The Texas Commission on Environmental Quality (TCEQ, agency, or commission) adopts the amendment to §350.76.

Amended §350.76 is adopted without change to the proposed text as published in the August 30, 2024, issue of the *Texas Register* (49 TexReg 6702-6709) and, therefore, will not be republished.

Background and Summary of the Factual Basis for the Adopted Rules

The purpose of this rulemaking is to amend 30 Texas Administrative Code (TAC) Chapter 350, Texas Risk Reduction Program (TRRP) rule §350.76, pertaining to the chemical-specific approaches used for developing and demonstrating attainment of the critical human health protective concentration levels (PCLs) for dioxins/furans and dioxin-like polychlorinated biphenyls (PCBs).

The TCEQ rulemaking adoption updates the approach for developing soil PCLs for dioxins/furans and dioxin-like PCBs used for residential and commercial/industrial land use under TRRP. The current approach is covered in the TRRP rule in §350.76(d) and §350.76(e), and the current PCLs are specified in the TRRP rule at §350.76(e)(3). The PCLs contained in the existing TRRP rule were based on a then-current 1998 United States Environmental Protection Agency (EPA) policy memo (OSWER Directive 9200.4-26), which described an approach for addressing dioxins in soil. Since that time, the EPA completed a reassessment of this approach and derived an updated reference dose for dioxins. Based on more recent scientific evaluations, the TCEQ can

support the use of a reference dose in the range of EPA's updated value, and that value is reflected in the approach provided in this rulemaking adoption. Upon the effective date of the adopted revisions, any activity conducted pursuant to TRRP must comply with the revised approach for developing dioxins/furans and dioxin-like PCBs soil PCLs used for residential and commercial/industrial land use under TRRP.

Additionally, the rulemaking adoption updates the toxicity equivalency factors (TEFs) related to dioxins/furans and dioxin-like PCBs contained in §350.76(d)(2)(B). Dioxins/furans and dioxin-like PCBs are mixtures of chemical compounds (congeners) with different toxicities. TRRP §§350.76(d) and (e) use TEFs to assess the relative toxicity of the individual congeners compared to the toxicity of the most toxic congener, 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8-TCDD), within a mixture of dioxins/furans and dioxin-like PCBs. The TEFs are applied as a multiplier of the concentration of each measured congener to calculate a 2,3,7,8-TCDD toxicity equivalency quotient (TEQ) concentration. The resulting 2,3,7,8-TCDD TEQ concentrations for each congener are summed to derive a total 2,3,7,8-TCDD TEQ concentration for the entire mixture. The total 2,3,7,8-TCDD TEQ concentration is then compared to a 2,3,7,8-TCDD PCL to determine the nature and extent of contamination and whether a remedy is required. The TRRP rule provides specific TEFs for various dioxins/furans and dioxin-like PCB compounds and directs persons to use these TEF values when demonstrating attainment of the critical PCL.

When the TRRP rule was promulgated in 1999, the most recent TEF values established

by the World Health Organization (WHO) in 1998 were listed in the rule. However, based on evolving science and current data, WHO updated the TEF values in 2005 and continues to develop the most current TEF values. EPA and other regulatory agencies have been using the 2005 WHO TEFs. The adopted TRRP §350.76 rule revision will allow cleanups being conducted under TRRP to adopt the 2005 WHO TEFs or more recent TEFs established by a scientifically valid source that have been reviewed and approved by the executive director. Upon the effective date of the adopted revisions, any activity conducted pursuant to TRRP must comply with the 2005 WHO TEFs, or more recent TEFs established by a scientifically valid source that have been reviewed and approved by the executive director, for dioxin-like PCBs and dioxins/furans.

The TRRP chemical-specific PCL approaches for dioxins/furans and dioxin-like PCBs are being revised in this rulemaking adoption to reflect updated information on dioxin toxicity and address appropriate updates to the WHO TEFs for dioxins/furans and dioxin-like PCBs. Adoption of the rule also provides TCEQ with the flexibility needed to evaluate and adopt more recent TEFs that have been derived since the TRRP rule was first adopted in 1999.

Section by Section Discussion

Subchapter D: Development of Protective Concentration Levels

The commission adopts the amendment to §350.76(d)(2)(B) which removes the figure and the directive for persons to use TEFs specified therein when determining a 2,3,7,8-TCDD TEQ for dioxin-like PCBs. The adopted rule will direct persons to apply the 2005

WHO TEFs, or more recent TEFs established by a scientifically valid source that have been reviewed and approved by the executive director, to the measured concentrations for each of the dioxin-like PCBs.

The commission adopts new subsection §350.76(d)(3). This subsection clarifies that a person may be required to evaluate the adequacy of a response action when the executive director determines that a substantial change in the TEFs alters the calculated TEQ in such a way that results in the actual toxicity of the dioxin-like PCB mixture not being protective of human health and the environment. The rule also specifies that it is possible that a person might not be required to conduct a response action in the case where a significant change in the TEFs affects the TEQ in such a way that reveals a response action is no longer warranted to protect human health and the environment. To maintain the numerical order of the rule, previous subsections (d)(3) and (d)(4) are being renumbered to (d)(4) and (d)(5), respectively.

