Dow AgroSciences (NZ) Ltd
Monitoring Programme
Annual Report
2017-2018

Technical Report 2018-22

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Executive summary

Dow AgroSciences (NZ) Ltd (DAS) operates an industrial agrichemical formulating and packaging facility located at Paritutu Road, New Plymouth, in the Herekawe catchment. This report for the period July 2017 to June 2018 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the Company's environmental and consent compliance performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of the Company's activities.

The Company holds two resource consents, which include a total of 24 conditions setting out the requirements that the Company must satisfy. The Company holds one consent to allow it to discharge stormwater into the Herekawe Stream, and one consent to discharge emissions into the air at the plant site.

During the monitoring period, Dow AgroSciences (NZ) Ltd demonstrated an overall high level of environmental performance.

The Council's monitoring programme for the year under review included four inspections, four sets water samples collected for pesticide analysis, and two biomonitoring surveys of receiving waters. The Company provided groundwater and air quality data from monitoring carried out by independent consultants.

The monitoring showed that DAS has had no significant impact on air quality in the vicinity of the plant or on water quality in the Herekawe Stream. No complaints in relation to DAS's activities were registered by the Council. There were no Unauthorised Incidents recording non-compliance in respect of this consent holder during the period under review.

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

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

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

This report includes recommendations for the 2018-2019 year.

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1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is for the period July 2017 to June 2018 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by Dow AgroSciences (NZ) Ltd (DAS). DAS operates an industrial agrichemical formulation plant situated at Paritutu Road, New Plymouth, in the Herekawe catchment.

The report includes the results and findings of the monitoring programme implemented by the Council in respect of the consent held by DAS that relates to discharges of water within the Herekawe catchment, and the air discharge permit held to cover emissions to air from the site.

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

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

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

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

Section 4 presents recommendations to be implemented in the 2018-2019 monitoring year.

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

1.1.3 The Resource Management Act 1991 and monitoring

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

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

d. natural and physical resources having special significance (for example recreational, cultural, or aesthetic); and

e. risks to the neighbourhood or environment.

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

1.1.4 Evaluation of environmental and administrative performance

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

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

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

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

Environmental Performance

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

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

For example:

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

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

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

Administrative performance

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

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

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

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

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

1.2 Process description

DAS prepares a range of agricultural chemicals at its facility in New Plymouth. It both manufactures (reacting substances to form new ones) and formulates (blending active ingredients and other agents). The production is based on 'batch' processes (i.e. not continuous) involving chemical reactions, blending or packaging. Various formulation types are produced/packed or repacked, including liquid concentrates, flowable suspensions, wettable powders and coated granules. There are approximately 36 different active ingredients handled on the site. Of these, 13 are contained in products that are only repacked or stored for further distribution. The remainder are used in the formulation of products in varying quantities. There are five production plants on the site, and in addition there are support activities such as laboratories and a high temperature waste incinerator.

Figure 1 Aerial photograph of the DAS Paritutu Road site

1.2.1 History

DAS has been located at the present site since 1960. The manufacturing processes for phenoxy herbicide active ingredients (2,4-D, MCPA and MCPB) and triclopyr were discontinued in early 1998 and the Phenoxy Plant shut down. These active ingredients were then imported for formulation into herbicide products. As a result of the closure of the Phenoxy Plant a number of raw materials are no longer used on the site, including chlorophenols (2,4-dichlorophenol and p-chloro-o-cresol) and monochloroacetic acid (MCAA). The cessation of these chemical syntheses reduced the number of chemicals stored on site and consequently has reduced the potential for odour to be emitted from the site.

Changes to the site over the past three decades have included:

- production of the herbicide 2,4,5-T ceased in 1987;
- ceasing the manufacture of dairy sanitisers and detergent bases;
- the high temperature solids incinerator has been upgraded to include a new control system, an extended secondary combustion chamber, and the installation of a liquids nozzle to allow liquids to be burnt;
- cessation of use of the 'liquids' incinerator in 1994, and demolition of the liquids incinerator in June 2000;
- diversion of stormwater from the roads in the vicinity of the incinerator to a new HDPE-lined stormwater pond (SV9200) in the 1995-1996 year;
- termination of the production of phenoxy herbicides (2,4-D, MCPA and MCPB) and triclopyr in 1998;
- introduction of the insecticide active ingredient spinosad, and start up of the Spinosad Plant in 1998;
- closure of the powders side of the Powders/Protectants Plant at the end of 1999;

- in accordance with the revised site Groundwater Management Plan, 18 groundwater bores were closed in 2001-2002; dedicated pumps were installed into remaining sampling wells in May 2002;
- formulation of solid herbicides ceased in June 2002 and the Solids Plant closed;
- the formulation of water-based glyphosate product was introduced during 2002-2003;
- from 2003-2004, there was reduced use of the High Temperature Incinerator, with the operation changed from continuous use to operation 5 days per week (24 hours) intermittently for a total of 6 months of the year;
- the esterification process of 2,4-D esters recommenced in October 2005, in the Commodity Herbicides Plant;
- the neutralisation process with amines of MCPA (2006) and 2,4-D (2007) recommenced, and of glyphosate (2007) and clopyralid (2012) commenced, in the Commodity Herbicides Plant;
- a new building air extraction and vent treatment system for improved odour control was completed in 2011 for the warehouse where 2,4-D acid is stored;
- the pilot plant and TCP plant were demolished in 2014;
- the amine neutralisation of glyphosate was ceased in 2013; and
- the esterification of 2,4-D was ceased in 2015.

1.2.2 Herbicides Plant

Formulations involving a wide range of active ingredients are prepared for sale. Both liquid (water and solvent based) and granular herbicides are produced. Triclopyr is the highest volume active ingredient.

Air from liquid formulation preparation areas is passed through a coarse filter to capture dust, before treatment through a series of carbon beds and then discharged to atmosphere.

1.2.3 Commodity Herbicides Plant

The amine neutralisation of MCPA recommenced in September 2006, using the same equipment that was used in 2,4-D esterification. Imported MCPA is mixed with dimethylamine (DMA) to convert the acid to the amine.

The amine neutralisation of 2,4-D recommenced in August 2007. Imported 2,4-D flake is mixed with a dimethylamine/dimethylethanolamine (DMEA) mixture to convert the acid to amine form.

The amine neutralisation of clopyralid commenced in September 2012. Imported clopyralid is mixed with DMA to convert the acid to amine form.

The process ventilation system is connected to a caustic scrubber followed by a carbon filter, to remove organic vapours before discharge to atmosphere.

1.2.4 Insecticides Plant

Liquid organophosphate insecticides, mostly based on chlorpyrifos, and adjuvants are blended and packaged for sale. The process ventilation system is connected to a sodium hypochlorite scrubber, in which chemical reactions between hypochlorite and compounds released from the process lead to the solubilisation of those compounds and their capture in the scrubber.

1.2.5 Granular Herbicides Plant

Granules, based on picloram, are formulated and packaged. Discharges are passed through a bag filter and absolute (high performance) filter before discharge.

1.2.6 Suspension Concentrates (Spinosad) Plant

Liquid spinosyn and sulfoxaflor based insecticides are formulated and packaged. The process ventilation system passes through a bag filter and absolute filter before discharge.

1.2.7 High Temperature Incinerator

A high temperature incinerator provides for the thermal destruction of DAS wastes. Materials to be combusted include all chemically contaminated clothing and production plant wastes. The liquids nozzle allows the burning of liquids such as wash water.

Emissions are controlled primarily by optimising the conditions of combustion, together with the proper design of the combustion chamber and stack.

1.2.8 Laboratories

Fumes from the laboratories are extracted either as general building ventilation air or through fume cupboard hoods. The quantities of chemicals involved are minute by comparison either with the formulating processes or with the amounts that would be handled by an end user of DAS's products.

1.2.9 Maintenance workshops

Activities carried out in the workshops, and periodically on site, include welding, painting, abrasive blasting, and other typical operations. Ventilation systems extract air from around particular process areas.

1.2.10 Product Development Laboratory

The building is used only infrequently, to trial process control or to produce small scale batches.

1.3 Resource consents

The Company holds two resource consents the details of which are summarised in the table below and outlined in sections 1.3.1 to 1.3.2.

Table 1 Summary of consents held by Dow AgroSciences Ltd

Consent number	Purpose	Granted	Review	Expires
4108-2	To discharge stormwater from an industrial agrichemical manufacturing site via retention dams together with uncontaminated stormwater from landscape and no-manufacturing areas into the Herekawe Stream	September 2008	June 2020	June 2026
4020-4	To discharge contaminants to air form all activities associated with current and future operation of an agricultural formulation and packaging plant	November 2014	June 2020	June 2044

1.3.1 Water discharge permit

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

The Company holds water discharge permit **4108-2** to cover the discharge of stormwater from its production site via retention dams, together with uncontaminated stormwater from landscape and non-

manufacturing areas, into the Herekawe Stream. This permit was issued by the Council on 4 September 2008 under Section 87(e) of the RMA. It is due to expire on 1 June 2026.

Condition 1 requires the adoption of the best practicable option for controlling effects of discharges on the environment.

Condition 2 sets a maximum stormwater catchment area.

Condition 3 requires a management plan to prevent and to deal with spillage and accidental discharges.

Condition 4 addresses record keeping.

Condition 5 prohibits significant adverse effects on the environment.

Condition 6 imposes limits upon the discharge's significant potential contaminants.

Condition 7 is a general review provision.

The permit is attached to this report in Appendix I.

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

1.3.2 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.

The Company holds air discharge permit **4020-4** to discharge contaminants to air from all activities associated with the current and future operation of an agrichemical formulation and packaging plant. This permit was issued by Council on 5 November 2014 under Section 87(e) of the RMA. It is due to expire on 1 June 2044.

Condition 1 relates to the maintenance and operation of emission control equipment.

Condition 2 prohibits offensive or objectionable odour or dust beyond the site boundary.

Condition 3 sets limits on concentrations of contaminants, other than from the High Temperature Incinerator Stack, at ground level off-site.

Conditions 4 to 10 deal with the High Temperature Incinerator, imposing limits on significant potential contaminants, prohibiting incineration of certain materials, placing controls on operating conditions, and requiring records to be kept.

Condition 11 requires an air discharge management and monitoring plan.

Conditions 12 and 13 relate to the maintenance of a chemical materials register.

Condition 14 deals with air monitoring and response triggers (thresholds for actions in response to any elevated emission levels).

Condition 15 requires the annual provision of information on air quality monitoring, any changes in process or in emission controls, and any consultation undertaken.

Condition 16 requires a six-yearly report on investigations into and, where applicable, the adoption of new technology to reduce or mitigate emissions to air.

Condition 17 is a review provision.

The permit is attached to this report in Appendix I.

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

1.4 Monitoring programme

1.4.1 Introduction

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

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

The monitoring programme for the DAS site consisted of six primary components.

1.4.2 Programme liaison and management

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

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

1.4.3 Site inspections

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

1.4.4 Stormwater sampling

The Council undertook sampling of both the discharges from the site and the water quality upstream and Stormwater is sampled and analysed for chemical and physical parameters before it is released. If the collected stormwater does not meet the release criteria, an application for approval is sought from New Plymouth District Council before it is pumped to the trade waste system.

Results of monitoring are reported by DAS to the Council, and samples of stormwater are taken by the Council for comparative laboratory analysis. The stormwater discharge was sampled by Council on four occasions, and the samples sent to an independent laboratory (AsureQuality) for acid herbicides analysis and a multi-residue pesticide scan.

1.4.5 Groundwater monitoring

DAS conducts an on-going groundwater monitoring and modelling program, prepared in consultation with the Council, to assess the quality of groundwater beneath the site. Results are forwarded to the Council annually, while relevant matters are discussed as they arise. Shallow groundwater under the site flows under natural gradients north and west towards the coastal marine area, including the Sugar Loaf Islands (Nga Motu) Marine Protected Area.

To address the low-level contamination found through a past investigation, DAS developed a Site Groundwater Management Plan, which was received and agreed to by the Council during the 1996-1997 period and (updated) in 2001. Contaminants (phenoxies and chlorophenols) were initially detected at low levels and groundwater flow suggested that the contamination evident would pose no environmental risk and would reduce to levels below detection.

DAS fully evaluated the site and recommended a monitoring approach to ensure that, as predicted by modelling, no adverse environmental effects occur. The current monitoring approach adopted through the Site Groundwater Management Plan requires the Council to remain fully informed of the results. The approach enables the risk of effects on the environment to be assessed fully on an on-going basis, and appropriate action to be taken. The information available at this time suggests that no adverse environmental effects are likely and that the contaminants will fully degrade before migration from the site occurs.

In July 2008, the Council agreed to a change in the date of annual sample collection, from October to June-August, to coincide with maximum groundwater levels. This was in response to most of the monitoring wells being found dry in October 2007.

1.4.6 Freshwater biological surveys

The Council has a bio-monitoring programme to assess biological diversity and richness of the Herekawe Stream. Two surveys were conducted during the monitoring year to assess whether discharges from DAS's Paritutu Road site were having any environmental impact on the stream.

1.4.7 Foreshore marine ecology inspection

The Council carries out an annual marine ecology inspection on the Back Beach foreshore by DAS's Paritutu Road plant to look for any evidence of a discharge from the site (including any groundwater seeps) and to assess any environmental impact. An inspection was not completed in the 2017-2018 period and will next be undertaken in 2018-2019.

2 Results

2.1 Water

2.1.1 Inspections

Stormwater from the production plants, dangerous goods storage compound, despatch store, incinerator and roads in these areas is collected in two retention pond systems. It is sampled and analysed for comparison with release criteria. If the stormwater meets the release criteria, it is discharged to the Herekawe Stream. Stormwater which fails to meet the release criteria may be pumped to the trade waste system with approval from the New Plymouth District Council.

Stormwater from the southern part of the site drains directly to a New Plymouth District Council stormwater drain and then to the Herekawe Stream. This part of the site is predominantly an open grassed area surrounding a parking area, two storage buildings, the closed pilot plant and the access road to the site.

There are four stormwater retention ponds at the Paritutu Road site: SV9000, SV9100, SV9200 and SV8000. Stormwater from building roofs and roading is collected in SV9100 after treatment in separators to remove silt. SV9000 is used as an overflow retention pond. Stormwater from around the incinerator building and roadway is collected in SV9200, while stormwater from around the despatch and dangerous goods storage areas is collected in SV8000.

If stormwater does not meet the release criteria, DAS seeks to identify the source of the contaminant so corrective actions can be implemented to prevent a recurrence.

Officers of the Council carried out regular inspections of the site during the 2017-2018 monitoring period. The inspections included the storage of raw materials and product, the maintenance and housekeeping of process areas and roadways, the stormwater collection and retention systems, stormwater sampling and release records and inspections of the discharge point and receiving waters in the Herekawe Stream. Scheduled inspections were carried out on 22 September and 15 November 2017, and 8 March and 28 May 2018.

Notes from these visits are summarised below. Records of production and incinerator operation were inspected and found to be satisfactory.

22 September 2017

The weather was fine at the time of the inspection with strong westerly wind blowing. Rainfall of 95 mm had been measured over the preceding week at the Brooklands Zoo monitoring station. Stormwater pond SV8000 contained 900 m^3 of stormwater while SV9100 held 190 m^3. The water was clear with some wind-blown floating debris, no sheen or odours were noted. The incinerator remained offline pending further upgrades. Rewiring was to be undertaken the following week in preparation for a new PLC installation, with the incinerator expected to resume operation in about a month. Site housekeeping was excellent. All roadways and stormwater catchments were clean. There were no noticeable odours or visible emissions to air. The Herekawe Stream was in moderate flow with very slight, short-lived foaming resulting from the DAS discharge. An odour survey was conducted around the site and no odours were apparent.

15 November 2017

The weather was fine at the time of the inspection with a mild north-west wind. No rainfall was recorded over the previous week at the Brooklands Zoo weather station. Stormwater pond SV8000 contained 400 m^3 of stormwater while SV9000 held 80 m^3. Water was clear with some wind-blown floating debris an no sheen or odours were noted. The incinerator was undergoing testing to commission the new control systems. Stack testing for 2,4-D from the herbicides plant was also being carried out at the time. No spills or incidents had occurred since the previous inspection. Site housekeeping was excellent. All roadways and

stormwater catchments were clean. There were no visible emissions to air. The Herekawe Stream was in low flow and the discharge caused a light plume due to washing iron oxide and dirt into the stream from around the outlet structure. An odour survey was conducted around the site with no odours apparent.

