

STAFF REPORT

TO: Environment & Planning Subcommittee

FROM: Leif Pigott Consent Planner Natural Resources

REFERENCE: RM090539

SUBJECT: **GARDENS OF THE WORLD LIMITED - REPORT EP9/11/11 -**
Report prepared for hearing of 23, 24 and 25 November 2009

1. INTRODUCTION

My name is Leif Pigott and I am currently employed by Tasman District Council as the Co-ordinator, Natural Resource Consents. For the record it should be noted that I worked for Environment Waikato (Waikato Regional Council) 1994-2000 where I was employed as a scientist specialising in air quality.

This report forms part of the suite of reports that assess the application submitted by Gardens of the World Ltd, and needs to be read in conjunction with the other staff reports.

This report assesses the applications to discharge contaminants to air from a crematorium. The contaminants to be discharged include particulate matter, oxides of nitrogen, sulphur dioxide and trace quantities of heavy metals, hydrogen chloride and dioxins/furans from the cremation of human remains.

There is also an application to discharge wastewater to land.

The Gardens of the World site is located on the corner of Paton Road and Clover Road. The site is about 2 kilometres from Brightwater and 4 kilometres from Richmond. The location of the crematorium is on the southern side of the formal gardens (a map is included in section 3 of this report).

Summary of the activity:

- The applicant has applied to run a crematorium, carrying out an average of six cremations per week during the day time.
- The crematorium that is fuelled by LPG with a maximum fuel usage of 80 litres per hour. The rate of fuel consumption will result in an energy release not exceed 586 KW.
- The discharge occurs via a stack that is at least 6.5 metres in height and it will be at least 1 metre above the roof. The discharge will be directly ventilated to air without any obstructions that may reduce the efflux velocity.

- The stack will be monitored to keep its opacity less than 15%, this is to ensure that normal operation does not cause any visible emission of smoke.
- The applicant will minimise the solid metal and chlorinated plastics that are cremated.

The discharge will contain combustion products from LPG (Most importantly PM₁₀ and NO₂) and the products of cremation (SO₂, HCl, dioxins, furans, and metals). The critical contaminants in terms of potential to cause adverse effects are SO₂, NO₂, PM₁₀, HCl, dioxins and furans and metals. Mercury is notable due to the volatilisation of the amalgam used for filling teeth.

The proposed discharge from the crematorium is deemed to be a discretionary activity in accordance with the discharged from industrial and trade processes Rule, 36.3.10 of the TRMP.

2. SUBMISSIONS

A total of 218 submissions were received, of which one was late and accepted. Of these submissions, 163 were supporting the application and 55 were in opposition. The following is a summary of the issues contained with the submission that related specifically to the discharge to air from the crematorium and the discharge of treated wastewater to land.

1. Emissions from the Crematorium

- Potential for the emissions from the crematorium to adversely impact on surrounding horticultural and agricultural uses on surrounding land as well as on soil, water and other rural uses of the surrounding land.
- Potential for the discharge to limit the long term diversity of use of the site.
- Amenity affects from the discharge, visual effects and odour

2. Mercury Emissions

- Several submissions raised concerns about the potential for mercury contamination to occur as a result of its release from amalgam dental fillings. The concerns included the potential to jeopardise food production from the surrounding land, to impact on vegetable growers and vineyards.

3. Waste Water Discharge to Land

- Several submissions raised concerns about the potential impact of the discharge of wastewater to land. The concerns included the contamination of groundwater.

Several submissions are in support of the application with the following comment:

- The crematorium will be non obtrusive, maintained below ground level using the latest technology with no effect on the environment.

2.2 Issues

Key issues raised in submissions relating to the emissions of the crematorium focusing on the emissions of the crematorium.

Key Issues:

1. Emissions from the crematorium
2. Mercury and its affect in the environment
3. Amenity affects from the discharge, visual effects and odour
4. Discharge of Wastewater

The decisions sought by submitters cover the complete range from granting, granting with conditions to full decline of the applications.

2. STATUTORY PROVISIONS

The application is a discretionary activity; therefore the Council must consider the application pursuant to Sections 104, 105 and 107 of the Resource Management Act 1991.

The matters for the Council to address in Section 104 are:

- Part II matters;
- the actual and potential effects on the environment of allowing the activity (Section 104 (1)(a));
- relevant objectives and policies in the Tasman Regional Policy Statement, and the Tasman Resource Management Plan (Section 104 (1) (b));
- any other matter the Council considers relevant and reasonably necessary to determine the application (Section 104 (1)(c));

The matter for the Council to have regard to in Section 105 are:

- the nature of the discharge and the sensitivity of the receiving enviornment to adverse effects;
- the applicant's reasons for the proposed choice; and
- any possible alternatives methods of discharge, including discharge into any other receiving environment.

The Council may not grant a resource consent if after reasonable mixing the contaminate or the water discharged is likely to give rise to all or any the effects listed S107 (1) (c) to (g) of the RMA.

