Greymouth Petroleum Ltd
Deep Well Injection
Monitoring Programme
Annual Report
2019-2020

Technical Report 2020-30

ISSN: 1178-1467 (Online)
Document: 2484250 (Word)
Document: 2616359 (Pdf)

Taranaki Regional Council
Private Bag 713
STRATFORD

November 2020

Executive summary

Greymouth Petroleum Ltd and its subsidiaries (the Company) operate a number of wellsites across the Taranaki region, with major fields located in the Tikorangi and Kaimiro areas. Each wellsite contains varying numbers of producing wells and associated production infrastructure. This report for the period July 2019 to June 2020 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) in relation to the Company's deep well injection (DWI) activities. The report details the results of the monitoring undertaken, assesses the Company's environmental performance during the period under review and the environmental effects of their DWI activities.

The Company held eight resource consents for DWI activities during the review period, which include a total of 124 conditions setting out the requirements that the Company must satisfy. Five of the eight consents were exercised during the period being reported.

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

The Council's monitoring programme for the year under review included five inspections, two injectate samples and 14 groundwater samples collected for physicochemical analysis. The monitoring programme also included a significant data review component, with all injection data submitted by the Company assessed for compliance on receipt.

The monitoring showed that the Company's DWI activities were being carried out in compliance with the conditions of the applicable resource consents. There is no evidence of any issues with any injection well currently in use, or the on-going ability of the receiving formation to accept injected fluids. The results of groundwater quality monitoring undertaken show no adverse effects of the activity at on local groundwater resources. Inspections undertaken during the monitoring year found sites being operated in a professional manner and there were no Unauthorised Incidents in relation to any of the Company's DWI consents.

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

For reference, in the 2019-2020 year, consent holders were found to achieve a high level of environmental performance and compliance for 81% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 17% of the consents, a good level of environmental performance and compliance was achieved.

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

This report includes recommendations to be implemented during the 2020-2021 monitoring period.

Table of contents

List of tables

List of figures

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 2019 to June 2020 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by Greymouth Petroleum Limited and its subsidiaries[1] (the Company) for deep well injection (DWI) activities. During the period under review, the Company held eight resource consents for the subsurface injection of fluids by DWI. The consents authorise discharges from seven separate wellsites within the Company's oil and gas fields. These include the Kaimiro-G, Kaimiro-J and Kaimiro-O wellsites located on the outskirts of Inglewood in North Taranaki. The Kowhai-A and Turangi-A wellsites located near Tikorangi and the Radnor-B and Ngatoro-E wellsites located on the outskirts of Midhurst and Inglewood respectively. Five of the eight consents were utilised during the review period. Consent 7390-1 which authorises DWI at the Turangi-A wellsite via the Turangi-3 well was not exercised during the period being reported. Consents 7068-1 and 10483-1, which authorise DWI at the Ngatoro-E and Radnor-B wellsite respectively, have not yet been given effect to.

The resource consents held by the Company permit the discharge of a range of fluids by DWI, including produced water, well drilling fluids, well workover fluids (including hydraulic fracturing and return fluids), contaminated and 'off spec' stormwater, and compatible groundwater utilised specifically for water flooding. The consents include a number of special conditions which set out specific requirements the Company must satisfy.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the DWI consents held by the Company. This is the 10th report to be prepared by the Council to cover the Company's DWI discharges and their effects.

1.1.2 Structure of this report

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

- consent compliance monitoring under the *Resource Management Act 1991* (RMA) and the Council's obligations;
- the Council's approach to monitoring sites though annual programmes;
- the resource consents held by the Company for DWI activities;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted by the Company.

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.

---

[1] Greymouth Petroleum Acquisitions Company Ltd hold Consent 5312-2.1, Petrochem Ltd hold consent 7466-1.1 and Greymouth Petroleum Central Ltd hold consent 10483-1.

Section 4 presents recommendations to be implemented in the 2020-2021 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 environmental impacts and was not obliged to issue any abatement notices or infringement notices in relation to such impacts.

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

For example:

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

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

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

Administrative performance

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

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

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

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

For reference, in the 2019-2020 year, consent holders were found to achieve a high level of environmental performance and compliance for 81% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 17% of the consents, a good level of environmental performance and compliance was achieved.[2]

[2] The Council has used these compliance grading criteria for 15 years. They align closely with the 4 compliance grades in the MfE Best Practice Guidelines for Compliance, Monitoring and Enforcement, 2018

1.2 Process description

The process of DWI involves injecting fluids deep underground into geological formations which are confined from overlying groundwater aquifers by low permeability strata. Injection wells are also designed and constructed to provide multi barrier protection against contaminant migration to groundwater systems.

The subsurface injection of fluids by DWI is often used as a method for disposing of waste fluids generated during oil and gas exploration and production activities. The greatest volume of waste fluids generated through these activities is saline water (brine) that is drawn to the surface with hydrocarbons through producing wells ('produced water'). The DWI consents currently held by the Company also authorise the injection of fluid types other than produced water. The range of fluid types authorised for injection varies by consent, but includes contaminated stormwater, well drilling fluids, well workover fluids, HF fluids and HF return fluids. In addition to providing a means to dispose of waste fluids, the subsurface injection of fluids by DWI is also an established oilfield technique for regulating reservoir pressure as a means of enhancing the rate of hydrocarbon recovery from a reservoir. This process, commonly referred to as water flooding, is often implemented when natural reservoir pressures become reduced due to ongoing production. Fluids can also be heated prior to injection to reduce the viscosity of the oil being produced, improving its flow toward a producing well and upward through the wellbore itself.

The Company has two water flooding programmes. One at the Kaimiro-O wellsite under consent 5312-2.1 and the other at the Kaimiro-G wellsite under consent 9470-1. Both programmes are designed to enhance production in the Mount Messenger formation via the company's production wells. All other consents are utilised for the disposal of the various forms of wastewater they authorise.

A schematic representation of injection wells for both waste discharge and enhanced oil recovery is presented in Figure 1.

Further details regarding hydrocarbon exploration and production in Taranaki, the DWI process and its history within region can be found in previous compliance reports published by the Council (see Bibliography).

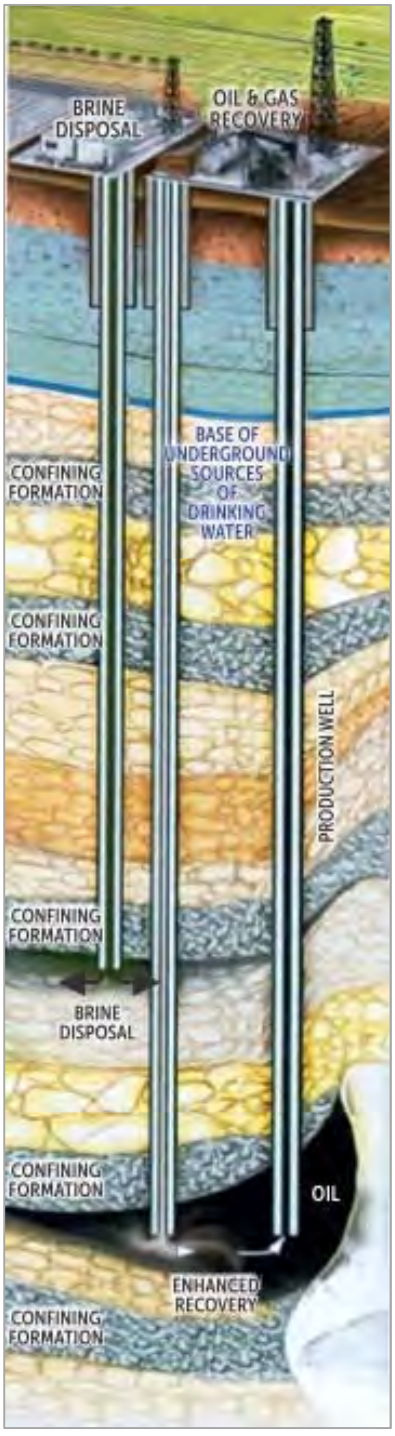

Figure 1 DWI schematic (www.epa.gov/uic)

1.3 Resource consents

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

The Company holds eight resource consents the details of which are summarised in Table 1 below. Summaries of the conditions attached to each active permit are set out in Section 3 of this report.

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

Figure 2 shows the location of the DWI consents held by the Company during the period under review.

Table 1 Resource consents held by the Company during the 2019-2020 monitoring year

Consent number	Purpose	Granted	Review	Expires
Discharges of waste to land				
5312-2.1	To discharge groundwater from the Matemateaonga Formation and produced water into the Mount Messenger Formation for improved hydrocarbon recovery purposes at the Kaimiro-O wellsite.	06 May 2015	June 2020	01 Jun 2032
7068-1	To discharge waste drilling fluids and/or produced water from hydrocarbon exploration and production operations by deep well injection at or about GR: Q19:114-210.	05 March 2007	None remaining	01 Jun 2021
7390-1	To discharge produced water from hydrocarbon exploration and production operations by deep well injection at the Turangi-A wellsite (via Turangi-3 well) at or about (NZTM) 1713836E-5681397N.	10 Oct 2008	June 2021	01 Jun 2027
7466-1.1	To discharge produced water from hydrocarbon exploration and production operations by deep well injection at the Kowhai wellsite (via Kowhai-2 well).	03 Feb 2014	June 2021	01 Jun 2027
7897-1	To discharge the following from hydrocarbon exploration operations at the Kaimiro-J wellsite by deep well injection into the Mount Messenger Formation: produced water; well drilling fluids; well work over fluids; hydraulic fracturing fluids, and 'off spec' stormwater from the consent holders wellsites.	12 Sep 2011	June annually	01 Jun 2036
9272-2	To discharge produced water, well drilling fluids, well workover and contaminated stormwater into the Mount Messenger Formation by deep well injection.	02 Jun 2016	June annually	01 Jun 2036
9470-1	To discharge produced water, well drilling fluids, well work over fluids into the Mount Messenger Formation by deep well injection via the Kaimiro-G wellsite at or about (NZTM) 1699622E-5663210N.	04 Feb 2013	June annually	01 Jun 2032
10483-1	To discharge produced water, well drilling fluids, well work over fluids, hydraulic fracturing fluids, and contaminated stormwater from hydrocarbon exploration and production operations into the Mount Messenger Formation by deep well injection at the Radnor-B wellsite.	23 Nov 2018	June annually	01 Jun 2034

1.4 Monitoring programme

1.4.1 Introduction

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

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

The monitoring programme for the Company's DWI sites consisted of five primary components.

1.4.2 Programme liaison and management

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

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

The Company's five active DWI wellsites were visited once during the monitoring period. With regard to consents for DWI activities, the main points of interest are general housekeeping and any processes with potential or actual discharges, including any surface water runoff, and their receiving environments.

In addition to the programmed DWI inspections, Council Officer's also visited the Company's Kaimiro-O wellsite on two occasions for injectate/groundwater sampling purposes and the Kowhai-A and Turangi-A production stations on a further three occasions as part of the Company's Production Station monitoring programme.

1.4.4 Injectate sampling

The sampling of injectate is carried out in order to characterise the general chemical nature of the discharge and also the variation in its chemical composition across the monitoring period.

The injectate sampling required by the respective DWI consents is primarily undertaken by the Company. The Company are required to analyse each different waste stream arriving on-site for discharge, or a minimum of two samples per year, if there are no significant changes to the composition of the discharge. Results of this monitoring are submitted to the Council on a monthly basis.

In addition to the Company's injectate sampling, the Council undertakes sampling of the groundwater abstracted via the Kaimiro-O groundwater bore, which is subsequently injected for water flooding purposes. These groundwater samples therefore also constitute an injectate sample for the purposes of this monitoring programme.

A summary of the details for each injection well and sampling point is included in Table 2 and locations are displayed in Figure 3.

Samples of injectate are analysed for the following:

- pH;
- conductivity;
- suspended solids;
- chlorides; and
- total petroleum hydrocarbons.

Table 2 Injection well details

Wellsite	Consent	Injection well	Site code	Formation	Sample point
Kaimiro-O	5312-2.1	Kaimiro-17	GND1385	Mount Messenger	Well head tap
Kowhai-A	7466-1.1	Kowhai-2	GND2289	Mount Messenger	Kowhai-2 well head tank
Kaimiro-J	7897-1	Kaimiro-11	GND1377	Mount Messenger	KPS – Tank 033
Turangi-A	9272-2	Turangi-5	GND2365	Mount Messenger	Tank 4
Kaimiro-G	9470-1	Kaimiro-10	GND2351	Mount Messenger	KPS – Tank 033
		Kaimiro-19	GND3025		

1.4.5 Groundwater sampling

Groundwater samples in relation to the DWI monitoring programme were obtained on two occasions during the monitoring period. This sampling is a continuation of the monitoring component of this programme which was initiated during the 2012-2013 monitoring period.

Seven monitoring sites were sampled during the review period, including one dedicated monitoring bore (GND2770) installed by the Company at the Kowhai-A wellsite. GND2770 replaced the former monitoring site which was an ephemeral spring (GND2464) in November 2017. The remainder of sites sampled are privately owned wells/bores.

Details of the groundwater monitoring sites included in the current monitoring programme are listed below in Table 3. The location of the sites in relation to the wellsite being monitored is illustrated in Figure 3.

Table 3 Location of groundwater monitoring sites

Site code	Wellsite	Type	Distance from injection well (m)	Casing depth (m)	Open or screened interval (m)	Total depth (m)	Aquifer
GND1673	Turangi-A	Bore	362	0-26	26-42	42	Marine Terraces
GND2232		Well	210	unlined	0-2.5	2.5	Marine Terraces
GND0701	Kaimiro-G	Well	56	0-7	7-10	10	Volcanics
GND2353		Well	685	unlined	0-4.2	4.2	Volcanics
GND2456	Kaimiro-O	Bore	15	0-330	330-342	342	Matemateaonga
GND2770	Kowhai-A	Bore	onsite	0-26	26-38	38	Marine Terraces
GND2472	Kaimiro-J	Bore	905	18	18-30	30	Volcanics

Groundwater samples taken by the Council were sent on behalf of the Company to Hill Laboratories Ltd (Hills) and analysed for a range of parameters including the following:

- pH;
- conductivity;
- chlorides; and
- total petroleum hydrocarbons.

Groundwater sampling at the Kaimiro-O wellsite requires additional parameters to be analysed under Consent 5312-2.1 as follows:

- anion/cation profile; and
- BTEX.

The parameters above are deemed sufficient to enable identification of any significant changes in groundwater quality related to DWI activities.

In addition to the routine sampling, baseline samples have been collected from all monitored sites and analysed for general ion chemistry, BTEX and dissolved gas concentrations. These more detailed analyses will allow a more in depth assessment of variations in groundwater composition should the need arise in the future.

1.4.6 Assessment of data submitted by the Company

A significant component of the monitoring programme is the assessment of consent holder submitted data. The Company is required to submit a wide range of data under the conditions of their DWI consents.

As required by the conditions of their consents, the Company has submitted an Injection Operation Management Plan for each active injection well. The plans are required to include the operational details of the injection activities and to identify the conditions that would trigger concerns about the integrity of the injection well, the receiving formation or overlying geological seals. The plans are also required to detail the action(s) to be taken by the consent holder if trigger conditions are reached. The Company was also required to submit well construction details, an assessment of the local geological environment, results of well integrity testing and details of the proposed monitoring plan for the injection well.

The Company is also required to maintain continuous records of injection volumes, and average and maximum injection pressures, and to characterise the chemical characteristics of all waste types being discharged. This data is submitted to the Council on a monthly basis where it is assessed for compliance against the relevant consent conditions.

