

Greymouth Petroleum Limited
Southern Sites
Monitoring Programme
Annual Report
2017-2018

Technical Report 2018-56

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Executive summary

Greymouth Petroleum Limited (GPL) operates the Kaimiro Production Station located at Inglewood, in the Waiongana catchment, and the associated Ngatoro-A satellite wellsite also located at Inglewood, in the Waitara catchment. Radnor Production Station is also operated by GPL and this is located at Midhirst in the Patea catchment. This report for the period July 2017 to June 2018 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the Company's environmental and consent compliance performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of the Company's activities.

GPL holds eight resource consents relating to production activities at the sites which include a total of 129 conditions setting out the requirements that the Company must satisfy. GPL holds two consents to allow it to take and use water, three consents to discharge treated stormwater and wastewater into the Mangaoraka and Ngatoro Streams, and three consents to discharge emissions into the air.

During the monitoring period Greymouth Petroleum Limited demonstrated an overall high level of environmental performance.

The Council's monitoring programme for the year under review included five inspections of the Kaimiro Production Station, seven inspections at Radnor Production Station, five inspections at the Ngatoro-A satellite site, and an annual inspection of the associated wellsites. In addition, two biomonitoring surveys of receiving waters and two ambient air quality surveys were carried out at the Kaimiro Production Station.

The results of biomonitoring carried out in the Mangaoraka Stream, indicated that the discharges were not having a significant adverse effect on the water quality downstream of the Kaimiro Production Station.

There were no adverse effects on the environment resulting from the exercise of the air discharge consents. Ambient air quality monitoring at the Kaimiro Production Station showed that levels of carbon monoxide, combustible gases, PM₁₀ particulates and nitrogen oxides 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 air emissions from the sites.

During the period under review, GPL demonstrated an overall high level of both environmental performance and administrative compliance with the resource consents.

For reference, in the 2017-2018 year, consent holders were found to achieve a high level of environmental performance and compliance for 76% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 20% of the consents, a good level of environmental performance and compliance was achieved.

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

This report includes recommendations for the 2018-2019 year, including a recommendation relating to an optional review of consent 4073-3.

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1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is for the period July 2017 to June 2018 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by Greymouth Petroleum Ltd (GPL). GPL operates the Kaimiro Production Station situated on Upland Road at Inglewood, in the Waiongana catchment. The associated Ngatoro-A satellite site is located on Upper Dudley Road at Inglewood, in the Waitara catchment. A further 20 wellsites are monitored annually in conjunction with the Kaimiro Production Station. Radnor Production Station is also operated by GPL and is located on Radnor Road in Midhirst in the Patea catchment.

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

One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of the Company's use of water, land and air, and is the 14th combined annual report by the Council for the Company.

1.1.2 Structure of this report

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

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

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 2018-2019 monitoring year.

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

1.1.3 The Resource Management Act 1991 and monitoring

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

- a. the neighbourhood or the wider community around an activity, and may include cultural and social-economic effects;

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

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

1.1.4 Evaluation of environmental and administrative performance

Besides discussing the various details of the performance and extent of compliance by the Company, this report also assigns them a rating for their environmental and administrative performance during the period under review.

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

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

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

Environmental Performance

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

Good: Likely or actual adverse effects of activities on the receiving environment were negligible or minor at most. There were some such issues noted during monitoring, from self-reports, or in response to unauthorised incident reports, but these items were not critical, and follow-up inspections showed they have been dealt with. These minor issues were resolved positively, co-operatively, and quickly. The Council was not obliged to issue any abatement notices or infringement notices in relation to the minor non-compliant effects; however abatement notices may have been issued to mitigate an identified potential for an environmental effect to occur.

For example:

- High suspended solid values recorded in discharge samples, however the discharge was to land or to receiving waters that were in high flow at the time;
- Strong odour beyond boundary but no residential properties or other recipient nearby.

Improvement required: Likely or actual adverse effects of activities on the receiving environment were more than minor, but not substantial. There were some issues noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent minor non-compliant activity could elevate a minor issue to this level. Abatement notices and infringement notices may have been issued in respect of effects.

Poor: Likely or actual adverse effects of activities on the receiving environment were significant. There were some items noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent moderate non-compliant activity could elevate an 'improvement required' issue to this level. Typically there were grounds for either a prosecution or an infringement notice in respect of effects.

Administrative performance

High: The administrative requirements of the resource consents were met, or any failure to do this had trivial consequences and were addressed promptly and co-operatively.

Good: Perhaps some administrative requirements of the resource consents were not met at a particular time, however this was addressed without repeated interventions from the Council staff. Alternatively adequate reason was provided for matters such as the no or late provision of information, interpretation of 'best practical option' for avoiding potential effects, etc.

Improvement required: Repeated interventions to meet the administrative requirements of the resource consents were made by Council staff. These matters took some time to resolve, or remained unresolved at the end of the period under review. The Council may have issued an abatement notice to attain compliance.

Poor: Material failings to meet the administrative requirements of the resource consents. Significant intervention by the Council was required. Typically there were grounds for an infringement notice.

For reference, in the 2017-2018 year, consent holders were found to achieve a high level of environmental performance and compliance for 76% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 20% of the consents, a good level of environmental performance and compliance was achieved.

1.2 Process description

1.2.1 Kaimiro Production Station

The Kaimiro Production Station (Photo 1) was commissioned in 1985. The production station separates and treats oil and gas from wells in the Kaimiro and Ngatoro fields. Oil is piped to the Omata tank farm and gas is piped into the national grid. Wellsites associated with the Kaimiro Production Station are as follows: Kaimiro: B, C, D, F, G, H, J, K, O; Ngatoro: A, B, C, D, E, F, G; Salisbury; Goldie; Windsor.

The York-A and Ngatoro South wellsites were reinstated during the monitoring period and their consents surrendered.

The production station's BTEX vapour incinerator was replaced in October 2007 with a more efficient unit. A new gas compressor was commissioned in June 2008 and upgrades made to all existing compressor PLC

control systems. These measures have resulted in a significant sustained improvement in plant energy efficiency at the Kaimiro site.



Photo 1 Kaimiro Production Station

Stormwater from the Kaimiro Production Station passes through a separator system and a skimmer pit before discharging to an unnamed tributary of the Mangaoraka Stream. All chemical storage is contained within bunds and isolated from the stormwater system.

1.2.2 Radnor Production Station

The Radnor wellsite (Photo 2) was constructed in 2003 with the first well drilled in 2004. A production station to handle oil and gas from the Radnor-B wellsite was constructed in late 2004, with commissioning of the plant in March 2005. A number of drilling campaigns were conducted, but the wells were eventually shut-in or abandoned and production ceased in 2010. Production resumed in late 2014 with the Radnor Production Station processing oil and gas from the Radnor-1B well. The Radnor-2 well was drilled during the monitoring period under review. The site is currently a remote, unmanned facility. Gas is exported to Methanex via a pipeline and oil is loaded out by tanker twice per week and transported to Kaimiro Production Station.



Photo 2 Radnor Production Station

1.2.3 Ngatoro-A satellite site



Photo 3 Ngatoro-A wellsite

Ngatoro-A (Photo 3) was established in July 1992. The site consists of five wells (Ngatoro-1, 6, 7 and 8), storage facilities for recovered oil, and a bunded earth flare pit. In July 1999 the north-east skimmer pit at the site was decommissioned. The south-west skimmer pit now receives all stormwater from the site for

treatment prior to discharge to an unnamed tributary of the Ngatoro Stream. Recovered oil and gas is piped off site to the Kaimiro Production Station, consequently flaring has been reduced.

1.3 Resource consents

GPL holds eight resource consents the details of which are summarised in the table below and outlined in sections 1.3.1 to 1.3.3.

Table 1 Resource consents held by GPL

Site	Consent number	Purpose	Granted	Review	Expires
Kaimiro Production Station	1334-3	To discharge treated stormwater from the Kaimiro Production Station into an unnamed tributary of the Mangaoraka Stream in the Waiongana Catchment	Jan 2002	-	June 2020
	4048-3	To discharge emissions into the air from the flaring of hydrocarbons arising from hydrocarbon production and hydrocarbon processing operations together with miscellaneous emissions at the Kaimiro Production Station	Jan 2008	June 2020	June 2026
Kaimiro-O	5384-2	To take groundwater from the Matemateaonga Formation for use in enhanced hydrocarbon recovery activities at the Kaimiro-O wellsite.	Sept 1988	June 2020	June 2032
Radnor Production Station	6394-1	To discharge emissions to air during flaring from well workovers, in emergency situations, from a permanent pilot flame and other miscellaneous emissions associated with production activities at the Radnor-B wellsite	June 2004	-	June 2022
	6399-1	To take water from the Piakau Stream for hydrocarbon exploration purposes associated with the Radnor-B wellsite	June 2004	-	June 2022
	9966-1	To discharge treated stormwater from hydrocarbon exploration and production operations at the Radnor-B wellsite through a roadside drain into an unnamed tributary of the Piakau Stream	Sep 2014	June 2022	June 2028
Ngatoro-A	4073-3	To discharge treated stormwater from hydrocarbon exploration and production operations at the Ngatoro-A wellsite, onto land and into an unnamed tributary of the Ngatoro Stream	June 2016	June 2019	June 2021
	7295-1	To cover discharge of emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Ngatoro-A site	May 2008	June 2021	June 2027

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.

GPL holds water abstraction permit **5384-2** to take groundwater from the Matemateaonga Formation for use in enhanced hydrocarbon recovery activities at the Kaimiro-O wellsite. This permit was first issued by the

Council on 18 September 1998 under Section 87(e) of the RMA. It was renewed on 24 July 2014 and is due to expire on 1 June 2032.

Condition 1 sets limits on the volume and rate of abstraction.

Condition 2 requires that the bore is labelled.

Conditions 3 to 7 deal with installation of a water meter and datalogger, recording and provision of data, accuracy of the equipment, access, and repairs and maintenance.

Condition 8 requires the consent holder to adopt the best practicable option to prevent or minimise adverse environmental effects.

Conditions 9 and 10 deal with lapse and review of the consent.

GPL holds water abstraction permit **6399-1** to take water from the Piakau Stream for hydrocarbon exploration purposes associated with the Radnor-B wellsite. This permit was issued by the Council on 10 June 2004 under Section 87(e) of the RMA. It is due to expire on 1 June 2022.

Condition 1 requires the consent holder to adopt the best practicable option to prevent or minimise any adverse environmental effects from the activity.

Condition 2 requires that the consent holder notify Council prior to abstracting water.

Conditions 3 to 5 place limits on the volume abstracted and require records of abstraction to be kept.

Condition 6 states that the exercise of the consent be undertaken in accordance with documentation submitted with the application.

Condition 7 requires the consent holder to ensure the intake structure is appropriately screened to avoid entrainment of freshwater fauna.

Condition 8 requires the consent holder to adopt the best practicable option to prevent or minimise adverse environmental effects.

Conditions 8 and 9 deal with lapse and review of the consent.

The permits are attached to this report in Appendix I.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consents which are appended to this report.

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.

GPL holds water discharge permit **1334-3** to cover discharge of treated stormwater from the Kaimiro Production Station into an unnamed tributary of the Mangaoraka Stream in the Waiongana Catchment. This permit was issued by the Council on 10 January 2002 under Section 87(e) of the RMA. It was transferred to GPL on 10 April 2002. An application for change of consent conditions was approved on 5 September 2012 to remove three redundant conditions relating to operational and management planning. A further change of consent was approved on 8 April 2014 to increase the catchment area, move the discharge point and increase the discharge chloride limit to 230 g/m³. It is due to expire on 1 June 2020.

Condition 1 requires the consent holder to adopt the best practicable option to prevent or minimise adverse effects of the discharge on any waterbody.

Condition 2 imposes a limit on the stormwater catchment size.

Condition 3 requires site specific details relating to contingency planning for the site.

Condition 4 requires all stormwater be directed through a stormwater treatment system.

Condition 5 requires that design, management and maintenance of the stormwater system be undertaken in accordance with information submitted in the application.

Condition 6 requires that hazardous substance storage areas be bunded with drainage to appropriate recovery systems, and not to the stormwater catchment.

Conditions 7, 8 and 9 impose limits on contaminants in the discharge, and stipulate effects the discharge shall not give rise to in the unnamed tributary of the Mangaoraka Stream.

Condition 10 requires that the consent holder prepare and annually maintain a contingency plan in relation to spillages at the site.

Condition 11 requires that the Council be advised of reinstatement of the site.

Condition 12 provides for review of the consent.

GPL holds water discharge permit **9966-1** to discharge treated stormwater from hydrocarbon exploration and production operations at the Radnor-B wellsite through a roadside drain into an unnamed tributary of the Piakau Stream. This permit was issued by the Council on 1 September 2014 under Section 87(e) of the RMA and is due to expire on 1 June 2028.

Condition 1 requires the consent holder to adopt the best practicable option to prevent or minimise adverse effects of the discharge on the environment.

Condition 2 imposes a limit on the stormwater catchment size.

Condition 3 requires written notification to the Council prior to commencement of site works and drilling operations.

Condition 4 requires that the consent holder prepare and maintain a contingency plan in relation to spillages at the site.

Conditions 5 to 9 deal with the design, management, and maintenance of the skimmer pits and stormwater system.

Conditions 10 to 13 impose limits on contaminants in the discharge, and stipulate effects the discharge shall not give rise to in the receiving water.

Condition 14 requires that the Council be advised of reinstatement of the site.

Conditions 15 and 16 are lapse and review provisions.

GPL hold water discharge permit **4073-3** to discharge treated stormwater from hydrocarbon exploration and production operations at the Ngatoro-A wellsite, onto land and into an unnamed tributary of the Ngatoro Stream. This permit was issued by the Council on 30 June 2016 under Section 87(e) of the RMA. It is due to expire on 1 June 2021.

There are 15 special conditions attached to the consent.

Condition 1 requires the consent holder to adopt the best practicable option to prevent or minimise adverse environmental effects.

Condition 2 sets limits on the catchment area size.

Condition 3 requires the consent holder to notify Council of any significant site works.

Condition 4 requires the consent holder to maintain and regularly update a contingency plan in relation to spills at the site.

Conditions 5 and 6 relate to the design, management, and maintenance of the stormwater system.

Conditions 7 to 9 deal with skimmer pit capacity, lining and installation.

Conditions 10 to 13 set out water quality standards for the discharge and receiving waters.

Condition 14 requires reinstatement of the site when no longer in use.

Condition 15 provides for review of the consent.

The permits are attached to this report in Appendix I.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consents which are appended to this report.

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.

GPL holds air discharge permit **4048-3** to cover discharge of emissions into the air from the flaring of hydrocarbons arising from hydrocarbon production and hydrocarbon processing operations together with miscellaneous emissions at the Kaimiro Production Station. This permit was first issued by the Council on 20 June 1995 under Section 87(e) of the RMA. It was transferred to GPL on 10 April 2002 and renewed on 10 January 2008. The current permit covers emissions from Kaimiro Production Station only and is due to expire on 1 June 2026. Separate air discharge permits were issued for the associated wellsites.

Condition 1 limits the duration of flaring during well testing.

Conditions 2, 3 and 4 specify the requirements for notification prior to flaring and before undertaking alterations to equipment or processes which may substantially alter the nature or quantity of the discharge.

Conditions 5 to 10 stipulate the required equipment and processes for undertaking flaring, and limit the substances which may be flared to gases from the well stream.

Conditions 11 to 16 stipulate limits on contaminants and effects from flaring and any other emissions from the production station.

Conditions 17 to 21 specify the requirements for the recording and reporting of information relating to flaring and the details of any measures undertaken to reduce or mitigate emissions from the production station.

Condition 22 provides for review of the consent.

GPL holds air discharge permit **6394-1** to discharge emissions to air during flaring from well workovers, in emergency situations, from a permanent pilot flame and other miscellaneous emissions associated with production activities at the Radnor-B wellsite. This permit was first issued by the Council on 20 June 1995 under Section 87(e) of the RMA. It was transferred to GPL on 10 April 2002 and renewed on 10 January 2008. The current permit covers emissions from Kaimiro Production Station only and is due to expire on 1 June 2026. Separate air discharge permits were issued for the associated wellsites.

Conditions 1 to 4 specify the requirements for notification prior establishment of the site, flaring, and before undertaking alterations to equipment or processes which may substantially alter the nature or quantity of the discharge.

Conditions 5 to 10 stipulate the required equipment and processes for undertaking flaring, and limit the substances which may be flared to gases from the well stream.

Conditions 11 to 17 stipulate limits on contaminants and effects from flaring and any other emissions from the production station.

Conditions 18 to 22 specify the requirements for the recording and reporting of information relating to flaring and the details of any measures undertaken to reduce or mitigate emissions from the production station.

Conditions 23 and 24 deal with lapse and review of the consent.

GPL holds air discharge permit **7295-1** to cover discharge of emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Ngatoro-A site. This permit was issued by the Council on 12 May 2008 under Section 87(e) of the RMA and is due to expire on 1 June 2027.

Twenty two special conditions are attached to the consent regarding: information and notification (Council and neighbourhood notification, alteration to plant equipment or processes); emissions from the site (regard to wind speed, solid and liquid separation and recovery, best practicable option, offensive odour or smoke, vapour recovery systems, smoke opacity, noxious gases, other contaminants); recording and reporting information (gas stream analysis, visible smoke log, flaring log, annual air discharge report); and lapse of consent and review of conditions.

The permits are attached to this report in Appendix I.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consents which are appended to this report.

1.3.4 Related consents

GPL also holds a number of consents relating to the sites which did not require active monitoring during the period under review. A summary of these consents is provided in Table 2.

Table 2 Consents related to Kaimiro Production Station, Radnor Production Station and Ngatoro-A

Wellsite	Consent number	Purpose	Issue date	Expiry
Kaimiro-B	3678-2	To discharge treated stormwater from hydrocarbon exploration operations at the Kaimiro-B wellsite into an unnamed tributary of the Mangaoraka Stream in the Waiongana catchment	Feb 2002	June 2020
	5481-2	To discharge emissions to air associated with hydrocarbon producing wells at the Kaimiro-B wellsite	June 2014	June 2032
Kaimiro-C	4153-2	To discharge treated stormwater, treated produced water, and treated drilling wastewater from hydrocarbon exploration and production activities at the Kaimiro-C wellsite onto land and into an unnamed tributary of the Mangaoraka Stream	Dec 2013	June 2026
	9750-1	To discharge emissions to air associated with hydrocarbon producing wells at the Kaimiro-C wellsite	Dec 2013	June 2032
Kaimiro-D	4165-2	To discharge treated stormwater, treated produced water, and treated drilling wastewater from hydrocarbon exploration and production operations at the Kaimiro-D wellsite into an unnamed tributary of the Mangaoraka Stream in the Waiongana catchment	Dec 2007	June 2026
	7300-1	To discharge emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Kaimiro-D wellsite	May 2008	June 2026
Kaimiro-F	4553-2	To discharge treated stormwater, treated produced water, and treated drilling wastewater from hydrocarbon exploration and production operations at the Kaimiro-F wellsite into an unnamed tributary of the Manganaeia Stream in the Waiongana catchment	Jan 2008	June 2026

Wellsite	Consent number	Purpose	Issue date	Expiry
Kaimiro-F	7299-1	To discharge emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Kaimiro-F wellsite	May 2008	June 2026
Kaimiro-G	4610-2	To discharge treated stormwater, treated surplus drilling water, and treated produced water from hydrocarbon exploration and production operations at the Kaimiro-G wellsite, onto land and into an unnamed tributary of the Mangaoraka Stream	May 2014	June 2026
	7296-1	To discharge emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Kaimiro-G wellsite	May 2008	June 2026
Kaimiro-H	4555-2	To discharge treated stormwater, treated produced water, and treated drilling wastewater from hydrocarbon exploration and production operations at the Kaimiro-H wellsite into the Manganaeia Stream in the Waiongana catchment	Jan 2008	June 2026
	7298-1	To discharge emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Kaimiro-H wellsite	May 2008	June 2026
Kaimiro-J	4612-2	To discharge treated stormwater, treated produced water and treated drilling wastewater from hydrocarbon production and exploration at the Kaimiro-J wellsite onto land and into an unnamed tributary of the Mangaoraka Stream	Dec 2013	June 2026
	7297-1	To discharge emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Kaimiro-J wellsite	Dec 2013	June 2026
Kaimiro-K	4820-2	To discharge treated stormwater and treated produced water from hydrocarbon exploration and production operations at the Kaimiro-K wellsite, into an unnamed tributary of the Manganaeia Stream	Jun 2014	June 2032
Kaimiro-O	5192-2	To discharge uncontaminated and treated stormwater [excluding produced water and drilling fluids] from hydrocarbon exploration and production operations at the Kaimiro-O wellsite into the Waiwhakaiho River	Jan 2008	June 2026
Ngatoro-B	3951-3	To discharge treated wastewater and treated stormwater from hydrocarbon exploration and production operations at the Ngatoro-B wellsite into an unnamed tributary of the Ngatoro Stream in the Waitara catchment	April 2009	June 2027
	7220-1	To cover discharge of emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Ngatoro-B site	May 2008	June 2027
Ngatoro-C	4015-3	To discharge treated stormwater from hydrocarbon exploration and production operations at the Ngatoro-C wellsite, into an unnamed tributary of the Kurapete Stream	Jul 2015	June 2033
	7294-2	To discharge emissions to air associated with hydrocarbon producing wells at the Ngatoro-C wellsite	Mar 2014	June 2033

