Before a Decision-Making Committee
Of the Environmental Protection Authority

APP203660

Under	the Hazardous Substances and New Organisms Act 1996
In the matter of	the modified reassessment of methyl bromide
By	**Stakeholders in Methyl Bromide Reduction Inc**
	Applicant

34TH MEMORANDUM OF COUNSEL FOR THE APPLICANT

25 JUNE 2021

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1. By Direction & Minute WGT037 dated 10 June 2021, the DMC directed the applicant to provide comments on the final PDP report[1] by 5pm on 25 June 2021.

2. The attached Technical Memorandum by Golder dated 25 June 2021 constitutes STIMBR's comments on the final PDP report.

3. As covered in Golder's Memorandum, PDP's work discloses a good correlation between monitored events and predicted concentrations. When paired with the conservatism in the deterministic modelling assessments already provided to the DMC, this supports Golder's conclusion that there is no basis to add further conservatism to the assessment.

M J Slyfield
Counsel for STIMBR
25 June 2021

[1] Pattle Delamore Partners Ltd, June 2021: Methyl Bromide Modelling Study — Port of Tauranga: Part 2.

GOLDER
MEMBER OF WSP

TECHNICAL MEMORANDUM

DATE 25 June 2021 **Project No.** 20399010-007-TM-Rev0

TO Ian Gear, Stakeholders in Methyl Bromide Reduction (STIMBR)

CC

FROM Cathy Nieuwenhuijsen **EMAIL** cnieuwenhuijsen@golder.com

REVIEW OF PDP REPORT

Introduction

This memo[1] provides a review of the report by PDP (2021)[2]. Overall, we consider that it is useful piece of work that adds value to the assessment process. The report uses the comprehensive monitoring campaign data and aims to validate the use of the CALPUFF dispersion model for the assessments of effects due to methyl bromide (MB) fumigation at the Port of Tauranga.

In this technical memorandum we have considered the following aspects of the report in turn:

- Monitoring data
- Meteorology
- Emission assumptions
- Dispersion modelling
- Model evaluation

Some concluding remarks follow these sections in the memo.

Monitoring data

The majority of data used was as presented in the Air Matters report for WorkSafe[3] and previously commented on by Golder[4]. The PDP report analyses additional data collected by Ecocific using both PIDs[5] and FTIR[6].

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[1] This report is provided subject to the limitations in Attachment A.

[2] PDP, June 2021: Methyl Bromide modelling study – Port of Tauranga: Part 2.

[3] Air Matters 2021 Final Summary Report for WorkSafe New Zealand

[4] Golder (2021) Technical memorandum regarding Review of EPA reports and WorkSafe monitoring dated 21 May 2021.

[5] PID – photo-ionization detector

[6] FTIR – Fourier Transform Infared Spectroscopy with data collected following USEPA method 320.

Ecocific undertook mobile PID measurements across transects downwind of fumigation activity as well as FTIR at fixed locations.

There are no concurrent FTIR and whole air (SUMMA[7]) cannister events and no attempt by PDP to validate the FTIR measurements. PDP has focussed on the use of the whole air cannister results and we consider this appropriate.

In total, there were 73 whole air cannister measurements undertaken in a wide range of meteorological conditions. On occasion, likely due to wind shifts, these were not directly downwind of the MB ventilation.

Meteorological Data

It appears that the setup of the meteorological modelling approach is consistent with good practice and similar to that developed by ASG for the other modelling assessments. Unfortunately, there no details are provided on various key input parameters including, for example, the radius of influence of the meteorological stations or the terrain.

A review of each event's CALPUFF modelling results compared to the 1-minute average wind direction monitoring at Berth 8 (shown in Appendix A PDP (2021)) indicates while most of the modelled wind directions are broadly consistent with those measured, there are occasions where the results shown by CALPUFF occur under different conditions to that shown in the presented Berth 8 data. This is not unexpected as CALPUFF uses hourly average values, but the variability contributes to the difficulty in evaluating CALPUFF predictions with paired[8] monitoring results. While wind direction is the most important variable in this case, no discussion on the modelled wind speed or stability compared to monitored values is provided therefore it is unclear how consistent the wider meteorological conditions used by CALPUFF model system are with what occurred during the monitoring.

Emission Assumptions

PDP has used two methods to determine MB emissions. The first uses pre-vent concentration data and headspace volume data from Genera to determine the expected emission. Alternatively, when pre-vent concentration data was not available, an estimate of emission rate was based on the known input mass of MB and an estimate of the loss due to sorption and recapture percentage. We agree that these are appropriate methods, but the second method of estimating the emission rate introduces uncertainty into the modelling assessment. Emission rate estimates were on approximately half of the monitoring events.

