

Swift Energy New Zealand Limited  
Piakau A Wellsite  
Monitoring Programme  
Report 2005

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## Executive summary

During 2005, Swift Energy New Zealand Limited established a hydrocarbon exploration site located on Stanley Road, Wharehuia, in the Waitara catchment. The operation took place from July to September 2005. No flaring was undertaken at this site.

This report describes the monitoring programme implemented by the Taranaki Regional Council to assess the Company's environmental performance for the Piakau A well drilling activities during the period under review, and the results and effects of the Company's activities at the exploration site.

The Company holds a number of resource consents for the activities relating to exploration at the Piakau A well 3 relate to this report. These consents include a total of 58 special conditions setting out the requirements that the Company must satisfy. 5047-2 relates to discharges to air from production testing, 5046-1 relates to the discharge of treated stormwater onto and into land in the Waitara catchment, 5045-2 relates to the discharge of drill cuttings and solids onto and into land. Watertake was permitted under the Regional Fresh Water Plan for Taranaki.

Site inspections were undertaken by the Taranaki Regional Council during the period July 2005 to September 2005 at the wellsite. Macroinvertebrate surveys were undertaken initially in relation to earlier drilling operations in 1986, 1987, 1997, and 1997a; and a final survey was conducted following the latest drilling in June 2006.

The present site was constructed in the early 1990's and with previous developments it is now too small and placed considerable pressure on staff to manage and maintain the site so that no effects to the environment occurred. Despite inclement weather experienced during the drilling phase site inspections confirm that the actual site was well managed and kept neat and tidy; and that the emissions and discharges were within consent limits.

Documentation required by consent conditions was audited and found to be in order.

The Council's monitoring programme included eight inspections of the site and surrounding environment, and the auditing of information held by the Company. Any requests for information or minor works to be carried out were promptly handled.

Drilling fluids, muds and cuttings were removed from the site and disposed of to Spence Road land farm.

Swift Energy New Zealand Limited's performance in relation to environmental matters was good at all times during the drilling of this exploration well.

The site is now producing and there are no plans for reinstatement.

## Table of contents

	Page
1. Introduction	1
1.1 Resource consents	1
1.1.1 Background	1
1.1.2 Discharge permit - treated stormwater	1
1.1.3 Air discharge permit	2
1.2 Monitoring programme	4
1.2.1 Introduction	4
1.2.2 Programme liaison and management	5
1.2.3 Site inspections	5
1.2.4 Ecological surveys	5
1.2.5 Air quality monitoring	5
1.2.6 Chemical sampling	5
1.2.7 Solid wastes	5
2. Results	6
2.1 Water	6
2.1.1 Inspections	6
2.1.2 Results of receiving environment monitoring	8
2.2 Air	12
2.2.1 Emission monitoring	12
2.2.2 Other ambient monitoring	12
2.3 Land	12
2.3.1 Land status	12
2.4 Contingency plan	12
2.5 Register of incidents	13
3. Discussion	14
3.1 The Resource Management Act (1991)	14
3.2 Discussion of plant performance	14
3.3 Environmental effects of exercise of water permit	14
3.4 Environmental effects of exercise of air discharge permit	15
3.5 Evaluation of performance	15
4. Recommendations	17
Glossary of common terms and abbreviations	18
Appendix I	Inspection advice notices
Appendix II	Sampling results
Appendix III	Photographs
Appendix IV	Resource consents held by Swift Energy Piakau A Wellsite
Appendix V	Company notifications regarding operations

### List of tables

<b>Table 1</b>	Results of potential discharge analysis, 15 July 2005	8
<b>Table 2</b>	Bio-monitoring results for the unnamed tributary of the Makara Stream	10
<b>Table 3</b>	Consent 5046-1 Discharge of stormwater onto and into land	15
<b>Table 4</b>	Consent 5047-2 Discharge of emissions to air from flaring	15

### List of figures

<b>Figure 1</b>	Biomonitoring sites in an unnamed tributary of the Makara Stream in relation to discharges from the Piakau A well site.	9
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## 1. Introduction

This report is the report for the period July 2005 to November 2005 by the Taranaki Regional Council on the monitoring programme associated with resource consents held by Swift Energy New Zealand Limited for drilling and production testing of the Piakau A oil and gas exploration well. The wellsite is located in a rural area, on predominantly flat farm land. The land surrounding the wellsite is extensively farmed, mainly for dairy and dry stock production. The wellsite is on the property of K & N Hosking, Stanley Road, Wharehuia in the Waitara catchment.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by Swift Energy New Zealand Limited that relate to treated stormwater from hydrocarbon exploration and production operations at the Piakau A wellsite onto and into land and into the Waitara catchment. It also covers the drill cuttings and solids from drilling operations which were removed from the site.