The commission amends §350.76(e)(1) by removing the directive for persons to use TEFs specified in the figure included in subsection (d)(2)(B), when demonstrating attainment of the critical PCL for 2,3,7,8-TCDD. The adopted rule will direct persons to apply the 2005 WHO TEFs, or more recent TEFs established by a scientifically valid source that have been reviewed and approved by the executive director, to demonstrate attainment of the critical PCL for 2,3,7,8-TCDD.

The commission's rulemaking adoption amends §350.76(e)(1)(B) to clarify that, when

homologue-specific analytical data are available, persons shall apply the 2005 WHO TEFs or more recent TEFs established by a scientifically valid source that have been reviewed and approved by the executive director. Additionally, this subsection clarifies that if a homologue class has more than one TEF for different congeners, persons shall use the highest of the latest TEFs that have been reviewed and approved by the executive director for that congener class. Additionally, the rulemaking adoption removes the language specifying that a TEF value of 0.5 be used for the pentachlorodibenzofuran homologue class.

The commission adopts the amendment for §350.76(e)(1)(C) to clarify that, when congener-specific analytical data are available, persons shall apply the 2005 WHO TEFs or more recent TEFs established by a scientifically valid source that have been reviewed and approved by the executive director.

The commission adopts a new subsection §350.76(e)(1)(D). This subsection clarifies that a person may be required to evaluate the adequacy of a response action when the executive director determines that a substantial change in the TEFs alters the calculated TEQ in such a way that it results in the actual toxicity of the dioxin and furan mixture not being protective of human health and the environment. The rule also specifies that it is possible that a person might not be required to conduct a response action in the case where a significant change in the TEFs affects the TEQ in such a way that reveals a response action is no longer warranted to protect human health and the environment.

The commission adopts the amendment to §350.76(e)(3) which removes language that establishes the critical soil PCL for residential properties for all three tiers as 1 part per billion (ppb) and for commercial/industrial properties for all three tiers as 5 ppb. The adopted rule specifies that the critical soil PCLs for residential and commercial/industrial properties shall be calculated for a 2,3,7,8-TCDD TEQ according to the equations and rule provisions provided in §350.75.

Final Regulatory Impact Determination

The commission reviewed the rulemaking adoption in light of the regulatory analysis requirements of the Texas Government Code, §2001.0225. The commission determined that the action is not subject to Texas Government Code, §2001.0225, because it does not meet the definition of a "Major environmental rule" as defined in that statute. A "Major environmental rule" is a rule, the specific intent of which is to protect the environment or reduce risks to human health from environmental exposure, and that may adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, or the public health and safety of the state or a sector of the state.

The specific intent of the rulemaking adoption is to adjust TRRP §350.76 methods and measures related to dioxins/furans and dioxin-like PCBs to align with current accepted science. Specifically, the rulemaking adoption revises the dioxin/furan and dioxin-like PCB soil PCLs used for residential and commercial/industrial land use under TRRP and

updates TEFs related to dioxins/furans and dioxin-like PCBs contained in §350.76 in light of more recent scientific evaluation, evolving science, and current data. The rulemaking adoption is not expected to adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, or the public health and safety of the state or a sector of the state. Instead, the rulemaking adoption may affect the costs and timeliness of cleanups of those sites where dioxins/furans or dioxin-like PCBs are the subject of investigation or remediation pursuant to TRRP. The adopted amendments do not rise to the level of material modifications, but instead are limited to incorporating modifications to the current regulatory framework based on current science and data regarding dioxins/furans and dioxin-like PCBs. Therefore, the rulemaking adoption does not meet the definition of a major environmental rule.

Furthermore, even if the rulemaking adoption did meet the definition of a major environmental rule, the rulemaking adoption does not meet any of the four applicability requirements listed in Texas Government Code, §2001.0225. Section 2001.0225 applies to a major environmental rule, the result of which is to: exceed a standard set by federal law, unless the rule is specifically required by state law; exceed an express requirement of state law, unless the rule is specifically required by federal law; exceed a requirement of a delegation agreement or contract between the state and an agency or representative of the federal government to implement a state and federal program; or adopt a rule solely under the general powers of the agency instead of under a specific state law. The rulemaking adoption does not meet any of the four

applicability requirements listed in Texas Government Code, §2001.0225.

First, the rulemaking does not exceed a standard set by federal law. Second, the rulemaking does not adopt requirements that are more stringent than existing state laws. Third, the rulemaking adoption does not exceed a requirement of a delegation agreement or contract between the state and an agency or representative of the federal government, where the delegation agreement or contract is to implement a state and federal program. Fourth, this rulemaking does not adopt a rule solely under the general powers of the agency. Rather, sections of the TWC, Chapter 26, and Texas Health & Safety Code, Chapter 361, authorize this rulemaking, which are cited in the Statutory Authority section of this preamble.

The commission invited public comment regarding the draft regulatory impact analysis determination during the public comment period. The TCEQ did not receive any comments on the regulatory impact analysis.

