

Contact Energy
Stratford Power Station
Monitoring Programme
Annual Report
2020-2021

Technical Report 2021-82



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Taranaki Regional Council
Private Bag 713
Stratford

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Executive summary

Contact Energy Ltd (the Company) operates the Stratford Power Station (SPS) located on State Highway 43 near Stratford in the Patea catchment. This report for the period July 2020 to June 2021 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the Company's environmental and consent compliance performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of the Company activities.

During the monitoring period, the Company demonstrated an overall high level of environmental performance.

The Company in relation to SPS holds 17 exercised resource consents, which include a total of 150 conditions setting out the requirements that they must satisfy. The consents provide for three gas-fired plants. These are a combined cycle plant (TCC1), a smaller open cycle peaking plant (SPP), and a yet to be built facility which will comprise of a copy of either of the two existing facilities. Some consents apply to the individual generation units, while others apply to the site as a whole.

The Council's monitoring programme for the year under review included four inspections, 12 water samples collected for physicochemical analysis and three biomonitoring surveys of receiving waters. In addition, monthly emission results and abstraction records were provided to the Council which were reviewed.

The monitoring showed that the Stratford Power Station continued to be well managed with negligible environmental effects as a process of the exercise of their consents.

Surface water abstraction was compliant with daily rate and volume. Process water discharges were compliant with consent defined parameters. Surface water monitoring indicated negligible impacts from the discharge of process waters.

The thermal tolerances within the receiving waters were not exceeded for the duration of the monitoring period. This included during the summer low flows where the thermal impacts to surface waters were minimal.

Inter-laboratory comparisons indicated good agreement for the majority of parameters assessed this monitoring period. The slight variation in dissolved reactive phosphorus analysis is reducing.

Emissions monitoring results from the Taranaki Combined Cycle (TCC) were within consent defined specifications for the full duration of the monitoring period.

The Stratford Peaker Plants (SPP) were stack tested with the resulting analysis indicating compliance with consent defined criteria.

The six yearly report, as required by the consent, was provided during December 2020.

No odours were noted or communicated during the monitoring period.

During the year, the Company demonstrated a high level of environmental and a high level of administrative performance with respect to their resource consents.

For reference, in the 2020-2021 year, consent holders were found to achieve a high level of environmental performance and compliance for 86% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 11% of the consents, a good level of environmental performance and compliance was achieved.

In terms of overall environmental and compliance performance by the consent holder over the last several years, this report shows that the consent holder's performance remains at high level in the period under review.

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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 for the period July 2020 to June 2021 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by Contact Energy Ltd (the Company). The Company operates two gas-fired power plants at Stratford Power Station (Taranaki Combine Cycle TCC and Stratford Peaker Plants SPP), situated on East Road (State Highway 43) near Stratford, in the Patea catchment.

The report includes the results and findings of the monitoring programme implemented by the Council in respect of the consents held by the Company that relate to abstractions and discharges of water within the Patea catchment, and the air discharge permits held by the Company to cover emissions to air from the site.

One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of the Company's use of water, land and air, and is the 23rd combined annual report by the Council for the Company.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about:

- consent compliance monitoring under the RMA and the Council's obligations;
- the Council's approach to monitoring sites through annual programmes;
- the resource consents held by the Company in the Patea catchment;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted in the Company's site/catchment.

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 2021-2022 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); and
- 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' in as much 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 Company, this report also assigns them a rating for their environmental and administrative performance during the period under review.

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 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 during investigations of incidents reported to the Council by a third party 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 during investigations of incidents reported to the Council by a third party. 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 during investigations of incidents reported to the Council by a third party. 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 2020-2021 year, consent holders were found to achieve a high level of environmental performance and compliance for 86% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 11% of the consents, a good level of environmental performance and compliance was achieved.¹

1.2 Process description

Taranaki Combined Cycle Plant (TCC)

The Taranaki Combined Cycle Power Plant (Figure 1) was the first large-scale combined-cycle power plant to be built in New Zealand. The plant was completed in 1998. It utilises a gas turbine and a steam turbine in tandem to generate electricity at an efficiency greater than could be achieved by either system alone. The hot exhaust gases from the gas turbine are directed into a heat recovery boiler where most of the heat is used to produce high pressure steam that drives the steam turbine. The station was designed to produce up to 354 MW of electricity at an efficiency of about 56%, which has since been improved to 383 MW at 56.7%. The combustion system in the gas turbine is especially designed to minimise the production of nitrogen oxides in the gases.

¹ The Council has used these compliance grading criteria for more than 17 years. They align closely with the 4 compliance grades in the MfE Best Practice Guidelines for Compliance, Monitoring and Enforcement, 2018

The cooling system for the steam system is based on an evaporative process. The cooling towers have been designed to minimise the formation of a vapour plume, so that a plume is visible only under cool or humid conditions.

The gas supply for the plant comes mainly from the Kupe and Maui fields together with a smaller component from the underground Ahuroa B Gas Storage facility. The station uses approximately 1.4 million cubic metres of gas per day in generation at full production.

Water is abstracted from the Patea River to supply the cooling towers and for steam generation. The water discharges are from plant utilities and domestic effluent, boiler blowdown and site stormwater. Septic tank effluent is discharged to land.

Stratford Peaker Plants (SPP)

The Stratford Peaker Plant (Figure 1) is designed to provide fast start-up (peaking) capacity to support the increasing volumes of weather-dependent renewable electricity sources in New Zealand, such as wind generation. Commercial operation commenced in June 2011. The plant may be required to run for hours during low wind conditions, or for months during dry hydro years or times of major plant outages. The two separate 100 MW high-efficiency open cycle gas fired turbines are capable of going from cold to full power in 10 minutes. To improve efficiency, air from the low pressure compressor passes through an inter-cooler before entering the high pressure compressor, giving an LHV efficiency of about 46% at full load.

The cooling system for the intercooler is similar in type to that of the Taranaki Combined Cycle Plant described above, being a hybrid dry/wet mechanical draft cooling tower.

Water to supply the cooling tower is drawn from the Patea River via the existing abstraction and storage system for the combined cycle plant. Wastewater is discharged to the Patea River. Site stormwater is transferred to the raw water holding pond at the combined cycle plant during operation. Domestic wastes are discharged to a land-based system which was upgraded in September 2018.

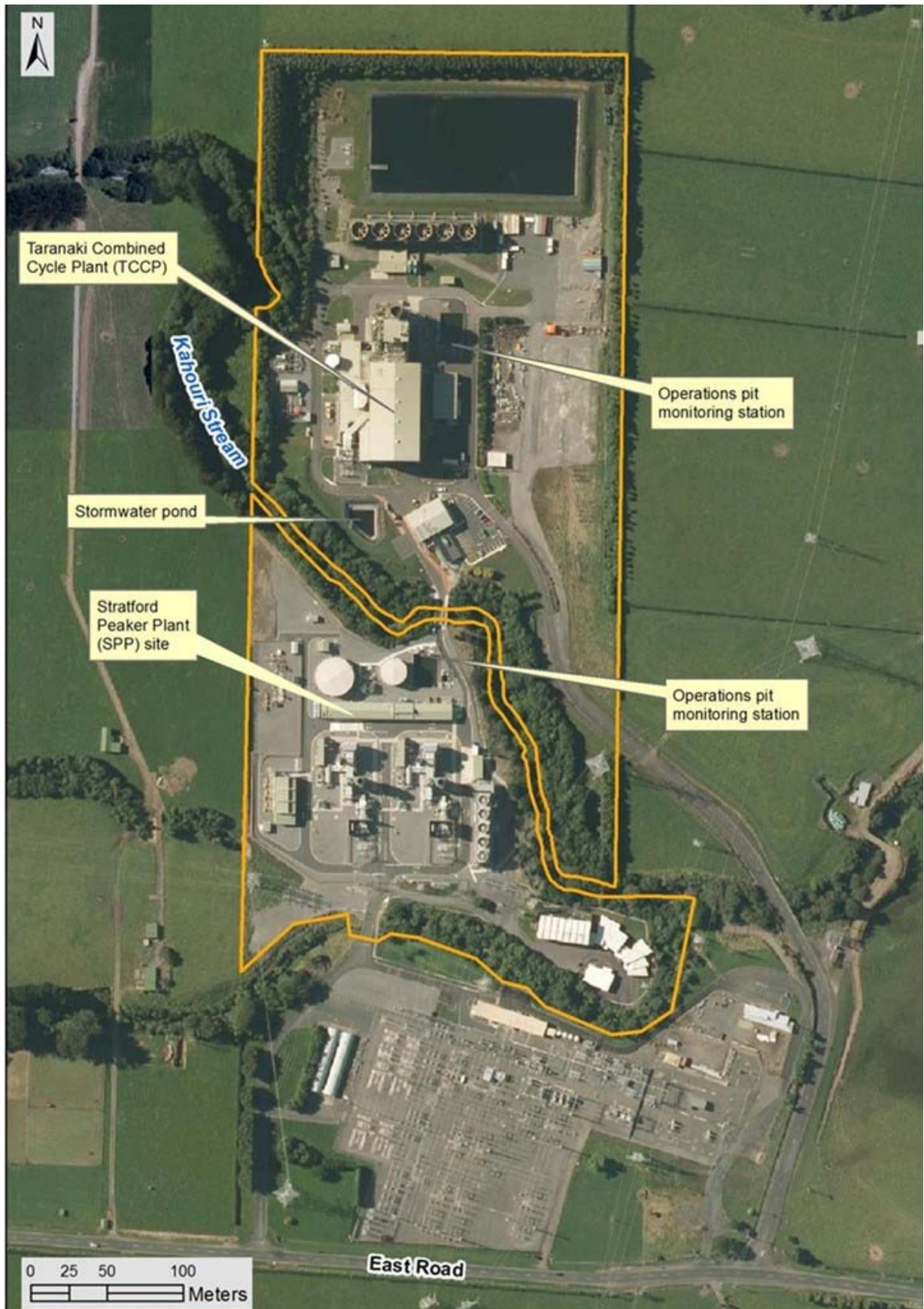


Figure 1 Aerial view of Stratford Power Station 2012

1.3 Resource consents

The Company holds 17 resource consents, the details of which are summarised in the table below. Summaries of the conditions attached to each permit are set out in Section 3 of this report.

A summary of the various consent types issued by the Council is included in Appendix I, as are copies of all permits held by the Company during the period under review.

Table 1 Summary of resource consents held by the Company

Consent Number	Purpose	Consent Granted/ Commencement Date	Change to Conditions Date	Next Review Date	Expiry Date
<i>Discharge to Air Permits</i>					
4022-2	Discharge emissions to air from fuel combustion	Dec 1994	Feb 2010	#	2022
4454-1	Discharge contaminants to air from power station & ancillary plant	Aug 1995	Feb 2010	#	2029
5846-1.3*	Discharge contaminants to air from power station & ancillary plant	Jan 2017	-	2022	2034
7247-1	Discharge emissions to air from cooling tower	Mar 2008	-	2022	2034
7786-1.1*	Discharge contaminants to air from construction	Jan 2017	-	2022	2028
<i>Discharge to Water Permits</i>					
5848-1	Discharge up to 78 L/s averaged over 15 minutes of used water to Patea River	Mar 2008	Mar 2008	2022	2034
4459-1.3	Discharge stormwater to Kahouri/Piakau Streams	Jul 2016	-	2022	2028
5633-1	Discharge sediment from water intake to Patea River	May 2000	-	2022	2028
5851-1.3*	Discharge sediment from water intake to Patea River	Jan 2017	-	2022	2034
7785-1.1*	Discharge construction contaminants to Piakau/Kahouri Streams	Jan 2017	-	2022	2028
<i>Water Use Permits</i>					
4455-1	Take up to 225 L/s averaged over 15 minutes from Patea River below Toko confluence	May 1994	Mar 2008	2022	2028
5847-1.3*	Take up to 225 L/s averaged over 15 minutes from Patea River at Skinner Road	Jan 2017	-	2022	2034
<i>Land Use Permits</i>					
5849-1.3	Gas pipeline structures on Kahouri Stream	Jan 2017	-	2022	2034
5850-1*	Intake structure on Patea River at Skinner Road	Nov 2001	Mar 2008	2022	2034
4456-1	Intake structure on Patea River below Toko confluence	May 1994	Jan 2000	2022	2028

Consent Number	Purpose	Consent Granted/ Commencement Date	Change to Conditions Date	Next Review Date	Expiry Date
4458-1	Diffuser structure on Patea River	May 1994	Mar 2008	2022	2028
7248-1	Bridge for pedestrian access and utilities over Kahouri tributary	Mar 2008	-	2022	2034
7250-1	Bridge for pedestrian access and utilities over Kahouri Stream	Mar 2008	-	2022	2034
4804-1	Bridge for electricity transmission over unnamed tributary of Kahouri Stream	Mar 2012	-	2022	2028
4460-1	Stormwater discharge structures (above unnamed tributary of Piakau Stream)	May 2012	-	2022	2028
7605-1	Stormwater discharge structure in Kahouri Stream	Feb 2010	Jun 2010	2022	2028
7653-1	Stormwater discharge structure in Kahouri Stream	Jun 2010	-	2022	2028
4461-1	Utilities structures on Kahouri Stream	Mar 2012	-	2022	2028
5852-1.4*	Utilities structures on Kahouri Stream	Jan 2017	-	2022	2034
4462-1	Water transmission structures above Toko Stream/unnamed streams	May 1994	Mar 2008	2022	2028

*indicates consents not yet exercised

Optional review date is within 6 months of receipt of report required by consent conditions:

1.4 Monitoring programme

1.4.1 Introduction

Section 35 of the RMA sets obligations upon the Council to gather information, monitor and conduct research on the exercise of resource consents within the Taranaki region. The Council is also required to assess the effects arising from the exercising of these consents and report upon them.

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 Company consisted of five 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;
- discussion over monitoring requirements;
- preparation for any consent reviews, renewals or new consent applications;
- advice on the Council's environmental management strategies and content of regional plans; and
- consultation on associated matters.

1.4.3 Site inspections

The Company site was visited four times during the monitoring period. These were conducted on the 18th August 2020, 3rd December 2020, 4th May 2021, and June 30th 2021.

With regard to consents for the abstraction of or discharge to water, the main points of interest were plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters. Air inspections focused on plant processes with associated actual and potential emission sources and characteristics, including potential odour, dust, noxious or offensive emissions.

Sources of data being collected by the Company were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

Inter-lab comparisons of inspection results were also conducted, and results are provided in section 2.2.1.

1.4.4 Chemical sampling

The Council undertook sampling of both the discharges from the site and the water quality upstream and downstream of the discharge point and mixing zone (Figure 2).

The used water discharge from both the TCCP and SPP were sampled on four occasions. The discharges were analysed for the analytes provided in Table 2.

Two sites on the Patea River were also sampled on three occasions for the parameters provided in Table 2.

Table 2 SPS chemical sampling analytes

Location	Analytes	
Discharges IND002023 IND002038	Chlorine (Total) Conductivity Dissolved reactive phosphorus (DRP) Un-ionised Ammonia NH ₃ Ammoniacal Nitrogen NH ₄	Oil and Grease pH Suspended solids Temperature Turbidity
Patea River PAT000356 PAT000357	Conductivity Dissolved reactive phosphorus (DRP) Flow Un-ionised Ammonia NH ₃ Ammoniacal Nitrogen NH ₄	pH Suspended solids Temperature Turbidity

1.4.5 Biomonitoring surveys

Biological surveys were performed on the 24th November 2020 and 24th February 2021 in the Patea River, and a single survey on the 9th March 2021 in the Kahouri Stream. These are to determine the effects of cooling water discharge, abstraction of water and discharge of stormwater from the Company's combined cycle and peaker power stations.

These surveys include establishing macroinvertebrate abundance, their corresponding 'health' based on MCI and SQMCI ranges, site habitat characteristics and hydrology, and a summary of macroinvertebrate taxa present during the survey.

1.4.6 Provision of consent holder data

The Company submitted monitoring data to the Council on a monthly basis for review pertaining to the operations of the plant, including water abstraction, wastewater discharges and air emissions discharges. It also provided the Council with an annual report as well as a consent required six yearly report (section 2.3.3). The annual report is appended to this report.

2 Results

2.1 Water



Figure 2 Physicochemical and biological sampling sites, discharge sites, and abstraction site locations

2.1.1 Inspections

At the SPS combined cycle (TCC) plant and peaker plant (SPP) site, inspection is made of areas where wastewater is generated, treated and monitored, and where chemicals and fuel/oil are stored, transferred and dispensed. The stormwater system is also included.

The laboratory and control room are also visited to view and discuss recent monitoring results. On the Patea River, the abstraction works at Vickers Quarry and the discharge structure beside East Road are inspected.

Inspections specifically address the operation of the water abstraction system, the raw water treatment plant, the cooling water systems, and the wastewater treatment systems (pH neutralisation, oil separation, holding ponds and monitoring stations). The maintenance of areas that are bunded to contain spillage (around chemical and oil storage/use, transformers, electrical batteries), and the stormwater drainage system, are given particular attention.

Four inspections were undertaken by the Council at Contact Energy's facility, Stratford Power Station (SPS), in the 2020-2021 monitoring period. These were undertaken on the following dates:

Inspection 1: 18th August 2020

Inspection 2: 3rd December 2020

Inspection 3: 4th May 2021

Inspection 4: 30th June 2021

During these inspections the following areas were also inspected;

- Peaker plant Ops pits (IND002038),
- Combined cycle Ops pit (IND002023),
- Stormwater pit (STW002032) and
- The diffuser on the Patea River with respect to the process water diffuser.

2.1.2 Inspection results and notes

The Company site appeared to be compliant across all consent conditions. In general, the site was found to be well kept with good housekeeping evident across the facility. Staff of the Company were found to hold good knowledge of the environmental aspects of running the plant, and to have proper training in dealing with contingency events that have the potential for causing adverse environmental effects.

Across all consent aspects there appeared to be no visual environmental impacts at any of the discharge locations.

Throughout the 2020-2021 monitoring period temperature data was downloaded monthly from all four monitoring sites (upstream and downstream of the weir, Hungers Road & Vickers quarry) or inspected after high river flow conditions if required. No major temperature variances were observed throughout this period². On one occasion the SPP temperature (3rd December 2020) had slight temperature variation to the Council's readings. This was corrected to align with lab results on the same day.

The TCC ops pits had a small amount of foam on the 18th August 2020 with oxygen weed present. This was dredged soon after. A minor blockage was noted on the Patea River diffuser during the December 2020 inspection. Duck weed was also cleared from the SPP ops sump on 4th May 2021, where it was spread to

² Instream temperature monitoring logger failed at the end of May 2021.

land on site (after discussion with the Council) and the sludge was removed offsite via Intergroup Contracting.

Nil to minimal odour was noted during inspections, including downwind of the SPP cooling towers. Any issues found during inspections, as previously noted were minor and were quickly resolved, or planned to be resolved by the Company during the monitoring period. In the case of the land spreading of the duck weed which was present in the SPP ops sump, a discussion was held between both parties as to the most reasonable manner to deal with this biological material. This encapsulates the working relationship between both parties.

Overall, there is good communication between the Company and the Council. This includes the supply of monthly monitoring reports from the Company to the Council as to the processes undertaken by the facility, which provides good transparency between both parties.

2.1.3 Results of abstraction and discharge monitoring

Water abstractions are regulated under consent 4455. Monitoring of the abstraction system is undertaken at two locations. One is located at the Patea River intake, while the other is located at the inlet to the raw water pond. The raw water pond provides for both power plants (the combined cycle and the two smaller Peaker plants). The Company also holds consent 5847 which is also related to water abstraction, however this is for a future proposed facility.

The record for water abstraction (Figure 3) is based on 15 minute average flows, rather than instantaneous values. This is undertaken to prevent short term spikes within the data set as a consequence of when the pumps are reversed into backwash mode or restarted, as this may give rise to transient water surges in the pipelines which may otherwise represent apparent but not actual breaches of the abstraction consent.

The analysis provided in Figure 3 indicated compliance with the consent defined maximum abstraction volume which is limited to 19,440 m³/day. In addition, the analysis provided by Figure 4 indicated compliance with the maximum abstraction rate (<225 L/s), which was not exceeded for the duration of the monitoring period.

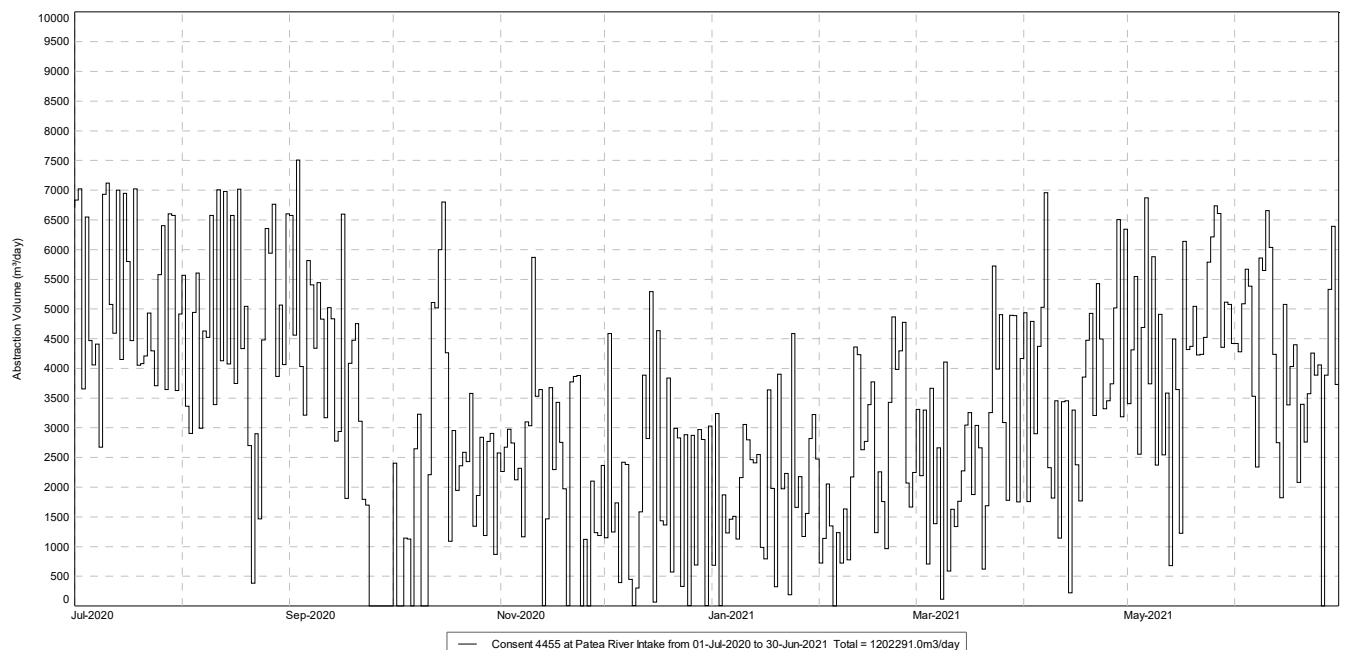


Figure 3 Consent 4454-1 daily abstraction from the Patea River SPP

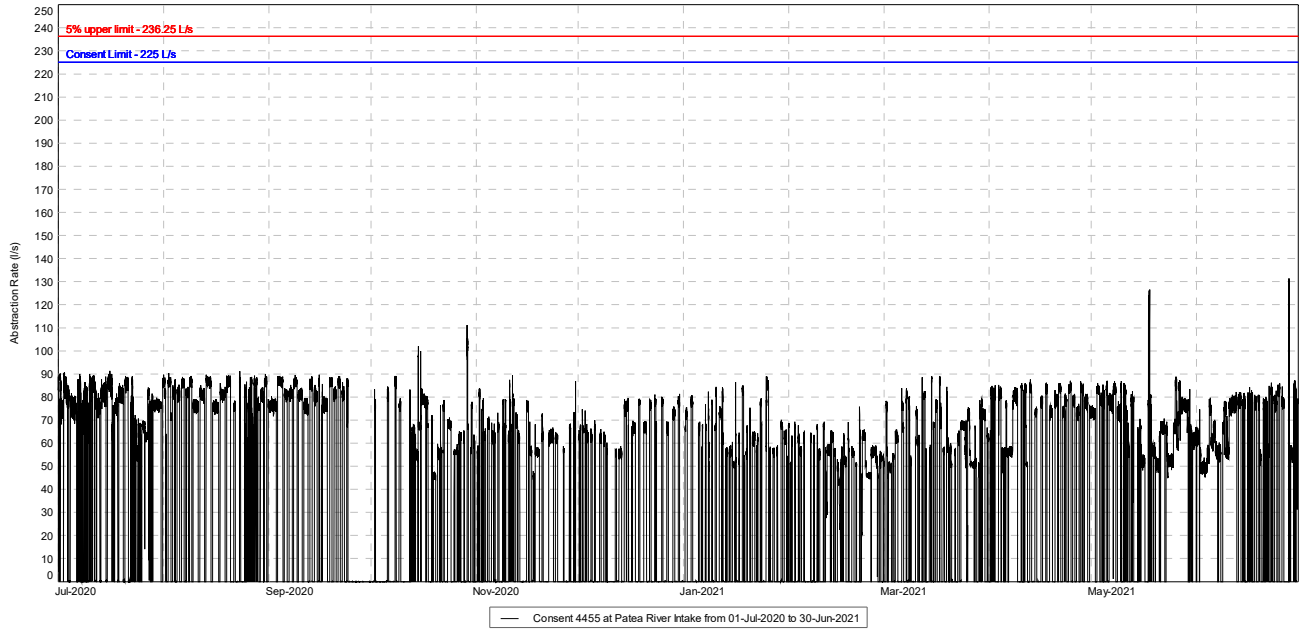


Figure 4 Abstraction rate maximum (L/s) Patea River SPP 2020-2021

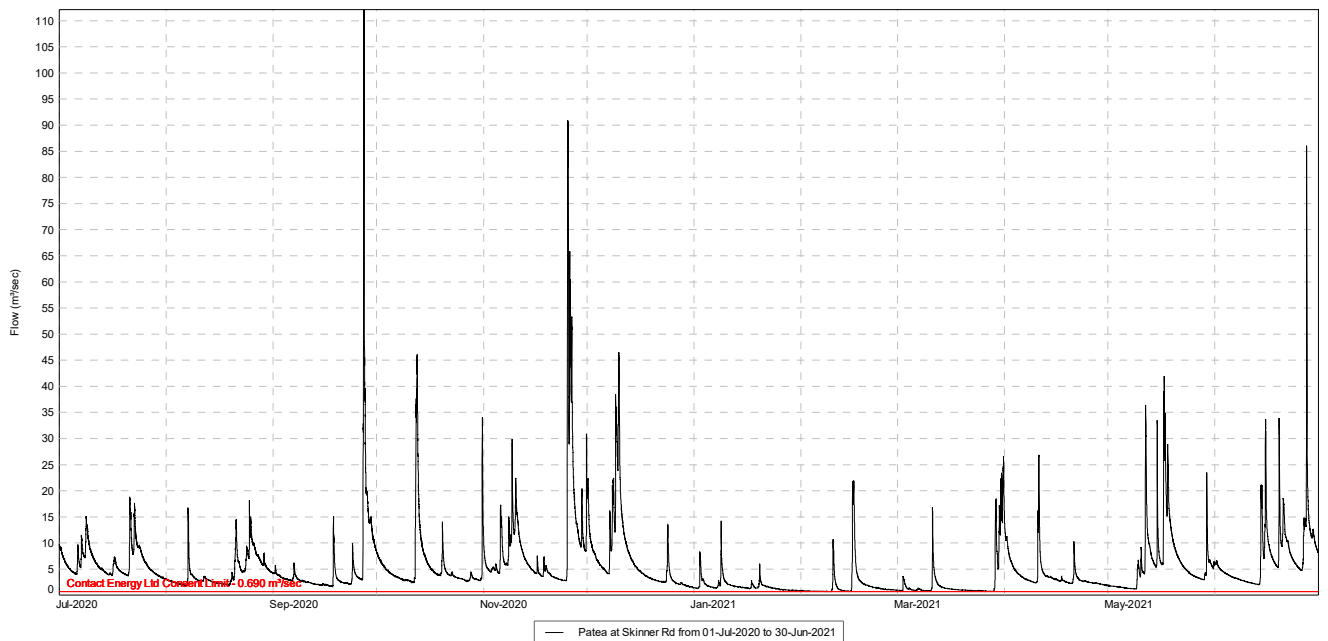


Figure 5 Patea River flow (m³/sec) at Skinner Road 2020-2021

Flow monitoring

The consent limit (4455-1) is 225 L/s when river flows at Skinner Road are above 765 L/s, ramping down to 150 L/s when river flows at Skinner Road are at or below 690 L/s. The record of the abstraction rate, as provided in Figure 4, can be compared against the flow at Skinner Road (Figure 5).

