Greymouth Petroleum Limited
Turangi Production Station
Monitoring Programme
Biennial Report
2012-2014

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Taranaki Regional Council
Private Bag 713
STRATFORD

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Executive summary

Greymouth Petroleum Limited holds consents for a petrochemical production station located on Turangi Road at Motunui, in the Parahaki catchment. The Turangi Production Station processes oil and gas from from the Company's northern Taranaki operations, including the Turangi and Kowhai groups of wellsites. This report for the period July 2012-June 2014 describes the monitoring programme implemented by the Taranaki Regional Council to assess the Company's environmental performance during the period under review, and the results and environmental effects of the Company's activities.

This report includes monitoring information specific to the Turangi Production Station programme. Results of monitoring of activities conducted at the associated wellsites are detailed in their respective wellsite monitoring reports.

The Company holds two resource consents in relation to the Turangi Production Station, which include a total of 52 conditions setting out the requirements that the Company must satisfy. The Company holds one consent to discharge stormwater and treated produced water onto land, in circumstances where it may subsequently enter an unnamed tributary of the Parahaki Stream, and one consent to discharge emissions related to production activities into the air at this site.

The Council's monitoring programme for the period under review included 17 inspections, nine water samples collected for physicochemical analysis, and two ambient air quality analyses. Monitoring of the water discharge from the site found that, with the exception of suspended solids in one sample, the limits specified in the consent were complied with. This exceedance did not give rise to any apparent adverse effects at the point of discharge or within the waters of the adjacent unnamed tributary of the Parahaki Stream.

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

In the 2012-2014 period, the Council responded to two complaints from members of the public in association with activities at the Turangi Production Station and the Kowhai-A wellsite. The investigations found that the discharges were in compliance with all applicable conditions in resource consents and provisions in Regional Plans.

During the period under review, the Company demonstrated a high level of environmental performance and compliance with the resource consents. The Turangi Production Station was well managed and maintained.

This report includes recommendation for the 2014-2015 year, including a recommendation relating to the optional review of consents 6497-1 and 6498-1.

Table of contents

List of tables

List of figures

List of photos

1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is the Biennial Report for the period July 2012 – June 2014 by the Taranaki Regional Council on the monitoring programme associated with resource consents held by Greymouth Petroleum Limited [GPL]. The Company operates a petrochemical production station situated on Turangi Road at Motunui, in the Parahaki catchment.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consent held by GPL that relates to discharges of water within the Parahaki catchment, and the air discharge permit held by GPL 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 Taranaki Regional 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 sixth combined annual report by the Taranaki Regional Council for the Company.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about compliance monitoring under the RMA and the Council's obligations and general approach to monitoring sites though annual programmes, the resource consents held by GPL in the Parahaki catchment, the nature of the monitoring programme in place for the period under review, and a description of the activities and operations conducted at the Turangi Production Station.

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

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

Section 4 presents recommendations to be implemented in the 2014-2015 monitoring year.

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

1.1.3 The Resource Management Act 1991 and monitoring

The *Resource Management Act 1991* [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 a discharger, and may include cultural and social-economic effects;
(b) physical effects on the locality, including landscape, amenity and visual effects;
(c) ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
(d) natural and physical resources having special significance (eg, recreational, cultural, or aesthetic);
(e) risks to the neighbourhood or environment.

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

1.1.4 Evaluation of environmental and consent performance

Besides discussing the various details of the performance and extent of compliance by the consent holder during the period under review, this report also assigns an overall rating. The categories used by the Council, and their interpretation, are as follows:

- A **high** level of environmental performance and compliance indicates that essentially there were no adverse environmental effects to be concerned about, and no, or inconsequential (such as data supplied after a deadline), non-compliance with conditions.

- A g**ood** level of environmental performance and compliance indicates that adverse environmental effects of activities during the monitoring period were negligible or minor at most, or, the Council did not record any verified unauthorised incidents involving significant environmental impacts and was not obliged to issue any abatement notices or infringement notices, or, there were perhaps some items noted on inspection notices for attention but these items were not urgent nor critical, and follow-up inspections showed they have been dealt with, and any inconsequential non compliances with conditions were resolved positively, co-operatively, and quickly.

- **Improvement required (environmental)** or **improvement required (administrative compliance)** (as appropriate) indicates that the Council may have been obliged to record a verified unauthorised incident involving measurable

environmental impacts, and/or, there were measurable environmental effects arising from activities and intervention by Council staff was required and there were matters that required urgent intervention, took some time to resolve, or remained unresolved at the end of the period under review, and/or, there were on-going issues around meeting resource consent conditions even in the absence of environmental effects. Abatement notices may have been issued.

- **Poor performance (environmental)** or **poor performance (administrative compliance)** indicates generally that the Council was obliged to record a verified unauthorised incident involving significant environmental impacts, or there were material failings to comply with resource consent conditions that required significant intervention by the Council even in the absence of environmental effects. Typically there were grounds for either a prosecution or an infringement notice.

1.2 Process description

The Turangi-A wellsite production facilities were commissioned in late 2006 following the successful drilling and testing of the Turangi-1 well. Two further production wells were drilled on the wellsite in 2008. The production facilities currently treat condensate and gas from GPL's northern Taranaki operations, including the Turangi and Kowhai groups of wellsites.

The primary facilities at the Turangi Production Station consist of:

- Wellhead shutdown systems.
- Sand catcher and heating systems.
- Inlet separator and LTS.
- Methanol storage and dosing system.
- A low pressure gas compressor.
- Flare system and flare pit.
- Storage tanks (condensate, methanol, and produced water) and a condensate load-out facility.

Gas is compressed, metered and exported to the national gas network. Condensate storage is located on the wellsite and currently consists of three 60 m^3 above ground tanks and a truck load-out facility. Condensate is trucked to the Omata tank farm on a daily basis. Produced formation water is stored on the site in bunded tanks prior to being pumped down the Turangi-3 well annulus into the Mt Messenger formation for disposal.

All chemical storage is contained within bunds and isolated from the stormwater system. The stormwater drain system consists of open culverts which capture and drain general surface water run-off from the site and some surrounding farmland. Stormwater from the site passes through two lined skimmer pits before discharging to land, near a tributary of the Parahaki Stream. The separate oily water drainage system consists of a buried pipe which gathers oily water from spill containment areas (i.e. curbed foundations and tank bunds) and directs these flows into a triple interceptor pit located near the truck loading bay. Oily water drains from the compressor house are collected in a buried fibreglass tank and are routinely pumped out into the storage tanks.

Photo 1 Turangi Production Station

1.3 Resource consents

1.3.1 Water discharge permit

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

GPL holds water discharge permit **6498-1**, to discharge treated stormwater and treated produced water from hydrocarbon exploration and production operations at the Turangi Production Station onto land, where it may enter into an unnamed tributary of the Parahaki Stream. This permit was issued by the Taranaki Regional Council on 7 December 2004 under Section 87(e) of the RMA. On 17 March 2008 the consent was varied in relation to the method of discharging produced water and it was also transferred from Greymouth Petroleum Acquisition Company Limited to Greymouth Petroleum Limited. On 10 September 2013 further variations were made to allow for an increase in the size of the catchment area and alterations to the stormwater system. It is due to expire on 1 June 2021.

Conditions 1 and 6 relate to the discharge of treated water and the perimeter drain.

Conditions 2 to 5 set out contaminant concentrations that must not be exceeded in the soil layer.

Conditions 7, 8 and 12 require records to be kept, and the provision of management and contingency plans.

Conditions 9 to 11 relate to the best practicable option, catchment area and works notifications.

Conditions 13 to 18 relate to the stormwater system design and bunding of hazardous substance storage areas.

Conditions 19 to 22 specify limits in the discharge, effects on receiving waters and no direct discharge to surface water.

Conditions 23 to 25 relate to site reinstatement, lapse and review.

The permit is attached to this report in Appendix I.

1.3.2 Air discharge pemit

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

GPL holds air discharge permit **6497-1**, to discharge emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Turangi Road wellsite. This permit was issued by the Taranaki Regional Council on 7 December 2004 under Section 87(e) of the RMA. On 10 September 2013 the consent was varied to allow for relocation of the flare pit. It is due to expire on 1 June 2021.

Conditions 1 to 3 specify design and reinstatement requirements.

Conditions 4 to 7 relate to notifications.

Conditions 8 and 9 require consideration of the wind and effective separation, prior to flaring.

Conditions 10 to 12 state that no liquid or solid hydrocarbons shall be flared, and only substances from the well stream will be combusted.

Conditions 13 to 15 relate to the best practicable option and prohibit effects beyond the boundary.

Condition 16 requires vapour recovery on storage vessels.