8 March 2018

The weather was clearing at the time of the inspection with a strong south-easterly wind blowing. Rainfall of 87 mm had been recorded over the previous week at the Brooklands Zoo monitoring station. Stormwater pond SV8000 contained 1,100 m^3 of stormwater while SV9100 held 250 m^3. The ponds had also been emptied the previous day and were very clean with no sheen or odours noted. The incinerator had been restarted in mid-February after control upgrades. It was burning liquids at the time of inspection and all parameters were satisfactory. There had been some minor damage to shed cladding and the plant from a recent cyclone and this had since been repaired. Site housekeeping was excellent. All roadways and stormwater catchments were clean. There were no visible emissions to air. The Herekawe Stream was in moderate flow with no effects apparent from the discharge. An odour survey was conducted around the site and no odours were apparent.

28 May 2018

There were occasional showers during the inspection with a moderate south-easterly wind. Rainfall of 43 mm was recorded over the previous week at the Brooklands Zoo monitoring station. Stormwater pond SV8000 contained 500 m^3 of stormwater while SV9100 held 175 m^3. The ponds were very clean and no sheens or odours were noted. The incinerator was offline again due to a hot spot in the refractory material and it would probably not be operational until after the three week site shutdown starting 18 June. The entire dry goods area was scheduled to be resurfaced with concrete due to the existing asphalt deteriorating. The stormwater sump was also being replaced with a larger 45 m^3 unit to prevent issues with surface flooding during heavy rainfall events. The project was expected to take 4 months starting from 1 July. Site housekeeping was excellent and all roadways and stormwater catchments were clean. There were no visible emissions to air. The Herekawe Stream was in moderate flow with slight foaming from the discharge which dissipated within 25 m. An odour survey was conducted around the site and no odours were noted.

2.1.2 Results of discharge monitoring

All stormwater collected in the four stormwater retention ponds is sampled and analysed by DAS prior to release. The samples are checked for the parameters controlled by consent 4108; floatable and suspended materials, odour, colour and visual clarity, pH and the potential chemical contaminants phenoxy herbicides, organophosphates, triclopyr, picloram, glyphosate, and oxyfluorfen. During the 2017-2018 year, a total of 185 stormwater samples were collected and analysed by DAS. On all occasions, the release criteria were met.

Two of the stormwater ponds are also sampled by the Council for consent compliance checking and inter-laboratory comparison on four occasions each year. The Council's laboratory determines general water quality parameters, and an independent specialist laboratory (AsureQuality) is used to analyse for the organic constituents limited on the consent. In 2017-2018, sampling was undertaken by an officer from the Council with staff from DAS on 22 September and 15 November 2017, and 8 March and 28 May 2018.

The focus of monitoring continued to be on acid herbicides, in connection with the recommencement of esterification of 2,4-D and neutralisation of MCPA and 2,4-D with amines, rather than on organophosphorus pesticides, which had not been detected from monitoring over the previous decade.

The results of Council monitoring for 2017-2018 are presented in Table 2 and Table 3.

Table 2 Stormwater results for acid herbicides and pH in 2017-2018

Parameter	Maximum concentration detected (g/m^3 or mg/L)	
	SV8000 (n=4)	SV9100 (n=4)
2,4,5-T	0.00045	0.00059
2,4-D	0.00085	0.00088
2,4-DB	0.00056	<0.00010
MCPA	0.00080	0.00032
MCPB	0.00022	0.00015
Picloram	0.00064	0.0048
Triclopyr	0.0013	0.00062
pH (range)	6.9	7.3

Table 3 Stormwater results for pesticides in 2017-2018

Parameter	Maximum concentration detected (g/m^3 or mg/L)		
	SV8000 (n=4)	SV9100 (n=4)	Maximum
Chlorpyrifos	<0.0010	<0.0010	<0.0010
Chlorpyrifos-methyl	<0.0010	<0.0010	<0.0010
Oxyfluorfen	<0.0010	<0.0010	<0.0010

Table 4 DAS stormwater results from 2017-2018 inter-laboratory comparisons

Consent Item	Consent limit	SV8000 (n=4)	SV9000 (n=4)	SV9100 (n=2)	SV9200 (n=2)
Oil, floatables, suspended solids	None present	Pass	Pass	Pass	Pass
Objectionable odour	None present	Pass	Pass	Pass	Pass
Colour and visual clarity	No change	Pass	Pass	Pass	Pass
pH	6.0 – 9.0	6.3 - 6.9	6.6 - 6.9	6.8 - 7.0	6.6 - 6.7
Total phenoxy herbicides	0.10 mg/L	0.075*	0.075*	0.075*	0.075*
Total organophosphates	0.0005 mg/L	0.0004**	0.0004**	0.0004**	0.0004**
Triclopyr	0.10 mg/L	0.025*	0.025*	0.025*	0.025*
Picloram	0.10 mg/L	0.025*	0.025*	0.025*	0.025*
Oxyfluorfen	0.005 mg/L	0.00035***	0.00035***	0.00035***	0.00035***

* none detected, assumes 2,4-D, MCPA, MCPB (phenoxy herbicides), and, triclopyr and picloram all present at half detection limit of 0.05 mg/L

** none detected, assumes chlorpyrifos and chlorpyrifos-methyl both present at half detection limit of 0.0004 mg/L

*** none detected, assumes oxyflurofen present at half detection limit of 0.0007 mg/L

A total of 255 pesticide residues were tested for (excluding acid herbicide compounds that were tested separately), at detection limits of 0.001 to 0.005 g/m^3. The list of residues determined is given in Appendix II.

A summary of DAS's results from inter-laboratory comparison exercises is presented in Table 4. The results indicate good agreement between laboratories, and compliance with the conditions of stormwater discharge consent 4108.

In September 2018, the Council received a stormwater report from DAS covering the period between July 2017 and June 2018. The stormwater report summarises the monitoring and discharge data for the DAS site during the 2017-2018 monitoring period. It also details process management of stormwater and its release from site. As noted in the report, there were no changes to the stormwater system during 2017-2018. The report is attached in Appendix III.

2.1.3 Groundwater monitoring

Field investigations into possible groundwater contamination at the site were commenced by DAS in 1993 and concluded in 1996. The site investigation identified two locations where soil and/or groundwater have been impacted by phenoxy herbicides and chlorophenols.

For a history of groundwater monitoring see 'Dow AgroSciences (NZ) Ltd, Monitoring Program Annual Report 2002-2003' Technical Report 2003-72.

The Council received a groundwater management report from DAS covering the period between July 2017 and June 2018. The report is based on the results of the groundwater sampling round undertaken in August 2017 by consultant ERM New Zealand Limited.

Groundwater sampling of the nine Groundwater Monitoring Plan wells was carried out between 28 August and 1 September 2017 using in-well bladder pumps in accordance with a "Low Flow Sampling Methodology".

Table 5 Groundwater monitoring results August 2017

Well identification No.	Phenoxy Herbicides Concentration (µg/L)	Chlorophenol Concentration (µg/L)
Shallow perimeter wells		
1	ND	ND
21	ND	ND
Deep Perimeter wells		
20	ND	ND
32R	ND	ND
41	ND	ND
42	≤0.18	≤0.32
47R	ND	ND
Additional non-perimeter wells		
39R	≤37.7	≤260.7
46A	≤0.58	≤0.63
Trigger levels	50,000	10,000

Phenoxy herbicides [2,4-D; 2,4,5-T; MCPA; MCPB]

Chlorophenols [2,4-DCP; 2,4,5-TCP; 2,4,6-TCP; PCOC]

ND = below laboratory reporting limits (<0.16 µg/L for phenoxy acids and <0.2µg/L for chlorophenols)

The results of the chlorophenol and phenoxy acid analyses are listed in Table 5.

No phenoxy acid or chlorophenol was detected in either of the shallow perimeter wells (1 and 21).

Phenoxy herbicides were detected in deep perimeter well 42 on the northern boundary, at ≤0.18, this was significantly below the action level of 50,000 µg/L. Chlorophenols were also detected in deep perimeter well 42 at ≤0.32. This is well below the action level of 10,000 µg/L.

Non-perimeter well 46A, drilled into the andesite south of the stormwater pond, showed low levels of phenoxy herbicides, at <0.58 µg/L, and of chlorophenols, at ≤0.63 µg/L. Well 39R had slightly higher levels of both phenoxy herbicides (37.7 µg/L) and chlorophenols (≤260.7), however these values were well below the trigger levels (which do not apply to non-perimeter wells anyway as these are sampled for interest and not subject to the established action levels).

Total phenoxy acid herbicide and total chlorophenol concentrations have not exceeded the Groundwater Management Plan trigger levels since sampling rounds began in 1993, and if detected, concentrations typically continue to show a decreasing trend.

Wells 20, 32, 39J, 41 and 47 were redeveloped in August 2013 to provide more reliable groundwater levels for low flow sampling techniques, and to free up the dedicated sampling pump in well 20. Wells 32, 39J and 47 frequently had insufficient water to sample and as a result were decommissioned in August 2015 and replaced with adjacent new wells 32R, 39R, and 47R.

All 28 existing monitoring wells (five shallow and 23 deep) were gauged on 24 September 2015 to assess groundwater levels, water column and silt build-up thickness. This five-yearly survey of all the wells is next due in 2020-2021.

2.1.4 Freshwater biological monitoring

Freshwater biological surveys were undertaken in the Herekawe Stream on 24 October 2017 and 8 February 2018. Copies of the full reports are attached as Appendix IV.

The surveys were undertaken using standard Council procedures and indicated that the streambed communities had not been significantly affected by stormwater discharges from the DAS site or other industrial sites in the vicinity. Decreases in the MCI and $SQMCI_s$ scores between the upstream 'control' site and site downstream of the discharges was more likely attributable to habitat differences between these sites which appeared to be related primarily to substrate type and possibly seawater inundation.

2.2 Air

2.2.1 Inspections

2.2.2 Inspections

Officers of the Council carried out regular inspections of the DAS Paritutu Road site during the 2017-2018 monitoring period. Scheduled inspections were undertaken on 22 September and 15 November 2017, and 8 March and 28 May 2018.

During each inspection a record was made of weather conditions prevailing at the time. An odour survey was carried out on the site boundary and around the surrounding neighbourhood. No odours were detected during any of the inspections.

The vents on site were visually checked for emissions during each inspection. At no time were any emissions noticed. A high standard of housekeeping in all areas of the site was noted at each inspection.

2.2.3 DAS air emissions report

In September 2018, Council received an air emissions report from DAS covering the period from July 2017 to June 2018. The main body of this report is attached in Appendix V-the appendices to the report are available on request from Council.

The report addresses changes in plant processes, emission control technology, resource consent requirements, and emission monitoring. Process management of air emissions is described, and the results from monitoring of point source emissions produced. General aspects of air quality management are covered, including the Air Discharge Management and Monitoring Plan (ADMMP). The results of monitoring are summarised in sections 2.2.4 and 2.2.5 below.

2.2.4 Process vents

Monitoring of process vent emissions from the Herbicides plant was carried out by independent specialist Source Testing New Zealand Ltd (STNZ). Emissions were sampled by STNZ using international standard methods where applicable, and analysed by an IANZ accredited laboratory.

The monitoring was undertaken in accordance with the Stack Emission Monitoring Plan attached to the ADMMP.

Sampling was timed and conducted to provide data representative of the various production and formulation processes. The emission component monitored was MCPA (acid and salt).

A summary of the emission test results and associated information is presented in Table 6.

Table 6 Summary of process vent emission monitoring results 2017-2018

Plant	Vent	Emission component	No.	Sampling period	Concentration* µg/m³	Emission limit**	
						µg/m³	%
Insecticides	03-5	Chlorpyrifos	-	Due 2018-19	-	-	-
Suspension Concentrates	BB600	Spinosad	-	Due 2018-19	-	-	-
Granulated Herbicides	03-14	Picloram	-	Due 2018-19	-	-	-
Herbicides	03-8	2,4-D ethylhexyl ester	3	14-15 November 2017	<0.3 – 0.7	214,000	0.0003
Commodity Herbicides	48-1	MCPA (acid and salt)	-	Due 2018-19	-	-	-

* all data corrected to 0˚C, one atmosphere, dry gas basis

** limits for emission component concentrations derived from Schedules 1 and 3 attached to consent 4020-4

Condition 3 of consent 4020-4 requires that the discharge of contaminants to air, other than from the High Temperature Incinerator Stack, shall be controlled to ensure that the maximum ground-level concentrations off site do not exceed air quality limits listed in Schedule 1 to the consent, using the following formula:

Maximum stack concentration (µg/m³) = air quality limit (µg/m³) x Dilution Factor

The Dilution Factor is taken from the table in Schedule 3 to the consent, based on worst-case predictions from air dispersion modelling of the dilution of contaminants with ambient air between each process plant stack and ground level at the site boundary.

Table 5 presents the emission component concentrations as a percentage of the relevant maximum stack concentrations that are allowed. The highest emission concentration measured was 0.0003% of the respective limit, for 2,4-D ethylhexyl ester from the Herbicides Plant stack.

It is noted that additional monitoring was carried out on the Commodity Herbicides Plant vent in April 2006, to verify that dioxins were not being generated from the 2,4-D esterification process. The maximum reported value for dioxins and furans was 0.00399 ng(TEQ)/m^3, which is well within the range of field blank data from previous testing of the High Temperature Incinerator. That is, not measurably different from ambient air levels. As dioxins/furans are not created as part of the 2,4-D esterification or neutralisation processes, future monitoring is not required. In comparison, the consent limit on average concentration for the High Temperature Incinerator stack is 0.1 ng(TEQ)/m^3.

2.2.4.1 Multiple sources

Where multiple sources of an individual contaminant are involved, individual stack concentrations for that contaminant will be determined to ensure the air quality limit is complied with on a cumulative basis (Schedule 3 of consent 4020-4).

During 2017-2018, there were three substances with potential to have multiple sources: 2,4-D, MCPA and clopyralid. These materials are used in the Herbicides Plant and the Commodity Herbicides Plant. However, the discontinuation of esterification in the Commodity Herbicides Plant has meant that each of these compounds is now predominantly used in only one plant at a time. Therefore there was no requirement to undertake a determination of multiple sources in 2017-2018.

2.2.5 High Temperature Incinerator

Conditions on DAS's air discharge permit 4020-3 placed limits on the discharge of dioxins/furans and of hydrogen chloride from the High Temperature Incinerator. New discharge permit 4020-4 retained the concentration limit on dioxins/furans, and changed the mass discharge limit for hydrogen chloride (HCl) to include total halides (HF, HCl and HBr).

Under the Stack Emission Monitoring Plan, discharges from the High Temperature Incinerator stack shall also be monitored annually for particulates, sulphur dioxide and metals.

The high temperature incinerator underwent upgrades to its burner management system and repair or its refractory during the year. As a consequence it was fully operational for only 22 days during the year and operated on liquids only for a further 70 days. As a consequence, permission was sought to waive vent monitoring of the Incinerator for the 2017-2018 year.

2.2.6 Community consultation

DAS was required by the conditions of the old air consent 4020-3 to hold a public meeting at least annually. There is no specific requirement under the new consent 4020-4 for community consultation, other than that the annual report required under condition 15 shall provide a description of any consultation undertaken and any views put forward by those consulted.

No community consultation was reported in the Air Discharge Annual Report that was produced for the 2017-2018 review period.

2.2.7 Technical review report

Special condition 18 on consent 4020-4 requires that:

No later than 30 April 2020 and every six years thereafter, the consent holder shall provide to the Chief Executive, Taranaki Regional Council, a written report which includes:

(a) *A review of any relevant technological advances in the reduction or mitigation of discharge to air from the site activities, and the costs and benefits of these advances;*
(b) *A summary concluding which air discharge and treatment methods will be operated onsite and why; and*
(c) *A description of any significant changes in air quality assessment methodology since the previous reporting period (including computer modelling techniques and the associated dilution factors set out in Schedule 3) that are likely to materially affect the assessment of environmental effects of the activities authorised by this consent.*

It is noted that the assessment of environmental effects that was undertaken in support of the application lodged in November 2013 for replacement of air discharge permit 4020-3 included a comprehensive review of technological advances relevant to the reduction or mitigation of discharges to air from the Paritutu site, and an assessment of issues relevant to the minimisation or mitigation of discharges to air from the site.

The first report under condition 18 is due by 30 April 2020.

2.3 Investigations, interventions, and incidents

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

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

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

In the 2017-2018 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Company's conditions in resource consents or provisions in Regional Plans.

3 Discussion

3.1 Discussion of site performance

In general, from the inspections of the site and from discussions held with staff, Council officers have concluded that DAS has a comprehensive, carefully documented and well considered approach to all areas of environmental performance. This included written methods for process management and technical control, documentation of processes and emissions, a self-monitoring programme implemented by DAS and regular provision of information to the Council. Staff are assigned particular areas of responsibility, so that familiarity and experience are gained. All major air emissions sources have appropriate treatment systems and in most cases general building ventilation is also extracted through similar treatment systems.