The abstraction is setup so it is not possible to exceed a pump rate of 225 L/s. Throughout the 2020-2021 monitoring period the maximum abstraction average intake flow was recorded was 127 L/s (June 2021) with an average abstraction of 47 L/s (Table 3). The total volume abstracted throughout the monitoring period was 1,202,291 m³. This was an increase of 203,502 m³ when compared to the previous monitoring period.

This abstraction volume was an increase of 16.9 % compared to the previous monitoring period (2019-2020), where the total abstraction volume was 998,789 m³. The TCC was in operation for a total 179 days

this monitoring period. For comparison, in the previous monitoring period the TCC was in operation for 136 days.

Table 3 Monthly abstraction data from the Company 2020-2021

Month	Max. Abstraction L/s average	Ave. Abstraction L/s average
July	87	60
August	88	53
September	88	41
October	102	26
November	86	27
December	79	22
January	86	23
February	72	27
March	87	30
April	84	42
May	124	51
June	127	47

2.1.4 Results of discharge monitoring

Consent 5848 is held by Contact Energy. This covers the discharge of used waters (mainly blowdown water) from the cooling system of combined cycle (TCC) and water treatment plant of the peaker facilities (SPP) to the Patea River (Figure 2).

The Company continuously monitors the following parameters:

- pH,
- Chlorine,
- Temperature (including the effluent of receiving waters), and
- Flow of the effluents from both plants (TCC and SPP).

The online monitoring sensors are checked twice daily. The Company also undertake sampling and analysis of grab samples from both operation pits (Figure 1) to assess the online sensor accuracy.

The Council samples the discharge from both plants. This is undertaken as close to quarterly as possible, although variations in the flow rate in the Patea River may lead to a slight augmentation in timing. Inter-laboratory comparison exercises are also undertaken between both parties of the same discharges through split samples.

The analysis undertaken by the Council in respect of the discharges includes the following:

- pH;
- Chlorine (free and total);
- Conductivity;
- Dissolved reactive phosphorus (DRP);
- Ammonia (NH₄)
- Oil and grease

- Suspended solids;
- Turbidity;
- Flow rate;
- Temperature; and
- Un-ionised ammonia (NH₃).

The Council analyses the samples to determine compliance with the specific consent conditions on effluent composition (pH and chlorine), it is also assessed for nutrients and nutrient minimisation (phosphorus). Ammonia is also assessed (in relation to the receiving water limit). General effluent parameters are also monitored for any significant change (conductivity, turbidity and suspended solids).

Consent 4459 covers the discharge of stormwater to the Kahouri Stream from the holding pond that serves both plants. Prior to 2011 there were minimal discharges from this pond as the majority of stormwater was recycled through the raw water pond. When the stormwater catchment area was increased as a result of redeveloping the site, the discharge from this source increased. This was also a reflection of the augmentation of the facilities' power generation capabilities, whereby the combined cycle (TCC) may be shut down for periods. This would result in a need to refresh the raw water pond at times through flow back into the Patea River, via the stormwater pond and Kahouri Stream. The stormwater prior to discharge is monitored by the Company and its compliance limits as defined by consent 4459 are as follows:

- pH (6-9),
- Suspended solids (100 g/m³), and
- Oil and grease (15 g/m³).

2.1.4.1 Results of monitoring by the Company

Tables 4 and 5 detail the monthly summaries provided to the Council from the Company. They relate to monitoring of the Patea River discharge by continuous analyser. The analyser record is also further checked for precision through the analysis of a grab sample from the associated operations pit.

Table 4 Monitoring of SPP effluent by the Company July 2020 - June 2021

Month	SPP & TCC Max flowrate discharge	SPP & TCC Ave flowrate discharge	SPP Max Cl ₂	SPP Ave Cl ₂	SPP Max pH	SPP min pH	SPP Temp Max	SPP Temp Ave
	L/s avg 15mins	L/s	ppm	ppm	pH	pH	°C	°C
July	40.587	11.453	0.097	0.009	9.51	5.03	15.20	12.45
August	42.723	11.084	0.086	0.004	8.32	6.27	16.72	13.20
September	35.868	10.295	0.079	0.004	7.80	6.91	14.19	12.72
October	45.347	18.258	0.048	0.007	7.98	5.89	19.49	16.02
November	43.883	22.548	0.844	0.010	8.75	6.11	19.10	16.21
December	39.923	20.713	0.538	0.013	8.17	6.13	21.19	18.51
January	38.969	20.811	0.143	0.016	8.16	6.20	23.53	20.12
February	42.525	21.076	1.183	0.011	8.31	6.86	22.97	20.36
March	38.860	19.190	0.791	0.017	8.88	6.11	22.66	18.73
April	38.538	13.490	0.104	0.038	7.73	6.88	30.46	17.08

Month	SPP & TCC Max flowrate discharge	SPP & TCC Ave flowrate discharge	SPP Max Cl ₂	SPP Ave Cl ₂	SPP Max pH	SPP min pH	SPP Temp Max	SPP Temp Ave
	L/s avg 15mins	L/s	ppm	ppm	pH	pH	°C	°C
May	44.512	10.926	0.821	0.015	8.33	7.32	15.96	13.47
June	51.521	9.356	0.049	0.024	7.99	6.40	13.28	11.62

Table 5 Monitoring of TCC plant effluent by the Company July 2020 - June 2021

Month	SPP & TCC Max flowrate discharge	SPP & TCC Ave flowrate discharge	TCC Max Cl ₂	TCC Ave Cl ₂	TCC Max pH	TCC min pH	TCC Temp Max	TCC Temp Ave
	L/s avg 15mins	L/s	ppm	ppm	pH	pH	°C	°C
July	40.587	11.454	0.76	0.03	7.53	6.90	23.20	20.23
August	42.723	11.363	1.02	0.04	8.79	6.97	23.38	20.14
September	35.868	9.994	0.05	0.01	8.17	6.71	22.80	20.62
October	45.347	17.733	0.06	0.02	8.95	6.84	22.20	15.69
November	43.883	22.548	0.06	0.02	8.45	6.56	21.69	16.98
December	39.923	20.662	0.48	0.04	8.96	6.75	20.30	18.10
January	38.969	20.836	0.98	0.03	8.93	6.50	25.86	20.43
February	42.525	21.076	0.26	0.02	8.57	6.91	22.48	19.75
March	38.860	18.995	0.05	0.00	8.97	6.83	27.20	19.85
April	38.538	13.520	0.12	0.01	8.95	6.72	26.09	20.73
May	44.512	10.926	0.75	0.01	7.75	6.77	26.52	22.11
June	51.521	9.111	0.16	0.01	8.81	6.05	22.69	20.01

Flow

The discharges from the Company in the 2020-2021 monitoring period were compliant with the associated consent limit which stipulates a rate of <78 L/s.

In 2020-2021, the combined average discharge flow from both plants (TCC and SPP) was 15.77 L/s, and the maximum recorded discharge flow was 51.521 L/s, recorded in June 2021. The total volume of wastewater discharged for the year was 483,448 m³. This was a 16% increase when compared to the previous monitoring period, when 405,785 m³ was discharged. This increase is most likely due to additional operational hours discussed in the previous section.

Chlorine

The yearly average value for chlorine within the discharge from the TCC was recorded as 0.02 ppm. The corresponding max value for chlorine was 1.02 ppm, recorded during August 2020. When chlorine levels reach or exceed 0.05 ppm, as with the pH, the discharge ceases.

For SPP, the yearly average value was recorded as 0.01 ppm chlorine, while the maximum recorded chlorine was found to be 1.18 ppm. This was recorded during February 2021. The control system engages and ceases the discharge prior to elevated chlorine process water discharging.

pH

The discharge pH remained within the consent range limit of pH 6.0-9.0 throughout the monitoring period for TCC, however on one occasion out of specification pH was noted. It also was recorded below the consent limit on two occasions at SPP.

For TCC the minimum pH observed was pH 4.86, recorded in December 2020. The maximum observed was pH 8.97, recorded in March 2021. For SPP the minimum pH recorded was pH 5.03, recorded in July 2020. The yearly maximum was recorded as pH 9.5, also recorded during July 2020.

When the continuous pH monitors indicate an exceedance with respect to the pH range limit, the wastewater discharge valve, at the relevant operations pit, on the site automatically closes immediately (within one minute). This does not allow the non-compliant discharge to enter the river.

The limits on the discharge monitor with respect to pH range, activate when the corresponding pH range reaches either, pH 6.1 or 8.9.

Temperature

The ambient river temperature during the monitoring period remained below the 25°C consented limit for the full duration of the monitoring period (Figure 6), allowing for continuous discharge if required. River temperature differentials also remained within consent limits. The maximum downstream river temperature was recorded at 21.6°C, 27 January 2021. The maximum differential of 0.58°C was recorded on the 24 March 2021 (Figure 7).



Figure 6 Patea River temperature 2020-2021

It is noted (consent 5848-1, condition 9) that the discharge should not alter the ambient water temperature of the receiving waters of the Patea River by more than 2°C at any time, and by no more than 1.5°C for 95% of the time, on an annual basis. Figure 7 shows that at no point during the monitoring period were the Company in breach of this conditional requirement. Post the 31 May 2021, the battery within the logger malfunctioned. This is the reason why, in both Figures 6 and 7, the record ceases at the end of May (31/05/2021, 13:15).

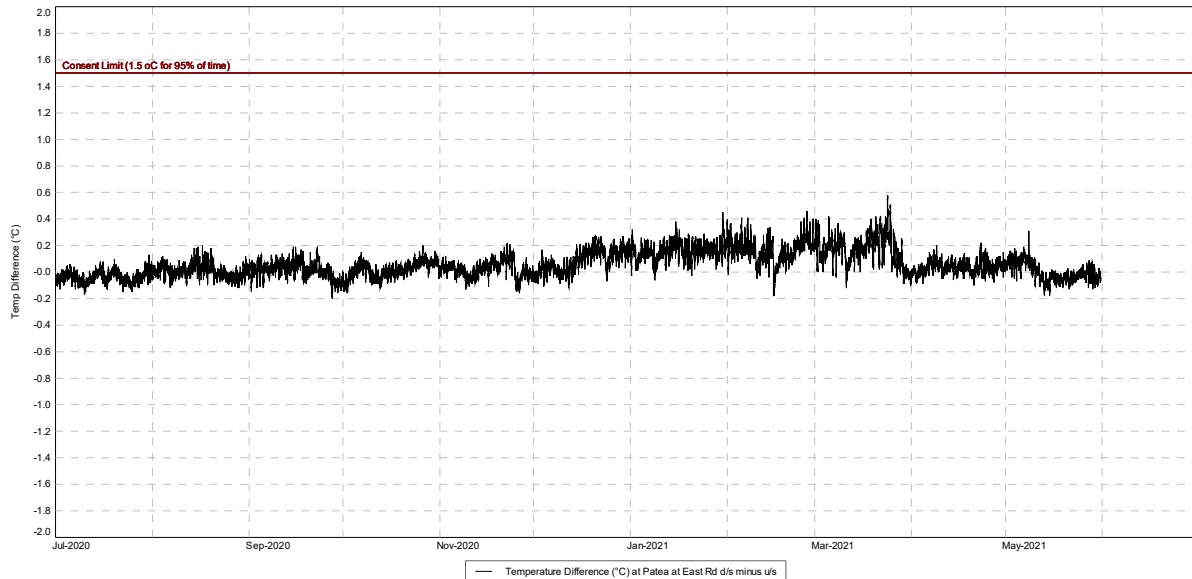


Figure 7 Temperature differential upstream minus downstream Patea River 2020-2021 monitoring period

2.1.4.2 Discharges to the Kahouri Stream

The Company recorded 17 occasions where stormwater was discharged to the Kahouri Stream during the 2020-2021 monitoring period. This occurred during high rainfall events. Stormwater monitoring is undertaken by the Company.

2.2 Results of receiving environment monitoring

2.2.1 Inter-lab Comparisons

The results of the Council monitoring of the effluent from the TCC and SPP in the 2020-2021 monitoring period are provided in Tables 6 and 7. Included in these tables are the corresponding concentrations of the continuous effluent monitoring provide by the Company for pH and chlorine and the associated grab samples, undertaken for validation of the continuous analysis.

Compliance monitoring

Specifically consent 5848-1 places limits on the pH range and the total residual chlorine concentrations within the effluent. As previously discussed, these limits are as follows:

The following concentration shall not be exceeded in the discharge effluent:

- pH range of discharge: pH 6.0-9.0;
- Total residual chlorine: 0.05 g/m³.

This condition shall apply immediately prior to the entry of the effluent into the receiving water.

Comparison exercises

Inter-laboratory comparisons were undertaken between the Company and the Council on four occasions this period (Tables 6 and 7). The comparisons were undertaken across the following parameters:

- Total residual chlorine;
- Conductivity;
- pH;
- Dissolved reactive phosphorus; and

- Turbidity.

The analysis provided in Tables 6 and 7 indicated that the facility was operating within its consent conditions with respect to discharges to the Patea River under consent 5848-1 in terms of pH and total residual chlorine. Further, the inter-laboratory comparison exercises indicated good agreement across all parameters.

Table 6 Inter-laboratory comparisons August 2020 and December 2020

18 Aug 2020	Site	IND002038 (Stratford Peaker Plant SPP)		IND002023 (Taranaki Combined Cycle TCC)	
	Units	Contact	TRC	Contact	TRC
Time	NZST	09:45	09:45	09:55	09:55
pH (lab)	pH	7.4	7.4	7.37	7.4
Total Cl ₂ (lab)	mg/L	0.00	<0.08	0.01	<0.07
Turbidity	NTU	1.34	1.56	3.57	3.5
Oil	g/m ³	A	<4	A	<4
Conductivity (lab)	µS/cm @ 25°C	353	356	1,304	1,309
Conductivity	mS/m	35.3	35.6	130.4	130.9
Phosphate (DRP)	g/m ³	1.96	0.59	NP	0.061
Discharge flow (meter)	L/s	23	-	7.1	-
pH (meter)	pH	7.52	-	7.23	-
Total Cl ₂ (meter)	mg/L	0.002	-	0.023	-
Temperature (meter)	°C	10.6	10.9	19.3	19.5
TSS	g/m ³	-	7	-	5
Ammonia	g/m ³	-	<0.01	-	<0.010
Un-ionised Ammonia	g/m ³	-	<0.00006	-	<0.00010
3 Dec 2020	Site	IND002038 (Stratford Peaker Plant SPP)		IND002023 (Taranaki Combined Cycle TCC)	
	Units	Contact	TRC	Contact	TRC
Time	NZST	08:15	08:15	08:30	08:30
pH (lab)	pH	7.09	7.0	7.52	7.4
Total Cl ₂ (lab)	mg/L	0.00	<0.07	0.00	<0.07
Turbidity	NTU	1.74	2.3	1.04	1.03
Oil	g/m ³	A	6	NP	7
Conductivity (lab)	µS/cm @25°C	429	430	160	166
Conductivity	mS/m	42.9	43.0	16.0	16.6
Phosphate (DRP)	g/m ³	1.02	0.22	NP	0.012
Discharge flow (meter)	L/s	-	8.05	-	15.2
pH (meter)	pH	7.21	-	7.17	-
Total Cl ₂ (meter)	mg/L	0.01	-	0.01	-
Temperature (meter)	°C	-	22.4	20.9	20.9
TSS	g/m ³	-	12	-	6
Ammonia	g/m ³	-	0.018	-	0.021
Un-ionised Ammonia	g/m ³	-	0.00009	-	0.00017

N/P = Not provided

Table 7 Inter-laboratory comparisons May 2021 and June 2021

4 May 2021	Site	IND002038 (Stratford Peaker Plant SPP)		IND002023 (Taranaki Combined Cycle TCC)	
	Units	Contact	TRC	Contact	TRC
Time	NZST	0945	0945	1005	1005
pH (lab)	pH	7.69	7.5	7.25	7.3
Total Cl2 (lab)	mg/L	0.00	-	0.01	-
Turbidity	NTU	0.75	0.71	4.45	4.3
Oil	g/m ³	A	<4	A	<4
Conductivity (lab)	µS/cm @ 25°C	297	305	1076	1094
Conductivity	mS/m	29.7	30.5	107.6	109.4
Phosphate (DRP)	g/m ³	0.67	0.162	N/P	0.113
Discharge flow (meter)	L/s	15	-	9.3	-
pH (meter)	pH	8.26	-	7.67	-
Total Cl2 (meter)	mg/L	0.024	-	0.009	-
Temperature (meter)	°C	12.7	12.7	20.9	20.9
TSS	g/m ³	-	4	-	6
Ammonia	g/m ³	-	0.038	-	0.021
Un-ionised Ammonia	g/m ³	-	0.00025	-	0.00017
30 June 2021	Site	IND002038 (Stratford Peaker Plant SPP)		IND002023 (Taranaki Combined Cycle TCC)	
	Units	Contact	TRC	Contact	TRC
Time	NZST	09:58	09:58	10:09	10:09
pH (lab)	pH	7.52	7.6	7.37	7.5
Total Cl2 (lab)	mg/L	0.01	<0.07	0.02	<0.07
Turbidity	NTU	1.69	1.78	3.35	4.2
Oil	g/m ³	A	<4	A	<4
Conductivity (lab)	µS/cm @25°C	279	280	938	917
Conductivity	mS/m	27.9	28.0	93.8	91.7
Phosphate (DRP)	g/m ³	0.48	0.101	NP	0.085
Discharge flow (meter)	L/s	15	-	19.6	-
pH (meter)	pH	7.67	-	7.78	-
Total Cl2 (meter)	mg/L	0.01	-	0.038	-
Temperature (meter)	°C	13.7	9.9	16.6	16.7
TSS	g/m ³	-	7	-	<3
Ammonia	g/m ³	-	<0.010	-	<0.010
Un-ionised Ammonia	g/m ³	-	<0.00007	-	<0.00009

NP = Not provided

A = Absent

The results of the two inter-laboratory comparisons undertaken in this monitoring period were provided in the above Tables 6 and 7. The results indicated the following:

- All results were within consent limits.

- pH variations were found to be relatively minor throughout the monitoring period, with the largest variation being 0.19 pH units, recorded at the SPP site on the 04 May 2021. In terms of consents; 5848-1 requires the pH of the discharge to remain within set standards (6-9 pH), the values recorded indicated compliance with this consent limit on the four occasions it was assessed.
- Total chlorine levels were monitored through lab samples, it is also monitored at the discharge through meters. The highest concentration of total Cl_2 was 0.024 mg/L at the SPP site on the 04 May 2021.
- The temperature comparisons indicated good agreement at the TCC discharge, but there were notable discrepancies at the SPP discharge, with a difference of 3.5°C during June 2021.
- Throughout this monitoring period both ammonia and un-ionised ammonia levels were monitored by the Council. The results indicated that levels of ammonia and un-ionised ammonia were all below, or close to, the limit of detection. The highest recording of ammonia was 0.038 g/m³ recorded on the 04 May 2021 at the SPP discharge site, while the highest recording for un-ionised ammonia was 0.00025 g/m³ recorded again on the 04 May 2021 at the SPP discharge site.
- Turbidity comparisons demonstrated reasonable agreement across both plants and all four inter-laboratory exercises.
- Oil levels were measured in g/m³ by the Council, and visual checks by the Company. The highest level recorded from Council was 7 g/m³ recorded on the 03 December 2020 on the TCC.
- Conductivity comparisons indicated good compliance between the two laboratories. The largest variation between the two laboratories was 21 $\mu\text{S}/\text{cm}$ points recorded on the 30 June 2021 at the TCC site. This a minor variation.
- Phosphate comparisons indicated some slight variation in results. The largest variation between the two laboratories was 1.37 g/m³, recorded on the 18 August 2020 at the SPP site. The Council made the Company aware of this variation and the Company are working towards gaining better agreement in this analyte. It is noted that in subsequent monitoring rounds, the variation has reduced. The Company consistently recorded higher phosphate concentrations than the Council.
- Total Suspended Solids (TSS) observations were monitored only by Council during this monitoring period. The highest reading of TSS occurred at the SPP site on the 03 December 2020. The result was 12 g/m³ of solids.

Overall, the inter-laboratory comparisons indicated good agreement between both parties. Subtle variations were noted, however the concentrations recorded were of a low value. Gaining identical results at low concentrations is difficult. The additional work to bring in to line the variation noted on the phosphate levels appears to be working.

2.2.2 Physicochemical monitoring by the Council

On four occasions in the 2020-2021 monitoring period water quality samples were collected from the Patea River. There are two sample sites (Figure 2) in respect to the discharge of monitored plant effluent from the Company. One site is located upstream (PAT000356), above the discharge, aimed at assessing the preceding water quality. The second site is located at the boundary of the 75 m mixing zone (PAT000357), post the discharge, downstream of the discharge, aimed at assessing the likely effect of the discharge.

The results of the four monitoring rounds on the Patea River are presented in Table 8.

Table 8 Surface water monitoring Patea River July 2020 - June 2021

Parameter	Discharge origin	TCC and SPP		TCC and SPP		TCC and SPP		TCC and SPP	
	Site	PAT000356	PAT000357	PAT000356	PAT000357	PAT000356	PAT000357	PAT000356	PAT000357
	Collected	18 Aug 2020	18 Aug 2020	3 Dec 2020	3 Dec 2020	4 May 2021	4 May 2021	30 Jun 2021	30 Jun 2021
	Time (NZST)	0940	0950	1040	1050	1045	1050	1030	1050
	Unit/Location	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream
Dissolved Reactive Phosphorus	g/m ³	0.039	0.047	0.026	0.023	0.049	0.047	0.020	0.020
Electrical Conductivity	mS/m	11.3	13.3	10.1	10.2	11.9	13.1	9.6	10.2
Free Ammonia as N	g/m ³	0.00051	0.00060	0.00131	0.00104	0.00067	0.00080	0.00024	0.00021
pH	pH Units	7.1	7.2	7.5	7.5	7.4	7.5	7.0	6.9
Sample Temperature	°C	6.5	6.9	16.1	15.6	8.8	9.3	8.0	8.2
Total Ammoniacal-N	g/m ³	0.27	0.24	0.127	0.120	0.164	0.134	0.162	0.150
Total Suspended Solids	g/m ³	<3	<3	<3	<3	<3	4	4	<3
Turbidity	FNU	1.33	1.13	2.0	1.99	1.32	1.50	1.12	0.99

The analysis provided in Table 8 indicate that the plant effluents from the two operation areas of SPP and TCC were having a minimal effect on Patea River at the time of sampling.

The monitoring indicated the following:

- Dissolved reactive phosphorus (DRP) results recorded minimal increases between both sites. The largest increase between the two sites was found during the August 2020 monitoring round with an increase of 0.008 g/m³.
- Electrical conductivity (EC) values indicated slight increases between the two monitoring sites across the four monitoring rounds. The largest increase was found in the August 2020 monitoring round with an increase of 2.0 mS/m.
- Free ammonia (NH₃) was recorded at very low concentrations throughout the monitoring period. The largest increase of free ammonia was recorded during the May 2021 monitoring round with an increase of 0.00013 g/m³, which is minimal.
- pH results indicated values all but one above neutral pH (>7 pH). The range recorded was 6.9-7.5 pH, with the lower readings recorded in the June 2021 monitoring round, and the higher readings were recorded during the December 2020 and May 2021 rounds.
- Surface water temperatures ranged from 6.5-16.1°C this monitoring period. The lower temperatures were observed in August 2020, whilst the higher temperatures were recorded in the December 2021 monitoring round. The greatest increase was noted at 0.5°C.
- Total ammoniacal nitrogen (NH₄) was recorded throughout this monitoring period. The range recorded <0.120 g/m³ through to 0.27 g/m³ indicated low concentrations for this analyte. It should

be noted that a higher concentration was recorded at the upstream water quality site (0.27 g/m³, PAT000356) in August 2020.

- Total suspended solids (TSS) was below the level of detection (<3 g/m³) during the majority of the monitoring period. The highest value of 4 was recorded at the downstream site in May 2021 and the upstream site in June 2021. The greatest increase was observed during May with an increase of 1 g/m³.
- Turbidity, as measured in FNU, ranged from 0.99-2.0 FNU, with the upper levels recorded during the September 2019 round and the lower levels recorded during the December 2020 round. The largest increase in this analyte was 0.18 FNU during the May 2021 monitoring.

2.2.3 Biomonitoring 2020-2021

Biomonitoring forms a key component of the consent compliance monitoring programme implemented by the Council following the construction of the Taranaki Combined Cycle (TCC) power station in 1998, and the addition of Stratford Peaker Plant (SPP) in 2011. These particular biological monitoring surveys relate primarily to consent 5848, which permits the discharge of cooling water into the Patea River approximately 1 km upstream of the river's confluence with the Kahouri Stream, east of Stratford, and consent 4459-1 to discharge stormwater into tributaries of the Patea River.

2.2.3.1 Biomonitoring Patea River 2020-2021

Five sites in total were surveyed in the Patea River. Consents granted in 2001 (5847 and 5850) for the future expansion of the power station (TCC2) required the establishment and monitoring of two additional sites in the mid-reaches of the Patea River, between the site of the proposed additional water abstraction (Skinner Road) and the confluence with the Mangaehu River. These sites (Figures 8 and 9) at Hungers Road and a further 13 km downstream (adjacent to Raupuha Road, below the Makuri Stream confluence) were initially sampled as a component of the environmental effects assessment for the power station expansion (Stark and Young, 2001 and CF251). They continue to provide baseline information in anticipation of this expansion.

