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Memorandum

Air Quality Program

January 16, 2019

To: 460 Rulemaking Stakeholders

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Subject: Updating the Small Quantity Emission Rates

Chapter 173-460 WAC, Controls for New Sources of Toxic Air Pollution Sources, establishes the list of toxic air pollutants and includes the following for each pollutant:

- Acceptable source impact level (ASIL) – an emissions level requiring a refined modeling evaluation.
- Small quantity emission rate (SQER) – a screening level for emissions that does not require dispersion modeling. Emissions below the SQER pose little risk to public health.
- De minimis emission level – trivial level of emissions that does not pose a public health or environmental risk established at five percent of the SQER. A rate of increased emissions equal to or higher than a de minimis emission level requires an air quality permit (notice of construction approval order).

How did we update the small quantity emission rates?

Each toxic air pollutant in WAC 173-460-150 has a small quantity emission rate (SQER). The SQER values are derived from the acceptable source impact level (ASIL) values, back-calculated through screening level air dispersion modeling using AERSCREEN Version 16216. We examined several possible source and building configurations to simulate a realistic yet conservative scenario that would apply anywhere.

AERSCREEN Model Configuration

The following model inputs and calculations were used to establish SQER values.

Parameter	Value
Emission rate	1 gram per second
Point source stack height	10, 10.5 and 11 meters
Point source stack diameter	0.33 meters
Point source exit velocity	1, 5 and 10 meters per second
Point source stack temperature	Ambient
Point source stack location	Four locations • Southwest corner of building • Building centroid • Center of each horizontal dimension
Volume source side length	0.5, 1,2 and 3 meters
Volume source release height + initial vertical dimension	• 5 + 5.5 meters • 6.5 + 4 meters • 7.5 + 3 meters • 10 + 0.5 meters
Flagpole receptor height	1.6 meters
Urban or rural dispersion	Rural
Building downwash	Only applies to point sources
Building height	10 meters
Building dimensions	10 x 20 meters
Terrain effects	No
Meteorology options	• Temperature 250 – 310K (Kelvin) • Minimum wind 0.5 meters per second • Friction velocity adjusted (Adj_u*)
Surface characteristics	• Desert shrubland • Grassland • Cultivated land
Receptor distances	5 to 50 meters in 5 meter increments

AERSCREEN Model Results

The median of all concentrations between 5 and 50 meters downwind of the source predicted by each of the 124 model runs was 4282 µg/m³. We consider this a robust and sufficiently conservative estimate of the concentration resulting from an emission rate of 1 gram per second.

SQER Calculations

Calculation	Carcinogenic TAP	Non-carcinogenic TAP	Acute reference exposure level[1]
Averaging period	Year	24-hour	1-hour
Emission unit	Grams/second	Grams/second	Grams/second
Formula	ASIL/(4282*0.1)	ASIL/(4282*0.6)	ASIL/4282
Result	Pounds/year	Pounds/day	Pounds/hour

TAP means toxic air pollutant.

We used the following calculations to establish SQER values for the year, 24-hour and 1-hour ASIL.

Year ASIL

SQER (lb/year) =

$$\left[\frac{\text{Annual ASIL } \left(\frac{\mu g}{m^3}\right) \text{ x } 60 \left(\frac{sec}{min}\right) \text{ x } 60 \left(\frac{min}{hr}\right) \text{ x } 8760 \left(\frac{hr}{yr}\right)}{4282 \left(\frac{\mu g}{m^3}\right) \text{ x } 0.1 \text{ x } 453.6 \left(\frac{g}{lb}\right)}\right] \Big/ 1 \left(\frac{g}{sec}\right)$$

24-hour ASIL

SQER (lb/day) =

$$\left[\frac{24-\text{hr ASIL } \left(\frac{\mu g}{m^3}\right) \text{ x } 60 \left(\frac{sec}{min}\right) \text{ x } 60 \left(\frac{min}{hr}\right) \text{ x } 24 \left(\frac{hr}{day}\right)}{4282 \left(\frac{\mu g}{m^3}\right) \text{ x } 0.6 \text{ x } 453.6 \left(\frac{g}{lb}\right)}\right] \Big/ 1 \left(\frac{g}{sec}\right)$$

1-hour ASIL

SQER (lb/hour) =

$$\left[\frac{1-\text{hr ASIL } \left(\frac{\mu g}{m^3}\right) \text{ x } 60 \left(\frac{sec}{min}\right) \text{ x } 60 \left(\frac{min}{hr}\right)}{4282 \left(\frac{\mu g}{m^3}\right) \text{ x } 453.6 \left(\frac{g}{lb}\right)}\right] \Big/ 1 \left(\frac{g}{sec}\right)$$

Conversion Factors

Converting ppm to µg/m3

$$Y \left(\frac{\mu g}{m^3}\right) = \frac{(\text{X ppm})(\text{molecular weight})}{24.45} \text{ x } 1000$$

[1] The 7/26/2018 draft ASIL table identifies 14 chemicals with a 1-hour acute reference exposure level.

AERSCREEN conversion factors

Convert from	Convert to	Multiply hourly value by
1-hour average	1-hour or 3-hour average	1
1-hour average	8-hour average	0.9
1-hour average	24-hour average	0.6
1-hour average	Annual average	0.1

Establishing a SQER for dimethyl and diethyl mercury

These compounds are known to cross the blood−brain barrier and to be highly neurotoxic. In the most recent known instance (1998) of a serious poisoning, a chemist died after spilling about 0.44-ml of dimethyl mercury onto a gloved hand. In light of that, in the last rule-making, we intentionally set the ASIL, SQER, and de minimis emission values for both dimethyl mercury and diethyl mercury to 1.00E-99, which is extremely close to zero. Since then, we have reviewed health impacts assessments of several Hanford cleanup projects that have potential emissions of dimethyl mercury, but we have not received any project applications for diethyl mercury emissions.

Prenatal brain development is sensitive to very small amounts of dimethyl- and diethyl mercury. Maternal inhalation of contaminated air exposes the fetus via placental transfer from the maternal bloodstream. Based on evaluation of dimethyl mercury research and other available information, we are proposing an ASIL of 0.14-ug/m3 (daily TWA) for dimethyl- and diethyl mercury, as part of this rulemaking effort. The corresponding SQER and de minimis values will be derived using the same methods we use for other toxic air pollutants.