

The Texas Commission on Environmental Quality (TCEQ, agency, or commission) adopts amendments to §§350.2 - 350.4, 350.33, 350.34, 350.37, 350.51, 350.54, 350.71, 350.73 - 350.77, 350.79, 350.91 - 350.96, 350.111, and 350.134, and adopts new §350.90. Sections 350.2, 350.4, 350.33, 350.34, 350.37, 350.51, 350.73 - 350.77, 350.90, and 350.95 are adopted *with changes* to the proposed text as published in the September 8, 2006, issue of the *Texas Register* (31 TexReg 7257). Sections 350.3, 350.54, 350.71, 350.79, 350.91 - 350.94, 350.96, 350.111, and 350.134 are adopted *without changes* to the proposed text and will not be republished.

#### BACKGROUND AND SUMMARY OF THE FACTUAL BASIS FOR THE ADOPTED RULES

The initial rulemaking of Chapter 350 was originally adopted on September 2, 1999, and became effective September 24, 1999. The purpose of the original rulemaking was to create a unified performance-based remediation program that is risk-based, consistent, streamlined, and that expedites site remediations. Subsequent to the initial adoption, the rulemaking has been readopted under the Quadrennial Review requirements. In August 2003, §350.1 was modified to include a provision to confirm that engineering, geoscience, and surveying information submitted to the agency must comply with the applicable professional licensing and registration acts. Other than the August, 2003 amendment, the rule has remained unchanged since its original adoption. Throughout this preamble, the Texas Risk Reduction Program (TRRP) rule in existence prior to these adopted amendments will be referred to as the “prior rule” or the “prior TRRP rule.”

The agency has gained much experience over the last seven years through intensive implementation of the rule at thousands of contamination sites located throughout Texas. The agency has noticed errors (misspellings, typographical, mathematical) in the rule that need to be corrected, as well as provisions

that either need clarification or modification to facilitate consistent and effective rule application. Some rule provisions required updating to reflect the latest scientific information. Additionally, the agency has reevaluated some policy positions and has developed new positions and procedures in guidance that were previously unaddressed by the rules.

Finally, the agency is adopting new rule provisions in support of a new electronic data management system initiative and expanded use of geographical information system technology to increase agency effectiveness and institutional memory as well as to improve the public availability of technical information stored at the agency. For all of these reasons, these amendments are adopted.

#### SECTION BY SECTION DISCUSSION

Administrative and grammatical changes are adopted throughout the sections to bring the rule language into agreement with Texas Register requirements, agency guidelines, and guidance provided in the *Texas Legislative Council Drafting Manual*, August 2006.

The name of the agency has changed from Texas Natural Resource Conservation Commission (TNRCC) to Texas Commission on Environmental Quality (TCEQ) since the original adoption of the rule. Therefore, changes are adopted to §§350.4(a)(58) and (b), 350.73(a)(4) and (c), and 350.111(a)(7) and (8) and (c), as well as to Figures 30 TAC §§350.73(f), 350.74(a), and 350.77(b) to reflect this agency name change.

Section 350.2(g), Applicability, was changed in response to public comment on the rule, which is explained in the RESPONSE TO COMMENTS section of the preamble. The change provides the

agency the latitude to grant a variance that will foster regulatory consistency between leaking petroleum storage tank (LPST) sites that have comparable conditions and are located within 0.25 miles from each other. As explained in the March 26, 1999, issue of the *Texas Register* (24 TexReg 2208) preamble to the original adoption rulemaking, one reason this chapter was adopted was to create greater uniformity between regulatory programs, and thus between remediation sites. However, because of the large number of LPST sites that have been remediated under the 30 TAC Chapter 334 regulations, the application of this chapter to an LPST site has sometimes had the opposite effect, resulting in regulatory inconsistency with comparable LPST sites located within 0.25 miles that have been regulated under Chapter 334. The variance provides remediation flexibility to the landowner under appropriate and qualified circumstances, while maintaining protection of human health and the environment.

Therefore, these provisions are adopted in order to provide the executive director with the discretion to grant a site-specific variance to use the Chapter 334 regulations in lieu of this chapter in certain instances. These adopted amendments provide criteria that must be met to be eligible to request the variance. Most importantly, there must be an LPST site within 0.25 miles that is regulated under the Chapter 334 risk-based corrective action regulations, and the regulatory requirements for the site must be substantially different from what is required by Chapter 350, even though the site conditions, release conditions, and receptor conditions are comparable.

If the person can demonstrate that Chapter 334 requirements apply to comparable LPST sites, located within 0.25 miles from the property seeking the variance, and that to comply with Chapter 350 unjustifiably imposes greater requirements, the person will be able to formally submit a request for a variance as set forth in these amendments. The person is responsible for initiating the variance request,

providing all information required under these amendments, and supplying any additionally requested information that is reasonable and appropriate. The requested variance will be granted if the executive director agrees with the person that the sites are comparable, and an unjustifiable difference in requirements will result if this chapter is applied to the LPST site. With the variance, the person will then apply the Chapter 334 risk-based corrective regulations in lieu of those set forth in Chapter 350.

However, the agency has chosen to allow this variance only for LPST sites that ceased aboveground or underground storage tank use and removed the tanks before September 1, 2003, the effective date of Chapter 350 for LPST sites. Further, the variance is only for those properties and future subdivisions of those properties where the landowner voluntarily commits to impose a permanent prohibition against any future aboveground or underground storage tank use at that property by means of a restrictive covenant enforceable by the State of Texas. In the opinion of the agency, these criteria ensure any LPST releases that will qualify for this variance are constrained to those releases that occurred prior to the date Chapter 350 became effective for LPST sites. This ensures that the application of Chapter 334 will be allowed only for legacy or historical releases that occurred prior to the effective date of Chapter 350. Any release occurring or potentially occurring as a consequence of storage tank system operation after that date, should be regulated under Chapter 350. Further, the agency believes if compliance with Chapter 350 does not create regulatory inconsistency with obligations under Chapter 334, then the variance is not warranted and compliance with Chapter 350 is fully appropriate.

If in the future the landowner of the property or subdivision of the property desires to resume storage tank use at the property or at a subdivision of the property, then the LPST release for which the variance was granted must be brought into full compliance with Chapter 350 at that time.

Adopted §350.2(m), concerning the use of this chapter on or after May 1, 2000, clarifies provisions regarding switching rules once the person established grandfather status under the previously applicable rules contained in 30 TAC Chapter 335, Subchapters A and S (Industrial Solid Waste and Municipal Hazardous Waste in General; Risk Reduction Standards, respectively). These provisions specify that, first, a person who desires to remain subject to Chapter 335 risk reduction standards may not use any provisions of Chapter 350 and that, second, a person who switches to Chapter 350 to complete a response action may not revert back to Chapter 335. As originally structured, the second provision appeared to apply only to risk reduction standard number 3. By deleting these two provisions from subsection (m)(1) and (2) and adding them to subsection (m), the provisions will apply uniformly to all three risk reduction standards set forth in Chapter 335.

Adopted §350.3, Process, modifies flowcharts that describe the sequence and timing for reporting to the agency. The adopted changes to the flowcharts correct typographical errors and more accurately summarize the rule. The amendment clarifies that documentation of any required institutional controls related to Remedy Standard A must be submitted within 90 days of agency approval of a Response Action Completion Report. The amendment also clarifies that proof of compliance with institutional control requirements must be submitted within 120 days of agency approval of a Response Action Plan, if a waste control unit, technical impracticability demonstration, and/or plume management zone (PMZ) is used. The adopted changes neither alter nor add requirements to the institutional control and reporting requirements of the prior rule.

Adopted §350.4, Definitions and Acronyms, includes revisions to correct typographical errors, revisions to the definitions for “Commercial/industrial land use,” “Implementation Procedures,” and

“Person,” changing the term “Sample quantitation limit” to “Sample detection limit,” and adding the acronym “TPDES” (Texas Pollutant Discharge Elimination System).

Section 350.4(a)(6) concerning the definition of anthropogenic background for surface water and sediment is not being adopted as proposed. The change from the proposed rule was effected based upon public comments received.

Adopted §350.4(a)(13), concerning the definition of “Commercial/industrial land use,” clarifies that the hiring of domestic household help at a property does not result in the land use of that property being considered commercial/industrial under the TRRP rule. The definition of the prior TRRP rule indicated that land use activities consistent with commercial/industrial land use include North American Industrial Classification System (NAICS) Code 814, which relates to the use of domestic help in a private household. The adopted change excludes NAICS Code 814.

Adopted §350.4(a)(45), concerning the definition of “Implementation Procedures,” corrects a reference to an agency document. The prior rule defined “Implementation Procedures” when used in the TRRP rule, as referring to the agency document, “Implementation of the Texas Natural Resource Conservation Commission Standards via Permitting.” This document has been renamed. The correct document to use when “Implementation Procedures” is referenced in the prior TRRP rule is now entitled “Procedures to Implement the Texas Surface Water Quality Standards.”

Changes are adopted to §350.4(a)(62), relating to the definition of “Person.” The definition of “Person” contained in the prior version of the TRRP rule excluded “a governmental entity that is not a

responsible party performing a remedial action.” The agency has determined that the prior definition was too broad with regard to governmental entities, in that it unintentionally implied that remediation projects conducted by governmental entities that were not responsible parties were not regulated by the TRRP rule. The definition of the prior rule was intended, in part, to provide relief for the situation where a governmental entity which is performing a remedial action but is not a responsible party, such as governmental entities remediating brownfields properties, or performing State Lead Petroleum Storage Tank (PST) or Superfund remediation, from being required to obtain: a) a restrictive covenant in the situation where the landowner refuses to execute the covenant; or b) the written consent from a landowner prior to filing a deed notice or Voluntary Cleanup Program certificate of completion on that landowner’s property. Given the potential for overbroad application of the definition of “Person” in the prior TRRP rule, the definition is narrowed. The related adopted changes to §350.111(c) specifically address this institutional controls requirement more suitably.

Adopted §350.4(a)(78), concerning the definition of “Sample quantitation limit,” replaces the word “quantitation” with “detection” in order to better fit the definition provided in the rule. Conforming changes are also adopted for §§350.51(d)(1) and (n), 350.54(h)(2), 350.71(k)(1), and 350.79.

Section 350.4(a)(88), concerning the definition of “Surface soil,” is not being adopted as proposed.

The change from the proposed rule was modified based upon unsupportive public comments received and the lack of new information to compel such a change.

Section 350.33(f)(4)(E), Remedy Standard B, is not being adopted as proposed. After further consideration, the amendment was determined to be unnecessary and offers no further clarification of the rule.

Section 350.34(1) and (2), No Further Action, was changed in response to public comment on the rule, which is explained in the RESPONSE TO COMMENTS section of the preamble. The change provides additional cross-references for rule requirements that may trigger the need for an institutional control.

Adopted §350.37(i) and (k), Human Health Points of Exposure, corrects and clarifies the rule. The amendment factors in potential impacts to downgradient reaches of the surface water body, and establishes the point of exposure (POE) for sediment or surface soil in intermittent streams.

Adopted §350.51(d), Affected Property Assessment, corrects and clarifies the rule so that it is fully consistent with the intent behind the rule provision. The goal of the provision is to ensure that the key question of whether groundwater has been affected by a chemical of concern (COC) release is specifically answered. Both the prior rule and the adopted rule require that the vertical extent of the release be investigated to the greater of the method quantitation limit or to the background concentration, or until groundwater is encountered, in which case the groundwater will be sampled. When groundwater has already been investigated, the prior rule softened the vertical assessment required by allowing the vertical assessment to terminate at the <sup>GW</sup>Soil protective concentration level (PCL). That reference to <sup>GW</sup>Soil in §350.51(d)(1) contained in the prior TRRP rule was incorrectly too specific, and should have instead more generally stated “the residential assessment level.”

