

TWN Limited Partnership
Waihapa Production Station
Monitoring Programme
Annual Report
2013-2014

Technical Report 2014-49

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Executive summary

TWN Limited Partnership operates a petrochemical production station located on Bird Road at Ngaere, in the Patea catchment. The Waihapa Production Station processes oil and gas from the Company's Tariki, Waihapa and Ngaere groups of wellsites. This report for the period July 2013-June 2014 describes the monitoring programme implemented by the Taranaki Regional Council to assess the Company's environmental performance during the period under review, and the results and environmental effects of the Company's activities.

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

The Company holds three resource consents for production activities at the site, which include a total of 33 conditions setting out the requirements that the Company must satisfy. The Company holds one consent to allow it to take and use water, one consent to discharge treated stormwater and process water into the Ngaere Stream, and one consent to discharge emissions into the air at this site.

The Council's monitoring programme for the year under review included seven inspections, eight water samples collected for physicochemical analysis, two biomonitoring surveys of receiving waters, and one ambient air quality analysis.

Monitoring of the stormwater discharge from the site found that all applicable conditions in the consent were complied with. There were no adverse effects found in the receiving waters of the Ngaere Stream.

There were no adverse effects on the environment resulting from the exercise of the air discharge consent. The ambient air quality monitoring at the site showed that levels of carbon monoxide and combustible gases were all below levels of concern at the time of sampling. No offensive or objectionable odours were detected beyond the boundary during inspections and there were no complaints in relation to odours or smoke from the site.

During the period under review, the Company demonstrated an overall high level of both environmental performance and administrative compliance with the resource consents. There were no unauthorised incidents recorded by the Council in relation to the Company's activities. The Waihapa Production Station was well managed and maintained.

For reference, in the 2013-2014 year, 60% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 29% demonstrated a good level of environmental performance and compliance with their consents.

This report includes recommendation for the 2014-2015 year.

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1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is the Annual Report for the period July 2013-June 2014 by the Taranaki Regional Council on the monitoring programme associated with resource consents held by TWN Limited Partnership [TWNLP] for the Waihapa Production Station situated on Bird Road, Stratford, and its associated wellsites.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by TWNLP that relate to abstraction and discharges of water within the Patea catchment, and the emissions to air from the Waihapa Production Station.

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 TWNLP's use of water, land and air, and is the first combined annual report by the Council for the Company. In previous years, the Waihapa production facilities and associated wellsites were reported on in a combined report with Origin Energy's Rimu Production Station. These facilities are now reported upon separately.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about compliance monitoring under the RMA and the Council's obligations and general approach to monitoring sites through annual programmes, the resource consents held by TWNLP 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 at the Waihapa Production Station.

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 2014-2015 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 (eg, recreational, cultural, or aesthetic);
- (e) risks to the neighbourhood or environment.

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

1.1.4 Evaluation of environmental and consent performance

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

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

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

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

Environmental Performance

- **High** No or inconsequential (short-term duration, less than minor in severity) breaches of consent or regional plan parameters resulting from the activity; no adverse effects of significance noted or likely in the receiving environment. The Council did not record any verified unauthorised incidents involving significant environmental impacts and was not obliged to issue any abatement notices or infringement notices in relation to such impacts.
- **Good** Likely or actual adverse effects of activities on the receiving environment were negligible or minor at most. There were some such issues noted during monitoring, from self reports, or in response to unauthorised incident reports, but these items were not critical, and follow-up inspections showed they have been dealt with. These minor issues were resolved positively, co-operatively, and quickly. The Council was not obliged to issue any abatement notices or infringement notices in relation to the minor non-compliant effects; however abatement notices may have been issued to mitigate an identified potential for an environmental effect to occur.

For example:

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

Administrative compliance

- **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 2013-2014 year, 60% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 29% demonstrated a good level of environmental performance and compliance with their consents.

1.2 Process description

The Waihapa Production Station is located on Bird Road approximately 7.5 km east of Stratford in a rural area which is predominantly used for dairying. The production station processes oil and gas from wells in the surrounding Tariki, Waihapa, and Ngaere [TWN] fields by separating the oil, gas, condensate and water components of each wellsite's production. The produced oil is temporarily stored on site prior to being piped to the Omata tank farm in New Plymouth. The gas is processed further to remove any remaining moisture using glycol strippers and is then compressed and piped to end users. The produced water is disposed of by deep well injection.



Photo 1 Waihapa Production Station

1.3 Resource consents

1.3.1 Water abstraction permit

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

TWNLP holds water permit **3767-2** to take water from the Ngaere Stream in the Patea catchment for utility and firewater purposes at the Waihapa Production Station. This permit was issued by the Council to Swift Energy NZ Ltd on 25 November 1999 under Section 87(d) of the RMA. It was transferred to Origin Energy on 11 April 2008 and then to TWNLP on 13 December 2013. This consent is due to expire on 1 June 2016.

Condition 1 imposes limits upon the volume of water to be abstracted.

Condition 2 requires the use of an accurate measuring and recording device and supply of abstraction data to the Council.

Condition 3 is a review provision.

A copy of the permit is attached to this report in Appendix I.

1.3.2 Water discharge permit

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

TWNLP holds water discharge permit **3457-2** to discharge treated impounded stormwater [including washdown water and minor quantities of process water subject to potential contamination by hydrocarbons] from the Waihapa Production Station into the Ngaere Stream and to discharge treated stormwater from perimeter drains to land where it may enter the Ngaere Stream. This permit was issued by the Council to Origin Energy on 27 September 2009 as a resource consent under Section 87(e) of the RMA. It was transferred to TWNLP on 13 December 2013, and is due to expire on 1 June 2028.

Condition 1 requires the adoption of the best practicable option.

Condition 2 limits the stormwater catchment area to 5 hectares.

Condition 3 requires maintenance of a contingency plan.

Condition 4 relates to management and maintenance of the stormwater treatment system.

Condition 5 requires all stormwater and produced water to be treated.

Condition 6 requires hazardous substance storage areas to be bunded.

Conditions 7, 8 and 9 impose limits upon contaminants in the discharge and adverse effects on the receiving waters.

Condition 10 concerns the provision of sampling results.

Condition 11 requires the consent holder to remedy any erosion.

Condition 12 is a review provision.

A copy of the permit is attached to this report in Appendix I.

1.3.3 Air discharge permit

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.

TWNLP holds air discharge permit **4049-3** to discharge emissions into the air from the flaring of hydrocarbons at the Waihapa Production Station in association with production, processing and maintenance activities and in emergency situations, together with miscellaneous emissions. This permit was issued by the Council to Origin Energy on 6 October 2009 as a resource consent under Section 87(e) of the RMA. It was transferred to TWNLP on 13 December 2013, and is due to expire on 1 June 2028.

Condition 1 requires the adoption of the best practicable option.

Conditions 2 to 5 concern record keeping and reporting.

Conditions 6 to 9 concern information and notifications.

Conditions 10 to 12 require the consent holder to take steps to minimise the effects of emissions and flaring.

Conditions 13 to 17 relate to levels of contaminants at or beyond the boundary

Condition 18 is a review provision.

A copy of the permit is attached to this report in Appendix I.

1.3.4 Producing wellsite consents

TWNLP also holds various air and water discharge consents for producing wellsites associated with the Waihapa Production Station monitored under a separate monitoring programme but reported on in the Waihapa Production Station monitoring programme technical report. These consents are summarized below in Table 1.

Table 1 Resource consents for production activities at wellsites associated with the Waihapa Production Station

Wellsite	Consent number	Purpose	Issue date	Expiry
Goss-A	6561-1	To discharge emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Goss-A wellsite	31/03/2005	2022
	6562-1	To discharge treated stormwater and treated produced water from hydrocarbon exploration and production operations at the Goss-A wellsite onto and into land in the vicinity of an unnamed tributary of the Ngaere Stream in the Patea catchment	31/03/2005	2022
Ngaere-F	4162-2	To discharge treated stormwater and produced water from hydrocarbon exploration and production operations onto and into land in the vicinity of the Patea River	9/09/2010	2028
Tariki-A	3679-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production operations at the Tariki-A wellsite onto and into land and into and unnamed tributary of the Mako Stream in the Waitara catchment	09/06/2003	2033
Tariki-B	3680-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production operations at the Tariki-B wellsite onto and into land and into and unnamed tributary of the Mako Stream in the Waitara catchment	09/06/2003	2033
Tariki-C	5273-1	To discharge up to 50 cubic metres/day of treated stormwater from hydrocarbon exploration and production operations into an unnamed tributary of Lake Ratapiko in the Waitara Catchment	04/02/1998	2016
	5456-3	To discharge emissions into the air from the flaring of gas together with miscellaneous emissions arising from hydrocarbon production operations from the Tariki-2C well on the Kupara North wellsite	27/08/2007	2021
Tariki-D	6202-1	To discharge emissions to air during flaring from well workovers and in emergency situations associated with production activities from the Tariki-D wellsite	10/09/2003	2021
	6203-1	To discharge treated stormwater and treated produced water from hydrocarbon exploration and production operations at the Tariki-D wellsite onto and into land and into an unnamed tributary of Lake Ratapiko in the Waitara catchment	10/09/2003	2021
Toko-B	4201-2	To discharge treated stormwater and produced water from hydrocarbon exploration and production operations into an unnamed tributary of the Patea River	16/09/2010	2028
Toko-D	4470-2	To discharge treated stormwater and produced water from hydrocarbon exploration and production operations onto and into land in the vicinity of an unnamed tributary of the Patea River	15/09/2010	2028
Toko-E	4474-2	To discharge treated stormwater and produced water from hydrocarbon exploration and production operations into an unnamed tributary of the Manawawiri Stream in the Patea catchment	17/09/2010	2028
Waihapa-A	3683-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production operations at the Waihapa-A wellsite onto and into land and into an unnamed tributary of the Waihapa Stream in the Patea catchment	09/06/2003	2034
Waihapa-B	3684-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production operations at the Waihapa-B wellsite onto and into land and into an unnamed tributary of the Ngaere Stream in the Patea catchment	09/06/2003	2034

Wellsite	Consent number	Purpose	Issue date	Expiry
Waihapa-C	3685-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production operations at the Waihapa-C wellsite onto and into land and into an unnamed tributary in the Patea catchment	09/06/2003	2034
Waihapa-D	3686-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production operations at the Waihapa-D wellsite onto and into land and into an unnamed tributary of the Ngaere Stream in the Patea catchment	09/06/2003	2034
Waihapa-E	3687-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production operations at the Waihapa-E wellsite onto and into land and into an unnamed tributary of the Ngaere Stream in the Patea catchment	09/06/2003	2034
Waihapa-F	4093-2	To discharge treated stormwater and produced water from hydrocarbon exploration and production operations onto and into land in the vicinity of the Ngaere Stream	10/09/2010	2028
Waihapa-G	6848-1	To discharge emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Waihapa-G wellsite	06/04/2006	2022
	7846-1	To discharge treated stormwater and production water from hydrocarbon exploration and production operations at the Waihapa-G wellsite onto and into land in the vicinity of an unnamed tributary of the Ngaere Stream	22/06/2011	2028
Waihapa-H	6854-1	To discharge emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Waihapa-H wellsite	03/04/2006	2022
	6855-1	To discharge treated stormwater and treated produced water from hydrocarbon exploration and production operations at the Waihapa-H wellsite onto and into land	03/04/2006	2022
Various	7518-1	To discharge emissions to air during flaring from well workovers and in emergency situations associated with production activities at established wellsites [Waihapa-A, B, C, D, E and F; Toko-B, D and E, Tariki-A and Ahuroa-B], together with miscellaneous emissions	06/10/2009	2028

1.4 Monitoring programme

1.4.1 Introduction

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

The Council may therefore make and record measurements of physical and chemical parameters, take samples for analysis, carry out surveys and inspections, conduct investigations, and seek information from consent holders.

The monitoring programme for the Waihapa site consisted of four primary components, as set out in Sections 1.4.2 to 1.4.5.

