Shell Taranaki Ltd
Maui Production Station
Monitoring Programme
Annual Report
2017-2018

Technical Report 2018-73

ISSN: 1178-1467 (Online)
Document: 2146376 (Word)
Document: 2181051 (Pdf)

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March 2019

Executive summary

Shell Taranaki Ltd (STL), formerly Shell Todd Oil Services Ltd, operates the Maui Production Station located on Tai Road, Oaonui, in the Ngapirau catchment. This report for the period July 2017 to June 2018 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the Company's environmental and consent compliance performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of the Company's activities.

The Company holds four resource consents, which include a total of 34 conditions setting out the requirements that the Company must satisfy. STL holds two consents relating to discharges to water, one consent to discharge emissions to the air, and one to maintain a structure in the coastal marine area. Wood Group M & O also holds one consent relating to the fire training facility to the north of Maui Production Station. The consent is for a discharge to water, and has seven conditions setting out requirements that must be satisfied.

During the monitoring period, Shell Taranaki Ltd demonstrated an overall high level of environmental performance.

The Council's monitoring programme for the year under review included six inspections, one biomonitoring survey of receiving waters, and two ambient air quality analyses. The consent holder supplied information on flaring and the results of discharge water quality analysis.

Receiving water inspections, in conjunction with sampling conducted by STL during the 2017-2018 period, showed that the discharges were not causing any adverse effects on the Ngapirau Stream at the time. This was supported by the findings of the macroinvertebrate survey carried out in the stream.

There were no adverse effects noted on the environment resulting from the exercise of the air discharge consent. The ambient air quality monitoring at the Maui Production Station showed that levels of carbon monoxide, combustible gases, PM_{10} particulates and nitrogen oxides were all below levels of concern at the time of sampling. No offensive or objectionable odours were detected beyond the boundaries during inspections. One complaint was received in relation to air emissions from the site, however it was not considered that STL had breached resource consent conditions.

During the period under review, STL demonstrated an overall high level of both environmental performance and administrative compliance with the resource consents. The Maui Production Station was well managed and maintained. There was one unsubstantiated incident recorded by the Council in relation to STL's activities.

During the period under review, Wood Group M & O demonstrated a good level of environmental performance and a high level of administrative compliance with the resource consents. It is noted however that historical discharge activities at the site have had a significant adverse effect in terms of the suitability of eels for human consumption. A rahui is in effect. There was one unauthorised incident initiated by the Council in relation to Wood Group M & O's use of fire-fighting foams (Other parties may also have been involved). Investigations into the potential environmental impacts of this activity are continuing.

For reference, in the 2017-2018 year, consent holders were found to achieve a high level of environmental performance and compliance for 76% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 20% of the consents, a good level of environmental performance and compliance was achieved.

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

This report includes recommendations for the 2018-2019 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 2017 to June 2018 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by Shell Taranaki Ltd (STL), formerly Shell Todd Oil Services Ltd. STL operates the Maui Production Station situated on Tai Road, Oaonui.

The report includes the results and findings of the monitoring programme implemented by the Council in respect of the consents held by the Company that relate to discharges of water within the Ngapirau and Oaonui catchments, structures in the coastal marine area, and emissions to air from the site.

One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of the Company's use of water, land and air, and is the 27th combined annual report by the Council for the Maui Production Station.

1.1.2 Structure of this report

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

- consent compliance monitoring under the RMA and the Council's obligations;
- the Council's approach to monitoring sites though annual programmes;
- the resource consents held by STL in the Ngapirau and Oaonui catchments;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted at the Maui Production Station.

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

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

Section 4 presents recommendations to be implemented in the 2018-2019 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 significant environmental impacts and was not obliged to issue any abatement notices or infringement notices in relation to such impacts.

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

For example:

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

Improvement required: Likely or actual adverse effects of activities on the receiving environment were more than minor, but not substantial. There were some issues noted during monitoring, from self

reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent minor non-compliant activity could elevate a minor issue to this level. Abatement notices and infringement notices may have been issued in respect of effects.

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

Administrative 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 2017-2018 year, consent holders were found to achieve a high level of environmental performance and compliance for 76% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 20% of the consents, a good level of environmental performance and compliance was achieved.

1.2 Process description

The onshore Maui Production Station at Oaonui was built to process gas and condensate from the offshore Maui Field. Exploration of the Maui field began in 1969, and production commenced in 1979 from the Maui-A platform. Gas and condensate is transported 33 km from the offshore Maui-A platform to the onshore Maui Production Station via submarine pipelines. Another platform, Maui-B, was installed in 1992. Gas and condensate from Maui-B is piped 15 km to Maui-A for initial separation, and then to the production station.

The Maui Production Station separates the various hydrocarbon components, mainly by distillation. The production station supplies natural gas to the national grid and liquefied petroleum gas (LPG) is transported off-site by road tankers. Condensate is piped to storage tanks at Omata.

Facilities at the Maui Production Station include: an administration building and workshop which accommodates the control room on the upper floor; glycol trains and oil heaters located in the north west portion of the site; fractionation trains, gas trains and compressor houses; condensate storage, LPG storage and LPG load out facilities; and a flare compound that contains a 55 metre high flare stack, a radio tower, and a flare seal recovery system, located in the south western corner of the site.

The plant formerly used two flares as essential plant safety features designed to combust excess gas during planned maintenance activities, and emergency situations. A change to plant management has seen this reduced to one flare. The flare continuously burns fuel gas as a purge to prevent air ingress to the flare system (thus avoiding an explosion risk) and to maintain a pilot flame at the flare tip.

The Council is responsible for monitoring the onshore production station and pipelines within the coastal marine area (to 12 nautical miles). Monitoring of the offshore Maui-A and B platforms does not come under the jurisdiction of the Council as they are situated outside the coastal marine area.

Photo 1 Maui Production Station

1.3 Resource consents

STL holds four resource consents and Group M & O one consent relating to the Maui Production Station site, the details of which are summarised in Table 1 and outlined in sections 1.3.1 to 1.3.3.

Table 1 Resource consents held in relation to the Maui Production Station

Consent number	Purpose	Granted	Review	Expires
0245-3	To discharge treated stormwater from the Maui Production Station to the Ngapirau Stream.	1975	-	June 2018
0246-3	To discharge treated domestic effluent from the oxidation ponds at the Maui Production Station to the Ngapirau Stream	1975	-	June 2018
1228-4	To discharge treated stormwater and wastewater from fire-fighting at the Fire Training Centre at the Maui Production Station to the Oaonui Stream.	1975	-	June 2018
4052-4	To discharge emissions into the air from the refining and distribution of hydrocarbons and associated processes at the Maui Production Station site.	January 2003	-	June 2024
5224-2	To place and maintain two pipelines in, under and over the foreshore and seabed in the coastal marine area between mean high water spring and the outer limit of the territorial sea	March 1998	-	June 2025

1.3.1 Water discharge permit

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

STL holds water discharge permit **0245-3** to discharge treated stormwater from the Maui Production Station to the Ngapirau Stream. The permit was first granted in 1975. The latest renewal was issued by the Council on 11 October 2000 under Section 87(e) of the RMA. A variation to the special conditions was approved on 4 September 2013 to align the limit on suspended solids in the discharge with modern consent conditions and standards in the Council's Regional Fresh Water Plan. The consent expired on 1 June 2018 and is currently being renewed.

There are 6 special conditions attached to this consent.

Condition 1 requires an oily water separator and stormwater oil trap.

Conditions 2 and 3 impose limits on contaminants (hydrocarbons and suspended solids) in the discharge, and stipulate effects the discharge shall not give rise to in the Ngapirau Stream.

Condition 4 requires a contingency plan to be maintained.

Conditions 5 and 6 are review provisions.

STL also holds water discharge permit **0246-3** to discharge treated domestic effluent from the oxidation ponds at the Maui Production Station to the Ngapirau Stream. The permit was first granted in 1975. The latest renewal was issued by the Council on 11 October 2000 under Section 87(e) of the RMA. The consent expired on 1 June 2018 and is currently being renewed.

There are 6 special conditions attached to this consent.

Condition 1 requires the oxidation ponds to be properly and efficiently maintained to ensure consent conditions are met.

Condition 2 stipulates effects the discharge shall not give rise to in the Ngapirau Stream.

Condition 3 required the treatment system to be upgraded by 30 November 2000.

Conditions 4, 5, and 6 are review provisions.

Wood Group M & O holds water discharge permit **1228-4** to discharge treated stormwater and wastewater from fire-fighting at the Fire Training Centre at the Maui Production Station to the Oaonui Stream. The permit was first granted in 1975. The latest renewal was issued by the Council on 11 October 2000 under Section 87(e) of the RMA. The consent expired on 1 June 2018 and is currently being renewed. STL previously held this discharge permit. As the consent relates to the Maui site it is commented upon as part of this report.

There are 7 special conditions attached to this consent.

Condition 1 requires the settling ponds to be operated and maintained to meet the conditions of this consent.

Conditions 2 to 4 impose limits on contaminants, and stipulate effects the discharge shall not give rise to in the receiving water.

Condition 5 requires a contingency plan to be maintained.

Conditions 6 and 7 are review provisions.

The permits are attached to this report in Appendix I.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consents which are appended to this report.

1.3.2 Air discharge permit

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.

STL holds air discharge permit **4052-4** to discharge emissions into the air from the refining and distribution of hydrocarbons and associated processes at the Maui Production Station site. The current permit was issued by the Council on 9 January 2003 under Section 87(e) of the RMA. It was subsequently amended on 7 April 2005 to remove reference to carbon dioxide emissions in condition 5 after an amendment to the RMA. It was subsequently amended on 26 August 2005 through insertion of a new condition 10, along with amendments to conditions 5 and 18 (previously condition 17), to include emissions from a carbon dioxide removal plant. A change to special condition 5 was requested by STL and made on 9 August 2013 to move the due date for annual reporting from May to August. The consent is due to expire on 1 June 2024.

There are 18 special conditions attached to this consent.

Condition 1 requires the consent holder to adopt the best practicable option.

Condition 2 states that the consent holder shall minimise emissions to air by ensuring the proper and effective operation of equipment and processes.

Condition 3 requires the use of equipment to avoid, remedy or mitigate any effect on the environment.

Condition 4 requires the consent holder to undertake effective liquid separation and recovery.

Condition 5 states that the consent holder must provide the Council with a report, in August each year detailing measures to reduce emissions, gas combustion, plant efficiency, etc.

Condition 6 states that there shall be no offensive or objectionable odour beyond the boundary of the site.

Condition 7 requires the consent holder to control all emissions of sulphur dioxide to the atmosphere.

Condition 8 requires the consent holder to control all emissions of nitrogen oxides to the atmosphere.

Condition 9 requires the consent holder to control all emissions of carbon monoxide to the atmosphere.

Condition 10 states that the consent holder shall control all emissions of benzene to the atmosphere.

Condition 11 requires that the consent holder shall control all other emissions to the air from the site.

Condition 12 requires the consent holder to obtain approval from the Council prior to undertaking any significant alterations to the plant or equipment.

Condition 13 requires the consent holder to notify the Council whenever flaring is expected to occur for more than five minutes.

Condition 14 requires notification of any incident that has an impact or a potential impact, within one week of the incident.

Conditions 15 and 16 require the consent holder to keep records of all smoke emitting incidents and continuous flaring incidents.

Condition 17 states that depressurisation of the plant shall be undertaken so that emissions of smoke are minimised.

Condition 18 is a review provision.

The permit is attached to this report in Appendix I.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report.

1.3.3 Coastal permit

Section 12(1)(b) of the RMA stipulates that no person may, in the coastal marine area, erect, reconstruct, place, alter, extent, remove, or demolish any structure or any part of a 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.

