

RKM Farms Limited (Piggery)
Monitoring Programme
Annual Report
2013-2014
Technical Report 2014–19

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Executive summary

RKM Farms Limited (formally GD & J Harvie) operates a piggery located on 599A South Road at Hawera, in the Tangahoe catchment. The piggery is a breeder, grower and finishing operation with up to 350 sows (3500 pig equivalents) at any one time, employing 5-6 full time staff.

This report for the period July 2013-June 2014 describes the monitoring programme implemented by the Taranaki Regional Council to assess the Company's environmental performance during the period under review, and the results and environmental effects of the Company's activities.

The Company holds a total of two resource consents, which include a total of 13 conditions setting out the requirements that the Company must satisfy. The Company holds resource consent **5108-2** to allow it to discharge treated effluent into the Tawhiti Stream, and consent **5266-1** to discharge emissions into the air at this site.

The Council's monitoring programme for the year under review included four inspections including two wastewater and receiving water samples collected for physicochemical analysis.

It is recommended to continue with four inspections per monitoring period

The monitoring showed that wastewater and receiving waters samples were well within the consented limits and no odour incidents were received by Council.

During the year, the Company demonstrated a high level of environmental performance and compliance with the resource consents, and the Council received no complaints about the site.

This report includes recommendations for the compliance monitoring programme for the 2014-2015 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 the Annual Report for the period July 2013-June 2014 by the Taranaki Regional Council on the monitoring programme associated with resource consents held by RKM Farms Limited. The Company operates a piggery situated on 599A South Road at Hawera, in the Tangahoe catchment.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consent held by RKM Farms Limited that relates to discharges of water within the Tangahoe catchment, and the air discharge permit held by RKM Farms Limited 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 Taranaki Regional Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of RKM Farms Limited piggery use of water, land, and air, and is the 3rd combined annual report by the Taranaki Regional Council for the Company.

1.1.2 Structure of this report

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

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

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

Section 4 presents recommendations to be implemented in the 2014-2014 monitoring year.

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

1.1.3 The Resource Management Act 1991 and monitoring

The *Resource Management Act 1991* (RMA) primarily addresses environmental 'effects' which are defined as positive or adverse, temporary or permanent, past, present or future, or cumulative. Effects may arise in relation to:

- (a) the neighbourhood or the wider community around 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 (eg, recreational, cultural, or aesthetic);
- (e) risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Taranaki Regional Council is recognising the comprehensive meaning of 'effects' inasmuch as is appropriate for each discharge source. 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 performance of resource users against regional plans and consents. Compliance monitoring, (covering both activity and impact) monitoring, also enables the Council to continuously assess its own performance in resource management as well as that of resource users particularly consent holders. It further enables the Council to continually re-evaluate its approach and that of consent holders to resource management, and, ultimately, through the refinement of methods, and considered responsible resource utilisation to move closer to achieving sustainable development of the region's resources.

1.1.4 Evaluation of environmental performance

Besides discussing the various details of the performance and extent of compliance by RKM Farms Limited Piggery in the Tangahoe catchment during the period under review, this report also assigns an overall rating. The categories used by the Council, and their interpretation, are as follows:

- a **high** level of environmental performance and compliance indicates that essentially there were no adverse environmental effects to be concerned about, and no, or inconsequential (such as data supplied after a deadline) non-compliance with conditions.
- a **good** level of environmental performance and compliance indicates that adverse environmental effects of activities during the monitoring period were negligible or minor at most, or, 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, or, there were perhaps some items noted on inspection notices for attention but these items were not urgent nor critical, and follow-up inspections showed they have been dealt with, and any

inconsequential non compliances with conditions were resolved positively, co-operatively, and quickly.

- **improvement required (environmental) or improvement required (administrative compliance)** (as appropriate) indicates that the Council may have been obliged to record a verified unauthorised incident involving measurable environmental impacts, and/or, there were measurable environmental effects arising from activities and intervention by Council staff was required and there were matters that required urgent intervention, took some time to resolve, or remained unresolved at the end of the period under review, and/or, there were on-going issues around meeting resource consent conditions even in the absence of environmental effects. Abatement notices may have been issued.
- **poor performance (environmental) or poor performance (administrative compliance)** indicates generally that the Council was obliged to record a verified unauthorised incident involving significant environmental impacts, or there were material failings to comply with resource consent conditions that required significant intervention by the Council even in the absence of environmental effects. Typically there were grounds for either a prosecution or an infringement notice.

1.2 Process description

The discharge is made up of effluent and washwater from the piggery operation which is situated at 599A South Road, Hawera (Figure 1). The piggery is a breeder, grower and finishing operation holding up to 5000 pigs (3636 pig equivalents) onsite at any one time. Approximately 71m³ of wastewater is discharged on a daily basis.

