

New Plymouth District Council
Crematorium
Monitoring Programme
Annual Report
2015-2016

Technical Report 2016-14

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Executive summary

The New Plymouth District Council (NPDC) operates a crematorium located on Junction Road, New Plymouth. Two gas-fired cremators are operated. This report for the period July 2015 to June 2016 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess NPDC's environmental performance during the period under review, and the results and environmental effects of NPDC's activities.

NPDC holds one resource consent relating to the crematorium, which include a total of 22 conditions setting out the requirements that NPDC must satisfy.

The Council's monitoring programme for the period under review included five inspections focussing on process control and possible visible emissions and odours.

The monitoring showed that, generally, consent compliance has been good. In the 2015-2016 monitoring period, there was one unauthorised incident registered with regard to visible emissions being discharged from the crematorium site. No complaint about the crematorium was received from the public. Due to the nature of activities at a crematorium site, the discharge of visible smoke or odours from a cremator may be found to be offensive.

During the reporting period, NPDC demonstrated a good level of environmental performance with the resource consent.

For reference, in the 2015-2016 year, 71% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 24% demonstrated a good level of environmental performance and compliance with their consents.

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

This report includes recommendations for the 2016-2017 year.

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1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This Annual report is for the period July 2015 to June 2016 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consent held by New Plymouth District Council (NPDC) to cover emissions to air from NPDC's crematorium on Junction Road (State Highway 3) at New Plymouth.

Since 1 October 1991, with the enactment of the *Resource Management Act 1991* (RMA), the Council has been the agency with primary responsibility for air quality management in the Taranaki region. Early in 1992, the Council initiated air quality monitoring programmes for industries holding discharge permits, and has subsequently issued and monitored air discharge permits for a number of other industrial and trade premises.

The Council began monitoring the New Plymouth crematorium in 1998. This report is the nineteenth annual report to be prepared by the Council to cover the crematorium air discharge and its effects.

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 through annual programmes;
- the resource consents held by NPDC in relation to the crematorium, the nature of the monitoring programme in place for the period under review;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted in NPDC 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 2016-2017 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 NPDC, 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 NPDC'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.
- **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 2015-2016 year, 71% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 24% demonstrated a good level of environmental performance and compliance with their consents.

1.2 Process description



Figure 1 Location of New Plymouth crematorium

The New Plymouth crematorium has been operating at its site on Junction Road (Figure 1), 5 km south of the city, since 1961. It was the only crematorium in the Taranaki region until March 2009, when of W Abraham Ltd crematorium commenced operation at Bell Block. Approximately 300 cremations are undertaken annually.

The propane gas-fired Newton Mark IV cremator was installed in 1997 to replace the original diesel-fired unit which, from then on, was used only as a back-up and for long coffins in about five cremations per year.

The diesel cremator failed in July 2003, and NPDC decided to replace it with a second gas-fired cremator. After investigation of various options and consultation with the Council, a change of consent 5205 was granted to provide for the (additional) operation of an Elecfurn HH2500 gas-fired cremator. The Elecfurn cremator was commissioned on 10 October 2005.

The number of cremations during 2015-2016, and preceding years is presented in Figure 2.