STL holds coastal permit **5224-2** to place and maintain two pipelines in, under and over the foreshore and seabed in the coastal marine area between mean high water spring and the outer limit of the territorial sea. The current permit was granted by the Council on 10 March 1998 under Section 87(c) of the RMA. It is due to expire on 1 June 2025.

There are 4 special conditions attached to this consent.

Condition 1 requires STL to notify the Council prior to maintenance works.

Condition 2 stipulates that during maintenance works STL must minimise disturbance, and prevent the discharge of silt, debris, and contaminants to the coastal marine area.

Condition 3 requires the structures to be removed (where practicable) and the area reinstated if and when the structures are no longer required.

Condition 4 is a review provision.

The permit is attached to this report in Appendix I.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report.

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 Maui Production Station 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;
- in discussion over monitoring requirements;
- preparation for any consent reviews, renewals or new consent applications;
- advice on the Council's environmental management strategies and content of regional plans; and
- consultation on associated matters.

1.4.3 Site inspections

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

1.4.4 Chemical sampling

Sampling of both the discharges from the site and the water quality upstream and downstream of the discharge point (Photo 2) and mixing zone was scheduled to be carried out during the period under review, however this sampling was not completed during the monitoring period and will next be undertaken during the 2018-2019 year.

The Council undertook sampling of the ambient air quality outside the boundary of the site. A multi-gas meter was deployed on one occasion in the vicinity of each plant, with monitoring consisting of continuous measurements of gas concentrations for the gases of interest (carbon monoxide and combustible gases). A PM_{10} particulate monitor was deployed concurrently with the multi-gas meter. Two nitrogen oxide measuring devices were also deployed in the vicinity of the plant on one occasion during the year under review. STL supplied data on flaring causes and flare volumes throughout the period.

1.4.5 Biomonitoring surveys

A biological survey was performed once in the Ngapirau Stream to determine whether or not the discharge of stormwater from the site has had a detrimental effect upon the communities of the stream.

Photo 2 Discharge to the Ngapirau Stream

2 Results

2.1 Water

2.1.1 Inspections

Six routine inspections were carried out at the Maui Production Station during the 2017-2018 period. The following was found during the inspections:

17 October 2017

The site was found to be neat and tidy. Ring drains and bunds were clear of contaminants and the fire water pond water was clean. The separator at the final discharge point into the Ngapirau stream had just been cleaned out, with weeds and sediment removed. Fresh water biota was evident in the stream indicating good water quality.

No flaring, smoke, or off site odours were noted.

8 November 2017

The wind was very strong at the time of the inspection and rain had fallen overnight. Ring drains and bunds were clear and the discharge from the sewage ponds was not causing any effect in the stream. The fire water pond was clear.

Minimal flaring was being undertaken and no odours or smoke were evident.

12 January 2018

Skimmer pits were clear of contaminants and there was no discharge off site.

1 March 2018

The site was undergoing maintenance and was in the middle of a 'shutdown' at the time of the inspection. Sand blasters and other technical crew were on site. The stormwater system and all separators and ring drains were clear of contamination. Kokopu were noted in a drain, indicating good water quality.

30 April 2018

The site stormwater system and discharge to the Ngapirau stream was inspected with no effects of any previous discharges noted. The water quality within the stream and separator was observed to be very good. Ring drains and bunds were all clear of contamination and the fire water pond was clear.

No flaring was noted and there were no unusual odours.

28 June 2018

The site was found to be neat and tidy and well managed. Inspection found that the stormwater system was fit for purpose; all ring drains and bunds were clear of contaminants and the water being discharged into the Ngapirau stream was very clean.

Minimal flaring was observed, with no smoke or odours noted.

2.1.2 Results of discharge monitoring

2.1.2.1 Site stormwater

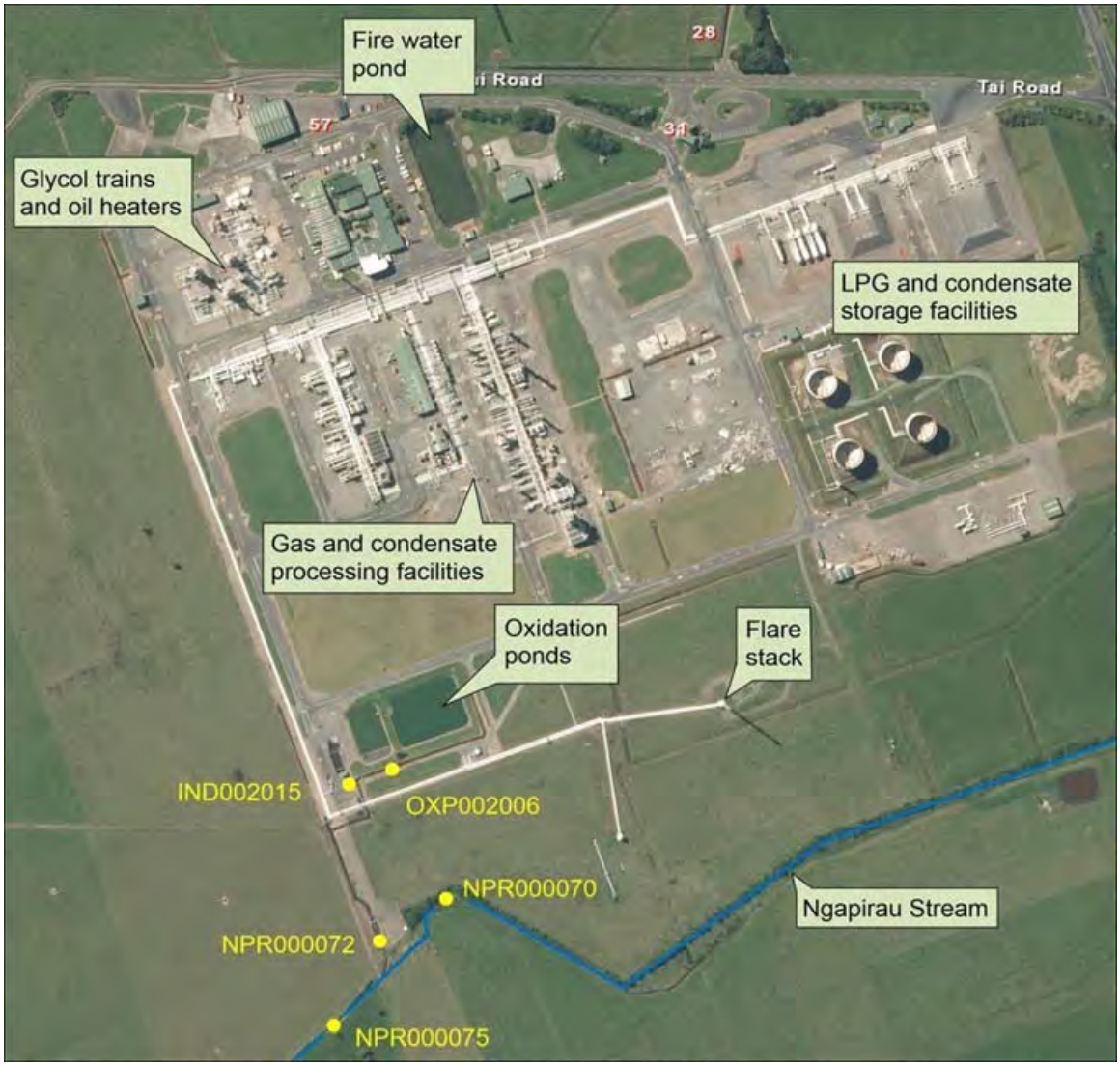

Figure 1 Maui Production Station and associated sampling sites

The stormwater network at the Maui Production Station consists of open stormwater drains around the site perimeter and stormwater pipelines from the process areas. The perimeter drains also accept stormwater runoff from Tai Road and a number of adjoining farms. The main internal discharges are into the open stormwater drains at several separate points. Stormwater from the internal catchment passes through the oily water separator before moving on to the secondary oil trap located at the south-west corner of the site.

The stormwater from inside the bunded areas does not enter into the stormwater drains and is directed straight to the oily waste separator. The stormwater in the perimeter drains goes directly to the secondary oil trap. The treated stormwater then flows to a tributary drain which discharges to the Ngapirau Stream.

STL have treated their domestic sewage on site since 1979 using a two-pond aerobic oxidation system. The discharge is to a perimeter drain, which flows to an oily water separator where it combines with the site stormwater before being discharged to the Ngapirau Stream (Figure 1).

The combined discharge from the site includes the treated stormwater discharge from process areas, the oxidation pond discharge and runoff collected in perimeter drains. It passes through a separator before entering the Ngapirau Stream.

Every month, STL provided the Council with the results for daily composite samples of the combined stormwater and oxidation ponds discharge, sampled downstream of the final separator. The results are summarised in Table 2.

Table 2 STL Maui Production Station combined discharge results summary for 2017-2018

Month	Hydrocarbons (g/m^3)		Suspended solids (g/m^3)		Glycol (g/m^3)	
Consent 0245-3 limits	***15***		***100***			
	Max	**Average**	**Max**	**Average**	**Max**	**Average**
July 2017	<2	<2	53	8	0	0
August 2017	<2	<2	51	10	0	0
September 2017	<2	<2	42	12	0	0
October 2017	<2	<2	17	7	0	0
November 2017	<2	<2	22	13	0	0
December 2017	<2	<2	28	10	0	0
January 2018	<2	<2	53	15	15	1
February 2018	2.9	<2	53	13	0	0
March 2018	<2	<2	22	7	<1	0
April 2018	3.0	<2	62	6	0	0
May 2018	3.4	<2	18	5	0	0
June 2018	<2	<2	35	5	0	0
Days limit exceeded	0		0		No limit	

Both hydrocarbon and suspended solid results were low on average and below the limit stipulated by consent 0245-3 throughout the monitoring period.

Glycol was present in four samples collected in mid-January while in March it was present twice, both times below the reporting limit of 1 g/m^3.

2.1.2.2 Fire-fighting, stormwater and wastewater discharge

Wood Group M & O operates a Fire Training Centre adjacent to the production station, to train personnel for fire and helicopter crash response. Fire training exercises are carried out approximately 25 times per year. Hydrocarbons (mainly LPG) are used as accelerants in training exercises. The residues accumulate in the first holding and settling pond, along with the wastewater used during exercises and stormwater.

The discharge is taken from the second pond from below the surface (to prevent entrainment of any hydrocarbon sheen) and flows to the Oaonui Stream. The wastewater and stormwater is held in the ponds for a varying amount of time depending on rainfall. Discharge only occurs when the ponds are full, which is usually only once or twice per month due to low inflow volumes and evaporation.

The facility is inspected regularly as part of the Council's monitoring programme for the Maui Production Station. The ponds are also checked for any discharges in conjunction with sampling at the production station. No samples were collected in the 2017-2018 period, as there were no discharges sighted during inspections.

STL samples the water in the ponds for hydrocarbon and suspended solids analyses prior to discharge. The results are provided to the Council and are presented in Table 3.

Table 3 Safety Training Centre stormwater discharge results 2017-2018

Date	Hydrocarbons (g/m^3)	Suspended solids (g/m^3)
Consent 1228-4 limits	***15***	***50***
3 July 2017	<2	21
16 August 2017	<2	19
11 September 2017	<2	1
25 September 2017	<2	22
24 October 2017	<2	5
26 March 2018	<2	28
21 May 2018	<2	4
21 June 2018	<2	11
Median (and maximum) values	<2	15 (28)

The monitoring results show that the discharge was in compliance with consent conditions.

2.1.3 Results of receiving environment monitoring

2.1.3.1 Biomonitoring

The Council's standard 'streambed-kick' technique was used at two established sites (NPR000100 and NPR000190, Figure 2) to collect streambed macroinvertebrates from an unnamed coastal stream on 7 November 2017. Sampling was undertaken relatively early, due to Taranaki experiencing a relatively dry spring. Samples were sorted and identified to provide number of taxa (richness) and MCI and $SQMCI_S$ scores for each site.