Dispersion Modelling

The dispersion modelling for each event was undertaken in a manner broadly consistent with other assessments to date. Therefore, the outcomes determined through this modelling and monitoring comparison are expected to be applicable to the other modelling studies of MB dispersion.

CALPUFF is designed as a regulatory model and previous studies have shown it provides reliable conservative upper estimates of effects over a large data set when good-quality inputs are used. The

[7] SUMMA canister samples are a brand of cannisters used in the whole air sampling undertaken by Air Matters for Worksafe. The term SUMMA and whole air sampling are often used interchangeably.

[8] That is, comparing modelling and monitoring at the same location and time.

validation of CALPUFF modelling at discrete locations during a set of short-term modelling and monitoring periods is challenging, as small fluctuations in wind direction can result in large differences in predicted impacts, relative to what was measured.

Additionally, the short release periods of MB during the fumigation events adds to the challenges of using data points paired in space and time to validate the modelling.

Model Evaluation

The PDP (2021) report presents a range of model-performance statistics. These give an indication of how well model results match up with monitoring results. The model-performance statistics, measuring such things as agreement, errors, and biases, are standard statistical measures and commonly used in air quality studies. They are consistent with the findings indicated by the correlations, which are that there is a range of performance, from under- to over-prediction for paired-in-space comparisons, but consistently better performance on transect averages.

The model-performance statistics shown in the PDP report apply to the data from all events, over the full range of ground-level concentrations. For regulatory purposes, the model needs to perform well at higher concentrations. In that case, performance measures might involve comparing the peak concentration itself, or the count of guideline exceedances, or other skill scores for the prediction of peaks. However, such measures may not be robust, as the monitoring does not cover a large number of events over a long period, and only a very small number of exceedances were observed. The main concern for regulatory purposes is the likelihood of exceedances occurring at any time.

The variability in model performance when compared with short-term events becomes less of an issue when using a long-term meteorological data set that covers a wide range of conditions. This is one of the reasons why regulatory assessments use several years of hourly meteorological data, as a matter of good practice. The variability in model performance for the paired observation analysis therefore does not detract from the use of CALPUFF as a regulatory model. The PDP report covers the above uncertainties well, and comments on the much-improved model performance relative to transect-averages of ground-level MB.

We agree with PDP that with good quality inputs, CALPUFF can be used to determine effects of MB and determine distance-based criteria. We disagree with the conclusion of underprediction by CALPUFF and the need for a correction factor of 25%. PDP made this conclusion based on comparison of the unpaired modelling and whole air cannister monitoring results (shown in Figure 10, PDP). On review of Figure 10 (PDP page 40), Golder identified that the maximum value was missing and a number of FTIR values had been included in the plot. This was confirmed through discussion with PDP[9]. Using the CALPUFF results and monitoring results in PDP Table 4 and Appendix D for the earlier monitoring[10], Golder has re-plotted the stationary monitoring values to reproduce PDP's Figure 10 using only the whole air cannister data, as was intended by PDP. This is provided below and indicates good correlation overall and with CALPUFF underpredicting by 11% on average (compared to the 20% shown in PDP's Figure 10). We consider this is a good comparison given the input assumptions required to use CALPUFF to simulate the dispersion of the emissions.

[9] Email C Bender to C Nieuwenhuijsen (22/6/2021)

[10] We note there are some inconsistencies in later half of Table D1 compared to those presented in Table 4 and the Air Matters monitoring reports. We have taken Table 4 data as being accurate, as MB monitoring data match with those presented in other reports.