1.4.2 Programme liaison and management

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

- ongoing liaison with resource consent holders over consent conditions and their interpretation and application;
- in discussion over monitoring requirements;
- preparation for any reviews;
- renewals;
- new consents;
- advice on the Council's environmental management strategies and content of regional plans and;
- consultation on associated matters.

1.4.3 Site inspections

The Waihapa site was visited seven times during the monitoring period. 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 consent holder 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.

1.4.4 Chemical sampling

The Council undertook sampling of both the discharge points from the site and the water quality upstream and downstream of the discharge points and mixing zone.

The production station firewater pond was sampled on two occasions, the API separator system was sampled on two occasions and the stormwater discharge was sampled on one occasion. Samples were analysed for alkalinity, hydrocarbons, conductivity, pH and suspended solids.

The Ngaere Stream was sampled on two occasions, and the samples analysed for alkalinity, hydrocarbons, conductivity, pH and turbidity.

Ambient gas monitoring was undertaken at the Waihapa Production Station using a multi-gas meter deployed in the vicinity of the plant on one occasion during the monitoring year. The instrument was placed in a down-wind position at the start of the deployment. Monitoring consisted of continual measurements of gas concentrations for the gases of interest (carbon monoxide and combustible gases).

The full air monitoring report is attached in Appendix III.

1.4.5 Biomonitoring surveys

A biological survey was performed on two occasions in the Ngaere Stream to determine whether or not the treated stormwater and API separator discharges from

the Waihapa Production Station were having a detrimental effect upon the communities of the stream.

The full survey reports are attached in Appendix II.

2. Results

2.1 Water

2.1.1 Inspections

Seven inspections were undertaken at the Waihapa Production Station and associated sites during the period under review. The following was found during the inspections:

23 July 2013

The site was inspected after recent rainfall and it was observed that ring drains and bunds were all secure and clear of contaminants; however some wind-blown debris (branches) needed to be removed. The API separators and firewater sumps were all clear at the time of inspection. Minimal flaring was occurring, no issues were noted.

24 September 2013

The site was inspected after a weekend of torrential rain and high winds. The firewater pond was full and samples were taken for analysis in preparation for water release from the fire pond. This water appeared visually clear of contaminants. Some litter and storm debris was noted in ring drains and bunds, but this was being cleaned by contractors during the inspection. Minimal flaring was underway and no odours or off site effects were detected. The area around the reinjection well was clean and tidy.

5 November 2013

Management of the Waihapa site had recently changed from Origin Energy Ltd to New Zealand Energy Corp [NZEC]. The site appeared neat and tidy. The reinjection well area was inspected and was also tidy. All skimmer pits, ring drains and bunds were clear of contaminants, and several frogs were noted in the firewater separator and main API separator systems.

30 April 2014

The Waihapa and Copper Moki sites were both inspected and found to be neat and tidy. There were no unauthorised discharges occurring off either site. Flaring at Waihapa was being undertaken but no odours or visible smoke emissions were detected off site. No flaring was occurring at Copper Moki. No issues were noted.

7 May 2014

A site inspection was conducted in conjunction with discharge sampling. Samples were taken from the separator and the firewater pond, and from the downstream receiving water site. The site was not discharging at the time, but had received their stormwater results and would likely be discharging within the next 24 hours. The site was generally tidy, some small debris was in the ring drain, but was unlikely to cause any issues. The pond looked good and samples were fairly clean in appearance. Supply of data was discussed, as were sampling requirements as per the monitoring programme. The Waihapa-H and Copper Moki wellsites were quickly inspected with NZEC environmental staff to discuss operations now that the assets have been transferred to NZEC. No issues were noted at any of the sites. Staff were helpful and friendly.

19 May 2014

Site inspection took place following heavy rainfall in the preceding week. The ducting on the northwest side of the site contained large amounts of wind blown vegetation which needed to be removed. The API separator was clear of contaminants and the

firewater pond appeared clear. All bunds were clean. The deep well reinjection area was tidy. Only a pilot flare was operating at the time. No issues were noted.

30 June 2014

A site inspection was undertaken during heavy rainfall to assess stormwater diversion and treatment facilities. It was observed that stormwater was being directed through the system as expected, however minor obstructions need to be monitored to ensure ongoing integrity of the systems. There was minimal flaring being undertaken at the time of inspection, which was not causing any odour or smoke issues. The deep well injection area was secure, and overall, the entire site was neat and tidy.

2.1.2 Results of discharge monitoring

Sampling of the discharges from the Waihapa Production Station was undertaken on two occasions during the 2013-2014 monitoring period. The samples were collected on 5 December 2013 and 7 May 2014. Tables 2-4 present the results along with a summary of previous results and limits stipulated by consent 3457-2. The sampling sites are shown in Figure 1.

Table 2 Results for the stormwater discharge from the firewater pond (site STW001058)

Date	Alkalinity g/m ³ CaCO ₃	Chloride g/m ³	Conductivity mS/m	Hydrocarbons g/m ³	pH	Suspended Solids g/m ³
05 Dec 2013	22	12.9	7.4	< 0.5	8.6	26
07 May 2014*	38	16.0	12.8	< 0.5	9.2	18
<i>Consent 3457-2 limits</i>	-	50	-	15	6.0 – 9.0	100
No. of samples	19	19	19	19	19	19
Min	5	6.8	3.8	0.5	6.5	2
Max	184	39.7	37.8	0.6	9.2	26
Median	68	16.4	20	0.5	7	2

*Pond was not discharging at time of sampling

Table 3 Results for the API separator discharge (site IND001026)

Date	Alkalinity g/m ³ CaCO ₃	Chloride g/m ³	Conductivity mS/m	Hydrocarbons g/m ³	pH	Suspended Solids g/m ³
05 Dec 2013	28	11.5	8.8	< 0.5	7.0	25
07 May 2014	15	2.8	3.1	0.5	7.4	9
<i>Consent 3457-2 limits</i>	-	50	-	15	6.0 – 9.0	100
No. of samples	7	7	7	7	7	7
Min	7	1.01	2.4	0.5	6.2	4
Max	28	11.5	8.8	0.9	7.4	25
Median	10	2.8	3.1	0.5	7	9

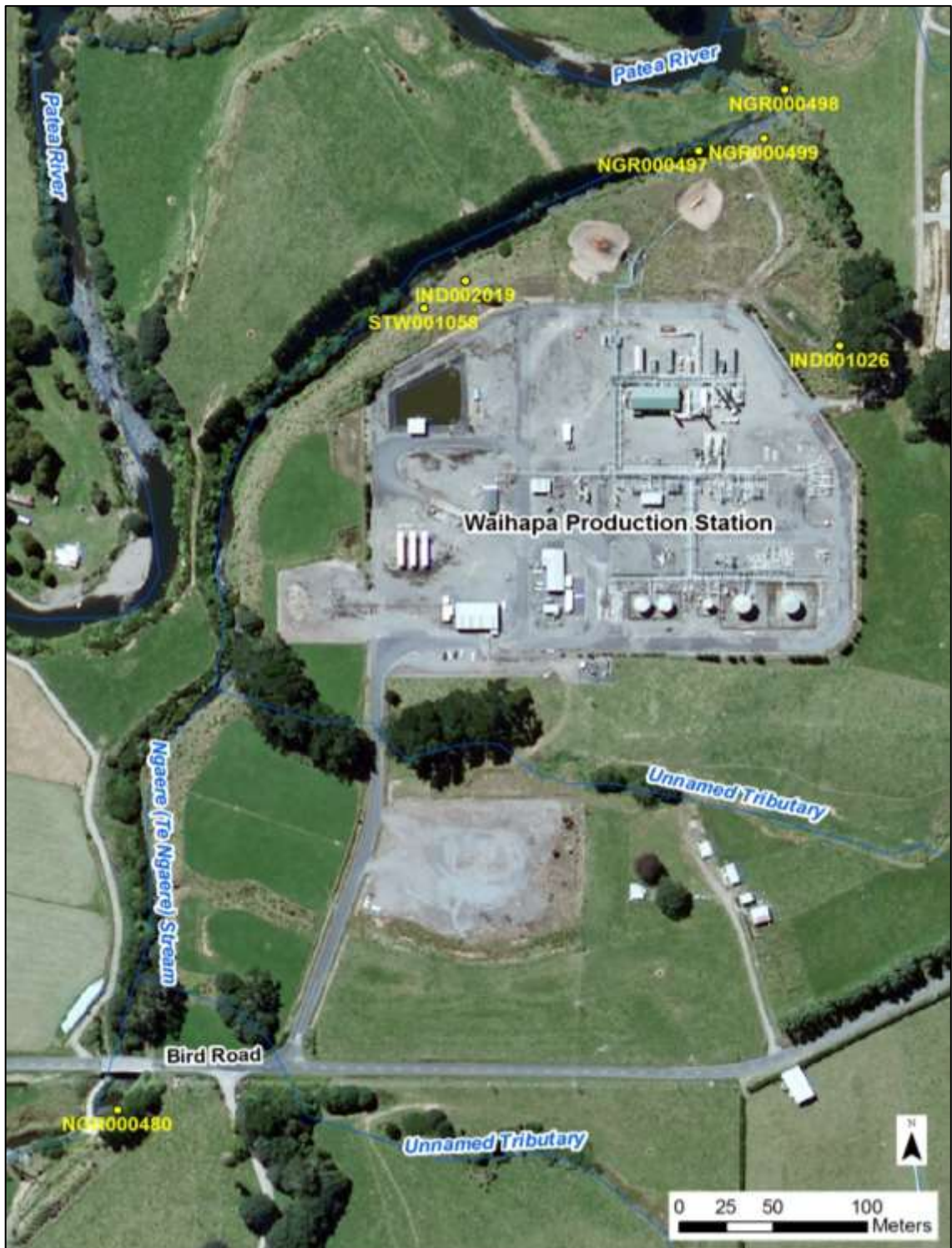


Figure 1 Monitoring sites in relation to Waihapa Production Station

Table 4 Results for the stormwater discharge (site IND002019)

Date	Alkalinity g/m ³ CaCO ₃	Chloride g/m ³	Conductivity mS/m	Hydrocarbons g/m ³	pH	Suspended Solids g/m ³
05 Dec 2013	1.3	0.2	0.5	< 0.5	6.6	2
<i>Consent 3457-2 limits</i>	-	50	-	15	6.0 – 9.0	100
No. of samples	16	16	16	16	16	16
Min	1	0.2	0.5	0.5	6.5	2
Max	61	45.4	19.2	0.6	7.5	12
Median	6	2.9	3.2	0.5	6.9	2

All results were within the limits imposed by consent 3457-2, except for an elevated pH in the firewater pond sample on 7 May 2014. However, this sample was taken from impounded water which was not being discharged so there was no breach of consent conditions and no effect on the water quality of the Ngaere Stream.

2.1.3 Provision of company data

The Company provides data on stormwater sample results as part of their annual supplied report. The Company samples impounded stormwater weekly and manually releases the stormwater if required, provided the discharge can meet the consent limits. If the results are not within the limits, the discharge is not released. This data is summarized in Table 5.

Table 5 TWNLP supplied firewater pond summary data

Parameter	pH	Suspended Solids g/m ³	Chloride g/m ³	Hydrocarbons g/m ³
<i>Consent 3457-2 limits</i>	6.0-9.0	100	50	15
No. of samples	36	36	36	36
Max	9.57	46	37.6	ND
Min	6.87	1.5	10.7	ND
Median	7.83	19.5	21.7	ND

ND = not detected

There were four samples taken during the year under review which returned pH results outside of the consented range. However, these results are from the firewater pond, not actual discharge results and the Company has informed the Council that they did not release stormwater when the results were not within the prescribed limits.

2.1.4 Results of receiving environment monitoring

Physicochemical monitoring

Samples were collected from two sites in the Ngaere Stream, in conjunction with stormwater discharge sampling. The results are shown in Table 6.

Table 6 Results for receiving water monitoring of the Ngaere Stream (NGR000497, NGR000498)

Date	Site	Alkalinity g/m ³	Chloride g/m ³	Conductivity mS/m	Hydrocarbons g/m ³	pH	Turbidity g/m ³
5-Dec-2013	NGR000497	33	17.4	16.0	<0.5	6.9	24
	NGR000498	34	18.2	16.0	<0.5	6.9	23
7-May-2014	NGR000497	28	19.6	24.3	<0.5	7.4	4.4

For the Ngaere Stream there was no significant difference between the upstream and downstream sites. The discharge complied with the consent in respect of receiving environment quality.