Takings Impact Assessment

The commission evaluated the rulemaking adoption and performed analysis of whether the adopted rules constitute a taking under Texas Government Code, Chapter 2007. The specific purpose of the adopted rules is to adjust TRRP §350.76 methods and measures related to dioxins/furans and dioxin-like PCBs to align with current accepted science. The rulemaking adoption substantially advances this stated purpose by revising the soil PCLs and updating the TEFs related to these constituents.

Promulgation and enforcement of this rulemaking adoption is neither a statutory nor a constitutional taking of private real property. Specifically, the subject adopted regulations do not affect a landowner's rights in private real property because this rulemaking does not burden (constitutionally) nor restrict or limit the owner's right to property and reduce its value by 25% or more beyond that which would otherwise exist in the absence of the regulations. In other words, the rulemaking adoption does not burden private real property because it incorporates modifications to the current regulatory framework based on current science and data regarding dioxins/furans and dioxin-like PCBs.

Consistency with the Coastal Management Program

This rulemaking is not applicable to the Coastal Management Program.

Public Comment

The commission offered a public hearing on September 30, 2024. The comment period closed on October 1, 2024 and no public comments were received.

SUBCHAPTER D: DEVELOPMENT OF PROTECTIVE CONCENTRATION LEVELS §350.76

Statutory Authority

The rule change is adopted under the authority of Texas Water Code (TWC), §5.102, concerning general powers of the commission; TWC, §5.103, which authorizes the commission to adopt any rules necessary to carry out its power and duties; TWC, §5.105, which authorizes the commission to establish and approve all general policy of the commission by rule; TWC, §26.011, which authorizes the commission to administer the provisions of TWC, Chapter 26; TWC, §26.039, which states that activities which are inherently or potentially capable of causing or resulting in the spillage or accidental discharge of waste or other substances and which pose serious or significant threats of pollution are subject to reasonable rules establishing safety and preventative measures which the commission may adopt or issue; TWC, §26.121, which prohibits persons from discharging wastes into or adjacent to any water in the state unless authorized to do so and prohibits persons from engaging in any other activity which causes pollution of any water in the state; TWC, §§26.262 and 26.264, which state it is the policy of this state to prevent the spill or discharge of hazardous substances into the waters in the state and authorizes the commission to issue rules to carry out the policy; TWC, §§26.341 and 26.345, which state it is the policy of this state to maintain and protect quality of groundwater and surface water resources from pollution from certain substances in underground and above-ground storage tanks and authorizes the commission to adopt rules to carry out the policy; TWC, §26.401, which

states that it is the policy of this state that discharges of pollutants, disposal of wastes, or other activities subject to state regulation be conducted in a manner to maintain and not impair groundwater uses or pose a public health hazard, and that groundwater quality be restored if feasible; Texas Health & Safety Code (THSC), §§361.017 and 361.024, which establish the commission's jurisdiction over all aspects of the management of industrial solid waste and hazardous municipal waste with all power necessary or convenient to carry out the responsibilities of that jurisdiction and authorizes the commission to adopt rules; and THSC, Chapter 361, Subchapter F, which authorizes the commission to identify, assess, and remediate facilities that may constitute an imminent and substantial endangerment to public health and safety or the environment due to a release or threatened release of hazardous substances into the environment.

The adopted rules implement TWC, Chapter 26, and THSC, Chapter 361.

§350.76. Approaches for Specific Chemicals of Concern to Determine Human Health Protective Concentration Levels.

(a) General.

(1) Due to the unique nature of the toxicity and/or exposure, the person shall use the COC-specific approaches described in this section for the following COCs:

(A) cadmium;

(B) lead;

(C) polychlorinated biphenyls;

(D) polychlorinated dibenzodioxins and dibenzofurans;

(E) polycyclic aromatic hydrocarbons; and

(F) total petroleum hydrocarbons.

(2) Except for the specific provisions contained in this section, the person shall establish RBELs and PCLs in accordance with the standard procedures outlined in the previous sections of this subchapter.

(3) This section addresses only those exposure pathways for which PCL equations are provided in this subchapter. When dealing with other exposure pathways as required in §350.71(c) of this title (relating to General Requirements), the executive director will specify how those pathways should be addressed for these COCs using the best available science.

(4) The person shall use the figures as required in subsections (b) - (g) of this section.

(b) Cadmium.

(1) In calculating residential soil PCLs that are protective for noncarcinogenic effects for all tiers, the person shall incorporate age-adjusted exposure assumptions for the soil ingestion, vegetable ingestion, and dermal soil exposure pathways. Accordingly, 30 years of cadmium exposure shall be partitioned into three specific exposure periods: <1 - 6 years, 6 - 18 years, and 18 - 30 years. Cadmium intake shall be calculated for each of these periods, based on the period-specific exposure assumptions. The soil PCL for cadmium shall be a function of the final integrated intake estimate, which shall be determined by time-weighting intake from each of the three exposure periods. The age-adjusted RBEL equations and default parameters to be used for cadmium are provided in the following figure. The soil PCL for cadmium shall be calculated by combining the pathway-specific PCLs as outlined in §350.75(i)(6) of this title (relating to Tiered Human Health Protective Concentration Level Evaluation).