One of the intents of the Resource Management Act (1991) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Taranaki Regional Council is integrating its environmental monitoring programmes and reporting the results of the programmes jointly. This report discusses the environmental effects of the Company's use of both water and air, and is the first report by the Taranaki Regional Council for the Company's activities at the Piakau A well site.

### 1.1 Resource consents

#### 1.1.1 Background

Swift Energy New Zealand Limited holds 3 resource consents related to exploration activities at the Piakau A wellsite. One of the consents was granted on 27 November 2005 and one on 16 July 2003 and one on 2 June 2005 (Granted 30 April 2003). The consent applications were processed on a non-notified basis as Swift Energy New Zealand Limited had obtained the landowners approval as an affected party, and the Council was satisfied that the environmental effects of the activity would be minor.

The consents are discussed below.

Copies of the consents and the Council reports describing the associated activities are contained in Appendix IV to this report.

Site construction was permitted under Rule 25 of the Regional Fresh Water Plan for Taranaki.

#### 1.1.2 Discharge permit - treated stormwater

Section 15(1)(a) of the Resource Management Act 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.

Swift Energy New Zealand Limited holds **discharge permit** 5046-1 to:

*'discharge up to 50 cubic metres/day [2 litres/second] of treated stormwater and treated wellsite water from hydrocarbon exploration and production operations into an unnamed tributary of the Makara Stream a tributary of the Makino Stream in the Waitara Catchment at or about GR:Q20:255-113'*

This permit was issued by the Taranaki Regional Council on 27 November 1996 as a resource consent under Section 87(e) of the Resource Management Act. It is due to expire on 1 June 2015.

Six special conditions are attached to this consent (Appendix IV).

Special condition 1 relates to after reasonable mixing the discharge shall not give rise to: oil, grease, scums, change in colour or clarity, any objectionable odour, or cause water to be unsuitable for consumption by animals.

Special condition 2 relates to the discharge shall not contain total recoverable hydrocarbons in excess of 15g/m<sup>3</sup> at any time.

Special condition 3 relates to after allowing for reasonable mixing the discharge shall not cause an increase in suspended solids in excess of 10 % of the upstream concentration.

Special condition 4 relates to the consent holder shall provide contingency maps outlining measures to prevent a spillage or accidental discharge of contaminants.

Special condition 5 relates to the consent holder shall notify the Taranaki Regional Council in writing five days prior to commencing site preparation activities.

Special condition 6 relates to the Taranaki Regional Council may review any or all of the conditions of this consent, by giving notice of review during June 2003 and/or June 2009, for the purpose of ensuring that the conditions are adequate to deal with adverse effects.

### 1.1.3 Air discharge permit

Section 15(1)(c) of the Resource Management Act 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.

Swift Energy New Zealand Limited holds **discharge permit** 5047-2 to:

*'discharge emissions into the air arising from flaring associated with hydrocarbon exploration and production testing operations and miscellaneous emissions at the Piakau A wellsite at or about GR:Q20:255-113'*

This permit was issued by the Taranaki Regional Council on 2 June 2005 [Granted: 30 April 2003] as a resource consent under Section 87(e) of the Resource Management Act. It is due to expire on 1 June 2021.

Twenty-four Special conditions are attached to this consent (Appendix IV).

Special condition 1 relates to all gas being flared at any time must first be treated by effective liquid and solid separation and recovery as far as is practicable to ensure that smoke emission during flaring is minimised.

Special condition 2 relates to if separation cannot be maintained at any time while there is flow from the well, notify the Taranaki Regional Council and re-establish within 3 hours.

Special condition 3 relates to no liquid or solid hydrocarbon shall be combusted through the gas flare system.

Special condition 4 relates to the consent holder shall have regard for the prevailing and predicted wind speed and direction at time of flaring.

Special condition 5 relates to the opacity of smoke emissions shall not exceed level of 1 as measured by the Ringelmann Scale for more than 4 minutes during any 1 hour period.

Special condition 6 relates to there shall be no alteration to the plant equipment without prior consultation with the Taranaki Regional Council.

Special condition 7 relates to the consent holder shall make available to the Taranaki Regional Council upon request an analysis of typical gas and crude oil stream from the field.

Special condition 8 relates to the consent holder shall not discharge any contaminant to air from the site at a rate or a quantity that it is liable to become toxic at or beyond the boundary.

Special condition 9 relates to there shall be no offensive odour or smoke beyond the boundary of the wellsite.

Special condition 10 relates to the consent holder shall provide to the Taranaki regional Council a report detailing: all emissions all measures to reduce emissions, and any other relevant issue.

Special condition 11 relates to the consent holder shall provide a final site layout plan to the Taranaki Regional Council prior to commencement of testing.

Special condition 12 relates to the Taranaki Regional Council shall be notified within 24 hours prior to initial flaring of each zone.

Special condition 13 relates to the consent holder shall notify residents 24 hours prior to flaring.

