

Cheal Petroleum Ltd
Cheal Production Station
Monitoring Programme
Annual Report
2019-2020

Technical Report 2020-56

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Executive summary

Cheal Petroleum Ltd (the Company), a subsidiary of Tamarind NZ Onshore Ltd, operates a petrochemical production station located on Mountain Road at Ngaere, in the Waingongoro catchment. The Cheal Production Station processes oil and gas from the Cheal group of wellsites. This report for the period July 2019 to June 2020 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the Company's environmental and consent compliance performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of the Company's activities.

The Company holds three resource consents in relation to the Cheal Production Station, which includes a total of 42 conditions setting out the requirements that the Company must satisfy. The Company holds one consent to take and use groundwater for water flooding purposes, one consent to discharge stormwater and treated waste water onto land in circumstances where it may subsequently enter an unnamed tributary of the Mangawharawhara Stream, and one consent to discharge emissions related to production activities into the air at the site.

During the monitoring period, Cheal Petroleum Ltd demonstrated an overall high level of environmental performance.

The Council's monitoring programme for the year under review included five inspections, six water samples collected for physicochemical analysis, and two ambient air quality analyses.

Stormwater system inspections showed that discharges from the sites complied with consent conditions. Receiving water sampling showed that the discharges complied with consent conditions. No adverse effects were observed in the tributary of the Mangawharawhara Stream at the time of monitoring.

There were no adverse effects on the environment found as a result of the exercise of the air discharge consent. Ambient air quality monitoring at the site showed that levels of carbon monoxide, combustible gases, PM₁₀ particulates, and nitrogen oxides were all below levels of concern at the time of sampling. No offensive or objectionable odours were detected beyond the boundary during inspections.

During the year, the Company demonstrated a high level of both environmental performance and administrative compliance 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 consent holder over the last several years, this report shows that the consent holder's performance remains at a high level.

This report includes recommendations for the 2020-2021 year.

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1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is 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 Cheal Petroleum Ltd (the Company). The Company operates a petrochemical production station situated on Mountain Road at Ngaere, in the Waingongoro catchment.

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

One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of the Company's use of water, land and air, and is the 11th combined annual report by the Council for the Cheal Production Station.

1.1.2 Structure of this report

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

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

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

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

Section 4 presents recommendations to be implemented in the 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.¹

1.2 Process description

The Cheal-A wellsite was first established on Mountain Road at Ngaere by NZOG Services Ltd in 1995. Austral Pacific developed the neighbouring Cheal-B wellsite in July 2006 and started construction of the Cheal Production Station adjacent to the Cheal-A wellsite in late 2006. The production station was commissioned in August 2007 and the tie-in to the Cheal-B pipeline was complete in December 2007.

The owners of the Cheal facilities, including Austral Pacific Energy (NZ) Ltd, were placed in receivership in April 2009. The consents were transferred to Cheal Petroleum Ltd in October 2009 and the site is now operated by Tamarind NZ Onshore Ltd. The production station continued to operate during this transition. Consents for Austral Pacific's Cardiff wellsite on Brookes Road were transferred to Cheal Petroleum in December 2010. This site is now known as Cheal-C and is operated by Tamarind NZ as part of the Cheal group.

¹ 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

Consents were granted to Cheal Petroleum for construction of three additional exploration wellsites in the area, being Cheal-D, Cheal-E and Cheal-G. Construction and commissioning of a multiphase pipeline from Cheal-E to the Cheal Production Station was undertaken in the 2014-2015 year.

The production station processes oil and gas from the Cheal wellsites. Some gas is used to power the site and to generate electricity for supply. Construction of a new gas processing plant and pipelines was completed in the 2012-2013 year to process raw inlet gas to New Zealand gas specifications for delivery on the First Gas pipeline system for domestic use. Stormwater from the Cheal-A wellsite and Production Station is collected in a large skimmer pit in the northwest corner of the site prior to discharge.



Photo 1 Cheal Production Station

1.3 Resource consents

1.3.1 Cheal-A and Cheal Production Station

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

Table 1 Table of consents relating to the Cheal Production Station

Consent number	Purpose	Granted	Review	Expires
4727-2	To discharge treated stormwater and produced water from hydrocarbon exploration and production operations at the Cheal-A wellsite and Cheal Production Station, onto and into land in circumstances where it may enter an unnamed tributary of the Mangawharawhara Stream	Nov 2011	June 2023	June 2029
7906-1	To discharge emissions into the air during flaring and to discharge miscellaneous emissions from tank vents and generators arising from hydrocarbon production activities including emergency situations and well workovers at the Cheal-A wellsite and Cheal Production Station	Nov 2011	June 2023	June 2029
10290-1	To take and use groundwater, including the incidental take of geothermal heat and energy, for water flooding purposes	Sep 2016	June 2023	June 2035

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.

1.3.2 Wellsite consents

The Company also holds consents for production activities at wellsites associated with the Cheal Production Station. A summary of these consents is provided in Table 2.

Table 2 Consents for production activities at wellsites associated with Cheal Production Station

Wellsite	Consent number	Purpose	Issue date	Expiry
Cheal-B	6814-1	To discharge emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Cheal-B wellsite	23/3/2006	2022
	6815-1	To discharge treated stormwater and treated produced water from hydrocarbon exploration and production operations at the Cheal-B wellsite onto and into land in the vicinity of the Ngaere Stream in the Patea catchment	23/3/2006	2022
Cheal-C	6403-1	To discharge treated stormwater, treated produced water and treated wastewater at the Cheal-C wellsite onto and into land in the vicinity of an unnamed tributary of the Mangawharawhara Stream in the Waingongoro catchment	22/7/2004	2023
	7780-2	To take and use water from an unnamed tributary of the Mangawharawhara Stream for hydrocarbon exploration activities at the Cheal-C wellsite	22/7/2014	2029
	9262-1	To discharge emissions to air associated with production activities from up to 10 wells at the Cheal-C wellsite, including: flaring associated with emergencies (including operational emergencies) and maintenance; emissions from gas treatment or production plants; and minor emissions from other miscellaneous activities	11/6/2012	2029
Cheal-D	9534-1	To discharge emissions to air associated with hydrocarbon producing wells at the Cheal-D wellsite	5/6/2013	2028
	9535-1	To discharge treated stormwater, treated surplus drilling water and treated produced water from hydrocarbon exploration and production operations at the Cheal-D wellsite, onto land and into an unnamed tributary of the Kahikatea Stream	2/4/2013	2028
Cheal-E	9549-1	To discharge emissions to air associated with hydrocarbon producing wells at the Cheal-E wellsite	1/11/2013	2028
Cheal-E	9550-1	To discharge treated stormwater, treated surplus drilling water and treated produced water from hydrocarbon exploration and production operations at the Cheal-E wellsite, onto land and into an unnamed tributary of the Ngaere Stream	6/5/2013	2028
Cheal-G	9614-1	To discharge emissions to air associated with hydrocarbon producing wells at the Cheal-G wellsite	5/2/2014	2029

Wellsite	Consent number	Purpose	Issue date	Expiry
	9615-1	To discharge treated stormwater, treated surplus drilling water and treated produced water from hydrocarbon exploration and production operations at the Cheal-G wellsite, onto land where it may enter the Tuikonga Stream	23/8/2013	2029

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 Cheal Production Station and associated wellsites consisted of three primary components.

