

CD Boyd Drilling Waste and Stockpiling
Landfarm and Landspreading
Monitoring Programme
Annual Report
2019-2020

Technical Report 2020-11

Taranaki Regional Council
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Executive summary

Colin Boyd (the consent holder), in conjunction with MI SWACO (the Company), operate a drilling waste stockpiling facility (Surrey Road stockpiling facility) and a landspreading/landfarming operation on his property, near Inglewood. This site is located within the Waitara catchment. Stockpiled drilling mud from the Surrey Road stockpiling facility is landfarmed or landspread on the consent holder's property. The consent holder also dewater water treatment sludge in lagoons at two locations on his property. This material is then applied to land via landfarming.

This report for the period July 2019 to June 2020 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the Company's environmental and consent compliance performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of the Company's activities.

The consent holder holds three resource consents, which include a total of 51 conditions setting out the requirements that the consent holder must satisfy. The consent holder holds three consents to allow it to discharge material to land.

During the monitoring period, the consent holder and the Company demonstrated an overall poor level of environmental performance.

The Council's monitoring programme for the year under review included seven inspections, 38 water samples, eight composite soil samples collected for physicochemical analysis and two biomonitoring surveys of receiving waters.

The monitoring showed that a brief impact of petroleum hydrocarbons to groundwater occurred during May 2020, most likely associated with material deliveries and a former storage pit being decommissioned.

1,050 m³ of drilling mud was landfarmed across two paddocks during this monitoring period with a further 1,544 m³ stockpiled during and after the end of the monitoring period.

All assessed landfarmed areas remain above the limit for surrender with elevated sodium and petroleum hydrocarbons. To date over 60 paddocks have been landfarmed though no corresponding surrender analysis has been undertaken.

There were numerous occurrences of non-compliances associated with the exercise of consents this period. The consent holder and Company were issued three abatement notices and three infringement notices. One of the non-compliances is likely responsible for a decrease in species diversity documented during the biannual biomonitoring surveys of the unnamed tributary of the Mangatengehu Stream.

The Company also reused a paddock which had been previously landfarmed in 2010 with prior assessment for chemical parameters of concern, as required by consent.

By comparison with previous years, the monitoring indicated a decline in performance, both from an environmental and administrative perspective.

There were four unauthorised incidents recording non-compliance in respect of this consent holder during the period under review.

In order to mitigate the cause of non-compliances identified in this monitoring period the Company has undertaken additional engineering controls in the form of the following:

An upgraded irrigation system through the help of third party operator (AgEnviro).

A solar powered live stream security camera has also been installed to enable constant supervision of the stockpiling facility (DataTalk).

The pump which enables stormwater to be irrigated to land from pit 4 has been fitted with an automatic start pump to prevent future over flow events. The associated generator has also been fitted with a reserve fuel tank, in order to prevent the generator from running out of fuel, as had occurred in the past. Which led to overflow events.

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

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

This report includes recommendations for the 2020-2021 year.

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1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is for the period July 2019 to June 2020 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by CD Boyd (the consent holder) and his subsidiary Company, Surrey Road Landfarms Limited. The consent holder in conjunction with MI SWACO (the Company) control and operate a drilling waste stockpile facility (Surrey Road stockpiling facility) as well as a landfarming and landspreading operation, situated on Surrey Road at Tariki, in the Waitara catchment.

The report includes the results and findings of the monitoring programme implemented by the Council in respect of the consents held by the consent holder that relate to the discharges of drilling mud to land within the Waitara catchment.

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

1.1.2 Structure of this report

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

- consent compliance monitoring under the RMA and the Council's obligations;
- the Council's approach to monitoring sites through annual programmes;
- the resource consents held by the consent holder in the Waitara catchment;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted in the consent holder's site/catchment.

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

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

Section 4 presents recommendations to be implemented in the 2020-2021 monitoring year.

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

1.1.3 The Resource Management Act 1991 and monitoring

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

- a. the neighbourhood or the wider community around an activity, and may include cultural and social-economic effects;
- b. physical effects on the locality, including landscape, amenity and visual effects;
- c. ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;

- d. natural and physical resources having special significance (for example recreational, cultural, or aesthetic); and
- e. risks to the neighbourhood or environment.

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

1.1.4 Evaluation of environmental and administrative performance

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

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

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

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

Environmental Performance

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

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

For example:

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

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

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

Administrative performance

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

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

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

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

For reference, in the 2019-2020 year, consent holders were found to achieve a high level of environmental performance and compliance for 81% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 17% of the consents, a good level of environmental performance and compliance was achieved.¹

1.2 Process description

1.2.1 Hydrocarbon exploration and production wastes

For the purposes of disposal to land, waste from the petroleum industry can be divided into two broad categories; exploration (drilling) wastes, and production wastes. The wastes disposed of through the consent holder's operations are primarily drilling waste. Fracture return fluids are not disposed of at these sites.

1.2.2 Drilling wastes

Waste drilling material is produced during well drilling for hydrocarbon exploration. The primary components of this waste are drilling fluids (muds) and rock cuttings.

¹ The Council has used these compliance grading criteria for 15 years. They align closely with the 4 compliance grades in the MfE Best Practice Guidelines for Compliance, Monitoring and Enforcement, 2018

1.2.3 Drilling fluids

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. 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 polynuclear 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.

1.2.4 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.

1.2.5 Landfarming process description

Basic steps in the landfarming process include:

1. Drilling waste is transported from a specific wellsite by truck (cuttings) or tanker (liquids). It is placed in a dedicated, fit for purpose, lined storage pit. At the consent holder's facilities cuttings arrive from site in metal 'D' bins directly collected from the wellsite. Material is subjected to an analytical screen undertaken in a registered laboratory. The analysis is dictated by specific consent conditions.
2. The required area is prepared by scraping back and stockpiling existing pasture/topsoil and levelling 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 levelled 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.

Consent 7559-1.4 allows for the discharge of drilling waste from hydrocarbon exploration activities with WBM and SBM to land for the purpose of temporary storage at the Surrey Road stockpiling facility.

Consent 7591-1.2 allows for the discharge of drilling cuttings and drilling fluids from hydrocarbon exploration activities with WBM and SBM muds onto and into the land via landfarming, landspreading, injection spreading and irrigation. The irrigation is the primary route to discharge contaminated storage e

The preferred method for the treatment and disposal of drilling material at the consent holder's property is via landspreading (under consent 7591-1.2). A large muck spreader (Photo 1), is used for this purpose.



Photo 1 A muck spreader as utilised by the consent holder for landspreading

An auger in the base of the spreader conveys material back and through an opening (where the size is controlled by a sliding plate) where it contacts two rapidly rotating augers and is applied up to 10 m on either side. The deposition rate is controlled by the size of the opening at the rear of the unit and the speed of forward travel by the tractor. The waste is deposited onto existing pasture in small fragments, which are allowed some time to dry out before chain harrows and roman discs are used to till and break-up the waste which is dispersed back into the soil, as shown in Photo 2.



Photo 2 Tilling of the soil post landspreading

1.3 Resource consents

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

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

Table 1 Resource consents held by the consent holder

Consent number	Purpose	Granted	Review	Expires
Discharges of waste to land				
7559-1.4	To discharge drilling waste (consisting of drilling cuttings and drilling fluid) from hydrocarbon exploration activities with water based muds and synthetic based muds onto and into land for the purpose of storage prior to disposal.	20 Nov 2009 Change 20 November 2018	June 2019	1 June 2027
7591-1.2	To discharge drilling waste cuttings (consisting of drilling cuttings and drilling fluids) from hydrocarbon exploration activities with water based muds and from synthetic based muds onto and into the land via landfarming, landspreading, injection spreading and irrigation.	21 Jan 2010 Change 20 November 2018	June 2019	1 June 2027
5821-2.2	To discharge sludge and other residuals from water treatment plants in the New Plymouth and South Taranaki Districts' onto and into land	14 Dec 2005	June 2021	1 June 2026

1.4 Monitoring programme

1.4.1 Introduction

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

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

The monitoring programme for the consent holder's operations site consisted of four primary components.

1.4.2 Programme liaison and management

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

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

1.4.3 Site inspections

The Surrey Road stockpiling site and associated landspreading/ landfarming areas were inspected on seven occasions this monitoring period. Additional visits were also conducted during monitoring rounds. With regard to 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 company or operator 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 Council collected samples of soil and water (groundwater and surface water) throughout the monitoring period. This is to assess the compliance of the consent holder with the consented conditions and to assess for any adverse effects arising from the facilities or activities of the consent holder.

1.4.4.1 Soil

In total, 8 composite soil samples from specific disposal areas were collected by Council staff. The sampling methodology utilised is adapted from the Guidelines for the Safe Application of Biosolids to Land in New Zealand (2003). This is undertaken through the compositing of 10 soil cores (Photo 3) (400 mm +/- depth to encompass the zone of application) taken at 10 m intervals along transects through an application area.



Photo 3 An example of an extracted soil core

The analysis undertaken by the Council is described in Table 2. Each transect is GPS referenced to allow for areas to be characterised and repeat analysis when required.

1.4.4.2 Water

Compliance water analysis was undertaken across the following sources in this monitoring period:

- surface water;
- stormwater discharge; and
- groundwater.

Surface water samples were also obtained on four separate occasions along the unnamed tributary of the Mangatengehu Stream (Figure 1) in relation to stormwater discharges from the Surrey Road stockpiling facilities. Surface water samples were also collected from surface drains in relation to the landfarmed paddock 48.

Groundwater analysis results were obtained through the groundwater monitoring bore network. The Surrey Road facility has three groundwater monitoring bores. These bores were installed to quantify the quality of the groundwater and, specifically to understand if any adverse effects were permeating from the facility through the storage of material in lined storage pits in the case of Surrey Road. A nova-flow drain discharge is also sampled.

The Council utilises a peristaltic low flow pump to collect the water samples. The samples are only collected post stabilisation of groundwater quality during pumping, and are obtained through a Yellow Springs Instrument (YSI) multi parameter probe and a flow through cell.

Surface water, groundwater, discharge and soil analytes are provided in Table 2 below.

Table 2 Chemical analytes

Surface / Discharge water analytes	
Barium (acid soluble)	Calcium
Benzene	Chloride
Toluene	Conductivity
Ethylene	Total petroleum hydrocarbons
Xylene M/O	Suspended Solids
Biological oxygen demand (BOD)	Total dissolved salts (TDS)
Biochemical oxygen demand (BCOD)	Temperature
	pH
Groundwater analytes	
Barium (acid soluble)	Sodium
Barium (dissolved)	Level
Benzene	Nitrite-nitrate nitrogen
Toluene	Total dissolved salts (TDS)
Ethylene	Temperature
Xylene M/O	Level
Chloride	Total petroleum hydrocarbon
Conductivity	Biochemical oxygen demand (BCOD)
Soil analytes	
Calcium	Ammoniacal nitrogen
Chloride	Nitrite-nitrate nitrogen
Magnesium	pH
Sodium	Total soluble salts
Conductivity	Total recoverable heavy metals
Potassium	Total petroleum hydrocarbons
Moisture factor	Polycyclic aromatic hydrocarbons
Sodium absorption ratio (SAR)	Monocyclic aromatic hydrocarbons

1.4.5 Biomonitoring surveys

Two biological surveys were performed during the monitoring period under review. The Surrey Road stockpiling facility is located in close proximity to the unnamed tributary of the Mangatengehu Stream. A Council Officer undertook a spring and a late summer survey of four specific monitoring sites on this tributary.

Please note that the specific biomonitoring reports are now reported separately from this report, however a summary of each survey is provided in Section 2.1.6.

1.4.6 Review of consent holder data

In accordance with the consent conditions the consent holder or subsidiary must supply the Council with an annual report. The annual report is to contain information pertaining to the records kept by the consent holder and shall include but not be limited to:

- the location from which the drilling waste originated;
- the composition of the waste, including analytical analysis of a specified range of analytes;

- the stockpiling locations if utilised;
- volume of material;
- the areas landfarmed, including a map;
- volumes of wastes landfarmed; and
- details of monitoring undertaken.

A letter report was provided by the management Company (MI SWACO) this monitoring year. This is appended as appendix II.

2 Results

2.1 Surrey Road stockpiling facility

The Surrey Road stockpiling facility (Figure 1) is located on the Taranaki ring plain bordering the Egmont National Park near Inglewood. An unnamed tributary of the Mangatengehu Stream flows adjacent to the facility. The proximity of the site to this recognised ecosystem had been taken into account in the setting of buffer distances and location of the stockpiling facilities.

The predominant soil type has been identified as gravelly sand and vegetation growth consists of native bush which transitions into pasture. Average annual rainfall for the site is 1,942 mm (taken from the nearby 'Stratford' monitoring station).

The stockpiling facility located at Surrey Road is operated under one consent (7559-1.4). This consent allows the consent holder to discharge specific quantities of drilling related material (consisting of drilling cuttings, drilling fluids and muds, both WBM and SBM) onto land for stockpiling purposes.

The landfarming or landspreading of material is actioned under a separate consent (7591-1.2) which is discussed later in this report. No consents are held to discharge stormwater from this stockpiling site; it is expected to comply with the permitted activity criteria of Rule 23 in the Regional Freshwater Plan for Taranaki (RFP). However contaminated stormwater is required to be pumped from the irrigation pit to the adjacent paddock.



