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Memorandum

Air Quality Program

February 14, 2019

To: Stakeholders for 460 Rulemaking

From: Elena Guilfoil, Environmental Planner, Policy and Planning Section
Gary Palcisko, Toxicologist, Science and Engineering Section

Subject: Recommendations for Updating WAC 173-460-150

The purpose of this rulemaking is to update the list of toxic air pollutants in Chapter 173-460 WAC, Controls for New Sources of Toxic Air Pollution Sources, to reflect the latest, best available health effects information. This rule includes air quality permitting requirements for businesses that emit toxic air pollutants.

What we said we would do

In our July 18, 2018 rulemaking announcement, we said we would:

- Update the list of toxic air pollutants
- Recalculate
  - Acceptable source impact levels (ASIL)
  - Small quantity emission rates (SQER)
  - De minimis emission values
- Update the rule to support the changes described above

Specifically, we said we intended to update the list of toxic air pollutants to:

- Add or subtract chemicals based on updated toxicity information available from the U.S. Environmental Protection Agency (EPA), California Office of Environmental Health Hazard Assessment (OEHHA), and Agency for Toxic Substances and Disease Registry (ATSDR). Our list of toxic air pollutants is based on the inhalation toxicity values established by these three agencies.
- Review ammonium sulfate as a toxic air pollutant and its associated toxicity value. This is in response to a request from the Far West Agribusiness Association to remove ammonium sulfate from the list of toxic air pollutants.

- Evaluate whether the rule should continue to list criteria pollutants as toxic air pollutants. If determined it should, retain criteria pollutants on the list of toxic air pollutants.
- Evaluate whether to establish additional acceptable source impact levels for specific groups of chemicals with established toxic equivalency factors. This approach would consider mixtures of similar chemicals (i.e., dioxin-like compounds and carcinogenic polycyclic aromatic hydrocarbons) to be a single toxic air pollutant based on toxic equivalency. If determined it should, update the toxic air pollutants list to include new acceptable source impact levels.
- Revise the small quantity emission rates and de minimis values based on updates to the acceptable source impact levels and the use of the latest version of EPA's AERSCREEN air quality dispersion model.
- Evaluate the use of early life adjustment factors when deriving acceptable source impact levels for chemicals that are considered to cause cancer through a mutagenic mode of action. These chemicals may pose a greater risk to infants and children than is reflected in their toxicity value.

What we did

During the rulemaking development process, we held five meetings from August 2018 through January 2019. During those meetings, we discussed eight topics related to updating the list of toxic air pollutants in WAC 173-460-150. This memo discusses each topic and our recommendation.

Topic list

Update the list of toxic air pollutants (TAP)

- Update the list (add or subtract chemicals)
- Review whether ammonium sulfate should be included as a toxic air pollutant

Update the list (add or subtract chemicals)

Discussion

Current status

The existing TAP list contains 395 chemicals:

- Cancer-causing chemicals: 288
- Chemicals with 24-hour averaging period: 93
- Chemicals with 1-hour averaging period: 14

We used the same process from the last update to identify chemicals to be added or removed from the list of toxic air pollutants:[1]

- The chemical must be listed in one or more of the acceptable data sources; and
- The chemical must have an associated inhalation toxicity value established to quantify human health risk and hazard.

Acceptable data sources that meet high standards for scientific credibility:

- EPA Integrated Risk Information system (IRIS)
- California Office of Environmental Health Hazard Assessment (OEHHA) reference exposure levels and cancer potency factors
- Agency for Toxic Substances and Disease Registry (ATSDR) minimal risk factors

Updated status

By applying the process noted above, the updated TAP list contains more chemicals:[2]

- Cancer-causing chemicals
- Chemicals with 24-hour averaging period
- Chemicals with 1-hour averaging period

Chemicals added that were left-off the 2009 list

We are asking for comments related to those chemicals that were available from acceptable data sources, but did not appear on the 2009 version of the TAP list:

[1] Background material: "Methods to Update the List of Toxic Air Pollutants," August 2008 for more details on the updating process for this rulemaking.

[2] 7/26/2018 ASIL Options Excel spreadsheet, and "2018 Draft ASIL Summary List," July 26, 2018.