Biomonitoring

The Council's standard 'kick-sampling' and a combination of the 'kick-sampling' and vegetation sweep' sampling techniques were used at three established sites (Figure 1) on two occasions to collect streambed macroinvertebrates from the Ngaere Stream, to assess whether the discharges from the Waihapa Production Station had had any detrimental effects on the macroinvertebrate communities of this stream. Samples were sorted and identified to provide the number of taxa (richness) and MCI and SQMCI_s scores for each site.

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

13 November 2013

This early summer macroinvertebrate survey indicated that the discharge of treated stormwater and API separator discharges from the Waihapa Production Station site had not had any recent detrimental effects on the macroinvertebrate communities of the Ngaere Stream. SQMCI_s scores were not significantly different between sites NGR000497 and NGR000498, but a marginally significant decrease between sites NGR000480 and NGR000497 was coincident with less shading at the downstream site.

Table 7 Summary of previous numbers of taxa and MCI values, together with results of the November 2013 survey of the Ngaere Stream

Site	Numbers of taxa			MCI values			SQMCI _s		
	Median	Range	Current Survey	Median	Range	Current Survey	Median	Range	Current Survey
NGR000480	19	11-26	17	85	65-107	88	4.4	2.3-6.1	4.0
NGR000497	21	12-27	17	84	67-105	91	4.0	2.9-5.8	3.1
NGR000498	22	12-27	18	85	62-104	86	3.4	2.2-4.8	3.2

The macroinvertebrate communities of the stream contained moderate proportions of 'tolerant' taxa at all sites. In addition, communities at all sites had a number of common dominant taxa (they shared four of the ten dominant taxa through the surveyed reach), although there was some variation as a result of subtle variations in habitat between sites. There were no significant changes in MCI values between sites, despite some differences in habitat. In addition, taxonomic richness (numbers of taxa) was consistent across all three sites. The MCI scores indicated that the stream communities were of fair 'health', and similar to typical conditions in comparison with median values recorded from past surveys. The absence of significant differences between the three sites indicated no recent impacts from any of the Waihapa Production Station discharges.

5 February 2014

This late summer macroinvertebrate survey indicated that the discharge of treated stormwater and API separator discharges from the Waihapa Production Station site had not had any recent detrimental effects on the macroinvertebrate communities of the Ngaere Stream. SQMCI₅ scores were not significantly different between sites NGR000497 and NGR000498, and the significant decrease between sites NGR000480 and NGR000497 was likely to be coincident with greater periphyton cover at the downstream site and also perhaps due to the change in sampling technique employed between the two sites.

Table 8 Summary of previous numbers of taxa and MCI values, together with results of the February 2014 survey of the Ngaere Stream

Site	Numbers of taxa			MCI values			SQMCI ₅		
	Median	Range	Current Survey	Median	Range	Current Survey	Median	Range	Current Survey
NGR000480	19	11-26	22	85	65-107	88	4.4	2.3-6.1	5.7
NGR000497	21	12-27	26	85	67-105	84	3.9	2.9-5.8	3.6
NGR000498	22	12-27	22	85	62-104	75	3.4	2.2-4.8	4.1

The macroinvertebrate communities of the stream contained moderate proportions of 'tolerant' taxa at all sites. In addition, there was only one significant change in MCI value (between sites NGR000480 and NGR000498), which can be attributed to the differences in habitat sampled. Also, taxonomic richness (numbers of taxa) was consistent across all three sites. The MCI scores indicated that the stream communities were of poor to fair 'health', and not significantly different to the median values recorded from past surveys. These results from three sites in the Ngaere Stream indicated no recent impacts from any of the Waihapa Production Station discharges.

2.2 Air

2.2.1 Inspections

Inspection notes are included in section 2.1.1 above. No issues regarding air quality were noted during the monitoring period.

2.2.2 Results of discharge monitoring

During the monitoring year, a multi-gas meter was deployed on one occasion in the vicinity of the Waihapa Production Station. The deployment lasted approximately forty-eight hours with the instrument placed in a down-wind position at the start of the run. Monitoring consisted of continuous measurements of gas concentrations for the gases of interest (carbon monoxide and combustible gases). The location of the multi-gas meter for the sampling run is shown in Figure 2.



Figure 2 Air monitoring site at Waihapa Production Station (2013-2014 year)

Because of the nature of the activities on the site, it was considered that the primary information of interest in respect of gases potentially emitted from the site was the average downwind concentration, rather than any instantaneous peak value. That is, the long-term exposure levels, rather than short-term maxima, are of most interest. The gas meter was therefore set up to create a data set based on recording the average concentration measured during each minute as raw data.

The consent covering air discharges from the Waihapa Production Station has specific limits related to particular gases. Special condition 15 of consent 4049-3 sets a limit on the carbon monoxide concentration at or beyond the production station's boundary. The limit is expressed as 10 mg/m³ for an eight hour average or 30 mg/m³ for a 1 hour average exposure. The maximum concentration of carbon monoxide found during the monitoring run was 9.2 mg/m³ (10.8 ppm), with an average concentration of only 0.85 mg/m³, which complies with the consent condition. This continues the pattern found in previous years.

LEL% is the percentage of the lower explosive limit, expressed as methane, that is detected in the air sampled. The sensor on the instrument reacts to gases and vapours such as acetone, benzene, butane, methane, propane, carbon monoxide, ethanol, and higher alkanes and alkenes, with varying degrees of sensitivity. The Council's Regional Air Quality Plan has a typical requirement that no discharge shall result in a dangerous level of airborne contaminants, including any risk of explosion. At no time did the level of explosive gases downwind of the Waihapa Production Station reach any more than a trivial level.

2.3 Investigations, interventions, and incidents

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

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

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

In the 2013-2014 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with TWNLP's conditions in resource consents or provisions in Regional Plans.

3. Discussion

3.1 Discussion of site performance

Monitoring of the Waihapa Production Station during the 2013-2014 period found that the site was well managed. All consent conditions relating to site operations and management were complied with. Any issues identified during inspections were quickly resolved.

3.2 Environmental effects of exercise of consents

Monitoring of the stormwater discharge from the site found that all applicable conditions in the consent were complied with. There were no adverse effects found in the receiving waters of the Ngaere Stream.

There were no adverse effects on the environment resulting from the exercise of the air discharge consent. The ambient air quality monitoring at the site showed that levels of carbon monoxide and combustible gases were all below levels of concern at the time of sampling. No offensive or objectionable odours were detected beyond the boundary during inspections and there were no complaints in relation to odours or smoke from the site.

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 9-11.

Table 9 Summary of performance for Consent **3457-2** to discharge treated impounded stormwater [including washdown water and minor quantities of process water subject to potential contamination by hydrocarbons] from the Waihapa Production Station into the Ngaere Stream and to discharge treated stormwater from perimeter drains to land where it may enter the Ngaere Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adoption of best practicable option	Site inspections	Yes
2. Catchment area not to exceed 5 ha	Site inspections	Yes
3. Maintenance of a contingency plan	Plan approved	Yes
4. Maintenance and management of the stormwater system in accordance with application documentation	Site inspections and liaison with consent holder	Yes
5. All stormwater and produced water to be treated	Site inspections	Yes
6. Bunding of hazardous substances	Site inspections	Yes
7. Limits on contaminants in the discharge	Sampling	Yes
8. Limit on temperature increase in receiving water	Sampling	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
9. Discharge shall not have certain effects on the receiving water	Sampling and inspection	Yes
10. Monitoring data to be made available upon request	Data received	Yes
11. Consent holder to remedy any erosion	Site inspections - no erosion noted	Yes
12. Review option	Next option for review June 2016	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 10 Summary of performance for Consent **3767-2** to take water from the Ngaere Stream for utility and firewater purposes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Limit on abstraction rate and volume	Pump capacity less than limit	Yes
2. Provision of abstraction data	Data received	Yes
3. Optional review provision	No further option for review prior to expiry	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 11 Summary of performance for Consent **4049-3** to discharge emissions into the air from the flaring of hydrocarbons at the Waihapa Production Station in association with production, processing and maintenance activities and in emergency situations, together with miscellaneous emissions

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adoption of best practicable option	Site inspections	Yes
2. Provision of monthly flaring information	Information received	Yes
3. Annual report on flaring and emissions	Report received	Yes
4. Maintenance of a flaring log	Site inspections	Yes
5. Record of smoke emitting incidents and complaints	Site inspections	Yes
6. Analysis of typical gas/condensate stream to be made available	Not requested	N/A
7. Consultation prior to plant alterations	Liaison with consent holder	Yes
8. Notification of hazardous situations beyond the site boundary	Liaison with consent holder	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
9. Notification prior to flaring	Notifications received	Yes
10. Minimise emissions	Site inspections and liaison with consent holder	Yes
11. Minimise flaring	Site inspections and liaison with consent holder	Yes
12. Control of plant depressurisation rate	Site inspections	Yes
13. No offensive/objectionable/obnoxious odour/dust/smoke at or beyond the site boundary	Site inspections	Yes
14. Discharged contaminants shall not be hazardous/toxic/noxious at or beyond the site boundary	Site inspections and air monitoring	Yes
15. Limit on carbon monoxide at or beyond the site boundary	Air monitoring	Yes
16. Limit on nitrogen dioxide at or beyond the site boundary	Not monitored in period under review	N/A
17. Limit on contaminants at or beyond the site boundary	Air monitoring	Yes
18. Review option	Next option for review June 2016	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

During the period under review, the Company demonstrated an overall high level of both environmental performance and administrative compliance with the resource consents as defined in Section 1.1.4. The Waihapa Production Station was well managed and maintained.

3.4 Recommendation from the 2011-2013 Annual Report

In the 2011-2013 Annual Report, it was recommended:

1. THAT the monitoring programme for the Waihapa Production Station in the 2013-2014 year, remain unchanged from that for 2011-2013.

This recommendation was implemented.

3.5 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for air/water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA the obligations of the Act in terms of monitoring emissions/discharges and effects, and subsequently 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 emitting to the atmosphere/ discharging to the environment.

It is proposed that for 2014-2015 the monitoring of the Copper Moki and TWN sites is included within the Waihapa Production Station programme to reflect the changes to the Company's infrastructure in the Ngaere area. A recommendation to this effect is attached to this report.

4. Recommendation

1. THAT monitoring of the Copper Moki and TWN sites is included within the 2014-2015 Waihapa Production Station programme to reflect the changes to the Company's infrastructure in the Ngaere area.

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.
Condy	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
Cu*	Copper.
Cumec	A volumetric measure of flow- 1 cubic metre per second (1 m ³ s ⁻¹).
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
E.coli	Escherichia coli, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre of sample.
F	Fluoride.
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
g/m 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.
l/s	Litres per second.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NH ₄	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH ₃	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
NO ₃	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
Pb*	Lead.
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
PM ₁₀	Relatively fine airborne particles (less than 10 micrometre diameter).
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	<i>Resource Management Act</i> 1991 and including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
UI	Unauthorised Incident.
UIR	Unauthorised 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.
Zn*	Zinc.

*an abbreviation for a metal or other analyte may be followed by the letters 'As', to denote the amount of metal recoverable in acidic conditions. This is taken as indicating the total amount

of metal that might be solubilised under extreme environmental conditions. The abbreviation may alternatively be followed by the letter 'D', denoting the amount of the metal present in dissolved form rather than in particulate or solid form.

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

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Appendix I

Resource consents held by TWN Limited Partnership

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

Name of
Consent Holder: TWN Limited Partnership
P O Box 8440
NEW PLYMOUTH 4342

Decision Date: 6 October 2009

Commencement Date: 6 October 2009

Conditions of Consent

Consent Granted: To discharge emissions into the air from the flaring of hydrocarbons at the Waihapa Production Station in association with production, processing and maintenance activities and in emergency situations, together with miscellaneous emissions at or about (NZTM) 1717334E-5642168N

Expiry Date: 1 June 2028

Review Date(s): June 2011, June 2016, June 2022

Site Location: Waihapa Production Station, Bird Road, Stratford

Legal Description: Sec 10 Blk III Ngaere SD

*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

Exercise of consent

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 actual or likely adverse effects on the environment associated with the discharge of contaminants into the environment arising from the emissions to air from the flare.

