Todd Energy Ltd
McKee Production Station
Monitoring Programme
Annual Report
2017-2018

Technical Report 2018-71

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Executive summary

Todd Energy Ltd operates a petroleum production station located on Otaraoa Road near Tikorangi, bridging the Waitara and Onaero catchments. The McKee Production Station processes oil and gas from the Company's McKee and Mangahewa groups of wellsites and includes electricity generation and LPG production facilities. 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 ten resource consents, which include a total of 104 conditions setting out the requirements that the Company must satisfy. The Company holds one consent to allow for the take and use of water, three consents to discharge stormwater and wastewater, three consents to discharge emissions into the air, one consent to allow the diversion of unnamed tributaries of the Mangahewa Stream, and two consents regarding the installation and use of structures.

During the monitoring period, Todd Energy Ltd demonstrated an overall high level of environmental performance.

The Council's monitoring programme for the year under review included six inspections of the production station and associated wellsites, six stream sediment samples collected for physicochemical analysis, two biomonitoring surveys of receiving waters, one night spotlighting fish survey and two ambient air quality surveys.

Stormwater system inspections showed that discharges from the sites complied with consent conditions at the time.

Biomonitoring in the Mangahewa Stream found similar numbers of taxa to previous surveys. Hydrocarbons have been found at varying concentrations in the stream sediment since testing began in 2011. The highest level measured to date, 50 metres downstream of the discharge, was recorded in February 2018. It is likely that this contamination is from historical activities at this site and it is unclear whether the lower taxa richnesses and MCI scores are related to this. Todd Energy are in the process of remediating a pond on the former McKee-E wellsite adjacent to the Mangahewa Stream. Further monitoring will be undertaken by the Company to assess effects on the stream environment resulting from the remedial works. This may also assist with determining any relationship between macroinvertebrate community health and hydrocarbon concentrations in the sediment.

There were no adverse effects on the environment resulting from the exercise of the air discharge consents. The ambient air quality monitoring at the 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 boundary during inspections.

During the year, the Company demonstrated an overall high level of both environmental performance and administrative compliance with the resource consents. There were no unauthorised incidents recorded by the Council in relation to the Company's activities. The McKee Production Station was well managed and maintained.

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 the consent holder'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 Todd Energy Limited (Todd Energy). Todd Energy operates the McKee Production Station (including the Mangahewa production facilities) on Otaraoa Road at Tikorangi, bridging the Waitara and Onaero catchments.

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

One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of the Company's use of water, land and air, and is the 28th combined annual report for the McKee Production Station (MPS).

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 Todd Energy in the Waitara and Onaero 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 MPS.

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 MPS is situated on Otaraoa Road, near Tikorangi and was commissioned in November 1984. It receives and processes oil and gas from a number of wellsites within the area. The Mangahewa Production Station is adjacent to the MPS and processes hydrocarbons from the Mangahewa wellsites. It came on-stream in September 2001. The surrounding land is predominantly used for dry stock farming.

Raw product from the wellsites is separated into gas, crude oil and condensate. These products are transported via either pipeline or road tanker to the Omata tank farm in New Plymouth. Produced water is a by-product of the process and this is deep well injected. All uncontaminated stormwater from the McKee and Mangahewa sites passes through a skimmer pit at the McKee site and discharges to the Mangahewa Stream. Treated impounded stormwater is discharged to the Waitara River.

A gas-powered electricity generation plant (EGP), comprised of three generation units, capable of producing a total of up to 9.1 MW of electricity, was commissioned early in 2009. During the 2012-2014 monitoring period, an adjoining LPG plant was completed and commissioned in the southern corner of the site.

The location of MPS is shown in Figure 1.

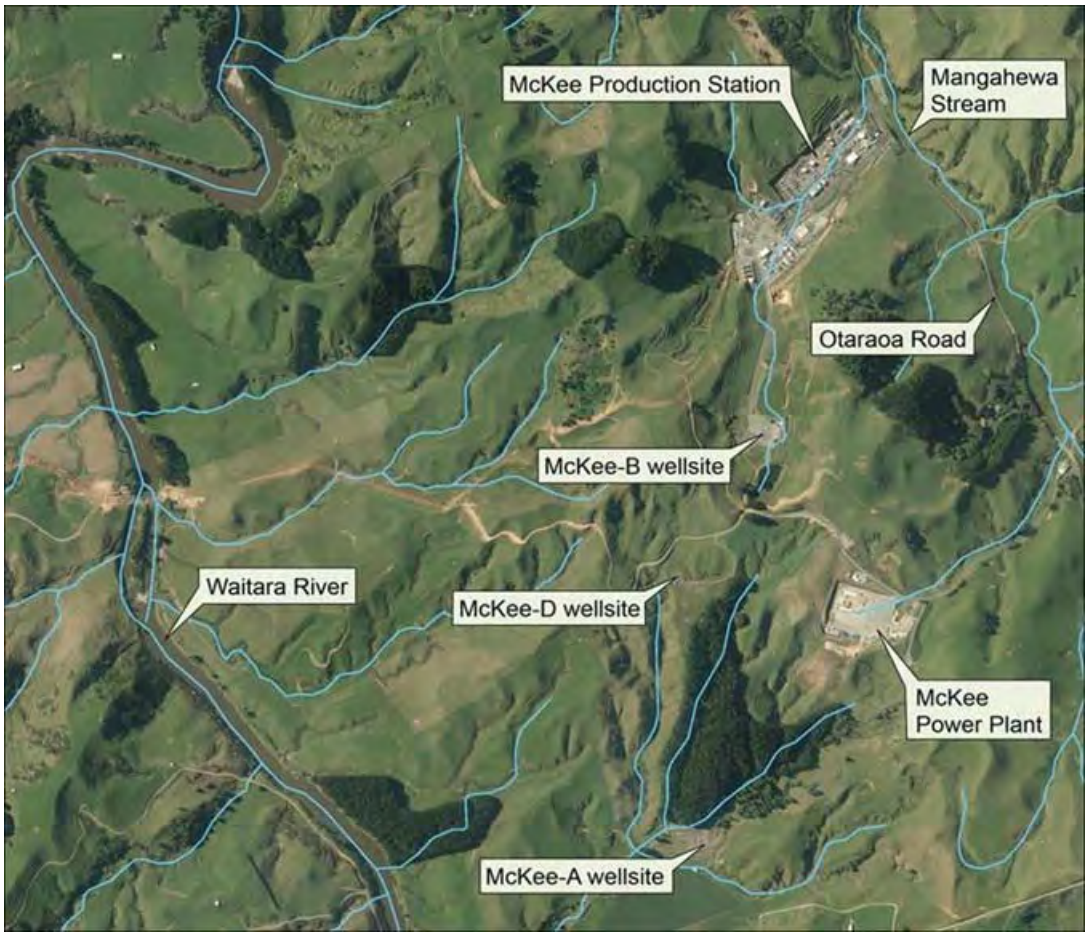

Figure 1 Location of the McKee Production Station

Photo 1 McKee Production Station

1.3 Resource consents

The Company holds ten resource consents the details of which are summarised in Table 1 and outlined in sections 1.3.1 to 1.3.5.

Table 1 Resource consents held by Todd Energy in relation to the McKee Production Station

Consent number	Purpose	Granted	Review	Expires
1157-1	To discharge uncontaminated stormwater from the site of the MPS into an unnamed tributary of the Mangahewa Stream.	Sept 1983	-	June 2023
1158-1	To discharge treated impounded stormwater from the site of the MPS into the Waitara River.	Sept 1983	-	June 2023
1159-1	To divert unnamed tributaries of the Mangahewa Stream in the vicinity of the MPS, and to discharge surface water run-off from adjacent land into the Mangahewa Stream, to permit construction and operation of the said facility.	Sept 1983	-	June 2023
1226-1	To take water from the Mangahewa Stream for process, fire-fighting and domestic purposes associated with operation of the MPS.	March 1984	-	June 2023
1227-1	To construct a weir control for the MPS water intake on the Mangahewa Stream in the Onaero catchment.	March 1984	-	June 2023
4006-2	To erect, place and maintain a bridge over the Waitara River for oil field access purposes.	July 1999	June 2021	June 2023
4050-3	To discharge emissions into the air arising from the flaring of hydrocarbons associated with production activities at the McKee-C wellsite and from hydrocarbon processing operations and miscellaneous emissions at the MPS.	Sept 2009	June 2021	June 2027
7290-1	To discharge emissions into the air from natural gas combustion and other related activities associated with the operation of an electricity generation plant at the MPS.	June 2008	June 2021	June 2027
7435-1	To discharge stormwater into an unnamed tributary of the Mangahewa Stream in the Onaero catchment from a LPG Plant.	July 2009	June 2021	June 2039
7436-1	To discharge emissions to air from the flaring of natural gas in emergency situations and miscellaneous emissions associated with the treatment of gas at the McKee LPG Plant and the Mangahewa Extraction Train 2 (MET2).	July 2009	June 2021	June 2039

1.3.1 Water abstraction permit

Section 14 of the RMA stipulates that no person may take, use, dam or divert any water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or it falls within some particular categories set out in Section 14.

The Company holds water abstraction permit **1226-1** to take water from the Mangahewa Stream for process, fire-fighting and domestic purposes associated with operation of the MPS. This permit was originally issued on 14 March 1984 under the *Water and Soil Conservation Act 1967* to Petroleum Corporation of NZ Ltd. It was transferred to Shell Todd Oil Services Ltd on 10 April 2002, to Todd Taranaki Ltd on 31 May 2006 and, finally, to Todd Energy on 15 November 2013. It is due to expire on 1 June 2023.

There are five special conditions attached to this consent.

Condition 1 requires the consent holder to maintain a minimum flow through the Mangahewa Stream.

Condition 2 requires the use of an accurate flow measuring and recording device and provides for the supply of flow data to the Council.

Condition 3 requires the intake structure to be designed and constructed so as to minimise stream disturbance and permit fish passage.

Condition 4 requires information on the location and design of the intake structure to be provided to Council prior to construction.

Condition 5 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.

1.3.2 Water discharge permits

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

The Company holds water discharge permit **1157-1** to discharge uncontaminated stormwater from the site of the MPS into an unnamed tributary of the Mangahewa Stream. This permit was originally issued on 28 September 1983 under the *Water and Soil Conservation Act 1967* to Petroleum Corporation of NZ Ltd. It was transferred to Shell Todd Oil Services Ltd on 10 April 2002, to Todd Taranaki Ltd on 31 May 2006 and, finally, to Todd Energy on 15 November 2013. It is due to expire on 1 June 2023.

There are ten special conditions attached to this consent.

Condition 1 requires the consent holder to ensure the stream can cope with the increased volume of water.

Condition 2 requires the consent holder to ensure that works associated with the exercise of this consent be designed to minimise disturbance of the bed and banks of the stream.

Condition 3 requires mitigation or prevention of erosion resulting from the exercise of the consent.

Condition 4 requires the corrective measures applied to have the approval of the Chief Executive of the Council.

Condition 5 requires the consent holder to install a sampling chamber in the main stormwater discharge line.

Condition 6 requires the stormwater layout and discharge points to be provided to the Chief Executive of the Council prior to construction.

Condition 7 requires the consent holder to provide a contingency plan.

Condition 8 prevents adverse effects in the receiving waters.

Condition 9 addresses monitoring requirements.

Condition 10 is a review provision.

The Company also holds water discharge permit **1158-1** to discharge treated impounded stormwater from the site of the MPS into the Waitara River. This permit was originally issued on 28 September 1983 under the *Water and Soil Conservation Act 1967* to Petroleum Corporation of NZ Ltd. It was transferred to Shell Todd Oil Services Ltd on 10 April 2002, to Todd Taranaki Ltd on 31 May 2006 and, finally, to Todd Energy on 15 November 2013. It is due to expire on 1 June 2023.

There are 17 special conditions attached to this consent.

Condition 1 requires contaminated stormwater to be stored and treated prior to discharge.

Condition 2 requires mitigation or prevention of erosion resulting from the exercise of the consent.

Condition 3 states that any corrective measures applied are to be to the satisfaction of the Council.

Condition 4 requires a sampling chamber be installed in the treated stormwater discharge line prior to the outfall.

Condition 5 requires the stormwater layout and discharge points be provided to the Chief Executive prior to construction.

Condition 6 requires the consent holder to supply specifications of the works to the Chief Executive prior to the exercise of the consent.

Condition 7 requires the appointment of a suitable wastewater operator on the site.

Condition 8 imposes limits on significant potential contaminants in the discharge.

Conditions 9, 10 and 11 protect the receiving water from adverse effects.

Condition 12 requires a management plan be provided to the Chief Executive of the Council prior to the exercise of the consent.

Condition 13 requires a contingency plan be provided to the Chief Executive prior to the exercise of the consent.

Conditions 14, 15 and 16 address monitoring requirements.

Condition 17 is a review provision.

The Company also holds water discharge permit **7435-1** to discharge stormwater into an unnamed tributary of the Mangahewa Stream in the Onaero catchment from a LPG Plant. This permit was issued to Todd Taranaki Ltd by the Council on 8 July 2009 under Section 87(e) of the RMA. It was transferred to Todd Energy on 15 November 2013 and is due to expire on 1 June 2039.

There are 12 special conditions attached to this consent.

Conditions 1 and 2 concern best practicable option and the catchment area.

Conditions 3 to 6 relate to information to be provided, notification, contingency and management planning.

Conditions 7 and 8 relate to stormwater treatment and hazardous substances storage.

Conditions 9 and 10 concern discharge quality and receiving water effects.

Conditions 11 and 12 are lapse and 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 is appended to this report.

1.3.3 Water permit

Section 14 of the RMA stipulates that no person may take, use, dam or divert any water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or it falls within some particular categories set out in Section 14.

The Company holds water permit **1159-1** to divert unnamed tributaries of the Mangahewa Stream in the vicinity of the MPS, and to discharge surface water run-off from adjacent land into the Mangahewa Stream, to permit construction and operation of the said facility. This permit was issued on 28 September 1983 under the *Water and Soil Conservation Act 1967* to Petroleum Corporation of NZ Ltd. It was transferred to

Shell Todd Oil Services Ltd on 10 April 2002, then to Todd Taranaki Ltd on 31 May 2006 and, finally, to Todd Energy on 15 November 2013. It is due to expire on 1 June 2023.

There are six special conditions attached to this consent.

Condition 1 requires that plans and locations of the diversions are forwarded to Council prior to commencement of construction.

Condition 2 requires that the natural channels of the streams below the diversion are capable of coping with the increased flow.

Condition 3 states that the consent holder shall prevent or mitigate any erosion that occurs.

Condition 4 states that any corrective action taken shall be to the satisfaction of the Council.

Condition 5 allows the Council to carry out biological monitoring on the Mangahewa Stream.

Condition 6 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 consents which is appended to this report.

1.3.4 Air discharge permits

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

The Company holds air discharge permit **4050-3** to discharge emissions into the air arising from the flaring of hydrocarbons associated with production activities at the McKee-C wellsite and from hydrocarbon processing operations and miscellaneous emissions at the MPS. This permit was issued by the Council on 30 September 2009 under Section 87(e) of the RMA. It is due to expire on 1 June 2027.

There are 21 special conditions attached to this consent.

Condition 1 requires the adoption of the best practicable option.

Condition 2 relates to vapour recovery.

Condition 3 concerns the opacity of smoke emissions.

Conditions 4 to 8 relate to levels of contaminants at or beyond the boundary.

Conditions 9 to 12 concern record keeping and reporting.

Conditions 13 and 14 of the permit relate specifically to MPS.

Conditions 15 to 20 of the permit relate specifically to the McKee-C wellsite.

Condition 21 is a review provision.

The Company also holds air discharge permit **7290-1** to discharge emissions into the air from natural gas combustion and other related activities associated with the operation of an electricity generation plant at the MPS. This permit was issued by the Council on 24 June 2008 under Section 87(e) of the RMA. It is due to expire on 1 June 2027.

There are ten special conditions attached to this consent.

Condition 1 requires the adoption of the best practicable option.

Condition 2 requires consultation with Council prior to significant alterations.

Conditions 3 to 8 relate to levels of contaminants at or beyond the boundary.

Conditions 9 and 10 are lapse and review provisions.

The Company also holds air discharge permit **7436-1** to discharge emissions to air from the flaring of natural gas in emergency situations and miscellaneous emissions associated with the treatment of gas at the McKee LPG Plant and the Mangahewa Extraction Train 2 (MET2). This permit was issued by the Council on 8 July 2009 under Section 87(e) of the RMA. It was altered on 24 October 2012 to include emissions from the MET2 plant and is due to expire on 1 June 2039.

There are 12 special conditions attached to this consent.

Condition 1 requires the adoption of the best practicable option.

Condition 2 requires consultation with Council prior to significant alterations.

Condition 3 requires the consent holder to minimise emissions.

Condition 4 concerns the monthly provision of flaring information.

Conditions 5 to 10 relate to levels of contaminants at or beyond the boundary.

Conditions 11 and 12 are lapse and 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.

1.3.5 Land use permits

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

Section 14 (1)(a) of the RMA stipulates that no person may take, use, dam or divert any water (other than coastal water) unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

The Company holds land use permit **1227-1** to construct a weir control for the MPS water intake on the Mangahewa Stream in the Onaero catchment. This permit was originally issued on 14 March 1984 under the *Water and Soil Conservation Act 1967* to Petroleum Corporation of NZ Ltd. It was transferred to Shell Todd Oil Services Ltd on 10 April 2002, to Todd Taranaki Ltd on 31 May 2006 and, finally, to Todd Energy on 15 November 2013. It is due to expire on 1 June 2023.

There are seven special conditions attached to this consent.

Condition 1 requires the consent holder to submit plans and proposed locations prior to commencement of construction.

Condition 2 requires the consent holder to minimise disturbance to the bed and banks of the river channel at both low flows and design flood levels.

Condition 3 requires the consent holder to prevent or mitigate any erosion.

Condition 4 requires the intake structure be designed and constructed to permit passage of fish.

Condition 5 requires that a minimum flow of 5 litres/second is maintained in the Mangahewa Stream.

Condition 6 requires the operation of the sluice pipe through the weir, for the purposes of de-silting the impoundment.

Condition 7 is a review provision.

The Company also holds land use permit **4006-2** to erect, place and maintain a bridge over the Waitara River for oil field access purposes. This permit was issued by the Council on 14 July 1999 under Section 87(e) of the RMA to Fletcher Challenge Energy Taranaki Ltd. It was transferred to Shell Todd Oil Services Ltd on 10 April 2002, to Todd Taranaki Ltd on 31 May 2006 and, finally, to Todd Energy on 15 November 2013. It is due to expire on 1 June 2023.

There are four special conditions attached to this consent.

Condition 1 requires that the consent holder notifies the Council prior to any works being undertaken, which would involve disturbance of or deposition to the riverbed or discharges to water.

Conditions 2 and 3 require that the structure authorised by the consent be maintained to ensure the conditions of the consent are met, and that the structure is to be removed and the area reinstated if and when it is no longer required.

Condition 4 is a review provision.

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.

1.3.6 Wellsite consents

Todd Energy also holds consents for production activities at wellsites associated with MPS. A summary of these consents is provided in Table 2.

Table 2 Consents for production activities at wellsites associated with the MPS

Wellsite	Consent number	Purpose	Issue date	Expiry
Makara-B	4883-2	To discharge treated stormwater and treated produced water from the Makara-B wellsite into an unnamed tributary of the Mangaone Stream in the Waitara catchment	28/05/2009	2027
	4884-2	To discharge emissions into the air from hydrocarbon exploration and production testing operations and miscellaneous emissions associated with eight wells at the Makara-B wellsite	07/04/2005	2021
Mangahewa-A	4919-2	To discharge treated stormwater from hydrocarbon exploration and production operations at the Mangahewa-A wellsite onto and into land and into an unnamed tributary of the Waitara River	27/10/2000	2021
	4920-3	To discharge emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Mangahewa-A wellsite	25/08/2008	2021
Mangahewa-C	6967-1	To discharge treated stormwater and treated produced water from hydrocarbon exploration and production operations at the Mangahewa-3 wellsite onto and into land in the vicinity of an unnamed tributary of the Waiau Stream	19/10/2006	2021

Wellsite	Consent number	Purpose	Issue date	Expiry
Mangahewa-C	6974-1	To discharge emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Mangahewa-3 wellsite	19/10/2006	2021
	7180-1	To discharge water containing contaminants from the hydrotesting of pipelines onto and into land at the Mangahewa-3 wellsite	14/12/2007	2021
	9594-1	To take and use groundwater for water supply purposes associated with hydrocarbon exploration and production activities	18/06/2013	2027
Mangahewa-D	7404-1	To take water from the Manganui River for wellsite and well drilling activities during hydrocarbon exploration and production operations at the Mangahewa-D wellsite	19/11/2008	2021
	7405-1	To discharge emissions to air during flaring from well workovers and in emergency situations, and to discharge miscellaneous emissions associated with production activities at the Mangahewa-D wellsite	05/02/2009	2027
	7407-1	To discharge treated stormwater, treated produced water and surplus drill water from hydrocarbon exploration and production operations at the Mangahewa-D wellsite onto and into land in the vicinity of an unnamed tributary of the Manganui River in the Waitara catchment	28/11/2008	2027
	9903-1	To take and use groundwater from a bore for general water supply purposes at the Mangahewa-D wellsite	26/05/2014	2033
Mangahewa-E	9453-1	To discharge treated stormwater and produced water from hydrocarbon exploration and production operations at the Mangahewa-E wellsite, onto land and into an unnamed tributary of the Waiau Stream	01/02/2013	2027
	9455-1	To discharge emissions to air associated with hydrocarbon producing wells at the Mangahewa-E wellsite	31/01/2013	2027
Mangahewa-G	10021-1	To discharge emissions to air associated with hydrocarbon producing wells at the Mangahewa-G wellsite	09/12/2014	2033
	10022-1	To discharge treated stormwater from hydrocarbon exploration and production operations at the Mangahewa-G wellsite, into an unnamed tributary of the Mangahewa Stream	08/01/2015	2033
	10026-1	To take and use water from a spring fed pond on an unnamed tributary of the Mangahewa Stream for hydrocarbon exploration activities at the Mangahewa-G wellsite	24/11/2014	2020

Wellsite	Consent number	Purpose	Issue date	Expiry
McKee-A	3666-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production operations at the McKee-A wellsite onto and into land and into an unnamed tributary in the Waitara catchment	22/04/2003	2033
McKee-B	3667-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production activities at the McKee-B wellsite onto and into land and into an unnamed tributary of the Mangahewa Stream in the Onaero catchment	28/04/2003	2033
	7462-1	To discharge emissions into the air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the McKee-B wellsite	21/04/2009	2027
McKee-C	3668-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production operations and electricity generation operations and associated activities at the McKee-C wellsite onto and into land and into an unnamed tributary of the Mangahewa Stream in the Onaero catchment	28/04/2003	2033
McKee-D	3669-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production operations at the McKee-D wellsite onto and into land and into an unnamed tributary in the Waitara catchment	28/04/2003	2033
McKee-E	4626-2	To discharge treated stormwater and treated produced water from the McKee-E wellsite into the Mangahewa Stream in the Onaero catchment	28/05/2009	2027
Mystone-A	4388-2	To discharge treated stormwater and treated produced water from hydrocarbon exploration and production operations at the Mystone-A wellsite onto and into land within the vicinity of an unnamed tributary of the Mangaone Stream in the Waitara catchment	13/05/2009	2027
	7455-1	To take water from the Manganui River for wellsite and well drilling activities during hydrocarbon exploration and production operations at the Mystone-A wellsite	13/03/2009	2021
	7459-1	To discharge emissions to air during flaring from well workovers and in emergency situations and miscellaneous emissions associated with production activities at the Mystone-A wellsite	31/03/2009	2027

Wellsite	Consent number	Purpose	Issue date	Expiry
Pouri-A	3671-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production operations at the Pouri-A wellsite onto and into land and into an unnamed tributary of the Mangahewa Stream in the Onaero catchment	16/09/2003	2033
Pukemai-A	3670-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production activities at the Pukemai-A wellsite onto and into land and into the Pukemai Stream in the Onaero catchment.	28/04/2003	2033
Toetoe-A	3676-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production operations at the Toetoe-A wellsite onto and into land and into the Mangaone Stream in the Waitara catchment	30/04/2003	2033
Toetoe-B	3677-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production activities at the Toetoe-B wellsite onto and into land and into an unnamed tributary of the Mangaone Stream in the Waitara catchment	28/04/2003	2033
Tuhua-A	3672-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production activities at the Tuhua-A wellsite onto and into land and into the Pouri Stream in the Onaero catchment	28/04/2003	2033
Tuhua-B	3673-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production activities at the Tuhua-B wellsite onto and into land and into the Pouri and Pukemai Streams in the Onaero catchment	28/04/2003	2033
Tuhua-C	3674-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production activities at the Tuhua-C wellsite onto and into land and into an unnamed tributary of the Pouri Stream in the Onaero catchment	28/04/2003	2033
Tuhua-D	3675-2	To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production operations at the Tuhua-D wellsite onto and into land and into the Pouri and Pukemai Streams in the Onaero catchment	28/04/2003	2033

Wellsite	Consent number	Purpose	Issue date	Expiry
Tuhua-E	4440-2	To discharge emissions into the air from the flaring of hydrocarbons and miscellaneous emissions associated with (a) hydrocarbon exploration and production testing operations and (b) emissions from production at the Tuhua-E wellsite	30/04/2003	2021

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 MPS and associated wellsites 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

The MPS site and associated wellsites were visited six times 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 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 the 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. The Company supplied data on flaring causes and flare and fuel gas volumes throughout the period.