Biomonitoring of the tributary of the Mangawharawhara Stream is not undertaken in relation to activities at the production station due to the lack of a suitable upstream control site. The point of entry for any discharge that reaches the tributary is immediately below the ponds at Ngaere Gardens. Sampling and visual inspection of the stream are the main means of receiving environment monitoring.

1.4.2 Programme liaison and management

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

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

1.4.3 Site inspections

Five inspections were undertaken at the Cheal Production Station and associated wellsites during the monitoring period. With regard to consents for the abstraction of or discharge to water, the main points of interest were plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters. Air inspections focused on plant processes with associated actual and potential emission sources and characteristics, including potential odour, dust, noxious or offensive emissions. Sources of data being collected by the Company were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

1.4.4 Chemical sampling

The combined Cheal Production Station/Cheal-A wellsite discharge was sampled twice, with the unnamed tributary of the Mangawharawhara Stream sampled concurrently.

The Council undertook sampling of the ambient air quality outside the boundary of the site. A multi-gas meter was deployed on one occasion in the vicinity of the plant, with monitoring consisting of continuous measurements of gas concentrations for the gases of interest (carbon monoxide and combustible gases). A PM₁₀ particulate monitor was deployed concurrently with the multi-gas meter. Two nitrogen oxide measuring devices were also deployed in the vicinity of the plant on one occasion during the year under review.

2 Results

2.1 Water

2.1.1 Inspections

Inspections were carried out on five occasions at the Cheal Production Station and associated facilities in the 2019-2020 year. The following was found during the inspections:

29 August 2019

Cheal Production Station and Cheal-E wellsite: Both sites were tidy with only minor staining noted on both sites. The ring drains and skimmer pits were in good order and operating as designed. The weather had been fine prior to the inspections and neither site was discharging stormwater. Receiving waters were visually fine, with nothing unusual downstream of the discharge point indicating that any previous discharges had had any adverse effects. Flaring was occurring at both sites at the time of inspection, and no smoke was observed.

11 October 2019

Cheal Production Station and Cheal-A wellsite: Both the oily water separator and skimmer pits were inspected and found to be in good working order. There was no discharge from the site at the time of the inspection. The flare was clean burning with no smoke visible.

1 November 2019

An annual inspection of the well sites associated with Cheal Production Station was carried out to check for compliance with resource consent conditions. Well sites inspected were Cheal-B, C, D, and G. In general, the sites were tidy and clean with minimal activity occurring. The sites were being maintained, with weed spraying evident on the site and in some places within the ring drains. The majority of ring drains were vegetated with grasses that helped with controlling and treating sediment laden stormwater. Hydrocarbon sheens were not observed within the skimmer pits or in puddles on any of the sites. The skimmer pits were all in good order with goose neck pipes functioning as required. The turbidity of the pits varied from clear to slightly turbid. The majority of the discharges are onto land before flowing to surface water. No effects were noted in the grass (such as burnt patches or dead grass) or in receiving waters.

Flaring was not occurring on any of the sites at the time of inspection. No visual effects were noted as a result of previous flaring on the sites.

It was noted that oil staining from a recent hydraulic spill at Cheal-B needed to be removed, as did crude oil on the ground from a recent work over at the site.

12 May 2020

Cheal Production Station and Cheal-A wellsite: No issues were noted in relation to the production station or wellsite. There was no discharge from the site and no visual impacts of any previous discharge were noted in the receiving water. Flares were clean burning with no smoke visible at the time of inspection.

Cheal-E: It was noted that the level of water in the skimmer pit at was unusually low. It was unclear as to whether this drop was due to siphoning, evaporation, a leak in the liner or some other reason.

23 June 2020

Cheal Production Station and Cheal-A wellsite: The 3-stage interceptor next to the workshop appeared to be full and this was mentioned to staff who confirmed that this interceptor drains to the skimmer pit. The skimmer pit was clear of hydrocarbon. Downstream of the discharge point was found to be free of scums, foams or any visual indicator to suggest the discharge was resulting in any adverse environmental effects.

A flare was being maintained at the time of the inspection and this was producing a light grey smoke, however this was dissipating quickly and was not visible 100 m from the flare pit. No odour was detected onsite and the flare was not considered to be objectionable to the surrounding landowners.

Cheal-E: As noted in the previous inspection, the inspecting officer was concerned that the integrity of the liner has been compromised and that the skimmer pits are discharging to groundwater. The consent holder was advised to investigate this matter further. No issues were noted in the receiving waters downstream of the discharge.

Flaring was observed at the time of the inspection. No odours or smoke were noted.

2.1.2 Results of discharge monitoring



Figure 1 Location of the Cheal Production Station and associated sampling sites

Chemical water quality sampling of the combined discharge from the Cheal Production Station and Cheal-A wellsite was undertaken twice during the 2019-2020 year. Table 3 below presents the results. The location of the sampling site (IND001056) is shown in Figure 1.

Table 3 Results for discharge monitoring from the Cheal Production Station (TRC site IND001056)

Parameter	Units	18 June 2020	29 June 2020	Consent limits
Chloride	g/m ³	5	7	50
Conductivity @ 25°C	mS/m	4.8	5.7	-
Hydrocarbons	g/m ³	< 0.7	< 0.7	15
Suspended solids	g/m ³	22	9	100
pH		6.8	6.8	6.0 – 9.0

The results show the discharge was in compliance with the resource consent limits at the time of sampling.

2.1.3 Results of receiving environment monitoring

Chemical water quality sampling of the receiving environment was undertaken in conjunction with discharge monitoring. The results are presented in Table 4 and the sampling sites are shown in Figure 1.

Table 4 Results of receiving environment monitoring in relation to the Cheal Production Station

Parameter	Date	18 June 2020		29 June 2020	
	Units	Upstream (MWW000237)	Downstream (MWW000238)	Upstream (MWW000237)	Downstream (MWW000238)
Chloride	g/m ³	14	13	14	13
Conductivity @ 25°C	mS/m	13.9	13.1	14.6	12.4
Hydrocarbons	g/m ³	< 0.7	< 0.7	< 0.7	< 0.7
Suspended solids	g/m ³	10	10	9	9
pH		6.9	6.8	6.8	7.0

There was little change between the upstream and downstream sites at the time of sampling indicating that the discharge was not significantly affecting the receiving waters.

