Review of Bay of Plenty Regional Air Plan

Controls on use of Methyl Bromide Fumigant

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Executive Summary

Over 300 tonnes of methyl bromide fumigant were used in the Bay of Plenty in 2013, the last year for which records are available. Almost all of this was at the main wharf at Port of Tauranga, and about 7 tonnes at Sulphur Point. This amounts, on average, to more than a tonne of gas being released into the atmosphere for each working day of the year.

Methyl bromide is very toxic, which makes it such an effective quarantine /phyto-sanitary fumigant for killing insects and other pests. Its main use at Port of Tauranga is in treatment of export logs, but also sawn timber, and containers for export / import, under an existing resource consent. There is also an existing global consent for quarantine and export fumigation with methyl bromide to occur throughout the Bay of Plenty region.

Because of its toxicity, methyl bromide is a risk to human health. Buffer distances, and Tolerable Exposure Limits (TELs) in the air, have been set by the NZ Environmental Protection Agency, and these must be complied with by fumigators. Regional councils however can impose additional or stricter controls if necessary and justifiable in terms of section 32 of the Resource Management Act.

This report supports the use of the EPA TELs to manage methyl bromide, but recognises that there are weaknesses in the monitoring data that is available, and its usefulness in establishing compliance with the TELs, in particular the levels that the public may be exposed to in the longer term (the annual average TEL).

The report also analyses the effectiveness of computer dispersion modelling as a tool for predicting the direction and concentration of gas plumes when fumigant is vented to the atmosphere at the end of the fumigation.

While the main focus is on methyl bromide, controls on all fumigants are recommended in the new Regional Air Plan, since other fumigants are used in the region, and there is pressure to find replacements for methyl bromide. Household and smaller-scale fumigation is recommended as continuing as in the current Plan - as a permitted activity.

All other fumigation is proposed to require discretionary resource consent so that its potential effects on the environment can be assessed, and decisions made to decline or grant the application, including with conditions to appropriately manage adverse effects and potential risks. Applications for larger fumigation need to include dispersion modelling to estimate the likely levels of fumigant at locations accessible to the public. The holders of consent involving large quantities of fumigant should also be required to undertake continuous ambient compliance monitoring capable of reporting at the 1 parts per billion level, and at both short-scale and annual time periods. The report also considers who should be responsible for monitoring when more than one fumigator is operating from a site, and concludes that in the case of methyl bromide the Hazardous Substances regulations put a responsibility on the landowner or occupier.

An exception to this discretionary activity is when methyl bromide is used with recapture technology at the end of fumigation, rather than the fumigant venting to air. Recognising the environmental and health benefits of this, it is recommended that when recapture is used the activity becomes a controlled activity. This provides an easier consenting pathway and should help incentivise use of re-capture.

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1 Introduction

1.1 What is Methyl Bromide?

Methyl bromide is a colourless, odourless gas used widely as a broad spectrum fumigant internationally and in New Zealand for quarantine use. Importing countries require that certain products exported from New Zealand are fumigated with methyl bromide prior to shipment. Methyl bromide is also used for quarantine purposes for goods coming into New Zealand from certain countries. As such, its main use within the Bay of Plenty Regional Council area is at the Port of Tauranga. There is also a consent currently to undertake methyl bromide fumigation at mobile sites i.e. in other parts of the region.

Methyl bromide is highly effective in treating timber, agricultural produce, buildings and containers to eradicate a wide range of pests, including soil-borne fungi, nematodes, weeds, insects, mites and rodents[1]. Its good penetration, high toxicity and fast action makes it a very effective fumigant, but also means that it needs particular care to ensure it is used safely. The principal issue with its use is the risk to human health, but methyl bromide is also an ozone depleting substance.

The brief for this report was in relation to methyl bromide, and focuses primarily on that fumigant since currently it is the most widely used in the region. However, other fumigants are licensed for use in New Zealand and some are used in the Bay of Plenty area. Also, other fumigants may come onto the market in the future. Phosphine is used for ship fumigations in transit, as an alternative to methyl bromide. Other fumigants include hydrogen cyanide, chloropicrin and 1,3-dichloropropene. Therefore the approaches to regulating fumigation suggested in this report consider all fumigants.

1.2 Methyl Bromide Use at Port of Tauranga

1.2.1 Main Wharf

Methyl bromide fumigations at the Port of Tauranga main site occur within the holds of ships, under tarpaulins (stacks of logs, timber or occasionally a container under a tarpaulin), and fumigation of containers.

Fumigation will typically last for 16 hours or so, after which point the cover or doors are opened and the fumigant is allowed to vent to the air. With the fumigation of the ships, the fumigation occurs within the holds of the ships which are then opened to vent at the end of the fumigation period.

In 2013, 297 tonnes of methyl bromide were used at the main wharf at the Port of Tauranga (Totara St), and 255 tonnes were used in 2012 (see Table 1). Data from 2014 has not yet been reported. Methyl bromide use in 2011 was 146 tonnes.

The areas where fumigations occur at the main port is shown in Appendix 1. The Port security fence which excludes the public is denoted by the heavy blue line on the map. Fumigation cannot occur currently at the northern end where cruise-ships berth, and may occur immediately south of this area only by application to the Port, if a passenger ship is not present.

[1] Application for the Reassessment of Methyl Bromide, Environmental Management Risk Authority 2010.

Space fumigated	Number of fumigations		Total amount of methyl bromide used (Kg)	
	2013	2012	2013	2012
Ship (hold)	25 vessels /120 holds	18 vessels /74 holds	72,129	46,334
Containers	410	793	1,567	3,779.8
Tent[2]	2,618 (logs) 683 (timber + containers)	2926 (logs) 147 (timber)	212,582 11,406	205,241
Total	**3,736**	**3,884**	**297,684**	**255,355**

Table 1: *Methyl bromide use at Port of Tauranga (Source: Annual Monitoring report to Environmental Protection Agency)*

1.2.2 Sulphur Point

The location of the existing three container fumigation areas at Sulphur Point are shown in Appendix 2.

Fumigation of containers occurs at Sulphur Point, in greater numbers than at the main port, as shown in Table 2.

Space fumigated	Number of fumigations		Total amount of methyl bromide used (Kg)	
	2013	2012	2013	2012
Containers	1,668	2,023	7,154	8,325

Table 2: *Methyl bromide use at Sulphur Point (Source: Annual Monitoring report to Environmental Protection Agency)*

[2] Under tarpaulins, mostly stacks of logs outdoors, but also cut timber and containers under tarpaulins

2 Regulation of Methyl Bromide

There is a hierarchy of controls relating to the use of methyl bromide, as follows (Table 3):

Level	Who	What
National	Environmental Protection Agency	Controls under Hazardous Substances and New Organisms Act 1996 (HSNO Act). Minimum statutory controls applying nationally, including allowable exposure levels for the public and minimum buffer zones
Regional	BOP Regional Council	Rules and resource consents applying at regional level (statutory, under the Resource Management Act)
Local	Port of Tauranga	Fumigations Procedures for Port of Tauranga (non-statutory procedures applying within the Port – sets allowable areas)

Table 3: *Levels of control over methyl bromide use*

In addition, there are standards in terms of Occupational Health that apply to workers, but not the public.