Condition 17 specifies the maximum opacity of smoke emissions.

Conditions 18 to 20 place limits on contaminant concentrations due to air emissions.

Conditions 21 to 25 specify records to be kept and reporting requirements.

Conditions 26 and 27 are lapse and review provisions.

The permit is attached to this report in Appendix I.

1.4 Monitoring programme

1.4.1 Introduction

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

The Taranaki Regional 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 Turangi Production Station consisted of three primary components.

1.4.2 Programme liaison and management

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

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

1.4.3 Site inspections

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

1.4.4 Chemical sampling

The Taranaki Regional Council undertook sampling of both the discharges from the site and the water quality upstream and downstream of the discharge point and mixing zone.

The Turangi Production Station discharge was sampled on three occasions, and the samples analysed for chlorides, conductivity, hydrocarbons, pH and suspended solids.

The unnamed tributary of the Parahaki Stream was sampled concurrently, and the samples analysed for the same constituents.

The Council also undertook sampling of the ambient air quality outside the boundary of the site. A multi-gas meter was deployed on two occasions 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).

The full air monitoring reports are attached in Appendix II.

2. Results

2.1 Water

2.1.1 Inspections

Seventeen inspections were carried out at the Turangi Production Station and associated wellsites in the 2012-2014 period. The following was found during the inspections:

31 August 2012
The site was neat and tidy. Ring drains, bunds and skimmer pits were clear, with no discharge occurring at time of inspection. Minor flaring was occurring with no noticeable smoke or odours. Everything was satisfactory.

15 October 2012
Both Turangi Production Station and Kowhai-A sites were inspected. There were no discharges occurring from the skimmer pits. Ring drains and bunds at both sites were clear of debris and fit for purpose. There was minimal flaring at Turangi with no off site effects. No flaring was occurring at Kowhai-A. Contingency plans were in place. The sites were neat, tidy and well managed.

20 November 2012
Inspection of Kowhai-A was undertaken. The site was neat and tidy. No flaring was occurring at the time of inspection and no stormwater was discharging from the site. Everything was satisfactory.

30 January 2013
An inspection of Kowhai-A was undertaken after a complaint was received regarding discharges at the site. Jimmy Goble from GPL was on site. Potable cooling water was being sprayed onto the fans of the gas compressor to facilitate cooling. Most of the water was evaporating from the fans but some was flowing into the ring drain where, owing to the hot dry conditions, it was evaporating rather than flowing to the skimmer pits. All consent conditions were being complied with. The ring drains and bunds were clear and there was no discharge from the skimmer pits. No flaring was occurring. The site was neat and tidy.

19 March 2013
Kowhai-A was inspected and a sample was taken of the water discharging to ground as result of the fine spray being used to assist the compressor cooling facility. The water was visually very clean and was not reaching ring drain (results: chloride 14.5 g/m^3, chlorine < 0.1 g/m^3, conductivity 19.8 mS/m @ 20°C, pH 8.0, turbidity 0.15 NTU; indicating compliance with discharge consent conditions). There was no discharge off site. The ring drains, skimmer pits and all bunds were clear and fit for purpose. Everything was satisfactory.

The Turangi Production Station was neat and tidy. Minimal flaring was occurring. The bunds and ring drains were clear. A build up of silt in the skimmer pits was to be removed. Everything was satisfactory.

15 May 2013
The Turangi Production Station was neat and tidy. There was no stormwater discharge off site. The ring drains and bunds were all clear of debris and contaminants. The skimmer pits were clear. Some minor flaring was occurring but this did not give rise to any off site effects. No flaring was occurring at Kowhai-A. Everything was satisfactory at both sites.

12 June 2013
Turangi Production Station was neat and tidy. Minimal flaring was being undertaken with no smoke or off site odours as a result. The skimmer pits were not discharging. Rings drains and bunds were secure, but the Company was asked to ensure that silt cloth barriers in the drains be reinstalled to be more effective.

25 June 2013
Inspection was undertaken of the Turangi sites with Allan Crawford from GPL. The stormwater systems were found to be operating in accordance with AEE information and site plans as submitted to the Council. No skimmer pits were discharging. Shut off valves were fitted to all outlets as required. Minimal flaring was being undertaken at Turangi Production Station. This did not give rise to any objectionable or off site odours. The silt cloth in the ring drains was to be redeployed as previously discussed. All sites were neat and tidy. No problems in regards to environmental performance were evident. Everything was satisfactory.

12 August 2013
The production station was inspected following a weekend of high rainfall. The skimmer pits were not discharging at the time of inspection but suspended solids were elevated and it may have been necessary to pump out the pits prior to any discharge occurring. Recommended silt control measures to reduce suspended solids levels in the pits were still to be implemented. Some flaring was being undertaken at the time of inspection. No odours or smoke were evident. The site was neat and tidy.

12 November 2013
The Turangi Production Station site was neat and tidy. The skimmer pits had been enlarged and lined and a shut off valve fitted. There was no water discharge from the site. Some flaring was occurring with no adverse effects. The reinjection wellsite was clear of all contaminants. Some minor changes to the site layout had been made in preparation for development of adjacent sites. The Kowhai sites were all satisfactory. No flaring or off site discharges were occurring.

9 January 2014
Inspection was undertaken prior to the mobilisation of the work-over rig to the site. All contingency measures were in place. The lined skimmer pit, ring drains and bunds were all secure. The site was inspected with Tony Jurisich and Allan Crawford from GPL. Improvements to the compaction and contour of the surface were underway. The site was neat and tidy.

28 January 2014
Inspection of the production station and associated sites was undertaken with Allan Crawford from GPL. Particular attention was paid to the stormwater systems following recent rain, and also to flaring activities and general operational activities. All sites were being operated in compliance with resource consents issued for this purpose.

Some maintenance issues were to be resolved. They were very minor and did not compromise environmental standards or consent conditions.

Mix, bury, cover sites, where utilised, were all secure and contained within ring drains. Injection wells were found to be operating in accordance with consent conditions. Wellsites and surrounding areas were all neat and tidy, and subject to routine daily monitoring. Everything was satisfactory.

13 February 2014
Annual inspection of associated wellsites and general monitoring of exploration and production activities was undertaken with Allan Crawford from GPL. All stormwater treatment systems were checked, including ring drains, bunds and skimmer pits. All sites were found to have secure stormwater treatment facilities and installations in accordance with information supplied to the Council. Flare pits were sited to minimise off site effects and no flaring had been undertaken for some time. Mix/bury/cover areas were inspected and no adverse effects were noted. This round of inspections was recorded by Allan on an internal report generated for GPL. No problems were encountered. Sites were all neat, tidy and well managed.

1 April 2014
Inspection was carried out at the Turangi Production Station in response to a complaint being received from a member of the public regarding continuous flaring at the wellsite. It was found that the production station was undergoing an extension. The extension involved the temporary construction of a flare pit followed by the construction of a new permanent flare pit on site.

At time of inspection, flaring was continuing at the site. A low volume flare was observed within the flare pit. As a result of the flare, some dark smoke was being emitted from the pit. This was dissipating quickly and minimal effect was observed 100 metres from the point of flaring. The flare pit was clean. However, the tip of the pipe at which the flare originated was worn and damaged.

Lara Walker from GPL was spoken with regarding the complaint and a subsequent investigation was undertaken by GPL in an attempt to further minimise the emission of smoke from the flare. As a result of consultation, engineers tweaked the system in an effort to reduce smoke emissions from the flare. Further efforts to reduce emissions were planned to be held over the coming days with a possible option being the temporary installation of a flare stack on site in which some of the flaring may take place.

It was also anticipated that the development of the temporary flare pit, followed shortly after by the construction of the new permanent facility would help to further reduce the emission of smoke, largely via improved combustion at the point of flaring. It was expected that flaring would be reduced at the site once the expansion project was fully commissioned and in operation.

29 April 2014
All sites were inspected with a GPL representative. No areas of concern were raised.

2 May 2014

Inspection was carried out at Turangi Production Station regarding the completion of the new temporary flare pit. It was found that the temporary flare pit had been constructed and lined as per resource consent requirements. Stormwater was found to have collected within the base of the unused flare pit. This water may have required removal prior to flaring. The Company was asked to ensure that if the water is drained on site then it must be directed for treatment through the skimmer pit treatment system prior to discharge from site.

Inspection of the pit found that the earth which covers the lining of the pit to protect it from the heat generated as a result of flaring had slumped off the side of the pit walls into the base of the pit. As a result this had exposed a significant area of lining. The Company was instructed to ensure that the lining was re-covered prior to the commencement of any flaring within the pit.

Flaring was being undertaken on site via both the original flare pit and an associated thermal oxidizer. No dark smoke was observed being emitted from either point of flaring at the time of inspection.