2.1.4 Summary of consented water abstractions reported by Cheal Petroleum

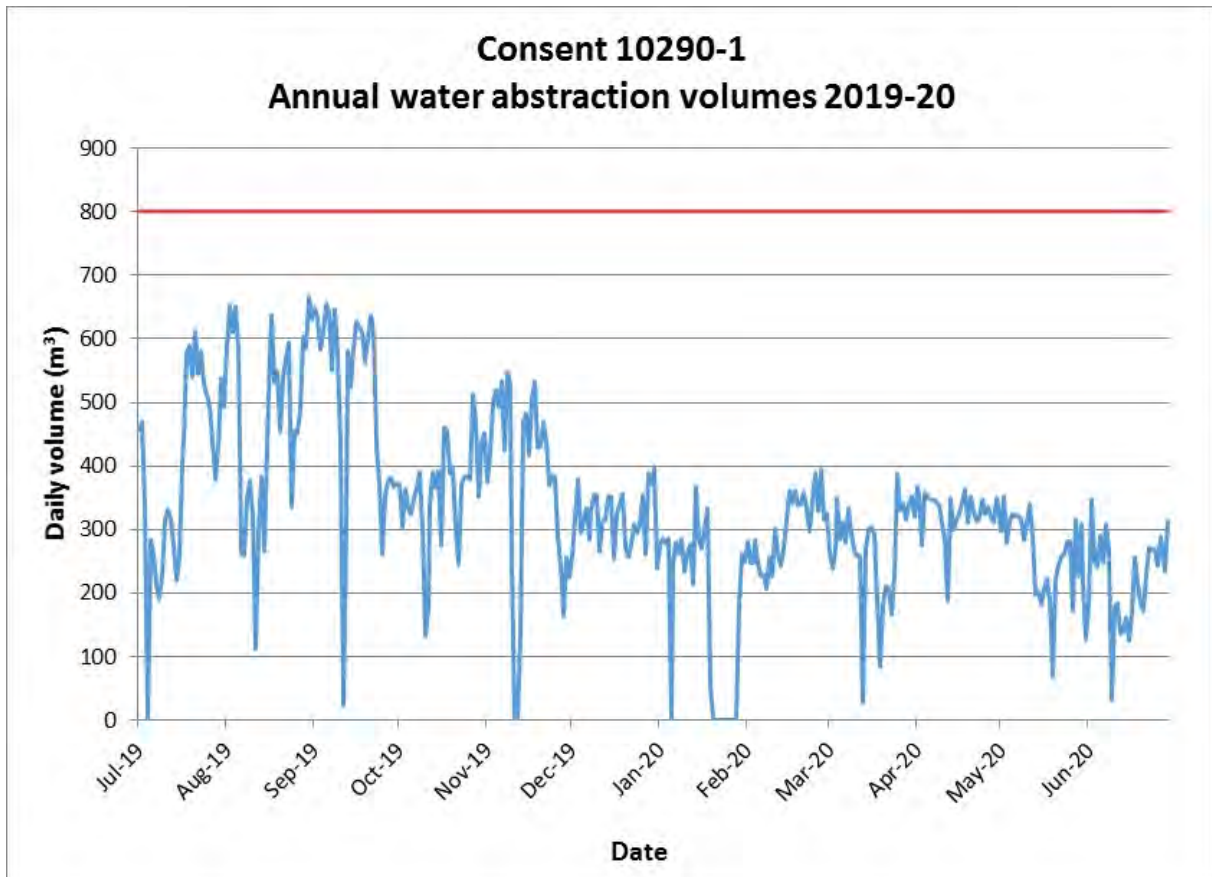


Figure 2 Daily groundwater abstraction under consent 10290-1

The consent holder supplied daily abstraction data for the period under review. Figure 2 shows that daily abstractions of groundwater under consent 10290-1 were well within the limit of 800 m³ per day.

The Cheal-C surface water take under consent 7780-2 was not exercised during the year under review.

2.2 Air

2.2.1 Inspections

Air inspections were carried out in conjunction with site inspections as discussed in Section 2.1.1 above. No issues regarding air quality were noted during the monitoring year.

2.2.2 Results of receiving environment monitoring

2.2.2.1 Carbon monoxide and combustible gases

During the monitoring year, a multi-gas meter was deployed on one occasion in the vicinity of the plant. The deployment lasted approximately 73 hours, with the instrument placed in a down-wind position at the start of the deployment. Monitoring consisted of continuous measurements of gas concentrations for the gases of interest (carbon monoxide and combustible gases). The monitoring sites used in the year under review are shown in Figure 3.

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



Figure 3 Air monitoring sites at Cheal Production Station for 2019-2020

The details of the sample run are summarised in Table 5 and the data from the sample run are presented graphically in Figure 4.

The consents covering air discharges from the Cheal Production Station have specific limits related to particular gases. Special condition 9 of consent 7906-1 sets limits on the carbon monoxide, nitrogen dioxide and fine particle (PM₁₀) concentrations at or beyond the production station's boundary. The limit on the carbon monoxide is expressed as 10 mg/m³ for an eight hour average exposure. The maximum concentration of carbon monoxide found during the monitoring run was 7.44 mg/m³ while the average concentration for the entire dataset was 0.42 mg/m³ which comply with consent conditions. This is similar to the results found in previous years.

Table 5 Results of carbon monoxide and LEL monitoring at Cheal Production Station

Period (from-to)		14 to 17 February 2020
Max	CO(ppm)	6.50*
	LEL(%)	0.20
Mean	CO(ppm)	0.37*
	LEL(%)	0.00
Min	CO(ppm)	0.00
	LEL(%)	0.00

Notes: (1) the instrument records in units of ppm. At 25°C and 1 atm, *1ppm CO = 1.145 mg/m³
(2) because the LEL of methane is equivalent to a mixture of approximately 5% methane in air, then the actual concentration of methane in air can be obtained by dividing the percentage LEL by 20.