Wellsite	Consent number	Purpose	Issue date	Expiry
Ngatoro-D	4070-3	To discharge treated stormwater from hydrocarbon exploration and production operations at the Ngatoro-D wellsite, onto land where it may enter an unnamed tributary of the Waionganaiti Stream	Mar 2015	June 2032
	7219-2	To discharge emissions to air associated with hydrocarbon producing wells at the Ngatoro-D wellsite	Apr 2014	June 2026
Ngatoro-E	4067-3	To discharge treated stormwater from hydrocarbon exploration and production operations at the Ngatoro-E wellsite, onto land and into the Ngatoroiti Stream	Jun 2016	June 2033
	4069-4	To discharge emissions to air from flaring during hydrocarbon exploration and production testing associated with up to 4 new wells, flaring from well workover activities and in emergency situations associated with production activities, and miscellaneous emissions at the Ngatoro-E wellsite.	Dec 2013	June 2021
Ngatoro-F	5974-1	To discharge stormwater, uncontaminated treated site water, and uncontaminated treated produced water from hydrocarbon exploration and production operations at the Tabla-1 wellsite onto and into land and into an unnamed tributary of the Ngatoroiti Stream a tributary of the Ngatoro Stream a tributary of the Manganui River in the Waitara catchment... now known as Ngatoro-F wellsite	April 2002	June 2021
	5975-1	To discharge emissions into the air from hydrocarbon exploration and production testing operations and miscellaneous emissions at the Tabla-1 wellsite involving five wells and up to six zones per well ...now known as Ngatoro-F wellsite	June 2002	June 2021
Ngatoro-G	7934-1	To discharge treated stormwater and produced water onto land and into an unnamed tributary of the Ngatoronui Stream from hydrocarbon exploration and production operations at the Ngatoro-G wellsite	Aug 2014	June 2027
	7935-1	To take water from the Ngatoronui Stream and an unnamed tributary of the Ngatoronui Stream for wellsite and well drilling during hydrocarbon exploration and production activities at the Ngatoro-G wellsite	Oct 2011	June 2021
	7938-1	To discharge emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Ngatoro-G wellsite	Oct 2011	June 2027
Goldie	5285-2	To discharge treated stormwater and treated produced water from hydrocarbon exploration and production operations at the Goldie wellsite into an unnamed tributary of the Waiongana Stream	Nov 2007	June 2026
	5982-1	To discharge emissions into the air from the flaring of hydrocarbons arising from production operations and miscellaneous emissions at the Goldie Wellsite	May 2002	June 2020
Salisbury	7492-1	To discharge treated stormwater and treated production water from hydrocarbon exploration and production operations at the Salisbury wellsite onto and into land in the vicinity of an unnamed tributary of the Waitepuke Stream in the Waitara catchment	Jun 2009	June 2027

Wellsite	Consent number	Purpose	Issue date	Expiry
Salisbury	7494-1	To discharge emissions to air from flaring of hydrocarbons and miscellaneous emissions associated with well clean-up, initial well testing and production testing at the Salisbury wellsite	Sep 2009	June 2027
Surrey	6042-2	To discharge emissions to air from hydrocarbon exploration and production testing operations and miscellaneous emissions associated with up to three wells at the Surrey-1 wellsite	Jan 2008	June 2027
	6043-2	To discharge stormwater from hydrocarbon exploration and production operations at the Surrey-1 wellsite	Jan 2008	June 2027
Windsor	5668-2	To discharge treated stormwater from hydrocarbon exploration and production operations at the Windsor	Nov 2015	June 2032
	5669-2	To discharge contaminants to air from hydrocarbon exploration at the Windsor-1 wellsite, including combustion involving flaring or incineration of petroleum recovered from natural deposits, in association with well development or redevelopment and testing or enhancement of well production flows	Oct 2015	June 2032

1.4 Monitoring programme

1.4.1 Introduction

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

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

The monitoring programme for the Kaimiro Production Station, Radnor Production Station and Ngatoro-A satellite site consisted of four primary components.

1.4.2 Programme liaison and management

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

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

1.4.3 Site inspections

Six inspections of the Kaimiro Production Station and Ngatoro-A satellite sites; six inspections of the Radnor Production Station; and an annual inspection of associated wellsites were undertaken 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 Company were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

1.4.4 Chemical sampling

The treated stormwater discharge from the Kaimiro Production Station was scheduled to be sampled twice, along with two sites in the unnamed tributary of the Mangaoraka Stream. The discharge from Ngatoro-A was also scheduled to be sampled twice during the year, along with the Ngatoro Stream tributary which receives discharges from the Ngatoro-A site. However, no samples were collected during the monitoring year.

The Council undertook sampling of the ambient air quality outside the boundary of the Kaimiro Production Station site. Passive absorption discs were placed at two sites on one occasion to measure nitrogen oxides. A multi-gas meter was also deployed on one occasion in the vicinity of the plant, with monitoring consisting of continuous measurements of gas concentrations for the gases of interest (carbon monoxide and combustible gases).

1.4.5 Biomonitoring surveys

Two biological surveys were performed in the unnamed tributary of the Mangaoraka Stream to determine whether or not the discharge of treated stormwater from the Kaimiro Production Station had had a detrimental effect upon the communities of the stream.

2 Results

2.1 Water

2.1.1 Inspections

Six inspections of the Kaimiro Production Station and Ngatoro-A satellite site; six inspections of the Radnor Production Station; and an annual inspection of associated wellsites were undertaken during the 2017-2018 monitoring period. The following was found during inspections:

9 October 2017

Radnor Production Station: The site was neat and tidy. No effects were observed from any offsite discharge.

Ngatoro-A: The site was observed to be neat and tidy. The skimmer pits were discharging clean water and this was not having any visible effect on the downstream receiving water. No flaring was occurring at the time of the inspection. Everything was satisfactory.

10 October 2017

Kaimiro Production Station: The site was neat and tidy and well managed. The skimmer pits were discharging with no effects noted in the receiving waters. Everything was satisfactory.

16 November 2017

Kaimiro Production Station and Ngatoro-A: Ring drains and bunds were secure. The skimmer pits were clear and there were no effects of any stormwater discharge to the streams. No flaring was taking place and there were no odours noted at either site. Everything was satisfactory.

20 November 2017

Ngatoro-A: An inspection was undertaken during a period of fine weather. The site was observed to be neat and tidy. The skimmer pits were clear of any contaminants and no in-stream effects of any discharge were noted. No flaring was occurring and no odours were noted offsite.

8 December 2017

Radnor Production Station: Bunding was observed to be in place around the mud dryer, chemical store and bulk liquid tanks. Temporary bunding and drip trays were also being used on site. The ring drain was found to be dry with no groundwater discharging. Council had been notified of the works onsite as per condition 3 of consent 9966-1. A contingency plan was in place for the site. It was recommended that the skimmer pit shut off valve be tested/serviced to ensure it is operating correctly and has not ceased. This will ensure that the skimmer pits operate as designed when rainfall occurs. The skimmer pits were full of algae. The water in the second pond was tested with a meter and found to be compliant with consent conditions (pH, chloride and suspended solids). The ponds were not discharging. The inspecting officer discussed the BPO with staff for containing drilling mud around the wellhead and also controlling suspended solids when the next rainfall event occurs.

11 January 2018

Kaimiro Production Station. Ngatoro-A and B: Both sites were observed to be neat and tidy. Aquatic species were present in the skimmer pits indicating good water quality. No flaring was being undertaken at either site during the inspections.

5 March 2018

Radnor Production Station: An inspection was undertaken with GPL staff. The skimmer pits were analysed using a meter with pH, chloride and suspended solid concentrations measured in the second skimmer pit

compliant with limits set by consent 9966-1. A discussion was held regarding the bunding of chemicals. Tarps were in use to cover dry chemicals and a plastic liner had been laid beneath the chemicals, however any spill onto the plastic liner during rainfall was likely to run off with no containment achieved. A drainage system with a shut off valve in order to control the release of clean stormwater captured with a bund system was recommended. It appeared that a new temporary bund for 200 litre drums was found to have overflowed as a hydrocarbon stain was sighted next to the bund and the lip of the bund was coated with hydrocarbons. This was discussed with staff as well as the need to ensure that stormwater removal is managed to avoid overflow. The diesel bund was dry. The ring drains contained vegetation that was still growing. Staff onsite advised that frogs were present in the skimmer pits, indicating good water quality. The drilling waste drier had been in use but was not at the time of inspection. Drilling waste was being transported to a worm farm at Uruti. The use of drip trays and liners was evident around the site. No flaring was occurring at the time of the inspection.

16 March 2018

Kaimiro Production Station: The site was observed to be neat and tidy. All ring drains and bunds were satisfactory. The skimmer pits were clear of contamination but contained natural occurring iron oxide resulting in discolored water. There was no effect noted in the receiving waters downstream of any previous discharge from the site. No flaring, odours or smoke were noted at the time of the inspection.

Ngatoro-A: The site was unmanned at the time of the inspection, which was undertaken around the perimeter of the site and at the discharge points to the receiving waters and downstream of the discharge. No issues were noted. No flaring was observed. Everything was satisfactory at both sites.

20 March 2018

Radnor Production Station: A site inspection was undertaken with H & S Tiger Drilling staff as they were drilling on site. The site stormwater systems had coped well in the torrential rain experienced in the week or so previously, with ring drains and bunds secure and undamaged and the skimmer pits containing very clean water which was discharging to an unnamed tributary of the Piakau stream. No effects from any previous discharge were noted in the receiving waters. Although no flaring was being undertaken at the time of the inspection it was noted that the flare pit was well constructed to minimise any off site effects. The site was neat and tidy despite well drilling activities occurring. Everything was satisfactory.

16 April 2018

Kaimiro Production Station and Ngatoro-A: Site inspections were undertaken following a weekend of fairly heavy rainfall. The stormwater drainage systems had coped well with the excessive rainfall with separators and all bunds clear of any contaminants and the skimmer pits at both sites clean. No adverse effects of any previous discharge to the adjacent streams were observed. No flaring was being undertaken at either of the sites and no odours or smoke were noted. The sites were well managed and maintained,

14 May 2018

Radnor Production Station: An inspection was undertaken following a weekend of heavy rainfall and stormy conditions. The stormwater system had coped well with the extreme weather, there was some slight discolouration from elevated suspended solids present in the first pond however water clarity had improved prior to discharge from the second pond with no effect on the receiving water evident. Production testing was underway with some flaring occurring as result, no smoke or odours were noted. The production site was generally neat and tidy. The wellsite was tidy with a lot of extra equipment present at the time. Everything was satisfactory.

24 May 2018

Radnor Production Station: Un-bunded chemicals had been placed at the north western end of the site and GPL staff advised that these were to be picked up and removed from the site. They were picked up and

removed during the inspection, however staff were advised that it was best practice to place chemicals in an appropriately banded area while awaiting pickup. GPL staff advised that stormwater from a neighbouring paddock was flowing through the site and tracking sediment onto the site. Sediment was observed in the ring drain on the eastern boundary and a discussion was had on methods to maintain the integrity of sediment controls in the ring drain. An oily sheen had been detected in the ring drain and the shut off valve for the skimmer pits had been closed. The discharge point from the skimmer pits into a manhole was inspected and it was found that the shut off valve had not fully shut and stormwater was still discharging. Samples were collected for analysis. An inspection of the skimmer pits found that both pits had appeared to have overflowed. A discussion was held as to the reasons why, and the increased stormwater catchment from the neighbouring property was identified as a possible cause. An increase in catchment size would breach special condition 2 of consent 9966-1. The surface sheen on the skimmer pits was being removed by vacuum truck for disposal.

The area around the drilling mud D tank contained sawdust and drilling mud. Staff advised that the site had already been scraped, however the recent heavy rain had brought more to the surface. The inspecting officer advised that this area of the site was in a poor state with regards to housekeeping and a discussion was held about which processes on site had led to so much of the product discharging onto the ground. Considering that staff were onsite and the product was clearly visible, Council considers that the best practicable option to prevent or minimise adverse effects on the environment, as required by consent conditions, was not undertaken in this instance. Also discussed were the sewage holding tanks and the potential for these to overflow during rainfall events. The inspecting officer requested that the integrity of tanks be checked to ensure they were not compromised, hydrostatic testing may be required to ensure sewerage does not discharge to groundwater.

8 June 2018

An annual inspection was undertaken at all of the associated wellsites and these were all found to be satisfactory.

2.1.2 Results of abstraction monitoring

Figure 1 provides a summary of the abstraction volumes for the consented water take at the Kaimiro-O wellsite under consent 5384-2. All daily volumes were within the 550 m³ limit stipulated by the consent.

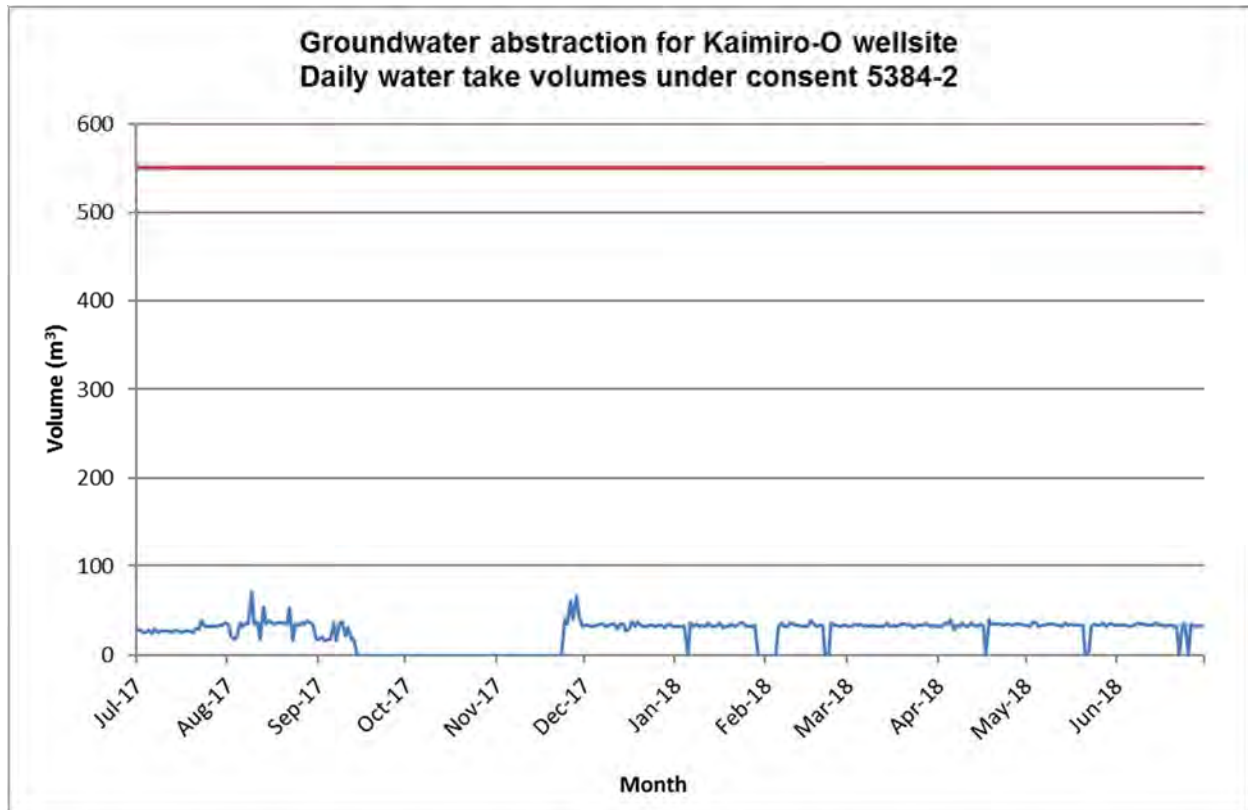


Figure 1 Daily water abstraction volumes for Kaimiro-O under consent 5384-2

2.1.3 Results of receiving environment monitoring

Macroinvertebrate surveys were performed on 4 December 2017 and 7 February 2018 at three sites in two unnamed tributaries of the Mangaoraka Stream in relation to stormwater discharges from the Kaimiro Production Station.

Taxa richness is the most robust index when determining whether a macroinvertebrate community has been exposed to toxic discharges. Macroinvertebrates when exposed to toxic discharges may die and be swept downstream or may deliberately drift downstream as an avoidance mechanism (catastrophic drift). The MCI is a measure of the overall sensitivity of the macroinvertebrate community to 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 relative abundances of taxa as well as sensitivity to pollution. Significant differences in taxa richness, MCI or SQMCI_s between sites may indicate the degree of adverse effects (if any) of the discharge being monitored.

During the December survey no significant differences were found between sites for any invertebrate metric. As is usual, site 2 recorded poorer results than sites 1 and 3, although these differences were not significant on this occasion. This most likely reflects poorer habitat quality due to sediment and iron oxide deposition in the minor tributary where site 2 is located. Taxonomic richness was lower than median at sites 1 and 3, and one taxon higher at site 2. MCI scores were similar to their respective medians at all three sites. SQMCI_s scores were similar to their respective medians at sites 1 and 2, while at site 3 it was significantly lower than the median score.

The February survey found taxonomic richnesses to be similar between the three sites, while MCI and SQMCI_s scores increased between sites 1 and 3. Scores at site 1 were significantly lower than site 3, while site 2 recorded scores not significantly different to either site 1 or 3. In contrast to most previous surveys, the minor tributary did not record poorer macroinvertebrate community health than the major tributary.

Taxonomic richness was lower than median at sites 1 and 3, and equal to median at site 2. MCI and SQMCI scores were significantly lower than historical medians at site 1, but similar to medians at sites 2 and 3.

Overall there was no evidence that discharges from the Kaimiro Production Station had had any recent detrimental effects on the macroinvertebrate communities of these two unnamed tributaries of the Mangaoraka Stream.

Copies of the full biomonitoring reports are attached in Appendix II.

2.2 Air

2.2.1 Inspections

Air inspections were carried out in conjunction with site inspections as discussed in section 2.1.1 above. On all occasions air discharges complied with consent conditions.

2.2.2 Results of discharge monitoring

2.2.2.1 Carbon monoxide and combustible gases

During the monitoring year, a multi-gas meter was deployed on one occasion in the vicinity of the plant. The deployment lasted approximately 72 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 monitoring sites used in the year under review are shown in Figure 2.



Figure 2 Air monitoring sites at Kaimiro Production Station for 2017-2018

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 summarised in Table 3 and the data from the sample run are presented graphically in Figure 3.

The consents covering air discharges from the Kaimiro Production Station have specific limits related to particular gases. Special condition 13 of consent 4048-3 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 one hour average exposure. The maximum concentration of carbon monoxide

found during the monitoring run was 0.6 mg/m^3 while the average concentration for the entire dataset was 0.12 mg/m^3 , which comply with consent conditions. This is consistent with the pattern found in previous years.

Table 3 Results of carbon monoxide and LEL monitoring at Kaimiro Production Station

Component		4 to 7 August 2017
Max	CO (ppm)	0.50
	LEL (%)	0.10
Mean	CO (ppm)	0.10
	LEL (%)	0.00
Min	CO (ppm)	0.00
	LEL (%)	0.00

Notes:

- (1) the instrument records in units of ppm. At 25°C and 1 atm, $1 \text{ ppm CO} = 1.145 \text{ mg/m}^3$
- (2) 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 percentage LEL by 20.

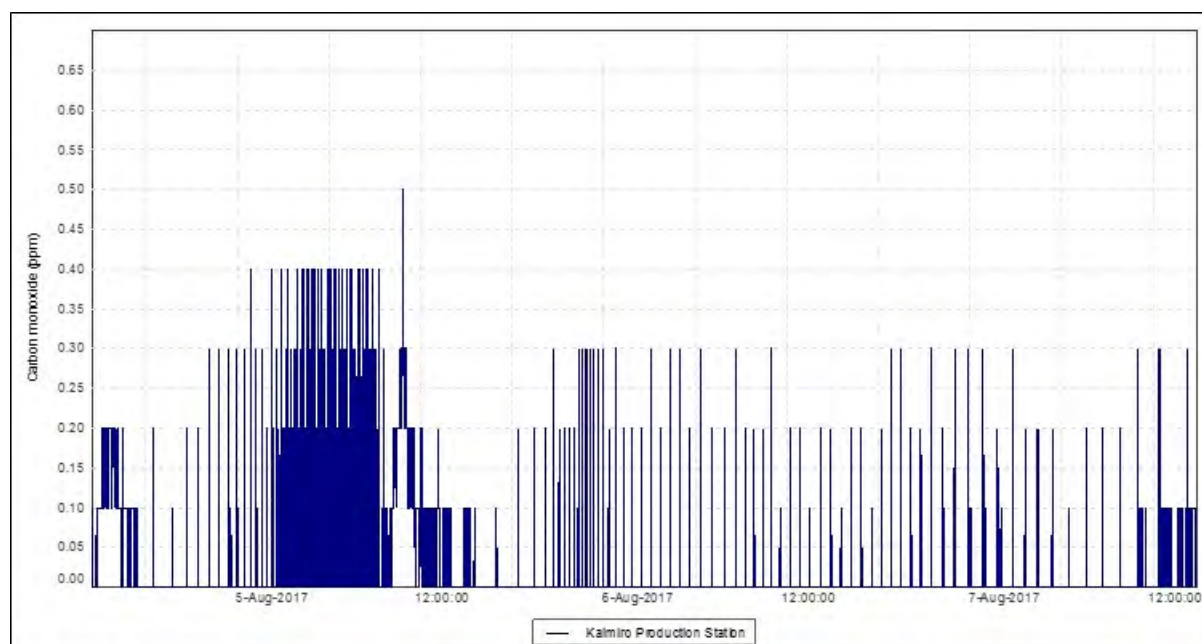


Figure 3 Ambient CO levels in the vicinity of Kaimiro Production Station

Lower Explosive Limit (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 dangerous levels of airborne contaminants, including any risk of explosion. At no time did the level of explosive gases downwind of the Kaimiro Production Station reach any more than a trivial level.