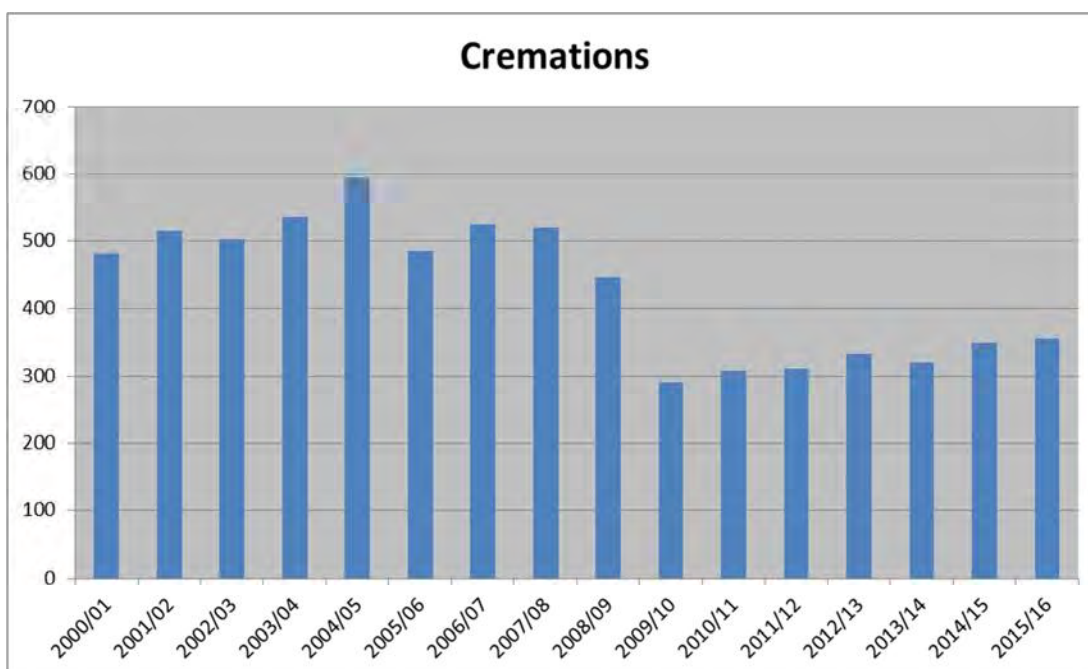


Figure 2 Annual number of cremations at New Plymouth Crematorium, July 2000 to June 2016

As can be shown on the graph in Figure 2 the establishment of the crematorium of W Abraham Ltd crematorium resulted in a substantial reduction in the number of cremations in 2009-2010 at the NPDC crematorium, and numbers remained similar at just over 325 cremations during the preceding years with 356 cremations carried out in the 2015-2016 period.

1.2.1 Newton cremator

The Newton cremator is designed to comply with the criteria of the United Kingdom Environmental Protection Act (PG 5/2 95). It is a fully automatic unit that needs minimal operator involvement. It is pre-heated, charged and monitored until it is ready for removal of ash. Structurally, it consists of two combustion zones. A secondary chamber is wrapped around the primary combustion chamber. Some of the heat generated during the cremation process is transferred through the walls, arch and floor of the primary chamber to the secondary chamber by thermal conductivity. This increases fuel efficiency and increases the ability of the system to maintain consistent and high temperatures throughout both zones.

The primary and secondary chamber burners, and eight different air suppliers, are modulated by a microprocessor controller to achieve optimum conditions. Another (third) burner was installed in the second chamber in November 2007 to maintain more uniform temperature and allow more rapid heat-up.

The computer controller will not allow the cremator to be charged unless the temperature in the secondary chamber reaches 650°C and a two-second residence time is achieved. Data on residence time, emission levels, furnace pressure and rates of temperature change are used to continuously check and adjust controls to ensure maximum efficiency.

A feature of the Newton cremator is a water curtain charging system. This spray system retards the start of the cremation process until the charge door is closed, and allows higher operating temperatures to be maintained. Benefits include increased operator safety and a reduction of the smoking effect of heavily varnished coffins. Higher temperatures can also be controlled using the water curtain system.

The exhaust flue from the Newton cremator initially was connected to the old brick flue for the diesel cremator. A long connecting duct, which had two sharp bends, led to reduced combustion efficiency and occasional smoking. A new 8-metre high flue for the Newton, with a more efficient flow path, was installed in June 2004. The high discharge point of the flue ensures that all ground-level concentrations are well below the recommended guideline levels. Controlled dilution air is provided at two points in the exhaust ducting of the Newton cremator. Exhaust velocities are therefore high and flue temperatures are quite low.

The average cremation time for the Newton cremator is 70 minutes.

During the first few minutes after a highly polished coffin is introduced into the cremator, flammable coatings are ignited. This can lead to excessive cremation temperatures, which result in the products of combustion moving too quickly through the secondary combustion chamber to be consumed, causing transient visible and odorous emissions.

Odours emanating from a crematorium site may occur if inefficient combustion (especially at low temperature) or burner lockout occurs during the later stages of the cremation. Close monitoring of the cremation process is needed to avoid releases, as any odour emitted is likely to be found offensive.

Emissions of heavy metals from the cremation process are not likely to be significant due to the low numbers of cremations occurring at the site per year. The only probable source is mercury from dental amalgams.

1.2.2 Elecfurn cremator

The Elecfurn HH-2500 is a hot hearth medium volume machine that, like the Newton machine, operates a gas-fired two-chamber controlled pyrolysis combustion process. A difference from the Newton is that the initial heat-up time is faster, being about 40 minutes rather than two hours, but the cycle time is longer, having a cremation time of about 90 minutes and requiring a 25-minute cool down prior to the next cremation (45 minutes longer than the Newton). This makes the Elecfurn the more efficient when only one cremation is performed in a day, but less efficient when consecutive cremations are performed because of longer cycle time and its higher gas usage rate.