Figure 1 Surrey Road stockpiling facility and monitoring locations

Site data	
Location	
Word descriptor:	Surrey Road, Inglewood, Taranaki
Map reference:	E 1701847
(NZTM)	N 5651476
Mean annual rainfall:	1,942 mm
Mean annual soil temperature:	-
Mean annual soil moisture:	-
Elevation:	~500 MASL
Geomorphic position:	Ring plain
Erosion / deposition:	Negligible
Vegetation:	Transitional-native bush to pasture
Parent material:	Tephra / volcanoclastic
Drainage class:	Free / well draining

2.1.1 Inspections

02 July 2019

During the inspection the following was noted. No recent mud deliveries had occurred. The lined storage pits had available storage capacity for stormwater ingress. At the time works were yet to occur to landfarm the content of the pit with the suspected degraded liner. The stormwater irrigation pond was essentially empty, however the outlet pipe was yet to be blocked off. A new pump had been brought to site for irrigation activities. On observation the irrigated area looked good and all receiving pasture appeared healthy, with no ponding or run-off into drains to have occurred.

At the time no visible hydrocarbons were discharging into the receiving drain from the nova-flow (GND2517) located under the storage pits. The discharge from the final stormwater pond (IND1067) was clear and no adverse effects were observed within the receiving waters. No recent landfarming activities had occurred.

The recently spread muds in the north west paddocks (86 and 87 b and c) had pasture strike occurring across all areas, and all surrounding drains were running clear. There was no rill erosion noted and no muds were found at the soil surface. Pasture strike was also occurring across the spreading area at the old Derby Road storage site².

22 August 2019

During the inspection the following was noted. No objectionable odours or visible emissions were found during the inspection. A new storage pit had been constructed and it was concrete lined. At the time of the observation no muds had been discharged into the pit. The adjacent storage pit was essentially full; the liquid 'balance' pit was also at capacity. However the irrigation storage pit, down gradient of the balance pipe had plenty of available capacity.

² For further information with respect to the former Derby Road site please refer to Technical Report 2019-73

The irrigation receiving pasture appeared healthy and the irrigator was well positioned with regards to buffer distances. No works had occurred to empty the storage pit with the degraded liner. The stormwater treatment ponds were free of surface hydrocarbons, the discharge was clear and no deleterious effects were occurring in the receiving waters at the time of inspection.

11 October 2019

During the inspection the following was observed. No objectionable odours or visible emissions were found during the inspection. Approximately 30 metal mud containers were stored at the site. The contents were being discharging into the lined storage pits. The solids pit was essentially full, the liquids pit appeared to contain liquids only, surface hydrocarbons were prevalent, and all the pits linked to the irrigation pit were full and discharging the liquid portions into the irrigation pit.

At the time the pump was present but not operational. As a process the liquids were discharging from the pit into the receiving drain³. The drain was slightly discoloured and surface hydrocarbons were present. A sample of the discharge was collected. This had a drilling mud/hydrocarbon odour; a sample from the final stormwater pond and receiving water samples were also collected. This did not display any perceived effects at the time of inspection.

The irrigation area was then inspected. There was no evidence of recent irrigation to have occurred. Had the irrigator been operating buffer distances would have been adhered to. During the inspection a fuel tanker refuelled the irrigation pump but the pump did not automatically start.

15 October 2019

An inspection was undertaken to confirm the discharge from the irrigation pond into the stormwater drain had ceased. Inspection found that the pond level was below the point of discharge (approximately 30 cm below the balance pipe), and the pump was not operating. The irrigation area was inspected: no ponding or apparent run-off was found and the receiving pasture appeared healthy. The adjacent drain was running slightly turbid due to recent rains.

07 January 2020

During an inspection the following was noted. Drilling muds were stored in lined pits. These appeared secure at the time of inspection and the balance pipes were free to convey storm water to the irrigation pond if required. The metal storage containers remained on-site and the contents were secure. All pods had lids in place and stormwater ingress was considered unlikely.

The irrigation pond was essentially empty. The irrigated area looked good on observation, and no ponding or evidence of run-off was found. No hydrocarbons were discharging from the nova-flow (GND2517) pipe under the storage pits. The final stormwater treatment ponds were free of surface hydrocarbons and the discharge was clear. No adverse effects were observed within the receiving waters.

10 February 2020

At the time of inspection the following was noted. Works were occurring to transfer the offshore generated drilling muds into the storage pits. At the time the receiving pits had available storage capacity and the liners appeared in good repair. The stormwater ponds had been emptied as the water was used to clean the

³ An infringement notice was issued for this non-compliance (ENF-22218).

storage bins. As a process, no discharges were occurring from the final storm water pond into the receiving waters and no deleterious effects were observed. No visible hydrocarbons were present discharging from the nova-flo pipe (GND2517) under the storage pits and no hydrocarbons were present on the surface of the receiving pond. The irrigation pond, on observation, was also empty. No incidents were reported.

19 May 2020

Inspection was undertaken to assess compliance with resource consent conditions. Material was being held in cell 3 from the former cell 1⁴. Cell 3 showed evidence of being compromised (photos were taken). This material was proposed to be landfarmed as per correspondence from Ruka Te Moana (MI SWACO) to TRC, and TRC received confirmation on the 30 March 2020 that the pits were now empty. The inspection found that this was not the case. A significant odour was present in the cell area which would be indicative that the storage cells still contained some residual material. This was non-compliant with condition 1 and 2, consent 7559-1.4.

20 May 2020

Inspection was undertaken by Council officers. Samples were collected from inside cell 3.

The results confirmed that material was still being held within the cell 3. Enforcement was undertaken. An abatement notice and infringement notice were issued.

2.1.2 Results of receiving environment monitoring

2.1.2.1 Groundwater monitoring

The Surrey Road stockpiling facility contains a groundwater monitoring network comprised of three monitoring wells. In addition, a nova flow which flows from under the storage pits is also sampled (GND2517). These four monitoring locations are sampled quarterly. Their locations are shown in Figure 1.

Analysis for total petroleum hydrocarbons (TPH) (C₇-C₉, C₁₀-C₁₄, C₁₅-C₃₆ and C₇-C₃₆) as well as benzene, toluene ethylbenzene and xylenes (BTEX) analysis is undertaken on three of four monitoring locations, (GND2166, 2167 and 2517). Only results recorded above the laboratory defined limit of detection (LOD) are tabulated. The quarterly results are provided in the following Tables 3-6.

Consent 7559-1.4, condition 8 states

The exercise of this consent shall not result in any contaminant concentration, within surface water or groundwater, which exceeds the background concentration for that particular contaminant, as determined by the Chief Executive, Taranaki Regional Council.

⁴ Abatement notice and infringement notice issued for this non-compliance.

Table 3 Monitoring well GND2165 2019-2020

GND2165	Collected	25 Oct 2019	13 Dec 2019	19 May 2020	16 Jun 2020
Parameter	Time	09:30	09:30	11:05	09:55
TEMP	°C	10.9	12.6	13.3	12.3
pH	pH Units	6.3	6.2	6.7	6.1
Electrical Conductivity (EC)	µS/cm	90	77	71	74
Acid Soluble Barium	g/m ³	< 0.11	< 0.11	< 0.11	< 0.11
Dissolved Barium	g/m ³	0.031	0.019	0.018	0.016
Chloride	g/m ³	6.7	5.6	5.1	6
Total Sodium	g/m ³	4.4	4	4.1	4.4
Total Dissolved Solids (TDS)	g/m ³	67	57	47	54
Nitrate-N + Nitrite-N	g/m ³	1.05	0.55	0.69	0.3

Table 4 Monitoring well GND2166 2019-2020

GND2166	Collected	25 Oct 2019	13 Dec 2019	19 May 2020	16 Jun 2020
Parameter	Time	10:25	10:30	12:00	10:50
TEMP	°C	12.2	14.1	13.3	11.1
pH	pH Units	5.5	5.7	6.1	6
Electrical Conductivity (EC)	µS/cm	44	40	51	54
Acid Soluble Barium	g/m ³	< 0.11	< 0.11	< 0.11	< 0.11
Dissolved Barium	g/m ³	0.009	0.01	0.011	0.01
Chloride	g/m ³	1.8	3.5	5.8	7.8
Total Sodium	g/m ³	2.6	2.8	4.9	4.4
Total Dissolved Solids (TDS)	g/m ³	36	21	38	35
Nitrate-N + Nitrite-N	g/m ³	0.33	0.26	0.88	0.74

Table 5 Monitoring well GND2167 2019-2020

GND2167	Collected	25 Oct 2019	13 Dec 2019	19 May 2020	16 Jun 2020
Parameter	Time	10:50	11:20	12:40	11:40
TEMP	°C	11.4	14	13.8	12.6
pH	pH Units	5.7	5.7	6.1	6
Electrical Conductivity (EC)	µS/cm	110	110	109	124
Acid Soluble Barium	g/m ³	< 0.11	< 0.11	< 0.11	< 0.11
Dissolved Barium	g/m ³	0.071	0.061	0.043	0.053
Chloride	g/m ³	10.8	10.6	11.3	16.9
Total Sodium	g/m ³	7.2	7.2	8.1	10.5

GND2167	Collected	25 Oct 2019	13 Dec 2019	19 May 2020	16 Jun 2020
Parameter	Time	10:50	11:20	12:40	11:40
Total Dissolved Solids (TDS)	g/m ³	74	71	80	77
Nitrate-N + Nitrite-N	g/m ³	1.09	1.21	1.11	2.4

Table 6 Monitoring location GND2517 2019-2020

GND2517	Collected	25 Oct 2019	13 Dec 2019	19 May 2020	16 Jun 2020
Parameter	Time	11:25	09:55	11:25	10:20
TEMP	°C	11.7	13.1	9.8	9.9
pH	pH Units	6.4	6.4	6.7	6.5
Electrical Conductivity (EC)	µS/cm	920	802	860	595
Acid Soluble Barium	g/m ³	0.45	0.36	0.41	0.24
Dissolved Barium	g/m ³	0.42	0.38	0.37	0.24
Chloride	g/m ³	199	165	200	121
Total Sodium	g/m ³	37	39	48	30
Total Dissolved Solids (TDS)	g/m ³	520	500	510	310
Nitrate-N + Nitrite-N	g/m ³	< 0.002	< 0.002	0.003	0.011
C ₇ - C ₉	g/m ³	< 0.06	< 0.10	< 0.10	< 0.10
C ₁₀ - C ₁₄	g/m ³	< 0.2	< 0.2	<u>0.4</u>	< 0.2
C ₁₅ - C ₃₆	g/m ³	0.8	< 0.4	<u>2.5</u>	< 0.4
Total hydrocarbons (C ₇ - C ₃₆)	g/m ³	0.8	< 0.7	<u>2.9</u>	< 0.7

The analysis of the four monitoring locations indicated the following:

- Minimal impacts were recorded in the three groundwater monitoring wells of GND2165, 2166 and 2167.
- Monitoring location GND2517, in comparison to the well locations, is a pipe located beneath the storage cells. This recorded more elevated concentrations of electrical conductivity, chloride, barium (both acid dissolved and soluble) and total dissolved solids than the monitoring wells. It also recorded concentrations of measurable TPH in the form of C₁₀-C₁₄, C₁₅-C₃₆ and C₇-C₃₆.

2.1.2.2 Surface water monitoring of the unnamed tributary of the Mangatengehu Stream

Surface water monitoring of the unnamed tributary of the Mangatengehu Stream and the Surrey Road stormwater discharge location (IND001067) was performed on four occasions this monitoring period. The monitoring locations are shown in Figure 1. The facility does not hold a specific stormwater discharge consent. It is expected to comply with the Regional Freshwater Plan (RFP) rule 23.

TPH and BTEX analysis was undertaken on all discharge samples (IND001067) as well as on surface water samples during the May 2020 round. No results were recorded above the LOD, and these results have not been tabulated. Similarly, no dissolved carbonaceous oxygen demand (CDBOD) was recorded above the LOD across all samples assessed.

The results of the four rounds of discharge and surface water monitoring are provided in the following Tables 7-10.

Table 7 Surface water monitoring round 1 25 October 2019

SW1	Site	MTH000060	IND001067	MTH000064
	Collected	25 Oct 2019	25 Oct 2019	25 Oct 2019
Parameter	Time	10:10	10:50	11:20
TEMP	°C	10	14.4	10.5
pH	pH Units	7.2	7.3	7.4
Electrical Conductivity (EC)	µS/cm	80	216	95
Acid soluble barium	g/m ³	NR	0.14	NR
Dissolved Barium	g/m ³	NR	0.143	NR
Total Sodium	g/m ³	6	13.4	6.7
Chloride	g/m ³	6.9	42	9.8
Total Dissolved Solids (TDS)	g/m ³	84	131	75
Total Suspended Solids	g/m ³	< 4	6	< 5

Table 8 Surface water monitoring round 2 13 December 2019

SW2	Site	MTH000060	IND001067	MTH000064
	Collected	13 Dec 2019	13 Dec 2019	13 Dec 2019
Parameter	Time	09:40	10:50	11:20
TEMP	°C	12.6	18.4	13.4
pH	pH Units	7.6	7.4	7.6
Electrical Conductivity (EC)	µS/cm	87	277	102
Acid soluble barium	g/m ³	NR	0.3	NR
Dissolved Barium	g/m ³	NR	0.174	NR
Total Sodium	g/m ³	6.4	25	7.6
Chloride	g/m ³	6.4	57	10.5
Total Dissolved Solids (TDS)	g/m ³	49	105	53
Total Suspended Solids	g/m ³	< 4	7	3

Table 9 Surface water monitoring round 3 7 May 2020

SW3	Site	MTH000060	IND001067	MTH000064
	Collected	07 May 2020	07 May 2020	07 May 2020
Parameter	Time	11:00	10:40	10:20
TEMP	°C	10.2	10.8	9.9
pH	pH Units	7.5	7	7.2
Electrical Conductivity (EC)	µS/cm	92	146	99
Acid soluble barium	g/m ³	<0.11	0.2	<0.11

SW3	Site	MTH000060	IND001067	MTH000064
	Collected	07 May 2020	07 May 2020	07 May 2020
Dissolved Barium	g/m ³	0.019	0.156	0.032
Total Sodium	g/m ³	6.2	9.5	6.9
Chloride	g/m ³	7.5	25	10
Total Dissolved Solids (TDS)	g/m ³	72	81	78
Total Suspended Solids	g/m ³	< 5	17	< 5

Table 10 Surface water monitoring round 4 16 June 2020

SW4	Site	MTH000060	IND001067	MTH000064
	Collected	16 Jun 2020	16 Jun 2020	16 Jun 2020
Parameter	Time	10:10	11:10	11:50
TEMP	°C	9.7	9.4	9.6
pH	pH Units	7.4	7.2	7.6
Electrical Conductivity (EC)	µS/cm	72	234	77
Acid soluble barium	g/m ³	NR	0.13	NR
Dissolved Barium	g/m ³	NR	0.141	NR
Total Sodium	g/m ³	5.5	13.8	6
Chloride	g/m ³	6.5	42	8.9
Total Dissolved Solids (TDS)	g/m ³	61	141	65
Total Suspended Solids	g/m ³	22	7	37

- The results for the four monitoring rounds did not indicate any significant impacts to surface water.
- Specifically small increases of conductivity, chloride, sodium and total dissolved solids were recorded as a result of the discharge on the surface water at lower monitoring location, MTH000064.
- No petroleum related impacts were recorded above the LOD and these results were not tabulated.
- No elevated oxygen demand was recorded above the LOD and these results were not tabulated.

