Greymouth Petroleum Hawera Landfarm Monitoring Programme Annual Report 2013-2014

Technical Report 2014–64

ISSN: 0114-8184 (Print)
ISSN:1178-1467 (Online)
Document: 1430543 (Word)
Document: 1429662 (Pdf)

Taranaki Regional Council
Private Bag 713
STRATFORD

November 2014

Executive summary

Greymouth Petroleum Acquisition Company Limited operates a drilling waste landfarm located off Rifle Range Road at Hawera. This report for the period July 2013-June 2014 describes the monitoring programme implemented by the Taranaki Regional Council to assess the Company's environmental performance during the period under review, and the results and environmental effects of the Company's activities.

In 2013-2014 Greymouth Petroleum Acquisition Company Limited achieved a high level of environmental performance in respect of this site.

The Company holds one resource consent, which includes a total of 29 conditions setting out the requirements that the Company must satisfy. This consent allows for the discharge of drilling waste onto and into land. This consent was due to expire in June 2014. The Company have applied for a renewal consent, which has not been finalised at the time of reporting.

The Council's monitoring programme for the year under review included two inspections, two soil samples, data review, and on-going liaison with the Company.

The site has not been active for several years and monitoring indicated that there appear to be no adverse environmental effects resulting from past discharges of drilling waste at the site. The former pit area has been remediated and reinstated, and has met surrender criteria in the Company supplied results. This will be confirmed by Council sampling in the 2014-2015 monitoring period.

During the year, the Company demonstrated a high level of both environmental and administrative performance and compliance with the resource consent. There were no unauthorised incidents in relation to the site.

This report includes recommendations for the 2014-2015 year.

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 Annual Report for the period July 2013-June 2014 by the Taranaki Regional Council on the monitoring programme associated with a resource consent held by Greymouth Petroleum Acquisition Company Limited (Greymouth). The Company operates a landfarm situated at the end of Rifle Range Road at Hawera.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consent held by Greymouth that relates to the discharge of drilling cuttings, drilling fluids and carbon filter sludge onto and into land. This is the tenth Annual Report to be prepared by the Taranaki Regional Council to cover Greymouth's discharges and their effects.

1.1.2 Structure of this report

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

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

Section 3 discusses the results, their interpretation, 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 an activity, and may include cultural and social-economic effects;
(b) physical effects on the locality, including landscape, amenity and visual effects;
(c) ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
(d) natural and physical resources having special significance (eg, recreational, cultural, or aesthetic);
(e) risks to the neighbourhood or environment.

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

1.1.4 Evaluation of environmental performance

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

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

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

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

Environmental Performance

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

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

compliant effects; however abatement notices may have been issued to mitigate an identified potential for an environmental effect to occur.

For example:

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

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

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

Administrative compliance

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

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

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

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

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

1.2 Process description

1.2.1 Drilling waste

Waste drilling material is produced during well drilling for hydrocarbon exploration. The primary components of this waste are drilling fluids (muds) and rock cuttings. Drilling fluids are engineered to perform several crucial tasks in the drilling of a hydrocarbon well. These include: transporting cuttings from the drill bit to the well surface for disposal; controlling hydrostatic pressure in the well; supporting the sides of the hole and preventing the ingress of formation fluids; and lubricating and cooling the drill bit and drill pipe in the hole.

Drilling fluids

Oil and gas wells may be drilled with either synthetic based mud (SBM) or water based mud (WBM). As the names suggest, these are fluids with either water (fresh or saline) or synthetic oil as a base material, to which further compounds are added to modify the physical characteristics of the mud (for example mud weight or viscosity). More than one type of fluid may be used to drill an individual well. In the past, oil based muds (diesel/crude oil based) have also been used. Their use has declined since the 1980s due to their ecotoxicity; they have been replaced by SBM. SBM use olefins, paraffins or esters as a base material. While this is technically still a form of oil based fluid, these fluids have been engineered to remove polycyclic aromatic hydrocarbons, reduce the potential for bioaccumulation, and accelerate biodegradation compared with OBM.

Common constituents of WBM and SBM include weighting agents, viscosifiers, thinners, lost circulation materials (LCM), pH control additives, dispersants, corrosion inhibitors, bactericides, filtrate reducers, flocculants and lubricants. Of these, the naturally occurring clay mineral barite (barium sulphate) is generally the most common additive. It is added to most drilling muds as a wetting and weighting agent.