2.2.2.2 PM₁₀ particulates

In September 2004 the Ministry for the Environment enacted National Environmental Standards (NESs) relating to certain air pollutants. The NES for PM₁₀ particulates is $50 \text{ } \mu\text{g/m}^3$ (24-hour average).

Particulates can be derived from many sources, including motor vehicles (particularly diesel), solid and oil-burning processes for industry and power generation, incineration and waste burning, photochemical processes, and natural sources such as pollen, abrasion, and sea spray.

PM₁₀ particles are linked to adverse health effects that arise primarily from the ability of particles of this size to penetrate the defences of the human body and enter deep into the lungs, significantly reducing the exchange of gases across the lung walls. Health effects from inhaling PM₁₀ include increased mortality and the aggravation of existing respiratory and cardiovascular conditions such as asthma and chronic pulmonary diseases.

During the reporting period, a DustTrak PM₁₀ monitor was deployed on one occasion in the vicinity of Kaimiro Production Station. The deployment lasted approximately 40 hours, with the instrument placed in a down-wind position at the start of the deployment. Monitoring consisted of continual measurements of PM₁₀ concentrations. The location of the DustTrak monitor during the sampling run is shown in Figure 2. The results of the sample run are presented in Figure 4 and Table 4.

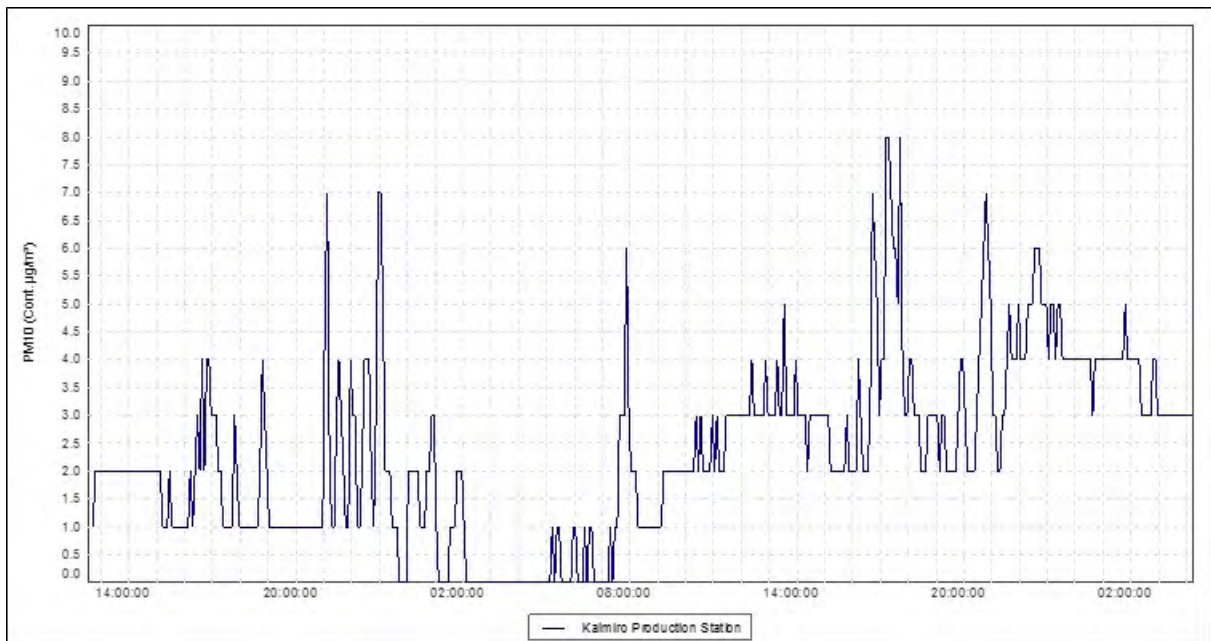


Figure 4 PM₁₀ concentrations (µg/m³) at Kaimiro Production Station

Table 4 Daily averages of PM₁₀ results from monitoring at Kaimiro Production Station

	4 to 6 August 2017 (40 hours)	
24 hr. set	Day 1 (start to 24 hours)	Day 2 (24 hours to end)
Daily average	1.5 µg/m ³	2.9 µg/m ³
NES	50µg/m ³	

During the 40 hour run, from 4 to 6 August 2017, the average recorded PM₁₀ concentration was 1.5 µg/m³ for the first 24 hour period and 2.9 µg/m³ for the second 24 hour period. These daily averages equate to 3% and 6%, respectively, of the 50 µg/m³ value that is set by the NES. Background levels of PM₁₀ in the region have been found to be typically around 11 µg/m³.

2.2.2.3 Nitrogen oxides

From 2014 onwards, the Council implemented a coordinated region-wide compliance monitoring programme to measure nitrogen oxides (NO_x). The programme involves deploying measuring devices at 24

NO_x monitoring sites (including two sites in the vicinity of Kaimiro Production Station) on the same day, with retrieval three weeks later. This approach assists the Council in further evaluating the effects of local and regional emission sources and ambient air quality in the region.

The consent covering air discharges from the Kaimiro Production Station has specific limits related to particular gases. Special condition 14 of consent 4048-3 sets a limit on the nitrogen dioxide concentration at or beyond the production station's boundary. The limit is expressed as 200 µg/m³ for a one hour average or 100 µg/m³ for a 24 hour average exposure.

NO_x passive adsorption discs were placed at two locations in the vicinity of the Kaimiro Production Station on one occasion during the year under review (Figure 2). The discs were left in place for a period of 21 days. The calculated average one hour and 24 hour theoretical maximum NO_x concentrations found at Kaimiro Production Station during the year under review equate to 7.5 µg/m³ and 3.9 µg/m³, respectively. The results show that the ambient ground level concentration of NO_x is well below the limits set out by consent 4048-3.

The full air monitoring report is attached in Appendix III.

2.2.3 Summary of flaring volumes reported by GPL

During the monitoring period flaring was undertaken at Kaimiro Production Station, Radnor Production Station and Ngatoro-E wellsite.

Kaimiro Production Station

A summary of flaring volumes at Kaimiro Production Station is provided in Figure 5.

At Kaimiro Production Station flaring occurred monthly during the year with approximately 321,900 m³ flared, this was a reduction of approximately 579,693 m³ compared with the previous monitoring period. The high amounts of flaring in February and March 2018 were due to a planned shutdown (February), the production station being unable to export gas and a compressor shutdown at Ngatoro-A (March). No smoke emissions or complaints were recorded.

Radnor Production Station

Flaring occurred in June, July, August, November and December 2017 and March 2018 at Radnor Production Station, with approximately 73,130 m³ flared (Figure 6). The majority of the flaring occurred due to an unplanned Methanex shutdown in August 2017, with small amounts in the other months due to unplanned maintenance.

Ngatoro-E

Approximately 21,332 m³ of gas was flared at Ngatoro-E during the reporting period (Figure 7). This was all in January and February 2018 and was associated with well maintenance operations.

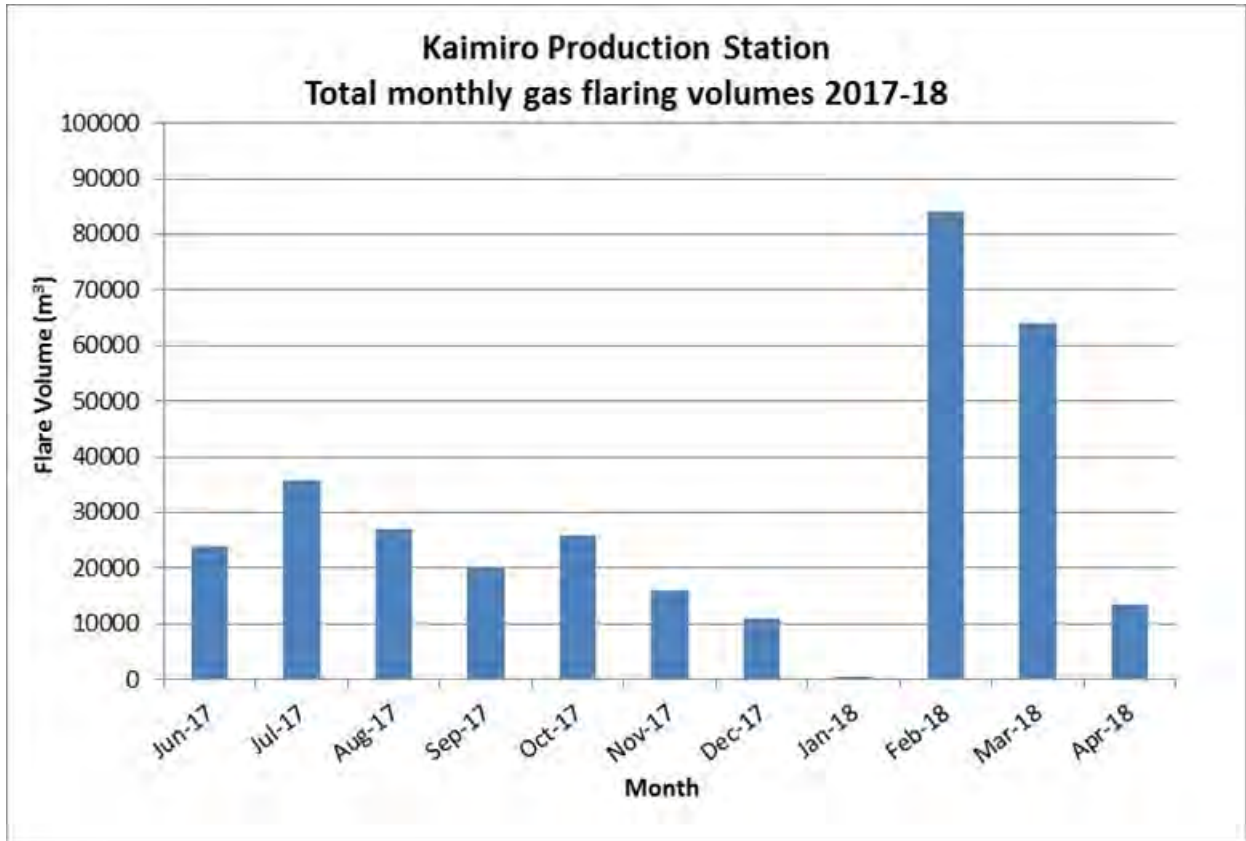


Figure 5 Summary of monthly gas flaring volumes at Kaimiro Production Station

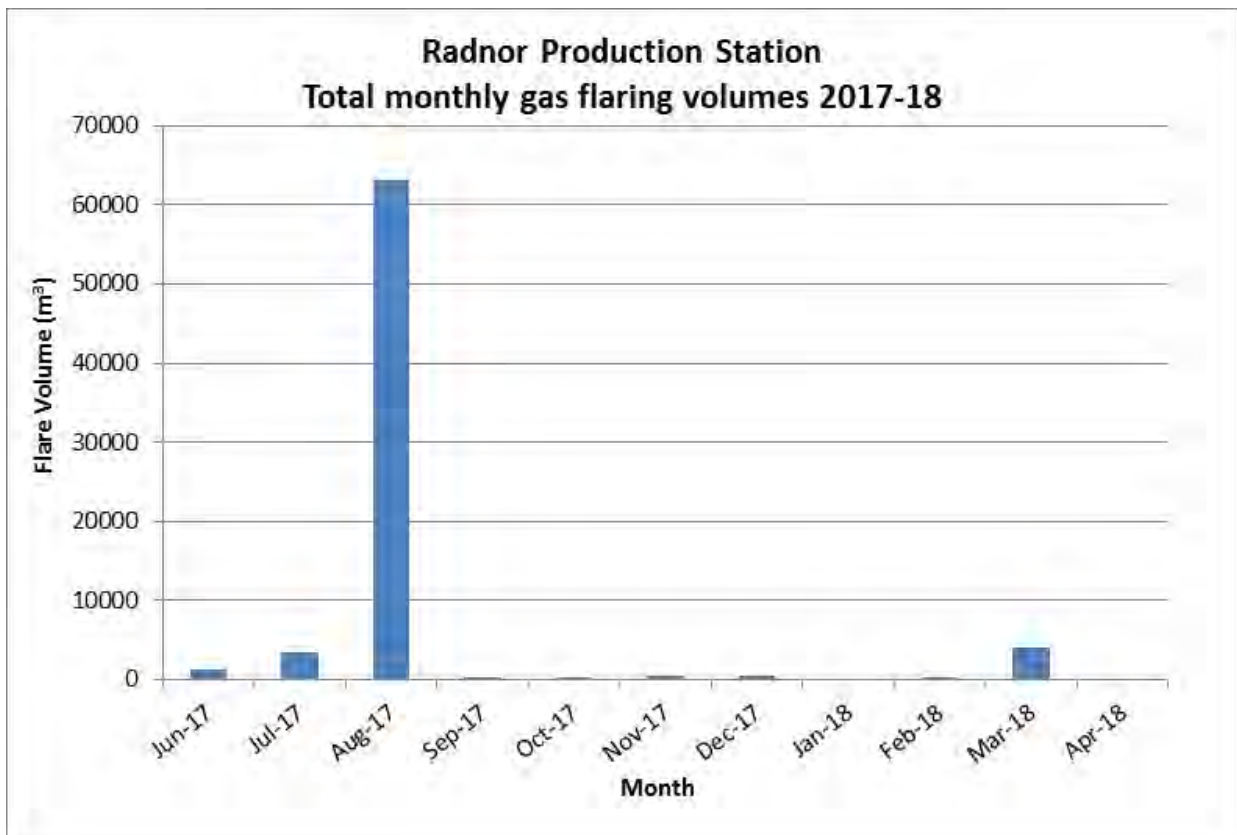


Figure 6 Summary of monthly gas flaring volumes at Radnor Production Station

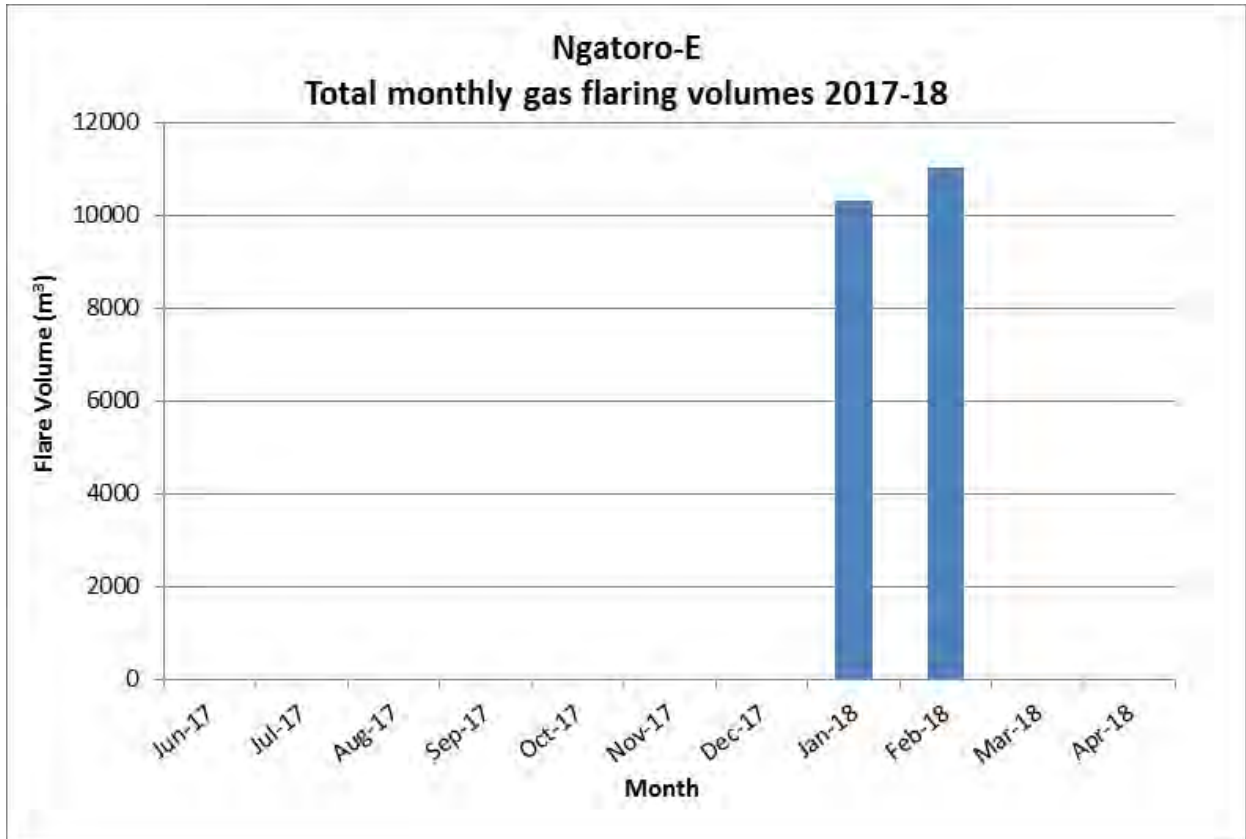


Figure 7 Summary of monthly gas flaring volumes at Ngatoro-E wellsite

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 Company. During the year matters may arise which require additional activity by the Council, for example provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

The Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The incident register 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 2017-2018 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Company's conditions in resource consents or provisions in Regional Plans.

3 Discussion

3.1 Discussion of site performance

Inspections of the Kaimiro, Radnor and Ngatoro sites during the 2017-2018 monitoring year found that they were generally well managed and the stormwater systems were maintained to a satisfactory standard. Emissions to air were well controlled. Several issues were raised during a site inspection at Radnor Production Station on in May 2018, however GPL undertook to resolve the issues in a timely manner.

3.2 Environmental effects of exercise of consents

Kaimiro Production Station

Results of biomonitoring carried out in the Mangaoraka Stream indicated that the discharges were not having a significant adverse effect on the downstream water quality.

There were no adverse environmental effects recorded as a result of the exercise of the air discharge permit at the Kaimiro Production Station. Measurements of ambient air quality at the site showed that the concentrations of carbon monoxide, nitrogen oxide, volatile organic compounds and combustible gases were below levels of concern.

Radnor Production Station

Results of in situ sampling of the discharge were within the limits prescribed by the consent. No adverse effects of any discharges were noted in the receiving waters.

No adverse effects as a result of flaring were noted at the site during 2017-2018.

Ngatoro-A satellite site

Inspections of the site did not note any significant adverse effect on the downstream water quality.

No flaring was undertaken at the site during 2017-2018.

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 5-12.