Figure: 30 TAC §350.76(b)(1)

Age-Adjusted RBEL Equations and Default Exposure Factors for Evaluating the Noncarcinogenic Effects of Cadmium
Residential Land Use

Dermal Contact with Non-Carcinogenic COCs in Soil - RBEL (mg/kg)

$$^{Soil}RBEL_{Derm\text{-}nc} = \frac{HQ \times RfD_d \times AT.AgeAdj.res \times 365\ days/yr}{10^{-6}\ kg/mg \times EF.res \times DF.adj \times ABS.d}$$

Ingestion of Non-Carcinogenic COCs in Soil - RBEL (mg/kg)

$$^{Soil}RBEL_{Ing\text{-}nc}(mg/kg) = \frac{HQ \times RfD_o \times AT.AgeAdj.res \times 365\ days/yr}{10^{-6}\ kg/mg \times EF.res \times IRsoil.AgeAdj.res \times RBAF}$$

HQ	Hazard Quotient (unitless)	1
AT.AgeAdj.res	Averaging Time - (yr)-Age-adjusted	30
RfD_o	Oral Reference Dose (mg/kg-day)	Chemical Specific
RfD_d	Dermal Reference Dose (mg/kg-day)	Chemical Specific
EF.res	Exposure Frequency (days/yr) (event/yr for dermal soil)	350
DF.adj	Dermal Adjustment Factor (mg-yr/kg-event)	352
ABS.d	Dermal Absorption Fraction (unitless)	Chemical Specific

Ingestion of Non-Carcinogenic COCs in Above-Ground Vegetables - RBEL (mg/kg)

$$^{Abg}RBEL_{Ing\text{-}nc} = \frac{HQ \times RfD_o \times AT.AgeAdj.res \times 365\ day/yr}{EF.res \times IRabg.AgeAdj.res}$$

Ingestion of Non-Carcinogenic COCs in Below-Ground Vegetables - RBEL (mg/kg)

$$^{Bg}RBEL_{Ing\text{-}nc} = \frac{HQ \times RfD_o \times AT.AgeAdj.res \times 365\ day/yr}{EF.res \times IRbg.AgeAdj.res}$$

Irsoil.AgeAdj.res	Age-Adjusted Soil Ingestion Rate (mg-yr/kg-day)	120
	Age-Adjusted Vegetable Ingestion Rate (kg-yr/kg-day)	
IRabg.AgeAdj.res	Above-Ground Vegetables	0.0028
IRbg.AgeAdj.res	Below-Ground Vegetables	0.0012
RBAF	Relative Bioavailability Factor	1

(2) In calculating residential and commercial/industrial soil PCLs for all tiers, the person shall use the reference dose values for cadmium in food in evaluating exposures to cadmium through the soil ingestion, vegetable ingestion, and dermal soil exposure pathways.

(c) Lead.

(1) The Tier 1 residential soil PCL ($^{Tot}Soil_{Comb}$) for lead is 500 mg/kg.

(2) Subject to prior approval by the executive director, the person may use property-specific data in conjunction with a lead model approved by the executive director (e.g., EPA Integrated Exposure Uptake Biokinetic model for lead in children (version 1.0 from 2005)) to calculate a Tier 3 residential soil PCL ($^{Tot}Soil_{Comb}$) for lead.

The person shall submit information to the executive director which demonstrates that variance from default model inputs is supported by property-specific information (e.g., data from a scientifically valid bioavailability study using property-specific soils). Property-specific model input values must be approved by the executive director. Consistent with the development of residential RBELs for COCs without chemical-specific approaches in accordance with §350.74 of this title (Development of Risk-Based Exposure Limits), variance from certain model default exposure factors such as soil/dust ingestion rates and exposure frequency to less conservative (i.e., lower) numerical values shall not be allowed.

(3) The commercial/industrial soil PCL ($^{Tot}Soil_{Comb}$) is based only on the soil ingestion pathway ($^{Soil}Soil_{Ing}$). The person shall use the exposure algorithm and default exposure factors in the following figure for calculating the Tier 1 commercial/industrial $^{Soil}RBEL_{Ing}$ value.

Figure: 30 TAC §350.76(c)(3)

Equation for Adult Lead Exposure Commercial/Industrial Land Use (Tier 1)
$^{Soil}Soil_{Ing} = {}^{Soil}RBEL_{Ing}$
$$^{Soil}RBEL_{Ing}(\mu g/g) = \frac{\left(PbB_{95}\,fetal/\left(R\times\left(GSD_i\right)^{1.645}\right)\right)-PbB0}{BKSF\times\left(IR_{sd}\times AF_{sd}\times EF_{sd}/365\right)}$$

Parameter	Definition (units)	Default
PbB_{95} fetal	95th Percentile PbB in Fetus (µg/dL)	10
R	Mean Ratio of Fetal to Maternal PbB	0.9
GSD_i	Individual Geometric Standard Deviation	1.91
PbB0	Baseline Blood Lead Value (µg/dL)	1.64
BKSF	Biokinetic Slope Factor (µg/dL per µg/day)	0.4
IR_{sd}	Soil/Dust Ingestion Rate (g/day)	0.05
EF_{sd}	Soil/Dust Exposure Frequency (days/yr)	250
AF_{sd}	Absolute Absorption Fraction of Lead in Soil/Dust	0.10