Special condition 14 relates to the consent holder shall adopt best practicable option to prevent or minimise any actual or potential effect on the environment.

Special condition 15 relates to separated gas shall be combusted so that emissions of smoke are minimised.

Special condition 16 relates to this consent shall not be exercised for more than an accumulated duration of 180 days per well.

Special condition 17 relates to the consent holder shall keep and make available to the Taranaki Regional Council upon request a record of all smoke-emitting incidents.

Special condition 18 relates to the consent holder shall keep and make available to the Taranaki Regional Council upon request a log of all flaring.

Special condition 19 relates to only substances originating from the well stream and treated as outlined by conditions 1, 2, 3, 14, and 15 are to be combusted within the flare pit.

Special condition 20 relates to the consent holder shall control all emissions of carbon monoxide to the atmosphere.

Special condition 21 relates to the consent holder shall control all emissions of nitrogen oxides to the atmosphere.

Special condition 22 relates to the consent holder shall control all emissions to the atmosphere other than carbon dioxide, carbon monoxide, and nitrogen oxide.

Special condition 23 relates to consent lapse on the expiry of five years from the date of issue of this consent.

Special condition 24 relates to the Taranaki Regional Council may serve notice of its intention to review, amend, delete, or add to the conditions of this consent.

## **1.2 Monitoring programme**

### **1.2.1 Introduction**

Section 35 of the Resource Management Act sets out an obligation for the Taranaki Regional Council to: gather information, monitor, and conduct research on the exercise of resource consents, and the effects arising, within the Taranaki region.

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

The monitoring programme for exploration oil wells consists of five primary components. They are:

- Programme liaison and management
- Site inspections
- Ecological surveys
- Air quality monitoring
- Chemical sampling

The monitoring programme for the Piakau A wellsite focused on the discharge of treated stormwater, discharge of wastes to land, and discharge to air at the exploration site. The five components are discussed below.

### **1.2.2 Programme liaison and management**

There is generally a significant investment of time and resources by the Taranaki Regional Council in ongoing liaison with resource consent holders over consent conditions and their interpretation and application, in discussion over monitoring requirements, preparation for any reviews, renewals, or new consents, advice on the Council's environmental management strategies, and consultation on associated matters. This approach was taken for the monitoring of the consents held by Swift Energy New Zealand Limited for the Piakau A well.

### **1.2.3 Site inspections**

The Piakau A site was inspected eight times on a random basis approximately once per week through the site construction and drilling phases, to ensure that good environmental practices were adhered to and resource consent special conditions were complied with. An important requirement of the site establishment is to ensure that the site is contoured so that all stormwater and any runoff is diverted via ring drains through a series of skimmer pits for treatment prior to discharge to a water body.

### **1.2.4 Ecological surveys**

Ecological surveys were undertaken in an unnamed tributary of the Makara Stream a tributary of the Makino Stream, upstream and downstream of the exploration site, before and after drilling in both phases. These are attached in Appendix II.

### **1.2.5 Air quality monitoring**

Air quality monitoring is usually carried out in association with the well clean-up phase, where flaring can cause smoke emissions, as well as observing any miscellaneous emissions. Special conditions relating to the air discharge permit were complied with, including the location of the site and flare pit and distance to the nearest residence. These would have ensured that no unacceptable adverse effect occurred. At this well flaring did occur.

### **1.2.6 Chemical sampling**

Chemical sampling was undertaken at this site on one occasion (15 July 2005).

### **1.2.7 Solid wastes**

Solid wastes, including drill cuttings, were removed from the site by contractor and placed at a licensed disposal area at Spence Road.

## 2. Results

### 2.1 Water

#### 2.1.1 Inspections

Inspections paid special attention to the ring drains, mud sumps, treatment by skimmer pits and the final discharge point from the skimmer pit on to land and then into water. At each visit to the site, an inspection was also made of the water take to ensure that the Council's conditions for abstraction as a permitted activity were adhered to.

During each inspection the following were checked and noted:

- weather;
- flow rate of surface waters in the general vicinity;
- flow rate of water take;
- whether pumping of water was occurring;
- general tidiness of site;
- ring drains;
- hazardous substance bunds;
- treatment by skimmerpits
- drilling muds;
- drill cuttings;
- mud pit capacity and quantity contained in pit;
- sewage treatment and disposal;
- cementing waste disposal;
- surface works;
- whether flaring was in progress, and if there was a potential for flaring, whether the Council had been advised;
- discharges and surface waters in the vicinity for effects on colour and clarity, aquatic life and odour;
- site records; and
- general observations

Inspections of the wellsite were undertaken on the following dates (main points noted during each visit are also indicated):

24 June 2005	B017731402	Drilling is progressing. The ring drains and bunds are satisfactory. Several drums need to be placed within bunds. A leak in the sewage system is to be fixed. There are some drilling muds that need to be pumped out.
6 July 2005	B018650998	The site is muddy but there have been no off site effects. All is satisfactory on site.
15 July 2005	B019542653	Samples have been taken of the discharge as part of routine monitoring. The discharge is slightly cloudy. Site is wet and muddy but is secure in regard to environment.