Drilling fluids may be intentionally discharged in bulk for changes to the drilling fluid programme or at the completion of drilling. Depending on operational requirements and fluid type and properties, fluids may be re-used in multiple wells.

Cuttings

Cuttings are produced as the drill bit penetrates the underlying geological formations. They are brought to the surface in the drilling fluid where they pass over a shaker screen that separates the cuttings and drilling fluids. The drilling fluids are recycled for reuse within the drilling process, but small quantities of drilling fluids remain adhered to the cuttings. The cuttings and smaller particle material from the drill fluid treatment units drain into sumps. If sumps cannot be constructed corrals or special bins are used. During drilling this material is the only continuous discharge.

1.2.2 Landfarming

The landfarming process has typically been used in the Taranaki region to assist the conversion of sandy coastal sites prone to erosion into productive pasture. Results of an independent research project conducted by AgKnowledge Ltd (2013) have indicated that the re-contoured sand dunes, after the inclusion of the drilling wastes (as per the consents), and with the addition of appropriate fertilisers and water (irrigation) are capable of producing high quality clover-based pastures and thus increasing the value of the land from about $3-4,000/ha to $30-40,000/ha (2013).

Landfarming uses natural and assisted bioremediation to reduce the concentration of petroleum compounds through degradation. The basic steps in the landfarming process are:

1. Drilling waste is transported from wellsites by truck (cuttings) or tanker (liquids). It may be discharged directly to land or placed in a dedicated storage pit.
2. The required area is prepared by scraping back and stockpiling existing pasture/topsoil and leveling out uneven ground.
3. Waste is transferred to the prepared area by excavator and truck and spread out with a bulldozer. Liquids may be discharged by tanker or a spray system.
4. Waste is allowed to dry sufficiently before being tilled into the soil to the required depth with a tractor and discs.
5. The disposal area is leveled with chains or harrows.
6. Stockpiled or brought in topsoil/clay is applied to aid stability and assist in grass establishment.
7. Fertiliser may be applied and the area is sown in crop or pasture at a suitable time of year.

1.3 Site location and description

Greymouth operates a drilling waste landfarm off Rifle Range Road, Hawera, shown in Figure 1. The site is owned by Fonterra and leased to the landfarm operator. The coastal area consists largely of sand dunes subject to wind erosion and areas of poor grass growth. The site is in close proximity to Nowell Lakes, two coastal lakes that have regional significance and feed a seasonal stream running along the eastern site boundary. The primary Hawera sewage outfall pipeline also passes through the site.

Site data

Location	
Word descriptor:	Rifle Range Road, Hawera, Taranaki
Map reference:	E 1710710
(NZTM)	N 5613550
Mean annual rainfall:	1,019 mm
Mean annual soil temperature:	~15.1°C
Mean annual soil moisture:	~32.9%
Elevation:	~90 m asl
Geomorphic position:	Cliff / dune backslope / hummocky terrain
Erosion / deposition:	Erosion
Vegetation:	Pasture
Parent material:	Tephra / Aeolian deposit
Drainage class:	Free / well draining