Chemical Name	CAS
Kerosene	8008-20-6
Fuel oil No. 2	68476-30-2
Malathion	121-75-5
JP-7	HZ0600-22-T
JP-4	50815-00-4
Acetone	67-64-1

Note: JP-5 and JP-8 are proposed as new chemicals on the list based on a recent ATSDR MRL.

Five existing chemicals were removed from the list.

Table 1. Deleted chemicals

Chemical	CAS	Reason Deleted	Replacement	CAS
Ammonium sulfate	7783-20-2	Petition Granted		
Chromium VI, chromic acid aerosol mist	18540-29-9	Redundant	Chromium(VI) & compounds	18540-29-9
Chromic acid	11115-74-5	Redundant	Chromic(VI) acid	7738-94-5
5-nitro-o-anisidine	99-59-2	Delisted by California		
Dibromochloromethane	124-48-1	Delisted by California		
Tetrabromodiphenyl ether	40088-47-9	Replaced by PBDEs	Polybrominated diphenyl ethers	no CAS

Recommendation

We recommend using the updated list of chemicals identified as toxic air pollutants.

Review whether ammonium sulfate should be included as a toxic air pollutant

Discussion

Current status

Ammonium sulfate is on the current list based on OEHHA's acute REL for "sulfates."

Updated status

We reviewed Far West Agribusiness Association's petition and supporting materials.[3]

[3] Refer to comments from Far West Agribusiness Association, McGregor, Simplot, and Two Rivers Terminal. See also "Petition to remove ammonium sulfate from the list of toxic air pollutants in WAC 173-460-150." Gary Palcisko Memorandum to 460 Rulemaking Stakeholders. January 14, 2019.

Recommendation

Based on our review of the material submitted and our additional analysis, we recommend removing ammonium sulfate from the list of toxic air pollutants.

Recalculate acceptable source impact levels (ASIL)

- Recalculate ASILs
- Review ASILs for groups of chemicals (Toxicity Equivalency)
- Review whether to continue to include criteria pollutants as toxic air pollutants
- Evaluate the use of early life adjustment factors
- Review the existing ASIL for dimethyl and diethyl mercury

Recalculate ASILs

Discussion

Current status

The ASIL for each chemical reflects the formulas below.

Calculating ASIL Values (cancer-causing)

$$\text{ASIL} = \frac{\text{target cancer risk}}{\text{URF}}$$

Calculating ASIL Values (24-hour averaging time)

$$\text{ASIL} = \text{chronic RfC, chronic REL, or MRL}$$

Calculating ASIL Values (1-hour averaging time)

$$\text{ASIL} = \text{acute REL}$$

Parameter	Description	Value	Units
ASIL	Acceptable source impact level	Calculated	(ug/m^3)
Target cancer risk	Cancer risk level considered to be …	1 in one million or 1×10^{-6}	none
URF	Unit risk factor	Chemical-specific	$(ug/m^3)^{-1}$

Updated status

EPA suggests the use of an early life adjustment factor to account for children's susceptibility to exposure to certain chemicals. Increased risks posed by chemicals that cause cancer through a mutagenic mode of action should be accounted for using early life

adjustment factors.[4] We updated the ASIL to reflect the early life adjustment factor.

Recommendation
Based on our evaluation, we recommend using early life adjustment factors to account for children's susceptibility during early life exposures.

Review ASILs for groups of chemicals (Toxicity Equivalency)

Discussion

Current status

Each chemical has its own ASIL value. Emissions and impacts of individual chemicals are compared to respective SQERs and ASILs. Groups of chemicals that have similar emission sources and mechanisms of toxicity are not considered together.

Updated status

Chemical groupings for dioxin-like compounds and carcinogenic PAHs will be considered together and compared to toxic equivalence (TEQ) ASILs.[5]

Recommendation

Based on our evaluation, we recommend using a TEQ approach when evaluating emissions of dioxin-like compounds and carcinogenic PAHs.