The Elecfurn is equipped with two fully modulating nozzle mixing gas burners, one each in the primary and secondary chambers, both controlled by a PLC. Three other modulating valves control hearth air, secondary addition air and flue eductor air. Like the Newton, an opacity (smoke) sensor is fitted for control and monitoring of visible emissions. The position of the opacity sensor is different to that of the Newton, being at the outlet of the secondary chamber rather than after the dilution air eductor.

A separate stack is installed for the Elecfurn machine, 10.3 metres in height, with a dedicated sampling port.

1.3 Resource consents

1.3.1 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.

NPDC holds air discharge permit **5205** to discharge emissions into the air from the operation of a crematorium including a Newton cremator and the supplementary operation of an Elecfurn HH2500 cremator. This permit was issued by the Council on 4 December 1997 under Section 87(e) of the RMA.

Consent 5205-1 expired June 2014. Council initiated a review of consent in July 2014 and consent 5205-2 was granted 12 May 2015.

Condition 1 requires adoption of the best practicable option to prevent or minimise any actual or likely adverse effects on the environment.

Condition 2 requires that the procedures and requirements set out in the consent application be followed, except when there is a conflict between such matters and the resource consent. In the case of conflict, the consent prevails.

Condition 3 requires that the consent holder consult with Council before carrying out any alterations which may change the nature, quantity or concentration of contaminants emitted from the site.

Condition 4 requires that Council be notified at least 24 hours before any maintenance relevant to exercise of the consent.

Condition 5 requires that the consent holder will operate, maintain, supervise, monitor and control all processes so that emissions authorised by this consent are maintained at a practicable minimum.

Conditions 6-7 relate to configuration of ducting and stacks.

Condition 8 addresses the reduction and minimisation of combustion of materials likely to generate unacceptable emissions, such as PVC.

Conditions 9 places temperature controls on the primary chamber to prevent the cremators doors from opening until temperature conditions have been met.

Condition 10 refers to the minimum stack height for the discharge of exhaust emissions from the cremators.

Condition 11 this condition address the requirements for the time and temperature within the secondary chamber for allowing complete combustion of the gases.

Conditions 12-13 addresses visible emissions, allowing no more than two one-minute periods per cremation of smoke of opacity more than 20% (Elec furn cremator) and 2% (Newton cremator) on the Ringlemann Scale.

Condition 14 requires continuous monitoring and recording of exhaust gas temperature.

Condition 15 requires the consent holder shall maintain the schedule of maintenance and calibration of each unit including but not limited to its controlling, recording, and monitoring equipment and systems.

Condition 16-17 places limits on emission rate of specified air pollutants at a rate or quantity that is liable to be hazardous or toxic or noxious beyond the boundary.

Condition 18-19 specifies that no discharge from the premises shall give rise to a ground level odour which is offensive or obnoxious or objectionable.

Condition 20 require and defines commissioning source emission testing on discharges from the cremator.

Condition 21 requires the provision on request from Council of all monitoring, calibration and process control data regarding operation of the cremator.

Condition 22 is a review of the consent conditions.

The permit is attached to this report in Appendix I.

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 crematorium consisted of two 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 reviews;

- renewals;
- new consents;
- advice on the Council's environmental management strategies and content of regional plans and;
- consultation on associated matters.

1.4.3 Site inspections

The crematorium was visited five times during the 2015-2016 monitoring period. The inspections focused on actual and potential emissions and characteristics, including potential odour, visible or offensive emissions. Sources of data being collected by the consent holder 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.

2. Results

2.1 Inspections

The crematorium was inspected at approximately three to four monthly intervals over the 2015-2016 review period with cremations being undertaken at the time of inspection on all occasions. The performance of the cremators was discussed with the operators. Particular attention was given to detection and cause(s) of any visual or odorous emissions.

In general, both cremators were operating satisfactorily, although a mechanical problem developed with the Newton Cremator causing visible emissions being observed. The Newton cremator had been used for the majority of cremations carried out and the Elecfurn cremator was used mainly as a back up.

A follow-up re-inspection was carried out after repairs had been made on the Newton Cremator to check any visual or odorous emissions.

24 July 2015

Routine compliance monitoring found the Newton Cremator operating. Temperature, obscuration and oxygen readings were all within limits. There were no visible emissions, nor was odour, detected at the time of inspection - only a slight heat haze emitting from the flue stack being observed.