5.1 Resource Management Act Part II Matters

In considering an application for resource consent, Council must ensure that if granted, the proposal is consistent with the purpose and principles set out in Part II of the Act.

Section 5 sets out the **purpose** of the Act which is to promote the sustainable management of natural and physical resources. "Sustainable management" means:

"Managing the use, development and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while -

- *sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
- *safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and*
- *avoiding, remedying, or mitigating any adverse effects of activities on the environment.*

Sections 6, 7 and 8 set out the **principles** of the Act:

- **Section 6** of the Act refers to matters of national importance that the Council shall recognise and provide for in achieving the purpose of the Act. There are no relevant matters.
- **Section 7** of the Act identifies other matters that the Council shall have particular regard to in achieving the purpose of the Act. Relevant matters to this application are:
 - 7(b) the efficient use and development of natural and physical resources
 - 7(c) the maintenance and enhancement of amenity values
 - 7(f) maintenance and enhancement of the quality of the environment, and
 - 7(g) any finite characteristics of natural and physical resources
- **Section 8** of the Act shall take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi). I do not anticipate that there are any relevant issues for this application in respect of Section 8.

If consent is granted, the proposed activity must be deemed to represent the sustainable use and development of a physical resource and any adverse effects of the activity on the environment are avoided, remedied or mitigated. *The critical issue of this application is whether the emissions will result in adverse effects that are more than minor.*

These principles underpin all relevant Plans and Policy Statements, which provide more specific guidance for assessing this application.

5.2 Tasman Regional Policy Statement

The Tasman Regional Policy Statement (TRPS) seeks to achieve the sustainable management of land, water and coastal environment resources. Objectives and policies of the Policy Statement clearly articulate the importance of maintenance and enhancement of the quality of soils, water and air for a range of uses and values where particulate, chemical and biological contamination pose a risk to this quality.

Because the Tasman Resource Management Plan (TRMP) was developed to be consistent with the Regional Policy Statement, it is considered that an assessment under the TRMP will satisfy an assessment against TRPS Policy Statement principles.

5.3 Tasman Resource Management Plan (TRMP)

The most relevant Objectives and Policies to this application are contained in: Chapter 5 (Site Amenity Effects), Chapter 33 (Discharges to Land and Fresh Water) and Chapter 34 (Discharges to Air).

The most relevant objectives and polices are listed below

Chapter 5

Objective 5.1.2 Avoidance, remedying or mitigation of adverse effects from the use of land on the use and enjoyment of other land and on the qualities of natural and physical resources.

Policy	
5.1.3.1	To ensure that any adverse effects of subdivision and development on site amenity, natural and built heritage and landscape values, and contamination and natural hazard risks are avoided, remedied, or mitigated.
5.1.3.2	To protect the quality of groundwater and surface water from the adverse effects of urban development and rural activities.
5.1.3.4	To limit the intensity of development where wastewater reticulation and treatment are not available.
5.1.3.5	To ensure that the characteristics, including size, soil type and topography of each lot of any proposed subdivision or built development are suitable for sustainable on-site treatment of domestic waste in unreticulated areas, particularly in areas where higher risks of adverse effects from on-site disposal of domestic wastewater exist.
5.1.3.6	To limit the use of on-site domestic wastewater disposal systems in the Special Domestic Wastewater Disposal Areas (SDWDAs) where cumulative adverse effects including degraded receiving water quality, health risks, nuisance odours, and overland flows of wastewater are likely or have been identified because of increasing system density.

5.1.3.7	To require developers to show, in any land use consent involving new on-site disposal of domestic wastewater in an SDWDA how a transition from on-site disposal to a community disposal or reticulated scheme will be made where Council has resolved to construct such a scheme within five years of the application being made.
5.1.3.9	To avoid, remedy, or mitigate effects of: (a) noise and vibration; (b) dust and other particulate emissions; (c) contaminant discharges; (d) odour and fumes;
5.1.3.11	To avoid, remedy, or mitigate the likelihood and adverse effects of the discharge of any contaminant beyond the property on which it is generated, stored, or used.
5.1.3.14	To provide sufficient flexibility in standards, terms and methods for rural sites to allow for the wide range of effects on amenities which are typically associated with rural activities, and which may vary considerably in the short or long term.

Chapter 33

Objective 33.1.0 The discharge of contaminants in such a way that avoids, remedies, or mitigates adverse effects while:

- a) maintaining existing water quality; and
- b) enhancing water quality where existing quality is degraded for natural and human uses or values.

Chapter 34

Objective 34.2.0 The discharge of contaminants to air in such a way that avoids, remedies or mitigates adverse effects while:

- a) maintaining existing air quality; and
- b) enhancing air quality where existing quality is degraded for natural or human uses or values.

Policy	
34.2.1	To ensure that any discharges of contaminants to air are undertaken in a way that avoids, remedies, or mitigates any adverse effects on the receiving environment or surrounding activities.
34.2.1A	To allow or regulate contaminant discharges to air in relation to their actual or potential contamination effects, including: (a) Adverse effects on human health. (b) Adverse effects on amenity values. (c) Contamination of adjacent sites. (d) Degradation of water quality. (e) The production of objectionable, noxious or offensive odours.