3.3.1 Kaimiro Production Station

Table 5 Summary of performance for consent 1334-3

Purpose: To discharge treated stormwater from the Kaimiro Production Station site into an unnamed tributary		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practicable option to prevent effects on environment	Site inspections	Yes
2. Maximum stormwater catchment	Site inspections	Yes
3. Contingency plan provided prior to commencement	Received	Yes

Purpose: To discharge treated stormwater from the Kaimiro Production Station site into an unnamed tributary		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
4. Site water directed for treatment through stormwater treatment system	Site inspections	Yes
5. Design, management and maintenance of stormwater system in accordance with application	Site inspections	Yes
6. Hazardous storage areas bunded with drainage to sumps	Site inspections	Yes
7. Limits on contaminants in the discharge	Samples not collected during period under review	N/A
8. Limits on chloride, BODCF and temperature increase below mixing zone	Samples not collected during period under review	N/A
9. Effects on receiving water below mixing zone	Inspections and biomonitoring	Yes
10. Annual preparation and maintenance of contingency plan relating to spills at the site	Plan up-to-date as of December 2017	Yes
11. Council advised prior to reinstatement of the site	Site not reinstated during period under review	N/A
12. Provisions for review of consent conditions	No further provision for review prior to expiry	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 6 Summary of performance for consent 4048-3

Purpose: To discharge emissions into the air from the flaring of hydrocarbons		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Limit on flaring duration	Site inspections and company logs	Yes
2. Neighbours notified prior to flaring	Information provided to neighbours	Yes
3. Council notified of continuous flaring	Notifications received	Yes
4. Consultation prior to alteration to plant equipment or processes	Site inspections and liaison with consent holder	Yes

Purpose: To discharge emissions into the air from the flaring of hydrocarbons		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
5. Regard given to wind conditions during flaring	No complaints received from neighbours	Yes
6. Gas treated by liquid and solid separation and recovery	Site inspections	Yes
7. No liquid or solid hydrocarbons combusted through gas flare	Site inspections	Yes
8. Flare only used to dispose of substances from the well stream	Site inspections	Yes
9. Hydrocarbon storage vessels fitted with vapour recovery systems	Site inspections	Yes
10. Best practicable option to prevent effects on environment	Site inspections	Yes
11. No offensive odour or smoke at boundary of site	Site inspections	Yes
12. Limit on smoke opacity	Site inspections	Yes
13. Limit on carbon monoxide emissions	Ambient gas monitoring	Yes
14. Limit on nitrogen dioxide emissions	Ambient gas monitoring	Yes
15. No discharge of contaminant that is hazardous, toxic or noxious beyond boundary	Site inspections and ambient gas monitoring	Yes
16. No discharge of contaminant that exceeds specific WES limits	Ambient gas monitoring	Yes
17. Record of smoke emitting incidents	Annual air report received	Yes
18. Provision of flaring logs to Council	Flaring logs received	Yes
19. Maintenance of flaring logs	Flaring logs received	Yes
20. Provision of annual air emissions report	Report received	Yes
21. Analysis of gas and crude oil stream	Not requested during period under review	N/A

Purpose: To discharge emissions into the air from the flaring of hydrocarbons		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
22. Provisions for review of consent conditions	Optional review scheduled in June 2020 if required	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 7 Summary of performance for consent 5384-2

Purpose: To take groundwater from the Matemateaonga Formation		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Total volume abstracted not to exceed 550 m ³ /day or 6.4 L/s	Review of data provided by consent holder	Yes
2. Bore to be labelled	Site inspection	Yes
3. Installation and maintenance of water meter and datalogger	Site inspections	Yes
4. Provision of data annually by 31 July	Data provided	Yes
5. Documentation proving equipment has been installed and is accurate	Certification achieved	Yes
6. Water meter and datalogger to be accessible to Council staff	Site inspections	Yes
7. Council to be notified if equipment breaks down	No issues during the period	Yes
8. Best practicable option to prevent or minimise adverse environmental effects	Site inspections and liaison with consent holder	Yes
9. Lapse of consent		N/A
10. Provisions for review of consent conditions	Optional review scheduled in June 2020 if required	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

3.3.2 Radnor Production Station

Table 8 Summary of performance for consent 6394-1

Purpose: To discharge emissions to air during flaring from well workovers, in emergency situations, from a permanent pilot flame and other miscellaneous emissions associated with production activities at the Radnor-B wellsite		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notify Council prior to establishment of production operations	Notification received	Yes
2. Neighbours notified prior to flaring	Information provided to neighbours	Yes
3. Council notified of continuous flaring	Notifications received	Yes
4. Consultation prior to alteration to plant equipment or processes	Site inspections	Yes
5. Regard given to wind conditions during flaring	No complaints received from neighbours	Yes
6. Gas treated by liquid and solid separation and recovery	Site inspections	Yes
7. Notify Council of any failure to maintain liquid and solid separation	No failure during monitoring period	N/A
8. No liquid or solid hydrocarbons combusted through gas flare	Site inspections	Yes
9. Flare only used to dispose of substances from the well stream	Site inspections	Yes
10. Best practicable option to prevent effects on environment	Site inspections	Yes
11. No discharge of contaminant that is hazardous, toxic or noxious beyond boundary	Site inspections	Yes
12. No offensive odour or smoke at boundary of site	Site inspections	Yes
13. Hydrocarbon storage vessels fitted with vapour recovery systems	Site inspections	Yes
14. Limit on smoke opacity	No assessed during monitoring period	N/A
15. Limit on carbon monoxide emissions	No assessed during monitoring period	N/A
16. Limit on nitrogen dioxide emissions	No assessed during monitoring period	N/A

Purpose: To discharge emissions to air during flaring from well workovers, in emergency situations, from a permanent pilot flame and other miscellaneous emissions associated with production activities at the Radnor-B wellsite		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
17. No discharge of contaminant that exceeds specific WES limits	No assessed during monitoring period	N/A
18. Record of smoke emitting incidents	Flaring logs received	Yes
19. Maintenance of flaring logs	Flaring logs received	Yes
20. Supply monthly flaring information to Council	Flaring logs received	Yes
21. Provision of annual air emissions report	Report received	Yes
22. Analysis of gas and crude oil stream	Not requested	N/A
23. Lapse of consent	Consent exercised within lapse period	N/A
24. Provisions for review of consent conditions	No further option to review prior to expiry	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 9 Summary of performance for consent 6399-1

Purpose: To take water from the Piakau Stream for hydrocarbon exploration purposes associated with the Radnor-B wellsite		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practicable option to prevent or minimise adverse environmental effects	Site inspections and liaison with consent holder	Yes
2. Notify Council prior to abstraction	No abstraction during period under review	N/A
3. Total volume abstracted not to exceed 100 m ³ /day or 25 L/s	No abstraction during period under review	N/A
4. Abstraction to cease when flow in Piakau Stream is below 45 L/sec	No abstraction during period under review	N/A
5. Maintenance of abstraction records	No abstraction during period under review	N/A

Purpose: To take water from the Piakau Stream for hydrocarbon exploration purposes associated with the Radnor-B wellsite		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
6. Exercise of consent in accordance with application	No abstraction during period under review	N/A
7. Intake structure to be screened	No abstraction during period under review	N/A
8. Lapse of consent	Consent exercised within lapse period	N/A
9. Provisions for review of consent conditions	No further provision for review prior to expiry	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 10 Summary of performance for consent 9966-1

Purpose: To discharge treated stormwater from hydrocarbon exploration and production operations at the Radnor-B wellsite through a roadside drain into an unnamed tributary of the Piakau Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practicable option to prevent effects on environment	Site inspections	Mostly. Inadequate containment of drilling muds noted in one inspection.
2. Maximum stormwater catchment	Site inspections	Yes
3. Consent holder to notify Council of site works or well drilling operations	Notification received	Yes
4. Consent holder to maintain and regularly update a contingency plan	Plan up-to-date as of December 2017	Yes
5. Design, management and maintenance of stormwater system in accordance with application	Site inspections	Mostly. Skimmer pits may have overflowed due to stormwater influx from neighbouring property.
6. All discharge from the site to flow through a perimeter drain and skimmer pit	Site inspections	Yes
7. Skimmer pit capacity at least 112.5m ³	Site inspections	Yes
8. Skimmer pits to be lined with an impervious material and be fitted with a shut off valve	Site inspections	Yes

Purpose: To discharge treated stormwater from hydrocarbon exploration and production operations at the Radnor-B wellsite through a roadside drain into an unnamed tributary of the Piakau Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
9. Perimeter drains and skimmer pits to be installed before any site works commence	Site inspections	Yes
10. Limits on contaminants in the discharge	Measured using a meter, results compliant	Yes
11. pH may exceed 9.0 if due to photosynthetic activity in the skimmer pits	pH in pits did not exceed 9.0 when measured	N/A
12. Limits on chloride, BOD and temperature increase below mixing zone	Not sampled during current monitoring period	N/A
13. Effects on stream below mixing zone	Inspections	Yes
14. Council advised prior to reinstatement of the site	Site not reinstated during period under review	N/A
15. Provisions for review of consent conditions	Optional review scheduled in June 2022 if required	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		High

3.3.3 Ngatoro-A satellite site

Table 11 Summary of performance for consent 4073-3

Purpose: To discharge treated stormwater from hydrocarbon exploration and production operations at the Ngatoro-A wellsite, onto land and into an unnamed tributary of the Ngatoro Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practicable option to prevent effects on environment	Site inspections	Yes
2. Maximum stormwater catchment	Site inspections	Yes
3. Consent holder to notify Council of site works or well drilling operations	No works during period under review	Yes
4. Consent holder to maintain and regularly update a contingency plan	Plan up-to-date as of December 2017	Yes

Purpose: To discharge treated stormwater from hydrocarbon exploration and production operations at the Ngatoro-A wellsite, onto land and into an unnamed tributary of the Ngatoro Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
5. Design, management and maintenance of stormwater system in accordance with application	Site inspections	Yes
6. All discharge from the site to flow through a perimeter drain and skimmer pit	Site inspections	Yes
7. Skimmer pit capacity at least 102m ³	Site inspections	Yes
8. Skimmer pits to be lined with an impervious material and be fitted with a shut off valve	Site inspections	Yes
9. Perimeter drains and skimmer pits to be installed before any site works commence	Site inspections	Yes
10. Limits on contaminants in the discharge	Samples not collected during period under review	N/A
11. pH may exceed 9.0 if due to photosynthetic activity in the skimmer pits	Samples not collected during period under review	N/A
12. Limits on chloride, BOD and temperature increase below mixing zone	Samples not collected during period under review	N/A
13. Effects on stream below mixing zone	Inspections	Yes
14. Council advised prior to reinstatement of the site	Site not reinstated during period under review	N/A
15. Provisions for review of consent conditions	Optional review scheduled in June 2019 if required, recommendation attached in section 3.6	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 12 Summary of performance for consent 7295-1

Purpose: To discharge emissions into the air during flaring		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Council notified of continuous flaring	No flaring at site during monitoring period	N/A

Purpose: To discharge emissions into the air during flaring		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
2. Neighbours notified prior to flaring	No flaring at site during monitoring period	N/A
3. Consultation prior to alteration to plant equipment or processes	Site inspections	Yes
4. Regard given to wind conditions during flaring	No flaring at site during monitoring period	N/A
5. Gas treated by liquid and solid separation and recovery	Site inspections	Yes
6. Notify Council of any failure to maintain liquid and solid separation	No flaring at site during monitoring period	N/A
7. No liquid or solid hydrocarbons combusted through gas flare	No flaring at site during monitoring period	N/A
8. Best practicable option to prevent effects on environment	No flaring at site during monitoring period	N/A
9. Flare only used to dispose of substances from the well stream	No flaring at site during monitoring period	N/A
10. No offensive odour or smoke at boundary of site	No flaring at site during monitoring period	N/A
11. Hydrocarbon storage vessels fitted with vapour recovery systems	Site inspections	Yes
12. Limit on smoke opacity	No flaring at site during monitoring period	N/A
13. Limit on carbon monoxide emissions	No flaring at site during monitoring period	N/A
14. Limit on nitrogen dioxide emissions	No flaring at site during monitoring period	N/A
15. No discharge of contaminant that is hazardous, toxic or noxious beyond boundary	No flaring at site during monitoring period	N/A
16. No discharge of contaminant that exceeds specific WES limits	No flaring at site during monitoring period	N/A
17. Analysis of gas and crude oil stream	No flaring at site during monitoring period	N/A
18. Record of smoke emitting incidents	No flaring at site during monitoring period	N/A
19. Maintenance of flaring logs	No flaring at site during monitoring period	N/A
20. Provision of annual air emissions report	Report received	Yes

Purpose: To discharge emissions into the air during flaring		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
21. Lapse of consent	Consent exercised within lapse period	N/A
22. Provisions for review of consent conditions	Optional review scheduled in June 2021 if required	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 13 Evaluation of environmental performance over time

Year	Consent no	High	Good	Improvement req	Poor
2011-12	1334-3, 4048-3, 5384-1, 6218-1	4			
	4073-2, 7295-1	2			
	3951-2, 7220-1	2			
2012-13	1334-3		1		
	4048-3, 5384-1, 6218-1	3			
	4073-2, 7295-1	2			
	3951-3, 7220-1	2			
2013-14	1334-3			1	
	4048-3, 5384-1, 6218-1	3			
	4073-2		1		
	7295-1	1			
	3951-3, 7220-1	2			
2014-15	1334-3, 4048-3, 5384-2	3			
	4073-2, 7295-1	2			
	3951-3, 7220-1	2			
2015-16	1334-3, 4048-3, 5384-2	3			
	4073-2, 7295-1	2			
	3951-3, 7220-1	2			
2016-17	1334-3, 4048-3, 5384-2	3			
	4073-2, 7295-1	2			
	3951-3, 7220-1	2			
Totals		42	2	1	

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

3.4 Recommendations from the 2016-2017 Annual Report

In the 2016-2017 Annual Report, it was recommended:

1. THAT in the first instance, monitoring of consented activities at the Kaimiro and Ngatoro sites in the 2017-2018 year continue at the same level as in 2016-2017.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

Recommendation one was carried out, while it was not considered necessary to undertake additional monitoring as per recommendation two.

3.5 Alterations to monitoring programmes for 2018-2019

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

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

The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki exercising resource consents.

It is proposed that for 2018-2019 monitoring of consented activities at the Kaimiro Production Station, Radnor Production Station, and Ngatoro-A satellite site continue at a similar level to that of 2017-2018, with the addition of a one-off round of BTEX (benzene toluene, ethylbenzene and total xylenes) monitoring at Kaimiro Production Station. This is in response to public concerns regarding benzene emissions from petroleum facilities, and this monitoring will be added to all petroleum industry compliance programmes in the 2018-2019 year.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the sites in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2018-2019.

3.6 Exercise of optional review of consent

Resource consent 4073-3 provides for an optional review of the consent in June 2019. Condition 15 allows the Council to review the consent, 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.

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

4 Recommendations

1. THAT in the first instance, monitoring of consented activities at the Kaimiro Production Station, Radnor Production Station and Ngatoro-A satellite site in the 2018-2019 year continue at a similar level as in 2017-2018, with the addition of a one-off round of BTEX monitoring.
2. THAT should there be issues with environmental or administrative performance in 2018-2019, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT the option for a review of resource consent 4073-3 in June 2019, as set out in condition 15 of the consent, not be exercised, as it is considered that the current conditions are adequate.

Glossary of common terms and abbreviations

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

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.
BODCF	Filtered carbonaceous biochemical oxygen demand. A measure of the presence of degradable organic matter, excluding the biological conversion of ammonia to nitrate.
Bund	A wall around a tank to contain its contents in the case of a leak.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
g/m ³	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
Incident Register	The Incident Register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
LEL	Lower Explosive Limit. The percentage of the lower explosive limit, expressed as methane that is detected in the air sampled.
m ²	Square Metres.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NES	National Environmental Standards
NO _x	Nitrogen oxides
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).

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, respectively).
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	<i>Resource Management Act 1991</i> and including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
UI	Unauthorised Incident.

For further information on analytical methods, contact a Science Services Manager.

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Appendix I

Resource consents held by Greymouth Petroleum Ltd

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

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

Name of
Consent Holder: Greymouth Petroleum Acquisition Company Limited
P O Box 3394
Fitzroy
NEW PLYMOUTH 4341

Decision Date
(Change): 8 April 2014

Commencement Date
(Change): 8 April 2014 (Granted: 10 January 2002)

Conditions of Consent

Consent Granted: To discharge treated stormwater from the Kaimiro
Production Station site into an unnamed tributary of the
Mangaoraka Stream in the Waiongana catchment

Expiry Date: 1 June 2020

Review Date(s): June 2014

Site Location: Kaimiro Production Station, Upland Road, Inglewood

Legal Description: Lot 4 DP 436344 (Discharge source)
Lot 2 DP 19651 (Discharge site)

Grid Reference (NZTM) 1699783E–5664369N

Catchment: Waiongana

Tributary: Mangaoraka

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

Consent 1334-3.2

General condition

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

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects of the discharge on any water body.
2. The maximum stormwater catchment area shall be no more than 25,000 m².
3. Prior to the exercise of this consent, the consent holder shall provide for the written approval of the Chief Executive, Taranaki Regional Council, site specific details relating to contingency planning for the production site.
4. All site water to be discharged under this permit shall be directed for treatment through the stormwater treatment system for discharge in accordance with the specific conditions of this permit.
5. The design, management and maintenance of the stormwater system shall be generally undertaken:
 - in accordance with the stormwater management plan submitted to Taranaki Regional Council on 16 August 2012, in response to the request for further information for application 7156; and
 - as amended by the stormwater design report submitted with the application for consent 1334-3.2, prepared by BTW Company Limited and dated 28 February 2014.

These plans shall be followed at all times. If changes are proposed, the consent holder shall advise the Taranaki Regional Council one month prior to the changes to the plan.

6. Any above ground hazardous substances storage areas shall be bunded with drainage to sumps, or other appropriate recovery systems, and not to the stormwater catchment.
7. Constituents of the discharge shall meet the standards shown in the following table.

Constituent	Concentration
pH (range)	6.5 – 8.5
suspended solids	100 gm ⁻³
total recoverable hydrocarbons (infrared spectroscopic technique)	15 gm ⁻³
chloride	230 gm ⁻³

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

Consent 1334-3.2

8. After allowing for reasonable mixing, within a mixing zone extending 15 metres downstream of the discharge point, the discharge shall not give rise to any of the following effects in the receiving waters of the unnamed tributary of the Mangaoraka Stream:
 - a. an increase in temperature of more than 2 degrees Celsius; and
 - b. filtered carbonaceous biochemical oxygen demand shall not exceed 2.00 gm^{-3} ; or
 - c. shall not cause the chloride concentration to exceed 50 gm^{-3}
9. After allowing for reasonable mixing, within a mixing zone extending 15 metres downstream of the discharge point, the discharge shall not give rise to any of the following effects in the receiving waters of the unnamed tributary of the Mangaoraka 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; and
 - e. any significant adverse effects on aquatic life.
10. The consent holder shall prepare annually and maintain a contingency plan to the satisfaction of the Chief Executive, Taranaki Regional Council, outlining measures and procedures undertaken to prevent spillage or accidental discharge of contaminants, and procedures to be carried out should such a spillage or discharge occur.
11. The Chief Executive, Taranaki regional Council, shall be advised in writing at least 48 hours prior to the reinstatement of the site and the reinstatement shall be carried out so as to minimise effects on stormwater quality.
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 2008 and/or June 2014, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 8 April 2014

For and on behalf of
Taranaki Regional Council

A D McLay
Director-Resource Management

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

Name of
Consent Holder: Greymouth Petroleum Acquisition Company Limited
P O Box 3394
NEW PLYMOUTH 4341

Consent Granted
Date: 10 January 2008

Conditions of Consent

Consent Granted: To discharge emissions into the air from the flaring of hydrocarbons arising from hydrocarbon production and processing operations, together with miscellaneous emissions, at the Kaimiro Production Station at or about 2609726E-6225978N

Expiry Date: 1 June 2026

Review Date(s): June 2014, June 2020

Site Location: Upland Road, Inglewood

Legal Description: Pt Sec 115 Tarurutangi Dist Blk III Egmont SD

Consent 4048-3

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

Duration

1. Flaring of gas from each well during well testing shall not occur on more than 30 days.

Information and notification

2. At least 24 hours before any flaring, other than in emergencies, the consent holder shall provide notification to all residents within 1000 metres of the site of the commencement of flaring. The consent holder shall include in the notification a 24-hour contact telephone number for a representative of the consent holder, and shall keep and make available to the Chief Executive, Taranaki Regional Council, a record of all queries and complaints received.
3. The consent holder shall notify the Chief Executive, Taranaki Regional Council, whenever the continuous flaring of hydrocarbons [other than purge gas] is expected to occur for more than five minutes in duration. Notification shall be no less than 24 hours before the flaring commences. Notification shall include the consent number and be emailed to worknotification@trc.govt.nz. Notification by fax or post is acceptable if the consent holder does not have access to email.
4. No alteration shall be made to plant equipment or processes which may substantially alter the nature or quantity of flare emissions or other site emissions, including but not limited to the recovery of produced gas, other than as authorised by this consent, without prior consultation with the Chief Executive, Taranaki Regional Council.

Emissions from the site

5. Other than for the maintenance of a pilot flare flame, the consent holder shall have regard to the prevailing and predicted wind speed and direction at the time of initiation of, and throughout, any episode of flaring so as to minimise offsite effects.

Consent 4048-3

6. All gas that is flared must first be treated by effective liquid and solid separation and recovery to ensure that smoke emission during flaring is minimised.
7. No liquid or solid hydrocarbons shall be combusted through the gas flare system.
8. Only substances originating from the well stream and treated as outlined by conditions 6 and 7 shall be combusted within the flare pit.
9. All hydrocarbon storage vessels shall be fitted with vapour recovery systems.
10. The consent holder shall adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or potential effect on the environment arising from any emission to air from the flare or any other emissions to air from the Kaimiro Production Station.
11. There shall not be any offensive odour or smoke at or beyond the boundary of the property where the production station is located.
12. The opacity of any smoke emissions shall not exceed a level of 1 as measured on the Ringelmann Scale.
13. The consent holder shall control all emissions of carbon monoxide to the atmosphere from the flare so that, whether alone or in conjunction with any other emissions from the production station, 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 [mg/m^3] [eight-hour average exposure], or 30 mg/m^3 one-hour average exposure] at or beyond the boundary of the property.
14. The consent holder shall control all emissions of nitrogen oxides to the atmosphere from the flare so that, whether alone or in conjunction with any other emissions from the production station, the maximum ground level concentration of nitrogen dioxide arising from the exercise of this consent measured under ambient conditions does not exceed 100 micrograms per cubic metre [$\mu\text{g}/\text{m}^3$] [24-hour average exposure], or 200 $\mu\text{g}/\text{m}^3$ [1-hour average exposure] at or beyond the boundary of the of the property.
15. The consent holder shall control emissions to the atmosphere, from the production station and flare, of contaminants other than carbon dioxide, carbon monoxide, and nitrogen oxides so that, whether alone or in conjunction with any other emissions from the production station, is not hazardous or toxic or noxious at or beyond the boundary of the property.
16. The consent holder shall control emissions to the atmosphere from the production station and flare of contaminants other than carbon dioxide, carbon monoxide, and nitrogen oxides so that, whether alone or in conjunction with any emissions from the flare, 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, is not increased above background levels:

Consent 4048-3

- a) by more than 1/30th of the relevant Occupational Threshold Value-Time Weighted Average, or by more than the Short Term Exposure Limit at any time [all terms as defined in Workplace Exposure Standards, 2002, Department of Labour]; or
- b) if no Short Term Exposure Limit is set, by more than three times the Time Weighted Average at any time [all terms as defined in Workplace Exposure Standards, 2002, Department of Labour].