Recording and submitting information

2. The consent holder shall supply to the Taranaki Regional Council each month a copy of flaring information comprising: the type and amount of material flared [including any gas used to maintain a pilot flame], the date this was flared, the reason why flaring was undertaken, and an indication of whether smoke was produced from such flaring events.
3. The consent holder shall provide to the Taranaki Regional Council during May of each year, for the duration of this consent, a report:
 - a) detailing gas combustion at the production station flare, including but not restricted to routine operational flaring and flaring logged in accordance with condition 4;
 - b) detailing any measures that have been undertaken by the consent holder to improve the energy efficiency of the production station;
 - c) detailing any measures to reduce smoke emissions;
 - d) detailing any measures to reduce flaring,
 - e) addressing any other issue relevant to the minimisation or mitigation of emissions from the production station flare; and
 - f) detailing any complaints received and any measures undertaken to address complaints.

Consent 4049-3

4. The consent holder shall keep and maintain a log of all continuous flaring incidents lasting longer than 5 minutes and any intermittent flaring lasting for an aggregate of 10 minutes or longer in any 60-minute period. The log shall contain the date, the start and finish times, the quantity and type of material flared, and the reason for flaring. The log shall be made available to the Chief Executive, Taranaki Regional Council, upon request, and summarised annually in the report required under condition 3. Flaring, under normal operation in the low pressure flare, of rich mono-ethylene glycol degasser vapour, condensate tank vapours, non-condensibles from tri-ethylene glycol/mono-ethylene glycol regeneration and purge gas shall be excluded from this requirement.
5. The consent holder shall keep and make available to the Chief Executive, Taranaki Regional Council, upon request, a record of all smoke emitting incidents, noting time, duration and cause. The consent holder shall also keep, and make available to the Chief Executive, upon request, a record of all complaints received as a result of the exercise of this consent.

Information and notification

6. The consent holder shall make available to the Chief Executive, Taranaki Regional Council upon request, an analysis of a typical gas and/or condensate stream from the Waihapa field, covering sulphur compound content and the content of compounds containing six or more carbon atoms in their molecular structure.
7. Prior to undertaking any alterations to the plant equipment, processes or operations, which may substantially alter the nature or quantity of flare emissions other than as described in the consent application, the consent holder shall first consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991.
8. Any incident whereby the discharge of emissions to air has potential or actual adverse environmental effects which has caused or is liable to cause a substantiated complaint, or a hazardous situation beyond the boundary of the property on which the production station flare is located, shall be notified to the Taranaki Regional Council, as soon as possible, followed by a written report to the Chief Executive, Taranaki Regional Council, within one week of the incident, with comment about the measures taken to minimise the impact of the incident and to prevent re-occurrence.
9. The consent holder shall notify the Chief Executive, Taranaki Regional Council, as soon as practicable, whenever the continuous flaring of hydrocarbons [other than the flaring of rich mono-ethylene glycol degasser vapour, condensate tank vapours, non-condensibles from tri-ethylene glycol/mono-ethylene glycol regeneration and purge gas] is expected to occur for more than five minutes in duration.

Preventing and minimising emissions

10. The consent holder shall minimise the emissions and impacts of air contaminants discharged from the flare by the selection of the most appropriate process equipment, process control equipment, emission control equipment, methods of control, supervision and operation, and the proper and effective operation, supervision, control and maintenance of all equipment and processes.
11. All practicable steps shall be taken to minimise flaring.
12. Other than in emergencies, the rate of depressurisation of the plant, or sections of the plant, shall be managed to prevent dense black smoke from being discharged from the flare.
13. The discharges authorised by this consent shall not, whether alone or in conjunction with any other emissions from the site arising through the exercise of any other consent, give rise to any levels of odour or dust or smoke that are offensive or obnoxious or objectionable at or beyond the property boundary.
14. The consent holder shall not discharge any contaminant to air from the site at a rate or a quantity such that the contaminant, whether alone or in combination with other contaminants, is or is liable to be hazardous or toxic or noxious at or beyond the boundary of the property where the production station is located.
15. The consent holder shall control all discharges of carbon monoxide to the atmosphere from the flare, whether alone or in conjunction with any other emissions from the site arising through the exercise of any other consent, 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 milligrams per cubic metre [eight-hour average exposure], or 30 milligrams per cubic metre [one-hour average exposure] at or beyond the boundary of the property on which the production station flare is located.
16. The consent holder shall control all discharges of nitrogen dioxide or its precursors to the atmosphere from the flare, whether alone or in conjunction with any other discharges to the atmosphere from the site arising through the exercise of any other consent, 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 200 micrograms per cubic metre [one hour average exposure], or 100 micrograms per cubic metre [twenty-four hour average exposure], at or beyond the boundary of the property on which the production station flare is located.

17. The consent holder shall control discharges to the atmosphere from the flare of contaminants other than carbon dioxide, carbon monoxide, and nitrogen oxides, whether alone or in conjunction with any other emissions from the site arising through the exercise of any other consent, 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 property on which the production station flare is located, is not increased above background levels:
- a) by more than 1/30th of the relevant Workplace Exposure Standard-Time Weighted Average [exposure averaged over a duration as specified for the Workplace Exposure Standard-Time Weighted Average], or by more than 1/10th of the Workplace Exposure Standard-Short Term Exposure Limit over any short period of time [all terms as defined in Workplace Exposure Standards, 2002, Department of Labour]; or
 - b) if no Short Term Exposure Limit is set, by more than the General Excursion Limit at any time [all terms as defined in Workplace Exposure Standards, 2002, Department of Labour].

Review

18. 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 2011 and/or June 2016 and/or June 2022, 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 or which it was not appropriate to deal with at the time; and/or
 - b) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment caused by the discharge; and/or
 - c) to alter, add or delete limits on mass discharge quantities or discharge or ambient concentrations of any contaminant or contaminants.

Signed at Stratford on 1 November 2013

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: TWN Limited Partnership
P O Box 8440
NEW PLYMOUTH 4342

Decision Date: 25 November 1999

Commencement Date: 25 November 1999

Conditions of Consent

Consent Granted: To take water from the Ngaere Stream in the Patea catchment for utility and firewater purposes at the Waihapa Production Station at or about (NZTM) 1717334E-5642268N

Expiry Date: 1 June 2016

Review Date(s): June 2004, June 2010

Site Location: Waihapa Production Station, Bird Road, Ngaere, Stratford

Legal Description: Sec 10 Blk III Ngaere SD

Catchment: Patea

Tributary: Ngaere

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

General conditions

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

Special conditions

- 1. That the volume abstracted per day shall not exceed 240 cubic metres, at a rate no greater than 2.8 litres/second.
- 2. That the consent holder shall install and operate a measuring device capable of accurately [to within 5%] recording daily rates of abstraction and shall measure, record and make such records available to the Chief Executive, Taranaki Regional Council, upon request.
- 3. That the Taranaki Regional Council may, pursuant to section 128 of the Resource Management Act 1991, review any or all of the conditions of this consent by giving notice of review during June 2004 and/or June 2010, 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 either were not foreseen at the time the application was considered or which it was not appropriate to deal with at that time.

Transferred at Stratford on 1 November 2013

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: TWN Limited Partnership
P O Box 8440
NEW PLYMOUTH 4342

Decision Date: 27 July 2009

Commencement Date: 27 July 2009

Conditions of Consent

Consent Granted: To discharge treated impounded stormwater [including washdown water and minor quantities of process water subject to potential contamination by hydrocarbons] from the Waihapa Production Station into the Ngaere Stream and to discharge treated stormwater from perimeter drains to land where it may enter the Ngaere Stream at or about (NZTM) 1717334E-5642168N

Expiry Date: 1 June 2028

Review Date(s): June 2016, June 2022

Site Location: Waihapa Production Station, Bird Road, Stratford

Legal Description: Sec 10 Blk III Ngaere SD

Catchment: Patea

Tributary: Ngaere

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

Consent 3457-2

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. Notwithstanding any other condition of this consent, 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 site.
2. Stormwater discharged shall be collected from a catchment area of no more than 5 hectares.
3. The consent holder shall maintain a contingency plan outlining measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not licensed by this consent and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge. No changes shall be made to the contingency plan without the prior approval of the Chief Executive, Taranaki Regional Council.
4. The management and maintenance of the stormwater treatment system shall be undertaken in general accordance with the information submitted in support of consent application 5217.
5. All stormwater and produced water shall be directed for treatment through the stormwater treatment system, identified under condition 4 of this consent, before being discharged.
6. Any above ground hazardous substances storage areas shall be bunded with drainage to an appropriate treatment system.

7. 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
total recoverable hydrocarbons	Concentration not greater than 15 gm ⁻³
chloride	Concentration not greater than 50 gm ⁻³

This condition shall apply before entry of the treated stormwater into the receiving waters of the Ngaere Stream, or onto/into land, at a designated sampling point(s) approved by the Chief Executive, Taranaki Regional Council.

8. After allowing for a mixing zone of 25 metres, the discharge shall not give rise to an increase in temperature of more than 2 degrees Celsius within the Ngaere Stream.
9. After allowing for a mixing zone of 25 metres, the discharge shall not give rise to any of the following effects in the Ngaere Stream:
- a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - b) any conspicuous change in the colour or visual clarity;
 - c) any emission of objectionable odour;
 - d) the rendering of fresh water unsuitable for consumption by farm animals;
 - e) any significant adverse effects on aquatic life.
10. Results of the water samples taken from the firewater pond [undertaken prior to the release of stormwater from the facility] shall be made available to the Chief Executive, Taranaki Regional Council, on request.
11. Any erosion, scour or instability of the bed or banks of the Ngaere Stream that is attributable to the discharges authorised by this consent shall be remedied by the consent holder.
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 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 1 November 2013

For and on behalf of
Taranaki Regional Council



Director-Resource Management

Appendix II

Biomonitoring reports

To Job Managers, C Mackenzie and V McKay
From Scientific Officer, B Thomas
Report No BT020
Doc No 1379633
Date 28 July 2014

Biomonitoring of the Ngaere Stream in relation to the Waihapa Production Station, November 2013

Introduction

This was the first survey completed of the two scheduled biomonitoring surveys relating to the Waihapa Production Station of Origin Energy Resources New Zealand Ltd (previously owned by Swift Energy New Zealand Ltd), for the 2013-2014 monitoring year.

The Production Station discharges stormwater, wastewater and firewater to the Ngaere Stream. An API separator of the production station discharges to a small tributary of the Ngaere Stream, a short distance upstream of the Ngaere Stream confluence with the Patea River.

The purpose of this survey was to determine whether this discharge from the Production Station has resulted in any detrimental effects on the macroinvertebrate communities in the Ngaere Stream downstream of the discharge.

The results from surveys performed since the 2002-2003 monitoring year are discussed in the reports listed in the references at the end of this report.

Methods

The standard '400ml kick-sampling' technique was used to collect streambed macroinvertebrates from sites 3 and 4 in the Ngaere Stream (Table 1, Figure 1) on 13 November 2013. A combination of the 'kick-sampling' and 'vegetation sweep' sampling techniques were used to collect streambed macroinvertebrates from site 5. The 'kick-sampling' and 'vegetation sweep' techniques are very similar to Protocol C1 (hard-bottomed, semi-quantitative) and C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark *et al*, 2001).

Table 1 Biomonitoring sites in the Ngaere Stream surveyed in association with the Waihapa Production Station

Site No.	Site code	GPS reference	Location
3	NGR 000480	E1717076 N5641732	Ngaere Stream, Bird Road Bridge
4	NGR 000497	E1717385 N5642263	Ngaere Stream, 35 m above confluence with Patea R
5	NGR 000498	E1717431 N5642297	Ngaere Stream, 10 m upstream confluence with Patea R

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

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

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. By averaging the scores obtained from a list of taxa 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. More 'sensitive' communities inhabit less polluted waterways.

