11 May 2021

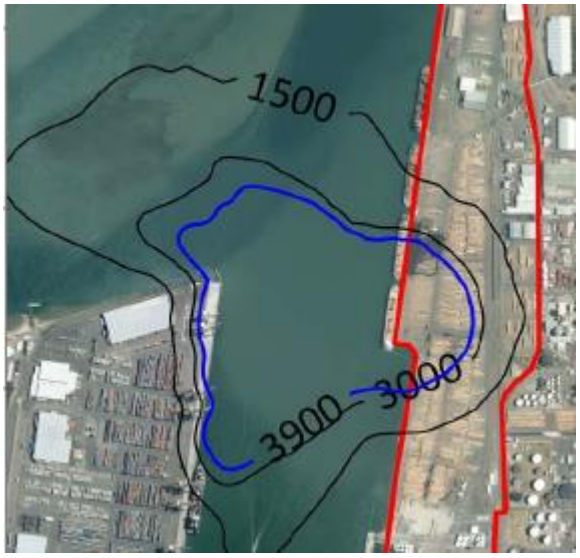
Kia ora koutou Decision Making Committee of the EPA,

Following Direction & Minute WGT033 and WGT034 of application APP203660 for the reassessment of methyl bromide (MB), and the invitation to provide comment on the additional information we provide the following to supplement our earlier "Comments from BOPRC…" (dated 12 April 2021):

1.0 Ship fumigation

1.(a) Golder modelling

The latest Golder Associates 2021 fumigation mitigation options investigation report (Golder 2021) shows MB levels equal to the tolerable exposure limit (TEL) of 3,900 µg/m^3 (= 1ppm) extending all the way from the Mount wharves at the Port of Tauranga (the Port) across to Sulphur Point for each of the three scenarios (figure 3, 4 and 5), a distance of over 500m. A clip from Figure 3 is reproduced below.



Source: Golder 2021 report

The report states that, *"For the ship hold assessment time of day restrictions … resulted in meeting the 1 hour TEL at the port boundary (based on 99.9th percentile modelling)." (s.2.1)*

This comment would appear to overlook the fact that the plume concentrations of MB exceeding the tolerable exposure limit extends well beyond the Port boundary and completely covers the heavily used public boating channel between Sulphur Point and the main Mount wharves. It is an important consideration that there is no legal mechanism to exclude the boating public from this area, other than for within 50m from a ship.

Additionally, the report does not comment on, nor does it present in the figures, just by how much MB concentrations exceed the TEL and where this occurs - presumably somewhere in the boating channel.

1.(b) Position of fumigation plume associated with ship fumigation

The Golder 2021 report modelling is based on using Todoroski Air Sciences December 2020 (TAS) report data, where *"… the emission rates are consistent, the same meteorological data are being used, the same receptors are chosen, and all other model-configuration parameters are the same as TAS.*" (s.2.4.2, Golder 2021).

It is noteworthy that all of the various ship fumigation scenarios modelled by TAS (with the isopleth diagrams presented in appendix A) show the ship releasing the gas reasonably central to the isopleths, in contrast to the Golder modelling. If the Golder figures 3, 4 and 5 (which unfortunately do not show the location of the venting ship) were adjusted so that the isopleths were similarly centrally positioned around a ship berthed at the Mount wharves, the levels of MB exceeding the TEL would then extend well beyond the eastern boundary of the Port and into the commercial area.

Significantly TAS identified a buffer requirement of between 370m and 1020m for 'ship only' fumigation (table 4-1), with the modelled scenarios described in table 3-2.

We consider that the potential size of the gas plume resulting from ship fumigation has obvious implications for workers based on the Port.

1.(c) Modelling by Sullivan Environmental Consultants (SEC)

Although the model inputs and assumptions are not fully stated, the latest modelling report by SEC January 2021 for ship holds (figures 3 & 4) seems to suggest that MB concentrations above the TEL are not found further than 100m from a ship fumigation. This would appear to be very much at odds with the results from the other air dispersion modellers. One reason may be that the 'AERMOD' model was used rather than the specified CALPUFF model.

It is hoped the air dispersion modelling experts will comment further on this.

2.0 Air dispersion models under predict buffer distance requirements

The March 2021 EPA update report (s.3.13) states that the independent monitoring and modelling programme commissioned by WorkSafe New Zealand found that, despite aligning the timing of their modelled peaks with the monitored results, "*their modelling consistently under predicted the concentrations."*

This under-prediction is consistent with section 2.4.1 of Dr Jenny Barclay's (ASG) review of the TAS modelling where she states that due to an error they "*under predict the concentration … between 8% … and 26%...".* The TAS report refers to this in table D-1 and do not dispute the error, stating that "d*ue to insufficient time, the potential under prediction issue raised by ASG could not be tested for…"*

3.0 Minimum wind speed – support for control

In the March 2021 EPA update report, s.7.3 states:

> "*As the DMC explicitly asked TAS for advice relating to adverse conditions to avoid, it would be appropriate to phrase TAS' recommendation of a 2 m/s minimum wind speed as a control."*

Not only are low wind speeds associated with poorer air mixing therefore requiring greater buffer distances, very low winds are typically more changeable and unpredictable making conditions riskier for Port workers and fumigators.