(4) The person may use a different exposure algorithm as presented in the following figure that considers soil and dust separately for calculating the Tier 2 and 3 commercial/industrial $^{Soil}RBEL_{Ing}$ value in cases where the person has adequate direct measurement data on the concentrations of lead in both soil and dust at the affected property. In addition, in calculating Tier 2 or 3 $^{Soil}RBEL_{Ing}$ values, the person may deviate from the default exposure factors as shown in the figure in paragraph (3) of this subsection and the following figure if property-specific or defensible alternative data (e.g., from open literature or privately funded studies) adequately support such an approach. The specific exposure factors for which the person may use property-specific or scientifically defensible alternative values are the following:

Figure: 30 TAC §350.76(c)(4)

Equation for Adult Lead Exposure Commercial/Industrial Land Use (Tiers 2 & 3 only)

$$^{Soil}Soil_{Ing} = {}^{Soil}RBEL_{Ing}$$

$$^{Soil}RBEL_{Ing}(\mu g/g) = \frac{\left(PbB_{95}\,fetal/\left(R\times\left(GSD_i\right)^{1.645}\right)\right)-PbB0}{BKSF\times\left(\left(IR_{sf}\times AF_s\times EF_{s/365}\right)+\left(K_{sd}\times IR_d\times AF_d\times EF_d/365\right)\right)}$$

Parameter	Definition (units)	Defaults
PbB_{95} fetal	95th Percentile PbB in Fetus (µg/dL)	10
R	Mean Ratio of Fetal to Maternal PbB	0.9
GSD_i	Individual Geometric Standard Deviation	1.91
PbB0	Baseline Blood Lead Value (µg/dL)	1.64
BKSF	Biokinetic Slope Factor (µg/dL per µg/day)	0.4
IR_s	Soil Ingestion Rate (g/day)	0.025
IR_d	Dust Ingestion Rate (g/day)	0.025
K_{sd}	Ratio of Concentration in Dust to that in Soil	***
EF_s	Soil Exposure Frequency (days/yr)	250
EF_d	Dust Exposure Frequency (days/yr)	250
AF_s	Absolute Absorption Fraction of Lead in Soil	0.10
AF_d	Absolute Absorption Fraction of Lead in Dust	0.10

***Based on direct measurement data on the concentrations of lead in both soil and dust at the affected property.

(A) individual geometric standard deviation (GSD_i);

(B) baseline blood lead (PbBO);

(C) absolute absorption fraction of lead in soil/dust (Afsd);

(D) absolute absorption fraction of lead in soil (AFs); and

(E) absolute absorption fraction of lead in dust (Afd).

(d) Polychlorinated Biphenyls.

(1) In calculating Tier 1 residential and commercial/industrial soil and groundwater PCLs, the person shall use the upper-reference point of the upper-bound slope factors (2 $(mg/kg\text{-}day)^{-1}$) for the soil ingestion, dermal contact with soil, vegetable ingestion, and inhalation (both vapor and particulate phases) exposure pathways.

(2) For Tiers 2 and 3, the person may use alternative slope factors when the following conditions are met:

(A) The person may use the lower reference point of the upper bound slope factors (0.4 $(mg/kg\text{-}day)^{-1}$) to calculate an inhalation unit risk factor when evaluating inhalation exposures to volatilized polychlorinated biphenyls. The person

must still use the upper reference point of the upper bound slope factors (2 (mg/kg-day)$^{-1}$) to evaluate inhalation exposures to particulate phase polychlorinated biphenyls.

(B) The person may conduct congener or isomer analyses. The person may use the lowest reference point of the upper-bound slope factors (0.07 (mg/kg-day)$^{-1}$) for the soil ingestion, dermal contact with soil, and inhalation exposure pathways if congener or isomer analyses verify that congeners with more than four chlorines comprise less than one-half percent of total polychlorinated biphenyls in a given exposure medium. The upper reference point of the upper-bound slope factors (2 (mg/kg-day)$^{-1}$) shall be used for all other exposure pathways regardless of the results of the congener- or isomer-specific analyses. If congener or isomer analyses indicate that congeners with more than four chlorines comprise greater than one-half percent of total polychlorinated biphenyls in a given exposure medium, then the person shall use the upper-reference point of the upper-bound slope factors (2 (mg/kg-day)$^{-1}$) for all pathways for that specific exposure medium. Further, when congener concentrations are available, the contribution of dioxin-like polychlorinated biphenyls to total dioxin equivalents shall be considered. The person shall determine the constituents considered to be dioxin-like polychlorinated biphenyls from the list established by the World Health Organization in 2005, or a more recent list of constituents established by a scientifically valid source that has been reviewed and approved by the executive director. The person shall apply the toxicity equivalency factors established by the World Health Organization in 2005, or more recent toxicity equivalency factors established by a scientifically valid source that have been reviewed and approved by

the executive director, [specified in the following figure]to the measured concentrations for each of the dioxin-like polychlorinated biphenyls. These values shall then be summed to obtain a 2,3,7,8-TCDD toxicity equivalency quotient. Toxicity equivalency quotients for dioxin-like polychlorinated biphenyls shall then be added to those for other dioxin-like compounds as specified in subsection (e) of this section to yield a total toxicity equivalency quotient concentration. This total toxicity equivalency [quotients]quotient concentration shall then be compared with the critical PCL for TCDD, 2,3,7,8-(dioxin). When addressing dioxin-like polychlorinated biphenyls in this manner, the person shall subtract the concentration of dioxin-like polychlorinated biphenyls from the total polychlorinated biphenyls concentration to avoid overestimating dioxin-like polychlorinated biphenyls by evaluating them twice.