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 pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring.

Significant differences in either the MCI or the $SQMCI_S$ between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

This early-summer macroinvertebrate survey indicated that the discharge of treated wastes from the Maui Production Station site had not had any significant detrimental effect on the macroinvertebrate communities of the stream in comparison with the historical condition of these communities to date. The macroinvertebrate communities found at two sites downstream of the site discharge reflected the poor habitat present during a period of low flow conditions in early summer, but also indicated that the water quality that preceded this survey was well above average.

The macroinvertebrate communities of the stream contained few 'sensitive' taxa. However, three 'sensitive' taxa were found in abundance at site 2, and two at site 3. At both sites, taxonomic richness (number of taxa) was similar to the long-term median, and there was little change in richness between sites 2 and 3. The MCI scores were both above average. The $SQMCI_S$ score recorded at site 2 was the highest recorded at this site to date, although a below average result was recorded at site 3. Overall, this indicates ongoing improvement in water quality and/or instream habitat.

The MCI and $SQMCI_S$ scores indicated that the stream communities were of above average but still of 'poor health', although probably typical of communities in drain-like habitats in early summer.

The full biomonitoring report is attached to this report in Appendix II.

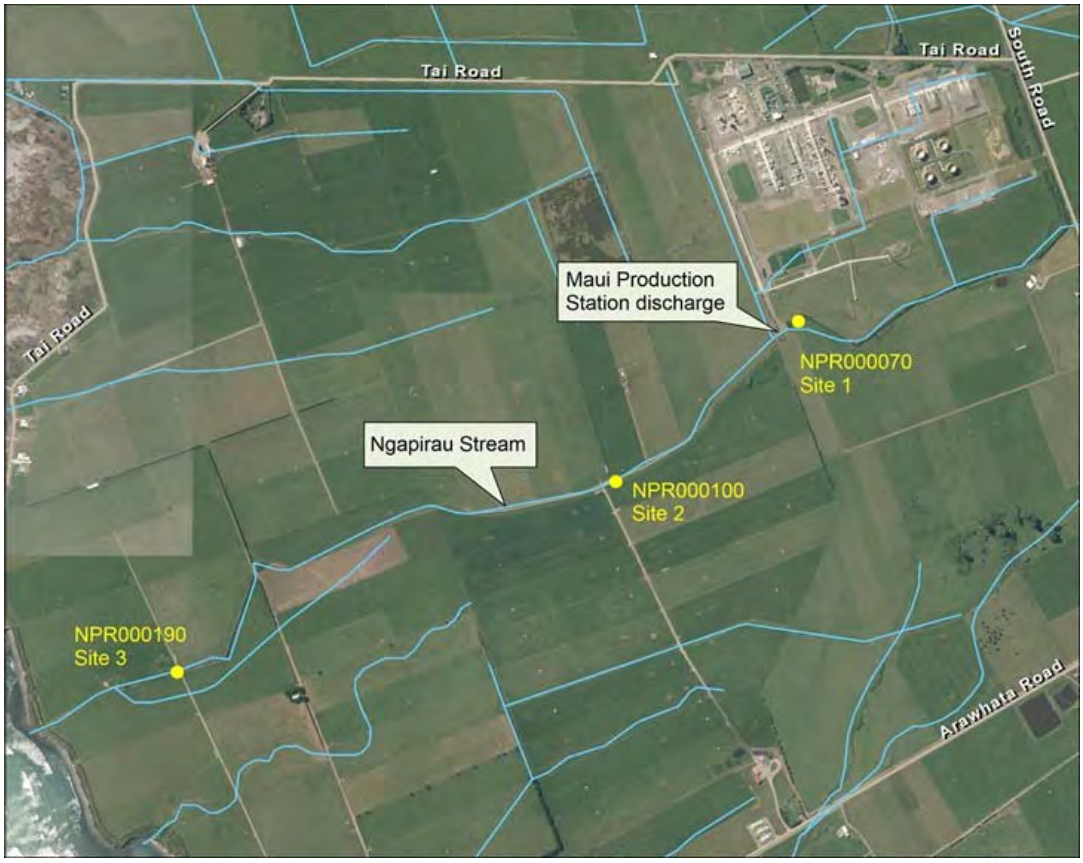

Figure 2 Biomonitoring sites in the Ngapirau Stream adjacent to the Maui Production Station

2.2 Air

2.2.1 Inspections

Air inspections were carried out in conjunction with site inspections as discussed in section 2.1.1 above. Air discharges were all found to be satisfactory, and no offensive, obnoxious or objectionable odours were noted during the inspections.

2.2.2 Results of receiving environment monitoring

2.2.2.1 Carbon monoxide and combustible gases

During the monitoring year, a multi-gas meter was deployed on one occasion in the vicinity of the plant. The deployment lasted approximately 47 hours, with the instrument placed in a downwind position at the start of the deployment. Monitoring consisted of continuous measurements of gas concentrations for the gases of interest (carbon monoxide and combustible gases). The monitoring sites used in the year under review are shown in Figure 3.

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

Photo 3 Emission sources at the Maui Production Station

Figure 3 Air monitoring sites at Maui Production Station for 2017-2018

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

Table 4 Results of carbon monoxide and LEL monitoring at Maui Production Station

Period (from-to)		6 to 8 July 2017 (47 hours)
Max	CO(ppm)	4.30
	LEL(%)	0.20
Mean	CO(ppm)	0.20
	LEL(%)	0.00

Period (from-to)		6 to 8 July 2017 (47 hours)
Min	CO(ppm)	0.00
	LEL(%)	0.00

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

The consent covering air discharges from the Maui Production Station has specific limits related to particular gases. Special condition 9 of consent 4052-4 sets a limit on the carbon monoxide concentration at or beyond the production station's boundary. The limit is expressed as 10 mg/m^3 for an eight hour average or 30 mg/m^3 for a one hour average exposure. The maximum concentration of carbon monoxide found during the monitoring run was 4.9 mg/m^3 while the average concentration for the entire dataset was 0.23 mg/m^3 which comply with consent conditions. This is in line with the pattern found in previous years.

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

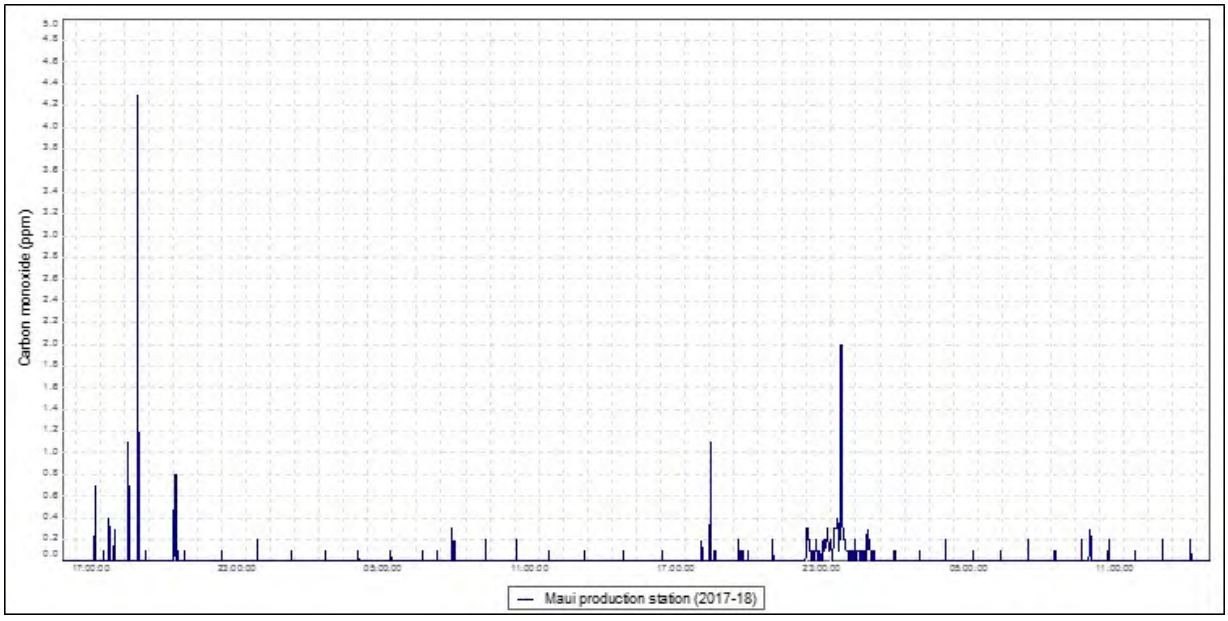

Figure 4 Ambient carbon monoxide levels in the vicinity of Maui Production Station

2.2.2.2 PM_{10} particulates

In September 2004 the Ministry for the Environment enacted National Environmental Standards (NESs) relating to certain air pollutants. The NES for PM_{10} particulates is 50 µg/m^3 (24 hour average).

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

PM_{10} particles are linked to adverse health effects that arise primarily from the ability of particles of this size to penetrate the defences of the human body and enter deep into the lungs, significantly reducing the

exchange of gases across the lung walls. Health effects from inhaling PM_{10} include increased mortality and the aggravation of existing respiratory and cardiovascular conditions such as asthma and chronic pulmonary diseases.

During the reporting period, a DustTrak PM_{10} monitor was deployed on one occasion in the vicinity of Maui Production Station. The deployment lasted approximately 41 hours, with the instrument placed in a down-wind position at the start of the deployment. Monitoring consisted of continual measurements of PM_{10} concentrations. The location of the DustTrak monitor during the sampling run is shown in Figure 3. The results of the sample run are presented in Table 5 and Figure 5.

Table 5 Daily averages of PM_{10} results from monitoring at Maui Production Station

	6 to 8 July 2017 (41 hours)	
24 hr. set	Day 1 (start to 24 hours)	Day 2 (24 hours to end)
Daily average	11.4 µg/m³	14.0 µg/m³
NES	50µg/m³	

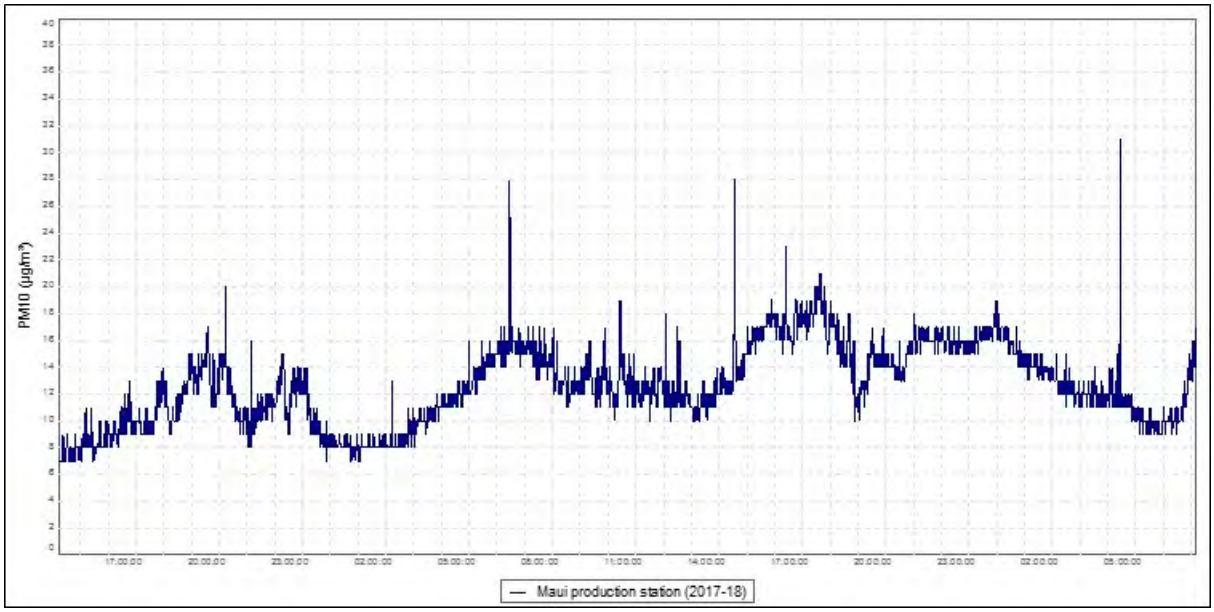

Figure 5 PM_{10} concentrations (µg/m³) at Maui Production Station

During the 41 hour run, from 6 to 8 August 2017, the average recorded PM_{10} concentration was 11.4 µg/m³ for the first 24 hour period and 14.0 µg/m³ for the second 24 hour period. These daily averages equate to 23% and 28%, respectively, of the 50 µg/m³ value that is set by the NES. Background levels of PM_{10} in the region have been found to be typically around 11 µg/m³.