22 July 2005	B020252282	Drilling is progressing. Skimmer pit is discharging. No flaring has been occurring. Water take is complying with consent. The site is muddy causing a build up of suspended solids in the skimmer pit and ring drains contain contaminants. The skimmer pits and ring drains shall be cleaned out as discussed. The level in the mud sump must be lowered to prevent overflow to storm water system.
2 August 2005	B021348052	The site is being enlarged. The skimmer pit has been cleaned out and is discharging. No flaring is occurring, testing will begin shortly. The new well is to be spudded next week. There are contaminants in the ring drain and within the Vause tank bund. Several drums stored outside of bunds. Dennis Ley is to organise clean up as discussed. The drums are to be placed within bunds. Engine oil is to be cleaned out of the Vause tank bund and the ring drain is to be cleaned out as required.
11 August 2005	B022341036	Dennis Ley and Bruce Forrest are on site. The rig is being moved in preparation for drilling of second hole. There are suspended solids in the ring drain and skimmer pit. There has been no discharge off site. There is oil residue in the ring drain. No flaring has been occurring. Water take is complying with consent. The site is messy. A meeting with Bill Wanstall is to be organised to discuss ongoing problems and remedial action. All ring drains are to be cleaned out and hay bales or sand bags positioned in the ring drain to reduce elevated suspended solids. Skimmer pit to be cleaned out to prevent discharge.
18 August 2005	B023029395	There is some mud seeping to ring drain (south side) this is to be prevented from reaching skimmer pit. Clean up of site undertaken and hay bales deployed in ring drains. Stormwater is to discharge to UNT. There have been no effects in receiving water but skimmer pit contents demonstrate high suspended solids as a result of muddy site, this is being monitored by staff.
5 September 2005	B024929153	There has been no discharge off site. There is drilling chemicals in the ring drains and skimmer pit. There is no discharge occurring from the skimmer pit. The ring drain and skimmer pit are to be pumped out as discussed with John. The shut off valve on the skimmer pit is to be kept closed until the pit is cleaned out.
13 September 2005	B025729923	Drilling is progressing. There has been no discharge or flaring occurring. There are drilling muds and fluids in the ring drain. Water take is complying. The skimmer pits and ring drains are to be cleaned out. The hay bales in the ring drains need to be replaced as discussed.

23 September 2005	B026547023	Site was inspected with Julia Lovelock (TRC). There has been no discharge off site. The skimmer pit is nearly full and ring drains are to be cleaned out. The mud sump level is secure. Water take is complying there was no draw off at time of inspection. All is satisfactory on site.
4 October 2005	B027731774	The rig is being moved from Piakau A to Ahuroa B. There has been no discharge from site. Flaring has been undertaken via Waihapa production station. Water take area is secure.
25 October 2005	B029747310	There was no staff on site. The site is neat and tidy. There was no discharge or flaring occurring. All is satisfactory on site.
4 November 2005	B031032327	Site is secure. There was no discharge or flaring occurring. The ring drains and bunds are secure. All is satisfactory on site.

Copies of the inspection notices and check sheets for each visit are attached to this report (Appendix I). Photographic records were made on some visits. Site photographs are attached to this report in Appendix III.

Some water recycling was undertaken to conserve usage.

All sewage was directed for treatment through a septic tank system and discharge was to land only.

Cementing wastes were directed into the mudpits.

### 2.1.2 Results of receiving environment monitoring

No off-site discharges were observed during monitoring. Any discharge would have been onto land out of the skimmer pit and flowed in a north westerly direction towards two unnamed tributaries of the Makara stream.