Also, adopted §350.51(d)(1) is split into additional paragraphs (2) and (3) to enhance readability, and paragraph (2) of the prior TRRP rule is renumbered as paragraph (4). In paragraph (2), an amendment is adopted to clarify that in the context of using §350.75(i)(7)(C) to limit the vertical assessment under §350.51(d), an adequate groundwater assessment must be conducted, unless the executive director

approves the omission or modification of the groundwater assessment on a site-specific determination. Information to be considered in the site-specific determination should include, but not necessarily be limited to, depth to the groundwater-bearing unit, characteristics of the geology that prohibit or impede vertical migration of COCs, and the physical and chemical properties of the COCs. An example of when such a determination may be made is the situation of a release over the Eagle Ford Shale. In this situation, the case may be made that the shale will prohibit migration of COCs to the groundwater-bearing unit below the shale. The lines of evidence that include the depth to that groundwater-bearing unit, the geology and hydrogeology of the site, and the chemical/physical properties of the COCs may, in combination, provide sufficient justification to not require sampling of groundwater to define the vertical extent of COCs. Note that depth to groundwater by itself is not an adequate justification for not sampling groundwater to define the vertical extent of COCs.

Section 350.51(i), concerning connections to a public water supply, is not being adopted as proposed. The change from the proposed rule was based upon unresponsive public comments received.

Adopted §350.51(j), concerning the collection of representative samples of groundwater, revises the text to reflect the fact that samples collected from any environmental medium (not just groundwater) should be collected and handled in a manner which will yield representative concentrations of COCs.

Adopted §350.51(k), concerning collecting representative samples of surface water, revises the text to reflect the fact that samples collected from either surface water or sediment should be collected and handled in a manner in accordance with a different, more appropriate guidance document for surface water/sediment collection, than was indicated in the prior rule. For this change, *Implementation*

*Procedures* is deleted, and *Surface Water Quality Monitoring Procedures, Volume I* is to be used in its place. Here, alternate sampling methodologies are still allowable with approval by the executive director.

Adopted §350.51(m), concerning site-specific background soil concentrations, adds the word “soil” into the rule to clarify that the Texas-specific background concentrations are for soil. Adopted changes to Figure 30 TAC §350.51(m), entitled, “Texas-Specific Background Concentrations,” include amending the title to include the word “soil,” because the table pertains exclusively to soils, not groundwater or other media; and also amending the title to include the units of milligrams per kilogram (mg/kg). In addition, the reference from fluorine is changed to fluoride, since fluoride is the correct form of the element that should be listed in the table. Finally, the table has been corrected to reflect thorium instead of thallium, as it was mistakenly portrayed as thallium in the prior rule, and had been previously corrected in guidance.

A footnote is adopted for additional clarification to the figure in §350.51(m). It references the document which is the source of the table data: *Background Geochemistry of Some Rocks, Soils, Plants, and Vegetables in the Conterminous United States*, by Jon J. Connor, Hansford T. Shacklette, *et al.*, Geological Survey Professional Paper 574-F, U.S. Geological Survey.

Adopted §350.54(d), Data Acquisition and Reporting Requirements, revises the laboratory accreditation requirements to be consistent with 30 TAC Chapter 25, Environmental Testing Laboratory Accreditation and Certification. The new requirements will be implemented on July 1, 2008. The adopted changes clarify the requirements for data generated prior to the implementation of the amended

rule. Also adopted is an amendment to §350.54(e)(4) to clarify that method detection limits are not analyst dependent.

Adopted §350.71(k), General Requirements, simplifies, clarifies, and changes the rule. Adopted paragraph (4) is added and is referenced in subsection (k). Additional text adopted for paragraph (1) adds specific context to clarify the intent of the rule and to facilitate consistent rule application.

Additional text is also adopted for paragraph (2) to clarify the residential assessment level is the analytical performance criteria to screen COCs from PCL development under this paragraph.

Furthermore, the additional text makes paragraph (2) self-contained, eliminating the prior need to also apply paragraph (3) when applying paragraph (2). The adopted amendment to paragraph (3) shortens and simplifies the rule language by deleting subparagraphs (A) and (B)(i) - (vi) from the prior rule.

Under amended paragraph (3), a COC not detected in the environmental medium, but known or reasonably anticipated to be associated with activities conducted at the on-site property, can be dropped from PCL development if all of the sample detection limits for the COC are less than the residential assessment level in the environmental medium. Adopted paragraph (4) clarifies that a COC not known or not reasonably anticipated to be associated with a facility or site activity and not detected in the environmental medium can be dropped from PCL development. If the COC is detected in another environmental medium at the on-site property, the COC is considered potentially associated with the facility or site and cannot be screened under adopted paragraph (4). The residential assessment level is intentionally not included in paragraph (4) to allow the person to use a broad spectrum analytical method without having to evaluate each of the analytes reported for those methods when those analytes are not detected and are not known or not reasonably anticipated to be associated with the on-site property.

Section 350.73, Determination and Use of Human Toxicity Factors and Chemical Properties, was changed in response to public comment on the rule, which is explained in the RESPONSE TO COMMENTS section of the preamble. The changes include revisions to §350.73(a) to add a new source to the list of acceptable sources for obtaining human toxicity factors, and to §350.73(b) and §350.73(a), which allow the executive director to direct persons to use a chronic human toxicity factor from a source other than that selected under the hierarchy in §350.73(a) in cases where the executive director has determined it to be necessary to use a more scientifically valid toxicity factor from a different source. The adopted new source of toxicity factors is United States Environmental Protection Agency (EPA) Provisional Peer Reviewed Toxicity Values (PPRTVs) (i.e., Superfund Health Risk Technical Support Center). This change is adopted to §350.73(a) because two of the sources in the list, the “EPA Health Effects Assessment Summary Table” and the “EPA National Center for Environmental Assessment,” will no longer have updates to toxicity factors, however, it will likely take a number of years for new toxicity factors to be developed to replace some of the values that are in those sources. Changes are adopted to §350.73(a) and §350.73(b) to give the executive director flexibility to approve a toxicity factor from a different tier of the source hierarchy in cases where a toxicity factor from the source selected in accordance with the hierarchy list provided in §350.73(a) is determined by appropriate TCEQ staff to be less scientifically valid than that from a different source tier based on more recent science. A change is adopted to §350.73(b) to redesignate it as §350.73(c) and to allow for the provision provided in adopted §350.73(b). Subsequent paragraphs and figures are renumbered to accommodate adopted subsection (b).

Changes are adopted to Figure: §350.73(f) to reflect current available chemical and physical data for 2-ethoxy ethanol (Table Compound No. 172).

Adopted §350.73(f)(1) removes incorrect references to leachate tests, including the Synthetic Precipitation Leaching Procedure (SPLP), as appropriate tests for determining the soil-water partition coefficient ( $K_d$ ) of inorganic compounds or the organic carbon-water partition coefficient ( $K_{oc}$ ) of ionizing organic compounds. The changes are adopted because leachate tests such as SPLP are not appropriate for determining the partitioning coefficients. The adopted changes continue to allow the use of data from appropriately conducted tests to be used to determine a site-specific  $K_d$  or  $K_{oc}$ .

Changes are adopted to Figure §350.73(f)(1)(C) to add pH-dependent soil-water partition coefficients ( $K_d$ ) for antimony and a revised single value for vanadium.

Figure: 30 TAC §350.74(a), entitled “Risk-Based Exposure Limit Equations and Default Exposure Factors for Residents,” is adopted to correct the reference citation for the relative bioavailability factor (RBAF) from §350.74(j)(1)(D) to §350.74(j)(1)(C). Figure: 30 TAC §350.74(a), entitled “Risk-Based Exposure Limit Equations and Default Exposure Factors for Residents,” and “Risk-Based Exposure Limit Equations and Default Exposure Factors for Commercial/Industrial Worker,” is adopted to renumber the references for RBEL-6: Surface Water RBEL to conform to the renumbering in adopted §350.74(h)(5) – (8).

Adopted §350.74(h), concerning the surface water risk-based exposure limit (<sup>SW</sup>RBEL), includes new language to make persons more aware that they may have to develop multiple RBELs or PCLs depending on the distance downstream from the contaminated site that COCs are expected to be present in the watershed, and that the RBELs and PCLs will vary with the different uses and exposure pathways within the watershed.

Adopted §350.74(h)(2) adds contact recreation as a water body use that the person must consider when applying human health criteria to establish <sup>SW</sup>RBELs. Adding contact recreation as a water body use acknowledges the fact that incidental ingestion of surface water and dermal contact with surface water sometimes occurs, and therefore, may be pathways of exposure to COCs, even when a water body is not a drinking water source.

Adopted §350.74(h)(3) replaces “limits” with “effluent limitations” to be more technically accurate. Also, the reference to 30 TAC Chapter 321, Subchapter H, is adopted to be changed to Texas Pollutant Discharge Elimination System (TPDES) General Permit Number TXG830000, because the existing reference is no longer valid. The adopted language also clarifies that these limitations apply to releases of groundwater or storm water that has been impacted by petroleum fuel.

Adopted §350.74(h)(4) is amended to spell out “United States” rather than use the abbreviation “U.S.” In addition, language that clarifies the meaning of the term “federal guidance criteria” is added.

Adopted §350.74(h)(5) is added to be elevated from the former §350.74(h)(6)(B). Elevation of this subsection emphasizes the fact that the specified analytes (chlorides, sulfates, etc.) should be treated as COCs where applicable at the affected property. In response to public comment on the rule, a change was made to §350.74(h)(5) to use these specific analytes as COCs when appropriate.

Because of the adopted additions previously discussed, §350.74(h)(6) is re-designated as §350.74(h)(7), and §350.74(h)(7) is re-designated as §350.74(h)(8). Also, adopted §350.74(h)(7) clarifies the fact that some parameters (nutrients, total dissolved solids, etc.) are sometimes COCs themselves, and adds an example where the RBEL is modified to address general criteria.

Changes are adopted to the groundwater-to-surface water PCL equation contained in Figure: 30 TAC §350.75(b)(1) to clarify that ecological receptors must be considered when determining PCLs for groundwater discharges to surface water. Prior to this rulemaking, the term in the numerator of the equation (<sup>SW</sup>RBEL) was only related to aquatic life and human health exposure pathways that are addressed by the Texas Surface Water Quality Standards (TSWQS). The adopted new term for the numerator of the equation, the PCL for surface water (<sup>SW</sup>SW), takes ecological receptors into consideration (including aquatic life) and other human pathways not addressed by the TSWQS, as described in later discussions of adopted changes to this section of the TRRP rule.

Changes are adopted to Figure: 30 TAC §350.75(b)(1) to correct the missing temperature term “K” for the units for the Universal Gas Constant in two places in the figure, and to update the amount of time that an individual is assumed to be exposed to a chemical or multiple COC (i.e., the exposure interval). The exposure interval value is used when performing certain calculations used to determine risk-based values. To reflect more recently published EPA information, the exposure interval(s) value is changed

to  $9.5 \times 10^8$  seconds (30 years). Prior to this rulemaking the value was  $1.0 \times 10^9$  (33 years). The change reflected in this adoption has already been addressed and implemented in guidance. Another adopted change to the figure replaces incorrect cross-references to tables that are supposed to contain “Soil organic carbon-water coefficient” values (i.e.,  $K_{oc}$  values) with the correct cross-reference. The adopted cross-references refer to tables containing  $K_d$  values, instead of  $K_{oc}$  values. An additional adopted change to the figure corrects the definition of the term “LDF,” changing it from “Lateral Dilution Factor” to “Leachate Dilution Factor,” to better represent the fact that the dilution factor is used in calculations for predicting the concentrations of a COC contained in groundwater after it leaches through soils containing that COC and dilutes in the groundwater. The adopted rule also changed the equation for calculating “The residential saturation limit where NAPL becomes mobile” to show the term “ $\theta_r$ ” as a multiplier, rather than as an exponent, and to correct the residential saturation value given in the figure, changing it from 0.0167 to the correct value of 0.04514. This too has already been achieved through guidance.