At each of these sites the Council collected streambed macroinvertebrates to investigate the effects of the cooling water discharge and abstraction of water for the Company's combined cycle and Peaker Power stations. Macroinvertebrates were identified, the number of different types of taxa counted (taxa richness), and MCI and SQMCI scores were calculated for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of nutrient pollution in streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to pollution. The SQMCI takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities. Significant differences in either the MCI or the SQMCI between sites indicate the degree of adverse effects (if any) of the discharges being monitored and enable the overall health of the macroinvertebrate communities to be determined.

Biomonitoring of the TCC station stormwater discharges to the Kahouri Stream is also performed as a separate monitoring programme and this is reported separately. The present biomonitoring surveys in the Patea River were performed on the 24th November 2020 and again on the 24th February 2021.

Method

The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from five riffle sites in the Patea River. These sites were located as listed in Table 9 and illustrated in Figure 4 and Figure 5.

Table 9 Location of biomonitoring sampling sites in relation to the Patea River

Site No	Site code	Grid reference	Location	Altitude (m asl)
1	PAT000356	E1714497 N5645112	U/s of TCC cooling wastes discharge	250
2	PAT000357	E1714662 N5645076	100 m d/s of TCC cooling wastes discharge	250
3	PAT000360	E1715919 N5644681	Skinner Road	240
4	PAT000397	E1718991 N5643531	Hungers Road	200
5	PAT000430	E1723952 N5641068	Raupuha Road	160

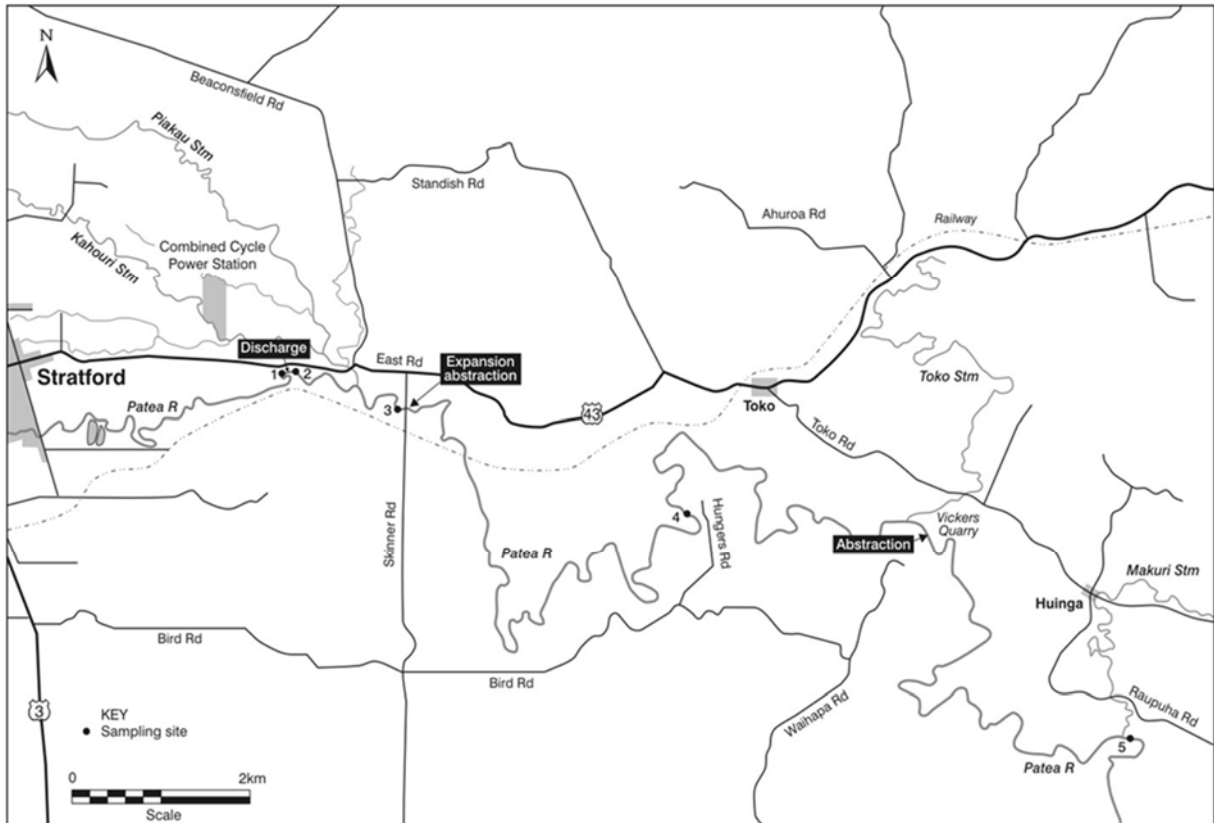


Figure 8 Location of biomonitoring sites in the Patea River in relation to Stratford Power Station

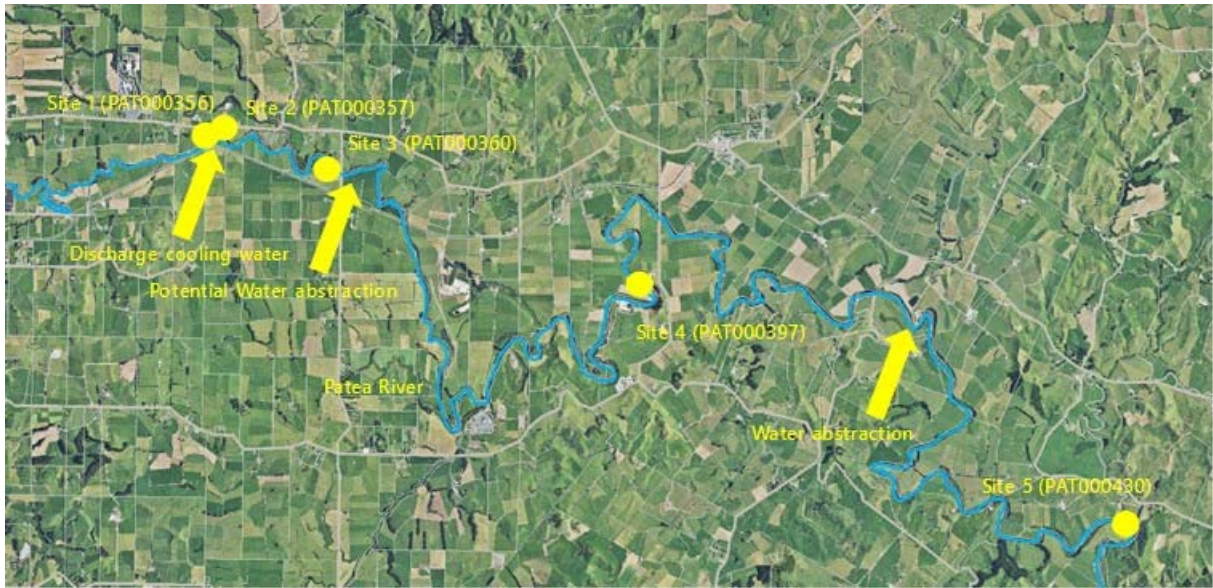


Figure 9 Location of biomonitoring sites in the Patea River in relation to the power station discharge of cooling water

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).

Samples were preserved with 70% ethanol for later stereomicroscopic sorting and identification. According to documented Taranaki Regional Council methodology and macroinvertebrate taxa abundances scored based on the categories in Table 10 and Table 11.

Table 10 Macroinvertebrate abundance categories

Abundance category	Number of individuals
R (rare)	1-4
C (common)	5-19
A (abundant)	20-99
VA (very abundant)	100-499
XA (extremely abundant)	500+

Table 11 Macroinvertebrate health based on MCI and SQMCI ranges which has been adapted for Taranaki streams and rivers from Stark's classification (Stark, 1985 and Stark and Maxted, 2007)

TRC Grading	MCI	SQMCI
Excellent	≥140	≥7.00
Very Good	120-139	6.00-6.99
Good	100-119	5.00-5.99
Fair	80-99	4.00-4.99
Poor	60-79	3.00-3.99
Very Poor	<60	<3.00

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 collected 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 (Table 11). More 'sensitive' communities inhabit less polluted waterways. A difference of 10.83 units or more in MCI values is considered significantly different between individual kick samples (Stark 1998) and from past TRC experience is also significantly different between individual kick-samples and other values (medians, means, limits, expected values etc).

A semi-quantitative MCI value, SQMCI (Stark 1999) 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 scores, and dividing by the sum of the loading factors. 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). A difference of 0.83 units or more in SQMCI values is considered significantly different between individual kick samples (Stark 1998) and from past TRC experience is also significantly different between individual kick-samples and other values (medians, means, limits, expected values etc).

2.2.3.1.1 November 2020 Results

Site habitat characteristics and hydrology

This spring survey was performed under low flow conditions, 13 days after a fresh in excess of 3 and 14 days after a fresh in excess of 7 times median flow in the Patea River (flow gauging site at the Patea River at Skinner Road). Environmental data recorded at the time of the survey is presented in Table 12.

Table 12 Summary of the environmental data recorded at five sites in relation to monitoring carried out for Contact Energy, 24 November 2020

Site number	Site 1	Site 2	Site 3	Site 4	Site 5
Site Code	PAT000356	PAT000357	PAT000360	PAT000397	PAT000430
Sample Number	FWB20331	FWB20332	FWB20333	FWB20334	FWB20335
Time	12:40	12:40	13:15	13:50	14:30
Temperature	13.3	13.3	13.5	14.1	15.0
Water colour	Uncoloured	Uncoloured	Uncoloured	Uncoloured	Uncoloured
Water clarity	Clear	Clear	Clear	Clear	Clear
Flow conditions	Moderate	Moderate	Moderate	Moderate	Moderate
Water speed	Swift	Swift	Swift	Swift	Swift
Sampling habitat	Riffle	Riffle	Riffle	Riffle	Riffle
Periphyton mats	Patchy	Patchy	Patchy	Patchy	Patchy
Periphyton filaments	Patchy	Patchy	Widespread	Patchy	Widespread
Moss	None	None	None	None	Patchy
Leaves	Patchy	Patchy	Patchy	None	Patchy
Wood	None	None	None	None	None
Macrophytes	None	None	None	None	Edges Only
Bank stability	Mostly Stable	Mostly Stable	Mostly Stable	Mostly Stable	Stable
Stock damage	None	None	None	None	None
Iron oxide or silt coating	No	No	No	No	No
Substrate embedded	No	No	No	No	No
Substrate disturbed	With Difficulty	With Difficulty	Moderate Kicking	Moderate Kicking	Moderate Kicking
Bed shaded	No	No	No	No	No

Site number	Site 1	Site 2	Site 3	Site 4	Site 5
Site Code	PAT000356	PAT000357	PAT000360	PAT000397	PAT000430
Sample Number	FWB20331	FWB20332	FWB20333	FWB20334	FWB20335
Undercut banks	No	No	No	Yes	No
Overhanging vegetation	No	No	No	No	No
Substrate composition	Silt	10	10	0	10
	Sand	5	5	5	5
	Fine gravel	10	10	10	10
	Coarse gravel	10	10	15	15
	Cobble	40	40	40	40
	Boulder	25	25	30	20
	Bedrock	0	0	0	0
	Hard clay	0	0	0	0
	Wood/root	0	0	0	0
	Concrete/gabion	0	0	0	0

Macroinvertebrate communities

Prior to the establishment of the Contact Energy Ltd's programme, biomonitoring surveys had been performed at site 1 (in association with other consents' monitoring programmes) and site 3 (SEM and investigation programmes). Site 2 was established specifically for the purpose of the Contact Energy Ltd consent monitoring programme and sampled initially in spring 1998. The two lower sites (sites 4 and 5) had been surveyed on fewer previous occasions, principally for environmental assessment purposes. A summary of the results of these previous surveys and the existing programme's results is presented in Table 13 and current survey results are presented in Table 14.

Table 13 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between January 1992 and the current survey

Site No.	N	No of taxa				MCI value				SQMCI value				
		Median	Range	Previous survey	Current survey	Median	Range	Previous survey	Current survey	N	Median	Range	Previous survey	Current survey
1	51	23	14-31	18	19	98	81-116	81	102	44	4.1	2.3-7.2	3.2	6.1
2	44	22	13-33	13	16	99	74-111	74	101	44	4.0	2.0-6.8	2.8	4.6
3	52	23	15-33	15	16	98	77-112	77	85	44	3.8	1.9-7.3	3.1	3.5
4	37	21	15-30	18	17	95	82-108	84	94	37	4.8	3.1-7.2	3.9	4.4
5	37	21	15-26	16	15	94	82-103	93	96	37	4.2	2.6-7.1	3.9	4.8

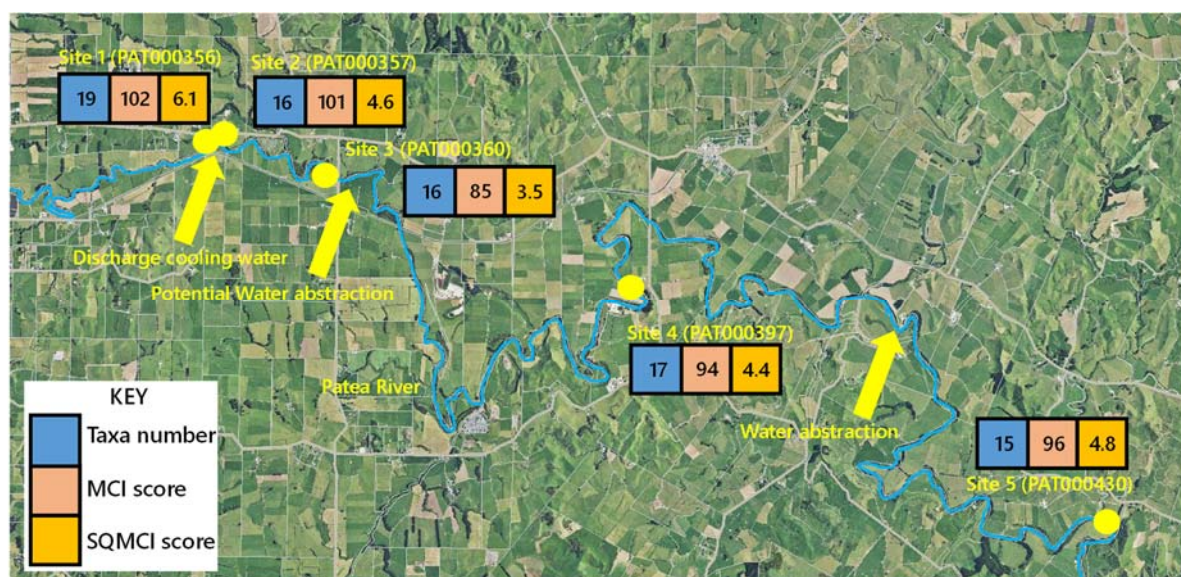


Figure 10 Location of biomonitoring sites in the Patea River in relation to the power station discharge of cooling water and water abstraction with taxa number, MCI scores and SQMCI scores for each site

The macroinvertebrate fauna results from the present survey are presented in Figure 10, and previous survey and current survey results are shown in Table 13.

Table 14 Macroinvertebrate fauna of the Patea River in relation to Stratford Power Ltd sampled on 24 November 2020

Taxa List	Site Number	Taranaki MCI score	1	2	3	4	5
	Site Code		PAT000356	PAT000357	PAT000360	PAT000397	PAT000430
	Sample Number		FWB20331	FWB20332	FWB20333	FWB20334	FWB20335
ANNELIDA (WORMS)	Oligochaeta	1	C	C	R	C	C
	Lumbricidae	5	-	-	-	R	C
MOLLUSCA	<i>Potamopyrgus</i>	4	C	C	R	A	A
EPHEMEROPTERA (MAYFLIES)	<i>Ameletopsis</i>	10	R	-	-	-	-
	<i>Austroclima</i>	7	-	R	-	-	R
	<i>Coloburiscus</i>	7	C	C	R	-	-
	<i>Deleatidium</i>	8	VA	A	C	A	A
	<i>Zephlebia group</i>	7	-	R	-	-	R
PLECOPTERA (STONEFLIES)	<i>Acoperla</i>	5	-	R	-	-	-
	<i>Zelandobius</i>	5	-	-	R	R	-
COLEOPTERA (BEETLES)	Elmidae	6	C	R	R	C	C
	Hydraenidae	8	R	-	-	-	-
MEGALOPTERA (DOBSONFLIES)	<i>Archichauliodes</i>	7	A	C	R	C	R
TRICHOPTERA (CADDISFLIES)	<i>Hydropsyche (Aoteapsyche)</i>	4	C	R	C	A	R
	<i>Costachorema</i>	7	C	C	-	R	-
	<i>Hydrobiosis</i>	5	C	C	C	A	C
	<i>Beraeoptera</i>	8	R	-	-	-	-
	<i>Oxyethira</i>	2	-	-	R	-	-
DIPTERA (TRUE FLIES)	<i>Pycnocentroides</i>	5	R	-	-	C	A
	<i>Aphrophila</i>	5	R	C	R	R	C
	Eriopterini	5	-	-	-	R	-
	<i>Maoridiamesa</i>	3	A	A	A	A	A
	Orthoclaadiinae	2	A	A	A	A	C
	Tanypodinae	5	-	-	-	R	-
	Tanytarsini	3	R	-	C	-	R
	Empididae	3	-	-	R	-	-
	Muscidae	3	-	-	R	-	-
	Psychodidae	1	R	-	-	-	-
<i>Austrosimulium</i>	3	C	C	-	-	-	
Tabanidae	3	-	-	-	R	-	

Taxa List	Site Number	Taranaki MCI score	1	2	3	4	5	
	Site Code		PAT000356	PAT000357	PAT000360	PAT000397	PAT000430	
	Sample Number		FWB20331	FWB20332	FWB20333	FWB20334	FWB20335	
No of taxa			19	16	16	17	15	
Taranaki MCI			102	101	85	94	96	
Taranaki SQMCI			6.1	4.6	3.5	4.4	4.8	
EPT (taxa)			8	8	5	6	6	
%EPT (taxa)			42	50	31	35	40	
'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa						

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

2.2.3.1.2 Discussion and conclusions for biomonitoring Patea River November 2020

The two upstream sites (sites 1 and 2), and to a minor extent the middle reach site (site 3) provide information regarding the effects of the cooling water discharge into the Kahouri Stream; while sites 4 and 5 provide information regarding the water abstraction. Sites 3, 4, and 5 also provide background information for the anticipated expansion of the power scheme.

Macroinvertebrate taxa richness was moderate with richness lower than historic medians during November 2020. There was little variation among sites though there was a slight decrease of three taxa between sites 1 and 2. Site 5 also recorded its equal lowest richness of 15 taxa. As the changes in taxa richness among sites, including the control site, were negligible, the Kahouri Stream input and water abstraction were not having an effect on taxa richness.

The MCI scores during November categorised sites 1 and 2 as having 'good' generic river health and sites 3, 4 and 5 as having 'fair' generic river health. There were no significant differences between sites 1 and 2 and sites 4 and 5, indicating that the Kahouri Stream input and water abstraction were not having an effect on taxa richness. However, there was a significant decrease in MCI scores between sites 2 and 3 but this appears unrelated to the discharge. Site 3 was also the only site that had a score significantly lower than its historic median indicating lower than normal macroinvertebrate health at the site. It should be noted that there was an improvement in MCI score at site 3 since the previous survey, but all sites had an increase in MCI score since the previous survey, with the majority of sites having a significant increase.

The SQMCI can be more sensitive than the MCI because, in addition to sensitivity scores, it also accounts for taxa abundance. These scores showed a significant decline from site 1 to site 2 of 1.5 units. The main reason for the change and incongruence with the MCI results was due to a one category change in abundance class in *Deleatidium* mayflies, a reduction from very abundant to abundant would result in a decrease of score by 1.2 units, changing it to 4.9, very similar to the site 2 score of 4.6. SQMCI can sometimes be too sensitive to the effects of the dominant taxa, especially when there is only one taxa in the highest abundance class. There was also a significant decrease in SQMCI score from site 2 to site 3, which was congruent with the MCI results and probably reflected a genuine decrease in macroinvertebrate health. There was a significant increase in SQMCI score from site 3 to site 4, which again was similar to the MCI results, which showed a non-significant increase of 9 units, and no significant difference between sites 4 and 5, again congruent with the MCI results. There was only one significant difference in SQMCI scores compared with historic medians, which was a significant increase in score at site 1, which as stated above, was probably not a true reflection of macroinvertebrate health.

In comparison, during the February 2021 period Macroinvertebrate taxa richness was moderate to moderately low with richness equal to or lower than historic medians. There was larger than usual variation among sites, with a large nine taxa increase between sites 2 and 3 with site 2 recording its second equal lowest richness of 14 taxa. There was only a small decrease in taxa richness between sites 1 and 2 of four

taxa indicating that the discharge of cooling water was not having a significant effect on macroinvertebrate richness.

The MCI scores categorised all sites as having 'fair' generic river health except site 2, which only had poor health. There was a significant decrease between sites 1 and 2 and then a significant increase between site 2 and 3 indicative of a localised impact on macroinvertebrate health between sites 1 and 3. Further, the result was the second lowest recorded MCI score at the site, with only the previous summer MCI score lower, and the site was also the only one to have a score significantly lower than its historic median. Long term monitoring results (Table 13) suggest MCI scores have been markedly fluctuating at the site between spring and summer surveys for the last four monitoring years (2017/18-2020/21) with this pattern not seen previously at the site. However, the control site (site 1) also appears to be exhibiting a similar but not as strong seasonal variation congruent with that of site 2 indicating activities upstream are affecting macroinvertebrate health (e.g. the Stratford WWTP discharge).

There was no obvious habitat differences between sites 1 and 2, with only the absence of wood being significantly different between the two sites along with some minor changes in percentage substrate categories. However, there was a change in temperature, but with site 2, which was sampled in a slightly warmer time of day, having a significantly lower temperature than site 1.

The SQMCI can be more sensitive than the MCI because, in addition to sensitivity scores, it also accounts for taxa abundance. These scores indicated that all sites in the Patea River were in poor health. There was a significant increase from site 3 to site 4 with no other significant differences between sites; indeed, sites 1, 2 and 3 had exactly the same score. The main reason for the incongruence with the MCI results between sites 1 and 2 was the presence of two high scoring rare taxa at site 1 that were not present at site 2. The MCI uses only presence/absence data and the high scoring taxa would have had a significant impact on the MCI score but negligible impact on SQMCI scores.

Overall, these biomonitoring survey performed in relation to the discharge of cooling water from the power station and water abstraction indicated no significant impacts upon the biological communities of the Patea River. There appeared to be a deterioration in stream health between sites 2 and 3 during the November 2020 period but this was unlikely to be related to the cooling water discharge, with the macroinvertebrate community at site 3 being in poorer than usual health.

2.2.3.1.3 February 2021 Results

This summer survey was performed 8 days after a fresh in excess of 3 times median flow and 76 days after a fresh in excess of 7 times median flow in the Patea River (flow gauging site at the Patea River at Skinner Road). Environmental data recorded at the time of the survey is presented in Table 15.

Table 15 Summary of the environmental data recorded at five sites in relation to monitoring carried out for Contact Energy, 24 February 2021

Site number	Site 1	Site 2	Site 3	Site 4	Site 5	
Site Code	PAT000356	PAT000357	PAT000360	PAT000397	PAT000430	
Sample Number	FWB20196	FWB20197	FWB20198	FWB20199	FWB20200	
Time	12:30	12:00	13:00	13:55	14:55	
Temperature	16.9	17.0	16.6	18.7	18.9	
Water colour	Uncoloured	Uncoloured	Uncoloured	Uncoloured	Uncoloured	
Water clarity	Clear	Clear	Clear	Clear	Clear	
Flow conditions	Low	Low	Moderate	Low	Low	
Water speed	Swift	Swift	Swift	Swift	Swift	
Sampling habitat	Riffle	Riffle	Riffle	Riffle	Riffle	
Periphyton mats	Patchy	Widespread	Widespread	Widespread	Patchy	
Periphyton filaments	Patchy	Patchy	Patchy	Widespread	Widespread	
Moss	Patchy	Patchy	Patchy	None	None	
Leaves	Patchy	Patchy	Patchy	None	Patchy	
Wood	Patchy	None	None	None	None	
Macrophytes	None	None	None	None		
Bank stability	Mostly Stable	Mostly Stable	Mostly Stable	Mostly Stable	Stable	
Stock damage	None	None	None	None	None	
Iron oxide or silt coating	No	No	No	No	No	
Substrate embedded	No	No	No	No	No	
Substrate disturbed	Moderate Kicking	Moderate Kicking	Moderate Kicking	Moderate Kicking	Moderate Kicking	
Bed shaded	No	No	No	No	No	
Undercut banks	No	Yes	Yes	No	No	
Overhanging vegetation	No	No	No	No	No	
Substrate composition	Silt	5	5	5	5	0
	Sand	5	5	5	10	5
	Fine gravel	15	10	10	15	10
	Coarse gravel	15	20	20	25	15
	Cobble	35	40	40	25	60
	Boulder	25	20	20	20	10
	Bedrock	0	0	0	0	0
	Hard clay	0	0	0	0	0
Wood/root	0	0	0	0	0	
Concrete/gabion	0	0	0	0	0	

Macroinvertebrate communities

A summary of the results of these previous surveys and the existing programme's results are presented in Table 16 and current survey results are presented in Table 17.

Table 16 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between January 1992 and the current survey

Site No.	N	No of taxa				MCI value				SQMCI value				
		Median	Range	Previous survey	Current survey	Median	Range	Previous survey	Current survey	N	Median	Range	Previous survey	Current survey
1	52	23	14-31	19	18	98	81-116	102	88	45	4.1	2.3-7.2	6.1	3.1
2	45	22	13-33	16	14	100	74-111	101	77	45	4.0	2.0-6.8	4.6	3.1
3	53	23	15-33	16	23	98	77-112	85	89	45	3.8	1.9-7.3	3.5	3.1
4	38	21	15-30	17	19	95	82-108	94	93	38	4.8	3.1-7.2	4.4	3.9
5	38	21	15-26	15	21	94	82-103	96	90	38	4.2	2.6-7.1	4.8	3.4

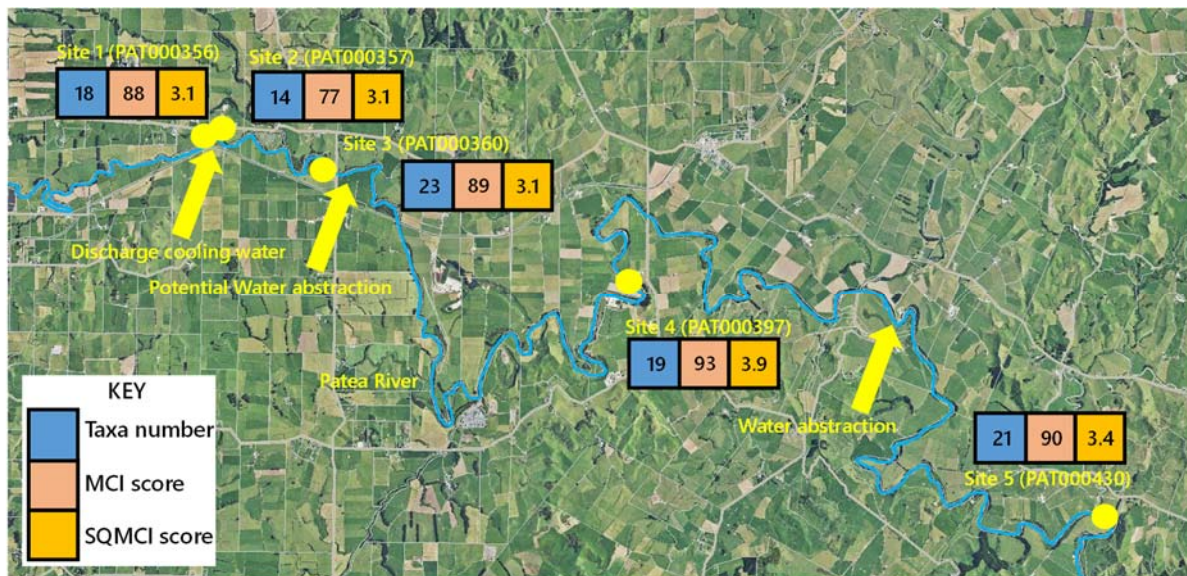


Figure 11 Location of biomonitoring sites in the Patea River in relation to the power station discharge of cooling water and water abstraction with taxa number, MCI scores and SQMCI scores for each site

The macroinvertebrate fauna results from the present survey are presented in Figure 11.