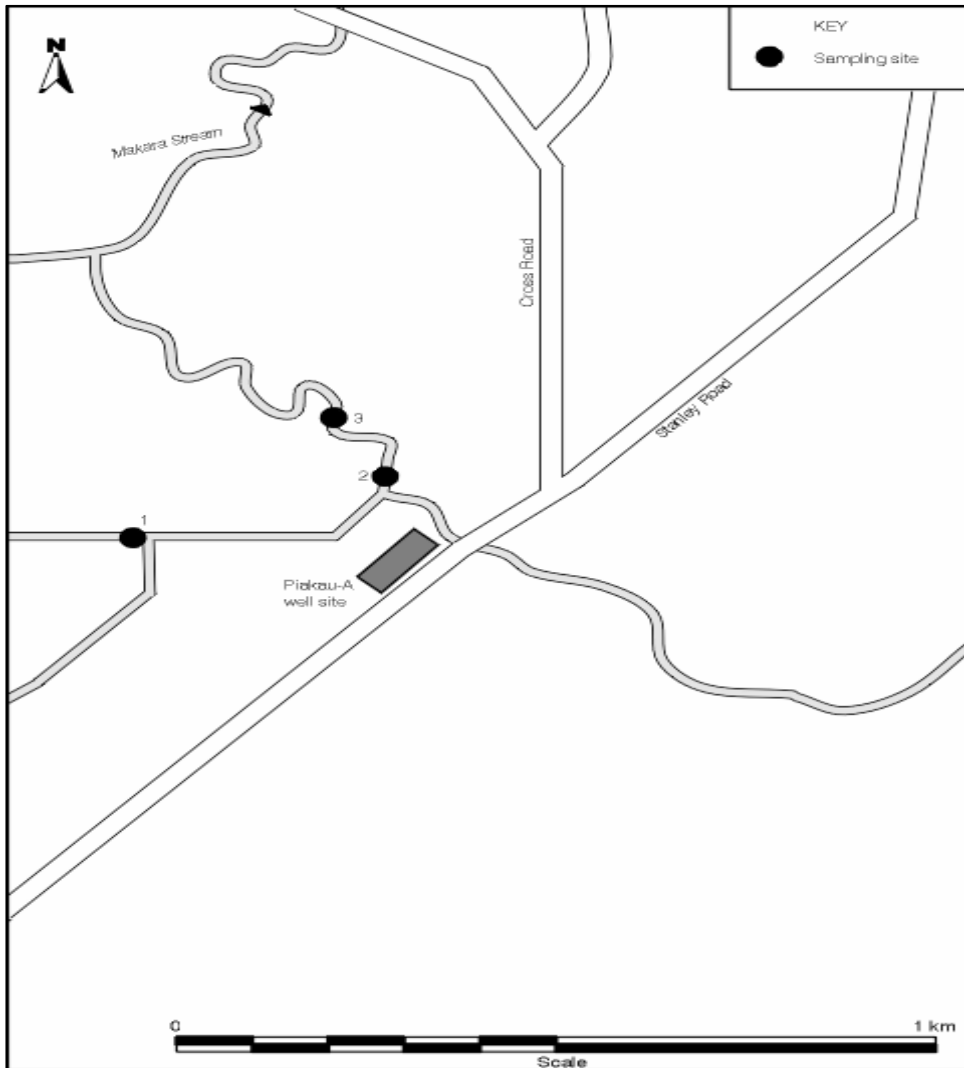
A sample of the potential discharge from the site was collected on 15 July 2005. No discharge was actually occurring at the time. The results are presented in Table 1. They show that any discharge of contaminants would have had only a negligible effect, if any, upon water quality of the suitability of the stream for any use. The full analysis report is attached to this report in Appendix II.

**Table 1** Results of potential discharge analysis, 15 July 2005

Analysis	Results	Units
	15 July 2005	
Chloride	59.6	g/m <sup>3</sup>
Conductivity	27.6	mS/m
Hydrocarbons	<0.5	g/m <sup>3</sup>
pH	7.2	pH
Suspended solids	55	g/m <sup>3</sup>
Turbidity	66.3	NTU

A freshwater biologist of the Council conducted biological monitoring surveys in an unnamed tributary of the Makara Stream a tributary of the Makino Stream, prior to and following drilling activities at the site, to determine whether site activities had had a detrimental effect upon the communities of the stream. Surveys were carried out before and after both phases of site development. Three sites were used, above and below the likely discharge zone for stormwater. The sites are shown in Figure 1. The first site was upstream of the Piakau well site, the second 50 metres downstream of the well, and the third was 300 metres downstream of the site.

Samples were collected at each site according to the Council's established streambed sampling methodology. All results from the biomonitoring are given in Table 2.



**Figure 1** Biomonitoring sites in an unnamed tributary of the Makara Stream in relation to discharges from the Piakou A well site.

The number of taxa found at each site is an indicator of diversity, while the MCI is an index that takes into account the abundance of each taxa found and its sensitivity to pollution or other adverse conditions. The greater the proportion of sensitive taxa, the higher the MCI value.

The results are shown in Table 2, for the previous sampling from earlier drilling operations (1986, 1987, 1997, & 1997a) and post-drilling (26 June 2006) surveys.

**Table 2** Bio-monitoring results for the unnamed tributary of the Makara Stream

Site	Number of taxa			MCI values		
	Pre drill (4 samples)		June 2006 Post drill	Pre drill (4 samples)		June 2006 Post drill
	Median	Range		Median	Range	
1. MKA000047	24	17-29	9	95	84-99	81
2. MKA000049	25	18-26	19	90	72-82	63
3. MKA000051	20	16-25	14	84	81-86	67

The previous surveys were undertaken from 1986, 1987, 1997, and 1997a these were conducted prior to drilling, in relation to earlier operations.