Adopted changes to Figure: §350.75(b)(1) also include revising the “Surface Water Exposure Pathway PCL Equation” section of the table to clarify that the PCL for surface water ( $^{SW}$ SW) is determined by comparing the value of the risk-based exposure limit for surface water for aquatic life and human health concerns ( $^{SW}$ RBEL), to the value of the PCL for surface water for ecological protection ( $^{SW}$ SW<sub>Eco</sub>), and choosing the smaller of the two values. A change is adopted to the same section of the table to add a cross-reference to §350.77(a).

Adopted §350.75(i)(4) clarifies that PCLs for discharges from groundwater to surface water are equal to PCLs for surface water plus adjustments for dilution (when allowed). The previously mentioned adopted change also clarifies that adjustments for dilution apply to ecological exposure pathways, as well as human health exposure pathways, for discharges from groundwater to surface water. Additional adopted changes to §350.75(i)(4) clarify that the PCLs for surface water for ecological protection ( $^{SW}SW_{Eco}$ ) must be considered when developing PCLs for discharges from groundwater to surface water, provide a cross-reference to the appropriate section of the rule for developing those PCLs, add a cross-reference to §350.75(i)(4)(A) for clarity, and remove unnecessary cross-references. In response to public comment, additional adopted changes to §350.75(i)(4)(A) clarify that different dilution factors may be applicable to the surface water RBEL and the  $^{SW}SW_{eco}$ . Section 350.75(i)(4)(A) provides that the final groundwater to surface water PCL would be based on the lowest quotient for a given COC.

The deleted cross-references were unnecessary because they are contained in §350.75(i)(4)(B). A reference to determining whether a water body is fresh water or marine is deleted because it applies to the establishment of PCLs for surface water, rather than the development of PCLs for the discharge of groundwater to surface water.

Changes are adopted to §350.75(i)(4)(A) - (C) as a part of the previously mentioned clarification that adjustments for dilution apply to ecological exposure pathways (including aquatic life), as well as to human health exposure pathways.

Adopted §350.76(c), Approaches for Specific Chemicals of Concern to Determine Human Health

Protective Concentration Levels, provides flexibility to establish residential lead <sup>Tot</sup>Soil<sub>Comb</sub> PCLs. The revision to the rule allows for the use of property specific inputs and models. Adopted subsection (c)(2) establishes that any model is considered a Tier 3 evaluation. Input values and models used in Tier 3 evaluations require the approval of the agency, but variance from certain model default exposure factors such as soil/dust ingestion rates and exposure frequency is not allowed in accordance with adopted §350.76(c)(2). In response to public comment, a request for variance from the soil/dust ingestion rates and exposure frequency is not allowed in accordance with adopted §350.76(c)(2). Subsequent paragraphs and figures are renumbered to accommodate adopted subsection (c)(2).

Adopted §350.76(e) directs the use of the same approach currently being used to demonstrate attainment of the critical PCL for 2,3,7,8-Tetrachlorodibenzodioxin (TCDD) in soil, for attainment of the critical PCL for 2,3,7,8-TCDD in other media (e.g., groundwater, sediment).

Changes are adopted to Figure: §350.76(g)(2), relating to Total Petroleum Hydrocarbons, to revise the surrogate chemicals. The prior rule addressed total petroleum hydrocarbon (TPH) contamination using a surrogate-chemical toxicity/physical property approach for the various aliphatic and aromatic carbon range fractions resulting from analysis by TCEQ Method 1006. The surrogate chemicals used by TCEQ for the various aliphatic and aromatic fractions appear in Figure: §350.76(g)(2). The Massachusetts Department of Environmental Protection (MA DEP) was one of the first regulatory agencies to use the toxicity surrogate-chemical approach for addressing environmental TPH contamination (MA DEP, 1994). In 1997, the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) published *Development of Fraction Specific Reference Doses (RfDs) and Reference Concentrations (RfCs) for Total Petroleum Hydrocarbons* (TPHCWG, 1997). TCEQ review of the

1994 MA DEP and 1997 TPHCWG approaches was useful in developing the current TRRP toxicity surrogate approach for TPH. TPHCWG surrogate chemicals and toxicity factors are currently used by TCEQ for several aliphatic and aromatic fractions. In November 2003, MA DEP published their *Final Updated Petroleum Hydrocarbon Fraction Toxicity Values for the VPH/EPH/APH Methodology*. TCEQ reviewed the 2003 MA DEP document and determined that several revisions to the surrogate chemicals found in Figure: §350.76(g)(2) are justified based on new scientific information and/or analyses conducted since the TPHCWG surrogate toxicity factors were published in 1997. Additionally, the footnote to this figure is revised to correct the term to reflect “less than or equal to.”

Section 350.77, Ecological Risk Assessment and Development of Ecological Protective Concentration Levels, is amended. An ecological risk assessment is conducted to determine the potential impacts posed to ecological receptors (i.e., aquatic life and wildlife) by COCs. The process is a tiered approach, with increasingly complex criteria being evaluated as the process progresses from Tier 1 (using an exclusion criteria checklist to determine if significant exposure to COCs is likely), to Tier 2 (comparing concentrations of COCs at an affected property to literature-based PCLs), to Tier 3 (using site-specific measurements of exposure and the effects of exposure to COCs).

Adopted §350.77(a) acknowledges existing agency guidance that was planned, but not in existence at the time the prior TRRP rule was created. The specific guidance document is the agency’s *Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas* (RG-263), as amended. The procedures contained in the guidance document have been in use since 2001. Referencing the document in the rule serves to make the person aware of the existence of the guidance document earlier in the ecological risk assessment process.

Adopted §350.77(a) also provides the ability to end an ecological risk assessment evaluation even if the Tier 1 evaluation failed, provided the person can demonstrate that a response action (e.g., a cap that prevents exposure to impacted soils) will eliminate the potential for wildlife to be exposed to COCs, or if it can be demonstrated that concentrations of COCs that are protective for humans are also protective of ecological receptors. The prior version of the TRRP rule indicated that a person could end the ecological risk assessment evaluation, based on the previously described factors, only if the response action is completed to address exposure to COCs by humans. The adopted changes broaden the type of response actions that may be considered as justification for ending the ecological risk evaluation to include response actions completed for any reason, so long as the potential for ecological receptors to be exposed to a COC is eliminated or rendered insignificant. The agency has determined that the adopted changes will reduce costs and effort with regard to ecological risk evaluations, without significantly impacting the protection of human health and the environment.

In addition, adopted §350.77(a) acknowledges the possibility of ending an ecological risk assessment evaluation following a Tier 1 evaluation that is failed due to surface water and/or sediment exposure pathway issues, using the expedited stream evaluation process. The expedited stream evaluation process has been implemented via the previously mentioned *Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas* (RG-263), as amended. The expedited stream evaluation process allows a person to exit the ecological risk assessment process if the evaluation establishes that the completed surface water and sediment exposure pathways are insignificant. Acknowledging the existence of the expedited stream evaluation process in the rule serves to make the person aware of the existence of the guidance document earlier in the ecological risk assessment process.

Adopted §350.77(b) includes a revision to correct a typographical error and a clarification that a person is required to continue on to Tier 2 or Tier 3 of the ecological risk assessment process unless a reasoned justification, as described in §350.77(a), and/or an expedited stream evaluation demonstrates that the ecological risk involved is acceptable. The adopted changes also inform the person that the reasoned justification approach and the expedited stream evaluation process are described in the agency's guidance. That guidance document is the *Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas* (RG-263), as amended.

Adopted §350.77(c) is amended to provide a reference to the agency's ecological risk assessment guidance. The adopted revision informs the person of the location of guidance concerning the elimination of a COC that does not pose an ecological risk and the development of PCLs for a COC that does pose an unacceptable risk to selected ecological receptors.

Adopted §350.77(c) also clarifies the current procedure for conducting a Tier 2 screening-level ecological risk assessment. The adopted clarifications are intended to enable the person to avoid a recurring issue that has been observed by agency staff reviewing Tier 2 screening-level ecological risk assessments. The adopted changes do not modify the current procedures for conducting Tier 2 screening-level ecological risk assessments.

Adopted new §350.90, Spatial and Electronic Information, was changed in response to public comment on the rule, which is explained in the RESPONSE TO COMMENTS section of the preamble. The rule requires a person to provide accurate spatial coordinates for any site data (e.g., sampling locations), as

required by the agency, in a format to be specified by the agency. The change made to §350.90(b) adds the stipulation that reports required under this subchapter may be requested in an electronic format.

These provisions are adopted to facilitate agency management of the data and evaluation and use of the data. Also adopted are conforming rule changes that delete §§350.91(c), 350.92(b), 350.93(b), 350.94(m), 350.95(f), and 350.96(b). Further conforming rule changes are adopted to §§350.92, 350.93, and 350.96, striking the “(a)” to make subsection (a) in each case implied.

Adopted §350.91(b)(7), Affected Property Assessment Report, adds language to indicate that if an expedited stream evaluation is conducted, it should be included in the Affected Property Assessment Report (APAR).

Additional language is added in §350.91(b)(15) to indicate that the person is to provide spatial data coordinates, as requested by the agency, for the affected property and any sampling or testing locations, in a format that is approved or required by the agency. Prior §350.91(b)(15) is renumbered as §350.91(b)(16).

Adopted §350.95(b), Response Action Completion Report, was changed in response to public comment on the rule. The change adds additional cross-references to institutional control rule requirements in the rule to clarify that institutional controls may be required for reasons other than commercial/industrial land use. The adopted language also includes the term “when applicable.”

Adopted §350.96(a), Post-Response Action Care Reports, replaces the word “reports” with “report.”

Adopted §350.111(c), Use of Institutional Controls, reflects a clarification and resulting change in language that acknowledges that the subject at issue is more appropriately addressed in this section rather than in the definition of “Person” contained in §350.4(a)(62) of the prior version of the TRRP rule. Therefore, the definition of “Person” is changed in the adopted rule, and the institutional control practice for non-responsible party governmental entities as it existed in the prior version of the rule is preserved by incorporating the necessary language into this section of the adopted rule. This adopted change is consistent with both current agency practice and the prior version of the TRRP rule. The adopted change reflects the intent that a governmental entity that is not a responsible party is excluded from the requirement of having to obtain written consent from the landowner prior to filing a deed notice or Voluntary Cleanup Program certificate of completion in the real property records. The language is also amended so that if subsection (b)(4) relating to change in circumstance, subsection (d) relating to technical impracticability, or subsection (f) relating to missing landowner, of this section apply, persons also are not required to obtain written landowner consent.

Adopted §350.111(c)(4) also incorporates the language and concept that was removed from the definition of “Person” in adopted §350.4(a)(62). This change is consistent with both current practice and the prior version of the TRRP rule which provides a governmental entity who is performing remediation activities under this title, but who is not a responsible party, the ability to impose a deed notice on property if the landowner refuses consent to file a restrictive covenant on the property in accordance with Remedy Standard B requirements. This rule provision is needed to extend the beneficial use of finite state and federal remediation funds so that more sites can be addressed, rather than expending excessive funds to complete an unwarranted removal/decontamination remedy, when a

control-based remedy that is fully protective of human health and the environment is the lowest cost remedial alternative. Conforming rule changes are adopted to §350.111(c)(2) and (3) to move the “or” at the end of paragraph (2) to the end of paragraph (3).