2.1 Regulations under the HSNO Act

The controls on methyl bromide were reviewed by the Environmental Protection Agency (formerly the Environmental Risk Management Authority) in 2010, under the Hazardous Substances and New Organisms Act 1996 (HSNO Act). The key regulations are:

a) **Minimum buffer distances.** The distance from which the public must be excluded during fumigation. The buffer distance depends on the type fumigation and amount of methyl bromide used, as shown in Table 4 below:

Use	Minimum buffer distance (metres)
Ship's hold (1000kg or more per 24h)	100
Ship's hold (<1000kg or more per 24h)	50
Tent fumigation (under sheets/tarpaulins)	50
Containers (volume of 77m3 or more per hour)	25
Containers (< 77m3 or more)	10

Table 4*: HSNO regulations – minimum buffer distances around methyl bromide fumigations*

b) **Tolerable exposure limits** (TELs). These set maximum allowable exposures of methyl bromide in the air at, or beyond, the edge of the minimum buffer distance. These TELs apply over a 1 hour period, a 24 hour period, as well as long term exposure (a chronic or annual average level), as in Table 5:

	TEL (tolerable exposure level)	
	ppm (parts per million)	mg/m^3
1 hour	1	3.9
24 hour	0.333	1.3
Chronic (annual average)	0.0013	0.005

Table 5: *HSNO regulations – maximum allowable levels of methyl bromide (TELs) at or beyond the minimum buffer distances*

Under the HSNO regulations, these two controls operate in tandem – the minimum setback distance from which the public must be excluded and the TELs. It is not sufficient just to have a buffer of the distance specified around the fumigation; the level of methyl bromide in the air must also comply at or beyond the distance set in the regulations.

In some instances the buffer distance set in the EPA regulations may not always achieve methyl bromide concentrations in public areas that comply with the TELs. In that case, larger buffer distances may be necessary. As the EPA document *Methyl bromide fumigations - post reassessment guidance for fumigators* states "Exceeding a TEL while complying with the minimum buffer zones is a breach of the HSNO controls".

Methyl bromide is usually allowed to dissipate in the atmosphere at the end of the fumigation period. The HSNO regulations state that if the methyl bromide is captured rather than vented to the air at the end of the fumigation, then the buffer distances in Table 3 do not apply.

There is also a range of other controls in the HSNO regulations including who is responsible for a site, what monitoring is required, signage, notification and a range of other matters.

2.2 Regulation under the Resource Management Act

Methyl bromide is a contaminant and the discharge of contaminants to air is subject to section 15 of the RMA.

Section 15 states:

> *15(1) No person may discharge any..*
>
> *(c) contaminant form any industrial and trade premises into air ..unless the discharge is expressly allowed by a national environmental standard or other regulation or a rule in a regional plan.., or a resource consent.*
>
> *15(2A) No person may discharge any contaminant into the air…from a place or any other source, whether moveable or not, in a manner that contravenes a regional rule unless the discharge –*

a) *Is expressly allowed by a national environmental standard or other regulation, or*

b) *Is expressly allowed by a resource consent, or*

c) *Is an activity allowed by section 20A* [existing uses].

The control of discharges to air is a function of regional councils under section 30 of the Act.

The discharge of methyl bromide needs either to be permitted by a rule in a regional plan, or allowed by a resource consent. The HSNO regulations for methyl bromide do not override the provisions of section 15 of the RMA – both the HSNO regulations and the RMA requirements must be met.

Regional councils can also set larger buffer distances and/or additional controls on methyl bromide fumigation if the council deems it necessary – and provided the requirements of section 32 of the RMA can be met.

As the EPA document *Methyl bromide fumigations - post reassessment guidance for fumigators* states:

> *"Regional and unitary councils can set more stringent controls under the Resource Management Act (RMA), including larger buffer zones if they deem them necessary because of local conditions... The HSNO controls are the minimum standards that must be achieved."*

The jurisdiction of the RMA and the Regional Council extends out to '12 miles' from shore. This includes discharges, except for those allowed by the Resource Management (Marine Pollution) Regulations 1998 which relate primarily to discharges from the normal operational requirements of ships. Fumigation is not one of the operational requirements.

2.3 Port Company Controls

Port authorities are also entitled to set more stringent requirements as part of allowing fumigation activities to occur on their land. For example, Port Nelson and the Port of Tauranga both have fumigation protocols that apply to the areas they control. Port Nelson requires the use of capture technology for all methyl bromide use at the Port.

In many cases the port companies do not take an active role in managing the fumigation that occurs on their properties. However the HSNO regulations do suggest that it is not just the fumigator who has responsibilities under the regulations. The owner/occupier of the site also has responsibilities. This is particularly the case where more than one fumigator may operate on a large site like a port – or any other large site for that matter.

This is discussed further in section 4.4, Multiple Operators.

3 Recapture of Methyl Bromide

Under the current HSNO regulations recapture rather than venting to the air of the methyl bromide gas at the end of fumigation will be mandatory from 2020.

Recapture is not widespread at present, but has been used at Port Nelson for all fumigations since 2008, and at has been introduced at CentrePort (Wellington) more recently.

Photo: Recapture unit capable of capturing methyl bromide from 4 containers simultaneously [Source: Genera Ltd website]

With recapture, at the end of the fumigation, the gas is pumped out of the fumigation enclosure into a device where the methyl bromide is retained. The systems currently used in New Zealand trap the methyl bromide on activated carbon. The methyl bromide is then destroyed (this can be done chemically, or by burial which breaks down the gas into harmless products).

Future technologies may possibly see the reuse of the gas rather than its destruction.

Recapture is estimated to minimise discharges of methyl bromide to the air by at least 95%, which significantly reduces the risk to human health and the environment. The remaining gas is lost from leakages, and off-gassing of timber or materials after fumigation.

Recapture units are now being up-scaled to deal with timber stack fumigations[3].

All the fumigations at Port of Tauranga are undertaken by Genera Limited. Genera's current resource consent for fumigation at the Port requires the gradual phasing in of capture technology – starting at 15% of container fumigations in April 2015, and 15% of log and timber fumigations by April 2016, gradually increasing to 100% by 2018 and 2019 respectively.

[3] e.g. http://www.nordiko.com.au/index.php?id=89

4 Possible Controls for Fumigation in Bay of Plenty

4.1 Introduction

A range of technical documents on methyl bromide use in New Zealand have been reviewed, including the reports to the Environment Court case on methyl bromide use at Port Nelson, the EPA decision on re-assessment of methyl bromide under the HSNO Act and many background documents produced as part of that re-assessment, as well as a number of other guidance documents and studies.

The rules on methyl bromide use in the Nelson Air Quality Plan were the subject of an Environment Court hearing in 2007. A large amount of scientific evidence from computer models was considered by the Court prior to it setting buffer distance for fumigations within the Port. This is discussed further in the following section.

The buffer distances that the Court settled on at Port Nelson are considerably greater than the ones specified in the HSNO regulations, even though the same exposure levels for the public were being used (i.e. what are now the HSNO TELs).

The Nelson buffer distances are not recommended for adoption in Tauranga, however, for the reasons discussed under section 4.2, Modelling. Essentially we do not consider that the modelling approaches used in the Nelson studies are robust enough to predict accurate exposure levels and to set realistic buffer distances.

While the discussion in the following sections relates particularly to methyl bromide, the general principles apply to other fumigants such as hydrogen cyanide, or phosphine should their use become widespread.

4.2 Modelling

4.2.1 Assessment of Effects of Fumigant Discharges

Assessing the effects of air emissions involves either monitoring the air downwind of an emission source, or alternatively measuring (or estimating) the rate of emission, and then using an atmospheric dispersion model to estimate the downwind effects. For many operations it is often not easy or practicable to measure the downwind concentrations, and the use of dispersion models is common in assessments of discharges to air. This approach is recommended by the United States Environmental Protection Agency (USEPA) which has developed a number of these models for regulatory use[4] and their use is also discussed in the MfE guidance document on dispersion modelling[5]. They are able to predict the downwind effects from stacks, volume sources (such as buildings, containers, log piles and ships holds), and area sources (such as lagoons).

Dispersion models are a collection of mathematical algorithms that describe how a contaminant that is released from a chimney stack, an area source such as a lagoon or a cloud of gas or dust from a

[4] Technology Transfer Network Support Center for Regulatory Atmospheric Modelling. Modelling Guidance and Support http://www.epa.gov/ttn/scram/guidanceindex.htm

[5] Good Practice Guide for Atmospheric Dispersion Modelling. Ministry for the Environment June 2004 PO Box 10-362, Wellington, New Zealand ISBN: 0-478-18941-9 ME number: 522.

building or log pile is dispersed (or diluted) due to the wind. The equations are complex and are carried out using computer programs. It is these programs that are referred to as the models and they vary in complexity and data requirements that are needed to produce results that are close to those that are actually found in the real world.