1.4.5 Biomonitoring surveys

Biological surveys were performed on two occasions in the Mangahewa Stream to determine whether or not the discharge of stormwater from the MPS has had a detrimental effect upon the communities of the stream. Soft sediment samples were taken concurrently from three sites and analysed for hydrocarbons.

1.4.6 Fish survey

Photo 2 MPS water supply weir in the Mangahewa Stream

Todd Energy holds resource consent 1227-1 for a weir located in the Mangahewa Stream. The weir is part of the water supply scheme for the MPS, and special condition 4 of the consent requires that the intake structure shall be designed, constructed and maintained so as to permit the upstream passage of fish. The purpose of this component of the monitoring programme is to assess compliance with this condition using spotlight and electric fishing surveys alternately, every three years. A night spotlighting survey was conducted in the year under review.

2 Results

2.1 Water

2.1.1 Inspections

Six inspections of the MPS and associated wellsites were undertaken during the period under review. The following was found during the inspections:

9 October 2017

The site was observed to be neat and tidy and well managed. Ring drains and bunds were secure and stormwater discharges to the Mangahewa stream were not affected by ring drain maintenance being undertaken at the time of the inspection; effective silt and sediment controls were in place. The water take from the Mangahewa stream was compliant with consent conditions and not affecting stream flow.

No flaring was evident at the time of the inspection.

12 January 2018

The site was neat and tidy and well managed. The stormwater system was operating effectively and was clear of any contaminants. Ring drains and bunds were all secure. The truck load out area was clean and effective loading out and safety procedures were observed. The water take, stormwater discharge area and associated weir and pumping system were inspected and were all observed to be satisfactory.

No smoke or odours were evident as a result of flaring.

21 March 2018

A site inspection was undertaken following recent severe weather conditions over the weeks prior, including the remnants of Cyclone Gita. The MPS site had coped well, with no land subsidence issues around the site noted. Ring drains and bunds were all clear of any contaminants and the discharge point by the weir in the Mangahewa stream did not give rise to any concerns. The truck load out area was secure and clean.

Earthworks associated with the pipe line from Manghewa-G wellsite had reached the MPS site and no silt control issues were noted.

A small hydrocarbon spill occurred by the exit gate during the inspection. Todd staff quickly mobilised the team and spill containment equipment and initiated a clean-up, thereby preventing any contaminants reaching the Mangahewa stream.

There was no evidence of any flaring, no odours or smoke.

17 May 2018

The site inspection showed that, despite the very heavy rainfall experienced in the previous week, the stormwater system had coped very well; all bunds and ring drains were clear of contaminants and no environmental effects were noted in the Mangahewa stream at or about the discharge point. The various interceptors and separators were also clear. The water intake area and associated weir in the Mangahewa stream were not affected by the water take for this plant. The land subsidence and instability issues near the truck load out area and the top site had been resolved with the installation of horizontal directionally drilled inserts.

Minimal flaring was being undertaken, there were no odours or smoke arising from this.

18 June 2018

An inspection was undertaken at the Mangahewa-D wellsite. It was raining heavily at the time with hail and lightning immediately preceding the inspection. No activity was occurring onsite due to the unfavourable

weather. The ring drains were three quarters full. The skimmer pits were discharging with full flow through the discharge pipes. The discharge from both pits was discoloured and the wetland below the site was very discoloured. In addition, large volumes of discoloured stormwater was discharging into the wetland from surrounding farmland and also from the groundwater/clean surface water diversion drain around the site. Sediment cloth had been installed in the eastern ring drain to help control sediment from earthworks. Unfortunately this had blocked the flow of water in the ring drain and caused stormwater to overtop the drain and discharge via the clean water diversion drain (a breach of special condition 6 of consent 10022). This was discussed with staff onsite, other methods to control sediment but allow stormwater to remain in the drain were suggested.

26 June 2018

An annual inspection of all well sites in the McKee, Mangahewa, Toetoe, Pouri, Tuhua and Pukemai fields was undertaken. The inspections were carried out during squally weather, with heavy showers occurring in the days prior. Of particular importance at these sites was the ability of the onsite stormwater systems to convey all water via the skimmer pits for effective treatment prior to discharging into or onto land and then adjacent water bodies. At all sites the stormwater facilities were observed to be adequate and fit for purpose. Some skimmer pits remained unlined; an agreement is in place with Todd Energy that these pits will be lined if any workover rigs, intensive production testing, or exploration occurs. The majority of the sites are grassed areas and silt discharge does not appear to be an issue. Where required, silt controls had been implemented. Most of the major producing sites (Mangahewa wellsites) had been landscaped with selective plantings and unwanted vegetation was controlled.

Historic mix-bury-cover areas were also inspected and no effects or problems were visible in these areas.

Flare pits were inspected and found to be mostly unused and clear of any contaminants.

2.1.2 Results of receiving environment monitoring

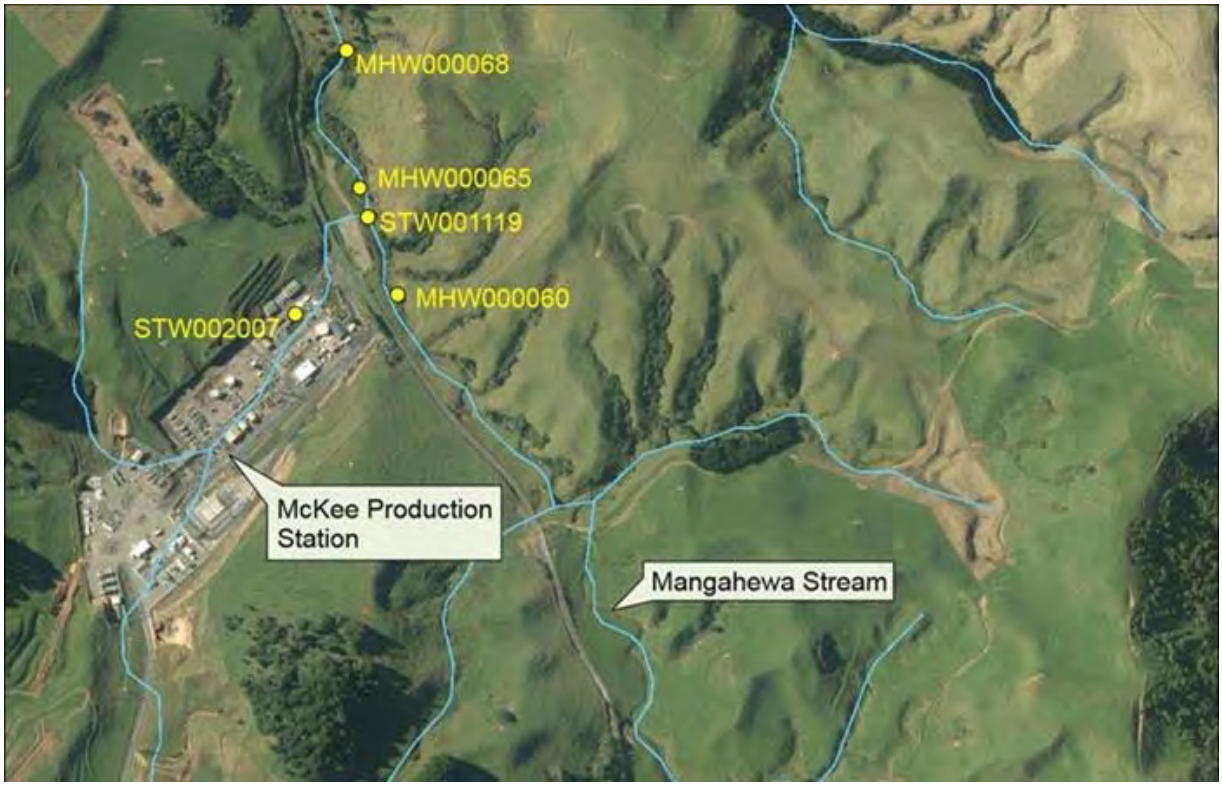

Figure 2 Sampling sites relating to MPS

2.1.2.1 Chemical

Sediments within the bed of the Mangahewa Stream in the vicinity of MPS have been found to contain hydrocarbons. The likely source is from historical contamination within the former McKee-E wellsite located between MPS and the Mangahewa Stream, although hydrocarbons have been found in sediments upstream of the MPS discharges and McKee-E. Monitoring of the levels of these hydrocarbons has been undertaken since 2011, in conjunction with biomonitoring surveys, to determine any potential impact on the health of the stream communities and whether the concentrations are decreasing over time due to degradation and/or downstream transport.

Table 3 shows the results of soft sediment sampling for the period 2011 to 2018. The sampling locations are shown in Figure 2.

Table 3 Soft sediment sampling of the Mangahewa Stream for hydrocarbons 2011-2018

Date	Hydrocarbons in sediment – mg/kg dry weight		
	100m u/s of discharge (site MHW000060)	50m d/s of discharge (site MHW00065)	250m d/s of discharge (site MHW000068)
3 June 2011	49	130	190
12 April 2013	< 10	170	56
6 June 2014	< 0.5	94	(no sample)
8 January 2015	11	34	87
2 April 2015	20	114	62
9 December 2015	< 14	39	40
1 April 2016	< 18	< 17	99
28 February 2017	93	443	235
28 April 2017	29	72	38
25 October 2017	16	155	48
7 February 2018	45	611	20

Monitoring during the 2017-2018 period found varying concentrations of hydrocarbons in the sediment at all three sites. Levels found upstream and 250 m downstream of the discharge were moderate and within the range of results found previously. Higher levels were found at the site 50 m downstream of the discharge, including the highest measured result to date. Further investigation is warranted to ascertain the ongoing source of hydrocarbon contamination in the stream sediments. Todd Energy are undertaking remedial works adjacent to the stream and will carry out a stream sediment study to assess any changes after these works are completed.

2.1.2.2 Biomonitoring

The Council's standard 'kick-sampling' technique was used at two established sites to collect streambed macroinvertebrates from the Mangahewa Stream on 25 October 2017 and 7 February 2018. The sites are shown in Figure 2 as MHW000060 (Site 1) and MHW000065 (Site 2). Samples were sorted and identified to provide the number of taxa (richness), MCI score and $SQMCI_S$ score for each site.

Taxa richness is the most robust index when determining whether a macroinvertebrate community has been exposed to toxic discharges. Macroinvertebrates when exposed to toxic discharges may die and be swept downstream or may deliberately drift downstream as an avoidance mechanism (catastrophic drift). The MCI is a measure of the overall sensitivity of the macroinvertebrate community to organic pollution in stony

streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_s$ takes into account relative abundances of taxa as well as sensitivity to pollution. Significant differences in taxa richness, MCI or $SQMCI_s$ between sites may indicate the degree of adverse effects (if any) of the discharge being monitored.

The October 2017 survey recorded taxa richnesses similar to their respective medians, while site 1 recorded a significantly higher than median MCI and site 2 recorded a significantly lower than median $SQMCI_S$ score. Taxa richnesses at both sites were similar to those recorded in the preceding survey, while MCI scores and $SQMCI_s$ scores were similar to those recorded in the preceding survey at site 1, but had decreased significantly at site 2. Hydrocarbon concentrations in the sediment showed a decrease from the high results recorded by the February 2017 survey, to levels similar to those found by previous surveys.

The February 2018 survey recorded taxa richnesses and $SQMCI_S$ scores similar to their respective medians, while site 2 recorded a significantly lower than median MCI score. Taxa richnesses at both sites were similar to those recorded in the preceding survey, while MCI score at site 1 were significantly lower than the preceding survey and $SQMCI_s$ score at site 2 was significantly higher than the preceding survey. The taxa richnesses, MCI and $SQMCI_S$ scores were similar between the two sites. Hydrocarbon concentrations in the sediment showed an increase from the previous survey, with the result at site 2 being the highest recorded to date, while sites 1 and 3 were lower than the high results recorded by the February 2017 survey. In this instance, this did not appear to have had a significant adverse effect on the macroinvertebrate community, although it may have been a contributing factor in the low taxa richness recorded at site 2 in the last four surveys.

Further monitoring will be needed to determine whether future results reflect a relationship between macroinvertebrate community health and hydrocarbon concentrations in the sediment. It should be noted that it has not been determined whether the hydrocarbon contamination is a remnant effect from the well blow-out that occurred here in 1995, or whether it is recent contamination. However, sampling suggests that there is hydrocarbon contamination occurring upstream. Therefore, there is insufficient evidence to conclude where the hydrocarbon contamination is coming from, and to what degree this contamination is affecting the macroinvertebrate communities. Further monitoring will be needed to determine whether future results reflect a relationship between macroinvertebrate community health and hydrocarbon concentrations in the sediment.

It is recommended that sediment samples continue to be collected and analysed for hydrocarbons, and that this sampling is undertaken in conjunction with the macroinvertebrate surveys.

The full biomonitoring reports are attached to this report in Appendix II.

2.1.2.3 Fish survey

A night spotlighting survey was conducted on 26 April 2018 at two sites in the Mangahewa Stream, one upstream (MHW000060) and one downstream (MHW000065) of the MPS water supply weir. In-stream habitat was relatively dissimilar between sites, the upstream site having little riparian vegetation, with slumping banks, and habitat dominated by swift runs, with few pools and the downstream site having established riparian vegetation, stable banks and a clear pool riffle structure. Both sites had good cover, with macrophyte beds and extensive undercut banks providing plenty of refuge for fish. The downstream site appeared to have been impacted by a significant flood, with one notable debris dam restricting access to an area of stream.

Fish diversity was lower than typical at the upstream site while at the downstream site it was moderate, reflecting the location of the site, in terms of its distance inland. In addition, the sampling methodology does not typically record high species richness. Fish abundance was low at both sites, and although the methodology will have also contributed to this, it is important to recognise that this stream was subject to a significant flood event in June 2015, which may have deleteriously affected the fish communities. Another

potential influence on the fish communities is that of hydrocarbon contamination. Sediment sampling undertaken over the last seven years has detected hydrocarbon contamination of the sediment, although the degree of contamination has varied both spatially and temporally. The most recent sampling, completed in February 2018, recorded a sharp increase in the contamination of the sediment at the downstream site. It should be noted that it has not been determined whether the hydrocarbon contamination is a remnant effect from the well blow-out that occurred here in 1995, or whether it is recent contamination. There is insufficient evidence to conclude where the hydrocarbon contamination is coming from, and to what degree this contamination is affecting the aquatic communities. It is also important to note that there have been no fish kills reported recently from this rural stream.

Longfin eel (*Anguilla dieffenbachii*), redfin bully (*Gobiomorphus huttoni*), banded kokopu (*Galaxias fasciatus*) and giant kokopu (*Galaxias argenteus*) were all recorded in the current survey, although only two unidentified galaxiids were recorded upstream of the weir. Previous surveys have recorded giant and banded kokopu upstream of the weir, but not redfin bully. It is possible that these species were present upstream of the weir during this survey, but that due to the inherent difficulty in surveying this site, may have been missed.

A visual assessment of this fish pass indicates that it is likely to be ineffective due to insufficient water depth, too steep a gradient, and very swift water flows. It is thought that those migrant fish recorded upstream of the weir migrated there as juveniles, and did so using the edge of the weir, by climbing through or under moist grass where it came into contact with water flow. This area provides a better substrate to climb up, while also having reduced water velocity. This grass is therefore critical to fish migration, and should not be removed or sprayed. Provided this grass remains, it is concluded that the weir did not pose a significant barrier to fish passage at that time. However, there may need to be additional work undertaken to quantify the population of redfin bully upstream of the weir.

This survey confirms that the McKee Production Station water supply weir did not form a significant barrier to fish passage, and therefore compliance with special condition 4 of resource consent 1227 has been achieved. However, the lack of redfin bully above the weir may need further investigation. Provided that regular inspections of the weir confirm that it is being maintained as required, it is recommended that fish monitoring be maintained at the current level of once every three years, using the spotlighting methodology.

The full survey report is attached to this report in Appendix III.

2.1.3 Summary of water abstractions reported by Todd Energy

Figures 3 to 6 provide summaries of the abstraction volumes for consented water takes in relation to the McKee and Mangahewa facilities. No water was abstracted under the water take consents for Mangahewa-E (9456-1) or Mystone-A (7455-1) during the period under review. All daily volumes for all of the abstractions were within the limits stipulated by their respective consents.

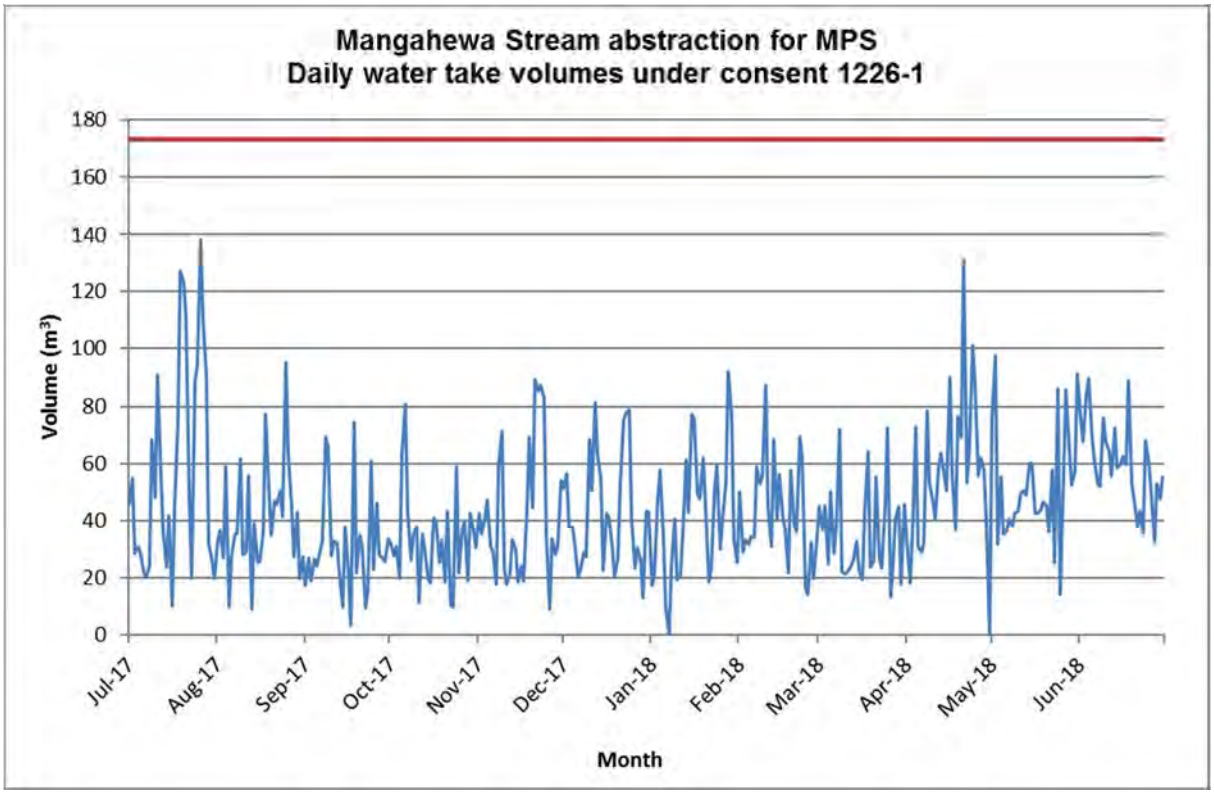

Figure 3 Daily water abstraction volumes for MPS under consent 1226-1

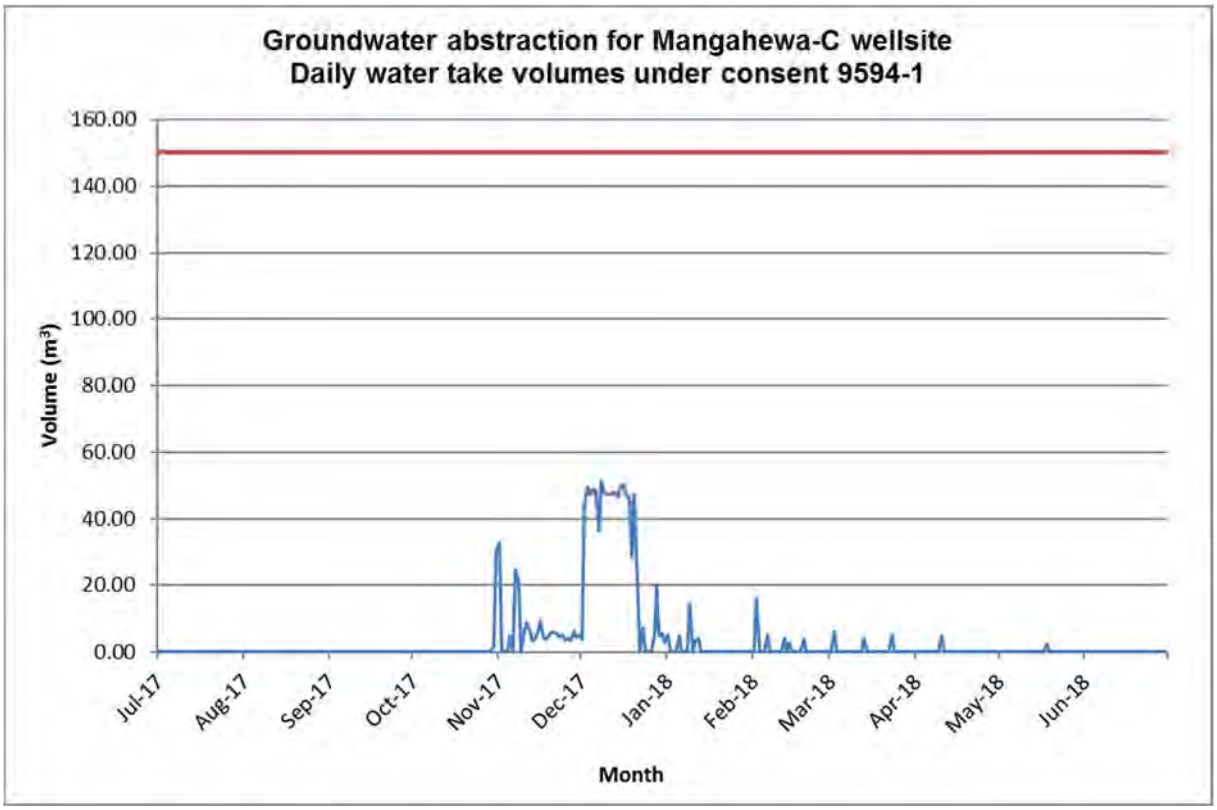

Figure 4 Daily groundwater abstraction volumes for Mangahewa-C under consent 9594-1