2.2.2.3 Nitrogen oxides

From 2014 onwards, the Council implemented a coordinated region-wide compliance monitoring programme to measure nitrogen oxides (NOx). The programme involves deploying measuring devices at 28 NOx monitoring sites (including two sites in the vicinity of Maui Production Station) on the same day, with retrieval three weeks later. This approach assists the Council in further evaluating the effects of local and regional emission sources and ambient air quality in the region.

The consent covering air discharges from the Maui Production Station has specific limits related to particular gases. Special condition 8 of consent 4052-4 sets a limit on the nitrogen dioxide concentration at or beyond

the production station's boundary. The limit is expressed as 200 µg/m³ for a one hour average or 100 µg/m³ for a 24 hour average exposure.

NOx passive adsorption discs were placed at two locations in the vicinity of the Maui Production Station on one occasion during the year under review. The discs were left in place for a period of 21 days. The calculated one hour and 24 hour theoretical maximum NOx concentrations found at Maui Production Station during the year under review equate to 8.1 µg/m³ and 4.2 µg/m³, respectively. The results show that the ambient ground level concentration of NOx is well below the limits set out by consent 4052-4.

The full air monitoring report is attached to this report in Appendix III.

2.2.3 Summary of flaring volumes reported by STL

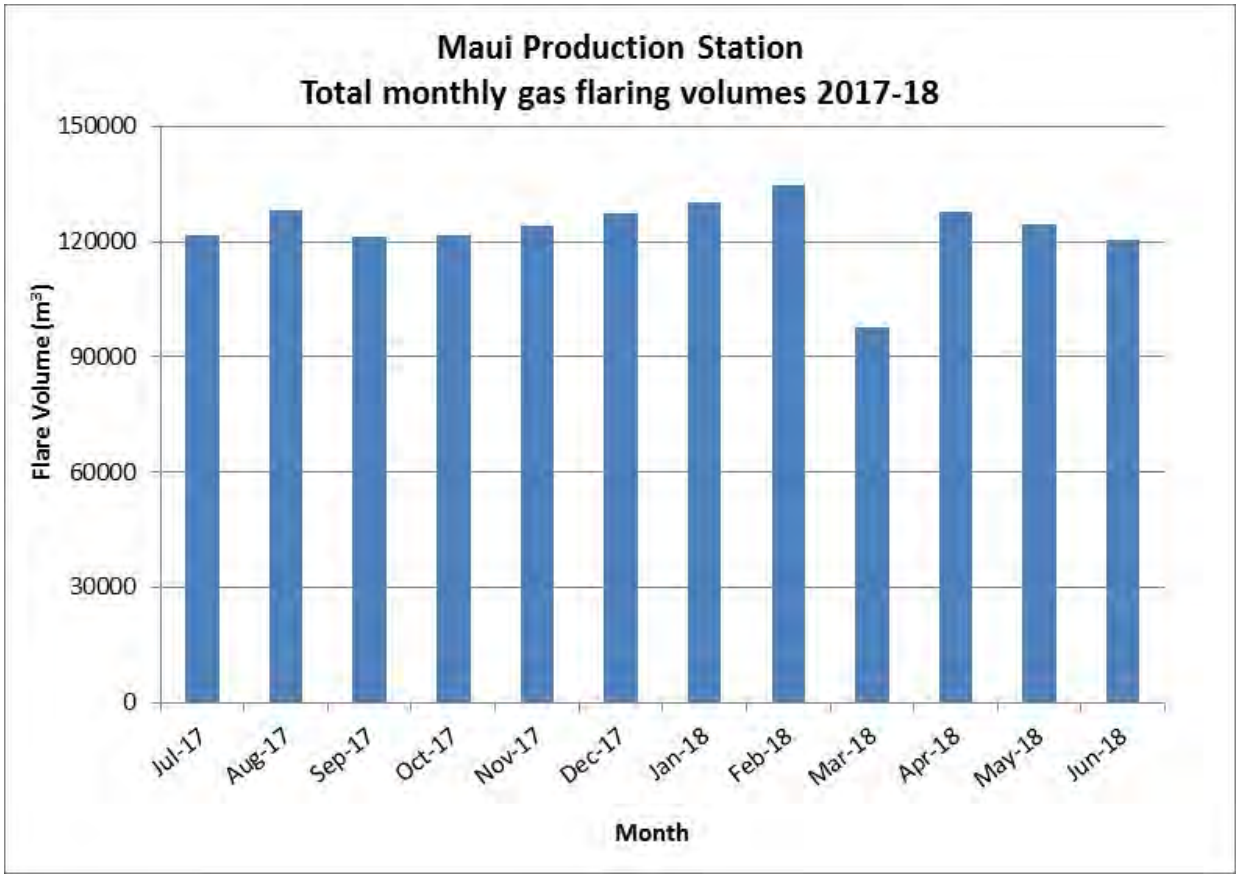

Figure 6 Monthly gas flaring for Maui Production Station under consent 4052-4

STL provided the Council with an annual report on flaring and emissions during the 2017-2018 period, as required by consent 4052-4. A summary of flaring volumes at Maui Production Station is provided in Figure 6. The total volume flared in the 2017-2018 year was 1,479,400 m³ of gas, similar to the previous monitoring period.

Flaring was relatively consistent through the period (around 123,000 m³/month), with a slight decrease in March 2018 due to a plant shutdown for maintenance purposes.

Of the 43 flaring events in the period, 42 generated light smoke which was localised and dissipated quickly. The majority of events related to plant shut-downs, process upsets, depressurisation, plant repairs and ongoing maintenance. The median duration of these events was 105 minutes. No complaints were received by STL from the public regarding flaring at the production station.

2.3 Investigations, interventions, and incidents

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

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

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

In the 2017-2018 period, the Council was required to undertake significant additional investigations and interventions, or record incidents, in association with the Company's conditions in resource consents or provisions in Regional Plans.

30 January 2018

Council received a complaint regarding black smoke discharging from the flare stack from the Maui production station at Tai Road, Oaonui. A subsequent inspection found routine intermittent flaring and essentially no smoke. An explanation was received from STL detailing how the smoke had been caused by various compressor and re-compressor trips resulting in a slightly extended period of flaring of off-gas from the fractionation train which caused more smoke from the flare as it contains heavier components. Photographs taken by the complainant at the time of the incident did not show anything which appeared to breach resource consent conditions and no further action was taken.

20 June 2018

Self-notification was received concerning the results of an investigation into the discharge of fluorosurfactant based fire-fighting foams at the Wood Group fire training facility adjacent to Maui Production Station. An inspection was undertaken as a further follow up to assess the use of PFAS aqueous film forming foams (AFFF) during fire training activities. Contractors were on site creating a temporary lined bund for the remaining AFFF currently held at the training facility. The AFFF chemicals were observed to be stored securely in 200 litre drums and 1000 litre pods which appeared to be in satisfactory condition. No spills or fugitive discharges were identified. It was outlined that testing of all but one container had confirmed the AFFF chemicals to be free of perfluorooctanesulfonic acid (PFOS). The AFFF chemicals on site at the time of the inspection were Alcoseal 3-6, Angus Tridol-S 3%, Ansulite 3X3. An unidentified chemical in a 1000 litre pod was to be disposed of in accordance with EPA requirements depending on the test results. Wood Group M & O has voluntarily stopped using AFFF for all training activities and all AFFF chemicals on site were to be disposed of via waste contractors. The company is looking to build new training facilities closer to New Plymouth and expect to vacate the current site by April 2019. STL was reportedly undertaking site investigations for PFAS contamination. The treatment pond was inspected, no foam was present and no discharge was occurring.

3 Discussion

3.1 Discussion of site performance

Monitoring of the Maui Production Station during the 2017-2018 year found that the site was well managed. All consent conditions relating to site operations and management were complied with.

An investigation is ongoing at Wood Group's Oaonui fire training facility in relation to the discharge of fluorosurfactant based fire-fighting foams.

3.2 Environmental effects of exercise of consents

Receiving water inspections, in conjunction with sampling conducted by STL during the 2017-2018 period, indicated that the discharges were not causing any adverse effects on the Ngapirau Stream at the time. This was supported by the findings of the macroinvertebrate survey carried out in the stream.

There were no adverse effects noted on the environment resulting from the exercise of the air discharge consent. The ambient air quality monitoring at the site indicated that levels of carbon monoxide, combustible gases, PM_{10} particulates and nitrogen oxides were all below levels of concern at the time of sampling. No offensive or objectionable odours were detected beyond the boundary during inspections and there were no complaints in relation to air emissions from the site.

3.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Tables 6-10.

Table 6 Summary of performance for consent 0245-3

Purpose: ***To discharge treated stormwater from the Maui Production Station to the Ngapirau Stream***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Oily water separator and stormwater oil trap operated and maintained correctly	Inspections and sampling	Yes
2. Limits on contaminants in the discharge	Company sampling	Yes
3. No effects in receiving water	Site inspections, sampling and biomonitoring	Yes
4. Contingency plan	Plan current as of September 2017	Yes
5. Review/change of consent to take account of operational requirements	Not required	N/A
6. Review of consent	Consent expired 1 June 2018	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

Table 7 Summary of performance for consent 0246-3

Purpose: *To discharge treated domestic effluent from the oxidation ponds at the Maui Production Station to the Ngapirau Stream*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Oxidation ponds maintained in aerobic condition to meet conditions	Inspections	Yes
2. No effects in receiving water	Site inspections, sampling and biomonitoring	Yes
3. Upgrade treatment system by November 2000	Upgrade completed	Yes
4. Option to review consent in 2001 to assess effectiveness of upgrade	Not exercised	N/A
5. Review/change of consent to take account of operational requirements	Not required	N/A
6. Review of consent	Consent expired 1 June 2018	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 8 Summary of performance for consent 1228-4

Purpose: *To discharge treated stormwater and wastewater from fire-fighting at the Fire Training Centre at the Maui Production Station to the Oaonui Stream* (held by Wood Group M & O)		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Settling pond operated and regularly maintained to meet conditions	Site inspections	Yes
2. Limits on contaminants in the discharge	Discharge results provided by consent holder	Yes
3. No chemicals or agents to be discharged without approval	Site inspections and liaison with consent holder	Possible breach of condition relating to foam use. Investigation ongoing.
4. No effects in receiving water	Site inspections	Yes
5. Contingency plan	Plan current	Yes
6. Review/change of consent to take account of operational requirements	Not required	N/A

Purpose: *To discharge treated stormwater and wastewater from fire-fighting at the Fire Training Centre at the Maui Production Station to the Oaonui Stream* (held by Wood Group M & O)		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
7. Review of consent	Consent expired 1 June 2018	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**Good** **High**