The key parameters that are critical inputs to all models are

- Quantification of the emission rate in grams per second or kilograms per hour
- Knowledge of the configuration of the emission source
- Good meteorological data for the site

Appendix I of the EPA/ERMA reassessment document[6], is a report by Dr Bruce Graham that includes a short discussion on these factors as used for inputs to dispersion models. Dr Graham's view was that "*The modelling approach is much less suited to other types of gas releases…*" where he was comparing normal stack sources with those from ships holds, log piles and containers. It is useful therefore to examine these in more detail to understand exactly why modelling is fraught with difficulties.

4.2.2 Quantification of the Emission Rate

All dispersion models require a quantification of the emission rate. In simple terms, the downwind concentration of any contaminant that is predicted by a model is directly proportional to the emission rate. In many cases, for example for stack sources, the emission rate can be either estimated or measured reasonably easily. This is not so for contaminants such as methyl bromide or any other fumigant from ships holds, log piles or containers.

4.2.2.1 Discharges from Ships' Holds

Dr Graham's report describes the typical method of venting for ships holds wherein the hold hatches or covers are progressively opened over a period of time. Information from Genera Ltd is that a typical venting takes place over about 24 hours, with about 6 hours estimated to achieve about 50% of the discharge[7]. It is likely that this figure would be regarded as typical only, and it would vary greatly depending on the ambient meteorology at the time.

The mechanism for the ventilation is essentially one where wind blowing across the hatch or hold cover opening will induce a slight negative pressure and extract the contents of the hold in a venturi fashion. The higher the wind speed, the greater the extraction rate. Furthermore, the emission rate will vary on a very short time scale as the venturi effect changes with short term wind gusts. The situation is further complicated by the fact that a number of openings in the holds are made progressively during the venting. In theory the ventilation rate could be calculated mathematically using assumptions about the hatches or covers, but it would be different for each ship configuration would need to be considered. From a practical point of view this would be an almost impossible task and only very crude estimates for a typical ship could be made.

[6] Application for the Reassessment of Methyl Bromide, Environmental Management Risk Authority 2010.
[7] Mr Mark Self. Genera Limited Personal communication December 2014

4.2.2.2 Log Piles

Log piles are vented by the wind once the tarpaulins are removed. The actual rate of ventilation will depend on a number of factors, the speed of tarpaulin removal, the log stacking configuration, the wind speed and the wind direction in relation to the pile.

If the tarpaulin is removed quickly the ventilation will proceed in two distinct phases. The first being an initial puff or slug release of the air under the tarpaulin, followed by a slower release of the material in the gaps between the logs. Piles with smaller diameter logs will vent slower than those with a larger diameter that have larger spaces between them. Exactly how fast this second phase occurs is unknown. If the wind speed is sufficiently fast, the ventilation could occur within a matter of minutes. On the other hand it may take hours under calm to variable conditions. There is also a possible third phase with a very slow release rate as methyl bromide outgases from the logs. However this has not been quantified.

The actual rate of ventilation will be dependent on the wind speed, but not necessarily in a linear relationship. For example, if the wind is blowing along the length of the pile, the amount of air that is forced into the spaces is a function of the wind pressure that is proportional to the square root of the wind speed. Other factors include the roughness of the logs and the length of the pile that would be highly variable.

Finally there is the further complication that the wind direction will most likely be at an oblique angle to the pile rather than directly along the pile or across it. Some kind of mathematical description might be possible but it would be very complex.

As with the ships holds, attempting to mathematically describe the ventilation would be extremely difficult and unless it was backed up with real world verification, it would be purely theoretical and of little value in trying to assess the realistic discharge.

4.2.2.3 Containers

Container discharges are somewhat similar to the ships holds, in that the rate of emission is dependent on the venturi effect of the wind passing over the open door. There is also likely to be an initial puff or slug release followed by a slower sustained exponentially decaying release as the fresh air displaces that which is deeper inside the container. This latter slower release will vary depending on the wind speed, the wind direction and the packing density within the container.

4.2.2.4 Fumigant Losses

Fumigants are injected at a concentration that is specific to the country that the product is destined to. For example methyl bromide rates for logs exported to China vary from 80 grams per cubic metre in summer to 120 grams per cubic metre in winter[8]. Losses can occur due to tarpaulin tears or imperfections, leakage due to imperfect seals on the ground or absorption/adsorption processes in the logs themselves. This latter point is also largely unknown.

Therefore the usual practice of assuming zero losses will most likely always over-estimate the actual discharge rate even if some kind of realistic emission configuration could be determined for the scenarios described above.

[8] Mr Mark Self. Genera Limited personal communication December 2014

4.2.3 Model Choice

The principal model used in New Zealand for studies of fumigant releases in the past has been AUSPLUME. This model has been widely used for regulatory purposes in Australia and New Zealand and has been shown to provide predictions that are close to those that are found in practice[9] for standard contaminant releases such as those from stack sources. It was used for the estimation of methyl bromide effects in the Nelson Environment Court case by both the applicant[10] (Genera Ltd) and the expert for the Nelson District Health Board[11].

However AUSPLUME it is not suitable for predicting the short term potential effects that can occur from short transient releases that last for say only 15 to 30 seconds nor for say ten minutes. All models such as AUSPLUME, AERMOD or CALPUFF assume that the discharge occurs at a constant rate over a typical time period of one hour. Even AUSPLUME that has an adjustment to calculate shorter term time averages, assumes that the discharge occurs for one hour and makes an empirical adjustment to obtain the shorter time averages[12]. It is possible to re-configure these models to simulate much shorter time periods if meteorological data is available at the same time scale. For example if 3 minute wind speed, wind direction and stability information is available, then 3 minute predictions are possible. However these will not be robust predictions because the dispersion equations within the model are based on hourly averages[13].

Accurate meteorological data at this time resolution is seldom available, and unless it is, short term plume meander cannot be modelled. In these cases the models can use so-called "example" meteorological conditions that are known to occur at a given site, those conditions can then be applied to the release scenario. But again plume meander cannot be properly accounted for over short time scales. Inevitably, this results in model predictions that are likely to be over estimates for any one location/release scenario since the model assumes that the discharge follows a straight line for the duration of the time period.

For these short term releases as expected from log piles, specialist PUFF models such as HYSPLIT[14] or SCIPUFF[15] are required that can simulate a short puff discharge and account for the real-time plume meander that occurs in practice. These two are similar models although there are some differences in the manner in which plume or puff dispersion is treated. Both require extensive on site real time meteorological data to obtain realistic predictions.

A further complication that occurs is that most plume type models ignore on-site obstacles such as buildings, and in the case of Ports of Tauranga, piles of logs that also act as buildings. These obstacles funnel the plume and reduce dispersion, leading to under-predictions of off-site effects. Neither HYSPLIT nor SCIPUFF are able to account for this phenomenon, and under-predictions are highly likely.

[9] Hamilton, S.D., A Comparison of the Air Dispersion Models AUSPLUME and AUSPUFF. Clean Air (CASANZ) Vol 33 No 2 May 1999
[10] ENV-2006-WLG-154. Evidence of Ron Pilgrim
[11] ENV-2006-WLG-154. Evidence of Craig Douglas Stevenson
[12] Good Practice Guide for Atmospheric Dispersion Modelling. Ministry for the Environment June 2004 PO Box 10-362, Wellington, New Zealand ISBN: 0-478-18941-9 ME number: 522.
[13] A User Guide for the CALPUFF Dispersion Model (version 5) Scire, J., Strimaitis, D. G., and Yamartino, R. J,. Earth Tech Inc. January 2000. http://www.src.com/calpuff/download/CALPUFF_UsersGuide.pdf
[14] http://www.arl.noaa.gov/HYSPLIT_info.php
[15] http://www.sage-mgt.net/services-and-solutions/modeling-and-simulation/scipuff-dispersion-model

The complexity of all the unknown factors discussed above and model limitations was highlighted in a recent modelling study[16] (the SCION study) using the HYSPLIT puff model. Despite using real time meteorological data it was unable to predict measured concentrations for the higher percentile values even though the intermediate level predictions were reasonably well predicted.