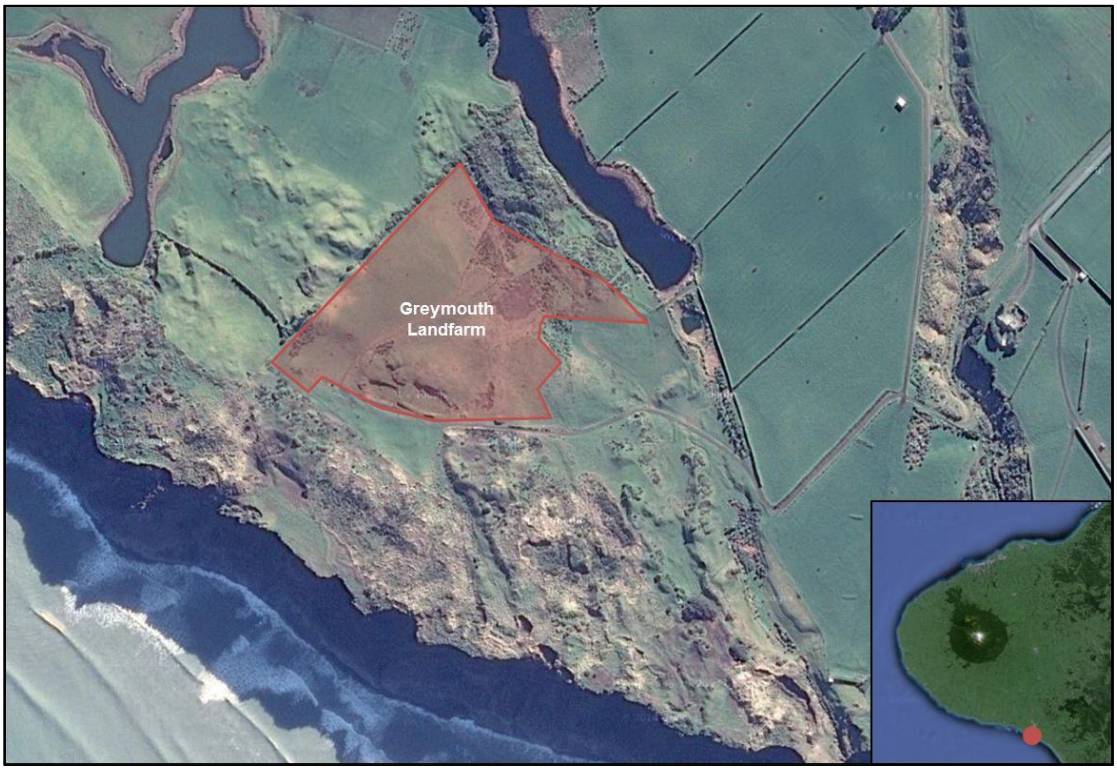

Figure 1 Aerial photograph showing the location and approximate extent of landfarmed areas of the Greymouth landfarm, and approximate regional location (inset)

1.4 Resource consent

1.4.1 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.

Greymouth holds discharge permit **6236-1** - To discharge drilling cuttings and fluids from hydrocarbon exploration drilling operations with water based muds, and drilling cuttings from hydrocarbon exploration drilling operations with synthetic based muds, and carbon filter sludge from Fonterra Kapuni, onto and into land via land farming. This permit was issued by the Taranaki Regional Council on 8 January 2004 under Section 87(e) of the Resource Management Act. The consent was varied on 4 April 2006, 8 December 2006, and 22 October 2009. This consent expired on 1 June 2014, but the Company were required to apply for a renewal consent, as not all areas had been shown to meet all surrender criteria for hydrocarbons by December 2013. At the time of reporting, consent conditions for a renewed consent are being finalised with the Company. Meanwhile the Company is entitled to continue to operate the site under the conditions of the old consent.

Conditions 1 and 2 relate to exercise of the consent in accordance with the application and adoption of the best practicable option.

Conditions 3 to 7 are notification, monitoring and reporting requirements.

Conditions 8 to 15 are operational requirements.

Conditions 16 to 19 specify discharge limits and loading rates.

Conditions 20 to 27 specify receiving environment limits.

Conditions 28 and 29 are lapse and review conditions.

The permit is attached to this report in Appendix I.

1.5 Monitoring programme

1.5.1 Introduction

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

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

The monitoring programme for the Greymouth landfarm site consisted of three primary components.

1.5.2 Programme liaison and management

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

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

1.5.3 Site inspections

Two scheduled inspections were made of the site during the monitoring period, with regard to the consents for the discharge of drilling waste. Inspections focussed on the following aspects:

- observable and/or ongoing effects upon soil and groundwater quality associated with the land disposal process
- effective incorporation of material, application rates and associated earthworks
- integrity and management of storage facilities
- dust and odour effects in proximity of the site boundaries
- housekeeping and site management

- the neighbourhood was surveyed for environmental effects.

1.5.4 Chemical sampling

During the monitoring year the Council obtained two soil samples from the area formerly used for storage and analysed for total petroleum hydrocarbons and the BTEX range of monocyclic aromatic hydrocarbons. The Company's contractor also supplied analytical results for soil samples.

2. Results

2.1 Inspections

23 September 2013

No recent disposal activity had occurred at site and historical pits had naturally re-vegetated. Pasture appeared healthy throughout all disposal areas, and small previously exposed areas were observed to be stable at the time of inspection.