Table 17 Macroinvertebrate fauna of the Patea River in relation to Stratford Power Ltd sampled on 24 February 2021

Taxa List	Site Number	Taranaki MCI score	1	2	3	4	5
	Site Code		PAT000356	PAT000357	PAT000360	PAT000397	PAT000430
	Sample Number		FWB21178	FWB21179	FWB21180	FWB21181	FWB21182
PLATYHELMINTHES (FLATWORMS)	<i>Cura</i>	3	-	-	-	-	R
ANNELIDA (WORMS)	Oligochaeta	1	A	C	C	R	R
	Lumbricidae	5	-	-	R	R	-
HIRUDINEA (LEECHES)	Hirudinea	3	R	-	-	-	-
MOLLUSCA	<i>Latia</i>	5	-	-	R	-	-
	<i>Physella</i>	3	R	-	-	-	-
	<i>Potamopyrgus</i>	4	A	C	A	A	VA
CRUSTACEA	<i>Paracalliope</i>	5	-	-	R	-	R
	<i>Paranephrops</i>	5	-	-	R	-	-
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>	7	-	-	-	R	C
	<i>Coloburiscus</i>	7	-	-	-	R	-
	<i>Deleatidium</i>	8	R	-	R	A	C
	<i>Zephlebia group</i>	7	R	R	R	-	R
HEMIPTERA (BUGS)	<i>Saldidae</i>	5	-	-	R	-	-
COLEOPTERA (BEETLES)	Elmidae	6	R	-	A	A	C
	Hydraenidae	8	R	-	-	-	-
MEGALOPTERA (DOBSONFLIES)	<i>Archichauliodes</i>	7	R	C	C	C	R
TRICHOPTERA (CADDISFLIES)	<i>Hydropsyche (Aoteapsyche)</i>	4	C	C	A	VA	A
	<i>Costachorema</i>	7	R	-	R	R	R
	<i>Hydrobiosis</i>	5	R	R	C	A	C
	<i>Oxyethira</i>	2	R	R	C	R	R
	<i>Pycnocentria</i>	7	-	-	-	-	C
	<i>Pycnocentroides</i>	5	-	R	-	A	C
DIPTERA (TRUE FLIES)	<i>Aphrophila</i>	5	-	R	R	R	-
	<i>Maoriadiamesa</i>	3	C	R	A	C	C
	Orthoclaadiinae	2	C	A	VA	VA	VA
	<i>Polypedilum</i>	3	-	-	-	-	R
	Tanytarsini	3	C	R	VA	C	VA
	Empididae	3	-	-	C	R	R
	Ephydriidae	4	-	-	-	R	-
	Muscidae	3	C	R	A	-	C
	<i>Austrosimulium</i>	3	C	A	R	-	-
	Tanyderidae	4	-	-	R	-	-
No of taxa			18	14	23	19	21
Taranaki MCI			88	77	89	93	90
Taranaki SQMCI			3.1	3.1	3.1	3.9	3.4
EPT (taxa)			5	4	5	7	8
%EPT (taxa)			28	29	22	37	38
'Tolerant' taxa		'Moderately sensitive' taxa	'Highly sensitive' taxa				

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

2.2.3.1.4 Taxa and MCI values in Patea River

The number of taxa and the macroinvertebrate community index results, by site, are provided in Figures 12-17. These figures include the data from both rounds (November 2020 and February 2021) of biomonitoring undertaken on the Patea River this monitoring period.

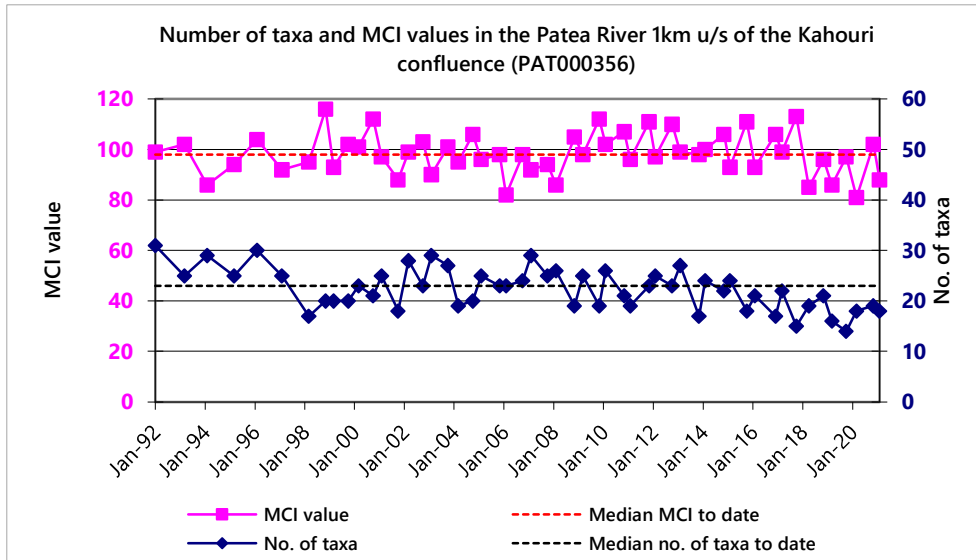


Figure 12 Taxa richness and MCI scores recorded to date at site PAT000365 u/s of discharge

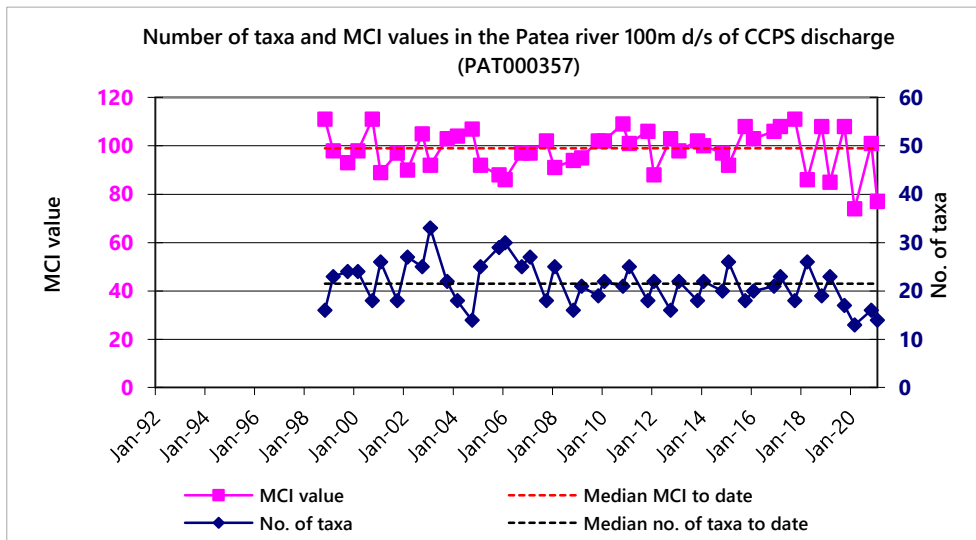


Figure 13 Taxa richness and MCI scores recorded to date at site PAT000357 d/s of discharge

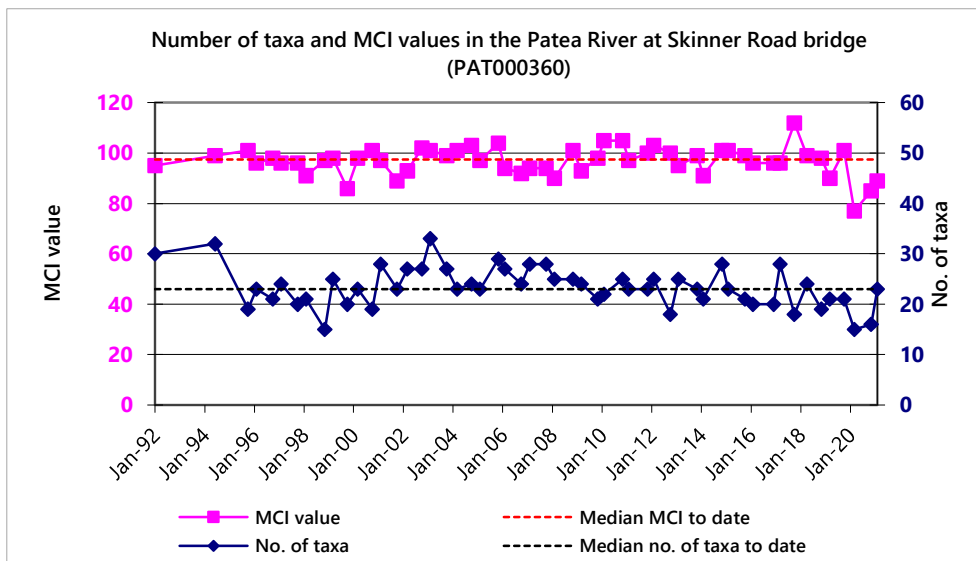


Figure 14 Taxa richness and MCI scores recorded to date at site PAT000360 Skinner Road Bridge

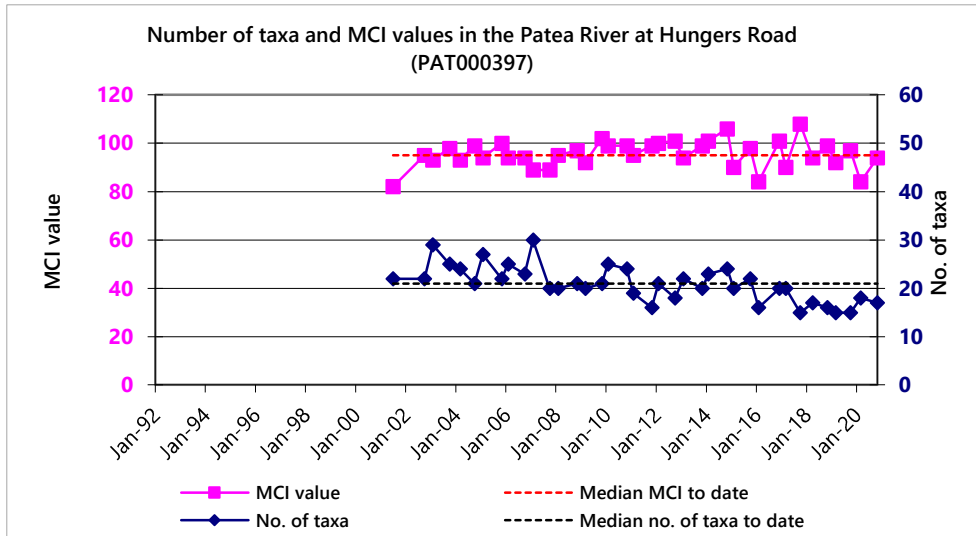


Figure 15 Taxa richness and MCI scores recorded to date at site PAT000397 Hungers Road

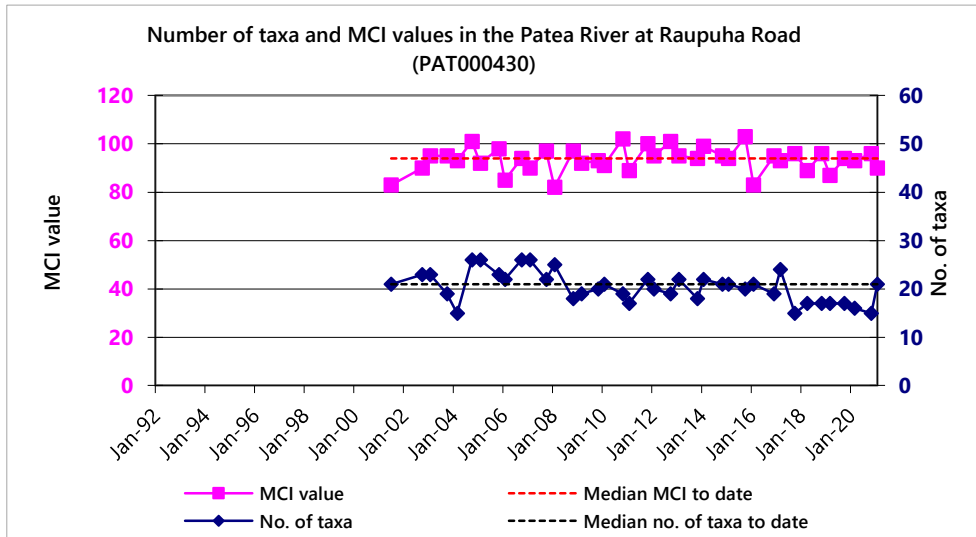


Figure 16 Taxa richness and MCI scores recorded to date at Raupuha Road

2.2.3.1.5 Discussion and conclusions Patea River

The two upstream sites (sites 1 and 2), and to a minor extent the middle reach site (site 3) provide information regarding the effects of the cooling water discharge into the Kahouri Stream; while sites 4 and 5 provide information regarding the water abstraction. Sites 3, 4, and 5 also provide background information for the anticipated expansion of the power scheme.

Macroinvertebrate taxa richness was moderate to moderately low with richness equal to or lower than historic medians. There was larger than usual variation among sites, with a large nine taxa increase between sites 2 and 3 with site 2 recording its second equal lowest richness of 14 taxa. There was only a small decrease in taxa richness between sites 1 and 2 of four taxa indicating that the discharge of cooling water was not having a significant effect on macroinvertebrate richness.

The MCI scores categorised all sites as having 'fair' generic river health except site 2, which only had poor health. There was a significant decrease between sites 1 and 2 and then a significant increase between site 2 and 3 indicative of a localised impact on macroinvertebrate health between sites 1 and 3. Further, the result was the second lowest recorded MCI score at the site, with only the previous summer MCI score lower, and the site was also the only one to have a score significantly lower than its historic median. Long term monitoring results (Figure 13) suggest MCI scores have been markedly fluctuating at the site between

spring and summer surveys for the last four monitoring years (2017/2018-2020/2021) with this pattern not seen previously at the site. However, the control site (site 1) also appears to be exhibiting a similar but not as strong seasonal variation congruent with that of site 2 indicating activities upstream are affecting macroinvertebrate health (e.g. the Stratford WWTP discharge).

There was no obvious habitat differences between sites 1 and 2, with only the absence of wood being significantly different between the two sites along with some minor changes in percentage substrate categories. However, there was a change in temperature, but with site 2, which was sampled in a slightly warmer time of day, having a significantly lower temperature than site 1.

The SQMCI can be more sensitive than the MCI because, in addition to sensitivity scores, it also accounts for taxa abundance. These scores indicated that all sites in the Patea River were in poor health. There was a significant increase from site 3 to site 4 with no other significant differences between sites; indeed, sites 1, 2 and 3 had exactly the same score. The main reason for the incongruence with the MCI results between sites 1 and 2 was the presence of two high scoring rare taxa at site 1 that were not present at site 2. The MCI uses only presence/absence data and the high scoring taxa would have had a significant impact on the MCI score but negligible impact on SQMCI scores.

Overall, this biomonitoring survey performed in relation to the discharge of cooling water from the power station and water abstraction indicated no significant impacts upon the biological communities of the Patea River.

2.2.3.2 Biomonitoring Kahouri Stream 2020-2021

This survey fulfilled the biological components of the 2020-2021 monitoring programme for the Contact Energy site located on East Road, Stratford. It was performed to determine whether consented stormwater discharges from the site had any recent detrimental effect upon the macroinvertebrate communities of the Kahouri Stream. The monitoring is related to consent 4459-1 to discharge stormwater into the tributary of the Patea River (the Kahouri Stream).

The results of biological surveys performed in the Kahouri Stream since 1996 are discussed in various reports referenced at the end of this report³.

Method

The standard '400 ml kick-sampling' technique was used to collect streambed macroinvertebrates from two established sites in the Kahouri Stream on 9th March 2021 (Table 18 and Figure 17).

Table 18 Biomonitoring sites in the Kahouri Stream sampled in relation to the Contact Energy site

Site No	Site code	GPS co-ordinates	Location
1	KHI000457	E 1713512 N 5645931	Kahouri Stream, upstream of the Contact Energy site
2	KHI000480	E 1714880 N 5645282	Kahouri Stream, 20 m upstream of the Piakau Stream confluence

³ Please note that full copies of the biomonitoring report are available on request.

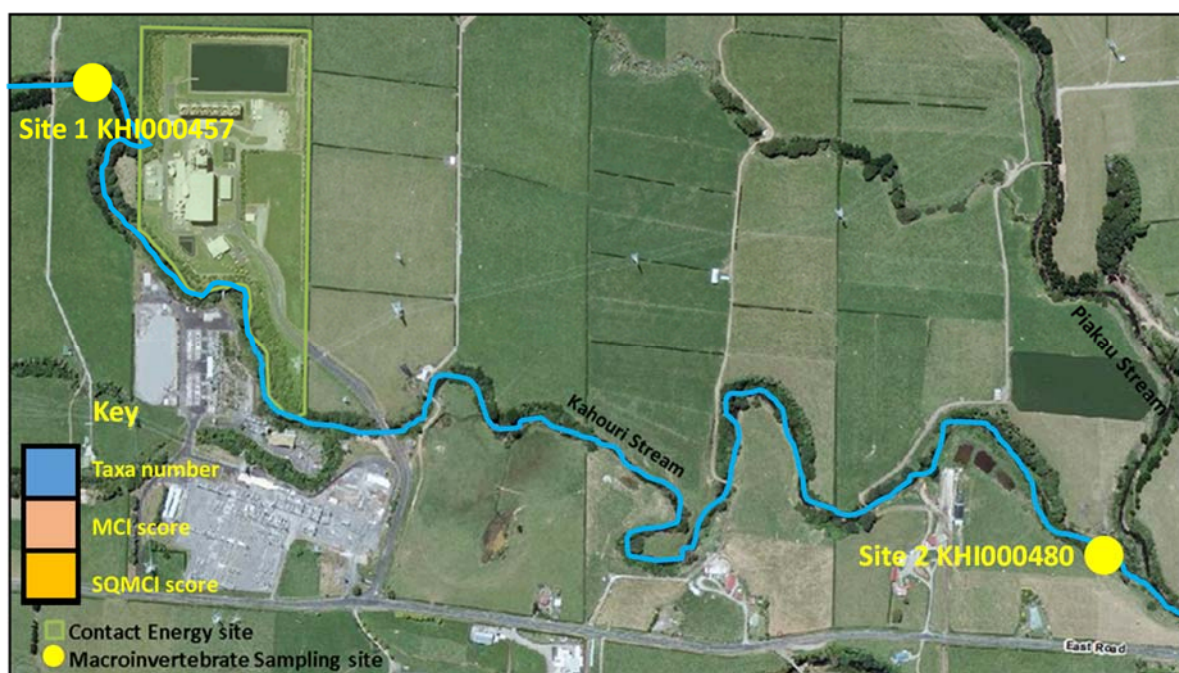


Figure 17 Kahouri Stream Sites sampled for macroinvertebrates, in relation to the Contact Energy site

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).

Samples were preserved with ethanol 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 abundances scored based on the categories presented in Table 19.

Table 19 Macroinvertebrate abundance categories and loading factors

Abundance category	Number of individuals	Loading factor
R (rare)	1-4	1
C (common)	5-19	5
A (abundant)	20-99	20
VA (very abundant)	100-499	100
XA (extremely abundant)	500+	500

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 one. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience.

By averaging the scores obtained from a list of taxa collected 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. A gradation of biological water quality conditions based upon MCI ranges which has been adapted for Taranaki streams and rivers from Stark's classification (Stark, 1985 and Stark, 1998) (Table 20). Communities that are more 'sensitive' inhabit less polluted waterways. A difference of 10.83 units or more in MCI values is considered significantly different (Stark 1998).

Table 20 Macroinvertebrate health based on MCI and SQMCI ranges which has been adapted for Taranaki streams and rivers from Stark's classification (Stark, 1985 and Stark, 1998)

Grading	MCI	SQMCI
Excellent	≥140	≥7.0
Very Good	120-139	6.0-6.9
Good	100-119	5.0-5.9
Fair	80-99	4.0-4.9
Poor	60-79	3.0-3.9
Very Poor	<60	<3.0

2.2.3.2.1 March 2021 Results

Site habitat characteristics and hydrology

This summer survey was performed under low flow conditions 21 days after a fresh in excess of 3 times median flow and 89 days after a fresh in excess of 7 times median flow in the Patea River (flow gauging site at the Patea River at Skinner Road). Environmental data at the time of the survey is presented in Table 21.

Table 21 Environmental data at the time of the survey

Site number	Site 1	Site 2
Site Code	KHI000457	KHI000480
Sample Number	FWB21224	FWB21225
Time	10:50	10:00
Temperature	13.7	14.3
Water colour	Uncoloured	Uncoloured
Water clarity	Clear	Clear
Flow conditions	Low	Low
Water speed	Swift	Swift
Sampling habitat	Riffle	Riffle
Periphyton mats	Patchy	Patchy
Periphyton filaments	Patchy	None
Moss	Patchy	Patchy
Leaves	Patchy	Patchy
Wood	Patchy	Patchy
Macrophytes	None	None
Bank stability	Mostly Stable	Mostly Stable
Stock damage	None	None
Iron oxide or silt coating	No	No
Substrate embedded	No	No
Substrate disturbed	Moderate Kicking	Moderate Kicking
Bed shaded	No	Partial
Undercut banks	No	Yes
Overhanging vegetation	No	Yes
Substrate	Silt	0
	Sand	5
	Fine gravel	10

Site number	Site 1	Site 2
Site Code	KHI000457	KHI000480
Sample Number	FWB21224	FWB21225
Coarse gravel	25	30
Cobble	40	30
Boulder	20	10
Bedrock	0	0
Hard clay	0	0
Wood/root	0	0
Concrete/gabion	0	0

Macroinvertebrate communities

Previous surveys performed in the Kahouri Stream have indicated that the macroinvertebrate communities have generally been in good condition with relatively high numbers of taxa and MCI values. Results of previous surveys performed at sites 1 and 2 are summarised in Table 22 together with current results, and the full results are reported in Table 23 and illustrated in Figures 18-20.