The Elecfurn Cremator was to be used for the second cremation of the day. The Elecfurn Cremator started a warm-up phase at 1320 hrs but was soon shut down as the primary air valve was showing 'not closed' and the cremator door remained open. A restart (warm up) was initiated towards the end of inspection.

Compliance was achieved with all related consent conditions.

13 November 2015

The Newton Cremator had reached operating temperature prior to inspection. Temperature, obscuration and oxygen readings were all within limits. No visible emissions, nor odour were detected throughout the inspection - only a clear visible heat haze emitting from the flue stack.

The Elecfurn Cremator was waiting on computer parts for the burner management system therefore was not available for service.

Compliance was achieved with all related consent conditions.

19 February 2016

The Elecfurn Cremator was loaded and programmed for 2 hours at the time of inspection.

Temperature, obscuration and oxygen readings were all within operating parameters throughout the inspection. There were no visible emissions. Odours were not detected during the inspection, apart from slightly noticeable, occasional, wafts. A clear visible heat haze was emitting from the flue stack.

The Newton Cremator was not available for use as scaffolding had been erected above the cremator to replace the windows and ceiling in the building.

Compliance was achieved with all related consent conditions.

26 May 2016

The Newton Cremator was loaded and programmed for a two hour period. Temperature, obscuration and oxygen readings were all initially showing normal operating parameters within the first 11 minutes of cremation.

The obscuration reading rapidly increased over the following 20 minutes peaking at 63.4 % then declining to 9.25 % and shortly thereafter returning to normal (5 minutes).

During this period dark grey black smoke was emitting from the Newton stack and blowing in an easterly direction (towards the LPG tanks). Smoke was also swirling around at ground level.

This was in breach of special conditions 13 & 17 of resource consent **5205-2**.

Special Consent Condition 13

In any one cremation cycle of the Newton cremator, not more than two one-minute averages of the opacity readings shall exceed 2% obscuration or Ringelmann Scale 1.

Special Consent Condition 17

The consent holder shall control all emissions to the atmosphere from the site of contaminants other than those expressly provided for under special condition 16, in order that they do not individually or in combination with other contaminants cause a hazardous, noxious, dangerous, offensive or objectionable effect at or beyond the boundary of the property.

NPDC were aware the cremator had a mechanical problem with the refractory bricks near the after burners which was causing a blockage. Austeng (Australian contractors) were scheduled to make repairs the following month.

Incident number IN/33307 was initiated.

15 June 2016

Re-inspection in regards to incident IN/33307 (26 May 2016).

This re-inspection was carried out during overcast weather conditions with a moderate south westerly wind blowing.

The Newton Cremator temperature, obscuration and oxygen readings were all showing normal operating parameters for the first 28 minutes of cremation after which the obscuration reading momentarily peaked at 2% then declining rapidly to 0% soon after.

During this period light grey smoke was emitting from the Newton stack and was noted to be going directly skyward, quickly dissipating, followed by a heat haze. Although the obscuration peaked at 2%, it was considered to not be a breach of special conditions 13 and 17 of resource consent **5205-2**.

NPDC were still urgently waiting for repairs to the refractory bricks near the after burners.

The Council was satisfied with the letter of explanation received from NPDC on 14 June 2016.

2.1.1 Cremator maintenance

Service report received from NPDC

There were a total of 356 cremations carried out at the NPDC Crematorium during the 2015-2016 monitoring period. Of these cremations 250 were performed via the Newton Cremator and 106 cremations were via the Elecfurn Cremator.

Newton Cremator:

Refractory contractors were on site to repair a fallen arch under the main floor that had been dislodged. All floor blocks in the main chamber broke on removal therefore new blocks had to be made up and reinstalled. The cremator was out of action until mid-January 2016.

Austeng Australia was on site for an annual service. All components were checked and a new door seal was fitted.

Refractory contractors were onsite for four days to repair wall blocks on the left front, under the main floor of the cremator. A new arch support and arch were fitted as well as new floor blocks. A thermal dry out took three days and the cremator was back in service on 24 January 2016.

All three thermocouples were replaced and new wiring was installed.

Refractory contractors removed some floor blocks for inspection for a possible collapse of brick work in the back lower chamber of the cremator. Nothing was found but a further inspection will occur at a later date.

Contractors replaced a faulty pressure switch as the cremator would not light.

Elecfurn Cremator:

Two new floor bricks were fitted by NPDC staff.

A new computer was installed as the original computer had failed.

Refractory contractors were onsite to carry out an inspection of brickwork in the cremator.