Recording and reporting information

17. Each time there is visible smoke as a result of the exercise of this consent, the consent holder shall record the time, duration and cause. The consent holder shall make the record available to the Chief Executive, Taranaki Regional Council, upon request.
18. Each month, the consent holder shall supply to the Chief Executive, Taranaki Regional Council a record of flaring information in relation to the production station, and each wellsite. The flaring information supplied shall comprise: 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 the flaring events.
19. The consent holder shall record and maintain a log of all continuous flaring events longer than five minutes duration, and any intermittent flaring lasting for an aggregate of ten minutes or longer in any 120-minute period. The log shall contain the date, the start and finish times of the flaring event, 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 20.
20. The consent holder shall provide to the Taranaki Regional Council during May of each year, for the duration of this consent, a report:
 - i) detailing any energy efficiency measures implemented on the site;
 - ii) detailing smoke emissions as required under condition 17;
 - iii) detailing any measures undertaken or proposed to reduce smoke emissions;
 - iv) detailing any measures undertaken or proposed to reduce flaring;
 - v) addressing any other issue relevant to the minimisation or mitigation of emissions from the flare;
 - vi) detailing any complaints received and any measures undertaken to address complaints; and
 - vii) reviewing all options and technological advances relevant to the reduction or mitigation of any discharge to air from the site, how these might be applicable and/or implemented at the site, and the benefits and costs of these advances.
21. The consent holder shall make available to the Chief Executive, Taranaki Regional Council, upon request, an analysis of a typical gas and condensate stream from the field, covering sulphur compound content and the content of carbon compounds of structure C₆ or higher number of compounds.

Review

22. 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 within six months of receiving a report prepared by the consent holder pursuant to condition 20 of this consent, and/or by giving notice of review during the month of June 2014 and/or June 2020, for any of the following purposes:
- 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;
 - 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;
 - c) to alter, add or delete limits on mass discharge quantities or discharge or ambient concentrations of any contaminant;
 - d) taking into account any Act of Parliament, regulation, national policy statement or national environmental standard which relates to limiting, recording, or mitigating emissions of gases which are products of combustion, and which is relevant to the air discharge from the Kaimiro Production Station.

Signed at Stratford on 10 January 2008

For and on behalf of
Taranaki Regional Council

Director-Resource Management

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

Name of
Consent Holder: Greymouth Petroleum Acquisition Company Limited
PO Box 3394
New Plymouth 4341

Decision Date: 30 June 2016

Commencement Date: 30 June 2016

Conditions of Consent

Consent Granted: To discharge treated stormwater from hydrocarbon exploration and production operations at the Ngatoro-A wellsite, onto land and into an unnamed tributary of the Ngatoro Stream

Expiry Date: 1 June 2021

Review Date(s): June 2019

Site Location: Ngatoro-A wellsite, 561 Dudley Road, Inglewood

Grid Reference (NZTM) 1701212E-5659859N

Catchment: Waitara

Tributary: Manganui
Ngatoro

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

General condition

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

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any 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 7000 m².
3. At least 5 working days prior, the consent holder shall advise the Chief Executive, Taranaki Regional Council of the date of each of the following events:
 - a) commencement of any site works (site works includes the introduction of a drilling rig, drilling equipment or any other associated equipment for the purpose of drilling, testing, well stimulation or well workover that may introduce contaminants to the site);
 - b) commencement of any well drilling operation; and
 - c) recommencement of any site works or drilling operations following a period of inactivity exceeding 30 days.

If any of these events is rescheduled or delayed, the consent holder shall immediately provide further notice advising of the new date.

Any advice given in accordance with this condition shall include the consent number and the wellsite name and be emailed to worknotification@trc.govt.nz.

4. The consent holder shall maintain and regularly update a contingency plan that details measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not authorised by this consent and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge. The plan shall be approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity prior to any discharge from the site.
5. Subject to the other conditions of this consent the design, management and maintenance of the stormwater system shall be undertaken in accordance with the information submitted in support of the application for this consent.
6. All discharges from the site, including from any containment pit or hydrocarbon combustion facility (e.g. flare pit, thermal oxidiser), shall flow to a perimeter drain and skimmer pit. Perimeter drains shall be designed, including by having a positive grade and low permeability, to ensure that runoff flows directly to a skimmer pit without ponding.

Consent 4073-3.0

7. The skimmer pit system shall have a combined capacity of no less than 102 m³ including a 'freeboard' of no less than 59 m³, and be designed to retain any hydrocarbons that enter them.
8. All skimmer pits and any other stormwater retention areas shall be lined with an impervious material to prevent seepage through the bed and sidewalls, and all skimmer pits shall have a valve that can be shut off to prevent any discharge from the site.
9. Perimeter drains and skimmer pits necessary to comply with the conditions of this consent shall be installed before any site works commences. Site works includes the introduction of a drilling rig, drilling equipment or any other associated equipment or facilities to the site for any purpose other than for the construction of the site.
10. Subject to condition 11 the constituents in the discharge shall meet the standards shown in the following table.

Constituent	Standard
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 [as determined by infrared spectroscopic technique]

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

11. The pH may exceed 9.0 if the exceedance is a result photosynthetic activity within the skimmer pits, but in any case the discharge shall not result in the pH of the receiving water increasing by more than 0.5 pH units after allowing for a mixing zone of 25 metres.
12. After allowing for a mixing zone of 25 metres from the point of discharge into the unnamed tributary of the Ngatoro Stream, the discharge shall not cause any of the following effects in the receiving water:
 - a) an increase in the temperature of more than 2 degrees Celsius;
 - b) the filtered carbonaceous biochemical oxygen demand to exceed 2 gm⁻³; or
 - c) the chloride concentration to exceed 50 gm⁻³.
13. After allowing for a mixing zone of 25 metres from the point of discharge into the unnamed tributary of the Ngatoro Stream, the discharge shall not give rise to any of the following effects in the receiving water:
 - a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - b) any conspicuous change in the colour or visual clarity;
 - c) any emission of objectionable odour;
 - d) the rendering of fresh water unsuitable for consumption by farm animals;
 - e) any significant adverse effects on aquatic life.

Consent 4073-3.0

14. The consent holder shall advise the Chief Executive, Taranaki Regional Council, in writing at least 48 hours prior to the reinstatement of the site and the reinstatement shall be carried out so as to minimise adverse effects on stormwater quality. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz.
15. 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 2019 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 30 June 2016

For and on behalf of
Taranaki Regional Council

A D McLay
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: Greymouth Petroleum Acquisition Company Limited
PO Box 3394
New Plymouth 4341

Decision Date: 24 July 2014

Commencement Date: 24 July 2014

Conditions of Consent

Consent Granted: To take groundwater from the Matemateaonga Formation for use in enhanced hydrocarbon recovery activities at the Kaimiro-O wellsite

Expiry Date: 01 June 2032

Review Date(s): June 2020, June 2026

Site Location: Kaimiro-O wellsite, 455 Alfred Road, Egmont Village
(Property owner: St Leger Manning Reeves & Robert Baker)

Legal Description: Pt Sec 115-116 Hua & Waiwhakaiho Hun (Site of take)

Grid Reference (NZTM) 1698651E-5663191N

Catchment: Waiwhakaiho

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

General condition

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

Special conditions

1. The total volume of water taken from the bore shall not exceed 550 cubic metres per day and/or 6.4 litres/second.
2. The bore shall be easily identifiable by permanent labels, which may be welded or engraved on the casing, or on the equivalent fixed part of the bore construction or associated building. The numbering on the label shall be the bore number assigned by the Taranaki Regional Council (GND2456).
3. Prior to exercising this consent the consent holder shall install, and thereafter maintain a water meter and a datalogger at the site of taking. The water meter and datalogger shall be tamper-proof and shall measure and record the rate and volume of water taken to an accuracy of $\pm 5\%$.

Note: Water meters and dataloggers must be installed, and regularly maintained, in accordance with manufacturer's specifications in order to ensure that they meet the required accuracy. Even with proper maintenance water meters have a limited lifespan.

4. The records of water taken shall:
 - a. be in a format that, in the opinion of the Chief Executive, Taranaki Regional Council, is suitable for auditing;
 - b. specifically record the water taken as 'zero' when no water is taken; and
 - c. for each 12-month period ending on 30 June, be provided to the Chief Executive, Taranaki Regional Council within one month after end of that period.
5. Within 30 days of the installation of a water meter or datalogger, and at other times when reasonable notice is given, the consent holder shall provide the Chief Executive, Taranaki Regional Council with a document from a suitably qualified person certifying that:
 - a. water measuring or recording equipment required by the conditions of this consent has been installed and/or maintained in accordance with the manufacturer's specifications; and/or
 - b. water measuring or recording equipment required by the conditions of this consent has been tested and shown to be operating to an accuracy of $\pm 5\%$.
6. The water meter and datalogger shall be accessible to Taranaki Regional Council officer's at all reasonable times for inspection and/or data retrieval.
7. If any measuring or recording equipment breaks down, or for any reason is not operational, the consent holder shall advise the Chief Executive, Taranaki Regional Council immediately. Any repairs or maintenance to this equipment must be undertaken by a suitably qualified person.

Consent 5384-2.0

8. At all times the consent holder shall adopt the best practicable option (BPO) to prevent or minimise any actual or likely adverse effect on the environment associated with the abstraction of groundwater, including, but not limited to, the efficient and conservative use of water.
9. This consent shall lapse on 30 September 2019, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.
10. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2020 and/or June 2026 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 24 July 2014

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

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

Name of
Consent Holder: Bridge Petroleum Limited
General Manager
P O Box 112341
Penrose
AUCKLAND

Change To
Conditions Date: 31 July 2006 [Granted: 10 June 2004]

Conditions of Consent

Consent Granted: To discharge emissions to air during flaring from well workovers, in emergency situations, from a permanent pilot flame and other miscellaneous emissions associated with production activities at the Radnor-B wellsite at or about GR: Q20:192-109

Expiry Date: 1 June 2022

Review Date(s): June 2010, June 2016

Site Location: Radnor-B Wellsite, Radnor Road, Midhirst
[Property owner: AB & LH Crowskey]

Legal Description: Lot 23 DP 18 Sec 47 Manganui Dist Blk XIII Huiroa SD

General conditions

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

Special conditions

Conditions 1 to 12 – unchanged

Information and notification

1. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least one month prior to the establishment of production operations at the Radnor-B wellsite.
2. At least 24 hours prior to any flaring, other than in emergencies, the consent holder shall undertake all practicable measures to notify residents within 1000 metres of the site of the commencement of flaring. The consent holder shall include in the notification a 24-hour contact telephone number for a representative of the consent holder, and shall keep and make available to the Chief Executive, Taranaki Regional Council, a record of all queries and/or complaints received.
3. The consent holder shall, whenever practicable, notify the Chief Executive, Taranaki Regional Council, whenever the continuous flaring of hydrocarbons [other than purge gas] is expected to occur for more than five minutes in duration. Notification shall, as far as practicable, be no less than 24 hours prior to such flaring being commenced.
4. No alteration shall be made to plant equipment or processes which may substantially alter the nature or quantity of flare emissions or other site emissions, including but not limited to the recovery of produced gas, other than as notified in this consent application, without prior consultation with the Chief Executive, Taranaki Regional Council, and the consent holder shall obtain any necessary approvals under the Resource Management Act 1991.

Emissions from the site

5. Other than for the maintenance of a pilot flare flame, the consent holder shall have regard to the prevailing and predicted wind speed and direction at the time of initiation of any episode of flaring or other combustion of hydrocarbons.
6. All gas being flared, at any time must first be treated by effective liquid and solid separation and recovery, as far as is practicable, to ensure that smoke emission during flaring is minimised.
7. If separation cannot be implemented and/or maintained at any time while there is a flow from the well, whether natural or induced, then the consent holder shall notify the Chief Executive, Taranaki Regional Council, and shall in any case re-establish liquid and solid separation and recovery within three hours.
8. Subject to special conditions 6 and 7, no liquid or solid hydrocarbons shall be combusted through the gas flare system other than in an emergency.
9. Only substances originating from the well stream and treated as outlined by conditions 6, 7, 8, and 10 are to be combusted within the flare pit.
10. The consent holder shall adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or potential effect on the environment arising from any emission to air from the flare or any other emissions to air from the Radnor-B wellsite. Any adoption of the best practicable option as outlined in this special condition shall be to the satisfaction of the Chief Executive, Taranaki Regional Council.
11. The consent holder shall not discharge any contaminant to air authorised by this consent 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 wellsite, or beyond 100 metres of the flare, whichever distance is greater.
12. There shall not be any offensive odour or smoke, as determined by an enforcement officer of the Taranaki Regional Council, beyond the boundary of the wellsite or beyond 100 metres of the flare, whichever distance is greater, arising from the exercise of this consent.

Condition 13 – changed

13. All hydrocarbon storage vessels shall be fitted with vapour recovery systems as soon as practicable, but no later than 6th May 2007.

Conditions 14 to 24 – unchanged

14. The opacity of any smoke emissions shall not exceed a level of 1 as measured on the Ringelmann Scale for more than four minutes cumulative duration in any 60-minute period.
15. The consent holder shall control all emissions of carbon monoxide to the atmosphere from the flare, whether alone or in conjunction with any other emissions from the wellsite, in order that the maximum ground level concentration of carbon monoxide arising from the exercise of this consent measured under ambient conditions does not exceed 10 mg/m³ [eight-hour average exposure], or 30 mg/m³ one-hour average exposure] at or beyond the boundary of the wellsite or beyond 100 metres from the flare, whichever distance is greater.
16. The consent holder shall control all emissions of nitrogen oxides to the atmosphere from the flare, whether alone or in conjunction with any other emissions from the wellsite, 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 100 micrograms per cubic metre [24-hour average exposure], or 200 micrograms per cubic metre [1-hour average exposure] at or beyond the boundary of the wellsite, or beyond 100 metres from the flare, whichever distance is greater.
17. The consent holder shall control emissions to the atmosphere from the wellsite and flare of contaminants other than carbon dioxide, carbon monoxide, and nitrogen oxides, whether alone or in conjunction with any emissions from the flare, 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 wellsite or beyond 100 metres from the flare, whichever distance is greater, is not increased above background levels:
 - a) by more than 1/30th of the relevant Occupational Threshold Value-Time Weighted Average, or by more than the Short Term Exposure Limit at any time [all terms as defined in Workplace Exposure Standards, 2002, Department of Labour]; or
 - b) if no Short Term Exposure Limit is set, by more than three times the Time Weighted Average at any time [all terms as defined in Workplace Exposure Standards, 2002, Department of Labour].

Recording and reporting information

18. 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.

Consent 6394-1

19. The consent holder shall keep and maintain a log of all continuous flaring incidents longer than five minutes, and any intermittent flaring lasting for an aggregate of ten minutes or longer in any 120-minute period. Such a log shall contain the date, the start and finish times, the quantity and type of material flared, and the reason for flaring. This log shall be made available to the Chief Executive, Taranaki Regional Council, upon request, and summarised annually in the report required under condition 20.
20. 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.
21. The consent holder shall provide to the Taranaki Regional Council during May of each year, for the duration of this consent, a report:
 - i) detailing gas combustion in the flare;
 - ii) detailing smoke emissions as required under condition 18;
 - iii) detailing any measures to reduce smoke emissions;
 - iv) detailing any measures to reduce flaring;
 - v) addressing any other issue relevant to the minimisation or mitigation of emissions from the flare;
 - vi) detailing any complaints received and any measures undertaken to address complaints; and
 - vii) reviewing all options and technological advances relevant to the reduction or mitigation of any discharge to air from the site, particularly but without limitation to gas capture and transfer, how these might be applicable and/or implemented at the site, and the benefits and costs of these advances.
22. The consent holder shall make available to the Chief Executive, Taranaki Regional Council, upon request, an analysis of a typical gas and crude oil stream from the field, covering sulphur compound content and the content of carbon compounds of structure C₆ or higher number of compounds.

Lapse and Review

23. This consent shall lapse on the expiry of 16 years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

Consent 6394-1

24. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2010 and/or June 2016, 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 31 July 2006

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: Bridge Petroleum Limited
P O Box 38187
Howick
AUCKLAND

Consent Granted
Date: 10 June 2004

Conditions of Consent

Consent Granted: To take water from the Piakau Stream for hydrocarbon exploration purposes associated with the Radnor-B wellsite at or about GR: Q20:192-109

Expiry Date: 1 June 2022

Review Date(s): June 2010, June 2016

Site Location: Radnor-B Wellsite, Radnor Road, Midhirst
[Property owner: A B & L H Crofskey]

Legal Description: Lot 23 DP 18 Sec 47 Manganui Dist Blk XIII Huiroa SD

Catchment: Patea

Tributary: Piakau South

Consent 6399-1

General conditions

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

Special conditions

1. At all times the consent holder shall adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or likely adverse effects on the environment associated with the abstraction of water from the Piakau Stream, including, but not limited to, the efficient and conservative use of water.
2. The consent holder shall notify the Taranaki Regional Council in writing at least 48 hours prior to any abstraction activity.
3. The volume of water abstracted shall not exceed 100 cubic metres/day at a rate not exceeding 25 litres/second.
4. The abstraction authorised by this consent shall cease when the flow in the Piakau Stream immediately below the abstraction site is less than 45 litres/second.
5. The consent holder shall maintain records of abstraction including date, pumping rates and volume abstracted, and shall make these records available to the Chief Executive, Taranaki Regional Council, upon request.
6. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 3092.
7. The consent holder shall ensure that the intake structure is appropriately screened to avoid the entrainment of freshwater fauna.
8. This consent shall lapse on the expiry of five years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

Consent 6399-1

9. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2010 and/or June 2016, 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 10 June 2004

For and on behalf of
Taranaki Regional Council

Director-Resource Management

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

Name of
Consent Holder: Greymouth Petroleum Limited
P O Box 3394
NEW PLYMOUTH 4341

Consent Granted
Date: 12 May 2008

Conditions of Consent

Consent Granted: To discharge emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Ngatoro-A wellsite at or about 2611074E-6221732N

Expiry Date: 1 June 2027

Review Date(s): June 2015, June 2021

Site Location: Ngatoro-A wellsite, Dudley Road, Inglewood
[Property owners: GD & VK Robinson]

Legal Description: Sec 11 Blk VIII Egmont SD

General conditions

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

Special conditions

Information and notification

1. The consent holder shall notify the Chief Executive, Taranaki Regional Council, whenever the continuous flaring of hydrocarbons [other than purge gas] is expected to occur for more than five minutes in duration. Notification shall be no less than 24 hours before the flaring commences. Notification shall include the consent number and be emailed to worknotification@trc.govt.nz. Notification by fax or post is acceptable if the consent holder does not have access to email.
2. At least 24 hours before any flaring, other than in emergencies, the consent holder shall provide notification to all residents within 1000 metres of the site of the commencement of flaring. The consent holder shall include in the notification a 24-hour contact telephone number for a representative of the consent holder, and shall keep and make available to the Chief Executive, Taranaki Regional Council, a record of all queries and complaints received in respect of any flaring activity.
3. No alteration shall be made to plant equipment or processes which may substantially alter the nature or quantity of flare emissions or other site emissions, including but not limited to the recovery of produced gas, other than as authorised by this consent , without prior consultation with the Chief Executive, Taranaki Regional Council.

Emissions from the site

4. Other than for the maintenance of a pilot flare flame, the consent holder shall have regard to the prevailing and predicted wind speed and direction at the time of initiation of, and throughout, any episode of flaring so as to minimise offsite effects.
5. All gas that is flared must first be treated by effective liquid and solid separation and recovery to ensure that smoke emission during flaring is minimised.

Consent 7295-1

6. If separation required by special condition 5 cannot be implemented or maintained at any time while there is a flow from the well, whether natural or induced, then the consent holder shall immediately advise the Compliance Manager, Taranaki Regional Council, and shall in any case re-establish liquid and solid separation and recovery within three hours.
7. Subject to special condition 6, no liquid or solid hydrocarbons shall be combusted through the gas flare system, other than in an emergency.
8. The consent holder shall adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or potential effect on the environment arising from any emission to air from the flare or any other emissions to air from the Ngatoro-A wellsite [including use of a separator during well clean-up].
9. Only substances originating from the well stream and treated as outlined by conditions 5, 6, 7, and 8 shall be combusted within the flare pit.
10. There shall not be any offensive odour or smoke, as determined by an enforcement officer of the Taranaki Regional Council, at or beyond the boundary of the property where the wellsite is located.
11. All hydrocarbon storage vessels shall be fitted with vapour recovery systems.
12. The opacity of any smoke emissions shall not exceed a level of 1 as measured on the Ringelmann Scale.
13. The consent holder shall control all emissions of carbon monoxide to the atmosphere from the flare so that, whether alone or in conjunction with any other emissions from the wellsite, 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 [mg/m^3] [eight-hour average exposure], or 30 mg/m^3 one-hour average exposure] at or beyond the boundary of the property where the wellsite is located.
14. The consent holder shall control all emissions of nitrogen oxides to the atmosphere from the flare so that, whether alone or in conjunction with any other emissions from the wellsite, the maximum ground level concentration of nitrogen dioxide arising from the exercise of this consent measured under ambient conditions does not exceed 100 micrograms per cubic metre [$\mu\text{g}/\text{m}^3$] [24-hour average exposure], or 200 $\mu\text{g}/\text{m}^3$ [1-hour average exposure] at or beyond the boundary of the of the property where the wellsite is located.
15. The consent holder shall control emissions to the atmosphere, from the production station and flare, of contaminants other than carbon dioxide, carbon monoxide, and nitrogen oxides so that, whether alone or in conjunction with any other emissions from the production station, is not hazardous or toxic or noxious at or beyond the boundary of the property.