Adopted §350.111(e) replaces the incorrect cross-reference of §350.33(f)(3)(E) with §350.111(f)(3)(F).

Adopted §350.134(b), Qualifying Criteria (for establishing a facility operations area), references 30 TAC Chapter 60, Compliance History, which was adopted post-Chapter 350. Chapter 60 rules establish additional criteria for evaluating the compliance history of a facility.

#### FINAL REGULATORY IMPACT ANALYSIS DETERMINATION

The commission reviewed the adopted rulemaking in light of the regulatory analysis requirements of Texas Government Code, §2001.0225, and determined that the rulemaking is not subject to §2001.0225 because it does not meet the definition of a "major environmental rule" as defined in that statute. A "major environmental rule" means a rule, the specific intent of which, is to protect the environment or reduce risks to human health from 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 commission has determined that the adopted rulemaking does not fall under the definition of a “major environmental rule” because the adopted amendments and new rule are primarily designed to clarify the existing regulatory requirements and adjust methods and measures to ensure a consistent application of soil and water analysis and remediation standards. In furtherance of this effort at promoting consistency, certain policies and practices concerning sampling, remediating, and reporting are altered in a manner which ensures

flexibility in the remediation process while maintaining appropriate protection of human health and the environment. The adopted amendments and new rule do not rise to the level of material, but rather are limited to incorporating modifications to the current regulatory framework based upon the implementation of the rules to date.

Furthermore, the adopted rulemaking does not meet any of the four applicability requirements listed in Texas Government Code, §2001.0225(a). Texas Government Code, §2001.0225(a), only applies to a major environmental rule, the result of which is to: 1) exceed a standard set by federal law, unless the rule is specifically required by state law; 2) exceed an express requirement of state law, unless the rule is specifically required by federal law; 3) 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 4) adopt a rule solely under the general powers of the agency instead of under a specific state law. This rulemaking does not meet any of these four applicability requirements because this rulemaking: 1) does not exceed any standard set by federal law; 2) does not exceed the requirements of state law; 3) does not exceed a requirement of a delegation agreement or contract between the state and an agency or representative of the federal government to implement any state and federal program; and 4) is not adopted solely under the general powers of the agency, but rather under specific authorizing statutes as referenced in the STATUTORY AUTHORITY sections of this preamble.

#### TAKINGS IMPACT ASSESSMENT

The commission evaluated the adopted rules and performed an assessment of whether these adopted rules constitute a takings under Texas Government Code, Chapter 2007. The specific purpose of the rules is to clarify the existing regulatory requirements and adjust methods and measures to ensure a

consistent application of soil and water analysis and remediation standards. Among other technical changes, the adopted rule contains a clarification of language regarding the filing of institutional controls by non-responsible party governmental entities performing remedial actions. The adopted change reflects the practice of the prior version of the TRRP rule but inserts the clarifying language in §350.111 as opposed to the prior means of excluding the qualifying governmental entities from the defined subset of persons to whom TRRP is applicable in §350.4(a)(62). Inserting the language in §350.111, rather than §350.4(a)(62), is adopted to achieve the same result of the prior TRRP rule regarding institutional controls while avoiding the overbroad and unintended interpretation that governmental entities are excluded from all other requirements of TRRP.

Promulgation and enforcement of the adopted amendments and new rule constitute neither a statutory nor a constitutional taking of private real property. Specifically, the adopted regulations do not affect a landowner's rights in real property because the clarification in the 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 exist in the absence of the adopted clarification of the regulations. In other words, there are no burdens imposed on private real property under this rulemaking because the adopted amendments and new rule do not materially change the substance of the rule but rather clarify the institutional control process as it relates to non-responsible party governmental entities conducting remedial actions. Therefore, the adopted rules do not have any impact on the use or enjoyment of private real property, and there will be no reduction in value of property as a result of this rulemaking.

**CONSISTENCY WITH THE COASTAL MANAGEMENT PROGRAM**

The commission reviewed the adopted rulemaking and found that it is identified in the Coastal Coordination Act Implementation Rules, 31 TAC §505.11(b)(2) relating to rules subject to the Coastal Management Program, and will, therefore, require that goals and policies of the Texas Coastal Management Program (CMP) be considered during the rulemaking process.

The commission reviewed this rulemaking for consistency with the CMP goals and in accordance with the regulations of the Coastal Coordination Council and determined that the rulemaking is procedural in nature and will have no substantive effect on commission actions subject to the CMP and is, therefore, consistent with CMP goals and policies.

#### PUBLIC COMMENT

The commission received comments from Brown and Caldwell (B&C), Groundwater Services, Inc. (GSI), Lowerre & Frederick, submitting on behalf of Lowerre & Frederick, Clean Water Action, Environmental Defense, Public Citizen, Sustainable Energy and Economic Development Coalition, and Texas Campaign for the Environment (Lowerre & Frederick), Texas Chemical Council (TCC), the Office of Public Interest Counsel of the Texas Commission on Environmental Quality (OPIC), URS Corporation (URS), and an individual. The public comment period closed at 5:00 p.m. on October 9, 2006.

#### RESPONSE TO COMMENTS

##### *§350.2(g), Applicability*

The TCEQ received comments concerning this section from TCC, Lowerre & Frederick, and OPIC. TCC supported the proposed language. Lowerre & Frederick and OPIC both expressed concern that the commission did not provide reasoned justification for the proposed changes. OPIC stated that a

justification as to how the variance would benefit human health and the environment was not provided. Lowerre & Frederick and OPIC expressed a concern that the proposed rule language is contrary to the original intent and purpose of applying Chapter 350 to PST sites.

**The commission acknowledges the comments submitted by TCC.**

**In response to Lowerre & Frederick's and OPIC's comments, the commission stresses that the proposed rule change would continue to be protective of human health and the environment insofar as standards under Chapter 334 are designed to ensure such protectiveness. As explained in the March 26, 1999, preamble to the TRRP rules adopted at that time, the agency shifted from Chapter 334 to Chapter 350 for LPST sites with the intention of making the regulatory strategies and requirements consistent for the benefit of both the regulated community and the agency (see the March 26, 1999, issue of the *Texas Register* (24 TexReg 2210 - 2211)). The adopted variance provides remediation flexibility to the landowner under appropriate and qualified circumstances, while maintaining protection of human health and the environment.**

**In the 1999 preamble to the TRRP rule, the commission originally expressed that it was seeking consistency with other programs which deal with the same types of chemicals of concern.**

**However, in light of the experience gained since TRRP became applicable to LPST sites, the commission has re-evaluated its position for the limited circumstances described in the adopted rule. The commission notes that many of the LPST releases being reported are discovered through real estate transactions conducted at properties where a tank system has been removed, in some cases prior to implementation of Chapter 334. Other LPST sites exist in close proximity**

**to sites which had tank systems removed and either have already been closed or are still conducting corrective action under Chapter 334. These LPST sites potentially have similar types of releases, subsurface and receptor conditions, and, in many cases, the hydrocarbon plumes from the sites are commingled, yet would be required to conduct activities under two different rules. In order to avoid such inconsistency, a qualified person may choose to apply for the variance, as described in the adopted rule, which may result in a more timely remediation effort and related potential benefits to human health and the environment.**

**The variance will be applicable only to sites where a release occurred prior to the application of Chapter 350 to LPST releases. New releases from all operational facilities will be regulated under Chapter 350.**

Lowerre & Frederick also requested clarification regarding whether the variance will be applicable for LPST sites that are being remediated under the Voluntary Cleanup Program.

**Under prior TRRP rules, LPST sites that are in the Voluntary Cleanup Program may comply with either the TRRP rule or with Chapter 334, depending on whether or not the release was reported prior to September 1, 2003 (March 26, 1999, issue of the *Texas Register* (24 TexReg 2210 - 2211)). Under the adopted rules, the owner/operator of a site with historic contamination (release occurring prior to September 1, 2003) may apply for a variance.**

OPIC noted that language in the preamble makes reference to “neighboring” sites, and the rule stated sites in “proximity.” OPIC suggested the term adjacent be used, or that proximity be defined.

**The commission agrees with OPIC's comments, and is specifying in the rule that a variance may be granted for a property within 0.25 miles of another LPST site which is regulated under Chapter 334. Within this distance, it is reasonable to expect comparable subsurface conditions as they relate to potential receptors. This distance is also appropriate in consistently remediating commingled plumes. Most of these mature releases have stable plumes typically limited in extent (most not exceeding 1,200 feet) as indicated in the 1997 Texas Bureau of Economic Geology study "Extent, Mass and Duration of Hydrocarbon Plume from Leaking Storage Tanks Sites in Texas" (GC97-1).**

OPIC commented that the detection date should not determine which facilities fall under TRRP versus under Chapter 334. Additionally, OPIC stated that the later detection of a release may increase risk and adverse effects to the environment and human health.

**The commission will consider granting a variance only to LPST sites where the facility ceased to operate, and the underground storage tank/aboveground storage tank system has been permanently removed. This would restrict the use of Chapter 334 to legacy/historical contamination situations. All releases occurring after September 1, 2003, would be regulated in accordance with Chapter 350.**

**The variance is only applicable to sites with comparable conditions (e.g., release, site, and receptor conditions). The variance will not be granted for situations where the person cannot demonstrate that additional regulatory requirements would be necessary if activities were**

**conducted in accordance with Chapter 350. In instances where there is a high risk to human health and the environment, the variance may not be considered, since the regulatory requirements under both rules would be comparable.**

OPIC commented that if the variance is adopted, the rule language should be revised to enhance readability and understanding. OPIC recommended the reordering of the rule language and suggested changes to clarify the requirements, and applicability of the variance.

**The commission thanks OPIC for their comments and has incorporated the suggestions in the adopted rule.**

*§350.4(a)(6), Definitions*

Regarding the proposal in §350.4(a)(6) to include diffuse non-point source pollution in surface water and sediment as an example of an anthropogenic source, Lowerre & Frederick objected for a number of reasons. They argue that non-point source pollution in these media may not be evident to the person sampling the media, and that many upstream point sources may be causing contamination that the person is tempted to attribute to anthropogenic background. Lowerre & Frederick argue that unless a non-point source is evident, that persons should not use the anthropogenic background argument.

Lowerre & Frederick further stated that if the agency's intent is to reduce the extent of investigation and remediation of surface water and sediment, it should do so using its broad prosecutorial discretion.

In an example using nitrates, Lowerre & Frederick argue that where an entire water body is impacted by nitrates, the anthropogenic background designation would remove the water body in part or in whole from meeting the surface water RBEL.

**Concerning the definition of “Background,” the proposed language would have added diffuse non-point source pollution in surface water and sediment as an example of anthropogenic background. The commission proposed the addition to make it clear that the agency would consider non-point source pollution as a possible anthropogenic background argument for surface water and sediment. The commission agrees with Lowerre & Frederick that it would have been difficult for persons to demonstrate that COCs in surface water and sediment are attributable to non-point source pollution, rather than the TRRP affected property in question, or multiple upstream point sources. As is, the existing rule language does not preclude consideration of an anthropogenic background proposal for surface water and sediment, including anthropogenic background attributable to non-point source pollution. For this reason, combined with the need to discuss this topic more in guidance, the commission has deleted the proposed change to §350.4(a)(6).**

*§350.4(a)(62), Definitions*

Concerning §350.4(a)(62), Lowerre & Frederick commented that the change of the definition of “Person” to make governmental entities that are not responsible parties subject to TRRP is not necessary since the entities’ exclusion from the prior definition was by design and not confusing. Lowerre & Frederick further commented that there is no reasoned justification for the change. Lowerre & Frederick’s comment recognized the need to provide relief for non-responsible party governmental entities from certain institutional control requirements; however, this comment argued that the prior rule addressed the situation with more wisdom by omitting governmental entities who are not responsible parties from the entirety of the rule.