An inspection of the ring drain along the north side of the site found that the drain was minimally defined and barely sufficient to collect, contain and direct stormwater on site. A high risk area existed where this potion of ring drain had been piped near the condensate tanks. This meant that any spill on site would flow directly over the ring drain and would rely on the contour of the adjacent truck access pathway to ensure that such spills or stormwater were directed back towards the ring drain system.

The Company was instructed to continue to monitor this drain and carry out regular maintenance on it to ensure that it was working efficiently. It was recommended that following completion of construction activities on site, it would be prudent to undertake a full detailed inspection and upgrade of the ring drain system.

20 June 2014

Site inspection of the Turangi Production Station was undertaken after recent heavy rainfall. It was not raining at the time, however. The ring drains and fitted silt traps were sound and the contents of the skimmer pits were clear. There was no discharge occurring and no effects from any previous discharge were noted. The new temporary flare pit was operating and was well shielded by containers. No smoke or odours were noted beyond the boundaries. The site was neat and tidy.

A significant extension to the site was being undertaken. Large stormwater sumps had been installed and extensive areas were to be paved or re-vegetated upon completion to prevent silt run off. Everything was satisfactory.

2.1.2 Results of discharge monitoring

Chemical water quality sampling of the discharge from the Turangi Production Station was undertaken on three occasions during the 2012-2014 period. The samples were collected on 18 June 2013, 11 June 2014 and 30 June 2014. Table 1 presents the results. The location of the sampling site (IND002035) is shown in Figure 1.

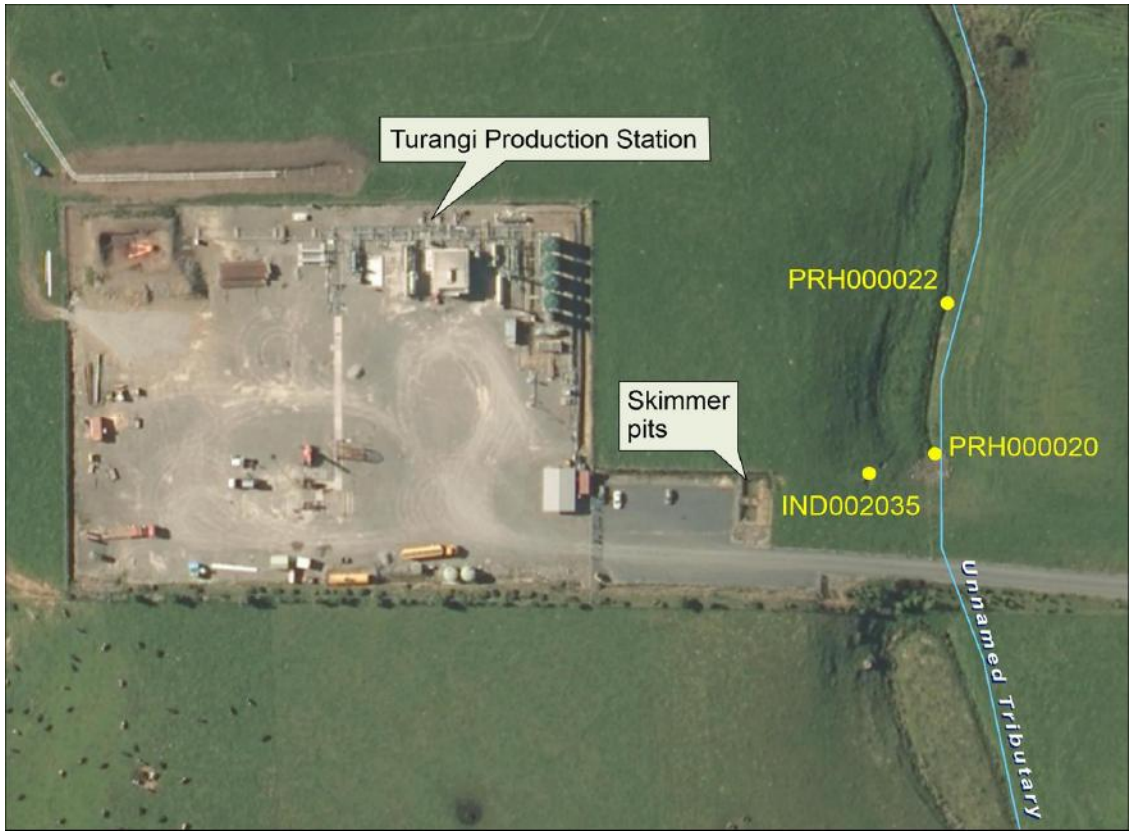

Figure 1 Turangi Production Station and associated sampling sites

Table 1 Results for discharge monitoring from the Turangi Production Station (site IND002035)

Parameter	Units	18 June 2013	11 June 2014	30 June 2014	Consent limits
Chloride	g/m^3	4.9	4.6	8.0	50
Conductivity	mS/m @ 20°C	2.4	3.6	5.6	-
Hydrocarbons	g/m^3	< 0.5	< 0.5	< 0.5	15
Suspended solids	g/m^3	**200**	48	57	100
Temperature	Deg. C	13.3	12.0	11.2	-
pH		7.1	7.0	7.4	6.5 – 8.5

All results were in compliance with the applicable conditions of consent 6498-1, except for the suspended solids in the 18 June 2013 sample. However, this did not give rise to any apparent adverse effects at the point of discharge or within the waters of the adjacent unnamed tributary of the Parahaki Stream.

2.1.3 Results of receiving environment monitoring

Chemical water quality sampling of the receiving environment was undertaken in conjunction with discharge monitoring on 18 June 2013, 11 June 2014 and 30 June 2014. The results are presented in Table 2 and the sampling sites are shown in Figure 1 above.

Table 2 Results of receiving environment monitoring in relation to the Turangi Production Station

Date	Parameter	Chloride	Conductivity	Hydrocarbons	Suspended solids	Temperature	pH
	Unit	g/m³	mS/m @ 20oC	g/m³	g/m³	Deg. C	
18 June 2013	Upstream site **PRH000020**	24.4	15.5	< 0.5	3	15.0	6.7
	Downstream site **PRH000022**	23.5	15.5	< 0.5	6	15.0	6.7
11 June 2014	Upstream site **PRH000020**	22.6	15.4	< 0.5	8	14.4	6.6
	Downstream site **PRH000022**	21.9	15.3	< 0.5	-	14.4	6.6
30 June 2014	Upstream site **PRH000020**	23.6	13.8	< 0.5	16	14.0	6.8
	Downstream site **PRH000022**	23.0	13.6	< 0.5	-	14.0	6.7

The results indicate that the discharge was not affecting the water quality of the tributary of the Parahaki Stream and was in compliance with all applicable consent conditions for receiving waters at the times of sampling.

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. Minor issues regarding air quality and the site expansion works were noted and addressed by GPL during the monitoring period.

2.2.2 Results of receiving environment monitoring

During the monitoring period, a multi-gas meter was deployed on two occasions in the vicinity of the plant, on 25 July 2012 and 16 May 2014.

25 July 2012

The deployment lasted approximately seventy-two hours, with the instrument placed in a downwind position at the start of the deployment. Monitoring consisted of continual measurements of gas concentrations for the gases of interest (carbon monoxide and combustible gases).

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

The consent covering air discharges from the Turangi Production Station has specific limits related to particular gases. Special condition 18 of consent 6497 sets a limit on the

carbon monoxide concentration at or beyond the production station's boundary. The limit is expressed as 10 mg/m^3 for an eight hour average or 30 mg/m^3 for a 1 hour average exposure. The maximum concentration of carbon monoxide found during the monitoring run was 2.3 ppm or 1.9 mg/m^3 and the average concentration was only 0.09 mg/m^3 which complies with the consent condition.

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

16 May 2014
The deployment lasted approximately seventy-two hours, with the instrument placed in a downwind position at the start of the deployment. Monitoring consisted of continual measurements of gas concentrations for the gases of interest (carbon monoxide and combustible gases).

The maximum concentration of carbon monoxide found during the monitoring run was 8.1 ppm or 6.9 mg/m^3 and the average concentration was only 0.26 mg/m^3 which complies with the consent conditions. At no time did the level of explosive gases downwind of the site reach any more than a trivial level. This continues the pattern found in previous years.

2.3 Investigations, interventions, and incidents

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

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

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

In the 2012-2014 period, the Council responded to two complaints from members of the public in association with activities at the Turangi Production Station (1 April 2014) and the Kowhai-A wellsite (30 January 2013). The investigations found that the discharges were in compliance with all applicable conditions in resource consents and provisions in Regional Plans, as detailed in section 2.1.1 above.