At Site 1, upstream of the drilling site discharge point, twenty-four (median) taxa were found. This is the same as than the median (24) of Council surveys found in streams at similar altitudes elsewhere in the region. The MCI of 95 (median)(a measure of the sensitivity to pollution of the taxa found) was slightly higher than the median of values recorded at similar altitudes elsewhere in the region.

At Site 2, 50 metres downstream of the discharge, twenty-five (median) taxa were present, with an MCI of 90 (median). The number of taxa was similar to those at Site 1. The MCI was slightly lower than that further upstream.

At Site 3, 300 metres downstream of the discharge, twenty (median) taxa were present, slightly lower than found at the two sites in the tributary, and below the median (24) for similar sites elsewhere in the region. The MCI value of 84 (median) was also slightly lower than at the upstream sites.

Overall, the previous surveys (1986, 1987, 1997, & 1997a) found relatively high MCI values and the number of taxa was also similar to the median value found at other surveys at similar altitudes.

At the time of the post-drilling survey on 26 June 2006, the tributary had a steady, flow of clear uncoloured water at all sites. The water temperature ranged from 9.2 to 10.0°C at these sites. The substrate at site 1 comprised of silt, sand, and fine gravel, which was coated in silt; the substrate at site 2 was predominantly sand, although some coarse gravel and cobbles were present; the substrate at site 3 was similar to site 1 although there was some coarse gravel present as well as wood and roots. All three sites had patchy moss growth, and site 1 and 3 had macrophytes on the streambed whereas site 2 had growth on the edges.

It is important to note that there was a silage pit and culvert crossing between the upstream site (site 1) and site 2. Some periphyton resembling sewage fungus was noted at site 2. Sewage fungus, also known as 'undesirable heterotrophic growths' is an indication of a marked organic influence, such as what could be expected from a silage pit, and/or the crossing. Where sewage fungus is found there are often impacts on the macroinvertebrate community also.

At Site 1, upstream of the discharge nine taxa were found; this significantly lower than the median number (24) found in the four previous surveys. The community was characterised by 'tolerant' oligochaete worms and 'moderately sensitive'

*paracalliope* amphipods. The abundance of amphipods reflects the presence of macrophytes and channel vegetation both on the banks and on the bed of the tributary.

The MCI score (81) was significantly lower than the median MCI for this site, and the lowest score recorded at this site to date. However, it wasn't significantly lower than the previous minimum (84), and reflects the similar proportion of 'tolerant' taxa (44%) to 'sensitive' taxa (56%). It does indicate that the water quality was slightly worse in the weeks preceding this survey compared to the previous surveys.

At Site 2, 50 metres downstream of the skimmer pit discharge, nineteen taxa were present. This is significantly higher than that recorded at site 1 upstream, but within the range of values recorded in the four previous surveys. The community was dominated by six 'tolerant' taxa (nematodes, oligochaete worms, ostracod seed shrimps, *Orthocladinae* and *Chironomus* larvae, and *Austrosimulium* sandfly larvae).

The community consisted predominantly of 'tolerant' taxa (74%) which resulted in an MCI score of 63. This is significantly lower than the previous minimum recorded at this site; and is also significantly lower than that recorded upstream during this survey. This indicates degradation of the macroinvertebrate community at this site. While there are differences in substrate between this site and that seen upstream, they are not significant enough to explain this degradation. The observation of what appeared to be 'sewage fungus' on the substrate combined with the drop in MCI scores indicates nutrient enrichment, and the presence of an organic discharge between the two sites. The silage pit and culvert crossing are both possible sources of this discharge, and the Inspectorate Department of the Council have been informed of this result.

At Site 3, 300 metres downstream of the skimmer pit discharge, fourteen taxa were present, slightly lower than that observed at site 2. The community was dominated by oligochaete worms, *Orthocladinae* and *Chironomus* larvae, and *Austrosimulium* sandfly larvae. Nematodes were absent at this site, despite being 'abundant' at site 2, and with the drop in abundance of *Physella* snails and *Chironomus* larvae, there is an indication of an improvement in water quality.

The MCI value of 67 is slightly higher than that recorded at site 2, and reflects the slight increase in the proportion of 'sensitive' taxa in the community (36%). This is also an indication that water quality may have been improving at site 3 compared to site 2, although there was also a slight improvement in the amount of available habitat.

Overall this site exhibited a slightly 'healthier' macroinvertebrate community than that seen at site 2, but the MCI was still well below that recorded in previous surveys, indicating that the effects from the discharge between sites 1 and 2 extended as far as site 3.

This June 2006 survey, found that the upstream site contained a high proportion of 'sensitive' taxa, indicating good water quality preceding this survey, although not as good as in previous surveys, as they returned higher MCI scores. The community deteriorated significantly downstream, with sewage fungus-like growths also being observed. While habitat downstream differed to that upstream, it did not differ sufficiently to explain this deterioration in macroinvertebrate community.