25 June 2014

No objectionable odours or visible emissions were detected at the time of inspection. No recent disposal activities had occurred at site and all historical pits were empty of drilling wastes and pasture had established. Spreading areas had essentially complete pasture cover which also appeared healthy. No muds were observed within the soil profile and no hydrocarbon odours were noted.

Photo 1 Hawera landfarm December 2013 showing former pit area

2.2 Receiving environment monitoring

Two soil samples were collected by sub-sampling from two test pits to a depth of 250mm from an area formerly used for storage (known as Pit 2), and were sent to R J Hill Laboratories. It had been established during the previous monitoring period that the spreading areas had all reached surrender criteria, but the former storage pits were still high in concentrations of some of the longer chain hydrocarbons. The results of this sampling are presented in Table 1.

Table 1 Soil samples obtained on 11 December 2013 from the base of the storage pits at the Greymouth Petroleum Hawera Landfarm

Parameter	Unit	Sample 1	Sample 2	Guideline Value (soil)*
Benzene	mg/kg	0.05	<0.05	1.1
Toluene	mg/kg	<0.05	<0.05	68
Ethylbenzene	mg/kg	0.11	0.11	53
meta Xylene	mg/kg	4.8	2.5	48 (combined)
ortha Xylene	mg/kg	2.0	0.2	
Total hydrocarbons	mg/kg	19100	6400	1620**
C7-C9	mg/kg	65	23	-
C10-C14	mg/kg	5800	2000	-
C15-C36	mg/kg	13300	4400	-
Arsenic	mg/kg	2	<2	20***
Cadmium	mg/kg	<0.10	<0.10	1***
Chromium	mg/kg	24	22	600***
Copper	mg/kg	27	16	100***
Lead	mg/kg	12.7	1.7	300***
Nickel	mg/kg	10	9	60***
Zinc	mg/kg	150	111	300***

*Guideline for assessing soil acceptance criteria Table 4.12 for sand based soils.
**Value is a total provided from the Guideline for assessing soil acceptance criteria Table 4.15 for sand based soils
***Guideline for the Safe Application of Biosolids to Land in New Zealand

The hydrocarbon concentration sampling results remained in excess of the consent surrender criteria at the base of former storage pit 2. As part of the application to renew consent 6236-1, the Company engaged BTW Company Ltd (BTW) to help remediate the former pit areas.

BTW completed this work in May 2014. A small quantity of pit base soil was excavated for disposal offsite, and BTW then resampled the pits. Their supplied results are given below in Table 2.

Table 2 BTW supplied results, Pit 2 post remediation

Parameter	Unit	Sample 1	Sample 2	Guideline Value (soil)*
Chloride	mg/kg	10	12	290
Total Nitrogen	g/100 g	0.11	0.13	-
Barium	mg/kg	330	220	10,000
Boron	mg/kg	<20	<20	-
Arsenic	mg/kg	<2	<2	20***
Cadmium	mg/kg	0.10	0.10	1***
Chromium	mg/kg	21	15	600***
Copper	mg/kg	25	41	100***
Lead	mg/kg	3.6	5.4	300***
Mercury	mg/kg	<0.10	<0.10	1
Nickel	mg/kg	10	7	60***
Zinc	mg/kg	89	80	300***
C7-C9	mg/kg	<9	<9	-
C10-C14	mg/kg	<20	<20	-
C15-C36	mg/kg	<40	<40	-
Total hydrocarbons	mg/kg	<70	<70	1620**
Benzene	mg/kg	<0.05	<0.06	1.1

Parameter	Unit	Sample 1	Sample 2	Guideline Value (soil)*
Toluene	mg/kg	<0.05	<0.06	68
Ethylbenzene	mg/kg	<0.05	<0.06	53
meta Xylene	mg/kg	<0.10	<0.11	48 (combined)
ortha Xylene	mg/kg	<0.05	<0.06	

*Guideline for assessing soil acceptance criteria Table 4.12 for sand based soils.
**Value is a total provided from the Guideline for assessing soil acceptance criteria Table 4.15 for sand based soils
***Guideline for the Safe Application of Biosolids to Land in New Zealand

These results show compliance with surrender criteria for all parameters. The hydrocarbon concentrations are below detection levels. It is recommended the Council take samples to confirm concentrations before the consent is considered for surrender. A recommendation to this effect is given in Section 4.