2.1.2.3 Biomonitoring of the unnamed tributary of the Mangatengehu Stream

Two macroinvertebrate surveys of the unnamed tributary of the Mangatengehu Stream were undertaken during this monitoring period. These were conducted 6 January 2020 and 18 March 2020.

Macroinvertebrate survey 6 January 2020

A biological survey of four sites in an unnamed tributary of the Mangatengehu Stream was performed on the 6th of January 2020, to monitor the 'health' of the macroinvertebrate community of the tributary, in relation to the storage of drilling waste within its vicinity and the discharge of stormwater to land or to the stream. Samples were processed to provide number of taxa (richness), MCI, and SQMCI score for each site.

Taxa richness and abundance is the most robust index when ascertaining whether a macroinvertebrate community has been exposed to harmful discharges. Macroinvertebrates when exposed to harmful chemicals may die or deliberately drift downstream as an avoidance mechanism (catastrophic drift). The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The SQMCI takes into account taxa abundances as well as sensitivity to pollution.

Significant differences in either the taxa richness, MCI or the SQMCI between sites may indicate the degree of adverse effects (if any) of the discharge being monitored.

In the January 2020 survey taxa richness was low and ranged between five and 17 taxa. Site 2 (Table 11 and Figure 2) recorded a taxa richness of five, which was equal to the lowest recorded for this site to date. Of these taxa, all were 'rare,' which indicated that a harmful discharge has likely affected the macroinvertebrate community at this site. Site 3, further downstream also recorded a very low taxa richness (nine) and low taxa abundances, with seven 'rare' and two 'common' taxa recorded. These results also suggest possible impacts from a harmful discharge, albeit less severe than that recorded upstream at site 2. The downstream site 4, exhibited some recovery, with a total of 17 taxa recorded, the highest of the four sites surveyed. Overall, these results are concerning, and could indicate a harmful discharge entering the stream between sites 1 and 2, which has dramatically lowered taxa richness, particularly at site 2.

MCI scores were reflective of 'good' macroinvertebrate community health at sites 1 and 4, 'poor' macroinvertebrate health at site 2 and 'fair' macroinvertebrate health at site 3. Site 1 recorded an MCI score of 100 units, which was not substantially different to that recorded at sites 3 and 4. It was however significantly higher than that recorded downstream at site 2. The MCI score of 76 units recorded at site 2 was the lowest score recorded for this site to date. The significant decrease of 24 MCI units between sites 1 and 2, indicated a decline in macroinvertebrate health at site 2. Again, this supports the possibility that a harmful discharge may have entered the unnamed tributary between sites 1 and 2. A significant increase in MCI was recorded between sites 2 and 3 (by 19 MCI units), which may indicate some recovery in a downstream direction. This is supported by a further significant increase of 12 MCI units between sites 3 and 4.

SQMCI scores were reflective of 'good' macroinvertebrate health at site 1, 'poor' health at sites 2 and 3 and 'fair' health at site 4. The SQMCI scores recorded at sites 2, 3 and 4 were not significantly different to one another, while the SQMCI score recorded at 'control' site 1 was significantly higher than the three downstream sites. Typically, the macroinvertebrate communities of the two 'impacted' sites have recorded substantially lower MCI and SQMCI scores in comparison to the two upstream site, largely due to habitat differences between the sites such as increased periphyton and iron oxide deposits. However, the current survey results are not congruent with this and suggest negative changes to the preceding water quality above site 2.

Overall, these results suggest that a discharge associated with stockpiling activities has entered the stream between sites 1 and 2 that has significantly adversely affected the macroinvertebrate communities of the unnamed tributary of the Mangatengehu Stream. The primary impacted site 2 recorded very low taxa richness and low taxa abundances. MCI and SQMCI scores were both significantly lower than those recorded at 'control' site 1 and were significantly lower than the medians for the site and medians recorded by 'control' sites elsewhere in the region. Sites 3 and 4 showed some recovery in regards to taxa richness and MCI scores in a downstream direction, however, SQMCI scores at both sites 3 and 4 were significantly lower than at site 1.

It is recommended that further investigation into stockpiling activities and associated discharges are undertaken to determine the source of any toxic discharges, and that these are managed immediately to ensure water quality and the health of the macroinvertebrate communities of the Mangatengehu Stream.

Table 11 Biomonitoring site code key

Site number	Site code	Grid reference (NZTM)	Location	Altitude (masl)
1	MTH000060	E1701830 N5651430	Upstream of drilling waste stockpiling site	495
2	MTH000062	E1701954 N5651468	Approximately 85 m upstream of the spring and skimmer pit discharge	495
3	MTH000064	E1702050 N5651525	Approximately 35 m downstream of the skimmer pit discharge	490
4	MTH000066	E1702102 N5651582	Approximately 100 m downstream, of the skimmer pit discharge	485



Figure 2 Biomonitoring site locations map

Macroinvertebrate survey 18 March 2020

In the current survey, taxa richness was low to moderate and ranged between 8 and 22 taxa. Site 2 recorded eight taxa, followed by site 4, (10 taxa), and site 3 (11 taxa). 'Control' site 1 recorded a moderate 22 taxa, which was just above the median for the site. Taxa abundances were extremely low at site 2, with five out of eight taxa recorded as 'rare' and only three as 'common'. Some improvement was recorded downstream at site 3, with three out of 11 taxa recorded as 'abundant' and at site 4, where two out of 10 taxa were recorded as 'abundant'. These results indicate that macroinvertebrates may have perished or exhibited 'catastrophic drift,' downstream of a harmful discharge, with site 2 the predominately-affected site, with improvement recorded in a downstream direction. These results are concerning, and could indicate a harmful discharge entering the stream between sites 1 and 2.

Analysis of the macroinvertebrate community composition at site 2 provides further insight into possible effects related to stockpiling activities. Eight taxa have been identified as 'characteristic' to site 2 including; the 'highly sensitive' mayfly taxon (*Deleatidium*), three 'moderately sensitive' taxa (koura (*Paranephrops*) and mayflies (*Austroclima*) and (*Zephlebia* group)), and four 'tolerant' taxa (oligochaete worms, blackfly larvae (*Austrosimulium*), orthoclad midges and midge (*Polypedilum*)). In previous surveys, these taxa have been

recorded as 'abundant' or more, however in the current survey, only two taxa were recorded as 'common' while others were 'rare' or absent. Four of these 'characteristic' taxa were absent, two were recorded as 'rare' (mayfly (*Zephlebia group*) and oligochaete worms) and only two were recorded as 'common,' the 'tolerant' taxa (orthoclad midges and midge (*Polypedilum*)). These results show that 'highly sensitive' and 'moderately sensitive' taxa have dramatically decreased at this site, and no 'tolerant' taxa have remained 'abundant' or more, which is reflective of a significant decrease in macroinvertebrate community health at this site.

MCI scores were reflective of 'fair' macroinvertebrate community health at sites 1, 2 and 3, and 'good' health at site 4. Site 1 recorded an MCI score of 97 units, which was not substantially different to that recorded at site 2, but was however significantly higher than that recorded at site 3 (by 17 units). Site 4 recorded the highest MCI score of 114 units, which was significantly higher than the scores recorded at the three upstream sites and was the highest score recorded for this site to date. The MCI results of this survey were variable and indicated below average 'health' at 'control' site 1 and 2 and a significant decline in macroinvertebrate community health at site 3. In comparison to the upstream sites, there was notable recovery at site 4, which recorded the highest MCI for the site to date.

SQMCI scores were reflective of 'fair' macroinvertebrate health at sites 1, 2 and 4 and 'poor' health at site 3. The SQMCI scores recorded at sites 1, 2 and 4 were not significantly different to one another, while the SQMCI score recorded at site 3 was significantly lower than that recorded at site 1. Typically, the macroinvertebrate communities present at the two 'impacted' sites (3 and 4) have recorded substantially lower MCI and SQMCI scores in comparison to the two upstream sites, largely due to habitat differences between the sites such as increased periphyton and iron oxide deposits. However, the current survey results are not congruent with this and suggest a decrease in 'health' at site 2 and an improvement at site 4. Increased shading can be associated with a decrease in nuisance periphyton, and may be contributing to the above average SQMCI scores recorded at both sites 3 and 4.

Overall, these results suggest that a harmful discharge associated with stockpiling activities has possibly entered the unnamed tributary of the Mangatengehu Stream between sites 1 and 2 and has adversely affected macroinvertebrate communities. Site 2 recorded a very low taxa richness and low taxa abundances. MCI and SQMCI scores were both significantly lower at site 3 than at 'control' site 1, and site 2 recorded MCI and SQMCI scores that were significantly lower than the medians for the site. Site 4 recorded low taxa richness but recorded a recovery in regards to MCI and SQMCI scores. It is recommended that further investigation into stockpiling activities and associated discharges are undertaken to determine the source of any toxic discharges, and that these are managed immediately to ensure water quality and the health of the macroinvertebrate communities of the unnamed tributary of the Mangatengehu Stream. It is also recommended that an additional 'control' site be added to this monitoring programme, upstream of the current 'control' site, and well above the stockpiling site and land spreading areas, to further ascertain any downstream effects on macroinvertebrate communities.

Subsequent investigations

The finding of decreased species abundance and diversity between sites 1 and 2 prompted the Council to assess the site. Between sites 1 and 2 is a bridge (Figure 2), which supports the irrigation line to the irrigator. This irrigation line supplies an irrigator which irrigates stormwater and diluted drilling fluid to land.

For context, in the 2014-2015 monitoring period this fluid discharged via the stormwater pond system, however this resulted in decreased species abundance and diversity below the tributary discharge location. As a result an engineering control in the form of a pump and an irrigator was sought by the Company to prevent the diluted drilling material from entering the stream. This improved the stream populations as a result.

A site inspection undertaken during May 2020 identified that material remained contained within cell 3. This cell did not have a fit for purpose storage liner. The operator had communicated to Council that this

material had been landfarmed by the Company earlier in the monitoring period. This had in fact not occurred.

A sample was collected (Table 7) from the storage cell 3. Analysis of the sample showed measurable TPH, BTEX, as well as elevated chloride and barium.

Table 12 Storage cell 3 compromised liner 20 May 2020

Cell/pit 3 sample	Collected	20 May 2020
Parameter	Time	12:30
TEMP	°C	9.3
pH	pH Units	7.4
Electrical Conductivity (EC)	µS/cm	2,240
	mS/m	224
Acid Soluble Barium	g/m ³	2.3
Dissolved Barium	g/m ³	2.4
Chloride	g/m ³	650
Total Sodium	g/m ³	128
Total Dissolved Solids (TDS)	g/m ³	1,430
Nitrate-N + Nitrite-N	g/m ³	0.008
Benzene	g/m ³	0.0033
Toluene	g/m ³	0.021
Ethylbenzene	g/m ³	0.0038
o-Xylene	g/m ³	0.0073
m&p-Xylene	g/m ³	0.026
C ₇ - C ₉	g/m ³	< 0.10
C ₁₀ - C ₁₄	g/m ³	< 0.2
C ₁₅ - C ₃₆	g/m ³	< 0.4
Total hydrocarbons (C ₇ - C ₃₆)	g/m ³	< 0.7

The Company were issued an abatement notice to comply with special conditions 1, 2 and 7 of consent 7559-1.4. The compliance date for this was set 3 July 2020.

The Company were also issued with an infringement notice for discharging material to land, via the compromised storage cell liner.

An abatement notice compliance inspection was undertaken on 3 July 2020 to assess whether material had been removed from the compromised liner.

The re-inspection for abatement notice compliance found the abatement notice had been given effect to, in that material had been removed from the pit with the compromised liner. The liner had also been removed.

However, on inspection of the corresponding irrigator, it was found to be not functioning as designed. The head had been removed and it was observed discharging uncontrolled in the irrigation paddock. This was in a manner so that ponding had occurred and overland flow from the irrigator to the unnamed tributary of the Mangatengehu Stream was observed at the time. Samples were collected (Table 13).

Of the two discharge overland flow paths, one was entering the unnamed tributary between sites 1 and 2, as had been identified As determined during the biomonitoring survey some months prior.