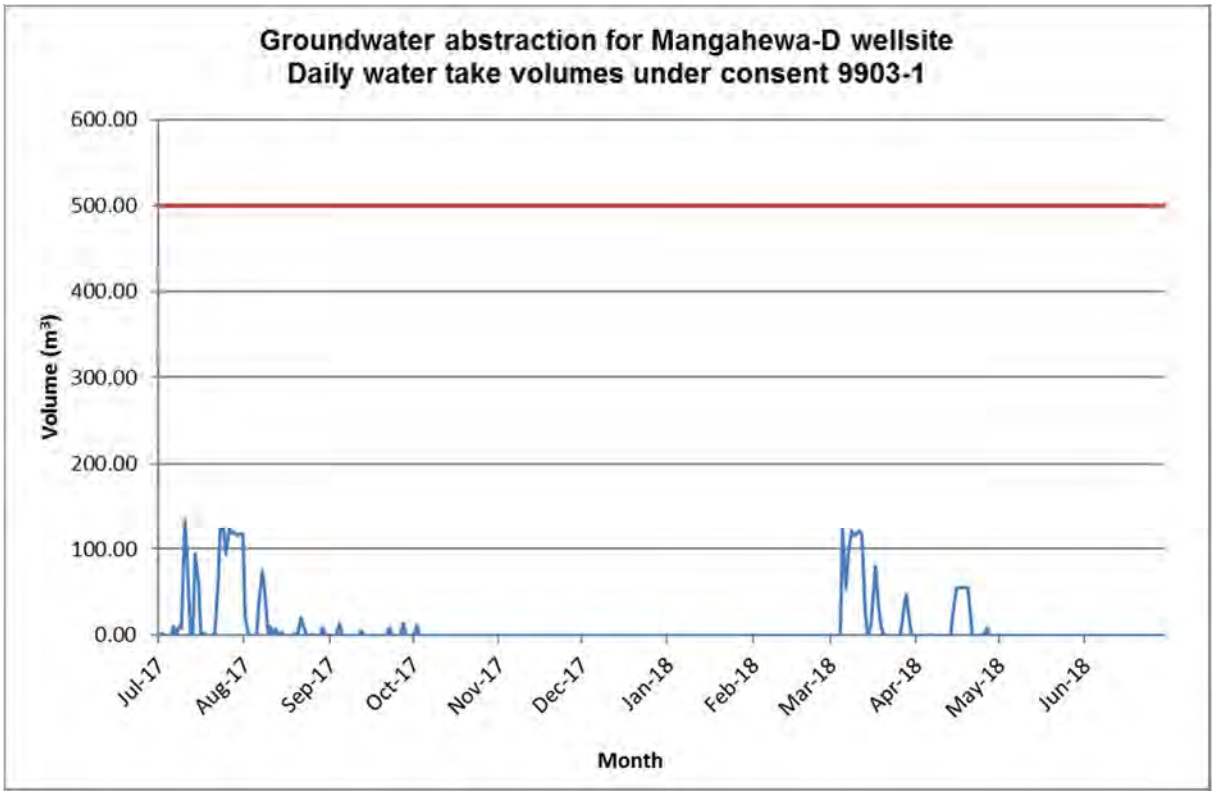

Figure 5 Daily groundwater abstraction volumes for Mangahewa-D under consent 9903-1

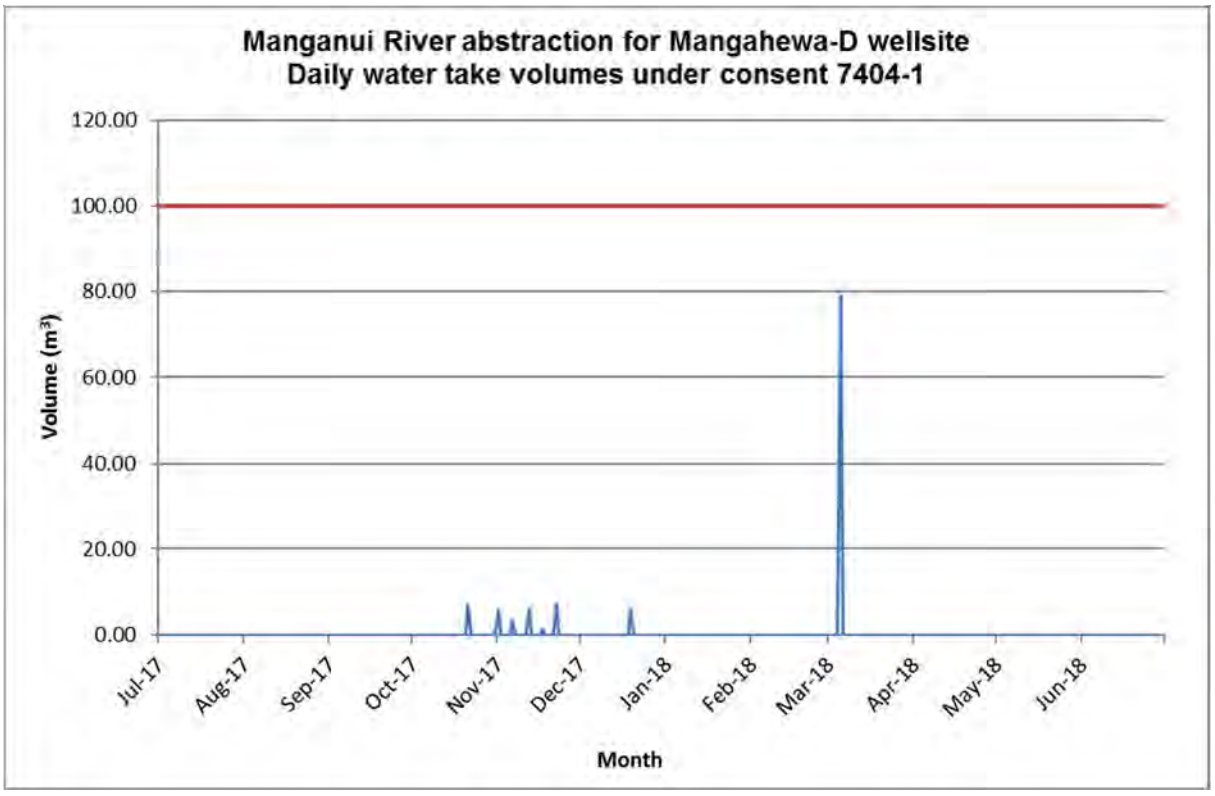

Figure 6 Daily water abstraction volumes for Mangahewa-D under consent 7404-1

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, with no offensive 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 (Figure 6). The deployment lasted approximately 43 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 7 Air monitoring sites at MPS

The details of the sample run are summarised in Table 4 and the data from the sample run are presented graphically in Figure 8**.**

The consents covering air discharges from MPS have specific limits related to particular gases. Special condition 5 of consent 4050-3 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 18.3 mg/m^3 with average concentration for the entire dataset was 0.23 mg/m^3 which comply with consent conditions. This is consistent with the pattern found in previous years.

Table 4 Results of carbon monoxide and LEL monitoring at MPS

Period (from-to)		18 to 20 April 2018 43 hours
Max	CO(ppm)	16.0
	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 MPS reach any more than a trivial level.

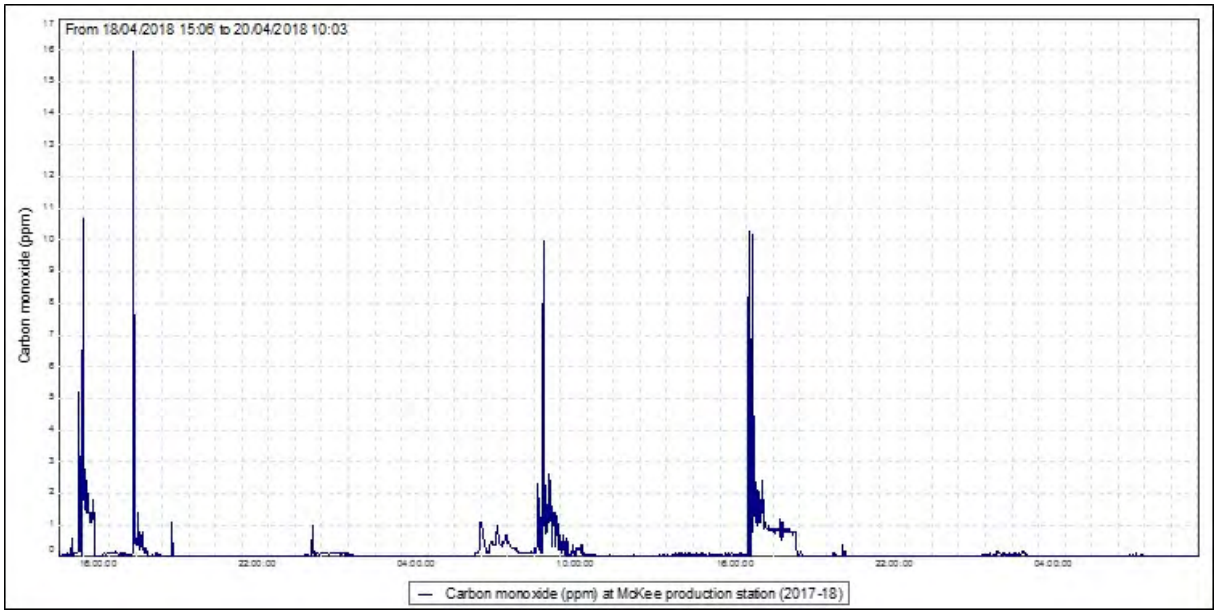

Figure 8 Ambient CO levels in the vicinity of the MPS

2.2.2.2 PM_{10}

In September 2004 the Ministry for the Environment made public National Environmental Standards (NESs) relating to certain air pollutants. The NES for PM_{10} 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 the MPS (Figure 6). The deployment lasted approximately 40 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 6.

The details of the sample run are presented in Figure 9 and Table 5.

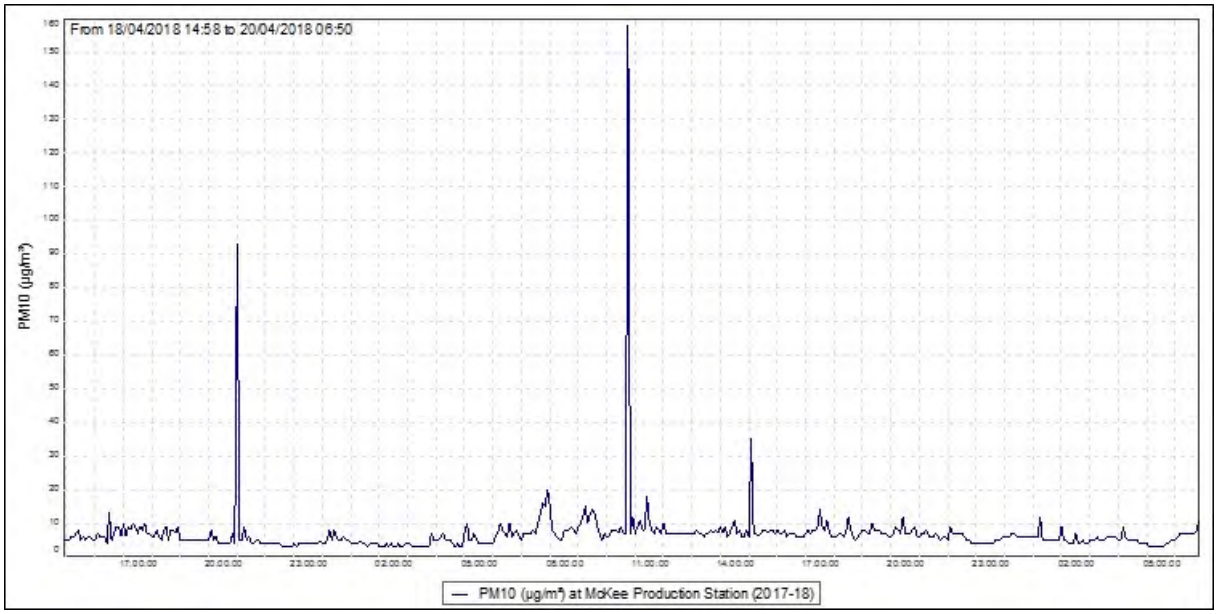

Figure 9 PM_{10} concentrations (µg/m³) at the MPS

Table 5 Daily mean of PM_{10} results during two days' monitoring at MPS

	40 hours (18 to 20 April 2018)	
24 hr. set	Day 1 (start to 24 hr)	Day 2 (24 hr to end)
Daily average	7.1 µg/m³	7.6 µg/m³
NES	50 µg/m³	

During the 40 hour run, from 18 to 20 April 2018, the average recorded PM_{10} concentration for the first 24 hour period was 7.1 µg/m³ and 7.6 µg/m³ for the second 24 hour period. These daily means equate to 14% and 15%, 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.

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 MPS) 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 consents covering air discharges from MPS have specific limits related to particular gases. Special condition 6 of consent 4050-3 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 MPS 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 MPS during the year under review equates to 11.6 µg/m³ and 6.2 µg/m³, respectively. The results show that the ambient ground level concentration of NOx is well below the limits set out by consent 4050-3.

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

2.2.3 Summary of flaring and fuel use reported by the Company

Summaries of flaring and fuel use at MPS are provided in Figures 10 and 11.

During the period under review, the Company kept the Council informed of all non-routine flaring at MPS. The majority of this flaring related to planned maintenance, repairs, plant and wellsite configuration changes, power outages and compressor trips and maintenance. No visible smoke events were recorded. There was no flaring associated with the exercise of the air discharge consents for the McKee EGP (7290-1).

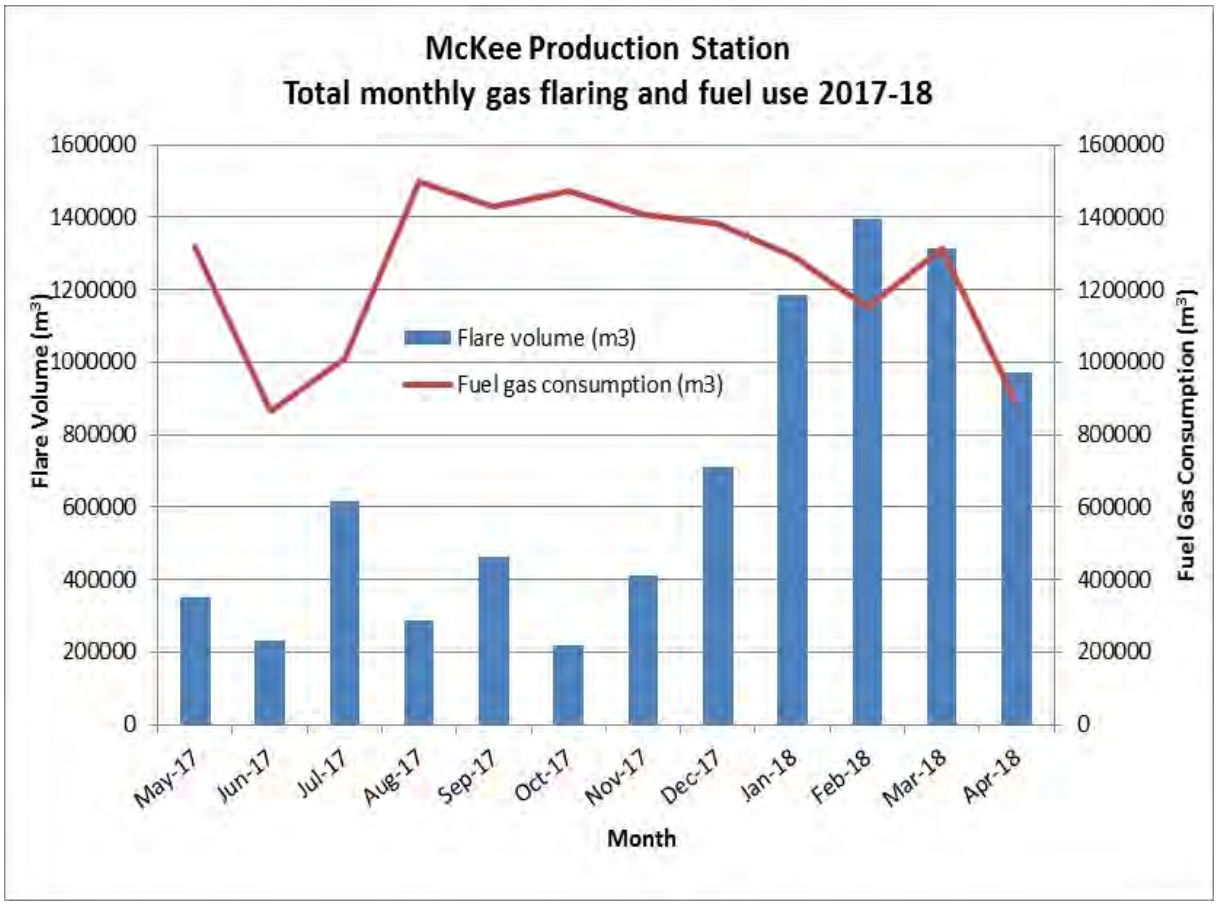

Figure 10 Monthly gas flaring and fuel use for MPS under consent 4050-3

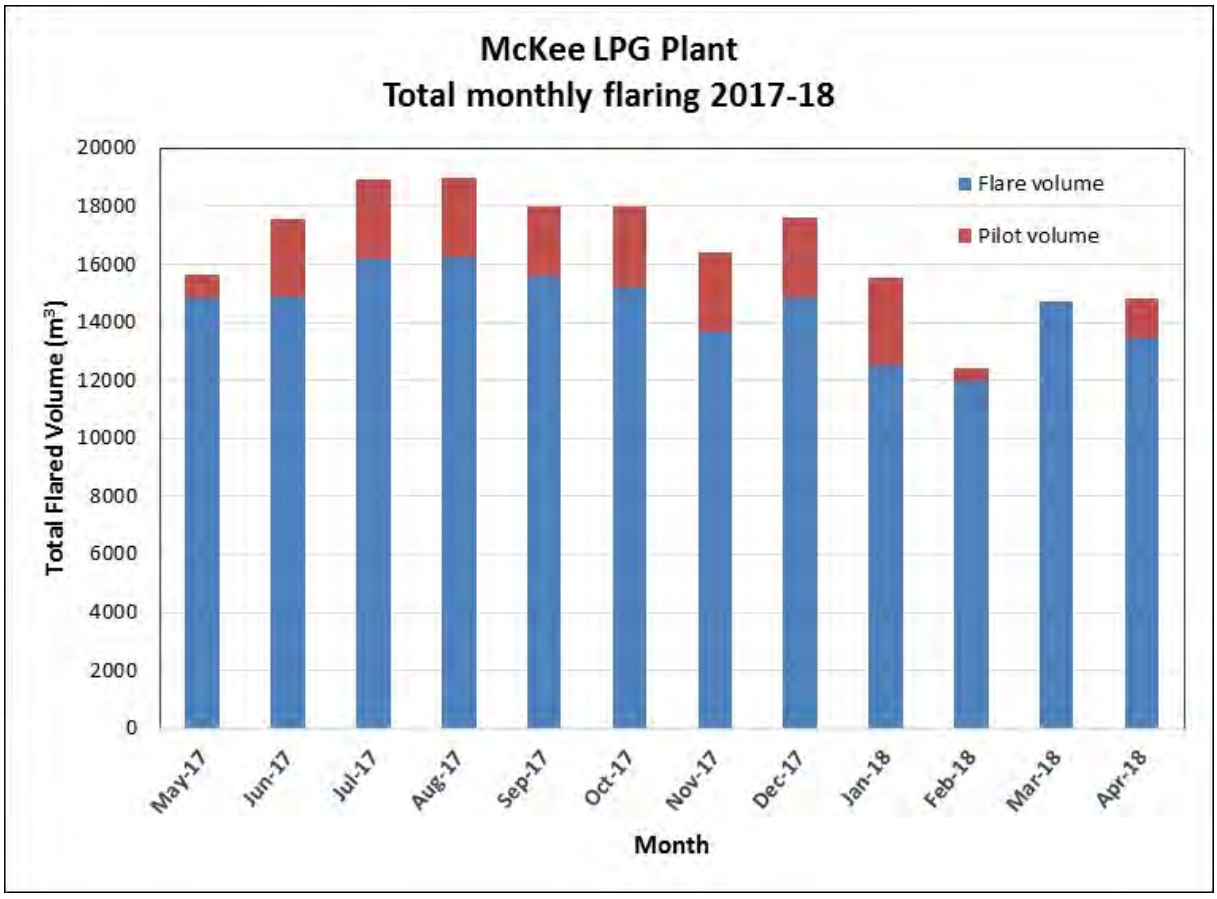

Figure 11 Monthly flaring volumes for McKee LPG Plant under consent 7436-1

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 not 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.

3 Discussion

3.1 Discussion of site performance

Inspections of the MPS during the 2017-2018 period found that the site was well managed and the stormwater system was maintained to a satisfactory standard. Emissions to air were well controlled. All water abstractions complied with the requirements of their respective consents.

3.2 Environmental effects of exercise of consents

Stormwater system inspections showed that discharges from the sites complied with consent conditions at the time.

Biomonitoring in the Mangahewa Stream found similar numbers of taxa to previous surveys. Hydrocarbons were found at varying concentrations in the sediment, including the highest level measured to date in February 2081, 50 metres downstream of the discharge. It is evident that the declining trend seen in the previous years is not continuing. It is unclear whether the lower taxa richnesses and MCI scores were primarily a result of the hydrocarbon contamination. Todd Energy are in the process of remediating a pond on the former McKee-E wellsite adjacent to the Mangahewa Stream. Further monitoring will be undertaken by the Company to assess effects on the stream environment resulting from the remedial works. This may also assist with determining any relationship between macroinvertebrate community health and hydrocarbon concentrations in the sediment.

Monitoring of the MPS water supply weir found that this did not form a significant barrier to fish passage.

There were no adverse effects on the environment resulting from the exercise of the air discharge consents. The ambient air quality monitoring at the 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 boundary during inspections.

3.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Tables 6-15.