Table 22 Summary of the numbers of taxa, MCI and SQMCI values recorded previously in the Kahouri Stream in relation to the Contact Energy site since 1 January 1995, together with the results of the current survey

Site	N	Numbers of taxa				MCI values				SQMCI values				
		Range	Median	Previous survey	Current	Range	Median	Previous survey	Current survey	N	Range	Median	Previous survey	Current
1	27	18-31	23	26	23	87-112	103	109	111	22	2.3-7.6	5.9	6.0	6.0
2	28	17-34	24	25	23	82-110	99	105	107	22	3.8-7.5	5.4	5.3	5.9

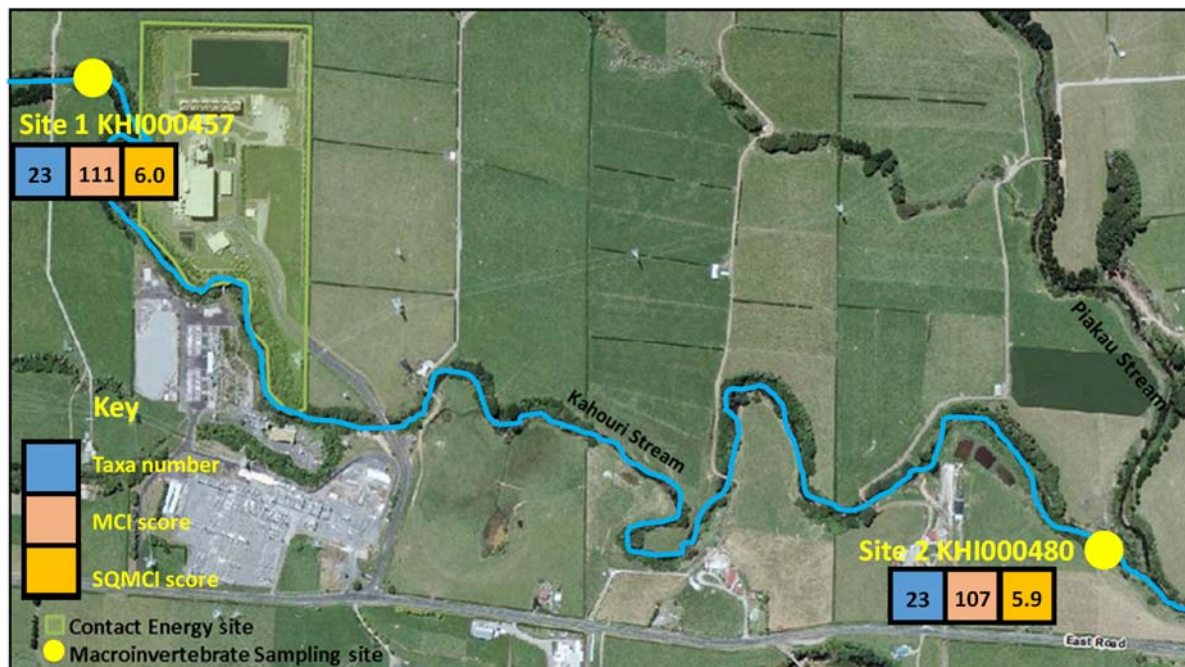


Figure 18 Map showing sampled sites with current taxa richness, MCI, and SQMCI values

2.2.3.2.2 Taxa and MCI values Kahouri Stream

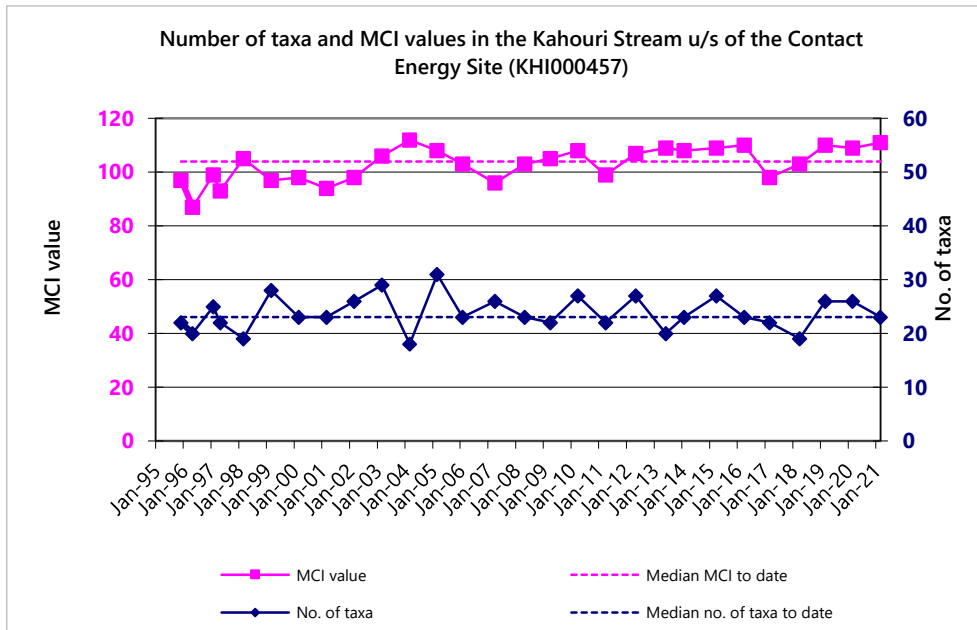


Figure 19 Taxa richness and MCI scores recorded to date at site KHI000457 u/s of stormwater discharge

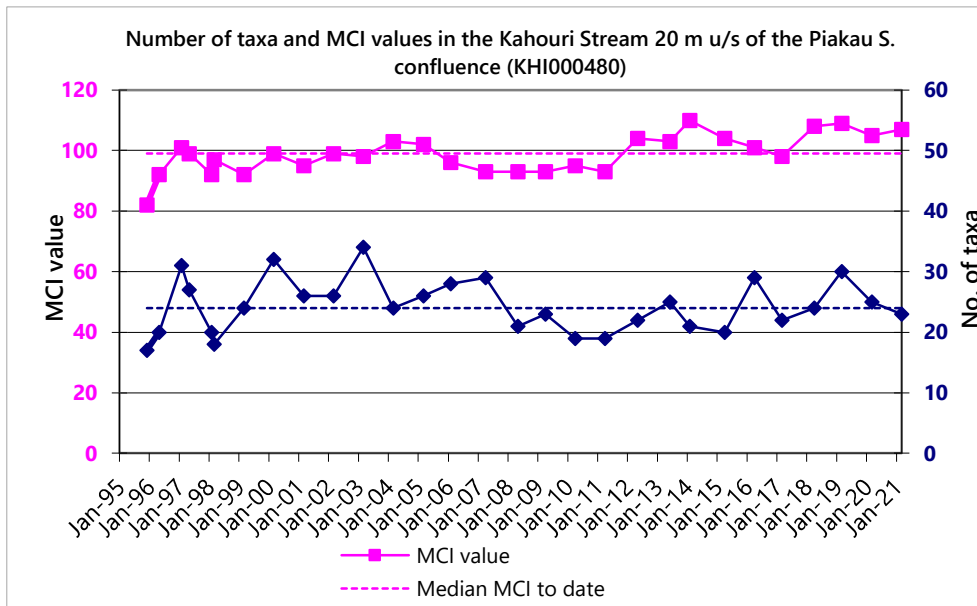


Figure 20 Taxa richness and MCI scores recorded to date at site KHI000480 below the stormwater discharge

Table 23 Macroinvertebrate fauna of the Kahouri Stream (sites 1 & 2) in relation to Contact Energy, East Road during the survey of 9 March 2021

Taxa List	Site Number	Taranaki MCI score	1	2	
	Site Code		KHI000457	KHI000480	
	Sample Number		FWB21224	FWB21225	
ANNELIDA (WORMS)	Oligochaeta	1	-	C	
MOLLUSCA	Potamopyrgus	4	R	A	
EPHEMEROPTERA (MAYFLIES)	Austroclima	7	C	C	
	Coloburiscus	7	VA	VA	
	Deleatidium	8	VA	VA	
	Ichthybotus	8	-	R	
	Nesameletus	9	C	R	
	Zephlebia group	7	-	C	
	COLEOPTERA (BEETLES)	Elmidae	6	A	A
Hydraenidae		8	R	R	
MEGALOPTERA (DOBSONFLIES)	Archichauliodes	7	A	A	
TRICHOPTERA (CADDISFLIES)	Hydropsyche (Aoteapsyche)	4	VA	VA	
	Costachorema	7	C	C	
	Hydrobiosis	5	C	C	
	Neurochorema	6	R	-	
	Beraeoptera	8	R	-	
	Confluens	5	C	-	
	Olinga	9	R	-	
	Oxyethira	2	C	-	
	Pycnocentria	7	-	R	
	Pycnocentroides	5	R	A	
	DIPTERA (TRUE FLIES)	Aphrophila	5	A	A
		Maoridiamesa	3	A	C
		Orthoclaadiinae	2	C	C
		Tanypodinae	5	R	-
		Tanytarsini	3	C	C
Muscidae		3	R	-	
Austrosimulium		3	-	R	
Tabanidae		3	-	R	
Tanyderidae		4	-	R	
No of taxa			23	23	
Taranaki MCI			111	107	
Taranaki SQMCI			6.0	5.9	
EPT (taxa)			12	11	
%EPT (taxa)			52	48	
'Tolerant' taxa		'Moderately sensitive' taxa		'Highly sensitive' taxa	

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

2.2.3.2.3 Discussion and conclusions Kahouri Stream

This summer 2021 biomonitoring survey of the Kahouri Stream that receives storm water from the Contact Energy site on East Road was undertaken during a relatively dry period. Results indicated that the storm water discharges had not had an impact on the macroinvertebrate communities of the stream.

Macroinvertebrate richness were moderate for both sites, both sites had the same taxa richness and taxa richness were similar or the same as historic medians. This indicates that there was no evidence of recent, toxic discharges negatively affecting macroinvertebrate communities. Taxa richness is the most robust index when ascertaining whether a macroinvertebrate community has been exposed to toxic discharges. Macroinvertebrates when exposed to toxic chemicals may die or deliberately drift downstream thus potentially lowering taxa richness at a site.

MCI scores indicated that both sites had 'good' macroinvertebrate health with no significant difference in scores between the two sites. Results were slightly higher than historic medians for both sites by 8 units

suggesting better than normal results but not significantly so. This indicated that there were no significant impacts from discharges from the Contact Energy site.

The SQMCI takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities. The SQMCI scores were largely congruent with the MCI scores though the 'control' site was in 'very good' health while the 'impact' site was in 'good' health. However, there was no significant difference in SQMCI scores between the control site and the impacted site (only 0.1 unit difference) or their respective historic medians. This reinforces the MCI results indicating that there were no significant impacts from discharges from the Contact Energy site.

Overall, there was no evidence that storm water discharges from the Contact Energy site had any discernible impact on the macroinvertebrate community of the Kahouri Stream.

2.3 Air

2.3.1 Inspections

Inspections in relation to emissions to the air comprised assessment of the visual effect of discharges from the power station site, including odour surveys. The TCC emissions are monitored through the use of continuous emissions monitoring sensors (CEMS), with monthly reports provided to Council. While for the SPP, the emissions are checked regularly with stack testing, with the most recent testing commissioned in January 2021.

2.3.2 Results of discharge monitoring

The Company provides monthly reports to the Council which summarise its emissions monitoring data with respect to the TCC. The report includes the average, maximum and minimum concentrations of the following target gases:

- Nitrogen oxides (NO_x);
- Oxygen (O₂);
- Carbon monoxide (CO); and
- Carbon dioxide (CO₂)

2.3.2.1 Taranaki Combined Cycle

In terms of the Taranaki Combined Cycle (TCC), under normal operation, the maximum concentration of total nitrogen oxides (NO_x) emissions for the year was reported as 31.45 ppm, this is below the consent limit of 50 ppm. There were five occasions during plant start up where the plant exceeded the 50 ppm limit which applies during steady-state operation. (Exceedance during start up is permitted for a brief period of time under consent 4454-1, condition 12). Across these start-up or cessation operations, the maximum NO_x value was reported at 80.50 ppm, September 2020.

The maximum hourly NO_x discharge rate reported to the Council was 113.23 kg/hr, which is in compliance with consent 4454-1, condition 13. This condition allows for a maximum of 430kg in any hour period. This was recorded in June 2021.

Total carbon dioxide (CO₂) emissions were calculated by the Company to comprise 451,084.87 tonnes CO₂ in the 2020-2021 monitoring period. This was an increase of 103,266 tonnes CO₂ (22.9%) when compared to the previous monitoring period. The TCC1 plant operation was in use for a total of 179 days this monitoring period. Of note, the TCC was in use 43 days more than the previous monitoring period (2019-2020: 136 days).

NOx emissions from the plant were recorded at 123.4 tonnes NOx in the 2020-2021 monitoring period. This is an increase of 15.9 tonnes NOx from the previous monitoring period (2019-2020: 107.5 tonnes).

2.3.2.2 Emissions testing of the Stratford Peaker plants

Consent 4022 defines the limits on the concentration and mass emission rate for nitrogen oxides (NOx) discharged to air from the operation of the two peaker plant gas turbines (SPP). Limits are also imposed on maximum ground level concentration of carbon dioxide, carbon monoxide and nitrogen oxides, derived from emissions to the atmosphere from the site as or beyond the site boundary under ambient conditions.

No continuous emissions monitoring sensors (CMES) are fitted to the peaker plants in SPP. The peaker plants employ NOx control technology, coupled with a relatively regular cycle of emissions for peaker plants of that design. The Company undertakes regular assessments of their peaker plants. The most recent assessment of the emissions from both plants was undertaken on the 26 January 2021.

The Company commissioned Air Resource Management Ltd to assess the air emissions performance of each the two General Electric (GE) LMS100 PA gas turbine power plants. The Company requested the air emissions testing to demonstrate that the Stratford Peaker plants were being operated in compliance with the requirements specified in the Taranaki Regional Council Resource Consent for air discharges for the site; Consent 4022-2, conditions 7 and 8.

The compliance conditions specified in conditions 7 and 8 of the resource consent N° 4022-2 for emissions from the Stratford site Peaker plants are:

7. *That except in any period of 30 minutes following the initiation of start-up of a turbine or in any period of 30 minutes prior to the cessation of the generation of electricity from a turbine, in the event that the discharge of nitrogen oxides exceeds:*
 - a) *A mass emission rate for the site of 175 g/s⁻¹, or*
 - b) *[cancelled]*
 - c) *A concentration in any gas turbine stack equivalent to 100 mg/m⁻³ at 450 degrees Celsius, or to 125 ppm [volumetric basis].*
Then the operator shall immediately initiate all reasonable steps to reduce the emissions to below these levels as soon as practicable.
8. *That the sum of all discharges of nitrogen oxides from the site of the power station is not to exceed 830 kg in any period of one hour.*

2.3.2.2.1 Stack testing SPP results

The air emissions testing carried on the 26 January 2021 on both gas turbines located at the Stratford Power Stations site indicated the following:

Table 24 Summary of NO_x emissions from SPP including the combined emission January 2021 (source Air Resource Management Project 21000)

SUMMARY OF NO_x

SOURCE	NO _x (ppm)	NO (ppm)	NO ₂ (ppm)	Test time (mins)	Gas Temp
GT21 (average)	38.78	36.79	2.00	147	416
GT22 (average)	40.19	37.91	2.28	147	423
Average/Total	39.49	37.35	2.14	294	

SOURCE	NO _x (ppm)	NO _x (mg/m ³ @ 0°C, 1 atm)	NO _x (g/s) Mass emission	NO _x (kg/hr) Mass emission
GT21 (average)	38.78	80.95	13.80	49.68
GT22 (average)	40.19	82.39	14.41	51.87
Total	78.97	163.34	28.21	101.55

The report by Air Resource Management concluded with the following:

Gas Turbine 21 showed an average of 38.78 ppm of NO_x, Gas Turbine 22 showed an average of 40.19 ppm of NO_x. Both Turbines were tested for 147 minutes each at 30 min loading increases, except for the last 15 at maximum kilowatt load.

Total NO_x for both turbines is 78.97 ppm, equivalent to 163 mg/m³ @ 0°C, 1 atm. Mass emission equates to 28.21 g/s of NO_x being emitted into the air or a mass emission of 101.55 kg/hour.

All of the above results show that the Company peaker plants (SPP) located in Stratford are operating within the limits of the air discharge consent 4022-2.

2.3.3 Reviews and audits

The Company hold three air discharge consents. Two of these (4454 & 4022) are currently in use for the TCC and SPP. The third (5846) relates to the currently un-built, though proposed future facility. Included in each of these three consents is a condition that requires the Company to provide the Council with reports which will include the following:

- reviewing technological advances in reducing or mitigating plant emissions;
- providing a site emissions inventory;
- describing the energy efficiency of the plant;
- covering other matter relating to mitigation or emissions reduction, and
- detailing carbon dioxide emissions from the site.

The most recent six yearly report which relates to both the TCC and SPP was received in December 2020. The main points of the report are summarised below.

Technological advances and energy efficiency improvements

Consent 4454-1

A large efficiency improvement was made on the GT26 Gas Turbine firing control in 2017-2018 with the engine now able to operate at variable fuel inlet pressures. A significant project was undertaken to remove the need for the Fuel Gas Compressors and their subsequent electrical load of 2000 kilowatts. This energy is now available for export and is especially effective in the low to mid load range where TCC often operates.

There have been no technological advances to the TCC (Taranaki Combined Cycle) plant in the last six years, as new technological advancements for these gas turbines have not been developed in recent years. Hence, technological advances to plant such as TCC which reduce or mitigate emissions are limited to minor adjustments as this plant already incorporates the latest available technology, such as EV burners and sequential combustion. The minor adjustments would generally result in small improvements in efficiency and output. Improvements to efficiency directly reduce carbon dioxide emissions whilst improvements to output improve the electricity sector's carbon dioxide emissions by displacing emissions from plants that have higher emission factors.

The technology relating to the mitigation of emissions is continually developing with the most notable advances being related to alternative electricity generating plant.

Consent 4022-2

There is one specific upgrade implemented at the end of 2019 on Peaker Unit GT22 which is worthwhile from an environmental improvement point of view.

The inlet air filters on the Gas turbines have a three to five year life cycle and during the last planned outage on GT22 when these filters were scheduled for replacement, the Company chose to install high grade HEPA filtration filters into the air intake housing of the gas turbine. HEPA stands for "high efficiency particulate air". Contact installed an E12 HEPA filter, which has the highest filtration class in the market, replacing the standard F9 synthetic filters which were struggling to keep the turbine hardware in a clean condition. This had meant regular water washes were required throughout the year (six weekly) to reduce the rate of degradation of the compressor hardware between outages (hand cleaning of the compressor occurs annually).

The cost of HEPA filtration had in the past been prohibitive, but the Company has been able to offset this extra cost through savings made as a result of sustained higher unit efficiency and a reduced number of water washes. The use of high efficiency filters has an improved operational and environmental outcome. The low pressure compressor cleanliness and efficiency does not significantly degrade. As a result of the sustained clean condition, the degradation in performance (efficiency) of the engine is minimal. In general terms, fouling, corrosion, and pressure drop cause gas turbines to become less efficient limiting their maximum power output and increasing their heat rate. Engines with higher heat rates burn more fuel to produce the same power. Therefore, burning less fuel for the same output means less emissions are produced and will result in an overall reduction in emissions between annual outages. Annually the reduced number of water washes results in less water use, less chemical use and less off-site discharges and an overall higher availability (due to the reduced number of water wash outages). The same upgrade is planned for GT21 in 2021.

No other significant environmental improvements are on General Electric's (the manufacturer) horizon. They are currently putting a lot of focus on modifying some of their IP (Intermediate Pressure) turbine hardware, since a number of users, including Contact Energy are suffering reduced equipment life due to early blade and nozzle failure.

Other issues requested by the Council

The Council has not advised the Company of any other issues relevant to the minimisation or mitigation of emissions from the sites to be included in this six-yearly report.

However, as detailed in previous reports, "other aspects" of Contact's operations impact upon its overall efficiency in the production of electricity, at Stratford and across the Company's other sites.

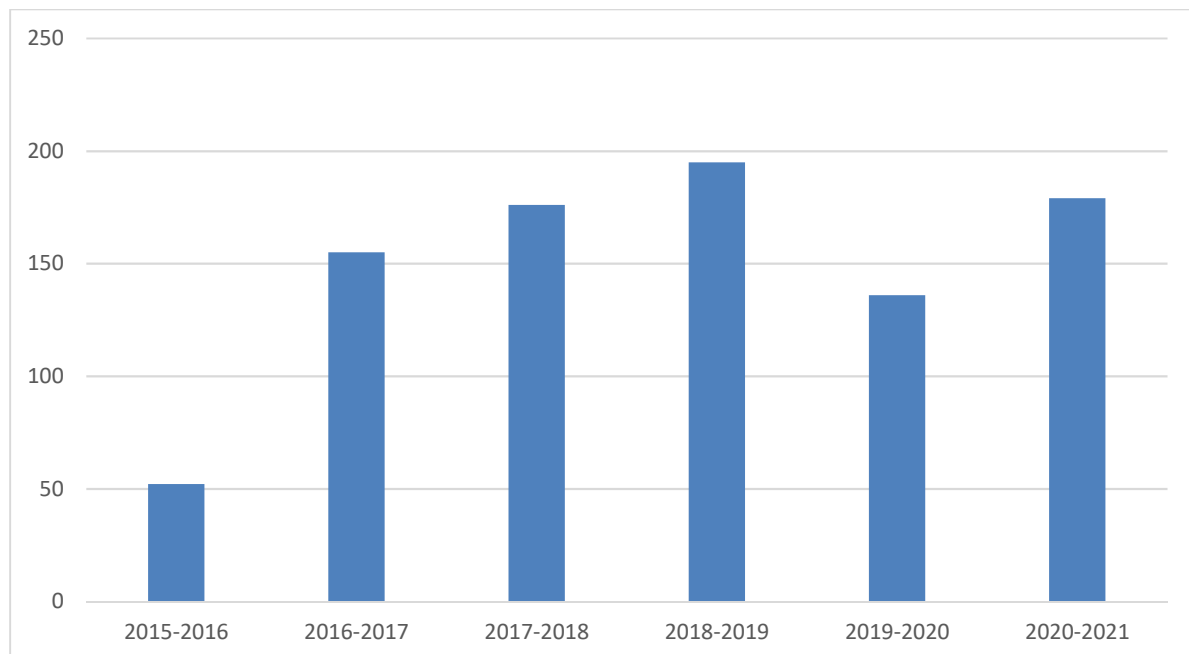
Contact Energy has a policy of continuous assessment of means to improve the thermodynamic performance of all thermal stations it owns and operates. This makes economic sense and is consistent with the RMA precept of sustainable use of resources. These are generally small and can be difficult to quantify but do result in a reduction in Contact's air emissions.

Energy efficiencies across the Company have included reduced usage of the TCC plant for base load generation other than during winter months, especially during wetter periods improved transmission flexibility elsewhere in the national network; closure of other less efficient natural-gas-fired generation capacity; arrangements for flexible large customer demand during peak demand periods; supply of heat or heat pump to industry in the vicinity of geothermal facilities, replacing the use of electricity for heat raising; and carbon sequestration through forestry.

Patterns of annual operation

Changes to the electricity market synopsis were undertaken in 2014. The following monitoring period (2015-2016) observed the TCC in operation for a total of 52 days. In the 2016-2017 monitoring period the TCC was in operation for a total of 155 days. In the 2017-2018 monitoring period TCC was in operation for a total of 176 days, in the 2018-2019 monitoring period TCC was in operation for 195 days. In the 2019-2020 monitoring period TCC was in operation for 136 days, while for this current monitoring period it was 179 days. This reflects the requirement for baseline power in New Zealand, which can vary annually.

Table 25 Annual days of operation SPS TCC 2015-2021



2.4 Incidents, investigations, and interventions

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 Contact Energy. 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 causes of non-compliance or failure to maintain good practices. A pro-active approach, that in the first instance avoids issues occurring, is favoured.

For all significant compliance issues, as well as complaints from the public, the Council maintains a database record. The record includes events where the individual/organisation concerned has itself notified the Council. Details of any investigation and corrective action taken are recorded for non-compliant events.

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 individual/organisation is indeed the source of the incident (or that the allegation cannot be proven).

In the 2020-2021 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Company's conditions in resource consents or provisions in Regional Plans.

3 Discussion

3.1 Discussion of site performance

Water abstraction

The daily surface water abstraction limit was not exceeded (19,440 m³/day) throughout the monitoring period. The maximum daily abstraction was recorded as 7,500 m³/day +/- . The daily surface water abstraction rate was not exceeded (<225 L/s). The maximum rate recorded was 131.43 L/s.

The total volume of abstracted surface water during this monitoring period was 1,202,291 m³. This is an increase of 16.9 % when compared to the previous monitoring period where 998,789 m³ was abstracted. The abstraction rate is required to be limited by the Company during the period of low flow within the Patea River (<0.690 m³/s). This was undertaken by the Company.

Discharge of process waters

The maximum discharge flow rate from the operations pits was 51.521 L/s, with the average combined flow recorded as 9.111 L/s. The total volume of wastewater discharged for the year was 483,448 m³. This was a 16% increase when compared to the previous monitoring period, when 405,785 m³ was discharged.

Chlorine analysis by the Company indicated compliance with the set requirement for not exceeding 0.05 g/ m³ in the discharge.

The discharge pH remained within the consent range limit of pH 6.0-9.0 throughout the monitoring period for TCC, however on one occasion out of specification pH was noted. It also was recorded below the consent limit on two occasions at SPP. For TCC the minimum pH observed was pH 4.86⁴, recorded in December 2020. The maximum observed was pH 8.97, recorded in March 2021. For SPP the minimum pH recorded was pH 5.03, recorded in July 2020. The yearly maximum was recorded as pH 9.5, also recorded during July 2020. When the continuous pH monitors indicate an exceedance with respect to the pH range limit, the wastewater discharge valve at relevant operations pit on the site automatically closes immediately (within one minute). This does not allow the non-compliant discharge to enter the river.

The valves, activate when the pH reading on the monitor reaches either, pH 6.1 or 8.9.

Temperature monitoring of receiving surface waters

The Patea River temperature during the monitoring period remained below the 25°C consented limit for the full duration, allowing for continuous discharge if required. River temperature differentials also remained within consent limits.

Kahouri stormwater

The stormwater over flow to the Kahouri Stream occurred on 17 occasions in this monitoring period. These were all noted to have occurred during high rainfall events.

Inter-laboratory comparisons

Inter-laboratory comparisons were undertaken on four occasions this monitoring period. The results provided by the Company indicated good agreement between both parties across the majority of parameters assessed. Additional work has been undertaken by the Company to bring in to line the variation noted on the phosphate levels. The discrepancy was noted to diminish throughout the monitoring period.

⁴ The low pH reading of 4.86 pH, recorded during December 2020, was the result of a faulty pH probe. Grabs samples were analysed while the probe was fixed, these were within specification.

Patea River physicochemical analysis

Physicochemical analysis of the Patea River was undertaken on four occasions this monitoring period. The aim was to assess the effects of the discharge from both or either operations pits when they are discharging to the Patea River. The results showed that the discharge of process waters were not causing an effect which was more than minor.

Emissions to air

The Taranaki combined cycle plant operation was in use for a total of 179 days this monitoring period. Of note, the TCC was in use 43 days more than the previous monitoring period (2019-2020: 136 days).

Total carbon dioxide (CO₂) emissions were calculated by the Company to comprise 451,084.87 tonnes CO₂ in the 2020-2021 monitoring period. This was an increase of 77,517 tonnes CO₂ (22.9%) when compared to the previous monitoring period. NO_x emissions from the plant were recorded at 123.4 tonnes NO_x in the 2020-2021 monitoring period. This is an increase of 15.9 tonnes NO_x from the previous monitoring period (2019-2020: 107.5 tonnes).

The maximum NO_x concentration within the air discharge under normal operational circumstances was recorded at 31.45 ppm.

On five occasions emissions of NO_x were higher than the consent limit (50 ppm) for NO_x concentration, which applies during steady-state operation. These five occasions were during start-up operations and so no non-compliance occurred. The Company are allowed a brief exceedance during start up or cessation activities with this specific area of plant.

The maximum hourly NO_x discharge rate reported to the Council was 113.23 kg/hr, which is in compliance with consent 4454-1, condition 13. This was recorded in June 2021. This condition allows for a maximum of 430 kg in any hour period.

It can be noted that the TCC is fitted with continuous emissions monitoring sensors (CEMS) which continually analyse for source exhaust gases.

Emissions from the Stratford Peaker Plant units (SPP), in comparison to the TCC, do not have emission specific monitoring sensors. The peaker plants employ NO_x control technology, coupled with a relatively regular cycle of emissions for peaker plants of that design. The Company undertakes regular assessments of their SPP units.

The most recent assessment was undertaken during January 2021. The results indicated the site was operating within the limits of the air discharge consent 4022-2.

There were no incidents, investigations or interventions required with respect to the Company this monitoring period. Site inspections noted good housekeeping throughout the site with knowledgeable and appropriately trained staff throughout.

Overall, there is good communication between the Company and the Council. This includes the supply of monthly monitoring reports from the Company to the Council as to the processes undertaken by the facility, which provides good transparency between both parties.

3.2 Environmental effects of exercise of consents

Minimal environmental effects were noted during the period under review. In terms of emissions to air, carbon dioxide and nitrogen oxides (CO₂ & NO_x) emissions from the TCC were increased when compared to the previous monitoring period. This was a direct result of the increased time in operation for the TCC this monitoring period.

For the SPP, stack testing was undertaken in January 2021, all results were recorded within compliance standards.

No issues related to odour were recorded or communicated by the inspectors during the inspections this monitoring period.

Biological monitoring of the Patea River (two occasions) and the Kahouri Stream (one occasion) was undertaken this monitoring period.

In terms of the Patea River, the biologist noted the following:

Overall, this biomonitoring survey performed in relation to the discharge of cooling water from the power station and water abstraction indicated no significant impacts upon the biological communities of the Patea River.

In terms of the Kahouri Stream the biologist noted the following:

Overall, there was no evidence that stormwater discharges from the Contact Energy site had any discernible impact on the macroinvertebrate community of the Kahouri Stream.

Inspections and monitoring of process waters did not indicate anything of an adverse nature. Temperature monitoring indicated compliance with consent defined criteria for both maximum thermal increase and total river temperature.

In terms of discharges of process waters to the Patea River, minimal effects were noted during the surface water and discharge monitoring rounds.

3.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Tables 26-42.