Ultimately the only real solution for modelling purposes would be to use a Computational Fluid Dynamics model (CFD), but the costs would be high.

4.2.4 Multiple Operators - Modelling

One important feature of the Ports of Tauranga, is that up until now, only one operator has been responsible for all the fumigation activities on site. The situation changes significantly if more than one operator were to be on site.

Putting aside the problems discussed above with respect to predictive model performance, the complexity of trying to accurately account for multiple discharges from multiple operators who may or may not work in cooperation increases dramatically when multiple fumigations are potentially carried out either simultaneously or sequentially within short time scales. Realistic predictions for compliance or resource consent applications will be extremely difficult and need to be viewed with great caution.

This is discussed further under section 4.4.

4.2.5 Summary

Given the large uncertainties involved with trying to predict compliance with dispersion models they are considered unlikely to provide realistic results regardless of the complexity of the model. Thus for applicants for resource consents, the choice of model and source configuration will be critical in trying to formulate a model that realistically represents the expected effects, yet does not under-predict.

For council reviewers the situation will also be difficult, and they will be faced with deciding whether or not the predictions are actually reliable enough to grant consent. Ultimately the real test for model performance is how well the predictions match the real world monitoring data. Thus where an applicant can show that the predictions are in line with monitoring data, some confidence can be applied to them.

In the case of the Ports of Tauranga, short term monitoring is available but the long term data is calculated from the short term data and is not suitable for comparison with the relevant standards as discussed below.

The most important point regarding models and predicted compliance is that council reviewers will not have adequate information to make informed decisions until good quality long term monitoring data is available.

[16] Strand, T. Wright, L. Uaea, T. Bromley, T. Martin, R. Port dispersion field study and modelling analyses. 2014 Scion. Rotorua. http://www.scionresearch.com

4.3 Monitoring

Monitoring of ambient levels of contaminants such as methyl bromide (or any contaminant for that matter) can be carried out in a number of ways and with a number of time scales ranging from short term (minutes to hours) to long term (days to multiple years). The time scale chosen should allow results to be obtained for comparison against relevant time averaged standards or guidelines.

With short term monitoring the main difficulty arises when trying to ensure that the monitor is located in the right place to actually measure the contaminant. To some extent this can be overcome using multiple monitors operating simultaneously, but there is no guarantee that the monitors will actually be in the right place at the right time.

Long term monitoring overcomes this problem to some extent by continuously monitoring the air at a specific location that is representative of those who might be exposed to the contaminant. Over a sufficiently long time (e.g. one to two years) the monitor will detect all the contaminant levels at the sampling location. Provided that the monitor is well placed to be representative of those who might be exposed, a realistic assessment of the true exposure can be obtained. Even if only one monitor is used, careful placement can still give results that are representative of other nearby locations.

The EPA/ERMA reassessment project included a recommended monitoring program that was prepared by SKM and included recommendations for appropriate instrumentation[17]. These have been incorporated into the New Zealand EPA guidance for fumigators[18] that sets out the methodology to demonstrate compliance with the regulated TELs (presented earlier in Table 5).

Of particular note in the guidance document is the acknowledgement that most instruments used for on-site monitoring have a lowest detection limit of 0.1 ppm (parts per million). While instruments with this limitation may be sufficient for the determination of hourly averages, they will not suitable for determining annual averages if there are sustained slow releases that result in effects where the concentration is less than the detection level. They also may not be suitable for determining 24 hour averages again where long sustained releases occur for example from ships holds or from the out-gassing of log piles that result in sub-ppm levels of the contaminant off-site.

To overcome the issue regarding longer term averages of levels that are less than the detection limit of the instrument, the EPA guidance document recommends methods to calculate the 24 hour and annual averages from the results of these instruments. The EPA method will give approximately correct results provided that there are no long slow releases that result in extended periods of time with sub ppm levels of fumigant. In these cases, the instrument will record zero and will not be included in the calculated time averaged level. The result will indicate compliance when in fact it may not comply.

[17] Environmental Risk Management Authority Decision Application for the Reassessment of a Hazardous Substance under Section 63 of the Hazardous Substances and New Organisms Act 1996 Name of substances: Methyl bromide and formulated substances containing methyl bromide Application Number: HRC08002 28 October 2010 Amended under s67A of the HSNO Act on 1 June 2011 Appendix P. http://www.epa.govt.nz/search-atabases/HSNO Application Register Documents/Methyl Bromide%20Appendices L to T.pdf

[18] Methyl bromide fumigations Post-reassessment guidance for fumigators APRIL 2011. http://www.epa.govt.nz/Publications/Methyl_bromide_guidance_for_fumigators.pdf

For small operations where the number of fumigations is low, or where the quantity of fumigant is small this will not result in significant error. But where there are a large number of fumigations carried out over a long period of time or where there are long slow releases, significant error is likely to occur.

This point is quite evident when looking at the results of methyl bromide levels inferred in the SCION study. Values of between 0.1 to 2 mg/m^3 for off-site one hour averages can be compared to the value of zero submitted to the EPA by Genera for Port of Tauranga for the years 2011 to 2014[19]. By way of example of how this can occur, 440 readings of 0.1 mg/m^3 (that will not be recorded by the usual monitors) will result in exceedances of the annual TEL but they will actually be reported as no exceedances in the monitoring report to the EPA. Similarly only 22 events of about 2 mg/m^3 will also exceed the annual TEL.

The SKM report discussed the use of more sophisticated instruments such as specialised photo-ionisation detectors (PID) and portable fourier transform infrared systems (FTIR). Other more complex instruments include open path FTIR and tuneable diode laser spectrometers (TDLS), but these are not in common use and are expensive not only from a capital expenditure perspective but also there are considerable maintenance and operational costs. All these types of instruments would be suitable for monitoring low levels of fumigants at the parts per billion (ppb) levels required for annual average determination. Canister sampling is probably not suitable for long term monitoring, i.e. annual average concentrations, because of the practical difficulties in set-up and analysis, but it can be very useful in establishing indicative short and medium time averaged levels such as hourly and 24 hourly averages.

Continuous sampling can provide both short and long term averaged concentrations for comparison with appropriate standards or guidelines. For methyl bromide and other fumigants, the most versatile and reliable instrument choice would be an FTIR analyser that can be configured to detect multiple species simultaneously. Potentially this could be an open path type instrument, as above, or a single point continuous sampler, but the latter would probably be preferred due to cost. They can be configured for 24/7 operation with data logging and alarm reporting capability.

Other suitable instruments may also be available, but the essential specifications are that they are capable of continuous operation over year long time scales and have minimum detectable limits in the ppb range, and that they can resolve for specific contaminants with no interferences.

4.4 Multiple Operators at a Site

To date at most fumigations sites in New Zealand there has generally been only one fumigator operating. That has certainly been true for Port of Tauranga. That may not always be the case and the situation changes significantly if more than one operator is on the site.

As discussed earlier, this can create considerable difficulty in accurately modelling what might occur if multiple fumigations are potentially carried out either simultaneously or sequentially within short time scales.

That in turn creates problems in terms of assessing new resource consent application for new operations. If there is no mechanism to prevent concurrent or nearly concurrent fumigations, then it raises issues of the meaningfulness of modelled predictions in Assessment of Environmental

[19] http://www.epa.govt.nz/about-us/monitoring/methyl-bromide-reports/read_mbr_reports/Pages/default.aspx

Effects in individual consent application. There is also an issue whether overlapping discharges would be likely to breach the TELs and therefore whether the application ought to be declined.