Nine new products were introduced to the site during 2017-2018. These were various fungicides, herbicides, insecticides and bactericides and all are finished products for distribution only (not manufactured on site).

Upon application of the "process for relating stack concentrations to air quality limits" as prescribed in Schedule 3 of air consent 4020-4, the discharge of contaminants to air was found to be controlled so that ground-level concentrations off-site did not exceed the relevant air quality limits.

The annual report on air emission monitoring was produced as required under consent 4020-4. Compliance with the consent conditions was demonstrated.

The annual report on stormwater discharge monitoring was produced as required under consent 4108-2. Compliance with the consent conditions was demonstrated.

The annual groundwater management report was produced as agreed in the Site Groundwater Management Plan. All groundwater samples from the perimeter wells were found to be significantly below the contaminant action levels.

The three-yearly review of the Air Discharge Management and Monitoring Plan (ADMMP) was undertaken during the 2017-2018 year in accordance with condition 11 of consent 4020-4. Changes included:

- Change of monitoring frequency for Commodity Herbicides Plant from annually to two-yearly as a result of volume changes.
- Minor changes to align discrepancies between various sections of the ADMMP, align management tools referenced with updated tools to be implemented, and correct descriptions to align with processes used.

3.2 Environmental effects of exercise of consents

Environmental investigations, including biomonitoring of the Herekawe Stream, found no cause for concern over the effects of the discharge of stormwater from the site.

The results of emission testing indicated that there is no potential health effect from the primary contaminants discharged from the site, according to recognised guidelines.

3.3 Environmental effects of exercise of groundwater movement

Monitoring of groundwater quality beneath the site has confirmed modelling that predicts that historical groundwater contamination at two points beneath the site would not result in any off-site effects, nor detection at the limits used by DAS for its routine monitoring.

3.4 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Table 7 and Table 8.

Table 7 Summary of performance for consent 4108-2

Purpose: ***To discharge stormwater from an industrial agrichemical manufacturing site via retention dams together with uncontaminated stormwater from landscape and no-manufacturing areas into the Herekawe Stream***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Adopt best practicable option	Checking that standard operating procedures to achieve compliance with consent conditions are followed	Yes
2. Stormwater catchment area not to be exceeded	Inspections of plant site	Yes
3. Provision of stormwater management plan	Latest plan on file August 2017	Yes
4. Keeping of discharge records	Inspection by Council and annual report by DAS received in September 2018	Yes
5. Controls on effect of discharge in receiving water	Inspections, chemical sampling and biomonitoring	Yes
6. Concentration limits upon potential contaminants in discharge	Chemical sampling by DAS with validation by Council	Yes
7. Optional review provision re environmental effects	Not scheduled for consideration during year under review. Next consideration June 2020	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**
Overall assessment of administrative performance in respect of this consent		**High**

N/A = not applicable

Table 8 Summary of performance for consent 4020-4

Purpose: ***To discharge contaminants to air from all activities associated with current and future operation of an agrichemical formulation and packaging plant***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Maintenance and operation of emission control equipment	Monitoring of activity as necessary by Council Officers and review of the ADMMP required by condition 11	Yes
2. Prohibition of offensive odour or dust beyond boundary	Monitoring of activity as necessary by qualified Council officers	Yes
3. Limits on contaminants, other than from incinerator, beyond the site	Testing as detailed in ADMMP	Yes
4. Limit on specific incinerator emission components	Not monitored during 2017-2018	N/A

Purpose: *To discharge contaminants to air from all activities associated with current and future operation of an agrichemical formulation and packaging plant*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
5. Limit on specific incinerator emission components mass discharge rate	Not monitored during 2017-2018	N/A
6. No incineration of certain materials	Inspection by Council, monitoring and recording of processes by DAS	Yes
7. Incinerator monitoring record keeping	Inspection by Council and Annual Report by DAS	Yes
8. Incinerator oxygen concentration	Continuous monitoring by DAS.	Yes
9. Incinerator secondary chamber temperature	Continuous monitoring by DAS	Yes
10. Incinerator exhaust gas temperature	Continuous monitoring by DAS	Yes
11. Air Discharge Management and Monitoring Plan	Plan up to date	Yes
12. Maintenance of Chemical Materials Register for current use	Review of records received by Council	Yes
13. Introduction of new items to Chemical Material Register	Data sheets received	Yes
14. Air Monitoring and triggers	No action required	Yes
15. Annual report on monitoring results, process change, and consultation	Report received September 2018	Yes
16. Six-yearly report on technological advances in emission reduction	Due April 2020	N/A
17. Review of consent	Not scheduled for consideration during year under review. Next consideration June 2020	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**
Overall assessment of administrative performance in respect of this consent		**High**

Table 9 Evaluation of environmental performance over time

Year	Consent no	High	Good	Improvement req	Poor
2010-11	4108-2	1			
	4020-3		1		
2011-12	4108-2	1			
	4020-3		1		

Year	Consent no	High	Good	Improvement req	Poor
2012-13	4108-2	1			
	4020-3	1			
2013-14	4108-2	1			
	4020-3	1			
2014-15	4108-2	1			
	4020-4	1			
2015-16	4108-2	1			
	4020-4	1			
2016-17	4108-2	1			
	4020-4	1			
2017-18	4108-2	1			
	4020-4	1			
Totals		14	2		

During the year, DAS demonstrated an overall high level of both environmental performance and administrative compliance with the resource consents as defined in Section 1.1.4.

3.5 Recommendations from the 2016-2017 Annual Report

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

1. THAT in the first instance, monitoring of consented activities at the DAS Paritutu Road plant in the 2017-2018 year continue at the same level as in 2016-2017.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

Recommendation one was implemented, while it was not considered necessary to carry out any additional monitoring as per recommendation two.

3.6 Alterations to monitoring programmes for 2018-2019

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

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

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

It is proposed that for 2018-2019 the monitoring programme remains unchanged from that of 2017-2018.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2018-2019.

4 Recommendations

1. THAT in the first instance, monitoring of consented activities at the DAS Paritutu Road plant in the 2018-2019 year continue at the same level as in 2017-2018.
2. THAT should there be issues with environmental or administrative performance in 2018-2019, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

Glossary of common terms and abbreviations

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

2,4-D	2,4 di-chloro-phenoxy-acetic acid, a herbicide.
2,4-DB	2,4 di-chloro-phenoxy-butanoic acid, a herbicide.
2,4,5-T	2,4,5 tri-chloro-phenoxy-acetic acid, a herbicide.
AEE	Assessment of environmental effects.
ADMMP	Air Discharge Management and Monitoring Plan.
Biomonitoring	Assessing the health of the environment using aquatic organisms.
Bund	A wall around a tank to contain its contents in the case of a leak.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
DMA	Dimethylamine.
DMEA	Dimethylethanolamine.
Dioxins	See PCDD.
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.
IPA	Isopropylamine.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
Incident Register	The Incident Register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
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.
MCPA	Methyl-chloro-phenoxy-acetic acid, a herbicide.
MCPB	Methyl-chloro-phenoxy-butanoic acid, a herbicide.
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.

ng/m^3	Nanograms per cubic metre.
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
PCDD	Polychlorinated dibenzo-para-dioxins, a contaminant of phenoxy herbicides.
PCDF	Polychlorinated dibenzofurans, a contaminant of phenoxy herbicides.
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	*Resource Management Act 1991* and including all subsequent amendments.
SQMCI	Semi quantitative macroinvertebrate community index.
TCP	Trichlorophenol.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.

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

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Appendix I

Resource consents held by Dow AgroSciences (NZ) Limited

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

Discharge Permit

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

Name of Consent Holder:	Dow AgroSciences (NZ) Limited Private Bag 2017 NEW PLYMOUTH
Change To Conditions Date:	11 November 2005 [Granted: 12 June 1996]

Conditions of Consent

Consent Granted:	To discharge emissions into the air from the manufacture of agrichemical products and associated processes at an agrichemical manufacturing complex at or about GR: P19:987-374
Expiry Date:	1 June 2014
Review Date(s):	June 1998, June 2000, June 2002, June 2004, June 2006, June 2008, June 2010, June 2012
Site Location:	89 Paritutu Road, New Plymouth
Legal Description:	Lot 1 DP 10018 Lots 1 & 2 DP 9829 Lot 1 DP 9022 Lot 3 DP 8465 Blk IV Paritutu SD
Catchment:	Herekawe

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

General conditions

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

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

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

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

Special conditions

Conditions 1 to 11 – unchanged

1. The consent holder shall at all times adopt the best practicable option to prevent or minimise any actual or likely adverse effect on the environment associated with the discharges into the air from the site. 'Best practicable option' shall be determined by the Taranaki Regional Council, taking into account the information supplied by the consent holder under condition 3 of this consent, and following review as set out under condition 20 of this consent.

2. The consent holder shall at all times operate, maintain, supervise, monitor and control all processes so that discharges authorised by this consent are maintained at a practicable minimum.

3. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, by 30 June 1998 and every two years thereafter, a written report:

(a) reviewing technological advances relevant to the reduction or mitigation of any discharge to air from the site, particularly but without limitation discharges of dioxin, how these might be applicable and/or implemented at the site, and the benefits and costs of these advances;

(b) assessing any other issue relevant to the minimisation or mitigation of discharges to air from the site that the Chief Executive, Taranaki Regional Council, considers should be included; and

(c) detailing any inventory of discharges to air from the site of such contaminants as the Chief Executive, Taranaki Regional Council, may from time to time specify following consultation with the consent holder.

4. Prior to undertaking any alteration to the plant, process, or operations as they were specified in the application and supporting documentation lodged with the Taranaki Regional Council for this consent, which may significantly change the nature or quantity of contaminants discharged to air 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.

5. The consent holder shall keep and make available to the Chief Executive, Taranaki Regional Council, upon request, all process control records relevant to air quality, air monitoring data, and documentation of air monitoring programmes, for a period of six months.

6. The consent holder shall keep and make available to the Chief Executive, Taranaki Regional Council, upon request, details of all formulations received, prepared, stored, mixed or otherwise processed on the premises, including but not limited to material safety data sheets and toxicological information and environmental fate information as contained in the agrochemical registration information. The information specific to any formulation shall be retained for a period of six months after that formulation is last processed.

7. The consent holder shall control all discharges of sulphur dioxide, carbon monoxide and nitrogen dioxide, in order that the maximum ground level concentrations of each of these contaminants shall satisfy the guideline values set out in Table 1 of 'Ambient Air Quality Guidelines', July 1994, Ministry for the Environment, when measured as specified in that document. Should the ambient concentration of any contaminant be found to exceed its relevant guideline value, this consent may be reviewed under condition 20.

8. The consent holder shall control all discharges, other than of carbon dioxide or as in condition 7 and 12, so as to ensure that the maximum ground level concentration for any particular contaminant at or beyond the boundary of the site is not increased above background levels:

> by more than 1/30th of the relevant Occupational Threshold Value -- Time Weighted Average for any eight-hour period of measurement, or by any more than the Short Term Exposure Limit for any fifteen-minute period of measurement, or, if no Short Term Exposure Limit is set, by more than three times the Time Weighted Average for any fifteen-minute period of measurement. [Workplace Exposure Standards and Biological Exposure Indices for New Zealand, 1992, Department of Labour].

9. The exercise and the effects of the exercise of this consent shall be monitored to the satisfaction of the Chief Executive, Taranaki Regional Council.

10. The opacity of discharges from the incinerator stacks shall not exceed 20%.

11. The discharge of hydrogen chloride from the incinerator stacks shall not exceed 1.5 kg/hour in aggregate.

Condition 12 – changed

12. The discharge of polychlorinated dibenzodioxins and polychlorinated dibenzofurans from any incinerator stack shall not exceed an average concentration of 0.1 ng/m^3 [adjusted to 0 degrees Celsius, dry gas basis, 101.3 kPa pressure, and 11% oxygen], nor a mass discharge rate of 5.0 µg/hour, when expressed as the equivalent amount of 2,3,7,8 tetrachloro dibenzo-p-dioxin according to NATO toxic equivalent factors. The average concentration shall be determined over not less than 3 sampling runs within any 12-month period, each of which shall be taken while the incinerator is fed on different waste types unless specifically approved otherwise by the Chief Executive, Taranaki Regional Council.

Conditions 13 to 22 – unchanged

13. Without restriction or limitation to conditions 5 or 9, the consent holder shall monitor and record, and make available to the Chief Executive, Taranaki Regional Council, upon request, the following operating parameters on the solid incinerator on a continuous basis:

    (a) oxygen concentration within or at the exit from the secondary combustion chamber;

    (b) carbon monoxide concentration within or at the exit from the secondary combustion chamber;

    (c) temperature within or at the exit of the primary combustion chamber; and

    (d) temperature within or at the exit of the secondary combustion chamber.

    Records shall be retained for a period of six months.

14. Without restriction or limitation to conditions 5 or 9, the consent holder shall record, and make available to the Chief Executive, Taranaki Regional Council, upon request, the feedstock type and loading rate, operating times and the prevailing weather conditions for each incinerator burn, and for the solids incinerator the loading time at which each batch is loaded into the incinerator. Records shall be retained for a period of six months.

15. The oxygen concentration within the secondary combustion chamber of the solids incinerator shall be maintained between 6% and 9% [by volume] as far as is practicable, and shall not be less than 4.5% [by volume], for more than 60 seconds at any time during the incineration of material during any 24-hour period.

16. The temperature in the secondary combustion chamber of the solids incinerator shall not be less than 1100 degrees Celsius, at any time during the incineration of material.

17. The temperature at the exit from the liquids incinerator chamber shall not be less than 1000 degrees Celsius and the total proportion of halogens within the feedstocks shall not exceed 0.8%.

18. The temperature of the exhaust gases from the solids incinerator stack shall not be less than 700 degrees Celsius immediately prior to discharge.

19. The discharges authorised by this consent shall not give rise to any direct significant adverse ecological effect on any off-site ecosystems, including but not limited to habitats, plants, animals, microflora and microfauna.

20. The Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 1998 and every two years thereafter for the purpose of:

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

    (b) requiring the holder to adopt the best practicable option to remove or reduce any adverse effect on the environment caused by any discharge into the air; or

    (c) to alter, add, or delete limits on discharge or ambient concentrations of any contaminants or contaminant.

21. The consent holder and staff of the Taranaki Regional Council shall meet as appropriate and at least once per year, with submitters to the consent and interested members of the local community, in order to discuss any matter relating to the exercise of this resource consent.

22. The Taranaki Regional Council, in conjunction with the consent holder, submitters to the consent and other interested members of the local community shall establish a programme to monitor odours and odour sources.

Signed at Stratford on 11 November 2005

For and on behalf of
Taranaki Regional Council

_____

Chief Executive

Discharge Permit

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

Name of Consent Holder:	Dow AgroSciences (NZ) Limited Private Bag 2017 New Plymouth 4342
Decision Date:	14 October 2014
Commencement Date:	05 November 2014

Conditions of Consent

Consent Granted:	To discharge contaminants to air from all activities associated with the current and future operation of an agrichemical formulation and packaging plant
Expiry Date:	01 June 2044
Review Date(s):	June 2020, June 2026, June 2032, June 2038 and in accordance with special condition 17
Site Location:	89 Paritutu Road, New Plymouth
Legal Description:	Lot 3 DP 8465 Lot 1 DP 9022 Lots 1 & 2 DP9829 Lot 1 DP10018 (Discharge source & site)
Grid Reference (NZTM)	1688529E-5675602N

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

General condition

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

Special conditions

1. The consent holder shall ensure that all emissions control equipment, including but not limited to that referred to in condition 16(b) is maintained and operated effectively and efficiently at all times.

2. The discharges authorised by this consent shall not give rise to any odour, or dust emissions, at or beyond the boundary of the site that is offensive or objectionable.

3. The discharge of contaminants to air, other than from the High Temperature Incinerator Stack (see conditions 4 and 5) shall be controlled to ensure that the maximum ground-level concentrations off-site do not exceed:

   (a) Subject to condition 3(b),the relevant air quality limits listed in Schedule 1 of this consent and assessed using the process set out in Schedule 3; and

   (b) In the case of emissions due to raw materials or formulations introduced to the site after this consent commences, limits developed in accordance with the approach set out in Schedule 2 and assessed using the process set out in Schedule 3.

   See Advice Notes 1 and 2.