[Figure: 30 TAC §350.76(d)(2)(B)]

Toxicity Equivalency Factors (TEFs) for Dioxin-Like Compounds

Congener/Class	TEF Value
2,3,7,8-Substituted Dibenzodioxins	
2,3,7,8-Tetrachlorodibenzodioxin	1
2,3,7,8-Pentachlorodibenzodioxins	1
2,3,7,8-Hexachlorodibenzodioxins	0.1
2,3,7,8-Heptachlorodibenzodioxins	0.01
Octachlorodibenzodioxins	0.0001
2,3,7,8-Substituted Dibenzofurans	
2,3,7,8-Tetrachlorodibenzofuran	0.1

1,2,3,7,8-Pentachlorodibenzofuran	0.05
2,3,4,7,8-Pentachlorodibenzofuran	0.5
2,3,7,8-Hexachlorodibenzofurans	0.1
2,3,7,8-Heptachlorodibenzofurans	0.01
Octachlorodibenzofurans	0.0001
Dioxin-Like PCBs	
3,4,4',5-TCB (81)	0.0001
3,3',4,4'-TCB (77)	0.0001
3,3',4,4',5-PeCB (126)	0.1
3,3',4,4',5,5'-HxCB (169)	0.01
2,3,3',4,4'-PeCB (105)	0.0001
2,3,4,4',5-PeCB (114)	0.0005
2,3',4,4',5-PeCB (118)	0.0001
2',3,4,4',5-PeCB (123)	0.0001
2,3,3',4,4',5-HxCB (156)	0.0005
2,3,3',4,4',5'-HxCB (157)	0.0005
2,3',4,4',5,5'-HxCB (167)	0.00001
2,3,3',4,4',5,5'-HpCB (189)	0.0001

(3) The executive director may determine that a change in a toxicity equivalency factor has been of such magnitude that the calculated toxicity equivalency quotient would not be representative of the actual toxicity of the dioxin-like polychlorinated biphenyl mixture and not protective of human health and the environment. If the executive director makes such a determination, then the person must evaluate the adequacy of the response action. If the executive director

determines that a change in a toxicity equivalency factor is of such magnitude that the calculated toxicity equivalency quotient would not be representative of the actual toxicity of the dioxin-like polychlorinated biphenyl mixture such that the proposed response action is no longer warranted to protect human health and the environment, then a response action based on the previous toxicity equivalency quotient shall no longer be required.

(4[3]) In evaluating inhalation exposures under Tiers 2 or 3, the person shall convert the appropriate slope factor to an inhalation unit risk factor, based on the following equation: Inhalation Unit Risk Factor (risk per $\mu g/m^3$)= oral slope factor x 20 m^3/day divided by 70 kg x 10^{-3} mg/µg.

(5[4]) In Tiers 2 and 3, and only when applicable for a specific site, the person may set soil PCLs based on the requirements of the Toxic Substances Control Act, 40 Code of Federal Regulations Parts 750 and 761, as amended. Sites must comply fully with all applicable Toxic Substances Control Act, as amended, requirements when establishing the soil PCL for polychlorinated biphenyls in this manner.

(e) Polychlorinated Dibenzo-p-Dioxins and Dibenzofurans.

(1) In demonstrating attainment of the critical PCL for TCDD, 2,3,7,8-(dioxin), the person shall determine the constituents considered to be dioxins and furans from the list established by the World Health Organization in 2005, or a more

recent list of constituents established by a scientifically valid source that has been reviewed and approved by the executive director. The person shall apply the toxicity equivalency factors established by the World Health Organization in 2005, or more recent toxicity equivalency factors established by a scientifically valid source that have been reviewed and approved by the executive director,[as shown in the figure in subsection (d)(2)(B) of this section] to the measured concentrations of the dioxins and furans in accordance with the following procedures.

(A) When analytical data are only available for total dioxins/furans, the person shall assume that the mixture consists solely of 2,3,7,8-TCDD, and a toxicity equivalency factor value of 1.0 shall be applied to the measured concentration to yield the 2,3,7,8-TCDD toxicity equivalency quotient concentration for the sample.

(B) When homologue-specific analytical data are available (e.g., tetrachlorodibenzodioxins), the person shall assume that each homologue class is comprised solely of 2,3,7,8-substituted congeners, and shall apply the toxicity equivalency factors established by the World Health Organization in 2005, or more recent toxicity equivalency factors established by a scientifically valid source that have been reviewed and approved by the executive director,[specified for the 2, 3, 7, 8-substituted congeners in the homologue class shall be applied] to the measured concentrations for that homologue class. If a homologue class has more than one toxicity equivalency factor for different congeners, the highest toxicity equivalency factor that has been reviewed and approved by the executive director shall be used for

that congener class.[A toxicity equivalency factor value of 0.5 should be used for the pentachlorodibenzofuran homologue class.] The toxicity equivalency quotient concentrations for each homologue class shall be summed to obtain a total toxicity equivalency quotient concentration for the sample.