As stated in the preamble to the proposed rule, the TCEQ agrees that non-responsible party governmental entities performing cleanups were intentionally excluded from the definition of “Person” contained in the prior rule. The prior definition of the rule was intended, in part, to provide relief for a governmental entity that was performing a remedial action but was not a responsible party, from being required to obtain: a) a restrictive covenant in the situation where the landowner refuses to execute the covenant; or b) the written consent from a landowner prior to filing a deed notice or Voluntary Cleanup Program certificate of completion on that landowner’s property. TCEQ’s basis for this definition change is not founded upon the premise that the prior definition was merely confusing. Rather, the change is adopted because of the unintended, broad interpretation of the prior definition which seemed to invite the argument that non-responsible party governmental entities conducting cleanups on National Priorities List sites were exempt from following the substantive requirements (such as certain Protective Concentration Levels) of TRRP as provided by 40 Code of Federal Regulations Part 300. The TCEQ consistently opposes such arguments when they are proffered; yet the resultant delay and additional burden on resources necessary to repeatedly oppose the argument provide a reasoned justification for the rule change. As stated in the preamble to the proposed rule changes, the rule changes are based on the need to correct and clarify provisions to promote consistency. This definition change is necessary to insure the consistent application of TRRP to the remediation of sites conducted by governmental entities which are not responsible parties. Therefore, the rule is adopted as proposed and corresponding amendments are made in §350.111(c) to address the institutional control requirements for non-responsible party governmental entities conducting cleanups.

*§350.4(a)(88), Definitions*

The commission received a number of comments expressing divergent points of view regarding the proposed revision to the definition of “Residential surface soil” contained in §350.4(a)(88). Under the proposed revision, “Residential surface soil” would have been redefined from 0-15 feet below ground surface (bgs) to 0-5 feet bgs, or to the top of the uppermost groundwater-bearing unit or bedrock, whichever is less in depth. Lowerre & Frederick opposed the proposed revision and commented that the TCEQ has a long history of recognizing exposure to soils in the 0-15 feet bgs interval (from the excavation of soil for swimming pool installation, for example) as a reasonably anticipated to be complete exposure pathway for residential scenarios and that the rationale TCEQ used in the 1999 TRRP preamble to reject comments lobbying for a more shallow surface soil interval and to support the 0-15 feet bgs residential surface soil interval remains sound. Lowerre & Frederick also expressed concern that there are no institutional control requirements for residential property under Remedy Standard A to notify innocent landowners and construction workers that bring soils from depths greater than 5 feet bgs to the surface that the soil may contain concentrations which are not health-protective. OPIC asked why the definition of surface soil is more appropriately adjusted to a depth of 5 feet bgs than to 15 feet bgs for both residential and commercial/industrial properties if the proposed change is only for the sake of consistency and simplicity of the application of TRRP. TCC, URS, and GSI agreed with the proposed revision to simplify the application of TRRP and preparation of affected property assessment reports.

**Historically, TCEQ has considered exposure to soils in the 0-15 feet bgs interval from excavation for residential construction (e.g., swimming pools, septic systems) as a reasonably anticipated to**

**be complete exposure pathway for residential scenarios. Although the commission believes a residential surface soil definition of 0-5 feet bgs would reduce the complexity of applying the TRRP rule and be sufficiently health-protective in the majority of cases, there is a lack of new information (e.g., federal guidance, published studies) since 1999 which would compel such a change. Additionally, residential pools are common in Texas and the possibility of excavated soils from 5-15 feet bgs being deposited at the surface with subsequent frequent exposure cannot be ruled out. If this were to occur, there would be no notice to residents of contaminants in subsurface soil, as institutional controls are not required for many Remedy Standard A response actions at residential properties. Therefore, as a reasonable precaution, the commission is not adopting the revision as proposed and is retaining the prior rule definition of residential surface soil.**

*§350.33(f)(4)(E), Remedy Standard B*

Concerning §350.33(f)(4)(E), two commenters supported the proposed change. The TCC commended the TCEQ for developing a risk-based approach to non-aqueous phase liquids (NAPL) management which is protective of human health and the environment while providing common sense and flexible application of NAPL response actions. The TCC supported the proposed change because risk-based NAPL response actions provide a valuable tool needed for TRRP implementation. URS noted this change to be consistent with the current state of science relative to NAPL and believes that it will provide reasonable flexibility during a remedy implementation while remaining protective of human health and the environment.

**The commission acknowledges the comments from TCC and URS, but is not adopting the**

**proposed changes in response to other comments in order to restore the provisions to reflect the commission's original intent as described in the adoption preamble to the prior rule.**

Concerning §350.33(f)(4)(E), Lowerre & Frederick noted a disparity between the executive summary and the actual proposed rule change. The executive summary implied that NAPL will continue to be removed to the extent practicable, while the actual proposed rule language struck this, or at least the removal of readily recoverable NAPL, as a requirement. Lowerre & Frederick opposed the actual rule proposal which will allow NAPL to remain in place if it does not pose any adverse health risk. In their opinion, NAPL recovery should be addressed under a pollution cleanup approach, not a risk-based approach.

**The commission agrees with the commenter regarding the apparent disparity between the executive summary comments and preamble compared to the actual proposed rule. The commission's original preference as described in the adoption preamble to the prior rule (see the September 17, 1999, issue of the *Texas Register* (24 TexReg 7546)), that identified NAPL be removed or treated, did not carry over clearly into the proposed rule. The commission's objective in the prior rule was to strike a balance between the starting presumption that readily recoverable NAPL within a Plume Management Zone be removed to the extent practicable and the recognition that controls may be appropriate in some situations. Therefore, the commission has decided to not make this proposed amendment and to instead maintain the 1999 rule. In contrast, the proposed language in clause (i) appears to be overly broad and could result in situations where no readily recoverable NAPL is removed if the person were to demonstrate that the NAPL remaining in place is protective of human health and the environment. Additionally, the commission has determined that this proposal is not supportable based upon the following reasons: 1) As**

proposed, clause (i) is redundant to the general requirements for Remedy Standard B as stated in §350.33(a) for protection of human health and the environment; 2) Clause (i) does not provide the person with any clearer direction for compliance compared to the original performance standard of recovering readily recoverable NAPL; 3) The performance requirement in the prior rule was promulgated to be compatible with a major policy of the EPA that regards NAPL as “principal threat waste” which should at a minimum be removed or treated. The proposed text appears to depart from the EPA policy. The commission chooses not to establish exceptions within this provision requiring a different response to NAPL for sites regulated under delegated federal programs such as the Resource and Conservation Recovery Act; and 4) Clause (i) could also conflict with clause (iv) of this subparagraph in certain situations. For instance, a person attempts to show that a NAPL release meets clause (i) by means of a PMZ with natural containment of the stable NAPL zone. However, monitoring over time shows that the extent of NAPL begins to expand under natural conditions or offsite influences. So long as the NAPL zone stays within the PMZ, the person is compliant with clause (i) because of its broad wording, yet compliance with clause (iv) could only be achieved with sufficient NAPL recovery such that an active recovery system can be demonstrated to effectively control or contain NAPL migration.

With regard to the comment that NAPL should be addressed under a pollution cleanup approach, not a risk-based approach, the commission points out that the person can address NAPL within a PMZ with any combination of removal, decontamination and control options available under Remedy Standard B. In keeping with the original intent of this provision, the commission is restoring the consideration for recovering readily recoverable NAPL which is initially a pollution cleanup approach. The commission is developing technical guidance in support of this provision

**which will clarify the conditions requiring recovery of readily recoverable NAPL. The guidance will be titled *Risk-Based NAPL Management (RG-366/TRRP-32)*. Therefore, the commission is not adopting the revisions as proposed.**

Lowerre & Frederick commented that if NAPL is not removed, groundwater resources will be compromised for many generations beyond what would be the case if NAPL removal had occurred. Lowerre & Frederick stressed the importance of preserving these valuable resources for future Texans, even if the approach is simply natural attenuation.

**The commission agrees and points out that the prior rule and adopted revisions retain the overall intent to protect human health and the environment, including groundwater resources. With particular regard to NAPL within a PMZ, the commission advocated in the original TRRP rule's adoption preamble as published in the September 17, 1999, issue of the *Texas Register* (see 24 TexReg 7546) that remediation be completed in a timely manner: *Specifically with regard to monitored natural attenuation, the remedial life span of the matter will be longer with NAPLs in place which serve as a continuing source of dissolved-phase COCs. However, as with any remedy, source area abatement is generally paramount to shortening remedial time frames. The acceptability of the remedial time frame will be made in the context of overall site risks on a site-specific basis. This commenter also questions whether using a monitored natural attenuation remedy, NAPL could remain in place, even though the monitoring period could be quite long. The commission notes that all response actions, including monitored natural attenuation, must be capable of achieving the Remedy Standard B response objectives 'within a reasonable time frame'. 'Quite long' using a monitored natural attenuation approach does not appear 'reasonable' if there are any other more***

*prompt and workable response approaches. The commission advocates that remediations be completed in a timely manner and included the institutional control provisions of §350.31(h) to reinforce this point. Nevertheless, the commission also recognizes the fact that corrective action resources are finite and limited, and remedial time frames can be adjusted in a protective manner to provide an effective balance of progress and cost. So there is no elimination of the use of monitored natural attenuation solely for the presence of NAPLs. Thus, without achieving removal of readily recoverable NAPL, a person is more likely to remain in a state of perpetual post-response action care.*

Lowerre & Frederick noted several concerns about leaving NAPL in place. Lowerre & Frederick stated that without an evaluation of the vapor intrusion exposure pathway, the TCEQ cannot ensure that high levels of toxins are not entering the homes and businesses of the people they are supposed to protect. The commenter stated that the vapor intrusion potential with NAPL present far exceeds the potential where no NAPL is present, and more generations of Texans may be adversely affected by leaving the NAPL in place.

**The commission shares the commenter's concern regarding the need to protect people from exposure to vapors from NAPL, particularly if left in place, but disagrees with the commenter regarding the evaluation of the vapor intrusion pathway. The TRRP rule addresses the vapor intrusion pathway with several approaches. First, as part of the general requirements for remedy standards, §350.31(a) and §350.33(a)(1) require the person to make the affected property protective and prohibit the exposure of humans to concentrations of COCs in exposure media, in this case the air, in excess of the critical human health PCL. Second, §350.31(c) requires the**

person to address and respond to buildup of explosive atmospheres in surface and subsurface structures and areas of routine construction. When volatile NAPLs and high concentrations of volatile COCs are in close proximity to basements, for example, the person can be required to conduct monitoring and take appropriate actions. While this provision is intended to address explosive hazards, it also follows that vapors, though not at explosive concentrations, could be a human health concern from long-term inhalation. Thus, the air inhalation pathway can be considered complete or reasonably anticipated to be complete and the person would have to respond to §350.71(c)(3) to develop PCLs protective for inhalation of volatile emissions in outdoor air above a PMZ. The person can attempt to show that the pathway is not complete by either demonstrating with vapor monitoring data or other appropriate method that emissions from groundwater are protective, or demonstrate that an existing structure (e.g., concrete slab) effectively blocks the pathway. Third, specifically focused on NAPLs in a PMZ is §350.33(f)(4)(E)(v) which requires that NAPLs not result in critical PCLs for other environmental media, in this case air, being exceeded at the applicable point of exposure. Lastly, the agency notes that if removal of readily recoverable NAPLs would not result in concentrations of COCs protective for air inhalation, then supplemental NAPL control measures which address suitable future use conditions or construction measures could be used so as to attain protective air exposure conditions. To address the concerns about vapor intrusion from NAPL adversely affecting more generations of Texans, the commission refers to its response to the preceding comment regarding NAPL removal and reasonable time frames for achieving response objectives.