Table 6 Summary of performance for consent 1157-1

Purpose: ***To discharge uncontaminated stormwater from the site of the MPS to an unnamed tributary of the Mangahewa Stream***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Ensure the stream can cope with increased volume of water	Inspection	Yes
2. Minimise disturbance of the stream	Inspection	Yes
3. Prevent or mitigate erosion	Inspection	Yes
4. Corrective measures applied are to be to the satisfaction of the Council	Inspection	Yes

Purpose: *To discharge uncontaminated stormwater from the site of the MPS to an unnamed tributary of the Mangahewa Stream*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
5. Install a sampling chamber in the main stormwater line	Inspection	Yes
6. Stormwater design and discharge points to be forwarded to Council	Information received	Yes
7. Provide contingency plan	Latest version approved December 2016	Yes
8. Discharge not to affect receiving water	Inspections	Yes
9. Council may carry out biological monitoring	Biomonitoring undertaken	Yes
10. 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**

N/A = not applicable

Table 7 Summary of performance for consent 1158-1

Purpose: *To discharge treated impounded stormwater from the site of the MPS into the Waitara River*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Stormwater to be directed for treatment prior to discharge	Inspection	Yes
2. Prevent or mitigate erosion	Inspection	Yes
3. Corrective measures applied are to be to satisfaction of Council	Inspection	Yes
4. Install a sampling chamber in the main stormwater line	Inspection	Yes
5. Stormwater layout design and discharge points are to be forwarded to the Council	Information received	Yes
6. Supply specifications of works to Council	Information received	Yes
7. Trained operator onsite capable of operation of all aspects of the treatment works	Inspection	Yes
8. Limits on contaminants in the discharge	Consent holder monitoring	Yes
9. Discharge shall have no other effect on the receiving water	Inspection	Yes

Purpose: *To discharge treated impounded stormwater from the site of the MPS into the Waitara River*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
10. Discharge not to cause adverse effects on the biological community of the Waitara River	Not monitored during the period under review	N/A
11. Discharge not to alter colour or clarity of the water	Inspections	Yes
12. Management plan	Management Plan received	Yes
13. Spill plan	Latest version approved December 2016	Yes
14. Council may undertake ecological monitoring of the receiving water	Not monitored during the period under review	N/A
15. Toxicological monitoring of discharge	Not undertaken during the period under review	N/A
16. Monitoring of discharge shall be undertaken as required	Consent holder monitoring	Yes
17. 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 8 Summary of performance for consent 1159-1

Purpose: *To divert unnamed tributaries of the Mangahewa Stream in the vicinity of the MPS, and to discharge surface water run-off from adjacent land into the Mangahewa Stream, to permit construction and operation of the said facility*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Plans and location of diversions to be forwarded to Council	Received	Yes
2. Ensure natural channels of stream can cope with increased flow	Inspection	Yes
3. Prevent or mitigate erosion	Inspection	Yes
4. Any corrective measures are to be to the satisfaction of Council	Inspection	Yes
5. Council may carry out biological monitoring	Biomonitoring undertaken	Yes
6. 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 9 Summary of performance for consent 1226-1

Purpose: *To take water from the Mangahewa Stream for process, fire-fighting and domestic purposes associated with operation of the MPS*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Minimum flow of at least 5 litres/sec to be maintained in tributary	Not assessed	N/A
2. Install metering system and forward records to Council	Records provided to Council	Yes
3. Intake structure to be designed to minimise disturbance	Inspection	Yes
4. Submit plans of intake structure	Provided	Yes
5. 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 1227-1

Purpose: *To construct a weir control for the MPS water intake on the Mangahewa Stream in the Onaero Catchment*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Submit plans and location of all works	Received	Yes
2. Works to minimise disturbance to beds and banks of river channel flows	Inspection	Yes
3. Prevent or mitigate any erosion	Inspection	Yes
4. Intake structure to be designed and constructed to permit passage of fish upstream	Fish survey	Yes
5. Minimum flow of no less than 5 litres/sec in the Mangahewa Stream	Not assessed	N/A
6. Operation of sluice pipe for desilting only with written approval of Council	No requests to undertake desilting	N/A
7. 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 11 Summary of performance for consent 4006-2

Purpose: *To erect, place and maintain a bridge over the Waitara River for oil field access purposes*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Notify Council prior to maintenance works which may disturb the river bed	No works undertaken	N/A
2. Structure shall be maintained to ensure conditions of consent are met	Inspection	Yes
3. Structure shall be removed and area reinstated when no longer required	Structure still in use	N/A
4. Review provision	Next option for review in 2021	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 12 Summary of performance for consent 4050-3

Purpose: *To discharge emissions into the air arising from the flaring of hydrocarbons associated with production activities at the McKee-C wellsite and from hydrocarbon processing operations and miscellaneous emissions at the MPS*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Consent holder shall adopt the best practicable option	Inspection	Yes
2. Hydrocarbon storage vessels are to be fitted with vapour recovery systems	Inspection	Yes
3. Opacity of smoke emissions shall not exceed 1 on the Ringlemann Scale	Not assessed	N/A
4. There shall be no offensive odour or smoke beyond the boundary	Inspection	Yes
5. Limits on CO concentration at or beyond the boundary	Ambient air sampling	Yes
6. Limits on NOx concentration at or beyond boundary	Ambient air sampling	Yes
7. No hazardous/toxic/noxious emissions at or beyond boundary	Inspection and ambient air sampling	Yes

Purpose: *To discharge emissions into the air arising from the flaring of hydrocarbons associated with production activities at the McKee-C wellsite and from hydrocarbon processing operations and miscellaneous emissions at the MPS*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
8. Limit on increase of contaminant concentrations at or beyond boundary	Not assessed	N/A
9. Gas and condensate analysis to be made available	Not requested	N/A
10. Consent holder to record occasions of visible smoke	Inspection	Yes
11. Consent holder to maintain flaring log	Inspection and log received by Council	Yes
12. Provision of flaring and emissions report each May	Report received by Council	Yes
13. No alterations to be made without consulting Council prior	Inspection	Yes
14. No liquid or solid hydrocarbons to be combusted except in emergency	Inspection and consent holders records	Yes
15. Council to be notified of flaring	Notifications received	Yes
16. Consent holder to notify residents within 1 km prior to flaring	No complaints received	Yes
17. Wind speed and direction to be taken into consideration for flaring	No complaints received	Yes
18. Gas flared to be treated by effective separation and recovery	Inspection	Yes
19. Council to be notified if separation fails	No incidents during period	N/A
20. Only well stream substances to be combusted in flare pit	Inspection and records	Yes
21. Review provision	Next option for review in 2021	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 13 Summary of performance for consent 7290-1

Purpose: *To discharge emissions into the air from natural gas combustion and other related activities associated with the operation of an electricity generation plant at the MPS*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Adoption of the best practicable option	Inspection	Yes
2. Consult with Council prior to alterations	Inspection	Yes
3. Dangerous levels of airborne contaminants at or beyond the boundary not allowed	Air quality monitoring	Yes
4. Odour, dust or smoke that is offensive or obnoxious or objectionable at or beyond the boundary not allowed	Inspection	Yes
5. Hazardous, toxic or noxious contaminants at or beyond the boundary not allowed	Inspection and air quality monitoring	Yes
6. Maximum ground level concentration of carbon monoxide at or beyond the boundary	Air quality monitoring	Yes
7. Maximum ground level concentration of nitrogen dioxide at or beyond the boundary	Air quality monitoring	Yes
8. Specified maximum ground level concentrations for contaminants other than carbon dioxide, carbon monoxide, and nitrogen oxides	Not assessed	N/A
9. Lapse condition	Not applicable – consent exercised	N/A
10. Review provision	Next option for review in 2021	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 14 Summary of performance for consent 7435-1

Purpose: ***To discharge stormwater into an unnamed tributary of the Mangahewa Stream in the Onaero catchment from a LPG Plant***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Consent holder shall adopt the best practicable option	Inspection and liaison with consent holder	Yes
2. Maximum catchment area 7,800 m^2	Site plans	Yes
3. Provide site plans	Plans received	Yes
4. Notify Council prior to exercise of consent	Notifications received	Yes
5. Maintain contingency plan	Latest version approved December 2016	Yes
6. Maintain stormwater management plan	Plan received	Yes
7. Stormwater directed to treatment system	Inspection	Yes
8. Hazardous substance storage to be bunded	Inspection	Yes
9. Limits contaminants in the discharge	Consent holder monitoring	Yes
10. Discharge not to cause certain effects in receiving waters	Inspection and sampling	Yes
11. Lapse provision	Not applicable - consent exercised	N/A
12. Review provision	Next option for review in 2021	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 15 Summary of performance for consent 7436-1

Purpose: ***To discharge emissions to air from the flaring of natural gas in emergency situations and miscellaneous emissions associated with the treatment of gas at the McKee LPG Plant and the Mangahewa Extraction Train 2***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Consent holder shall adopt the best practicable option	Inspection	Yes
2. No alterations to be made without consulting Council prior	Inspection	Yes
3. Consent holder to minimise emissions	Inspection	Yes

Purpose: *To discharge emissions to air from the flaring of natural gas in emergency situations and miscellaneous emissions associated with the treatment of gas at the McKee LPG Plant and the Mangahewa Extraction Train 2*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
4. Monthly flaring information to be provided to Council	Information received	Yes
5. No dangerous levels of contaminants at or beyond the boundary	Inspection and ambient air sampling	Yes
6. There shall be no offensive/obnoxious/objectionable odour/dust/smoke at or beyond the boundary	Inspection	Yes
7. No hazardous/toxic/noxious emissions at or beyond boundary	Inspection and ambient air sampling	Yes
8. Limits on CO concentration at or beyond boundary	Ambient air sampling	Yes
9. Limits on NOx concentration at or beyond boundary	Ambient air sampling	Yes
10. Limit on increase of contaminant concentrations at or beyond boundary	Not assessed	N/A
11. Lapse provision	Not applicable - consent exercised	N/A
12. Review provision	Next option for review in 2021	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 16 Evaluation of environmental performance over time

Year	Consent no	High	Good	Improvement req	Poor
2009-10	1157-1, 1158-1, 1159-1, 1226-1, 1227-1, 4006-2, 4050-3, 7290-1, 7435-1, 7436-1	10			
2010-11	1157-1, 1158-1, 1159-1, 1226-1, 1227-1, 4006-2, 4050-3, 7290-1, 7435-1, 7436-1	7	2	1	
2011-12	1157-1, 1158-1, 1159-1, 1226-1, 1227-1, 4006-2, 4050-3, 7290-1, 7435-1, 7436-1	9		1	
2012-14	1157-1, 1158-1, 1159-1, 1226-1, 1227-1, 4006-2, 4050-3, 7435-1, 7436-1	8	2		

Year	Consent no	High	Good	Improvement req	Poor
2014-15	1157-1, 1158-1, 1159-1, 1226-1, 1227-1, 4006-2, 4050-3, 7435-1, 7436-1	10			
2015-16	1157-1, 1158-1, 1159-1, 1226-1, 1227-1, 4006-2, 4050-3, 7290-1, 7435-1, 7436-1	10			
2016-17	1157-1, 1158-1, 1159-1, 1226-1, 1227-1, 4006-2, 4050-3, 7290-1, 7435-1, 7436-1	10			
Totals		64	4	2	

During the year, the Company demonstrated an overall high level of both environmental performance and administrative compliance with the resource consents as defined in Section 1.1.4. There were no unauthorised incidents recorded by the Council in relation to the Company's activities.

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 the MPS 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.

Recommendation one was implemented, while it was not considered necessary to undertake additional monitoring 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 McKee 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 McKee 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:

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.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
EGP	The electricity generation plant at MPS.
g/m^3	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
Incident Register	The Incident Register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
LEL	Lower Explosive Limit. The percentage of the lower explosive limit, expressed as methane that is detected in the air sampled.
m^2	Square Metres.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mg/m^3	Milligrams per cubic meter.
MPP	McKee Power Plant.
MPS	McKee Production Station.
mS/m	Millisiemens per metre.
NO_3	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
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).
ppm	Parts per million. Equal to 1mg/L (water) or 1mg/kg (soil).
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	*Resource Management Act 1991* and including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
µg/m	Micrograms per cubic meter of air, equivalent to one-millionth of a gram per cubic meter of air.

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

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Appendix I

Resource consents held by Todd Energy Limited

(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:	Todd Energy Limited P O Box 802 NEW PLYMOUTH
Decision Date (Change):	8 August 1984
Commencement Date (Change):	8 August 1984 [Granted: 28 September 1983]

Conditions of Consent

Consent Granted:	To discharge up to 325 litres/second of uncontaminated stormwater from the site of McKee Production Facility into an unnamed tributary of the Mangahewa Stream at or about GR: Q19:255-343
Expiry Date:	1 June 2023
Site Location:	Grantee's property, near unnamed tributary of Mangahewa Stream
Legal Description:	Pt Otaraoa No 3 DP 2961 Blk X Waitara SD
Catchment:	Onaero
Tributary:	Mangahewa

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

General conditions

a) This right is subject to all the relevant provisions of the Water and Soil Conservation Act 1967, and any regulations made thereunder. It is the obligation of the grantee of this right to comply with all statutory requirements relating to the exercise thereof.

b) The Taranaki Regional Council may prescribe the method of management of this right, including the limitation of periods during which the right may be fully exercised, if a water shortage or other abnormal circumstance occurs in the locality.

c) The grantee shall keep such records relating to the exercise of this right as may reasonably be required by the Taranaki Regional Council and shall, if so requested, supply this information to the Taranaki Regional Council. Further, the grantee shall, at his own expense, if the Taranaki Regional Council so requests, install such measuring devices as are considered reasonably necessary by the Taranaki Regional Council for the acquisition of such records.

d) This right is granted subject to the Taranaki Regional Council or its servants or agents being permitted such access as is reasonably required for the purposes of carrying out inspections and measurements in connection with this right.

e) The standards, techniques and methods of monitoring of this right shall be to the specific approval of the Chief Executive, Taranaki Regional Council.

f) The design, construction and maintenance of any works relating to the right shall be to a standard adequate to meet the conditions of this right, so that the exercise of this does not cause damage to any property or injury to any person.

g) This right may be cancelled in writing to the grantee by the Taranaki Regional Council if the right is not exercised within twelve months of the date or grant or such longer time as the Chief Executive, Taranaki Regional Council, may approve.

h) This right may be terminated by the Taranaki Regional Council upon not less that 12 months notice in writing to the grantee if, in the opinion of the Taranaki Regional Council, the public interest so requires, but without prejudice to the grantee to apply for a further right in respect of the same matter.

i) The actual and reasonable cost of supervision of this right, including certification, approval, monitoring, water sampling and analyses, be met by the grantee.

j) The Grantee shall provide to the Chief Executive, Taranaki Regional Council, on his request (and, at his discretion, for his approval) plans, specifications and maintenance programmes of works associated with the exercise of this right, showing that the conditions of this right are able to be met.

k) Before the Taranaki Regional Council or its Chief Executive:

   i) imposes any requirement or makes any request under General Condition (c); or
   ii) grants or withholds any approval under the provisions of this right; or

iii) makes any determination as to any programme or supervision or monitoring or as to the actual and reasonable cost to be met by the Grantee; or

iv) makes any determination as to adequacy under General Conditions (f) and/or (j);

the Taranaki Regional Council shall confer with the Grantee to enable agreement to be reached between the Taranaki Regional Council and the Grantee on the subject matter and costs thereof, provided that if any dispute arises concerning the matters dealt with in (i)-(iv) above, the dispute shall be referred to an independent arbitrator to be mutually agreed upon, the arbitration to be conducted in accordance with the Arbitration Act 1908, or in such a manner as the parties affecting may agree upon.

Special conditions

1. That the Grantee shall be responsible for ensuring that the natural channels of the streams below the discharge point, for a distance to be decided upon by agreement between the Chief Executive, Taranaki Regional Council and the Grantee, are capable of coping with the increased volumes of water.

2. That the works associated with the exercise of this right shall be designed to minimise disturbance to the bed and banks of the stream channels both at low flows and design flood levels, subject to Condition 1 above.

3. That the Grantee shall, where possible, prevent or mitigate any erosion which may occur as a result of works associated with the exercise of this right.

4. That any corrective measures applied as a result of (2) and (3) above shall be to the satisfaction of the Chief Executive, Taranaki Regional Council.

5. That the Grantee shall install a sampling chamber in the main stormwater discharge lines, to the satisfaction of the Chief Executive, Taranaki Regional Council.

6. That plans for stormwater design layout and discharge points shall be forwarded to the Chief Executive, Taranaki Regional Council, for his approval prior to the commencement of construction.

7. That the Grantee shall provide, for the approval of the Chief Executive, Taranaki Regional Council, a contingency plan for actions to be taken in the event of a spillage or accumulation of off-specification effluent, at least three months or such shorter time as the Chief Executive, Taranaki Regional Council may allow, prior to the exercise of this right.

8. That the discharge shall not alter the level or concentration of suspended solids, oils and hydrocarbons, pH, temperature or any other parameter in the receiving water, without prior written approval of the Chief Executive, Taranaki Regional Council.

9. That the Taranaki Regional Council may carry out a programme of biological monitoring of the Mangahewa Stream environment, subject to Section 24K of the Water and Soil Conservation Act 1967.

10. That there shall be a review by the Grantee and Taranaki Regional Council of all conditions, restrictions and prohibitions every five years, and if as a result of this review the Grantee or the Taranaki Regional Council require a variation, then the variation procedures shall be pursuant to Section 24B of the Water and Soil Conservation Act 1967.

Transferred at Stratford on 15 November 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:	Todd Energy Limited P O Box 802 NEW PLYMOUTH
Decision Date (Change):	8 August 1984
Commencement Date (Change):	8 August 1984 [Granted: 28 September 1983]

Conditions of Consent

Consent Granted:	To discharge up to 10 litres/second of treated impounded stormwater from the site of the McKee Production Facility into the Waitara River at or about GR: Q19:241-337
Expiry Date:	1 June 2023
Site Location:	East Bank Of Waitara River
Legal Description:	Pt Otaraoa No 3 DP 2961 Blk X Waitara SD
Catchment:	Waitara

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

General conditions

a) This right is subject to all the relevant provisions of the Water and Soil Conservation Act 1967, and any regulations made thereunder. It is the obligation of the grantee of this right to comply with all statutory requirements relating to the exercise thereof.

b) The Taranaki Regional Council may prescribe the method of management of this right, including the limitation of periods during which the right may be fully exercised, if a water shortage or other abnormal circumstance occurs in the locality.

c) The grantee shall keep such records relating to the exercise of this right as may reasonably be required by the Taranaki Regional Council and shall, if so requested, supply this information to the Taranaki Regional Council. Further, the grantee shall, at his own expense, if the Taranaki Regional Council so requests, install such measuring devices as are considered reasonably necessary by the Taranaki Regional Council for the acquisition of such records.

d) This right is granted subject to the Taranaki Regional Council or its servants or agents being permitted such access as is reasonably required for the purposes of carrying out inspections and measurements in connection with this right.

e) The standards, techniques and methods of monitoring of this right shall be to the specific approval of the Chief Executive, Taranaki Regional Council.

f) The design, construction and maintenance of any works relating to the right shall be to a standard adequate to meet the conditions of this right, so that the exercise of this does not cause damage to any property or injury to any person.

g) This right may be cancelled in writing to the grantee by the Taranaki Regional Council if the right is not exercised within twelve months of the date or grant or such longer time as the Chief Executive, Taranaki Regional Council, may approve.

h) This right may be terminated by the Taranaki Regional Council upon not less that 12 months notice in writing to the grantee if, in the opinion of the Taranaki Regional Council, the public interest so requires, but without prejudice to the grantee to apply for a further right in respect of the same matter.

i) The actual and reasonable cost of supervision of this right, including certification, approval, monitoring, water sampling and analyses, be met by the grantee.

j) The Grantee shall provide to the Chief Executive, Taranaki Regional Council, on his request (and, at his discretion, for his approval) plans, specifications and maintenance programmes of works associated with the exercise of this right, showing that the conditions of this right are able to be met.

k) Before the Taranaki Regional Council or its Chief Executive:

   i) imposes any requirement or makes any request under General Condition (c); or
   ii) grants or withholds any approval under the provisions of this right; or

iii) makes any determination as to any programme or supervision or monitoring or as to the actual and reasonable cost to be met by the Grantee; or

iv) makes any determination as to adequacy under General Conditions (f) and/or (j);

the Taranaki Regional Council shall confer with the Grantee to enable agreement to be reached between the Taranaki Regional Council and the Grantee on the subject matter and costs thereof, provided that if any dispute arises concerning the matters dealt with in (i)-(iv) above, the dispute shall be referred to an independent arbitrator to be mutually agreed upon, the arbitration to be conducted in accordance with the Arbitration Act 1908, or in such a manner as the parties affecting may agree upon.

Special conditions

1. That any stormwater originating from process or tankage areas, or areas where the level of contamination or likely contamination is significant, or is contaminated in the opinion of the Chief Executive, Taranaki Regional Council, shall be retained in the stormwater holding pond for treatment and discharged via the treatment system as treated stormwater.

2. That the Grantee shall, where possible, prevent or mitigate any erosion which occurs as a result of works associated with the exercise of this right.

3. That any corrective measures applied as a result of (2) above shall be to the satisfaction of the Chief Executive, Taranaki Regional Council.

4. That the Grantee shall install a sampling chamber in the treated stormwater discharge line to the outfall, to the satisfaction of the Chief Executive, Taranaki Regional Council

5. That plans for stormwater design layout, discharge point and works shall be forwarded to the Chief Executive, Taranaki Regional Council, for the written approval, prior to the commencement of construction.

6. The Grantee shall supply specifications of all works associated with the exercise of this right showing that the special conditions of the right particularly (8) and (9) can be met, at least three months prior to the exercise of this right for the written approval of the Chief Executive, Taranaki Regional Council.

7. That at all times of plant operation a suitably trained operator be available on site capable of operation of all aspects of the treatment works, to the satisfaction of the Chief Executive, Taranaki Regional Council.

8. That on the basis of 24 hour flow-proportioned composite samples, components of the effluent stream shall conform to the following:

Temperature	$<20^{o}C$
pH	6.5 – 8.5
Total recoverable hydrocarbons	90% of samples $<10\ g/m^3$
	the balance of samples $<20\ g/m^3$
Suspended solids	$<30\ g/m^3$

9. That other than specified in Condition 8 above, the discharge shall not alter the level of concentration of any other parameter in the receiving water, without prior written approval of the Chief Executive, Taranaki Regional Council

10. The discharge shall cause no adverse effects to the biological communities of the Waitara River.

11. That the discharge shall not alter to a conspicuous extent the natural colour and clarity of the receiving water.

12. That the grantee shall provide an Effluent Disposal Management Plan for the plant, including commissioning phases, at least three months (or such shorter time as the Chief Executive, Taranaki Regional Council, may allow) prior to the exercise of this right for the approval of the Chief Executive, Taranaki Regional Council.

13. That the Grantee shall provide a Contingency Plan for actions to be taken in the event of a spillage or accumulation of off-specification effluent, at least three months (or such shorter time as the Chief Executive, Taranaki Regional Council may allow) prior to the exercise of this right, for the approval of the Chief Executive, Taranaki Regional Council

14. That ecological monitoring of the receiving water may be carried out by the Taranaki Regional Council to determine the effects of the discharge on in-stream ecology, subject to Section 24K of the Water and Soil Conservation Act 1967.

15. The Commission may undertake such toxicological testing of the final discharge from time to time, as may be required by the Chief Executive, Taranaki Regional Council, subject to Section 24K of the Water and Soil Conservation Act 1967.

16. The Grantee shall undertake such monitoring of the final discharge as may be required by the Chief Executive, Taranaki Regional Council (Section 24K of the Water and Soil Conservation Act 1967).

17. That there shall be a review by the Grantee and Taranaki Regional Council of all conditions, restrictions and prohibitions every five years, and if as a result of this review the Grantee or the Taranaki Regional Council require a variation, then the variation procedures shall be pursuant to Section 24B of the Water and Soil Conservation Act 1967.

Transferred at Stratford on 15 November 2013

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Water Permit

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

Name of Consent Holder:	Todd Energy Limited P O Box 802 NEW PLYMOUTH
Decision Date (Change)	8 August 1984
Commencement Date (Change)	8 August 1984 (Granted: 28 September 1983)

Conditions of Consent

Consent Granted:	To divert unnamed tributaries of the Mangahewa Stream in the vicinity of the McKee Production Facility, and to discharge surface water run-off from adjacent land into the Mangahewa Stream, to permit construction and operation of the said facility at or about GR: Q19:255-343
Expiry Date:	1 June 2023
Site Location:	Grantee's property, near unnamed tributary of Mangahewa Stream
Legal Description:	N/A
Catchment:	Onaero
Tributary:	Mangahewa

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

General conditions

a) This right is subject to all the relevant provisions of the Water and Soil Conservation Act 1967, and any regulations made thereunder. It is the obligation of the grantee of this right to comply with all statutory requirements relating to the exercise thereof.

b) The Taranaki Regional Council may prescribe the method of management of this right, including the limitation of periods during which the right may be fully exercised, if a water shortage or other abnormal circumstance occurs in the locality.

c) The grantee shall keep such records relating to the exercise of this right as may reasonably be required by the Taranaki Regional Council and shall, if so requested, supply this information to the Taranaki Regional Council. Further, the grantee shall, at his own expense, if the Taranaki Regional Council so requests, install such measuring devices as are considered reasonably necessary by the Taranaki Regional Council for the acquisition of such records.

d) This right is granted subject to the Taranaki Regional Council or its servants or agents being permitted such access as is reasonably required for the purposes of carrying out inspections and measurements in connection with this right.

e) The standards, techniques and methods of monitoring of this right shall be to the specific approval of the Chief Executive, Taranaki Regional Council.

f) The design, construction and maintenance of any works relating to the right shall be to a standard adequate to meet the conditions of this right, so that the exercise of this does not cause damage to any property or injury to any person.

g) This right may be cancelled in writing to the grantee by the Taranaki Regional Council if the right is not exercised within twelve months of the date or grant or such longer time as the Chief Executive, Taranaki Regional Council, may approve.

h) This right may be terminated by the Taranaki Regional Council upon not less that 12 months notice in writing to the grantee if, in the opinion of the Taranaki Regional Council, the public interest so requires, but without prejudice to the grantee to apply for a further right in respect of the same matter.

i) The actual and reasonable cost of supervision of this right, including certification, approval, monitoring, water sampling and analyses, be met by the grantee.

j) The Grantee shall provide to the Chief Executive, Taranaki Regional Council, on his request (and, at his discretion, for his approval) plans, specifications and maintenance programmes of works associated with the exercise of this right, showing that the conditions of this right are able to be met.

k) Before the Taranaki Regional Council or its Chief Executive:

   i) imposes any requirement or makes any request under General Condition (c); or
   ii) grants or withholds any approval under the provisions of this right; or

iii) makes any determination as to any programme or supervision or monitoring or as to the actual and reasonable cost to be met by the Grantee; or

iv) makes any determination as to adequacy under General Conditions (f) and/or (j);

the Taranaki Regional Council shall confer with the Grantee to enable agreement to be reached between the Taranaki Regional Council and the Grantee on the subject matter and costs thereof, provided that if any dispute arises concerning the matters dealt with in (i)-(iv) above, the dispute shall be referred to an independent arbitrator to be mutually agreed upon, the arbitration to be conducted in accordance with the Arbitration Act 1908, or in such a manner as the parties affecting may agree upon.