4. The total concentration of polychlorinated dibenzodioxins and polychlorinated dibenzofurans in any discharge from the High Temperature Incinerator Stack shall not exceed 0.1 nanograms per cubic metre (adjusted to 0 degrees Celsius, dry gas basis, 101.3 kPa pressure and 11% oxygen) when calculated as total toxic equivalents using the World Health Organization 2005 toxic equivalence factors.

   See Advice Notes 1 and 3.

5. The rate of discharge of total halides from the High Temperature Incinerator stack shall not exceed 1.5 kg/hour.

   See Advice Note 1.

6. There shall be no incineration of plastics and packaging that contain brominated flame retardants.

7. The consent holder shall record, and make available to the Chief Executive, Taranaki Regional Council upon request:

   a) the carbon monoxide concentration within or at the exit from the secondary combustion chamber;
   b) the feedstock type and loading rate;
   c) operating times; and
   d) the prevailing weather conditions

   for each incinerator burn. Records shall be retained for a period of six months.

8. The oxygen concentration within the secondary combustion chamber of the incinerator shall be maintained between 6% and 9% (by volume) as far as is practicable, and shall not be less than 4.5% (by volume), for more than 60 seconds at any time during the incineration of material during any 24-hour period.

9. The temperature in the secondary chamber of the High Temperature Incinerator shall not be less than 1100 degrees Celsius at any time during the incineration of waste.

10. The temperature of the exhaust gas from the High Temperature Incinerator shall not be less than 1000 degrees Celsius at any time during the incineration of waste.

11. Within three months of the date of commencement of consent, and at intervals not exceeding three years thereafter, the consent holder shall prepare and provide to the Chief Executive, Taranaki Regional Council and the Medical Officer of Health for Taranaki, for comment, a draft Air Discharge Management and Monitoring Plan ("ADMMP") for the site. The ADMMP shall be finalised and submitted to the Chief Executive, Taranaki Regional Council within a further three months. The ADMMP shall be to the satisfaction of the Chief Executive of the Taranaki Regional Council, acting in a technical certification capacity, and shall detail the management and monitoring of air discharges on the site and procedures and methodologies to ensure consent compliance. As a minimum, the ADMMP shall include:

    (a) A summary of the on-site air discharge activities and the nature of the discharges to air from each source on-site;

    (b) A description of how compliance with the conditions of this consent will be achieved;

    (c) A description of the air quality control measures and equipment, and maintenance programme in place for each of the air treatment systems used on-site, including specifically the systems used in the:
        - Commodity Herbicides Plant;
        - Herbicides Plant;
        - Granular Herbicides Plant;
        - Insecticides Plant;
        - High Temperature Incinerator Stack and Building;
        - Raw Material Storage Warehouse;
        - Product Development Laboratory;
        - Bulk Storage Tanks;
        - Natural gas-fired boiler; and
        - Any other air discharge sources on-site.

    (d) Descriptions of the site operating requirements related to the air discharge activities on-site, including:
        - Operating procedures;
        - Monitoring and supervision procedures including any performance indicators ; and
        - Waste processing and discharge logs.

(e) A description of the High Temperature Incinerator operational record-keeping and reporting procedures and requirements including:
- Feedstock type and loading rate, operating times and the prevailing weather conditions for each incinerator burn;
- Continuous monitoring of oxygen, carbon monoxide and temperature;
- Limits on the oxygen concentration at the outlet of the secondary combustion chamber; and
- limits on the halogen content of the feedstock;

(f) A description of the management procedures for the Product Development Laboratory, including management of the air treatment system, to minimise discharges to air to the extent practicable;

(g) A description of any additional air quality limits determined in accordance with condition 3(b);

(h) The consent holder's Air Monitoring Programme including, as a minimum:
- Identification of the contaminants and compounds being monitored;
- A description of the methodology for the air monitoring programme;
- Monitoring locations and frequency; and
- A description of how compliance with consent conditions will be demonstrated.

(i) A description of the Odour Register for the site, which is used to record any observations of odour (both on-site and off-site), the findings of any investigations, and any recommendations that arise; and

(j) A 'Contingency Plan' detailing measures and procedures to be undertaken to avoid or mitigate the adverse environmental effects of any spillage or discharge of contaminants not authorised by this consent. The Contingency Plan shall include the requirement that the Medical Officer of Health for Taranaki be notified as soon as practicable following any contingency event occurring that is likely to adversely affect human health beyond the boundary of the site.

12. At all times the consent holder shall maintain:

(a) A Chemical Materials Register containing details of all of the chemicals or product formulations currently received, prepared, stored, mixed or otherwise processed on-site; and

(b) The Safety Data Sheet, toxicology information and environmental fate information for each chemical and product listed in the Chemical Materials Register; and

(c) Details of the assessments and resulting air quality limits determined in accordance with condition 3(b).

The information required by this condition shall be retained and be made available to the Chief Executive, Taranaki Regional Council upon request.

13. Before any new chemicals or product formulations are introduced to the site for purposes other than research or development, they shall be added to the Chemical Materials Register.

14. For any air monitoring undertaken, the following actions apply:

    (a) If a measured air quality parameter would result, or has resulted in air quality that is 25% or less of the relevant limit referred to in condition 3, then no action is required;

    (b) If the measured air quality parameter would result, or has resulted in air quality that is more than 25% and less than or equal to 50% of the relevant limit referred to in condition 3, the consent holder shall notify the Chief Executive, Taranaki Regional Council within three working days of receipt of the monitoring results;

    (c) If the measured air quality parameter would result, or has resulted in air quality that is more than 50% and less than or equal to 100% of the relevant limit referred to in condition 3, the consent holder shall notify the Chief Executive, Taranaki Regional Council immediately upon receipt of the monitoring results, and investigate, and where appropriate remedy, the cause of the decrease in discharge quality. The consent holder shall notify the Chief Executive, Taranaki Regional Council of the outcomes of any investigations and subsequent actions, within 10 working days of receipt of the monitoring results; and

    (d) If the measured air quality parameter would result, or has resulted in air quality that is greater than 100% of the relevant limit referred to in condition 3, the consent holder shall immediately cease the discharge activity and notify the Chief Executive, Taranaki Regional Council upon receipt of the monitoring results. The consent holder shall then investigate the cause of the decrease in discharge quality, and remedy the cause of the exceedance prior to any recommencement of the discharge activity. A summary report shall be provided to the Chief Executive, Taranaki Regional Council within 10 working days of the original notification.

15. Before 30 September each year the consent holder shall provide to the Chief Executive, Taranaki Regional Council the following information for the 12 month period ending on the previous 30 June:

    (a) The results of all air quality monitoring that the consent holder has undertaken under the Air Monitoring Programme in accordance with condition 11(h);

    (a) A description of any process changes or changes to emission control technology that have been implemented at the site; and

    (c) A description of any consultation undertaken and any views put forward by those consulted.

16. No later than 30 April 2020 and every six years thereafter, the consent holder shall provide to the Chief Executive, Taranaki Regional Council, a written report which includes:

    (a) A review of any relevant technological advances in the reduction or mitigation of discharges to air from the site activities, and the costs and benefits of these advances;

    (b) A summary concluding which air discharge and treatment methods will be operated on-site and why; and

    (c) A description of any significant changes in air quality assessment methodology since the previous reporting period (including computer modelling techniques and the associated dilution factors set out in Schedule 3) that are likely to materially affect the assessment of environmental effects of the activities authorised by this consent.

17. In accordance with section 128 and 129 of the Resource Management Act 1991, the Chief Executive, 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:

    (a) During the month of June 2020 and/or June 2026, and/or June 2032, and/or June 2038 for the purpose of ensuring that the conditions are adequate to avoid, remedy or mitigate any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at that time; and

    (b) Within three months of receiving any report provided pursuant to condition 16 to direct the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment.

Signed at Stratford on 14 October 2014

For and on behalf of
Taranaki Regional Council

_____

A D McLay
Director - Resource Management

Advice Notes

1. Compliance with the limits in conditions 3, 4, and 5 shall be demonstrated by monitoring, or, as described in the ADMMP, by the use of air emission technology that has been designed to ensure any discharge meets those limits.

2. The methodology used for relating stack concentrations to air quality limits shall be determined in accordance with the process provided for in Schedule 3 of this consent.

3. If any monitoring is undertaken to assess compliance with condition 4, compliance shall be determined based on the average of not less than 3 samples, each of which shall be taken while the incinerator is fed on different waste types.

SCHEDULE 1: Air quality limits applying beyond the boundary of the site

The air quality limits for the one hour and the 24-hour average will apply at any location beyond the site boundary. The air quality limits for the annual average will apply at any land on which any residential activity (excluding any temporary or transient residential activity) is established.

Agrichemical actives

Substance	Air quality limit (annual average)
2,4-D acid, esters and salts	2 µg/m^3
2,4-DB acid and salts	4 µg/m^3
aminopyralid acid and amine salts	10 µg/m^3
Buprofezin	2 µg/m^3
Chlorpyrifos	0.57 µg/m^3
chlorpyrifos-methyl	1.9 µg/m^3
clopyralid acid and amine salts	30 µg/m^3
cyhalofop-butyl	0.6 µg/m^3
dicamba acid and amine salts	57 µg/m^3
Fenpyroximate	2 µg/m^3
Florasulam	10 µg/m^3
fluroxypyr, methylheptyl ester	153 µg/m^3
glyphosate acid and amine salts	191 µg/m^3
haloxyfop-R methyl ester	0.06 µg/m^3
lambda cyhalothrin	3.7 µg/m^3

MCPA acid, esters and salts	10 µg/m^3
MCPB acid and salts	2 µg/m^3
(s)-methoprene	10 µg/m^3
methoxyfenozide	19 µg/m^3
myclobutanil	6 µg/m^3
Oxyfluorfen	0.6 µg/m^3
picloram acid, esters and salts	57 µg/m^3
Quinoxyfen	38 µg/m^3
Spinetoram	6 µg/m^3
Spinosad	4 µg/m^3
Sulfoxaflor	6 µg/m^3
triclopyr, ester and amine salt	6 µg/m^3

Note: most of the toxicity data makes no distinction between the individual substances and their esters, amines, or salt forms. The air quality limit specified is a total, inclusive of all forms of the active.

Other compounds

Substance	Air quality limit	Averaging period
Benzene	3.6 µg/m^3	Annual
2,4-dichlorophenol	0.6 µg/m^3	Annual
2-ethyl hexanol	160 µg/m^3	Annual
Diethanolamine	3 µg/m^3	Annual
diethylene glycol monoethyl ether	27 µg/m^3	Annual
Dimethylamine	9 µg/m^3	Annual
dimethylethanolamine	50 µg/m^3	Annual
dipropylene glycol monomethyl ether	310 µg/m^3	Annual
EDTA	5 µg/m^3 120 µg/m^3	Annual 24-hour
Ethylbenzene	570 µg/m^3 1,000 µg/m^3	Annual 24-hour
Isopropylamine	12 µg/m^3	Annual
Monoethanolamine	7.5 µg/m^3	Annual
Naphthalene	3 µg/m^3	Annual
N-methyl-2-pyrrolidone	100 µg/m^3	Annual
propylene glycol	120 µg/m^3	24-hour
sodium bicarbonate	5 µg/m^3	Annual

Substance	Air quality limit	Averaging period
sodium hydroxide	2 µg/m^3	Annual
triethanolamine	5 µg/m^3	Annual
1,2,4-trimethylbenzene	20 µg/m^3	Annual
toluene (as a component in some distillate solvents)	5000 µg/m^3	Annual
triisopropanolamine	40 µg/m^3	Annual
xylene (as a component in some distillate solvents)	870 µg/m^3	Annual

SCHEDULE 2: Process for developing air quality limits for emissions associated with new raw materials or formulations.

The air quality limit for any particular contaminant shall be determined in accordance with the hierarchy set out in the Good Practice Guide (GPG) for Assessing Discharges to Air from Industry (Ministry for the Environment, June 2008), or another hierarchy as may be specified in the ADMMP.

In the event that no recognised air quality criteria (as described in the GPG) are available, a limit will be developed by calculating the air concentration that would give rise to an exposure equivalent to one tenth of the Acceptable Daily Intake (or equivalent) set by the New Zealand Environmental Protection Agency, Joint FAO/WHO Meeting on Pesticide Residues (JMPR) or European Commission. This procedure is described in Appendices E5 and E8, Dow AgroSciences (NZ) Ltd: Technical Air Quality Assessment - Discharges to Air – Paritutu Road Site, New Plymouth, Volume 2, prepared by Graham Environmental Consulting Ltd and Tonkin & Taylor Ltd, 31 October 2013.

The air quality limits for the one hour and the 24-hour average will apply at any location beyond the site boundary. The air quality limits for the annual average will apply at land on which any residential activity (excluding any temporary or transient residential activity) is established.

SCHEDULE 3: Process for relating stack concentrations to air quality limits.

Assessment of compliance with the air quality limits in Schedule 1 and those determined in accordance with Schedule 2 can be achieved based on actual or potential stack emissions, by using the following formula:

Maximum stack concentration ($\mu g/m^3$) = air quality limit ($\mu g/m^3$) x Dilution Factor

Where:

a) The stack concentration of any particular contaminant may be measured by stack emission testing or estimated based on the measured stack concentration of another representative contaminant and corrected for differences in molecular weight and vapour pressure; and

b) The Dilution Factor is taken from:

   i. the following table for the averaging period specified for the relevant air quality criterion; or

   ii. where the relevant averaging period is annual average and a residential activity (excluding any temporary or transient residential activity) has established within the hatched area shown on Figure 1 attached, the results of an atmospheric dispersion modelling study carried out to a similar standard as that provided with the application.

Where multiple sources of an individual contaminant are involved, individual stack concentrations for that contaminant will be determined to ensure that the air quality limit is complied with on a cumulative basis.

Plant stack	Dilution Factor		
	1-hour average	24-hour average	Annual average
Commodity Herbicides	750	1,300	29,000
Herbicides	550	1,150	107,000
Granular Herbicides	1,300	2,400	432,000
Insecticides – Emulsifiable Concentrates	700	1,250	232,000
Insecticides – Suspension Concentrates	1,500	2,750	513,000

SCALE 1:5000
0 50 100 150 200 250 (m)

Aerial photo sourced from Google Earth(Copyright: 2009). Images Copyright; Image @ 2013 DigitalGlobe. Flown 23/02/2013.

Property boundaries sourced from Land Information New Zealand data as at 8-Jul-2013 (Crown Copyright Reserved).

Tonkin & Taylor
Environmental and Engineering Consultants
105 Carlton Gore Road, Newmarket, Auckland

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DOW AGROSCIENCES (NZ) LTD
AIR DISCHARGE PERMIT
PARITUTU, NEW PLYMOUTH
Site Plan

FIG. No. Figure 1 REV. 0

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Discharge Permit

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

Name of Consent Holder:	Dow AgroSciences (NZ) Limited Private Bag 2017 NEW PLYMOUTH
Consent Granted Date:	4 September 2008

Conditions of Consent

Consent Granted:	To discharge stormwater from an industrial agrichemical manufacturing site via retention dams together with uncontaminated stormwater from landscape and non-manufacturing areas into the Herekawe Stream at or about (NZTM) 1688226E-5675009N
Expiry Date:	1 June 2026
Review Date(s):	June 2014, June 2020
Site Location:	89 Paritutu Road, New Plymouth
Site Legal Description:	Lot 3 DP 8465 Lot 1 DP 9022 Lots 1 & 2 DP 9829 Lot 1 DP 10018
Catchment:	Herekawe

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

General conditions

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

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

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

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

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.

2. The stormwater discharged shall be collected from a catchment area of no more than 16 hectares.

3. The consent holder shall maintain, and comply with at all times, a stormwater management plan, approved by the Chief Executive, Taranaki Regional Council, detailing measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not licensed by this consent, and measures to avoid, remedy or mitigate the environmental effects of such a discharge.

4. The consent holder shall keep records of the date and time that the stormwater discharges begin and end, the volume of water discharged, and the results of all physicochemical testing carried out on water discharged to the Herekawe Stream. These records shall be made available to the Chief Executive, Taranaki Regional Council, upon request.

5. After allowing for a mixing zone of 25 metres from the point of discharge, the discharge shall not give rise to any of the following effects in the Herekawe Stream:

   a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
   b) any conspicuous change in the colour or visual clarity;
   c) any emission of objectionable odour;
   d) any significant adverse effects on aquatic life.