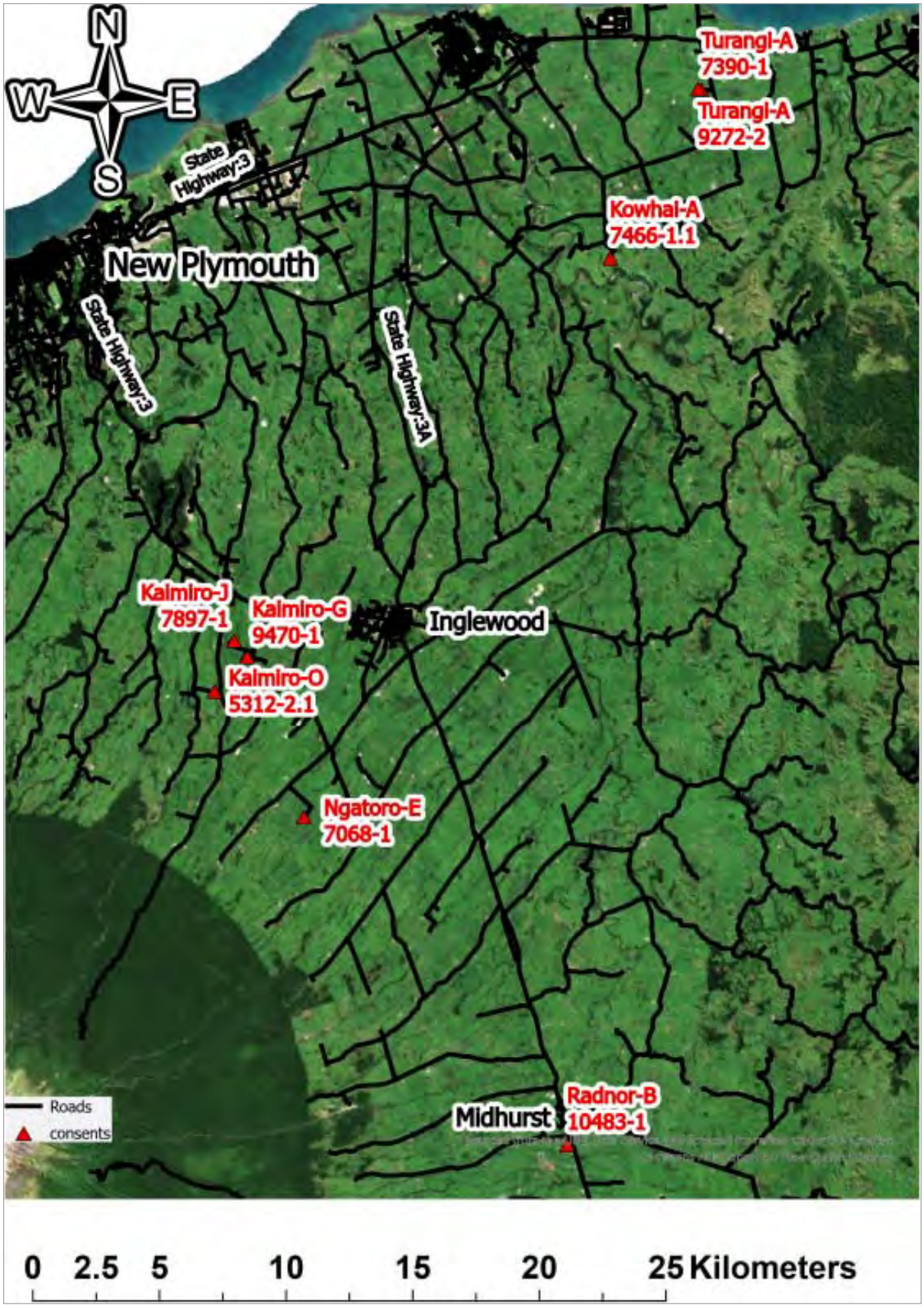

Figure 2 Location of the DWI consents held by the Company during the period under review

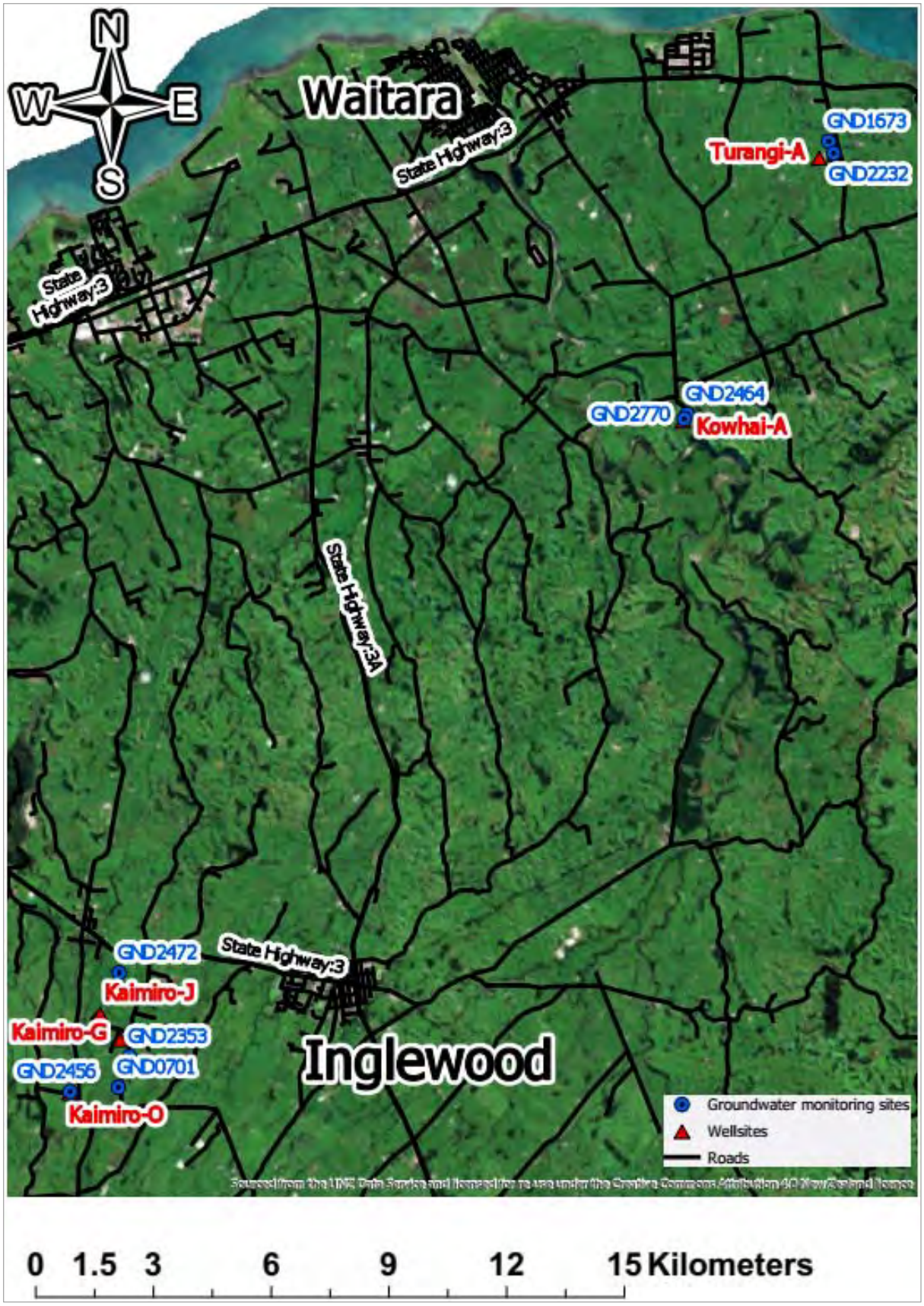

Figure 3 Location of monitoring sites in relation to the Company's active DWI wellsites

2 Results

2.1 Inspections

The routine inspections undertaken at each active wellsite during the monitoring year included undertaking a general visual assessment of the operational equipment, storage facilities and associated equipment.

The inspecting officer concluded that the wellsites were generally in good condition and being well managed.

No significant issues were identified by staff during any additional inspections undertaken as part of the production station monitoring programmes or for the purpose of injectate sampling.

2.2 Injectate monitoring

Samples of injectate were obtained from the Company's Kaimiro-O wellsite by the Council on 18 November 2019 and 26 May 2020. The samples were sent to Hills on the same day for physicochemical analysis. Injectate at this site is sourced from a groundwater abstraction bore located at the wellsite. Samples are therefore used to assess any changes in groundwater quality and the composition of injected fluids at this site. All other wellsites are sampled by the Company, or a third party on behalf of the Company, and the results are submitted to the Council monthly.

The results of the sample analyses collected by the Council and the range of results since 2013 for comparison are included below in Table 4. The range of results provided by the Company over the review period, are included in Table 5 to Table 8.

The range of values associated with the results of these analyses illustrates the variability in the composition of injectate across the monitoring period. The composition of the injectate varies depending on the origin and volume of fluids transferred from each individual source at the time of injection.

The concentrations of each analyte measured over the 2019-2020 period are within the typical range for injectate samples at these sites.

Table 4 Results of the Council's biannual injectate sampling Kaimiro-O wellsite (2019-2020)

Parameter	Unit	Minimum	Maximum	TRC184314	TRC191946
Date	-	1-Jul-13 to 30-Jun-20		18-Nov-19	26-May-20
Time	NZST	-	-	9:05	13:25
pH	pH units	7.0	8.6	7.5	7.8
Conductivity	µS/cm @ 25°	1,511	1,683	1,520	1,511
Suspended solids	g/m^3	2	26	3	<3
Temperature	Deg°C	11	26	24	13
Salinity	TDS g/m^3	940	990	960	950
Chloride	mg/L	70	240	160	158
Total hydrocarbons*	g/m^3	<0.5	10.7	<0.7	<0.7

*Note * not required under Consent 5312-2.1*

Table 5 Results of the Company's monthly injectate sampling Kowhai-A wellsite (2019-2020)

Parameter	Unit	Minimum	Maximum
Date	-	01-Jul-19 to 30-Jun-20	
pH	pH units	6.4	7.1
Suspended solids	g/m^3	8	48
Temperature	Deg°C	16.0	25.5
Salinity	TDS g/m^3	17	33
Chloride	mg/L	5,800	15,100
Total petroleum hydrocarbons	g/m^3	24	220

Table 6 Results of the Company's monthly injectate sampling Kaimiro-J wellsite (2019-2020)

Parameter	Unit	Minimum	Maximum
Date	-	01-Jul-19 to 30-Jun-20	
pH	pH units	6.5	7.1
Suspended solids	g/m^3	12	290
Temperature	Deg°C	9.5	27.5
Salinity	TDS g/m^3	18	39
Chloride	mg/L	2,700	25,000
Total petroleum hydrocarbons	g/m^3	15	740

Table 7 Results of the Company's monthly injectate sampling Turangi-A wellsite (2019-2020)

Parameter	Unit	Minimum	Maximum
Date	-	01-Jul-19 to 30-Jun-20	
pH	pH units	6.7	7.8
Electrical conductivity	mS/m	2,340	5,600
Suspended solids	g/m^3	7	81
Temperature	Deg°C	16.0	28.5
Salinity	TDS g/m^3	14.2	17.1
Chloride	mg/L	2,600	9,400
Total petroleum hydrocarbons	g/m^3	33	1,750

Table 8 Results of the Company's monthly injectate sampling Kaimiro-G wellsite (2019-2020)

Parameter	Unit	Minimum	Maximum
Date	-	01-Jul-19 to 30-Jun-20	
pH	pH units	6.5	10
Suspended solids	g/m^3	12	1,160
Temperature	Deg°C	9.5	35.1
Salinity	TDS g/m^3	3	39
Chloride	mg/L	1,090	25,000
Total petroleum hydrocarbons	g/m^3	15	740

2.3 Groundwater sampling

Groundwater samples were obtained on two occasions from two sites located in the vicinity of the Kaimiro–G (GND0701 and GND2353) and Turangi-A (GND1673 and GND2232) wellsites and one site each in the vicinity of the Kaimiro-O (GND2456), Kaimiro-J (GND2472) and Kowhai-A (GND2770) wellsites.

The groundwater samples were collected following standard groundwater sampling methodologies and generally in accordance with the National Protocol for State of the Environment Groundwater sampling in New Zealand (2006).

The results of the analyses carried out during the monitoring period compared to historical concentrations are set out below in Table 9 to Table 15.

The results show there have been no significant changes in groundwater composition in the vicinity of any monitored wellsite since monitoring commenced. The subtle variation in analyte concentrations at each site and between each site are a result of natural seasonal fluctuation and sampling variability.

Table 9 Results of Kaimiro-O wellsite groundwater sampling at GND2456 (consent 5312-2.1)

Parameter	Unit	Minimum	Maximum	TRC193944	TRC201341
Date	-	01-Jul-13 to 30-Jun-20		18-Nov-19	26-May-20
Time	NZST	-	-	9:05	13:25
pH	pH units	7.0	8.6	7.5	7.8
Electrical conductivity	µS/cm @ 25ºC	1,511	1,683	1,520	1,511
Chloride	g/m^3	70	240	160	158
Calcium	g/m^3	59	64	64	63
Potassium	g/m^3	10	11	10	10
Magnesium	g/m^3	62	73	71	71
Sodium	g/m^3	166	184	171	167
Alkalinity	g/m^3 $CaCo_3$	300	335	320	320
Bicarbonate	g/m^3 HCO_3	360	400	390	390
Total Nitrogen	g/m^3 N	0.002	0.016	0.006	0.006
Nitrite	g/m^3 N	<0.002	0.011	<0.002	<0.002
Nitrate	g/m^3 N	<0.002	0.007	0.005	0.004
Sulphate	g/m^3	260	310	260	260
Benzene	g/m^3	<0.0010	<0.0010	<0.0010	<0.0010
Ethylbenzene	g/m^3	<0.0010	<0.0010	<0.0010	<0.0010
Toluene	g/m^3	<0.0010	0.0015	<0.0010	<0.0010
XYLENE-O	g/m^3	<0.0010	0.023	<0.0010	<0.0010
XYLENE-M	g/m^3	<0.002	0.069	<0.002	<0.002
Total petroleum hydrocarbons	g/m^3	<0.5	10.7	<0.7	<0.7
Temperature	Deg°C	10.8	25.6	24	13
Suspended solids	g/m^3	2	26	3	<3
Total dissolved solids	g/m^3	940	990	960	950

Table 10 Results of Kowhai-A wellsite groundwater sampling at GND2770 (consent 7466-1.1)

Parameter	Unit	Minimum	Maximum	TRC193941	TRC201338
Date	-	01-Jul-14 to 30-Jun-20*		08-Nov-19	26-May-20
Time	NZST	-	-	10:15	10:30
pH	pH units	6.0	6.8	6.7	6.6
Electrical conductivity	µS/cm @ 25°C	191	338	195	191
Chloride	g/m^3	35	87	39	35
Total petroleum hydrocarbons	g/m^3	<0.5	<0.7	<0.7	<0.7

*Note * Prior to November 2017 historical sampling was undertaken at GND2464*

Table 11 Results of Kaimiro-J wellsite groundwater sampling at GND2472 (consent 7897-1)

Parameter	Unit	Minimum	Maximum	TRC193942	TRC201339
Date	-	01-Jul-14 to 30-Jun-20		21-Nov-19	26-May-20
Time	NZST	-	-	9:00	16:30
pH	pH units	6.7	7.6	6.7	6.9
Electrical conductivity	µS/cm @ 25°C	195	503	195	197
Chloride	g/m^3	13	20	14	15
Total petroleum hydrocarbons	g/m^3	<0.5	0.8	<0.7	<0.7

Table 12 Results of Turangi-A wellsite groundwater sampling at GND1673 (consent 9272-2)

Parameter	Unit	Minimum	Maximum	TRC193945	TRC201342
Date	-	01-Jul-14 to 30-Jun-20		08-Nov-19	28-May-20
Time	NZST	-	-	13:30	12:50
pH	pH units	6.3	7.9	7.9	7.2
Electrical conductivity	µS/cm @ 25°C	221	341	317	329
Chloride	g/m^3	13	44	16	14
Total petroleum hydrocarbons	g/m^3	<0.5	<0.7	<0.7	<0.7

Table 13 Results of Turangi-A wellsite groundwater sampling at GND2232 (consent 9272-2)

Parameter	Unit	Minimum	Maximum	TRC193940	TRC201337
Date	-	01-Jul-14 to 30-Jun-20		08-Nov-19	28-May-20
Time	NZST	-	-	14:00	13:30
pH	pH units	6.2	7.3	6.8	6.7
Electrical conductivity	µS/cm @ 25°C	182	331	198	331
Chloride	g/m^3	23	70	38	70
Total petroleum hydrocarbons	g/m^3	<0.5	<0.5	<0.7	<0.7

Table 14 Results of Kaimiro-G wellsite groundwater sampling at GND0701 (consent 9470-1)

Parameter	Unit	Minimum	Maximum	TRC193947	TRC201344
Date	-	01-Jul-14 to 30-Jun-20		18-Nov-19	26-May-20
Time	NZST	-	-	10:10	12:55
pH	pH units	5.7	6.2	5.8	6.1
Electrical conductivity	µS/cm @ 25°C	107	160	143	160
Chloride	g/m^3	10	20	13	14
Total petroleum hydrocarbons	g/m^3	<0.5	<0.5	<0.7	<0.7

Table 15 Results of Kaimiro-G wellsite groundwater sampling at GND2353 (consent 9470-1)

Parameter	Unit	Minimum	Maximum	TRC193946	TRC201343
Date	-	01-Jul-14 to 30-Jun-20		18-Nov-19	26-May-20
Time	NZST	-	-	9:45	13:40
pH	pH units	6.2	7.1	6.2	6.6
Electrical conductivity	µS/cm @ 25°C	160	243	177	160
Chloride	g/m^3	20	30	29	22
Total petroleum hydrocarbons	g/m^3	<0.5	<0.5	<0.7	<0.7

2.4 Provision of consent holder data

The Company provided records of their injection activities during the 2019-2020 monitoring period, including daily injection volumes, pumping duration and maximum and average injection pressures. All data was provided within the consented timeframes.