3. Discussion

3.1 Discussion of site performance

Monitoring the Turangi Production Station during the 2012-2014 period found that the site was well managed. All consent conditions relating to site operations and management were complied with. Any issues identified during inspections were quickly resolved.

3.2 Environmental effects of exercise of consents

Monitoring of the skimmer pit discharge from the site found that, with the exception of suspended solids in one sample, the limits specified in the consent were complied with. This exceedance did not give rise to any apparent adverse effects at the point of discharge or within the waters of the adjacent unnamed tributary of the Parahaki Stream.

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

3.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the period under review is set out in Tables 3-4.

Table 3 Summary of performance for Consent 6497-1 to discharge emissions to air

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Flare pit to be lined	Inspections	Yes
2. Flaring shall occur at the designated location	Inspections	Yes
3. Temporary flare pit to be removed upon completion of the new flare pit	Completion pending	N/A
4. Notification to Council one month prior to production operations	Production operations commenced early 2006	N/A
5. Notification to neighbours 24 hrs prior to flaring & record of complaints	Inspections and liaison with consent holder	Yes
6. Notification to Council 24 hrs prior to flaring	Notifications received	Yes
7. No alterations without approval	Inspections and liaison with consent holder	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
8. Take into account wind speed & direction when flaring	Inspections and Company records	Yes
9. Effective separation to minimise smoke	Inspections	Yes
10. Notification to Council of ineffective separation	Notifications received, inspections and liaison with consent holder	Yes
11. No liquid or solid hydrocarbons flared	Inspections and liaison with consent holder	Yes
12. Only substances from well stream to be flared	Inspections and Company records	Yes
13. Adoption of the best practicable option	Inspections and liaison with consent holder	Yes
14. No hazardous/toxic/noxious contaminants beyond boundary	Inspections and air monitoring	Yes
15. No offensive odour or smoke beyond boundary	Inspections	Yes
16. Hydrocarbon storage vessels to have vapour recovery systems	Inspections	Yes
17. Specified opacity for smoke emissions	Not assessed	N/A
18. Control of carbon monoxide emissions	Air monitoring	Yes
19. Control of nitrogen oxide emissions	Not measured, sampling undertaken in previous years	N/A
20. Control of emissions to achieve specified contaminant concentrations	Not assessed	N/A
21. Keep & maintain record of smoke emitting incidents	Inspection and annual flaring report	Yes
22. Keep & maintain flaring log	Inspection and annual flaring report	Yes
23. Monthly flaring information supplied	Information received	Yes
24. Provision of annual flaring & air emissions report during May	Latest report received 12 May 2014	Yes
25. Analysis of typical gas and crude oil stream	Analysis not requested	N/A
26. Lapse provision	Consent exercised	N/A
27. Optional review provision	Next option for review in June 2015	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 4 Summary of performance for Consent 6498-1 to discharge treated stormwater and treated produced water

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. No observable hydrocarbon run-off to perimeter drain	Inspection	Yes
2. Soil conductivity limits	Not assessed	N/A
3. Soil sodium absorption ratio limits	Not assessed	N/A
4. Concentrations in soil not to be exceed prior to expiry/cancellation/ surrender	Consent still current	N/A
5. Hydrocarbons in soil to comply with MfE guidelines	Not assessed	N/A
6. Treated produced water discharged to land shall be within perimeter drain	All produced water re-injected	Yes
7. Records to be kept and forwarded to Council quarterly	Inspection and company records	Yes
8. Approved management plan	Received and approved	Yes
9. Adoption of the best practicable option	Inspection and liaison with consent holder	Yes
10. Maximum stormwater catchment area	Inspection and company records	Yes
11. Notification to Council 7 days prior to site works and well drilling	Notifications received	Yes
12. Approved contingency plan	Latest update received 14 Aug 2013	Yes
13. All stormwater & produced water discharged through treatment system	Inspection	Yes
14. Consent exercised in accordance with application documentation	Inspection and liaison with consent holder	Yes
15. Design of skimmer pits to meet minimum size and hydrocarbon capture requirements	Inspections and sampling	Yes
16. Stormwater retention areas to be lined	Inspections	Yes
17. Stormwater system to be installed prior to any site works	Inspections	Yes
18. Bunding and drainage of hazardous substances	Inspections	Yes
19. Concentrations not to be exceeded in the discharge	Sampling	No. One exceedance of suspended solids limit during period.
20. Temperature increase of not more than 2 degrees Celsius in receiving waters	Sampling	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
21. No effects upon surface water bodies	Inspections	Yes
22. No direct discharge to surface water	Inspections	Yes
23. 48 hrs notice prior to reinstatement	Site still active	N/A
24. Lapse provision	Consent exercised	N/A
25. Optional review provision	Next option for review in June 2015	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**Good**

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

3.4 Recommendation from the 2011-2012 Annual Report

In the 2011-2012 Annual Report, it was recommended:

1. THAT the monitoring programme for resource consents associated with Greymouth's production facilities at the Turangi-A wellsite in the 2012-2013 year continue at the same level as in 2011-2012.

This recommendation was implemented.

3.5 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for air/water discharges in the region, the Taranaki Regional Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA the obligations of the Act in terms of monitoring emissions/discharges and effects, and subsequently reporting to the regional community. The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki emitting to the atmosphere/discharging to the environment.

It is proposed that for 2014-2015 the monitoring programme is amended to account for changes at the expanded Turangi Production Station site by altering the location of the stormwater discharge sampling points. A recommendation to this effect is attached to this report.

3.6 Exercise of optional review of consent

Resource consents 6497-1 and 6498-1 provide for optional review in June 2015. Conditions 27 and 25, respectively, allow the Council to review the consents for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of these resource consents, which were

either not foreseen at the time the applications were considered or which it was not appropriate to deal with at the time.

Based on the results of monitoring in the period 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 for either of these consents.

A recommendation to this effect is presented in Section 4 of this report.

4. Recommendations

1. THAT monitoring of consented activities at the Turangi Production Station in the 2014-2015 year be amended from that undertaken in 2012-2014 to account for changes at the expanded site by altering the location of the stormwater discharge sampling points.

2. THAT the option for review of resource consents in June 2015, as set out in conditions 27 and 25 of consents 6497-1 and 6498-1, respectively, not be exercised on the grounds that the current conditions are considered adequate to deal with any adverse effects on the environment arising from the exercise of these resource consents.

Glossary of common terms and abbreviations

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

Al*	Aluminium.
As*	Arsenic.
Biomonitoring	Assessing the health of the environment using aquatic organisms.
BOD	Biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate.
BODF	Biochemical oxygen demand of a filtered sample.
Bund	A wall around a tank to contain its contents in the case of a leak.
CBOD	Carbonaceous biochemical oxygen demand. A measure of the presence of degradable organic matter, excluding the biological conversion of ammonia to nitrate.
cfu	Colony forming units. A measure of the concentration of bacteria usually expressed as per 100 millilitre sample.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Condy	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
Cu*	copper.
Cumec	A volumetric measure of flow- 1 cubic metre per second (1 m^3s^{-1}).
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
E.coli	Escherichia coli, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre of sample.
F	Fluoride.
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
g/m^3	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.

l/s	Litres per second.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NH_4	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH_3	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
NO_3	Nitrate, normally expressed in terms of the mass of nitrogen (N.)
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
Pb*	Lead.
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
PM_{10}	Relatively fine airborne particles (less than 10 micrometre diameter).
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	*Resource Management Act* 1991 and including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
UI	Unauthorised Incident.
UIR	Unauthorised Incident Register – contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
Zn*	Zinc.

*an abbreviation for a metal or other analyte may be followed by the letters 'As', to denote the amount of metal recoverable in acidic conditions. This is taken as indicating the total amount of metal that might be solubilised under extreme environmental conditions. The abbreviation may alternatively be followed by the letter 'D', denoting the amount of the metal present in dissolved form rather than in particulate or solid form. For further information on analytical methods, contact the Council's laboratory.

Bibliography and references

Taranaki Regional Council (2013): Greymouth Petroleum Turangi-A Wellsite Monitoring Programme Annual Report 2011-2012. Technical Report 2012-73.

Taranaki Regional Council (2011): Greymouth Petroleum Turangi-A Wellsite Monitoring Programme Annual Report 2010-2011. Technical Report 2011-20.

Taranaki Regional Council (2010): Greymouth Petroleum Turangi-A Wellsite Monitoring Programme Annual Report 2009-2010. Technical Report 2010-47.

Taranaki Regional Council (2009): Greymouth Petroleum Turangi-A Wellsite Monitoring Programme Annual Report 2008-2009. Technical Report 2009-37.

Taranaki Regional Council (2008): Greymouth Petroleum Turangi-A Wellsite Monitoring Programme Annual Report 2007-2008. Technical Report 2008-91.