The wastewater from around the piggery is gravity fed to a series of sumps and is then agitated and pumped from the sumps to the oxidation pond treatment system.

The treatment system comprises of three ponds. The first pond, which is anaerobic in nature, is designed to capture the solid component of the discharge, and has an approximate holding capacity of 34,587m³. The second and third ponds are aerobic and have a total of 10,350m³ and 10,800m³ capacities respectively. The pond treatment system has a combined capacity of approximately 55,737 m³.

Discharge from the pond treatment system flows through a tertiary treatment system, comprised of a wetland which is approximately 1600m² in area. Raupo is planted within the wetlands to further treat the discharge.

From the wetland the treated discharge flows through an open drain and directly into the Tawhiti Stream.

The treatment system rarely discharges during the warmer months – January to March - because of evaporation within the two aerobic ponds.

In addition to discharging to the Tawhiti Stream, effluent including accumulated solids is pumped out of the anaerobic pond and onto land on an annual basis.



Figure 1 Approximate location of RKM Farms Limited Piggery

1.3 Resource consents

1.3.1 Water discharge permit

RKM Farms Limited holds water discharge permit **5108-2** to discharge treated piggery effluent from an anaerobic and twin aerobic pond treatment system, followed by a tertiary treatment (wetland) system, into the Tawhiti Stream in the Tangahoe catchment. This permit was issued by the Taranaki Regional Council on 9 August 2010 under Section 87(e) of the RMA. It is due to expire on 1 June 2028.

The discharge of treated wastewater of this nature may affect the water quality of a stream, particularly if there is insufficient dilution. Some effects may be obvious (e.g. appearance, turbidity) while biological effects may be more subtle.

Five special conditions are attached to this consent.

Special Condition 1 requires the consent holder to submit a 'Site layout Plan' which clearly shows the entire wastewater network system including the locations of ancillary equipment i.e. sump and pumps.

Special Condition 2 requires the consent holder to adopt the best practicable option to prevent or minimise any adverse environmental effects.

Special Condition 3 require the number of pigs [equivalent = 50kg per pig] on the property at any one time shall not exceed 3636 pig equivalents.

Special Condition 4 defines the mixing zone and prohibits a number of effects.

Special Condition 5 allows for a review of the consent – the next review date is June 2016.

The permit is attached to this report in Appendix I.

1.3.2 Air discharge permit

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

RKM Farms Limited holds air discharge permit **5266-1** to discharge emissions into the air from a pig farming operation and associated activities, including effluent treatment and other waste management activities. This permit was issued by the Taranaki Regional Council on 17 April 1998 under Section 87(e) of the RMA. It is due to expire on 1 June 2016.

Eight special conditions are attached to this consent.

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

Special Condition 2 requires consultation should any alterations occur to any operations, equipment or layout.

Special Condition 3 requires the consent holder to minimise the emissions discharged into the air from the site.

Special Condition 4 requires the consent holder to operate the piggery in accordance with the information provided.

Special Conditions 5 and 6 require the consent holder to minimize the emissions and impacts of air contaminants from the site.

Special Condition 7 requires the consent holder to prevent any adverse ecological effect on the ecosystems associated with authorised discharges.

Special Condition 8 allowed for a review of the consent – No further reviews are provided for prior to expiry.

The permit is attached to this report in Appendix I.

1.3.3 Discharges of wastes to land

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

RKM Farms Limited engages an authorized contractor to undertake the spreading of effluent including solids from the anaerobic pond to land on an annual basis.

Agricultural contractor Lloyd Gernhoefer holds resource consent [5352-2] to irrigate effluent to land and thus is responsible for managing any potential effects on the environment from the activity.

The permit is attached to this report in Appendix I.

1.4 Monitoring programme

1.4.1 Introduction

Section 35 of the RMA sets out obligation/s upon 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 and report upon these.

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 RKM Farms Limited consisted of three primary components.

1.4.2 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 the content of regional plans, and consultation on associated matters.

1.4.3 Site inspections

RKM Farms Limited Piggery was visited four times during the monitoring period. With regard to consents for 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. The piggery was also visited on two separate occasions to monitor and collect wastewater discharge samples from the site and the water quality samples upstream and downstream of the discharge point and mixing zone.

As far as practical, inspections related to air emissions were integrated with inspections undertaken for other purposes e.g. inspection of the oxidation ponds. The air monitoring programme has been incorporated and part of the inspection focuses on processes with associated actual and potential emission sources and characteristics, including potential odour.

1.4.4 Chemical sampling

The Taranaki Regional Council undertook sampling of both the discharges from the site and the water quality upstream and downstream of the discharge point and mixing zone.

The treated effluent discharge was sampled on two occasions, and the samples analysed for biochemical oxygen demand (BOD5), chloride, conductivity, dissolved reactive phosphate (DRP), un-ionised ammonia, pH, suspended solids and temperature.