Analysis of the incident (Table 13) recorded an increase in surface water chloride and barium (dissolved), a drop in pH, and an increase in total dissolved solids as result of the illegal discharge.

Table 13 Irrigator incident sample results

Irrigator incident	Site	MTH000060	MTH000062	Discharge to tributary	Irrigator sample
	Collected	29 Sep 2020	29 Sep 2020	29 Sep 2020	29 Sep 2020
Parameter	Time	13:24	13:40	13:47	14:04
Acid Soluble Barium	g/m ³	< 0.11	< 0.11	1.67	0.8
Dissolved Barium	g/m ³	0.016	0.102	1.71	0.73
Chloride	g/m ³	5.3	18.2	270	410
Electrical Conductivity (EC)	mS/m	6.6	11.3	97.5	152.3
pH	pH Units	7	6.6	6.3	6.9
Total Dissolved Solids (TDS)	g/m ³	60	101	590	950
Benzene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Toluene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Ethylbenzene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
m&p-Xylene	g/m ³	< 0.002	< 0.002	< 0.002	< 0.002
o-Xylene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
C ₇ - C ₉	g/m ³	< 0.10	< 0.10	< 0.10	< 0.10
C ₁₀ - C ₁₄	g/m ³	< 0.2	< 0.2	< 0.2	0.6
C ₁₅ - C ₃₆	g/m ³	< 0.4	< 0.4	< 0.4	4.3
Total hydrocarbons (C ₇ - C ₃₆)	g/m ³	< 0.7	< 0.7	< 0.7	4.9

An abatement notice was issued to cease the discharge and an infringement notice was also issued.

2.2 Landspreading and landfarming

The Company undertakes landspreading or landfarming of drilling waste material across a large consented area on the consent holder's farm (Figure 3 and 8). To date 60 paddocks have been landfarmed. In this monitoring period two paddocks (48 and 50) were utilised by the consent holder for landfarming.



Figure 3 Aerial view of the consent holder's consented landfarming area

Material received on site during the monitoring period is described in the following Table 14.

Table 14 Summary of activity Surrey Road stockpiling facility July 2019-June 2020

Operator	Well	Type	Volume	Date stockpiled	Cell	Date spread	Paddock
Todd energy	Mangahewa 26	WBM	230m ³	April 2019	1	March 2020	48
	Mangahewa 27	WBM	280m ³	May 2019	1	March 2020	48
Tamarind	Tui H3	WBM /SBM	540m ³	July 2019	1	March 2020	51
Surrey Road	Cell # 3 debris	WBM/SBM	600m ³	May 2020	1	pending	TBC
Todd energy	Mangahewa 23	WBM	25m ³	May 2020	1	pending	TBC
	McKee 9	WBM	19m ³	May 2020	5	pending	TBC
Current and future stockpiling in 2020							
OMV	MA-07A	WBM/SBM	500m ³	September 2020	1	pending	TBC
	MA-03A	WBM/SBM	500m ³	December 2020	1	pending	TBC

2.2.1 Surface water sampling

In this monitoring period the Council sampled the surface water in the unnamed tributary surrounding paddock 48. The analysis is provided in the following Table 15.

Table 15 Surface water sampling in relation to paddock 48

Surface water sampling locations	Location	1	2	3	4	5
Paddock 48	Collected	07 May 2020				
Parameter	Time	11:40	11:50	12:00	12:10	12:25
TEMP	°C	10.8	10.9	10.8	10.7	10.8
Electrical Conductivity (EC)	mS/m	8.9	9	7.1	7.1	8.4
Acid Soluble Barium	g/m ³	< 0.11	< 0.11	< 0.11	< 0.11	< 0.11
Chloride	g/m ³	6.6	6.7	7.3	7.2	9
Dissolved Barium	g/m ³	0.025	0.039	0.028	0.031	0.04
pH	pH Units	6.8	6.9	6.9	6.6	7.2
Total Dissolved Solids (TDS)	g/m ³	77	79	65	57	58
Benzene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Toluene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Ethylbenzene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
m&p-Xylene	g/m ³	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
o-Xylene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
C ₇ - C ₉	g/m ³	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
C ₁₀ - C ₁₄	g/m ³	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
C ₁₅ - C ₃₆	g/m ³	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Total hydrocarbons (C ₇ - C ₃₆)	g/m ³	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7

The analysis provided by Table 13 did not indicate any elevated contaminants of concerns. Of note, no acid soluble barium, petroleum hydrocarbons or benzene, toluene, ethylbenzene, or xylenes (BTEX) were recorded above the laboratory defined limit of detection (LOD).

An image of the location of the samples collected is provided in the following Figure 3.

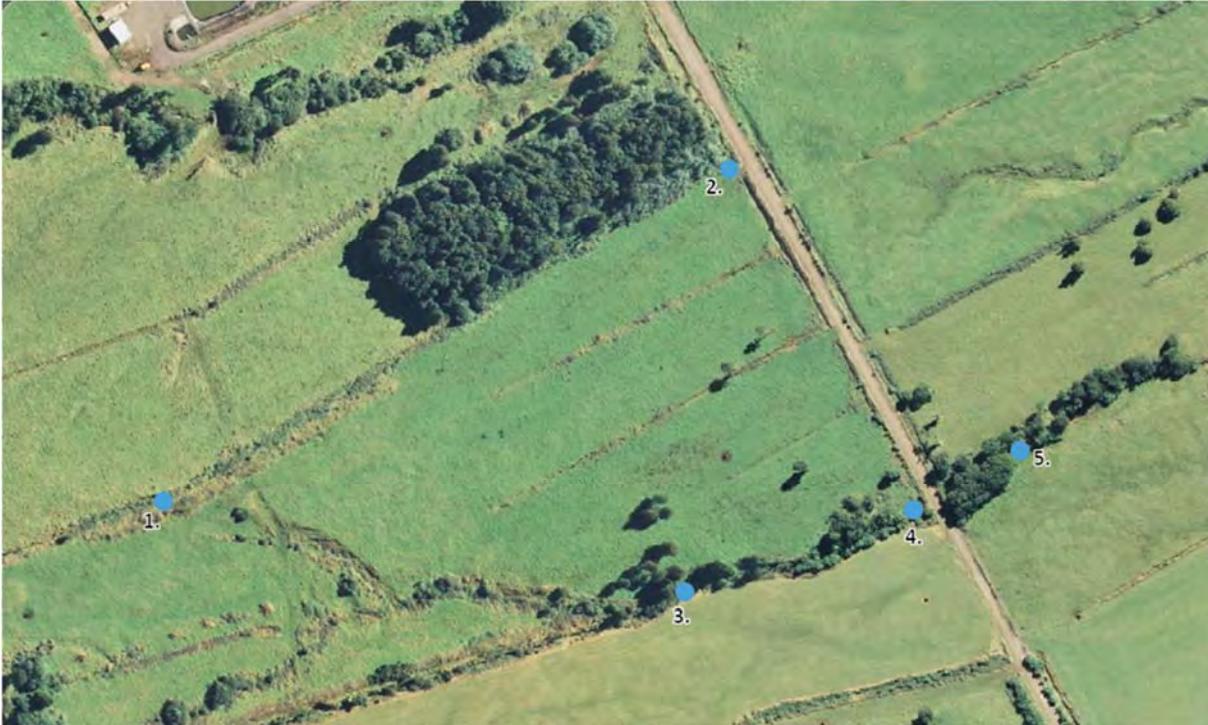


Figure 4 Surface water monitoring locations paddock 48

2.2.2 Soil sampling

Eight composite soil samples were collected from four landfarmed areas in the 2019-2020 monitoring period (Table 16). Of the four landfarmed areas sampled, two of the areas were landfarmed in the 2018-2019 monitoring period. These were paddocks 87 B and 87 C and correspond with transects E and G. One landfarmed area (Derby Road) was landfarmed at the end of the 2017-2018 monitoring period, defined by transect A-D. Paddock 51 (transects G and H) was landfarmed in the 2019-2020 monitoring period.

Polycyclic aromatic hydrocarbons which were not subject to consent defined conditions and which were not detected above the laboratory defined limit of detection were omitted from the soil analysis Table 16.

Table 16 Landfarm soil samples 2019-2020 monitoring period

Soil samples 2019-2020	Location	7591-1.2	Transect A	Transect B	Transect C	Transect D	Transect E	Transect F	Transect G	Transect H
	Paddock/site	Surrender	Derby Rd	Derby Rd	Derby Rd	Derby Rd	P 87B	P 87 C	P 51	P 51
	Collected	Limit	25 Jun 2020							
Parameter	Time		10:55	11:08	11:30	11:55	12:30	12:50	13:30	14:00
Dry Matter (Env)	g/100g as rcvd		73	77	74	69	68	63	58	64
1-Methylnaphthalene	mg/kg dry wt		0.128	0.153	< 0.014	< 0.015	< 0.015	< 0.016	< 0.018	0.082
2-Methylnaphthalene	mg/kg dry wt		0.22	0.25	< 0.014	< 0.015	< 0.015	< 0.016	< 0.018	0.154
Acenaphthene	mg/kg dry wt		< 0.4	< 0.4	< 0.014	< 0.015	< 0.015	< 0.016	< 0.018	0.065
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.027	< 0.014	< 0.013	< 0.014	< 0.015	< 0.015	< 0.016	< 0.018	< 0.04
Chrysene	mg/kg dry wt		0.014	0.019	< 0.014	< 0.015	< 0.015	< 0.016	< 0.018	< 0.04
Fluoranthene	mg/kg dry wt		0.018	0.019	< 0.014	< 0.015	< 0.015	< 0.016	< 0.018	< 0.04
Fluorene	mg/kg dry wt		< 0.4	< 0.4	< 0.014	< 0.015	< 0.015	< 0.016	< 0.018	0.071
Naphthalene	mg/kg dry wt	7.2	0.1	0.11	< 0.07	< 0.08	< 0.08	< 0.08	< 0.09	< 0.08
Phenanthrene	mg/kg dry wt		0.054	0.075	< 0.014	< 0.015	< 0.015	< 0.016	< 0.018	0.05
Perylene	mg/kg dry wt		< 0.014	< 0.013	< 0.014	< 0.015	0.029	< 0.016	< 0.018	< 0.04
Pyrene	mg/kg dry wt	160	0.015	< 0.013	< 0.014	< 0.015	< 0.015	< 0.016	< 0.018	< 0.04
Total of Reported PAHs in Soil	mg/kg dry wt		< 1.3	< 1.2	< 0.4	< 0.4	< 0.4	< 0.4	< 0.5	< 0.6
Sodium Absorption Ratio (SAR)		8*	0.7	0.9	0.5	0.4	1.1	0.8	2.1	1.2
Conductivity from soluble salts	mS/cm		0.4	0.6	< 0.2	< 0.2	0.4	0.3	< 0.2	< 0.2
pH	pH Units		7.5	7.3	7.4	7	7.3	7.1	6.1	6.3
Chloride	mg/kg dry wt	700	520	890	18	13	480	350	54	330
Soluble Salts	g/100g dry wt	0.25	0.15	0.19	< 0.05	< 0.05	0.14	0.09	< 0.05	0.07
Total Recoverable Calcium	mg/kg dry wt		36,000	25,000	12,400	5,500	11,000	10,900	2,500	4,500
Total Recoverable Magnesium	mg/kg dry wt		3,700	2,400	1,290	870	1,600	1,210	820	940
Total Recoverable Potassium	mg/kg dry wt		940	640	380	260	870	540	340	410

Soil samples 2019-2020	Location	7591-1.2	Transect A	Transect B	Transect C	Transect D	Transect E	Transect F	Transect G	Transect H
	Paddock/site	Surrender	Derby Rd	Derby Rd	Derby Rd	Derby Rd	P 87B	P 87 C	P 51	P 51
	Collected	Limit	25 Jun 2020							
Parameter	Time		10:55	11:08	11:30	11:55	12:30	12:50	13:30	14:00
Total Recoverable Sodium	mg/kg dry wt	460	600	540	870	750	670	600	520	530
Total Recoverable Barium	mg/kg dry wt		3,400	1,800	920	990	5,400	5,100	320	2,300
Total Recoverable Arsenic	mg/kg dry wt	17*	4	3	< 2	< 2	2	< 2	< 2	< 2
Total Recoverable Cadmium	mg/kg dry wt	0.8*	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.11	0.1	0.15
Total Recoverable Chromium	mg/kg dry wt	600*	22	13	6	4	9	7	5	8
Total Recoverable Copper	mg/kg dry wt	100*	35	34	45	38	41	41	42	41
Total Recoverable Lead	mg/kg dry wt	160*	6.8	4.5	3.4	3.1	9.6	10.7	4.9	6.2
Total Recoverable Mercury	mg/kg dry wt	1*	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	60*	14	8	4	< 2	5	4	2	3
Total Recoverable Zinc	mg/kg dry wt	300*	48	30	31	29	39	32	34	60
C7 - C9	mg/kg dry wt	210	< 9	< 8	< 8	< 9	< 9	< 10	< 11	< 10
C10 - C14	mg/kg dry wt	150	650	290	< 20	< 20	870	610	< 30	1,680
C15 - C36	mg/kg dry wt	1,300	13,600	8,600	620	195	3,700	2,700	164	4,900
Total hydrocarbons (C7 - C36)	mg/kg dry wt		14,300	8,900	640	210	4,500	3,300	177	6,500
Benzene	mg/kg dry wt	1.1	< 0.06	< 0.06	< 0.06	< 0.07	< 0.07	< 0.08	< 0.09	< 0.08
Toluene	mg/kg dry wt	82	< 0.06	< 0.06	< 0.06	< 0.07	< 0.07	< 0.08	< 0.09	< 0.08
Ethylbenzene	mg/kg dry wt	59	< 0.06	< 0.06	< 0.06	< 0.07	< 0.07	< 0.08	< 0.09	< 0.08
m&p-Xylene	mg/kg dry wt	59	< 0.12	< 0.11	< 0.12	< 0.13	< 0.14	< 0.15	< 0.17	< 0.15
o-Xylene	mg/kg dry wt		< 0.06	< 0.06	< 0.06	< 0.07	< 0.07	< 0.08	< 0.09	< 0.08