The MCI was designed as a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. MCI results can also reflect the effects of warm temperatures, slow current speeds and low dissolved oxygen levels, because the taxa capable of tolerating these conditions generally have low sensitivity scores. Usually more 'sensitive' communities (with higher MCI values) inhabit less polluted waterways. The use of this index in non-stony streams is possible if results are related to physical habitat (e.g., good quality muddy/weedy sites tend to produce lower MCI values than good quality stony sites). Weedy stream macroinvertebrate communities tend to be dominated by more 'tolerant' taxa than is the case in stony stream communities. It may therefore require more severe organic pollution to cause a significant decline in MCI value in weedy streams.

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

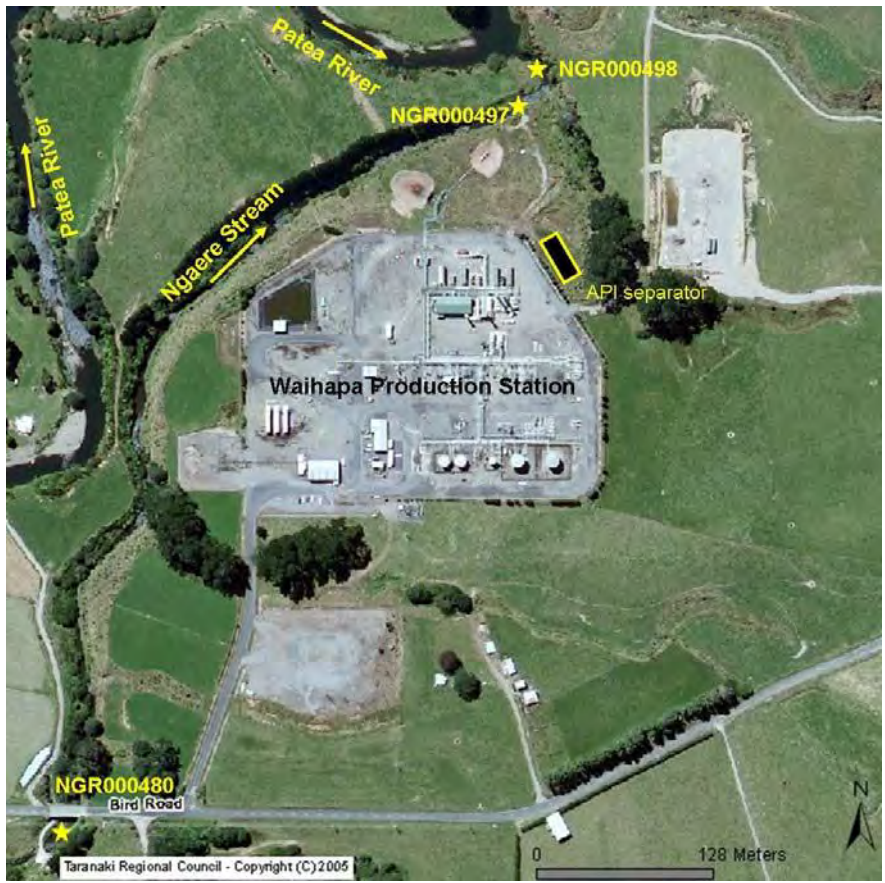


Figure 1 Biological sampling sites in the Ngaere Stream related to the Waihapa Production Station

Results and discussion

At the time of this midday survey there was a moderate, brown and cloudy flow in the Ngaere Stream at all three sites. Water temperatures ranged from 13.1°C to 13.2°C. Substrate was similar at sites 4 and 5 in the Ngaere Stream and comprised mainly of cobbles, gravels, silt and sand with the addition of some boulders at site 4 and wood and root at site 5. Substrate at site 3 comprised of more silt and sand with less gravels and cobbles. Some boulders and wood and root were also noted at this site. Periphyton filaments were patchy and thin mats were recorded at all sites. Moss was patchy at all sites. Macrophytes were recorded on the edges and bed of the stream at all three sites. This survey was undertaken during early summer 12 days after the latest fresh in excess of 3x median flow.

Macroinvertebrate communities

A summary of survey results performed to date at the three sites in the Ngaere Stream are presented in Table 2 and the full results of the current survey in Table 3.

Table 2 Summary of previous numbers of taxa and MCI values, together with results of the November 2013 survey of the Ngaere Stream

Site	Number of previous surveys	Numbers of taxa			MCI values			SOMCIs			
		Median	Range	Current Survey	Median	Range	Current Survey	Number of previous surveys	Median	Range	Current Survey
3	39	19	11-26	17	85	65-107	88	27	4.4	2.3-6.1	4.0
4	27	21	12-27	17	84	67-105	91	18	4.0	2.9-5.8	3.1
5	31	22	12-27	18	85	62-104	86	27	3.4	2.2-4.8	3.2

Site 3: Bird Road, upstream of Production Station

A moderate community richness of 17 taxa was recorded at site 3 in the Ngaere Stream upstream of all Waihapa Production Station discharges. This was two taxa below the historical median number of taxa for this site (Table 2, Figure 2). The community was characterised by two 'tolerant' taxa (oligochaete worms and snails (*Potamopyrgus*)) and four 'moderately sensitive' taxa (mayfly (*Austroclima*), elmids beetles, amphipods (*Paracalliope*), and stonefly (*Zelandobius*). Some of these taxa are associated with nutrient-enriched habitats in streams coincident with periphyton substrate cover which was patchy at this partially shaded site.

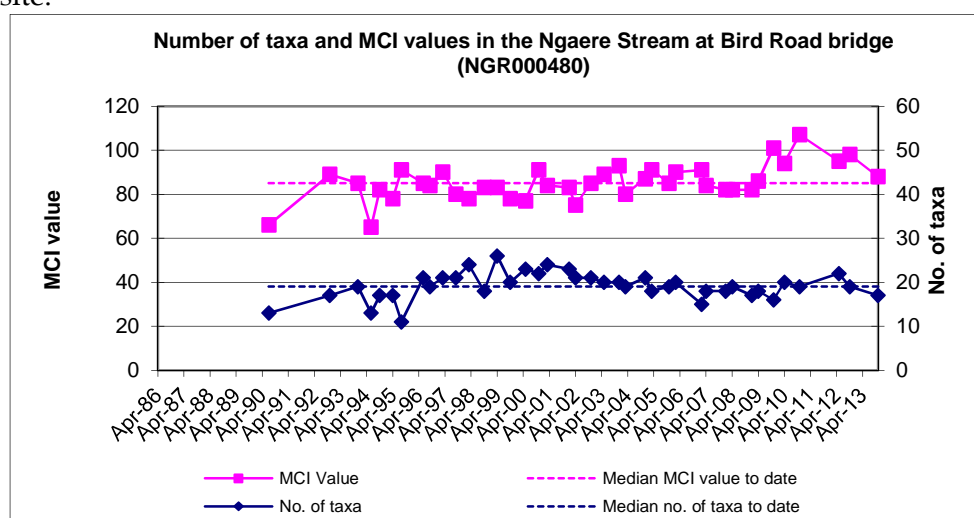


Figure 2 Taxa richness and MCI scores recorded to date at Bird Road Bridge (site 3)

Table 3 Macroinvertebrate fauna of the Ngaere Stream in relation to Waihapa Production Station sampled on 13 November 2013

Taxa List	Site Number	MCI score	Site 3	Site 4	Site 5
	Site Code		NGR000480	NGR000497	NGR000498
	Sample Number		FWB13295	FWB13296	FWB13297
ANNELIDA (WORMS)	Oligochaeta	1	VA	VA	VA
	Lumbricidae	5	R	-	-
MOLLUSCA	<i>Potamopyrgus</i>	4	VA	R	VA
CRUSTACEA	Ostracoda	1	-	-	R
	<i>Paracalliope</i>	5	A	A	A
	<i>Paranephrops</i>	5	-	-	R
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>	7	A	A	C
	<i>Deleatidium</i>	8	R	R	R
	<i>Zephlebia group</i>	7	-	R	C
PLECOPTERA (STONEFLIES)	<i>Zelandobius</i>	5	A	A	A
COLEOPTERA (BEETLES)	Elmidae	6	VA	A	A
MEGALOPTERA (DOBSONFLIES)	<i>Archichauliodes</i>	7	-	R	-
TRICHOPTERA (CADDISFLIES)	<i>Aoleapsyche</i>	4	R	R	-
	<i>Hydrobiosis</i>	5	C	C	C
	<i>Oxyethira</i>	2	C	C	A
	<i>Pycnocentria</i>	7	R	-	-
	<i>Pycnocentroides</i>	5	R	-	C
	<i>Triplectides</i>	5	-	-	R
DIPTERA (TRUE FLIES)	<i>Aphrophila</i>	5	-	R	-
	<i>Maoridiamesa</i>	3	-	A	R
	Orthocladinae	2	C	A	A
	<i>Polypedilum</i>	3	R	-	-
	Tanytarsini	3	R	C	C
	<i>Austrosimulium</i>	3	R	R	VA
	No of taxa		17	17	18
	MCI		88	91	86
	SQMCI _s		4.0	3.1	3.2
	EPT (taxa)		7	6	7
	%EPT (taxa)		41	35	39
	'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa		

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

The community contained a moderate proportion of 'tolerant' taxa (47 % of richness), resulting in the MCI score of 88 units, an insignificant 3 units (Stark, 1998) higher than the median score recorded by previous surveys at this site (Table 2). This score was a reduction in MCI score, by 10 units from the preceding survey, carried out October 2012 and a discontinuation of the previous improvement in MCI scores that were recorded over five prior surveys. A moderate SQMCI_s score was recorded for this site (4.0 units), reflecting a slight numerical dominance of two 'tolerant' taxa in particular (Table 3). This score was slightly below (0.4 unit) the long term median for surveys conducted at this site.

Site 4: 35m u/s of Patea River confluence

A community richness of 17 taxa was found at site 4, nearly 600m downstream of site 3 (and below various discharges from the Waihapa Production Station to the Ngaere Stream), but above the small unnamed tributary (which receives the API separator discharge). This was the same as that found at site 3 upstream but four taxa below the median for this site (Table

2, Figure 3). There were only three differences in dominant taxa composition at this site. There was a significant reduction in the abundance of 'tolerant' snails (*Potamopyrgus*), and increases in the abundances of 'tolerant' orthoclad midge and (*Maoridiamesa*) midge larvae. The increase in midge larvae was probably coincident with increased algal growth caused by the reduction in shading at this site (Table 3). Again, some of these taxa are associated with nutrient-enriched habitats of mid to lower reaches of streams in agricultural catchments, but the majority of changes related to the different habitat characteristics at site 4.

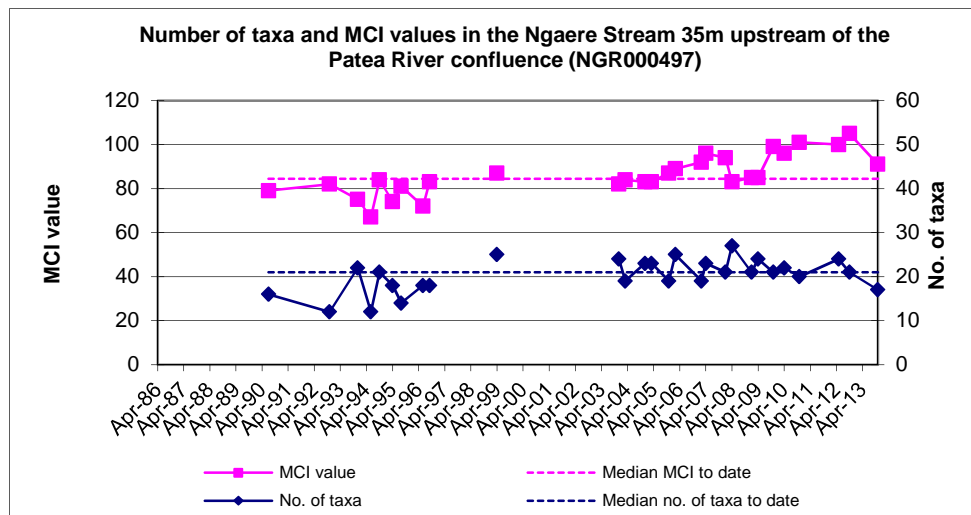


Figure 3 Number of taxa and MCI scores recorded to date at site 4, 35 m upstream of the confluence with the Patea River

There were two significant changes in individual taxon abundances between sites 3 and 4, with the predominant taxa altering from two 'tolerant' and four 'moderately sensitive' taxa (at site 3) to three 'tolerant' and four 'moderately sensitive' taxa at site 4, which was illustrated by the SQMCI_s value (3.1), a significant 0.9 unit below the SQMCI recorded at site 3.