Special conditions

1. That plans and locations for the proposed diversions shall be forwarded to the Chief Executive, Taranaki Regional Council, for his written approval prior to commencement of construction.

2. That the Grantee shall be responsible for ensuring that the natural channels of the streams below the diversion, for a distance to be decided upon by agreement between the Chief Executive, Taranaki Regional Council and the Grantee, are capable of coping with the increased volumes of water.

3. That the Grantee shall, where possible, prevent or mitigate any erosion which occurs as a result of works associated with the exercise of this right.

4. That any corrective measures applied as a result of (2) and (3) above shall be to the satisfaction of the Chief Executive, Taranaki Regional Council.

5. That the Taranaki Regional Council may carry out a programme of biological monitoring of the Mangahewa Stream environment, subject to Condition (1) above.

6. That there shall be a review by the Grantee and Taranaki Regional Council of all conditions, restrictions and prohibitions every five years, and if as a result of this review the Grantee or the Taranaki Regional Council require a variation, then the variation procedures shall be pursuant to Section 24B of the Water and Soil Conservation Act 1967.

Transferred at Stratford on 15 November 2013

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Water Permit

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

Name of Consent Holder:	Todd Energy Limited P O Box 802 NEW PLYMOUTH
Decision Date (Change):	8 August 1984
Commencement Date (Change):	8 August 1984 (Granted: 14 March 1984)

Conditions of Consent

Consent Granted:	To take up to 172,800 litres/day of water at a maximum rate of 2 litres/second from the Mangahewa Stream for process and domestic purposes associated with operation of the Mckee Production Station at or about GR: Q19:256-344
Expiry Date:	1 June 2023
Site Location:	Mangahewa Stream, Otaraoa Road, Waitara
Legal Description:	Pt Otaraoa No 3 DP 2961 Blk X Waitara SD
Catchment:	Onaero
Tributary:	Mangahewa

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

General conditions

a) This right is subject to all the relevant provisions of the Water and Soil Conservation Act 1967, and any regulations made thereunder. It is the obligation of the grantee of this right to comply with all statutory requirements relating to the exercise thereof.

b) The Taranaki Regional Council may prescribe the method of management of this right, including the limitation of periods during which the right may be fully exercised, if a water shortage or other abnormal circumstance occurs in the locality.

c) The grantee shall keep such records relating to the exercise of this right as may reasonably be required by the Taranaki Regional Council and shall, if so requested, supply this information to the Taranaki Regional Council. Further, the grantee shall, at his own expense, if the Taranaki Regional Council so requests, install such measuring devices as are considered reasonably necessary by the Taranaki Regional Council for the acquisition of such records.

d) This right is granted subject to the Taranaki Regional Council or its servants or agents being permitted such access as is reasonably required for the purposes of carrying out inspections and measurements in connection with this right.

e) The standards, techniques and methods of monitoring of this right shall be to the specific approval of the Chief Executive, Taranaki Regional Council.

f) The design, construction and maintenance of any works relating to the right shall be to a standard adequate to meet the conditions of this right, so that the exercise of this does not cause damage to any property or injury to any person.

g) This right may be cancelled in writing to the grantee by the Taranaki Regional Council if the right is not exercised within twelve months of the date or grant or such longer time as the Chief Executive, Taranaki Regional Council, may approve.

h) This right may be terminated by the Taranaki Regional Council upon not less that 12 months notice in writing to the grantee if, in the opinion of the Taranaki Regional Council, the public interest so requires, but without prejudice to the grantee to apply for a further right in respect of the same matter.

i) The actual and reasonable cost of supervision of this right, including certification, approval, monitoring, water sampling and analyses, be met by the grantee.

j) The Grantee shall provide to the Chief Executive, Taranaki Regional Council, on his request (and, at his discretion, for his approval) plans, specifications and maintenance programmes of works associated with the exercise of this right, showing that the conditions of this right are able to be met.

k) Before the Taranaki Regional Council or its Chief Executive:

   i) imposes any requirement or makes any request under General Condition (c); or
   ii) grants or withholds any approval under the provisions of this right; or

iii) makes any determination as to any programme or supervision or monitoring or as to the actual and reasonable cost to be met by the Grantee; or

iv) makes any determination as to adequacy under General Conditions (f) and/or (j);

the Taranaki Regional Council shall confer with the Grantee to enable agreement to be reached between the Taranaki Regional Council and the Grantee on the subject matter and costs thereof, provided that if any dispute arises concerning the matters dealt with in (i)-(iv) above, the dispute shall be referred to an independent arbitrator to be mutually agreed upon, the arbitration to be conducted in accordance with the Arbitration Act 1908, or in such a manner as the parties affecting may agree upon.

Special conditions

1. That a minimum flow of not less than 5 litres/second should be maintained in the tributary at all times except when due to natural conditions.

2. That the Grantee shall install a metering system to continuously record the abstraction rate with an error of less than 10%, and shall supply this record or parts of this records to the Taranaki Regional Council at the Taranaki Regional Council's request.

3. That the intake structure shall be designed to minimise disturbance to the stability of the bed and banks of the streams/river's channels both at low flows and flood levels. The intakes shall be so designed, constructed, maintained and modified so as to permit upstream passage of fish.

4. That the Grantee shall submit plans of the intake structure, its location, and the metering system to the Taranaki Regional Council for written approval by the Chief Executive, prior to commencement of construction.

5. That there shall be a review by the Grantee and Taranaki Regional Council of all conditions, restrictions and prohibitions every five years, and if as a result of this review the Grantee or the Taranaki Regional Council require a variation, then the variation procedures shall be pursuant to Section 24B of the Water and Soil Conservation Act 1967.

Transferred at Stratford on 15 November 2013

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Land Use Consent

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

Name of Consent Holder:	Todd Energy Limited P O Box 802 NEW PLYMOUTH
Decision Date:	14 March 1984
Commencement Date:	14 March 1984

Conditions of Consent

Consent Granted:	To construct a weir control for the Mckee Production Site water intake on the Mangahewa Stream in the Onaero Catchment at or about GR: Q19:256-344
Expiry Date:	1 June 2023
Site Location:	Mangahewa Stream, Otaraoa Road, Waitara
Legal Description:	Pt Otaraoa No 3 DP 2961 Blk X Waitara SD
Catchment:	Onaero
Tributary:	Mangahewa

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

General conditions

a) This right is subject to all the relevant provisions of the Water and Soil Conservation Act 1967, and any regulations made thereunder. It is the obligation of the grantee of this right to comply with all statutory requirements relating to the exercise thereof.

b) The Taranaki Regional Council may prescribe the method of management of this right, including the limitation of periods during which the right may be fully exercised, if a water shortage or other abnormal circumstance occurs in the locality.

c) The grantee shall keep such records relating to the exercise of this right as may reasonably be required by the Taranaki Regional Council and shall, if so requested, supply this information to the Taranaki Regional Council. Further, the grantee shall, at his own expense, if the Taranaki Regional Council so requests, install such measuring devices as are considered reasonably necessary by the Taranaki Regional Council for the acquisition of such records.

d) This right is granted subject to the Taranaki Regional Council or its servants or agents being permitted such access as is reasonably required for the purposes of carrying out inspections and measurements in connection with this right.

e) The standards, techniques and methods of monitoring of this right shall be to the specific approval of the Chief Executive, Taranaki Regional Council.

f) The design, construction and maintenance of any works relating to the right shall be to a standard adequate to meet the conditions of this right, so that the exercise of this does not cause damage to any property or injury to any person.

g) This right may be cancelled in writing to the grantee by the Taranaki Regional Council if the right is not exercised within twelve months of the date or grant or such longer time as the Chief Executive, Taranaki Regional Council, may approve.

h) This right may be terminated by the Taranaki Regional Council upon not less that 12 months notice in writing to the grantee if, in the opinion of the Taranaki Regional Council, the public interest so requires, but without prejudice to the grantee to apply for a further right in respect of the same matter.

i) The actual and reasonable cost of supervision of this right, including certification, approval, monitoring, water sampling and analyses, be met by the grantee.

j) The Grantee shall provide to the Chief Executive, Taranaki Regional Council, on his request (and, at his discretion, for his approval) plans, specifications and maintenance programmes of works associated with the exercise of this right, showing that the conditions of this right are able to be met.

k) Before the Taranaki Regional Council or its Chief Executive:

   i) imposes any requirement or makes any request under General Condition (c); or
   ii) grants or withholds any approval under the provisions of this right; or

iii) makes any determination as to any programme or supervision or monitoring or as to the actual and reasonable cost to be met by the Grantee; or

iv) makes any determination as to adequacy under General Conditions (f) and/or (j);

the Taranaki Regional Council shall confer with the Grantee to enable agreement to be reached between the Taranaki Regional Council and the Grantee on the subject matter and costs thereof, provided that if any dispute arises concerning the matters dealt with in (i)-(iv) above, the dispute shall be referred to an independent arbitrator to be mutually agreed upon, the arbitration to be conducted in accordance with the Arbitration Act 1908, or in such a manner as the parties affecting may agree upon.

Special conditions

1. That the Grantee shall submit plans and the proposed locations of all works associated with this right to the Chief Executive, Taranaki Regional Council for written approval prior to commencement of construction.

2. That the works associated with the exercise of this right shall be designed to minimise disturbance to the bed and banks of the river channel both at low flows and design flood levels.

3. That the Grantee shall, where possible, prevent or mitigate any erosion which may occur as a result of works associated with the exercise of this right.

4. That the intake structure shall be so designed, constructed and maintained so as to permit the upstream passage of fish.

5. That a minimum flow of not less than 5 litres/second should be maintained in the Mangahewa Stream at all times.

6. That the operation of the sluice pipe through the weir, for the purposes of desilting the impoundment, shall only take place following the obtaining of prior written approval from the Chief Executive, Taranaki Regional Council.

7. That there shall be a review by the Grantee and Taranaki Regional Council of all conditions, restrictions and prohibitions every five years, and if as a result of this review the Grantee or the Taranaki Regional Council require a variation, then the variation procedures shall be pursuant to Section 24B of the Water and Soil Conservation Act 1967.

Transferred at Stratford on 15 November 2013

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Land Use Consent

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

Name of Consent Holder:	Todd Energy Limited P O Box 802 NEW PLYMOUTH
Decision Date:	14 July 1999
Commencement Date:	14 July 1999

Conditions of Consent

Consent Granted:	To erect, place and maintain a bridge over the Waitara River for oil field access purposes at or about GR: Q19:248-322
Expiry Date:	1 June 2033
Review Date(s):	June 2003, June 2009, June 2015, June 2021, June 2027
Site Location:	Waitara River, Bristol/McKee Road, Waitui
Legal Description:	Road Reserve Blk XIV Waitara SD
Catchment:	Waitara

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 (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) 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. That the consent holder shall notify the Taranaki Regional Council, at least 48 hours prior to the commencement and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the riverbed or discharges to water.

2. That the structure[s] authorised by this consent shall be maintained to ensure the conditions of this consent are met.

3. That the structure[s] authorised by this consent shall be removed and the area reinstated, if and when the structure[s] are no longer required. The consent holder shall notify the Taranaki Regional Council at least 48 hours prior to structure[s] removal and reinstatement.

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 2003 and/or June 2008 and/or June 2015 and/or June 2021 and/or June 2027, for the purpose of ensuring that the conditions adequately deal with the environmental effects arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 15 November 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:	Todd Energy Limited PO Box 802 New Plymouth 4340
Decision Date (Change):	24 June 2015
Commencement Date (Change):	24 June 2015 (Granted Date: 30 September 2009)

Conditions of Consent

Consent Granted:	To discharge emissions into the air from flaring of hydrocarbons associated with the production activities at the McKee-C wellsite, the Mangahewa Expansion Compression facility and from hydrocarbon processing operations and miscellaneous emissions at the McKee Production Station
Expiry Date:	1 June 2027
Review Date(s):	June 2015, June 2021
Site Location:	McKee-C wellsite, 1334 Otaraoa Road, Tikorangi
Legal Description:	Lot 2 DP 474093 Lot 1 DP 14374
Grid Reference (NZTM)	1715282E-5672495N and 1715153E-5672258N

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 potential effect on the environment arising from any emission to air from the flare or any other emissions to air from the McKee Production Station or McKee-C wellsite or the Mangahewa Expansion Compression facility, including use of a separator during well clean-up.

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

3. The opacity of any smoke emissions shall not exceed a level of 1 as measured on the Ringelmann Scale.

4. There shall not be any offensive odour or smoke, as determined by an enforcement officer of the Taranaki Regional Council, at or beyond the boundary of the property where the production station and wellsite is located.

5. The consent holder shall control all emissions of carbon monoxide to the atmosphere from the flare so that, whether alone or in conjunction with any other emissions from the wellsite, the maximum ground level concentration of carbon monoxide arising from the exercise of this consent measured under ambient conditions does not exceed 10 milligrams per cubic metre (mg/m^3) (eight-hour average exposure), or 30 mg/m^3 one-hour average exposure at or beyond the boundary of the property where the production station and wellsite are located.

6. The consent holder shall control all emissions of nitrogen oxides to the atmosphere from the flare so that, whether alone or in conjunction with any other emissions from the wellsite, the maximum ground level concentration of nitrogen dioxide arising from the exercise of this consent measured under ambient conditions does not exceed 100 micrograms per cubic metre ($\mu g/m^3$) (24-hour average exposure), or 200 $\mu g/m^3$ (1-hour average exposure) at or beyond the boundary of the of the property where the production station and wellsite are located.

7. The consent holder shall control emissions to the atmosphere, from the production station, wellsite and flare, of contaminants other than carbon dioxide, carbon monoxide, and nitrogen oxides so that, whether alone or in conjunction with any other emissions from the production station, is not hazardous or toxic or noxious at or beyond the boundary of the property.

8. The consent holder shall control emissions to the atmosphere from the production station, wellsite and flare of contaminants other than carbon dioxide, carbon monoxide, and nitrogen oxides so that, whether alone or in conjunction with any emissions from the flare, the maximum ground level concentration for any particular contaminant arising from the exercise of this consent measured at or beyond the boundary of the property where the wellsite is located, 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).

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

10. Each time there is visible smoke as a result of the exercise of this consent, the consent holder shall record the time, duration and cause. The consent holder shall make the record available to the Chief Executive, Taranaki Regional Council, upon request.

11. The consent holder shall record and maintain a log of all continuous flaring events longer than five minutes duration, and any intermittent flaring lasting for an aggregate of ten minutes or longer in any 120-minute period. The log shall contain the date, the start and finish times of the flaring event, the quantity and type of material flared, and the reason for flaring. The log shall be made available to the Chief Executive, Taranaki Regional Council, upon request, and summarised annually in the report required under condition 12.

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

    i) detailing smoke emissions as required under condition 11;
    ii) detailing any measures undertaken or proposed to reduce smoke emissions;
    iii) detailing any measures undertaken or proposed to reduce flaring;
    iv) addressing any other issue relevant to the minimisation or mitigation of emissions from the flare.

McKee Production Station and the Mangahewa Expansion Compression (MEC) facility

13. No alteration shall be made to plant equipment or processes which may substantially alter the nature or quantity of flare emissions or other site emissions, including but not limited to the recovery of produced gas, other than as authorised by this consent , without prior consultation with the Chief Executive, Taranaki Regional Council.

14. No liquid or solid hydrocarbons from the McKee Production Station and the Mangahewa Expansion Compression facility shall be combusted through the gas flare system, other than in an emergency.

McKee-C wellsite

15. The consent holder shall notify the Chief Executive, Taranaki Regional Council, whenever the continuous flaring of hydrocarbons (other than purge gas) from the McKee-C wellsite is expected to occur for more than five minutes in duration. Notification shall be no less than 24 hours before the flaring commences. Notification shall include the consent number and be emailed to worknotification@trc.govt.nz. Notification by fax or post is acceptable if the consent holder does not have access to email.

16. At least 24 hours before any flaring from the McKee-C wellsite, other than in emergencies, the consent holder shall provide notification to all residents within 1000 metres of the site of the commencement of flaring. The consent holder shall include in the notification a 24-hour contact telephone number for a representative of the consent holder, and shall keep and make available to the Chief Executive, Taranaki Regional Council, a record of all queries and complaints received in respect of any flaring activity.

17. Other than for the maintenance of a pilot flare flame, the consent holder shall have regard to the prevailing and predicted wind speed and direction at the time of initiation of, and throughout, any episode of flaring from the McKee-C wellsite so as to minimise offsite effects.

18. All gas that is flared from the McKee-C wellsite must first be treated by effective liquid and solid separation and recovery to ensure that smoke emission during flaring is minimised.

19. If separation required by special condition 18 cannot be implemented or maintained at any time while there is a flow from the well, whether natural or induced, then the consent holder shall immediately advise the Compliance Manager, Taranaki Regional Council, and shall in any case re-establish liquid and solid separation and recovery within three hours.

20. Only substances originating from the well stream and treated as outlined by conditions 18 and 19 shall be combusted within the flare pit.

Review

21. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2015 and/or June 2021, for any of the following purposes:

    a) dealing with any significant adverse effect on the environment arising from the exercise of the consent which was not foreseen at the time the application was considered or which it was not appropriate to deal with at the time;
    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;
    c) to alter, add or delete limits on mass discharge quantities or discharge or ambient concentrations of any contaminant.

Signed at Stratford on 24 June 2015

For and on behalf of
Taranaki Regional Council

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B G Chamberlain
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:	Todd Energy Limited P O Box 802 NEW PLYMOUTH 4340
Decision Date:	24 June 2008
Commencement Date:	24 June 2008

Conditions of Consent

Consent Granted:	To discharge emissions into the air from natural gas combustion and other related activities associated with the operation of an electricity generation plant at the McKee Production Station at or about (NZTM) 1715334E-5672399N
Expiry Date:	1 June 2027
Review Date(s):	June 2015, June 2021
Site Location:	McKee Production Station, Otaraoa Road, Tikorangi
Legal Description:	Lot 1 DP 14374 Blk X Waitara SD

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

2. 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 1991.

3. The discharges authorised by this consent shall not, whether alone or in conjunction with any other emissions from the site arising through the exercise of any other consent held by the consent holder, give rise to any dangerous levels of airborne contaminants at or beyond the boundary of the property including but not limited to any risk of fire or explosion.

4. The discharges authorised by this consent shall not, whether alone or in conjunction with any other emissions from the site arising through the exercise of any other consent held by the consent holder, give rise to any odour or dust or smoke that is offensive or obnoxious or objectionable at or beyond the boundary of the property on which the production station is located.

5. The consent holder shall not discharge any contaminant to air from the site at a rate or a quantity such that the contaminant, whether alone or in conjunction with any other emissions from the site arising through the exercise of any other consent held by the consent holder, is or is liable to be hazardous or toxic or noxious at or beyond the boundary of the property where the electricity generation plant is located.

6. The consent holder shall control all discharges of carbon monoxide to the atmosphere from the site, whether alone or in conjunction with any other emissions from the site arising through the exercise of any other consent held by the consent holder, 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 milligrams per cubic metre [eight-hour average exposure], or 30 milligrams per cubic metre [one-hour average exposure] at or beyond the boundary of the property on which the production station is located.

7. The consent holder shall control all discharges of nitrogen dioxide or its precursors to the atmosphere from the site, whether alone or in conjunction with any other discharges to the atmosphere from the site arising through the exercise of any other consent held by the consent holder, 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 200 micrograms per cubic metre [one hour average exposure], or 100 micrograms per cubic metre [twenty-four hour average exposure], at or beyond the boundary of the property on which the production station is located.

8. The consent holder shall control discharges to the atmosphere from the site of contaminants other than carbon dioxide, carbon monoxide, and nitrogen oxides, whether alone or in conjunction with any other emissions from the site arising through the exercise of any other consent held by the consent holder, 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 property on which the production station is located, is not increased above background levels:

    a) by more than 1/30th of the relevant Workplace Exposure Standard-Time Weighted Average [exposure averaged over a duration as specified for the Workplace Exposure Standard-Time Weighted Average], or by more than 1/10th of the Workplace Exposure Standard-Short Term Exposure Limit over any short period of 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 the General Excursion Limit at any time [all terms as defined in Workplace Exposure Standards, 2002, Department of Labour].

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

10. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2015 and/or June 2021, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 15 November 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:	Todd Energy Limited P O Box 802 NEW PLYMOUTH 4340
Decision Date:	8 July 2009
Commencement Date:	8 July 2009

Conditions of Consent

Consent Granted:	To discharge stormwater into an unnamed tributary of the Mangahewa Stream in the Onaero catchment from a LPG Plant at or about (NZTM) 1715355E-5672389N
Expiry Date:	1 June 2039
Review Date(s):	June 2015, June 2021, June 2027, June 2033
Site Location:	McKee Production Station, Otaraoa Road, Waitara
Legal Description:	Lot 1 DP 14374 Blk X Waitara SD
Catchment:	Onaero
Tributary:	Mangahewa

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 at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects of the discharge on any water body.

2. The stormwater discharged shall be from a catchment area not exceeding 7,800 m^2.

3. Within one month of the completion of the development of the site the consent holder shall provide, to the written satisfaction of the Chief Executive, Taranaki Regional Council, detailed plans of stormwater catchment and drainage pathways, including clean areas, potentially contaminated areas, and bunded areas, and the containment, treatment and discharge systems put into place.

4. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least seven days prior to the exercise of this consent. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz. Notification by fax or post is acceptable only if the consent holder does not have access to email.

5. The consent holder shall maintain a contingency plan. The contingency plan shall be adhered to in the event of a spill or emergency and shall, to the satisfaction of the Chief Executive, Taranaki Regional Council, detail measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not authorised by this consent and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge.

6. The consent holder shall maintain a stormwater management plan. This plan shall be adhered to at all times and shall, to the satisfaction of the Chief Executive, Taranaki Regional Council document how the site is to be managed in order to minimise the contaminants that become entrained in the stormwater. The plan shall include but not necessarily be limited to:

   a. management of the interceptor system.
   b. the loading and unloading of materials;
   c. maintenance of conveyance systems; and
   d. general housekeeping.

7. All stormwater discharged under this permit shall be directed for treatment through the stormwater treatment system for discharge in accordance with the special conditions of this permit.

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

9. The following concentrations shall not be exceeded in the discharge,

Component	**Concentration**
pH (range)	6.0-9.0
suspended solids	100 gm^{-3}
total recoverable hydrocarbons [infrared spectroscopic technique]	15 gm^{-3}
chloride	50 gm^{-3}

   This condition shall apply prior to the entry of the treated stormwater into the unnamed tributary of the Mangahewa Stream at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

10. After allowing for reasonable mixing, within a mixing zone extending 25 metres downstream of the discharge point, the discharge shall not give rise to any of the following effects in the receiving waters of the unnamed tributary of the Mangahewa Stream:

    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.

11. This consent shall lapse on 30 September 2014, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

12. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2015 and/or June 2021 and/or June 2027 and/or June 2033, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 15 November 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:	Todd Energy Limited P O Box 802 NEW PLYMOUTH 4340
Decision Date (Change):	24 October 2012
Commencement Date (Change):	24 October 2012 (Granted: 8 July 2009)

Conditions of Consent

Consent Granted:	To discharge emissions to air from the flaring of natural gas in emergency situations and miscellaneous emissions associated with the treatment of gas at the McKee LPG Plant and the Mangahewa Extraction Train 2 at or about (NZTM) 1715363E-5672126N
Expiry Date:	1 June 2039
Review Date(s):	June 2015, June 2021, June 2027, June 2033
Site Location:	McKee Production Station, Otaraoa Road, Waitara
Legal Description:	Lot 1 DP 14374 Blk X Waitara SD (Discharge source & site)

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

2. 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 1991.