The Tawhiti Stream upstream and downstream of the discharge was sampled on two occasions, and the samples analysed for filtered carbonaceous biochemical oxygen demand (FCBOD5), chloride, conductivity, dissolved reactive phosphate (DRP), un-ionised ammonia, pH, suspended solids and temperature.

The monitoring programme allows for the discharge and receiving water to be sampled on two occasions.

2. Results

2.1 Water

2.1.1 Inspections

10 September 2013

A light breeze was blowing at the time of inspection. Normal piggery odours were noticed at various downwind sites around the piggery. The sump below the load out yard was discharging with no evidence of any overflows occurring. The main sump pump was also operating. All piggery effluent was being pumped down to the treatment ponds system. The first anaerobic pond displayed vigorous microbial activity (boil ups) and the second and third ponds were working as normal. The final pond was discharging treated effluent into the Tawhiti Stream. Overall, the wastewater treatment system appeared to be working well, and well managed.

22 November 2013

This inspection was carried out during fine weather conditions with a light south easterly wind blowing. Normal piggery odours were detected at the various sites around the piggery. The sump below the load out yard was low with no evidence of any recent overflows. The main sump level was also low. The first anaerobic pond displayed good microbial activity with the second and final pond working well with good green colouring. Pig mortality was disposed of and covered in the offal pit and burning was taking place at the time of inspection. Overall the piggery was found to be well managed and maintained.

19 December 2013

Water quality samples were collected during fine weather conditions. The treated piggery effluent discharge flow rate was estimated at 0.2 liters per second having no visual environmental impact on the Tawhiti Stream. Tawhiti Stream was running at a moderate to low, steady flow and was slightly turbid, green brown in colour.

24 March 2014

A slight south easterly breeze was blowing at the time of inspection. Normal piggery odours were detected at various downwind sites. The sump at the western end of the piggery was operating as well as the northern sump. The sump pump at the north eastern side of the piggery was not operating. A replacement pump was due to arrive shortly. Effluent from this sump was being pumped back to another sump in the interim. Agricultural contractor (Lloyd Gernhoefer) had recently desludged the first pond, spray irrigating the effluent to pasture. The pond level had been lowered approximately 700-800mm below the discharge pipe. The overall effluent treatment system was well managed.

20 May 2014

This final inspection for the monitoring period was carried out during fine weather conditions - a slight westerly wind was blowing. Slightly noticeable downwind odour was emanating along the eastern side of the piggery. The sump area below the load-out yard appeared to be operating well. The sump at the northern end of the piggery was also well maintained. The back up pond level was low. A new pump had been installed at the north eastern sump. The ponds system appeared to be working satisfactory with good microbial display in the anaerobic pond. The final

discharge into the Tawhiti Stream had good dilution showing no visual environmental impact on the receiving waters.

4 June 2014

Water quality samples were collected from the piggery discharge and Tawhiti Stream. The treated piggery effluent discharge flow rate into the Tawhiti Stream was estimated at 1.5 litres per second. Very little odour was found to be emanating from the treated effluent (this exits the wetland) and only slightly noticeable odour was emanating from the pond system. The Tawhiti Stream was running at a moderate steady flow, slightly turbid and light brown in colour. No visual environmental effects were observed at the downstream monitoring site. The consent holder has reduced their operation by reducing sow numbers from 430 to 350 sows. This has been brought about by the new piggery regulations regarding sow pen sizes.

2.1.2 Results of discharge monitoring

2.1.2.1 Receiving waters physicochemical monitoring



Figure 2 Location of sampling sites

Table 1 Location of sampling sites in Tawhiti Stream including the piggery discharge

Site	Site code	GPS reference	Location
Tawhiti Stream	TWH000495	E1715350 N5614243	20 metres upstream of piggery discharge
Piggery effluent	PGP003001	E1715305 N5614206	Discharge outlet from aerobic pond
Tawhiti Stream	TWH000496	E1715356 N5614111	30 metres downstream of piggery discharge

Figure 2 shows RKM Farms Limited Piggery in relation to the receiving waters of Tawhiti Stream (Tangahoe Catchment).

The consent holders' farm boundary borders along the true right bank of Tawhiti Stream to where it meets the Tangahoe River, and along the river to South Road Bridge. Environmental monitoring sites are illustrated in relation to the piggery operation.

Samples were collected from the discharge point as well as upstream and downstream of the discharge on two occasions during the monitoring year under review.

Results of the survey performed on 19 December 2013 are presented in Table 2. On this occasion the stream was at a moderate low steady flow and slightly turbid green brown in colour. The ponds' treated wastewater discharge was estimated at about 0.25 L/sec.