*Denotes consent values which should not be exceeded

- The following polycyclic aromatic hydrocarbon (PAHs) compounds were recorded:
 - Methylnaphthalene, 2- methylnaphthalene, acenaphthylene, chrysene, fluoranthene, fluorene, naphthalene, phenanthrene, perylene, and pyrene. These were recorded at trace concentrations.
 - Of the specific compounds (benzo (a) pyrene, naphthalene and pyrene) which relate to consent surrender concentrations, all results were below consent defined limit for surrender.
- Sodium absorption ratio results did not exceed 2.1 SAR. The consent limit is set at 8 SAR.
- The pH of the soil samples ranged 6.1 -7.5 pH.
- Chloride analysis indicated a range of 13- 890 mg/kg. The limit for surrender is set at <700 mg/kg. Transect B remained above this limit.
- In terms of soluble salts, the analysis indicated all soil transect remained below the consent surrender limit which is set at <0.25 g/100 g. Ranging <0.005 – 0.19 g/100 g.
- Calcium results ranged 2,500-36,000 mg/kg. The higher results were recorded in the former Derby Road soil samples, transects A- D.
- Magnesium ranged 820 – 3,700 mg/kg.
- Potassium ranged 260 – 940 mg/kg.
- Sodium ranged 520 – 870 mg/kg. The limit for surrender is set at < 460 mg/kg. All samples were above this limit and surrender of the consent cannot yet be considered
- Barium results ranged 320- 5,400 mg/kg. The higher end of the results were recorded in the previously landfarmed areas of 87 B and 87 C.
- Total recoverable heavy metal results, which have set limits defined by consent, remained below the consented limit across all samples.
- In terms of petroleum hydrocarbons
 - C₇-C₉ results remained below the LOD across all samples.
 - Mid-range C₁₀-C₁₄ results ranged from below the LOD to 1,680 mg/kg. All samples which recorded measurable C₁₀-C₁₄ were recorded above the set limit of for surrender, <150 mg/kg.
 - C₁₅-C₃₆ were recorded in all samples analysed, ranging 164 – 13,600 mg/kg. The concentration for surrender is set at <1,300 mg/kg. Transects C, D and G were below this limit.
- Benzene, toluene, ethylbenzene and xylenes (m, p and o) were below the LOD.

The analysis indicated that all soil sample locations remain above the limit for surrender, due to elevated levels of sodium and petroleum hydrocarbons.

A map of the consent holder's spread area is provided in Figure 8. A map of each soil transect is provided in the following Figures 4 -6.

Officer's note

A significant number of landfarmed areas remain active to the consent 7591-1.2. These landfarmed areas number over 60 paddocks. To date only two paddocks (83 and 84) have been assessed for surrender criteria and these were re-used in the 2017-2018 monitoring period.

It is suggested that the consent holder and its associated management Company (MI SWACO) plan to have a portion of these paddocks assessed for surrender potential in the upcoming monitoring period.

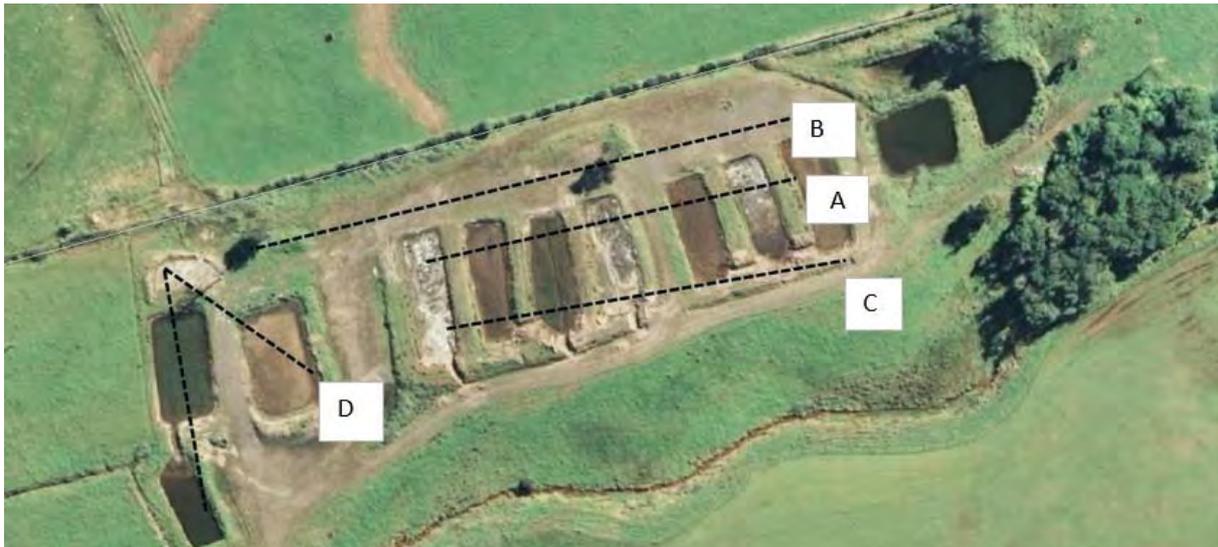


Figure 5 Soil sample transects A - D former Derby Road storage facility

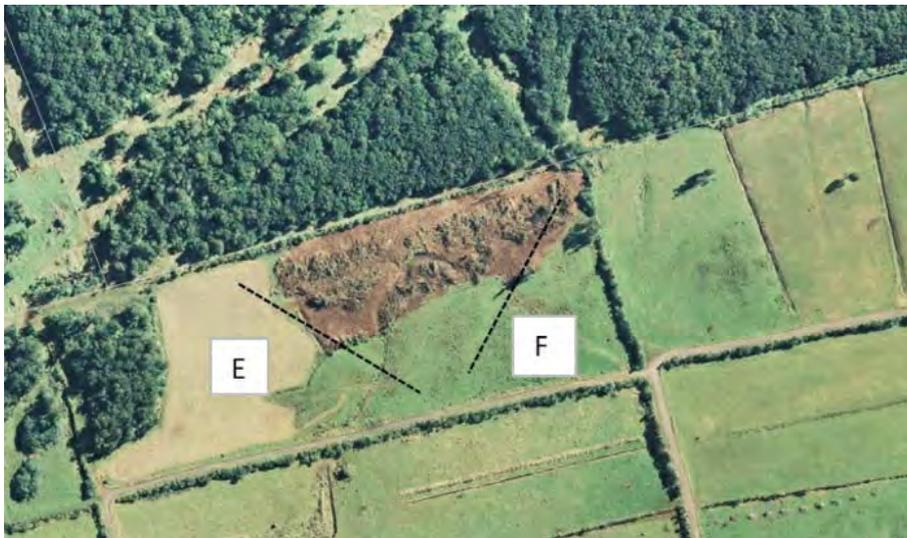


Figure 6 Soil sample transects E and F paddocks 87 B and C

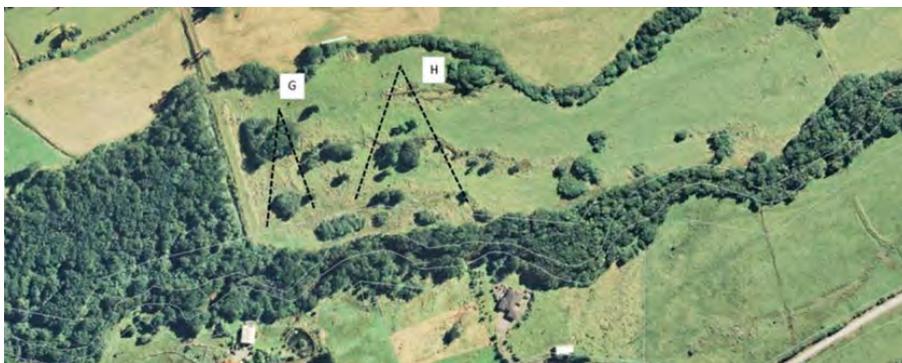


Figure 7 Soil sample transects G and H paddock 51

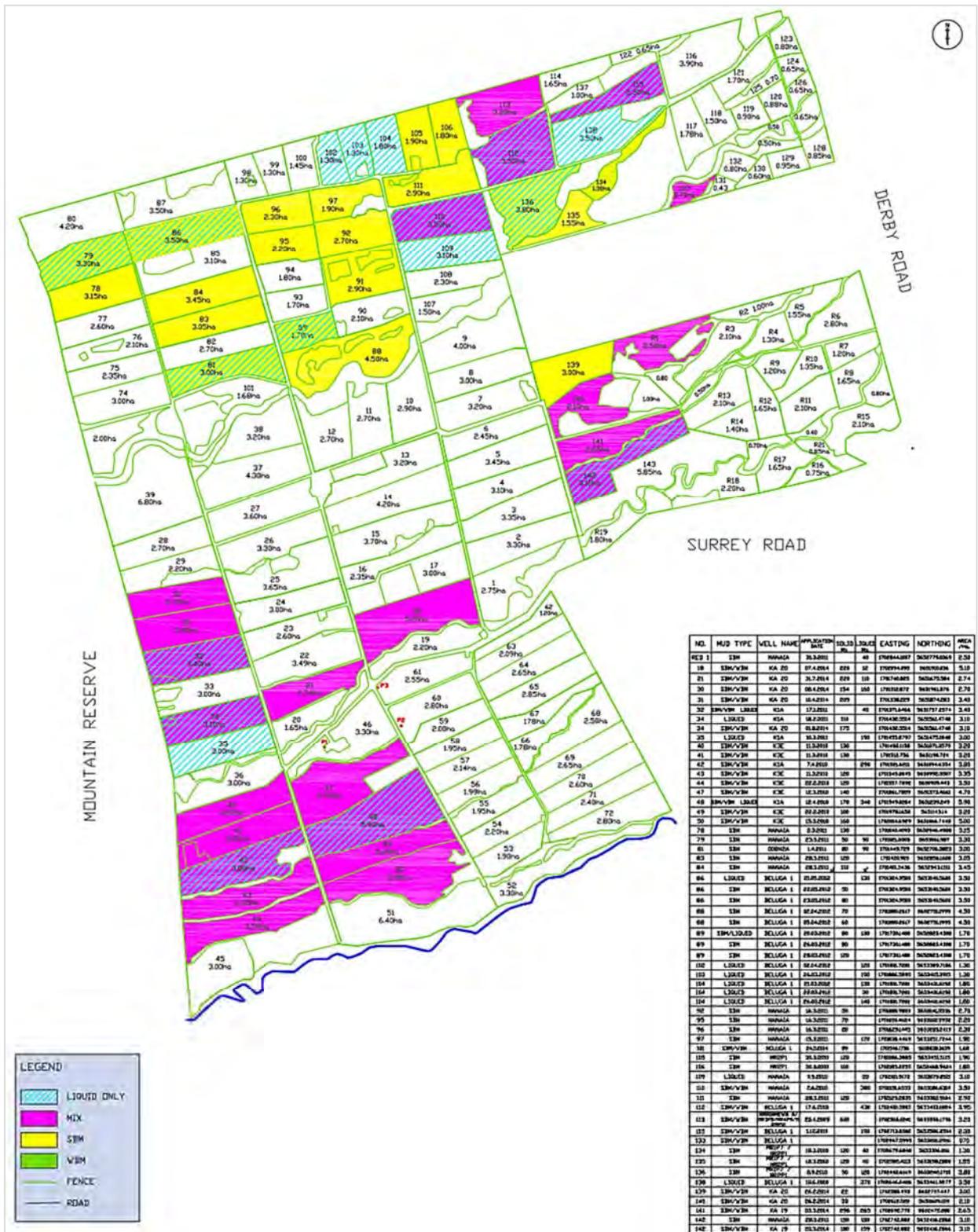


Figure 8 CD Boyd landfarming landspreading area map

2.3 Incidents, investigations, and interventions

The monitoring programme for the year was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with the 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 causes of non-compliance or failure to maintain good practices. A pro-active approach, that in the first instance avoids issues occurring, is favoured.

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

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

Table 17 below sets out details of any incidents recorded, additional investigations, or interventions required by the Council in relation to the consent holder's activities during the 2019-2020 period. This table presents details of all events that required further investigation or intervention regardless of whether these were found to be compliant or not.

Table 17 Incidents, investigations, and interventions summary table

Date	Details	Compliant (Y/N)	Enforcement Action Taken?	Outcome
October 2019	Observed during inspections was the irrigation pond (pit 4) discharging into the site surface drain rather than being pumped to irrigation area. This also occurred in April 2019. This is a breach of consent 7591-1.2, condition 2.	N	Infringement notice	Pump re-fuelled and irrigation from irrigation pit to irrigation area re-commenced
March 2020	Paddock 48 re-used without prior analysis. Breach of consent 7591-1.2, condition 12	N	No	Downgraded annual report scoring, additional samples will be collected in upcoming monitoring period.
2018-2019 through to May 2020	Excavated pit 1 material stored in pit 3. Pit 3 did not have a fit for purpose liner and constituted a breach of consent 7559-1.4 condition 2.	N	Abatement and infringement notice issued	Material removed from compromised pit 3 and moved to fit for purpose pit 1. Pit 3 decommissioned.
September 2020	Irrigator from pit 3, irrigation pit, not functioning as designed. Head removed from irrigator and discharging in a manner which lead to ponding and overland flow to nearby unnamed tributary of the Mangatengehu Stream. Breach of consent 7591-1.2, condition 11,14 and 15.	N	Abatement notice and infringement notice issued	Follow up inspection indicated the irrigator was functioning as designed with no ponding or overland flow. Consent holder post this incident engaged expert opinion to prevent this re-occurring.