34.2.2	To provide for contaminant discharges to air while maintaining or enhancing the ambient air quality.
34.2.4	To provide for management of some actual and potential adverse effects of discharges to air - particularly odour and dust effects - as ancillary to landuse activities, and to take them into account when resource consent applications are being considered.
34.2.5	To consider other resource management techniques such as buffer areas, separation distances, landscaping or planting requirements, or covenants over the land's title as alternative means of protecting sensitive areas or activities from the adverse effects of discharges to air.
34.2.5A	To adopt the best practicable option for discharge of contaminants to air associated with activities which are temporary or informal in nature.
34.2.6A	To manage air quality to meet National Environment Standards for ambient air quality, especially in relation to concentrations of PM10.
34.2.6D	To take into account national guidelines for air quality when considering applications to discharge contaminants into the air.
34.2.6F	To take into account potential adverse effects on ambient winter-time PM10 concentrations in the Richmond Airshed of discharges to air that may enter the Richmond Airshed.

Commentary on consistency with policies and objectives of the TRMP

In my opinion the application is in general accordance with the objectives and policies of the TRMP. The objectives and policies provide for contaminant discharges to air while maintaining or enhancing the ambient air quality. The objectives and policies allow for the disposal of wastewater to land in the Special Domestic Wastewater Disposal Areas (SDWDAs) where it is adequately treated and applied to land in such a way as to avoid remedy or mitigate any adverse effects.

Relevant TRMP rules for Discharge to Air

The proposed discharge activities do not comply with the permitted activity Rule 36.3.2 of the TRMP and are deemed to be a discretionary activity in accordance with Rule 36.3.10 because the discharge is from a specified industrial and trade premises (x) Crematoria.

There are several rules which need to be examined to determine if there is any permitted baseline.

Rule 36.3.4A Discharge of contaminants from outdoor burning

The site is in the Fire Sensitive Area where the discharge from outdoor burning is permitted during the months September- May (inclusive) and the burning of plant material that needs to be burnt to stop the spread of disease or the discharge is from a kiln or forges is permitted year round.

Rule 36.3.6 Discharge from enclosed combustion processes

The permitted activity Rule 36.3.6, allows a discharge of up to 5MW in the Rural 1 zone outside the Richmond air shed subject to conditions. The application is for a maximum heat output of 0.567MW or about one ninth of the permitted activity rule for an enclosed LPG burner.

Rule 36.3.3 Discharge from small solid fuel burning appliances in urban areas and the National Environmental Standard for Wood burners

These allow a non-clean air woodburner to discharge PM₁₀ from the property as the property is greater than 2 hectares in area.

The permitted baseline test is relevant and that there are rules that allow some of the effects generated by this proposal. Of course there are also other effects which are not covered by the permitted activity rules, for example the discharge of mercury to air.

Relevant TRMP rules of Discharge of Wastewater to land

Relevant rule within the TRMP relating to the discharge of domestic wastewater to land

Rule 36.1.5. allows for the discharge of up to 2000 litres per day of wastewater to land averaged over seven days. The site is in the Special Domestic Wastewater Area and the wastewater must be treated to a secondary standard.

3. ASSESSMENT OF EFFECTS

3.1 Discharge to Air

The applicant has applied to run a crematorium fuelled by LPG, with a typical maximum number of cremations of six per week. The rate of fuel consumption will not exceed 586 KW with a maximum fuel usage of 80 litres per hour. The discharge is via a stack with a height of at least 6.5 metres and it will be at least 1 metre above the roof. The discharge will be directly ventilated to air without any obstructions that may reduce the efflux velocity.

The stack will be monitored to maintain opacity at less than 15% to ensure that normal operation does not cause any visible emission of smoke. The applicant will minimise the solid metal and chlorinated plastics that are cremated.

The discharge will be combustion products from the LPG (Most importantly PM₁₀, NO₂) and the products of cremation (SO₂, HCl, dioxins, furans, and metals). The critical contaminants in terms of potential adverse effects are SO₂, NO₂, PM₁₀, HCl, dioxins and furans and metals, notably mercury from the volatilisation of the amalgam used for filling teeth.

3.1.1 Location of the Discharge

The following figure shows the location (white circle) of the discharge with 1 metre contours.



The site of the discharge (white dot) is just to the north of an embankment that drops down to the neighbouring property. Other than the embankment the general area is generally flat.

Note: The distances from the crematorium to the residential properties quoted in section 5 of the Specialist Environmental Services Limited report are only approximate. The properties are +/- 30 metres in distance. However this does not change the report significantly.