The consent authority has very little ability to effect meaningful control in these instances since the original fumigator will already have resource consent and rights under it. Its strongest power is to decline the new resource consent application if it believes it cannot grant it with sufficient conditions on the consent to ensure significant adverse effects are avoided, or if the applicant does not volunteer conditions that would address issues arising from multiple operators.

It is very difficult for a consent authority to make existing and new dischargers co-operate to avoid simultaneous releases of fumigant, particularly given the fumigators are likely to be commercial competitors.

The party who can effect co-operation is the landowner/occupier on whose land the fumigations are happening or proposed to happen. In the case of the Port of Tauranga it is the Port Company. They, as landowner, have the ability to control who comes onto their land, what they do, where they do it, how they do it, and even when they do it.

The Port Company holds the key to multiple fumigators being able to operate on a site effectively. Put another way, without the active involvement of the port (or a large landowner in other situations), it is difficult to see how a regional council could grant consent for multiple fumigators to operate on a single site, as there is not an effective means to manage the activities within the exposure levels set in each resource consent, nor to enforce them.

4.4.1 EPA / HSNO and Multiple Operators

The EPA document *Post-Reassessment Guidance for Fumigators* anticipates the possibility of more than one fumigator working on a site:

> *There is a possibility that more than one operator will be using methyl bromide at some sites. It is the responsibility of the person in charge of the site to collate the data to ensure that all monitoring data are compared to the appropriate TELs, and especially the annual average value. The person in charge of the site should be continuously and proactively calculating the 24-hour and annual average air concentrations of methyl bromide and comparing these to the TELs. This analysis should allow people who apply methyl bromide to ensure that they do not exceed either of these values. If the person in charge of the site establishes that the 24-hour and annual average concentrations are close to either of the TELs, they should take extra steps (such as larger buffer zones or controlled venting) to ensure that future fumigations do not result in any exceedance of the TEL.*

The 'person in charge' is a defined term in the HSNO regulations for methyl bromide. Where there is just one fumigator working on a site, then the 'person in charge' is the person leading that fumigation team. That person is responsible for a number of things under the HSNO regulations, including establishing the buffer from which the public is excluded, ensuring the TELs are not breached, monitoring and a number of regulatory matters.

However it is clear from the above extract from the EPA guidance document that when there is more than one fumigator operating, the 'person in charge of the site' changes. When more than one operator is present the 'person in charge of the site' is monitoring on behalf of the entire site, not the individual fumigations, and 'continuously and proactively' calculating methyl bromide average and comparing these with the TELs.

The EPA sees the person in charge of the site giving the data to the 'people who apply methyl bromide to ensure that they do not exceed ..the values'. Moreover the EPA guide sees the person in charge taking extra steps if monitored levels are close to TELs to avoid breaches from occurring.

The HSNO regulations define 'person in charge' as:

> *a person who is—*
> *1. the owner, lessee, sublessee, occupier, or person in possession of the site, or any part of it; or*
>
> *2. any other person who, at the relevant time, is in effective control or possession of the relevant part of the site.*

In other words, the 'person in charge' can be the owner of the site.

The HSNO regulations in terms of responsibility for complying with the TELs talk both about the *'person in charge of a site'* and *'a person who uses methyl bromide'* as being required to *"ensure that methyl bromide is used in a manner that does not result in a concentration of methyl bromide, in air at the boundary of the buffer zone, that exceeds the* TEL_{air} *values."* (clause 27).

Under the HSNO regulations a site can be an allotment or several joined allotments in one title, and it can be the total area of land occupied by an activity – such as all the land area used for a port activity (or some other large undertaking).

Thus it seems clear, particularly when there may be multiple operator on a site, that both the landowner/occupier and the fumigator have responsibilities and liabilities under the HSNO regulations.

Extracts from the HSNO regulations are included in Appendix 4.

4.4.2 RMA and Multiple Operators

The situation under the Resource Management Act is slightly different. A person can apply for a resource consent to do something on someone else's land. The landowner may give written consent for the activity to occur on their land, but it is the consent holder who is liable in terms of enforcement and operating within the terms of the resource consent.

At the Port for instance, a fumigator can (and does, in the case of Genera Ltd) hold a resource consent for fumigation, but the Port Company is not a party to the consent or liable under it.

Unless the Port were a party to the resource consent application, there is little the consent authority could do to impose requirements on the Port e.g. in terms of monitoring or controlling the time fumigators released fumigants, since conditions on resource consents cannot bind third parties.

However, given the responsibilities that fall on landowners under the HSNO regulations, the Port could voluntarily offer to extend the responsibilities it already has under HSNO and should be doing, into the Resource Management Act realm.

How such a function could tie into resource consents issued and be legally enforced is something that the Regional Council might want to seek legal advice on.

The Port Company couldn't be compelled to co-operate, but as stated earlier, without the Port's involvement it is difficult to see how an effective RMA regulatory system could work, and how more than one consent for fumigation could pass the required statutory tests in order to gain consent.

The Port could fulfil a number of key roles including:

- Controlling the number of operators
- Controlling the location and timing of fumigators operating
- Keeping records of who is fumigating when (importance if breaches of TEL occur, to establish liability or for remedial action, such as creating larger public exclusion areas)
- Providing monitoring records and annual average calculations to EPA, Council and fumigators
- Install a minimum of at least a single continuous monitoring system for compliance monitoring (can charge each fumigator).

5 Recommendations

a. That objectives, policies and methods (including) rules be included in the Bay of Plenty Regional Air Plan relating to fumigants in general, not just methyl bromide. Draft provisions are included in **Appendix 3** of this report.

b. That the policy framework focus on protecting public health, with particular regard to 'sensitive sites' such as schools, playgrounds, early childhood centres, hospitals, long-term care facilities, and places where people are unable to be readily evacuated (e.g. correctional facilities).

c. That, for methyl bromide, the Tolerable Exposure Limits established in the Hazardous Substances and New Organisms regulations are appropriate human exposure levels to use in decision-making under the Regional Air Plan. But, that better monitoring of fumigation discharges is needed to ensure compliance with these levels, particularly to be able to determine the longer-term exposure levels (the annual average or chronic TEL).

d. That provisions similar to the existing Rule 17 in the operative Regional Air Plan be used to permit household and small-scale fumigation.

e. That all other fumigation require resource consent as a discretionary activity, except that if re-capture technology is used with methyl bromide, then it be a controlled activity (non-notified).