3 Discussion

3.1 Discussion of site performance

Surrey Road stockpiling facility held and landfarmed 1,050 m³ of drilling waste material during this monitoring period. This material was landfarmed across two paddocks, 48 and 50 respectively. This material originated from Todd Energy's Mangahewa wells, 26 and 27. It consisted of water based drilling muds. In addition, water based and synthetic based muds from Tamarind's Tui H3 well was also landfarmed.

The Surrey Road site was found to be non-compliant on a few occasions this monitoring period. The first was related to the irrigation pump which was not functioning during the October 2019 inspection. The corresponding irrigation pit (Pit 4) was observed discharging to the receiving drains, which in turn flow in to the stormwater system and then the unnamed tributary of the Mangatengehu Stream. This was the second occurrence of this within a six month period.

The second was related to the Company continuing to hold former excavation material from pit 1 and land farmable material in a compromised storage pit, pit 3. The management Company (MI SWACO) had been advised by the Council that pit 3 was compromised in the previous monitoring period (2018-2019).

In this monitoring period the Company informed the Council by e-mail that the material held within the compromised pit 3 had been landfarmed, along with the rest of the drilling waste during the farming exercises undertaken during March 2020. An inspection to assess whether this had occurred was undertaken in May 2020. The inspection found to the contrary and the Company were issued an abatement notice and infringement notice.

A follow up inspection to assess compliance with the abatement notice was undertaken after the monitoring period of this report. The follow up inspection found the compromised pit 3 had been excavated and all material (600 m³) had been removed and discharged in to a fit for purpose pit, pit 1. Pit 3 has since been retired and is proposed to be upgraded with cement, as had occurred previously with pit 1, in future, operations dependent.

The third event occurred when pit 3 had been removed from service and the illegal discharge to land ceased. However the inspection found that the corresponding irrigator, associated with the pump from pit 4 was in operation and was not functioning as designed. The head had been removed from the irrigator and the fluid was ponding in the middle of the irrigation area, resulting in two distinct overland flow paths. These were tracked to the nearby unnamed tributary of the Mangatengehu Stream. This constituted an illegal discharge to surface water. The Company were issued an abatement notice and an infringement notice for this occurrence.

Post this occurrence the Company were brought into the Council for a discussion in respect to their non-compliances. The result of the meeting was the Company were to engage expert opinion in operation of the irrigator.

Post this meeting, the Company have communicated that the irrigation system has been upgraded to a new irrigation system through the help of third party operator (AgEnviro). A solar powered live stream security camera has also been installed to enable constant supervision of the stockpiling facility (DataTalk).

The pump which enables stormwater to be irrigated to land from pit 4 has been fitted with an automatic start pump to prevent future over flow events. The associated generator has been fitted with a reserve fuel tank, in order to prevent the generator from running out of fuel, as had occurred in the past. Which led to overflow events.

Additional adjustments to the irrigation system have been proposed in the upcoming monitoring period.

These additional engineering controls will be assessed in the upcoming monitoring period.

Landspreading inspections found that previous landfarmed areas had good pasture cover which appeared healthy. It is however noted the former Derby Road stockpiling facility holds very patchy grass cover and it is recommended that at the consent holder undertakes action to mitigate the barren patches in this landfarmed area.

Landfarming was undertaken on two paddocks this period as discussed. However the consent holder did not undertake pre sampling of paddock 48, which had already been utilised by the consent holder for landfarming operations of material from site K1A in April of 2010. Reapplication of material may occur if consent defined soil conditions are met and provided to the Council, prior to re-application.

The re-application occurred and the likely effect of re-landfarming a 10 year old landfarmed paddock may be minimal. The action underlines the need for the consent holder and Company to begin submitting previously landfarmed areas for surrender assessment. As discussed in this report, the total number of landfarmed paddocks number over 60.

Water treatment sludge disposal locations remain dormant at the same two locations as the previous monitoring period. One is located at the corner of Derby and Surrey Roads, while the second location, at Surrey Road stockpiling facility, also remains in-situ. There is no consent requirement for the consent holder to landfarm this material within a set time period. The effects of the sludge management will be reported when it is finally put to land. Inspections will continue until this has been landfarmed.

3.2 Environmental effects of exercise of consents

The main environmental effects associated with the exercise of consent at the Surrey Road stockpiling facility and associated landspreading were documented during the biannual biological monitoring of the unnamed tributary of the Mangatengehu Stream.

The biologist stated the following during the January 2020 monitoring round:

Overall, these results suggest that a discharge associated with stockpiling activities has entered the stream between sites 1 and 2 that has significantly adversely affected the macroinvertebrate communities of the unnamed tributary of the Mangatengehu Stream. The primary impacted site 2 recorded very low taxa richness and low taxa abundances. MCI and SQMCI scores were both significantly lower than those recorded at 'control' site 1 and were significantly lower than the medians for the site and medians recorded by 'control' sites elsewhere in the region. Sites 3 and 4 showed some recovery in regards to taxa richness and MCI scores in a downstream direction, however, SQMCI scores at both sites 3 and 4 were significantly lower than at site 1.

The finding concerning the irrigator during September 2020, in a manner where overland flow was occurring to the unnamed tributary, between biomonitoring sites 1 and 2, suggests the reason for the decline in species documented by the Council biologist earlier in the monitoring period.

The Company has since taken actions to mitigate this by engaging expert opinion on irrigation operation, which included upgrading the irrigator from one irrigator to multiple low application units. Additional engineering controls have been discussed and deployed with further planned during the upcoming monitoring period. Inspections will assess how well these developments function over time.

In terms of onsite monitoring, the nova coil located beneath the storage cells recorded measurable petroleum hydrocarbons during the May 2020 monitoring round. This corresponds with the decommissioning of the compromised pit 3 and also deliveries of additional Todd Energy drilling mud from both Mangahewa 23 and McKee 9. The hydrocarbons were a short term impact as the follow up monitoring round did not record them above the laboratory defined limit of detection. No corresponding hydrocarbons were recorded

Landfarmed areas were found during inspections to be re-grassing well. The area which requires additional attention is the former Derby Road stockpiling facility which does not hold good grass cover and is best

described as patchy. The Company and the consent holder are reminded of their requirement to maintain pasture cover, as required by consent, post landfarming.

The former Derby Road stockpiling facility continues to record decreasing contaminant concentrations over time, though all sampled landfarmed areas remain above the limit for surrender for sodium and petroleum hydrocarbons.

Minimal effects to surface water were recorded as a process of the re-application of material in paddock 48, though the company and the consent holder need to make sure they do not re landfarm former landfarm areas without the requisite analysis submitted for assessment by the Council prior to landfarming occurring.

There have been a number of non-compliances associated with the exercise of the consent this period and the Council will require and if needs be, enforce the Company and consent holder to undertake steps to improve their overall performance in the upcoming monitoring period.

3.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Tables 18-20.

Table 18 Summary of performance for consent 7559-1.4

Purpose: To discharge drilling wastes [consisting of drilling cuttings and drilling fluids] from hydrocarbon exploration activities with WBM and SBM onto and into land for the purpose of storage prior to disposal		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Shall adopt best practicable option	Inspections	No Three abatement notices issued and three infringement notices
2. Install fit for purpose high grade synthetic liners for storage pits	Inspections	No Pit 3 observed to be compromised. Infringement issued
3. Notify Council 48 hrs prior to stockpiling wastes	Notification provided	Yes
4. Limited to wastes generated in Taranaki including the offshore region	Review of delivery records	Yes
5. No hydraulic fracturing fluids contained within wastes	Review of delivery records	Yes
6. Volume of material stored shall not exceed 4,000 m ³ at any one time	Review of delivery records and annual report documentation	Yes
7. All material spread under consent 7591 within a 12 month period	Inspections indicated material landfarmed within 12 months	Yes Current stored material is required to be landfarmed within the next 12 months

Purpose: To discharge drilling wastes [consisting of drilling cuttings and drilling fluids] from hydrocarbon exploration activities with WBM and SBM onto and into land for the purpose of storage prior to disposal		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
8. No contamination of groundwater or surface water to exceed background concentrations	Groundwater and surface water monitoring	No Monitoring of GND2517 indicated petroleum hydrocarbons May 2020. Overland flow from irrigator incident tripled the chloride concentration within the unnamed tributary of the Mangatengehu Stream. Both short term incidents
9. Consent holder shall keep records of the waste from each well including the following. <ul style="list-style-type: none"> • Specific analysis • Storage commencement • Monitoring details, locations, methods 	Records kept	Yes
10. The consent holder shall provide a report each year which includes information as per condition 9	Letter report provided	Yes
11. Review condition	Not required	N/A
Overall assessment of environmental performance and compliance in respect of this consent		Poor
Overall assessment of administrative performance in respect of this consent		Poor

Table 19 Summary of performance for consent 7591-1.2

Purpose: To discharge drilling waste from hydrocarbon exploration activities onto and into land via landspreading		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Landfarming/ landspreading definition	N/A	N/A

Purpose: To discharge drilling waste from hydrocarbon exploration activities onto and into land via landspreading		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
2. Adoption of the best practicable option	Inspection identified issue	No Three abatement notices and three infringement notices
3. Prior to the exercise of this consent a management plan must be submitted	Plan submitted November 2009	Yes
4. Notify Council 48 hours prior to landspreading/ landfarming	Notifications to Council	Yes
5. Limited to wastes generated in Taranaki including the Taranaki basin	Consent holder's records	Yes
6. No hydraulic fracturing material in waste discharged	Consent holder's records	Yes
7. Consent authorises landfarming/ landspreading as per appendix I of consent	Consent holder's records	Yes
8. Waste application layer shall not exceed: <ul style="list-style-type: none"> • 100 mm for TPH content of <50,000 mg/kg • 50 mm for TPH >50,000 mg/kg • In a rate and manner where no ponded liquids remain 	Inspections and soil sampling	Former Derby Road site contains a waste layer greater than 100 mm, though concentration less than 5% TPH, mixed with water treatment sludge. Other landfarming areas close to 100 mm
9. The exercise of this consent shall not result in chloride exceeding 800 kg/ha	Consent holder records	Not calculated in year under review
10. Nitrogen loading shall not exceed 1,000 kg/Ha over any five year period	Consent holder records	Not calculated in year under review
11. Landspreading of liquid fraction or the stormwater component of the storage pits shall be undertaken through a landspreader, injection spreader or irrigator	Inspection	No Irrigator not functioning as designed on two occasions
12. Areas where any discharge has occurred may receive future applications if the following conditions are met: 17, 19, 20, 21	Inspections indicated one area was reused without prior sampling	No. Paddock 48 reused without prior testing

Purpose: <i>To discharge drilling waste from hydrocarbon exploration activities onto and into land via landspreading</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
13. Areas landfarmed must be re-sown into pasture or crop as soon as practicable. If not achieved within two months additional measure must be undertaken	Inspections	Former Derby Road site experiencing re-vegetation issues and reseeding is on-going. Other recently landfarmed areas developing vegetation. Old landfarming areas hold good pasture
14. No waste shall be applied within: <ul style="list-style-type: none"> • 12 m of boundaries • 12 m of named streams • 6 m of other water courses 	Inspections	No Irrigator ponded and ran overland to unnamed tributary of Mangatengehu Stream
15. Liquid wastes which may flow overland shall not be discharged within 25 m of boundaries or water courses	Inspection	No See above. Abatement notice and infringement notice issued
16. Post application the material must be incorporated to a depth of 100 mm and the TPH concentration must be below 2% TPH	Inspections and sampling	Yes
17. After March 2027 constituents in the soil at any depth less than 500 mm shall meet the following standards <ul style="list-style-type: none"> • prior to areas being reused for disposal • at the time of expiry/cancellation/surrender 	Inspections and sampling	Not required at present
18. The consent may not be surrendered unless the standards specified in condition 17 are met		Testing not required
19. Concentration of metals in soil must comply with set guidelines	Sampling	Yes
20. Conductivity must be less than 400 mS/m. If background soil conductivity greater than 400 mS/m, then waste application shall not increase conductivity by more than 100 mS/m	Sampling	Yes

Purpose: To discharge drilling waste from hydrocarbon exploration activities onto and into land via landspreading		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
21. Sodium absorption ratio [SAR] must be less than 8. If background soil SAR is greater than 8, then waste application shall not increase SAR by more than 1	Sampling	Yes
22. Total dissolved solids in surface water or groundwater shall not exceed 2,500 g/m ³	Sampling	Yes
23. No contamination of groundwater or surface water to exceed background concentrations	Sampling	No Short term impacts to groundwater and surface water
24. Records to be kept by consent holder and made available to the Council	Records provided on request	Yes
25. Consent holder to report to Council by 31 August each year on records specified in condition 24	Letter report provided though late 04/11/2020	Yes
26. Optional review provision re environmental effects	Not required	N/A
Overall assessment of environmental performance and compliance in respect of this consent		Poor
Overall assessment of administrative performance in respect of this consent		Poor