Table 16 provides an overview of the Company's injection activities across all consents utilised during the monitoring period. The total volume of fluid injected by the Company over the monitoring period was slightly greater than that recorded during the previous three monitoring periods (Table 17). The greatest volume of fluid (37%) was injected via the Turangi-5 well located at the Turangi-A wellsite.

Table 16 Summary of injection activity during the 2019-2020 monitoring year

Consent	Wellsite	Injection well	Total volume discharged (m^3) 01/07/19 – 30/06/20	Discharge period		Well ID
				From	To	
5312-2.1	Kaimiro-O	Kaimiro-17	11,876.00	01/07/2019	30/06/2020	GND1385
7466-1.1	Kowhai-A	Kowhai-2	11,784.84	01/07/2019	30/06/2020	GND2289
7897-1	Kaimiro-J	Kaimiro-11	8,023.70	03/02/2019	30/06/2020	GND1377
9272-2	Turangi-A	Turangi-5	28,103.20	01/07/2019	30/06/2020	GND2365
9470-1	Kaimiro-G	Kaimiro-10/Kaimiro-19	16,409.36	01/07/2019	30/06/2020	GND2351
Total			76,197.10	-	-	-

Table 17 Summary of the Company's historical injection activity by year

Period	Total volume discharged (m^3)	Period	Total volume discharged (m^3)
2019-2020	76,197	2010-2011*	77,211
2018-2019	59,539	2009-2010*	77,211
2017-2018	57,742	2008-2009	15,992
2016-2017	62,618	2007-2008	16,870
2015-2016	89,308	2006-2007	18,833
2014-2015	91,909	2005-2006	29,631
2013-2014	98,517	2004-2005	14,916
2012-2013	84,032	2003-2004	10,482
2011-2012*	77,211	-	-

2.4.1 Summary of injection at the Kaimiro-O wellsite (consent 5312-2.1)

Table 18 provides a summary of the historical injection undertaken at the Kaimiro-O wellsite since 2015. Injection at the site is undertaken for the purpose of water flooding and is managed in response to the needs of the water flood programme.

The data shows that the volume of fluid discharged via the wellsite was similar to last year. All injection during the period remained within consented limits. The injection data for the wellsite during the reporting period are also presented graphically in Figure 4. The data indicates that wellhead pressures generally fluctuate between 50 and 70 bar and injection remained fairly consistent across the monitoring period.

Table 18 Summary of injection via the Kaimiro-17 well (2015-2020)

Kaimiro-17 injection well					
Year	**Annual volume (m^3)**	**Max. injection volume (m^3/day)**	**Maximum injection rate (m^3/hr)**	**Maximum injection pressure (bar)**	**Average injection pressure (bar)**
Consent limit 5312-2 and 2.1	-	**1,000**	**41.6**	**85**	-
2019-2020	11,876	65	39.9	70	40
2018-2019	11,818	70	40.0	68	45
2017-2018	9,310	71	35.5	85	71
2016-2017	2,000	77	26.0	85	64
2015-2016	9,919	92	36.8	70	59
Consent limit 5312-1	-	-	-	-	-
2014-2015	13,403	58	18.3	119**	74
2013-2014	15,299	69	18.0	93**	72

*Note ** Maximum injection pressures were recorded during reporting periods prior to the consent limit of 85 bar being applied*

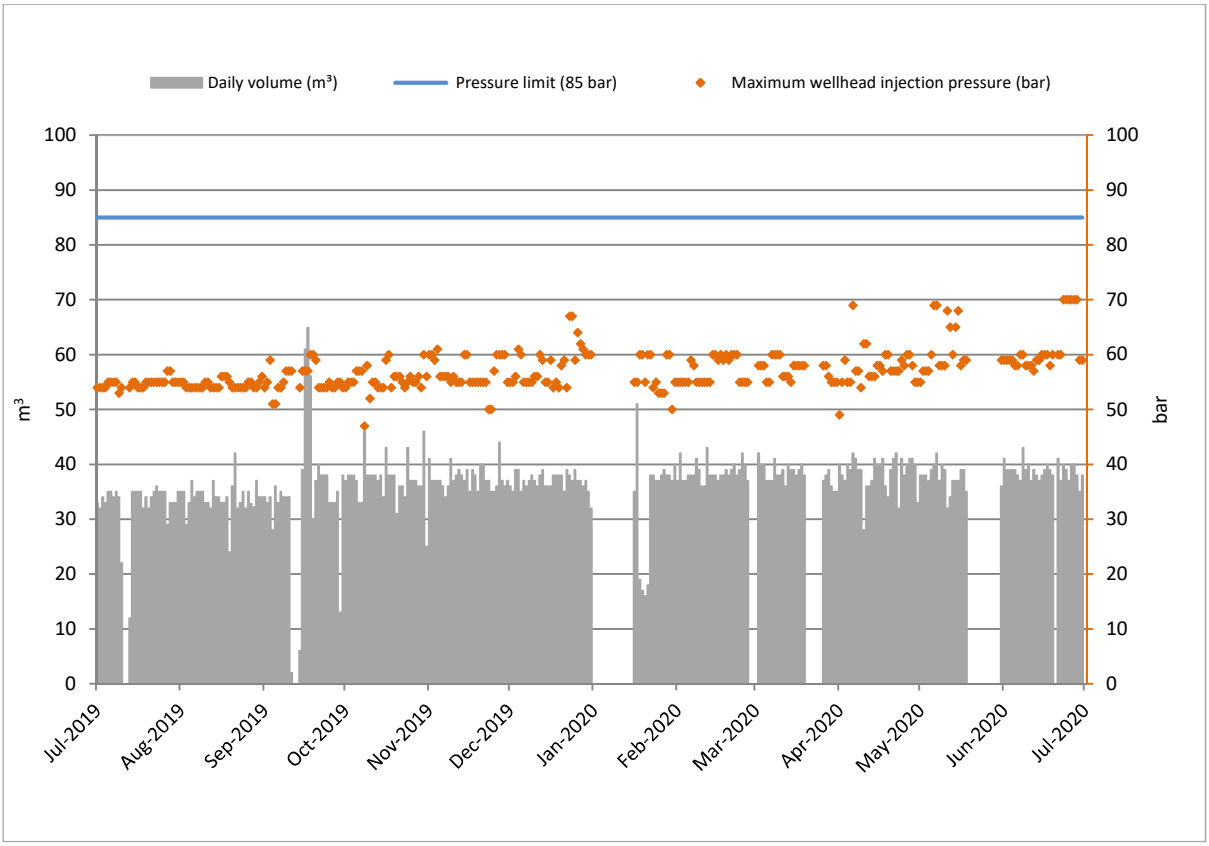

Figure 4 Kaimiro-17 well: Daily injection volumes and injection pressures (2019-2020)

2.4.2 Summary of injection activities at the Kowhai-A wellsite (consent 7466-1.1)

Table 19 provides a summary of the historical injection undertaken at the Kowhai-A wellsite since 2013.

The data shows that the volume of fluid discharged via the wellsite was slightly lower than the previous year and that Injection at the wellsite has generally decreased overtime. All injection during the period remained within consented limits.

The injection data for the wellsite during the reporting period are also presented graphically in Figure 5. The data indicates that wellhead pressures generally fluctuate between 17 and 23 bar. Injection remained fairly consistent across the monitoring period with daily volumes generally between 25-30 m^3/day. Maximum pressures and volumes follow a similar pattern with higher pressures corresponding to higher injection volumes and lower pressures to lower volumes.

Table 19 Summary of injection via the Kowhai-2 well (2013-2020)

Kowhai-2 injection well					
Year	**Annual Volume (m^3)**	**Max. injection volume (m^3/day)**	**Max. injection rate (m^3/hr)**	**Max. injection pressure (bar)**	**Avg. injection pressure (bar)**
Consent limit	-	**916**	**38.0**	**92**	-
2019-2020	11,785	75	15.5	24	15
2018-2019	14,496	89	8.6	22	17
2017-2018	9,993	143	11.9	23	21
2016-2017	20,181	86	10.7	23	19

Kowhai-2 injection well					
Year	Annual Volume (m^3)	Max. injection volume (m^3/day)	Max. injection rate (m^3/hr)	Max. injection pressure (bar)	Avg. injection pressure (bar)
Consent limit	**-**	**916**	**38.0**	**92**	**-**
2015-2016	30,106	109	6.9	27	23
2014-2015	35,918	121	7.0	27	22
2013-2014	36,552	159	6.6	28	24

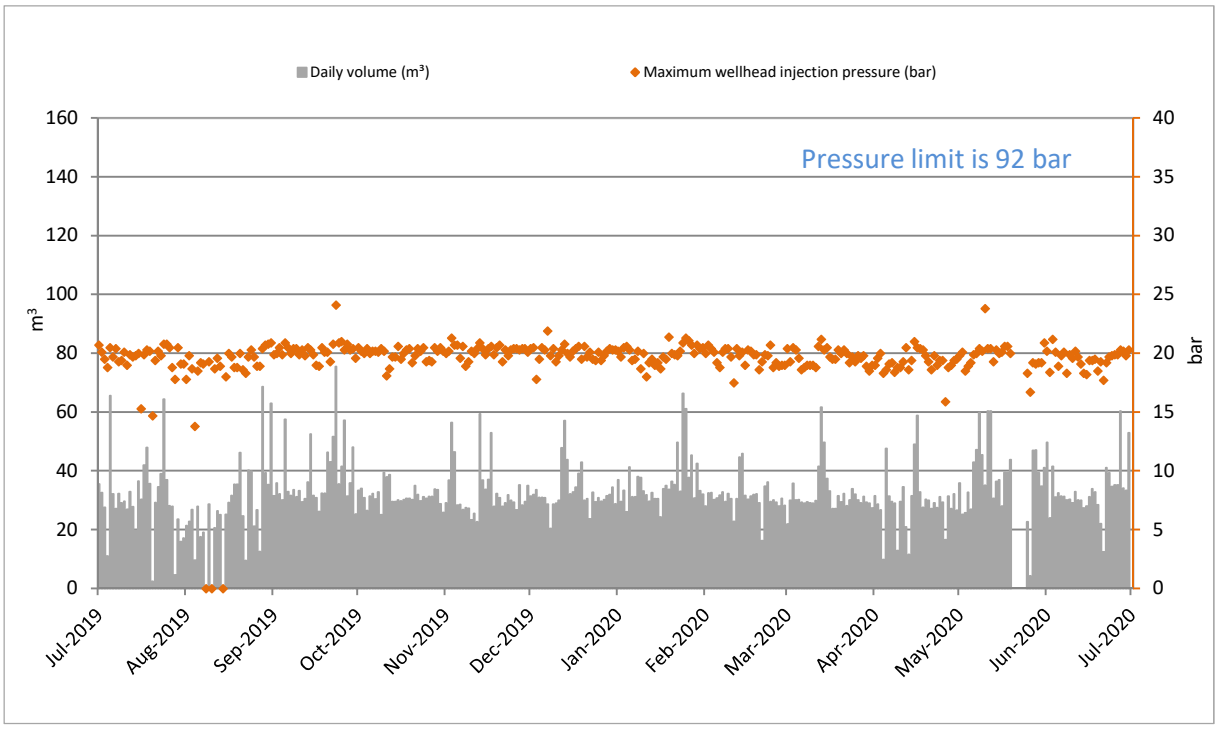

Figure 5 Kowhai-2 well: Daily injection volumes and injection pressures (2019-2020)

2.4.3 Summary of injection activities at the Kaimiro-J wellsite (consent 7897-1)

Table 20 provides a summary of the historical injection undertaken at the Kaimiro-J wellsite since 2013.

The data shows that injection during the monitoring period was significantly lower than the previous year and that the volume of fluid discharged via the wellsite fluctuates greatly from year to year. All injection during the period remained within consented limits.

The injection data for the wellsite during the reporting period are also presented graphically in Figure 6. The data indicates that wellhead pressures ranged between 40 and 55 bar. Injection became more sporadic and decreased across the monitoring period. Maximum pressures and volumes followed a similar pattern with higher pressures corresponding to higher injection volumes and lower pressures to lower volumes.

Table 20 Summary of injection via the Kaimiro-11 well (2013-2019)

Kaimiro-11 injection well					
Year	Annual Volume (m^3)	Max. injection volume (m^3/day)	Max. injection rate (m^3/hr)	Max. injection pressure (bar)	Avg. injection pressure (bar)
Consent limit	-	**687**	**29**	**115**	-
2019-2020	8,024	144	21.0	55	N/A*
2018-2019	16,284	178	16.3	65	N/A*
2017-2018	7,137	124	11.1	50	N/A*
2016-2017	19,077	119	28.8	55	47
2015-2016	30,615	186	15.3	53	52
2014-2015	16,960	137	14.0	56	49
2013-2014	24,885	191	10.9	76	44

*Note * reporting of average injection pressures are not required under consent 7897-1*

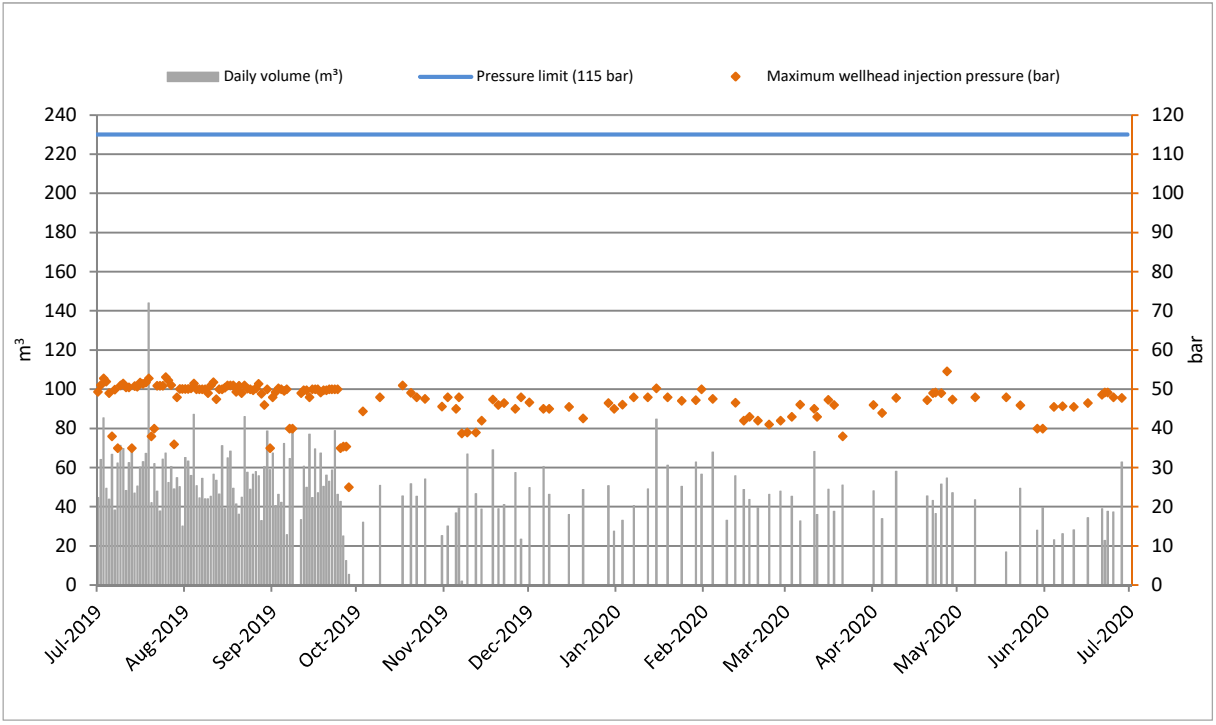

Figure 6 Kaimiro-11 well: Daily injection volumes and injection pressures (2019-2020)

2.4.4 Summary of injection activities at the Turangi-A wellsite (consent 9272-2)

Table 21 provides a summary of the historical injection undertaken at the Turangi-A wellsite since 2013.