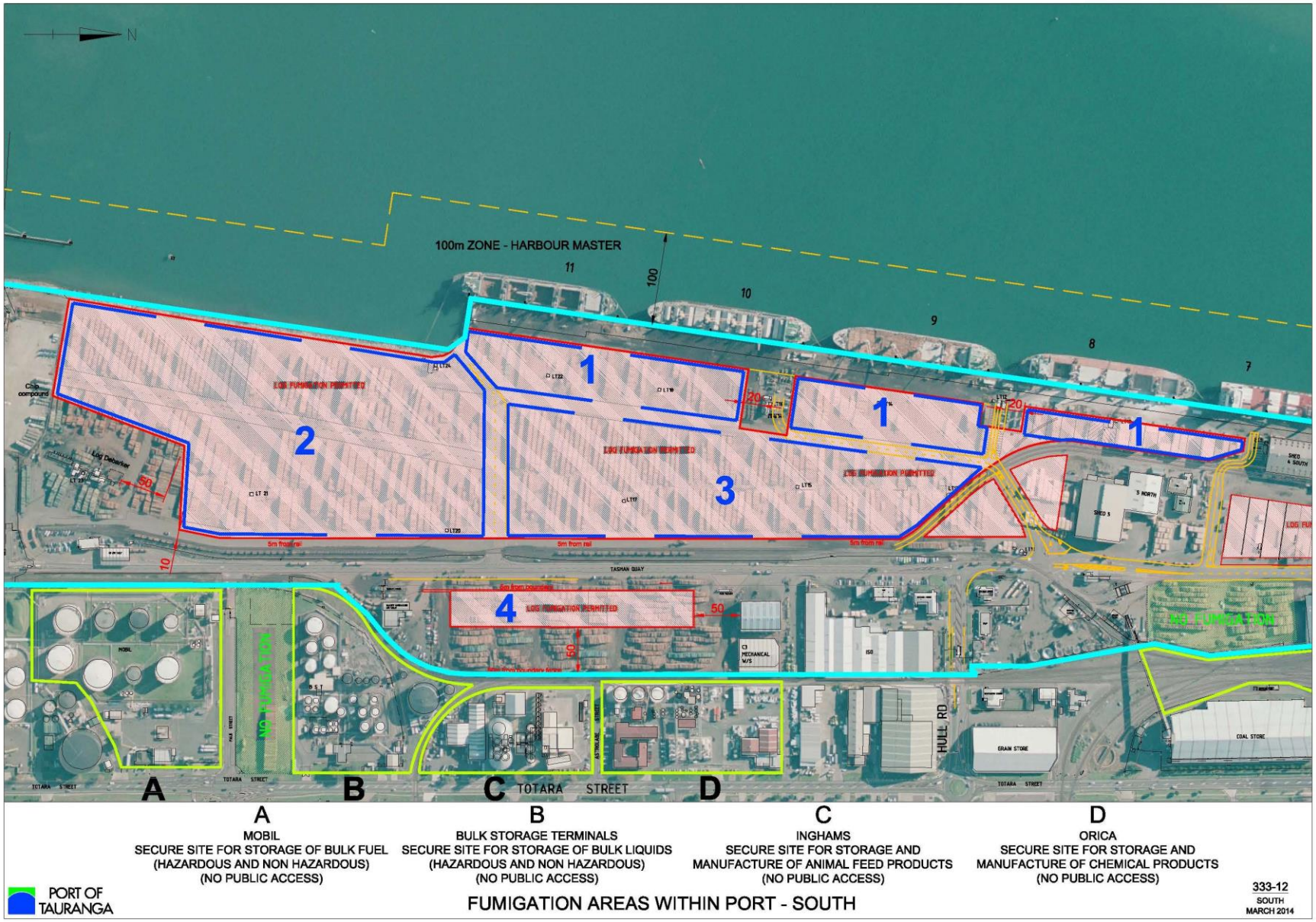
f. The purpose of the controlled activity status when recapture of methyl bromide is used is to provide a regulatory process that provides an incentive to fumigators to re-capture the fumigant, as opposed to the more difficult, and probably publicly notified, discretionary consent process when gas is vented to the air.

g. That the discretionary activity rule link to a list of assessment matters/guidelines. This is to help applicants with the matters they need to include in resource consent applications. It is also to assist council officers and decision-makers considering applications as to the information they should require from applicants and matters that may be relevant in making a

determination on the application. Particular attention is paid to the provision of good information through appropriate modelling and monitoring.

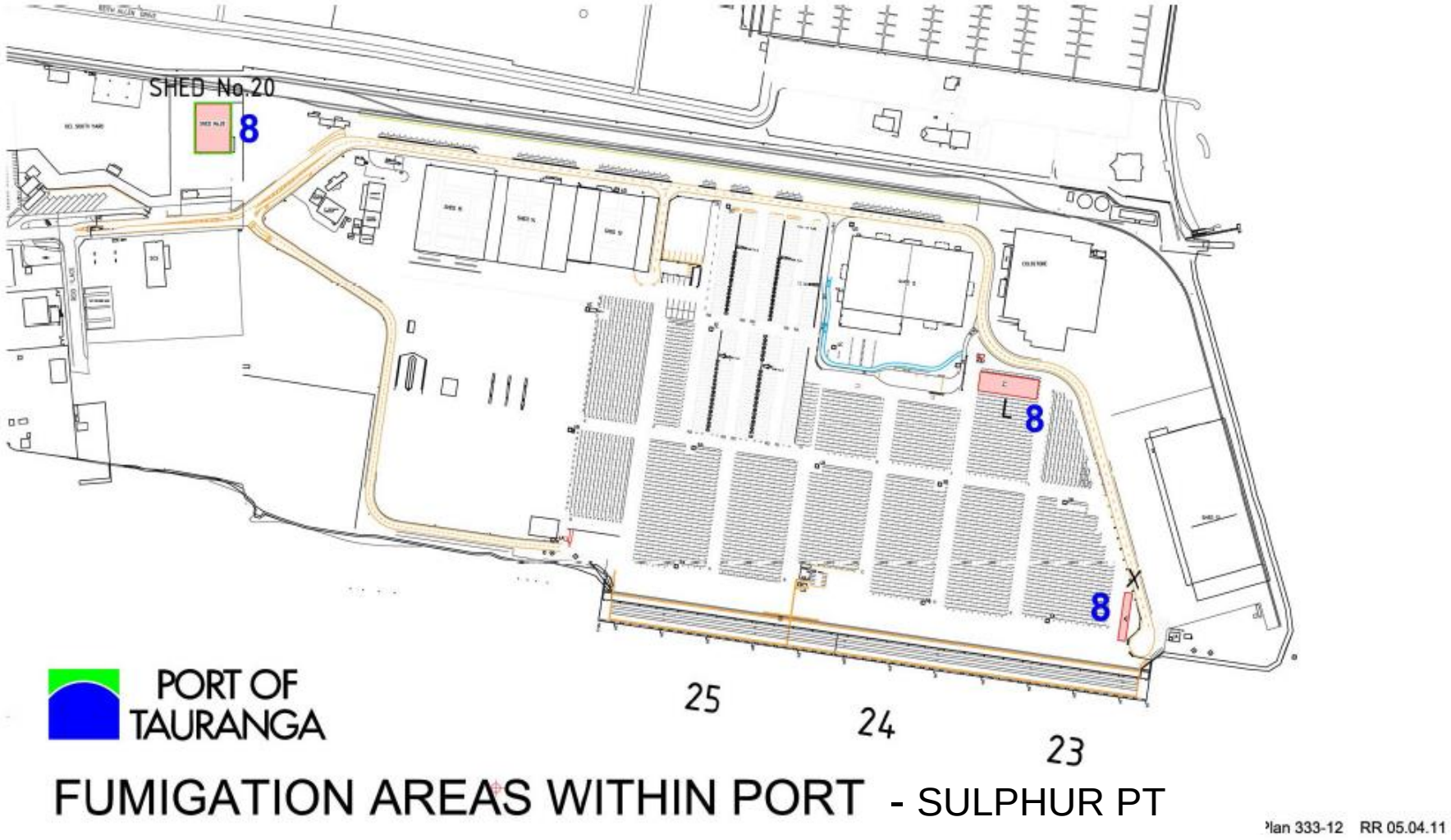
Appendix 1 - Port of Tauranga Fumigation areas

Port of Tauranga – Fumigation areas




100m ZONE - HARBOUR MASTER
FUMIGATION ON APPLICATION
NO LOG FUMIGATION
NO FUMIGATION
LOG FUMIGATION PERMITTED
LOG FUMIGATION PERMITTED
COMMON USER STORAGE
FUMIGATION
6
7
E
KIWIRAIL
PRIVATE LAND
(NO PUBLIC ACCESS)
PORT OF TAURANGA
FUMIGATION AREAS WITHIN PORT - NORTH
333-12
NORTH
MARCH 2014

Appendix 2 - Port of Tauranga – Sulphur Point Fumigation areas


SHED No.20
8
8
8
PORT OF TAURANGA
25
24
23
FUMIGATION AREAS WITHIN PORT - SULPHUR PT
Plan 333-12 RR 05.04.11

Appendix 3 – Draft Objectives, Policies and Methods for Fumigation

Draft Fumigation Provisions for consideration for inclusion in Review of BOP Regional Air Quality Plan

Issue:
The discharge of fumigants into air during and following fumigation can potentially harm the health of members of the public.