Consent 7295-1

16. The consent holder shall control emissions to the atmosphere from the wellsite and flare of contaminants other than carbon dioxide, carbon monoxide, and nitrogen oxides so that, whether alone or in conjunction with any emissions from the flare, 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 where the wellsite is located, is not increased above background levels:
- a) by more than 1/30th of the relevant Occupational Threshold Value-Time Weighted Average, or by more than the Short Term Exposure Limit at any time [all terms as defined in Workplace Exposure Standards, 2002, Department of Labour]; or
 - b) if no Short Term Exposure Limit is set, by more than three times the Time Weighted Average at any time [all terms as defined in Workplace Exposure Standards, 2002, Department of Labour].

Recording and reporting information

17. The consent holder shall make available to the Chief Executive, Taranaki Regional Council, upon request, an analysis of a typical gas and condensate stream from the field, covering sulphur compound content and the content of carbon compounds of structure C₆ or higher number of compounds.
18. Each time there is visible smoke as a result of the exercise of this consent, the consent holder shall record the time, duration and cause. The consent holder shall make the record available to the Chief Executive, Taranaki Regional Council, upon request.
19. The consent holder shall record and maintain a log of all continuous flaring events longer than five minutes duration, and any intermittent flaring lasting for an aggregate of ten minutes or longer in any 120-minute period. The log shall contain the date, the start and finish times of the flaring event, 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 20.
20. The consent holder shall provide to the Taranaki Regional Council during May of each year, for the duration of this consent, a report:
- i) detailing any energy efficiency measures implemented on the site;
 - ii) detailing smoke emissions as required under condition 18;
 - iii) detailing any measures undertaken or proposed to reduce smoke emissions;
 - iv) detailing any measures undertaken or proposed to reduce flaring;
 - v) addressing any other issue relevant to the minimisation or mitigation of emissions from the flare;
 - vi) detailing any complaints received and any measures undertaken to address complaints; and
 - vii) reviewing all options and technological advances relevant to the reduction or mitigation of any discharge to air from the site, how these might be applicable and/or implemented at the site, and the benefits and costs of these advances.

Lapse and Review

21. This consent shall lapse five years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.
22. 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 within six months of receiving a report prepared by the consent holder pursuant to condition 20 of this consent, and/or by giving notice of review during the month of June 2015 and/or June 2021, for any of the following purposes:
 - 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;
 - 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;
 - c) to alter, add or delete limits on mass discharge quantities or discharge or ambient concentrations of any contaminant;
 - d) taking into account any Act of Parliament, regulation, national policy statement or national environmental standard which relates to limiting, recording, or mitigating emissions of gases which are products of combustion, and which is relevant to the air discharge from the Ngatoro-A wellsite.

Signed at Stratford on 12 May 2008

For and on behalf of
Taranaki Regional Council

Director-Resource Management

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

Name of
Consent Holder: Greymouth Petroleum Limited
PO Box 3394
New Plymouth 4341

Decision Date: 01 September 2014

Commencement Date: 01 September 2014

Conditions of Consent

Consent Granted: To discharge treated stormwater from hydrocarbon exploration and production operations at the Radnor-B wellsite through a roadside drain into an unnamed tributary of the Piakau Stream

Expiry Date: 01 June 2028

Review Date(s): June 2016, June 2022

Site Location: Radnor-B wellsite, 15 Radnor Road, Midhurst
(Property owner: AB & LH Cropskey)

Legal Description: Lots 22 & 23 DP 18 (Site of skimmer pit & discharge)

Grid Reference (NZTM) 1709334E-5649159N

Catchment: Patea

Tributary: Piakau

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

General condition

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

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any 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 1.6 Ha.
3. At least 5 working days prior, the consent holder shall advise the Chief Executive, Taranaki Regional Council of the date of each of the following events:
 - a) commencement of any site works (site works includes the introduction of a drilling rig, drilling equipment or any other associated equipment or facilities to the site for any purpose other than for the construction of the site);
 - b) commencement of any well drilling operation; and
 - c) recommencement of any site works or drilling operations following a period of inactivity exceeding 30 days.

If any of these events is rescheduled or delayed, the consent holder shall immediately provide further notice advising of the new date.

Any advice given in accordance with this condition shall include the consent number and the wellsite name and be emailed to worknotification@trc.govt.nz.

4. The consent holder shall maintain a contingency plan that details measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not authorised by this consent and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge. The contingency plan shall be certified by the Chief Executive, Taranaki Regional Council prior to discharging from the site, and after any change to the Plan.
5. Subject to the other conditions of this consent the design, management and maintenance of the stormwater system shall be undertaken in accordance with the information submitted in support of the application for this consent, in particular, in accordance with:
 - the '*Stormwater Design Report for Radnor wellsite*' submitted with the application, prepared by BTW Company Limited and dated 31 July 2014; and
 - the '*Assessment of Environmental Effects*' (AEE) submitted with the application, prepared by BTW Company Limited and dated 31 July 2014.

These plans shall be followed at all times. If changes are proposed, the consent holder shall advise the Taranaki Regional Council one month prior to the changes to the plan.

Consent 9966-1.0

6. All discharges from the site, including from any containment pit or hydrocarbon combustion facility (e.g. flare pit, thermal oxidiser), shall flow to a perimeter drain and skimmer pit. Perimeter drains shall be designed, including by having a positive grade and low permeability, to ensure that runoff flows directly to a skimmer pit without ponding.
7. Skimmer pits shall have a combined capacity of no less than 112.5 m³ including a 'freeboard' of no less than 146.5 m³, and be designed to retain any hydrocarbons that enter them.
8. All skimmer pits and any other stormwater retention areas shall be lined with an impervious material to prevent seepage through the bed and sidewalls, and all skimmer pits shall have a valve that can be shut off to prevent any discharge from the site.
9. Perimeter drains and skimmer pits necessary to comply with the conditions of this consent shall be installed before any site works commences. Site works includes the introduction of a drilling rig, drilling equipment or any other associated equipment or facilities to the site for any purpose other than for the construction of the site.
10. Subject to condition 11 the constituents in the discharge shall meet the standards shown in the following table.

Constituent	Standard
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 (as determined by infrared spectroscopic technique)
chloride	Concentration not greater than 230 gm ⁻³

This condition shall apply immediately after the skimmer pit at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

11. The pH may exceed 9.0 if the exceedance is a result photosynthetic activity within the skimmer pits, but in any case the discharge shall not result in the pH of the receiving water increasing by more than 0.5 pH units after allowing for a mixing zone of 25 metres determined from (NZTM) 1710199E-5648843N.
12. After allowing for a mixing zone of 25 metres, determined from (NZTM) 1710199E-5648843N, the discharge shall not cause any of the following effects in the receiving water:
 - a) an increase in the temperature of more than 2 degrees Celsius;
 - b) the filtered carbonaceous biochemical oxygen demand to exceed 2 gm⁻³; or
 - c) the chloride concentration to exceed 50 gm⁻³.

Consent 9966-1.0

13. After allowing for a mixing zone of 25 metres, determined from (NZTM) 1710199E-5648843N, the discharge shall not give rise to any of the following effects in the receiving water:
 - a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - b) any conspicuous change in the colour or visual clarity;
 - c) any emission of objectionable odour;
 - d) the rendering of fresh water unsuitable for consumption by farm animals;
 - e) any significant adverse effects on aquatic life.
14. The consent holder shall advise the Chief Executive, Taranaki Regional Council, in writing at least 48 hours prior to the reinstatement of the site and the reinstatement shall be carried out so as to minimise adverse effects on stormwater quality. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz.
15. This consent shall lapse on 30 September 2019, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.
16. 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 01 September 2014

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

Appendix II

Biomonitoring reports

To Job Manager, Callum MacKenzie
From Environmental Scientist, Katie Blakemore
Document 2027219
Report No KB034
Date 22 March 2018

Biomonitoring of two unnamed tributaries of the Mangaoraka Stream in relation to discharges from the Kaimiro Production Station, December 2017

Introduction

This was the first of two biomonitoring surveys scheduled to be undertaken in the 2017-2018 monitoring year for the Kaimiro Production Station of Greymouth Petroleum (previously owned by Fletcher Challenge Energy Taranaki Limited).

The Taranaki Regional Council has undertaken surveys since January 1985 in the tributaries of the Mangaoraka Stream that receive stormwater and wastewater from the production station area. During 1987 and 1988 oil seepage to these streams disrupted the aquatic communities. Biomonitoring was not undertaken for nearly four years following the oil seepage period, until 1992. The results of surveys performed since the 1998-99 monitoring year are discussed in the references at the end of this report.

Methods

This survey was undertaken on 4 December 2017 at three sites in two unnamed tributaries of the Mangaoraka Stream. Figure 1 shows the location of these sampling sites. Site 1 is the 'control' site which is located in a major tributary of the Mangaoraka Stream, upstream of the confluence with a more minor tributary. Site 2 is situated in the minor tributary which receives the stormwater discharge from the production station and site 3 is approximately 50 metres downstream of the confluence of this tributary (Table 1).

Table 1 Biomonitoring sites in two tributaries of the Mangaoraka Stream sampled in relation to discharges from the Kaimiro Production Station

Site number	Site code	Grid reference (NZTM)	Location	Altitude (masl)
1	MRK000198	E1700117 N5664652	Major tributary approx. 50m u/s of confluence with minor tributary	240
2	MRK000204	E1700054 N5664636	Minor tributary (receives discharge) 150m d/s of Upland Road	240
3	MRK000207	E1700171 N5665679	Major tributary approx. 50m d/s of confluence with minor tributary	240

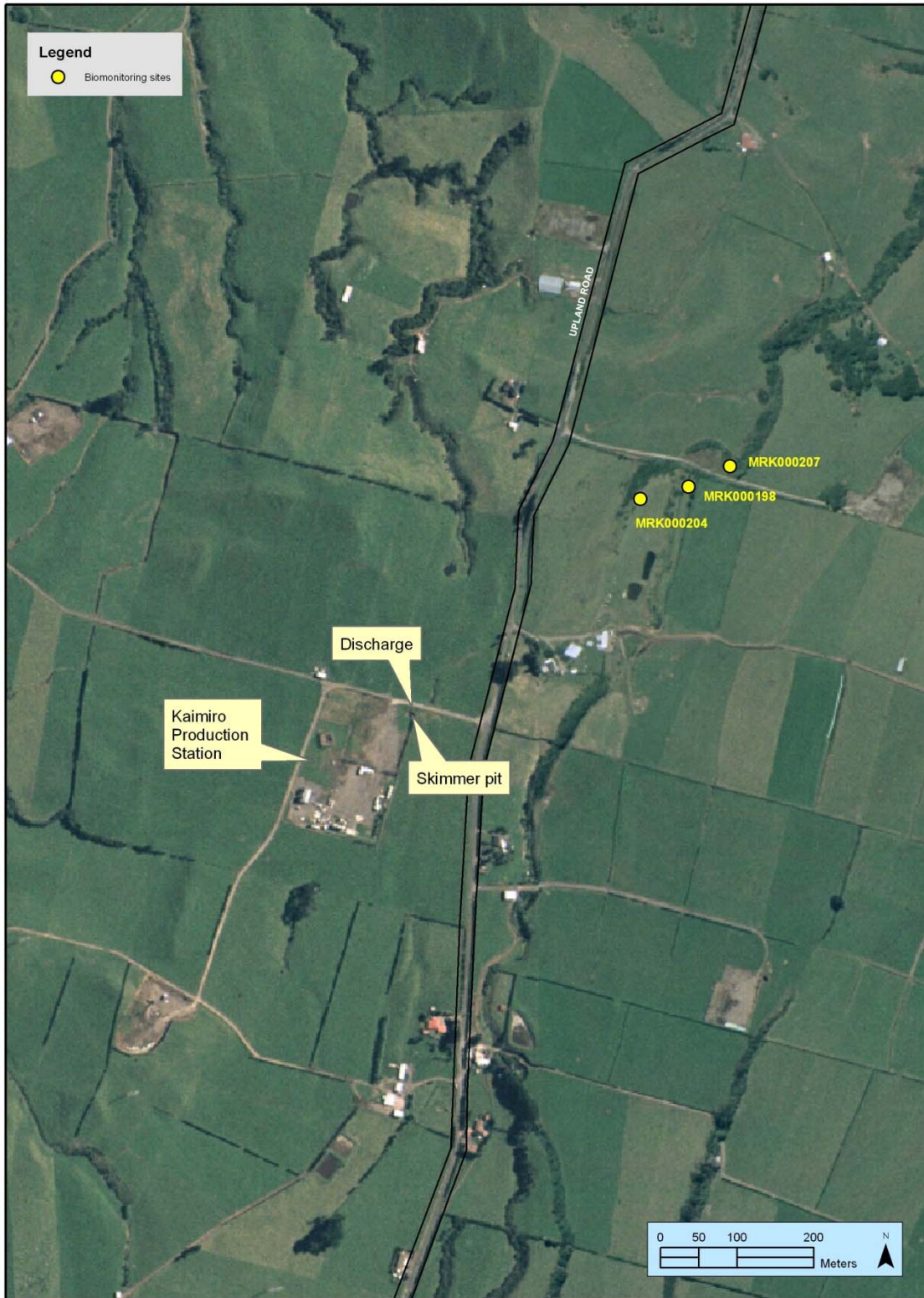


Figure 1 Biomonitoring sites in two unnamed tributaries of the Mangaoraka Stream related to the Kaimiro Production Station

The Council's standard '400ml kick-sampling' technique was used at sites 1, 2 and 3 (Table 1). The 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark *et al*, 2001).

Samples were preserved with Kahle's Fluid for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark et al. 2001). Macroinvertebrate taxa found in each sample were recorded based on the abundance categories in Table 2.

Table 2 Macroinvertebrate abundance categories

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

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. By averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. However, other physical variables such as sedimentation, temperatures, water velocity, and dissolved oxygen levels may also affect the MCI values because the taxa that are able to tolerate extremes in these variables generally have lower sensitivity scores. More 'sensitive' communities inhabit less polluted waterways. A gradation of biological water quality conditions based upon MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985; Boothroyd and Stark, 2000) (Table 3).

Table 3 Macroinvertebrate community health based on MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985 and Boothroyd and Stark, 2000)

Grading	MCI
Excellent	> 140
Very Good	120-140
Good	100-119
Fair	80-99
Poor	60-79
Very Poor	<60

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, so that its corresponding range of values is 20x lower.

Results

Site habitat characteristics and hydrology

This December 2017 survey followed a period of 26 days since a fresh of both 3 times and 7 times median flow. Flows had been stable since this time and the flows at the time of the survey were close to mean annual low flow. There was a slow, very low flow at sites 1 and 2, and a steady, very low flow at site 3 at the time of the survey. Water temperatures ranged from 14.3 -17.6°C at the time of the survey.

Substrate at sites 1 and 2 was predominantly cobble and gravels, with some silt, sand and bedrock also present. Site 3 had predominantly bedrock substrate, with some cobbles, gravel, silt and sand present. There was an iron oxide coating on the streambed at sites 1 and 2 but not at site 3.

Site 1 had widespread long filamentous periphyton which was not present at any other site, while periphyton mats were patchy at site 1, absent at site 2 and slippery at site 3. Moss and leaves were patchy on the streambed at all three sites. Woody debris was present at site 3 but absent at sites 1 and 2. Macrophytes were present on the streambed at site 1 but absent at sites 2 and 3. Overhanging vegetation was present at sites 2 and 3, while undercut banks were present at sites 1 and 2. Site 1 had no shading of the streambed, site 2 had partial shading of the streambed and site 3 had complete shading.

Macroinvertebrate communities

Most past surveys have shown that the larger tributary supports richer macroinvertebrate communities, including abundances of 'sensitive' mayflies. These results reflect the good habitat conditions normally provided by faster-flowing, stony-bedded streams on the upper to mid reaches of the ring plain. The smaller tributary has tended to support communities with lower numbers of taxa and smaller proportions of 'sensitive' taxa. This in part has been due to the slower flow and/or iron oxide deposition on the more sedimented streambed of this tributary.

Table 4 provides a summary of the results from previous surveys sampled in relation to the Kaimiro Production Station discharges along with current survey results.

Table 4 Number of taxa, MCI and SQMCI_s values for two unnamed tributaries of the Mangaoraka Stream, sampled in relation to the Kaimiro Production Station on 4 December 2017 and a summary of historical data for these sites.

Site No.	N	No of taxa			MCI value			SQMCI _s value			
		Median	Range	Dec 2017	Median	Range	Dec 2017	N	Median	Range	Dec 2017
1	61	27	16-37	20	97	83-115	93	36	3.6	1.9-6.4	3.4
2	57	15	3-26	16	81	55-103	85	35	2.2	1.2-4.4	2.7
3	61	24	14-33	17	100	71-111	94	36	4.2	1.7-6.3	3.0

The full results of the current survey are presented in Table 5.

Table 5 Macroinvertebrate communities in two unnamed tributaries of the Mangaoraka Stream in relation to the Kaimiro Production Station on 4 December 2017

Taxa List	Site Number	MCI score	1	2	3
	Site Code		MRK000198	MRK000204	MRK000207
	Sample Number		FWB17436	FWB17437	FWB17438
ANNELIDA (WORMS)	Oligochaeta	1	A	A	VA
MOLLUSCA	<i>Potamopyrgus</i>	4	C	-	R
	Sphaeriidae	3	R	-	-
CRUSTACEA	Copepoda	5	-	C	-
	Ostracoda	1	-	R	-
	Paraleptamphopidae	5	-	-	A
	<i>Paranephrops</i>	5	-	R	-
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>	7	A	-	A
	<i>Deleatidium</i>	8	C	-	R
	<i>Zephlebia</i> group	7	A	R	A
HEMIPTERA (BUGS)	<i>Microvelia</i>	3	-	-	R
COLEOPTERA (BEETLES)	Elmidae	6	C	R	R
	Hydraenidae	8	R	-	-
	Ptilodactylidae	8	-	-	R
	Staphylinidae	5	R	-	-
TRICHOPTERA (CADDISFLIES)	<i>Hydropsyche</i> (<i>Aoteapsyche</i>)	4	C	-	R
	<i>Costachorema</i>	7	R	-	-
	<i>Hydrobiosis</i>	5	C	-	-
	<i>Psilochorema</i>	6	-	R	R
	Oeconesidae	5	-	R	-
	<i>Oxyethira</i>	2	C	C	-
	<i>Triplectides</i>	5	-	-	R
DIPTERA (TRUE FLIES)	<i>Aphrophila</i>	5	C	-	-
	Hexatomini	5	R	R	-
	<i>Zelandotipula</i>	6	-	C	-
	<i>Chironomus</i>	1	R	-	-
	Orthocladiinae	2	VA	A	A
	<i>Polypedilum</i>	3	-	-	C
	Tanypodinae	5	-	R	-
	Culicidae	3	-	-	C
	<i>Paradixa</i>	4	-	R	-
	<i>Austrosimulium</i>	3	A	R	R
	Stratiomyidae	5	R	-	-
ACARINA (MITES)	Acarina	5	R	R	R
No of taxa			20	16	17
MCI			93	85	94
SQMCIs			3.4	2.7	3.0
EPT (taxa)			6	3	6
%EPT (taxa)			30	19	35
'Tolerant' taxa		'Moderately sensitive' taxa	'Highly sensitive' taxa		

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

Site 1

A moderate taxa richness of 20 taxa was recorded at this 'control' site at the time of the survey. This is seven taxa less than the median taxa richness at this site (Table 4) but four taxa more than that recorded in the preceding survey (Figure 2). The macroinvertebrate community at the time of sampling was characterised by two 'moderately sensitive' taxa, [mayflies (*Austroclima* and *Zephlebia*)] and three 'tolerant' taxa [oligochaete worms, midge larvae (Orthoclaadiinae) and sandfly larvae (*Austrosimulium*)] (Table 5).

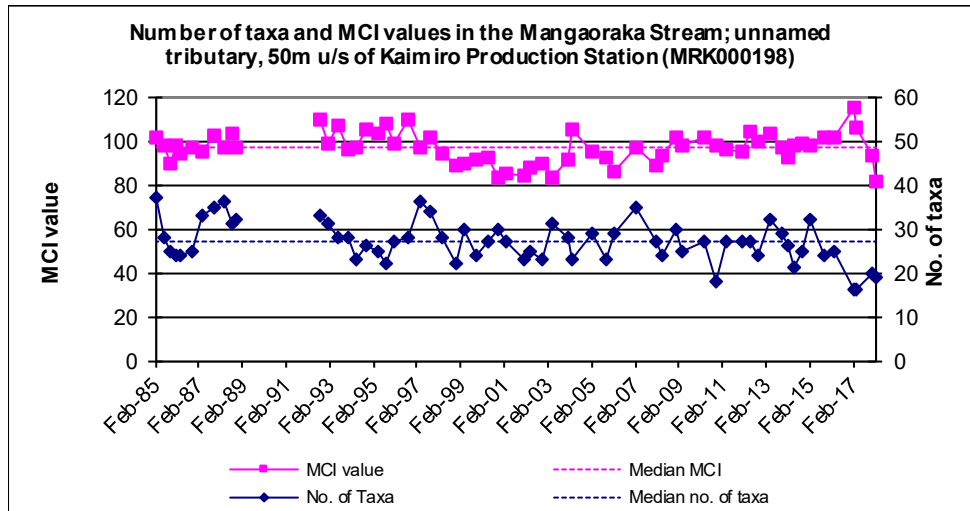


Figure 2 MCI scores and taxa richness at site 1, 50m upstream of Kaimiro Production Station tributary confluence (MRK000198)

The MCI score of 93 units indicated 'fair' macroinvertebrate community health and was slightly lower than the median MCI score for this site of 97 units but significantly lower (Stark 1998) than the previously recorded score of 106 units (Table 4, Figure 2). The SQMCI_s score of 3.4 units was not significantly different from the median score of 3.6 units, but was significantly lower (Stark 1998) than the previously recorded score of 6.4 units (which was the highest SQMCI_s score recorded at this site to date) (Table 4).