6. Concentrations of the following components shall not be exceeded in the discharge:

Component	**Concentration**
Total phenoxy herbicides [2,4-D, MCPA and MCPB]	0.10 mg/L
Total organophosphates [chlorpyrifos and chlorpyrifos-methyl]	0.0005 mg/L
Triclopyr 0.10	mg/L
Picloram 0.10	mg/L
Glyphosate	0.10 mg/L
Oxyfluorfen	0.005 mg/L
pH [range]	6.0 – 9.0

This condition shall apply prior to the entry of the stormwater into the Herekawe Stream, at designated sampling points approved by the Chief Executive, Taranaki Regional Council.

7. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2014 and/or June 2020, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 4 September 2008

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Appendix II

List of 255 pesticide residues analysed for in DAS stormwater

AsureQuality Limited | 1C Quadrant Drive | Waiwhetu | Lower Hutt 5010 | Wellington | New Zealand
PO Box 31242 | Lower Hutt 5040 | Wellington | New Zealand
t. +64 4 570 8800 | e. cswellington@asurequality.com | w. www.asurequality.com
Global Experts in Food Assurance

Certificate of Analysis

Final Report

Callum Mackenzie
Taranaki Regional Council
Private Bag 713
Stratford 4352
New Zealand

PO Number: 71916

Report Issued: 12-Jun-2018 **AsureQuality Reference: 18-152783** **Sample(s) Received:** 29-May-2018 07:30

Results

The tests were performed on the samples as received.

Customer Sample Name: TRC182437 **AsureQuality ID:** 18-152783-1

Sample Description: Stormwater SV8000

Sample Condition: Acceptable **Sampled Date**: 28-May-2018

Test	Result	Unit	Method Reference
Acid Herbicides in Water			
Acifluorfen	<0.40	µg/L	AsureQuality Method (GC-MS)
Bentazone	<0.10	µg/L	AsureQuality Method (GC-MS)
Bromoxynil	<0.10	µg/L	AsureQuality Method (GC-MS)
Dicamba	<0.10	µg/L	AsureQuality Method (GC-MS)
Dinoseb	<0.10	µg/L	AsureQuality Method (GC-MS)
3,5-Dichlorobenzoic acid	<0.10	µg/L	AsureQuality Method (GC-MS)
2,4-D	0.17	µg/L	AsureQuality Method (GC-MS)
2,4-DB	<0.10	µg/L	AsureQuality Method (GC-MS)
Dichlorprop	<0.10	µg/L	AsureQuality Method (GC-MS)
Fenoprop	<0.10	µg/L	AsureQuality Method (GC-MS)
MCPA	<0.10	µg/L	AsureQuality Method (GC-MS)
MCPB	<0.10	µg/L	AsureQuality Method (GC-MS)
Mecoprop	<0.10	µg/L	AsureQuality Method (GC-MS)
Pentachlorophenol	<0.10	µg/L	AsureQuality Method (GC-MS)
Picloram	0.26	µg/L	AsureQuality Method (GC-MS)
Triclopyr	0.72	µg/L	AsureQuality Method (GC-MS)
2,4,6-Trichlorophenol	<0.12	µg/L	AsureQuality Method (GC-MS)
2,4,5-T	0.20	µg/L	AsureQuality Method (GC-MS)

Multiresidue Pesticides in Water - AsureQuality Method (GC-MS)

No residues were detected.

Customer Sample Name: TRC182438 **AsureQuality ID:** 18-152783-2

Sample Description: Stormwater SV9100

Sample Condition: Acceptable **Sampled Date**: 28-May-2018

Test	Result	Unit	Method Reference
Acid Herbicides in Water			
Acifluorfen	<0.40	µg/L	AsureQuality Method (GC-MS)
Bentazone	<0.10	µg/L	AsureQuality Method (GC-MS)

Test	Result	Unit	Method Reference
Bromoxynil	<0.10	µg/L	AsureQuality Method (GC-MS)
Dicamba	<0.10	µg/L	AsureQuality Method (GC-MS)
Dinoseb	<0.10	µg/L	AsureQuality Method (GC-MS)
3,5-Dichlorobenzoic acid	<0.10	µg/L	AsureQuality Method (GC-MS)
2,4-D	0.21	µg/L	AsureQuality Method (GC-MS)
2,4-DB	<0.10	µg/L	AsureQuality Method (GC-MS)
Dichlorprop	<0.10	µg/L	AsureQuality Method (GC-MS)
Fenoprop	<0.10	µg/L	AsureQuality Method (GC-MS)
MCPA	0.10	µg/L	AsureQuality Method (GC-MS)
MCPB	<0.10	µg/L	AsureQuality Method (GC-MS)
Mecoprop	<0.10	µg/L	AsureQuality Method (GC-MS)
Pentachlorophenol	<0.10	µg/L	AsureQuality Method (GC-MS)
Picloram	1.9	µg/L	AsureQuality Method (GC-MS)
Triclopyr	0.62	µg/L	AsureQuality Method (GC-MS)
2,4,6-Trichlorophenol	<0.12	µg/L	AsureQuality Method (GC-MS)
2,4,5-T	0.20	µg/L	AsureQuality Method (GC-MS)

Multiresidue Pesticides in Water - AsureQuality Method (GC-MS)

No residues were detected.

Analysis Summary

Wellington Laboratory

Analysis	Method	Authorised by
Acid Herbicides in Water		
PS-AHRB01, 01-DEFAULT	AsureQuality Method (GC-MS)	Andrew Steedman
Multiresidue Pesticides in Water		
PS-MRGW01, 01-DEFAULT	AsureQuality Method (GC-MS)	David Tran

Results that are prefixed with '<' indicate the lowest level at which the analyte can be reported, and that in this case the analyte was not observed above this limit.

NR = Not Reportable

Andrew Steedman
Scientist

David Tran
Scientist

Appendix

Analyte LOR Summary

Multiresidue Pesticides in Water - AsureQuality Method (GC-MS)

Analyte	LOR (mg/L)	Analyte	LOR (mg/L)	Analyte	LOR (mg/L)
Acetochlor	0.0010	Alachlor	0.0010	Aldrin	0.0010
Allidochlor	0.0010	Ametryn	0.0010	Anilofos	0.0010
Atrazine	0.0010	Azaconazole	0.0010	Azinphos-methyl	0.0050
Azoxystrobin	0.0010	Benalaxyl	0.0010	Bendiocarb	0.0010
Benfluralin	0.0010	Benodanil	0.0010	Benoxacor	0.0010
Bifenox	0.0050	Bifenthrin	0.0010	Bioresmethrin	0.0010
Bitertanol	0.0010	Bromacil	NR	Bromobutide	0.0010
Bromophos	0.0010	Bromophos-ethyl	0.0010	Bromopropylate	0.0010
Bupirimate	0.0010	Buprofezin	0.0010	Butachlor	0.0010
Butafenacil	0.0010	Butamifos	0.0010	Cadusafos	0.0010
Carbaryl	0.0050	Carbofuran	0.0010	Carboxin	0.0010
Carfentrazone-ethyl	0.0010	cis-Chlordane	0.0010	trans-Chlordane	0.0010
Chlorfenapyr	0.0010	Chlorfenvinphos	0.0010	Chlorobenzilate	0.0010
Chlorothalonil	0.0010	Chlorpropham	0.0010	Chlorpyrifos	0.0010
Chlorpyrifos-methyl	0.0010	Chlorthal-dimethyl	0.0010	chlozolinate	0.0010
Clodinafop-propargyl	0.0010	Clomazone	0.0010	Cloquintocet-mexyl	0.0010
Coumaphos	0.0010	Cyanazine	0.0010	Cyanophos	0.0010
Cyflufenamid	0.0010	Cyfluthrin	0.0050	Cyhalofop-butyl	0.0010
Cyhalothrin	0.0010	Cypermethrin	0.0050	Cyproconazole	0.0010
Cyprodinil	0.0010	o,p'-DDD	0.0010	p,p'-DDD	0.0010
o,p'-DDE	0.0010	p,p'-DDE	0.0010	o,p'-DDT	0.0010
p,p'-DDT	0.0050	Deltamethrin	0.0050	Demeton-S-methyl	0.0010
Diazinon	0.0010	Dichlobenil	0.0010	Dichlofenthion	0.0010
Dichlofluanid	0.0010	Dichlorvos	0.0010	Diclobutrazol	0.0010
Diclofop-methyl	0.0010	Dicloran	0.0010	Dicofol	0.0010
Dieldrin	0.0010	Diethofencarb	0.0010	Difenoconazole	0.0020
Diflufenican	0.0010	Dimepiperate	0.0010	Dimethenamid	0.0010
Dimethoate	0.0050	Dimethomorph	0.0010	Dimethylvinphos	0.0010
Dioxabenzofos	0.0010	Diphenamid	0.0010	Diphenylamine	0.0010
Disulfoton	0.0010	Dithiopyr	0.0010	Edifenphos	0.0010
α-Endosulfan	0.0010	β-Endosulfan	0.0050	Endosulfan sulfate	0.0010
Endrin	0.0010	EPN	0.0050	Epoxiconazole	0.0010
EPTC	0.0010	Esprocarb	0.0010	Ethalfluralin	0.0010
Ethiofencarb	0.0010	Ethion	0.0010	Ethoprophos	0.0010
Etoxazole	0.0010	Etridiazole	0.0010	Etrimfos	0.0010
Famphur	0.0010	Fenamiphos	0.0010	Fenarimol	0.0010
Fenchlorphos	0.0010	Fenitrothion	0.0050	Fenobucarb	0.0010
Fenoxanil	0.0010	Fenoxaprop-ethyl	0.0010	Fenoxycarb	0.0010
Fenpropathrin	0.0010	Fenpropimorph	0.0010	Fensulfothion	0.0010
Fenthion	0.0010	Fenvalerate	0.0020	Fipronil	0.0010
Flamprop-methyl	0.0010	Fluacrypyrim	0.0010	Fluazifop-P-butyl	0.0010
Fluazinam	0.0050	Flumiclorac-pentyl	0.0010	Flumioxazin	0.0010

Multiresidue Pesticides in Water - AsureQuality Method (GC-MS) - continued...

Analyte	LOR (mg/L)	Analyte	LOR (mg/L)	Analyte	LOR (mg/L)
Fluquinconazole	0.0010	Flusilazole	0.0010	Flutolanil	0.0010
Flutriafol	0.0010	Fluvalinate	0.0010	Fonofos	0.0010
Fosthiazate	0.0010	Furalaxyl	0.0010	Furathiocarb	0.0010
Haloxyfop-etotyl	0.0010	Haloxyfop-methyl	0.0010	α-HCH	0.0010
β-HCH	NR	Lindane (γ-HCH)	0.0010	δ-HCH	0.0010
Heptachlor	0.0010	Heptachlor endo-epoxide	0.0050	Heptachlor exo-epoxide	0.0010
Heptenophos	0.0050	HCB	0.0010	Hexaconazole	0.0010
Hexazinone	0.0010	Indoxacarb	0.0010	Iprobenfos	0.0010
Iprodione	0.0010	Iprovalicarb	0.0010	Isazofos	0.0010
Isofenphos	0.0010	Isoprocarb	0.0010	Isoprothiolane	0.0010
Jodfenphos	0.0010	Kresoxim-methyl	0.0010	Lactofen	0.0010
Leptophos	0.0010	Malathion	0.0010	Mepronil	0.0010
Metalaxyl	0.0010	Methacrifos	0.0010	Methidathion	0.0010
Methiocarb	0.0010	Metolachlor	0.0010	Mevinphos	0.0010
Molinate	0.0010	Myclobutanil	0.0050	Napropamide	0.0010
Nitrofen	0.0010	Nitrothal-isopropyl	0.0010	Norflurazon	0.0050
Oxadiazon	0.0010	Oxadixyl	0.0010	Oxyfluorfen	0.0010
Paclobutrazol	0.0010	Parathion	0.0010	Parathion-methyl	0.0010
Penconazole	0.0010	Pendimethalin	0.0010	Permethrin	0.0050
Phenthoate	0.0010	Phorate	0.0010	Phorate sulfone	0.0010
Phorate sulfoxide	0.0010	Phosalone	0.0010	Phosmet	0.0010
Phosphamidon	0.0010	Picolinafen	0.0010	Piperonyl butoxide	0.0010
Piperophos	0.0010	Pirimicarb	0.0010	Pirimiphos-methyl	0.0010
Pretilachlor	0.0010	Prochloraz	0.0010	Procymidone	0.0010
Profenofos	0.0010	Promecarb	0.0010	Prometryn	0.0010
Propachlor	0.0010	Propargite	0.0010	Propazine	0.0010
Propetamphos	0.0010	Propham	0.0010	Propiconazole	0.0010
Propoxur	0.0010	Propyzamide	0.0050	Prothiofos	0.0010
Pyraclostrobin	0.0010	Pyraflufen-ethyl	0.0010	Pyrazophos	0.0010
Pyributicarb	0.0010	Pyridaben	0.0010	Pyridaphenthion	0.0010
Pyrimethanil	0.0010	Pyrimidifen	0.0010	(E)-Pyriminobac-methyl	0.0010
(Z)-Pyriminobac-methyl	0.0010	Pyriproxyfen	0.0010	Quinalphos	0.0050
Quinoxyfen	0.0010	Quintozene	0.0010	Quizalofop-ethyl	0.0010
Simazine	0.0010	Simeconazole	0.0010	Simetryn	0.0010
Tebuconazole	0.0010	Tebufenpyrad	0.0010	Tecnazene	0.0010
Tefluthrin	0.0010	Terbacil	0.0010	Terbufos	0.0010
Terbuthylazine	0.0010	Terbutryn	0.0010	Tetrachlorvinphos	0.0010
Tetraconazole	0.0010	Tetradifon	0.0010	Thenylchlor	0.0010
Thiobencarb	0.0010	Thiometon	0.0010	Tolclofos-methyl	0.0010
Tolylfluanid	0.0010	Tralkoxydim	NR	Triadimefon	0.0010
Triadimenol	0.0010	Tri-allate	0.0010	Triazophos	0.0010
Tribufos	0.0010	Trifloxystrobin	0.0010	Trifluralin	0.0010
Uniconazole-P	0.0010	Vinclozolin	0.0010	XMC	0.0010

Acid Herbicides in Water - AsureQuality Method (GC-MS)

Analyte	LOR (µg/L)
Acifluorfen	0.40
Bentazone	0.10
Bromoxynil	0.10
Dicamba	0.10
Dinoseb	0.10
3,5-Dichlorobenzoic acid	0.10
2,4-D	0.10
2,4-DB	0.10
Dichlorprop	0.10
Fenoprop	0.10
MCPA	0.10
MCPB	0.10
Mecoprop	0.10
Pentachlorophenol	0.10
Picloram	0.10
Triclopyr	0.10
2,4,6-Trichlorophenol	0.12
2,4,5-T	0.10

Analyte Definitions

Acid Herbicides in Water - AsureQuality Method (GC-MS)

Analyte	Full Name
2,4-D	(2,4-Dichlorophenoxy)acetic acid
2,4-DB	4-(2,4-Dichlorophenoxy)butanoic acid
MCPA	(4-Chloro-2-methylphenoxy)acetic acid
MCPB	4-(4-Chloro-2-methylphenoxy)butanoic acid
2,4,5-T	(2,4,5-Trichlorophenoxy)acetic acid

LOR = Limit of Reporting LOD = Limit of Detection NR = Not Reportable

Appendix III

DAS Annual Stormwater Report 2017-2018

Agriculture Division of DowDuPont™

DowAgroSciences (NZ) Ltd

Stormwater Discharge Report

1 July 2017 – 30 June 2018

Consent No. 4108-2

20 September 2018

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2 Introduction

Discharge of stormwater from the Paritutu Site is subject to the conditions detailed in discharge permit 4108-2 issued by the Taranaki Regional Council.

In order to comply with these conditions, stormwater from the production plant, dangerous goods storage compound, despatch store, incinerator, and roads in these areas is directed to stormwater retention ponds. The water collected in these ponds is sampled and analysed before being released. The sampling, analysis and release procedures are outlined in standard operating procedures.

Drainage from process areas is segregated from non-process areas to reduce the potential for contamination of stormwater. Areas around storage tanks and process equipment, located outside buildings in the production area, are contained by bunding. This water is discharged to the site trade waste system.

Stormwater from the southern part of the site drains directly to the New Plymouth District Council stormwater drain and then to the Herekawe Stream. This part of the site is a predominantly open grassed area surrounding a parking area, two storage buildings, and the access road to the site. Specific controls for stormwater from the storage buildings and storage tank bunds are in place to direct stormwater to the trade waste system.

There are four stormwater retention ponds on the site:

Concrete stormwater retention pond: SV9100

Stormwater enters this system through a series of under/over separators and then discharges into SV9100. This pond collects water from the production plant and roads in this area.

Concrete stormwater retention pond: SV9000

When SV9100 is full, the water overflows into SV9000. This pond collects water from the production plant and roads in this area.