(C) When congener-specific analytical data are available (e.g., 1, 2, 3, 4, 7, 8-hexachlorodibenzofuran), the person shall determine the constituents considered to be dioxins and furans from the list established by the World Health Organization in 2005, or a more recent list of constituents established by a scientifically valid source that has been reviewed and approved by the executive director. The person shall apply the toxicity equivalency factors established by the World Health Organization in 2005, or more recent toxicity equivalency factors established by a scientifically valid source that have been reviewed and approved by the executive director for the 2, 3, 7, 8-substituted congeners, to the measured concentrations. The toxicity equivalency quotient concentrations for each 2, 3, 7, 8-substituted congener shall then be summed to obtain a total toxicity equivalency quotient concentration for the sample.

(D) The executive director may determine that a change in a toxicity equivalency factor has been of such magnitude that the calculated toxicity equivalency quotient would not be representative of the actual toxicity of the dioxin and furan mixture and not protective of human health and the environment. If the executive director makes such a determination, the person must evaluate the adequacy

of the response action. If the executive director determines that a change in a toxicity equivalency factor is of such magnitude that the calculated toxicity equivalency quotient would not be representative of the actual toxicity of the dioxin and furan mixture such that the proposed response action is no longer warranted to protect human health and the environment, then a response action based on the previous toxicity equivalency quotient shall no longer be required.

(2) The person shall then compare the total toxicity equivalency quotient concentration established in paragraph (1) of this subsection to the critical PCL for TCDD, 2, 3, 7, 8-(dioxins).

(3) The person shall calculate [The]the critical soil PCLs for residential and commercial/industrial properties for a 2,3,7,8-TCDD toxicity equivalency quotient according to the equations and rule provisions provided in §350.75 of this title (relating to Tiered Human Health Protective Concentration Level Evaluation).[for all three tiers is 1 part per billion (ppb) and for commercial/industrial properties for all three tiers is 5 ppb.]

(f) Polycyclic Aromatic Hydrocarbons.

(1) In calculating residential and commercial/industrial PCLs for all tiers, the person shall evaluate the following seven polycyclic aromatic hydrocarbons as carcinogens:

(A) benzo {a} anthracene;

(B) benzo {b} fluoranthene;

(C) benzo {k} fluoranthene;

(D) benzo {a} pyrene (B {a} P);

(E) chrysene;

(F) dibenzo {a, h} anthracene; and

(G) indeno {1, 2, 3-c, d} pyrene.

(2) The person shall use the relative potency factors outlined in the following figure to estimate cancer slope factors and unit risk estimates for each of the polycyclic aromatic hydrocarbons identified in paragraph (1) of this subsection for all exposure pathways (e.g., the soil ingestion, vegetable ingestion, inhalation, dermal contact with soil, and groundwater ingestion (in the absence of a primary MCL) exposure pathways):

Figure: 30 TAC §350.76(f)(2)

Relative Potency Factors (RPF) for Carcinogenic PAHs	
Compound	**RPF**
Benz{a}anthracene	0.1
Benzo{a}pyrene	1
Benzo{b}fluoranthene	0.1
Benzo{k}fluoranthene	0.01
Chrysene	0.001
Dibenz{a,h}anthracene	1
Indeno{1,2,3-c,d}pyrene	0.1

(3) The cancer slope factors and inhalation unit risk factors for the seven carcinogenic polycyclic aromatic hydrocarbons, shall be calculated according to the equations set forth in the following figure:

Figure: 30 TAC §350.76(f)(3)

Equations for Calculating Cancer Slope Factors and Unit Risk Factors for Carcinogenic PAHs

$$SF_{PAH} = (SF_{B[a]P})\ (RPF_{PAH})$$

where:
SF_{PAH} = adjusted cancer slope factor for a PAH $(mg/kg\text{-}day)^{-1}$
$SF_{B[a]P}$ = cancer slope factor for benzo{a}pyrene $(mg/kg\text{-}day)^{-1}$
RPF_{PAH} = relative potency factor for a PAH in Figure 30 TAC §350.76(f)(2) (unitless)

$$URF_{PAH} = (URF_{B[a]P})\ (RPF_{PAH})$$

where:
URF_{PAH} = adjusted inhalation unit risk factor for a PAH $(\mu g/m^3)^{-1}$
$URF_{B[a]P}$ = inhalation unit risk factor for benzo{a}pyrene $(\mu g/m^3)^{-1}$
RPF_{PAH} = relative potency factor for a PAH in (Figure 30 TAC §350.76(f)(2))

(unitless)

(4) The person shall not apply the relative potency factor for any pathways when evaluating noncarcinogenic endpoints.

(5) For class 1 or 2 groundwater, the person shall establish PCLs according to the procedures in subparagraphs (A) and (B) of this paragraph.

(A) In evaluating residential and commercial/industrial exposures to class 1 and 2 groundwater for all tiers, the person shall use the most currently available primary MCL for benzo{a}pyrene as ${}^{GW}GW_{Ing}$ for benzo{a}pyrene.