The data shows that the volume of fluid discharged via the wellsite was higher than that over the previous periods. All injection during the period remained within consented limits.

The injection data for the wellsite during the reporting period are also presented graphically in Figure 7. The data indicates that wellhead pressures generally fluctuate between 23 and 27 bar and that injection increased substantially in the latter part of the year. Maximum pressures and volumes follow a similar

pattern with higher pressures corresponding to higher injection volumes and lower pressures to lower volumes.

Table 21 Summary of injection via the Turangi-5 well (2013-2019)

Turangi-5 (WDW) injection well					
Year	Annual Volume (m^3)	Max. injection volume (m^3/day)	Max. injection rate (m^3/hr)	Max. injection pressure (bar)	Avg. injection pressure (bar)
Consent limit 9272-2	-	-	-	**111**	-
2019-2020	28,103	202	10.6	27	24
2018-2019	16,940	103	4.2*	25	20
2017-2018	20,025	195	11.0	26	19
2016-2017	18,520	180	23.0	31	20
2015-2016	1,304	53	10.2	22	21
Consent limit 9272-1	-	**687**	**28.6**	**115**	-
2015-2016	15,468	192	12.1	29	22
2014-2015	14,746	59	31.1	27	20
2013-2014	17,411	142	20.6	32	27

*Note * this is the maximum average daily rate*

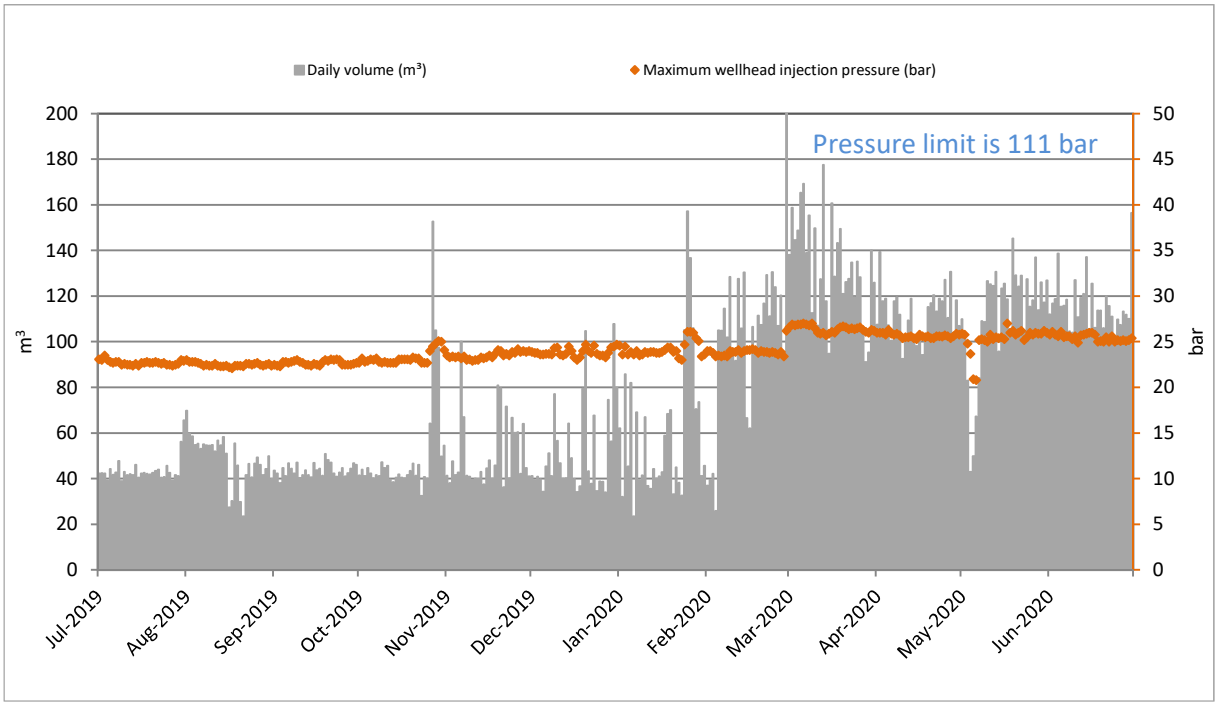

Figure 7 Turangi-5 well: Daily injection volumes and injection pressures (2019-2020)

2.4.5 Summary of injection activities at the Kaimiro-G wellsite (consent 9470-1)

Table 22 provides a summary of the historical injection undertaken at the Kaimiro-G wellsite since 2013.

The data shows that the volume of fluid discharged via the wellsite was similar to that over the previous year. The increased volumes seen during the two most recent years are a result of the Kaimiro-19 well, which is now the primary injection well at the site, being added to the programme. All injection during the period remained within consented limits.

The injection data for the wellsite during the reporting period are also presented graphically in Figure 8. The data indicates that wellhead pressures in the Kaimiro-10 and Kaimiro-19 well differ significantly. The Kaimiro-19 well is primarily used for water flooding and is hydraulically linked to the Goldie 1 production well. The well operated under a vacuum during the previous monitoring year and now pressures range between 1 and 4 bar. Pressures in the Kaimiro-10 well historically ranged between 60 and 75 bar and have decreased as the volume of fluid injected via the well has reduced over time.

Maximum pressures and volumes follow a similar pattern in both wells with higher pressures corresponding to higher injection volumes and lower pressures to lower volumes.

Table 22 Summary of injection via the Kaimiro-10/Kaimiro-19 wells (2013-2019)

Kaimiro-10 and Kaimiro-19 injection wells					
Year	**Annual Volume (m^3)**	**Max. injection volume (m^3/day)**	**Max. injection rate K-10/K-19 (m^3/hr)**	**Max. injection pressure K-10/K-19 (bar)**	**Avg. injection pressure K-10/K-19 (bar)**
Consent limit	**-**	**206**	**8.6**	**73**	**-**
2019-2020	16,409	141	8.5/6.4	72/5	48/2
2018-2019	16,592	128	8.4/5.0	73/5	62/2
2017-2018	5,277	184	8.5/8.6	73/0	72/0
2016-2017	2,840	133	6.7/8.6	72/0	72/0
2015-2016	1,896	76	7.2	73	72
2014-2015	10,882	121	9.1	73	42
2013-2014	4,370	63	8.6	74	69

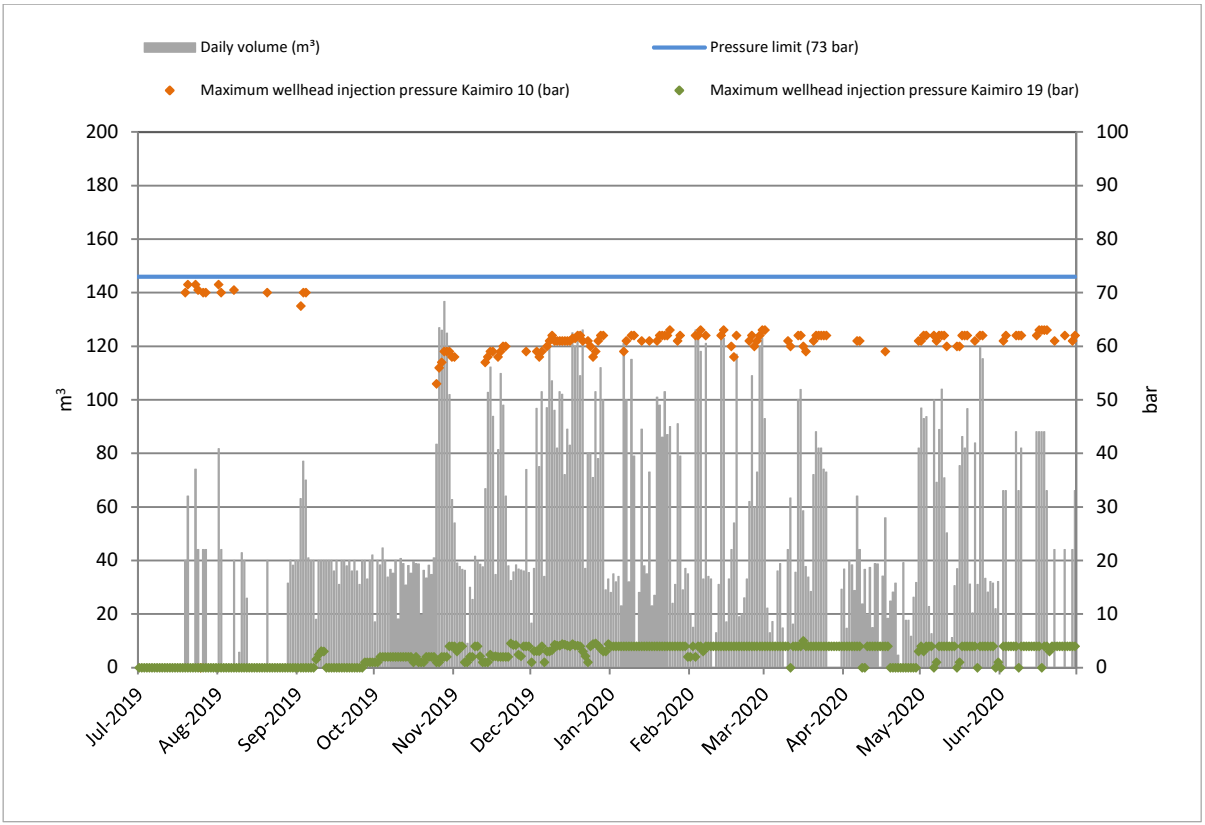

Figure 8 Kaimiro-10/Kaimiro-19 wells: Daily injection volumes and injection pressures (2019-2020)

2.5 Incidents, investigations, and interventions

The monitoring programme for the year was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with 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.

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

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

There were no incidents recorded, additional investigations, or interventions required by the Council in relation to the Company's DWI activities during the 2019-2020 period.

3 Discussion

3.1 Discussion of site performance

During the period under review, the Company exercised five resource consents authorising the discharge of fluids by DWI. The exercised consents licensed discharges of various forms of fluid into the Mount Messenger formation. The main source of fluids for injection was produced water from the Company's Turangi, Kowhai and Kaimiro fields.

The operation of the injection wells is monitored by Company staff, with automated systems recording the injection data required under the conditions of their consent. During the review period the Company managed their injection activities to comply with all specific restrictions on injection volumes, rates and pressures stipulated in the conditions of each of their DWI consents. This data was submitted to the Council at the specified frequency throughout the monitoring period.

The volume of injection undertaken during the 2019-2020 monitoring period was slightly higher than during the previous three reporting periods. All injection was undertaken within consented limits.

An assessment of the Company's historical injection data indicates that injection pressures generally fluctuate in response to injection volumes, with higher maximum pressures corresponding with higher daily injection volumes. There is no evidence of any sustained increases in injection pressures over time at any injection site.

Routine inspections of active injection sites undertaken by the Council during the period found no issues in relation to any of the Company's DWI activities. The Council was not required to enter any incidents in relation to the exercising of the Company's DWI consents during the review period, nor were any complaints received from the public in relation to these consents.

Modelling of injection zones undertaken by the Company indicates that injection operations being undertaken continue to pose no risk to the integrity of geological seals confining the injection zone targeted at each active injection site. Additionally, the modelling shows that the receiving formations targeted for injection at all sites retain capacity for on-going injection.

3.2 Environmental effects of exercise of consents

No adverse environmental effects have been recorded by the Council in relation to any DWI consent exercised by the Company.

The groundwater monitoring component of this programme continued during the period under review, with 14 samples being taken from monitoring sites in the vicinity of the Company's active injection wells. The results of the monitoring carried out show that the groundwater composition at each site has remained stable since the commencement of monitoring during the 2012-2013 period. Some very minor fluctuations in analyte concentrations are attributable to seasonal variations in water composition and standard sampling variability. There is no evidence to suggest that injection activities undertaken by the Company during the review period have had any adverse effect on local groundwater quality.

No complaints were received from the public with regard to any of the Company's DWI activities during the period under review, and no incidents were recorded by the Council.

Compliance with the conditions of the Company's DWI consents exercised during the 2019-2020 monitoring period is summarised below in Section 3.3.

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 23 to Table 30 and an evaluation of the Company's environmental performance in relation to their DWI activities since 2007 is presented in Table 31.

Table 23 Summary of performance for consent 5312-2.1

Purpose: ***To discharge groundwater from the Matemateaonga Formation and produced water into the Mount Messenger Formation for improved hydrocarbon recovery purposes at the Kaimiro-O wellsite.***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Prior to exercising the consent, the consent holder shall submit an "Injection Operation Management Plan."	Receipt of satisfactory "Injection Operation Management Plan."	Yes
2. Injection well, geological and operational data submission requirements. This information can be included in the "Injection Operation Management Plan."	Receipt of satisfactory information.	Yes
3. The injection pressure at the wellhead shall not exceed 85 bar.	Review and analysis of injection data.	Yes
4. The rate of injection shall not exceed 41.6 m^3/hour.	Review and analysis of injection data.	Yes
5. The volume of fluid injected shall not exceed 1,000 m^3/day.	Review and analysis of injection data.	Yes
6. No injection permitted after 1 June 2027.	Assessment of injection records and site inspection notices	Yes
7. The consent holder shall at all times adopt the best practicable option.	Assessment of consent holder records and site inspection notices.	Yes
8. The injection of fluids shall be confined to the Mount Messenger Formation, deeper than 1,000 metres total vertical depth sub-sea.	Review of "Injection Operation Management Plan," well construction log and injection data.	Yes
9. Discharge must not result in fracturing of geological seals confining the injection zone.	Assessment of injection records and results of groundwater sampling and analysis programme.	Yes
10. The consent holder shall ensure that the exercise of this consent does not result in contaminants reaching any useable freshwater (groundwater or surface water).	Assessment of injection records and results of groundwater sampling and analysis programme.	Yes
11. Maintain full records of injection data.	Receipt and assessment of injection data.	Yes
12. Maintain records and undertake analysis to characterise injectate at intervals not exceeding six months.	Receipt and assessment of injection data.	Yes

Purpose: *To discharge groundwater from the Matemateaonga Formation and produced water into the Mount Messenger Formation for improved hydrocarbon recovery purposes at the Kaimiro-O wellsite.*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
13. If not carried out by an IANZ accredited laboratory, analysis shall be carried out in accordance with QA plan which has been certified by the Chief Executive.	Inspection of QA plan.	N/A
14. The consent holder shall undertake a programme of sampling and testing (the 'Monitoring Programme') that monitors the effects of the exercise of this consent on freshwater resources.	Monitoring Programme submitted to the Chief Executive, Taranaki Regional Council, for certification.	Yes
15. Lists the range of parameters required to be tested for in the analysis of groundwater samples.	Implementation of groundwater monitoring programme and assessment of results.	Yes
16. All groundwater sampling and analysis shall be undertaken in accordance with a Sampling and Analysis Plan, which shall be submitted to the Chief Executive, Taranaki Regional Council for review and certification before the first sampling is undertaken.	Receipt of Sampling and Analysis Plan prior to first round of sampling being undertaken.	Yes
17. The consent holder shall provide to the Council, before 30 June each year, a summary of all data required by conditions 11 and 12, and a report detailing compliance with consent conditions over the previous 1 July to 30 June period. The report shall also provide an assessment of injection well condition, well integrity and an updated injection modelling report.	Receipt of satisfactory report before 30 June each year.	Yes
18. Review provision.	N/A	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 24 Summary of performance for consent 7068-1

Purpose: To discharge waste drilling fluids and/or produced water from hydrocarbon exploration and production operations by deep well injection at or about GR: Q19:114-210		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Submission of an Injection Operation Management Plan.	Receipt of satisfactory information.	-
2. The consent holder shall ensure that the exercise of this consent does not result in contamination of or potential risks to any usable freshwater aquifer.	Assessment of injection records and results of groundwater sampling and analysis programme.	-
3. Recording requirements for discharge volumes, rates, and pressures.	Receipt of well discharge data.	-
4. Chemical analysis of discharge.	Receipt of discharge analysis results.	-
5. Limits pressure to below that required to fracture the injection formation	Assessment of injection records and results of groundwater sampling and analysis programme.	-
6. Provision of annual report detailing all records collected in accordance with conditions 3 & 4.	Receipt of satisfactory information.	-
7. This is a lapse condition.	Receive notice of exercise of consent.	-
8. This is a review condition.	N/A	-
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**Not yet given effect to**