Table 20 Summary of performance for consent 5821-2

Purpose: To discharge sludge and other residuals from water treatment plants in the New Plymouth and South Taranaki districts onto and into the land		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adoption of best practicable option	Inspection	Yes
2. Exercise undertaken in accordance with application	Inspection and monitoring	Yes
3. Notification to be provided prior to exercise of consent	Notification provided	Yes
4. Notification 48 hours prior to undertaking disposal of sludge to site	No deliveries in period under review	Yes
5. Sludge to be spread as per application	Inspection	Yes

Purpose: To discharge sludge and other residuals from water treatment plants in the New Plymouth and South Taranaki districts onto and into the land		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
6. Ensure sludge stockpiles areas adequately bunded and no discharge of leachate to any water course	Inspection indicated no discharge at either of the two current storage sites	Yes
7. No discharge of sludge to land within 25 m of any water course, including farm drains	Inspection. Derby Road site spread with landfarming material 2017-2018 monitoring period	Yes
8. Shall not exceed a total aluminium concentration of 55 µg/L within specific stream, farm drains or water course	Monitoring not required, no discharge	N/A
9. No area of land stripped for application may exceed 40 acres	Inspection	Yes
10. Post application, the area of land must be contoured and sown into pasture	Inspection indicated contouring and pasture strike	Yes
11. Exercise of consent shall not result in contamination of groundwater/ surface water or change in suitability of the water source	Monitoring and inspection	Yes
12. The exercise of consent shall not result in effects in surface water	No discharge to receiving waters in year under review	Yes
13. Is a lapse condition	Not applicable, consent in effect	N/A
14. Is a review condition	Not required at present	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative compliance in respect of this consent		High

Table 21 Evaluation of environmental performance over time

Year	Consent no	High	Good	Improvement req	Poor
2013-2014	6900-2	1			
	7911-1		1		
	7559-1			1	
	7591-1	N/A			
2014-2015	6900-2	1			
	7911-1	1			
	7559-1		1		
	7591-1.1	1			
2015-2016	6900-2	1			
	7911-1	1			
	7559-1.3		1		
	7591-1.1		1		
2016-2017	6900-2	1			
	7911-1		1		
	7559-1.3			1	
	7591-1.1		1		
2018-2019	6900-2		1		
	7911-1	1			
	7559-1.4			1	
	7591-1.2				1
	5821-2	1			
Totals		9	8	3	

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

3.4 Recommendations from the 2018-2019 Annual Report

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

1. THAT in the first instance, monitoring of consented activities at Derby Road stockpiling facility will cease due to the specific consents being surrendered. Compliance soil sampling will be covered under the landspreading consent 7591-1.2 in the 2019-2020 monitoring period.
2. THAT monitoring of Surrey Road stockpiling facility will continue as per the 2018-2019 monitoring period.
3. THAT monitoring of landspreading /landfarming will continue as per the 2018-2019 monitoring period. A proposal will be drawn up to begin the assessment of previously landfarmed areas on the consent holder's property. This will begin the assessment of these areas for surrender potential.
4. THAT monitoring of the water treatment sludge storage areas will continue as per the 2018-2019 monitoring period until these area have been re-instated to land.

5. THAT should there be issues with environmental or administrative performance in 2019-2020, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

The above recommendations, apart from the proposal for surrender sampling of previously landfarmed areas were undertaken.

3.5 Alterations to monitoring programmes for 2020-2021

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

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

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

1. It is proposed that for 2020-2021 the monitoring of Surrey Road stockpiling facility will continue as per the 2019-2020 monitoring period.
2. It is proposed that for 2020-2021 the monitoring of landspreading continue as per the 2019-2020 monitoring period.
3. It is proposed that for 2020-2021 the monitoring of the water treatment sludge storage areas will continue as per the 2018-2019 monitoring period until these area have been re-instated to land.

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

4 Recommendations

1. THAT in the first instance, monitoring of consented activities at Surrey Road stockpiling facility in the 2020-2021 year continue at the same level as in 2019-2020.
2. THAT in the first instance, monitoring of consented activities at landspreading in the 2020-2021 year continue at the same level as in 2019-2020.
3. THAT in the first instance, monitoring of consented activities at water treatment sludge disposal in the 2020-2021 year continue at the same level as in 2019-2020.
4. THAT should there be issues with environmental or administrative performance in 2020-2021, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

Glossary of common terms and abbreviations

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

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.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 25°C and expressed in $\mu\text{S}/\text{cm}$.
Cu*	Copper.
Cumec	A volumetric measure of flow- 1 cubic metre per second ($1 \text{ m}^3\text{s}^{-1}$).
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.
$\text{g}/\text{m}^2/\text{day}$	grams/metre ² /day.
g/m^3	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.

Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
Incident register	The incident register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
m ²	Square Metres.
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.
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.
MPN	Most Probable Number. A method used to estimate the concentration of viable microorganisms in a sample.
µS/cm	Microsiemens per centimetre.
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.
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	<i>Resource Management Act 1991</i> and including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
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 a Science Services Manager.

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Taranaki Regional Council 2019: CD Boyd Drilling Waste Stockpiling Landfarm/ Landspreading Monitoring Programme Annual Report 2019-2019. Technical Report 2019-73.

Taranaki Regional Council, 2001: Regional Fresh Water Plan for Taranaki.

Appendix I

Resource consents held by CD Boyd

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

Water abstraction permits

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

Water discharge permits

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

Air discharge permits

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

Discharges of wastes to land

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

Land use permits

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

Coastal permits

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

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

Name of
Consent Holder: Colin David Boyd
PO Box 44
Inglewood 4347

Decision Date
(Change): 20 December 2018

Commencement Date
(Change): 20 December 2018 (Granted Date: 20 November 2009)

Conditions of Consent

Consent Granted: To discharge drilling wastes (consisting of drilling cuttings and drilling fluids) from hydrocarbon exploration activities with water based muds and synthetic based muds, onto and into land for the purpose of storage prior to disposal

Expiry Date: 1 June 2027

Review Date(s): June 2019, June 2025

Site Location: Surrey Road, Inglewood

Grid Reference (NZTM) 1701847E-5651476N & 1701850E-5651480N

Catchment: Waitara

Tributary: Manganui
Mangamawhete
Mangatengehu

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

General condition

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

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
2. All waste shall be stored in pits that are lined with 'fit for purpose' high-grade synthetic liner or equivalent and the consent holder shall demonstrate, that the lined pits are suitable for storing liquid without leakage through the base or side walls. The consent holder shall monitor the integrity of the pit liners and repair or replace liners as required.

Notification and sampling requirements prior to discharge

3. The consent holder shall notify the Chief Executive, Taranaki Regional Council, (by emailing worknotification@trc.govt.nz) at least 48 hours prior to bringing wastes onto the site. Notification shall include the following information:
 - a. the consent number;
 - b. the name of the well(s) from which the waste was generated;
 - c. the type of waste; and
 - d. the volume of waste.

Discharge limits

4. Subject to condition 5, the exercise of this consent is limited to waste generated in the Taranaki region, including from outside the 12 nautical mile maritime limit within the Taranaki Basin.
5. Waste brought to the site shall not contain any hydraulic fracturing fluids.
6. The volume of material stored on the site shall not exceed 4000 m³ at any one time.
7. All material must be spread onto land in accordance with consent 7591 as soon as practicable, but no later than 12 months after being brought onto the site.

Receiving environment limits for water

8. The exercise of this consent shall not result in any contaminant concentration, within surface water or groundwater, which after reasonable mixing, exceeds the background concentration for that particular contaminant.

Monitoring and reporting

9. The consent holder shall keep records of the wastes from each individual well, including:
- a) composition of wastes, including concentrations of Metals (As, Cd, Cr, Cu, Pb, Hg, Ni and Zn), Salts (Barium, Calcium, Chloride, Magnesium, Sodium, Potassium), Hydrocarbons (Total Petroleum Hydrocarbons, Mono Cyclic Aromatic Hydrocarbons and Poly Cyclic Aromatic Hydrocarbons) and Nitrogen;
 - b) dates of commencement of storage;
 - c) details of monitoring, including sampling locations, sampling methods and the results of analysis;

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

10. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, by 31 August of each year, a report on all records required to be kept in accordance with condition 9, for the period of the previous 1 July to 30 June.

Review

11. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2019 and/or June 2025, 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 20 December 2018

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

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

Name of
Consent Holder: Surrey Road Landfarms Limited
PO Box 44
Inglewood 4347

Decision Date 20 December 2018
(Change):

Commencement Date 20 December 2018 (Granted Date: 21 January 2010)
(Change):

Conditions of Consent

Consent Granted: To discharge drilling waste cuttings (consisting of drilling cuttings and drilling fluids) from hydrocarbon exploration activities with water based muds and synthetic based muds onto and into the land via landfarming, landspreading, injection spreading and irrigation

Expiry Date: 1 June 2027

Review Date(s): June 2019, June 2025

Site Location: Surrey Road, Inglewood

Grid Reference (NZTM) 1701750E-5652370N & 1701750E-5652370N

Catchment: Waitara

Tributary: Manganui
Mangawmawhete
Mangatengehu
Waipuku

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

General condition

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

Special conditions

1. For the purposes of this consent the following definitions shall apply:
 - a. landfarming means the discharge of drilling wastes from vehicles, tanks, or other containers onto and into land, with spreading, or incorporation into the soil as soon as practicable; and
 - b. landspreading means the discharge to land of the liquid fraction of drilling wastes. This includes the stormwater component of the storage cells through the use of a landspreader and/or irrigator and/or injection spreader. Throughout the application of the liquid fraction the consent holder shall maintain pasture cover at all times.
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. For the purpose of this consent, the best practicable option will include undertaking the landfarming/landspreading/injection spreading of drilling waste during extended periods of dry weather.
3. Prior to the exercise of this consent, the consent holder shall provide, to the written satisfaction of the Chief Executive, Taranaki Regional Council, a landfarming management plan to demonstrate 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) control of site access;
 - b) procedures for notification to Council of disposal activities;
 - c) procedures for the receipt and stockpiling of drilling wastes onto the site;
 - d) procedures for the management of stormwater recovered from, or discharging from, the drilling waste stockpiling area;
 - e) methods used for the mixing and testing of different waste types;
 - f) procedures for landfarming drilling wastes (including means of transfer from stockpiling area, means of spreading, and incorporation into the soil);
 - g) contingency procedures;
 - h) sampling regime and methodology; and
 - i) post-landfarming management, monitoring and sites reinstatement.

Consent 7591-1.2

4. The consent holder shall notify the Chief Executive, Taranaki Regional Council, (by emailing worknotification@trc.govt.nz) at least 48 hours prior to landfarming/landspreading/injection spreading waste from each separate storage cell. Notification shall include the following information:
 - a) the consent number;
 - b) the name of the well(s) from which the waste was generated;
 - c) the type of waste to be applied;
 - d) the volume of waste to be applied;
 - e) the specific concentrations of Metals (As, Cd, Cr, Cu, Pb, Hg, Ni and Zn), Salts (Barium, Calcium, Chloride, Magnesium, Sodium, Potassium). Hydrocarbons (Total Petroleum Hydrocarbons, Mono Cyclic Aromatic Hydrocarbons and Poly Cyclic Aromatic Hydrocarbons) and Nitrogen in the waste prior application to land;
 - f) the specific location and area over which the waste will be applied; and
 - g) the method of application.

In order to demonstrate compliance with conditions 8, 9, 10, 11, 16, 19, 20, and 21 of this consent.

5. Subject to condition 6, the exercise of this consent is limited to waste generated in the Taranaki Region, and from outside the 12 nautical mile maritime limit, within the Taranaki Basin.
6. Waste discharged shall not contain any hydraulic fracturing fluids.
7. This consent authorises the application of material to land only within the area indicated on the attached map (Appendix 1).

Discharge limits

8. For the purposes of landfarming, wastes shall be applied to land in a layer not exceeding:
 - a) 100 mm thick for wastes with a hydrocarbon concentration less than 50,000 mg/kg dry weight; or
 - b) 50 mm thick for wastes with a hydrocarbon concentration equal to or greater than 50,000 mg/kg dry weight; and
 - c) in a rate and manner such that no ponded liquids remain after one hour, for all wastes.
9. The exercise of this consent shall not result in a chloride loading exceeding 800 kg/ha.

Consent 7591-1.2

10. The nitrogen loading (including that from any application of nitrogen fertiliser) over any area where drilling wastes are applied, shall not exceed 1000 kilograms per hectare over any 5 year period.
11. Landspreading of liquid fraction of drilling wastes and or stormwater component of the storage cells shall be undertaken through the use of a landspreader or injection spreader or irrigator. Throughout the application of the liquid fraction the consent holder shall maintain pasture cover at all times.
12. The areas where any discharge has occurred may receive future applications of material only if they meet the standards defined by conditions 17, 19, 20, 21 of this consent.
13. As soon as practicable following the landfarming of wastes the discharge area shall be re-sown into pasture (or into crop). If revegetation cannot be established within two months of the discharge, the consent holder shall undertake appropriate land stabilisation measures to minimise wind and/or stormwater erosion.
14. No waste shall be discharged within:
 - a) 12 metre(s) of property boundaries; or
 - b) 12 metre(s) of the Mangamawhete, Mangatengehu and Waipuku Streams; or
 - c) 6 metre(s) of any other surface water course (including farm drains).
15. Any liquid drilling waste which may flow over land, shall not be discharged within 25 metre(s) of property boundaries or surface water courses (including farm drains).

Receiving environment limits for soil

16. As soon as practicable following the application of drilling wastes to land, the consent holder shall incorporate the material into the soil to a depth of at least 250 mm for landfarming and 100 mm for the injection spreader, so that the hydrocarbon concentration at any point in the soil/waste mix is equal to or less than 20,000 mg/kg (2%) dry weight at any point.