Table 2 Receiving water and discharge samples – 19 December 2013

Parameters	Units	PGP003001 Discharge	TWH000495 Upstream	TWH000496 Downstream
Time of sample collection		0955	0945	1005
Ammoniacal nitrogen	g/m ³	33.6	0.014	0.027
BOD (BODC-2)	g/m ³	16	-	-
BOD (filtered, carbonaceous)	g/m ³	-	<0.5	<0.5
Chloride	g/m ³	203	36.2	34.6
Conductivity	mS/m	129	26.2	26.6
Dissolved reactive phosphorus	g/m ³	23.3	0.045	0.056
Suspended solids	g/m ³	15	14	14
Temperature	°C	17.0	17.5	17.1
Turbidity	NTU	12	10	9.6
Un-ionised ammonia	g/m ³	0.7965	0.0003	0.0010
pH		7.8	7.8	8.0

Samples were collected on a fine clear day with a light south easterly breeze blowing. No odour was noticed to be emanating from around the pond perimeter towards the sampling sites. There was a moderate, steady low flow in the Tawhiti Stream. The stream was slightly turbid, green brown in colour. The wastewater discharge from the wetland showed no downstream environmental impact on the Tawhiti Stream.

The above results indicate that the level of un-ionised ammonia in the treated piggery discharge resulted in a very slight but inconsequential elevation of un-ionised ammonia level in the downstream receiving water monitoring site. Special consent condition 4b specifies that after a mixing zone of 30 metres downstream of the point where the discharge enters the Tawhiti Stream, un-ionised ammonia level shall not exceed 0.025 g/m³. The above result showed the un-ionised ammonia level was well within limit (4% of the consented limit).

Special consent condition 4a specifies that after a mixing zone of 30 metres downstream of the point where the discharge enters the Tawhiti Stream, filtered carbonaceous biochemical oxygen demand must not exceed 2.00g/m³. The above results show no measurable increase of BOD₅.

Results of the survey performed on 04 June 2014 are presented in Table 3. On this occasion the stream was running at a moderate steady flow and the ponds' treated wastewater discharge was estimated at about 0.50 L/sec.

Table 3 Receiving water and discharge samples – 04 June 2014

Parameters	Units	PGP003001 Discharge	TWH000495 Upstream	TWH000496 Downstream
Time of sample collection		1330	1310	1345
Ammoniacal nitrogen	g/m ³	120	0.025	0.128
BOD	g/m ³	36	-	-
BOD (filtered, carbonaceous)	g/m ³	-	<0.5	0.5
Chloride	g/m ³	477	36.7	35.3
Conductivity	mS/m	309	27	27.3
Dissolved reactive phosphorus	g/m ³	43.2	0.042	0.078
Suspended solids	g/m ³	50	20	15
Temperature	°C	11.1	10.5	10.6
Turbidity	NTU	42	11	9.1
Un-ionised ammonia	g/m ³	2.9059	0.0006	0.0030
pH		8.0	8.0	8.0

These samples were collected during fine, calm weather conditions. Very light piggery odour was emanating apposite the ponds system towards the south side. Tawhiti Stream was running at a moderate steady flow and slightly turbid brown in colour. No visual environmental effects were observed in the Tawhiti Stream from the piggery discharge along towards the downstream monitoring site.

The above results indicate that the level of un-ionised ammonia in the treated piggery discharge resulted in a slight elevation of un-ionised ammonia level in the downstream receiving water monitoring site. Special consent condition 4b specifies that after a mixing zone of 30 metres downstream of the point where the discharge enters the Tawhiti Stream, the un-ionised ammonia level shall not exceed 0.025 g/m³. The above result showed the un-ionised ammonia level was well within limit (12% of the consented limit).

Special consent condition 4a specifies that after a mixing zone of 30 metres downstream of the point where the discharge enters the Tawhiti Stream, filtered carbonaceous biochemical oxygen demand must not exceed 2.00g/m³. The above results also show no measurable increase of BOD₅

Table 4 Summary of treated wastewater analyses from RKM Farms Limited Piggery for the period July 2013 to June 2014

Parameter	unit	09 December 2013	04 June 2014	Median
Conductivity @ 20°C	mS/m	129	309	219
Chloride	g/m ³	203	477	340
pH	pH	7.8	8.0	7.9

Parameter	unit	09 December 2013	04 June 2014	Median
Total carbonaceous BOD ₅	g/m ³	16	36	26
Ammoniacal nitrogen	g/m ³ N	33.6	120	77
Dissolved reactive phosphorus	g/m ³ P	23.3	43.2	33
Suspended solids	g/m ³	15	50	32

Monitoring of wastewater on the two occasions during the 2013-2014 year indicated a well treated wastewater typical of wastewater quality in terms of BOD₅, suspended solids and turbidity with nutrient levels within range (Table 4).

2.2 Air

2.2.1 Inspections

As far as practicable, inspections relating to air emissions were integrated with inspection undertaken for other purposes e.g., effluent discharges. The air monitoring programme had been costed on the basis of an integrated approach to resource monitoring.