3.1.2 Meteorology

The applicant has assumed that the wind field is similar to that of Nelson airport and shown that the windrose in Richmond at the TDC offices is similar in shape to Nelson airport. Given that most of the localised drainage wind patterns occur at night the assumption that the wind is similar to Nelson for the modelling is realistic for the screening modelling that was undertaken. The prevailing wind coming from the south west and north northeast and a significant proportion of wind being less than 10 km per hour.

3.1.3 Number of Cremations

The number of cremations will have a direct relationship with the emissions. The applicant has not been clear about the number of cremations they intend to undertake. The following table provides relevant extracts from the application documents.

Page	Text from Application
Initial application Page 16,	<p>Cremations</p> <p>The applicants anticipate holding six cremations a week. Of these, three are expected to be cremations with no family in attendance, while three are expected to be attended by family for a small service in the place of religious assembly. All cremations will be held during the day.</p>
Assessment of environmental effects of contaminant discharges to air, Page 2	<p>Description of the proposal</p> <p>Typically a maximum of approximately six cremations are expected to occur each week</p>
Assessment of environmental effects of contaminant discharges to air, Page 8	<p>Modelling Assumptions</p> <p>Three 1.5 hour cremations per day for 24 hour averages Average of one cremations per day for predicted 24 hour averages</p>

From the information supplied above it is difficult to determine what the applicant proposes. The air quality modelling input of a maximum of three cremations per day with an annual average of one cremation per day which allows a typical maximum of six cremations per week.

3.1.4 Modelling Assessment

This assessment follows the tier 2 assessment outlined in the Good Practice Guide for Assessing Discharges to Air from Industry published by the Ministry for the Environment. It is a relatively simple screening exercise to determine whether a proposal is likely to result in exceedances of ambient air quality criteria, in particular the ambient air quality standards. The aim of a screening assessment is to provide conservative estimates of air quality impacts, which can provide confidence that a project will not result in significant air quality impacts. The recommended screening assessment process is based on the methods most commonly used in New Zealand. In this case a standard industry model called Ausplume (V6) was used. Given the nature, scale and location of the discharge it is an appropriate model to use.

There are several assumptions made in the modelling. These are likely to over estimate the predicted ground level concentrations (GLCs). Given the chosen model and the screening nature of the modelling it is appropriate to over predict the GLC.

The modelling results are examined and the SO₂, NO₂ and PM₁₀ levels at the property boundary are well below the National Environmental Standards and Guideline Levels. This is consistent with a the discharge from a 5MW LPG burner being a permitted discharge on a site with Rural 1 zoning. The crematorium is about 0.6MW when it is running. The following paragraphs consider the modelling result

with the relevant guidelines. They suggest that the levels of combustion contaminants should have effects that in the opinion of the reporting officer are very minor.

Fine Particulate (PM₁₀)

Fine particulate material is the most important contaminant in the Tasman District. Most of the PM₁₀ is generated by combustion sources, particularly the burning of wood.

The emissions from the crematorium is approximately equivalent to two clean air wood burners. The modelling showed GLC at the boundary of 0.7 ug/m³ which is 1.4% of the environmental standard. The report suggests a background level in this environment is likely to be about 15 ug/m³. The site is outside of the gazetted Richmond air shed and the Council has no monitoring for the site however it is very unlikely that the air quality standard of 50 ug/m³ for 24 hour average would be exceeded at this location. These levels are very minor and should not cause any adverse effects.

Sulphur Dioxide (SO₂)

The ground level concentrations for sulphur dioxide are significantly less than all the guidelines or standards summarised in the table below. With the maximum GLC of SO₂ predicted to be about 11 µg/m³ at the property boundary for one hour.

Note that the WHO 24 hour SO₂ level has been included in this table as it is possible that this could be used to revise the New Zealand guideline.

Indicator	Level	Source
Sulphur dioxide 10 minutes	500 µg/m ³	WHO
Sulphur dioxide 24 hours	20 µg/m ³	WHO
Sulphur dioxide 24 hours	120 µg/m ³	National Ambient Air Quality Guidelines, 2002
Sulphur dioxide, agricultural crops Annual and winter average	30 µg/m ³	Critical levels for protecting ecosystems MfE
Sulphur dioxide forest and natural vegetation Annual and winter average	20 µg/m ³	Critical levels for protecting ecosystems MfE

Nitrogen Dioxide (NO₂)

The ground level concentrations for NO₂ are significantly less than the levels those listed below, with the maximum GLC of NO₂ predicted to be about 7 µg/m³ at the property boundary for one hour. This is about 7 % of the guideline value thus well below any trigger. This is expected as most of the NO₂ will be due to the burning of the LPG and is consistent with the permitted activity rule for LPG burners of this size

Indicator	Level	Source
Nitrogen dioxide 24 hours	100 µg/m ³	National Ambient Air Quality Guidelines, 2002

Nitrogen dioxide (NO ₂) 1 year	40 µg/m ³	WHO
Nitrogen dioxide (NO ₂) 1 hour	200 µg/m ³	WHO
Nitrogen dioxide (NO ₂) Annual	30 µg/m ³	Critical levels for protecting ecosystems MfE

Dioxins and Furans

The cremator is designed to minimise the emissions of dioxins and furans by operating at a minimum temperature of 800 degrees C and a residence time of two seconds. The chlorinated plastics will be removed from the casket before burning to limit the formation of dioxins.