Fumigants used in Bay of Plenty include:

- domestic borer bombs /pest control
- commercial fumigations of houses or commercial and industrial buildings, plant and grain silos
- pest control in horticulture such as strawberry growing
- fumigation for phyto-sanitary and quarantine purposes on imports and exports.

It is only the latter fumigations, the ones for quarantine purposes that are considered to be a significant resource management issue. The fumigants for those fumigations need to be more toxic to meet quarantine purposes, and often very large quantities are used. For example, a tonne or more of methyl bromide gas is used in the fumigation of a ship's holds. Methyl bromide is main fumigant used in the region, but phosphine is also used as an alternative in ship fumigations. Use of methyl bromide is now restricted to quarantine and essential phyto-sanitary use. Non-critical use under the Montreal Protocol, such as for strawberry growing, was phased out in NZ in 2007[20]. Phosphine or other fumigants are used for these other uses.

A secondary issue is the affect that methyl bromide has on depletion of the ozone layer. The Government has passed specific legislation and regulations to regulate the manufacture, use and importation of ozone-depleting substances – the Ozone Layer Protection Act 1996, along with the Ozone Layer Protection Regulations. The primary management of the ozone-depleting substances is at the national level via this statute and regulations.

Objective:
Avoid adverse effects on the health of the public from the use of fumigants.

Policies:

1) Adverse effects from fumigation on human health should be reduced, for example by encouraging fewer fumigations, use of lesser amount of fumigant, the use of safer fumigants or alternatives methods, or use of recapture technology of fumigant gases.
2) When fumigant gases are used within the region, to ensure that the relevant exposure levels set by the NZ Environmental Protection Agency in regulations to protect human health are complied with.

[20] http://www.biosecurity.govt.nz/commercial-transport-and-border-management/facilities/official-use-of-methyl-bromide

3) Particular regard should be had to protecting, from fumigant use, the health of persons on sensitive sites, such as schools, playgrounds, early childhood centres, hospitals, long-term care facilities, and places that cannot be readily evacuated such as correctional facilities.
4) Fumigations requiring large amounts of fumigant should collect accurate and reliable monitoring data in order to better understand the levels of fumigant in the receiving environment and to provide good information for processing of consents and their compliance.

Methods:

1) Rules that permit low level use of fumigants, such as household and small-scale commercial use, but require resource consent for larger uses.
2) Rules that provide a less onerous consenting requirement when activities employ recapture of methyl bromide fumigant.
3) Guidelines for applicants for resource consent, consent planners and decision-makers with respect to the matters that need to be considered in preparing and processing resource consent applications.

Rules:

Permitted Activity – Fumigation

The discharge of any contaminant to air from fumigation is a permitted activity providing the following conditions are complied with:

(a) The fumigant used is approved as a fumigant by is an approved substance under the Hazardous Substances and New Organisms Act 1996;

(b) Not more than 1 kilogram of fumigant shall be discharged to air on a site over any one hour period;

(c) At any point beyond the boundary of the subject property, or on public land;

  (i) The discharge shall not result in any noxious or dangerous levels of airborne contaminants;

  (ii) The discharge shall not result in any offensive or objectionable odour;

  (iii) The discharge shall not result in any objectionable deposition of particulate matter on any land or structure;

(d) Discharger must adopt the best practicable option to prevent or minimise any adverse effects of the discharge beyond the boundary of the property.

Controlled Activity – Methyl Bromide Fumigation with Capture

The discharge of any contaminant to air from fumigation with methyl bromide is a non-notified controlled activity for which applications will be considered without the need to obtain written approval of affected persons, subject to compliance with the following conditions:

(a) The methyl bromide in the air space of the fumigated volume is captured and either destroyed or recovered at the end of the fumigation period;

(b) The application is accompanied by scientific evidence that the capture process is capable of reducing the concentration of methyl bromide in the fumigated volume to at least 5% of the original concentration of methyl bromide at the commencement of the fumigation;

(c) No fumigation occurs within 100 metres of any sensitive site.

For the purposes of imposing conditions, control is reserved over:

- ambient monitoring
- keeping of records
- duration of consent
- review of conditions
- the method by which the captured methyl bromide is destroyed or recaptured
- training requirements for operators
- the operation of the fumigation process to minimise discharge of methyl bromide to the atmosphere
- the number of fumigations on the site, and the timing of the fumigation
- contingency planning
- signage, notices and methods of excluding people.

Discretionary Activity – Fumigation

The discharge of any contaminant to air from fumigation that is not a permitted activity or a controlled activity is a discretionary activity.

When considering whether to decline or grant the application, or grant it with conditions, as part of its consideration under section 104 of the Act, the council will have regard to the degree of compliance with the matters in Annex A.

Definitions

Fumigant	a chemical, which at a specific temperature and pressure can exist in a gaseous state in sufficient quantities to be lethal to a pest organism and which is an approved substance under the Hazardous Substances and New Organisms Act 1996.
Fumigation	the use of a Fumigant for the purpose of destruction of rodents, pests, or other plant or animal organisms.
Fumigated Volume	the volume contained within the fumigation enclosure, such as tarpaulin, container, building or ship hold.
Sensitive Site	a place where members of the public are likely to be present and are unable to readily evacuate themselves, such as a school, a playground, early childhood centre, hospital, rest home, or place of detention.

Principal reasons for adopting these Methods of Implementation

Small scale domestic or commercial fumigation has not proven to be a significant resource management issue. The threshold in the previous Regional Air Plan below which fumigation is permitted has been continued with, as this cut-off level is accepted in the community and has been working.

The default consent category for fumigations discharging above this level is discretionary. However, with methyl bromide if capture or destruction technology is used, the consent category is controlled (non-notified). This is a reflection of the much lower environmental impacts when methyl bromide is captured at the end of the fumigation, rather than vented to the atmosphere. This simpler consent category is also aimed as an incentive to applicants to encourage capture /destruction of methyl bromide, rather than the usual venting to the air where a fully discretionary consent is required. Discretionary activities often will need to go through a full public notification process.

For discretionary applications a guideline is included in the Plan to provide direction on the information expected with applications, particularly with respect to modelling the expected discharge and monitoring of emissions.

Annex A - Guidelines - Matters to be considered in discretionary activity applications for fumigation with methyl bromide

The matters below are 'provisions in a plan' in terms of section 104 (1)(b)(vi). This is an inclusive list and does not limit the matters included in any consent application or considered by the consent authority.

Assessment Matter	Additional Factors
1. The scale, frequency and potential effects of the proposed fumigation.	As with any Assessment of Environmental Effects, the level of detail in the application and the assessment of effects must be proportional to the likely or potential effects on the environment i.e. a 'horses for courses' approach. This reflects both the scale of the likely discharge (size of discharge, frequency, time of day etc) as well as the sensitivity of the receiving environment (e.g. if there are any sensitive sites close by).
2. The degree and reliability to which the applicant has modelled or otherwise estimated the likely levels of methyl bromide at the location that the public may be potentially most affected.	For smaller discharges dispersion modelling may not be necessary. Evidence from monitoring at other locations or scientific reports may be adequate to estimate the likely methyl bromide levels at the edge of the buffer zone. For larger fumigations, dispersion modelling will be necessary. It is up to the applicant to demonstrate the accuracy and effectiveness of the modelling used. The reason for the model and the assumptions must be spelt out clearly E.g: Does the model and source configuration realistically represent the expected effects, without under-predicting? How realistic is the model configuration, and how well do the predictions compare with monitoring data. How reliable is the monitoring data, give that long term data (annual average) is calculated from short term data which may not detect fumigant levels that nevertheless contribute to the annual average TEL.
3. The type of monitoring proposed to be undertaken.	Where fumigation will involve the use of 1000kg or more of methyl bromide in any 24 hour period[21], or modelling or other estimates indicate 50% or more of the annual average TEL may be reached at the edge of the buffer zone or where the public may access, then