HDPE stormwater retention pond: SV9200

This pond collects stormwater from the incinerator and roads in this area. Stormwater in this pond is discharged through SV9100 when it is empty.

HDPE stormwater retention pond: SV8000

This pond collects stormwater from the despatch and dangerous goods areas and roads in this area.

3 Changes Made During the Year

3.1 Stormwater System Changes

Other than carrying out routine maintenance, no physical changes were made to the stormwater system during the period.

3.2 Consent Changes

No consent changes occurred during the reported period.

4 Monitoring & Discharge

4.1 Conditions

Performance Criteria

1. *Adopting best practicable option to prevent or minimise any adverse effects on the environment.*
2. *Stormwater discharge from catchment area of no more than 16 hectares.*
3. *Compliance with the stormwater management plan (standard operating procedure) at all times.*
4. *Records of stormwater sampling, analysis and discharge shall be kept and made available for review by the Taranaki Regional Council.*
5. *After allowing for a mixing zone of 25 metres from the point of discharge, the discharge shall not give rise to any of the following effects on the Herekawe Stream:*
    a. *the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;*
    b. *any conspicuous change in the colour or visual clarity;*
    c. *any emission of any objectionable odour;*
    d. *any significant adverse effects on aquatic life.*
6. *Discharge shall not exceed the following limits prior to the entry of stormwater into the Herekawe Stream:*

Total phenoxy herbicides	*0.10*	*mg/L*
Total organophosphates	*0.0005*	*mg/L*
Triclopyr	*0.10*	*mg/L*
Picloram	*0.10*	*mg/L*
Glyphosate	*0.10*	*mg/L*
Oxyfluorfen	*0.005*	*mg/L*
pH	*6.0 – 9.0*	

7. *The consent may be reviewed in 2014 and 2020.*

4.2 Monitoring

Stormwater collected in the four stormwater retention ponds is sampled and analysed before release to the Herekawe Stream.

In the rare event that stormwater does not meet the release criteria, the Company will identify the source of the contamination so corrective actions can be implemented to prevent a reoccurrence. Prompt attention is given to the containment and clean-up of any spills/leaks on site.

If an incident occurs and impacts the standard management of the stormwater system the Company will discuss the specific details and obtain the any necessary approvals from the Taranaki Regional Council, before any action is taken. Water may be treated, or an alternative method of disposal identified such as, seeking approval from the New Plymouth District Council to pump to the site trade waste system.

4.3 Results

There were a total of 185 discharges from the stormwater retention ponds to the Herekawe Stream, during the monitoring period of 1 July 2017 to 30 June 2018.

On all occasions (100%) the conditions of the discharge consent were met, that is, there were no breaches of the consent conditions. For details refer to Appendix 1 attached to this report.

5 Biological Monitoring

5.1 Conditions

Performance Criteria

Discharge shall not cause an adverse biological impact on the receiving water.

5.2 Monitoring

The Taranaki Regional Council has undertaken regular biomonitoring of the Herekawe Stream to assess the impact stormwater discharges from industrial sites in the area have on the stream bed fauna and microflora. The surveys have been carried out at six monthly intervals since April 1986.

Three sites are sampled during each survey period:

(a) Upstream of Centennial Drive culvert and stormwater discharges;
(b) Downstream of stormwater discharges and approximately 75m above the coast; and
(c) Downstream of stormwater discharges and approximately 50m above the coast.

5.3 Results

Results from the biological monitoring studies are held by the Taranaki Regional Council.

6 General

6.1 Stormwater Quality Inspections

Regular stormwater quality inspections, including collection of stormwater samples for inter-laboratory testing, were undertaken by officers of the Taranaki Regional Council during 1 July 2017 to 30 June 2018.

6.2 Incident Review

During the monitoring year (1 July 2017 to 30 June 2018) there were zero incidents resulting in breaches of the discharge resource consent conditions.

7 Appendices

Appendix 1: Stormwater discharged to the Herekawe Stream (2017-18)

Appendix IV

Biomonitoring reports

To	Scott Cowperthwaite & Callum MacKenzie, Job Managers
From	Darin Sutherland, Environmental Scientist
Doc No	2081176
Report No	DS098
Date	2 July 2018

Biomonitoring of the Herekawe Stream in relation to the Omata Tank Farm and other stormwater discharges, surveyed in February 2018

Introduction

This biological survey was the second of two scheduled for the Herekawe Stream in the 2017-2018 monitoring year to assess whether there had been any detrimental effects on the Herekawe Stream from stormwater discharges originating from STOS, DowAgro Sciences, Chevron, Origen Energy and NPDC. The results from surveys performed since the 2001-02 monitoring years are discussed in reports referenced at the end of this report.

Methods

The standard '400 ml kick-net' technique was used to collect streambed macroinvertebrates at a 'control' site and another downstream site in the Herekawe Stream (Table 1, Figure 1) on 8 February 2018. The 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001).

Table 1 Biomonitoring sites in the Herekawe Stream in relation to stormwater discharges

Site No	Site code	Grid reference	Location
1	HRK000085	E1688283 N5674972	Upstream of Centennial Drive culvert and stormwater discharges
2	HRK000094	E1688201 N5675010	Downstream of stormwater discharges, approx. 75 m above coast

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

Table 2 Macroinvertebrate abundance categories

Abundance category	Number of individuals
R (rare)	1-4
C (common)	5-19
A (abundant)	20-99
VA (very abundant)	100-499
XA (extremely abundant)	500+

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly `sensitive' taxa were assigned the highest scores of 9 or 10, while the most `tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. By averaging the scores obtained from a list of taxa collected from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. A gradation of biological water quality conditions based upon MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985 and Boothroyd and Stark, 2000) (Table 3). More 'sensitive' communities inhabit less polluted waterways. A difference of 10.83 units or more in MCI values is considered significantly different (Stark 1998).

Table 3 Macroinverbrate health based on MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2015) from Stark's classification (Stark, 1985 and Boothroyd and Stark, 2000)

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

A semi-quantitative MCI value ($SQMCI_s$) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these products, and dividing by the sum of the loading factors (Stark, 1998 & 1999). The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA). Unlike the MCI, the $SQMCI_s$ is not multiplied by a scaling factor of 20, so that its corresponding range of values is 20x lower, ranging from 0 to 10 $SQMCI_s$ units. A difference of 0.83 units or more in $SQMCI_s$ values is considered significantly different (Stark 1998).

Figure 1 Biomonitoring sites in the Herekawe Stream

Results

Site habitat characteristics and hydrology

This summer survey was performed under very low flow conditions (approximately mean annual low flow), 34 days after a fresh in excess of 3 times median flow and 92 days after a fresh in excess of 7 times median flow (flow gauge at the Mangaoraka River at Corbett Rd). The survey followed a dry summer period. The water temperature was 17.9°C at both sites. At site 1 the water speed was steady, water uncoloured and clear while at site 2 the water speed was slow, water brown and dirty.

The channel at site 1 was narrow and constrained by gabion baskets on the banks and bed of the stream where the substrate was comprised mainly of sand with some fine and coarse gravels. The stream at this site had no periphyton mats but there was widespread filamentous algae. There was patchy wood and macrophytes were recorded on the edge of the streambed. The substrate at site 2 was also comprised mainly of sand. The site can periodically be affected by salt water intrusion under high tide and low flow conditions. There was no periphyton mats or filamentous algae. Woody debris was widespread and macrophytes were recorded on the edge of the streambed.

Macroinvertebrates

A number of surveys have been performed previously at these two sites. Results of the current and past surveys are summarised in Table 4 and the results of the current survey presented in Table 5.

Table 4 Results of the current and previous surveys (since April 1986) performed at sites 1 and 2 in the Herekawe Stream in relation to the Omata Tank Farm and other stormwater discharges

Site No.	N	No of taxa			MCI value			$SQMCI_s$ value		
		Median	Range	Current survey	Median	Range	Current survey	Median	Range	Current survey
1	64	18	11-29	20	87	68-100	85	4.0	1.7-4.8	3.9
2	64	16	9-22	16	73	54-97	66	3.7	1.7-4.5	3.8

Table 5 Macroinvertebrate fauna of the Herekawe Stream in relation to Omata Tank Farm and other stormwater discharges sampled on 8 February 2018

Taxa List	Site Number	MCI score	1	2
	Site Code		HRK000085	HRK000094
	Sample Number		FWB18041	FWB18042
NEMERTEA	Nemertea	3	R	-
ANNELIDA (WORMS)	Oligochaeta	1	C	C
MOLLUSCA	*Physa*	3	-	R
	Potamopyrgus	4	VA	VA
CRUSTACEA	Ostracoda	1	C	R
	Isopoda	5	-	R
	Paracalliope	5	A	C
	Paranephrops	5	R	-
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	C	-
	Coloburiscus	7	R	-
PLECOPTERA (STONEFLIES)	*Megaleptoperla*	9	R	-
HEMIPTERA (BUGS)	*Anisops*	5	-	R
	Sigara	3	-	A
COLEOPTERA (BEETLES)	Elmidae	6	C	-
	Hydrophilidae	5	-	C
TRICHOPTERA (CADDISFLIES)	*Hydrobiosis*	5	R	-
	Psilochorema	6	R	-
	Oxyethira	2	C	R
	Triplectides	5	R	C
DIPTERA (TRUE FLIES)	*Aphrophila*	5	R	-
	Eriopterini	5	-	R
	Chironomus	1	R	R
	Orthocladiinae	2	C	R
	Polypedilum	3	R	R
	Tanypodinae	5	R	-
	Tanytarsini	3	-	R
	Austrosimulium	3	A	-
		No of taxa	20	16
		MCI	85	66
		SQMCIs	3.9	3.8
		EPT (taxa)	6	1
		%EPT (taxa)	30	6
'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa		

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

Site 1 (upstream of stormwater discharges)

A moderate macroinvertebrate community richness of 20 taxa was found at site 1 ('control' site) at the time of the summer survey. This was two taxa higher than the historical median for this site (18 taxa) and one taxon lower than the previous survey (21 taxa) on October 2017 (Table 4, Figure 2).

The MCI score of 85 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) to the historical median MCI score of 87 units and the preceding survey (83 units).

The $SQMCI_S$ score of 3.9 units was not significantly different (Stark, 1998) to the median MCI score of 4.0 units and to the preceding survey (3.7 units) (Stark, 1998) (Table 4).

The community was characterised by two 'tolerant' taxa [snails (*Potamopyrgus*) and sandflies (*Austrosimulium*)] and one 'moderately sensitive' taxon [amphipod (*Paracalliope*)] (Table 5).

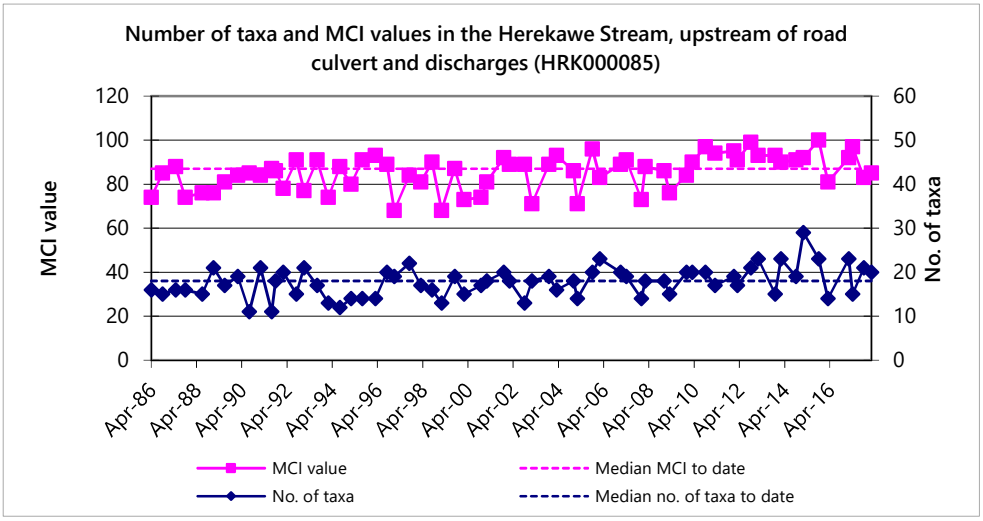

Figure 2 Number of taxa and MCI values in the Herekawe Stream upstream of the Centennial Road culvert since monitoring began in 1986

Site 2 (downstream of stormwater discharges)

A moderate macroinvertebrate community richness of 16 taxa was found at site 2 ('impact' site). This was the same as the historical median (16 taxa) for this site and one taxon higher than the previous survey (15 taxa) (Table 4, Figure 3).

The MCI score of 66 units indicated a community of 'poor' biological health which was not significantly different (Stark, 1998) to the historical median (73 units) but was significantly lower than the preceding survey (84 units).

The $SQMCI_S$ score of 3.8 units was not significantly different to median MCI score of 3.7 units or the preceding survey (4.0 units) (Stark, 1998) (Table 4).

The community was characterised by two 'tolerant' taxa [snails (*Potamopyrgus*) and water boatman (*Sigara*) (Table 5).

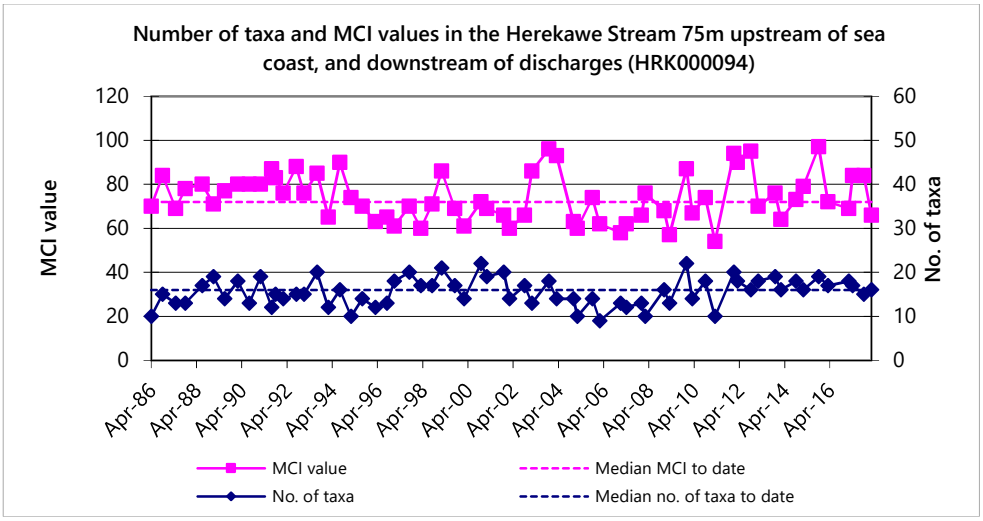

Figure 3 Number of taxa and MCI values in the Herekawe Stream downstream of industrial stormwater discharges since monitoring began in 1986

Discussion and conclusions

Macroinvertebrate richnesses at both sites were moderate and similar to historic medians. The 'control' site (site 1) was four taxa higher than the 'impact' site (site 2) but the overall difference was negligible indicating that there had been no significant toxic charges occurring preceding the survey. The higher taxa number recorded at site 1 was probably due to greater habitat diversity than was present at site 2 (e.g. larger range of substrate types) at the time of the survey. Taxa richness is the most robust index when ascertaining whether a macroinvertebrate community has been exposed to toxic discharges such as petrochemicals that could be discharged by the Omata Tank Farm. Macroinvertebrates when exposed to toxic chemicals may die and be swept downstream or deliberately drift downstream as an avoidance mechanism (catastrophic drift). The lack of any discernible impact on taxa richness at site 2 strongly indicates that no toxic discharges have been occurring.

MCI scores indicated that the 'control' site was in 'fair' health while the 'impact' site was in 'poor' health. There was a significant decrease in MCI score by 19 units at the 'impact' site. This reflected previous surveys as the historic median for the 'impact' site is significantly lower than the 'control' site by 14 units. The main difference between the two sites was the amount of EPT taxa at the 'control' site (six taxa) compared with the 'impact' site (one taxa). This reflected the better habitat quality at the 'control' site which had some gravels and cobbles while the 'impact' site substrate was nearly completely comprised of sand with a minor amount of silt. Furthermore, the 'impact' site is in very close proximity to the sea and could suffer from saline intrusion during very high tides.

The $SQMCI_s$ can be more sensitive to organic pollution compared with the MCI. Both sites had $SQMCI_s$ scores that indicated 'poor' health. The scores were not significantly different from each other and to historic medians. This suggested no difference in macroinvertebrate health between the 'control' and 'impact' sites. None of the EPT present at the 'control' site were abundant and thus only had a minor influence on the $SQMCI_s$ score.