'Tolerant' taxa comprised the same proportion (47% of total taxa) of the community as site 3, which was reflected in the MCI score of 91 units. This is the seventeenth consecutive survey where the MCI score has been equal to or higher than the running median for this site. This was 7 units higher than the median of previous surveys' scores, but 14 units below the maximum for this site (which had been recorded by the spring 2010 survey (Figure 3)). The MCI score for this survey was three units above that recorded at site 3 upstream of all Waihapā Production Station discharges. The results indicate that it is unlikely that there had been any recent changes in physicochemical water quality caused by discharges from the Production Station between sites 3 and 4.

Site 5: 10m u/s of Patea River confluence

A community richness of 18 taxa was recorded at site 5, downstream of the various Waihapā Production Station discharges and downstream of the unnamed tributary receiving the API separator discharge. This was slightly below the median richness found by previous surveys at this site but slightly above that recorded at the upstream sites (Table 2, Figure 4). There were five differences in dominant taxa composition between this site and site 4. Increases in abundances of 'tolerant' snails (*Potamopyrgus*), black sandfly larvae (*Austrosimulium*) and axehead caddis (*Oxyethira*) and decreases in 'tolerant' *Maoridiamesa* midge larvae and 'sensitive' mayfly (*Austroclima*) were recorded (Table 3).

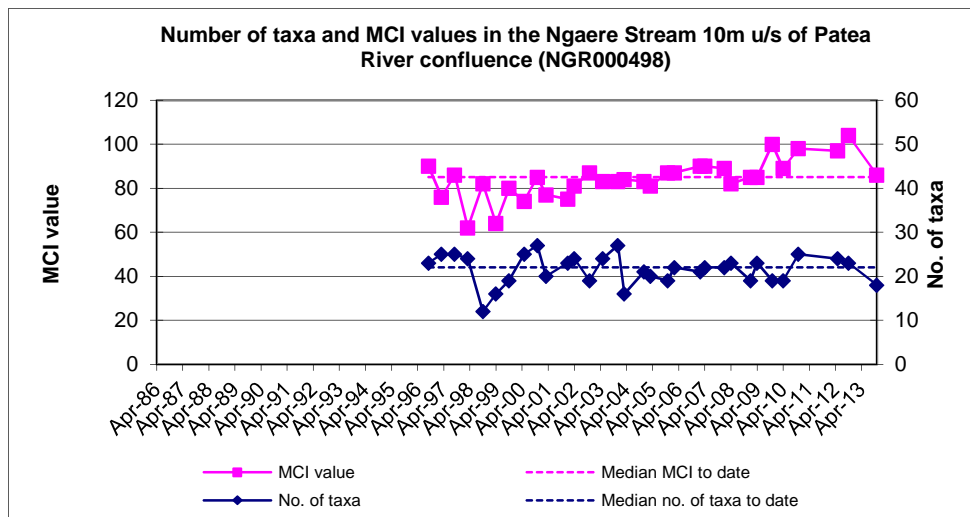


Figure 4 Number of taxa and MCI scores recorded to date at site 5, downstream of all Waihapa Production Station discharges

There were only two significant changes in dominant taxa between adjacent sites 4 and 5, including an increased abundance of two ‘tolerant’ taxa, which produced a very similar SQMCI_s value (3.2) to site 4. This SQMCI_s was only 0.2 unit below the median value for this site (Table 2), but 0.8 unit lower than that recorded at the reference site 3 (Stark, 1998). The very subtle changes recorded from site 4 are more attributable to changes in habitat characteristics at site 5, and are unlikely to be have been due to discharges to the tributary entering the Ngaere Stream between sites 4 and 5.

The community was again comprised of a moderate (44%) of ‘tolerant’ taxa which was reflected in the MCI score of 86 units. As with the two upstream sites, this score was above the median score from previous surveys at this site. However, it was a significant 18 units below the MCI score recorded in the previous survey and well below the MCI scores recorded in the past 3 surveys. This score was not significantly different to the scores recorded at the two sites upstream, indicative of no recent impacts of the API separator discharge on the macroinvertebrate communities of the Ngaere Stream.

Conclusions and summary

The Council’s standard ‘kick-sampling’ and a combination of the ‘kick-sampling’ and vegetation sweep’ sampling techniques were used at three established sites to collect streambed macroinvertebrates from the Ngaere Stream, to assess whether the discharges from the Waihapa Production Station had had any detrimental effects on the macroinvertebrate communities of this stream. This early summer survey was the first of two surveys programmed for the 2013-2014 monitoring period. Samples were sorted and identified to provide the number of taxa (richness) and MCI and SQMCI_s scores for each site.

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

This early summer macroinvertebrate survey indicated that the discharge of treated stormwater and API separator discharges from the Waihapa Production Station site had not had any recent detrimental effects on the macroinvertebrate communities of the Ngaere Stream. SQMCI_s scores were not significantly different between sites 4 and 5, but a marginally significant decrease between sites 3 and 4 was coincident with less shading at the downstream site.

The macroinvertebrate communities of the stream contained moderate proportions of 'tolerant' taxa at all sites. In addition, communities at all sites had a number of common dominant taxa (they shared four of the ten dominant taxa through the surveyed reach), although there was some variation as a result of subtle variations in habitat between sites. There were no significant changes in MCI values between sites, despite some differences in habitat. In addition, taxonomic richness (numbers of taxa) was consistent across all three sites. The MCI scores indicated that the stream communities were of fair 'health', and similar to typical conditions in comparison with median values recorded from past surveys. The absence of significant differences between the three sites indicated no recent impacts from any of the Waihapa Production Station discharges.

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To Job Managers, C Mackenzie and V McKay
From Scientific Officer, B Thomas
Report No BT040
Doc No 1425425
Date November 2014

Biomonitoring of the Ngaere Stream in relation to the Waihapa Production Station, February 2014

Introduction

This was the second survey completed of the two scheduled biomonitoring surveys relating to the Waihapa Production Station of Origin Energy Resources New Zealand Ltd (previously owned by Swift Energy New Zealand Ltd), for the 2013-2014 monitoring year.

The Production Station discharges stormwater, wastewater and firewater to the Ngaere Stream. An API separator of the production station discharges to a small tributary of the Ngaere Stream, a short distance upstream of the Ngaere Stream confluence with the Patea River.

The purpose of this survey was to determine whether this discharge from the Production Station has resulted in any detrimental effects on the macroinvertebrate communities in the Ngaere Stream downstream of the discharge.

The results from surveys performed since the 2002-2003 monitoring year are discussed in the reports listed in the references at the end of this report.

Methods

The standard '400ml kick-sampling' technique was used to collect streambed macroinvertebrates from site 4 in the Ngaere Stream (Table 1, Figure 1) on February 2014. A combination of the 'kick-sampling' and 'vegetation sweep' sampling techniques were used to collect streambed macroinvertebrates from site 3 and site 5. The 'kick-sampling' and 'vegetation sweep' techniques are very similar to Protocol C1 (hard-bottomed, semi-quantitative) and C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark *et al*, 2001).

Table 1 Biomonitoring sites in the Ngaere Stream surveyed in association with the Waihapa Production Station

Site No.	Site code	GPS reference	Location
3	NGR 000480	E1717076 N5641732	Ngaere Stream, Bird Road Bridge
4	NGR 000497	E1717385 N5642263	Ngaere Stream, 35 m above confluence with Patea R
5	NGR 000498	E1717431 N5642297	Ngaere Stream, 10 m upstream confluence with Patea R

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

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

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. By averaging the scores obtained from a list of taxa 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. More 'sensitive' communities inhabit less polluted waterways.

The MCI was designed as a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. MCI results can also reflect the effects of warm temperatures, slow current speeds and low dissolved oxygen levels, because the taxa capable of tolerating these conditions generally have low sensitivity scores. Usually more 'sensitive' communities (with higher MCI values) inhabit less polluted waterways. The use of this index in non-stony streams is possible if results are related to physical habitat (e.g., good quality muddy/weedy sites tend to produce lower MCI values than good quality stony sites). Weedy stream macroinvertebrate communities tend to be dominated by more 'tolerant' taxa than is the case in stony stream communities. It may therefore require more severe organic pollution to cause a significant decline in MCI value in weedy streams.

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

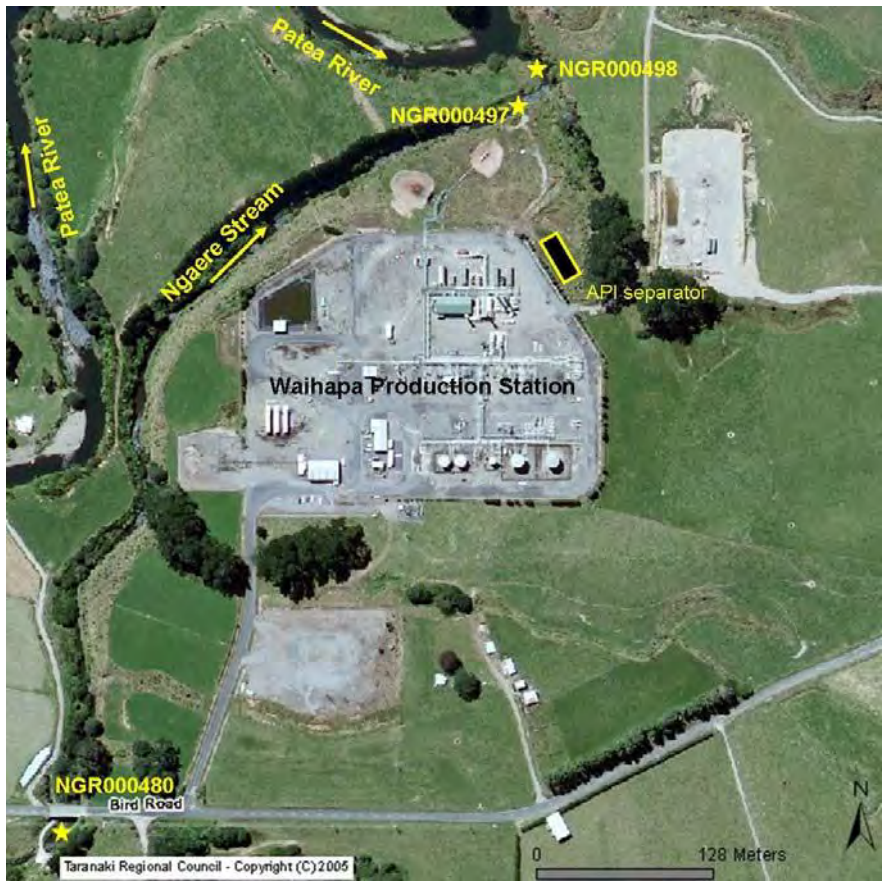


Figure 1 Biological sampling sites in the Ngaere Stream related to the Waihapa Production Station

Results and discussion

At the time of this late morning survey there was a low, slow and cloudy flow in the Ngaere Stream at all three sites. Water temperatures ranged from 16.4°C to 16.7°C. The substrate at site 3 and site 4 comprised of similar proportions of silt, sand, gravels and cobbles with some boulders. Site 4 had slightly less silt and more boulders than site 3. At site 5 the substrate comprised of silt, sand and cobbles with smaller proportions of gravels and boulders. At site 3 periphyton mats were patchy while filaments were widespread, whereas at site 4 both mats and filaments were widespread. At site 5 there was slightly less periphyton proliferation, with both mats and filaments recorded as patchy. Macrophytes were recorded on the edges and bed of the stream at all three sites. This survey was undertaken during summer, 15 days after the latest fresh in excess of 3x median flow.