[21] The Environmental Protection Agency's HSNO regulations for methyl bromide differentiate between more than 1000kg per 24h and less than this for fumigation of ships' holds. The actual justification for this spit at 1000 kg per 24 hours is not clear from the EPA documentation, but represents a significant release. The Graham report (Application for the Reassessment of Methyl Bromide, Environmental Management Risk Authority 2010) shows the levels of methyl bromide measured at various distances (100m to 500m) from ships holds and logs, that vented between 1015 kg and 4811 kg, varied from 0.01 to 1.38 ppm as one hour averages indicating that the annual averages would likely be significant (depending on the number of fumigations carried out, and the procedure used for venting). It is logical therefore that a minimum requirement for continuous monitoring should be required for methyl bromide where the release rate is greater than 1000 kg in any 24 hour period.

	continuous ambient monitoring must be undertaken by the consent holder (or by agreement, the landowner or occupier where there is more than one fumigator operating on a site) . Monitoring should be capable of reporting at about the 1 ppb level, and recorded for 10 minute, 1 hour, 24 hour and annual averages. Where fumigation involves the use of less than 1000 kg of methyl bromide in any 24 hour period then monitoring should be carried out in accordance with the EPA guidance[22] and with instruments with a minimum detection level of 0.05 ppm or better[23].
4. Whether monitors will have sufficient spatial coverage and be located such that the results are representative of exposure to persons off site.	Guidance for monitor locations can be found in New Zealand siting standard AS/NZS 3580.1.1:2007, *Methods for sampling and analysis of ambient air – Guide to siting air monitoring equipment*.
5. The cumulative effects from the new discharge where existing fumigations are already occurring.	Matters to consider include: Who will be the 'person in charge of the site' in terms of the HSNO regulations, and how will discharges will be managed to control simultaneous or near simultaneous discharges to avoid breaches of the Tolerable Exposure Limits? How effective and enforceable are those controls? How will the 'person in charge of the site' collect monitoring information for the site, calculate the relevant TELs and provide this to the fumigators operating on the site? Records are also needed of, as a minimum, time, place and size/type of fumigation, time of release, wind speed and direction on release to help correlate any monitoring breaches with a particular operator. What procedures or change will be put in place if measured levels approach at TEL limit? If mechanisms to prevent simultaneous or near simultaneous discharges are not provided for, what are the results of modelling to show predicted methyl bromide concentrations in places the public would be exposed.
6. The contingency plans that are in place should a breach of the 1 h or 24h TEL be detected.	Item 5 above deals with situations where more than one fumigator is operating on a site. Item 6 deals with situation where there is just a single operator.

[22] Methyl bromide fumigations Post-reassessment guidance for fumigators APRIL 2011. http://www.epa.govt.nz/Publications/Methyl_bromide_guidance_for_fumigators.pdf

[23] Environmental Risk Management Authority Decision Application for the Reassessment of a Hazardous Substance under Section 63 of the Hazardous Substances and New Organisms Act 1996 Name of substances: Methyl bromide and formulated substances containing methyl bromide Application Number: HRC08002 28 October 2010 Amended under s67A of the HSNO Act on 1 June 2011 Section 16

7. The consideration of alternatives to the discharge of fumigant.	This includes other means of killing the target organisms, or means of containing, destroying or recovering the fumigant. When a significant adverse effect on the environment is likely, a description of any possible alternative locations or methods is required (Schedule 4, RMA)
8. The degree to which an adaptive management approach could be used.	Adaptive management is a process of continually improving management and decision-making in the face of uncertainty as a result of learning by doing. It can be used in resource management decision-making where there is uncertainty or insufficient data. Monitoring and gaining more information is then used to improve the management of the activity. Adaptive management is not 'try it and see' or a way of getting around a poor consent application. It involves getting the correct balance between improved future management (e.g. through improved monitoring data) and a good short-term outcome using available information. Adaptive management in certain situations could potentially be used to allow a fumigation activity to occur. However, this could only potential occur it if were subject to a defined process of monitoring to improve knowledge on the effects, and a structured process to review the consent to take account of the information collected. An adaptive management process, however, cannot allow a fumigation consent to occur if significant adverse effects on human health are likely or reasonably possible, or if there is a high risk of breaching the HSNO Tolerable Exposure Limits.

Appendix 4 – Extracts from the Hazardous Substances and New Organisms Act regulations for methyl bromide

http://www.epa.govt.nz/Documents/HRC08002-Methyl-Bromide-decision.pdf

Prohibition on use of methyl bromide in excess of tolerable exposure limit. A person in charge of a site and a person who uses methyl bromide must ensure that methyl bromide is used in a manner that does not result in a concentration of methyl bromide, in air at the boundary of the buffer zone, that exceeds the TEL_{air} values.

Person in charge, in relation to a **site** where **fumigation** is or is intended to be carried out, means a person who is—
1. the owner, lessee, sublessee, occupier, or person in possession of the **site**, or any part of it; or

2. any other person who, at the relevant time, is in effective control or possession of the relevant part of the **site**.

Clause 3, Table 2: 1 hour and 24 hour exposure levels
(1) The **person in charge** of the **site** must, for each **monitoring location**, keep a record of the following information for every **ventilation**:

1 hour exposure level; and

24 hour exposure level.

(2) The **person in charge** of the **site** must notify Department of Labour and the relevant Medical Officer of Health as soon as practicable, but within 5 working days, if either the:

(a) **1 hour exposure level** exceeds the 1 hour TELair value for **methyl bromide**; or

(b) **24 hour exposure level** exceeds the 24 hour TELair value for **methyl bromide**.

Annual monitoring report

(1) The **person in charge** of a **site** where more than the reporting threshold set out in clause 5(2) is applied must produce an **annual monitoring report**.

(2) The reporting threshold is 500 kg or more of **methyl bromide** in one **calendar year** at a **site**.

(3) ....

Site means:
Where the methyl bromide is used:

1. an area of land which is:

(a) comprised of a single allotment, or other legally defined parcel of land and held in a single certificate of title; or

(b) comprised of a single allotment or legally defined parcel of land for which a separate certificate of title could be issued without further consent of the Council, being in any case the smaller of land area i) or ii); or

2. an area of land which is comprised of two or more adjoining legally defined parcels of land held together in one certificate of title in such a way that the lots cannot be dealt with separately without prior consent of the Council; or

3. an area of land which is comprised of two or more adjoining certificates of title where such titles are:

(a) subject to a condition imposed under section 37 of the Building Act or section 240 Resource Management Act 1991; or

(b) held together in such a way that they cannot be dealt with separately without the prior consent of the Council; and

4. in the case of land subdivided under the cross lease or company lease systems (other than strata titles), site shall mean an area of land containing:

(a) a building or buildings for residential or business purposes with any accessory building, plus any land exclusively restricted to the users of that building; or

(b) a remaining share or shares in the fee simple creating a vacant part of the whole for future cross lease or company lease purposes; and

5. in the case of land subdivided under the Unit Titles Act 1972 (other than strata titles), site shall mean an area of land containing a principal unit or proposed unit on a unit plan together with its accessory units;

(a) in the case of strata titles, site shall mean the underlying certificate of titles, immediately prior to subdivision; and

(b) in the case of an activity that occupies more than one adjoining allotment, whether held in single legal title or multiple titles, for the purpose of compliance with any rules that specify a level of effect at the boundary or that specify capacities or discharge quantities, then the site shall be the total area of land occupied by that activity, and boundary shall be the boundary around that area of land. ―Adjoining‖ (in the context of this definition) includes otherwise contiguous allotments which are straddled by a vehicle access or a legal road.

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