The community composition between the two sites had some similarities such as high numbers of snails as would be expected given there proximity to each other and similar to previous survey results (see DS075). Also, in keeping with previous results, the community composition also suggests that site 2 is more lentic (pond like) than site 1. This is shown by the presence of slower flowing water favouring species at site 2 such as water boatmen (*Sigara*) and backswimmers (*Anisops*) which were present at site 2 but not recorded at site 1, though differences were not as pronounced as they have been in previous surveys (e.g. DS075).

Overall, the results indicate that stormwater discharges have not been significantly affecting the macroinvertebrate community at site 2.

Summary

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

Taxa richness is the most robust index when ascertaining whether a macroinvertebrate community has been exposed to toxic discharges. Macroinvertebrates when exposed to toxic chemicals may die and be swept downstream or deliberately drift downstream as an avoidance mechanism (catastrophic drift). The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_S$ takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities. It may be the more appropriate index if non-organic impacts are occurring. Significant differences in either taxa richness, community composition, the MCI or $SQMCI_s$ between sites may indicate the degree of adverse effects (if any) of the discharges being monitored.

There was a typical, moderate taxa richness at both sites indicating that stormwater discharges were not toxic to the macroinvertebrate community present at the 'impact site'.

MCI scores indicated that the 'control' site was in 'fair' health while the 'impact' site was in 'poor' health and there was a significant decrease between the two sites which is typical for these sites and was likely due to differences in habitat between the two sites, probably in relation to substrate type and possibly seawater inundation. $SQMCI_s$ scores were very similar between sites and to historic medians which suggested that there had been no deterioration in water quality due to stormwater discharges at the bottom site.

This summer macroinvertebrate survey indicated that the discharge of treated stormwater and discharges from the Omata Tank Farm or Dow Agro Sciences sites was highly unlikely to have had a significant effect on the macroinvertebrate communities of the stream.

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To	Job Managers, Scott Cowperthwaite & Callum MacKenzie
From	Scientific Officer, Darin Sutherland
Doc No	2030713
Report No	DS083
Date	29 March 2018

Biomonitoring of the Herekawe Stream in relation to the Omata Tank Farm and other stormwater discharges, surveyed in October 2017

Introduction

This biological survey was the first of two scheduled for the Herekawe Stream in the 2017-2018 monitoring year to assess whether there had been any detrimental effects on the Herekawe Stream from stormwater discharges originating from STOS, DowAgro Sciences, Chevron, Origen Energy and NPDC. The results from surveys performed since the 2001-02 monitoring years are discussed in reports referenced at the end of this report.

Methods

The standard '400 ml kick-net' technique was used to collect streambed macroinvertebrates at a 'control' site and another downstream site in the Herekawe Stream (Table 1, Figure 1) on 24 October 2017. The 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001).

Table 1 Biomonitoring sites in the Herekawe Stream in relation to stormwater discharges

Site No	Site code	Grid reference	Location
1	HRK000085	E1688283 N5674972	Upstream of Centennial Drive culvert and stormwater discharges
2	HRK000094	E1688201 N5675010	Downstream of stormwater discharges, approx. 75 m above coast

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

Table 2 Macroinvertebrate abundance categories

Abundance category	Number of individuals
R (rare)	1-4
C (common)	5-19
A (abundant)	20-99
VA (very abundant)	100-499
XA (extremely abundant)	500+

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly `sensitive' taxa were assigned the highest scores of 9 or 10, while the most `tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. By averaging the scores obtained from a list of taxa collected from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. A gradation of biological water quality conditions based upon MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985 and Boothroyd and Stark, 2000) (Table 3). More 'sensitive' communities inhabit less polluted waterways. A difference of 10.83 units or more in MCI values is considered significantly different (Stark 1998).

Table 3 Macroinverbrate health based on MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2015) from Stark's classification (Stark, 1985 and Boothroyd and Stark, 2000)

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

A semi-quantitative MCI value ($SQMCI_s$) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these products, and dividing by the sum of the loading factors (Stark, 1998 & 1999). The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA). Unlike the MCI, the $SQMCI_s$ is not multiplied by a scaling factor of 20, so that its corresponding range of values is 20x lower, ranging from 0 to 10 $SQMCI_s$ units. A difference of 0.83 units or more in $SQMCI_s$ values is considered significantly different (Stark 1998).

Figure 1 Biomonitoring sites in the Herekawe Stream

Results

Site habitat characteristics and hydrology

This spring survey was performed under moderate flow conditions (approximately median flow), 10 days after a fresh in excess of 3 times median flow and 11 days after a fresh in excess of 7 times median flow (flow gauge at the Mangaoraka River at Corbett Rd). The survey followed a relatively wet summer period with several freshes recorded over the preceding month. The water temperature was 15.9°C at site 1 and 14.8°C at site 2. At site 1 the water speed was steady, water uncoloured and clear while at site 2 the water speed was steady, water uncoloured and clear.

The channel at site 1 was narrow and constrained by gabion baskets on the banks and bed of the stream where the substrate was comprised mainly of sand with some fine and coarse gravels. The stream at this site had no periphyton mats but there was patchy filamentous algae. The substrate at site 2 was also comprised mainly of sand. The site can periodically be affected by salt water intrusion under high tide and low flow conditions. There was no periphyton mats or filamentous algae.

Unlike the previous survey where macrophytes were recorded at both sites no macrophytes were recorded during the current survey. It appeared that recent large freshes had scoured the streambed of macrophytes.

Macroinvertebrates

A number of surveys have been performed previously at these two sites. Results of the current and past surveys are summarised in Table 4 and the results of the current survey presented in Table 5.

Table 4 Results of the current and previous surveys (since April 1986) performed at sites 1 and 2 in the Herekawe Stream in relation to the Omata Tank Farm and other stormwater discharges

Site No.	N	No of taxa			MCI value			$SQMCI_s$ value		
		Median	Range	Current survey	Median	Range	Current survey	Median	Range	Current survey
1	63	18	11-29	21	87	68-100	83	4.0	1.7-4.8	3.7
2	63	16	9-22	15	72	54-97	84	3.7	1.7-4.5	4.0

Table 5 Macroinvertebrate fauna of the Herekawe Stream in relation to Omata Tank Farm and other stormwater discharges sampled on 24 October 2017

Taxa List	Site Number	MCI score	1	2
	Site Code		HRK000085	HRK000094
	Sample Number		FWB17310	FWB17311
ANNELIDA (WORMS)	Oligochaeta	1	C	C
	Lumbricidae	5	R	-
MOLLUSCA	Potamopyrgus	4	A	XA
CRUSTACEA	Ostracoda	1	-	R
	Paracalliope	5	R	A
	Talitridae	5	R	-
	Paratya	3	-	C
	Paranephrops	5	R	-
EPHEMEROPTERA (MAYFLIES)	Austroclima	7	C	-
	Coloburiscus	7	R	-
	Nesameletus	9	-	R
	Zephlebia group	7	-	C
PLECOPTERA (STONEFLIES)	Zelandobius	5	R	-
COLEOPTERA (BEETLES)	Elmidae	6	C	R
	Dytiscidae	5	-	R
	Staphylinidae	5	R	-
TRICHOPTERA (CADDISFLIES)	Hydropsyche (Aoteapsyche)	4	R	-
	Hydrobiosis	5	R	-
	Oxyethira	2	R	R
	Triplectides	5	-	C
DIPTERA (TRUE FLIES)	Aphrophila	5	C	R
	Chironomus	1	R	-

Taxa List	Site Number	MCI score	1	2
	Site Code		HRK000085	HRK000094
	Sample Number		FWB17310	FWB17311
	Orthocladiinae	2	A	A
	Polypedilum	3	C	C
	Empididae	3	R	-
	Ephydridae	4	R	-
	Austrosimulium	3	R	-
ACARINA (MITES)	Acarina	5	-	C
		No of taxa	21	15
		MCI	83	84
		SQMCIs	3.7	4.0
		EPT (taxa)	5	3
		%EPT (taxa)	24	20

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

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

Site 1 (upstream of stormwater discharges)

A moderate macroinvertebrate community richness of 21 taxa was found at site 1 ('control' site) at the time of the spring survey. This was three more than the historical median for this site (18 taxa) and six taxa more than the previous survey (15 taxa) on April 2017 (Table 4, Figure 2).

The MCI score of 83 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) to the historical median MCI score of 88 units but significantly lower than the preceding survey (97 units). It should be noted that the preceding survey score of 97 units was only three units off the maximum score ever recorded for the site (100 units).

The $SQMCI_S$ score of 3.7 units was not significantly different (Stark, 1998) to the median MCI score of 4.0 units, but was significantly lower than the preceding survey (4.8 units) (Stark, 1998) (Table 4).

The community was characterised by two 'tolerant' taxa [snails (*Potamopyrgus*) and orthoclad midges] (Table 5).

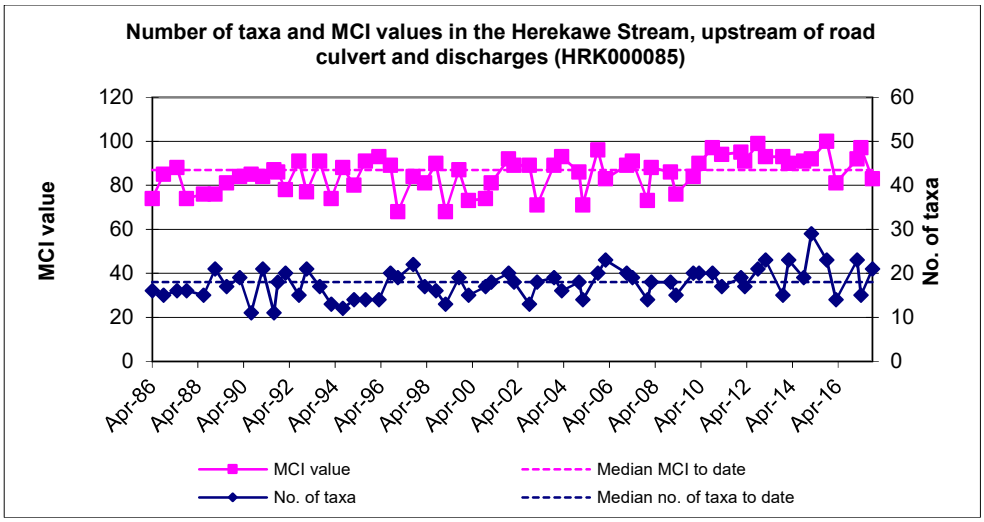

Figure 2 Number of taxa and MCI values in the Herekawe Stream upstream of the Centennial Road culvert since monitoring began in 1986

Site 2 (downstream of stormwater discharges)

A moderate macroinvertebrate community richness of 15 taxa was found at site 2 ('impact' site). This was one less than the historical median (16 taxa) for this site and one taxon lower than the previous survey (18 taxa) (Table 4, Figure 3).

The MCI score of 84 units indicated a community of 'fair' biological health which was significantly higher (Stark, 1998) than the historical median (72 units) by 12 units and the same as the preceding survey (84 units).

The $SQMCI_S$ score of 4.0 units was not significantly different to median MCI score of 3.7 units or the preceding survey (3.7 units) (Stark, 1998) (Table 4).

The community was characterised by two 'tolerant' taxa [snails (*Potamopyrgus*) and orthoclad midges] and one 'moderately sensitive' taxon [amphipod (*Paracalliope*)] (Table 5).

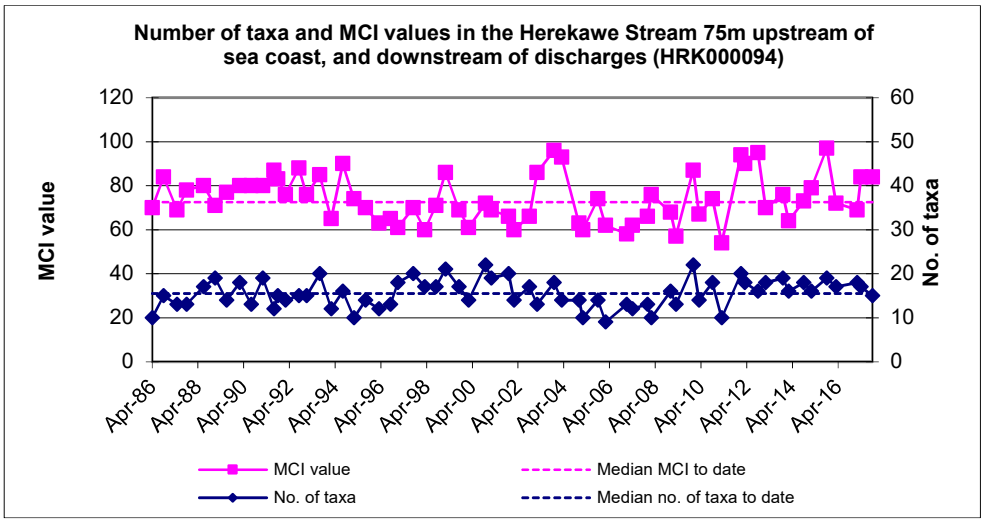

Figure 3 Number of taxa and MCI values in the Herekawe Stream downstream of industrial stormwater discharges since monitoring began in 1986

Discussion and conclusions

Macroinvertebrate richness at the 'control' site (site 1) was six taxa higher than the 'impact' site (site 2) but the 'impact' site had a moderate taxa richness indicating that there had been no significant toxic charges occurring

preceding the survey. The higher taxa number recorded at site 1 was probably due to greater habitat diversity than was present at site 2 (e.g. larger range of substrate types) at the time of the survey. Furthermore, taxa richness at both sites was similar to the historical medians (1-3 taxa different). Taxa richness is the most robust index when ascertaining whether a macroinvertebrate community has been exposed to toxic discharges such as petrochemicals that could be discharged by the Omata Tank Farm. Macroinvertebrates when exposed to toxic chemicals may die and be swept downstream or deliberately drift downstream as an avoidance mechanism (catastrophic drift). The lack of any discernible impact on taxa richness at site 2 strongly indicates that no toxic discharges have been occurring.

MCI scores indicated that both sites had 'fair' macroinvertebrate health. Site 2 ('impact' site) had a MCI score that was significantly higher than the historical median (by 12 units) and the same as the preceding survey, indicating that there had been a significantly period of better than normal macroinvertebrate health at the site. Furthermore, there was a very slight increase in MCI score from the 'control' site to the 'impact' site indicating no real difference in macroinvertebrate health between the two sites.

The $SQMCI_s$ can be more sensitive to organic pollution compared with the MCI. Both sites had $SQMCI_s$ scores not significantly different from historic medians and there was a slight non-significant increase in score from site 1 to site 2, congruent with the MCI result.

The community composition between the two sites had some similarities such as high numbers of snails and orthoclad midges as would be expected given there proximity to each other and similar to previous survey results (see DS075). Also, in keeping with previous results, the community composition also suggests that site 2 is more lentic (pond like) than site 1, as evidenced by the presence of slower flowing water favouring species at site 2 such as the diving beetle, *Dytiscidae* and seed shrimp (Ostracods), which was present at site 2 but not recorded at site 1 though differences were not as pronounced as they have been in previous surveys (e.g. DS075).

There was no evidence that stormwater discharges have been having a toxic effect on the macroinvertebrate community at site 2. There were no significant differences in MCI and $SQMCI_s$ scores between sites and only a small difference in taxa number probably related to habitat differences.

Summary

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

Taxa richness is the most robust index when ascertaining whether a macroinvertebrate community has been exposed to toxic discharges. Macroinvertebrates when exposed to toxic chemicals may die and be swept downstream or deliberately drift downstream as an avoidance mechanism (catastrophic drift). The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_S$ takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities. It may be the more appropriate index if non-organic impacts are occurring. Significant differences in either taxa richness, community composition, the MCI or $SQMCI_s$ between sites may indicate the degree of adverse effects (if any) of the discharges being monitored.

There was a typical, moderate taxa richness at both sites indicating that stormwater discharges were not having a toxic effect on macroinvertebrate communities.

There was a slight increase in MCI and $SQMCI_s$ scores from the upstream 'control' site to the downstream 'impact' site, indicating that there had been no deterioration in water quality due to stormwater discharges at the bottom site.

This spring macroinvertebrate survey indicated that the discharge of treated stormwater and discharges from the Omata Tank Farm or Dow Agro Sciences sites was highly unlikely to have had a significant effect on the macroinvertebrate communities of the stream.