The modelling is likely to over predict the levels as the modelling is using an emission rate that is seven times higher than that measured from a similar cremator.

The indicator for total dioxins and furans (TEQ) is less than 10% of the Texas long term effects level and this drops to 2% at the nearest dwelling.

These compounds are a risk for long term exposure. The modelled annual peak GLC at the dwelling for dioxins will be less than the background measurements undertaken by MFE in 1998 for rural and urban environments. The levels of these compounds will be very low.

Mercury

The modelled ground level concentration of the mercury are less than 1.5% of the relevant guideline (assuming worst case where the mercury is in its organic form). These guidelines are for inhalation exposure only thus they do not address soil contamination.

Table 5.4: National Ambient Air Quality Guidelines, 2002

Indicator	Level	Averaging Time
Mercury (inorganic)	0.33 µg/m ³	Annual
Mercury (organic)	0.13 µg/m ³	Annual

Accumulative Effects From Other Discharge Sources

The site is far enough away from Richmond and Brightwater to be considered rural and not to have any significant influence from industrial or urban air pollutions sources. The traffic volumes on the local roads are low enough not to result in significant levels of PM₁₀, NO₂ and carbon monoxide (CO) and the density of wood burners in the area should result in the PM₁₀ levels being well below the environmental standard.

Amenity Effects

The amenity effects of the discharge need to be considered, these comprise of deposited material, visual effects and odour.

The emissions from the stack should only be visible as a heat haze with a little smoke at startup. There is automatic monitoring of the stack to keep the opacity at less than 15%. The burner should not produce any deposited particulate material and the residence time should limit the risk of producing any odour.

There are similar units operating in sensitive areas in NZ that reportedly are not causing any issues. It is however appropriate to include a condition of consent as proposed by the applicant that states the discharge shall not cause odour or particulate matter that is offensive or objectionable beyond the boundary of the property on which the consent is exercised.

Soil Contamination By Mercury

The potential for mercury build up in soil surround the crematorium has been raised as a concern within the submissions.

The mercury originates from amalgam fillings in the mouths of cremated individuals (amalgam being approximately 50% mercury by weight). Most mercury emitted is in the form of gaseous elemental mercury. This form of mercury is estimated to stay in the atmosphere from 6 to 18 months. (United Nations Environment Program. The Global Atmospheric Mercury assessment: Sources, Emissions and Transport, December 2008).

The soils around Gardens of the World area are likely to have relatively low concentration of mercury. Work previously undertaken in Nelson and Mapua has shown that the soils in this area are relatively low in mercury compared to Auckland and sites in the Waikato. Mercury is a natural component of the Earth's crust at about 0.1 mg/kg (CRC Handbook of Chemistry and Physics), and it is interesting to compare the level of mercury in these Mapua and Nelson soils with background levels elsewhere in New Zealand. Environment Waikato's study of 26 background soil sites found an average of 0.078 mg/kg for mercury (max. 0.26, min. <0.1 and SD of 0.078 mg/kg). These Waikato soils have a slightly higher mean and larger Standard Deviation than the Nelson and Mapua soils. Auckland Regional Councils 1999 survey found a background range of <0.03 and 0.45 mg/kg for mercury in all soil types, with a geometric mean range of 0.07 to 0.2 mg/kg (ARC Technical Publication no 153). Auckland soils will include some volcanic soils which may explain why the geometric mean from the Tasman sedimentary soils of 0.039 mg/kg is lower than their range.

Trigger level concentration are used when assessing if the soil on a site is contaminated. If the concentration of the contaminant in soil sample is below the trigger level threshold then the site may be regarded as uncontaminated from the contaminant.

Based upon the UK's Interdepartmental Committee on the Redevelopment of Contaminated Land "Guidance on the assessment and redevelopment of contaminated land", ICRCL Guidance Note 59/83 the trigger level of 1 mg/kg has been chosen as an uncontaminated level. It should also be noted that the soil guideline value to protect young children for residual use with plant uptake and allotments from the UK is 8mg/kg. The Canadian Health guideline is 6.6 mg/kg of mercury within soil.

A few investigations have been undertaken examining the build up of mercury in soil around existing crematoria. Two recent studies are listed below:

1. Effects of Mercury Release from Amalgam Dental Restorations During Cremation on Soil Mercury Levels of Three New Zealand Crematoria, A. K. Nieschmidt, N. D. Kim, Bulletin of Environmental Contamination and Toxicology, Volume 58, Number 5/ May 1997, pp. 744 – 751
2. Assessing the local impacts of mercury emissions from crematoria. M.D.Wood, A.Punt and R.t.Leah Liverpool University. Funded by Food Standards Agency UK. 2007.