No surface water sample was taken from Nowell Lake, as no activity had been occurring at the site, and previous results have indicated there was no effect of discharges to land on this body of water.

2.3 Investigations, interventions, and incidents

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

The 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 Unauthorised Incident Register (UIR) includes events where the company concerned has itself notified the Council. The register contains details of any investigation and corrective action taken.

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

During the 2013-2014 monitoring period, it was not necessary for the Council to undertake significant additional investigations and interventions, or record incidents, in association with Greymouth Landfarm's conditions in resource consents or provisions in Regional Plans in relation to the Company's activities. This reflects the lack of recent activity at this site.

3. Discussion

3.1 Discussion of site performance

The site was not active during the monitoring year under review and there have been no disposals of drilling wastes in recent years.

All spreading areas sampled previously have been shown to be within surrender criteria for the parameters tested for. However, the areas which were previously used to house the storage pits were sampled in the 2012-2013 monitoring year, and found to be above surrender criteria for hydrocarbons. They were re-tested in the 2013-2014 monitoring year by the Council and found to still be in excess of the surrender criteria for longer chain hydrocarbons. As the consent was due to expire in June 2014, the Company were required to apply for a renewal consent to ensure the site remained the responsibility of the consent holder until surrender criteria were reached in all areas prior to surrender or expiry. The storage area has since been remediated and reinstated and (pending Council soil results) should be within surrender criteria. At the time of reporting, the Company are looking to surrender the areas farmed under consent 6236-1 (partial surrender), and renew the discharge consent to have the option to potentially landfarm the 5.34 Ha of area that is still available for spreading.

3.2 Environmental effects of exercise of consents

The monitoring, together with previous sampling of soils and surface waters, indicated that there were no on-going adverse environmental effects resulting from past discharges of drilling waste at the site. Aside from the areas where pasture establishment has struggled in the past, there are no visual or odour indications remaining from the activity. Soil quality has been shown to be improving over time in the previous soil sample results, with the spreading areas now meeting consent surrender criteria, and having been successfully reinstated with pasture and grazed with no significant issues.

Monitoring of the discharge from Nowell Lake in previous years has indicated that the landfarming operation is unlikely to be having an adverse effect on lake water quality. Previous sampling of the Nowell Lake has been used as an indicator of any potential effects on both ground and surface water from activities at the site, as it is a coastal lake with contributions from both surface and groundwater. Water samples taken previously have shown no effects of the landfarming activities, the site has not been used to dispose of any additional waste for several years, and the 25m buffer zone was maintained throughout previous operations at the site.

3.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Table 3.

Table 3 Summary of performance for Consent **6236-1** - Discharge of drilling waste