Table 26 Summary of performance for consent 4022-2

Purpose: To discharge emissions to the air from fuel combustion and other related activities associated with the operation of the Stratford Power Station and ancillary plant		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option (BPO)	Site inspections - checking that standard operating procedures to achieve compliance with conditions are followed Stack testing commissioned this monitoring period, compliant results	Yes
2. Consulting over significant proposed changes	Liaison during visits and also consistent communication with Council via monthly reports, chemical changes and plant operations	Yes

Purpose: To discharge emissions to the air from fuel combustion and other related activities associated with the operation of the Stratford Power Station and ancillary plant		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
3. Provision of reports on specific monitoring/investigations	Received December 2020	Yes
4. Limit on ambient carbon monoxide	Not monitored beyond boundary in this monitoring period Source monitoring at commissioning and modelling undertaken during the assessment of effects provided adequate results	N/A
5. Limit on ambient nitrogen oxides	Not monitored beyond boundary in this monitoring period Source monitoring at commissioning and modelling undertaken during the assessment of effects provided adequate results	N/A
6. Limit on other emissions at boundary	Not monitored beyond boundary in this monitoring period Source monitoring at commissioning and modelling undertaken during the assessment of effects provided adequate results	N/A
7. Limits on nitrogen oxides outside start-up or shut-down periods	Stack testing commissioned in January 2021 indicated compliance with this condition	Yes
8. Limit on nitrogen oxides mass discharge rate	Stack testing commissioned in January 2021 indicated compliance with this condition	Yes
9. Stack height	Inspection by Council	Yes
10. Ecological effects	Inspection by Council and observation of vegetation	Yes
11. Optional review of consent	No review currently sought, conditions fit for purpose	N/A
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 27 Summary of performance for consent 4454-1

Purpose: To discharge emissions to air from a combined cycle power station and ancillary plant		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option (BPO)	Site inspections-checked that standard operating procedures to achieve compliance with conditions are followed Outlined when equipment malfunctioned and also when equipment was brought back online	Yes
2. Outline BPO measures at time of commissioning	Report provided in 1998, as required	N/A
3. Option to review BPO measures	No review sought by Council	N/A
4. Consulting over significant proposed changes	Liaison during visits. No significant changes undertaken during year	N/A
5. Provision of reports on specific monitoring/investigations	Received December 2020	Yes
6. Limit on ambient carbon monoxide	Not monitored beyond boundary, as continuous CO emission monitoring by the Company gave low results	N/A
7. Limit on ambient nitrogen oxides	Not monitored, as emissions monitored continuously by Contact Energy, and previous ambient monitoring by Council, gave low results	N/A
8. Limit on other emissions at boundary	Not monitored, as emissions monitoring by the Company and dispersion modelling undertaken during AEE stage demonstrated no requirement	N/A
9. Limits on nitrogen oxides outside start-up or shut-down periods	Continuous monitoring by the Company and monthly report to Council	Yes
10. Limit on nitrogen oxides mass discharge rate	Continuous monitoring by the Company and monthly report to Council.	Yes
11. Stack height	Inspection by Council	Yes
12. Ecological effects	Inspection by Council and observation of vegetation	Yes
13. Visibility of cooling system plume	Inspection and observation by Council and The Company	Yes
14. Cooling system drift	Inspection and observation by Council	Yes
15. Optional review of consent	Review available within 6 months of report being submitted as per condition 8. Report submitted December 2020. No review required	N/A
16. Lapse of consent	Consent was exercised	N/A
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 28 Summary of performance for consent 4455-1

Purpose: To take water up to 19,440 m³/day [225 L/s averaged over 10 minutes] of water on a continuous basis from the Patea River for use on power stations on East Road, Stratford		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Measurement of abstraction rate	Continuous flow metering by the Company and monthly report	Yes
2. Limit on maximum abstraction rate	Continuous flow metering by the Company and monthly report to Council	Yes
3. Limit on abstraction rate during low river flows	Continuous flow metering by the Company and monthly report to Council	Yes
4. Limit on abstraction rate during very low river flows	Continuous flow metering by the Company and monthly report to Council	Yes
5. Optional review of consent	Next option for review in June 2022	N/A
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 29 Summary of performance for consent 4456-1

Purpose: To erect, place, use and maintain an intake structure in and on the bed of the Patea River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notification of works	Maintenance communicated when required	Yes
2. Construction and maintenance in accordance with documentation	Maintenance communicated when required	Yes
3. Adopt BPO to prevent or minimise adverse effects	Communicated when required	Yes
4. Riverbed disturbance and reinstatement	Inspections	Yes
5. Removal of structure when no longer required		N/A
6. Timing of works	Communicated to the Council when required	Yes
7. Optional review provision	Next option for review in June 2022	N/A
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 30 Summary of performance for consent 4458-1

Purpose: To erect, place, use and maintain a diffuser structure in and above the bed of the Patea River for the purpose of discharging used water from power stations at East Road, Stratford		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Provision of design plans	Plans received by Council and approved in 1996	Yes
2. Construction and maintenance in accordance with documentation		N/A
3. Passage of fish not to be obstructed	Not observed to be obstructing fish during period under review, assessed during surface water sample collection	Yes
4. Notification prior to and after maintenance		Yes
5. Timing of works	Works undertaken during low flows	Yes
6. Adopt best practicable option to prevent or minimise adverse effects	Liaison with the Company and inspection of diffuser	Yes
7. Riverbed disturbance and reinstatement		N/A
8. Removal of structure when no longer required		N/A
9. Optional review provision re environmental effects	Next option for review in June 2022	N/A
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 31 Summary of performance for consent 4459-1.3

Purpose: To discharge stormwater from the operation of a Power Station site into an unnamed tributary of the Piakau Stream and into the Kahouri Stream, both tributaries of the Patea River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Provision of plans prior to completion of construction	Plans received by Council	Yes
2. Concentration limits upon potential contaminants in discharge	Monitored by the Company	Yes

Purpose: To discharge stormwater from the operation of a Power Station site into an unnamed tributary of the Piakau Stream and into the Kahouri Stream, both tributaries of the Patea River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
3. Provision of contingency plan	Plan received by Council and approved 1996. Most recent update produced May 2016	Yes
4. Controls on effect of discharge in receiving water	Inspection and biological monitoring by Council	Yes
5. Optional review provision re environmental effects	Next option for review in June 2022	N/A
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 32 Summary of performance for consent 4460-1

Purpose: To erect, place, use and maintain, in and above the beds of an unnamed tributary of the Piakau Stream and of the Kahouri Stream, both tributaries of the Patea River, structures for the purpose of discharging stormwater from a power station site		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Provision of plans	Plans received by Council and approved	Yes
2. Construction and maintenance in accordance with documentation	No maintenance during period under review	N/A
3. Passage of fish not to be obstructed	No monitoring during review period, as design of structure satisfactory	N/A
4. Notification prior to and after maintenance	No maintenance during period under review	N/A
5. Timing of works	No maintenance during period under review	N/A
6. Adopt best practicable option to prevent or minimise adverse effects	No maintenance during period under review	N/A
7. Riverbed disturbance and reinstatement	No maintenance during period under review	N/A
8. Removal of structure when no longer required		N/A
9. Optional review provision re environmental effects	Next option for review in June 2020	N/A

Purpose: To erect, place, use and maintain, in and above the beds of an unnamed tributary of the Piakau Stream and of the Kahouri Stream, both tributaries of the Patea River, structures for the purpose of discharging stormwater from a power station site		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 33 Summary of performance for consent 4461-1

Purpose: To erect, place, use and maintain in, over and under the bed of the Kahouri Stream, a tributary of the Patea River, within the site and adjacent land immediately to the southeast ,a bridge, pipelines, cables and associated utilities for a power station site		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Provision of plans	Plans received by Council and approved	Yes
2. Construction and maintenance in accordance with documentation	No maintenance during period under review	N/A
3. Passage of fish not to be obstructed	No monitoring during review period, as design of structure satisfactory	N/A
4. Notification prior to and after maintenance	No maintenance during period under review	N/A
5. Timing of works	No maintenance during period under review	N/A
6. Adopt best practicable option to prevent or minimise adverse effects	No maintenance during period under review	N/A
7. Riverbed disturbance and reinstatement	No maintenance during period under review	N/A
8. Removal of structure when no longer required		N/A
9. Optional review provision re environmental effects	Next option for review in June 2022	N/A
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 34 Summary of performance for consent 4462-1

Purpose: To erect, place, use and maintain water pipelines and associated control cables above, through or below the beds of the Toko Stream and various small unnamed streams, for the purpose of water transmission from the Patea River to power stations at East Road, Stratford		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Provision of design plans	Plans received by Council and approved in 1996	N/A
2. Construction and maintenance in accordance with documentation	No maintenance during period under review	N/A
3. Passage of fish not to be obstructed	No monitoring during review period, as design of structure satisfactory	N/A
4. Notification prior to and after maintenance	No maintenance during period under review	N/A
5. Timing of works	No maintenance during period under review	N/A
6. Adopt best practicable option to prevent or minimise adverse effects	No maintenance during period under review	N/A
7. Riverbed disturbance and reinstatement	No maintenance during period under review	N/A
8. Removal of structure when no longer required		N/A
9. Optional review provision re environmental effects	Next option for review in June 2022	N/A
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 35 Summary of performance for consent 4804-1

Purpose: To erect, place, use and maintain over the bed of an unnamed tributary of the Kahouri Stream in the Patea catchment, within the site and adjacent land immediately to the southeast a bridge structure to convey high voltage electricity cables and associated communication cables for a power station site		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Provision of design plans	Plans received by Council and approved in 1996	Yes
2. Construction and maintenance in accordance with documentation	No maintenance during period under review	N/A

Purpose: To erect, place, use and maintain over the bed of an unnamed tributary of the Kahouri Stream in the Patea catchment, within the site and adjacent land immediately to the southeast a bridge structure to convey high voltage electricity cables and associated communication cables for a power station site		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
3. Notification prior to and after maintenance	No monitoring during review period, as design of structure satisfactory	N/A
4. Timing of works	No maintenance during period under review	N/A
5. Adopt best practicable option to prevent or minimise adverse effects	No maintenance during period under review	N/A
6. Riverbed disturbance and reinstatement	No maintenance during period under review	N/A
7. Removal of structure when no longer required		N/A
8. Optional review provision re environmental effects	Next option for review in June 2022	N/A
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 36 Summary of performance for consent 5633-1

Purpose: To discharge fine sediment and organic matter from water intake structure tee screens to the Patea River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge according to documentation submitted	Inspection by Council	Yes
2. Controls on effect of discharge in receiving water	Inspection and biological monitoring by Council	Yes
3. Optional review provision re environmental effects	Next option for review in June 2022	N/A
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 37 Summary of performance for consent 5848-1

Purpose: To discharge up to 6,740 m³ (78 L/s averaged over 15 minutes) of used water, mainly blowdown water from the cooling system from power stations at East Road, Stratford into the Patea River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge in accordance with effluent disposal management plan	Inspection by Council, and provision of annual report by The Company	Yes
2. Provision and revision of effluent disposal management plan	Plan received by Council and approved 1996. Most recent update received February 2010 approved by Council	Yes
3. Provision of details on proposed new water treatment chemicals	Communicated and accepted February 2021	Yes
4. Provision of details on proposed new cleaning chemicals	As above	N/A
5. Optional review of consent on notification of new chemicals	No review required	N/A
6. Provision and maintenance of contingency plan	Plan received by Council and approved. Most recent update released May 2016	Yes
7. Controls on effect of discharge in receiving water	Inspection, sampling and biological monitoring by Council	Yes
8. Passage of fish not to be obstructed	Inspection of diffuser during compliance inspections did not indicate any fish barriers. Trout monitoring survey in January 2004 did not show any effect	Yes
9. Limit on river temperature increase	Monitoring by Council indicated that this complaint for the full duration of the monitoring period.	Yes
10. Limit on maximum river temperature	Monitoring by the Council indicated that the maximum river temperature was not exceeded for the duration of the monitoring period.	Yes
11. Consent holder to continuously monitor temperature and provide records	Monthly reporting by Contact Energy	Yes
12. Concentration limits upon potential contaminants in discharge	Continuous monitoring and monthly reporting by Contact Energy, and measurement checks by Council through inter-laboratory analysis	Yes
13. Limit on ammonia in river	Monitoring by Council	Yes
14. Lapse of consent	Consent was exercised	N/A

Purpose: To discharge up to 6,740 m³ (78 L/s averaged over 15 minutes) of used water, mainly blowdown water from the cooling system from power stations at East Road, Stratford into the Patea River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
15. Optional review provision re environmental effects	Next option for review in June 2022	N/A
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 38 Summary of performance for consent 7247-1

Purpose: To discharge emissions into air from the operation of the cooling tower associated with the Stratford Peaker Power Plant		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option (BPO)	Site inspections - checking that standard operating procedures to achieve compliance with conditions are followed	Yes
2. Cooling tower design as described in application	Inspection by Council	Yes
3. Prior notification of exercise of consent	Notification received 10 November 2010	N/A
4. Minimisation of emissions	Inspection by Council	Yes
5. Visibility of cooling system plume	Inspection and observation by Council and the Company	Yes
6. Cooling system drift	Inspection and observation by Council	Yes
7. Description of water treatment regime to be provided	Description provided 10 November 2010, likely to be amended in the upcoming monitoring period	Yes
8. Consulting over significant proposed changes	Liaison during visits. No significant changes undertaken during year	Yes
9. Offensive odour prohibited	New corrosion inhibitor trialled and now successfully implemented	Yes
10. Ecological effects	Inspection by Council and observation of vegetation	Yes
11. Lapse of consent	Consent was exercised	N/A

Purpose: To discharge emissions into air from the operation of the cooling tower associated with the Stratford Peaker Power Plant		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
12. Optional review of consent	Next option for review in June 2022	N/A
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 39 Summary of performance for consent 7248-1

Purpose: To erect, place, use and maintain a bridge over an unnamed tributary of the Kahouri Stream for pedestrian access and carriage of water pipes, high voltage cables, control cables and associated utilities		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Exercise of consent in accordance with application	Site inspections	Yes
2. Provision of bridge plans prior to construction	Not received	N/A
3. Notification prior to exercise of consent	Notification received 15 February 2010	N/A
4. Minimisation of sediment in stream	No maintenance during period under review	N/A
5. Area and volume of disturbance to be minimised	No maintenance during period under review	N/A
6. Structure removed and area reinstated if no longer required		N/A
7. Lapse of consent		N/A
8. Optional review provision re environmental effects	Next option for review in June 2022	N/A
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 40 Summary of performance for consent 7250-1

Purpose: To erect, place, use and maintain a bridge over the Kahouri Stream for pedestrian access and carriage of water pipes, high voltage cables, control cables and associated utilities		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Exercise of consent in accordance with application	Site inspections	Yes
2. Provision of bridge plans prior to construction	Not received.	N/A
3. Notification prior to exercise of consent	Notification received 15 February 2010	N/A
4. Minimisation of sediment in stream	No maintenance during period under review	N/A
5. Area and volume of disturbance to be minimised	No maintenance during period under review	N/A
6. Structure removed and area reinstated if no longer required		N/A
7. Lapse of consent		N/A
8. Optional review provision re environmental effects	Next option for review in June 2022	N/A
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 41 Summary of performance for consent 7605-1

Purpose: To construct, place and maintain a stormwater outlet structure in the Kahouri Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Exercise of consent in accordance with application	Site inspections	Yes
2. Notification prior to exercise of consent	Notification received 16 March 2010	N/A
3. Area and volume of disturbance to be minimised	No maintenance during period under review	N/A
4. Minimisation of sediment in stream	No maintenance during period under review	N/A
5. Structure removed and area reinstated if no longer required		N/A

Purpose: To construct, place and maintain a stormwater outlet structure in the Kahouri Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
6. Lapse of consent		N/A
7. Optional review provision re environmental effects	Next option for review in June 2022	N/A
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 42 Summary of performance for consent 7653-1

Purpose: To construct, place and maintain a stormwater outlet structure in the Kahouri Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Exercise of consent in accordance with application	Site inspections by Council	Yes
2. Timing of works	No maintenance during period under review	N/A
3. Notification prior to exercise of consent	Notification received 9 July 2010	N/A
4. Area and volume of disturbance to be minimised	No maintenance during period under review	N/A
5. Minimisation of sediment in stream	No maintenance during period under review	N/A
6. Structure removed and area reinstated if no longer required	Site inspections	N/A
7. Lapse of consent		N/A
8. Optional review provision re environmental effects	Next option for review in June 2022	N/A
Overall assessment of consent compliance and environment performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

During the year, the Company demonstrated a high level of environmental and high level of administrative performance with the resource consents as defined in Section 1.1.4.

3.4 Recommendations from the 2019-2020 Annual Report

In the 2019-2020 Annual Report, it was recommended:-

1. THAT in the first instance, monitoring of consented activities at the Company's Stratford Power Station (SPS) in the 2020-2021 year continue at the same level as in 2019-2020.
2. THAT should there be issues with environmental or administrative performance in 2020-2021, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

Recommendation 1 was undertaken, recommendation 2 was not required.

3.5 Alterations to monitoring programmes for 2021-2022

In designing and implementing the monitoring programmes for air/water discharges in the region, the Council has taken into account:

- the extent of information already made available through monitoring or other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record of administrative and environmental performances of the consent holder; and
- reporting 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 exercising resource consents.

There are no planned changes to the current compliance monitoring programme for Stratford Power Station in the 2021-2022 monitoring period.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2021-2022.

3.6 Exercise of optional review of consent

All resource consents, apart from 4022-2 and 4454-1 provide for an optional review of the consent in June 2022. A condition within these consents allows the Council to review the consents, if there are grounds that warrant a review.

Based on the results of monitoring in the year under review, and in previous years, as set out in earlier annual compliance monitoring reports, it is considered that there are no grounds that require a review to be pursued.

4 Recommendations

1. THAT in the first instance, monitoring of consented activities at Stratford Power Station in the 2021-2022 year continue at the same level as in 2020-2021.
2. THAT should there be issues with environmental or administrative performance in 2021-2022, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

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 25°C and expressed in $\mu\text{S}/\text{cm}$.
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.
FNU	Formazin nephelometric units, a measure of the turbidity of water
Fresh	Elevated flow in a stream, such as after heavy rainfall.
$\text{g}/\text{m}^2/\text{day}$	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.
Incident register	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.
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.
MPN	Most Probable Number. A method used to estimate the concentration of viable microorganisms in a sample.
µS/cm	Microsiemens per centimetre.
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 , PM _{2.5} , PM _{1.0}	Relatively fine airborne particles (less than 10 or 2.5 or 1.0 micrometre diameter, respectively).
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 or FNU.
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 a Science Services Manager.

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Appendix I

Resource consents held by Contact Energy Stratford

(For a copy of the signed resource consent
please contact the TRC Consents department)

Water abstraction permits

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. Permits authorising the abstraction of water are issued by the Council under Section 87(d) of the RMA.

Water discharge permits

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. Permits authorising discharges to water are issued by the Council under Section 87(e) of the RMA.

Air discharge permits

Section 15(1)(c) of the RMA stipulates that no person may discharge any contaminant from any industrial or trade premises into air, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Permits authorising discharges to air are issued by the Council under Section 87(e) of the RMA.

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. Permits authorising the discharge of wastes to land are issued by the Council under Section 87(e) of the RMA.

Land use permits

Section 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 resource consent, a rule in a regional plan, or by national regulations. Land use permits are issued by the Council under Section 87(a) of the RMA.

Coastal permits

Section 12(1)(b) of the RMA stipulates that no person may erect, reconstruct, place, alter, extend, remove, or demolish any structure that is fixed in, on, under, or over any foreshore or seabed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Coastal permits are issued by the Council under Section 87(c) of the RMA.

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

Name of
Consent Holder: Contact Energy Limited
P O Box 10742
WELLINGTON 6143

Change To
Conditions Date: 9 February 2010 [Granted: 14 December 1994]

Conditions of Consent

Consent Granted: To discharge emissions into the air from fuel combustion and other related activities associated with the operation of the Stratford Power Station and ancillary plant at or about (NZTM) 1713825E-5645366N

Expiry Date: 1 June 2022

Review Date(s): As per special condition 11

Site Location: Stratford Peaker Power Station,
State Highway 43 [East Road], Stratford

Legal Description: Lot 1 DP 19365 & Lot 1 DP 17776 Blk II Ngaere SD

Consent 4022-2

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 adopt the best practicable option to prevent or minimise any actual or likely adverse effect on the environment associated with the discharge of contaminants into the environment from the site.
2. That prior to undertaking any alterations to the plant, processes or operations, as specified in the application which may significantly change the nature or quantity of contaminants emitted from the site, the consent holder shall consult with the Chief Executive and shall obtain any necessary approvals under the Resource Management Act.
3. That the consent holder shall provide to the Council within two years from the granting of this consent and every six years thereafter a written report:
 - a) reviewing any technological advances in the reduction or mitigation of emissions, how these might be applicable and/or implemented at the power station, and the costs and benefits of these advances; and
 - b) detailing an inventory of emissions from the site of such contaminants as the Chief Executive, Taranaki Regional Council, may from time to time specify following consultation with the consent holder; and
 - c) detailing any measures that have been taken by the consent holder to improve the energy efficiency of the power station; and
 - d) addressing any other issue relevant to the minimisation or mitigation of emissions from the site that the Chief Executive, Taranaki Regional Council, considers should be included; and
 - e) detailing carbon dioxide emissions from the site.

Consent 4022-2

4. That the consent holder shall control all emissions of carbon monoxide to the atmosphere from the site, in order that the maximum ground level concentration of carbon monoxide arising from the exercise of this consent measured under ambient conditions does not exceed 10 mg m^{-3} [eight-hour average exposure], or 30 mg m^{-3} [one-hour average exposure] at or beyond the boundary of the site.
5. That the consent holder shall control all emissions of nitrogen oxides to the atmosphere from the site, in order that the maximum ground level concentration of nitrogen dioxide arising from the exercise of this consent measured under ambient conditions does not exceed 20 ug m^{-3} [twenty-four-hour average exposure], or 60 ug m^{-3} [four-hour average exposure] at or beyond the boundary of the site.
6. That the consent holder shall control all emissions to the atmosphere from the site of contaminants other than carbon dioxide, carbon monoxide, and nitrogen oxides, in order that the maximum ground level concentration for any particular contaminant arising from the exercise of this consent measured at or beyond the boundary of the site is not increased above background levels:
 - a) by more than 1/30th of the relevant Occupational Threshold Value-Time Weighted Average, or by more than the Short Term Exposure Limit at any time, [all terms as defined in Workplace Exposure Standards and Biological Exposure indices for New Zealand, 1992, Department of Labour], or
 - b) if no Short Term Exposure Limit is set, by more than three times the Time Weighted Average at any time, [all terms as defined in Workplace Exposure Standards and Biological Exposure Indices for New Zealand, 1992, Department of Labour].
7. That except in any period of 30 minutes following the initiation of start-up of a turbine or in any period of 30 minutes prior to the cessation of the generation of electricity from a turbine, in the event that the discharge of nitrogen oxides exceeds:
 - a) a mass emission rate for the site of 175 g s^{-1} , or
 - b) *[cancelled]*
 - c) a concentration in any gas turbine stack equivalent to 100 mg m^{-3} at 450 degrees Celsius, or to 125 ppm [volumetric basis].

then the operator shall immediately initiate all reasonable steps to reduce the emissions to below these levels as soon as practicable.
8. That the sum of all discharges of nitrogen oxides from the site of the power station is not to exceed 830 kg in any period of one hour.
9. That the minimum height of discharge of the products of combustion from the turbines shall be 15 metres above ground level.
10. That the discharges authorised by this consent shall not give rise to any direct significant adverse ecological effect on any ecosystems in the Taranaki region, including but not limited to habitats, plants, animals, microflora and microfauna.

Consent 4022-2

11. That subject to the provisions of this condition, the Taranaki Regional Council may within six months of receiving a report prepared by the consent holder pursuant to condition 3 of this consent, serve notice that it intends to review the conditions of this resource consent in accordance with Section 128(1)(a) of the Act for the purposes of:
- a) dealing with any significant adverse effect on the environment arising from the exercise of the consent which was not foreseen at the time the application was considered and which it is appropriate to deal with at the time of the review or
 - b) requiring the holder to adopt the best practicable option to remove or reduce any adverse effect on the environment caused by the discharge; or
 - c) taking into account any Act of Parliament, regulation, national policy statement, regional policy statement or regional rule which relates to limiting, recording, or mitigating carbon dioxide and which is relevant to emissions from the Stratford gas turbine power station.

Signed at Stratford on 9 February 2010

For and on behalf of
Taranaki Regional Council

Chief Executive

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

Name of
Consent Holder: Contact Energy Limited
P O Box 10742
WELLINGTON 6143

Change To
Conditions Date: 9 February 2010 [Granted: 15 August 1995]

Conditions of Consent

Consent Granted: To discharge contaminants to air, subject to the following specified conditions, from a combined cycle power station and ancillary plant ['the station'] located adjacent to East Road approximately three kilometres East of the town of Stratford at or about (NZTM) 1713732E-5645766N

Expiry Date: 14 August 2029

Site Location: East Road, Stratford

Legal Description: Lot 2 of Subdiv of Lot 2 Lt 18343 Blk II Ngaere SD

Consent 4454-1

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

(note condition numbering intentionally begins at 4)

- 4) That the consent holder shall adopt the best practicable option to prevent or minimise any actual or likely adverse effect on the environment associated with the discharge of contaminants into the environment from the site.
- 5) That a general outline of the methods, specifications, operating guidelines or other measures which represent the best practicable option at the time of commissioning will be supplied by the consent holder and thereafter attached to this consent as Schedule A.
- 6) That the measures representing the best practicable option may be reviewed in accordance with the procedure provided for in condition 18.
- 7) That prior to undertaking any alterations to the plant, processes or operations specified in the application, which alterations may significantly change the nature or quantity of contaminants emitted from the site, the consent holder shall consult with the Chief Executive and shall obtain any necessary approvals under the Resource Management Act.
- 8) That the consent holder shall provide to the Council within two years from the commencement of commissioning of the Station and again at four years from commencement of commissioning of the Station and every six years thereafter, a written report:
 - a) reviewing any technological advances in the reduction or mitigation of emissions, especially, but not exclusively in respect of the cooling tower plume and of carbon dioxide, how these might be applicable and/or implemented at the power station, and the costs and benefits of these advances; and
 - b) detailing an inventory of emissions from the site of such contaminants as the Chief Executive may from time to time specify following consultation with the consent holder; and

Consent 4454-1

- c) detailing any measures that have been taken by the consent holder to improve the energy efficiency of the Station; and
 - d) addressing any other issue relevant to the minimisation or mitigation of emissions from the site that the Chief Executive considers should be included; and
 - e) detailing carbon dioxide emissions from the site.
- 9) That the consent holder shall control all emissions of carbon monoxide to the atmosphere from the site, in order that the maximum ground level concentration of carbon monoxide arising from the exercise of this consent measured under ambient conditions does not exceed 10 mg/m³ [eight-hour average exposure], or 30 mg/m³ [one-hour average exposure] at or beyond the boundary of the site.
- 10) That the consent holder shall control all emissions of nitrogen oxides to the atmosphere from the site, in order that the maximum ground level concentration of nitrogen dioxide arising from the exercise of this consent measured under ambient conditions does not exceed 30 µ/m³ [twenty-four hour average exposure], or 95 µg/m³ [four-hour average exposure] at or beyond the boundary of the site.
- 11) That the consent holder shall control all emissions to the atmosphere from the site of contaminants other than carbon dioxide, carbon monoxide, and nitrogen oxides, in order that the maximum ground level concentration for any particular contaminant arising from the exercise of this consent measured at or beyond the boundary of the site is not increased above background levels:
- a) by more than 1/30th of the relevant Occupational Threshold Value-Time Weighted Average, or by more than the Short Term Exposure Limit at any time, [all terms as defined in Workplace Exposure Standards and Biological Exposure Indices for New Zealand, 1992, Department of Labour], or
 - b) if no Short Term Exposure Limit is set, by more than three times the Time Weighted Average at any time, [all terms as defined in Workplace Exposure Standards and Biological Exposure Indices for New Zealand, 1992, Department of Labour].
- 12) That except in any period of 240 minutes following the initiation of start-up of a turbine or in any period of 30 minutes prior to the cessation of the generation of electricity from a turbine, in the event that the discharge of nitrogen oxides exceeds:-
- a) a mass emission rate for the site of 70 g/s, or
 - b) a mass emission rate per gas turbine stack of [70 divided by n] g/s [where n = number of gas turbine stacks], or
 - c) a concentration in any gas turbine stack equivalent to 75 mg/m³ at 84° Celsius, or to 50 ppm [volumetric basis] then the operator shall immediately initiate all reasonable steps to reduce the emissions to below these levels as soon as practicable.