Table 9 Summary of performance for Consent 4052-4

Purpose: *To discharge emissions into the air from the refining and distribution of hydrocarbons and associated processes at the Maui Production Station site*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Adoption of best practicable option to minimise adverse effects	Site inspections and liaison with consent holder	Yes
2. Minimise emissions by appropriate selection, operation, supervision, control and maintenance of equipment	Site inspections and liaison with consent holder	Yes
3. Appropriate maintenance and operation of equipment	Site inspections	Yes
4. Treatment of flaring gas by effective liquid separation and recovery	Site inspections	Yes
5. Provision of annual report on flaring to council	Report received	Yes
6. No offensive, obnoxious or objectionable odours beyond site boundary	Site inspections	Yes
7. Limit on maximum ground level concentration of sulphur dioxide	Not measured, sampling in previous years	N/A
8. Limit on maximum ground level concentration of nitrogen oxides	Air quality monitoring	Yes
9. Limit on maximum ground level concentration of carbon monoxide	Air quality monitoring	Yes
10. Limit on maximum ground level concentration of benzene	Not monitored during period under review	N/A
11. Limit on maximum ground level concentration for other contaminants	Air quality monitoring	Yes

Purpose: *To discharge emissions into the air from the refining and distribution of hydrocarbons and associated processes at the Maui Production Station site*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
12. Consultation with Council prior to significant alterations to plant, processes, or operations	Site inspections and liaison with consent holder	Yes
13. Notification of flaring more than five minutes in duration	Flaring notifications received	Yes
14. Notification to Council of incidents or hazardous situations	No incidents or hazardous situations to notify this period	Yes
15. Record of smoke emitting events	Site inspections, records kept by consent holder, and liaison with consent holder	Yes
16. Maintenance of log of continuous flaring incidents	Site inspections, records kept by consent holder, and liaison with consent holder	Yes
17. Depressurisation of plant to prevent dense black smoke being discharged from the flare	Site inspections, records kept by consent holder, and liaison with consent holder	Yes
18. Optional review provision	No further option for review prior to expiry	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 10 Summary of performance for Consent 5224-2

Purpose: *To place and maintain two pipelines in, under and over the foreshore and seabed in the coastal marine area between mean high water spring and the outer limit of the territorial sea*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Notify Council before undertaking major maintenance works	Notification received	Yes
2. During maintenance works observe measures to prevent discharge and minimise disturbance	Liaison with Company	Yes
3. Structures to be removed and area reinstated when no longer required	Currently operational	N/A
4. Review of consent	No further option for review prior to expiry	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 11 Evaluation of environmental performance over time

Year	Consent no	High	Good	Improvement req	Poor
2010-11	0245-3, 0246-3, 4052-4, 5224-2	3	1		
	1228-4	1			
2011-12	0245-3, 0246-3, 4052-4, 5224-2	3	1		
	1228-4	1			
2012-14	0245-3, 0246-3, 4052-4, 5224-2	3	1		
	1228-4	1			
2014-15	0245-3, 0246-3, 4052-4, 5224-2	4			
	1228-4	1			
2015-16	0245-3, 0246-3, 4052-4, 5224-2	4			
	1228-4		1		
2016-17	0245-3, 0246-3, 4052-4, 5224-2	4			
	1228-4		1		
Totals		25	5		

During the year, STL demonstrated an overall high level of both environmental performance and administrative compliance with the resource consents as defined in Section 1.1.4. The Maui Production Station was well managed and maintained. There was one unsubstantiated incident recorded by the Council in relation to STL's activities (refer to Section 2.3, 30 Jan 2018).

During the period under review, Wood Group M & O demonstrated a good level of environmental performance and a high level of administrative compliance with the resource consents. There was one unauthorised incident initiated by the Council in relation to Wood Group M & O's use of fire-fighting foams. Investigations into the potential environmental impacts of this activity are continuing.

3.4 Recommendations from the 2016-2017 Annual Report

In the 2016-2017 Annual Report, it was recommended:

1. THAT in the first instance, monitoring of consented activities at Maui Production Station in the 2017-2018 year continue at the same level as in 2016-2017.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT the option for a review of resource consent 4052-4 in June 2018, as set out in condition 18 of not be exercised, on the grounds that the current conditions are adequate to deal with any potential adverse effects.

Recommendations one and three were implemented, while it was not considered necessary to undertake additional monitoring or investigation as per recommendation two.

3.5 Alterations to monitoring programmes for 2018-2019

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

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

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

It is proposed that for 2018-2019, monitoring of consented activities at Maui Production Station continue at a similar level to that of 2017-2018, with the addition of a one-off round of BTEX (benzene toluene, ethylbenzene and total xylenes) monitoring. This is in response to public concerns regarding benzene emissions from petroleum facilities, and this monitoring will be added to all petroleum industry compliance programmes in the 2018-2019 year.

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 2018-2019.

4 Recommendations

1. THAT in the first instance, monitoring of consented activities at Maui Production Station in the 2018-2019 year continue at a similar level as in 2017-2018, with the addition of a one-off round of BTEX monitoring.
2. THAT should there be issues with environmental or administrative performance in 2018-2019, 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:

AFFF	Aqueous film forming foams. These foams are water-based and frequently contain a hydrocarbon-based surfactant.
Biomonitoring	Assessing the health of the environment using aquatic organisms.
Bund	A wall around a tank to contain its contents in the case of a leak.
CO	Carbon monoxide
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
EPA	Environmental Protection Agency.
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.
LEL	Lower Explosive Limit (LEL) gives the percentage of the lower explosive limit, expressed as methane, that is detected in the air sampled.
m^2	Square Metres.
mg/m^3	Milligrams per cubic metre.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NOx	Nitrogen oxides.
NH_4	Ammonium, 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).

PFAS	Per-and poly-fluoroalkyl substances (fluorosurfactants). A class of manufactured chemicals that have been used since the 1950s to make commercial and industrial products that resist heat, stains, grease and water, including 'Scotchguard', non-stick cookware products and fire-fighting foams. These chemicals have been identified worldwide as emerging contaminants. Some PFAS have been shown to be toxic to some animals, and because they don't break down in the environment they have potential to bioaccumulate in plants and animals.
PFOS	Perfluorooctanesulfonic acid. A highly persistent PFAS compound which was added to Annex B of the Stockholm Convention on Persistent Organic Pollutants in May 2009.
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
PM_{10}	Relatively fine airborne particles (less than 10 micrometre diameter, respectively).
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	*Resource Management Act 1991* and including all subsequent amendments.
Separator	A device designed to separate oil and suspended solids from wastewater and stormwater.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
$\mu g/m^3$	Micrograms per cubic metre of air.

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

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Appendix I

Resource consents held by Shell Taranaki Ltd and Wood Group M & O

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

Discharge Permit

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

Name of Consent Holder:	Shell Todd Oil Services Ltd Private Bag 2035 NEW PLYMOUTH 4342
Decision Date (Change):	4 September 2013
Commencement Date (Change):	4 September 2013 (Granted: 11 October 2000)

Conditions of Consent

Consent Granted:	To discharge treated stormwater from the Maui Production Station to the Ngapirau Stream
Expiry Date:	1 June 2018
Site Location:	Maui Production Station, Tai Road, Oaonui
Legal Description:	Lot 1 DP 11402 Ngatitara 7C Blk XV Opunake SD (Discharge source & site)
Grid Reference (NZTM)	1669907E-56379680N
Catchment:	Ngapirau

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

General condition

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

b) That 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) That 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 oily water separator and the stormwater oil trap shall be operated and regularly maintained to ensure that the conditions of this consent are met.

2. The discharge shall not exceed the following concentrations:

Contaminant	Concentration
Total recoverable hydrocarbons	15 gm^{-3}
Suspended solids	100 gm^{-3}

3. After allowing for reasonable mixing, within a mixing zone extending 20 metres downstream of the discharge point, the discharge [in conjunction with any other discharge pertaining to the same property] shall not give rise to any of the following effects in the receiving water:

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

4. The consent holder shall maintain, and regularly update, a contingency plan, outlining measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not licensed by this consent and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge.

5. The resource consent holder may apply to the Taranaki Regional Council for a change or cancellation of any of the conditions of this resource consent in accordance with section 127(1)(a) of the Resource Management Act 1991 to take account of operation requirements or the results of monitoring.

6. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2006 and/or June 2012, 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 consent, which either were not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 4 September 2013

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Discharge Permit

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

Name of Consent Holder:	Shell Todd Oil Services Limited Private Bag 2035 NEW PLYMOUTH
Consent Granted Date:	11 October 2000

Conditions of Consent

Consent Granted:	To discharge treated domestic effluent from the oxidation ponds at the Maui Production Station to the Ngapirau Stream at or about GR: P20:800-999
Expiry Date:	1 June 2018
Review Date(s):	June 2006, June 2012
Site Location:	Maui Production Station, Tai Road, Oaonui
Legal Description:	Lot 1 DP 11402 Pt Ngatitara 6C 6D 6E & 7C Blocks Blk XV Opunake SD
Catchment:	Ngapirau stream between the Oaonui Stream and the Okaweu Stream

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

General conditions

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

b) That 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) That 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 properly and efficiently maintain and operate the oxidation ponds system, which shall be regularly maintained in an aerobic condition, to ensure that the conditions of this consent are met.

2. That after allowing for reasonable mixing, within a mixing zone extending 20 metres below the discharge point, the discharge [in conjunction with any other discharges pertaining to the same property] shall not give rise to any of the following effects in the receiving waters:

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

3. The consent holder shall upgrade the treatment system to avoid effects as a result of algal blooms in the oxidation ponds. The upgrade shall be in accordance with the URS New Zealand Ltd 30 August 2000 report recommendations and be completed by 30 November 2000.

4. The Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2001, for the purpose of assessing the effectiveness of works required under special condition 3.

5. The resource consent holder may apply to the Taranaki Regional Council for a change or cancellation of any of the conditions of this resource consent in accordance with section 127(1)(a) of the Resource Management Act 1991 to take account of operation requirements or the results of monitoring.

6. The Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2006 and/or June 2012, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which either were 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 11 October 2000

For and on behalf of
Taranaki Regional Council

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Chief Executive

Discharge Permit

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

Name of Consent Holder:	M & O Pacific Limited P O Box 265 NEW PLYMOUTH 4340
Consent Granted Date:	11 October 2000

Conditions of Consent

Consent Granted:	To discharge treated stormwater and wastewater from fire fighting at the Fire Training Centre at the Maui Production Station to the Oaonui Stream at or about (NZTM) 1669945E-5638740N
Expiry Date:	1 June 2018
Review Date(s):	June 2006, June 2012
Site Location:	Fire Training Centre, Maui Production Station, Tai Road, Oaonui
Legal Description:	Ngatitara 7C Block Blk XV Opunake SD
Catchment:	Oaonui

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

General conditions

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

b) That 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) That 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 settling ponds shall be operated and regularly maintained to ensure that the conditions of this consent are met.

2. The discharge shall not exceed the following concentrations:

Contaminant	Concentration
Total recoverable hydrocarbons	15 gm^{-3}
Suspended solids	50 gm^{-3}

3. That, other than specified in condition 2, no chemicals or agents may be discharged without the written approval of the Chief Executive, of the Taranaki Regional Council.

4. After allowing for reasonable mixing, within a mixing zone extending 10 metres downstream of the discharge point, the discharge shall not give rise to any of the following effects in the receiving water:

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

5. The consent holder shall maintain, and regularly update, a contingency plan, outlining measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not licensed by this consent and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge.

6. The resource consent holder may apply to the Taranaki Regional Council for a change or cancellation of any of the conditions of this resource consent in accordance with section 127(1)(a) of the Resource Management Act 1991 to take account of operation requirements or the results of monitoring.

7. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2006 and/or June 2012, 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 consent, which either were not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 24 November 2009

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Discharge Permit

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

Name of Consent Holder:	Shell Taranaki Limited Private Bag 2035 New Plymouth 4340	
Decision Date (Change):	9 August 2013	
Commencement Date (Change):	9 August 2013	(Granted Date: 9 January 2003)

Conditions of Consent

Consent Granted:	To discharge emissions into the air from the refining and distribution of hydrocarbons and associated processes at the Maui Production Station site
Expiry Date:	1 June 2024
Review Date(s):	June 2018
Site Location:	Maui Production Station, Tai Road, Oaonui
Grid Reference (NZTM)	1670046E-5638140N

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

General conditions

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

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

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

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

Special conditions

1. The consent holder shall adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or likely adverse effect on the environment associated with the discharge of contaminants into the air from the site.

2. The consent holder shall minimise the emissions and impacts of air contaminants discharged from the site by the selection of the most appropriate process equipment, process control equipment, emission control equipment, methods of control, supervision and operation, and the proper and effective operation, supervision, control and maintenance of all equipment and processes.

3. All equipment used to avoid, remedy, or mitigate any effect on the environment from the discharge of emissions into the air shall be maintained in good condition and shall be operated within design parameters at all times that the plant is in operation.

4. The consent holder shall undertake effective liquid separation and recovery, as far as is practicable, to avoid or mitigate smoke emissions during flaring.

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

a) detailing gas combustion in the flares under condition 16, such information to be compiled on a month by month basis;
b) detailing smoke emissions as required under condition 15;
c) detailing any measures to reduce smoke emissions;
d) detailing any measures to reduce flaring;
e) providing data on the emitted and/or ambient concentrations and/or mass discharge rates and/or an emission inventory, of such contaminants the Chief Executive, Taranaki Regional Council, may from time to time specify;
f) detail current measures by the consent holder to improve plant efficiency on the site; and
g) addressing any other issue relevant to the minimisation or mitigation of emissions from the flares or from elsewhere on the site.

6. The discharges authorised by this consent shall not give rise to any offensive or obnoxious or objectionable odour at or beyond the site boundary in the opinion of an enforcement officer of the Taranaki Regional Council.

7. The consent holder shall control all emissions of sulphur dioxide to the atmosphere from the site, in order that the maximum ground level concentration of sulphur dioxide arising from the exercise of this consent measured under ambient conditions does not exceed 350 μg m^{-3} [one-hour average exposure] or 125 μg m^{-3} [twenty-four hour average exposure] at or beyond the boundary of the site.

8. The consent holder shall control all emissions of nitrogen oxides to the atmosphere from the site, in order that the maximum ground level concentration of nitrogen dioxide arising from the exercise of this consent measured under ambient conditions does not exceed 100 μg m^{-3} [twenty-four hour average exposure], or 200 μg m^{-3} [one-hour average exposure] at or beyond the boundary of the site.

9. The consent holder shall control all emissions of carbon monoxide to the atmosphere from the flare, whether alone or in conjunction with any other emissions from the site arising through the exercise of any other consent, in order that the maximum ground level concentration of carbon monoxide arising from the exercise of this consent measured under ambient conditions does not exceed 10 mg m^{-3} [eight-hour average exposure], or 30 mg m^{-3} one-hour average exposure] at or beyond the boundary of the property on which the production station flare is located.

10. The consent holder shall control all emissions of benzene to the atmosphere from the site, in order that the maximum ground level concentration of benzene arising from the exercise of this consent measured under ambient conditions does not exceed the relevant Ministry for the Environment Ambient Air Quality Guideline for beneze [10 μg m^{-3} [annual average exposure] from 2002 until 2010 and 3.6 μg m^{-3} [annual average exposure] from 2010] at or beyond the boundary of the site.

11. The consent holder shall control all emissions to the atmosphere from the site of contaminants other than carbon dioxide, sulphur dioxide, carbon monoxide, and nitrogen oxides, in order that the maximum ground level concentration for any particular contaminant arising from the exercise of this consent measured at or beyond the boundary of the site is not increased above background levels:

    a) by more than 1/30th of the relevant Occupational Threshold Value-Time Weighted Average, or by more than the Short Term Exposure Limit at any time, [all terms as defined in Workplace Exposure Standards, 2002, Department of Labour]; or
    b) if no Short Term Exposure Limit is set, by more than three times the Time Weighted Average at any time, [all terms as defined in Workplace Exposure Standards, 2002, Department of Labour].

12. Prior to undertaking any alterations to the plant, processes or operations, which may significantly change the nature or quantity of contaminants emitted to air from the site, the consent holder shall first consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act.

13. The consent holder shall whenever practicable notify the Chief Executive, Taranaki Regional Council, whenever the continuous flaring of hydrocarbons (other than purge gas) is expected to occur for more than five minutes in duration.

14. Any incident having air environment impact or potential impact which has or is liable to cause significant substantiated complaint or a hazardous situation beyond the boundary of the consent holder's site, shall be notified to the Taranaki Regional Council, as soon as possible, followed by a written report to the Chief Executive, Taranaki Regional Council, within one week of the incident, with comment about the measures taken to minimise the impact of the incident and to prevent re-occurrence.

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

16. The consent holder shall keep and maintain a log of all continuous flaring incidents longer than five minutes, and any intermittent flaring lasting for an aggregate of ten minutes or longer in any 120-minute period. Such a log shall contain the date, the start and finish times, the quantity and type of material flared, and the reason for flaring. This log shall be made available to the Chief Executive upon request, and summarised annually in the report required under condition 5. All practicable steps shall be taken to minimise flaring.

17. Other than in emergencies, or during tests or exercises to simulate emergencies to a maximum frequency of twice per year, depressurisation of the plant, or sections of the plant, shall be carried out over a sufficient period of time to prevent dense black smoke from being discharged from the flares.

18. Subject to the provisions of this condition, the Council may within six months of receiving a report prepared by the consent holder pursuant to condition 5 of this consent but not more often than once every three years, or in June 2006 and/or June 2012 and/or June 2018, serve notice that it intends to review the conditions of this resource consent in accordance with section 128(1)(a) of the Resource Management Act 1991 for the purposes of:

    a) dealing with any significant adverse effect on the environment arising from the exercise of the consent which was not foreseen at the time the application was considered or which it was not appropriate to deal with; and/or

    b) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment caused by the discharge; and/or

    c) to alter, add or delete limits on mass discharge quantities or discharge or ambient concentrations of any contaminant or contaminants; and/or

    d) taking into account any Act of Parliament, regulation, national policy statement or national environmental standard which relates to limiting, recording, or mitigating emissions of carbon dioxide, sulphur dioxide, nitrogen dioxide and/or benzene, and which is relevant to the air discharge from the Maui Production Station.

Transferred at Stratford on 11 January 2018

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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

Name of Consent Holder:	Shell Taranaki Limited Private Bag 2035 New Plymouth 4340
Decision Date:	10 March 1998
Commencement Date:	10 March 1998

Conditions of Consent

Consent Granted:	To place and maintain two pipelines in, under and over the foreshore and seabed in the coastal marine area between mean high water spring and the outer limit of the territorial sea
Expiry Date:	1 June 2025
Site Location:	Oaonui Beach To Outer Limit Of The Territorial Sea, Oaonui
Grid Reference (NZTM)	1668150E-5638140N
Catchment:	Tasman Sea

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

General conditions

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

b) That 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) That 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. That the consent holder shall notify the Taranaki Regional Council at least 48 hours prior to undertaking any major maintenance works which could involve disturbance of, or discharge to, the coastal marine area.

2. That during any subsequent maintenance works, the consent holder must observe every practicable measure to prevent the discharge of silt and/or debris and/or any other contaminants to, and to minimise the disturbance of, the bed of the coastal marine area.

3. That where practicable, the structures licensed by this consent shall be removed and the area reinstated, if and when they are no longer required, to the satisfaction of the Chief Executive, Taranaki Regional Council.

4. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2005 and/or June 2015, for the purpose of ensuring that the conditions adequately deal with the environmental effects arising from the exercise of this consent, which were not foreseen at the time the application was considered and which it was not appropriate to deal with at that time.

Transferred at Stratford on 11 January 2018

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

Appendix II

Biomonitoring reports

To	Callum McKenzie; Job Manager
From	Bart Jansma; Environmental Scientist
Report No	BJ307
Doc No	2014422
Date	12 April 2018

Biomonitoring of an unnamed coastal stream (Ngapirau Stream) in relation to waste discharges from the Shell Todd Oil Services Ltd Maui Production Station, November 2017

Introduction

This early summer biological survey of an unnamed coastal stream receiving wastewater from the Maui gas treatment plant at Oaonui was the only survey scheduled for the 2017-2018 monitoring year. The results from surveys performed since the 2001-2002 monitoring year are discussed in reports referenced later in this report.

Methods

Macroinvertebrates were collected from sites 2 and 3, in an unnamed coastal stream (Table 1, Figure 1), on 7 November 2017 by the Taranaki Regional Council. The sampling method employed was the 'streambed-kick' sampling technique, which is very similar to Protocol C1 (hard-bottomed, semi-quantitative), of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001). Site 1 was removed from the monitoring programme in the 2001-2002 monitoring year due to fluctuating flows (a tendency to dry up in summer), which influenced the results obtained from this site.

Samples were preserved with Kahle's Fluid for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology, which is very similar to protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark et al. 2001). Macroinvertebrate taxa found in each sample were recorded as:

R (rare)	= less than 5 individuals;
C (common)	= 5-19 individuals;
A (abundant)	= estimated 20-99 individuals;
VA (very abundant)	= estimated 100-499 individuals;
XA (extremely abundant)	= estimated 500 individuals or more.

Table 1 Biomonitoring sites in an unnamed coastal stream related to the Maui Production Station

Site No.	Site Code	GPS Reference (NZTM)	Location
2	NPR 000100	E1669554 N5637641	Approximately 500 m downstream of discharges
3	NPR 000190	E1668603 N5637217	Approximately 1600 m downstream of discharges

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. Averaging the scores assigned to the taxa found at a site, and multiplying the average by a scaling factor of 20 produces a Macroinvertebrate Community Index (MCI) value.

The MCI was designed as a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. MCI results can also reflect the effects of warm temperatures, slow current speeds and low dissolved oxygen levels, because the taxa capable of tolerating these conditions generally have low sensitivity scores. Usually more 'sensitive' communities (with higher MCI values) inhabit less polluted waterways.

A semi-quantitative MCI value ($SQMCI_s$) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these products, and dividing by the sum of the loading factors (Stark, 1998 and 1999). The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA). Unlike the MCI, the $SQMCI_s$ is not multiplied by a scaling factor of 20, therefore $SQMCI_s$ values range from 1 to 10, while MCI values range from 20 to 200.