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Comply with application documentation	Inspection, sampling and liaison with consent holder	Yes
2. Adoption of the best practicable option	Inspection, sampling and liaison with consent holder	Yes
3. Notify Council 48 hours prior to transfer of waste to disposal site	No disposals during monitoring period	N/A
4. Notify Council 12 hours prior to discharging stockpiled material onto or into land	No discharges during monitoring period	N/A
5. Notification of discovery of archaeological remains	Inspection/ notification	N/A
6. Provide chemical analysis of waste material for each at time of disposal	No disposals during monitoring period	N/A
7. Record all details, compositions, treatments and movements of waste and stockpiled material	No disposals during monitoring period	N/A
8. Keep areas for stockpiling and disposal of water based drilling wastes separate from synthetic mud based drilling waste. Keep stockpile and disposal areas for individual wells separate	No disposals during monitoring period	N/A
9. Disposal area corresponds with information supplied in application	Inspection	Yes
10. No discharge within 25 m of surface water	No discharges during monitoring period	N/A
11. No destabilisation of neighbouring land	Inspection	Yes
12. Consent applies only to wastes generated in Taranaki	No disposals during monitoring period	N/A
13. Disposal of all wastes must be incorporated into the soil as soon as practicable	No disposals during monitoring period	N/A
14. Discharge area shall be tilled and resown to pasture/crop as soon as possible after completion	No discharges during monitoring period	N/A
15. Maximum stockpiling volume of 1,000 m^3, discharge within two months of arrival on site	No stockpiling during monitoring period	N/A
16. Discharge depth limited to 150mm for waste with less than 5% hydrocarbons, or 50mm for waste with greater than 5% hydrocarbons	No discharges during monitoring period	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
17. If waste has greater than 5% hydrocarbons, incorporate waste into the soil so that the surface 250mm contains less than 5% hydrocarbons	No discharges during monitoring period	N/A
18. Chloride loading shall not exceed 800 kg/ha	No discharges during monitoring period	N/A
19. Nitrogen loading shall not exceed 200 kg/ha	No discharges during monitoring period	N/A
20. Conductivity must be less than 400 mSm^{-1}. If background soil has an conductivity greater than 400 mSm^{-1}, then conductivity after disposal shall not exceed original conductivity by more than 100 mSm^{-1}	No discharges during monitoring period	N/A
21. Sodium absorption ratio [SAR] must be less than 18.0.	No discharges during monitoring period	N/A
22. Levels of metals in soil must comply with guidelines	Analysis	Yes
23. Prior to expiry/cancellation/surrender, soil hydrocarbon content must comply with Ministry for the Environment guidelines	Analysis	Pending final Council results
24. Levels not to be exceeded in soil prior to expiry/cancellation/surrender a) conductivity, 290 mSm^{-1} b) dissolved salts, 2500 g/m^3 c) sodium, 460 g/m^3 d) chloride, 700 g/m3	Analysis	N/A
25. Total dissolved salts in surface or groundwater not to exceed 2500 g/m^3	Analysis	N/A
26. Disposal of waste shall not lead to contamination of any surface water	Inspection & analysis	Yes
27. Disposal of waste shall not result in any adverse effects on surface groundwater	Inspection & analysis	Yes
28. Consent lapses after 5 years unless exercised	Consent exercised	N/A
29. Optional review provision re environmental effects	No option for review prior to expiry in 2014	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

During the year, the Company demonstrated a high level of both environmental performance and administrative compliance with the resource consents. In previous monitoring reports it was suggested that the Company re-sow the areas where pasture establishment has been patchy. This work has yet to be completed, but the areas appear to be re-grassing naturally in any case.

3.4 Recommendations from the 2012-2013 Annual Report

In the 2012-2013 Annual Report, it was recommended:

1. THAT the monitoring programme for consented activities at the Greymouth Petroleum Hawera Landfarm in the 2013-2014, remain unchanged from that for 2012-2013.

2. THAT the consent holder considers the reinstatement of the former pit area to ensure surrender criteria is met for hydrocarbons prior to the consent expiry date of 1 June 2014.

These recommendations were implemented.

4. Recommendations

1. THAT the monitoring programme for consented activities at the Greymouth Petroleum Hawera Landfarm in the 2014-2015, providing the site remains at the current state of activity, remains unchanged from that for 2013-2014.

2. THAT Council staff re-sample the former storage pit area prior to processing the surrender or partial surrender of the consent.

3. THAT, if the consent holder elects to renew the consent to use the 5.34 Ha of available spreading area, a revised monitoring programme will be implemented in accordance with the consent renewal.

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.
BTEX	MAH's benzene, toluene, ethylbenzene and xylene.
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.
MAHs	Monocyclic aromatic hydrocarbons, molecules consist of a single six-sided hydrocarbon ring.
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).
OW	Oily waste.
PAHs	Polycyclic aromatic hydrocarbons, molecules consist of more than two six-sided hydrocarbon rings.
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.
SBM	Synthetic based mud.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
TPH	Total petroleum hydrocarbons
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.
WBM	Water based mud.
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

Department of Health 1992: Public health guidelines for the safe use of sewage effluent and sewage sludge on land. Department of Health.

Ministry for the Environment 1999: Guidelines for assessing and managing petroleum hydrocarbon contaminated sites in New Zealand, Ministry for the Environment.

Taranaki Regional Council 2005: Guidelines for the control of drilling waste disposal onto and into land, Taranaki Regional Council.

Taranaki Regional Council, 2005: Greymouth Petroleum - Hawera Landfarm Monitoring Programme Annual Report 2004-2005. Technical Report 2005-02.

Taranaki Regional Council, 2006: Greymouth Petroleum - Hawera Landfarm Monitoring Programme Annual Report 2005-2006. Technical Report 2006-16.