Appendix I

Resource consents held by Greymouth Petroleum Limited

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):	10 September 2013
Commencement Date (Change):	10 September 2013 (Granted: 7 December 2004)

Conditions of Consent

Consent Granted:	To discharge emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Turangi Road wellsite
Expiry Date:	1 June 2021
Review Date(s):	June 2015
Site Location:	Turangi Production Station, Turangi Road, Motunui (Property owner: BA & JM McKenzie)
Legal Description:	Sec 21 Blk VI Waitara SD (Discharge source & site)
Grid Reference (NZTM)	1713792E-5681411N (temporary flare pit) 1713756E-5681440N

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

Information and notification

1. Flaring shall only occur over a pit, or similar containment area, lined with impermeable material that prevents any liquid from leaking through its base or sidewalls and discharging to land.

2. Flaring shall only occur within 20 metres of the location defined by NZTM:

- 1713792E-5681411N (temporary flare pit); and
- 1713756E-5681440N.

3. The temporary flare pit shall be removed and site reinstated following the completion of the permanent flare pit.

4. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least one month prior to the establishment of production operations at the Turangi Road wellsite.

5. At least 24 hours prior to any flaring, other than in emergencies, the consent holder shall undertake all practicable measures to notify residents within 1000 metres of the site of the commencement of flaring. The consent holder shall include in the notification a 24-hour contact telephone number for a representative of the consent holder, and shall keep and make available to the Chief Executive, Taranaki Regional Council, a record of all queries and/or complaints received.

6. The consent holder shall, whenever practicable, notify the Chief Executive, Taranaki Regional Council, whenever the continuous flaring of hydrocarbons (other than purge gas) is expected to occur for more than five minutes in duration. Notification shall, as far as practicable, be no less than 24 hours prior to such flaring being commenced.

7. No alteration shall be made to plant equipment or processes which may substantially alter the nature or quantity of flare emissions or other site emissions, including but not limited to the recovery of produced gas, other than as notified in this consent application, without prior consultation with the Chief Executive, Taranaki Regional Council, and the consent holder shall obtain any necessary approvals under the Resource Management Act 1991.

Emissions from the site

8. Other than for the maintenance of a pilot flare flame, the consent holder shall have regard to the prevailing and predicted wind speed and direction at the time of initiation of any episode of flaring or other combustion of hydrocarbons.

9. All gas being flared, at any time must first be treated by effective liquid and solid separation and recovery, as far as is practicable, to ensure that smoke emission during flaring is minimised.

10. If separation cannot be implemented and/or maintained at any time while there is a flow from the well, whether natural or induced, then the consent holder shall notify the Chief Executive, Taranaki Regional Council, and shall in any case re-establish liquid and solid separation and recovery within three hours.

11. Subject to special conditions 9 and 10, no liquid or solid hydrocarbons shall be combusted through the gas flare system other than in an emergency.

12. Only substances originating from the well stream and treated as outlined by conditions 9, 10, 11 & 13 are to be combusted within the flare pit.

13. The consent holder shall adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or potential effect on the environment arising from any emission to air from the flare or any other emissions to air from the Turangi Road wellsite. Any adoption of the best practicable option as outlined in this special condition shall be to the satisfaction of the Chief Executive, Taranaki Regional Council.

14. The consent holder shall not discharge any contaminant to air authorised by this consent at a rate or a quantity such that the contaminant, whether alone or in combination with other contaminants, is or is liable to be hazardous or toxic or noxious at or beyond the boundary of the wellsite, or beyond 100 metres of the flare, whichever distance is greater.

15. There shall not be any offensive odour or smoke, as determined by an enforcement officer of the Taranaki Regional Council, beyond the boundary of the wellsite or beyond 100 metres of the flare, whichever distance is greater, arising from the exercise of this consent.

16. All hydrocarbon storage vessels shall be fitted with vapour recovery systems.

17. The opacity of any smoke emissions shall not exceed a level of 1 as measured on the Ringelmann Scale for more than four minutes cumulative duration in any 60-minute period.

18. The consent holder shall control all emissions of carbon monoxide to the atmosphere from the flare, whether alone or in conjunction with any other emissions from the wellsite, in order that the maximum ground level concentration of carbon monoxide arising from the exercise of this consent measured under ambient conditions does not exceed 10 mg/m^3 (eight-hour average exposure), or 30 mg/m^3 one-hour average exposure) at or beyond the boundary of the wellsite or beyond 100 metres from the flare, whichever distance is greater.

19. The consent holder shall control all emissions of nitrogen oxides to the atmosphere from the flare, whether alone or in conjunction with any other emissions from the wellsite, in order that the maximum ground level concentration of nitrogen dioxide arising from the exercise of this consent measured under ambient conditions does not exceed 100 micrograms per cubic metre (24-hour average exposure), or 200 micrograms per cubic metre (1-hour average exposure) at or beyond the boundary of the wellsite, or beyond 100 metres from the flare, whichever distance is greater.

20. The consent holder shall control emissions to the atmosphere from the wellsite and flare of contaminants other than carbon dioxide, carbon monoxide, and nitrogen oxides, whether alone or in conjunction with any emissions from the flare, in order that the maximum ground level concentration for any particular contaminant arising from the exercise of this consent measured at or beyond the boundary of the wellsite or beyond 100 metres from the flare, whichever distance is greater, is not increased above background levels:

    a) by more than 1/30th of the relevant Occupational Threshold Value-Time Weighted Average, or by more than the Short Term Exposure Limit at any time (all terms as defined in Workplace Exposure Standards, 2002, Department of Labour); or

    b) if no Short Term Exposure Limit is set, by more than three times the Time Weighted Average at any time (all terms as defined in Workplace Exposure Standards, 2002, Department of Labour).

Recording and reporting information

21. 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.

22. The consent holder shall keep and maintain a log of all continuous flaring incidents longer than five minutes, and any intermittent flaring lasting for an aggregate of ten minutes or longer in any 120-minute period. Such a log shall contain the date, the start and finish times, the quantity and type of material flared, and the reason for flaring. This log shall be made available to the Chief Executive, Taranaki Regional Council, upon request, and summarised annually in the report required under condition 20.

23. 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.

24. The consent holder shall provide to the Taranaki Regional Council during May of each year, for the duration of this consent, a report:

    i) detailing any energy efficiency measures implemented on the site;
    ii) detailing smoke emissions as required under condition 21;
    iii) detailing any measures to reduce smoke emissions;
    iv) detailing any measures to reduce flaring;
    v) addressing any other issue relevant to the minimisation or mitigation of emissions from the flare;
    vi) detailing any complaints received and any measures undertaken to address complaints; and
    vii) reviewing all options and technological advances relevant to the reduction or mitigation of any discharge to air from the site, how these might be applicable and/or implemented at the site, and the benefits and costs of these advances.

25. The consent holder shall make available to the Chief Executive, Taranaki Regional Council, upon request, an analysis of a typical gas and crude oil stream from the field, covering sulphur compound content and the content of carbon compounds of structure C_6 or higher number of compounds.

Lapse and Review

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

27. 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 2009 and/or June 2015, 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 September 2013

For and on behalf of
Taranaki Regional Council

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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):	10 September 2013
Commencement Date (Change):	10 September 2013 (Granted: 7 December 2004)

Conditions of Consent

Consent Granted:	To discharge treated stormwater and treated produced water from hydrocarbon exploration and production operations at the Turangi Production Station onto land, where it may enter into an unnamed tributary of the Parahaki Stream
Expiry Date:	1 June 2021
Review Date(s):	June 2015
Site Location:	Turangi Production Station, Turangi Road, Motunui (Property owner: BA & JM McKenzie)
Legal Description:	Sec 21 Blk VI Waitara SD (Discharge source & site)
Grid Reference (NZTM)	1713982E-5681378N
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 consent holder shall ensure that the discharge of treated produced water to land does not result in an observable Hydrocarbon run-off into the perimeter drain.

2. The conductivity of the soil layer containing the discharge shall be maintained at less than 400 mSm^{-1}, or alternatively, if the background soil conductivity exceeds 400 mSm^{-1}, the application of waste shall not increase the soil conductivity by more than 100 mSm^{-1} over the background concentrations established prior to the exercise of this consent.

3. The sodium absorption ratio (SAR) of the soil layer containing the discharge shall be maintained at less than 18.0, or alternatively if the background soil SAR exceeds 18.0, the application of waste shall not increase the SAR by more than 1.0 over the background concentrations established prior to the exercise of this consent.

4. Prior to the expiry, cancellation, or surrender of this consent soil parameters shall not exceed the following limits: conductivity, 290 mSm^{-1}; total dissolved salts, 2500 gm^{-3}; sodium, 460 gm^{-3}; and chloride, 700 gm^{-3}.