Lowerre & Frederick commented that NAPLs present in the PMZ may spread beyond the PMZ without

causing the COCs in dissolved-phase groundwater to exceed PCLs, while still impacting groundwater quality beyond the PMZ in terms of aesthetic properties (odor, taste, color, etc, such as “old” diesel type aspects). Lowerre & Frederick stated that this may happen because the monitoring requirements at the point of exposure downgradient of the PMZ do not screen for aesthetic properties; they only screen for human health and environment protective concentration levels.

**The commission points out that this concern is addressed in the TRRP rule by a number of provisions. First, NAPL expansion within an existing PMZ would trigger §350.33(f)(4)(E)(iv), which requires the person to operate an active recovery system to effectively control or contain NAPL migration. To illustrate another example of the way the rule addresses the concern is to presume the person is developing a PMZ to address a NAPL zone. As part of the affected property assessment required by §350.51, the person must conduct a field survey to locate water wells at least 500 feet beyond the boundary of the affected property and conduct a records survey to identify all water wells within 0.5 miles of the limits of the groundwater affected property. This information has bearing on the establishment of a PMZ as reflected in §350.33(f)(4)(A)(i) which considers, among other items, the proximity and withdrawal rates of groundwater users, the current and future uses of groundwater in the area, and the persistence and permanence of the potentially adverse effects. If the commission determines that aesthetics are a concern in light of these findings, the person can be required to develop numeric criteria in accordance with §350.74(f), regarding the groundwater ingestion risk-based exposure limit, and §350.74(i), regarding aesthetics. The person would then use these numeric criteria for groundwater monitoring purposes at the alternate point of exposure established at the downgradient limit of the PMZ.**

*§350.34, No Further Action*

Lowerre & Frederick commented that the TCEQ should clarify that Remedy Standard A closures are limited to institutional controls on land use and modify §350.32(b)(1) to state that, along with physical controls, other institutional controls are prohibited under Remedy Standard A.

**The commission disagrees that clarification is needed that Remedy Standard A closures are limited to institutional controls on land use and that modification is needed to §350.32(b)(1) to state that other institutional controls are prohibited under Remedy Standard A. The commission believes that the prior rule is sufficiently clear as to the allowable institutional controls under Remedy Standard A. This has not proven to be an issue of confusion or concern, since the prior rule was implemented in 1999. As previously noted, the adopted revisions to §350.34 do not add or remove any institutional control requirements for either Remedy Standard A or B.**

Concerning §350.34(1), Lowerre & Frederick opposed the proposed changes. Lowerre & Frederick commented that the proposed change would imply that institutional controls other than land use can be utilized under Remedy Standard A. Lowerre & Frederick commented that the prior rule does not seem to specifically authorize any institutional controls to be utilized in a Remedy Standard A closure other than land use.

**The commission disagrees that the proposed revisions to §350.34(1) would allow any additional institutional controls to be applied to any property that did not exist in the prior rule, regardless of the Remedy Standard or land use of that property. The revisions are intended to clarify the**

**rule by adding references to provisions under which an institutional control may be required under Remedy Standard A.**

Lowerre & Frederick also commented that the proposed revisions to §350.34(1) do not conform to the idea of complete risk reduction under Remedy A, due to the reference in §350.51(1)(3) to the use of statistical methods to determine representative concentrations of COCs.

**The commission notes that the use of statistical approaches to determine representative concentrations of COCs at a property is allowed under the prior rule for Remedy Standard A, subject to agency approval. The proposed revisions to §350.34 do not alter risk reduction of the prior rule under either Remedy Standard A or B.**

Lowerre & Frederick commented that the agency has not provided a reasoned justification for the proposed revisions to §350.34(1).

**The commission considers the adopted revisions to §350.34(1) to be reasonably justified because the only change made is to add references to the prior rule provisions. This modification does not change the requirements of the prior rule; however, due to the apparent misunderstanding as to the intent of the proposed changes, the adopted §350.34(1) and (2) contain additional clarification regarding the institutional controls in question. The additional clarification spells out the basis, as set forth in the prior rule, for the need for the newly-referenced institutional controls (e.g., that an institutional control is required for the use of a non-default exposure area, the use of occupational inhalation criteria as RBELs, or the use of non-default RBEL exposure factors).**

Concerning §350.34(1) and (2) TCC commented that the proposed rule language contained a typographical error which should have read “§350.51(1)(3) or (4)” rather than “§350.51(1), (3) or (4).”

**The TCEQ agrees with this comment and has made the change to the adopted rule.**

*§350.37(i) Human Health Points of Exposure*

Regarding POEs for surface water runoff or groundwater discharges to surface water, URS commented that the proposed change to §350.37(i) to include the entire extent of any on-site or off-site surface water body meeting the criteria may be burdensome as it is unclear how far downstream potential impacts must be identified. Additionally, TCC recommended deletion of the word, “any” in the last sentence. TCC stated that this is a significant overstatement with implications regarding extent and commingling that would best be addressed in guidance.

**The commission disagrees with the suggestion that this language is burdensome because the rule has not defined the distance to which downstream impacts must be identified. Where there are releases to surface water, the objective of this language is to ensure that persons will be mindful that water bodies down gradient of the initial point of entry may need to be evaluated depending on the nature of the release, fate and transport characteristics of the COCs in question, and the nature of the watershed. Based on this information, persons should make a determination as to the distance downstream to evaluate a release, subject to agency concurrence. In response to the TCC suggestion that the word “any” be removed from the last sentence, the sentence has been modified to state, “this includes the surface water body at the initial point of entry and other**

**water bodies that may be impacted by COCs associated with the release in question.”**

*§350.37(k), Human Health Points of Exposure*

Regarding POEs for intermittent water bodies (§350.37(k)), TCC combined concerns with those offered in response to the proposed change to §350.37(i).

**The TCC recommendation is not specific to the language added in §350.37(k) related to the application of both sediment and surface soil POEs to intermittent water bodies. The intent of the proposed language is to make persons aware that it may be appropriate to evaluate intermittent streams as soil and sediment depending on the possible human health and ecological exposure pathways at a particular affected property. The language is not intended to direct persons to do this in every case. The commission agrees that the discussion of affected property characteristics that would necessitate consideration of either exposure medium (soil or sediment), would be best addressed in guidance. The commission has made no changes to the proposal in response to this comment.**

*§350.51(d), Affected Property Assessment*

Regarding vertical soil assessment requirements in §350.51(d), Lowerre & Frederick commented that the Executive Summary describes a rule change that is not listed in the proposed rule and the actual proposed rule changes are not listed in the Executive Summary.

**The commission agrees that the language in the Executive Summary regarding the proposed changes to §350.51(d) does not accurately reflect the proposed changes in the rule. The**

**commission clarifies that the prior rule and the adopted rule both require that the vertical extent of a release be investigated to the greater of the method quantitation limit or the background concentration. The adopted amendment in the rule changes the reference to the “<sup>GW</sup>Soil PCL” to “residential assessment level” for vertical assessment requirements when an adequate groundwater assessment has been conducted.**

Lowerre & Frederick, in commenting on the Executive Summary, requested that the commission require a groundwater sample be collected in almost every case and vertical assessments should not allow use of SPLP as a groundwater protection based PCL.

**The commission’s response to the comments that pertain to the proposed changes as reflected in the Executive Summary language is that the commission is not substituting the phrase “the higher of the method quantitation limit or background concentrations” with the phrase “the residential assessment level.” With this understanding, the commission believes the comments that pertain to the proposed changes as reflected in the Executive Summary language have been addressed.**

Lowerre & Frederick also commented that the proposed changes to §350.51(d) reflected in the rule are supported and give more clarity as to how §350.75(i)(7)(C) is to be evaluated in relation to assessment requirements.

**The commission acknowledges the support for the adoption of this rule.**

Lowerre & Frederick also commented that depth of vertical delineation wells itself should not be a factor in eliminating further vertical delineation requirements, but rather other factors such as the competence and thickness of a geologic formation to prevent contaminant migration and the absence of preferential vertical migration pathways should be considered.

**The commission agrees that the depth of the groundwater-bearing unit and the corresponding depth of a soil boring/groundwater monitoring well required to assess such groundwater-bearing unit is not in and of itself a justification for use in §350.75(i)(7)(C). Site-specific determinations for applicability of using §350.75(i)(7)(C) for vertical assessment will require several supporting lines of evidence. The commission agrees that competence and thickness of a geologic formation and absence of preferential vertical migration pathways are lines of evidence that should be considered in determining applicability of §350.75(i)(7)(C).**

The TCC expressed support for the proposed amendment as reflected in the Executive Summary to allow the vertical extent of a release to be investigated to the assessment level, rather than to the currently stated greater of the method quantitation limit or the background concentration.

**The commission clarifies that the prior rule and the adopted rule require that the vertical extent of a release must be investigated to the greater of the method quantitation limit or the background concentration. The adopted rule changes the reference to the “<sup>GW</sup>Soil PCL” to “residential assessment level” for vertical assessment requirements when an adequate groundwater assessment has been conducted.**

Regarding §350.51(i), GSI commented that although it understands the commission must facilitate the implementation of Texas Water Code (TWC), §26.408, the addition of the new language is problematic because water utilities (and other entities) do not maintain “publicly-available lists” of properties that are connected to their water systems. GSI also commented that while utility companies may be able to provide their general geographic areas of service to the public, they “will not” identify the specific properties for which service is provided. GSI further commented that the precise meaning of the word “connected” is unclear, and asks whether undeveloped properties that have access to a public water supply, but do not have current service, are considered to be “connected.”

Also regarding §350.51(i), Lowerre & Frederick commented that while it supports the memorialization of TCEQ’s TWC, §26.408 data collection requirements, it cannot support the rule change because it appears to link TWC, §26.408 data collection efforts to the submittal of an APAR, and this in turn increases the time that private well owners may ingest contaminated groundwater. Lowerre & Frederick further commented that the reporting of contaminated groundwater to the TCEQ should be linked to a document submittal that immediately follows reporting of the release to the commission. Lastly, the TCC commented that they supported the proposed change to §350.51(i).

**The commission agrees that groundwater contamination should be reported to the TCEQ as soon as possible. The commission guidance document *Determining Which Releases are Subject to TRRP* (October 21, 2003), for example, states in part that releases must be reported to the TCEQ within 24 hours of occurrence or discovery, in accordance with the TWC and applicable program requirements. The proposed language was not intended to be a comprehensive memorialization of all TWC, §26.408 data collection requirements, as these are already contained in the guidance,**

***Preparation of a Drinking Water Survey Report (RG-428).* Based upon the public comments received, and in consideration of all relevant information, the commission has decided not to adopt the proposed change to §350.51(i).**

*§350.51(m), Affected Property Assessment*

Regarding §350.51(m), URS supported the proposed changes but requested that the rule clarify that these background concentrations defined in rule for soil, can also be used for sediments in intermittent streams. URS was concerned that limiting the use of the Texas-specific background concentrations to soil is problematic in that additional data may need to be collected where sediment in an intermittent stream is being evaluated in its dry scenario as soil.