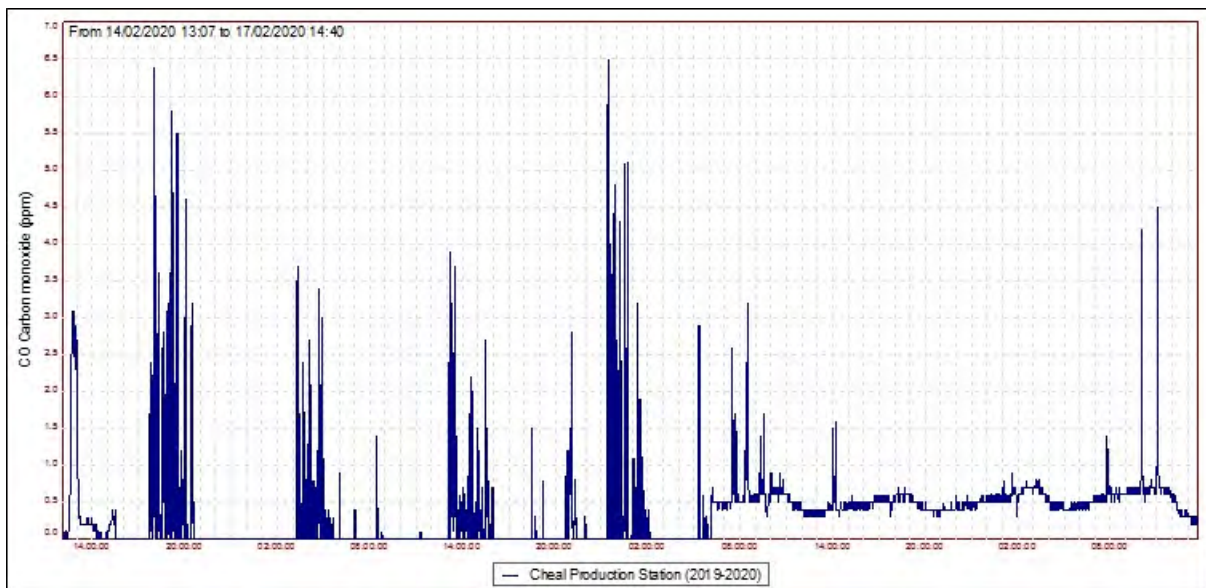


Figure 4 Ambient CO levels in the vicinity of the Cheal Production Station

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

2.2.2.2 PM₁₀ particulates

In September 2004 the Ministry for the Environment enacted National Environmental Standards (NESs) relating to certain air pollutants. The NES for PM₁₀ particulates is 50 µg/m³ (24-hour average). The same limit is imposed on consent 7906-1, in condition 9, which provides for the discharge of emissions to air from Cheal Production Station.

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

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

During the reporting period, a DustTrak PM₁₀ monitor was deployed on one occasion in the vicinity of the Cheal Production Station. The deployment lasted approximately 74 hours, with the instrument placed in a down-wind position at the start of the deployment. Monitoring consisted of continual measurements of PM₁₀ concentrations. The location of the DustTrak monitor during the sampling run is shown in Figure 3. The results of the sample run are presented in Figure 5 and Table 6.

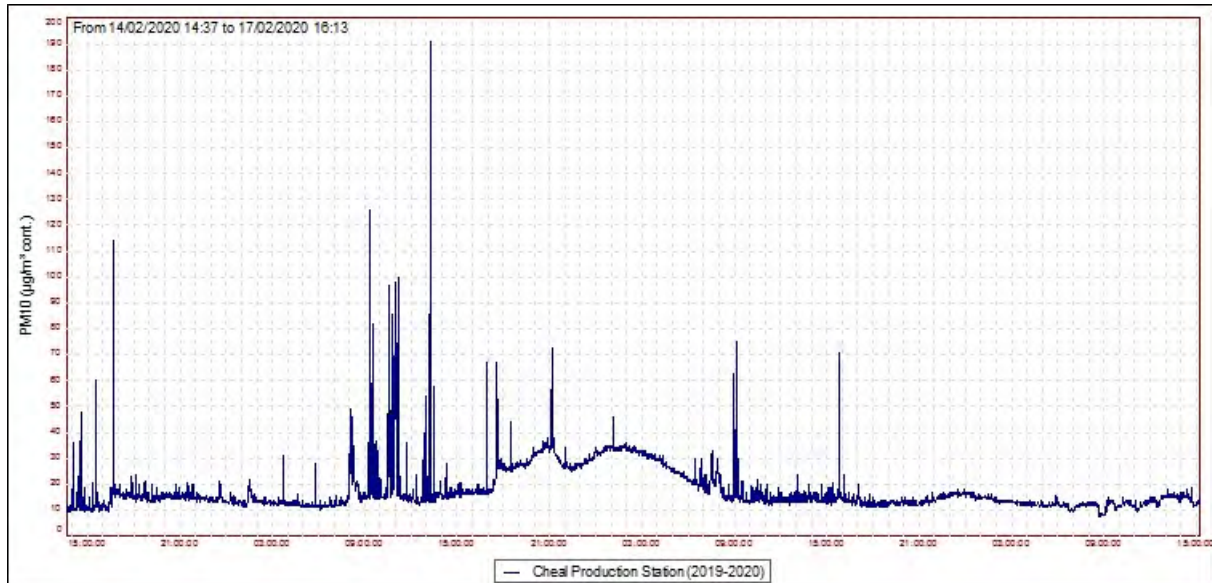


Figure 5 PM10 concentrations ($\mu\text{g}/\text{m}^3$) at the Cheal Production Station

During the 74 hour run, from 14 to 17 February 2020, the average recorded PM₁₀ concentration for the first 24 hour period was $16.2\mu\text{g}/\text{m}^3$, $24\mu\text{g}/\text{m}^3$ for the second and $13.3\mu\text{g}/\text{m}^3$ for the third 24 hour period. These daily means equate to 32.4%, 48% and 26.6%, respectively, of the $50\mu\text{g}/\text{m}^3$ value that is set by the National Environmental Standard and consent 7906-1. Background levels of PM₁₀ in the region have been found to be typically around $11\mu\text{g}/\text{m}^3$.

Table 6 Daily averages of PM₁₀ results from monitoring at Cheal Production Station

	74 hours (14-17 December 2020)		
24 hr. set	Day 1	Day 2	Day 3
Daily average	$16\mu\text{g}/\text{m}^3$	$24\mu\text{g}/\text{m}^3$	$13\mu\text{g}/\text{m}^3$
NES	$50\mu\text{g}/\text{m}^3$		

2.2.2.3 Nitrogen oxides

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

The consent covering air discharges from the Cheal Production Station has specific limits related to particular gases. Special condition 9 of consent 7906-1 sets a limit on the nitrogen dioxide concentration at or beyond the production station's boundary. The limit is expressed as 200 $\mu\text{g}/\text{m}^3$ for a 1-hour average exposure.

NOx passive adsorption discs were placed at two locations in the vicinity of the Cheal Production Station on one occasion during the year under review. The discs were left in place for a period of 21 days. The calculated 1-hour theoretical maximum NOx concentration found at Cheal Production Station during the year under review equates to 16.0 $\mu\text{g}/\text{m}^3$. The results show that the ambient ground level concentration of NOx is well below the limits set out by consent 7906-1.

Copies of air monitoring reports for this site are available from the Council upon request.

2.2.3 Summary of flaring volumes reported by the Company

A summary of flaring volumes at Cheal Production Station is provided in Figure 6.