5. At all times the levels of hydrocarbons in the soil within the discharge area shall comply with the guideline values for sandy soil type in the surface layer set out in Tables 4.12 and 4.15 of the Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (Ministry for the Environment, 1999), appended to this consent.

6. Any discharge of treated produced water directly to land shall occur within the area enclosed by the perimeter drain

7. The consent holder shall keep records of the following:

   a) The results of analysis of a monthly representative sample of the composition of the treated produced water, which is being or will be discharged on the site (including pH level, electro-conductivity, Salinity, and concentration of total hydrocarbons)
   b) volumes of treated produced water discharged directly to land
   c) dates and times of commencement and completion of discharge events
   d) sampling, analysis and results of monitoring undertaken by the consent holder

   and shall forward these records to the Chief Executive, Taranaki Regional Council, on a quarterly basis, or as requested by the Council.

8. Prior to the exercise of this consent, the consent holder shall provide, to the written satisfaction of the Chief Executive, Taranaki Regional Council, a management plan to confirm that the activity will be conducted to comply with all of the conditions of this consent. The management plan shall be reviewed annually and shall include as a minimum:

   a. sampling regime
   b. a representative analysis of the quality of soil within the proposed discharge area;
   c. procedures for notification to Council of disposal activities;
   d. contingency procedures;
   e. site reinstatement and monitoring; and
   f. control of site access.

9. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects of the discharge on the environment.

10. The maximum stormwater catchment area shall be no more than 1.8 hectares.

11. The Chief Executive, Taranaki Regional Council, shall be advised in writing at least 7 days prior to any site works commencing, and again in writing at least 7 days prior to any well drilling operation commencing.

12. Prior to the exercise of this consent, the consent holder shall provide for the written approval of the Chief Executive, Taranaki Regional Council, site specific details relating to contingency planning for the wellsite.

13. 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.

14. Subject the other conditions of this consent the design, management and maintenance of the stormwater system shall be undertaken in accordance with the information submitted in support of the consent application 7570, and in particular:

    - Drawing 12364-02, Sheet 1, prepared by BTW Company Limited and dated June 2013;
    - Drawing 12364-02, Sheet 5, prepared by BTW Company Limited and dated June 2013; and
    - Stormwater design report for Turangi Production Station, prepared by BTW Company Limited, referenced 12364-8/2013 and dated 14 August 2013.

15. Skimmer pits shall have a combined capacity of no less than 340 m^3, and be designed to retain any hydrocarbons that enter them.

16. 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.

17. Perimeter drains and skimmer pits necessary to comply with the conditions of this consent shall be installed before any site works commences. Site works includes the introduction of a drilling rig, drilling equipment or any other associated equipment or facilities to the site for any purpose other than for the construction of the site.

18. Any above ground hazardous substances storage areas shall be bunded with drainage to sumps, or other appropriate recovery systems, and not to the stormwater catchment.

19. The following concentrations shall not be exceeded in the discharge from the perimeter drain through the interceptor pit:

Component	**Concentration**
pH (range)	6.5 - 8.5
suspended solids	100 gm^{-3}
total recoverable hydrocarbons (infrared spectroscopic technique)	15 gm^{-3}
chloride	50 gm^{-3}

    This condition shall apply prior to the entry of the treated stormwater and produced water either onto and into land, or into surface water, at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

20. After allowing for reasonable mixing, within a mixing zone extending seven times the width of the water body downstream of a designated discharge point, the discharge shall not give rise to an increase in temperature of more than 2 degrees Celsius.

21. After allowing for reasonable mixing, within a mixing zone extending seven times the width of the water body downstream of a designated discharge point, the discharge shall not give rise to any of the following effects in the receiving waters:

    a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
    b) any conspicuous change in the colour or visual clarity;
    c) any emission of objectionable odour;
    d) the rendering of fresh water unsuitable for consumption by farm animals;
    e) any significant adverse effects on aquatic life.

22. The discharge onto and into land shall occur a minimum of 20 metres from any surface water body. Discharge shall be onto and into land and there shall be no direct discharge to surface water.

23. The Chief Executive, Taranaki Regional Council, shall be advised in writing at least 48 hours prior to the reinstatement of the site and the reinstatement shall be carried out so as to minimise effects on stormwater quality.

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

25. 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 2009 and/or June 2015, 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 September 2013

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Appendix 1

Tables 4.12 and 4.15 of the Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand [Ministry for the Environment, 1999].

Table 4.12 Tier 1 soil acceptance criteria *Agricultural use* [1,3,6] ALL PATHWAYS (all values mg/kg)

Soil Type/ Contaminant	Depth of contamination		
	Surface (<1m)	1m - 4m	> 4m
SAND			
MAHs			
Benzene	1.1 [v]	1.9 [7,v]	2.4 [7,v]
Toluene	(68) [4,v]	(94) [4,m]	(230) [4,v]
Ethylbenzene	(53) [4,v]	(92) [4,7,v]	(120) [4,v]
Xylenes	(48) [4,v]	(130) [4,7,v]	(180) [4,v]
PAHs			
Naphthalene	7.2 [p]	70 [v]	80 [v]
Non-carc. (Pyrene)	(160) [4,p]	NA [2]	NA [2]
Benzo(a)pyrene eq. [5]	0.027 [p]	(25) [4,m]	NA [2]
SANDY SILT			
MAHs			
Benzene	1.1 [v]	1.9 [v]	2.4 [v]
Toluene	(82) [4,v]	(170) [4,v]	(240) [4,v]
Ethylbenzene	(59) [4,v]	(92) [4,v]	(140) [4,v]
Xylenes	(59) [4,v]	(130) [4,v]	(180) [4,v]
PAHs			
Naphthalene	7.2 [p]	83 [v]	(130) [4,v]
Non-carc. (Pyrene)	(160) [4,p]	NA [2]	NA [2]
Benzo(a)pyrene eq. [5]	0.027 [p]	(25) [4,m]	NA [2]
SILTY CLAY			
MAHs			
Benzene	1.7 [v]	4.6 [v]	12 [v]
Toluene	(210) [4,v]	(950) [4,v]	(3,000) [4,v]
Ethylbenzene	(110) [4,v]	(800) [4,v]	(2,800) [4,v]
Xylenes	(160) [4,v]	(710) [4,v]	(2,200) [4,v]
PAHs			
Naphthalene	7.2 [p]	(330) [4,v]	(1,100) [4,v]
Non-carc. (Pyrene)	(160) [4,p]	NA [2]	NA [2]
Benzo(a)pyrene eq. [5]	0.027 [p]	(25) [4,m]	NA [2]

NOTES:

1. Based on protection of human health. Refer to Table 4.20 for protection of groundwater. Site-specific consideration of aesthetic and ecological impacts is required.
2. NA indicates contaminant not limiting as estimated health-based criterion is significantly higher than that likely to be encountered on site.
3. Surface soil acceptance criteria are based on the lower value of volatilisation criteria (Table 4.16), other pathway criteria (Table 4.18) and criteria for the protection of maintenance workers (Table 4.19). Criteria for soils at 1 m are based on the lower value of those arising from volatilisation and maintenance criteria. Criteria for soils at 4 m are based on volatilisation only.
4. Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons. For further explanation refer to Appendix 4M.
5. Risk associated with mixture of carcinogenic PAHs assessed by comparison with criteria based on benzo(a)pyrene equivalent concentration. Refer to Section 4.4.3 for details of the calculation of Benzo(a)pyrene equivalent concentrations.
6. The following notes indicate the limiting pathway for each criterion: v - Volatilisation, s - Soil Ingestion, d - Dermal, p - Produce, m - Maintenance/Excavation
7. Due to the nature of boundary conditions in volatilisation model, calculated criteria for sandy soils are higher than that for silt soil type. Therefore, the criteria for sand are set equal to the criteria for silt. Refer Appendix 4D for details.