Taranaki Regional Council, 2008: Greymouth Petroleum - Hawera Landfarm Monitoring Programme Annual Report 2006-2007. Technical Report 2007-40.

Taranaki Regional Council, 2009: Greymouth Petroleum - Hawera Landfarm Monitoring Programme Annual Report 2007-2008. Technical Report 2008-90.

Taranaki Regional Council, 2009: Greymouth Petroleum - Hawera Landfarm Monitoring Programme Annual Report 2008-2009. Technical Report 2009-51.

Taranaki Regional Council, 2010: Greymouth Petroleum - Hawera Landfarm Monitoring Programme Annual Report 2009-2010. Technical Report 2010-26.

Taranaki Regional Council, 2011: Greymouth Petroleum - Hawera Landfarm Monitoring Programme Annual Report 2010-2011. Technical Report 2011-31.

Taranaki Regional Council, 2012: Greymouth Petroleum - Hawera Landfarm Monitoring Programme Annual Report 2011-2012. Technical Report 2012-55

Taranaki Regional Council, 2013: Greymouth Petroleum - Hawera Landfarm Monitoring Programme Annual Report 2012-2013. Technical Report 2013-45

Appendix I

Resource consent held by Greymouth Petroleum Acquisition Company Ltd

Consent 6236-1

TARANAKI REGIONAL COUNCIL
CHIEF EXECUTIVE
PRIVATE BAG 713
47 CLOTEN ROAD
STRATFORD
NEW ZEALAND
PHONE: 06-765 7127
FAX: 06-765 5097
www.trc.govt.nz

Please quote our file number on all correspondence

Discharge Permit

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

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

Change To Conditions Date: 22 October 2009 [Granted: 8 January 2004]

Conditions of Consent

Consent Granted: To discharge drilling cuttings and fluids from hydrocarbon exploration drilling operations with water based muds, and drilling cuttings from hydrocarbon exploration drilling operations with synthetic based muds, and carbon filter sludge from Fonterra Kapuni, onto and into land via land farming at or about (NZTM) 1710710E-5613550N

Expiry Date: 1 June 2014

Review Date(s): June 2010

Site Location: Rifle Range Road, Hawera
[Property owner: Kiwi Co-operative Dairies Limited]

Legal Description: Lot 12 DP 2625 Hawera SD

Catchment: Unnamed catchment 19
Unnamed catchment 20

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 exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of applications 2726, 4147, 4447 and 6340. In particular, Drawing No. 929-31-0002 (Revision A) provided with application 6340, which shows the disposal area boundary. In the case of any contradiction between the documentation submitted in support of applications 2726, 4147, 4447 and 6340 and the conditions of this consent, the conditions of this consent shall prevail.

2. 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 on the environment from the exercise of this consent.

Notification, monitoring and reporting

3. The consent holder shall notify the Taranaki Regional Council in writing at least 48 hours prior to commencement per well of transfer of wastes from the hydrocarbon exploration wellsite, to the disposal property for discharge onto or into land via stockpiling, spreading, tilling, and/or layering. Notification shall include the consent number, a brief description of the activity consented and be emailed to worknotification@trc.govt.nz.

4. The consent holder shall notify the Taranaki Regional Council in writing at least 12 hours prior to discharging stockpiled material onto or into land [for the purpose of this condition 'discharging' means spreading, tilling or layering].

5. In the event that any archaeological remains are discovered as a result of works authorised by this consent, the works shall cease immediately at the affected site and tangata whenua and the Chief Executive, Taranaki Regional Council, shall be notified within one working day. Works may recommence at the affected area when advised to do so by the Chief Executive, Taranaki Regional Council. Such advice shall be given after the Chief Executive, Taranaki Regional Council, has considered: tangata whenua interest and values, the consent holder's interests, the interest of the public generally, and any archaeological or scientific evidence. The New Zealand Police, Coroner, and Historic Places Trust shall also be contacted as appropriate, and the work shall not recommence in the affected area until any necessary statutory authorisation or consent has been obtained.

6. The consent holder shall provide the Chief Executive, Taranaki Regional Council, with a chemical analysis of a representative sample of the drilling wastes per well, including the results of leachate testing, within two weeks of the initial disposal of wastes per well, at the disposal site.