2.2 Cemeteries and crematoria by-law

The NPDC bylaw contains a part on cemeteries and crematoria. The bylaw was revised during the 2007-2008 reporting period. An updated NPDC bylaw 2008, made under the *Local Government Act 2002*, came into force on 1 July 2008.

Part 3 of the bylaw deals with Cemeteries and Crematoria. Resource consent 5205 is attached as an appendix. Items that have particular relevance to the exercise of a resource consent to emit to air from crematoria are detailed below:

13 General conditions of cremation

13.1(e) *Any person may be cremated in a crematorium if the council has received a declaration from the funeral director or the person presenting the body that to the best of his or her knowledge the casket contains no substances prohibited under the part.*

13.5 *The authorised officer may require the removal of any casket furnishings prior to cremation and these shall be disposed of in such a manner as the council or an authorised officer decides.*

14 Style, design and material of any casket in which a person is to be cremated

14.1 *A casket for cremation:*

b) shall be constructed from materials that will when combusted not exceed the crematorium's Taranaki Regional Council Air discharge permit (attached to this part as Appendix 2) or any subsequent amendment of the discharge permit or include any of the materials listed in Appendix 1 of this part;

f) shall not contain any bottle, can or other thing or object which may explode or release carcinogens into the atmosphere, cause the crematorium to exceed its air discharge permit from the Taranaki Regional Council, or cause harm or damage to persons or property during cremation.

14.3 *Materials that are unsuitable for combustion in the course of a cremation may be used on the exterior of a casket if they can be removed easily prior to cremation.*

15 The council may make rules relating to cemeteries and cremation

15.1 *The council may from time to time, by resolution, make rules relating to one or more cemeteries and crematoria on the following matters:*

j) items prohibited from cremation.

Appendix I to the bylaw (which is for information only) contains a list of items prohibited from cremation. The list includes, among other things, die cast metals/aluminium/copper (large items only), mattresses, and PVC in all forms.

2.3 Investigations, interventions, and incidents

The monitoring programme for the year was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with the consent holder. During the year matters may arise which require additional activity by the Council, for example provision of advice and information, or investigation of potential or actual courses 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 NPDC 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 2015-2016 monitoring period, the Council was required to undertake an additional inspection in regard to an air discharge incident. This was in relation to a breach of special conditions 13 and 17 of resource consent **5205-2**.

3. Discussion

3.1 Discussion of site performance

Inspections by the Council over the 2015-2016 period found on-site management to be high and operation of the cremation facility to be good. Conditions on consent 5205 in respect of site operations and management were mostly complied with apart from an air discharge breach of special conditions 13 and 17 of resource consent **5205-2**.

The air consent breach was caused by collapsed refractory bricks inhibiting sufficient air flow allowing complete combustion which caused the Newton Cremator to emit black smoke.

During the 2015-2016 monitoring period the Newton Cremator required significant refractory repairs. The cremator was out of service for several days. The Elecurn cremator's computer was replaced and minor refractory work was completed.

The establishment of a second crematorium in the region resulted in a substantial reduction in the number of cremations in 2009-2010 at the NPDC crematorium, and numbers remained similar averaging 325 cremations during the proceeding years with 356 cremations being carried out during the 2015-2016 period.

3.2 Environmental effects of exercise of consents

The Taranaki Crematorium operated by the NPDC is located on Junction Road, 5 km south of the city of New Plymouth. The present site of the crematorium is regarded as a suitable site to fulfil the needs of the community and NPDC.

The crematorium site is surrounded primarily by Council land, the majority of which is in forestry. The site is isolated from the major residential areas and continues to be in respect to rural zone management. State Highway 3 passes by the crematorium. This is the only road in the immediate vicinity. There are a few dwellings in the vicinity of the site on the neighbouring water treatment plant site (Council-owned) near the crematorium boundary.

3.2.1 Neighbourhood

During this 2015-2016 reporting period no complaint was received via the public regarding emissions from the crematorium.

3.2.2 Physical effects

The installation of gas-fired cremators has significantly enhanced the environmental performance of the facility. There are five potential issues surrounding the discharges to air from the Taranaki Crematorium.

(a) Visible emissions

Inefficient combustion has the potential to produce visible emissions from the exhaust stack. Under the worst circumstances there is potential for black/dark smoke to be discharged. The discharge of smoke from the old cremator system was identified as an area of concern by at least one nearby resident.

The automated system allows control of the combustion process, and conditions can be altered instantaneously. The stoichiometric fuel/air ratio, greater heat, longer combustion zone and introduction of dilution air in the exhaust stream all contribute to the positive environmental performance of the cremator.