Table 4.12 (CONTINUED)
Tier 1 soil acceptance criteria *Agricultural use* [1,3,6] ALL PATHWAYS
(all values mg/kg)

Soil Type/ Contaminant	Depth of contamination		
	Surface (<1m)	1m - 4m	> 4m
CLAY			
MAHs			
Benzene	2.7 [v]	8.8 [v]	(26) [4,v]
Toluene	(320) [4,v]	(2,400) [4,v]	(8,500) [4,v]
Ethylbenzene	(160) [4,v]	NA [2]	NA [2]
Xylenes	(250) [4,v]	(1,800) [4,v]	(6,500) [4,v]
PAHs			
Naphthalene	7.2 [p]	(360) [4,v]	(1,200) [4,v]
Non-carc. (Pyrene)	(160) [4,p]	NA [2]	NA [2]
Benzo(a)pyrene eq. [5]	0.027 [p]	(25) [4,m]	NA [2]
PUMICE			
MAHs			
Benzene	1.2 [v]	2.4 [v]	3.1 [v]
Toluene	(73) [4,v]	(240) [4,v]	(350) [4,v]
Ethylbenzene	(48) [4,v]	(140) [4,v]	(220) [4,v]
Xylenes	(53) [4,v]	(180) [4,v]	(260) [4,v]
PAHs			
Naphthalene	7.2 [p]	140 [v]	(220) [4,v]
Non-carc. (Pyrene)	(160) [4,p]	NA [2]	NA [2]
Benzo(a)pyrene eq. [5]	0.027 [p]	(25) [4,m]	NA [2]
PEATS AND HIGHLY ORGANIC SOILS			
MAHs			
Benzene	5.7 [v]	10 [v]	13 [v]
Toluene	(2,500) [4,v]	(2,900) [4,v]	(3,800) [4,v]
Ethylbenzene	(2,200) [4,v]	(2,500) [4,v]	(3,200) [4,v]
Xylenes	(1,700) [4,v]	(2,000) [4,v]	(2,600) [4,v]
PAHs			
Naphthalene	7.2 [p]	(2,700) [4,v]	(3,500) [4,v]
Non-carc. (Pyrene)	(160) [4,p]	NA [2]	NA [2]
Benzo(a)pyrene eq. [5]	0.027 [p]	(25) [4,m]	NA [2]

NOTES:

1. Based on protection of human health. Refer to Table 4.20 for protection of groundwater. Site-specific consideration of aesthetic and ecological impacts is required.
2. NA indicates contaminant not limiting as estimated health-based criterion is significantly higher than that likely to be encountered on site.
3. Surface soil acceptance criteria are based on the lower value of volatilisation criteria (Table 4.16), other pathway criteria (Table 4.18) and criteria for the protection of maintenance workers (Table 4.19). Criteria for soils at 1 m are based on the lower value of those arising from volatilisation and maintenance criteria. Criteria for soils at 4 m are based on volatilisation only.
4. Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons. For further explanation refer to Appendix 4M.
5. Risk associated with mixture of carcinogenic PAHs assessed by comparison with criteria based on benzo(a)pyrene equivalent concentration. Refer to Section 4.4.3 for details of the calculation of Benzo(a)pyrene equivalent concentrations.
6. The following notes indicate the limiting pathway for each criterion: v - Volatilisation, s - Soil Ingestion, d - Dermal, p - Produce, m - Maintenance/Excavation

Table 4.15 Tier 1 soil acceptance criteria for TPH[1,3,5,6] *Agricultural use* ALL PATHWAYS
(all values in mg/kg)

Soil Type/ Contaminant	Depth of contamination		
	Surface (<1m)	1m - 4m	> 4m
SAND			
C_7-C_9 [4]	120 [m]	120 [m]	(3,800) [7,8,v]
C_{10}-C_{14}	58 [x]	(560) [7,x]	(650) [7,x]
C_{15}-C_{36}	(4,000) [7,x]	NA [2]	NA [2]
SANDY SILT			
C_7-C_9 [4]	(500) [7,m]	(500) [7,m]	(3,800) [7,v]
C_{10}-C_{14}	58 [x]	(670) [7,x]	(4,900) [7,v]
C_{15}-C_{36}	(4,000) [7,x]	NA [2]	NA [2]
SILTY CLAY			
C_7-C_9 [4]	(2,700) [7,v]	(7,300) [7,v]	(19,000) [7,v]
C_{10}-C_{14}	58 [x]	(2,700) [7,x]	(8,900) [7,x]
C_{15}-C_{36}	(4,000) [7,x]	NA [2]	NA [2]
CLAY			
C_7-C_9 [4]	(15,000) [7,v]	NA [2]	NA [2]
C_{10}-C_{14}	58 [x]	(2,900) [7,x]	(9,700) [7,x]
C_{15}-C_{36}	(4,000) [7,x]	NA [2]	NA [2]
PUMICE			
C_7-C_9 [4]	(810) [7,m]	(810) [7,m]	(4,800) [7,v]
C_{10}-C_{14}	58 [x]	(1,100) [7,x]	(1,800) [7,x]
C_{15}-C_{36}	(4,000) [7,x]	NA [2]	NA [2]
PEATS AND HIGHLY ORGANIC SOILS			
C_7-C_9 [4]	(6,700) [7,m]	(6,700) [7,m]	NA [2]
C_{10}-C_{14}	58 [x]	NA [2]	NA [2]
C_{15}-C_{36}	(4,000) [7,x]	NA [2]	NA [2]

NOTES:

1. Criteria for C10 - C14 and C15 - C36 are based on consideration of aliphatic component of TPH measurement and consideration of TPH as a surrogate measure for PAH, consideration of PAHs completed by extrapolation of PAH content of diesel and PAH criteria (refer Table 4.10)
2. NA indicates estimated criterion exceeds 20,000 mg/kg. At 20,000 mg/kg residual separate phase is expected to have formed in soil matrix. Some aesthetic impact may be noted.
3. Based on protection of human health only. Site specific consideration of aesthetic and ecological impact is required.
4. Based on health effects associated with aliphatic component only. Separate consideration of the health effects associated with the aromatic component (i.e. BTEX) is required.
5. Soil acceptance criteria are based on the lower value of criteria based on volatilisation (Table 4.16), other pathways (Table 4.18), criteria for the protection of maintenance workers (Table 4.19) and TPH criteria developed as surrogates for PAHs (Table 4.22). Surface soils criteria are based on all three pathways, criteria for soils at 1 m are based on volatilisation and maintenance workers, and criteria for soils at 4 m are based on volatilisation only. PAH surrogate considerations apply at all depths.
6. The following notes indicate the limiting pathway for each criterion: v - Volatilisation, s - Soil Ingestion d - Dermal, p - Produce, m - Maintenance/Excavation, x - PAH surrogate
7. Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons. For further explanation refer to Appendix 4M.
8. Due to the nature of boundary conditions in volatilisation model, calculated criteria for sandy soils are higher than that for silt soil type. Therefore, the criteria for sand are set equal to the criteria for silt. Refer Appendix 4D for details.

Appendix II

Air monitoring reports

Memorandum

To Job Manager, Callum McKenzie
From Scientific Officer - Air Quality, Brian Cheyne
File 6497-1, FRODO-#1376025
Date July 16, 2014

Ambient gas monitoring at Turangi-A wellsite

Multiple Gas Detector

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

From 16/05/2014 14:55 to 17/05/2014 18:38		
(CO) Carbon Monoxide		
Max	Mean	Min
8.1 (ppm)	0.3 (ppm)	0.00 (ppm)

(LEL) Lower Explosive Limit		
Max	Mean	Min
0.30 (%)	0.00 (%)	0.00(%)

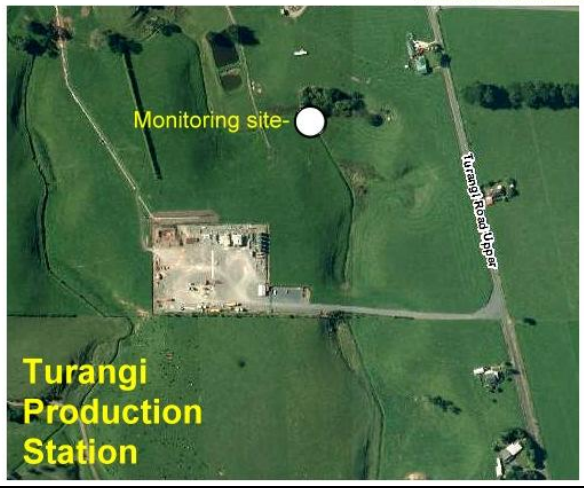

Figure 1 Air monitoring site (CO and LEL) at Turangi-A wellsite (2013-14)

Note: (1) the instrument records in units of ppm. At 15°C

1ppm CO = 0.85 mg m^{-3}

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

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

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

The consent covering air discharges from the Turangi-A wellsite has specific limits related to particular gases. Special condition 15 of consent 6497 sets a limit on the carbon monoxide concentration at or beyond the production station's boundary. The limit is expressed as 10 mg/m^3 for an eight hour average or 30 mg/m^3 for a 1 hour average exposure. The maximum concentration of carbon monoxide found during the monitoring run was 8.1 ppm or 6.9 mg/m^3 and the average concentration was only 0.26mg/m^3 which complies with the consent condition. This continues the pattern found in previous years.