Macroinvertebrate communities

A summary of survey results performed to date at the three sites in the Ngaere Stream are presented in Table 2 and the full results of the current survey in Table 3.

Table 2 Summary of previous numbers of taxa and MCI values, together with results of the February 2014 survey of the Ngaere Stream

Site	Number of previous surveys	Numbers of taxa			MCI values			SOMCIs			
		Median	Range	Current Survey	Median	Range	Current Survey	Number of previous surveys	Median	Range	Current Survey
3	40	19	11-26	22	85	65-107	88	27	4.4	2.3-6.1	5.7
4	28	21	12-27	26	85	67-105	84	18	3.9	2.9-5.8	3.6
5	32	22	12-27	22	85	62-104	75	27	3.4	2.2-4.8	4.1

Table 3 Macroinvertebrate fauna of the Ngaere Stream in relation to Waihapa Production Station sampled on 05 February 2014

Taxa List	Site Number	MCI score	Site 3	Site 4	Site 5
	Site Code		NGR000480	NGR000497	NGR000498
	Sample Number		FWB14045	FWB14046	FWB14047
NEMERTEA	Nemertea	3	-	R	-
ANNELIDA (WORMS)	Oligochaeta	1	C	C	A
MOLLUSCA	<i>Physa</i>	3	-	-	R
	<i>Potamopyrgus</i>	4	C	A	A
CRUSTACEA	Ostracoda	1	R	R	A
	<i>Paracalliope</i>	5	VA	VA	XA
	<i>Paranephrops</i>	5	-	R	R
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>	7	VA	C	-
	<i>Coloburiscus</i>	7	R	-	-
	<i>Deleatidium</i>	8	-	C	C
	<i>Zephlebia group</i>	7	R	R	C
PLECOPTERA (STONEFLIES)	<i>Zelandobius</i>	5	R	R	-
ODONATA (DRAGONFLIES)	<i>Xanthocnemis</i>	4	R	-	R
HEMIPTERA (BUGS)	<i>Anisops</i>	5	-	-	R
	<i>Sigara</i>	3	-	-	A
COLEOPTERA (BEETLES)	Elmidae	6	A	C	R
MEGALOPTERA (DOBSONFLIES)	<i>Archichauliodes</i>	7	R	R	R
TRICHOPTERA (CADDISFLIES)	<i>Aoteapsyche</i>	4	A	C	-
	<i>Costachorema</i>	7	-	R	-
	<i>Hydrobiosis</i>	5	R	C	-
	<i>Oecetis</i>	4	-	-	C
	<i>Oxyethira</i>	2	R	A	VA
	<i>Paroxyethira</i>	2	-	R	C
	<i>Pycnocentria</i>	7	A	-	-
	<i>Pycnocentrodus</i>	5	R	R	-
	<i>Aphrophila</i>	5	R	C	-
DIPTERA (TRUE FLIES)	<i>Chironomus</i>	1	-	-	A
	<i>Corynoneura</i>	3	R	-	C
	<i>Maoridiamesa</i>	3	-	C	-
	Orthoclaadiinae	2	R	VA	A
	<i>Polypedilum</i>	3	R	R	R
	Tanytarsini	3	-	R	-
	<i>Paradixa</i>	4	R	-	R
	Empididae	3	-	C	-
	Muscidae	3	-	R	-
	<i>Austrosimulium</i>	3	C	C	C
No of taxa			22	26	22
MCI			88	84	75
SQMCIs			5.7	3.6	4.1
EPT (taxa)			8	8	3
%EPT (taxa)			36	31	14
'Tolerant' taxa		'Moderately sensitive' taxa	'Highly sensitive' taxa		

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

Site 3: Bird Road, upstream of Production Station

A moderate community richness of 22 taxa was recorded at site 3 in the Ngaere Stream upstream of all Waihapa Production Station discharges. This was three taxa above the historical median number of taxa for this site (Table 2, Figure 2).

The community was characterised by one 'tolerant' taxon (caddisfly (*Aoteapsyche*)) and four 'moderately sensitive' taxa (mayfly (*Austroclima*), elmids beetles, amphipods (*Paracalliope*), and sandy cased caddis (*Pycnocentria*)). Some of these taxa are associated with nutrient-enriched habitats in streams coincident with periphyton substrate cover which was widespread at this unshaded site.

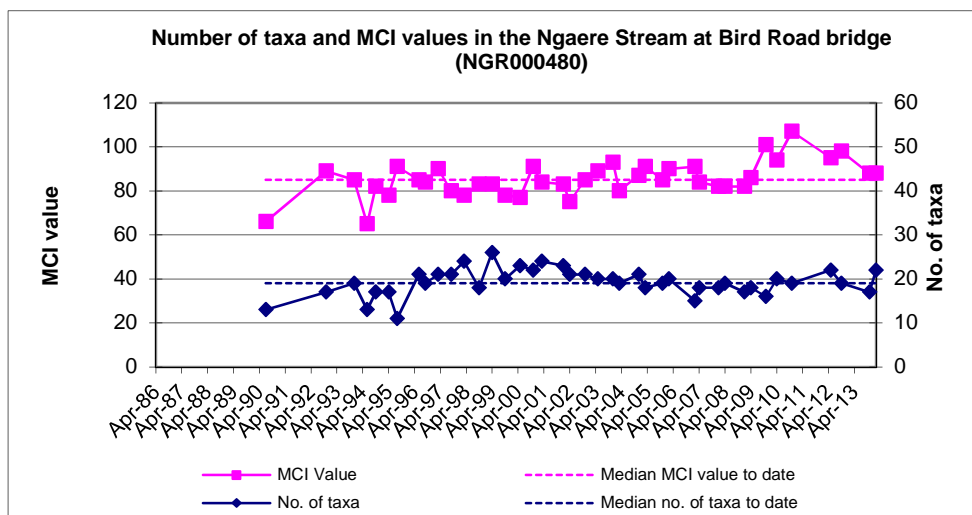


Figure 2 Taxa richness and MCI scores recorded to date at Bird Road Bridge (site 3)

The community contained equal proportions of 'tolerant' and 'sensitive', resulting in the MCI score of 88 units, an insignificant (Stark, 1998) 3 units higher than the median score recorded by previous surveys at this site (Table 2). This score was the same as the MCI score recorded by the preceding survey, carried out November 2013.

A moderately high SQMCI_s score was recorded for this site (5.7 units), reflecting the numerical dominance of two 'sensitive' taxa in particular (Table 3). This score was significantly (Stark, 1998) higher (by 1.3 units) the long term median for surveys conducted at this site.

Site 4: 35m u/s of Patea River confluence

A moderately high community richness of 26 taxa was found at site 4, nearly 600m downstream of site 3 (and below various discharges from the Waihapa Production Station to the Ngaere Stream), but above the small unnamed tributary (which receives the API separator discharge). This was four taxa more than recorded at site 3 upstream and five taxa above the median for this site (Table 2, Figure 3).

The community was characterised by three 'tolerant' taxa (snail (*Potamopyrgus*), orthoclad midges and axehead caddis (*Oxyethira*)); and one 'moderately sensitive' taxon (amphipod (*Paracalliope*)). The amphipod (*Paracalliope*) was only dominant taxon common to both site 3 and site 4. Again, some of the dominant taxa at site 4 are associated with nutrient-enriched habitats of mid to lower reaches of streams in agricultural catchments. The majority of changes between site 3 and site 4 are related to the different habitat characteristics at site 4,

(particularly to an increase in the abundance of long green filamentous algae) and also partly due to the change in sampling technique used between sites.

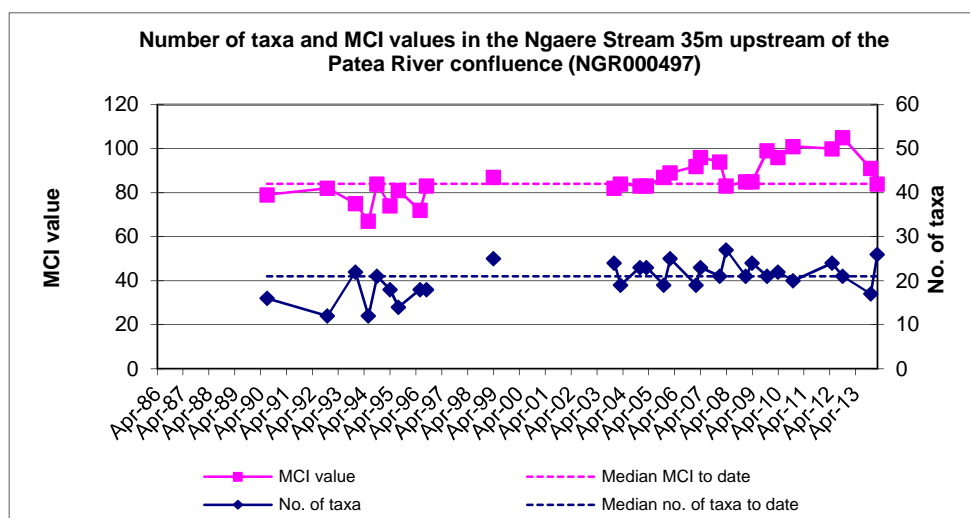


Figure 3 Number of taxa and MCI scores recorded to date at site 4, 35 m upstream of the confluence with the Patea River

There were seven significant changes in individual taxon abundances between sites 3 and 4, with the predominant taxa altering from one 'tolerant' taxon and four 'moderately sensitive' taxa (at site 3) to three 'tolerant' taxa and one 'moderately sensitive' taxon at site 4, which was illustrated by the SQMCI_s value (3.6), a significant 2.1 units below the SQMCI recorded at site 3.

'Tolerant' taxa comprised 54% of total taxa of the community as site 3, which was reflected in the MCI score of 84 units. This MCI score was 1 unit below the running median for this site, and lower than those MCI scores recorded by the previous eight surveys. This score was however 17 units higher than the minimum MCI score recorded for this site (which had been recorded by the June 1994 survey (Figure 3)). The MCI score for this survey was four units below that recorded at site 3 upstream of all Waihapa Production Station discharges. The results indicate that it is unlikely that there had been any recent changes in physicochemical water quality caused by discharges from the Production Station between sites 3 and 4.

Site 5: 10m u/s of Patea River confluence

A community richness of 22 taxa was recorded at site 5, downstream of the various Waihapa Production Station discharges and downstream of the unnamed tributary receiving the API separator discharge. This was the same as the median richness found by previous surveys at this site and the same as that recorded at the upstream site (Table 2, Figure 4).

The community was characterised by seven 'tolerant' taxa (oligochaete worms, snail (*Potamopyrgus*), ostracod seed shrimp, axehead caddis (*Oxyethira*), chironomid blood worms, orthoclad midges and water boatman (*Sigara*)); and one 'moderately sensitive' taxon (amphipod (*Paracalliope*)).

