

Comments regarding the Sullivan Environmental Consulting Modelling report, 22 June 2020.

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1. Sullivan Environmental Consulting Report

In general the Sullivan Environmental Consulting (SEC) Modelling report was difficult to read, understand and interpret. It did not follow the Expert Conferencing guidance.

2. Monte Carlo method

- Use of the Monte Carlo approach in modelling for methyl bromide (MB) at the Port is questionable. It relies on a great body of empirical information, or a list of assumptions.
- What assumptions were used in the modelling?
- The inherent weaknesses of SEC modelling using Monte Carlo:
 - No interactive link between data and parameters
 - Approximate technique (because it is simulation based)
 - Unidirectional
 - Validation is often ad hoc (by means of resampling)
 - Does not allow for 'backwards reasoning'

3. New Zealand Assessment Criteria for Methyl Bromide

The SEC report says that due to a relatively high probability for model artifacts/outliers to occur the use of the highest percentiles may be unreliable and suggests that the 98th percentile results are most suitable.

NZ criteria for Methyl Bromide 1-hour TEL has been pointed out in previous modelling studies and the 1-hour max TEL is important, as is the 15-minute STEL, which can be estimated from the 8-hour WES-TWA. The significant quantities of Methyl Bromide released over a small concentrated area makes these criteria significant. The 98th percentile (438th highest concentration at a single point is irrelevant) and should **not** be the focus of assessment as recommended by SEC. (98th percentile may be a more reasonable assessment criteria for large area fumigations, such as strawberry fields, where plume is well mixed over a large area at the edge of field).

(Note. WorkSafe: In the event of no STEL, excursions above the WES-TWA should be controlled, even where the 8-hour WES-TWA is within recommended limits. Worker exposure levels may exceed three times the value of the WES-TWA (15 ppm) for no more than 15 minutes at a time, on no more than four occasions spaced one hour apart. Under no circumstance should they exceed five times the value of the WES-TWA level (25 ppm), as reported in the Beca Review by ASG.

Therefore, the SEC model's focus on 98th percentile results is incorrect for use in NZ, which allows no exceedances above the criteria. Therefore 1-hour max and 1-hour 99.9th is relevant for New Zealand. Although it has been pointed out that the 1-hour 99.9th may miss the plume altogether, and that the 1-hour max is a better protector of health. This is supported by WorkSafe monitoring

and 1-hour modelling max. Further, the meteorology data is of a high standard which will render SEC outliers as genuine outliers as long as CALPUFF model set up well.

4. Modelling

- Due to the limited time available to consider SEC latest modelling we are unable to verify whether the stated modelling scenarios were correctly modelled.
- It was noted that not all of the model scenarios requested by Experts were modelled.
- SEC report says that the 1-hour TEL and 24-hour TELs were met at the port boundary using 98th percentile equivalent concentrations. This means that modelled exceedances at the 1-hour maximum and the 1-hour 99.9th percentile TELs were most likely exceeded. This does not appear to be reported anywhere in the report.
- Ships and log piles modelled concurrently. The Experts specifically asked for ship and log stacks to modelled separately and presented separately
- For log stacks SEC modelled square volume sources, for example a 50m long x 5m wide x 6m high log pile, was modelled as a 25m x 25m log pile. This is not was agreed on in the Expert Conferencing. It was agreed that each source would be a set of equivalent square sources of the size of the log pile. So for example a log pile of 50m x 5m would be five volume sources each of 5m x 5m.

This is important for the following reasons;

- The smaller the square volume sources the better the results will be downwind,
- The larger the volume source the lower the concentration downwind because the larger sigma y has to be, the more dilute the plume becomes in across wind directions.
- Volume sources allow emission leakage, they must be properly set up to avoid this happening which will result in model under prediction of results as compared to equivalent area sources.

5. Ship hold ventilation

There is confusion as to the ventilation assumptions made in the ship hold modelling. The Experts requested ship hold modelling be conducted starting at 10pm with one hold being opened every two hours until all holds were opened. This was based on the Beca report and Golder modelling, which stated that Genera was only going to fumigate ship holds in this manner as the concentrations from uncontrolled opening was recognized by Genera to be significant. As a result of this statement and the fact the Golder modelling conducted the ship hold modelling this way (model results are included in Beca report). The Experts agreed that this may be the only permissible way forward for Genera to operate ship fumigation events. However, it appears the SEC did not follow the Expert advice, or if they did have not supplied enough supporting data as to confirm this.

Preparation for ventilation includes setting up exclusion zones and ambient monitors. The holds are currently opened sequentially with approximately 5 minutes between the beginning of one hold opening and the beginning of the next hold opening. A 2-hour gap between hold openings is being considered for future operation. Under the current FMP procedures (Beca, 2019), ambient concentrations are constantly recorded using PID during ventilation and these are used to determine the rate and timing for holds to be opened. (Beca Report)

6. Ventilation rate of log piles

The first paragraph on page 10 of the SEC report says that to provide a more conservative approach, distributions were analyzed based on only using the first hour of venting when emission rates are higher. For example emissions from logs were modelled as 50x greater in the first hour than for each subsequent hour of the 12 hour venting period.

Note that it is not clear from SEC report exactly how log piles have been modelled. However, it is not conservative to assume 50% of emissions are released in the first hour. It is likely to be much more than this.

7. Recapture

The lowest recapture rate modelled assumed a minimum recapture rate of 30% as a conservative measure, assuming 70% of the stacks have recapture technology applied. SEC did not look at any event with no recapture despite the fact that events with no recapture are still occurring.

The Experts specifically asked for an event with no recapture and a high application rate of 150 kg on a 1250m³ volume log stack. This was not done by SEC.