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Appendix V

DAS Annual Air Discharge Report 2017-2018

Agriculture Division of DowDuPont™

DowAgroSciences (NZ) Ltd

Air Discharge Report

1 July 2017 – 30 June 2018

Consent No. 4020-4.0

20 September 2018

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Appendix 1 Dow AgroSciences (NZ) Ltd, New Plymouth, Air Discharge Monitoring of the Herbicides Plant, November 2017, Source Testing New Zealand Limited, issued December 2017. 17

2 Introduction

Dow AgroSciences (NZ) Ltd formulates agricultural chemicals at the New Plymouth site. All sources of air emissions from the Dow AgroSciences site are permitted by Air Discharge Permit (Consent 4020-4.0) granted and monitored by the Taranaki Regional Council ("TRC").

This report details the following for the 2017-18 year:

(a) The results obtained from all air quality monitoring undertaken during the year
(b) A description of changes to processes, emission control technology, consent conditions and products made during the year
(c) A description of any consultation undertaken during the year and any views put forward by those consulted

3 Changes Made During the Year

3.1 Process Changes

During the 2017-18 year, nine new products were introduced to the site. All are finished products for distribution only and are not manufactured on site. These were notified to the Taranaki Regional Council at the time:

(a) Botran® 75WP
(b) DuPontTM Acanto® Fungicide
(c) DuPontTM Classic® Herbicide
(d) DuPontTM Curzate® Fungicide
(e) DuPontTM Fontelis® Fungicide
(f) DuPontTM Kocide® OptiTM Fungicide/bactericide
(g) DuPontTM Lannate® L Insecticide
(h) DuPontTM Talendo® Fungicide
(i) DuPontTM ZorvecTM EnicadeTM Fungicide

3.2 Emission Control Technology Changes

No changes were made to emission control equipment during the year.

3.3 Permit Changes

During the 2017-18 year, the three-yearly review of the Air Discharge Management and Monitoring Plan (ADMMP) was completed in accordance with Special Condition 11 of the consent.

Changes included:

(a) Change of monitoring frequency for Commodity Herbicides Plant from annually to two-yearly as a result of volume changes.
(b) Minor changes to:
    a. align discrepancies between various sections of the ADMMP
    b. align management tools referenced with updated tools to be implemented.
    c. Correct descriptions to align with processes used

3.4 Monitoring Changes

During the 2017-18 year, the following monitoring changes were made.

(a) High Temperature Incinerator
    a. The high temperature incinerator underwent upgrades to its burner management system and repair of its refractory during the year. As a consequence it was fully operational for only 22 days during the year and operated on liquids only for a further 70 days.
    b. Permission was sought and received from the Taranaki Regional Council to waive vent monitoring of the Incinerator for the 2017-2018 year.
(b) Commodity Herbicides Plant
    a. As part of the three-yearly ADMMP review, the frequency of monitoring frequency for Commodity Herbicides Plant was

changed from annually to two-yearly. This change resulted in no monitoring for Commodity Herbicides during 2017-2018.

4 Process Vents

4.1 Permit Conditions

Special Condition 2

The discharges authorised by this consent shall not give rise to any odour, or dust emissions, at or beyond the boundary of the site that is offensive or objectionable.

Special Condition 3

The discharge of contaminants to air, other than from the High Temperature Incinerator Stack (see conditions 4 and 5) shall be controlled to ensure that the maximum ground level concentrations off-site do not exceed:

(a) Subject to condition 3(b), the relevant air quality limits listed in schedule 1 of this consent and assessed using the process set out in Schedule 3; and
(b) In the case of emissions due to raw materials or formulations introduced to the site after this consent commences, limits developed in accordance with the approach set out in schedule 2 and assessed using the process set out in Schedule 3

Special Condition 14

For any air monitoring undertaken, the following conditions apply:

(a) If a measured air quality parameter would result, or has resulted in, air quality that is 25% or less of the relevant limit referred to in condition 3, then no action is required.

Subsequent sub-clauses (b) to (d) outline actions for results of 25% and higher.

4.2 Insecticides Plant (Vent No. 03-5)

Permit Conditions

Emission Component:	Chlorpyrifos
Air Quality Limit from Schedule 1:	0.57 µg/m^3 (annual average)
Dilution Factor from Schedule 3:	232,000 (annual average)
Maximum Stack Concentration:	132,240 µg/m^3

Sampling Plan

This vent was last monitored in 2016-17, and is next scheduled to be monitored in 2018-19.

The formulating and packing activities carried out during the reporting period were typical for the Insecticides Plant.

Plant Operating Conditions

Chlorpyrifos is an organophosphate active ingredient used in liquid insecticide formulations. Chlorpyrifos is obtained in a solid form and melted in a hot water bath before use. Chlorpyrifos is pumped into a vessel containing solvent(s) and emulsifiers. The product is mixed, transferred to a bulk tank and packed.

Emissions may occur during the melting and pump-out of the active ingredient and during the packing of finished product.

Local exhaust ventilation removes vapour from the drum pump-out station, the top of the blending vessel, the bulk tank and the pack-off point. The extracted air is passed through a wet scrubber (BS1400) containing alkaline sodium hypochlorite solution before being vented to atmosphere.

The process technician monitors the condition of the scrubber solution. Results are logged and are available for inspection during visits by officers of the Taranaki Regional Council**.**

Conclusion

Operation of the Insecticides Plant processes and air treatment system is consistent with the 2016-17 year. Monitoring carried out in the 2016-17 year gave results less than 0.002% of the discharge consent maximum stack for chlorpyrifos.

This indicates the performance of the Insecticides Plant meets the conditions of the air discharge permit.

4.3 Suspension Concentrates Plant (Vent No. BB600)

Permit Conditions

Emission Components:	Spinosad Spinetoram
Air Quality Limit from Schedule 1:	4 µg/m3 Spinosad (annual average) 6 µg/m3 Spinetoram (annual average)
Dilution Factor from Schedule 3:	513,000 (annual average)
Maximum Stack Concentration:	2,052,000 µg/m3 Spinosad 3,078,000 µg/m3 Spinetoram

Sampling Plan

This vent was last monitored in 2016-17, and is next scheduled to be monitored in 2018-19.

The formulating and packing activities carried out during the reporting period were typical for the Suspension Concentrates Plant.

Plant Operating Conditions

Spinosad and spinetoram are naturally produced metabolites from living organisms and are the active ingredients used in several liquid insecticide formulations. Spinosad and spinetoram are obtained in a solid form and loaded into a vessel containing solvent(s) and emulsifiers. The product is mixed and packed.

The process ventilation system extracts air from the loading hood and blender area. The process air passes through a bag filter, pre-filter and absolute filter before discharge.

The process technician monitors the condition of, and the pressure across, the filters. Results are logged and are available for inspection during visits by officers of the Taranaki Regional Council**.**

Conclusion

Operation of the Suspension Concentrates Plant processes and air treatment system is consistent with the 2016-17 year. Monitoring carried out in the 2016-17 year gave results less than 0.0001% of the discharge consent maximum stack concentration for spinetoram.

This indicates the performance of the Suspension Concentrates Plant meets the conditions of the air discharge permit.

4.4 Granulated Herbicides Plant (Vent No. 03-14)

Permit Conditions

Emission Components:	Picloram
Air Quality Limit from Schedule 1:	57 µg/m^3 Picloram acid, esters and salts (annual average)
Dilution Factor from Schedule 3:	432,000 (annual average)
Maximum Stack Concentration:	24,624,000 µg/m^3 Picloram

Sampling Plan

This vent was last monitored in 2016-17, and is next scheduled to be monitored in 2018-19.

The formulating and packing activities carried out during the reporting period were typical for the Granulated Herbicides Plant.

Plant Operating Conditions

Picloram is a herbicide active ingredient used in a granule formulation. Picloram is obtained in a solid form and neutralised in solution with either amine or potassium hydroxide before being mixed with and dried onto inert granules.

The process ventilation system extracts air from the loading hood, blender and packing area. The process air passes through a bag filter and absolute filter before discharge. Product caught on the filters is returned to the following batches.

The process technician monitors the condition of, and the pressure across, the filters. Results are logged and are available for inspection during visits by officers of the Taranaki Regional Council.

Conclusion

Operation of the Granulated Herbicides Plant processes and air treatment system is consistent with the 2016-17 year. Monitoring carried out in the 2016-17 year gave results of 0.0000003% of the discharge consent maximum stack concentration for picloram.

This indicates the performance of the Granulated Herbicides Plant meets the conditions of the air discharge permit.

4.5 Herbicides Plant (Vent No. 03-8)

Permit Conditions

Emission Components:	2,4-D (acid and ester) Haloxyfop-R methyl ester
Air Quality Limit from Schedule 1:	2 µg/m^3 2,4-D acid, esters and salts (annual average) 0.06 µg/m^3 haloxyfop-R methyl ester (annual average)
Dilution Factor from Schedule 3:	107,000 (annual average)
Maximum Stack Concentration:	214,000 µg/m^3 2,4-D (acid and ester) 6420 µg/m^3 haloxyfop-R methyl ester

Sampling Plan

An Air Quality Scientist with STNZ (Source Testing New Zealand Limited, Wellington) was commissioned by Dow AgroSciences (NZ) Ltd to undertake air discharge monitoring of the Herbicides Plant, coordinate the analyses of the samples with an accredited laboratory and prepare a report.

For details of the sampling methodology and quality control refer to Appendix 1: *Dow AgroSciences (NZ) Ltd, New Plymouth, Air Discharge Monitoring of the Herbicides Plant, November 2017, Source Testing New Zealand Limited, issued December 2017*.

The packing activities carried out during the sampling period were typical for the Herbicides plant.

Plant Operating Conditions

The process ventilation system extracts air from the packing area. The process air passes through pre-filters followed by activated carbon filters before discharge.

The process technician monitors the condition of the pre-filters and activated carbon filters. Results are logged and are available for inspection during visits by officers of the Taranaki Regional Council.

Air Discharge Monitoring Results

For details of the Herbicides Plant air discharge monitoring results refer to Appendix 1.

Three (3) samples were collected for 2,4-D ethylhexyl ester from the Herbicides Plant vent during the batch formulating and packaging of 2,4-D ethylhexyl ester based products over the period 14th to 15th November 2017.

The maximum concentration of 2,4-D ethylhexyl ester in the air discharged from the vent was 0.7 µg/m^3 (corrected to 0°C, 101.3 kPa dry gas basis).

Conclusion

Under normal operating conditions, the maximum emission of 2,4-D ethylhexyl ester from the Herbicides Plant vent (#03-8) was 0.7 µg/m^3; which is 0.0003% of the discharge consent maximum stack concentration of 214,000 µg/m^3 for 2,4-D ethylhexyl ester.

This indicates the performance of the Herbicides Plant meets the conditions of the air discharge permit.

4.6 Commodity Herbicides Plant (Vent No. 48-1)

Permit Conditions

Emission Components:	MCPA (acid and salt)
Air Quality Limit from Schedule 1:	10 µg/m^3 MCPA acid, esters and salts (annual average)
Dilution Factor from Schedule 3:	29,000 (annual average)
Maximum Stack Concentration:	290,000 µg/m^3 MCPA (acid)

Sampling Plan & Methods

This vent was last monitored in 2016-17, and is next scheduled to be monitored in 2018-19.

The production and formulating activities carried out during the sampling period were typical for the Commodity Herbicides Plant.

Plant Operating Conditions

MCPA acid is reacted with amine (dimethylamine) to produce an aqueous solution of the amine salt. It is tested and transferred to a bulk tank to be packed in the Herbicides Plant at a later date.

The process ventilation system extracts air from the loading hood and process areas. The process air passes through a caustic scrubber and activated carbon filter before discharge.

The process technician monitors the condition of the caustic scrubber and the activated carbon filters. Results are logged and are available for inspection during visits by officers of the Taranaki Regional Council.

Conclusion

Operation of the Commodity Herbicides Plant processes and air treatment system is consistent with the 2016-17 year. Monitoring carried out in the 2016-17 year gave results of 0.0003% of the discharge consent maximum stack concentration for MCPA.

These results indicate the performance of the Commodity Herbicides Plant meets the conditions of the air discharge permit.

5 Multiple Sources of an Individual Contaminant

Schedule 3

Where multiple sources of an individual contaminant are involved, individual stack concentrations for that contaminant will be determined to ensure the air quality is complied with on a cumulative basis

Applicable Situations

There are three substances that have the potential to have multiple sources: 2,4-D, MCPA and clopyralid. These materials are used in the Herbicides Plant and the Commodity Herbicides Plant.

However, the discontinuation of esterification in the Commodity Herbicides Plant in 2015-16 has meant that each of these compounds is now predominantly used in only one plant at a time.

During 2017-18 no indicator compound monitored was common between the two plants.

Conclusion

This requirement had no application during the 2017-18 year.

6 Incinerator

6.1 Permit Conditions

Special Condition 4

The total concentration of polychlorinated dibenzodioxins and polychlorinated dibenzofurans in any discharge from the High Temperature Incinerator Stack shall not exceed 0.1 nanograms per cubic metre (adjusted to 0 degrees Celsius, dry gas basis, 101.3 kPa pressure and 11% oxygen) when calculated as total toxic equivalents using the World Health Organisation 2005 toxic equivalence factors.

Special Condition 5

The rate of discharge of total halides from the High Temperature Incinerator Stack shall not exceed 1.5 kg/hr.

Special Condition 6

There shall be no incineration of plastics and packaging that contain brominated flame retardants.

Special Condition 8

The oxygen concentration within the secondary combustion chamber of the incinerator shall be maintained between 6% and 9% (by volume) as far as is practicable, and shall not be less than 4.5% (by volume) for more than 60 seconds at any time during the incineration of material during any 24-hour period.

Special Condition 9

The temperature in the secondary chamber of the High Temperature Incinerator shall not be less than 1100 degrees Celsius at any time during the incineration of waste.

Special Condition 10

The temperature of the exhaust gas from the High Temperature Incinerator shall not be less than 1000 degrees Celsius at any time during the incineration of waste.

6.2 High Temperature Incinerator (Vent No. 64-1)

Sampling Plan & Methods

The high temperature incinerator underwent upgrades to its burner management system and repair of its refractory during the year. As a consequence it was fully operational for only 22 days during the year and operated on liquids only for a further 70 days.

As a consequence, permission was sought and received from the Taranaki Regional Council to waive vent monitoring of the Incinerator for the 2017-2018 year. Consequently no monitoring was conducted during the year.

The waste incinerated during the sampling programmes was typical of waste disposed of through the incinerator.

Incinerator Operating Conditions

The high temperature incinerator typically operates up to seven days/week and up to 24 hours/day, for the majority of the year. It is used to burn solid and liquid waste from the formulating and packaging plants. This waste includes all chemically contaminated materials including: packaging, contaminated drums, used protective clothing and production plant wastes. The liquids nozzle allows the burning of liquid wastes such as wash water.

Every day the high temperature incinerator is operated a log sheet is completed during the day detailing various operating parameters and including the times at which waste was placed in the high temperature incinerator, the quantity and a description of the waste. The primary and secondary chamber temperatures, and stack gas oxygen and carbon monoxide concentrations are continuously monitored and recorded on a chart which is attached to each log sheet at the completion of the "burn". Process messages and alarms are printed and this is attached to each log sheet. This information is retained for future reference and available for inspection during visits by officers of the Taranaki Regional Council. All information relating to the operating conditions during the sampling runs is also retained.

Conclusion

For the periods of time the incinerator was fully operational during the year, the waste burnt and control systems were consistent with the 2016-17 year. Monitoring carried out in the 2016-17 year gave results of:

(a) maximum emission of PCDD/PCDF of 0.00558 ng/m^3 WHO-TEQ, which is less than the discharge consent limit of 0.1 ng/m^3 WHO-TEQ (corrected for 0°C, 101.3 kPa, 11 % O_2, dry gas basis).
(b) maximum emission of Total Halides from the incinerator stack of 0.205 kg/hr, which is below the discharge consent limit of 1.5 kg/hr.

These results indicate the performance of the Incinerator meets the conditions of the air discharge permit.

7 General

7.1 Air Quality Inspections

Officers of the Taranaki Regional Council undertook regular air quality inspections during the period.

7.2 Incident Review

During the monitoring year (1 July 2017 to 30 June 2018) there were zero incidents resulting in breaches of the discharge resource consent conditions.

7.3 Consultation

Consultation was carried out with both the Taranaki Regional Council and the Taranaki Medical Officer of Health during the three-yearly review of the Air Discharge Management and Monitoring Plan, as required by Special Condition

8 Appendices

Appendix 1 Dow AgroSciences (NZ) Ltd, New Plymouth, Air Discharge Monitoring of the Herbicides Plant, November 2017, Source Testing New Zealand Limited, issued December 2017.