Consent 4454-1

- 13) That the sum of all discharges of nitrogen oxides from the site of the power station is not to exceed 430 kg in any period of one hour.
- 14) That the minimum height of discharge of the products of combustion from the turbines shall be 35 metres above ground level.
- 15) That the discharges authorised by this consent shall not give rise to any direct significant adverse ecological effect on any ecosystems in the Taranaki region, including but not limited to habitats, plants, animals, microflora, and microfauna.
- 16) That the evaporative cooling system to be used shall not produce a visible plume at any ambient condition further from saturation than 6° Celsius and 85% relative humidity.
- 17) That the evaporative cooling system shall be operated in order that the loss of cooling water as droplet drift to atmosphere does not exceed in aggregate 0.02% of the cooling water circulation rate at the time.
- 18) That subject to the provisions of this condition, the Council may within six months of receiving a report prepared by the consent holder pursuant to condition 8 of this consent, serve notice that it intends to review the conditions of this resource consent in accordance with Section 128(1)(a) of the Resource Management Act for the purpose of:
 - a) dealing with any significant adverse effect on the environment arising from the exercise of the consent which was not foreseen at the time the application was considered and which it is appropriate to deal with at the time of the review; or
 - b) requiring the holder to adopt the best practicable option to remove or reduce any adverse effect on the environment caused by the discharge; or
 - c) taking into account any Act of Parliament, regulation, national policy statement, regional policy statement or regional rule which relates to limiting, recording, or mitigating carbon dioxide and which is relevant to emissions from the Station.
- 19) That this consent shall lapse on the expiry of six years after the date of commencement 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(b) of the Resource Management Act 1991.

Signed at Stratford on 9 February 2010

For and on behalf of
Taranaki Regional Council

Chief Executive

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

Name of
Consent Holder: Contact Energy Limited
P O Box 10742
WELLINGTON

Change To
Conditions Date: 6 March 2008 [Granted: 25 May 1994]

Conditions of Consent

Consent Granted: To take up to 19,440 cubic metres/day [225 litres/second averaged over 15 minutes] of water on a continuous basis from the Patea River for use on Power Stations at East Road, Stratford at or about 2631900E-6204900N

Expiry Date: 1 June 2028

Review Date(s): June 2010, June 2016, June 2022

Site Location: Toko Road, Stratford

Legal Description: Patea Riverbed adjoining Pt Lot 2 DP 739 & Lot 1 DP 20723 Blk IV Ngaere SD

Catchment: Patea

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 resource consent holder shall install and operate a measuring device capable of recording instantaneous and daily rates of abstraction and shall make such records available to the Chief Executive, Taranaki Regional Council, upon request.
- 2. When the flow in the Patea River at the Taranaki Regional Council Skinner Road recorder [Q20:260-064] is more than 765 litres per second, up to 225 litres per second may be abstracted.
- 3. When the flow in the Patea River at the Taranaki Regional Council Skinner Road recorder [Q20:260-064] is between 765 litres per second and 690 litres per second abstraction may be up to a rate of the flow at the Skinner Road recorder less 540 litres per second.
- 4. When the flow in the Patea River at the Taranaki Regional Council Skinner Road recorder [Q20:260-064] is less than 690 litres per second, up to 150 litres per second may be abstracted.
- 5. The Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2010, and/or June 2016, and/or June 2022, 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 and which it is appropriate to deal with at the time of review.

Signed at Stratford on 6 March 2008

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: Contact Energy Limited
PO Box 10742
Wellington 6143

Decision Date
(Change): 8 July 2016

Commencement Date
(Change): 8 July 2016 (Granted Date: 25 May 1994)

Conditions of Consent

Consent Granted: To discharge stormwater from the operation of a power station site into the Kahouri Stream

Expiry Date: 1 June 2028

Review Date(s): June 2022 and in accordance with special condition 10

Site Location: Stratford Power Station, 167 East Road, Stratford

Grid Reference (NZTM) 1713640E-5645680N & 1713757E-5645561N

Catchment: Patea

Tributary: Kahouri
Piakau

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

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

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 consent.
2. The stormwater discharged shall be from an area not exceeding 7.5 ha outlined in Appendix 1 (attached).
3. All stormwater shall be directed for treatment through the stormwater treatment system for discharge in accordance with the special conditions of this permit.
4. Constituents of the discharge shall meet the standards shown in the following table.

<u>Constituent</u>	<u>Standard</u>
pH	Within the range 6.0 to 9.0
suspended solids	Concentration not greater than 100 gm ⁻³
oil and grease	Concentration not greater than 15 gm ⁻³

This condition shall apply before entry of the treated stormwater into the receiving waters at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

5. The consent holder will notify the Taranaki Regional Council as soon as practicable if a direct discharge of stormwater from the SP1 pond to the Kahouri Stream is required or has been undertaken. The volume and duration of the discharge will be recorded and this information made available to the Council upon request.
6. After allowing for reasonable mixing, within a mixing zone extending 5 metres downstream of the discharge point, the discharge shall not, either by itself or in combination with other discharges, give rise to any or all of the following effects in the receiving water:
 - 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.
7. The consent holder shall maintain and regularly update a 'Contingency Plan' that details measures and procedures that will be undertaken to prevent, and to avoid environmental effects from, a spillage or any discharge of contaminants not authorised by this consent. The plan shall be approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity.

Consent 4459-1.3

8. The site shall be operated in accordance with a 'Management Plan' prepared by the consent holder and approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The plan shall detail how the site is to be managed to minimise the contaminants that become entrained in the stormwater and shall include as minimum:
- a) the loading and unloading of materials;
 - b) maintenance of conveyance systems;
 - c) general housekeeping; and
 - d) management of the treatment system.

Note: A Stormwater Management Plan template is available in the Environment section of the Taranaki Regional Council's web site www.trc.govt.nz.

9. The consent holder shall notify the Chief Executive, Taranaki Regional Council, prior to making any changes to the processes or operations undertaken at the site, or the chemicals used or stored on site that could alter the nature of the discharge. Any such change shall then only occur following receipt of any necessary approval under the Resource Management Act 1991. Notification shall include the consent number, a brief description of the activity consented and an assessment of the environmental effects of any changes, and be emailed to consents@trc.govt.nz.
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:
- a) during the month of June 2022 and/or
 - b) within 3 months of receiving a notification under special condition 9 above;

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 8 July 2016

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

Appendix 1



Stormwater catchment

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

Name of
Consent Holder: Contact Energy Limited (WELLINGTON)
P O Box 10742
WELLINGTON

Consent Granted
Date: 24 May 2000

Conditions of Consent

Consent Granted: To discharge fine sediment and organic matter from water
intake structure tee screens to the Patea River
at or about GR: Q20:319-049

Expiry Date: 1 June 2028

Review Date(s): June 2004, June 2010, June 2016, June 2022

Site Location: Patea River, approximately 500 m downstream from the
Toko Stream confluence, Toko Road, Toko, Stratford

Legal Description: Pt Sec 2 DP 1041 Blk IV Ngaere SD

Catchment: Patea

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 discharge licensed by this consent shall be undertaken in accordance with the documentation submitted in support of the application to ensure the conditions of this consent are met.
2. After allowing for mixing within a mixing zone extending 25 metres downstream of the intake structure, the discharge shall not give rise to any of the following effects in the receiving waters of the Patea River:
 - 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.
3. The Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2004 and/or June 2010 and/or June 2016 and/or June 2022, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects of the discharge 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 4 July 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: Contact Energy Limited
PO Box 10742
Wellington 6143

Decision Date
(Change): 19 January 2017

Commencement Date
(Change): 19 January 2017 (Granted Date: 27 November 2001)

Conditions of Consent

Consent Granted: To take and use up to 19,440 cubic metres/day (225 litres/second averaged over 15 minutes) of water from a water intake structure in the Patea River for cooling and power station purposes

Expiry Date: 1 June 2034

Review Date(s): June 2022, June 2028

Site Location: Skinner Road, Stratford

Grid Reference (NZTM) 1715933E-5644667N

Catchment: Patea

*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 resource consent holder shall install and operate a measuring device capable of recording instantaneous and daily rates of abstraction and shall make such records available to the Chief Executive, Taranaki Regional Council, upon request.
2. The maximum rate of abstraction authorised by the exercise of this consent shall be managed so that:-
 - a) when the flow in the Patea River at the point of abstraction is more than 1040 litres per second, up to 225 litres per second may be abstracted;
 - b) when the flow in the Patea River at the point of abstraction is between 1040 litres per second and 887 litres per second, a residual flow of at least 812 litres per second shall be maintained at all times in the Patea River downstream of the abstraction point;
 - c) when the flow in the Patea River at the point of abstraction is between 887 litres per second and 695 litres per second, up to 75 litres per second may be abstracted;
 - d) when the flow in the Patea River at the point of abstraction is between 695 litres per second and 620 litres per second, a residual flow of at least 620 litres per second shall be maintained at all times in the Patea River downstream of the abstraction point; and
 - e) when the flow in the Patea River at the point of abstraction is less than 620 litres per second, no abstraction is permitted.

For (c) and (d) abstraction is permitted only if the maximum abstraction permitted under consent 4455 is already being extracted.

The residual flow below the abstraction point and at the point of abstraction will be as measured, or as implied from measurements, at the Taranaki Regional Council Skinner Road recorder (1715933E-5644667N).

3. The maximum rate of abstraction authorised by the exercise of this consent in combination with Water Permit 4455 shall not exceed 225 litres per second.

Consent 5847-1.3

4. By the agreement of the consent holder the consent holder shall provide a one off donation to the Taranaki Regional Council of \$100,000 (plus Goods and Services Tax), for the purposes of enhancing the habitat values of the Patea River and/or its tributaries, benefiting the ecological and/or recreational uses of the Patea catchment, or as otherwise agreed between the Manager, Stratford Power Station, and the Chief Executive, Taranaki Regional Council. The donation is payable at the start of the construction of the power station in respect of which this consent has been sought.
5. This consent shall lapse on 6 December 2024 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 (b) of the Resource Management Act 1991.
6. The Taranaki Regional Council may review any or all of the conditions of this consent, by giving notice of review during June 2010, and/or June 2016 and/or June 2022 and/or June 2028 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 not foreseen at the time the application was considered and which it is appropriate to deal with at the time of the review.

Signed at Stratford on 19 January 2017

For and on behalf of
Taranaki Regional Council

A D McLay
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: Contact Energy Limited (WELLINGTON)
P O Box 10742
WELLINGTON

Consent Granted
Date: 27 November 2001

Conditions of Consent

Consent Granted: To discharge up to 6,740 cubic metres/day [78 litres/second averaged over 15 minutes] of used water mainly blowdown water from the cooling system from combined cycle power stations into the Patea River at or about GR: Q20:246-068

Expiry Date: 1 June 2034

Review Date(s): June 2004, June 2010, June 2016, June 2022, June 2028

Site Location: Combined Cycle Power Station, State Highway 43 [East Road], Stratford

Legal Description: Pt Sec 121 Blk II Ngaere SD

Catchment: Patea

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 shall be exercised in accordance with the procedures set out in an effluent disposal management plan [the effluent disposal management plan], which shall demonstrate ability to comply with consent conditions and shall address the following matters:
 - i) monitoring of discharge effluent;
 - ii) chemical, physicochemical, ecological and biological [including trout] monitoring of the Patea River;
 - iii) minimisation of ammonia and dissolved reactive phosphorus in the discharge effluent;
 - iv) mitigation of the effects of the discharge [including but not limited to, the options of riparian planting and other off-site mitigation measures]; and
 - v) reporting on the exercise of consent.
2. The effluent disposal management plan shall be submitted to the Chief Executive, Taranaki Regional Council, for approval not later than three months prior to the exercise of the consent, and such approval shall not be unreasonably withheld if the effluent disposal management plan demonstrates ability to comply with the conditions of this consent and addresses the matters set out in special condition 1 above. Thereafter the effluent disposal management plan shall be subject to revision upon three months' notice by either the consent holder or the Taranaki Regional Council.
3. No later than three months prior to exercise of the consent, the consent holder shall provide to the Chief Executive, Taranaki Regional Council, details of water treatment chemicals for use at the Stratford Combined Cycle Power Station, including raw water, boiler water and cooling water. Further, the consent holder shall provide to the Chief Executive, Taranaki Regional Council, details of any change in water treatment chemical, or increase in maximum concentration of any water treatment chemical used, no later than one month prior to the change.
4. No later than three months prior to exercise of the consent, the consent holder shall provide to the Chief Executive, Taranaki Regional Council, details of cleaning chemicals for use at the Stratford Combined Cycle Power Station. Further, the consent holder shall provide to the Chief Executive, Taranaki Regional Council, details of any change in cleaning chemical, or increase in maximum concentration of any cleaning chemical used, no later than one month prior to the change.

Consent 5848-1

5. Pursuant to section 128(1)(a) of the Resource Management Act 1991, the Taranaki Regional Council may review special condition 12 of this consent, by giving notice of review within three months of the provision of information under special condition 3 or 4 involving the use of treatment or cleaning chemicals not already advised to the Council or at concentrations not already advised to the Council, for the purpose of including standards addressing water treatment chemicals, cleaning chemicals and their products.
6. The consent holder shall prepare and maintain a contingency plan, to the satisfaction of the Chief Executive, Taranaki Regional Council, for action to be taken in the event of accidental spillage or discharge of contaminants, the initial plan to be provided no later than three months prior to exercise of this consent.
7. That after allowing for reasonable mixing in a zone of 75 metres extending downstream of the discharge point ['the mixing zone'], the discharge shall not give rise to all or any of the following effects in the receiving water:
 - i) the production of any conspicuous oil or grease films, scums or foams or floatable or suspended materials;
 - ii) any conspicuous change in the colour or visual clarity;
 - iii) any emission of an objectionable odour;
 - iv) the rendering of freshwater unsuitable for consumption by farm animals;
 - v) any significant adverse effects on aquatic life, habitats, or ecology;
 - vi) any undesirable biological growths.
8. Within the mixing zone the discharge shall not give rise to a barrier preventing the movement of fish species.
9. The discharge shall not :
 - (i) alter the ambient temperature of the receiving waters of the Patea River by more than 1.5 degrees Celsius for 95% of the time that the discharge is occurring on an annual basis; and
 - (ii) alter the ambient temperature of the receiving waters of the Patea River by more than 2.0 degrees Celsius at any timewhen measured simultaneously immediately upstream and 75 metres downstream of the discharge site.
10. The discharge shall not raise the temperature of the receiving water above 25 degrees Celsius when measured 75 metres downstream of the discharge site.
11. The consent holder shall continuously monitor the temperature of the receiving waters so as to assess compliance with special conditions 9 and 10, and forward the results of this monitoring to the Chief Executive, Taranaki Regional Council, at monthly intervals.
12. The following concentrations shall not be exceeded in the discharge effluent:

Component	Concentration
pH [range]	6.0 – 9.0
Total Residual Chlorine	0.05 gm ⁻³

This condition shall apply immediately prior to the entry of the effluent into the receiving water.

Consent 5848-1

13. The discharge shall not cause the concentration of un-ionised ammonia in the Patea River to exceed 0.025 grams per cubic metre when measured at a point 75 metres downstream of the discharge.
14. This consent shall lapse on the expiry of six years after the date of commencement 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(b) of the Resource Management Act 1991.
15. The Taranaki Regional Council may review any or all of the conditions of this consent, by giving notice of review during June 2004, and/or June 2010, and/or June 2016 and/or June 2022 and/or June 2028 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 not foreseen at the time the application was considered and which it is appropriate to deal with at the time of the review.

Transferred at Stratford on 4 July 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: Contact Energy Limited
PO Box 10742
Wellington 6143

Decision Date
(Change): 19 January 2017

Commencement Date
(Change): 19 January 2017 (Granted Date: 27 November 2001)

Conditions of Consent

Consent Granted: To erect, place, use and maintain at or about (NZTM) 1713596E-5645713N gas pipelines and associated utilities, under the bed, and including disturbance for installation by trenching of the bed, of the Kahouri Stream in the Patea catchment, for power station purposes

Expiry Date: 1 June 2034

Review Date(s): June 2022, June 2028

Site Location: Stratford Power Station Site, SH 43, East Road, Stratford

Grid Reference (NZTM) 1713596E-5645713N
1713810E-5645800N

Catchment: Patea

Tributary: Kahouri

*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. Prior to commencing construction the consent holder shall provide plans and details of the structures, to the reasonable satisfaction of the Chief Executive, Taranaki Regional Council.
2. The structures shall be constructed and maintained in accordance with the plans and details provided under condition 1, to the reasonable satisfaction of the Chief Executive, Taranaki Regional Council.
3. During and subsequent to construction works the consent holder must observe every practicable measure to minimise the discharge or placement of silt and/or organics and/or debris into the watercourse, and to avoid or remedy erosion and scour attributable to the works.
4. The consent holder must notify the Taranaki Regional Council at least seven days before commencing construction.
5. Construction of the structures must be undertaken only between 1 November and 30 April inclusive. These dates may be altered only by the written approval of the Chief Executive, Taranaki Regional Council.
6. The exercise of this consent must not result in any barrier to the passage of fish species.
7. This consent shall lapse on 6 December 2024 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 (b) of the Resource Management Act 1991.

Consent 5849-1.3

8. The Taranaki Regional Council may review any or all of the conditions of this consent, by giving notice of review during June 2004, and/or June 2010, and/or June 2016 and/or June 2022 and/or June 2028 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 not foreseen at the time the application was considered and which it is appropriate to deal with at the time of the review.

Signed at Stratford on 19 January 2017

For and on behalf of
Taranaki Regional Council

A D McLay
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: Contact Energy Limited
P O Box 10742
WELLINGTON

Change To
Conditions Date: 6 March 2008 [Granted: 27 November 2001]

Conditions of Consent

Consent Granted: To erect, place, use and maintain an intake structure and ancillary pipework and pumps in and on the bed, and including disturbance associated with construction of the bed of the Patea River, for the purpose of taking water for Power Stations at East Road, Stratford at or about 2626000E-6206400N

Expiry Date: 1 June 2034

Review Date(s): June 2010, June 2016, June 2022, June 2028

Site Location: Skinner Road, Stratford

Legal Description: Patea Riverbed adjoining Pt Lot 8 DP 141 Blk III
Ngaere SD

Catchment: Patea

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 notify the Taranaki Regional Council, at least 48 hours prior to the commencement and upon completion of the initial construction and again prior to and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the riverbed or discharges to water.
- 2. The structure[s] authorised by this consent shall be constructed generally in accordance with the documentation submitted in support of the application and shall be maintained to ensure the conditions of this consent are met.
- 3. The consent holder shall adopt the best practicable option to avoid or minimise the discharge of silt or other contaminants into water or onto the riverbed and to avoid or minimise the disturbance of the riverbed and any adverse effects on water quality.
- 4. The consent holder shall ensure that the area and volume of riverbed disturbance shall, so far as is practicable, be minimised and any areas which are disturbed shall, so far as is practicable, be reinstated.
- 5. 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.
- 6. Any disturbance of parts of the riverbed covered by water and/or any works which may result in downstream discolouration of water shall be undertaken only between 1 November and 30 April, except where this requirement is waived in writing by the Chief Executive, Taranaki Regional Council.
- 7. This consent shall lapse on 6 December 2017 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 (b) of the Resource Management Act 1991.

Consent 5850-1

8. The Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2010 and/or June 2016 and/or June 2022 and/or June 2028, for the purpose of ensuring that the conditions adequately deal with the environmental effects arising from the exercise of this consent which were not foreseen at the time the application was considered and which it is appropriate to deal with at the time of the review.

Signed at Stratford on 6 March 2008

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: Contact Energy Limited
PO Box 10742
Wellington 6143

Decision Date
(Change): 19 January 2017

Commencement Date
(Change): 19 January 2017 (Granted Date: 7 December 2001)

Conditions of Consent

Consent Granted: To discharge fine sediment and organic matter from water intake structure screens to the Patea River

Expiry Date: 1 June 2034

Review Date(s): June 2022, June 2028

Site Location: Skinner Road, Stratford

Grid Reference (NZTM) 1715933E-5644667N

Catchment: Patea

*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 discharge licensed by this consent shall be undertaken in accordance with the documentation submitted in support of the application to ensure the conditions of this consent are met.
- 2. After allowing for mixing within a mixing zone extending 25 metres downstream of the intake structure, the discharge shall not give rise to any of the following effects in the receiving waters of the Patea River:
 - 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.
- 3. This consent shall lapse on 6 December 2024 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 (b) of the Resource Management Act 1991.

Consent 5851-1.3

4. The Taranaki Regional Council may review any or all of the conditions of this consent, by giving notice of review during the month of June 2004 and/or June 2010 and/or June 2016 and/or June 2022 and/or June 2028, 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 not foreseen at the time the application was considered and which it is appropriate to deal with at the time of the review.

Signed at Stratford on 19 January 2017

For and on behalf of
Taranaki Regional Council

A D McLay
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: Contact Energy Limited
PO Box 10742
Wellington 6143

Decision Date
(Change): 19 January 2017

Commencement Date
(Change): 19 January 2017 (Granted Date: 6 December 2001)

Conditions of Consent

Consent Granted: To erect, place, use and maintain a bridge, cables including high voltage electricity cables and associated utilities at or about (NZTM)1713770E-5645532N over the Kahouri Stream in the Patea catchment for power station purposes at or about (NZTM)1713810E-5645800N

Expiry Date: 1 June 2034

Review Date(s): June 2022, June 2028

Site Location: Stratford Power Station Site, SH 43, East Road, Stratford

Grid Reference (NZTM) 1713770E-5645532N
1713810E-5645800N

Catchment: Patea

Tributary: Kahouri

*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. Prior to commencing construction the consent holder shall provide final plans and details of the bridge, cables and associated utilities, to the reasonable satisfaction of the Chief Executive, Taranaki Regional Council.
2. The bridge, cables and associated utilities shall be constructed generally in accordance with the plans and details provided under condition 1, and shall be maintained to ensure the conditions of this consent are met.
3. The consent holder shall notify the Taranaki Regional Council in writing at least 48 hours prior to the commencement and upon completion of the initial construction 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 consent holder shall adopt the best practicable option to avoid or minimise the discharge of silt or other contaminants into water or onto the riverbed and to avoid or minimise the disturbance of the riverbed and any adverse effects on water quality.
5. The consent holder shall ensure that the area and volume of riverbed and bank disturbance shall, so far as is practicable, be minimised and any areas which are disturbed shall, so far as is practicable, be reinstated.
6. 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 the structure(s) removal and reinstatement.
7. This consent shall lapse on 6 December 2024 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 (b) of the Resource Management Act 1991.

Consent 5852-1.4

8. The Taranaki Regional Council may review any or all of the conditions of this consent, by giving notice of review during the month of June 2004 and/or June 2010 and/or June 2016 and/or June 2022 and/or June 2028, 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 not foreseen at the time the application was considered and which it is appropriate to deal with at the time of the review.

Signed at Stratford on 19 January 2017

For and on behalf of
Taranaki Regional Council

A D McLay
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: Contact Energy Limited
P O Box 10742
WELLINGTON

Consent Granted
Date: 6 March 2008

Conditions of Consent

Consent Granted: To discharge emissions into the air from the operation of the cooling tower associated with the Stratford Peaker Power Plant at or about 2623861E-6207168N

Expiry Date: 1 June 2034

Review Date(s): June 2010, June 2016, June 2022, June 2028

Site Location: State Highway 43 [East Road], Stratford

Legal Description: Lot 1 DP 17776 & Lot 1 DP 19365 Blk II Ngaere SD

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 consent.
2. A hybrid dry/wet mechanical draft cooling tower, as described in section 3.3.4 of the assessment of environmental effects provided with the application, shall be installed.
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. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz. Notification by fax or post is acceptable only if the consent holder does not have access to email.
4. The consent holder shall at all times operate, maintain, supervise, monitor and control all processes so that emissions authorised by this consent are maintained at the minimum practicable level.
5. The evaporative cooling system to be used shall not produce a visible plume at any ambient condition further from saturation than 6° Celsius and 85% relative humidity.
6. That the evaporative cooling system shall be operated in order that the loss of cooling water as droplet drift to atmosphere does not exceed in aggregate 0.02% of the cooling water circulation rate at the time.
7. Prior to undertaking any alterations to the plant, processes or operations which may significantly change the nature or quantity of contaminants emitted from the site and authorised by this consent, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act.

Consent 7247-1

8. The consent holder shall provide the Chief Executive, Taranaki Regional Council a description of the water treatment regime to be used in the cooling tower systems no later than 7 days prior to the first exercise of this consent. The consent holder shall thereafter advise the Chief Executive of the current water treatment regime.
9. The discharges authorised by this consent shall not give rise to an odour at or beyond the boundary of the site that is offensive or objectionable.
10. The discharges authorised by this consent shall not give rise to any significant adverse ecological effect on any ecosystems, including but not limited to habitats, plants, animals, microflora and microfauna.
11. This consent shall lapse on the expiry of five 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 2010 and/or June 2016 and/or June 2022 and/or June 2028, 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 6 March 2008

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: Contact Energy Limited
P O Box 10742
WELLINGTON

Consent Granted
Date: 6 March 2008

Conditions of Consent

Consent Granted: To erect, place, use and maintain a bridge over an unnamed tributary of the Kahouri Stream for pedestrian access and carriage of water pipes, high voltage cables, control cables and associated utilities at or about 2623738E-6207157N

Expiry Date: 1 June 2034

Review Date(s): June 2010, June 2016, June 2022, June 2028

Site Location: State Highway 43 [East Road], Stratford

Legal Description: Lot 1 DP 19365 & Lot 1 DP 18343 Blk II Ngaere SD

Catchment: Patea

Tributary: Kahouri

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 substantially in accordance with the documentation submitted in support of application 4907. In the case of any contradiction between the documentation submitted in support of application 4907 and the conditions of this consent, the conditions of this consent shall prevail.
2. Before beginning construction of the bridge the consent holder shall provide plans of the bridge to the Chief Executive, Taranaki Regional Council.
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. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz. Notification by fax or post is acceptable only if the consent holder does not have access to email.
4. The consent holder shall take all reasonable steps to:
 - a) minimise the amount of sediment discharged to the stream;
 - b) minimise the amount of sediment that becomes suspended in the stream; and
 - c) mitigate the effects of any sediment in the stream.