**URS is correct that the agency, in certain circumstances, has accepted soil background data in lieu of sediment background data for intermittent streams. Normally, the use of soil background data to evaluate sediment constituents is not appropriate since the sediment (aquatic) and soil (terrestrial) environments (chemistry and biology) are dissimilar and cannot be used interchangeably. The agency's position in guidance has been that this approach (use of soil background concentrations for intermittent streams) may be useful where perennial pools do not occur, and there is adequate justification provided to evaluate the stream bottom as soil. This has been allowed on a case-by-case basis only. Therefore, the commission disagrees with the suggestion. Furthermore, the suggestion is beyond the scope of the proposal. No change has been made in response to this comment.**

*§350.71(k), General Requirements*

Regarding §350.71(k), Lowerre & Frederick commented the proposed rule strikes out many valuable considerations when the sample quantitation limit is greater than the residential assessment level. These are important considerations and should be left in the rule as they are currently listed.

**The commission disagrees the rule language in the existing §350.71(k)(3)(B)(i) - (vi) should be retained, when considering the entirety of the adopted rule. By removing §350.71(k)(3)(B)(i) - (vi) from the rule, the commission eliminates the potential for misapplication of that provision to COCs known or reasonably anticipated to be associated with current or historical activities conducted at the on-site property. The rule is amended to allow the person to focus on the detected COCs and the COCs known or reasonably anticipated to be associated with activities conducted at the on-site property. In addition, commonly used broad spectrum methods generate analytical results for a large number of analytes amenable to those analyses. The language in §350.71(k)(3)(B) removed from the rule by this amendment required the person to evaluate each of those analytes against the respective residential assessment level even though the analyte was not detected in any environmental medium at the on-site property and the analyte was not known or reasonably anticipated to be associated with the on-site property. The adopted provisions require that evaluation only for detected COCs and COCs known or reasonably anticipated to be associated with the on-site property, but do not require the person to make that evaluation for COCs not detected in any environmental medium at the on-site property and not known or reasonably anticipated to be associated with the on-site property. As adopted, §350.71(k)(2) and §350.71(k)(3) require the sample quantitation limits (now termed the sample detection limits by this amended rule) are less than the respective residential assessment level for detected COCs and COCs known or reasonably anticipated to be associated with the on-site property. To ensure the**

**appropriate analytical method is used for detected COCs and COCs known or reasonably anticipated to be associated with the on-site property, §350.54(e)(3) requires the person to use an analytical method capable of quantitating the COC at or below the residential assessment level. When no available analytical method is capable of achieving a method quantitation limit less than the residential assessment level for the COC, the §350.54(e)(3) provision allows the person to use the best available method having the lowest method quantitation limit.**

URS commented that the revisions are generally supported and clarify the data screening process.

**The commission acknowledges the support for the adoption of this rule.**

TCC commented that they are in agreement with the approach presented in the amended language and commented that the provision will prevent the development of needless PCLs, thus helping to reduce the time needed for APAR development.

**The commission acknowledges the support for the adoption of this rule.**

*§350.73(a), Determination and Use of Human Toxicity Factors and Chemical Properties*

The commission received several comments regarding the proposed revision to the method of selecting appropriate chronic human health toxicity factors contained in §350.73(a). Lowerre & Frederick opposed the change and commented that the revision would result in human toxicity factors developed by the regulated community moving from the bottom to the top of the hierarchy and superseding the objectivity and public trust inherent in toxicity factors from the other sources. Additionally, Lowerre &

Frederick expressed concern that the executive director approval required for toxicity factors from “other scientifically valid sources” under §350.73(a)(7) would be delegated solely to TCEQ project managers. TCC also opposed the change, commenting that peer-reviewed and scientifically-defensible toxicity data should be the preferred method of selecting toxicity factors. However, the TCC supported adding Provisional Peer Reviewed Toxicity Values (PPRTVs) as the secondary source in the hierarchy of sources for human toxicity factors. GSI expressed concerns that some of the listed sources are not readily available and the proposed rule language may require that provisional toxicity factor values or other inappropriate values be used, and suggested TRRP indicate that the TCEQ tables provide appropriate toxicity factors.

**The commission recognizes the importance of peer-reviewed and scientifically defensible chronic human toxicity factors and agrees that toxicity factors from sources high in the hierarchy list of the prior rule, such as the Integrated Risk Information System (IRIS), are generally preferred. The commission appreciates TCC support in regards to adding PPRTVs as the secondary source in the hierarchy of sources for human toxicity factors. Under the proposed revision to §350.73, toxicity factors available from sources high in the hierarchy list would have continued to be utilized in the vast majority of cases. However, to address the concerns raised in comments, the proposed rule language was revised to retain the toxicity factor source hierarchy of the prior rule with a provision added as §350.73(b) to provide the agency with flexibility, if needed, based on scientific considerations. In limited instances, a toxicity factor from the source selected under the hierarchy list in §350.73(a) may be determined by appropriate TCEQ staff to be no longer scientifically defensible based on more recent science (e.g., a toxicity factor may have been developed more than 10 years ago and in some cases may no longer be utilized by the agency**

which developed it). In such cases, the agency desires the flexibility for the executive director to approve a toxicity factor from a different tier of the source hierarchy (e.g., “other scientifically valid sources as approved by the executive director”). Therefore, the proposed rule language was revised to retain the toxicity factor source hierarchy in §350.73(a) with the provision that in accordance with new adopted §350.73(b), the executive director may direct persons to use a toxicity factor from a source other than that selected under the hierarchy in cases where the executive director has determined it to be necessary to use a more scientifically valid toxicity factor from a different source. The flexibility provided by adopted §350.73(b) is similar to that which would have been provided by proposed §350.73(a)(7), which would have allowed the executive director to approve a more recent and more scientifically valid toxicity factor from a source other than that selected in accordance with the hierarchy list (e.g., potentially EPA’s Office of Pesticide Programs or Office of Water). Appropriate TCEQ staff will be delegated the task of determining when utilizing toxicity factors in accordance with §350.73(b) is necessary and appropriate based on scientific validity. The TCEQ will continue to maintain a table of appropriate chronic human health toxicity factors for convenient reference because many users of the TRRP rule rely on TCEQ tables, as opposed to the original sources. The table will also aid in ensuring consistency and the use of appropriate toxicity factors across sites. The commission adopts §350.73(a) - (c).

*§350.73(f)(1), Determination and Use of Human Toxicity Factors and Chemical Properties*

Concerning §350.73(f)(1), comments were received from B&C and from GSI. The comments from both B&C and GSI expressed the desire to retain the current rule language and to allow the use of Synthetic Precipitation Leaching Procedure (SPLP) in the determination of site-specific soil/soil-water

partition coefficients. GSI stated that SPLP leachate tests are the only practical method available to measure a site-specific  $K_d$  value and B&C quote from the EPA (1994) (*Test Methods for Evaluating Solid Waste*, SW-846, US EPA, OSWER, Washington D.C.) SPLP method, noting that it was designed to determine the mobility of both organic and inorganic analytes present in liquids, soils, and wastes.

**The commission disagrees with the comments of GSI. The SPLP analytical method (EPA Method 1312) was developed to estimate mobility of hazardous waste in the soil column. The EPA made clear that the analytical method was to be used to “. . . model an acid rain leaching environment . . .” (EPA, 1996: *Soil Screening Guidance: User’s Guide*, EPA 540-R-96-018, US EPA, OSWER, Washington D.C.). In April 1996, the EPA introduced the option of using a leach test that “. . . may be used instead of the soil/water partition equation . . .” (EPA, 1996: *Soil Screening Guidance: User’s Guide*, EPA 540-R-96-018, EPA, OSWER, Washington D.C.), making a clear distinction between a synthetic leaching procedure and the determination of  $K_d$ . Further, the EPA indicates that “. . . if this option is chosen, soil parameters are not needed for this pathway . . .” (EPA, 1996). The EPA intends that a leach test may be used in lieu of the soil/water partitioning equation model for evaluating mobility of constituents in soils. Neither the EPA, nor states, intend that results of a leach test are to be substituted for, or otherwise used to develop soil-water partition coefficients. Additionally, a leach test should not be blended into a fate and transport model. The TCEQ objects to the use of the SPLP analytical method for use in the determination of soil-water partitioning coefficients for the following reasons: 1) the SPLP method (EPA Method 1312) is not intended for, nor does it address  $K_d$  determination in any way; 2) a  $K_d$  determination is made at chemical equilibrium, and the SPLP (EPA Method 1312) does not require, nor does it address chemical equilibrium; 3) the determination of the  $K_d$  is based on a number of analytical results over a range of concentrations to**

construct the sorption isotherm from which a  $K_d$  can be derived, the SPLP procedure does not address the construction of sorption isotherms nor the derivation of  $K_d$ ; and 4) the determination of the  $K_d$  isotherm requires a rigorous analysis to construct appropriately (e.g., Langmuir D, 1997 *Aqueous Environmental Geochemistry*; EPA, 1999 *Understanding Variation in Partition Coefficient,  $K_d$ , Values; Volume I: The  $K_d$  Model of Measurement, and Application of Chemical Reaction Codes*, EPA 402-RR-99-004A, OAR, Washington, D.C.). It is for these reasons that the TCEQ believes not only that use of the SPLP leachate is not “the only practical method available to measure a site-specific  $K_d$  value,” but that it is not a  $K_d$  determination method at all. The TCEQ agrees with B&C’s observation that the SPLP procedure is designed to determine the mobility of both organic and inorganic analytes present in liquids, soils and wastes.

B&C commented that the SPLP leaching of actual samples of affected soils provides a more accurate measure of partitioning than many laboratory partitioning tests.

The commission disagrees with the comment because  $K_d$  determinations are predicated upon the establishment of chemical equilibrium of chemical components partitioned between the solid and liquid phases of the system being measured. Wisconsin Department of Natural Resources (DNR) (*Guidance on Use of Leaching Tests*, PUBL RR-523-03, 2003) states that many systems subjected to EPA Method 1312 do not reach equilibrium within 24 hours and may require up to 96 hours. The SPLP method specifies an extraction period of  $18 \pm 2$  hours and does not require chemical equilibrium. Therefore, since the SPLP analytical method does not even address the most fundamental aspect of the  $K_d$  determination, it cannot qualify as a method for determining  $K_d$  values.

GSI acknowledged that while SPLP was not developed specifically as a method to measure  $K_d$ , the method can be used to measure  $K_d$  provided that the chemical concentration in the leachate is not limited by compound solubility and that the SPLP procedure is very similar to American Society for Testing and Materials (ASTM) Standard D 5285-03, a procedure for measuring  $K_d$  recommended in *Toxicity Factors and Chemical/Physical Parameters* (TCEQ RG-366/TRRP-19).

**The commission agrees with GSI regarding the limitations of the SPLP analytical method.**

**However, GSI's comments do not acknowledge the most important aspect of the  $K_d$  determination laboratory procedure: attaining chemical equilibrium within the system. The commission concurs with GSI's observation that ASTM Standard Test Method D 5285 is "very similar" to the SPLP method, with one important exception: ASTM D 5285 requires confirmation of equilibrium conditions during the laboratory experiment. This test feature is among the reasons the TCEQ has recommended its use for  $K_d$  determinations in Table 1 of TRRP-19.**

B&C commented that many laboratory partitioning tests which rely on spiked samples and do not accurately simulate aging of a release that may have occurred over the course of decades in some cases.