The authors estimated that most (99.95%) of the mercury either never reaches the local soil or is deposited and then re-volatilised. With the mercury in the soil increasing 0.1mg/kg for every 18,000 cremations. Thus it would take about 170,000 cremations to get the soil to the trigger level of 1mg/kg. Or if we assume an average of one cremation per day, i.e, 365 per year it would take over 470 years for the soil to reach 1.0 mg/kg for mercury. Thus based on the current research the risk of contaminating the soil is low.

Mercury has been used in the rural New Zealand environment. In the 1940s lime sulphur spray was replaced with organomercuric sprays that were used until they were phased out in about 1962.

Burning of fossil fuels (primarily coal) is the single largest source of mercury into the atmosphere globally, accounting for about 45% of the total anthropogenic emissions. (United Nations Environment Program. The Global Atmospheric Mercury assessment: Sources, Emissions and Transport, December 2008).

The mercury emitted into the air from the coal burning of the Brightwater milk plant and local glasshouses is a greater source of mercury than that emitted from the proposed crematorium.

Mercury is present in the coal and the concentrations of mercury are quite variable. Data presented at the Coal research conference in 1985 by N.G. Purchase (working for Coal Research Association of NZ) shows that Westland coal had concentrations from 0.2 grams to 0.24 grams of mercury per tonne of coal. There can be tonnes of coal burnt each hour in the surrounding area. To give some idea of the volume of coal burnt the Brightwater site has consent to burn 1.1 tonnes per hour and most of the coal heated glasshouses around Hope burn hundreds of kilograms per hour when they need to heat the glasshouses. Contrast this with the mercury from a cremation being in to order of 2-3 grams or in the mercury in 10-15 tonnes of coal.

Measuring mercury levels in the top few centimetres of soil is straight forward with the cost of the analysis being about \$40 per sample. If the hearing committee thought it was prudent a monitoring programme that started before any emissions and sampled every five years could provide reassurance to the submitters at relatively little cost to the applicant. If a soil sample is found to be greater than 0.5 mg/kg a more in-depth sampling programme agreed with the council that would examine the spatial extent of any contamination and the consent may be reviewed.

Wastewater

The applicant has provided a report prepared Cameron Gibson & Wells Ltd discussing the wastewater. The site is within the Special Domestic Wastewater Area (permitted activity rule 36.1.5) and any new discharge needs to be treated to a secondary standard. This means that the wastewater is treated to a much better standard than that coming out of a septic tank and the risk of contamination of groundwater is lower.

The irrigation bore on the property takes water from a confined aquifer, with the water originating from the river and the hill slopes to the south. The water take is from 19.3 to 21.7 metres below the surface.

The bore log provided by Waimea Drilling shows gravels surrounded by silts and yellow clay for most of the bores depth. This soil type is not very free draining and provides a deep protective layer over the aquifer, resulting in a confined aquifer.

There are two existing discharges from the house and the toilet block by the parking area. Both of these systems were working when they were inspected and are permitted as they are existing.

The site is suited to disposal of wastewater. The soil on the site will not limit the land disposal of treated wastewater (Category 2 soil). Most of the treatment of wastewater occurs in the first 600mm of soil below the land application area given the soil type, the depth (19 metres) to the aquifer and the fact that there is a confining layer above the aquifer contamination of the bore water should not occur.

It is currently very difficult to assess the volume of wastewater that will be resulting from the proposed reception centre. The estimates supplied suggest that the wastewater from the reception centre will be within the permitted activity levels. The system will be built to cope with higher flows and be treated to a tertiary standard (that is include UV disinfection).

While it is difficult to assess an accurate wastewater volume from the Crematorium and Chapel it is very unlikely that this will be more than half of the permitted activity volume.

The applicant is proposing to treat the wastewater to a higher standard than is required and the soil type should not present any difficulties in applying the wastewater to land in a way that causes adverse effects that are no more than minor

It is accepted that the wastewater discharge is likely to be covered under the permitted activity rule, at least initially. It is difficult to determine if/when the wastewater flow may be greater than 2,000 litres per day averaged over seven days. Staff accept that the applicant has proposed to design the system for 2400 litres per day and propose that they also put in a flow meter and log the flows. Once this flow is exceeded the applicant will need to obtain a resource consent for the application of treated wastewater to land. Until this occurs the applicant is entitled to discharge wastewater to land as a permitted activity.

3.2 Summary of Key Issues

Key issues raised by the submitters are as follows:

- Emissions from the crematorium
- Mercury and its affect in the environment
- Amenity affects from the discharge, visual effects and odour
- Number of cremations per day/week
- Discharge of Wastewater

From the information provided staff accept that the emission from the crematorium should have affects that are no more than minor.

4. RECOMMENDATION AND DRAFT CONSENT CONDITIONS

4.1 Volunteered Consent Conditions

The applicant has volunteered the following consent conditions

Air discharge consent

1. The discharge shall be from a liquefied petroleum gas-fired cremator located on a property at 95 Clover Road East, Hope, described as Lot 1 DP 18219.
2. The discharge into air from the cremator shall occur via a stack at a height of at least 6.5 metres above ground level and at least 1 metre above the roof ridgeline of the building.