2.2.2 Results discharge monitoring

The RMA effectively requires that there should be no offensive or objectionable odour beyond the boundary of the farm.

Odours emitted from normal piggery operations are generally influenced by weather conditions (i.e. wind direction), effluent treatment pond management, irrigating sludge to land and general piggery hygiene practices.

The offensiveness of odour at any time is reliant on individual perception, Council methods of measurement, and practices of the pork producer. The Environmental Management System (EMS) deals with piggery operational practices ensuring the effect of odour is taken into account when the pork producer is undertaking activities relating to areas of the piggery.

All inspections that were carried out during the monitoring period found 'noticeable' piggery odour emanating from the southern side of the pond system and around the piggery in general when wind conditions were from the north to northwest quarter. No odour emissions were 'noted' beyond the perimeter of the boundary.

2.3 Investigations, interventions, and incidents

The monitoring programme for the year was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with the consent holder. During the year matters may arise which require additional activity by the Council e.g. 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 Taranaki Regional Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including

non-compliance with consents, which may damage the environment. The Unauthorised Incident Register (UIR) includes events where the company concerned has itself notified the Council. The register contains details of any investigation and corrective action taken.

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

In the 2013-2014 period, it was not necessary for the Council to undertake significant additional investigations and interventions, or record incidents, in association with RKM Farms Limited Piggery's conditions in resource consents or provisions in Regional Plans in relation to the Company's activities during the monitoring period.

3. Discussion

3.1 Discussion of site performance

During the year, the Company has demonstrated that a high level of environmental performance and compliance issues relating with the resource consents was achieved.

RKM Farms Limited manages the piggery business which was previously managed and operated by GD & J Harvie. The date of transfer was 1 August 2013.

The previous discharge to water consent (expired June 2010) was monitored within a joint monitoring programme. However, given that the piggery operation is of a large scale it was considered appropriate that a tailored monitoring programme specific to the site now be undertaken. This approach is consistent with other piggery operations which are of a smaller or similar scale.

All four monitoring inspections that were carried out by inspecting officers found the piggery in general to be a well managed operation. All wastewater treatment facilities and disposal processes were adequately maintained.

The consent holder has reduced their operation by reducing sow numbers from 430 to 350 sows. This has been brought about by the new piggery regulations regarding sow pens which recently came into effect.

Although no pig farming operation can operate without producing some odour emissions steps are taken to prevent or minimise the effects of odour. No piggery odour complaints were received by the Council during the 2013-2014 monitoring period.

Agricultural contractor Lloyd Gernhoefer desludged the anaerobic pond and spray irrigated onto flatter paddocks, south of the ponds system. Neither ponding nor pasture burning was observed after a follow-up inspection.

The initial 2010-2011 monitoring programme allowed for four monitoring inspections of the piggery to be carried out per monitoring period and then a review of the number of inspections required. It was recommended to continue with four monitoring inspections per monitoring period including physicochemical sampling of the receiving water and piggery discharge on two of these occasions (spring and late summer) bringing this programme into line with other monitored piggeries throughout the region.

Environmental effects of exercise of consents

The Tawhiti Stream, until it converges with the Tangahoe River, has been identified as needing enhancement of its natural, ecological and amenity values, and life supporting capacity under Appendix IB of the RFWP. The discharge from the piggery effluent into the unnamed tributary of the Tawhiti Stream falls for consideration under Rule 39 of the Regional Fresh Water plan as a discretionary activity.

3.2 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Tables 5 and 6.

Table 5 Summary of performance for Consent 5108-2 Discharge treated piggery effluent from an oxidation ponds system followed by tertiary treatment into water

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Provision of wastewater plan	Plan received by Council Nov 2010	Yes
2. Adoption of best practical option to avoid or minimise adverse effects	Liaison with Company and inspection	Yes
3. Maximum allowable number of pig equivalents	Liaison with Company	Yes
4. Minimum concentrations in receiving water after mixing	Inspection and physicochemical sampling	Yes
5. Optional review provision	Consent expires June 2028 – next review June 2016	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High

N/A = not applicable

Table 6 Summary of performance for Consent 5266-1 Discharge emissions to air from a pig farming operation and associated practices including effluent treatment and other waste management activities

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adoption of action to minimise adverse environmental effects	Monitoring inspections	Yes
2. Consultation and approval prior to alterations to plant and process	Monitoring inspections	N/A
3. Minimisation of impact and emissions through use of equipment and suitable methods	Monitoring inspections	Yes
4. Operation in accordance with application	Monitoring inspections	Yes
5. Objectionable odour at site boundary not permitted	Monitoring inspections	Yes
6. Objectionable dust levels at site boundary not permitted	Monitoring inspections	Yes
7. Significant adverse ecological effect on ecosystems	Monitoring inspections	Yes
8. Review of consent conditions	Consent expires June 2016 with no further review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High