Table 25 Summary of performance for consent 7390-1

Purpose: To discharge produced water from hydrocarbon exploration and production operations by deep well injection at the Turangi-A wellsite (via Turangi-3 well) at or about (NZTM) 1713836E-5681397N.		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. The maximum injection pressure shall not exceed 55 bar (800 psi).	Assessment of consent holder records.	N/A
2. The volume of liquid re-injected shall not exceed 300 m^3/day.	Assessment of consent holder records.	N.A
3. Recording requirements for discharge volumes, rates, and pressures.	Receipt of well discharge data.	N/A
4. Chemical analysis of discharge.	Receipt of discharge analysis results.	N/A

Purpose: To discharge produced water from hydrocarbon exploration and production operations by deep well injection at the Turangi-A wellsite (via Turangi-3 well) at or about (NZTM) 1713836E-5681397N.		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
5. Provision of annual report detailing all records collected in accordance with conditions 3 & 4.	Receipt of satisfactory information.	N/A
6. Submission of an Injection Operation Management Plan.	Receipt of satisfactory information.	N/A
7. The consent holder shall ensure that the exercise of this consent does not result in contamination of or potential risks to any usable freshwater aquifer.	Assessment of injection records and results of groundwater sampling and analysis programme.	N/A
8. This is a lapse condition.	Receive notice of exercise of consent.	N/A
9. This is a review condition.	N/A	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**Not exercised** **Not exercised**

Table 26 Summary of performance for consent 7466-1.1

Purpose: ***To discharge produced water from hydrocarbon exploration and production operations by deep well injection at the Kowhai wellsite (via Kowhai-2 well).***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Provision of geological and injection well construction information.	Receipt of satisfactory information.	Yes
2. The maximum injection pressure shall not exceed 92 bar (1,352 psi).	Assessment of consent holder records.	Yes
3. The volume of liquid re-injected shall not exceed 916 m^3/day.	Assessment of consent holder records.	Yes
4. The rate of injection shall not exceed 38 m^3/hour.	Assessment of consent holder records.	Yes
5. The injection of fluids shall be confined to the Mount Messenger Formation, deeper than 970 metres true vertical depth below ground level.	Review of "Injection Operation Management Plan," well construction log and injection data.	Yes
6. Recording requirements for discharge volumes, rates, and pressures.	Receipt of well discharge data.	Yes
7. Chemical analysis of discharge.	Receipt of discharge analysis results.	Yes

Purpose: *To discharge produced water from hydrocarbon exploration and production operations by deep well injection at the Kowhai wellsite (via Kowhai-2 well).*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
8. Provision of annual report detailing all records collected in accordance with conditions 6 & 7.	Receipt of satisfactory information.	Yes
9. Notification provision.	Received five working days prior to consent exercise.	Yes
10. Submission of an Injection Operation Management Plan.	Receipt of satisfactory information.	Yes
11. The consent holder shall ensure that the exercise of this consent does not result in contamination of or potential risks to any usable freshwater aquifer.	Assessment of injection records and results of groundwater sampling and analysis programme.	Yes
12. This is a lapse condition.	Receive notice of exercise of consent.	Yes
13. This is a review condition.	N/A	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 27 Summary of performance for consent 7897-1

Purpose: *To discharge produced water, well drilling fluids, well workover fluids, hydraulic fracturing fluids and 'off-spec' stormwater from the consent holder's wellsites into the Mount Messenger Formation by deep well injection via the KAI-11 waste disposal well.*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Prior to exercising the consent, the consent holder shall submit an Injection Operation Management Plan.	Receipt of satisfactory Injection Operation Management Plan.	Yes
2. Injection well, geological and operational data submission requirements. This information can be included in the Injection Operation Management Plan.	Receipt of satisfactory information.	Yes
3. The injection pressure at the wellhead shall not exceed 115 bar (1,685 psi).	Review and analysis of injection data.	Yes
4. The rate of injection shall not exceed 687 m^3/day (3 bpm).	Review and analysis of injection data.	Yes
5. The volume of fluid injected shall not exceed 687 m^3/day.	Review and analysis of injection data.	Yes

Purpose: *To discharge produced water, well drilling fluids, well workover fluids, hydraulic fracturing fluids and 'off-spec' stormwater from the consent holder's wellsites into the Mount Messenger Formation by deep well injection via the KAI-11 waste disposal well.*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
6. The injection of fluids shall be confined to the Mount Messenger Formation, deeper than 1,320 metres true vertical depth below ground level.	Review of Injection Operation Management Plan, well construction log and injection data.	Yes
7. The consent holder shall at all times adopt the best practicable option.	Assessment of consent holder records and site inspection notices.	Yes
8. Maintain full records of injection data.	Receipt and assessment of injection data.	Yes
9. Maintain records and undertake analysis to characterise each type of waste arriving on-site for discharge.	Receipt and assessment of injection data.	Yes
10. The data required by conditions 9 & 10 above, for each calendar month, is required to be submitted by the 15th day of the following month.	Receipt of satisfactory data by the date specified.	Yes
11. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least five days prior to the first exercise of this consent.	Notification received by Council.	Yes
12. The consent holder shall ensure that the exercise of this consent does not result in contaminants reaching any useable freshwater (groundwater or surface water).	Assessment of injection records and results of groundwater sampling and analysis programme.	Yes
13. The consent holder shall undertake a programme of sampling and testing (the 'Monitoring Programme') that monitors the effects of the exercise of this consent on freshwater resources.	Monitoring Programme submitted to the Chief Executive, Taranaki Regional Council, for certification.	Yes
14. Lists the range of parameters required to be tested for in the analysis of groundwater samples.	Implementation of Groundwater Monitoring Programme and assessment of results.	Yes

Purpose: *To discharge produced water, well drilling fluids, well workover fluids, hydraulic fracturing fluids and 'off-spec' stormwater from the consent holder's wellsites into the Mount Messenger Formation by deep well injection via the KAI-11 waste disposal well.*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
15. All groundwater sampling and analysis shall be undertaken in accordance with a Sampling and Analysis Plan, which shall be submitted to the Chief Executive, Taranaki Regional Council for review and certification before the first sampling is undertaken.	Receipt of Sampling and Analysis Plan prior to first round of sampling being undertaken.	Yes
16. The consent holder shall provide to the Council, during the month of May each year, a summary of all data collected and a report detailing compliance with consent conditions over the previous 1 July to 30 June period. The report shall also provide an assessment of injection well condition, well integrity and an updated injection modelling report.	Receipt of satisfactory report during May each year.	Yes
17. Lapse clause.	Receive notice of exercise of consent.	Yes
18. Consent review provision.	N/A	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 28 Summary of performance for consent 9272-2

Purpose*: To discharge produced water, well drilling fluids, well workover fluids and contaminated stormwater into the Mount Messenger Formation by deep well injection via the Turangi-A waste disposal well.*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Authorises discharge via Turangi-5 well or an alternate well at the wellsite.	Receipt of satisfactory information.	Yes
2. Prior to exercising the consent, the consent holder shall submit an "Injection Operation Management Plan."	Receipt of satisfactory "Injection Operation Management Plan."	Yes
3. Injection well, geological and operational data submission requirements. This information can be included in the "Injection Operation Management Plan."	Receipt of satisfactory information.	Yes

Purpose: *To discharge produced water, well drilling fluids, well workover fluids and contaminated stormwater into the Mount Messenger Formation by deep well injection via the Turangi-A waste disposal well.*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
4. No injection permitted after 1 June 2031.	Review and analysis of injection data.	
5. The consent holder shall at all times adopt the best practicable option.	Assessment of consent holder records and site inspection notices.	Yes
6. The injection of fluids shall be confined to the Mount Messenger Formation, deeper than 1,350 metres true vertical depth below ground level.	Review of "Injection Operation Management Plan," well construction log and injection data.	Yes
7. The wellhead pressure shall not exceed 1610 psi (111 bar).	Review and analysis of injection data.	Yes
8. The consent holder shall ensure discharge does not fracture any geological seal.	Assessment of injection records and results of groundwater sampling and analysis programme.	Yes
9. The consent holder shall ensure that the exercise of this consent does not result in contaminants reaching any useable freshwater (groundwater or surface water).	Assessment of injection records and results of groundwater sampling and analysis programme.	Yes
10. Limits the range of fluids that can be discharged under the consent.	Assessment of consent holder records and injectate sample analysis.	Yes
11. Maintain full records of injection data.	Receipt and assessment of injection data.	Yes
12. Maintain records and undertake analysis to characterise each type of waste arriving on-site for discharge.	Receipt and assessment of injection data.	Yes
13. If not carried out by an IANZ accredited laboratory, analysis shall be carried out in accordance with QA plan which has been certified by the Chief Executive QA/QC.	Inspection of QA plan.	Yes
14. Discharge must not result in fracturing of geological seals confining the injection zone.	Assessment of injection records and results of groundwater sampling and analysis programme.	Yes
15. The consent holder shall undertake a programme of sampling and testing (the 'Monitoring Programme') that monitors the effects of the exercise of this consent on freshwater resources.	Monitoring Programme submitted to the Chief Executive, Taranaki Regional Council, for certification.	Yes

Purpose: *To discharge produced water, well drilling fluids, well workover fluids and contaminated stormwater into the Mount Messenger Formation by deep well injection via the Turangi-A waste disposal well.*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
16. Lists the range of parameters required to be tested for in the analysis of groundwater samples.	Implementation of groundwater monitoring programme and assessment of results.	Yes
17. All groundwater sampling and analysis shall be undertaken in accordance with a Sampling and Analysis Plan, which shall be submitted to the Chief Executive, Taranaki Regional Council for review and certification before the first sampling is undertaken.	Receipt of Sampling and Analysis Plan prior to first round of sampling being undertaken.	Yes
18. The consent holder shall provide to the Council, during the month of May each year, a summary of all data collected and a report detailing compliance with consent conditions over the previous 1 July to 30 June period. The report shall also provide an assessment of injection well condition, well integrity and an updated injection modelling report.	Receipt of satisfactory report during May each year.	Yes
19. Consent review provision.	N/A	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 29 Summary of performance for consent 9470-1

Purpose: *To discharge produced water, well drilling fluids, well workover fluids into the Mount Messenger Formation by deep well injection via the Kaimiro-G wellsite.*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Prior to exercising the consent, the consent holder shall submit an "Injection Operation Management Plan."	Receipt of satisfactory "Injection Operation Management Plan."	Yes
2. Injection well, geological and operational data submission requirements. This information can be included in the "Injection Operation Management Plan."	Receipt of satisfactory information.	Yes

Purpose: *To discharge produced water, well drilling fluids, well workover fluids into the Mount Messenger Formation by deep well injection via the Kaimiro-G wellsite.*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
3. The injection pressure at the wellhead shall not exceed 1,077 psi (73 bars).	Review and analysis of injection data.	Yes
4. The rate of injection shall not exceed 8.6 m^3/hr (0.9 bpm).	Review and analysis of injection data.	Yes
5. The volume of fluid injected shall not exceed 206 m^3/day.	Review and analysis of injection data.	Yes
6. The injection of fluids shall be confined to the Mount Messenger Formation, deeper than - 995 metres true vertical depth Sub-sea.	Review of "Injection Operation Management Plan," well construction log and injection data.	Yes
7. The consent holder shall at all times adopt the best practicable option.	Assessment of consent holder records and site inspection notices.	Yes
8. Limits the range of fluids that can be discharged under the consent.	Assessment of consent holder records and injectate sample analysis.	Yes
9. Maintain full records of injection data.	Receipt and assessment of injection data.	Yes
10. Maintain records and undertake analysis to characterise each type of waste arriving on-site for discharge.	Receipt and assessment of injection data.	Yes
11. The data required by conditions 9 & 10 above, for each calendar month, is required to be submitted by the 15th day of the following month.	Receipt of satisfactory data by the date specified.	Yes
12. The consent holder shall ensure that the exercise of this consent does not result in contaminants reaching any useable freshwater (groundwater or surface water).	Assessment of injection records and results of groundwater sampling and analysis programme.	Yes
13. The consent holder shall undertake a programme of sampling and testing (the 'Monitoring Programme') that monitors the effects of the exercise of this consent on freshwater resources.	Monitoring Programme submitted to the Chief Executive, Taranaki Regional Council, for certification.	Yes
14. All groundwater samples taken for monitoring purposes shall be taken in accordance with recognised field procedures and analysed for: a) pH b) conductivity c) chloride; and d) total petroleum hydrocarbons	Implementation of Groundwater Monitoring Programme and assessment of results.	Yes

Purpose: *To discharge produced water, well drilling fluids, well workover fluids into the Mount Messenger Formation by deep well injection via the Kaimiro-G wellsite.*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
15. All groundwater sampling and analysis shall be undertaken in accordance with a Sampling and Analysis Plan, which shall be submitted to the Chief Executive, Taranaki Regional Council for review and certification before the first sampling is undertaken.	Receipt of Sampling and Analysis Plan prior to first round of sampling being undertaken.	Yes
16. The consent holder shall provide to the Council, during the month of July, a summary of all data collected and a report detailing compliance with consent conditions over the previous 1 July to 30 June period.	Receipt of satisfactory report by 31 August each year.	Yes
17. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least five days prior to the first exercise of this consent.	Notification received by Council.	Yes
18. No injection permitted after 1 June 2027.	Assessment of injection records and site inspection notices.	N/A
19. Consent review provision.	N/A	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 30 Summary of performance for consent 10483-1

Purpose: To discharge produced water, well drilling fluids, well work over fluids, hydraulic fracturing fluids, and contaminated stormwater from hydrocarbon exploration and production operations into the Mount Messenger Formation by deep well injection at the Radnor-B wellsite.		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Prior to exercising the consent, the consent holder shall submit an "Injection Operation Management Plan."	Receipt of satisfactory "Injection Operation Management Plan."	-
2. Injection well, geological and operational data submission requirements. This information can be included in the "Injection Operation Management Plan."	Receipt of satisfactory information.	-
3. No injection after 1 June 2029	Review and analysis of injection data.	-

Purpose: To discharge produced water, well drilling fluids, well work over fluids, hydraulic fracturing fluids, and contaminated stormwater from hydrocarbon exploration and production operations into the Mount Messenger Formation by deep well injection at the Radnor-B wellsite.		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
4. The consent holder shall at all times adopt the best practicable option.	Assessment of consent holder records and site inspection notices.	-
5. The injection of fluids shall be confined to the Mount Messenger Formation, deeper than 1,100 metres true vertical depth Sub-sea.	Review of "Injection Operation Management Plan," well construction log and injection data.	-
6. Discharge must not result in fracturing of geological seals confining the injection zone.	Assessment of injection records and results of groundwater sampling and analysis programme.	-
7. The consent holder shall ensure that the exercise of this consent does not result in contaminants reaching any useable freshwater (groundwater or surface water)	Assessment of injection records and results of groundwater sampling and analysis programme.	-
8. Limits the range of fluids that can be discharged under the consent.	Assessment of consent holder records and injectate sample analysis.	-
9. Maintain records and undertake analysis to characterise each type of waste arriving on-site for discharge.	Receipt and assessment of injection data.	-
10. Maintain full records of injection data.	Receipt and assessment of injection data.	-
11. All groundwater sampling and analysis shall be undertaken in accordance with a Sampling and Analysis Plan, which shall be submitted to the Chief Executive, Taranaki Regional Council for review and certification before the first sampling is undertaken.	Receipt of Sampling and Analysis Plan prior to first round of sampling being undertaken.	-
12. The data required by conditions 9 & 10 above, for each calendar month, is required to be submitted by the 28th day of the following month.	Receipt of satisfactory data by the date specified.	-
13. The consent holder shall undertake a programme of sampling and testing (the 'Monitoring Programme') that monitors the effects of the exercise of this consent on freshwater resources.	Monitoring Programme submitted to the Chief Executive, Taranaki Regional Council, for certification.	-