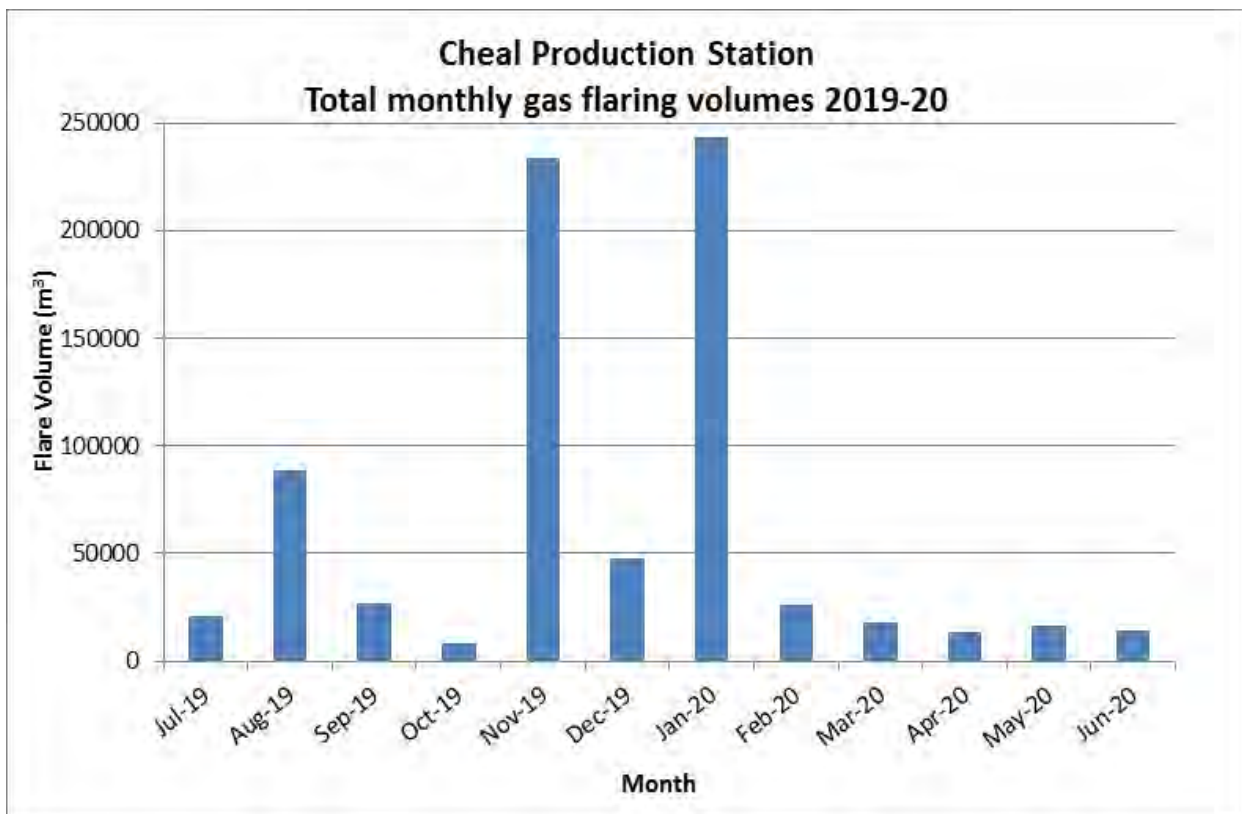


Figure 6 Summary of monthly gas flaring volumes at Cheal Production Station

During the period under review, Cheal Petroleum kept the Council informed of all non-routine flaring at the production station. The majority of this flaring related to mechanical failures, facility start-ups and shut-downs, and process upsets. Mechanical failure was the main source of the very high flare volumes in November and January. At most, light smoke was generated by these flaring events with no offsite effects. No complaints were received by the Company or the Council during the year under review.

2.3 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).

Table 7 below sets out details of any incidents recorded, additional investigations, or interventions required by the Council in relation to the Company's activities during the 2019-2020 period. This table presents details of all events that required further investigation or intervention regardless of whether these were found to be compliant or not.

Table 7 Incidents, investigations, and interventions summary table

Date	Details	Compliant (Y/N)	Enforcement Action Taken?	Outcome
14 October 2019	Notification was received from the Company regarding a hydraulic spill at the Cheal-B wellsite	Y	No	An inspection found that wear of a pipe had led to approximately 80 L of hydraulic oil spilling to ground. The oil was contained and removed from site. Consent conditions were complied with.

3 Discussion

3.1 Discussion of site performance

Monitoring of the Cheal Production Station and associated wellsites during the 2019-2020 year found that the sites were generally neat and tidy and well managed.

There was a small hydraulic oil spill at the Cheal-B wellsite, however this was contained and removed from the site with consent conditions complied with at all times.

3.2 Environmental effects of exercise of consents

Stormwater system inspections showed that discharges from the sites complied with consent conditions. Receiving water monitoring showed that the discharges were compliant with consent conditions at the time of sampling and no adverse effects were observed in the tributary of the Mangawharawhara Stream.

There were no adverse effects on the environment found as a result of the exercise of the air discharge consent. The ambient air quality monitoring at the site showed that levels of carbon monoxide, combustible gases, PM₁₀ particulates, and nitrogen oxides were all below levels of concern at the time of sampling. No offensive or objectionable odours were detected beyond the boundary during inspections.

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 8-10.

Table 8 Summary of performance for consent 4727-2

Purpose: To discharge treated stormwater and produced water from hydrocarbon exploration and production operations at the Cheal-A wellsite and Cheal Production Station, onto and into land in circumstances where it may enter an unnamed tributary of the Mangawharawhara Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option	Inspections	Yes
2. Stormwater collection from catchment area no larger than 3 ha	Inspections	Yes
3. Advise Council at least 7 days before site works commence	Notifications received	Yes
4. A contingency plan be maintained detailing measures to avoid, remedy and mitigate spillage or discharge	Latest update received January 2018	Yes
5. Management and maintenance of stormwater system	Inspections	Yes
6. Stormwater and produced water treated through stormwater system before discharged	Inspections	Yes
7. Design of skimmer pits to meet minimum size and hydrocarbon capture requirements	Inspections and water sampling	Yes
8. Stormwater retention areas to be lined	Inspections	Yes

Purpose: To discharge treated stormwater and produced water from hydrocarbon exploration and production operations at the Cheal-A wellsite and Cheal Production Station, onto and into land in circumstances where it may enter an unnamed tributary of the Mangawharawhara Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
9. Constituents meet specified standards	Water sampling	Yes
10. Temperature increase less than 2°C after 25 m mixing zone	Water sampling	Yes
11. No effects to receiving waters after 25 m mixing zone	Inspections and water sampling	Yes
12. Advise Council prior to reinstatement of site	Site still active	N/A
13. Review provision	Next option for review in June 2023	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 9 Summary of performance for consent 7906-1

Purpose: To discharge emissions into the air during flaring and to discharge miscellaneous emissions from tank vents and generators arising from hydrocarbon production activities including emergency situations and well workovers at the Cheal-A wellsite and Cheal Production Station		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt the best practicable option	Inspections and review of records	Yes
2. Maintain a flaring log	Review of records	Yes
3. Provide monthly flaring data	Records received	Yes
4. Provide an annual air emission report	Report received	Yes
5. Keep a record of all smoke emitting incidents and complaints	Review of records	Yes
6. Provide analysis of typical gas and crude oil stream from the wells	Analysis not requested	N/A
7. No alterations to plant, equipment or processes without prior consultation	Inspections and liaison with consent holder	Yes
8. Notification of flaring events longer than 5 minutes duration	Notifications received	Yes
9. Emissions are controlled in order to meet requirements of the ambient air quality standards	Air monitoring	Yes
10. All emissions to the atmosphere are controlled	Inspections and air monitoring	Yes