Consent 7591-1.2

17. After 1 March 2027 (three months before the consent expiry date), constituents in the soil at any depth less than 500 mm shall meet the standards shown in the following table:

Constituent	Standard
Conductivity	Not greater than 290 mS/m
Chloride	Not greater than 700 mg/kg
Sodium	Not greater than 460 mg/kg
Total Soluble Salts	Not greater than 2500 mg/kg
TPH Fraction	Guideline Value Agricultural Ecological Direct Soil Contact (Fine Sand) From table 5.2
F1 (C6-C10)	210
F2 (>C10-C16)	150
F3 (>C16-C34)	1300
F4 (>C34)	5600
Canadian Council of Ministers of the Environment (CCME), in the document Canada Wide Standard for Petroleum Hydrocarbons (PHC) in Soil: Scientific Rationale, 2008. Table 5.2	
Soil Type/ Contaminant	Depth of contamination
	Surface (<1m) (mg/kg)
SANDY Silt	
MAHs	
Benzene	1.1
Toluene	82
Ethylbenzene	59
Xylene	59
PAHs	
Naphthalene	7.2
Non-carc (Pyrene)	160
Benzo(a)pyrene	0.027
Table 4.12 SANDY SILT Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (MFE 1999)	

The requirement to meet these standards shall not apply if, before 1 March 2027, the consent holder applies for a new consent to replace this consent when it expires, and that the application is not subsequently withdrawn. These conditions also apply:

- a) prior to drilling wastes being discharged onto an area that has previously been used for the disposal of drilling wastes; and
 - b) at the time of expiry, cancellation, or surrender of this consent.
18. This consent may not be surrendered unless the standards specified in condition 17 have been met.

Consent 7591-1.2

19. The concentration of metals and salts in the soil layer containing discharged material shall comply with the following criteria:

Metal/ Salt	Maximum value (mg/kg)
Arsenic ¹	17
Barium – Barite ²	10,000
Cadmium ¹	0.8
Chromium ³	600
Copper ³	100
Lead ¹	160
Nickel ³	60
Mercury	1
Zinc ³	300

¹SCS – Rural Residential MfE 2011b; ² Alberta Environment 2009; ³ NZWWA 2003, lowest of protection of human health and ecological receptors. (Biosolids to land)

20. The conductivity of the soil layer containing discharged material shall be less than 400 mS/m, or alternatively, if the background soil conductivity exceeds 400 mS/m, the application of waste shall not increase the soil conductivity by more than 100 mS/m.
21. After incorporation of the waste within the soil, the sodium absorption ratio (SAR) of the waste soil mix shall not be more than 3 units higher than background soil SAR, or exceed a SAR of 8. Alternatively if the soil SAR exceeds 8, the application of the waste shall not increase the SAR by more than 1.

Receiving environment limits for water

22. The exercise of this consent shall not result in a level of total dissolved salts within any surface water or groundwater of more than 2500 g/m³.
23. The exercise of this consent shall not result in any contaminant concentration, within surface water or groundwater, which exceeds the background concentration for that particular contaminant, as determined by the Chief Executive, Taranaki Regional Council.

Monitoring and reporting

24. For all waste discharged, the consent holder shall keep records of the following:
- the source i.e. the well from which it originated;
 - composition of wastes, as analysed in condition (4 e);
 - application areas, including a map showing individual disposal areas with GPS co-ordinates;
 - volume of wastes applied;
 - dates of commencement and completion of application events;
 - details of monitoring, including sampling locations, sampling methods and the results of analysis;

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

Consent 7591-1.2

25. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, by 31 August of each year, a report on all records required to be kept in accordance with condition 24, for the period of the previous 1 July to 30 June.

Lapse and review

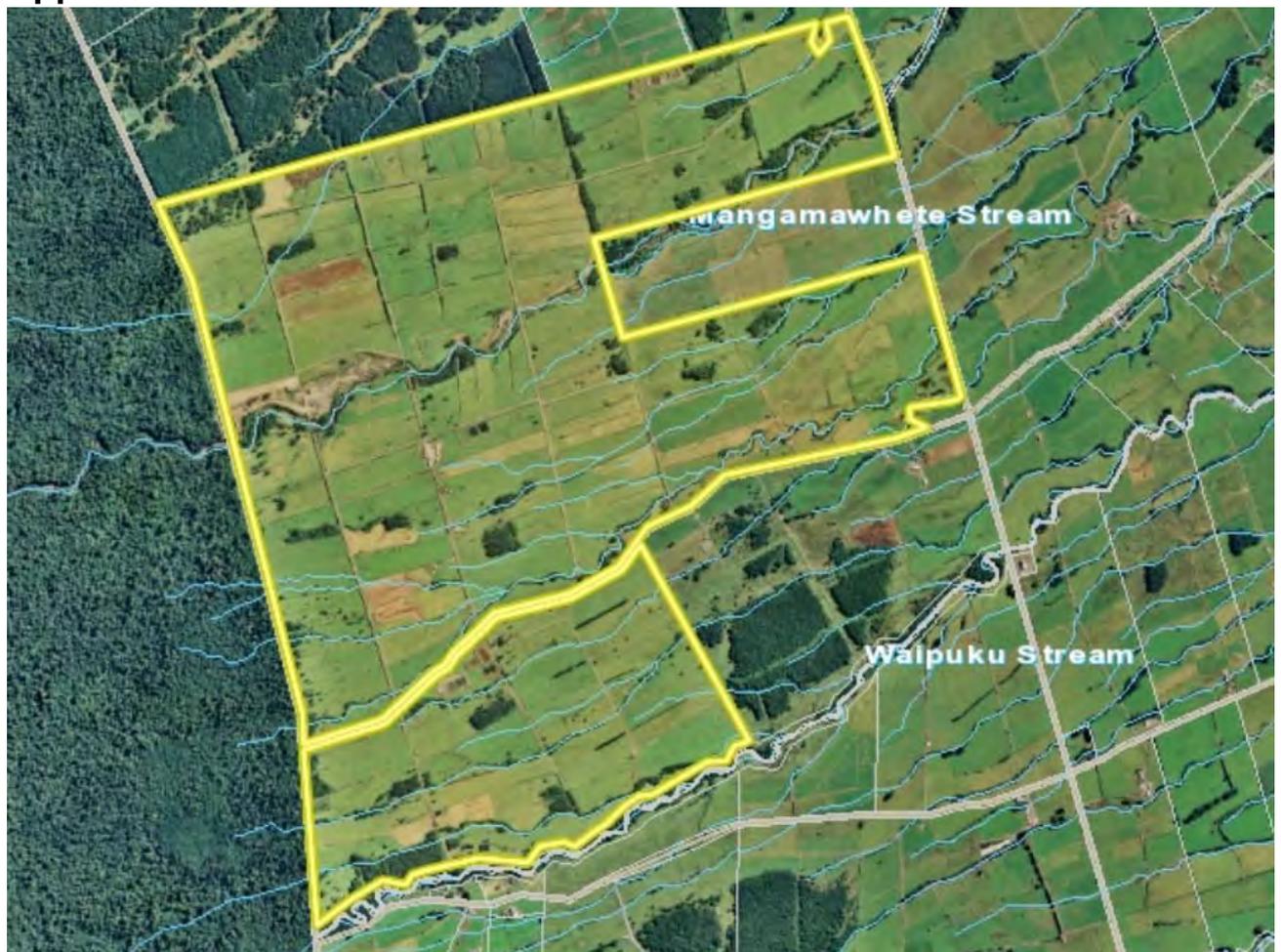
26. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2016 and/or June 2017 and/or June 2018 and/or June 2019 and/or June 2025 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, or to take into account any Act of Parliament, regulations, national policy statement, and national environmental standard which is relevant to this consent.

Signed at Stratford on 20 December 2018

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

Appendix 1



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

Name of
Consent Holder: Colin David Boyd
P O Box 44
INGLEWOOD 4347

Decision Date
(Change): 5 February 2014

Commencement Date
(Change): 5 February 2014 (Granted: 14 December 2005)

Conditions of Consent

Consent Granted: To discharge sludge and other residuals from water treatment plants in the New Plymouth and South Taranaki Districts onto and into land

Expiry Date: 1 June 2026

Review Date(s): June 2015, June 2021

Site Location: Surrey Road, Inglewood

Legal Description: Secs 9, 10 & Pt Sec 13 Blk XII Egmont SD
Lot 2 DP 344156 Blk XII Egmont SD
Secs 17 & 18 Blk XVI Egmont SD (Discharge sites)

Grid Reference (NZTM) 1701925E-5652253N

Catchment: Waitara

Tributary: Mangamawhete
Mangatengehu

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

Consent 5821-2.2

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 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.
2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of the original application and any subsequent applications to change conditions. In the case of any contradiction between the documentation submitted in support of previous applications and the conditions of this consent, the conditions of this consent shall prevail.
3. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least seven days prior to the exercise of this consent.
4. The consent holder shall notify the Taranaki Regional Council at least 48 hours prior to the transportation of the sludge to the disposal site, and again at least 48 hours prior to beginning the actual disposal operation. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz.
5. The sludge shall only be spread in the areas specified in application 4067 and 6784.
6. The consent holder shall ensure that sludge stockpiles are adequately bunded to ensure that there is no stormwater or leachate runoff to any surface watercourse, including farm drains.
7. The sludge shall not be deposited within 25 metres of the Mangamawhete Stream, the Mangatengehu Stream or the Waipuku Stream, or within 10 metres of any open drain or other watercourse.
8. The exercise of the consent shall not result in a total aluminium concentration exceeding 55ug/L in the Mangamawhete Stream, the Mangatengehu Stream or the Waipuku Stream or any open drain or watercourse including farm drains.

Consent 5821-2.2

9. The area of bare land, stripped for receipt of the residuals, exposed at any particular time shall not exceed 40 acres.
10. As soon as practicable following discharge and incorporation, the discharge area shall be contoured and sown into pasture.
11. 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.
12. The exercise of this consent shall not result in any of the following effects on surface water:
 - a) The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended material;
 - b) Any conspicuous change in the colour or visual clarity
 - c) Any emission of objectionable odour;
 - d) The rendering of freshwater unsuitable for consumption by farm animals;
 - e) Any significant adverse effects on aquatic life.
13. 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.
14. 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 and/or June 2021, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 5 February 2014

For and on behalf of
Taranaki Regional Council

A D McLay
Director-Resource Management

Appendix II

Letter report from Company

Haidie Burchell-Burger

From: Ruka Te Moana <RTeMoana@miswaco.slb.com>
Sent: Wednesday, 4 November 2020 1:45 PM
To: Nathan Crook; Lisa Stevenson
Cc: Richard Taylor; Gary McVey; Jarred Michael Wallace; Laura Fagg; matthew@mhareb.co.nz; Marcus Jesen
Subject: TRC Annual Summary 7559-1.4 and 7591-1.2 Surrey Road Land Farm 2019-2020
Importance: High

Good afternoon Nathan,

Please see the summary of activity at Surrey Road from July 2019 to July 2020:

OPERATOR	WELL	TYPE	VOLUME	DATE STOCKPILED	CELL	DATE SPREAD	PADDOCK
TODD ENERGY	Mangahewa 26	WBM	230m3	April 2019	1	March 2020	48
	Mangahewa 27	WBM	280m3	May 2019	1	March 2020	48
TAMARIND	Tui H3	WBM /SBM	540m3	July 2019	1	March 2020	51
SURREY ROAD	Cell # 3 debris	WBM/SBM	600m3	May 2020	1	pending	TBC
TODD ENERGY	Mangahewa 23	WBM	25m3	May 2020	1	pending	TBC
	McKee 9	WBM	19m3	May 2020	5	pending	TBC
CURRENT AND FUTURE STOCKPILING IN 2020							
OMV	MA-07A	WBM/SBM	500m3	September 2020	1	pending	TBC
	MA-03A	WBM/SBM	500m3	December 2020	1	pending	TBC

Non-Compliance 19th May 2020:

Some debris was still left remaining in Cell #3 after TRC had been notified that it had been completely emptied. The cell has a compromised/damaged liner so the decision was made to decommission Cell #3 and get it relined/concreted at a later date. The debris was immediately removed from Cell #3 into Cell #1.

Non-Compliance 7th July 2020:

The irrigation pond, Cell #4 was discharging into the adjacent drain which leads to the stormwater treatment system. A sample was taken of the discharge point. The irrigation pump was not going. The discharge had a hydrocarbon odour. The drain had noticeable foaming just down of the discharge point. Just up from the discharge point, a sheen was visible near the irrigation hose, this may be leaking. The drain cleared towards the stormwater ponds. An inspection of the stormwater ponds found that there were no sheens. The receiving waters were sampled and inspected. The discharge was slight turbid. No effect was noted in the receiving waters.

There was a malfunction with the float switch which failed to trigger the pump for irrigation. The float switch was replaced and the pump remained operational.

A high end, solar security camera system was installed in order to help remotely monitor the pump automation and water level in Cell #4.

Non-Compliance 29th September 2020:

During a severe weather bomb of torrential rain, the irrigated rain water from Cell #4 was pooling on paddock 49 and the sprinkler head was removed in an attempt to keep up with the incoming rainwater. This was deemed as an

uncontrolled discharge and a mixture of rainwater and irrigated rainwater was flowing from the paddock 49 into the nearby stream.

An irrigation consultant from AgEnviro was immediately employed to survey the site and prescribe a custom irrigation system (pump, hosing, fittings, sprinklers). This is being installed next week.

Please let me know if you have any further questions from your end in terms of your annual report.

Regards,

Ruka Te Moana
M-I SWACO Project Engineer / CEC
Schlumberger NZ
rtemoana@slb.com
+64 274370998

Schlumberger-Private