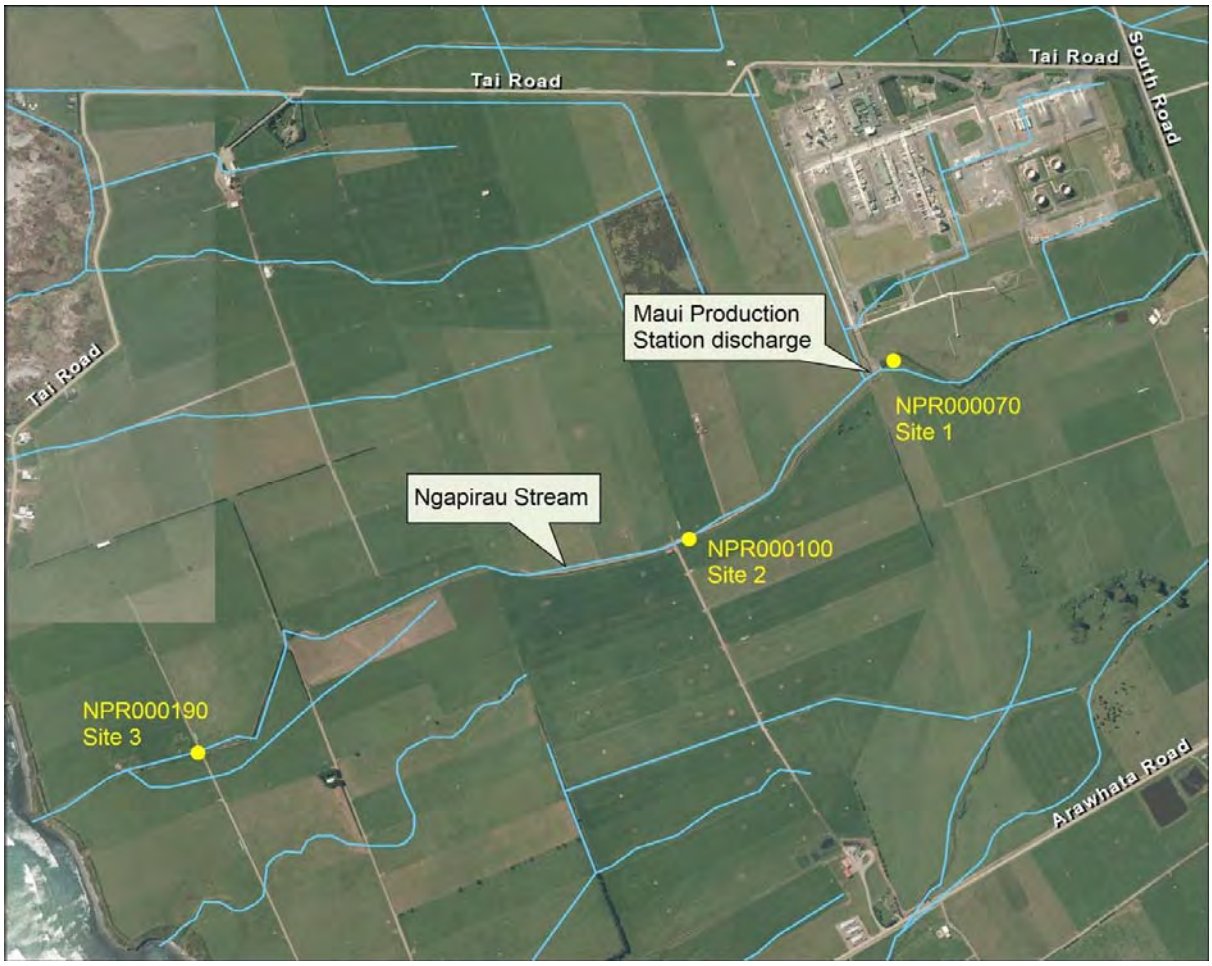

Figure 1 Biomonitoring sites in the unnamed ('Ngapirau') coastal stream adjacent to the Maui Production Station

Results and discussion

At the time of this midday survey, the water temperatures in the stream were 19.6°C at site 2, approximately 500m downstream of the production station and 18.3°C at site 3, approximately 1,600m downstream of the production station. The low and steady stream flow was uncoloured and clear at both sites and followed a short recession period, 19 days after the most recent fresh (above 3 times median flow) in the nearby Punehu Stream.

The streambed was comprised mainly of bedrock, gravels and cobbles at site 2, with the addition of some silt, sand and gravels. The substrate at site 3 was relatively soft, and was dominated by hard clay, with some sand and gravels. Site 2 had a similar degree of algal growth as that noted in the previous survey, with slippery films and widespread patches of filamentous growth observed. Site 3 had a reduced algal biomass as site 2, with no slippery film noted, but with widespread filamentous algal growths. Site 2 was unshaded whereas site 3 was partially shaded and neither site supported any macrophytes. Discolouration caused by an unauthorised dairy effluent discharge to the stream upstream of the Maui Production Station discharge had been noted on some previous survey occasions but has not been seen to be occurring for at least the last ten surveys. With similar flow conditions compared with the previous survey, habitat in the stream was above average, and a moderately sized sample was collected.

Microscopic analysis revealed that there were no 'undesirable heterotrophic growths' at either site consistent with the visual absence of such growths, at the time of this early summer survey.

Of note was the incidental capture of three elver (juvenile eels) in the invertebrate net while sampling at site 2.

Macroinvertebrate communities

This drain-like stream typically supports macroinvertebrate communities of limited taxonomic richness, with relatively low proportions of 'sensitive' taxa, as reflected by the MCI values. Results from previous surveys are summarised in Table 2, together with current results, which are also illustrated in Figure 2.

Table 2 Numbers of taxa and MCI values recorded in previous surveys performed since June 1988 in the unnamed coastal stream receiving wastes from the Maui Production Station at Oaonui, together with current results

Site	N	Numbers of taxa			MCI values			$SQMCI_S$ (N=26)		
		Range	Median	Current survey	Range	Median	Current survey	Range	Median	Current survey
2	47	8-21	15	16	44-78	63	68	1.1-4.5	2.5	4.6
3	36	9-26	16	15	58-80	67	71	1.3-4.7	2.8	2.1

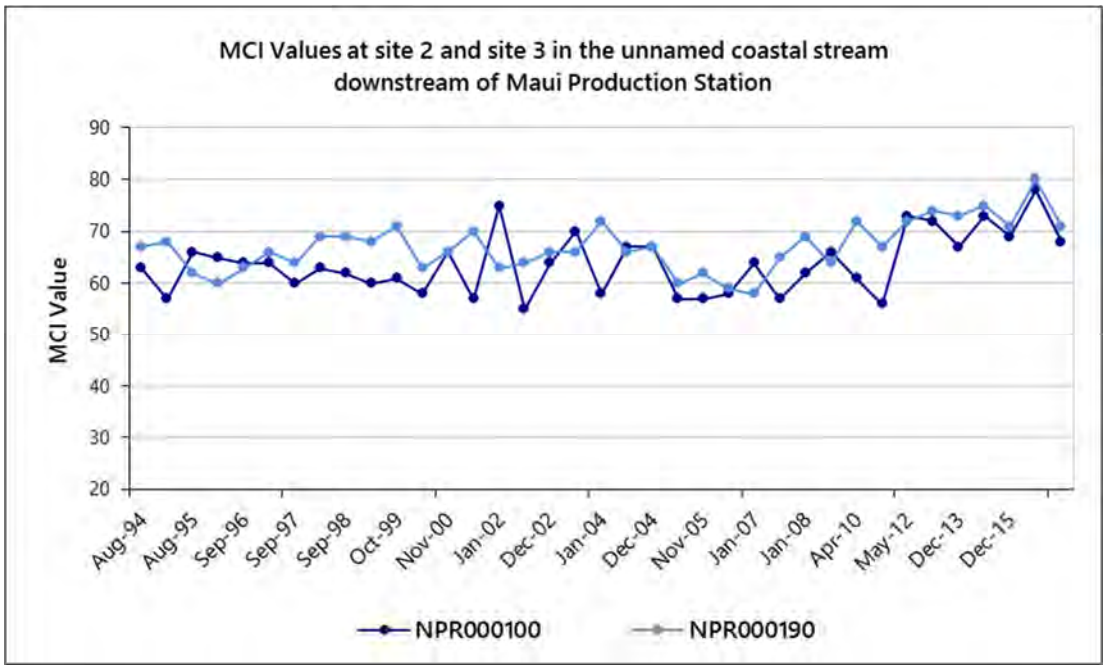

Figure 2 MCI values recorded in the unnamed ('Ngapirau') coastal stream since August 1994

Table 3 Macroinvertebrate fauna of an unnamed coastal stream ('Ngapirau' Stream) in relation to the Maui Production Station, sampled on 7 November 2017

Taxa List	Site Number	MCI score	2	3
	Site Code		NPR000100	NPR000190
	Sample Number		FWB17415	FWB17416
PLATYHELMINTHES (FLATWORMS)	*Cura*	3	-	R
ANNELIDA (WORMS)	Oligochaeta	1	R	XA
	Lumbricidae	5	C	R
MOLLUSCA	*Potamopyrgus*	4	VA	VA
CRUSTACEA	Ostracoda	1	C	R
	Paracalliope	5	XA	VA
ODONATA (DRAGONFLIES)	*Xanthocnemis*	4	R	-
COLEOPTERA (BEETLES)	Dytiscidae	5	R	R
TRICHOPTERA (CADDISFLIES)	*Costachorema*	7	-	R
	Hydrobiosis	5	VA	A
	Oxyethira	2	C	-
DIPTERA (TRUE FLIES)	*Aphrophila*	5	A	C
	Chironomus	1	R	A
	Corynoneura	3	-	R
	Maoridiamesa	3	VA	C
	Orthocladiinae	2	C	A
	Polypedilum	3	-	R
	Tanytarsini	3	R	-
	Muscidae	3	R	-
ACARINA (MITES)	Acarina	5	R	-
		No of taxa	16	15
		MCI	68	71
		$SQMCI_s$	4.6	2.1
		EPT (taxa)	1	2
		%EPT (taxa)	6	13
'Tolerant' taxa	'Moderately sensitive' taxa		'Highly sensitive' taxa	

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

Site 2

A moderate richness of sixteen taxa was found at site 2, which was one more than the median of previous values recorded at this site (Table 2) and similar to that recorded in the previous survey. The community was dominated by two 'tolerant' taxa (very abundant snail (*Potamopyrgus*) and *Maoridiamesa* midge larvae) and three 'moderately sensitive' taxa (extremely abundant *Paracalliope* amphipods, very abundant *Hydrobiosis* caddisfly larvae and abundant *Aphrophila* cranefly larvae).

This site's habitat supported a community with an increased proportion of 'tolerant' taxa (62% of taxa number) from the previous survey, resulting in the 'poor' MCI score of 68 units. This score was five units higher than the median of all previous scores, a statistically insignificant result (Stark, 1998), but ten units less than that recorded in the previous survey (Table 2, Figure 2). The extreme abundance of the 'moderately sensitive' amphipod *Paracalliope* resulted in an $SQMCI_S$ score of 4.6 units. Although this indicates that only fair water quality preceded this survey, this score is significantly higher than the median $SQMCI_S$ score for this site (by 1.9 units), and is the highest $SQMCI_S$ score recorded at this site to date, indicating better than average water quality. In general, the current results are above average for this site, and not reflective of any impacts caused by the Maui Production Station discharge.

Site 3

A slightly improved community richness of fifteen taxa was found at site 3 (when compared with the previous survey), one taxon fewer than the median richness for this site and that recorded upstream (Table 2). The community was dominated by four 'tolerant' taxa (extremely abundant oligochaete worms, very abundant snail (*Potamopyrgus*) and abundant midge larvae (*Chironomus* and orthoclads)), and two 'moderately sensitive' taxa (very abundant amphipods (*Paracalliope*) and abundant *Hydrobiosis* caddisfly larvae).

This softer-bottomed, nutrient enriched habitat supported a community dominated by 'sensitive' taxa (60% of taxa number), resulting in the MCI score of 71 units. This score is four units higher than the median MCI score for this site, also a statistically insignificant result. It was also an insignificant three units higher than recorded at site 2 upstream (Figure 2, Table 2). The extreme abundance of the very 'tolerant' oligochaete worms resulted in a significantly lower $SQMCI_S$ score (2.1 units), which is 0.7 units lower than the median for this site, and breaks the above average trend observed in the previous six surveys. Community compositions were relatively dissimilar at the two sites with only 55% of the total taxa (20) found in the reach of the stream surveyed, present at both sites.