Purpose: To discharge emissions into the air during flaring and to discharge miscellaneous emissions from tank vents and generators arising from hydrocarbon production activities including emergency situations and well workovers at the Cheal-A wellsite and Cheal Production Station		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
11. Tanks used as hydrocarbon storage vessels are fitted with vapour recovery systems	Inspections	Yes
12. Review provision	Next option for review in June 2023	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 10 Summary of performance for consent 10290-1

Purpose: To take and use groundwater, including the incidental take of geothermal heat and energy, for water flooding purposes		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Provide bore completion log prior to exercising consent	Information received	Yes
2. The bore shall tap one aquifer only	Bore completion log	Yes
3. Annulus of bore to be sealed with grout	Inspection and bore completion log	Yes
4. Top of casing to be at least 300 mm above concrete pad	Inspection	Yes
5. Wellhead to be suitable protected from vehicle damage	Site inspection	Yes
6. Bore to be easily identifiable by permanent labels	Site inspection	Yes
7. Water sample to be collected and analysed	Sample collected on 10 October 2016	Yes
8. Rate of take not to exceed 8 L/sec or 800 m ³ per 24 hours	Abstraction records provided	Yes
9. Water meter and datalogger to be installed at the site	Site inspection	Yes
10. Water records from 1 July to 30 June to be supplied by 31 July annually	Records supplied	Yes
11. Documentation certifying the water measuring and recording equipment to be supplied at installation and every 5 years thereafter	Documentation received	Yes
12. Council to be advised of equipment failure	Notification received	N/A
13. Water meter and datalogger to be accessible to Council staff	Inspection	Yes

Purpose: To take and use groundwater, including the incidental take of geothermal heat and energy, for water flooding purposes		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
14. Record of groundwater levels to be provided	Records provided	Yes
15. Consent holder to adopt best practicable option to prevent or minimise adverse effects	Inspection and review of data	Yes
16. Lapse of consent	Consent has been exercised	N/A
17. Review provision	Next option for review in June 2023	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 11 Evaluation of environmental performance over time

Year	Consent no	High	Good	Improvement req	Poor
2010-12	4727-2, 7906-1	2	-	-	-
2012-13	4727-2, 7906-1	2	-	-	-
2013-14	4727-2, 7906-1	2	-	-	-
2014-15	4727-2, 7906-1, 9211-1	3	-	-	-
2015-16	4727-2, 7906-1, 9211-1	3	-	-	-
2016-17	4727-2, 7906-1, 10290-1	3	-	-	-
2017-18	4727-2, 7906-1, 10290-1	3	-	-	-
2018-19	4727-2, 7906-1, 10290-1	3	-	-	-
Totals		21	0	0	0

During the year, the Company demonstrated an overall high level of both environmental performance and administrative compliance with the resource consents as defined in Section 1.1.4. The Cheal Production Station and associated wellsites were well managed and maintained.

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 at Cheal Production Station and associated facilities in the 2019-2020 year be amended from that undertaken in 2018-2019, by reducing the number of inspections per year from six to four.
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.

These recommendations were implemented.

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 that for 2020-2021 monitoring of consented activities at the Cheal Production Station remains unchanged from 2019-2020.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the sites in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2020-2021.

4 Recommendations

1. THAT in the first instance, monitoring of consented activities at Cheal Production Station and associated facilities 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.

Glossary of common terms and abbreviations

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

Biomonitoring	Assessing the health of the environment using aquatic organisms.
BTEX	Benzene, toluene, ethylbenzene and xylenes (BTEX).
Bund	A wall around a tank to contain its contents in the case of a leak.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 25°C and expressed in mS/m.
g/m ³	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
Incident Register	The Incident Register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
m ²	Square Metres.
MfE	Ministry for the Environment.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
mS/m	Millisiemens per metre.
O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
PM ₁₀	Relatively fine airborne particles (less than 10 micrometre diameter).
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	<i>Resource Management Act 1991</i> and including all subsequent amendments.

SS	Suspended solids.
Temp	Temperature, measured in °C (degrees Celsius).
UI	Unauthorised Incident.
VOC	Volatile organic compounds

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

Bibliography and references

- Ministry for the Environment. 2018. Best Practice Guidelines for Compliance, Monitoring and Enforcement under the Resource Management Act 1991. Wellington: Ministry for the Environment.
- Taranaki Regional Council (2020): Ambient Gas (PM10, NOx, CO and LEL) Monitoring at Cheal Production Station during the 2019-2020 monitoring year, Internal Memorandum.
- Taranaki Regional Council (2020): Cheal Petroleum Limited Cheal Production Station Monitoring Programme Annual Report 2018-2019, Technical Report 2019-48.
- Taranaki Regional Council (2019): Cheal Petroleum Limited Cheal Production Station Monitoring Programme Annual Report 2017-2018, Technical Report 2018-44.
- Taranaki Regional Council (2017): Cheal Petroleum Limited Cheal Production Station Monitoring Programme Annual Report 2016-2017, Technical Report 2017-46.
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- Taranaki Regional Council (2014): Cheal Petroleum Limited Cheal Production Station Monitoring Programme Annual Report 2013-2014, Technical Report 2014-29.
- Taranaki Regional Council (2014): Cheal Petroleum Limited Cheal Production Station Monitoring Programme Annual Report 2012-2013, Technical Report 2013-88.
- Taranaki Regional Council (2013): Cheal Petroleum Limited Cheal Production Station Monitoring Programme Biennial Report 2010-2012, Technical Report 2012-74.
- Taranaki Regional Council (2010): Austral Pacific Energy (NZ) Limited Cheal Production Station Monitoring Programme Annual Report 2009-2010, Technical Report 2010-88.
- Taranaki Regional Council (2010): Austral Pacific Energy (NZ) Limited Cheal Production Station Monitoring Programme Biennial Report 2007-2009, Technical Report 2009-78.
- Taranaki Regional Council (2009): Austral Pacific Energy (NZ) Limited Cheal A 6 & 7 Wellsite Monitoring Programme Annual Report 2007-2008, Technical Report 2008-49.
- Taranaki Regional Council (2006): Rata Energy NZ Ltd & Austral Pacific Energy (NZ) Limited Cheal Production Wells Monitoring Programme Annual Report 2005-2006, Technical Report 2006-29.
- Taranaki Regional Council (2005): Rata Energy NZ Ltd & Austral Pacific Energy (NZ) Limited Cheal Production Wells Monitoring Programme Annual Report 2004-2005, Technical Report 2005-16.