The discharge shall be directed vertically into air and shall not be impeded by any obstruction above the stack which decreases the vertical efflux velocity, below that which would occur in the absence of such obstruction.

3. The automated gas-fired cremator shall be programmed and operated in such a manner that the secondary combustion chamber temperature during cremation exceeds 800 degrees Celsius.

The gas-fired cremator shall have a secondary combustion chamber gas residence time of at least two seconds at 871 degrees Celsius, averaged over the period of one cremation.

4. The liquefied petroleum gas burning rate shall not exceed 80 litres per hour.
5. The temperature of gases in the secondary combustion chamber of the gas-fired cremator shall be continuously displayed and shall be visually monitored during cremation to check compliance with Condition 3(a).
6. The consent holder shall keep records of the total number of cremations performed each week and each year. These records shall be provided to the Tasman District Council on request.
7. The opacity of emissions from the stack shall not be darker than Ringelmann Shade 1 as determined in accordance with the New Zealand Standard 5201:1973, except for a period not exceeding two minutes in each hour of operation.

8. Any handles and nameplates that are made from chlorinated plastic or solid metal shall be removed from the casket exterior prior to cremation.
9. The discharge shall not cause odour or particulate matter that is offensive or objectionable beyond the boundary of the property on which the consent is exercised.
10. The cremator shall be serviced at least once every year by a person competent in the servicing of such appliances. The servicing shall include adjustments to ensure compliance with the conditions of this consent. Service reports shall be prepared and retained and copies shall be provided to the Tasman District Council on request.
11. The Tasman District Council may, on the last working day of March each year, serve notice of its intention to review the conditions of this consent for the purposes of:
 - a) dealing with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; or
 - b) requiring the adoption of the best practicable option to remove or reduce any adverse effect on the environment.

4.2 Discharge to Air

There needs to be a limit on the number of cremations per week. Staff propose the air quality modelling input of a maximum of three cremations per day with an annual average of one cremation per day to be included as consent condition. This allows the typical maximum of six cremations per week that is referred to in the application.

4.3 Contamination of Mercury in the Soil

Some monitoring of the mercury levels in the ground is justified as the cost to clean up any contamination would be high compared to the relatively low monitoring expense.

4.4 Discharge to Land of Wastewater

It is accepted that the wastewater discharge is likely to be compliant with the permitted activity rule 36.1.5, at least initially.

The applicant is proposing to treat the wastewater to a higher standard than is required and the soil type and profile should not present any difficulties in applying the wastewater to land in a way that causes adverse effects that are no more than minor.

It is difficult to determine if/when the wastewater flow may be greater than 2,000 litres per day averaged over seven days. Staff accept that the applicant has proposed to design the system for 2400 litres per day and propose that they also put in a flow meter and log the flows. Once this flow is exceeded the applicant will need to obtain a resource consent for the application of treated wastewater to land.

4.5 General Discussion

The adverse effects from the discharge to air and discharge of wastewater to land should be no more than minor.

5. RECOMMENDATION

If the Committee considers it appropriate to grant the land use consent RM090539 then I recommend that the discharge to air consent be granted. The following draft consents have been included for the Committee to consider.

Leif Pigott
Consent Planner Natural Resources



(DRAFT) RESOURCE CONSENT DECISION

Resource Consent Number: RM090539

Pursuant to Section 104B of the Resource Management Act 1991 ("the Act"), resource consent is hereby granted to:

Gardens of the World Limited
(hereinafter referred to as "the Consent Holder")

Activity authorised by this consent: To discharge contaminants to air from a LPG fuelled crematorium.

Location Details:

Address of property: 95 Clover Road East, Hope
Legal description: Lot 1 DP 18219.
Certificate of title: 12A/1049
Valuation number: 1943044000
Location co-ordinates: 2521282E 5980883N (New Zealand Map Grid Datum)

Pursuant to Section 108 of the Act, this consent is issued subject to the following conditions:

General

1. The Consent Holder shall ensure that all works are carried out in accordance with the application and plans submitted by Quickfall Associates Limited that is dated August 2009.
2. The discharge shall be from a liquefied petroleum gas (LPG)-fired cremator.
3. The total number of cremations performed each year will not exceed 312. A maximum of three cremations may be performed each day.
4. The discharge into air from the cremator shall occur via a stack at a height of at least 6.5 metres above ground level and at least 1 metre above the roof ridgeline of the building.
5. The discharge shall be directed vertically into air and shall not be impeded by any obstruction above the stack which decreases the vertical efflux velocity, below that which would occur in the absence of such obstruction.