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

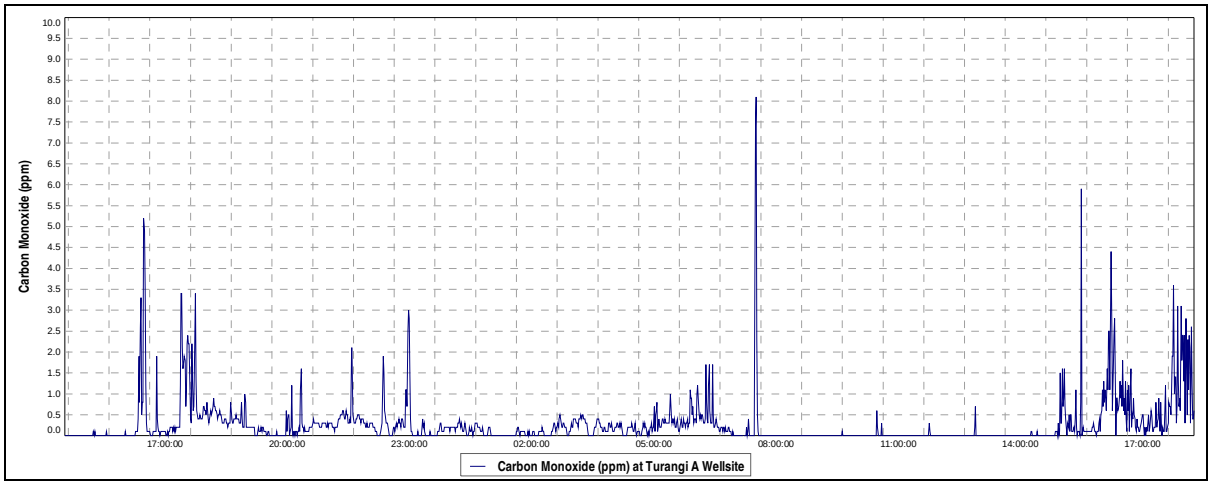

Figure 2 Graphs of ambient gas levels in the vicinity of the Turangi-A wellsite (2013-14)

Memorandum

To Job Manager, Callum McKenzie
From Scientific Officer - Air Quality, Brian Cheyne
File 6497-1, FRODO-#1326662
Date March 21, 2014

Ambient gas monitoring at Turangi-A wellsite

Multiple Gas Detector

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

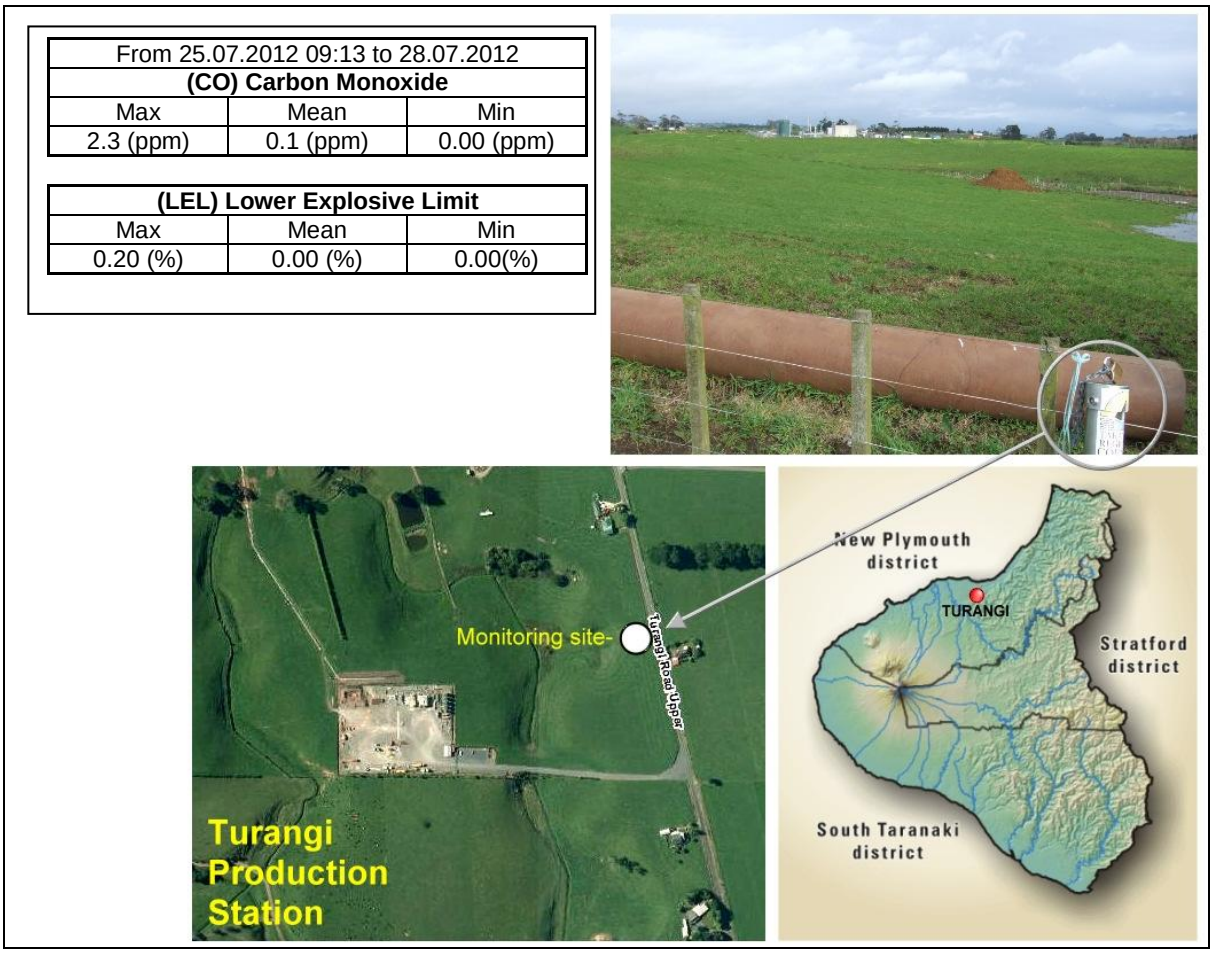

Figure 1 Air monitoring site (CO and LEL) at Turangi-A wellsite (2012-13)

Note: (1) the instrument records in units of ppm. At 15°C

1ppm CO = 0.85 mg m^{-3}

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

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

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

The consent covering air discharges from the Turangi-A wellsite has specific limits related to particular gases. Special condition 15 of consent 6497 sets a limit on the carbon monoxide concentration at or beyond the production station's boundary. The limit is expressed as 10 mg/m^3 for an eight hour average or 30 mg/m^3 for a 1 hour average exposure. The maximum concentration of carbon monoxide found during the monitoring run was 2.3 ppm or 1.9 mg/m^3 and the average concentration was only 0.09mg/m^3 which complies with the consent condition. This continues the pattern found in previous years.

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

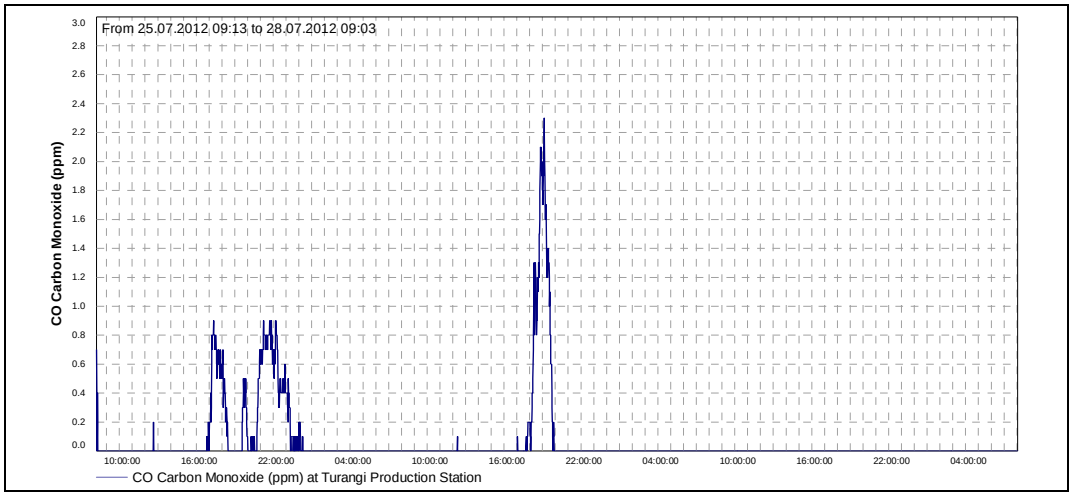

Figure 2 Graphs of ambient gas levels in the vicinity of the Turangi-A wellsite