Conclusions

This early summer biomonitoring survey of a small coastal stream that receives wastewater (including treated sewage) from the Maui Production Station was preceded by a relatively dry spring period, with the stream being in recession for 26 days prior to this survey. The results of this survey indicate that the wastewater discharge had not had an impact on the macroinvertebrate communities of the stream. It should be noted however that the poor physical habitat conditions of this drain-like watercourse are not suitable for most 'sensitive' invertebrate taxa, and this may often limit the degree of impact the discharges can have on the biological communities. The absence of 'heterotrophic growths' at both sites also indicated a lack of impacts of the discharge on the stream, with no clear improvement in the quality of the macroinvertebrate communities with distance downstream. The MCI values were very similar at sites 2 and 3, despite the slightly improved habitat at site 3, primarily through improved shading and reduced algal growth. Both MCI values were above their respective long-term medians, and a new maximum $SQMCI_S$ score was recorded at site 2. Overall, the scores at both sites were reflective of the poor habitats over the

summer period. In general, the current results are above average for this site, and not reflective of any impacts caused by the Maui Production Station discharge.

Summary

The Council's standard 'streambed-kick' technique was used at two established sites to collect streambed macroinvertebrates from an unnamed coastal stream on 7 November 2017. Sampling was undertaken relatively early, due to Taranaki experiencing a relatively dry spring. Samples were sorted and identified to provide number of taxa (richness) and MCI and $SQMCI_s$ scores for each site.

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 pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring.

Significant differences in either the MCI or the $SQMCI_S$ between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

This early-summer macroinvertebrate survey indicated that the discharge of treated wastes from the Maui Production Station site had not had any significant detrimental effect on the macroinvertebrate communities of the stream in comparison with the historical condition of these communities to date. The macroinvertebrate communities found at two sites downstream of the site discharge reflected the poor habitat present during a period of low flow conditions in early summer, but also indicated that the water quality that preceded this survey was well above average.

The macroinvertebrate communities of the stream contained few 'sensitive' taxa. However, three 'sensitive' taxa were found in abundance at site 2, and two at site 3. At both sites, taxonomic richness (number of taxa) was similar to the long-term median, and there was little change in richness between sites 2 and 3. The MCI scores were both above average. The $SQMCI_S$ score recorded at site 2 was the highest recorded at this site to date, although a below average result was recorded at site 3. Overall, this indicates ongoing improvement in water quality and/or instream habitat.

The MCI and $SQMCI_S$ scores indicated that the stream communities were of above average but still of 'poor health', although probably typical of communities in drain-like habitats in early summer.

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Working Group Report No. 1. Prepared for the Ministry for the Environment. Sustainable Management Fund Project No. 5103. 57p.

Appendix III

Air monitoring report

To	Job Manager, Callum MacKenzie
From	Environmental Scientist - Air Quality, Brian Cheyne
Document	2122623
Date	September 14, 2018

Ambient Gas (PM10, NOx, CO and LEL) Monitoring at Maui Production Stations during 2017-2018 monitoring year

Introduction

In July 2017 and January 2018 as part of the compliance monitoring programme for the Maui production station, a survey of ambient air quality sampling was carried out by the Taranaki Regional Council (the Council) in the vicinity of the plant. The main objectives were to measure:

- The concentrations of PM10 using a portable data logging TSI 'DustTrak';
- To measure the concentrations of the nitrogen oxides (NOx) using a passive sampling method, that gives a result for average exposure;
- And to measure carbon monoxide (CO) using a portable multi gas meter that provides instantaneous data throughout the monitoring period.

The findings of this study are presented in this memorandum, together with the locations of the monitoring sites which are provided in Figure 1.

Carbon monoxide (CO) and Lower explosive limit (LEL)

During the monitoring year, a multi-gas meter was deployed on one occasion in the vicinity of the plant. The deployment lasted approximately 47 hours, with the instrument placed in a down-wind position at the start of the deployment. Monitoring consisted of continuous measurements of gas concentrations for the gases of interest (carbon monoxide and combustible gases).

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

Figure 1 Air monitoring sites at Maui production station (2017-2018)

The details of the sample run are summarised in Table 1 and the data from the sample run are presented graphically in Figure 2**.**

The consents covering air discharges from the Maui production station have specific limits related to particular gases. Special condition 9 of consent 4052-4 set a limit on the carbon monoxide concentration at or beyond the production station's boundary. The limit is expressed as 10 mg/m^3 for an eight hour average or 30 mg/m^3 for a one hour average exposure. The maximum concentration of carbon monoxide found during the monitoring run was 4.9 mg/m^3 with average concentration for the entire dataset was only 0.23 mg/m^3 which comply with consent conditions. This is in line with the pattern found in previous years.

Table 1 Results of carbon monoxide and LEL monitoring at Maui production station (2017-2018)

Period (from-to)		6/07/2017 16:28 to 8/07/2018 15:31
Max	CO(ppm)	4.30
	LEL(%)	0.20
Mean	CO(ppm)	0.20
	LEL(%)	0.00
Min	CO(ppm)	0.00
	LEL(%)	0.00

Note: (1) the instrument records in units of ppm. At 25°C, 1 atm.

1ppm CO = 1.145 mg/m^3

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

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

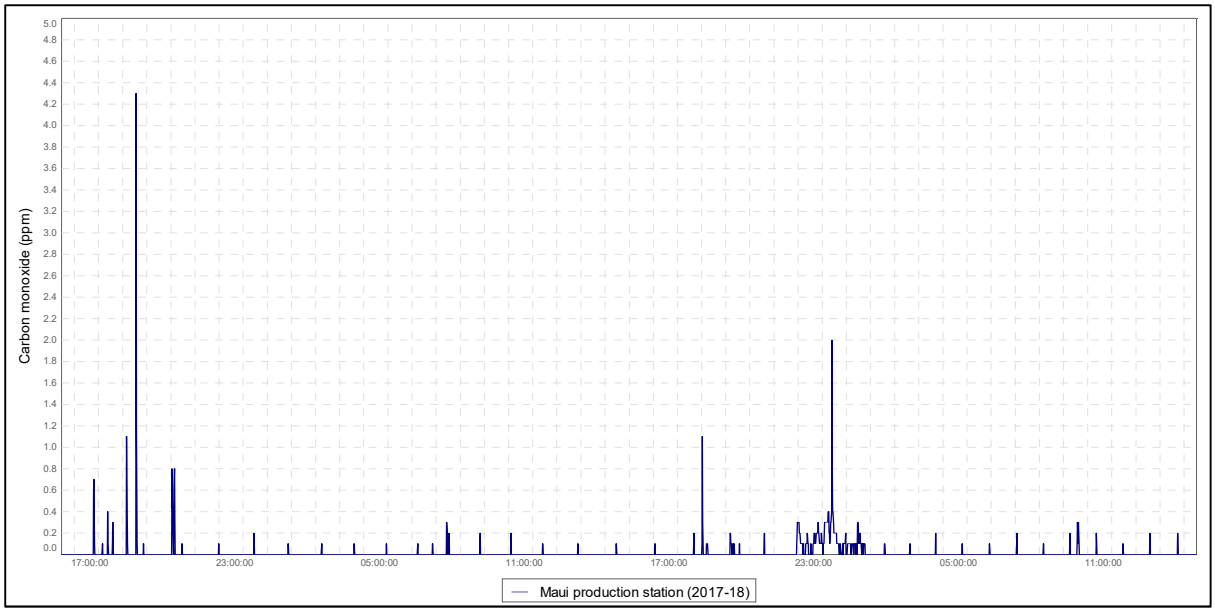

Figure 2 Graph of ambient CO levels in the vicinity of the Maui Production Station (2017-2018)

PM10

In September 2004 the Ministry for the Environment made public National Environmental Standards (NESs) relating to certain air pollutants. The NES for PM10 is 50 µg/m^3 (24-hour average).

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

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

During the reporting period, a "DustTrak" PM10 monitor was deployed on one occasion in the vicinity of the Maui production station. The deployment lasted approximately 41 hours, with the instrument placed in a down-wind position at the start of the deployment. Monitoring consisted of continual measurements of PM10 concentrations. The location of the "DustTrak" monitor during the sampling run is shown in Figure 1.

The details of the sample run are presented in Figure 3 and Table 2.

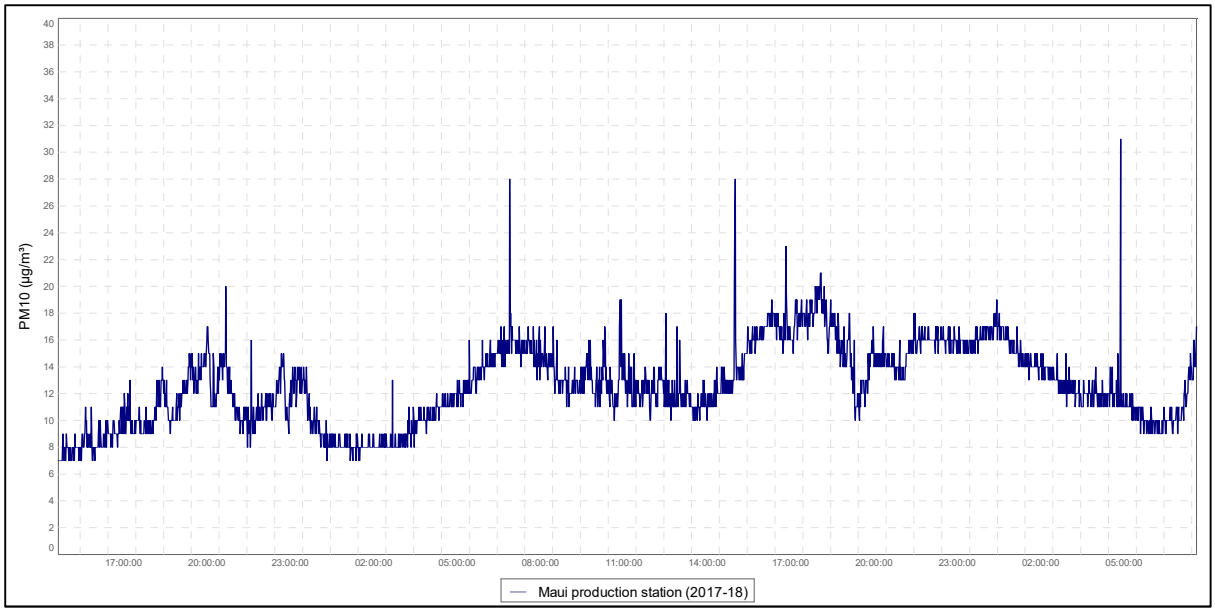

Figure 2 PM10 concentrations (µg/m³) at the Maui production station (2017-2018)

Table 1 Daily mean of PM10 results during two days' monitoring at Maui production station

	(41 hours) (6-8/07/2017)	
24 hr. set	Day 1	Day 2
Daily average	11.4 µg/m³ (Start to 24hrs)	14.0 µg/m³ (24hrs to end)
NES	50µg/m³	

During the 41-hour run, from 6th to 8th of August 2017, the average recorded PM_{10} concentration for the first 24 hour period was 11.4µg/m³ and 14.0µg/m³ for the second 24 hour period. These daily means equate to 23% and 28%, respectively, of the 50 µg/m³ value that is set by the National Environmental Standard.

Background levels of PM_{10} in the region have been found to be typically around 11 µg/m³.

Nitrogen oxides (NOx)

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

The complete report covering region-wide NOx monitoring is attached to this memorandum (TRC #2089257).

The consents covering air discharges from the Maui production station have specific limits related to particular gases. Special condition 8 of consent 4052-4 set a limit on the nitrogen dioxide concentration at or beyond the production station's boundary. The limit is expressed as 100 µg/m³ for a 24 hour average or 200 µg/m³ for a one hour average exposure.

NOx passive adsorption discs were place at two locations in the vicinity of the Maui production station on one occasion during the year under review. The discs were left in place for a period of 21 days.

The calculated 1-hour and 24-hour theoretical maximum NOx concentrations found at the Maui production station during the year under review equates to 8.1µg/m³ and 4.2µg/m³ respectively. The results show that the ambient ground level concentration of NO_x is well below the limits set out by consent 4052-4.