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

3.3 Recommendations from the 2012-2013 Annual Report

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

1. THAT monitoring of consented activities for RKM Farms Limited Piggery in the 2013-2014 year continues at the same level as in 2012-2013 period.
2. THAT piggery inspections for the 2013-2014 period remain at four inspections as in the 2012-2013 period and these inspections to be carried out tri-monthly.
3. THAT the provisions in the monitoring programme to sample the discharge and receiving waters on two separate occasions remain unchanged.
4. THAT the consent holder notifies the Council with information when solids are extracted from the first anaerobic pond for disposal on an annual basis, including details of where the solids are spread over land.
5. THAT the option for review of resource consent 5108-2 (wastewater discharge) in June 2014, as set out in condition 5 of consent 5108-2, not be exercised.

Recommendation 1 & 2 was achieved. Four compliance inspections were undertaken with two extra visits to the piggery when water quality samples were collected.

Recommendation 3 was achieved with two sampling runs being performed

Recommendation 4 was achieved – pond 1 was desludged over a 3 day period

Recommendation 5 was implemented, a review of the wastewater discharge was not undertaken.

3.4 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for air/water discharges in the region, the Taranaki Regional Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA, the obligations of the Act in terms of monitoring emissions/discharges and effects, and subsequently reporting to the regional community, 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 emitting to the atmosphere/discharging to the environment.

In the case of RKM Farms Limited Piggery monitoring programme, it is recommended that there be no alteration to the programme for the 2014-2015 period. A recommendation to this effect is attached to this report.

3.5 Exercise of optional review of consent

Resource consent 5108-2 provides for an optional review of the consent in June 2016. Condition 5 allows the Council to review the consent, if there are grounds to consider that existing conditions are not adequate to deal with adverse effects, or to specify further the requirements of best practical option, or to address any apparent deficiencies in the pond design.

Resource consent **5108** no optional review was warranted in June 2014.

Resource Consent **5266** expires June 2016 with no further option for review.

4. Recommendations

1. THAT monitoring of consented activities at RKM Farms Ltd (Piggery) in the 2014-2015 year continues at the same level as in 2013-2014.
2. THAT the provision in the monitoring programme to sample the discharge and receiving waters on two separate occasions remain unchanged.
3. THAT the consent holder continues to notify Council with information when solids are extracted from the main pond for disposal on an annual basis, including details of where the solids are spread over land.
4. THAT the piggery inspections for the 2014-2015 period remain at four inspections as in the 2013-2014 period and these inspections to be carried out tri-monthly.

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.
Cumec	A volumetric measure of flow- 1 cubic metre per second (1 m ³ s ⁻¹).
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 ³	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
l/s	Litres per second.

MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NH ₄	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH ₃	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
NO ₃	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
Pb*	Lead.
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
PM ₁₀	Relatively fine airborne particles (less than 10 micrometre diameter).
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15.)
RMA	Resource Management Act 1991 and including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
UI	Unauthorised Incident.
UIR	Unauthorised Incident Register – contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
Zn*	Zinc.

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

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

Bibliography and references

Taranaki Regional Council 2011: GD & J Harvie Piggery Monitoring Programme Annual Report 2010-2011. Technical Report 2011-05.

Taranaki Regional Council 2012: GD & J Harvie Piggery Monitoring Programme Annual Report 2011-2012. Technical Report 2012-25.

Taranaki Regional Council 2013: GD & J Harvie Piggery Monitoring Programme Annual Report 2012-2013. Technical Report 2013-02.

Appendix I

Resource consents held by RKM Farms Limited Piggery

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

Name of
Consent Holder: RKM Farms Limited
599B South Road
R D 12
HAWERA 4672

Decision Date: 9 August 2010

Commencement Date: 9 August 2010

Conditions of Consent

Consent Granted: To discharge treated piggery effluent from an anaerobic and twin aerobic pond treatment system, followed by a tertiary treatment system, into the Tawhiti Stream

Expiry Date: 1 June 2028

Review Date(s): June 2012, June 2014, June 2016, June 2022

Site Location: 599A South Road, Hawera

Legal Description: Pt Lot 3 DP 3116

Grid Reference (NZTM) 1715327E-5614198N

Catchment: Tangahoe

Tributary: Tawhiti

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

General condition

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

Special conditions

Information to be submitted

1. The consent holder shall prepare a Site Layout Plan [drawing] which clearly shows the entire wastewater network system including the location and extent of the following:
 - The drainage system [e.g. swales] within the piggery sheds which the wastewater generated drains to;
 - The collection areas [e.g. sumps] for the wastewater prior to it being pumped to the pond treatment system;
 - The pipe network between the collection areas and pond treatment system;
 - The pond treatment system including the location of the pipe network between the ponds; and
 - Any other details which would assist in showing how the wastewater is conveyed from the piggery sheds to the wastewater treatment system.