Appendix I

Resource consents held by Cheal Petroleum Ltd

(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: Cheal Petroleum Limited
 P O Box 402
 NEW PLYMOUTH 4340

Decision Date: 10 November 2011

Commencement
Date: 10 November 2011

Conditions of Consent

Consent Granted: To discharge emissions into the air during flaring and to discharge miscellaneous emissions from tank vents and generators arising from hydrocarbon production activities including emergency situations and well workovers at the Cheal-A wellsite and Cheal Production Station at or about (NZTM) 1712310E-5639497N

Expiry Date: 1 June 2029

Review Date(s): June 2017, June 2023

Site Location: Cheal-A wellsite and Cheal Production Station, Mountain Road, Ngaere [Property owners: JR & RP Lightoller]

Legal Description: Pt Sec 24 Blk VI Ngaere SD [site of discharge]

*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 [the Council] all the administration, monitoring and supervision costs of this consent, fixed in accordance to section 36 of the Resource Management Act.

Special conditions

Exercise of consent

1. The consent holder shall at all times adopt the best practicable option [as defined in section 2 of the Resource Management Act 1991] to prevent or minimise any actual or likely adverse effects on the environment associated with the discharge of contaminants into the environment arising from the emissions to air from the flare.

Recording and submitting information

2. The consent holder shall keep and maintain a log of all continuous flaring incidents lasting longer than 5 minutes and any intermittent flaring lasting for an aggregate of 10 minutes or longer in any 60-minute period. The log shall contain the date, the start and finish times, the quantity and type of material flared, and the reason for flaring. The log shall be made available to the Chief Executive, Taranaki Regional Council, upon request, and summarised annually in the report required under condition 4. Flaring, under normal operation in the low pressure flare, of rich mono-ethylene glycol degasser vapour, condensate tank vapours, non-condensibles from tri-ethylene glycol/mono-ethylene glycol regeneration and purge gas shall be excluded from this requirement.
3. The consent holder shall supply to the Taranaki Regional Council each month a copy of flaring information comprising: the type and amount of material flared [including any gas used to maintain a pilot flame], the date this was flared, the reason why flaring was undertaken, and an indication of whether smoke was produced from such flaring events.
4. The consent holder shall provide to the Taranaki Regional Council during May of each year, for the duration of this consent, a report:
 - a) detailing gas combustion at the production station flare, including but not restricted to routine operational flaring and flaring logged in accordance with condition 2;
 - b) detailing any measures that have been undertaken by the consent holder to improve the energy efficiency of the production station;
 - c) detailing any measures to reduce smoke emissions;
 - d) detailing any measures to reduce flaring;
 - e) addressing any other issue relevant to the minimisation or mitigation of emissions from the production station flare; and
 - f) detailing any complaints received and any measures undertaken to address complaints.

5. The consent holder shall keep and make available to the Chief Executive, Taranaki Regional Council, upon request, a record of all smoke emitting incidents, noting time, duration and cause. The consent holder shall also keep, and make available to the Chief Executive, upon request, a record of all complaints received as a result of the exercise of this consent.

Information and notification

6. The consent holder shall make available to the Chief Executive, Taranaki Regional Council upon request, an analysis of a typical gas and/or condensate stream from the Mt Messenger Formation and Urenui Formation, covering sulphur compound content and the content of compounds containing six or more carbon atoms in their molecular structure.
7. Prior to undertaking any alterations to the plant equipment, processes or operations, which may substantially alter the nature or quantity of flare emissions other than as described in the consent application, the consent holder shall first consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991.
8. The consent holder shall notify the Chief Executive, Taranaki Regional Council, as soon as practicable, whenever the continuous flaring of hydrocarbons [other than the flaring of rich mono-ethylene glycol degasser vapour, condensate tank vapours, non-condensibles from tri-ethylene glycol/mono-ethylene glycol regeneration and purge gas] is expected to occur for more than five minutes in duration.

Preventing and minimising emissions

9. The consent holder shall control all emissions of carbon monoxide, nitrogen dioxide, fine particles [PM₁₀] and sulphur dioxide to the atmosphere from the site, in order that the maximum ground level concentration of any of these contaminants arising from the exercise of this consent measured under ambient conditions does not exceed the relevant ambient air quality standard as set out in the Resource Management [National Environmental Standards for Air Quality Regulations, 2004] at or beyond the boundary of the property on which the site is located.
10. The consent holder shall control all emissions to the atmosphere from the site of contaminants other than those expressly provided for under special condition 7, in order that they do not individually or in combination with other contaminants cause a hazardous, noxious, dangerous, offensive or objectionable effect at or beyond the boundary of the property on which the site is located.
11. All permanent tanks used as hydrocarbon storage vessels, shall be fitted with vapour recovery systems.

Review

12. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2017 and/or June 2023, for the purposes of:

- a) dealing with any significant adverse effect on the environment arising from the exercise of the consent which was not foreseen at the time the application was considered or which it was not appropriate to deal with at the time; and/or
- b) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment caused by the discharge; and/or
- c) to alter, add or delete limits on mass discharge quantities or discharge or ambient concentrations of any contaminant or contaminants.

Signed at Stratford on 10 November 2011

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: Cheal Petroleum Limited
 P O Box 402
 NEW PLYMOUTH 4340

Decision Date (Change): 29 April 2013

Commencement Date 29 April 2013 (Granted: 10 November 2011)
(Change):

Conditions of Consent

Consent Granted: To discharge treated stormwater and produced water from hydrocarbon exploration and production operations at the Cheal-A wellsite and Cheal Production Station, onto and into land in circumstances where it may enter an unnamed tributary of the Mangawharawhara Stream

Expiry Date: 1 June 2029

Review Date(s): June 2017, June 2023

Site Location: Cheal-A wellsite and Cheal Production Station,
 4723 Mountain Road, Ngaere
 (Property owners: JR & RP Lightoller)

Legal Description: Pt Sec 24 Blk VI Ngaere SD (Discharge source & site)

Grid Reference (NZTM) 1712269E-5639504N

Catchment: Waingongoro

Tributary: Mangawharawhara

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

General condition

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

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or likely adverse effect on the environment associated with the discharge of contaminants from the site.
2. Stormwater discharged shall be collected from a catchment area of no more than 3 hectares.
3. At least 7 working days prior the consent holder shall advise the Chief Executive, Taranaki Regional Council of the date of each of the following events:
 - a) commencement of any site works, and
 - b) commencement of any well drilling operation.

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

Any advice given in accordance with this condition shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz.

4. The consent holder shall maintain a contingency plan that, to the satisfaction of the Chief Executive, Taranaki Regional Council, details measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not authorised by this consent and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge. The contingency plan shall be provided to the Council prior to discharging from the site.
5. The design, management and maintenance of the stormwater system shall be undertaken in accordance with the information submitted in support of the consent application 5603 in particular sections 7.2 and 8.1, and consent application 7378.
6. All discharges from the site, including from any containment pit or hydrocarbon combustion facility (e.g. flare pit, thermal oxidiser), shall flow to a perimeter drain and skimmer pit. Perimeter drains shall be designed, including by having a positive grade and low permeability, to ensure that runoff flows directly to a skimmer pit without ponding.
7. Skimmer pits shall have a combined capacity of no less than 250 m³, and be designed to retain any hydrocarbons that enter them.
8. All skimmer pits and any other stormwater retention areas shall be lined with an impervious material to prevent seepage through the bed and sidewalls, and all skimmer pits shall have a valve that can be shut off to prevent any discharge from the site.