Review whether to continue to include criteria pollutants as toxic air pollutants

Discussion

Current status

The four TAPs nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), and lead (Pb) are also criteria pollutants known as National Ambient Air Quality Standards or NAAQS regulated under Chapter 173-400 WAC. They are included as TAPs because one of the authoritative agencies we rely on to establish our group of TAPs lists them. The ASIL for NO_2, SO_2, and CO reflects a one-hour averaging period; lead is a cancer-causing chemical so its ASIL reflects a year averaging period.[6]

Updated status[7]

- Reviewed NAAQS status and compared to TAP levels
- Chemicals are still listed as a TAP by authoritative agency we rely on to establish our list

[4] Refer to "Use of early-life adjustment factors in deriving acceptable source impact levels for a subset of toxic air pollutants." Gary Palcisko Memorandum to 460 Rulemaking Stakeholders. Feb. 14, 2019.
[5] Refer to" Deriving ASILs for mixtures of dioxin-like compounds and mixtures of polycyclic aromatic hydrocarbon TEQ." Gary Palcisko Memorandum to 460 Rulemaking Stakeholders. Feb. 14, 2019.
[6] CES page 3, 40, and 41. Publication 09-02-008.
[7] See Gary Palcisko "Criteria Air Pollutants as Toxic Air Pollutants" PowerPoint presentation, Nov. 16, 2018.

Recommendation

Based on our review of the material, we recommend retaining these chemicals as toxic air pollutants because they provide additional consideration of potential public health impacts that NAAQS compliance alone does not provide.

Evaluate the use of early life adjustment factors

Discussion

Current status

The ASIL values do not reflect an early life adjustment factor.

Updated status

EPA determined that early-life adjustment factors were necessary to account for increased susceptibility among infants and children exposed to mutagenic chemicals. We relied on three EPA documents to determine the chemicals that act through a mutagenic mode of action.[8] EPA established an early-life adjustment factor for lifetime cancer exposure of 1.66 for these chemicals:

- Benzidine
- Benzo(a)pyrene
- Dibenz(a,h)anthracene
- 7-12-dimethylbenz(a)anthracene
- 3-methylcholanthrene
- N-nitrosodiethylamine
- N-nitrosodimetylamine
- N-nitroso-N-ethylurea
- N-nitroso-N-methylurea
- Safrole
- Urethane
- Acrylamide
- Ethylene oxide
- Methylene chloride
- 1,2,3-trichloropropane
- Chloroprene
- Benz(a)anthracene
- Benzo(b)fluoranthene
- Bnezo(k)fluoranthene
- Chromium VI
- Chrysene
- Coke oven emissions
- 1,2-Dibromo-3-chloropropane
- Indeno(1,2,3-cd)pyrene
- 2,4'-methylene-bis(2-chloraniline)

EPA developed an early-life adjustment factor for trichloroethylene (TCE) of 1.22 because the mutagenic mode of action applies to kidney tumors, but not for other cancers.

Vinyl chloride was found on EPA's mutagenic list. In the IRIS documentation for vinyl chloride, EPA provided two separate unit risk factors: one for inhalation exposure beginning as an adult, and one for lifetime exposures beginning at birth. No early-life adjustment factor was used to derive the vinyl chloride ASIL because we used the unit risk factor for continuous lifetime exposure from birth.

Recommendation

Based on our review of the material, we recommend the use of early life adjustment factors for cancer risk.

[8] "Use of early-life adjustment factors in deriving acceptable source impact levels for a subset of toxic air pollutants." Memo from Elena Guilfoil to 460 Rulemaking Stakeholders. Feb. 14, 2019.

Review the existing ASIL for dimethyl and diethyl mercury

Discussion

Current status

Dimethyl and diethyl mercury 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, the rule intentionally sets 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. The intent of this value is to require regulatory review for all emissions of these chemicals.[9]

Updated status

Our toxicologist has reviewed the 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.

We evaluated dimethyl mercury research and other available information.[10] 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 our evaluation of this material, we recommend an ASIL of 0.14-ug/m3 (daily TWA) for dimethyl- and diethyl mercury.

Recommendation

Based on our evaluation of research and other available information, we recommend an ASIL of 0.14-ug/m3 for dimethyl- and diethyl mercury.