The Plan shall be submitted to the Chief Executive, Taranaki Regional Council, within two months of the commencement date of this consent.

Wastewater discharge

2. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
3. The number of pigs [equivalent 50 kg per pig] on the property at any one time shall not exceed 3636 pig equivalents.
4. After a mixing zone of 30 metres downstream of the point where the discharge enters the Tawhiti Stream, the discharge shall not, either by itself or in combination with other discharges, give rise to any or all of the following adverse effects in the Tawhiti Stream:
 - a) filtered carbonaceous biochemical oxygen demand must not exceed 2.00 gm⁻³;
 - b) a level of unionised ammonia greater than 0.025 gm⁻³;
 - c) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - d) any conspicuous change in the colour or visual clarity;
 - e) any emission of objectionable odour;
 - f) the rendering of fresh water unsuitable for consumption by farm animals; and
 - g) any significant adverse effects on aquatic life.

Consent 5108-2

5. In accordance with section 128 and 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 in any of the following years: 2012, 2014, 2016, 2022; for any of the following purposes:
 - a) Ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, and in particular to address any more than minor adverse effects relating to the discharge of wastewater; and/or
 - b) To determine any measures that may be appropriate to comply with condition 2 of this consent, and which are necessary to address any adverse effects of the discharge of wastewater from the site; and/or
 - c) To address any apparent deficiencies in the design of the pond treatment system.

Transferred at Stratford on 01 August 2013

For and on behalf of
Taranaki Regional Council

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: Gary David Naismith Harvie
599A South Road
R D 12
HAWERA 4672

Decision Date: 9 August 2010

Commencement
Date: 9 August 2010

Conditions of Consent

Consent Granted: To discharge treated piggery effluent from an anaerobic and twin aerobic pond treatment system, followed by a tertiary treatment system, into the Tawhiti Stream in the Tangahoe catchment at or about (NZTM) 1715327E-5614198N

Expiry Date: 1 June 2028

Review Date(s): June 2012, June 2014, June 2016, June 2022

Site Location: 599A South Road, Hawera

Legal Description: Pt Lot 3 DP 3116

Catchment: Tangahoe

Tributary: Tawhiti

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

General condition

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

Special conditions

Information to be submitted

1. The consent holder shall prepare a Site Layout Plan [drawing] which clearly shows the entire wastewater network system including the location and extent of the following:
 - The drainage system [e.g. swales] within the piggery sheds which the wastewater generated drains to;
 - The collection areas [e.g. sumps] for the wastewater prior to it being pumped to the pond treatment system;
 - The pipe network between the collection areas and pond treatment system;
 - The pond treatment system including the location of the pipe network between the ponds; and
 - Any other details which would assist in showing how the wastewater is conveyed from the piggery sheds to the wastewater treatment system.

The Plan shall be submitted to the Chief Executive, Taranaki Regional Council, within two months of the commencement date of this consent.

Wastewater discharge

2. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
3. The number of pigs [equivalent 50 kg per pig] on the property at any one time shall not exceed 3636 pig equivalents.
4. After a mixing zone of 30 metres downstream of the point where the discharge enters the Tawhiti Stream, the discharge shall not, either by itself or in combination with other discharges, give rise to any or all of the following adverse effects in the Tawhiti Stream:
 - a) filtered carbonaceous biochemical oxygen demand must not exceed 2.00 gm^{-3} ;
 - b) a level of unionised ammonia greater than 0.025 gm^{-3} ;
 - c) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - d) any conspicuous change in the colour or visual clarity;
 - e) any emission of objectionable odour;
 - f) the rendering of fresh water unsuitable for consumption by farm animals; and
 - g) any significant adverse effects on aquatic life.

Consent 5108-2

5. In accordance with section 128 and 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 in any of the following years: 2012, 2014, 2016, 2022; for any of the following purposes:
- a) Ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, and in particular to address any more than minor adverse effects relating to the discharge of wastewater; and/or
 - b) To determine any measures that may be appropriate to comply with condition 2 of this consent, and which are necessary to address any adverse effects of the discharge of wastewater from the site; and/or
 - c) To address any apparent deficiencies in the design of the pond treatment system.