Previously NPDC had experienced a number of technical problems with this facility and had worked closely with the manufacturer to meet its environmental goals. Infrequently the crematorium has experienced difficulties meeting its 'free from visible smoke' condition in its consent.

(b) Odour

Odours emanating from a crematorium site are also likely to be found offensive and possibly emotionally disturbing. Again, inefficient combustion (especially at low temperature) can lead to odour discharges. Improved combustion processes associated with the new, tightly controlled, cremator has led to minimal odour being produced.

(c) Toxic by-products

The production of toxic by-products, such as heavy metals and dioxins, is a concern with many combustion processes. The AEE provided by NPDC clarifies this issue, stating that:

Dioxins are removed due to the complete combustion process and particularly the secondary chamber system that ensures full and controllable combustion. The cremation process is not considered a significant source for heavy metal by-products.

(d) Particulate deposition

The reported low opacity of the smoke discharge from the two gas-fired cremators indicates low levels of particulates. The controlling computer monitors particulate levels and displays these on the screen at all times. The cremators are controlled so that they operate below the consent limit of 80 ppm. At this level it is not expected that there will be any adverse effects, such as the visible deposition of particulate either off or on the crematorium site.

(e) Nitrogen and sulphur oxides

Nitrogen and sulphur oxides are often by-products of the combustion process.

Monitoring conducted by the Council in February and March 1999 has shown that the crematorium does not have any significant impact on nitrogen oxides levels in the vicinity.

The adverse effects from the NPDC's crematorium have potential to be marked given the sensitive nature of crematorium activities and social attitudes. The requirement for an efficient combustion system is emphasised with regard to minimising these effects. Maintenance of an efficient combustion process is therefore a paramount consideration of crematorium management.

3.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Table 1.

Table 1 Summary of performance for Consent 5205

Purpose: To discharge emissions into the air from the operation of a crematorium		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option to minimise adverse effects	Inspections and liaison with consent holder	Yes
2. Exercise in accordance with application	Inspections and liaison with consent holder	Yes
3. Approval prior to alterations to plant or processes	Inspection and liaison with consent holder	Yes
4. Notification to Council prior to maintenance	Inspection and liaison with consent holder	Yes
5. Cremator operated & maintained to prevent smoke, fumes during charging	Inspection	No
6. Duct work leak proofed	Inspection	Yes
7. Stack and duct insulation	Inspection	Yes
8. Steps to reduce and minimise combustion of certain materials	Liaison with consent holder	Yes
9. Limit on minimum temperature and time in secondary chamber	Continuous monitoring by consent holder	Yes
10. Minimum stack height	Inspection	Yes
11. Limit on minimum temperature in secondary chamber at charging	Continuous monitoring by consent holder	Yes
12. Limit on opacity Elecfern cremator	Monitoring by consent holder and inspection by Council	Yes
13. Limit on opacity Newton cremator	Monitoring by consent holder and inspection by Council	No
14. Continuously record outlet temperature of gases	Continuous monitoring by consent holder	Yes
15. Maintain a maintenance / calibration schedule	Liaison with consent holder	Yes
16. Limits on emission components	Monitoring by Council and NPDC (if required)	Yes
17. Limits on emission components	Monitoring by Council and NPDC (if required)	Yes
18. No offensive odour beyond boundary	Inspection	Yes
19. No offensive odour beyond boundary	Inspection	Yes
20. Commissioning source emission tests	As requested by Council (if required)	N/A

Purpose: To discharge emissions into the air from the operation of a crematorium		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
21. Provision of monitoring results	Liaison with consent holder	Yes
22. Optional review provision	(5205-2 was granted 12 May 2015), next review 2020	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

During the 2015-2016 year, New Plymouth District Council demonstrated a Good level of environmental performance and High level of administrative performance with the resource consents as defined in Section 1.1.4.

3.4 Recommendations from the 2013-2015 Biennial Report

In the 2013-2015 Biennial Report, it was recommended:

THAT monitoring of air emissions from the New Plymouth crematorium in the 2015-2016 year continue as three-monthly inspections, at the same level as in 2014-2015.

3.5 Alterations to monitoring programmes for 2015-2016

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

- the extent of information made available by previous authorities;
- its relevance under the RMA;
- its obligations to monitor emissions/ discharges and effects under the RMA; and
- to report 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 emitting to the atmosphere/ discharging to the environment.