Purpose: To discharge produced water, well drilling fluids, well work over fluids, hydraulic fracturing fluids, and contaminated stormwater from hydrocarbon exploration and production operations into the Mount Messenger Formation by deep well injection at the Radnor-B wellsite.		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
14. All groundwater samples taken for monitoring purposes shall be taken in accordance with recognised field procedures and analysed for: e) pH f) conductivity g) chloride; and h) total petroleum hydrocarbons	Implementation of Groundwater Monitoring Programme and assessment of results.	-
15. All groundwater sampling and analysis shall be undertaken in accordance with a Sampling and Analysis Plan, which shall be submitted to the Chief Executive, Taranaki Regional Council for review and certification before the first sampling is undertaken.	Receipt of Sampling and Analysis Plan prior to first round of sampling being undertaken.	-
16. The consent holder shall provide to the Council, during the month of July, a summary of all data collected and a report detailing compliance with consent conditions over the previous 1 July to 30 June period.	Receipt of satisfactory report by 31 August each year.	-
17. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least five days prior to the first exercise of this consent.	Notification received by Council.	-
18. Consent review provision.	N/A	-
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**Not yet given effect to**

Table 31 Evaluation of environmental performance over time

Year	Consent number	High	Good	Improvement required	Poor
2019-2020	5312	1	-	-	-
	7068*	Not exercised	-	-	-
	7390	Not exercised	-	-	-
	7466	1	-	-	-
	7897	1	-	-	-
	9272	1	-	-	-
	9470	1	-	-	-
	10483*	Not exercised	-	-	-
2018-2019	5312	1	-	-	-
	7068*	Not exercised	-	-	-
	7390	Not exercised	-	-	-
	7466	1	-	-	-
	7897	1	-	-	-
	9272	1	-	-	-
	9470	1	-	-	-
	9476*	lapsed	-	-	-
	10483*	Not exercised	-	-	-
2017-2018	5312	1	-	-	-
	7068*	Not exercised	-	-	-
	7390	Not exercised	-	-	-
	7466	1	-	-	-
	7897	1	-	-	-
	9272	1	-	-	-
	9470	1	-	-	-
	9476*	Not exercised	-	-	-
	10483*	Not exercised	-	-	-
2016-2017	5312	1	-	-	-
	7068*	Not exercised	-	-	-
	7390	Not exercised	-	-	-
	7466	1	-	-	-
	7897	1	-	-	-
	9272	1	-	-	-
	9470	1	-	-	-
	9476*	Not exercised	-	-	-
2015-2016	5312	1	-	-	-

Year	Consent number	High	Good	Improvement required	Poor
	7068*	Not exercised	-	-	-
	7390	Not exercised	-	-	-
	7466	1	-	-	-
	7897	1	-	-	-
	9272	1	-	-	-
	9470	1	-	-	-
	9476*	Not exercised	-	-	-
2014-2015	5312	1	-	-	-
	7068*	Not exercised	-	-	-
	7390	Not exercised	-	-	-
	7466	1	-	-	-
	7897	1	-	-	-
	9272	1	-	-	-
	9470	1	-	-	-
	9476*	Not exercised	-	-	-
2013-2014	5312	1	-	-	-
	7068*	Not exercised	-	-	-
	7390	Not exercised	-	-	-
	7466	1	-	-	-
	7897	-	1	-	-
	9272	1	-	-	-
	9470	1	-	-	-
	9476*	Not exercised	-	-	-
2012-2013	5312	1	-	-	-
	7068*	Not exercised	-	-	-
	7390	1	-	-	-
	7466	1	-	-	-
	7897	Not exercised	-	-	-
	9272	1	-	-	-
	9470	1	-	-	-
	9476*	Not exercised	-	-	-
2009-2012	4921	1	-	-	-
	5312	1	-	-	-
	7068*	Not exercised	-	-	-
	7390	1	-	-	-
	7466	-	1	-	-

Year	Consent number	High	Good	Improvement required	Poor
	7897	-	1	-	-
2007-2009	4921	-	1	-	-
	5312	-	1	-	-
	6659	Not exercised	-	-	-
	6728	Not exercised	-	-	-
	7068	Not exercised	-	-	-
	7128	Not exercised	-	-	-
	7390	-	1	-	-
Totals		42	6	0	0

*Note *= has not yet been given effect to.*

During the year, the Company demonstrated a high level of environmental and high level of administrative performance with the resource consents as defined in Section 1.1.4. This continues the high level of environmental performance by the Company in relation to DWI consents over recent years.

3.4 Recommendations from the 2018-2019 Annual Report

In the 2018-2019 Annual Report, it was recommended:

1. THAT in the first instance, monitoring of consented activities in the 2019-2020 year continue at the same level as in 2018-2019.
2. THAT should there be issues with environmental or administrative performance in 2019-2020, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT the option for a review of resource consents in June 2020, as set out in the respective consent conditions not be exercised.

The recommendations above were implemented during the period under review.

3.5 Alterations to monitoring programmes for 2020-2021

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 the range of monitoring carried out during the 2019-2020 period be continued during the 2020-2021 monitoring period. Recommendations to this effect are included in Section 4 of this report.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site(s) 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 2020-2021.

3.6 Exercise of optional review of consent

Condition 18 of resource consent 7897-1, condition 19 of resource consents 9272-2 and 9470-1, condition 9 of resource consent 7390-1, condition 13 of resource consent 7466-1.1 and condition 17 of resource consent 10483-1 all provide for an optional review in June 2021. A review may be undertaken if the conditions are not adequate to deal with any adverse effects on the environment arising from the exercise of the resource consent, which were either not foreseen at the time the application was considered or which was not appropriate to deal with at the time.

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 or grounds to exercise the review option on either consent.

4 Recommendations

1. THAT in the first instance, monitoring of consented activities in the 2020-2021 year continue at the same level as in 2019-2020.
2. THAT should there be issues with environmental or administrative performance in 2020-2021, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT the option for a review of resource consents in June 2021, as set out in the respective consent conditions not be exercised.

Glossary of common terms and abbreviations

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

Aquifer (freshwater)	A formation, or group or part of a formation that contains sufficient saturated permeable media to yield exploitable quantities of fresh water.
BPO	Best practicable option.
Conductivity	A measure of the level of dissolved salts in a sample. Usually measured at 25°C and expressed as microsiemens per centimetre (µS/cm) or as Total Dissolved Solids (g/m^3).
Confining layer	A geological layer or rock unit that is impermeable to fluids.
Deep well injection (DWI)	Injection of fluids at depth for disposal or enhanced recovery.
Fracture gradient	A measure of how the pressure required to fracture rock in the earth's crust changes with depth. It is usually measured in units of "pounds per square inch per foot" (psi/ft) and varies with the type of rock and the strain of the rock.
g/m^3	Grams per cubic metre. A measure of concentration which is equivalent to milligrams per litre (mg/L), or parts per million (ppm).
Hydraulic fracturing (HF)	The process of increasing reservoir permeability by injecting fluids at pressures sufficient to fracture rock within the reservoir ("fracking").
Injectate	Fluid disposed of by deep well injection.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
IR	Unauthorised Incident Register – contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
m bgl	Metres below ground level.
m bmp	Metres below measuring point.
µS/cm	Microsiemens per centimetre.
mS/m	Millisiemens per metre.
m TVD	Metres true vertical depth.
m^3	Cubic metre.
N/A	Not applicable.

pH	Numerical system for measuring acidity in solutions, with 7 as neutral. Values lower than 7 are acidic and higher than 7 are 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.
Plug and abandon	To prepare a wellbore to be shut in and permanently isolated.
Produced water	Water associated with oil and gas reservoirs that is produced along with the oil and gas. Typically highly saline with salt concentrations similar to seawater and containing low levels of hydrocarbons.
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).
UI	Unauthorised Incident.
UOM	Uncertainty of measurements - relates to the margin of doubt that exists for the result of any measurement,
Water flooding	A method of thermal recovery in which hot water is injected into a reservoir through specially distributed injection wells. Hot water flooding reduces the viscosity of the crude oil, allowing it to move more easily toward production wells.

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

Bibliography and references

Greymouth Petroleum Limited. Annual DWI Report (July 2016 to July 2017) by Greymouth Petroleum Limited, August 2017. Document number 1907996.

Greymouth Petroleum Limited. Annual DWI Report (July 2015 to July 2016). Electronic data file provided to TRC by Greymouth Petroleum Limited, August 2016. Document number 1737914.

Greymouth Petroleum Limited. Annual DWI Report (July 2014 to July 2015). Electronic data file provided to TRC by Greymouth Petroleum Limited, July 2015. Document number 1553297.

Greymouth Petroleum Limited. Annual DWI Report (July 2012 to July 2013). Electronic data file provided to TRC by Greymouth Petroleum Limited, August 2013. Document number 1251286.

Ministry for the Environment 2018: Best Practice Guidelines for Compliance, Monitoring and Enforcement under the Resource Management Act 1991. Wellington: Ministry for the Environment.

Ministry for the Environment (2006). A National Protocol for State of the Environment Groundwater Sampling in New Zealand. Ref. ME781.

Stevens G. 2001. Taranaki: In: Groundwaters of New Zealand, M.R, Rosen and P.A. White (eds). New Zealand Hydrological Society Inc., Wellington. P381-386.

Taranaki Regional Council. 2020. Greymouth Petroleum Limited Deep Well Injection Monitoring Programme Annual Report 2018-2019. Technical Report 2019-75. Document number 2349340.

Taranaki Regional Council. 2019. Greymouth Petroleum Limited Deep Well Injection Monitoring Programme Annual Report 2017-2018. Technical Report 2018-82. Document number 2146556.

Taranaki Regional Council. 2018. Greymouth Petroleum Limited Deep Well Injection Monitoring Programme Annual Report 2016-2017. Technical Report 2017-22. Document number 1855942.

Taranaki Regional Council. 2016. Greymouth Petroleum Limited Deep Well Injection Monitoring Programme Annual Report 2015-2016. Technical Report 2016-58. Document number 1751918.

Taranaki Regional Council. 2016. Greymouth Petroleum Limited Deep Well Injection Monitoring Programme Annual Report 2014-2015. Technical Report 2015-24. Document number 1554285.

Taranaki Regional Council. 2015. Greymouth Petroleum Limited Deep Well Injection Monitoring Programme Annual Report 2013-2014. Technical Report 2014-90. Document number 1478763.

Taranaki Regional Council. 2013. Greymouth Petroleum Limited Deep Well Injection Monitoring Programme Annual Report 2012-2013. Technical Report 2013-56. Document number 1254000.

Taranaki Regional Council. 2011. Greymouth Petroleum acquisitions Company Limited - Deep Well Injection Monitoring Programme - Triennial Report, 2009-2012. Technical Report 2012-47. Document number 1119464.

Taranaki Regional Council. 2013. Greymouth Petroleum Acquisitions Company Limited Deep Well Injection Monitoring Programme Biennial Report 2007-2009. Technical Report 2009-93. Document number 767004.

Appendix I

Resource consents held by Greymouth Petroleum Limited

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

Water abstraction permits

Section 14 of the RMA stipulates that no person may take, use, dam or divert any water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or it falls within some particular categories set out in Section 14. Permits authorising the abstraction of water are issued by the Council under Section 87(d) of the RMA.

Water discharge permits

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

Air discharge permits

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

Discharges of wastes to land

Sections 15(1)(b) and (d) of the RMA stipulate that no person may discharge any contaminant onto land if it may then enter water, or from any industrial or trade premises onto land under any circumstances, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Permits authorising the discharge of wastes to land are issued by the Council under Section 87(e) of the RMA.

Land use permits

Section 13(1)(a) of the RMA stipulates that no person may in relation to the bed of any lake or river use, erect, reconstruct, place, alter, extend, remove, or demolish any structure or part of any structure in, on, under, or over the bed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Land use permits are issued by the Council under Section 87(a) of the RMA.

Coastal permits

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

Discharge Permit

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

Name of Consent Holder:	Greymouth Petroleum Acquisition Company Limited PO Box 3394 New Plymouth 4341
Decision Date (Change):	6 May 2015
Commencement Date (Change):	6 May 2015 (Granted Date: 24 July 2014)

Conditions of Consent

Consent Granted:	To discharge groundwater from the Matemateaonga Formation and produced water into the Mount Messenger Formation for improved hydrocarbon recovery purposes at the Kaimiro-O wellsite
Expiry Date:	1 June 2032
Review Date(s):	June 2020, June 2026
Site Location:	Kaimiro-O wellsite, 455 Alfred Road, Egmont Village (Property owner: Cradles Trust Nominees Limited)
Legal Description:	Pt Secs 115 & 116 Hua & Waiwhakaiho Hun (Discharge source & site)
Grid Reference (NZTM)	1698671E-5663161N
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. By 1 July 2015, the consent holder shall submit an "Injection Operation Management Plan." The plan shall include the operational details of the injection activities and identify the conditions that would trigger concerns about the integrity of the injection well, the receiving formation or overlying geological seals. The plan shall also detail the action(s) to be taken by the consent holder if trigger conditions are reached.

2. By 1 July 2015, the consent holder shall provide to the Chief Executive, Taranaki Regional Council:

   (a) a geological assessment of the environment in which the well is located, including the injection zone, the geological seals confining the injection zone and any associated faulting;
   (b) details of the injection well design and its structural integrity;
   (c) an assessment of the suitability of the injection well for the proposed activity;
   (d) details of how the integrity of the injection well will be monitored and maintained; and
   (e) a chemical assessment of the receiving formation water which confirms its Total Dissolved Solids (TDS) concentration, and also demonstrates that the mixing of formation and injection fluids will not result in any adverse effects on the receiving formation or the injection well.

   (Note: The information required by condition 2 may be included within the "Injection Operation Management Plan" required by condition 1.)

3. The injection pressure at the wellhead shall not exceed a maximum injection pressure of 85 bar.

4. The rate of injection shall not exceed 41.6 cubic metres per hour.

5. The volume of fluid injected shall not exceed 1000 cubic metres per day.

6. There shall be no injection of any fluids after 1 June 2027.

7. The consent holder shall at all times adopt the best practicable option, as defined in Section 2 of the Resource Management Act 1991, to prevent or minimise any actual or likely adverse effect on the environment.

8. The injected fluids shall be confined to the Mount Messenger Formation, deeper than 1,000 metres total vertical depth sub-sea.

9. The consent holder shall ensure that the discharge authorised by this consent does not result in the fracturing of the geological seals confining the injection zone.

10. The consent holder shall ensure that the exercise of this consent does not result in contaminants reaching any useable fresh water (groundwater or surface water). Useable fresh groundwater is defined as any groundwater having a TDS concentration of less than 1,000 mg/l.

11. Once the consent is exercised, the consent holder shall keep daily records of the:

    (a) injection hours;
    (b) volume of fluid discharged; and
    (c) maximum and average injection pressure.

12. The consent holder shall have the injection fluid analysed for the following parameters, at intervals not exceeding six months:

    i. pH;
    ii. conductivity;
    iii. chloride concentration;
    iv. total dissolved solids; and
    v. suspended solids concentration.

13. If the analysis required by condition 12 above is not carried out in an International Accreditation New Zealand (IANZ) accredited laboratory, it shall be undertaken in accordance with a "Quality Assurance (QA) Plan" that has been certified by the Chief Executive, Taranaki Regional Council, as meeting the requirements of condition 12. The Taranaki Regional Council may also, at its discretion, carry out an audit of the consent holder's sampling and analysis regime to assess adherence to the QA plan.

14. The consent holder shall undertake a programme of sampling and testing that monitors the effects of the exercise of this consent on fresh water resources within an Area of Review (AoR) to assess compliance with condition 10 (the 'Monitoring Programme'). The Monitoring Programme shall be designed to characterise local groundwater quality, and be submitted to the Chief Executive, Taranaki Regional Council, for certification before 1 January 2015, and shall include:

    (a) the location of sampling sites;
    (b) well/bore construction details; and
    (c) sampling frequency.

    The AoR shall extend 1,000 metres from the point of injection. It is a requirement that at least one suitable monitoring bore be located within 500 metres of the well head. If no suitable existing bores are available, it will be necessary for the Monitoring Programme to include installation of, and sampling from, a suitable bore. The bore would be of a depth, location and design determined after consultation with the Chief Executive, Taranaki Regional Council and installed in accordance with NZS 4411:2001.

15. All groundwater samples taken for monitoring purposes shall be taken in accordance with recognised field procedures and analysed for:

    (a) pH;
    (b) conductivity
    (c) anion and cation profile
    (d) total petroleum hydrocarbons; and
    (e) BTEX.