This recommendation is consistent with an earlier submission point by Bay of Plenty Regional Council and we fully support 2 m/s minimum wind speed as a control for both ship and log stack fumigation.

4.0 Emissions rates and recapture rates – enforceable controls

Some of the modelling mitigations were based on maximum emission rates. For example, a maximum emission rate of 32.6 µg/m^3 during 7-9am and 3-7pm (Golder 2021). This is a concept that may work well in theory however when it comes to the fumigator determining this, or the regulator verifying compliance, it will prove extremely difficult. EPA staff have recognised this in s.7.11 of their March 2021 update report.

This difficulty with verifying compliance also applies to recapture, where higher recapture percentages are used to support reduced buffer distances. At a practical level it is the corresponding MB concentration in the fumigation enclosure (e.g. under tarpaulins) immediately prior to release that can be measured and therefore this is what the control must stipulate.

Examining the various trial results available to the DMC will enable an appropriate MB concentration prior to release to be determined, based on how it relates to the agreed air dispersion modelling predictions. Setting a maximum vented MB concentration, i.e. something that can be verified prior to release, will provide confidence to the public and the wider community that harmful levels of gas are being avoided.

5.0 Port worker exposure

The 2010 Decision of the Environmental Risk Management Authority ("ERMA", the EPA's predecessor) for the reassessment of methyl bromide may well have intended that the instantaneous limit for Port workers be 5ppm (refer to extract below, s.12.4.15)

> 12.4.15 *The Committee notes that non-fumigation staff working in the vicinity of a fumigation may be at risk during ventilation activities. The controls on methyl bromide require that fumigation staff must ensure than no person is present in an area where a gas concentration above the workplace exposure standard (WES) value is present, unless they are wearing appropriate respiratory protective equipment.*

Despite this the general interpretation is that the only legally enforceable exposure limit for workers based on the Port ('occupation bystanders') is 5ppm averaged over 8 hours.

Currently all Port workers (including office workers with no association to fumigation) may in theory be exposed to up to 40 times the tolerable exposure limit of 1ppm, averaged over one hour. For example, 40ppm MB for one hour, and no exposure for the other seven hours results in an average over 8 hours of 'only' 5ppm, the Worker Exposure Standard (WES).

To adequately protect people who work on the Port there needs to be a one hour average limit - such as the TEL set for the public and also a short term (e.g. 10 – 15 minute) exposure limit (STEL). An example of this is the STEL set by Australian authorities, refer to the 'Guide to performing QPS

fumigations with methyl bromide (agriculture.gov.au)', prepared by the Australian Department of Agriculture and Water Resources, 2018.

The Air Matters reports (commissioned by WorkSafe) presented in the appendices of the newly posted PDP report refer to the TEL as "a *level of exposure that a person outside of the buffer zone during a fumigation event (public) can experience without suffering adverse health effects, however, individual susceptibility may lead to a varying response.*" (e.g. p.67 of 112). It is unclear why this same exposure limit doesn't apply to workers on the Port who have no involvement with fumigation.

The exposure of workers on the Port to methyl bromide gas, most of whom have no involvement with the fumigation activity, has been largely overlooked in all of the discussion about modelling and human exposure, yet Port workers are at greater risk than the general public because of their proximity to the fumigation events, the duration of their exposure and the much higher exposure limits applied to them.

6.0 Photoionization detectors (PID) used for methyl bromide monitoring

The most common way of monitoring MB historically has been by using PIDs measuring Total Volatile Organic Compounds (TVOC). As can be seen by Air Matters 2021 final summary report (Air Matters 2021) the results can vary significantly from actual MB levels.

The table below examines all MB canister values in table 1-1 of the Air Matters 2021 report greater than 500 ppb (this value was chosen so any background TVOCs will be proportionally less significant to the PID readings). It shows that while in a couple of cases the PID read slightly low, in the majority of cases the PID significantly under represented MB concentrations, in some cases reading about half the actual value (see shaded rows).

Event	Sample location	TVOC result (ppb)	MB Canister reading (ppb)	Difference (%)
5	16	578	1220	211
6	3	788	720	91
7	11	417	603	145
9	1	270	680	252
9	22	2239	3420	153
10	1	615	591	96
10	23	2408	4790	199
11	25	1024	1320	129
11	26	547	585	107
19	53	366	629	172

(Data sourced from Table 1-1, Air Matters 2021 report)

For this reason it is important to specify how MB is to be measured and to recognise the limitations of PIDs when setting controls.

Thank you for the opportunity to provide these comments, we trust they will be of use in your deliberations.

Ngā mihi nui.

[redacted] for Bay of Plenty Regional Council.