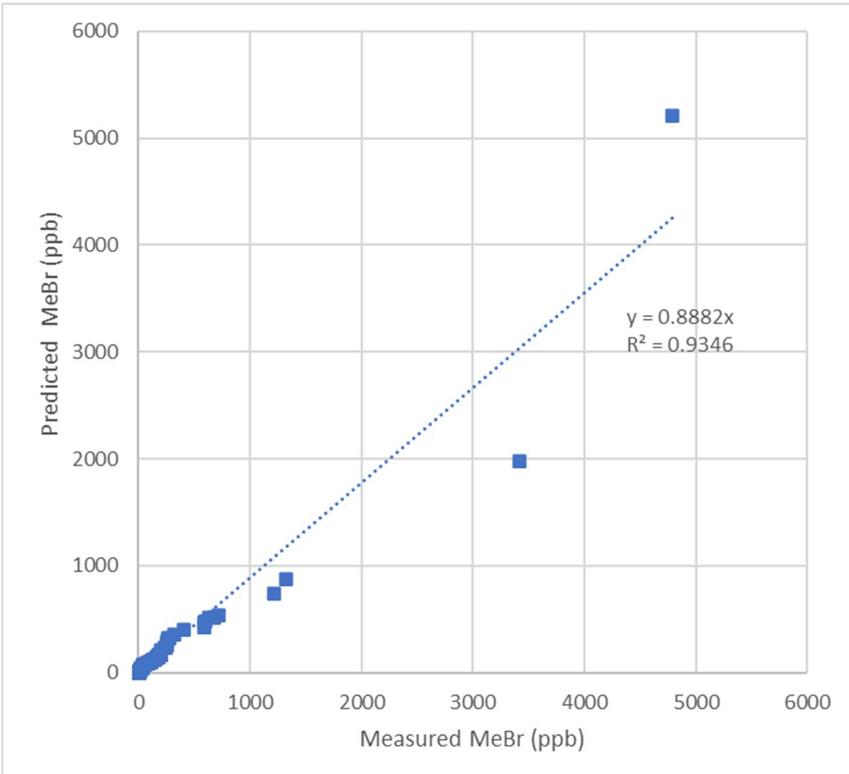

Figure 1: Golder corrected version of Figure 10 (PDP part 2 report) – Only showing stationary monitors results.

PDP notes that model performance was better for the transect data. This is not surprising as the transects reduce the impact of wind direction variability in both the monitoring and modelling.

Limited ship-hold monitoring was undertaken. However, in both the events where ambient monitoring results were obtained, the monitored values were lower than the model predictions. Even when accounting for PDP assuming an emission rate that was higher than Golder/TAS[11] has used to date, the overestimation of the model provides support that the emission assumptions and therefore predicted effects by the deterministic modelling undertaken by TAS and Golder are likely to be conservative.

With regard to GRAL/GRAMM Modelling, GRAL was run for two case studies, but results from them were inconclusive, with respect to whether GRAL should be used as an alternative to CALPUFF. Further testing would be required. We therefore see no need to introduce another alternative modelling approach at this late stage.

[11] TAS. (2020). Air dispersion modelling of methyl bromide for decision making committee. Todoroski Air Sciences, Sydney, Australia, December 2020. and TAS. (2021). Draft Review of Golder Air Dispersion Modelling Of Methyl Bromide For Decision-Making Committee, Todoroski Air Sciences, Sydney, Australia, May 2021.

Conclusion

We consider that PDP (2021) provides further validation of CALPUFF as an appropriate model for the assessment of effects from fumigation activities. It also confirms that the model setup assumptions and source configurations that have been used in the recent modelling assessments are appropriate.

While the paired comparison of monitoring and modelling results – comparing individual results at the same time and place - do not show a strong relationship, PDP's use of unpaired results – such as averages over a cross-plume or along-plume transects – shows good correlations. Overall, we agree with PDP's conclusions that with appropriate inputs, the CALPUFF model can be used to assess the impact of MB fumigation events at sensitive locations, and for the purpose of determining distance-based separation criteria.

PDP concludes that CALPUFF underpredicts the monitoring values by between 10% and 20%, and on that basis put the case that CALPUFF results should be scaled up by 25%. We disagree that 25% is an appropriate percentage as we have confirmed that the incorrect dataset was used to reach this conclusion. Further, we do not agree that scaling up is appropriate for all modelling assessments, with reasoning as follows:

1. For the 21 events comprising of 73 monitored values, CALPUFF predicts concentrations that are 89 % of those measured (this is found using Golder's corrected values as discussed above). Given the uncertainty in emission rates, the short-term nature of the emissions and the variability in local wind patterns during these events, this can be considered a good correlation for the events considered.

2. For the continuous deterministic modelling assessment (as has been already completed by TAS and updated by Golder), the uncertainty in emission rate is resolved by the controls recommended in Golder (2021), and the short-term nature of the emissions and the wind variability are accounted for through the use of a large dataset (3 years of hourly data with continuous emissions during operating hours of 7am to 7pm) and the use of an upper percentile prediction (99.9th percentile).

Therefore, we believe that sufficient conservatism is already built into the deterministic modelling assessments presented, such that this modelling is expected to result in overpredictions of effects. Therefore, the continuous deterministic modelling approach does not need to additionally account for the 11% underprediction shown in the PDP comparison. To do so, would add a further layer of conservatism beyond that necessary.

This is in line with evaluation previously completed by Golder (2021), which concluded that when accounting for the MB released during the monitoring periods compared to the rate assessed in the deterministic modelling, the modelling results are consistently higher than those measured.

Golder Associates (NZ) Limited

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CN/NG
Attachments Report Limitations

https://golderassociates.sharepoint.com/sites/136246/project files/6 deliverables/007 review of pdp/20399010-007-tm-rev0_review of pdp.docx

APPENDIX A

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