Site 2

A moderately low taxa richness of 16 taxa was recorded at the time of this survey. This is one taxon higher than the median score of 15 for this site (Table 4, Figure 3), and is substantially higher than the previous result of 9 taxa (Figure 3). The macroinvertebrate community at the time of sampling was characterised by only two 'tolerant' taxa [oligochaete worms and midge larvae (Orthoclaadiinae)] (Table 5).

The recorded MCI score of 85 units indicated 'fair' macroinvertebrate community health. This score is an insignificant (Stark 1998) 4 units higher than the median score of 81 units for this site and 6 units lower than the previous score of 91 units (Table 4, Figure 3). The SQMCI_s score of 2.7 units is not significantly different (Stark 1998) from either the median SQMCI_s score of 2.2 units for this site or the previous score of 2.1 units.

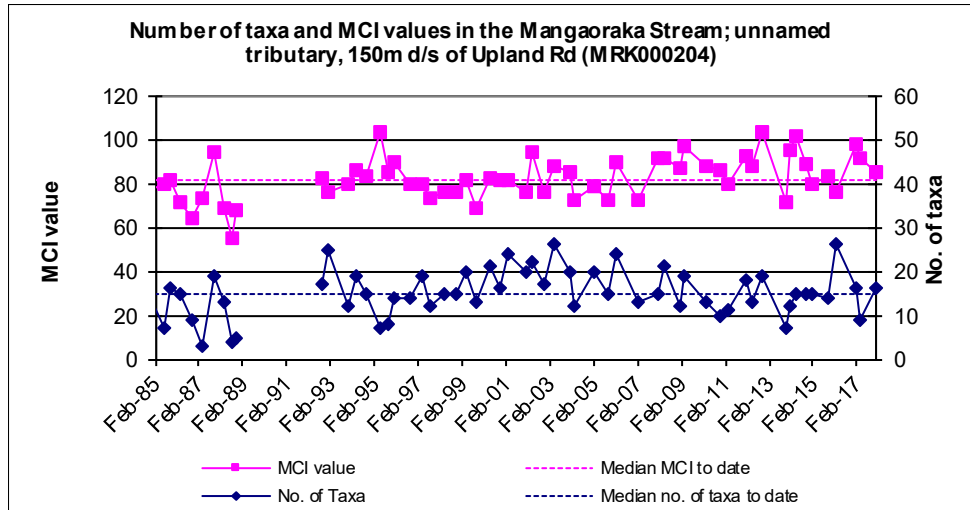


Figure 3 MCI scores and taxa richness at site 2, Kaimiro Production Station tributary 150m downstream of Upland Rd (MRK000204)

Site 3

A moderately low taxa richness of 17 taxa was recorded in this survey. This is three taxa more than the previously recorded score but seven taxa less than the median taxa richness for this site (Table 4, Figure 4). The macroinvertebrate community at the time of sampling was characterised by five taxa, three 'moderately sensitive' taxa [mayflies (*Austroclima* and *Zephlebia*) and amphipod (*Paraleptamphopidae*)] and two tolerant taxa [oligochaete worms and midge larvae (*Orthoclaadiinae*)] (Table 5).

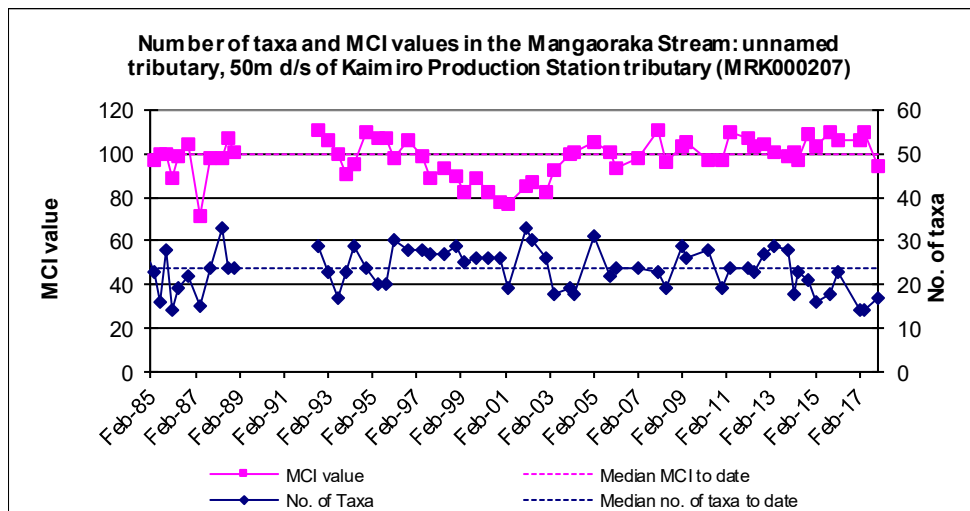


Figure 4 MCI scores and taxa richness at site 3, 50m downstream of Kaimiro Production Station tributary confluence (MRK000207)

The recorded MCI score of 94 units categorises the site as having 'fair' macroinvertebrate community health. This is not significantly different from the median MCI score of 100 units for this site, but is significantly lower (Stark 1998) than the previously recorded score of 110 units at this site (Table 4, Figure 4). The SQMCI_s score of 3.0 units was significantly lower (Stark 1998) than the median score for this site of 4.2 units and was insignificantly lower than the previously recorded score of 3.6 units (Table 4).

Discussion and conclusions

The Council's 'kick-sampling' technique was used at three sites to collect benthic macroinvertebrates from two unnamed tributaries of the Mangaoraka Stream in relation to discharges from the Kaimiro Production Station. This has provided data to assess any potential impacts the consented discharges have had on the

macroinvertebrate communities of the stream. Samples were processed to provide number of taxa (taxa richness), MCI and SQMCI_s scores for each site.

Taxa richness is the most robust index when determining whether a macroinvertebrate community has been exposed to toxic discharges. Macroinvertebrates when exposed to toxic discharges may die and be swept downstream or may deliberately drift downstream as an avoidance mechanism (catastrophic drift). The MCI is a measure of the overall sensitivity of the macroinvertebrate community to 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 relative abundances of taxa as well as sensitivity to pollution. Significant differences in taxa richness, MCI or SQMCI_s between sites may indicate the degree of adverse effects (if any) of the discharge being monitored.

Most of the previous surveys undertaken in relation to the Kaimiro Production Station stormwater discharge have shown that the larger tributary of the Mangaoraka Stream (sites 1 and 3) supports higher taxonomic richnesses and healthier macroinvertebrate communities than the smaller tributary receiving the Production Station discharges. Iron oxide deposition is often noted at this site, and was present on this sampling occasion. The results of this summer survey are in agreement with these previous results, with site 2 having the lowest taxonomic richness, MCI and SQMCI_s scores of the sites, although no significant differences were recorded between sites for any metric in this survey. MCI scores were similar to historic medians at all three sites, and lower than the preceding result at all sites, although this difference was significant for sites 1 and 3 only. The SQMCI_s scores were similar to the historic median at sites 1 and 2, although at site 3 the score was significantly lower than the historic median.

Taxonomic richnesses of 20, 16 and 17 taxa were recorded at sites 1-3 respectively. These values were lower than respective median scores for sites 1 and 3. All recorded richnesses were higher than those recorded in the preceding survey (which were lower than usual). Overall, these results do not provide any evidence of detrimental impacts caused by discharges from Kaimiro Production Station, as site 2, which is located in the tributary receiving the discharge, had slightly higher than median MCI and SQMCI_s scores and taxonomic richness.

In general, this survey found moderately low taxonomic richness, and similar to usual MCI and SQMCI_s scores. These results provide no evidence that discharges from the Kaimiro Production Station have had any recent detrimental effects on the macroinvertebrate communities of these two unnamed tributaries of the Mangaoraka Stream.

Summary

A macroinvertebrate survey was performed on 4 December 2017 at three sites in two unnamed tributaries of the Mangaoraka Stream in relation to stormwater discharges from the Kaimiro Production Station. No significant differences were found between sites for any invertebrate metric. As is usual, site 2 recorded poorer results than sites 1 and 3, although these differences were not significant on this occasion. This most likely reflects poorer habitat quality due to sediment and iron oxide deposition in the minor tributary where site 2 is located.

Taxonomic richness was lower than median at sites 1 and 3, and one taxon higher at site 2. MCI scores were similar to their respective medians at all three sites. SQMCI_s scores were similar to their respective medians at sites 1 and 2, while at site 3 it was significantly lower than the median score. Overall there is no evidence that discharges from the Kaimiro Production Station have had any recent detrimental effects on the macroinvertebrate communities of these two unnamed tributaries of the Mangaoraka Stream.

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Report No KB050
Date 24 May 2018

Biomonitoring of two unnamed tributaries of the Mangaoraka Stream in relation to discharges from the Kaimiro Production Station, February 2018

Introduction

This was the second of two biomonitoring surveys scheduled to be undertaken in the 2017-2018 monitoring year for the Kaimiro Production Station of Greymouth Petroleum (previously owned by Fletcher Challenge Energy Taranaki Limited).

The Taranaki Regional Council has undertaken surveys since January 1985 in the tributaries of the Mangaoraka Stream that receive stormwater and wastewater from the production station area. During 1987 and 1988 oil seepage to these streams disrupted the aquatic communities. Biomonitoring was not undertaken for nearly four years following the oil seepage period, until 1992. The results of surveys performed since the 1998-99 monitoring year are discussed in the references at the end of this report.

Methods

This survey was undertaken on 7 February 2018 at three sites in two unnamed tributaries of the Mangaoraka Stream. Figure 1 shows the location of these sampling sites. Site 1 is the 'control' site which is located in a major tributary of the Mangaoraka Stream, upstream of the confluence with a more minor tributary. Site 2 is situated in the minor tributary which receives the stormwater discharge from the production station and site 3 is approximately 50 metres downstream of the confluence of this tributary (Table 1).

Table 1 Biomonitoring sites in two tributaries of the Mangaoraka Stream in relation to discharges from the Kaimiro Production Station

Site number	Site code	Grid reference (NZTM)	Location	Altitude (masl)
1	MRK000198	E1700117 N5664652	Major tributary approx. 50m u/s of confluence with minor tributary	240
2	MRK000204	E1700054 N5664636	Minor tributary (receives discharge) 150m d/s of Upland Road	240
3	MRK000207	E1700171 N5665679	Major tributary approx. 50m d/s of confluence with minor tributary	240

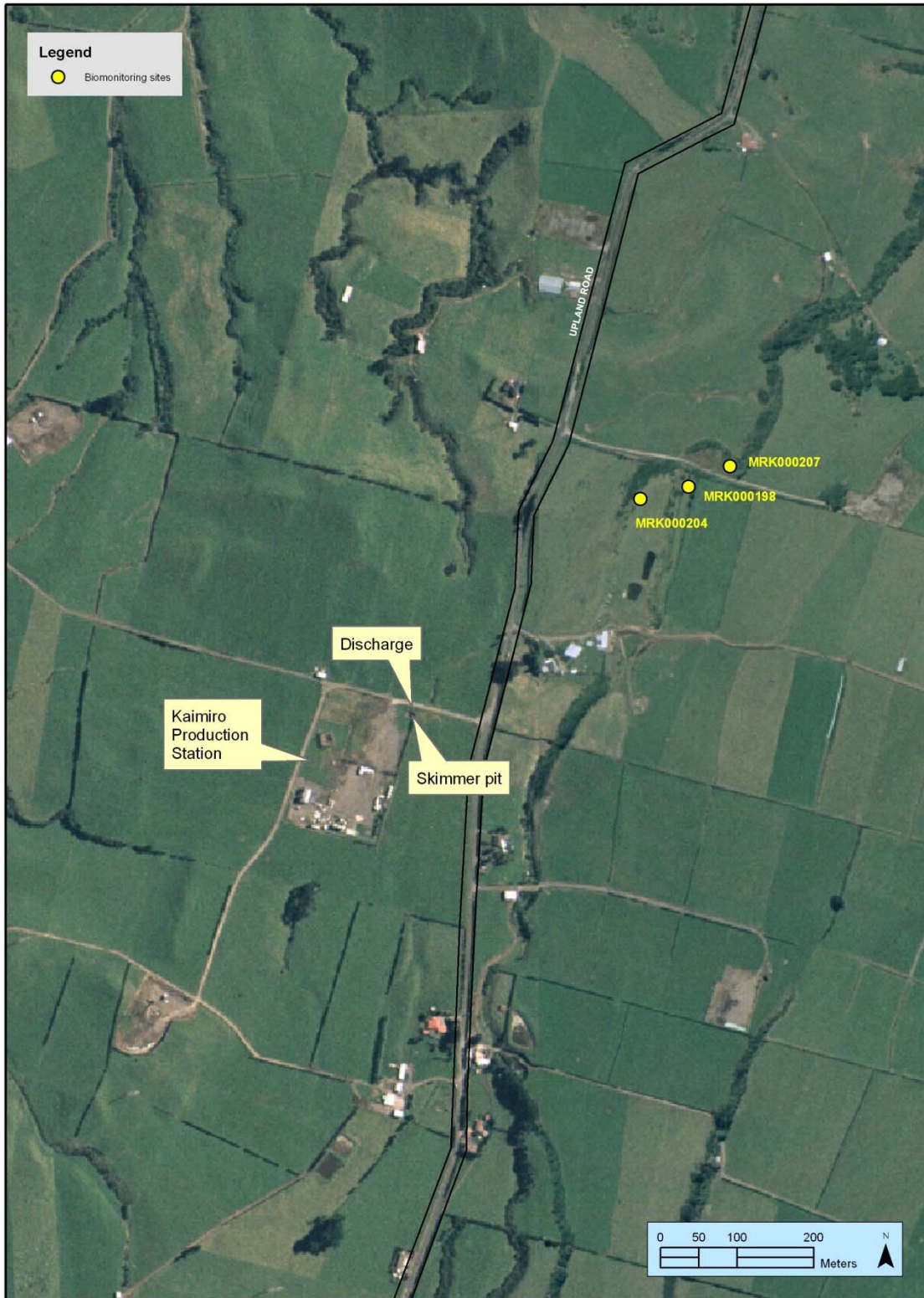


Figure 1 Biomonitoring sites in two unnamed tributaries of the Mangaoraka Stream related to the Kaimiro Production Station

The Council's standard '400ml kick-sampling' technique was used at sites 2 and 3, while a combination of the 'kick-sampling' and 'vegetation sweep' techniques was used at site 1 (Table 1). The 'kick-sampling' and 'vegetation sweep' techniques are very similar to Protocol C1 (hard-bottomed, semi-quantitative) and

Protocol C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark *et al.*, 2001).

Samples were preserved with Kahle's Fluid and ethanol for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark *et al.*, 2001). Macroinvertebrate taxa found in each sample were recorded based on the abundance categories in Table 2.

Table 2 Macroinvertebrate abundance categories

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

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. By averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. However, other physical variables such as sedimentation, temperatures, water velocity, and dissolved oxygen levels may also affect the MCI values because the taxa that are able to tolerate extremes in these variables generally have lower sensitivity scores. More 'sensitive' communities inhabit less polluted waterways. A gradation of biological water quality conditions based upon MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985; Boothroyd and Stark, 2000) (Table 3).

Table 3 Macroinvertebrate community health based on MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985 and Boothroyd and Stark, 2000)

Grading	MCI
Excellent	>140
Very Good	120-140
Good	100-119
Fair	80-99
Poor	60-79
Very Poor	<60

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, so that its corresponding range of values is 20x lower.

Results

Site habitat characteristics and hydrology

This February 2018 survey followed a period of 33 days since a fresh of 3 times and 119 days since a fresh of 7 times median flow. Flows had been stable since the previous survey and the flows at the time of the survey were close to mean annual low flow. There was a steady, low flow at all three sites. The water was a turbid brown at sites 1 and 3 in the major tributary and cloudy but uncoloured in the minor tributary. Water temperatures ranged from 15.9 °C -18.4 °C at the time of the survey.

Substrate at sites 1 and 3 was predominantly cobble and gravels, with some silt, sand and boulder present. Site 3 also had a small amount of wood/root. Site 2 had predominantly silt, sand and fine gravel, with some cobble, coarse gravel and hard clay present. There was an iron oxide coating on the streambed at sites 1 and 2 but not at site 3.

Sites 1 and 2 had patchy periphyton mats and filaments, while site 3 had slippery mats and no filaments. Moss and leaves were patchy on the streambed at sites 2 and 3, while site 1 had patchy moss only. Macrophytes were present on the stream margins at site 1 but absent at sites 2 and 3. Overhanging vegetation was present at all three sites, while undercut banks were present at sites 1 and 2. Sites 1 and 2 had partial shading of the streambed and site 3 had complete shading.

Macroinvertebrate communities

Most past surveys have shown that the larger tributary supports richer macroinvertebrate communities, including abundances of 'sensitive' mayflies. These results reflect the good habitat conditions normally provided by faster-flowing, stony-bedded streams on the upper to mid reaches of the ring plain. The smaller tributary has tended to support communities with lower numbers of taxa and smaller proportions of 'sensitive' taxa. This in part has been due to the slower flow and/or iron oxide deposition on the more sedimented streambed of this tributary.

Table 4 provides a summary of the results from previous surveys sampled in relation to the Kaimiro Production Station discharges along with current survey results.

Table 4 Number of taxa, MCI and SQMCI_s values for two unnamed tributaries of the Mangaoraka Stream, sampled in relation to the Kaimiro Production Station on 7 February 2018 and a summary of historical data for these sites.

Site No.	N	No of taxa			MCI value			SQMCI _s value			
		Median	Range	Feb 2018	Median	Range	Feb 2018	N	Median	Range	Feb 2018
1	62	27	16-37	19	97	83-115	81	37	3.6	1.9-6.4	2.3
2	58	15	3-26	15	81	55-103	88	36	2.3	1.2-4.4	2.8
3	62	24	14-33	18	100	71-111	92	37	4.1	1.7-6.3	3.6

The full results of the current survey are presented in Table 5.

Table 5 Macroinvertebrate communities in two unnamed tributaries of the Mangaoraka Stream in relation to the Kaimiro Production Station on 7 February 2018

Taxa List	Site Number	MCI score	1	2	3
	Site Code		MRK000198	MRK000204	MRK000207
	Sample Number		FWB18033	FWB18034	FWB18035
ANNELIDA (WORMS)	Oligochaeta	1	R	A	A
	Lumbricidae	5	-	-	R
CRUSTACEA	Ostracoda	1	R	-	-
	Isopoda	5	R	R	R
	Paraleptamphopidae	5	-	-	R
	Talitridae	5	-	R	R
	<i>Paranephrops</i>	5	-	R	-
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>	7	-	-	C
	<i>Zephlebia group</i>	7	C	R	A
HEMIPTERA (BUGS)	<i>Sigara</i>	3	R	-	-
COLEOPTERA (BEETLES)	Elmidae	6	R	-	R
	Dytiscidae	5	R	-	-
TRICHOPTERA (CADDISFLIES)	<i>Hydropsyche (Aoteapsyche)</i>	4	-	-	R
	<i>Hydrobiosis</i>	5	R	-	-
	<i>Hydropsyche (Orthopsyche)</i>	9	R	R	C
	<i>Polypsectopus</i>	6	-	C	-
	<i>Psilochorema</i>	6	R	R	R
	<i>Oxyethira</i>	2	R	R	-
	<i>Triplectides</i>	5	R	R	R
DIPTERA (TRUE FLIES)	Eriopterini	5	R	R	R
	<i>Chironomus</i>	1	VA	R	A
	<i>Corynoneura</i>	3	R	-	-
	Orthocladiinae	2	C	C	C
	<i>Polypedilum</i>	3	-	-	C
	Tanytarsini	3	-	C	-
	<i>Paradixa</i>	4	-	R	R
	Muscidae	3	R	-	-
	<i>Austrosimulium</i>	3	VA	-	A
ACARINA (MITES)	Acarina	5	C	-	-
No of taxa			19	15	18
MCI			81	88	92
SQMCIs			2.3	2.8	3.6
EPT (taxa)			5	5	6
%EPT (taxa)			26	33	33
'Tolerant' taxa		'Moderately sensitive' taxa	'Highly sensitive' taxa		

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

Site 1

A moderate taxa richness of 19 taxa was recorded at this 'control' site at the time of the survey. This is eight taxa less than the median taxa richness at this site (Table 4) but one taxon less than that recorded in the preceding survey (Figure 2). The macroinvertebrate community at the time of sampling was characterised by only two 'tolerant' taxa [midge larvae (*Chironomus*) and sandfly larvae (*Austrosimulium*)] (Table 5).