    Note: *The samples required, under conditions 15 and 16 could be taken and analysed by the Taranaki Regional Council or other contracted party on behalf of the consent holder.*

16. All groundwater sampling and analysis shall be undertaken in accordance with a *Sampling and Analysis Plan*, which shall be submitted to the Chief Executive, Taranaki Regional Council for review and certification before the first sampling is undertaken. This Plan shall specify the use of standard protocols recognised to constitute good professional practice including quality control and assurance. An IANZ accredited laboratory shall be used for all sample analysis. Results shall be provided to the Chief Executive, Taranaki Regional Council within 30 days of sampling and shall include supporting quality control and assurance information.

    Note: *The Sampling and Analysis Plan may be combined with the Monitoring Programme required by condition 14.*

17. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, before 30 June each year, all data required by conditions 11 and 12, and a report detailing compliance with consent conditions over the previous 1 July to 30 June period. Based on the data provided, the report shall also provide:

    a) an assessment of injection well performance;
    b) an assessment of the on-going integrity and isolation of the wellbore; and
    c) an assessment of the on-going integrity and isolation of the receiving formation.

18. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 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 timeThe consent holder shall ensure that the discharge authorised by this consent does not result in the fracturing of the geological seals confining the injection zone.

Signed at Stratford on 6 May 2015

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 Limited P O Box 3394 NEW PLYMOUTH
Consent Granted Date:	5 March 2007

Conditions of Consent

Consent Granted:	To discharge waste drilling fluids and/or produced water from hydrocarbon exploration and production operations by deepwell injection at or about GR: Q19:114-210
Expiry Date:	1 June 2021
Review Date(s):	June 2009, June 2015
Site Location:	Ngatoro-E wellsite, 561 Upper Dudley Road, Inglewood [Owners: G & V Robinson]
Legal Description:	Pt DP 2282 Sec 11 Pt Sec 17 Pt Sec 3 Blk VII Sec 12 Blk VIII Egmont SD
Catchment:	Waitara
Tributary:	Manganui Ngatoro Ngatoro-iti

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

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. Prior to the exercise of this consent for each individual well to be used for deepwell injection, the consent holder shall submit, to the written satisfaction of the Chief Executive, Taranaki Regional Council, a log of the injection well, and an injection well operation management plan, to demonstrate that special condition 2 of this consent can be met. The report shall:

a) identify the injection zone, including a validated bore log and geophysical log;
b) detail the results of fluid sampled from the injection zone, and the proposed wastes to be injected for maximum and mean concentrations for pH, suspended solids, total dissolved solids, salinity, chlorides, and total hydrocarbons;
c) demonstrate the integrity of well casing; and
d) outline design and operational procedure to isolate the zone.

2. The consent holder shall ensure that injection will not contaminate or endanger any actual or potential useable freshwater aquifer.

3. The consent holder shall keep daily records of the nature and amounts of all material injected, including injection pressure and rate, and shall make the records available to the Taranaki Regional Council on a 3 monthly basis, and when there has been a significant pressure change event.

4. The consent holder shall monitor the injected wastes daily for maximum and mean concentrations for pH, suspended solids, total dissolved solids, salinity, chlorides, and total hydrocarbons and shall make the records available to the Taranaki Regional Council every two months.

5. The consent holder shall inject fluids at pressures below the pressure that would be required to fracture the injection formation.

6. The consent holder shall provide to the Taranaki Regional Council during the month of May of each year, for the duration of the consent, a written report on all matters required under special conditions 1, 2, 3, 4 and 5 above.

7. This consent shall lapse on the 1 June 2021, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(b) of the Resource Management Act 1991.

8. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent, by giving notice of review during the month following receipt of information required under special condition 6 above, and the month of June 2009 and/or June 2015 required 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 5 March 2007

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Discharge Permit

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

Name of Consent Holder:	Greymouth Petroleum Limited P O Box 3394 NEW PLYMOUTH 4341
Consent Granted Date:	10 October 2008

Conditions of Consent

Consent Granted:	To discharge produced water from hydrocarbon exploration and production operations by deepwell injection at the Turangi-A wellsite (via Turangi-3 well) at or about (NZTM) 1713836E-5681397N
Expiry Date:	1 June 2027
Review Date(s):	June 2009, June 2011, June 2015, June 2021 and month following receipt of information required under special condition 6
Site Location:	Turangi-A wellsite, Upper Turangi Road, Waitara [Property owner: BA & JM McKenzie]
Legal Description:	Sec 21 Blk VI Waitara SD
Catchment:	Parahaki

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

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. The injection pressure at the wellhead shall not exceed a maximum injection pressure of 55 bars (800 PSI).

2. The volume of liquid re-injected shall not exceed 300 cubic metres per day.

3. The consent holder shall keep daily records of:

a) Maximum and average injection pressure;
b) Maximum and average rate of injection; and
c) Volume of fluid injected.

4. The consent holder shall measure and record the following constituents of the discharge:

a) Ph;
b) Suspended Solids concentration;
c) Temperature;
d) Salinity;
e) Chloride concentration; and
f) Total hydrocarbon concentration.

These constituents shall be measured at time intervals sufficiently frequent to yield data representative of the injected fluid in the opinion of the Chief Executive of the Taranaki Regional Council.

5. The Consent holder shall report to the Taranaki Regional Council's Chief Executive, during the month of May of every year, a monthly summary of all records collected in accordance with conditions 3 and 4. The report shall cover details on the major changes in characteristics or sources of injected fluid.

6. Before the well is used for deepwell injection the consent holder shall submit an "Injection Operation Management Plan" which describes the reinjection process and identifies the conditions that would trigger concerns about the integrity of the well, or the injection zone, and the action to be taken by the consent holder if trigger conditions are reached.

7. The consent holder shall ensure that the exercise of this consent not contaminate or put at risk actual or potential usable freshwater aquifer.

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

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 following receipt of information required under special condition 6 above, and the month of June 2009 and/or June 2011 and/or June 2015 and/or June 2021 required 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 October 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:	Petrochem Limited P O Box 3394 NEW PLYMOUTH 4341
Decision Date (Change):	3 February 2014
Commencement Date (Change):	3 February 2014 (Granted: 1 May 2009)

Conditions of Consent

Consent Granted:	To discharge produced water from hydrocarbon exploration and production operations by deep well injection at the Kowhai wellsite (via Kowhai-2 well)
Expiry Date:	1 June 2027
Review Date(s):	June 2015, June 2021 and within one month following the receipt of information required under special condition 8
Site Location:	Kowhai-A wellsite, Ngatimaru Road, Tikorangi (Property owners: RN & BJ Jupp)
Legal Description:	Pt Sec 44 Tikorangi Dist Blks IX & X Waitara SD (Discharge source & site)
Grid Reference (NZTM)	1710931E-5676289N
Catchment:	Waiau

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

General conditions

a) On receipt of a re.quirement 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. Upon completion of well the following information shall be provided to the Chief Executive of the Taranaki Regional Council:

   a) Subsurface construction details, including design of the exterior surface casing, the intermediate protective casing, and the innermost casing, tubing, and packer;
   b) Borelog of the well from 0.0 mbgl to 500 metres below ground level;
   c) Annular pressure; and
   d) Cementing details

2. The injection pressure at the wellhead shall not exceed a maximum injection pressure of 1,352 pounds per square inch (92 Bar).

3. The volume of liquid re-injected shall not exceed 916 cubic metres per day.

4. The rate of injection shall not exceed 4 barrels per minute (38 cubic metres per hour).

5. The fluids shall be injected into the Mount Messenger Formation at a minimum depth of 970 metres below ground level (true vertical depth).

6. The consent holder shall keep daily records of:

   a) Maximum and average injection pressure;
   b) Maximum and average rate of injection; and
   c) Volume of fluid injected.

7. The consent holder shall measure and record the following constituents of the discharge:

   a) pH;
   b) Suspended Solids concentration;
   c) Temperature;
   d) Salinity;
   e) Chloride concentration; and
   f) Total hydrocarbon concentration.

These constituents shall be measured at time intervals sufficiently frequent to yield data representative of the injected fluid in the opinion of the Chief Executive of the Taranaki Regional Council.

8. The consent holder shall report to the Taranaki Regional Council's Chief Executive, during the month of May of every year, a monthly summary of all records collected in accordance with conditions 6 and 7. The report shall cover details on the major changes in characteristics or sources of injected fluid.

9. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least 5 working days prior to the exercise of this consent. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz. Notification by fax or post is acceptable only if the consent holder does not have access to email.

10. Before the well is used for deepwell injection the consent holder shall submit an "Injection Operation Management Plan" which describes the reinjection process and identifies the conditions that would trigger concerns about the integrity of the well, or the injection zone, and the action to be taken by the consent holder if trigger conditions are reached.

11. The consent holder shall ensure that the exercise of this consent not contaminate or put at risk actual or potential usable freshwater aquifer.

12. This consent shall lapse on the 30th June 2014, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(b) of the Resource Management Act 1991.

13. 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 following receipt of information required under special condition 8 above, and the month of June 2015 and/or June 2021, 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 3 February 2014

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
Decision Date (Change):	19 July 2013
Commencement Date (Change):	19 July 2013 (Granted: 12 September 2011)

Conditions of Consent

Consent Granted:	To discharge the following from hydrocarbon exploration operations at the Kaimiro-J wellsite by deepwell injection into the Mount Messenger formation: • produced water; • well drilling fluids; • well workovers fluids; • hydraulic fracturing fluids; and • 'off-spec' stormwater from the consent holder's wellsites
Expiry Date:	1 June 2026
Review Date(s):	June annually
Site Location:	Kaimiro-J wellsite, 1140 Junction Road, Inglewood (Property owner: BJ & SM Duynhoven)
Legal Description:	Lot 1 DP 19651 (Discharge source & site)
Grid Reference (NZTM)	1699274E-5664725N
Catchment:	Waiongana
Tributary:	Mangaoraka

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. Before this consent is exercised the consent holder shall submit an "Injection Operation Management Plan" which describes the reinjection process and identifies the conditions that would trigger concerns about the integrity of the well, or the injection zone, and the action to be taken by the consent holder if trigger conditions are reached.

2. Before this consent is exercised the consent holder shall provide to the Chief Executive of the Taranaki Regional Council:

   (a) Subsurface construction details, including design of the exterior surface casing, the intermediate protective casing, and the innermost casing, tubing, and packer;
   (b) A log of the well from 0.0 metres below ground level to 1,000 metres below ground level; clearly showing the freshwater/brine water interface zone;
   (c) Annular pressure; pressure testing which demonstrates well integrity [Mechanical Integrity Test];
   (d) Receiving Formation fracture pressure and geological seal fracture pressure;
   (e) A chemical analysis of the formation-water;
   (f) Cementing details.

3. The injection pressure at the wellhead shall not exceed a maximum injection pressure of 1669 psi (115 bar).

4. The rate of injection shall not exceed 29 cubic metres per hour (3 bpm).

5. The volume of fluid injected shall not exceed 687 cubic metres per day (4,320 bpd).

6. The injection of fluids shall be confined to the Mt. Messenger Formation, deeper than 1,320 metres true vertical depth.

7. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or likely adverse effect on the environment; in particular, ensuring that the injection material is contained within the injection zone.

8. The consent holder shall keep daily records of the:

   (a) maximum injection pressure;
   (b) maximum and average rate of injection; and
   (c) volume of fluid injected;

   during exercise of this consent.

9. For each waste stream arriving on site for discharge, the consent holder shall record the following information:

   (a) type of fluid;
   (b) source of fluid (site name and location);
   (c) an analysis of the fluid for:
      (i) pH;
      (ii) suspended solids concentration;
      (iii) temperature;
      (iv) salinity;
      (v) chloride concentration; and
      (vi) total hydrocarbon concentration.

   The analysis required by condition 9 above is not necessary if a sample of the same type of fluid, from the same source, has been taken, analysed and provided to the Chief Executive, Taranaki Regional Council within the previous 6 months.

10. The information required by conditions 8 and 9 above, for each calendar month, shall be provided to the Chief Executive, Taranaki Regional Council before the 15th day of the following month.

11. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least 5 working days prior to the first exercise of this consent. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz.

12. The consent holder shall ensure that the exercise of this consent does not result in contaminants reaching any useable fresh water (groundwater or surface water). Usable fresh groundwater is defined as any groundwater having a Total Dissolved Solids concentration of less than 1,000 mg/l.

13. The consent holder shall undertake a programme of sampling and testing that monitors the effects of the exercise of this consent on fresh water resources to assess compliance with condition 12 (the 'Monitoring Programme'). The Monitoring Programme shall be certified by the Chief Executive, Taranaki Regional Council ('the Chief Executive'), before 30 June 2013, and shall include:

   (a) the location of sampling sites;
   (b) well/bore construction details; and
   (c) sampling frequency.

14. All water samples taken for monitoring purposes shall be taken in accordance with recognised field procedures and analysed for:

   (a) pH;
   (b) conductivity;
   (c) chloride; and
   (d) total petroleum hydrocarbons.

   Note: *The samples required, under conditions 13 and 14, could be taken and analysed by the Council or other contracted party on behalf of the consent holder.*

15. All sampling and analysis shall be undertaken in accordance with a *Sampling and Analysis Plan*, which shall be submitted to the Chief Executive for review and certification before the first sampling is undertaken. This plan shall specify the use of standard protocols recognised to constitute good professional practice including quality control and assurance. An International Accreditation New Zealand (IANZ) accredited laboratory shall be used for all sample analysis. Results shall be provided to the Chief Executive within 30 days of sampling and shall include supporting quality control and assurance information. These results will be used to assess compliance with condition 12.

    Note: The Sampling and Analysis Plan may be combined with the Monitoring Programme required by condition 13.

16. The consent holder shall provide to Taranaki Regional Council, during the month of July of every year, a summary of all data collected and a report detailing compliance with consent conditions over the previous 1 July to 30 June period. The report shall also provide and assess data which illustrates the on-going integrity and isolation of the wellbore, well performance and condition. The consent holder shall also provide an updated injection modeling report, illustrating the ability of the receiving formation to continue to accept additional waste fluids and estimating its remaining storage capacity.

17. This consent shall lapse on the 30 September 2016, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(b) of the Resource Management Act 1991.

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

Signed at Stratford on 19 July 2013

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Discharge Permit

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

Name of Consent Holder:	Greymouth Petroleum Turangi Limited PO Box 3394 Fitzroy New Plymouth 4341
Decision Date:	2 June 2016
Commencement Date:	2 June 2016

Conditions of Consent

Consent Granted:	To discharge produced water, well drilling fluids, well workover fluids and contaminated stormwater into the Mount Messenger Formation by deepwell injection
Expiry Date:	1 June 2036
Review Date(s):	June annually
Site Location:	Turangi-A wellsite, 160 Turangi Road Upper, Motunui (Property owner: BA & JM McKenzie)
Grid Reference (NZTM)	1713836E-5681373N
Catchment:	Parahaki

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. This consent only authorises discharges via deepwell injection into:

   (a) the well known as Turangi-5 located at the Turangi-A wellsite; or
   (b) another well located on the Turangi-A wellsite.

2. The discharge shall be undertaken in accordance with an "Injection Operation Management Plan" prepared by the consent holder and approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The plan shall include, as a minimum, details of:

   (a) the operational details of the injection activities;
   (b) identification of the conditions that would trigger concerns about the integrity of the injection well, the receiving formation or overlying geological seals; and
   (c) the action(s) to be taken by the consent holder if trigger conditions are reached.

3. Before discharging to any well, the consent holder shall provide to the Chief Executive, Taranaki Regional Council:

   (a) a geological assessment of the environment in which the well is located, including the injection zone, the geological seals confining the injection zone and any associated faulting;
   (b) details of the well design and its structural integrity;
   (c) an assessment of the suitability of the well for the proposed activity;
   (d) details of how the integrity of the well will be monitored and maintained;
   (e) confirmation of the depth to which fresh water resources, as defined in condition 9, are encountered below the site; and
   (f) a chemical assessment of the receiving formation water which confirms its Total Dissolved Solids (TDS) concentration, and also demonstrates that the mixing of formation and injection fluids will not result in any adverse effects on the receiving formation or the injection well.

   (Note: The information required by condition 3 may be included within the "Injection Operation Management Plan" required by condition 2).

4. There shall be no injection of any fluids after 1 June 2031.

5. The consent holder shall at all times adopt the best practicable option, as defined in Section 2 of the Resource Management Act 1991, to prevent or minimise any actual or likely adverse effect on the environment.

6. The injection of fluids shall be confined to the Mount Messenger Formation, and be injected below a minimum depth of 1,200 metres true vertical depth below ground level.