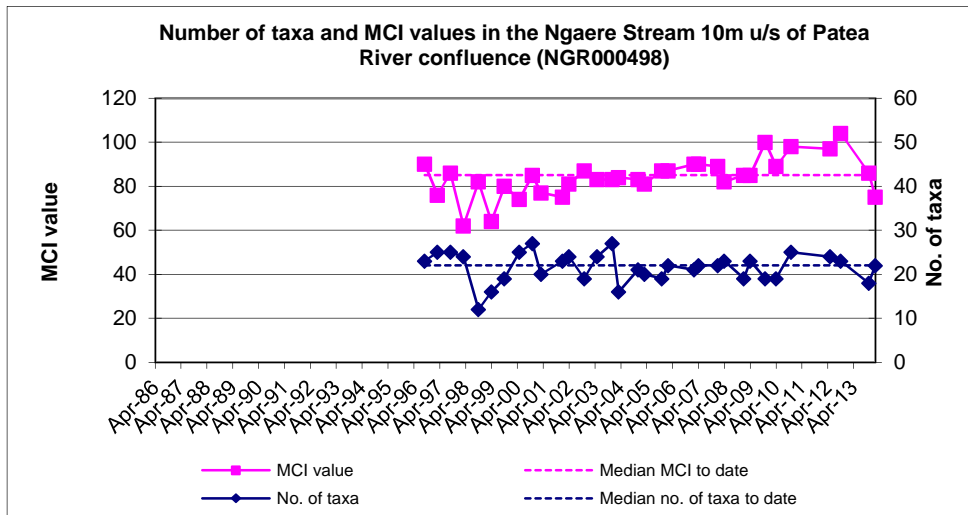


Figure 4 Number of taxa and MCI scores recorded to date at site 5, downstream of all Waihapā Production Station discharges

The community comprised of a moderately high (68 %) proportion of ‘tolerant’ taxa which was reflected in the MCI score of 75 units. This MCI score was below (by 10 units) the median score from previous surveys at this site and below the MCI score recorded in the previous survey. This score was not significantly different to the score recorded at site 4, but was significantly (Stark, 1998) lower than that recorded upstream at site 3 (by 13 MCI units). This significant reduction in MCI score can be attributed to a higher proportion of ‘tolerant’ taxa recorded at this site, mainly the result of a change in habitat between the two sites. In comparison to the two upstream sites, the backwater sampled at site 5 (due to lack of safe accessibility) recorded a slower flow and higher sedimentation than the two upstream sites. As a consequence, there were five ‘tolerant’ taxa recorded at site 5 that were not present upstream at site 3 including; snail (*Physa*), water boatman (*Sigara*) sandy-cased caddis (*Oecetis*), purse-caddis (*Paroxyethira*) and Chironomus blood worms, all of which are commonly found in slow flowing or still water habitats. In addition, there was also one ‘moderately sensitive’ taxon (backswimmer (*Anisops*)) present at this site, also reflective of the slow flow conditions. Considering habitat variation, these results are indicative of no recent impacts of the API separator discharge on the macroinvertebrate communities of the Ngaere Stream.

There were four significant changes in dominant taxa between adjacent sites 4 and 5, including an increased abundance of four ‘tolerant’ taxa, which produced the SQMCI₅ value of 4.1 units, which was slightly higher (by 0.5 unit) than that recorded by site 4. This SQMCI₅ was 0.7 unit above the median value for this site (Table 2), but a significant (Stark, 1998) 1.6 units lower than that recorded at the reference site 3 (Stark, 1998). The changes recorded are more attributable to changes in habitat characteristics at site 5, and are unlikely to have been due to discharges to the tributary entering the Ngaere Stream between sites 4 and 5.

Conclusions and summary

The Council’s standard ‘kick-sampling’ and a combination of the ‘kick-sampling’ and ‘vegetation sweep’ sampling techniques were used at three established sites to collect streambed macroinvertebrates from the Ngaere Stream, to assess whether the discharges from the Waihapā Production Station had had any detrimental effects on the macroinvertebrate communities of this stream. This late summer survey was the second of two surveys programmed for the 2013-2014 monitoring period. Samples were sorted and

identified to provide the number of taxa (richness) and MCI and SQMCI_s scores for each site.

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

This late summer macroinvertebrate survey indicated that the discharge of treated stormwater and API separator discharges from the Waihapa Production Station site had not had any recent detrimental effects on the macroinvertebrate communities of the Ngaere Stream. SQMCI_s scores were not significantly different between sites 4 and 5, and the significant decrease between sites 3 and 4 was likely to be coincident with greater periphyton cover at the downstream site and also perhaps due to the change in sampling technique employed between the two sites.

The macroinvertebrate communities of the stream contained moderate proportions of 'tolerant' taxa at all sites. In addition, there was only one significant change in MCI value (between sites 3 and 5), which can be attributed to the differences in habitat sampled. Also, taxonomic richness (numbers of taxa) was consistent across all three sites. The MCI scores indicated that the stream communities were of poor to fair 'health', and not significantly different to the median values recorded from past surveys. These results from three sites in the Ngaere Stream indicated no recent impacts from any of the Waihapa Production Station discharges.

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Appendix III

Air monitoring report

Memorandum

To Job Manager, David Olson
From Scientific Officer - Air Quality Officer, Brian Cheyne
File FRODO - #1351442, 4049 (Consent)
Date September 4, 2014

Ambient gas monitoring at Waihapa Production Station

During the monitoring year, a multi-gas meter was deployed on one occasion in the vicinity of the Waihapa Production Station. Deployment lasted approximately forty-eight, hours with the instrument placed in a down-wind position at the start of the deployment. Monitoring consisted of continuous measurements of gas concentrations for the gases of interest (carbon monoxide and combustible gases). The location of the multi-gas meter for the sampling run and summarised details of the sample are shown in Figure 1.

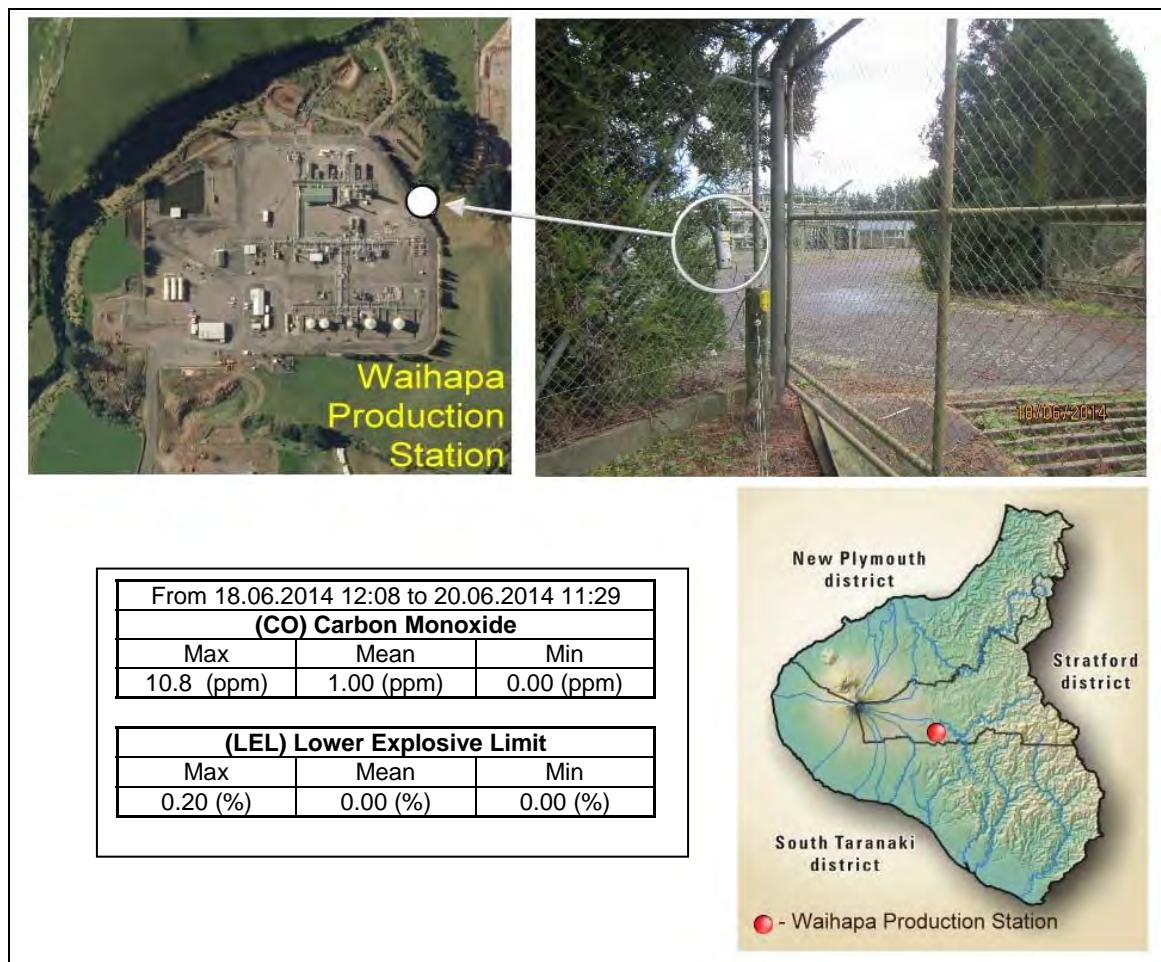


Figure 1 Air monitoring site- Waihapa production station (year 2013-2014)

Because of the nature of the activities on the site, it was considered that the primary information of interest in respect of gases potentially emitted from the site was the average downwind concentration, rather than any instantaneous peak value. That is, the long-term exposure levels, rather than short-term maxima, are of most interest. The gas meter was therefore set up to create a data set based on recording the average concentration measured during each minute as raw data.

The details of the sample run are presented graphically in Figure 2.

The consent covering air discharges from the Waihapa Production Station has specific limits related to particular gases. Special condition 15 of consent 4049-3 sets a limit on the carbon monoxide concentration.

“The consent holder shall control all discharges of carbon monoxide to the atmosphere from the flare, whether alone or in conjunction with any other emissions from the site arising through the exercise of any other consent, 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 milligrams per cubic metre [eight-hour average exposure], or 30 milligrams per cubic metre [one-hour average exposure] at or beyond the boundary of the property on which the production station flare is located.”

The maximum concentration of carbon monoxide found during the monitoring run was 10.8ppm or 9.2 mg/m³ and average concentration was only 0.85 mg/m³ which complies with the consent condition. This continues the pattern found in previous years.

Note: (1) the instrument records in units of ppm. At 15°C
1ppm CO = 0.85 mg m⁻³

(2) See text for explanation of LEL. Because the LEL of methane is equivalent to a mixture of approximately 5% methane in air, then the actual concentration of methane in air can be obtained by dividing the %LEL by 20.

LEL% gives the percentage of the lower explosive limit, expressed as methane, that is detected in the air sampled. The sensor on the instrument reacts to gases and vapours such as acetone, benzene, butane, methane, propane, carbon monoxide, ethanol, and higher alkanes and alkenes, with varying degrees of sensitivity. The Council's Regional Air Quality Plan has a typical requirement that no discharge shall result in a dangerous level of airborne contaminants, including any risk of explosion. At no time did the level of explosive gases downwind of the Waihapa Production Station reach any more than a trivial level.

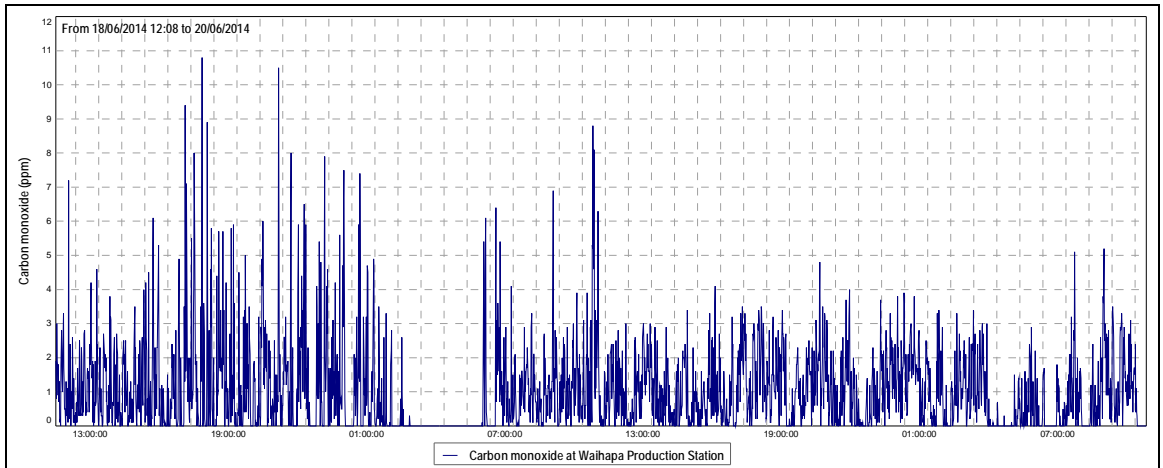


Figure 2 Graph of ambient gas levels in the vicinity of the Waihapa Production station (2013-14)