Undertaking work in accordance with *Guidelines for Earthworks in the Taranaki region*, by the Taranaki Regional Council, will achieve compliance with this condition.

5. The consent holder shall ensure that the area and volume of riverbed disturbance shall, so far as is practicable, be minimised and any areas which are disturbed shall, so far as is practicable, be reinstated.
6. Except with the written agreement of the Chief Executive, Taranaki Regional Council, 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.

Consent 7248-1

7. This consent shall lapse on the expiry of five 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 2010 and/or June 2016 and/or June 2022 and/or June 2028, 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 6 March 2008

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: Contact Energy Limited
P O Box 10742
WELLINGTON

Consent Granted
Date: 6 March 2008

Conditions of Consent

Consent Granted: To erect, place, use and maintain a bridge over the Kahouri Stream for pedestrian access and carriage of water pipes, high voltage cables, control cables and associated utilities at or about 2623777E-6207372N

Expiry Date: 1 June 2034

Review Date(s): June 2010, June 2016, June 2022, June 2028

Site Location: State Highway 43 [East Road], Stratford

Legal Description: Lot 1 DP 17776 & Lots 1 & 2 DP 19365 Blk II Ngaere SD

Catchment: Patea

Tributary: Kahouri

*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 substantially in accordance with the documentation submitted in support of application 4909. In the case of any contradiction between the documentation submitted in support of application 4909 and the conditions of this consent, the conditions of this consent shall prevail.
2. Before beginning construction of the bridge the consent holder shall provide plans of the bridge to the Chief Executive, Taranaki Regional Council.
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. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz. Notification by fax or post is acceptable only if the consent holder does not have access to email.
4. The consent holder shall take all reasonable steps to:
 - a) minimise the amount of sediment discharged to the stream;
 - b) minimise the amount of sediment that becomes suspended in the stream; and
 - c) mitigate the effects of any sediment in the stream.

Undertaking work in accordance with *Guidelines for Earthworks in the Taranaki region*, by the Taranaki Regional Council, will achieve compliance with this condition.

5. The consent holder shall ensure that the area and volume of riverbed disturbance shall, so far as is practicable, be minimised and any areas which are disturbed shall, so far as is practicable, be reinstated.
6. Except with the written agreement of the Chief Executive, Taranaki Regional Council, 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.

Consent 7250-1

7. This consent shall lapse on the expiry of five 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 2010 and/or June 2016 and/or June 2022 and/or June 2028, 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 6 March 2008

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: Contact Energy Limited
 P O Box 10742
 WELLINGTON 6143

Change To 15 June 2010 [Granted: 23 February 2010]
Conditions Date:

Conditions of Consent

Consent Granted: To construct, place and maintain a stormwater outlet
 structure in the Kahouri Stream at or about (NZTM)
 1713704E-5645626N

Expiry Date: 1 June 2028

Review Date(s): June 2016, June 2022

Site Location: 189 East Road, Stratford

Legal Description: Lot 1 DP 19365

Catchment: Patea

Tributary: Kahouri

General condition

- a. The consent holder shall pay to the Taranaki Regional Council [Council] all the administration, monitoring and supervision costs of this consent, fixed in accordance to section 36 of the Resource Management Act.

Special conditions

1. The exercise of this consent shall be undertaken in accordance with the documentation submitted in support of application 6435, in particular, UGL drawing number 3200-0030-S-3609. In the event of a conflict between that material and this consent; the conditions of this consent shall take precedence.
2. 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 riverbed or discharges to water. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz. Notification by fax or post is acceptable only if the consent holder does not have access to email.
3. The consent holder shall ensure that the area and volume of streambed disturbance is, as far as practicable, minimised and any areas that are disturbed are, as far as practicable, reinstated.
4. The consent holder shall take all reasonable steps to:
 - a. minimise the amount of sediment discharged to the stream;
 - b. minimise the amount of sediment that becomes suspended in the stream; and
 - c. mitigate the effects of any sediment in the stream.

Undertaking work in accordance with *Guidelines for Earthworks in the Taranaki region*, by the Taranaki Regional Council, will achieve compliance with this condition.

5. Except with the written agreement of the Chief Executive, Taranaki Regional Council, the structure[s] authorised by this consent shall be removed and the area reinstated, if and when the structure is no longer required. A further resource consent may be required to authorise the removal of the structure, and the consent holder is advised to seek advice from the Council on this matter.
6. This consent shall lapse on 31 March 2015, 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 7605-1

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 2016 and/or June 2022, 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 15 June 2010

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: Contact Energy Limited
 P O Box 10742
 WELLINGTON 6143

Consent Granted 21 June 2010
Date:

Conditions of Consent

Consent Granted: To construct, place and maintain a stormwater outlet
 structure in the Kahouri Stream at or about (NZTM)
 1713740E-5645575N

Expiry Date: 1 June 2028

Review Date(s): June 2016, June 2022

Site Location: 189 East Road, Stratford

Legal Description: Lot 1 DP 19365

Catchment: Patea

Tributary: Kahouri

General condition

- a. The consent holder shall pay to the Taranaki Regional Council [the Council] all the administration, monitoring and supervision costs of this consent, fixed in accordance to section 36 of the Resource Management Act.

Special conditions

1. The exercise of this consent shall be undertaken in accordance with the documentation submitted in support of application 6498. Specifically this includes United Group Infrastructure Plan 3200-0030-S-3608. If there is any conflict between the documentation submitted in support of application 6498 and the conditions of this consent, the conditions of this consent shall prevail.
2. Any disturbance of parts of the riverbed covered by water and/or any works which may result in downstream discolouration of water shall be undertaken only between 1 November and 30 April, except where this requirement is waived in writing by the Chief Executive, Taranaki Regional Council.
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 riverbed or discharges to water. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz.
4. The consent holder shall ensure that the area and volume of streambed disturbance is, as far as practicable, minimised and any areas that are disturbed are, as far as practicable, reinstated.
5. The consent holder shall take all reasonable steps to:
 - a. minimise the amount of sediment discharged to the stream;
 - b. minimise the amount of sediment that becomes suspended in the stream; and
 - c. mitigate the effects of any sediment in the stream.

Undertaking work in accordance with *Guidelines for Earthworks in the Taranaki region*, by the Taranaki Regional Council, will achieve compliance with this condition.

6. Except with the written agreement of the Chief Executive, Taranaki Regional Council, the structure[s] authorised by this consent shall be removed and the area reinstated, if and when the structure is no longer required. A further resource consent may be required to authorise the removal of the structure, and the consent holder is advised to seek advice from the Council on this matter.
7. This consent shall lapse on 30 June 2015, 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 7653-1

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 2016 and/or June 2022, 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 21 June 2010

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: Contact Energy Limited
PO Box 10742
Wellington 6143

Decision Date
(Change): 19 January 2017

Commencement Date
(Change): 19 January 2017 (Granted Date: 23 March 2012)

Conditions of Consent

Consent Granted: To discharge stormwater, sediment, dewatering water and washdown water into an unnamed tributary of the Piakau Stream at or about 1713959E-5646039N and into the Kahouri Stream at or about 1713635E-5645679N, from earthworks associated with the construction activities of a power station

Expiry Date: 1 June 2028

Review Date(s): June 2022

Site Location: Stratford Power Station Site, SH 43, East Road, Stratford

Grid Reference (NZTM) 1713959E-5646039N
1713635E-5645679N

Catchment: Patea

Tributary: Kahouri
Piakau

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

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. At least 30 working days prior to the commencement of any earthworks, the consent holder shall prepare and submit to the Chief Executive, Taranaki Regional Council, an erosion and sediment control plan. The erosion and sediment control plan shall detail the methodology that will be used to ensure that erosion and sediment control works comply with the conditions of this consent.
2. The consent holder shall at all times adhere to the erosion and sediment control plan approved under condition 1 of this consent. Any changes to the plan approved shall be submitted for certification to the Chief Executive, Taranaki Regional Council prior to being implemented.
3. At least 7 working days prior to the commencement of works the consent holder shall notify the Taranaki Regional Council of the proposed start date for the work. Notification shall include the consent number and a brief description of the activity consented and shall be emailed to worknotification@trc.govt.nz.
4. All runoff from any un-vegetated area shall pass through settlement ponds or sediment traps with a minimum total capacity of:
 - a) 100 cubic metres for every hectare of exposed soil between 1 November to 30 April; and
 - b) 200 cubic metres for every hectare of exposed soil between 1 May to 31 October; unless other sediment control measures that achieve an equivalent standard are agreed to by the Chief Executive of the Taranaki Regional Council.
5. The obligation described in condition 3 above shall cease to apply, and accordingly the erosion and sediment control measures can be removed, in respect of any particular site or area of any site, only when the site is stabilised.

Note: For the purpose of conditions 4 and 5 "stabilised" in relation to any site or area means inherently resistant to erosion or rendered resistant, such as by using rock or by the application of basecourse, colluvium, grassing, mulch, or another method to the reasonable satisfaction of the Chief Executive, Taranaki Regional Council and as specified in the Taranaki Regional Council's Guidelines for Earthworks in the Taranaki Region, 2006. Where seeding or grassing is used on a surface that is not otherwise resistant to erosion, the surface is considered stabilised once, on reasonable visual inspection by an officer of the Taranaki Regional Council, an 80% vegetative cover has been established.

Consent 7785-1.1

6. All earthworked areas shall be stabilised vegetatively or otherwise as soon as is practicable immediately following completion of soil disturbance activities.

Note: For the purposes of this condition "stabilised" has the same definition as that set out in condition 4.

7. 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 likely adverse effect on the environment associated with the discharge of contaminants from the power station site.
8. This consent shall lapse on 6 December 2024, 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 2016 and/or June 2022, 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 19 January 2017

For and on behalf of
Taranaki Regional Council

A D McLay
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: Contact Energy Limited
PO Box 10742
Wellington 6143

Decision Date
(Change): 19 January 2017

Commencement Date
(Change): 19 January 2017 (Granted Date: 23 March 2012)

Conditions of Consent

Consent Granted: To discharge contaminants (dust) to air from earthworks associated with the construction activities of a power station

Expiry Date: 1 June 2028

Review Date(s): June 2022

Site Location: Stratford Power Station Site, SH 43, East Road, Stratford

Grid Reference (NZTM) 1713810E-5645800N

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

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. The dust discharge shall result from earthworks not exceeding 13 hectares.
2. At least 30 working days prior to the commencement of any earthworks, the consent holder shall prepare and submit to the Chief Executive, Taranaki Regional Council, a dust control management plan. The dust management plan shall detail the methodology that will be used to ensure that discharges to air comply with the conditions of this consent, in particular, special conditions 5 and 6.
3. The consent holder shall at all times adhere to the dust control management plan approved under condition 2 of this consent. Any changes to the plan approved shall be submitted for certification to the Chief Executive, Taranaki Regional Council prior to being implemented.
4. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least 48 hours prior to the commencement of earthworks associated with this consent . Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz.
5. 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 consent.
6. Any discharge to air from the site shall not give rise to any offensive, objectionable, noxious or toxic levels of dust at or beyond the boundary of the property, and in any case, suspended particulate matter shall not exceed 3 mg/ m³ [measured under ambient conditions] beyond the boundary of the project site.
7. The consent holder shall maintain a permanent record of any complaints received alleging adverse effects from or related to the exercise of this consent. This record shall include the following, where practicable:
 - a. the name and address of the complainant, if supplied;
 - b. date, time and details of the alleged event;
 - c. weather conditions at the time of the alleged event (as far as practicable);
 - d. investigations undertaken by the consent holder in regards to the complaint and any measures adopted to remedy the effects of the incident/complaint; and
 - e. measures put in place to prevent occurrence of a similar incident.

Consent 7786-1.1

8. The consent holder shall make the complaints record available to officers of Taranaki Regional Council, on request.
9. The consent holder shall notify the Chief Executive, Taranaki Regional Council of any complaints received, which relate to the exercise of this consent, within 24 hours of being received.
10. This consent shall lapse on 6 December 2024, 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.
11. 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 2016 and/or June 2022, 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 19 January 2017

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

Appendix II

Company provided Annual Report

Taranaki Regional Council
Private Bag 713
Stratford

Attn: Lorraine Smith

28th September 2021

Dear Lorraine

Subject: Stratford Power Station Annual Report for the period 1 July 2020 to 30 June 2021

This summary relates to compliance with Resource Consents held for the operation of Stratford Power Station and the Resource Management (Measurement and Reporting of Water Takes) Regulations for the period 1 July 2020 to 30 June 2021.

Please find included an overview of plant operation with regard to consent monitoring and relevant operational changes for the year in review. Summary reports reflecting the last year are included for wastewater discharge, raw water abstraction and stack emissions.

Yours faithfully

A handwritten signature in black ink, appearing to read "Grant Stieller".

Grant Stieller
Generation Controller - Taranaki

Consent Monitoring Highlights for the period 1 July 2020 – 30 June 2021

Consent 4455-1 Water Take from the Patea River:

Abstraction from the Patea River was within the consent requirements throughout the year with the river flow results being supplied by TRC.

The total volume of water taken from the Patea River during the year was 1,182,103 m³ with an average abstraction rate of 37 l/s. The maximum abstraction rate for the year was 127 l/s on 28th June 2021.

Consent 5848-1 Waste Water Discharge into the Patea River:

River Temperature:

- During the year the river temperature remained below 25°C allowing for continuous site discharge.
- Temperature differentials remained within the consent limit of 1.5°C for the entire year.
- River temperature probes were calibrated periodically during the year in accordance with the maintenance plan.

The maximum River water temperature and difference between upstream and downstream temperatures occurred in January with a river water temperature of 22°C and differential of 0.54°C.

Discharge Flow:

The maximum recorded combined discharge flow for the year was 51.52 l/s, this being within the discharge consent limit of 78 l/s.

The average combined discharge flow from the site was 15.77 l/s for the year.

The total volume of wastewater discharged for the year from site was 483,448 m³. This equates to approximately 48.4% of the water abstracted for plant use during the year.

Monitoring of both the TCC and SPP wastewater discharges is by online analysers. Routine inter-comparison sampling is also performed to verify accuracy of testing in the laboratory. Calibration and servicing of the wastewater pH meters and chlorine meters was carried out as required throughout the year.

High chlorine values were recorded on several occasions while the wastewater discharge valves were closing. These high values often occur due to low sample volume when the circulation pump has been stopped due to low water level in the wastewater pit. When the high chlorine values are recorded, the control system is in the process of closing the outlet valve to prohibit discharge, thus keeping outflows within consent limits.

Consent 4459-1 Discharge storm water to Piakau and Kahouri Streams: Stratford Power Station:

Storm water discharge remained within consent conditions for the entire year.

The TCC storm water pond overflowed into the neighbouring river on several occasions during the year due to high rainfall occurrences. These are included in monthly reporting statistics. The storm water recovery pump was available for automatic operation. During normal rainfall all storm water from both sites is collected and used within the process.

Consent 4454-1 Discharge to air (TCC):

The maximum hourly Nitrogen Oxides discharge rate from the plant for the reporting year was 113.23 kg/hr, which is below the consent limit of 430 kg/hr.

Under normal operation, the maximum concentration of Nitrogen Oxide emissions for the year was 31.45 ppm this is below the consent limit of 50 ppm.

Under start up and shut down operation, the plant is permitted to exceed the 50 ppm. limit, the maximum emissions during these periods was 81.33 ppm.

Total Carbon Dioxide stack emissions were calculated to be 451,084.9 tonnes for the year and the total Nitrogen Oxides emissions from the plant were recorded at 123.4 tonnes for the year.

The cooling tower plume was visible under low ambient conditions as allowed under consents.

Consent 4022-1 Discharge to air (SPP):

The cooling tower plume was visible under low ambient conditions as allowed under consents.

Inter Laboratory Comparisons and site inspections:

During the year, inter laboratory comparisons samples were taken on several occasions. Results reported between the site Laboratory, on-line analysers and the TRC Laboratory were acceptable for all parameters being measured. Inter-comparison sampling occurred on 18th August 2020, 3rd December 2020, 4th May 2021 and 30th June 2021

Site Inspection Notices

Inspection Notice	Inspection Type	Date Issued	Consent	Comments
OBS-2020-79333	Stratford Compliance Monitoring	18th August 2020	R2/4022-2, R2/4454-1 R2/4455-1, R2/4456-1, R2/4459-1.3, R2/4461-1, R2/5847-1.3 R2/5848-1, R2/5850-1, R2/7247-1	All Compliant
OBS-2020-83046	Stratford Compliance Monitoring	3rd December 2020	R2/4022-2, R2/4454-1, R4459-1.3, R2/4460-1, R2/5848-1	All Compliant
OBS-2021-88078	Stratford Compliance Monitoring	4th May 2021	R2/4022-2, R2/4454-1 R2/4460-1, R2/5848-1	All Compliant
OBS-2021-90438	Stratford Compliance Monitoring	30th June 2021	R2/4022-2, R2/4454-1 R2/4459-1.3, R2/5848-1	All Compliant

Plant Improvements:

The SPP water treatment plant performance improvement project continues with numerous instrument replacements and continuous improvements to promote less wastage of water and less chemical cleaning of the RO units.

Plant Operation:

TCC operated for a continuous period of 100 days during the winter period of 2021. This was supporting a 10 year low in the hydro catchments.

Peaker plant availability and start reliability continue to meet the daily system demands and have fulfilled an important role supporting North Island reserves allowing for higher output from the South Island Hydro Generators.

TCC Number of Operational Days July 2020 – June 2021

July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June
31	27	23	6	4	0	0	0	7	20	31	30

GT21 Number of Operational Days July 2020 – June 2021

July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June
18	20	10	15	9	7	4	25	18	13	6	10

GT22 Number of Operational Days July 2020 – June 2021

July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June
28	15	9	24	16	9	7	12	14	10	10	12

Appendix III

Company provided six yearly Annual Report



Taranaki Combined Cycle and Stratford Peaker Plant Power Stations

Consents 4454-1 and 4022-2

**Compliance Report Pursuant to Condition 8 of Consent 4454-1 – To discharge
contaminants to air from the Taranaki Combined Cycle Power Station**

**Compliance Report Pursuant to Condition 3 of Consent 4022-2 – To discharge
emissions to air from the Stratford Peaker Power Station**

December 2020

1. Introduction

Condition 8 of Consent 4454-1 and Condition 3 of Consent 4022-2 require:

That the consent holder shall provide to the Council every 6 years a written report:

- a) Reviewing any technological advances in reduction or mitigation of emissions, especially but not exclusively in respect of the cooling tower plume and of carbon dioxide, how these might be applicable and/or implemented at the power station, and the costs and benefits of these advances; and
- b) Detailing an inventory of emissions from the site of such contaminants as the General Manager may from time to time specify following consultation with the consent holder; and
- c) Detailing any measures that have been taken by the consent holder to improve the energy efficiency of the Station; and
- d) Addressing any other issues relevant to the minimisation or mitigation of emissions from the site that the General Manager considers should be included; and
- e) Detailing carbon dioxide emissions from the site.

2. Reporting Time-frames

Consent 4454-1

The Taranaki Combined Cycle (TCC) Station was commissioned in 1998, thus Condition 8 requires reports in 2000, 2002, and every six years thereafter. Reports from commissioning have been forwarded to the Taranaki Regional Council (TRC) in 2000, 2002, 2008 and 2014.

This is the third of the six yearly reports (2020).

Consent 4022-2

Consent 4022 was originally granted for discharges from Stratford Power Station (SPS), and was varied on 6 March 2008 and 9 February 2010 for Stratford Peaker Plant. Condition 3 requires reports in 1996, and every six years thereafter. The last report was submitted in December 2014.

This is the fifth of the six yearly reports (2020).

3. Technological Advances and Energy Efficiency Improvements

4454-1

A large efficiency improvement was made on the GT26 Gas Turbine firing control in 2017-18 with the engine now able to operate at variable fuel inlet pressures. A significant project was undertaken to remove the need for the Fuel Gas Compressors and their subsequent electrical load of 2000 kilowatts. This energy is now available for export and is especially effective in the low to mid load range where TCC often operates.

There have been no technological advances to the TCC (Taranaki Combined Cycle) plant in the last six years, as the technological advancements for these gas turbines have not been developed in recent years. Hence, technological advances to plant such as TCC which reduce or mitigate emissions are limited to minor adjustments as this plant already incorporates the latest available technology, such as EV burners and sequential combustion. The minor adjustments would generally result in small improvements in efficiency and output. Improvements to efficiency directly reduce carbon dioxide emissions whilst improvements to output improve the electricity sector's carbon dioxide emissions by displacing emissions from plants that have higher emission factors.

The technology relating to the mitigation of emissions is continually developing with the most notable advances being related to alternative electricity generating plant.

4022-2

There is one specific upgrade implemented at the end of 2019 on Peaker Unit GT22 which is worthwhile mentioning from an environmental improvement point of view.

The inlet air filters on the Gas turbines have a three to five year life cycle and during the last planned outage on GT22 where these filters were scheduled for replacement, we chose to install high grade HEPA filtration filters into the air intake housing of the gas turbine. HEPA stands for “high efficiency particulate air” and we installed an E12 HEPA filter, which has the highest filtration class in the market. We replaced the standard F9 synthetic filters which were struggling to keep our turbine hardware in a clean condition. This required regular water washes throughout the year (six weekly) to reduce the rate of degradation of the compressor hardware between outages (hand cleaning of the compressor occurs annually).

The cost of HEPA filtration has in the past been prohibitive, but we have been able to offset this extra cost through savings made as a result of sustained higher unit efficiency and a reduced number of water washes. The use of high efficiency filters has an improved operational and environmental outcome. The low pressure compressor cleanliness and efficiency does not significantly degrade. As a result of the sustained clean condition, the degradation in performance (efficiency) of the engine is minimal. In general terms, fouling, corrosion, and pressure drop cause gas turbines to become less efficient limiting their maximum power output and increasing their heat rate. Engines with higher heat rates burn more fuel to produce the same power. Therefore, burning less fuel for the same output means less emissions are produced and will result in an overall reduction in emissions between annual outages. Annually the reduced number of water washes results in less water use, less chemical use and less off-site discharges and an overall higher availability (due to the reduced number of water wash outages). The same upgrade is planned for GT21 in 2021.

No other significant environmental improvements are on General Electric’s (the manufacturer) horizon. They are currently putting a lot of focus on modifying some of their IP (Intermediate Pressure) turbine hardware since a number of users, including Contact Energy are suffering reduced equipment life due to early blade and nozzle failure.

4. Inventory of Emissions

The General Manager has not detailed any contaminants from the site for which he needs an inventory of emissions.

5. Other Issues as requested by General Manager

The General Manager has not advised of any other issues relevant to the minimisation or mitigation of emissions from the sites that he considers should be included in this report.

However, as detailed in previous reports, the following “other aspects” of Contact’s operations impact upon its overall efficiency in the production of electricity.

Contact Energy has a policy of continuous assessment of means to improve the thermodynamic performance of all thermal stations it owns and operates. This makes economic sense and is consistent with the RMA precept of sustainable use of resources. These are generally small and can be difficult to quantify but do result in a reduction in Contact’s air emissions.

Energy efficiencies across the company have included:

- **Changes in the electricity market:** Until such time as electricity demand increases, the Taranaki Combined Cycle plant is unlikely to operate in a base load capacity outside of winter months. It is also likely that there will be periods when the plant may be operated from Monday to Friday only and shutdown during weekends when national electricity demand is lower. Under wet year scenarios it is likely that the plant will be put into long term storage. This type of operation results in reduced emissions and consumption of natural gas only when New Zealand needs electricity. Contact expects that its two Stratford peaking plants will continue to operate much as they have since being commissioned in 2010.
- **Transmission upgrades:** Transpower are continuing their work on the Clutha Upper Waitaki Line Project to allow additional generation to be exported from Southland, following enabling works initially funded by Contact and Meridian. Due to the imminent closure of Tiwai aluminium smelter, Transpower are targeting completion by May 2022. The increased lines capacity will play a direct role in displacing emissions from thermal plant.
- **Otahuhu B:** In September 2015 we closed the Otahuhu Combined Cycle power station due to the growth in renewable electricity generation (such as our Te Mihi geothermal power station in May 2014). This plays a role in offsetting several thousand tonnes of carbon dioxide and other air emissions per year from fossil fuel generated electricity.

- **Demand Flex:** We launched our demand flexibility platform in 2020 which enables our commercial and industrial customers to automatically reduce power consumption from equipment such as pumps, fans and compressors during high-usage periods and reduce fossil-fuel generation as a result. We have continued to grow this platform and now have over 20 customers signed up providing a total portfolio of 7MW.
- **Direct Heat:** We supply geothermal direct heat to Taupō businesses around our geothermal power stations, including the Prawn Park, Tenon, Wairakei Terraces, Ohaaki Heat and Wairakei Resort. This year we connected Nature's Flame to our geothermal operations providing heat for drying the wood fibres used to make biomass pellets which reduces carbon emissions through displaced coal usage.
- **Electrification opportunities:** We have partnered with Open Country Dairy to support the installation of New Zealand's largest electrode boiler (13MW) at their Awarua site, and have collaborated with industrial customers to explore heat-pumping solutions for hot water provision.
- **Development:** We are well-progressed with our understanding of the geothermal resources at Tauhara, and are monitoring other renewable generation options for the future. Investigating the potential to further develop Tauhara aligns with our decarbonisation strategy and positive results from an appraisal campaign confirm that Tauhara is a world-class renewable geothermal project.
- **Drylandcarbon:** In March 2019 we invested in the Drylandcarbon partnership to create a geographically diversified forest portfolio to sequester carbon on marginal land. In June 2020 Drylandcarbon planted its first seedlings at Matiawa Station on the Kaikōura coast to officially get its carbon offset programme underway.

6. Carbon Dioxide Emissions

The reporting of greenhouse gases can no longer be considered in a discharge permit according to the Energy & Climate Change Amendment Act 2004 under RMA s104E. The requirement to report greenhouse gases now falls under the Climate Change Regulations 2003 as part of the NZ Emissions Trading Scheme. Contact is a voluntary participant in reporting its CO₂ emissions from TCC.

4454-1

Year Ending 30 June	CO ₂ Emissions M tonne
2015	0.132
2016	0.135
2017	0.410
2018	0.482
2019	0.425
2020	0.348

4022-2

Year Ending 30 June	CO ₂ Emissions M tonne
2015	0.240
2016	0.255
2017	0.247
2018	0.239
2019	0.110
2020	0.156