It is proposed that for 2016-2017 monitoring programme remain at the same level as the 2015-2016 monitoring programme.

A recommendation to this effect is attached to this report.

3.6 Exercise of optional review of consent

Resource consent 5205-2 provides for an optional review of the consent in June 2020. Condition 22 allows the Council to review the consent for the purpose of:

- a) adding, amending or deleting any limit on discharge or ambient concentrations or any contaminant or contaminants; and/or

- b) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment caused by any discharge to the environment; and/or
- c) requiring the consent holder to install, calibrate and/or maintain any monitoring and/or recording device to monitor combustion conditions or environmental performance of the cremators; and/or
- d) ensuring that the conditions are adequate to deal with any significant adverse effects of the discharge on the environment arising from the exercise of this consent which were not foreseen at the time the application was considered.

4. Recommendations

THAT monitoring of air emissions from the New Plymouth crematorium in the 2016-2017 year continue at a similar level as to during the 2015-2016 monitoring period.

Glossary of common terms and abbreviations

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

g/m ³	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
Incident register	The incident register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
PM ₁₀	Relatively fine airborne particles (less than 10 micrometre diameter).
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	<i>Resource Management Act 1991</i> and including all subsequent amendments.

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

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- New Plymouth District Council Bylaw (2008): Part 3, Cemeteries and Crematoria, [http://www.newplymouthnz.com/Council/Council-Documents/Bylaws/Bylaw2008 Part3CemeteriesandCrematoria.htm](http://www.newplymouthnz.com/Council/Council-Documents/Bylaws/Bylaw2008%20Part3CemeteriesandCrematoria.htm)
- Stockholm Convention on Persistent Organic Pollutants 2001: <http://chm.pops.int/>; http://chm.pops.int/Portals/0/Repository/batbep_guideline08/UNEP-POPS-BATBEP-GUIDE-08-12.English.PDF
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- Taranaki Regional Council (1999): New Plymouth District Council Crematorium Monitoring Programme Annual Report 1998-1999. Technical Report 99-03
- Taranaki Regional Council (1997): Regional Air Quality Plan for Taranaki
- United Kingdom Department of Environment (1991): Environmental Protection Act 1990, Part 1 – Secretary of State’s Guidance – Crematoria – PG5/2(91) February 1991

Appendix I

**Resource consent held by
New Plymouth District Council**

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

Name of
Consent Holder: New Plymouth District Council
Private Bag 2025
New Plymouth 4342

Decision Date: 12 May 2015

Commencement Date: 12 May 2015

Conditions of Consent

Consent Granted: To discharge emissions into the air from the operation of a
crematorium

Expiry Date: 1 June 2032

Review Date(s): June 2020, June 2026

Site Location: 629 Junction Road, New Plymouth

Legal Description: 1696418E-5669150N

Grid Reference (NZTM) Pt Lot 1 DP 8125 Blk X Paritutu SD
(Discharge source & site)

*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 at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or likely adverse effects on the environment arising from discharges to air from the site.
2. The consent holder shall undertake the activity in general accordance with the application for this consent (5205-2.0) and the application for the expired consent (5205-1.0). If there is a conflict between the applications the later application shall prevail, and if there is a conflict between the applications and consent conditions the conditions shall prevail.
3. Prior to undertaking any alterations to the plant, process, or operations, which may significantly change the nature or quantity or concentration of contaminants emitted from the site, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991 and any amendments.
4. The consent holder shall notify the Chief Executive, Taranaki Regional Council, at least 2 working days before any maintenance that may affect or include the calibration, monitoring, or process control of the cremators. Notification shall include the consent number and a brief description of the work to be done, and be emailed to worknotification@trc.govt.nz.
5. The consent holder shall at all times operate, maintain, supervise, monitor and control all processes so that emissions authorised by this consent are maintained at a practicable minimum.
6. The cremators and all duct work shall be maintained leak proof and gas tight to prevent the discharge of gases from the duct work or cremator, other than through the stack.
7. The stack flue and duct work leading to the stack shall be adequately insulated to avoid, as far as practicable, the condensation of liquids or the formation of soot smuts.
8. The consent holder shall take all reasonable steps to reduce and minimise the quantity of materials (such as PVC, metals, and other materials listed in the guidelines published by the Australasian Cemeteries and Crematoria Association (May 2004): *Contents of coffins delivered for cremation*) combusted within the cremator.