3. 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.

4. The consent holder shall supply to the Taranaki Regional Council each month a copy of flaring information comprising: the type and amount of material flared (including any gas used to maintain a pilot flame), the date this was flared, the reason why flaring was undertaken, and an indication of whether smoke was produced from such flaring events.

5. The discharges authorised by this consent shall not, whether alone or in conjunction with any other emissions from the McKee Production Station, give rise to any dangerous levels of airborne contaminants at or beyond the boundary of the property including but not limited to any risk of fire or explosion.

6. The discharges authorised by this consent shall not, whether alone or in conjunction with any other emissions from the McKee Production Station arising through the exercise of any other consent held by the consent holder, give rise to any odour or dust or smoke that is offensive or obnoxious or objectionable at or beyond the boundary of the property on which the production station is located.

7. The consent holder shall not discharge any contaminant to air from the site at a rate or a quantity such that the contaminant, whether alone or in conjunction with any other emissions from the McKee Production Station arising through the exercise of any other consent held by the consent holder, is or is liable to be hazardous or toxic or noxious at or beyond the boundary of the property where the LPG plant is located.

8. The consent holder shall control all discharges of carbon monoxide to the atmosphere from the site, whether alone or in conjunction with any other emissions from the McKee Production Station arising through the exercise of any other consent held by the consent holder, 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 milligrams per cubic metre [eight-hour average exposure], or 30 milligrams per cubic metre [one-hour average exposure] at or beyond the boundary of the property on which the LPG plant is located.

9. The consent holder shall control all discharges of nitrogen dioxide or its precursors to the atmosphere from the site, whether alone or in conjunction with any other discharges to the atmosphere from the McKee Production Station arising through the exercise of any other consent held by the consent holder, 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 200 micrograms per cubic metre [one hour average exposure], or 100 micrograms per cubic metre [twenty-four hour average exposure], at or beyond the boundary of the property on which the LPG plant is located.

10. The consent holder shall control discharges to the atmosphere from the site of contaminants other than carbon dioxide, carbon monoxide, and nitrogen oxides, whether alone or in conjunction with any other emissions from the McKee Production Station arising through the exercise of any other consent held by the consent holder, 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 property on which the LPG plant is located, is not increased above background levels:

    a) by more than 1/30th of the relevant Workplace Exposure Standard-Time Weighted Average [exposure averaged over a duration as specified for the Workplace Exposure Standard-Time Weighted Average], or by more than 1/10th of the Workplace Exposure Standard-Short Term Exposure Limit over any short period of 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 the General Excursion Limit at any time [all terms as defined in Workplace Exposure Standards, 2002, Department of Labour].

11. This consent shall lapse on 30 September 2014, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

12. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2015 and/or June 2021 and/or June 2027 and/or June 2033, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 15 November 2013

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Appendix II

Biomonitoring reports

To	Job Manager, Callum MacKenzie
From	Environmental Scientist, Katie Blakemore
Document	2035335
Report No	KB037
Date	10 April 2018

Biomonitoring of the Mangahewa Stream in relation to the McKee Production Station, October 2017

Introduction

This was the first of two biomonitoring surveys relating to the McKee Production Station scheduled to be undertaken in the 2017-18 monitoring year. Sites 1, 2 and 4 were monitored by some previous surveys in the Mangahewa Stream, in order to determine recovery over this reach of the stream following a small pipeline leakage of hydrocarbon products referenced in previous surveys, documented recovery required that only sites 1 and 2 were monitored by the more recent surveys. Results from surveys performed since 2000-2001 monitoring year are discussed in the reports referenced by this report. Previously the McKee Production Station was under Fletcher Challenge Energy ownership. It was owned for a period by Shell Todd Oil Services Ltd and was then transferred to Todd Taranaki Ltd.

Methods

The standard '400 ml kick-sampling' technique was used to collect streambed macroinvertebrates from riffle habitats at two established sites (sites 1 and 2) in the Mangahewa Stream (Table 1, Figure 1) on 25 October 2017. This 'kick-sampling' technique 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).

Table 1 Biomonitoring sites in the Mangahewa Stream, sampled in relation to the McKee Production Station

Site number	Site code	Grid reference (NZTM)	Location	Altitude (masl)
1	MHW000060	E1715626 N5672668	Upstream of stormwater discharge and intake pond	120
2	MHW000065	E1715568 N5672791	150m downstream of McKee Production Station	120

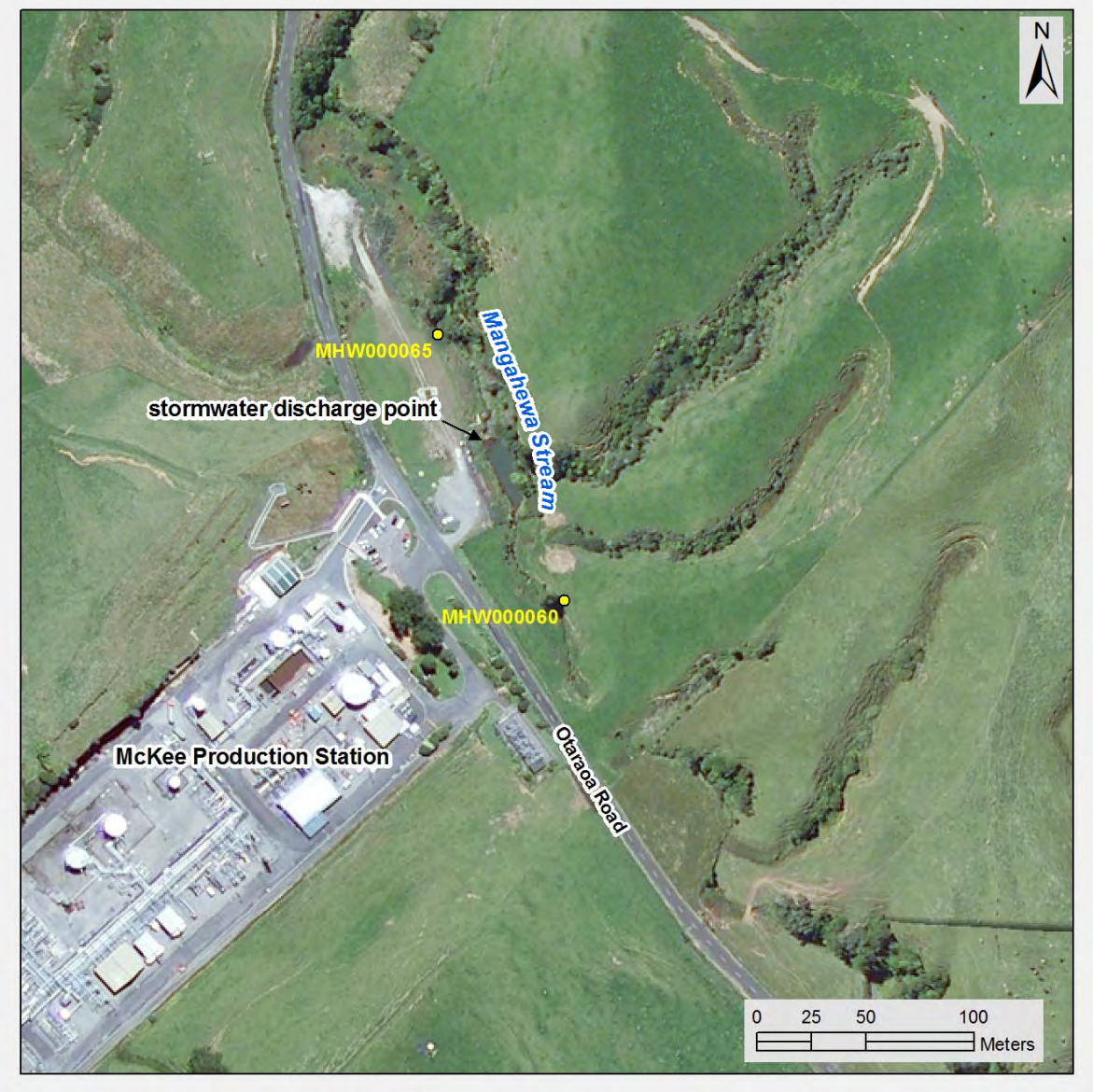

Figure 1 Biomonitoring sites in the Mangahewa Stream related to the McKee Production Station

Samples were preserved with Kahle's Fluid for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark et al. 2001). Macroinvertebrate taxa found in each sample were recorded based on the abundance categories in Table 2.

Table 2 Macroinvertebrate abundance categories

Abundance category	Number of individuals
R (rare)	1-4
C (common)	5-19
A (abundant)	20-99
VA (very abundant)	100-499
XA (extremely abundant)	>499

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. By averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. More 'sensitive' communities inhabit less polluted waterways. A difference of 11 or more MCI units is considered significantly different (Stark 1998). A gradation of biological water quality conditions based upon MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985; Boothroyd and Stark, 2000) (Table 3).

Table 3 Macroinvertebrate community health based on MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985 and Boothroyd and Stark, 2000)

Grading	MCI
Excellent	>140
Very Good	120-140
Good	100-119
Fair	80-99
Poor	60-79
Very Poor	<60

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, so that its corresponding range of values is 20x lower.

Sediment samples were also collected during this survey, with these samples analysed for hydrocarbon contamination. This sampling was incorporated into the monitoring programme in 2011. These samples were collected at sites 1 and 2, and also from a third site, located approximately 240m downstream of site 2.

Results

The survey was carried out under moderate flow conditions, 11 days after a fresh of 3x median flow and 12 days following a fresh of 7x median flow. At the time of the survey, sites 1 and 2 had clear and uncoloured, moderate flow. Water velocity was steady at both sites. Water temperatures ranged from 13.2 -13.4 °C at the two sites.

The substrate at site 1 was dominated by cobble, with silt, sand, fine and coarse gravels, and boulder present in smaller amounts. Site 2 had substrate dominated by fine and coarse gravels. Silt, sand and cobble were also present in smaller amounts. There was a layer of deposited sediment present on the streambed at both sites. Banks were highly unstable at site 1 and mostly stable at site 2, with minor stock damage at site 1, and no stock damage at site 2.

Periphyton mats were slippery at site 1 and absent at site 2, while filamentous periphyton was patchy at both sites. Macrophytes were present on the stream margins at both sites 1 and 2. Moss, leaves and wood were patchy on the streambed at site 1 and absent at site 2. Partial shading of the streambed was provided by the stream banks at site 1 and by overhanging vegetation at site 2.

The results of the sediment sampling are illustrated in Figure 2.

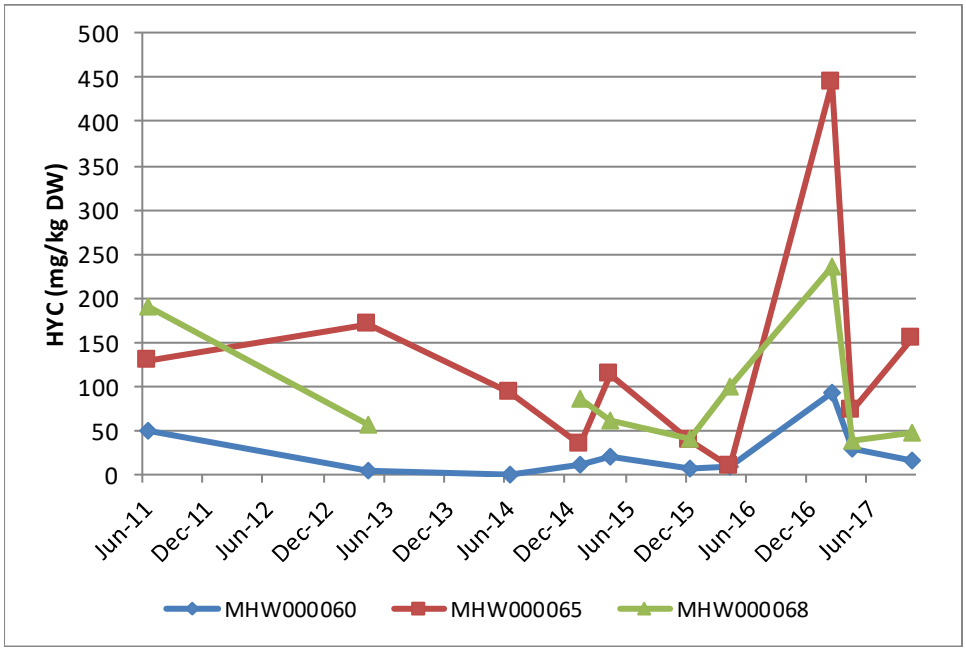

Figure 2 Sediment sampling results at three sites in the Mangahewa Stream, sampled in relation to McKee Production Station from June 2011 – October 2017

Macroinvertebrate communities

Table 4 provides a summary of the results from previous surveys sampled at the site, together with results from the current survey. Macroinvertebrate fauna recorded in the current survey are provided in Table 5.

Table 4 Numbers of macroinvertebrate taxa, MCI and $SQMCI_S$ values recorded in previous surveys of the Mangahewa Stream in relation to the McKee Production Station from March 1983, together with current results

Site	Number of previous surveys	Numbers of taxa			MCI values			$SQMCI_s$ values			
		Median	Range	Current Survey	Median	Range	Current Survey	Number of previous surveys	Median	Range	Current Survey
1	71	15	4-25	12	75	48-98	92	34	3.5	1.3-4.4	4.1
2	66	17	3-31	15	83	27-98	80	34	3.4	1.9-4.2	2.2

Table 5 Macroinvertebrate fauna of the Mangahewa Stream in relation to McKee Production Station discharges, sampled on 25 October 2017

Taxa List	Site Number	MCI score	1	2
	Site Code		MHW000060	MHW000065
	Sample Number		FWB17324	FWB17325
NEMERTEA	Nemertea	3	-	R
ANNELIDA (WORMS)	Oligochaeta	1	C	VA
MOLLUSCA	*Potamopyrgus*	4	A	A
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	C	R
	Deleatidium	8	C	R
PLECOPTERA (STONEFLIES)	*Zelandobius*	5	C	-
COLEOPTERA (BEETLES)	Elmidae	6	R	-
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	R	-
TRICHOPTERA (CADDISFLIES)	*Hydropsyche (Aoteapsyche)*	4	-	R
	Hydrobiosis	5	A	C
	Oeconesidae	5	-	R
	Oxyethira	2	R	C
DIPTERA (TRUE FLIES)	*Aphrophila*	5	R	A
	Orthocladiinae	2	A	A
	Polypedilum	3	-	R
	Muscidae	3	-	C
	Austrosimulium	3	R	R
ACARINA (MITES)	Acarina	5	-	R
No of taxa			12	15
MCI			92	80
SQMCIs			4.1	2.2
EPT (taxa)			4	5
%EPT (taxa)			33	33
'Tolerant' taxa	'Moderately sensitive' taxa		'Highly sensitive' taxa	

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

Site 1 – upstream of Production Station

Results to date for this site are illustrated in Figure 3.

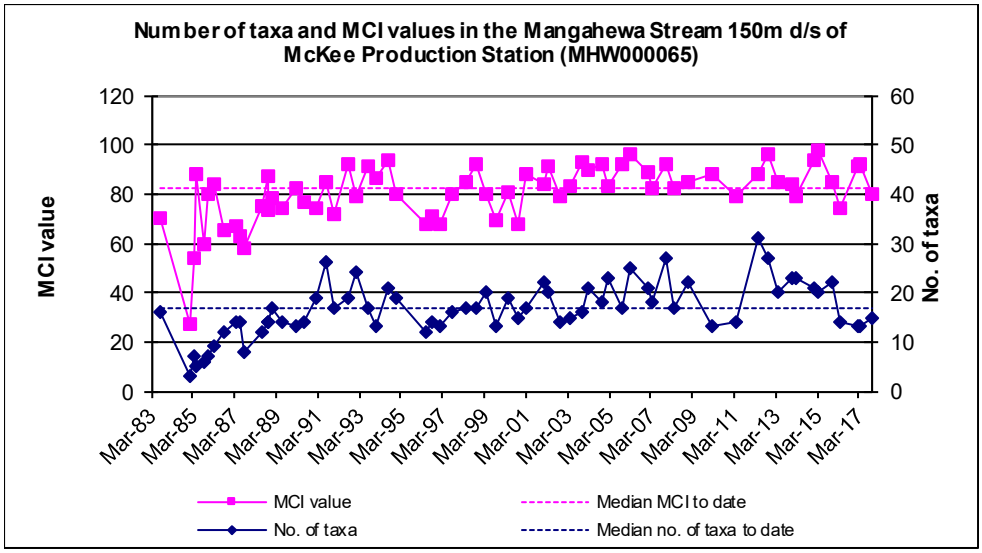

Figure 3 Number of taxa and MCI scores at site 1, upstream of the McKee Production Station in the Mangahewa Stream

A low taxa richness of 12 taxa was recorded at site 1, two taxa more than was recorded in the preceding survey (Figure 3) and three taxa less than the median for this site (median richness 15 taxa; Table 4, Figure 3). The macroinvertebrate community was characterised by one 'moderately sensitive' taxon [caddisfly (*Hydrobiosis*)] and two 'tolerant' taxa [mud snail (*Potamopyrgus*) and midge larvae (Orthocladiinae)].

A MCI score of 92 units was recorded at this site in the current survey, categorising the site as having 'fair' macroinvertebrate community health (Table 3). This score was significantly higher (Stark 1998) than the median score for this site (median MCI score 75 units; Table 4, Figure 3), but was not significantly different from the score of 82 units recorded in the preceding survey (Figure 3). A $SQMCI_s$ score of 4.1 units was recorded, which was not significantly different (Stark 1998) from the score of 3.7 units recorded in the preceding survey or from the median score for this site (3.5 units; Table 4).

Site 2 – 150 downstream of Production Station discharges

Results to date for this site are illustrated in Figure 4.

A moderately low taxa richness of 15 taxa was recorded at this site, two taxa more than was recorded in the preceding survey (Figure 4) but two taxa less than the median richness recorded for this site (median richness 17 taxa; Table 4, Figure 4). The macroinvertebrate community on this occasion was characterised by one 'moderately sensitive' taxon [cranefly (*Aphrophila*)] and three 'tolerant' taxa [oligochaete worm, mud snail (*Potamopyrgus*) and midge larvae (Orthocladiinae)].

A MCI score of 80 units was recorded in the current survey, categorising the site as having 'fair' macroinvertebrate community health (Table 3). This score is a significant (Stark 1998) twelve units lower than the score recorded in the preceding survey (92 units; Figure 4), but is similar to the median score for this site (83 units; Table 4, Figure 4). A $SQMCI_s$ score of 2.2 units was recorded in the current survey, which is significantly lower (Stark 1998) than the score of 4.0 units recorded in the preceding survey and the median score for this site (3.4 units; Table 4).

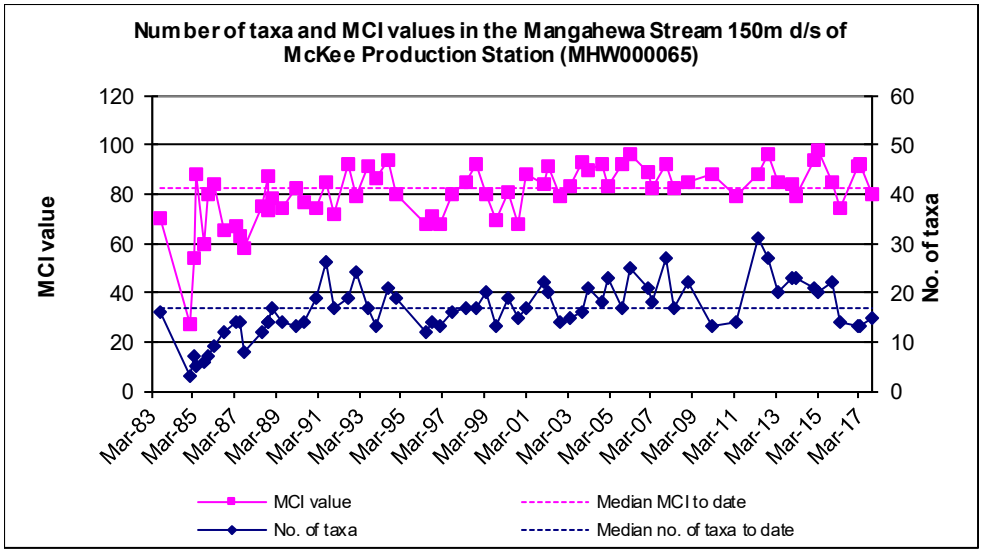

Figure 4 Number of taxa and MCI scores at site 2, 150m downstream of the McKee Production Station in the Mangahewa Stream

Discussion and conclusions

The Council's 'kick-sampling' technique was used at two sites to collect benthic macroinvertebrates from the Mangahewa Stream in relation to discharges from the McKee Production Station. This has provided data to assess any potential impacts the consented discharges have had on the macroinvertebrate communities of the stream. Samples were processed to provide number of taxa (taxa richness), MCI and $SQMCI_s$ scores for each site.

Taxa richness is the most robust index when determining whether a macroinvertebrate community has been exposed to toxic discharges. Macroinvertebrates when exposed to toxic discharges may die and be swept downstream or may deliberately drift downstream as an avoidance mechanism (catastrophic drift). The MCI is a measure of the overall sensitivity of the macroinvertebrate community to organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_s$ takes into account relative abundances of taxa as well as sensitivity to pollution. Significant differences in taxa richness, MCI or $SQMCI_s$ between sites may indicate the degree of adverse effects (if any) of the discharge being monitored.

Taxa richnesses were similar to the previously recorded median for both sites, and were similar at the two sites. Taxa richness was slightly higher than the preceding survey for both sites. MCI scores of 92 and 80 were recorded at sites 1 and 2 respectively, which is a significant decrease between the two sites. The score at site 1 was significantly higher than median, while site 2 was similar to median. The score at site 1 was similar to that in the preceding survey, while site 2 had decreased significantly since this time. $SQMCI_S$ scores of 4.1 and 2.2 were recorded at sites 1 and 2 respectively, showing a significant decrease between the two sites. The score at site 1 was similar to both the historical median and the preceding result, while site 2 was significantly lower than both the historical median and preceding result. The decrease in MCI and $SQMCI_S$ scores at site 2 is a result of a higher proportion and numerical dominance of 'tolerant' taxa at this site compared to site 1.

The February 2010 and April 2011 surveys recorded low taxa richnesses of 13 and 14 taxa at site 2. In the 2011 survey, during sample collection and processing a strong hydrocarbon odour was noted indicating that a discharge of hydrocarbons had occurred recently, which had had a toxic affect on the macroinvertebrate communities. This is further supported by the observations made during processing of that sample, that there were very few individuals recorded (10 of 14 taxa recorded less than five individuals, most only 1 or 2 specimens), and that those individuals present were very small. There were no such

observations made during sampling and processing of the current sample, providing no indication that such a discharge had preceded the current survey, similar to that concluded in the previous eleven surveys. Since 2011, a recovery has been documented, and taxa richnesses have improved. However, the preceding two surveys (February 2017 and April 2017) recorded a taxa richness of only 13 taxa at site 2, equal to that found in the February 2010 survey and one taxon less than that found in the April 2011 survey. Since April 2011, stream sediments have been sampled for hydrocarbons in conjunction with the macroinvertebrate surveys. The February 2017 recorded the highest hydrocarbon concentrations in the streambed sediment to date, however the April 2017 survey and the current survey found levels that were similar to those recorded by prior surveys.

No hydrocarbon odour was recorded at either site at the time of sampling, and hydrocarbon concentrations in the sediment decreased from those recorded in the previous survey at site 1 but increased at sites 2 and 3. Hydrocarbons can have a toxic influence on macroinvertebrates, potentially causing lower taxa richnesses and/or abundances. Further, it is possible that any effects of the hydrocarbons have been exacerbated by low flow conditions preceding the current survey, resulting in the moderately low richnesses recorded in this survey. The presence of hydrocarbons appears to be a continuing factor affecting macroinvertebrate community health.

Summary

The Council's standard 'kick-sampling' technique was used at two established sites to collect streambed macroinvertebrates from the Mangahewa Stream on 25 October 2017. Samples were sorted and identified to provide the number of taxa (richness), MCI score and $SQMCI_S$ score for each site.