Some recovery was observed at site 3, 250 metres further downstream, with three taxa typical of organically enriched communities dropping in abundance (Nematodes, *Physella* snails and *Chironomus* midges).

The changes observed between sites 1 and 2 indicated an organic discharge, due to the presence of 'sewage fungus'. A discharge from drilling operation would most likely be toxic and not conducive to the growth of 'sewage fungus'. Therefore it can be concluded that this survey did not record any adverse effect from the drilling operations. A silage pad and race crossing noted between these two sites are both potential sources for this discharge, and the Council's Inspectorate department have been made aware of this result.

Communities at all sites were in worse health than their respective pre-drill communities, with sites 2 and 3 being significantly so. At the upstream site this result is probably due to environmental conditions, while the changes at the downstream sites are most likely due to an organic discharge in the weeks preceding the post drill survey, and not related to the well site.

## **2.2 Air**

### **2.2.1 Emission monitoring**

Flaring was undertaken at this site.

No chemical monitoring of air quality was undertaken during the testing of Piakau. A well, but visual inspections of the flare pit and site layout at each visit showed no adverse effects were likely to arise if flaring had occurred, in any case. There is only one residence that of the landowner, within a 500 metre radius of the well and no complaints were received.

Assessments made by officers of the Council on site visits included confirming the site layout, particularly the flare pit location, the provision of liquid separation equipment on the well head flow line, and the logging of any flaring or emission incident. The vicinity of the site was checked for odour, dust, or other possible discharge to air.

### **2.2.2 Other ambient monitoring**

No other ambient air sampling was undertaken, as the controls implemented by the Company did not give rise to any concerns in regard to air quality.

## **2.3 Land**

### **2.3.1 Land status**

The well site was constructed in rolling country and little earthworks were required. The land is not reinstated.

## **2.4 Contingency plan**

There was no reason to invoke the spill response contingency plan during drilling.

## **2.5 Register of incidents**

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

Incidents may be alleged to be associated with a particular site. If there is 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 period under review, there were no incidents recorded by the Council that were associated with operations at the Piakau A well site.

### **3. Discussion**

#### **3.1 The Resource Management Act (1991)**

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

- (a) the neighbourhood or the wider community around a discharger, and may include cultural and socio-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 (e.g., recreational, cultural, or aesthetic);
- (e) risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Taranaki Regional Council is recognising the comprehensive meaning of 'effects' inasmuch as is appropriate for each discharge source. Monitoring programmes are therefore not only based on existing permit conditions, but also on the obligations of the Resource Management Act to assess the effects of the exercise of consents.

#### **3.2 Discussion of plant performance**

Swift Energy New Zealand Limited provided the following plans and information in compliance with the consents:

- contingency plan for accidental spillage or discharge;
- advice of drilling muds and fluids components;
- final site layout plan; and
- notification of the various stages of activity

Careful management on site ensured that no effects to the environment occurred. All staff co-operated and if any minor works were requested these were promptly carried out.

There were no UIRs or abatement notices issued by the Council that were associated with the operations occurring at the Piakau A well site.

#### **3.3 Environmental effects of exercise of water permit**

All stormwater was directed to the well constructed skimmer pit where any contaminants were separated before discharge.

There were no environmental effects to water as a result of the drilling. There was no discharge from the skimmer pits during inspections. Any discharge would have been onto land.

### 3.4 Environmental effects of exercise of air discharge permit

The nearest residence was approximately 500 metres away and the nature of the land precluded any effects. The air discharge consent was exercised as flaring took place.

### 3.5 Evaluation of performance

During the drilling of Piakau A, the Company demonstrated a good level of environmental performance and compliance with the resource consents.

There was no evidence of off-site effects as a result of the drilling operation.

Tables 3 and 4 below; set out the specific points of compliance with each condition of the resource consents. There is no table for resource consent 5045-2 discharge of solid drilling wastes via Mix-bury-cover as this consent was not exercised.

**Table 3** Consent 5046-1 Discharge of stormwater onto and into land

Condition requirement	Means of compliance	Compliance achieved?
1. Effects of discharge	No effects observed at inspections	Yes
2. Discharge shall not contain total recoverable hydrocarbons	Viewed records at inspections	Yes
3. Discharge shall not cause an increase in suspended solids	No effects observed during inspections	Yes
4. Supply TRC with contingency maps outlining measures to be undertaken to prevent a spillage	Received prior to works commencing	Yes
5. Notify TRC in writing five days prior to commencing site preparation activities	Notification received prior to works commencing	Yes
6. TRC may review any or all of the conditions of this consent	No intention to review as yet	N/A

**Table 4** Consent 5047-2 Discharge of emissions to air from flaring

Condition requirement	Means of compliance	Compliance achieved?
1. All gas to be flared must be treated by liquid and solid separation	Viewed records at inspection	Yes
2. Notify TRC if separation failure occurs and re-establish within 3 hours	No separation failure occurred	Yes
3. No liquid or solid hydrocarbons to be combusted through the gas flare	Viewed records	Yes
4. Regard for prevailing and predicted wind speed and direction at initiation of flaring	Viewed records	Yes

