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South Portland

As a retired Certified Industrial Hygienist with a specialty in indoor air quality and a retired environmental laboratory director with experience measuring ambient air quality, I would like to address the requirement that tank farm operators be responsible for fence line monitoring of benzene, ethylbenzene, toluene and xylenes using EPA Method 325.

In a preliminary study done in the fall of 2020 using EPA Method 325, I found that the level of benzene was 2.5 times higher than the long term health guideline of 0.4 ppb along the southern border of the South Portland Terminal tank farm. This study was submitted to the DEP, CDC and the South Portland Clean Air Advisory Committee (SPCAAC). This finding corresponds to the elevated cancer risk for that location indicated by the EPA HEM-3 model for cancer risk assessment. So, we have good evidence that increased health risks do exist along the fence line of one of the 3 gasoline storage tank farms in South Portland. It is thus imperative that all tank farms have to demonstrate that levels of benzene and its sister compounds listed above are not exceeding long term health guidelines. The other 3 tanks farms that do not store gasoline also need to be included since in the case of Sprague and Global tanks farms the heated tanks of residual fuel and asphalt also have emissions that contain benzene. Those emissions were what resulted in the Federal lawsuits against both of those corporations. The Portland Pipeline tank farms also need to be included because the crude oil they store contains significant amounts of benzene. Currently, 8 of the Portland Pipeline Co. tanks near SPS and Kaler Elementary contain millions of gallons of oil.

I therefor strongly support the part of LD 1532 that requires that the tank farms be required to hire an independent 3rd party to perform continuous fence line monitoring. The annual cost for each tank farm would be approximately thirty thousand dollars per year, which includes sampling and analysis.

Finally, there is evidence that indicates that the actual emissions of benzene are being under reported due to inaccuracies in the present method of estimating emissions known as AP-42. This fact makes it even more important that actual ambient levels of benzene, ethylbenzene, toluene and xylenes at the fence line be determined. Unfortunately, residents of South Portland live along those fence lines.

For those legislators who wish to read more about my findings with regard to problems with AP-42, I have copied the report and attached it below. This report was submitted to MEDEP and the SPCAAC.

Respectfully,

Tom Mikulka, Ph.D.

The case for direct measurement of emissions from gasoline tanks.

The Clean Air Advisory Committee has recommended that the MEDEP perform direct measurements of emissions from internal floating roof tanks (IFRT's) used to store gasoline in South Portland. DEP officials have stated that this is not possible and instead advocate the use of AP-42 methodology to estimate emissions.

The 2006 EPA document on emission factor documentation for AP-42 (1) contains a study conducted by Radian Corp (2) which compares measured emissions versus estimated emissions using AP-42. It is therefor clear that it is possible to measure emissions from IFRT's. DEP needs to explain why it will not be possible to use the same methodology. The diagram of a typical IFRT provided on page 28 of the DEP report to the ENR Committee (3) shows that the tanks have a central vent and several perimeter vents. It should be possible to seal the perimeter vents and then measure emissions from the central vent using the same tenting method employed by the EPA to measure emissions from the heated tanks(4).

The reason why it is important to measure emissions is illustrated by the Radian Corp

study results which are found on pages 5-59 through 5-71. The study found that for an IFRT with a capacity of 930,000 gallons of unleaded gasoline the daily emission loss at 77.8 F was 77.6 lbs/day. Three scenarios were then used to estimate emissions. Each scenario differed in the assumptions made about tank fittings. The estimates for the 3 scenarios ranged from 32 to 48 lbs/day.

The report concludes:

The results of these analyses support the continued use of the API floating roof tank estimating equations in AP-42. The estimating equations for tanks with mechanical shoe rim-seals appear to be very reliable for estimating emissions for large tank populations. The equations for the liquid and vapor mounted resilient-filled rim-seals are less reliable than those for mechanical shoe seals, but they provide reasonable estimates for large tank populations.

While the equations do provide good estimates of emissions for tank populations, their ability to present reliable estimates for single tanks is limited. Assuming all input parameters for a single tank are correct, the inherent uncertainty in the coefficients used makes the emission estimate imprecise. The 95 percent confidence interval for annual emissions from a single tank typically spans an order of magnitude or more.

The conclusions highlighted in bold print are critical to the case in South Portland where emission calculations are made on individual tanks and where each of the 3 gasoline storage facilities represents a small population of tanks. It indicates that the variability of AP-42 results can differ by an order of magnitude. For example, if the daily emissions for a tank averaged 100 lbs, the 95 % confidence level could range from 100 +/- 5 lbs to as much as 100 +/- 50 lbs or more. And, that assumes that all of the many input factors used by the operator are correct. In short, AP-42 calculations provide rough estimates in the case of a small number of tanks. Including the possibility that incorrect assumptions are being made increases the unreliability.

To further illustrate the variability that comes with using AP-42 for small groups of tanks, the data contained in Table 5-17 of the report cited above (1) was used to calculate the emissions from the 3 gasoline tank farms in South Portland. The Radian study found the emissions from a 930,000 tank of gasoline were 77.6 lb/day (14.2 tpy) at 78 F. The following table shows the gasoline capacity of each tank farm based upon information obtained from MEDEP report to the legislature (3), the 2018 reported emissions and what should be the actual emissions based upon the Radian study. The actual VOC's were adjusted for the differences in temperatures, 78 F vs the yearly average for Portland of 47 F. At the lower Portland temperature the emission rate would be approximately half that at 78 F.

Tank Farm	Gasoline Capacity(gal)	Estimated VOC's	Actual VOC's
(AP-42, 2018)			
Citgo	12.2 million (21.2)*	45 tpy	98 tpy (162)*
SP Terminal	21.7 million	41.5 tpy	166 tpy
Gulf	17.8 million	28.5 tpy	136 tpy
Radian Study	0.93 million		14.2 tpy

* Value in () are based on maximum potential gasoline storage. 3 tanks licensed for gasoline are also used for distillate. The lower value excludes these tanks.

The results indicate that each of the tank farms may be underestimating emissions to a significant degree.

Emission Factor Documentation for AP-42 Section 7.1, Organic Liquid Storage Tanks, Final Report, For U. S. Environmental Protection Agency Office of Air Quality Planning and Standards Emission Factor and Inventory Group. 2006

(2) Field Testing Program to Determine Hydrocarbon Emissions from Floating Roof Tanks, Final Report, Volumes I and II, Radian Corporation, May 1979.

(3) Report to the Joint Standing Committee on the Environment and Natural Resources, Measurement and Control of Emissions from Aboveground Petroleum Storage Tanks, MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION, January 1, 2021

4) VOC and VOC HAP Emissions Testing from Residual Oil Tank No. 3 Tank Headspace and Loading Operations at Global's South Portland, Maine Terminal Test

Dates: April 11-26, 2013 and July 2, 2013.

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