This October 2017 survey recorded taxa richnesses similar to their respective medians, while site 1 recorded a significantly higher than median MCI and site 2 recorded a significantly lower than median $SQMCI_S$ score. Taxa richnesses at both sites were similar to those recorded in the preceding survey, while MCI scores and $SQMCI_s$ scores were similar to those recorded in the preceding survey at site 1, but had decreased significantly at site 2. Hydrocarbon concentrations in the sediment showed a decrease from the high results recorded by the February 2017 survey, to levels similar to those found by previous surveys. Further monitoring will be needed to determine whether future results reflect a relationship between macroinvertebrate community health and hydrocarbon concentrations in the sediment.

It should be noted that it has not been determined whether the hydrocarbon contamination is a remnant effect from the well blow-out that occurred here in 1995, or whether it is recent contamination. However, sampling suggests that there is hydrocarbon contamination occurring upstream. Therefore, there is insufficient evidence to conclude where the hydrocarbon contamination is coming from, and to what degree this contamination is affecting the macroinvertebrate communities. Further monitoring will be needed to determine whether future results reflect a relationship between macroinvertebrate community health and hydrocarbon concentrations in the sediment.

It is recommended that sediment samples continue to be collected and analysed for hydrocarbons, and that this sampling is undertaken in conjunction with the macroinvertebrate surveys.

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To	Job Manager, Callum MacKenzie
From	Environmental Scientist, Katie Blakemore
Document	2035685
Report No	KB038
Date	10 April 2018

Biomonitoring of the Mangahewa Stream in relation to the McKee Production Station, February 2018

Introduction

This was the second of two biomonitoring surveys relating to the McKee Production Station scheduled to be undertaken in the 2017-18 monitoring year. Sites 1, 2 and 4 were monitored by some previous surveys in the Mangahewa Stream, in order to determine recovery over this reach of the stream following a small pipeline leakage of hydrocarbon products referenced in previous surveys, documented recovery required that only sites 1 and 2 were monitored by the more recent surveys. Results from surveys performed since 2000-2001 monitoring year are discussed in the reports referenced by this report. Previously the McKee Production Station was under Fletcher Challenge Energy ownership. It was owned for a period by Shell Todd Oil Services Ltd and was then transferred to Todd Taranaki Ltd.

Methods

The standard '400 ml kick-sampling' technique was used to collect streambed macroinvertebrates from riffle habitats at two established sites (sites 1 and 2) in the Mangahewa Stream (Table 1, Figure 1) on 7 February 2018. This 'kick-sampling' technique 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).

Table 1 Biomonitoring sites in the Mangahewa Stream, sampled in relation to the McKee Production Station

Site number	Site code	Grid reference (NZTM)	Location	Altitude (masl)
1	MHW000060	E1715626 N5672668	Upstream of stormwater discharge and intake pond	120
2	MHW000065	E1715568 N5672791	150m downstream of McKee Production Station	120

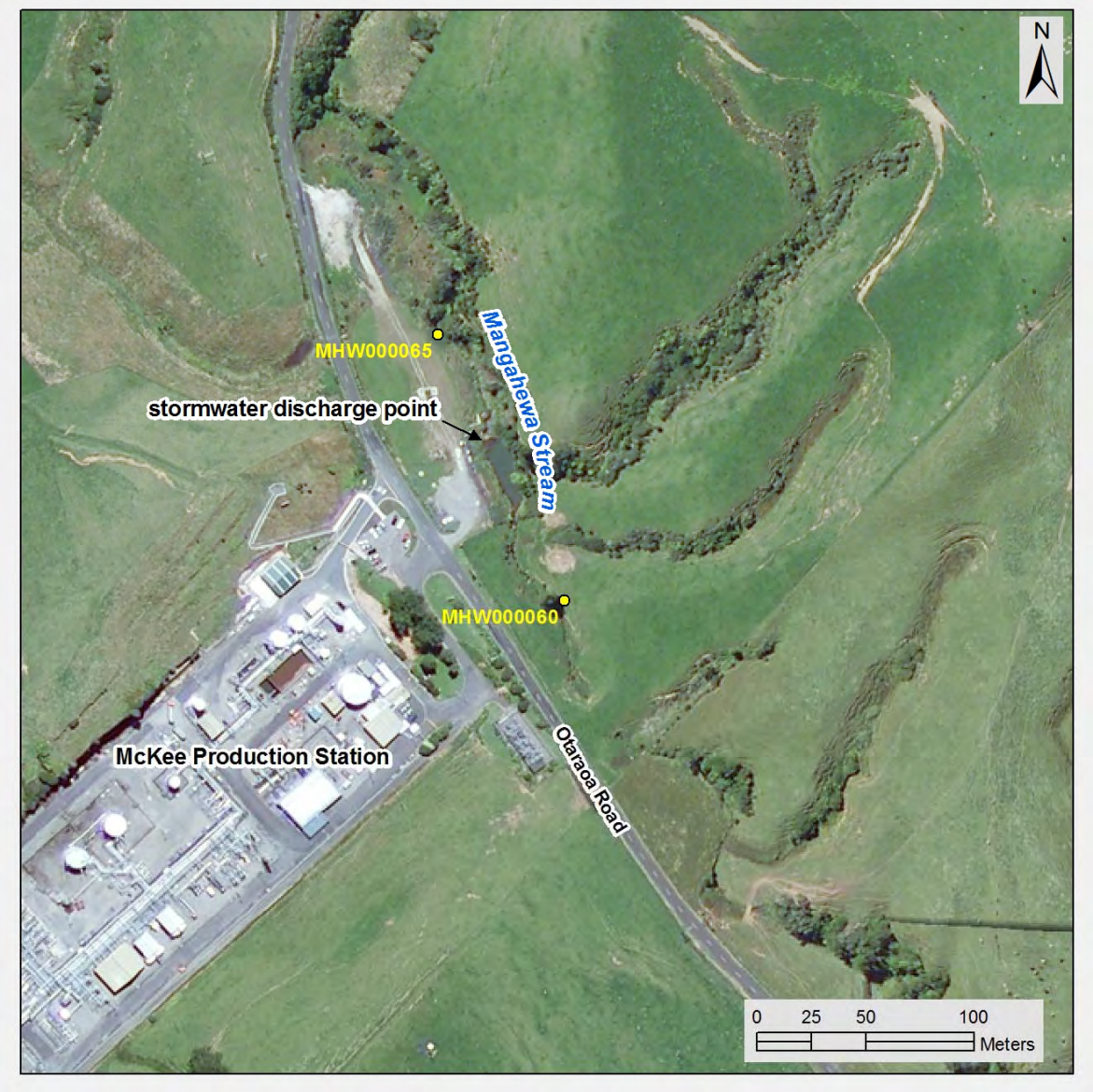

Figure 1 Biomonitoring sites in the Mangahewa Stream related to the McKee Production Station

Samples were preserved with Kahle's Fluid for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark et al. 2001). Macroinvertebrate taxa found in each sample were recorded based on the abundance categories in Table 2.

Table 2 Macroinvertebrate abundance categories

Abundance category	Number of individuals
R (rare)	1-4
C (common)	5-19
A (abundant)	20-99
VA (very abundant)	100-499
XA (extremely abundant)	>499

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. By averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. More 'sensitive' communities inhabit less polluted waterways. A difference of 11 or more MCI units is considered significantly different (Stark 1998). A gradation of biological water quality conditions based upon MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985; Boothroyd and Stark, 2000) (Table 3).

Table 3 Macroinvertebrate community health based on MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985 and Boothroyd and Stark, 2000)

Grading	MCI
Excellent	>140
Very Good	120-140
Good	100-119
Fair	80-99
Poor	60-79
Very Poor	<60

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, so that its corresponding range of values is 20x lower.

Sediment samples were also collected during this survey, with these samples analysed for hydrocarbon contamination. This sampling was incorporated into the monitoring programme in 2011. These samples were collected at sites 1 and 2, and also from a third site, located approximately 240m downstream of site 2.

Results

The survey was carried out under very low flow conditions, 33 days after a fresh of 3x median flow and 119 days following a fresh of 7x median flow. At the time of the survey, sites 1 and 2 had clear and uncoloured, very low flow. Water velocity was steady at sites 1 and 2. Water temperatures ranged from17.3 -17.7 °C at the two sites.

The substrate at site 1 was dominated by cobble and coarse gravel, with silt, sand, fine gravels, and boulder present in smaller amounts. Site 2 had substrate dominated by fine and coarse gravels. Silt, sand and cobble were also present in smaller amounts. There was a layer of deposited sediment present on the streambed at both sites. Banks were mostly stable at both sites, with minor stock damage at site 1, and no stock damage at site 2.

Periphyton mats were patchy at site 1 and slippery at site 2, while filamentous periphyton was widespread at both sites. Macrophytes were present on the stream margins at site 1 and on the streambed at site 2. Moss and leaves were patchy on the streambed both sites, while wood was patchy on the streambed at site 2 only. Partial shading of the streambed was provided by the stream banks at site 1 and by overhanging vegetation at site 2.

The results of the sediment sampling are illustrated in Figure 2

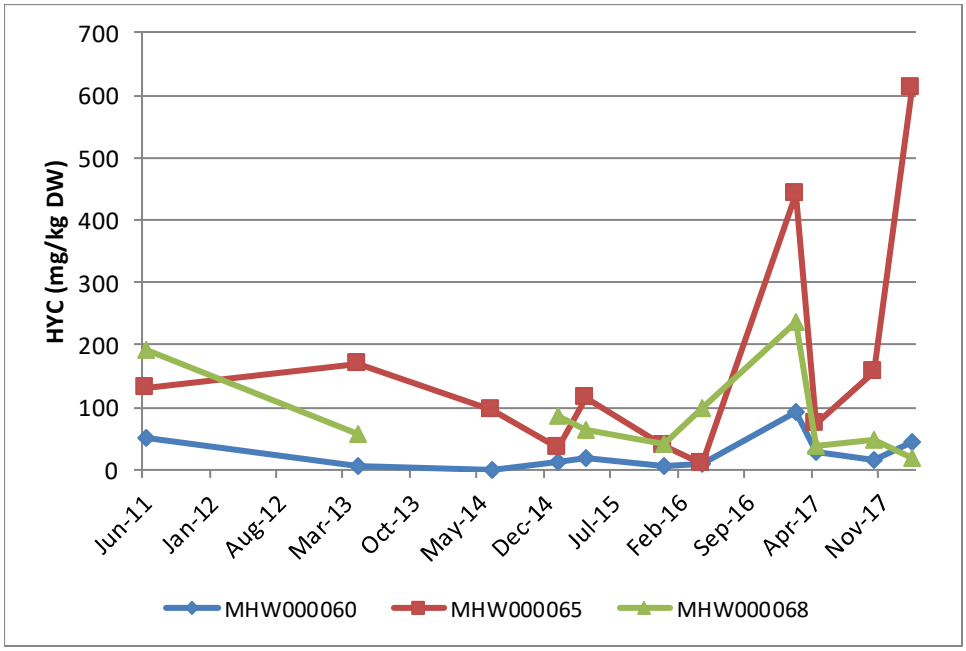

Figure 2 Sediment sampling results at three sites in the Mangahewa Stream, sampled in relation to McKee Production Station from June 2011 – February 2018

Macroinvertebrate communities

Table 4 provides a summary of the results from previous surveys sampled at the site, together with results from the current survey. Macroinvertebrate fauna recorded in the current survey are provided in Table 5.

Table 4 Numbers of macroinvertebrate taxa, MCI and $SQMCI_S$ values recorded in previous surveys of the Mangahewa Stream in relation to the McKee Production Station from March 1983, together with current results

Site	Number of previous surveys	Numbers of taxa			MCI values			$SQMCI_s$ values			
		Median	Range	Current Survey	Median	Range	Current Survey	Number of previous surveys	Median	Range	Current Survey
1	72	15	4-25	18	75	48-98	77	35	3.5	1.3-4.4	3.3
2	67	17	3-31	15	82	27-98	71	35	3.4	1.9-4.2	3.5

Table 5 Macroinvertebrate fauna of the Mangahewa Stream in relation to McKee Production Station discharges, sampled on 7 February 2018

Taxa List	Site Number	MCI score	1	2
	Site Code		MHW000060	MHW000065
	Sample Number		FWB18028	FWB18029
NEMERTEA	Nemertea	3	R	C
ANNELIDA (WORMS)	Oligochaeta	1	C	A
HIRUDINEA (LEECHES)	Hirudinea	3	R	-
MOLLUSCA	*Ferrissia*	3	R	-
	Physa	3	-	R
	Potamopyrgus	4	VA	VA
CRUSTACEA	Ostracoda	1	A	R
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	-	C
	Zephlebia group	7	R	-
ODONATA (DRAGONFLIES)	*Xanthocnemis*	4	R	-
	Procordulia	5	-	R
HEMIPTERA (BUGS)	*Anisops*	5	R	-
COLEOPTERA (BEETLES)	Elmidae	6	R	R
TRICHOPTERA (CADDISFLIES)	*Hydropsyche (Aoteapsyche)*	4	-	R
	Hydrobiosis	5	-	R
	Polyplectropus	6	C	-
	Oxyethira	2	A	C
	Paroxyethira	2	A	C
	Triplectides	5	C	R
DIPTERA (TRUE FLIES)	Eriopterini	5	R	-
	Orthocladiinae	2	R	R
	Tanypodinae	5	R	-
	Empididae	3	-	R
ACARINA (MITES)	Acarina	5	R	-
		No of taxa	18	15
		MCI	77	71
		SQMCIs	3.3	3.5
		EPT (taxa)	3	4
		%EPT (taxa)	17	27
'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa		

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

Site 1 – upstream of Production Station

Results to date for this site are illustrated in Figure 3.

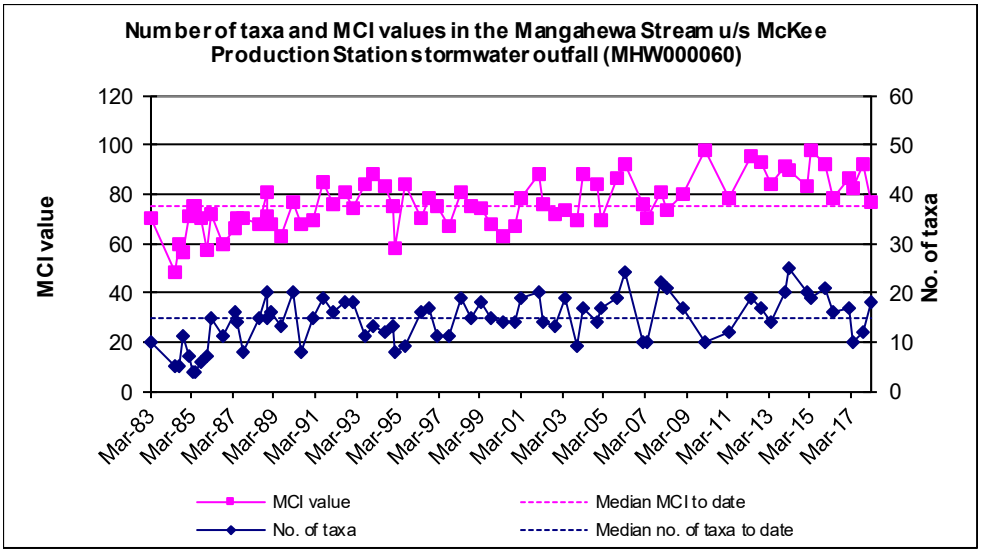

Figure 3 Number of taxa and MCI scores at site 1, upstream of the McKee Production Station in the Mangahewa Stream

A moderate taxa richness of 18 taxa was recorded at site 1, six taxa more than was recorded in the preceding survey (Figure 3) and three taxa more than the median for this site (median richness 15 taxa; Table 4, Figure 3). The macroinvertebrate community was characterised by four 'tolerant' taxa [mud snail (*Potamopyrgus*), seed shrimp (Ostracod) and caddisflies (*Oxyethira* and *Paroxyethira*)].

A MCI score of 77 units was recorded at this site in the current survey, categorising the site as having 'poor' macroinvertebrate community health (Table 3). This score was not significantly higher (Stark 1998) than the median score for this site (median MCI score 75 units; Table 4, Figure 3), but was significantly lower than the score of 92 units recorded in the preceding survey (Figure 3). A $SQMCI_s$ score of 3.3 units was recorded, which was not significantly different (Stark 1998) from the score of 4.1 units recorded in the preceding survey or from the median score for this site (3.5 units; Table 4).

Site 2 – 150 downstream of Production Station discharges

Results to date for this site are illustrated in Figure 4.

A moderately low taxa richness of 15 taxa was recorded at this site, equal to that recorded in the preceding survey (Figure 4) and two taxa less than the median richness recorded for this site (median richness 17 taxa; Table 4, Figure 4). The macroinvertebrate community on this occasion was characterised by two 'tolerant' taxa [oligochaete worm, mud snail (*Potamopyrgus*)].

A MCI score of 71 units was recorded in the current survey, categorising the site as having 'poor' macroinvertebrate community health (Table 3). This score is a not significantly lower (Stark 1998) than the score recorded in the preceding survey (80 units; Figure 4), but is significantly lower than the median score for this site (83 units; Table 4, Figure 4). A $SQMCI_s$ score of 3.5 units was recorded in the current survey, which is significantly higher (Stark 1998) than the score of 2.2 units recorded in the preceding survey but similar to the median score for this site (3.4 units; Table 4).

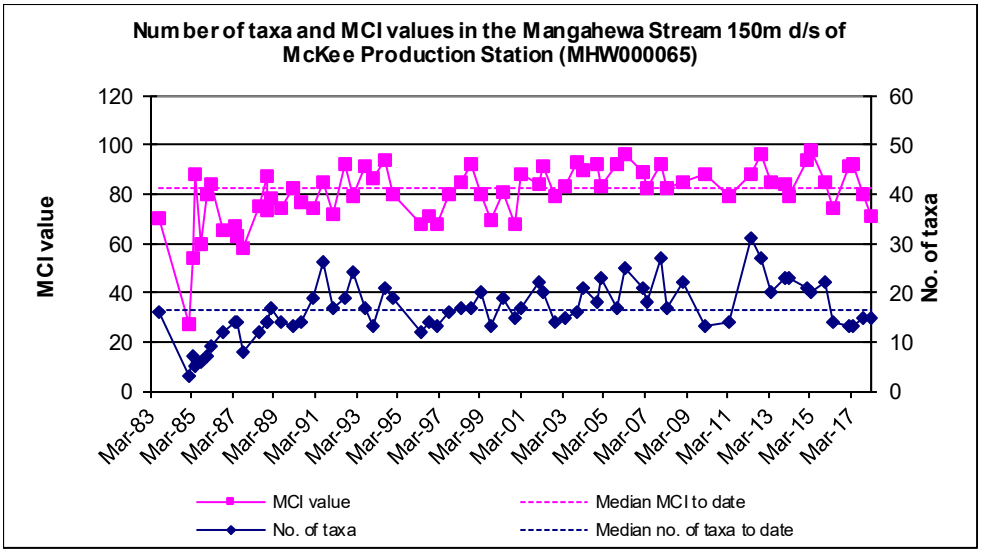

Figure 4 Number of taxa and MCI scores at site 2, 150m downstream of the McKee Production Station in the Mangahewa Stream

Discussion and conclusions

The Council's 'kick-sampling' technique was used at two sites to collect benthic macroinvertebrates from the Mangahewa Stream in relation to discharges from the McKee Production Station. This has provided data to assess any potential impacts the consented discharges have had on the macroinvertebrate communities of the stream. Samples were processed to provide number of taxa (taxa richness), MCI and $SQMCI_s$ scores for each site.

Taxa richness is the most robust index when determining whether a macroinvertebrate community has been exposed to toxic discharges. Macroinvertebrates when exposed to toxic discharges may die and be swept downstream or may deliberately drift downstream as an avoidance mechanism (catastrophic drift). The MCI is a measure of the overall sensitivity of the macroinvertebrate community to organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_s$ takes into account relative abundances of taxa as well as sensitivity to pollution. Significant differences in taxa richness, MCI or $SQMCI_s$ between sites may indicate the degree of adverse effects (if any) of the discharge being monitored.

Taxa richnesses were similar to the previously recorded median for both sites, and were similar at the two sites. Taxa richness at the two sites was equal to or slightly higher than the preceding survey. Similar MCI scores of 77 and 71 were recorded at the two sites respectively. This represented a significant decrease since the previous survey at site 1, and a slight decrease at site 2. The score at site 1 was similar to the historical median for this site, while at site 2 the score was significantly lower than the historical median. Similar $SQMCI_S$ scores of 3.3 and 3.5 were recorded at the two sites respectively. The score at site 1 was similar to both the historical median and the preceding result, while site 2 was similar to the historical median and significantly higher than the preceding result.

The February 2010 and April 2011 surveys recorded low taxa richnesses of 13 and 14 taxa at site 2. In the 2011 survey, during sample collection and processing a strong hydrocarbon odour was noted indicating that a discharge of hydrocarbons had occurred recently, which had had a toxic affect on the macroinvertebrate communities. This is further supported by the observations made during processing of that sample, that there were very few individuals recorded (10 of 14 taxa recorded less than five individuals, most only 1 or 2 specimens), and that those individuals present were very small. There were no such observations made during sampling and processing of the current sample, providing no indication that such a discharge had preceded the current survey, similar to that concluded in the previous twelve surveys.

Since 2011, a recovery has been documented, and taxa richnesses have improved. However, the February 2017 and April 2017 surveys recorded a taxa richness of only 13 taxa at site 2, equal to that found in the February 2010 survey and one taxon less than that found in the April 2011 survey. Stream sediments have been sampled for hydrocarbons in conjunction with the macroinvertebrate surveys since 2011. In February 2017, the hydrocarbon concentrations in the streambed sediment were the highest that had been recorded up to that time. Since then, the April 2017 and October 2017 surveys recorded levels similar to those recorded by previous surveys. The current survey showed a slight elevation in hydrocarbons in the sediment at site 1, although this result is lower than was recorded at the same site in February 2017. Site 2 had significantly elevated hydrocarbons in the sediment, with the highest result recorded to date in the current survey (Figure 2). No hydrocarbon odour was recorded at either site at the time of sampling. Hydrocarbons can have a toxic influence on macroinvertebrates, potentially causing lower taxa richnesses and/or abundances. Further, it is possible that any effects of the hydrocarbons have been exacerbated by low flow conditions preceding the current survey, resulting in the moderately low richnesses recorded in this survey. The presence of hydrocarbons appears to be a continuing factor affecting macroinvertebrate community health. It is difficult to ascertain the impacts of the hydrocarbons on the macroinvertebrate communities, however the taxa richnesses at site 2 have been below the median richness for four consecutive surveys.

Summary

The Council's standard 'kick-sampling' technique was used at two established sites to collect streambed macroinvertebrates from the Mangahewa Stream on 7 February 2018. Samples were sorted and identified to provide the number of taxa (richness), MCI score and $SQMCI_S$ score for each site.

This February 2018 survey recorded taxa richnesses and $SQMCI_S$ scores similar to their respective medians, while site 2 recorded a significantly lower than median MCI score. Taxa richnesses at both sites were similar to those recorded in the preceding survey, while MCI score at site 1 were significantly lower than the preceding survey and $SQMCI_s$ score at site 2 was significantly higher than the preceding survey. The taxa richnesses, MCI and $SQMCI_S$ scores were similar between the two sites. Hydrocarbon concentrations in the sediment showed an increase from the previous survey, with the result at site 2 being the highest recorded to date, while sites 1 and 3 were lower than the high results recorded by the February 2017 survey. In this instance, this did not appear to have a had a significant adverse effect on the macroinvertebrate community, although it may have been a contributing factor in the low taxa richness recorded at site 2 in the last four surveys. Nonetheless, further monitoring will be needed to determine whether future results reflect a relationship between macroinvertebrate community health and hydrocarbon concentrations in the sediment.

It should be noted that it has not been determined whether the hydrocarbon contamination is a remnant effect from the well blow-out that occurred here in 1995, or whether it is recent contamination. However, sampling suggests that there is hydrocarbon contamination occurring upstream. Therefore, there is insufficient evidence to conclude where the hydrocarbon contamination is coming from, and to what degree this contamination is affecting the macroinvertebrate communities. Further monitoring will be needed to determine whether future results reflect a relationship between macroinvertebrate community health and hydrocarbon concentrations in the sediment.