6. The automated gas-fired cremator shall be programmed and operated in such a manner that the secondary combustion chamber temperature during cremation exceeds 800 degrees Celsius.
7. The gas-fired cremator shall have a secondary combustion chamber gas residence time of at least two seconds at 871 degrees Celsius, averaged over the period of one cremation. The temperature of gases in the secondary combustion chamber shall be continuously monitored and recorded during operation of the cremator. Records shall be provided to the Tasman District Council on request.
8. The liquefied petroleum gas burning rate shall not exceed 80 litres per hour.
9. The temperature of gases in the secondary combustion chamber of the gas-fired cremator shall be continuously displayed and shall be visually monitored during cremation to check compliance with Condition 3.
10. The consent holder shall keep records of the total number of cremations performed each week and each year. These records shall be provided to the Tasman District Council each year by the 1 May.
11. The opacity of emissions from the stack shall not be darker than Ringelmann Shade 1 as determined in accordance with the New Zealand Standard 5201:1973, except for a period not exceeding two minutes in each hour of operation.
12. Any handles and nameplates that are made from chlorinated plastic or solid metal shall be removed from the casket exterior prior to cremation.
13. The discharge shall not cause odour or particulate matter that is offensive or objectionable beyond the boundary of the property on which the consent is exercised.
14. The cremator shall be serviced at least once every year by a person competent in the servicing of such appliances. The servicing shall include adjustments to ensure compliance with the conditions of this consent. Service reports shall be prepared and retained and copies shall be provided to the Tasman District Council each year by the 1 May.
15. The consent holder shall measure the mercury concentration in the soil on the property at XXXXXXXX prior to the commencement of the cremator operation and subsequently in the six months prior to the five year, 10 year, and 15 year (and every five years after that) anniversary of this consent.
16. Sampling shall consist of at least four individual soil samples collected from the top 3-5 cm of surface soil, at or near the property boundary to the west-southwest of the stack.
17. The method of sample analysis shall in accordance with USEPA method 200.2 for "Total Recoverable Metals" and analysis by ICP-MS for trace levels of mercury. The analysis shall be carried out by an IANZ-accredited testing laboratory.

18. The results of the sampling and analysis shall be forwarded to the Tasman District Council (Attention: Coordinator Compliance Monitoring) within six weeks of the date of sampling.
19. A record of any complaints relating to the odour, smoke and particulate matter shall be maintained and shall include:
 - a) The location where odour and/or deposited particulate matter was detected by the complainant;
 - b) The date and time when the odour and/or deposited particulate matter was detected;
 - c) Description of the wind speed and wind direction when the odour and/or deposited particulate matter was detected by the complainant;
 - d) The most likely cause of the odour and/or deposited particulate matter detected;
 - e) Any corrective action undertaken by the consent holder to avoid, remedy or mitigate the odour and/or deposited particulate matter detected by the complainant; and
 - f) The name and contact details of the complainant.

These records shall be provided to the Tasman District Council each year by 1 May.

20. The Council may, during the month of April each year, review any or all of the conditions of the consent pursuant to Section 128 of the Resource Management Act 1991 for all or any of the following purposes:
 - a) to deal with any adverse effect on the environment which may arise from the exercise of the consent that was not foreseen at the time of granting of the consent, and which is therefore more appropriate to deal with at a later stage; and/or
 - b) to require the Consent Holder to adopt the best practical option to remove or reduce any adverse effects on the environment resulting from the discharge; and/or
 - c) to review the contaminant limits, loading rates and/or discharge volumes and flow rates of this consent if it is appropriate to do so; and/or
 - d) to require consistency with any relevant Regional Plan, District Plan, National Environmental Standard or Act of Parliament.
21. The lapsing date for the purposes of section 125 shall be 5 years after the consent can be given effect to.
22. The duration of the consent shall be 35 years from the date of commencement.

ADVICE NOTES

1. Officers of the Council may also carry out site visits to monitor compliance with resource consent conditions.
2. The Consent Holder should meet the requirements of the Council with regard to all Building and Health Bylaws, Regulations and Acts. Building consent will be required for these works.
3. Access by the Council or its officers or agents to the property is reserved pursuant to Section 332 of the Resource Management Act.
4. All reporting required by this consent should be made in the first instance to the Council's Co-ordinator Compliance Monitoring.
5. This resource consent only authorises the activity described above. Any matters or activities not referred to in this consent or covered by the conditions must either:
 - a) comply with all the criteria of a relevant permitted activity rule in the Tasman Resource Management Plan (TRMP);
 - b) be allowed by the Resource Management Act; or
 - c) be authorised by a separate resource consent.
6. Plans attached to this consent are (reduced) copies and therefore will not be to scale and may be difficult to read. Originals of the plans referred to are available for viewing at the Richmond office of the Council. Copies of the Council Standards and documents referred to in this consent are available for viewing at the Richmond office of the Council.
7. Monitoring of this resource consent will be undertaken by the Council as provided for by Section 35 of the Act and a one-off fee has already been charged for this monitoring. Should the monitoring costs exceed this fee, the Council reserves the right to recover these additional costs from the Consent Holder. Costs can be minimised by consistently complying with conditions, thereby reducing the necessity and/or frequency of Council staff visits.