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

   a) wastes from each individual well [including records of all additives used at the wellsite during the drilling process];
   b) stockpiling area[s];
   c) disposal area[s];
   d) composition of material [including concentrations of nitrogen, chloride and hydrocarbons];
   e) volumes of material stockpiled;
   f) volumes of material disposed;
   g) dates and times of commencement and completion of stockpiling and discharge events; and
   h) treatments applied;

   and shall make the records available to the Chief Executive, Taranaki Regional Council upon request.

Operational requirements

8. The consent holder shall ensure that areas used for the stockpiling and disposal of water based drilling wastes are kept separate and distinct from areas utilised for the stockpiling and disposal of cuttings from wells drilled with synthetic based muds. Stockpile and disposal areas for individual wells shall be kept separate and distinct. For the purpose of this condition 'disposal' means spreading, tilling or layering.

9. The area shown on Drawing No. 929-31-0003 Revision A [provided with application 6340] where "Future Disposal Area A" and "Area C" overlap, may receive one further disposal of drilling wastes only, after 1 November 2009.

10. No discharge [including but not limited to stockpiling on land and/or application onto or into land] shall take place within 25 metres of surface water [including the Tasman Sea and Nowell's Lakes].

11. The exercise of this consent shall not result in the destabilisation of neighbouring land.

12. The exercise of this consent is limited to wastes generated within the Taranaki region.

13. As soon as practicable following discharge of drill cutting from any well all wastes from that well shall be incorporated [whether by tillage or soakage] into the soil to meet the conditions of this consent.

14. The discharge area shall be tilled and resown to pasture [or into crop] as soon as practicable following completion of the discharge.

15. The stockpiling of material authorised by this consent shall be limited to a maximum volume of 1000 cubic metres at any one time on the property. In any case all stockpiled material must be discharged onto and into land within two months of being brought onto the site [for the purpose of this condition 'discharge' means spreading, tilling or layering].

Discharge limits and loading rates

16. The rate of discharge shall be limited to an application spread depth of 150 mm prior to the wastes being incorporated into soil for waste solids with hydrocarbon content less than 5%, or, if hydrocarbon content of waste solids is equal or greater than 5% the application spread depth shall be limited to 50 mm of waste solids prior to incorporation into soil.

17. The hydrocarbon content in the waste prior to discharge at the site shall be less than 5%, or if hydrocarbon level in the waste is equal or greater than 5% the waste shall be incorporated into the soil so that the hydrocarbon content in the soil/waste mix shall be less than 5% anywhere in the surface 250 mm of soil after mixing in accordance with special condition 13.

18. Following incorporation into the soil the discharge shall not result in a chloride loading exceeding 800 kg/ha.

19. Following incorporation into the soil the discharge shall not result in a nitrogen loading exceeding 200 kg /ha.

Receiving environment limits

20. The conductivity of the soil/waste layer after application shall be 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 within the upper 20 cm by more than 100 mSm-1.

21. The sodium absorption ratio [SAR] of the soil/waste layer after application shall be 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.

22. The levels of metals in the soil shall comply with the guidelines for heavy metals in soil set out in Table 7.1, Section 7 of the Ministry for the Environment and New Zealand Water & Wastes Assoication's Guidelines for the safe application of biosolids to land in New Zealand [2003].

23. Prior to the expiry, cancellation, or surrender of this consent the levels of hydrocarbons in the soil shall comply with the guideline values for sandy soil in the surface layer [less than 1 metre depth] 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].

24. Prior to the expiry, cancellation, or surrender of this consent soil levels shall not exceed the following limits: conductivity, 290 mS/m; total soluble salts, 2500 mg/kg; sodium, 460 mg/kg; and chloride, 700 mg/kg.

25. The exercise of this consent shall not result in a level of total dissolved salts within any surface or groundwater of more than 2500 gm-3.

26. The exercise of this consent, including the design, management and implementation of the discharge shall not lead or be liable to lead to contaminants entering a surface water body by direct surface overland flow.

27. The exercise of this consent shall not result in any adverse impacts on groundwater as a result of leaching, or on surface water including aquatic ecosystems, and/or result in a change to the suitability of use of the receiving water as determined by the Chief Executive, Taranaki Regional Council.

Lapse and review

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

29. 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 2005 and/or June 2006 and/or June 2010, 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 22 October 2009

For and on behalf of
Taranaki Regional Council

~~Director~~-Resource Management