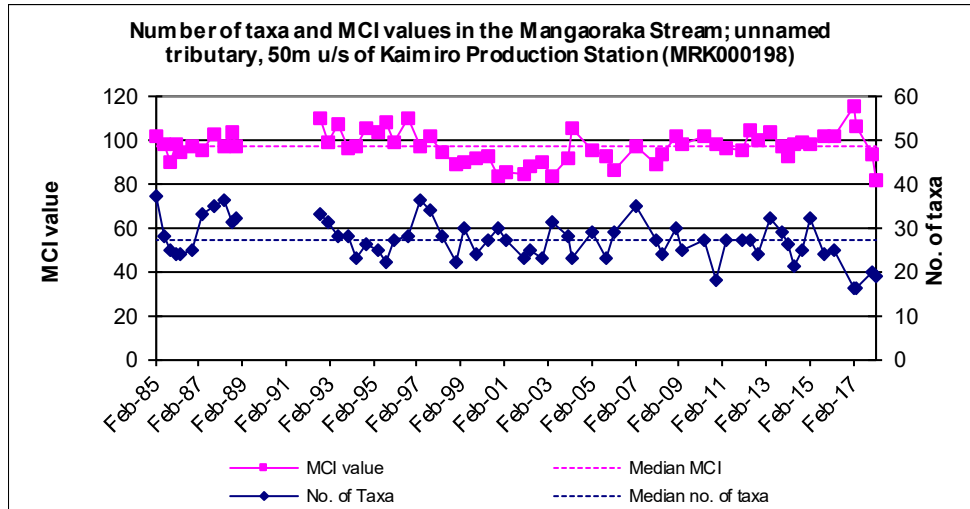


Figure 2 MCI scores and taxa richness at site 1, 50m upstream of Kaimiro Production Station tributary confluence (MRK000198)

The MCI score of 81 units indicated 'fair' macroinvertebrate community health but was significantly lower (Stark 1998) than the median MCI score for this site of 97 units and the previously recorded score of 93 units (Table 4, Figure 2). This was also the lowest MCI score recorded at this site to date. The SQMCI_s score of 2.3 units was significantly lower (Stark 1998) than the median score of 3.6 units, and the previously recorded score of 3.4 units (Table 4).

Site 2

A moderately low taxa richness of 15 taxa was recorded at the time of this survey. This is equal to the median score of 15 for this site (Table 4, Figure 3), and is one taxon less than the previous result of 16 taxa (Figure 3). The macroinvertebrate community at the time of sampling was characterised by only one 'tolerant' taxon [oligochaete worms] (Table 5).

The recorded MCI score of 88 units indicated 'fair' macroinvertebrate community health. This score is an insignificant (Stark 1998) seven units higher than the median score of 81 units for this site and three units more than the previous score of 85 units (Table 4, Figure 3). The SQMCI_s score of 2.8 units is not significantly different (Stark 1998) from either the median SQMCI_s score of 2.3 units for this site or the previous score of 2.7 units (Table 4).

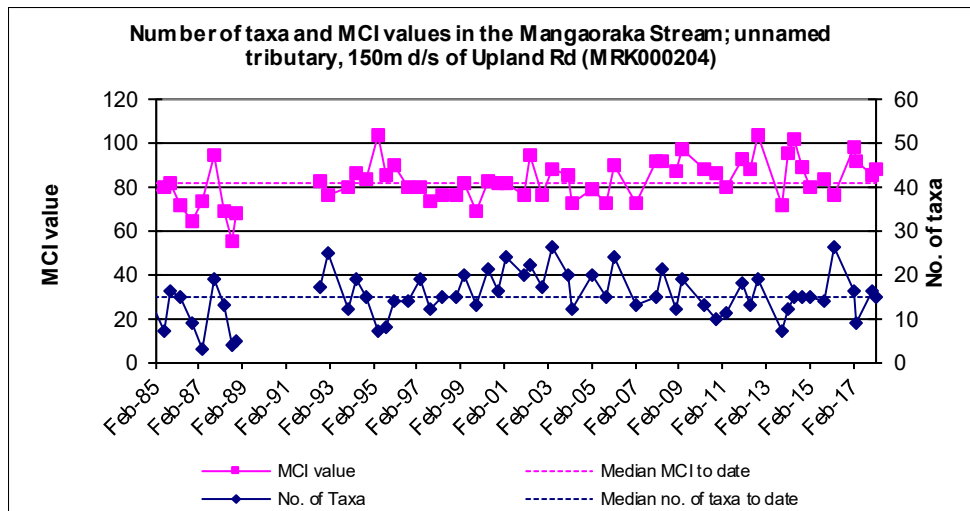


Figure 3 MCI scores and tax richness at site 2, Kaimiro Production Station tributary 150m downstream of Upland Rd (MRK000204)

Site 3

A moderately low tax richness of 18 taxa was recorded in this survey. This is one taxon more than the previously recorded score and six taxa less than the median tax richness for this site (Table 4, Figure 4). The macroinvertebrate community at the time of sampling was characterised by four taxa, one 'moderately sensitive' taxon [mayfly (*Zephlebia*)] and three 'tolerant' taxa [oligochaete worms, midge larvae (*Chironomus*) and sandfly larvae (*Austrosimulium*)] (Table 5).

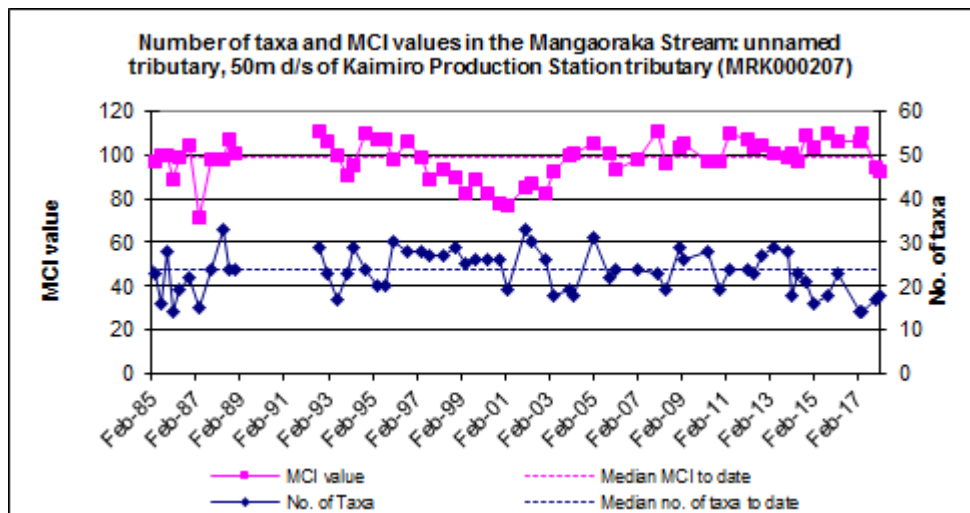


Figure 4 MCI scores and tax richness at site 3, 50m downstream of Kaimiro Production Station tributary confluence (MRK000207)

The recorded MCI score of 92 units categorises the site as having 'fair' macroinvertebrate community health. This is not significantly different (Stark 1998) from the median MCI score of 100 units for this site or the previously recorded score of 94 units at this site (Table 4, Figure 4). The SQMCI_s score of 3.6 units was insignificantly lower (Stark 1998) than the median score for this site of 4.1 units and was insignificantly higher than the previously recorded score of 3.0 units (Table 4).

Discussion and conclusions

The Council's 'kick-sampling' techniques was used at two sites, while a combination of the 'kick-sampling' and 'vegetation sweep' techniques was used at a third site, to collect benthic macroinvertebrates from two unnamed tributaries of the Mangaoraka Stream in relation to discharges from the Kaimiro Production

Station. This has provided data to assess any potential impacts the consented discharges have had on the macroinvertebrate communities of the stream. Samples were processed to provide number of taxa (taxa richness), MCI and SQMCI_s scores for each site.

Taxa richness is the most robust index when determining whether a macroinvertebrate community has been exposed to toxic discharges. Macroinvertebrates when exposed to toxic discharges may die and be swept downstream or may deliberately drift downstream as an avoidance mechanism (catastrophic drift). The MCI is a measure of the overall sensitivity of the macroinvertebrate community to 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 relative abundances of taxa as well as sensitivity to pollution. Significant differences in taxa richness, MCI or SQMCI_s between sites may indicate the degree of adverse effects (if any) of the discharge being monitored.

Most of the previous surveys undertaken in relation to the Kaimiro Production Station stormwater discharge have shown that the larger tributary of the Mangaoraka Stream (sites 1 and 3) supports higher taxonomic richnesses and healthier macroinvertebrate communities than the smaller tributary receiving the Production Station discharges. Iron oxide deposition is often noted at this site, and was present on this sampling occasion. The results of this summer survey are in partial agreement with these previous results, with site 2 having the lowest taxonomic richness of the three sites, and MCI and SQMCI_s scores intermediate between those of sites 1 and 3. MCI and SQMCI_s scores at site 2 were not significantly different from historical medians, the preceding survey result or from the scores recorded at sites 1 and 3.

The major tributary of the Mangaoraka Stream recorded a significant increase in both MCI and SQMCI_s scores between site 1 and site 3. Both MCI and SQMCI_s scores were significantly lower than the historical medians and the preceding survey result at site 1, but were not significantly different to their historical medians at site 3.

Taxonomic richnesses of 19, 15 and 18 taxa were recorded at sites 1-3 respectively. These values were lower than respective median scores for sites 1 and 3, and equal to the median score at site 2. All recorded richnesses differed by only one taxon from those recorded in the preceding survey. Overall, these results do not provide any evidence of detrimental impacts caused by discharges from Kaimiro Production Station, as site 2, which is located in the tributary receiving the discharge, had slightly higher than median MCI and SQMCI_s scores and equal to median taxonomic richness.

In general, this survey found moderately low taxonomic richness, and similar to usual MCI and SQMCI_s scores at sites 2 and 3. MCI and SQMCI_s scores at site 1, upstream of the production station discharges were lower than usual. These results provide no evidence that discharges from the Kaimiro Production Station have had any recent detrimental effects on the macroinvertebrate communities of these two unnamed tributaries of the Mangaoraka Stream.

Summary

A macroinvertebrate survey was performed at three sites in two unnamed tributaries of the Mangaoraka Stream on 7 February 2018 in relation to stormwater discharges from the Kaimiro Production Station. Taxonomic richnesses were similar between the three sites, while MCI and SQMCI_s scores increased between sites 1 and 3. Scores at site 1 were significantly lower than site 3, while site 2 recorded scores not significantly different to either site 1 or 3. In contrast to most previous surveys, the minor tributary did not record poorer macroinvertebrate community health than the major tributary.

Taxonomic richness was lower than median at sites 1 and 3, and equal to median at site 2. MCI and SQMCI_s scores were significantly lower than historical medians at site 1, but similar to medians at sites 2 and 3. Overall there is no evidence that discharges from the Kaimiro Production Station have had any recent detrimental effects on the macroinvertebrate communities of these two unnamed tributaries of the Mangaoraka Stream.

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Appendix III

Air monitoring report

To Job Manager, Callum MacKenzie
From Environmental Scientist - Air Quality, Brian Cheyne
File 2115447
Date August 31, 2018

Ambient Gas (PM10, NO_x, CO and LEL) Monitoring at Kaimiro Production Stations during 2017-2018 monitoring year

Introduction

In August 2017 and January 2018 as part of the compliance monitoring programme for the Kaimiro production station, a survey of ambient air quality sampling was carried out by the Taranaki Regional Council (the Council) in the vicinity of the plant. The main objectives were to measure:

- The concentrations of PM10 using a portable data logging TSI 'DustTrak';
- To measure the concentrations of the nitrogen oxides (NO_x) using a passive sampling method, that gives a result for average exposure;
- And to measure carbon monoxide (CO) using a portable multi gas meter that provides instantaneous data throughout the monitoring period.

The findings of this study are presented in this memorandum, together with the locations of the monitoring sites which are provided in Figure 1.

Carbon monoxide (CO) and Lower explosive limit (LEL)

During the monitoring year, a multi-gas meter was deployed on one occasion in the vicinity of the plant. The deployment lasted approximately 72 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).

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.



Figure 1 Air monitoring sites at Kaimiro production station (2017-2018)

The details of the sample run are summarised in Table 1 and the data from the sample run are presented graphically in Figure 2.

The consents covering air discharges from the Kaimiro production station have specific limits related to particular gases. Special condition 13 of consent 4048-3 set a limit on the carbon monoxide concentration at or beyond the production station's boundary. The limit is expressed as 10 mg/m^3 for an eight hour average or 30 mg/m^3 for a one hour average exposure. The maximum concentration of carbon monoxide found during the monitoring run was 0.6 mg/m^3 with average concentration for the entire dataset was only 0.12 mg/m^3 which comply with consent conditions. This is in line with the pattern found in previous years.

Table 1 Results of carbon monoxide and LEL monitoring at Kaimiro production station

Period (from-to)		04/08/2017 14:28 to 07/08/2017 14:50
Max	CO(ppm)	0.50
	LEL(%)	0.10
Mean	CO(ppm)	0.10
	LEL(%)	0.00
Min	CO(ppm)	0.00
	LEL(%)	0.00

Note: (1) the instrument records in units of ppm. At 25°C , 1 atm.

$$1\text{ppm CO} = 1.145 \text{ mg/m}^3$$

- (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 percentage 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

dangerous levels of airborne contaminants, including any risk of explosion. At no time did the level of explosive gases downwind of the Kaimiro production station reach any more than a trivial level.

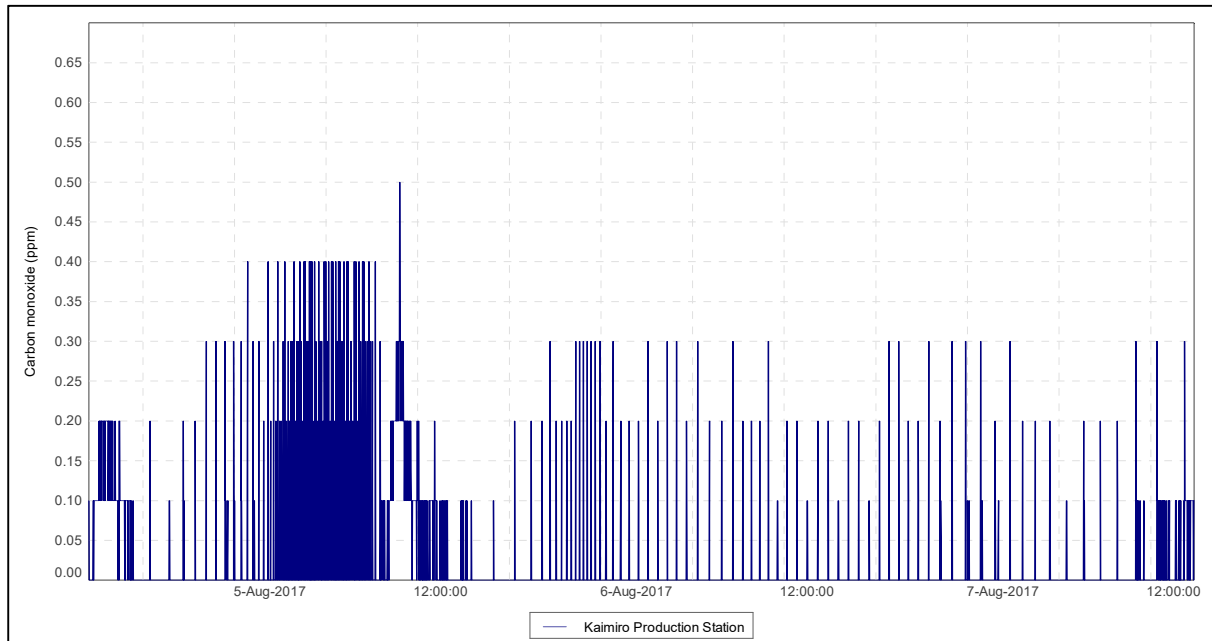


Figure 2 Graph of ambient CO levels in the vicinity of the Kaimiro Production Station (2017-18)

PM10

In September 2004 the Ministry for the Environment made public National Environmental Standards (NESs) relating to certain air pollutants. The NES for PM10 is $50 \mu\text{g}/\text{m}^3$ (24-hour average).

Particulates can be derived from many sources, including motor vehicles (particularly diesel), solid and oil-burning processes for industry and power generation, incineration and waste burning, photochemical processes, and natural sources such as pollen, abrasion, and sea spray.

PM10 particles are linked to adverse health effects that arise primarily from the ability of particles of this size to penetrate the defences of the human body and enter deep into the lungs significantly reducing the exchange of gases across the lung walls. Health effects from inhaling PM10 include increased mortality and the aggravation of existing respiratory and cardiovascular conditions such as asthma and chronic pulmonary diseases.

During the reporting period, a "DustTrak" PM10 monitor was deployed on one occasion in the vicinity of the Kaimiro production station. The deployment lasted approximately 40 hours, with the instrument placed in a down-wind position at the start of the deployment. Monitoring consisted of continual measurements of PM10 concentrations. The location of the "DustTrak" monitor during the sampling run is shown in Figure 1.

The details of the sample run are presented in Figure 3 and Table 2.

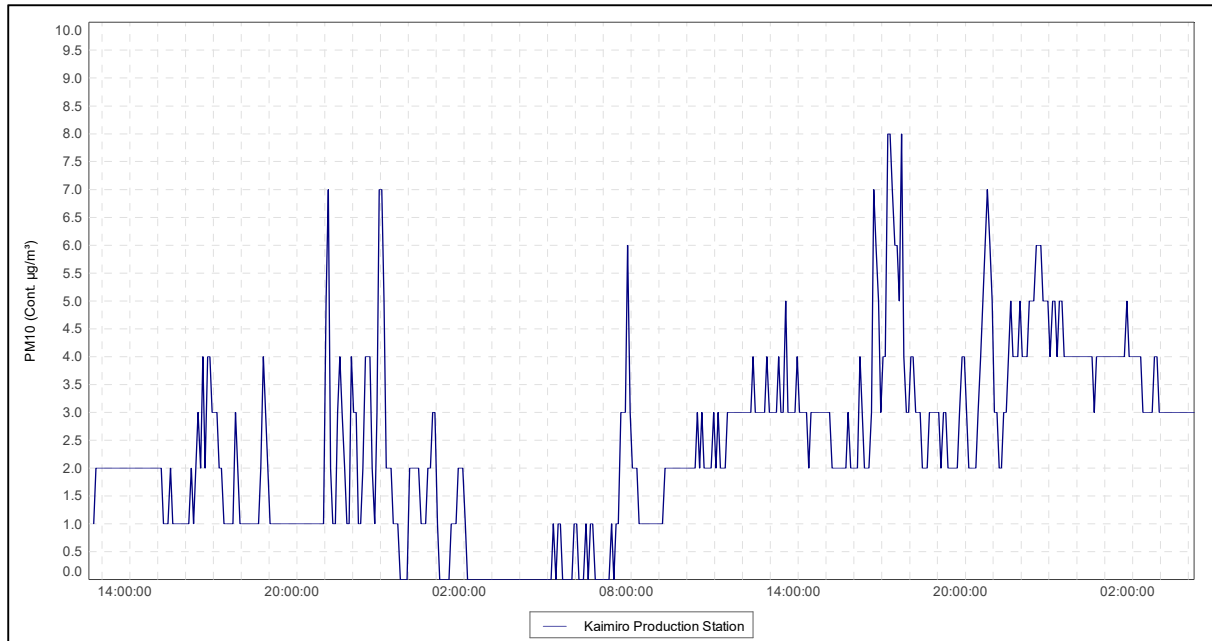


Figure 2 PM10 concentrations ($\mu\text{g}/\text{m}^3$) at the Kaimiro production station (2017-18)

Table 1 Daily mean of PM10 results during two days' monitoring at Kaimiro production station

	(40 hours) (4/08/2017 13:32 to 06/08/2017 05:12)	
24 hr. set	Day 1 (Start to 24 hrs)	Day 2 (24 hrs to end)
Daily average	1.5 $\mu\text{g}/\text{m}^3$	2.9 $\mu\text{g}/\text{m}^3$
NES	50 $\mu\text{g}/\text{m}^3$	

During the 40-hour run, from 4th of August to 6th of August 2017, the average recorded PM₁₀ concentration for the first 24 hour period was 1.5 $\mu\text{g}/\text{m}^3$ and 2.9 $\mu\text{g}/\text{m}^3$ for the second 24 hour period. These daily means equate to 3% and 5.8%, respectively, of the 50 $\mu\text{g}/\text{m}^3$ value that is set by the National Environmental Standard.

Background levels of PM₁₀ in the region have been found to be typically around 11 $\mu\text{g}/\text{m}^3$.

Nitrogen oxides (NOx)

From 2014 onwards, the Council has implemented a coordinated region-wide compliance monitoring programme to measure NOx. The programme involves deploying all measuring devices at 30 NOx monitoring sites (including two sites in the vicinity of the Kaimiro production station) on the same day, with retrieval three weeks later. This approach assists the Council in further evaluating the effects of local and regional emission sources and ambient air quality in the region.

The complete report covering region-wide NOx monitoring is attached in the Appendix to this memorandum (TRC #2089257).

The consents covering air discharges from the Kaimiro production station have specific limits related to particular gases. Special condition 14 of consent 4048-3 set a limit on the nitrogen dioxide concentration at or beyond the production station's boundary. The limit is expressed as 100 $\mu\text{g}/\text{m}^3$ for a 24 hour average or 200 $\mu\text{g}/\text{m}^3$ for a one hour average exposure.

NO_x passive adsorption discs were placed at two locations in the vicinity of the Kaimiro production station on one occasion during the year under review. The discs were left in place for a period of 21 days.

The calculated 1-hour and 24-hour theoretical maximum NO_x concentrations found at the Kaimiro production station during the year under review equates to 7.45µg/m³ and 3.9 µg/m³ respectively. The results show that the ambient ground level concentration of NO_x is well below the limits set out by consent 4048-3.