(B) In establishing ${}^{GW}GW_{Ing}$ for class 1 and 2 groundwater for the six remaining carcinogenic polycyclic aromatic hydrocarbons, the person shall use the higher of the calculated ${}^{GW}RBEL_{Ing}$ or the primary MCL for B{a}P as ${}^{GW}GW_{Ing}$ for that specific polycyclic aromatic hydrocarbon. In the event that primary MCLs for the other carcinogenic polycyclic aromatic hydrocarbons become available, those MCLs would serve as ${}^{GW}GW_{Ing}$ for these compounds.

(g) Total Petroleum Hydrocarbons.

(1) The person shall follow the methodology prescribed by this subsection to establish PCLs for total petroleum hydrocarbons, unless the executive director approves the use of an alternate method.

(2) In order to establish PCLs for total petroleum hydrocarbons, the person shall establish PCLs for each of the aliphatic and aromatic hydrocarbon fractions listed in the following figure (e.g., aliphatic $>C_6$-C_8) for the mandatory and complete or reasonably anticipated to be completed exposure pathways as required in §350.71(c) of this title (relating to General Requirements):

Figure: 30 TAC §350.76(g)(2)

Hydrocarbon Fractions and Toxicity Factors		
Aliphatic Hydrocarbon Fraction	Surrogate for Oral RfD	Surrogate for Inhalation RfC
C_6	n-hexane	n-hexane[1] commercial hexane[2]
$>C_6$-C_8	n-hexane	n-hexane[1] commercial hexane[2]
$>C_8$-C_{10}	C9-C17 aliphatics	dearomatized white spirits
$>C_{10}$-C_{12}	C9-C17 aliphatics	dearomatized white spirits
$>C_{12}$-C_{16}	C9-C17 aliphatics	dearomatized white spirits
$>C_{16}$-C_{21}	white mineral oils	----
$>C_{16}$-C_{21} (for transformer mineral oil releases only)	transformer mineral oil	----
$>C_{21-35}$ [3]	white mineral oil	----

$>C_{21}$-C_{35} (for transformer mineral oil releases only)	transformer mineral oil	----
Aromatic Hydrocarbon Fraction	Surrogate for Oral RfD	Surrogate for Inhalation RfC
$>C_{7-8}$	ethylbenzene	ethylbenzene
$>C_{8}$-C_{10}	multiple aromatic compounds	high flash aromatic naphtha
$>C_{10}$-C_{12}	multiple aromatic compounds	high flash aromatic naphtha
$>C_{12}$-C_{16}	multiple aromatic compounds	multiple aromatic compounds
$>C_{16}$-C_{21}	pyrene	----
$>C_{21}$-C_{35} [3]	pyrene	----

Footnotes:

1. For mixtures with greater than 53% n-hexane content.
2. For mixtures with less than or equal to 53% n-hexane content.
3. The person may truncate the analysis at C_{28} when there does not appear to be significant mass of $>C_{28}$ based on the gas chromatogram and the product is anticipated to be a lighter hydrocarbon (e.g., gasoline, diesel, not transformer mineral oil, or used motor oil).

(3) The person shall use the specific toxicity factors for the specific surrogates as shown in the figure in paragraph (2) of this subsection for a hydrocarbon fraction. If a reference concentration is not available, then the person shall not be required to comply with §350.73(c) of this title (relating to Determination and Use of Human Toxicity Factors and Chemical Properties). The PCLs established under this subsection shall be based on noncarcinogenic effects.

(4) The person shall ensure that the PCLs established for each hydrocarbon fraction comply with the hazard quotient criteria as set forth in §350.72 of this title (relating to Carcinogenic Risk Levels and Hazard Indices for Human Health Exposure Pathways).

(5) The person shall ensure that the PCLs established for the total petroleum hydrocarbons comply with the hazard index criteria as set forth in §350.72 of this title considering only the hydrocarbon fractions as shown in the figure in paragraph (2) of this subsection. The person shall follow the methodology prescribed in §350.72(d) of this title to adjust the hydrocarbon fraction PCLs to meet the hazard index criteria for the total petroleum hydrocarbons.

(6) The person shall use an analytical method approved by the executive director to determine the concentration of the hydrocarbon fractions at the affected property.

(7) When the bulk total petroleum hydrocarbons composition can be assumed to be relatively consistent based on process knowledge, the person may establish mixture-specific (e.g., gasoline, diesel, transformer mineral oil, or other petroleum product) PCLs based on property-specific mixture compositions or mixture compositions considered to be representative of the mixture. The person shall comply with the other provisions of this subsection in the development of the mixture-specific PCLs, but the person shall be allowed to determine compliance with the mixture-

specific total petroleum hydrocarbons PCL with a bulk total petroleum hydrocarbons analytical method acceptable to the executive director in lieu of analysis of the concentration of each hydrocarbon fraction.

(8) The PCLs established for each individual aliphatic and aromatic hydrocarbon fraction used to establish the mixture specific PCLs shall not exceed a hazard quotient of 1 and the mixture-specific PCL shall not exceed a hazard index of 10.