Signed at Stratford on 9 August 2010

For and on behalf of
Taranaki Regional Council

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: RKM Farms Limited
599B South Road
R D 12
HAWERA 4672

Decision Date: 17 April 1998

Commencement Date: 17 April 1998

Conditions of Consent

Consent Granted: To discharge emissions into the air from a pig farming operation and associated practices including effluent treatment and other waste management activities

Expiry Date: 1 June 2016

Review Date(s): June 2004, June 2010

Site Location: South Road Hawera

Legal Description: Pt Lot 3 DP 3116 Pt Sec 540 & 687/8 Patea Dist Blk X
Hawera SD

Grid Reference (NZTM) 1715250E-5613970N

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

General conditions

- a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special Conditions

1. That at all times the consent holder shall adopt the best practicable option [as defined in section 2 of the Resource Management Act 1991] to prevent or minimise any actual or likely adverse effect on the environment associated with the discharge of contaminants into the air from the site.
2. That prior to undertaking any alterations to the pig farming and effluent disposal processes, operations, equipment or layout, as specified in application 243 and supporting documentation, which may significantly change the nature or quantity of contaminants emitted from the site, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991 and its amendments.
3. That 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, and emission control equipment, the methods of control, supervision and operation, proper and effective operation, supervision, maintenance and control of all equipment and processes, and the proper care of all pigs on the site.
4. That the consent holder shall at all times operate the piggery and associated activities substantially in accordance with the information provided in support of application 243, except as otherwise required or directed by the conditions set out in this resource consent.
5. That the discharges authorised by this consent shall not give rise to an odour at or beyond the boundary of the site that, in the opinion of at least one enforcement officer of the Taranaki Regional Council, is offensive or objectionable.
6. That the discharges authorised by this consent shall not give rise to suspended or deposited dust at or beyond the boundary of the site that, in the opinion of at least one enforcement officer of the Taranaki Regional Council, is offensive or objectionable.

Consent 5266-1

7. That the discharges authorised by this consent shall not give rise to any direct significant adverse ecological effect on any ecosystems in the Taranaki region.
8. 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 2004 and/or June 2010, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were not foreseen at the time the application was considered and which it was not appropriate to deal with at that time.

Transferred at Stratford on 1 August 2013

For and on behalf of
Taranaki Regional Council

Director-Resource Management

TRK985266



PRIVATE BAG 713
47 CLOTEN ROAD
STRATFORD
NEW ZEALAND
PHONE 0-6-765 7127
FAX 0-6-765 5097

DISCHARGE PERMIT

Pursuant to the **RESOURCE MANAGEMENT ACT 1991**
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: **HARVIE GARY D N & JEAN**
32 SOUTH ROAD RD12 HAWERA

Consent
Granted Date: **17 April 1998**

CONDITIONS OF CONSENT

Consent Granted: **TO DISCHARGE EMISSIONS INTO THE AIR FROM A PIG FARMING OPERATION AND ASSOCIATED PRACTICES INCLUDING EFFLUENT TREATMENT AND OTHER WASTE MANAGEMENT ACTIVITIES AT OR ABOUT GR: Q21:253-757**

Expiry Date: **1 June 2016**

Review Date[s]: **June 2004 and June 2010**

Site Location: **SOUTH ROAD HAWERA**

Legal Description: **PT LOT 3 DP3116 PT SEC 540 & 687/8 PATEA DIST BLK X
HAWERA SD**

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

TRK985266

General conditions

- a) That on receipt of a requirement from the General Manager, Taranaki Regional Council (hereinafter the General Manager), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special Conditions

- 1. THAT at all times the consent holder shall adopt the best practicable option [as defined in section 2 of the Resource Management Act 1991] to prevent or minimise any actual or likely adverse effect on the environment associated with the discharge of contaminants into the air from the site.
- 2. THAT prior to undertaking any alterations to the pig farming and effluent disposal processes, operations, equipment or layout, as specified in application 243 and supporting documentation, which may significantly change the nature or quantity of contaminants emitted from the site, the consent holder shall consult with the General Manager, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991 and its amendments.
- 3. THAT 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, and emission control equipment, the methods of control, supervision and operation, the proper and effective operation, supervision, maintenance and control of all equipment and processes, and the proper care of all pigs on the site.
- 4. THAT the consent holder shall at all times operate the piggery and associated activities substantially in accordance with the information provided in support of application 243, except as otherwise required or directed by the conditions set out in this resource consent.
- 5. THAT the discharges authorised by this consent shall not give rise to an odour at or beyond the boundary of the site that, in the opinion of at least one enforcement officer of the Taranaki Regional Council, is offensive or objectionable.
- 6. THAT the discharges authorised by this consent shall not give rise to suspended or deposited dust at or beyond the boundary of the site that, in the opinion of at least one enforcement officer of the Taranaki Regional Council, is offensive or objectionable.
- 7. THAT the discharges authorised by this consent shall not give rise to any direct significant adverse ecological effect on any ecosystems in the Taranaki region.

TRK985266

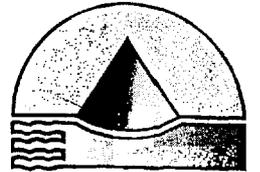
8. THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2004 and/or June 2010, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were not foreseen at the time the application was considered and which it was not appropriate to deal with at that time.

Signed at Stratford on 17 April 1998

For and on behalf of
TARANAKI REGIONAL COUNCIL



DIRECTOR - RESOURCE MANAGEMENT



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