Consent 4727-2

9. Constituents in the discharge shall meet the standards shown in the following table.

Constituent	Standard
pH	Within the range 6.0 to 9.0
suspended solids	Concentration not greater than 100 gm ⁻³
total recoverable hydrocarbons	Concentration not greater than 15 gm ⁻³ [as determined by infrared spectroscopic technique]
chloride	Concentration not greater than 50 gm ⁻³

10. After allowing for a mixing zone of 25 metres, the discharge shall not give rise to an increase in temperature of more than 2 degrees Celsius.
11. After allowing for a mixing zone of 25 metres, the discharge shall not give rise to any of the following effects in the receiving water:
- the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - any conspicuous change in the colour or visual clarity;
 - any emission of objectionable odour;
 - the rendering of fresh water unsuitable for consumption by farm animals;
 - any significant adverse effects on aquatic life.
12. The consent holder shall advise the Chief Executive, Taranaki Regional Council, in writing at least 48 hours prior to the reinstatement of the site and the reinstatement shall be carried out so as to minimise adverse effects on stormwater quality. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz.
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 of June 2017 and/or June 2023, 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 29 April 2013

For and on behalf of
Taranaki Regional Council

Chief Executive

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

Name of
Consent Holder: Cheal Petroleum Limited
 PO Box 402
 New Plymouth 4340

Decision Date 31 October 2017
(Change):

Commencement Date 31 October 2017 (Granted Date: 8 September 2016)
(Change):

Conditions of Consent

Consent Granted: To take and use groundwater, including the incidental
 take of geothermal heat and energy, for water flooding
 purposes

Expiry Date: 1 June 2035

Review Date(s): June 2023, June 2029

Site Location: Cheal-A wellsite, 4273 Mountain Road, Ngaere

Grid Reference (NZTM) 1712385E-5639375N

Catchment: Waingongoro

Tributary: Mangawharawhara

*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 this consent The consent holder shall ensure that a bore completion report (driller's log) that includes the information listed below is completed for GND2590 and provided to the Taranaki Regional Council for approval:
 - a) Well/bore location in GPS Coordinates, ground RL and stick up heights;
 - b) A sketch or drawing of the drilling project area, showing the location of all bores and their location in relation to nearby pertinent features;
 - c) Stratigraphic log;
 - d) Drilled depth and final bore depth;
 - e) Screen and casing details and depths;
 - f) Static water level;
 - g) Water quality data collected during and after drilling;
 - h) Name of bore owner;
 - i) Location of the drilling project;
 - j) Description of the drilling project;
 - k) Project number or job reference, and resource consent number or permit if applicable;
 - l) Start and finish dates of well/bore drilled;
 - m) Drilling method used;
 - n) Name and address of driller;
 - o) Description of grouting method and volumes used;
 - p) Name of personnel on site including driller, driller crew and supervisor;
 - q) Name of person preparing the drilling log;
 - r) Technique used and time for the well development;
 - s) Any results of the tests for discharge of water.
2. The bore shall tap no more than one aquifer. All aquifers and permeable zones of differing pressure or water quality shall be sealed to prevent the interconnection or movement of groundwater between aquifers and permeable zones.
3. The annulus of the bore shall be sealed with grout to prevent fluid movement down the sides of the bore casing.
4. The top of the casing shall be no less than 300 mm above the concrete pad and the bore shall be covered or capped to prevent contaminants entering the bore and underlying groundwater.
5. The wellhead shall be suitably constructed and/or adequately protected (e.g. by fencing or a building) to ensure that it is not vulnerable to damage by any vehicles that may have access to the vicinity.

Consent 10290-1.1

6. The bore shall be easily identifiable by permanent labels, which may be welded or engraved on the casing, or on the equivalent fixed part of the well construction or associated building. The numbering on the label shall be the bore number assigned by Taranaki Regional Council (GND2590).
7. Within 14 days of it being completed a water sample shall be collected from the well and analysed for a suite of parameters that characterise the water in the aquifer.

Note: Unless already taken, this sample will be taken by Taranaki Regional Council staff during the monitoring inspection and the cost of analysis charged to the consent holder.

8. The rate of taking shall not exceed 8 litres per second, and the volume taken in any 24 hour period ending at midnight (New Zealand Standard Time) shall not exceed 800 cubic metres.
9. Before exercising this consent the consent holder shall install, and thereafter maintain a water meter and a datalogger at the site of taking (or a nearby site in accordance with Regulation 10 of the *Resource Management (Measurement and Reporting of Water Takes) Regulations 2010*). The water meter and datalogger shall be tamper-proof and shall measure and record the rate and volume of water taken to an accuracy of $\pm 5\%$. Records of the date, the time and the rate and volume of water taken at intervals not exceeding 15 minutes, shall be made available to the Chief Executive, Taranaki Regional Council at all reasonable times.

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

10. The records of water taken shall:
 - (a) be in a format that, in the opinion of the Chief Executive, Taranaki Regional Council, is suitable for auditing;
 - (b) specifically record the water taken as 'zero' when no water is taken; and
 - (c) for each 12-month period ending on 30 June, be provided to the Chief Executive, Taranaki Regional Council within one month after end of that period.
11. The consent holder shall provide the Chief Executive, Taranaki Regional Council with a document from a suitably qualified person certifying that water measuring and recording equipment required by the conditions of this consent ('the equipment'):
 - (a) has been installed and/or maintained in accordance with the manufacturer's specifications; and/or
 - (b) has been tested and shown to be operating to an accuracy of $\pm 5\%$.

The documentation shall be provided:

- (i) within 30 days of the installation of a water meter or datalogger;
- (ii) at other times when reasonable notice is given and the Chief Executive, Taranaki Regional Council has reasonable evidence that the equipment may not be functioning as required by this consent; and
- (iii) no less frequently than once every five years.

Consent 10290-1.1

12. If any measuring or recording equipment breaks down, or for any reason is not operational, the consent holder shall advise the Chief Executive, Taranaki Regional Council immediately. Any repairs or maintenance to this equipment must be undertaken by a suitably qualified person.
13. The water meter and datalogger shall be accessible to Taranaki Regional Council officers at all reasonable times for inspection and/or data retrieval.
14. The consent holder shall provide a record of groundwater levels interpreted from pressure transducer data.
15. At all times the consent holder shall adopt the best practicable option to prevent or minimise any actual or likely adverse effect on the environment associated with the abstraction of water, including, but not limited to, the efficient and conservative use of water.
16. This consent shall lapse on 30 September 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(1)(b) of the Resource Management Act 1991.
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 2023 and/or June 2029 for the purposes of:
 - a. 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; and/or
 - b. to require any data collected in accordance with the conditions of this consent to be transmitted directly to the Council's computer system, in a format suitable for

Signed at Stratford on 31 October 2017

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management