7. The injection pressure at the wellhead shall not exceed 1610 psi (111 bar). If exceeded, the injection operation shall cease immediately and the Chief Executive, Taranaki Regional Council informed immediately.

8. The consent holder shall ensure that the discharge authorised by this consent does not result in the fracturing of the geological seals confining the injection zone.

9. The consent holder shall ensure that the exercise of this consent does not result in contaminants reaching any useable fresh water (groundwater or surface water). Useable fresh groundwater is defined as any groundwater having a TDS concentration of less than 1,000 mg/L.

10. Only the following types of fluid may be discharged:

    (a) produced water;
    (b) well workover fluids;
    (c) well drilling fluids; and
    (d) contaminated stormwater.

11. From the date of the first discharge the consent holder shall keep a record of the:

    (a) hours of injection each day;
    (b) volume of fluid discharged each day; and
    (c) maximum and average injection pressure each day.

12. For each waste stream arriving on site for discharge, the consent holder shall characterise the fluids by recording the following information:

    (a) type of fluid (as listed in condition 10);
    (b) source of fluid (site name and company);
    (c) an analysis of a representative sample of the fluid for:
        (i) pH;
        (ii) conductivity;
        (iii) suspended solids concentration;
        (iv) temperature;
        (v) salinity;
        (vi) chloride concentration; and
        (vii) total hydrocarbon concentration.

    The analysis required by condition 12(c) above is not necessary if a sample of the same type of fluid, from the same source, has been taken, analysed and provided to the Chief Executive, Taranaki Regional Council within the previous 6 months.

13. If the analyses required by the condition 12(c) above is not carried out in an International Accreditation New Zealand accredited laboratory, it shall be undertaken in accordance with a "Quality Assurance (QA) Plan" that has been certified by the Chief Executive, Taranaki Regional Council, as meeting the requirements of conditions. The Council may also, at its discretion, carry out an audit of the consent holder's sampling and analysis regime to assess adherence to the QA plan.

14. The information required by conditions 11 and 12 above, for each calendar month, shall be provided to the Chief Executive, Taranaki Regional Council before the 28th day of the following month.

15. The consent holder shall undertake a programme of sampling and testing that monitors the effects of the exercise of this consent on fresh water resources within an Area of Review (AoR) to assess compliance with condition 9 (the 'Monitoring Programme'). The Monitoring Programme shall be designed to characterise local groundwater quality, and be submitted to the Chief Executive, Taranaki Regional Council, for certification before the exercising of this consent, and shall include:

    (a) the location of sampling sites;
    (b) well/bore construction details; and
    (c) sampling frequency.

    The AoR shall extend 1,000 metres from the point of injection. It is a requirement that at least one suitable monitoring bore be located within 500 metres of the well head. If no suitable existing bores are available, it will be necessary for the Monitoring Programme to include installation of, and sampling from, a suitable bore. The bore would be of a depth, location and design determined after consultation with the Chief Executive, Taranaki Regional Council and installed in accordance with NZS 4411:2001. The bore shall be completed no later than 6 months after granting this consent.

16. All groundwater samples taken for monitoring purposes shall be taken in accordance with recognised field procedures and analysed for:

    (a) pH;
    (b) conductivity;
    (c) chloride; and
    (d) total petroleum hydrocarbons.

    Note: The samples required, under conditions 15 and 16, could be taken and analysed by the Taranaki Regional Council or other contracted party on behalf of the consent holder.

17. All groundwater sampling and analysis shall be undertaken in accordance with a *Sampling and Analysis Plan*, which shall be submitted to the Chief Executive, Taranaki Regional Council for review and certification before the first sampling is undertaken. This Plan shall specify the use of standard protocols recognised to constitute good professional practice including quality control and assurance. An IANZ accredited laboratory shall be used for all sample analysis. Results shall be provided to the Chief Executive, Taranaki Regional Council within 30 days of sampling and shall include supporting quality control and assurance information.

    Note: The Sampling and Analysis Plan may be combined with the Monitoring Programme required by condition 15.

18. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, before 31 August each year, a summary of all data collected and a report detailing compliance with consent conditions over the previous 1 July to 30 June period. Based on the data provided, the report shall also provide:

    a) an assessment of injection well performance;
    b) an assessment of the on-going integrity and isolation of the wellbore;
    c) an assessment of the on-going integrity and isolation of the receiving formation; and
    d) an updated injection modeling report, demonstrating the ability of the receiving formation to continue to accept additional waste fluids and an estimation of remaining storage capacity.

19. 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 each year, 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 2 June 2016

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 Limited P O Box 3394 NEW PLYMOUTH 4341
Decision Date:	4 February 2013
Commencement Date:	4 February 2013

Conditions of Consent

Consent Granted:	To discharge produced water, well drilling fluids, well workover fluids into the Mount Messenger Formation by deepwell injection via the Kaimiro-G wellsite at or about (NZTM) 1699622E-5663210N
Expiry Date:	1 June 2032
Review Date(s):	June annually
Site Location:	Kaimiro-G wellsite, 1240 Upland Road, Kaimiro (Property owner: NJ & LS Seconi)
Legal Description:	Sec 138 Tarurutangi Dist (Discharge source & site)
Catchment:	Waiongana
Tributary:	Mangaoraka

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. Before this consent is exercised, the consent holder shall submit an "Injection Operation Management Plan" which shall include the operational details of the injection activities and identify the conditions that would trigger concerns about the integrity of the injection well, injection zone or overlying geological formations. The plan will also detail the action(s) to be taken by the consent holder if trigger conditions are reached.

2. Before this consent is exercised the consent holder shall provide to the Chief Executive of the Taranaki Regional Council:

   (a) a final well completion log for the injection well including subsurface construction details, design of the exterior surface casing, the intermediate protective casing, and the innermost casing, tubing, and/or packer(s);
   (b) well cementing details, cement bond log and results of annular pressure testing which demonstrates well integrity;
   (c) details of on-going well integrity monitoring, well maintenance procedures and safe operating limits for the well;
   (d) a detailed geological log of the well;
   (e) details and results of the Formation Integrity Testing carried out on the receiving formation and confining layers and an assessment of the results against the estimated modelled values submitted in the consent application 7032;
   (f) results of an electrical resistivity survey, clearly showing the confirmed depth of freshwater as defined in condition 11; and
   (g) a full chemical analysis of the receiving formation-water.

   (Note: These details can be included within the "Injection Operation Management Plan.")

3. The injection pressure at the wellhead shall not exceed 1,077 psi (73 bars). If exceeded, the injection operation shall be ceased immediately and the Chief Executive of the Taranaki Regional Council informed immediately.

4. The rate of injection shall not exceed 8.6 cubic metres per hour (0.9 bpm)

5. The volume of fluid injected shall not exceed 206 cubic metres per day (1,296 bpd).

6. The injection of fluids shall be confined to the Mt. Messenger Formation, deeper than -995 metres True Vertical Depth Sub-sea.

7. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or likely adverse effect on the environment; in particular, ensuring that the injection material is contained within the injection zone.

8. Only the fluids listed below and originating from the consent holder's operations may be discharged:

   (a) produced water;
   (b) well drilling fluids;
   (c) well workover fluids, including hydraulic fracturing return fluids; and
   (d) contaminated stormwater.

9. Once the consent is exercised, the consent holder shall keep daily records of the:

   (a) total injection hours;
   (b) volume of fluid injected;
   (c) maximum and average rate of injection; and
   (d) maximum and average injection pressure.

10. For each waste stream arriving on site for discharge, the consent holder shall record the following information:

    (a) type of fluid;
    (b) source of fluid (site name and location);
    (c) an analysis of the fluid for:
        (i) pH;
        (ii) suspended solids concentration;
        (iii) temperature;
        (iv) salinity;
        (v) chloride concentration; and
        (vi) total hydrocarbon concentration.

    The analysis required by condition 10(c) above is not necessary if a sample of the same type of fluid, from the same source, has been taken, analysed and provided to the Chief Executive, Taranaki Regional Council within the previous 6 months.

11. The information required by conditions 9 and 10 above, for each calendar month, shall be provided to the Chief Executive, Taranaki Regional Council before the 15th day of the following month.

12. The consent holder shall ensure that the exercise of this consent does not result in contaminants reaching any useable fresh water (groundwater or surface water). Usable fresh groundwater is defined as any groundwater having a Total Dissolved Solids concentration of less than 1000 mg/l.

13. The consent holder shall undertake a programme of sampling and testing that monitors the effects of the exercise of this consent on fresh water resources to assess compliance with condition 12 (the 'Monitoring Programme'). The Monitoring Programme shall be certified by the Chief Executive, Taranaki Regional Council ('the Chief Executive'), before this consent is exercised, and shall include:

    (a) the location of sampling sites;
    (b) well/bore construction details; and
    (c) sampling frequency.

14. All water samples taken for monitoring purposes shall be taken in accordance with recognised field procedures and analysed for:

    (a) pH;
    (b) conductivity;
    (c) chloride; and
    (d) total petroleum hydrocarbons.

    Note: *The samples required, under conditions 13 and 14, could be taken and analysed by the Council or other contracted party on behalf of the consent holder.*

15. All sampling and analysis shall be undertaken in accordance with a *Sampling and Analysis Plan*, which shall be submitted to the Chief Executive for review and certification before the first sampling is undertaken. This plan shall specify the use of standard protocols recognised to constitute good professional practice including quality control and assurance. An International Accreditation New Zealand (IANZ) accredited laboratory shall be used for all sample analysis. Results shall be provided to the Chief Executive within 30 days of sampling and shall include supporting quality control and assurance information. These results will be used to assess compliance with condition 12.

    Note: *The Sampling and Analysis Plan may be combined with the Monitoring Programme required by condition 13.*

16. The consent holder shall provide to Taranaki Regional Council, during the month of July of every year, a summary of all data collected and a report detailing compliance with consent conditions over the previous 1 July to 30 June period. The report shall also provide and assess data which illustrates the on-going integrity and isolation of the wellbore, well performance and condition. The consent holder shall also provide an updated injection modeling report, illustrating the ability of the receiving formation to continue to accept additional waste fluids and estimating its remaining storage capacity.

17. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least 5 days prior to the first exercise of this consent. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz.

18. There shall be no fluids discharged under this consent after 1 June 2027.

19. 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 each year, 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 4 February 2013

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Discharge Permit

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

Name of Consent Holder:	Greymouth Petroleum Central Limited PO Box 3394 Fitzroy New Plymouth 4341
Decision Date	23 November 2018
Commencement Date	23 November 2018

Conditions of Consent

Consent Granted:	To discharge produced water, well drilling fluids, well work over fluids, hydraulic fracturing fluids and contaminated stormwater from hydrocarbon exploration and production operations into the Mount Messenger Formation by deep well injection at the Radnor-B wellsite
Expiry Date:	1 June 2034
Review Date(s):	June annually
Site Location:	Radnor wellsite, Radnor Road, Midhirst (Property owner: Airport Farm Trustee Limited)
Grid Reference (NZTM)	1709263E-5649159N
Catchment:	Patea
Tributary:	Kahouri Piakau

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

General condition

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

Special conditions

1. Before exercising the consent, the consent holder shall submit an "Injection Operation Management Plan." The plan shall include the operational details of the injection activities and identify the conditions that would trigger concerns about the integrity of the injection well, the receiving formation or overlying geological seals. The plan shall also detail the action(s) to be taken by the consent holder if trigger conditions are reached.

2. Before exercising the consent, the consent holder shall provide to the Chief Executive, Taranaki Regional Council:

   (a) a geological assessment of the environment in which the well is located, including the injection zone, the geological seals confining the injection zone and any associated faulting;
   (b) details of the injection well design and its structural integrity;
   (c) an assessment of the suitability of the injection well for the proposed activity;
   (d) details of how the integrity of the injection well will be monitored and maintained;
   (e) confirmation of the depth to which fresh water resources, as defined in condition 7, are encountered below the site; and
   (f) a chemical assessment of the receiving formation water which confirms its Total Dissolved Solids (TDS) concentration, and also demonstrates that the mixing of formation and injection fluids will not result in any adverse effects on the receiving formation or the injection well.

   (Note: The information required by condition 2 may be included within the "Injection Operation Management Plan" required by condition 1).

3. There shall be no injection of any fluids after 1 June 2029.

4. 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.

5. The injection of fluids shall only be injected to the Mount Messenger Formation, at a minimum depth of 1,100 metres true vertical depth sub-sea (1,442 metres below ground level).

6. The consent holder shall ensure that the discharge authorised by this consent does not result in the fracturing of the geological seals confining the injection zone.

7. The consent holder shall ensure that the exercise of this consent does not result in contaminants reaching any useable fresh water (groundwater or surface water). Useable fresh groundwater is defined as any groundwater having a TDS concentration of less than 1,000 mg/L.

8. Only the following types of fluid may be discharged:

   (a) produced water;
   (b) well drilling fluids;
   (c) well workover fluids, including hydraulic fracturing fluids; and
   (d) contaminated stormwater.

9. For each waste stream arriving on site for discharge, the consent holder shall characterise the fluids by recording the following information:

   (a) type of fluid (as listed in condition 8);
   (b) source of fluid (site name and company);
   (c) an analysis of a representative sample of the fluid for:
      (i) pH;
      (ii) conductivity;
      (iii) suspended solids concentration;
      (iv) temperature;
      (v) salinity;
      (vi) chloride concentration; and
      (vii) total hydrocarbon concentration.

   The analysis required by condition 9(c) above is not necessary if a sample of the same type of fluid, from the same source, has been taken, analysed and provided to the Chief Executive, Taranaki Regional Council within the previous 6 months.

10. Once the consent is exercised, the consent holder shall keep daily records of the:

   (a) injection hours;
   (b) volume of fluid discharged; and
   (c) maximum and average injection pressure.

11. If the analysis required by condition 9(c) above is not carried out in an International Accreditation New Zealand (IANZ) accredited laboratory, it shall be undertaken in accordance with a "Quality Assurance (QA) Plan" that has been certified by the Chief Executive, Taranaki Regional Council, as meeting the requirements of condition 9. The Council may also, at its discretion, carry out an audit of the consent holder's sampling and analysis regime to assess adherence to the QA plan.

12. The information required by conditions 9 and 10 above, for each calendar month, shall be provided to the Chief Executive, Taranaki Regional Council before the 28th day of the following month.

13. The consent holder shall undertake a programme of sampling and testing that monitors the effects of the exercise of this consent on fresh water resources to assess compliance with condition 7 (the 'Monitoring Programme'). The Monitoring Programme shall be submitted to the Chief Executive, Taranaki Regional Council, for certification before exercising the consent, and shall include:

    (a) the location of sampling sites;
    (b) well/bore construction details; and
    (c) sampling frequency.

    It is a minimum requirement that at least one suitable monitoring bore be located within 500 metres of the well head. If no suitable existing bores are available, it will be necessary for the Monitoring Programme to include installation of, and sampling from, a suitable bore. The bore would be of a depth, location and design determined after consultation with the Chief Executive, Taranaki Regional Council and installed in accordance with NZS 4411:2001.

14. All groundwater samples taken for monitoring purposes shall be taken in accordance with recognised field procedures and analysed for:

    (a) pH;
    (b) conductivity;
    (c) chloride; and
    (d) total petroleum hydrocarbons.

    Note: The samples required, under conditions 13 and 14, could be taken and analysed by the Council or other contracted party on behalf of the consent holder.

15. All groundwater sampling and analysis shall be undertaken in accordance with a *Sampling and Analysis Plan*, which shall be submitted to the Chief Executive, Taranaki Regional Council for review and certification before the first sampling is undertaken. This Plan shall specify the use of standard protocols recognised to constitute good professional practice including quality control and assurance. An IANZ accredited laboratory shall be used for all sample analysis. Results shall be provided to the Chief Executive, Taranaki Regional Council within 30 days of sampling and shall include supporting quality control and assurance information.

    Note: The Sampling and Analysis Plan may be combined with the Monitoring Programme required by condition 13.

16. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, before 31 August each year, a summary of all data collected and a report detailing compliance with consent conditions over the previous 1 July to 30 June period. Based on the data provided, the report shall also provide:

    a) an assessment of injection well performance;
    b) an assessment of the on-going integrity and isolation of the wellbore;
    c) an assessment of the on-going integrity and isolation of the receiving formation; and
    d) an updated injection modeling report, demonstrating the ability of the receiving formation to continue to accept additional waste fluids and an estimation of remaining storage capacity.

17. 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 each year, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 23 November 2018

For and on behalf of
Taranaki Regional Council

_____

A D McLay
Director - Resource Management