Condition requirement	Means of compliance	Compliance achieved?
5. Opacity of smoke emissions not exceeding specified limits	Observed at inspections	Yes
6. No alteration to plant equipment without consultation	No application for alteration received	Yes
7. Keep an analysis of typical gas and crude oil stream from the field	Viewed records at inspections and are available upon request.	Yes
8. Consent holder not to discharge contaminant at a rate that it is liable to become toxic	No discharges observed at inspections	Yes
9. No offensive odour or smoke at or beyond the boundary	No odour or smoke observed during inspections	Yes
10. Provide TRC with report detailing: gas combustions, smoke emissions, measures to reduce emissions, etc	Received	Yes
11. Provide TRC with a final site layout plan prior to commencement of testing	Received prior to works commencing	Yes
12. Notify TRC within 24 hours prior to initial flaring of each site	Notification received	Yes
13. Undertake to notify residents 24 hours prior to flaring	Residents notified.	Yes
14. Adopt best practicable option	Viewed records	Yes
15. Combust separated gas as soon as practicable to minimise smoke emissions	Viewed records	Yes
16. Consent not to be exercised for more 180 accumulated days per well tested	Viewed records	Yes
17. Keep and make available to TRC records of all smoke-emitting incidents	Viewed at inspections and records available upon request	Yes
18. Keep and make available to TRC a log of all flaring	Viewed records at inspections and are available upon request	Yes
19. Substances originating from the well stream and treated as outlined by conditions 1, 2, 3, 14, and 15 to be combusted within the flare pit	Viewed records at inspections	Yes
20. Control all emissions of carbon monoxide	Viewed records during inspections	Yes
21. Control all emissions of nitrogen oxides to the atmosphere	Viewed records at inspections	Yes
22. Control all other emissions to the atmosphere from the site	Viewed records during inspections	Yes

Condition requirement	Means of compliance	Compliance achieved?
23. Consent lapse	N/A	N/A
24. TRC may serve notice of its intention to review, amend, delete, or add to the conditions of this consent	N/A	N/A

#### 4. Recommendations

1. THAT this report be forwarded to the Company, and to any interested parties upon request; and
2. THAT the Company be asked to inform the Council of the intention to either drill, test or undertake reinstatement.
3. THAT the current level of monitoring during exploratory drilling be continued for all similar operations.

## Glossary of common terms and abbreviations

The following abbreviations and terms are used within this report:

Al*	aluminium.
As*	arsenic
Biomonitoring	assessing the health of the environment using aquatic organisms
BOD	biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate
BODF	biochemical oxygen demand of a filtered sample
bund	a wall around a tank to contain its contents in the case of a leak
CBOD	carbonaceous biochemical oxygen demand. A measure of the presence of degradable organic matter, excluding the biological conversion of ammonia to nitrate
cfu	colony forming units. A measure of the concentration of bacteria usually expressed as per 100 millilitre sample
COD	chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Condy	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m
Cu*	copper
DO	dissolved oxygen
DRP	dissolved reactive phosphorus
<i>E.coli</i>	<i>Escherichia coli</i> , an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre of sample
F	Fluoride
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample
fresh	elevated flow in a stream, such as after heavy rainfall
g/m <sup>3</sup>	grammes per cubic metre, and equivalent to milligrammes per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures
l/s	litres per second
MCI	macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats
mS/m	millisiemens per metre
mixing zone	the zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NH <sub>4</sub>	ammonium, normally expressed in terms of the mass of nitrogen (N)
NH <sub>3</sub>	unionised ammonia, normally expressed in terms of the mass of nitrogen (N)
NO <sub>3</sub>	nitrate, normally expressed in terms of the mass of nitrogen (N)
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water

O&G	oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons)
Pb*	lead
pH	a numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	measurement of both physical properties(e.g. temperature, clarity, density) and chemical determinants ( e.g. metals and nutrients) to characterise the state of an environment
PM <sub>10</sub>	relatively fine airborne particles (less than 10 micrometre diameter
resource consent	refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15)
RMA	Resource Management Act 1991 and subsequent amendments
SS	suspended solids,
Temp	temperature, measured in °C (degrees Celsius)
Turb	turbidity, expressed in NTU
UIR	Unauthorised Incident Register entry- an event recorded by the Council on the basis that it had potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan
Zn*	zinc

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

For further information on analytical methods, contact the Council's laboratory

**Appendix I**  
**Inspection advice notices**

**Appendix II**  
**Sampling results**

**Appendix III**  
**Photographs**

**Appendix IV**  
**Resource consents held by**  
**Swift Energy Piakau A Wellsite**

**Appendix V**  
**Company notifications regarding operations**