It is recommended that sediment samples continue to be collected and analysed for hydrocarbons, and that this sampling is undertaken in conjunction with the macroinvertebrate surveys.

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Appendix III

Fish survey report

To	Callum McKenzie, Job Manager
From	Bart Jansma, Environmental Scientist
Document	2099833
Report No	BJ315
Date	25 Jul 2018

Fish survey conducted in the Mangahewa Stream in relation to the McKee Production Station water supply weir, April 2018

Introduction

Todd Energy Ltd holds a resource consent for a weir located in the Mangahewa Stream. The weir is part of the water supply scheme for the McKee production station, and the purpose of the consent is:

To construct a weir control for the McKee Production Site water intake on the Mangahewa Stream in the Onaero Catchment

Special condition 4 under resource consent 1227 requires that the intake structure shall be so designed, constructed and maintained so as to permit the upstream passage of fish. The purpose of this monitoring programme is to assess compliance with this special condition and was a scheduled component of the monitoring programme for the 2017-2018 monitoring period.

The weir is 1.5 m high and is located off Otaraoa Road, inland from Waitara, at an altitude of 120 m a.s.l. A fish pass has been installed on this weir, and consists of a series of concrete steps over which the stream flow cascades. A visual assessment of this fish pass indicates that it is likely to be ineffective due to insufficient water depth, too steep a gradient, and very swift water flows (Photo 1). Two surveys have been undertaken to date in relation to this fish pass (Jansma 2011, 2015). However, some work was done in the early 1990's in relation to a spill of oil and drilling muds that occurred on site at that time. This work recorded the presence of a number of native fish species (McWilliam (1996), TRC (1995), Moore (1995)) in the Mangahewa Stream.

Just downstream of the McKee production station water supply weir is a double culvert crossing. This crossing has also been identified as a possible barrier to fish passage, and will need to be considered when assessing results.

A spotlighting survey was performed on 26 April 2018 in the Mangahewa Stream at two sites, upstream and downstream of the water supply weir, to assess the effectiveness of the fish pass. During the previous survey, these same sites were surveyed using both electric fishing and spotlighting. Both methods have their advantages and disadvantages for determining fish populations, and tend to target different species. For example, electric fishing is generally used when targeting species that inhabit riffles (e.g. bullies and eels), while spotlighting is the best method when targeting nocturnal galaxiids such as giant and banded kokopu.

Photo 1 McKee Production Station water supply weir in Mangahewa Stream, with the fish pass in the centre of the weir.

Methods

On 26 April 2018, two sites were surveyed using the night spotlighting technique. Night spotlighting surveys are undertaken using hand held spotlights powered by 12 amp hour batteries, with observed fish captured using hand held scoop nets where possible. Those fish captured were counted and identified where possible, with their size estimated. Upstream of the weir, the stream was approximately one metre wide, with a total of approximately 63m^2 surveyed. Downstream, a 150 metre reach was surveyed, with an average width of 2.5 metres, although some areas were unfishable due to flood debris. In total, approximately 359 m^2 was surveyed downstream. There was significantly more area surveyed downstream, as this site is also a part of the Council's State of the Environment Monitoring Programme for Freshwater Fish, which follows a more extensive monitoring protocol (Joy et al, 2013). This protocol required 150 m of stream length to be surveyed, with results recorded for each 15 m reach.

Details of the sites surveyed are given in Table 1 and the location of sites surveyed in relation to the weir and fish pass are shown in Figure 1.

Table 1 Location of sites surveyed for fish in relation to the McKee Production Station water supply weir

Stream	Site code	Description	Altitude (m)	Distance Inland from sea (km)
Mangahewa Stream	MHW000060	Upstream of McKee Production Station water supply weir	120	18.4
	MHW000065	Downstream of McKee Production Station water supply weir	115	18.2

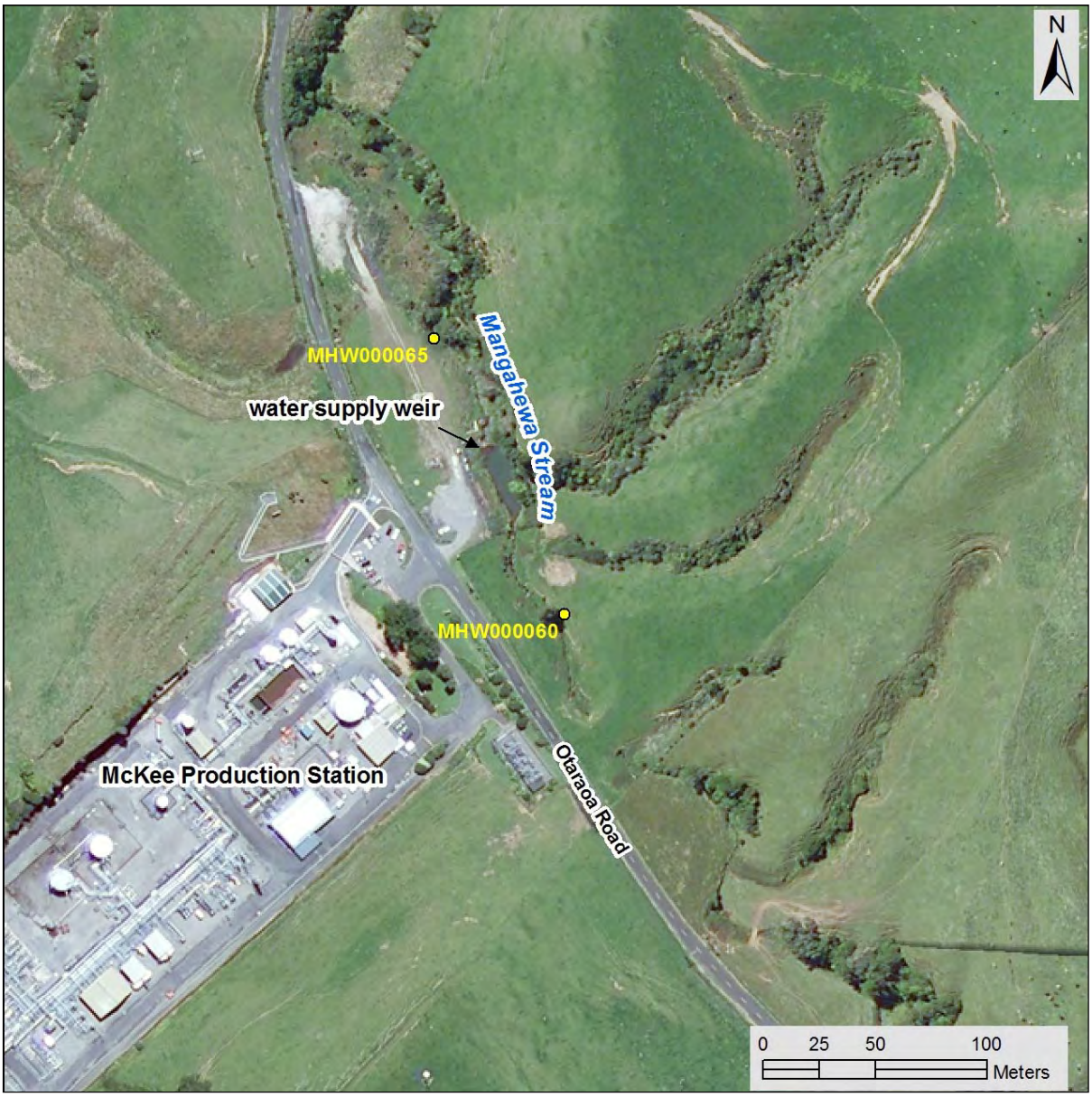

Figure 1 The location of survey sites monitored in the Mangahewa Stream in relation to the McKee Production Station water supply weir. The direction of flow is towards the top of the image (north).

Results and Discussion

The survey sites differed somewhat in terms of instream habitat. The downstream site had relatively good riparian protection and mature vegetation along the margins, which provided good shade. In contrast, there was evidence of stock access at the upstream site, with primarily pasture on the margins. The channel shape differed markedly also, with a much narrower but deeper channel upstream, compared to a wider shallower channel downstream. The flow structure below the weir consisted of pools and riffles, while upstream there were few pools, with flow typically quite swift and difficult to see into. With regard to instream cover, only the downstream site contained coarse woody debris, while both sites had macrophytes on the bed. Both sites had significantly undercut banks. The undercut banks and macrophyte beds provided sufficient cover for fish, who typically moved there once disturbed. The substrate at both sites was similar, with gravels and cobbles predominating. The downstream site appeared to have been impacted by a significant flood, with one notable debris dam restricting access to an area of stream.

The results of the surveys conducted in the Mangahewa Stream in April 2018 are presented in Table 2. For comparison, results of previous fish surveys are included.

It should be noted that some of the previous records were of fish found dead after the McKee-E(13) wellsite spill in 1995, and that some of these fish were found quite some distance downstream (where a higher diversity could be expected).

Table 2 Fish species recorded in the Mangahewa Stream upstream and downstream of the water supply weir in April 2018, together with historical records. Size range in mm is given in brackets.

		Downstream of weir MHW000065		Upstream of weir MHW000060	
		Spot lighting	Historical data	Spot lighting	Historical data
Longfin eel	*Anguilla dieffenbachii*	6 (200-1000)	✓	-	✓
Shortfin eel	*Anguilla australis*	-	✓	-	✓
Giant kokopu	*Galaxias argenteus*	1 (250)	✓	-	✓
Banded kokopu	*Galaxias fasciatus*	1 (120)	✓	-	✓
Shortjaw kokopu	*Galaxias postvectis*	-	✓	-	-
Inanga	*Galaxias maculatus*	-	✓	-	-
Torrentfish	*Cheimarrichthys fosteri*	-	✓	-	-
Common bully	*Gobiomorphus cotidianus*	-	✓	-	-
Redfin bully	*Gobiomorphus huttoni*	17 (45-110)	✓	-	-
Unidentified eel	*Anguilla* sp.	1 (90)		-	
Unidentified galaxiid	*Galaxias* sp.	1 (60)		2 (50-120)	
Freshwater crayfish	*Paranephrops planifrons*	C	✓	O	✓
Shrimp	*Paratya fluviatilis*	C	✓	-	✓
	Total abundance	27	-	2	-
	Total number of species	4	9	1	4

Note: For freshwater crayfish and shrimp, O=occasional, C=common, A=abundant. Crayfish and shrimp are not included in abundance or species richness totals.

The diversity of fish (number of fish species) in the communities was particularly low upstream of the weir with only one species recorded as present. Although two galaxiids were recorded, they could not be identified to species level. Downstream of the weir there was a higher diversity of fish, with four species recorded (Table 2). It should be noted that there was a significant flood in June 2015, which could have caused a reduction in fish diversity and density in this stream. It may take some time for a population of giant kokopu to recover, as it is reliant on successful migrations of juveniles (whitebait). Fish abundance was also quite low. Although this may also be related to the large 2015 flood, survey methodology may have also contributed. Spotlighting generally records fewer fish than electric fishing, as it is less likely to record those fish inhabiting riffles (bullies and small eels), which are usually the most abundant in a community. However, the abundance of kokopu at both sites was low when compared with previous surveys.

Longfin eels (*Anguilla dieffenbachii*) and shortfin eels (*Anguilla australis*) are both considered extremely good climbers, with elvers able to climb most vertical surfaces. Although no eels were recorded upstream of the weir in the current survey, it is not considered an indication that the passage for eels at the weir is restricted. This is because few eels were also observed downstream of the weir, and spotlighting is not a particularly effective method for quantifying a population of eels, as it underrepresents juveniles. In addition, eels have been recorded upstream in moderate numbers during past electric fishing surveys.

Galaxiids have varying climbing abilities, with the most capable climbers considered to be koaro (*Galaxias brevipinnis*) and the least capable being inanga (*Galaxias maculatus*). Of the two *Galaxias* species recorded in the current survey (banded kokopu (*Galaxias fasciatus*) and giant kokopu (*Galaxias argenteus*)), banded kokopu are considered to be stronger climbers. It is highly likely that the unidentified galaxiids recorded at both sites were either banded or giant kokopu. All but one of the fourteen galaxiids recorded in the Mangahewa Stream in May 2009 was recorded using the spotlighting method, which reflects the nocturnal habit of these two species, and the fact that during the day, they take cover deep under undercut banks. All the galaxiids observed upstream of the weir are expected to have migrated to this reach while still in the juvenile stage, and it is unlikely that they will have utilised the fish pass, due to swift water speeds and insufficient water depth. It is thought that these fish will have used the edge of the weir, by climbing through or under moist grass where it came into contact with water flow. This area provides a better substrate to climb up, while also having reduced water velocity. This grass, visible in photo 1, is therefore critical to fish migration, and should not be removed or sprayed.

The only other fish species recorded during these surveys were redfin bully (*Gobiomorphus huttoni*), with 17 individuals recorded downstream of the weir. It is unknown whether redfin bully exist upstream of the weir, as due to water depth and good instream cover, this species may have been missed in the current survey. However, a visual assessment of the weir suggests that small redfin bully should be able negotiate this weir, as they have been known to climb steep concrete faces.

Photo 2 Farm access crossing, located in the Mangahewa Stream just downstream of the McKee Production Station water supply weir.

It is appropriate to include the farm crossing located just downstream of the water supply weir in any discussion around fish passage in this reach of the Mangahewa Stream. This crossing consists of two culverts, and has been identified as a barrier to fish passage. During the current survey, and that undertaken previously, the culverts were observed to be slightly perched, but it is likely that during higher flows they will be inundated. However, water velocities may then become an impediment to passage.

The results of the surveys undertaken to date indicate that this access crossing is not a complete barrier to fish passage. There was no accrual of fish noted downstream of the culvert, while numerous migrant fish have been observed upstream in the past, including two kokopu species. However, there may be periods of time when passage past the structure is impeded due to swift water flows, or a fall of water at the outlet caused by the culvert becoming perched. It was interesting to note that during the previous (2015) current survey, a crayfish was observed in one of the culverts, out of the water and crawling upstream. This indicates that at this time the structure may have had excessive water velocities. A similar observation was made during the May 2009 survey.

Although the relatively poor results recorded in the current survey may have been influenced by the June 2015 flood event, it is possible that they have also been influenced by hydrocarbon contamination. Sediment monitoring undertaken over the last seven years has identified hydrocarbon contamination of the sediment that can vary significantly both throughout the stream and from year to year. Monitoring undertaken in February 2018 recorded a significant increase in the concentration of hydrocarbons in the sediment at the downstream monitoring site (MHW000065) (Blakemore, 2018). It should be noted that it has not been determined whether the hydrocarbon contamination is a remnant effect from the well blow-out that occurred here in 1995, or whether it is recent contamination. There is insufficient evidence to conclude where the hydrocarbon contamination is coming from, and to what degree this contamination is affecting the aquatic communities. It is also important to note that there have been no fish kills reported recently from this rural stream. Further monitoring will be needed to determine whether future results reflect a relationship between macroinvertebrate community health and hydrocarbon concentrations in the sediment.

Summary

A night spotlighting survey was conducted on 26 April 2018 at two sites in the Mangahewa Stream, one upstream and one downstream of the McKee Production Station water supply weir. In-stream habitat was relatively dissimilar between sites, the upstream site having little riparian vegetation, with slumping banks, and habitat dominated by swift runs, with few pools and the downstream site having established riparian vegetation, stable banks and a clear pool riffle structure. Both sites had good cover, with macrophyte beds and extensive undercut banks providing plenty of refuge for fish. The downstream site appeared to have been impacted by a significant flood, with one notable debris dam restricting access to an area of stream.

Fish diversity was lower than typical at the upstream site while at the downstream site it was moderate, reflecting the location of the site, in terms of its distance inland. In addition, the sampling methodology does not typically record high species richness. Fish abundance was low at both sites, and although the methodology will have also contributed to this, it is important to recognise that this stream was subject to a significant flood event in June 2015, which may have deleteriously affected the fish communities. Another potential influence on the fish communities is that of hydrocarbon contamination. Sediment sampling undertaken over the last seven years has detected hydrocarbon contamination of the sediment, although the degree of contamination has varied both spatially and temporally. The most recent sampling, completed in February 2018, recorded a sharp increase in the contamination of the sediment at the downstream site. It should be noted that it has not been determined whether the hydrocarbon contamination is a remnant effect from the well blow-out that occurred here in 1995, or whether it is recent

contamination. There is insufficient evidence to conclude where the hydrocarbon contamination is coming from, and to what degree this contamination is affecting the aquatic communities. It is also important to note that there have been no fish kills reported recently from this rural stream.

Longfin eel (*Anguilla dieffenbachii*), redfin bully (*Gobiomorphus huttoni*), banded kokopu (*Galaxias fasciatus*) and giant kokopu (*Galaxias argenteus*) were all recorded in the current survey, although only two unidentified galaxiids were recorded upstream of the weir. Previous surveys have recorded giant and banded kokopu upstream of the weir, but not redfin bully. It is possible that these species were present upstream of the weir during this survey, but that due to the inherent difficulty in surveying this site, may have been missed.

A visual assessment of this fish pass indicates that it is likely to be ineffective due to insufficient water depth, too steep a gradient, and very swift water flows. It is thought that those migrant fish recorded upstream of the weir migrated there as juveniles, and did so using the edge of the weir, by climbing through or under moist grass where it came into contact with water flow. This area provides a better substrate to climb up, while also having reduced water velocity. This grass is therefore critical to fish migration, and should not be removed or sprayed. Provided this grass remains, it is concluded that the weir did not pose a significant barrier to fish passage at that time. However, there may need to be additional work undertaken to quantify the population of redfin bully upstream of the weir.

This survey confirms that the McKee Production Station water supply weir did not form a significant barrier to fish passage, and therefore compliance with special condition 4 of resource consent 1227 has been achieved. However, the lack of redfin bully above the weir may need further investigation. Provided that regular inspections of the weir confirm that it is being maintained as required, it is recommended that fish monitoring be maintained at the current level of once every three years, using the spotlighting methodology.

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Appendix IV

Air monitoring report

To	Job Manager, Callum MacKenzie
From	Environmental Scientist - Air Quality, Brian Cheyne
File	2124252
Date	September 18, 2018

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

Introduction

In January 2018 and April 2018 as part of the compliance monitoring programme for the McKee 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 43 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 McKee 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 McKee production station have specific limits related to particular gases. Special condition 5 of consent 4050-3 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 18.3 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 McKee production station

Period (from-to)		18/04/2018 15:06 to 20/04/2018 10:03
Max	CO(ppm)	16.0
	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 McKee production station reach any more than a trivial level.

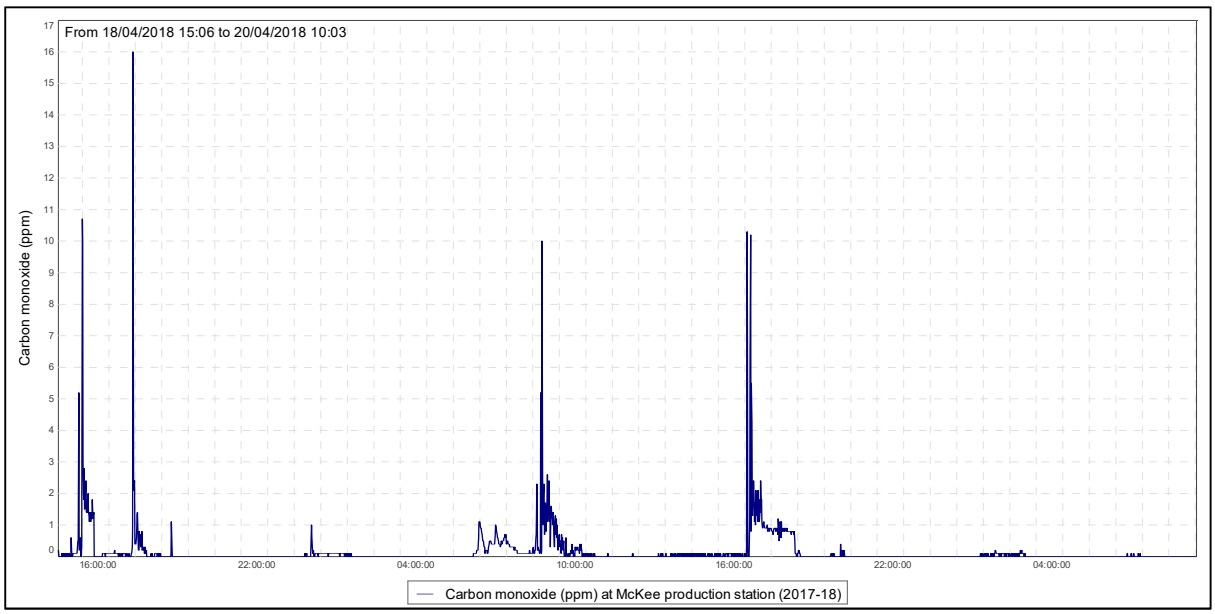

Figure 2 Graph of ambient CO levels in the vicinity of the McKee Production Station (year 2017-18).

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 McKee production station. The deployment lasted approximately 40 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.

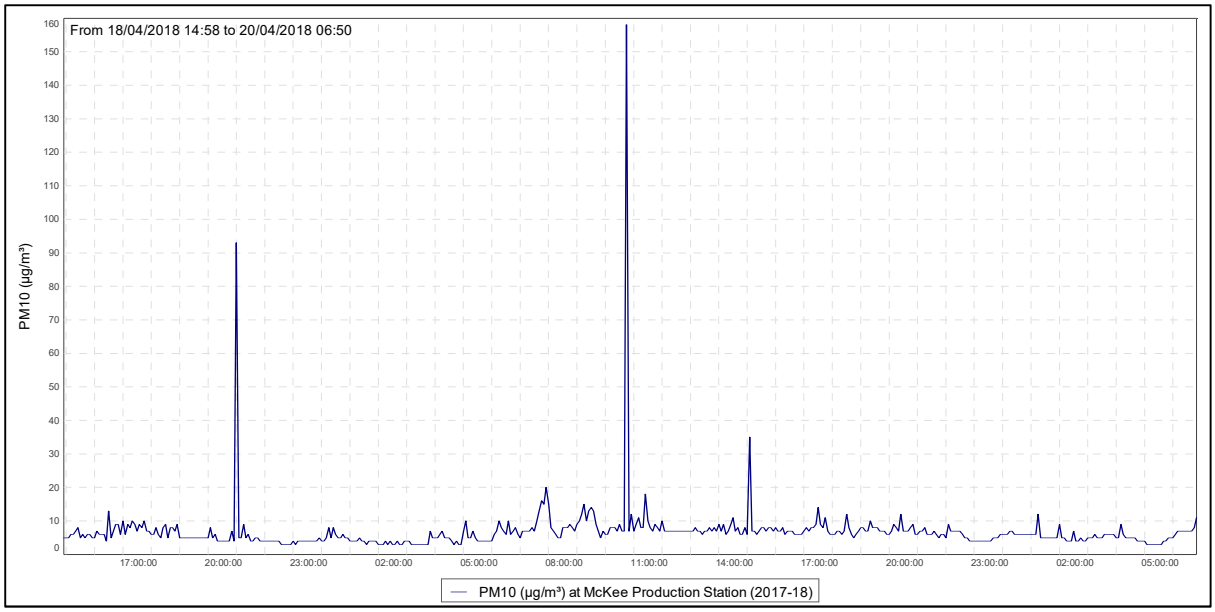

Figure 2 PM10 concentrations (µg/m³) at the McKee production station (2017-18)

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

	(40 hours) (18/04-20/04/2018)	
24 hr. set	Day 1 (Start to 24 hr.)	Day 2 (24 hr. to end)
Daily average	7.1 µg/m³	7.6 µg/m³
NES	50µg/m³	

During the 40-hour run, from 18th to 20st of April 2018, the average recorded PM_{10} concentration for the first 24 hour period was 7.1µg/m³ and 7.6µg/m³ for the second 24 hour period. These daily means equate to 14.2% and 15.2%, 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 11µg/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 McKee 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 in the Appendix to this memorandum (TRC #2089257).

The consents covering air discharges from the McKee production station have specific limits related to particular gases. Special condition 6 of consent 4050-3 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 McKee 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 McKee production station during the year under review equates to 11.6µg/m³ and 6.2µg/m³ respectively. The results show that the ambient ground level concentration of NO_x is well below the limits set out by consent 4050-3.