Recalculate the small quantity emission rates (SQER)

- Recalculate the SQER modeling parameters
- Recalculate the SQER

Recalculate the SQER modeling parameters

Discussion

Current status

The SQER value was established through screening level air dispersion modeling using EPA's SCREEN3 model with one conservative building scenario.

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[9] "Concise Explanatory Statement and Responsiveness Summary for the Adoption of WAC 173-400-110, General Regulations for Air Pollution Sources and Chapter 173-460 WAC, Controls for New Sources of Toxic Air Pollutants," May 19, 2009, Publication number 09-02-008.

[10] "A Dimethyl Mercury Inhalation Risk Screening Concentration," Matt Kadlec, October 10, 2018. PowerPoint presentation. See also "A Dimethyl Mercury Inhalation Risk Screening Concentration for Public Health Protection," poster presentation, International Society of Exposure Science Conference, October 28 - November 1, 2012, Seattle, Washington.

Updated status
We updated the model to AERSCREEN Version 16216 because EPA no longer supports the SCREEN3 model. We examined several source and building configurations rather than one to simulate a more realistic yet conservative scenario.

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.[11]

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.

Recommendation

Based on our review of the material, we recommend using the updated modeling parameters.

Recalculate the SQER

Discussion

Current status
The current SQER was based on a SCREEN3 modeling run using scenario to intentionally yield high offsite concentrations. The one hour concentration produced by this effort was 3623 µg/m³. This provided assurance that the SQER would be protective of public health.

The SQER for dimethyl and diethyl mercury was set purposely low to ensure that a project with these emissions would go through a health impact analysis. The SQER, ASIL, and de minimis emissions value were set at the same value.

Updated status
We updated the modeling scenario using the latest version of EPA's AERSCREEN dispersion model. The resulting one hour concentration was 4282 µg/m³. The SQER derived from this value represents an emission rate that is unlikely to exceed an ASIL.

We also recommend establishing the SQER for dimethyl and diethyl mercury using the same methods we use for other TAPs because we are proposing a new ASIL for these chemicals that reflects our review of the research.

[11] See January 16, 2019 email from Elena Guilfoil and Ranil Dhammapala to 460 Rulemaking Stakeholders: "Updating the Small Quantity Emission Rates."

Recommendation

Based on our review of the material, we recommend using an updated one hour concentration of 4282 µg/m³ to derive SQERs.

Recalculate the de minimis emission values

- Review whether the SQER should be equal to the de minimis emission value
- Recalculate the de minimis emission value

Review whether the SQER should be equal to the de minimis emission value

Discussion

Current status

We derived the de minimis by dividing the SQER by a factor of 20. The concept of de minimis was new in the 2009 version of the rule. The previous version did not have a de minimis concept meaning that any increase in emissions of a TAP would be regulated.

Updated status

We discussed with stakeholders if the SQER and de minimis values should be the same.[12] We heard a number of opinions, but most thought that a buffer between the SQER and de minimis value provided a logical framework for regulating toxic air pollutant emissions.

Recommendation

We recommend retaining a buffer between the SQER and de minimis values.

Recalculate the de minimis emission value

Current status

We derived the de minimis by dividing the SQER by a factor of 20.

Updated status

We reviewed a number of scenarios and decided to derive the de minimis by dividing the SQER by a factor of 10. Coupled with the fact that SQERs are roughly 17% lower than previous SQERs, the change in de minimis values is minimal.

Recommendation

We recommend deriving de minimis by dividing the SQER by a factor of 10.

Exception - Criteria pollutants

We recommend retaining the current de minimis emission values for nitrogen dioxide, sulfur dioxide, carbon monoxide and lead based on the 2009 decision to establish a single de minimis emissions value for criteria pollutants that applies under both Chapter 173-400 WAC and Chapter 173-460 WAC. The WAC 173-400-110(5) de minimis rates were

[12] Refer to 1/23/2019 stakeholder meeting summary.

translated into 1-hour values for this rule. Otherwise, most projects with a combustion component would not qualify for the de minimis exemption.

Update the rule to support the changes described above

- Update the rule to support the changes described above

Update the rule to support the changes described above

Discussion

We will not need to update other portions of Chapter 173-460 WAC to support revising the table in WAC 173-460-150.

Recommendation

We recommend making no other changes at this time.