Consent 5205-2.0

9. The cremators shall be interlocked so as to prevent the introduction of a coffin to the primary chamber unless the temperature in the secondary combustion zone exceeds 650°C for the Elecfurn cremator and 720°C for the Newton cremator.
10. The minimum stack height for the discharge of exhaust emissions from the cremators shall be eight metres above ground level.
11. The incineration of the waste gases in the secondary chamber for both cremators shall be undertaken such that waste gases are held at a minimum temperature of 850°C for a minimum period of 2 seconds.
12. In any one cremation cycle of the Elecfurn cremator, not more than two one-minute averages of the opacity readings shall exceed 20% obscuration or Ringelmann Scale 1.
13. In any one cremation cycle of the Newton cremator, not more than two one-minute averages of the opacity readings shall exceed 2% obscuration or Ringelmann Scale 1.
14. The consent holder shall continuously record the temperature of gases within or at the outlet of the secondary chamber.
15. The consent holder shall maintain the schedule of maintenance and calibration of each unit including but not limited to its controlling, recording, and monitoring equipment and systems.
16. The consent holder shall control all emissions of carbon monoxide, nitrogen dioxide, fine particles (PM₁₀) and sulphur dioxide to the atmosphere from the site, in order that the maximum ground level concentration of any of these contaminants arising from the exercise of this consent measured under ambient conditions does not exceed the relevant ambient air quality standard as set out in the Resource Management (National Environmental Standards for Air Quality Regulations, 2004) at or beyond the boundary of the property.
17. The consent holder shall control all emissions to the atmosphere from the site of contaminants other than those expressly provided for under special condition 16, in order that they do not individually or in combination with other contaminants cause a hazardous, noxious, dangerous, offensive or objectionable effect at or beyond the boundary of the property.
18. The discharges authorised by this consent shall not give rise to an odour at or beyond the boundary of the site that is offensive or objectionable.

Consent 5205-2.0

19. For the purposes of special conditions 17 and 18, without restriction, an odour shall be deemed to be offensive or objectionable if:
 - a. it is held to be so in the opinion of an enforcement officer of the Taranaki Regional Council, having regard to the duration, frequency, intensity and nature of the odour; and/or
 - b. an officer of the Taranaki Regional Council observes that an odour is noticeable, and either it lasts longer than ten (10) minutes continuously, or it occurs frequently during a single period of more than one (1) hour; and/or
 - c. no less than three individuals from at least two different properties, each declare in writing that an objectionable or offensive odour was detected beyond the boundary of the site, provided the Taranaki Regional Council is satisfied that the declarations are not vexatious and that the objectionable or offensive odour was emitted from the site at the frequency and duration specified in (b). Each declaration shall be signed and dated and include:
 - i. the individuals' names and addresses;
 - ii. the date and time the objectionable or offensive odour was detected;
 - iii. details of the duration, frequency, intensity and nature of the odour that cause it to be considered offensive or objectionable;
 - iv. the location of the individual when it was detected; and
 - v. the prevailing weather conditions during the event.
20. At the written request of the Chief Executive, Taranaki Regional Council, the consent holder shall undertake emission test on discharges from the cremator. This emission testing shall:
 - a. be undertaken for all pollutants that are requested to be tested in writing by the Chief Executive, Taranaki Regional Council, for the volumetric flow of combustion gases, and for the oxygen concentration at the exit of the secondary chambers and at the test ports;
 - a. for each sample, be conducted over a complete cremation cycle, commencing as soon typical operating conditions have achieved, ending once calcining is complete, and over a period of at least one hour; and
 - b. comprise not less than three separate samples for each type of emission test undertaken, and shall have the concentration results corrected to 0 (zero) degrees Celsius, 1 (one) atmosphere pressure and on a dry gas basis.
21. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, upon request, all monitoring (including results of all tests, relevant operating parameters, raw data, all calculations, assumptions and an interpretation of the results), and calibration and process control data whether generated and held by an operator, any automated process control systems or any agent of the consent holder.

Consent 5205-2.0

22. The Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2020 and/or June 2026 for the purpose of:
- a) adding, amending or deleting any limit on discharge or ambient concentrations of any contaminant or contaminants; and/or
 - b) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment caused by any discharge to the environment; and/or
 - c) requiring the consent holder to calibrate and/or maintain any monitoring and/or recording device to monitor combustion conditions or environmental performance of the cremator including but not limited to devices for the measurement and/or recording of oxygen and/or carbon monoxide within the secondary combustion chamber and/or exhaust stack; and/or
 - d) ensuring that the conditions are adequate to deal with any adverse effects of the discharge on the environment arising from the exercise of this consent which were not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 12 May 2015

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management