranaki ring plain stream. Prepared for Taranaki Regional Council. Stark Environmental Report No. 2009-01. 47p.

TRC, 1999: Some statistics from the Taranaki Regional Council database (FWB) of macroinvertebrate surveys performed during the period from January 1980 to 31 December 1998. TRC Technical Report 99-17.