**The commission acknowledges the potential for such a scenario. However, since  $K_d$  determinations are based on chemical equilibria, the "simulation of aging" is not relevant either to the appropriate laboratory experiments or to the SPLP analytical method.**

GSI commented that although TRRP-19 provides recommended methods for measuring site-specific  $K_d$ , none of these methods are appropriate because: 1) they are not standard methods offered by commercial laboratories; and 2) they require use of clean site soils, and therefore do not reflect "dual equilibrium"

desorption or other processes that limit the desorption of chemicals from historically contaminated soils.

**The commission disagrees with aspects of this comment. Firstly, TRRP-19 recommends four international (ASTM) standard methods for  $K_d$  determinations. The remaining methods recommended in TRRP-19 are those used by the EPA specifically for  $K_d$  determinations. Since the proper determination of  $K_d$  is a laboratory experimental procedure, not merely a sample analysis, it should be considered a specialized procedure, and not all commercial environmental laboratories could be expected to provide that service. However, the TCEQ is aware of commercial laboratories willing and capable of performing a standard  $K_d$  determination. Secondly, TCEQ-recommended  $K_d$  determination methods are capable of evaluating and accommodating numerous complex isotherm sorption models (e.g., EPA, 1999 *Understanding Variation in Partition Coefficient,  $K_d$ , Values; Volume I: The  $K_d$  Model of Measurement, and Application of Chemical Reaction Codes*, EPA 402-RR-99-004A, OAR, Washington, D.C.). The complete absence of  $K_d$ -related determination methodology in EPA Method 1312 is among the primary reasons that the commission considers the SPLP leaching method inappropriate for use in  $K_d$  determinations.**

GSI commented that only tests that utilize contaminated site soils will yield  $K_d$  values that accurately reflect the site-specific potential for chemical leaching to groundwater.

**The commission believes this statement is imprecise. Proper  $K_d$  determinations utilize representative uncontaminated soils from contaminated sites that provide the most accurate site-specific  $K_d$  values for use in the Tier 2 and Tier 3 <sup>GW</sup>Soil PCL models.**

GSI commented that other state regulatory agencies (e.g., Wisconsin DNR) have recognized the utility of leaching tests and specifically SPLP for measuring site-specific  $K_d$  values. The TCEQ should retain this valuable tool for the development of appropriate site-specific PCLs that accurately reflect the potential for leaching to groundwater and if necessary, the TCEQ should issue guidance presenting the appropriate application of SPLP for measuring site-specific  $K_d$  values.

**Aspects of this comment inaccurately characterize the regulatory acceptance of SPLP. Other state regulatory agencies (e.g., Wisconsin DNR) do not use SPLP for measuring site-specific  $K_d$  values.**

**As discussed, Wisconsin DNR (*Guidance on Use of Leaching Tests*, PUBL RR-523-03, 2003) states that many systems subjected to EPA Method 1312 do not reach equilibrium within 24 hours and may require up to 96 hours. The SPLP method specifies an extraction period of  $18 \pm 2$  hours and does not require chemical equilibrium. Therefore, since the EPA Method 1312 (SPLP analytical method) must be modified with respect to confirmation of equilibrium, it is no longer the SPLP method. As such, the adopted rule language acknowledges this critical technical distinction and instead continues to allow the use of “very similar”  $K_d$ -determination-specific methods in Table 1 of TRRP-19, as previously noted by GSI.**

GSI commented that a guidance document could address appropriate chemical concentrations in soil relative to the compound solubility and present the appropriate methods for calculating  $K_d$  from the SPLP test results.

**The commission points out that it has published recommended standard methods for the**

**determination of  $K_d$  in Table 1 of TRRP-19, but that the use of SPLP in those determinations is inappropriate.**

B&C commented that the valence state of spiked inorganics may differ from the valence state of the actual release, thereby rendering recovery of spiked inorganics even less representative of the actual mobility of inorganic COCs in the affected media. It is recognized that SPLP involves a 20x dilution; this should be corrected for by multiplying the reported leachate concentration by 20 before comparing total concentrations to SPLP leachate concentrations to arrive at a Tier 2 soil-leachate partition factor for the COC ( $K_{sw}$ ). Obviously, a sufficient number of total and SPLP analyses must be conducted and a reasonable curve fit must be demonstrated before a Tier 2  $K_{sw}$  can be established based upon the comparison of total to SPLP concentrations. However, if these conditions are met, the relationship between total and SPLP concentrations provides a technically defensible method for developing a Tier 2  $K_{sw}$ .

**The commission agrees with the comment by B&C that use of SPLP in the determination of  $K_d$  is fraught with complexities, requires significant modifications, and must be supplemented by methodologies that can provide a defensible  $K_d$  value. These are the primary reasons that led the commission to conclude that the most accurate and defensible site-specific  $K_d$  values can most easily be obtained using the recommended standard laboratory experiments published in Table 1 of TRRP-19. These are the same primary reasons for adopting the rule language that removes reference to the SPLP method for  $K_d$  determination. However, the TCEQ continues to accept non-standard proposals for  $K_d$ -determination methods for approval.**

B&C commented that in accordance with §350.75(g), the executive director may require the person to provide sufficient monitoring data to verify that PCLs established under any tier are based on an appropriate understanding of conditions at the affected property. Therefore, a Tier 2  $K_{sw}$  established by use of SPLP testing can be verified by groundwater monitoring.

**The commission acknowledges the provision for requesting sufficient monitoring. However, the use of SPLP for purposes of  $K_a$  determinations is excluded from the rule language for the reasons provided.**

*§350.74(h), Development of Risk-Based Exposure Limits*

Regarding the new provision in §350.74(h) that the surface water RBEL is protective of down gradient water bodies, URS requested that the TCEQ clarify how far downstream this change would be applicable. URS further stated that if applied to a great distance downstream, additional work would be required without a corresponding benefit. TCC had similar objections and stated that the provision is too ill-defined and should be deferred to guidance.

**The commission disagrees with the suggestion that the rule clarify the distance downstream for consideration of the surface water RBEL. The adopted rule language already notes that the fate and transport characteristics of the COC should be considered. Furthermore, it should be noted that in the development of the existing TRRP-24 guidance document (related to the determination of surface water and sediment PCLs), the multi-stakeholder work group attempted to define a distance downstream but was not able to reach consensus. A definition of a “cutoff” distance downstream is beyond the scope of the proposal. Consideration of a “cutoff” distance would**

**warrant input from the public. This distance should be determined on a case-by-case basis. No change has been made in response to this comment.**

*§350.74(h)(3), Development of Risk-Based Exposure Limits*

Regarding the proposed changes to §350.74(h)(3), the TCC recommended that the rule be modified to clarify that the associated limits (the surface water RBELs) apply to TRRP only when the general TPDES permit currently applies to the affected property, and suggests language to this effect.

**The commission disagrees with the TCC suggestion that the general permit limits apply to TRRP only when the affected property currently has a general TPDES permit. As was the intent in the original rule language referencing Chapter 321, Subchapter H, the general permit is being used as a source of RBEL values only, not as a way to restate what is already regulated through the general permit at a particular affected property. The limits in the general permit would then be one of the sources of RBELs for given COCs. If, for example, the MTBE (methyl tert-butyl ether) limit in the general permit is lower than the MTBE RBEL applicable to aquatic life and human health (e.g., paragraphs (1), (2), and (4)), then the surface water RBEL would be based on the limit defined in the general permit. The question whether the affected property discharge is regulated by the general permit is irrelevant. What is relevant is whether the release of groundwater or storm water from the facility in question has been impacted by petroleum fuel as defined in the general permit. Currently the general permit defines petroleum fuel as gasoline, diesel fuel, fuel oil, kerosene, and jet fuel. No change has been made to the proposed rule language.**

*§350.74(h)(5), Development of Risk-Based Exposure Limits*

In response to the proposal in §350.74(h)(5) that the criteria for chlorides, sulfates, total dissolved solids, and pH be emphasized as RBELs, the TCC recommended leaving this discussion in the TRRP-10 guidance document.

**Elevation of this subsection emphasizes the fact that the specified analytes (chlorides, sulfates, et al.) should be treated as COCs where appropriate, and as such, they would have corresponding RBEL values. As provided in the existing TRRP-24 guidance, these types of parameters need only be evaluated in association with an affected property if they are COCs for the affected property. Once they are determined to be COCs, then this particular rule language provides the source for the appropriate RBEL values. The identification of a COC or target COC is not the subject of this rule provision, and will likely be discussed in the TRRP guidance document (TRRP-10, “Target COCs”) noted in the TCC comment. The commission disagrees with the TCC recommendation. However, since there is a possible misunderstanding that the rule is directing that these types of parameters will always be COCs, the commission is modifying the proposed rule language to state that “The person shall apply the numerical criteria, as appropriate, for chlorides, sulfates, total dissolved solids, and pH, for classified segments as specified in §307.10(1) of this title (relating to Appendices A - E), as amended.”**

*§350.75(b)(1), Tiered Human Health Protective Concentration Level Evaluation*

Regarding Figure §350.75(b)(1), TCC commented that the word “lesser” should be used rather than “lessor.”

**The commission agrees and has made the recommended change.**

*§350.75(i)(4), Tiered Human Health Protective Concentration Level Evaluation*

Regarding §350.75(i)(4), TCC commented that the proposed change does not accurately reflect the process of calculating a groundwater-to-surface water PCL (<sup>SW</sup>GW), as the language suggests that there is only one surface water dilution factor for all surface water RBELs, and neglects the possibility that different dilution factors may be applicable to different surface water RBELs. TCC provided an example where dilution factors for ecological and human health exposure pathways are based on differing critical stream flows. TCC suggested the addition of a clarifying statement at the end of the paragraph to account for situations where different surface water dilution factors may be applicable to the surface water RBEL or the ecological surface water PCL. In such cases, TCC recommended that the RBEL and PCL be divided by their respective dilution factors prior to determining the critical groundwater PCL relevant to these pathways.

**The commission agrees and has made the recommended change. This scenario (use of differing stream flows to determine the dilution factor) will only occur where the groundwater discharge is clearly greater than 15% of the 7Q2 (seven-day, two-year low-flow) for releases to freshwater streams and rivers (per §350.75(i)(4)(D)). When determining the groundwater-to-surface water dilution factor in this particular case, it is appropriate to pair the human health surface water RBEL with the harmonic mean flow, and to pair the aquatic life surface water RBEL with 0.25 times the 7Q2 for acute criteria, and the 7Q2 for chronic criteria.**

*§350.76(c), Approaches for Specific Chemicals of Concern to Determine Human Health Protective*

*Concentration Levels*

Lowerre & Frederick commented on the potential use of EPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children. Lowerre & Frederick opposed the proposed revision unless the model is insulated with conservative assumptions, citing concerns that neither the person performing the remediation nor TCEQ staff are likely to be able to ensure that the model is appropriately calibrated for site-specific conditions, that the model assumptions based on current conditions (e.g., exposure patterns, lead species) may not be protective of potential future exposure, and that assessment and notice to innocent landowners will be limited in the event a higher residential soil lead PCL is calculated. TCC expressed agreement with the proposed revision.

**The commission appreciates TCC support of the proposed revision and recognizes the importance of the concerns raised by Lowerre & Frederick. The proposed language for §350.76(c)(2) indicates that both use of a model and site-specific model input values must be approved by the executive director. Given the potential adverse impact of lead on young children, the executive director will consider it critical, when deciding whether to approve model use for a site, that potential exposure of children to elevated soil lead be reduced through remediation of elevated soil lead in as timely a manner as possible. If model use or site-specific model inputs are not approved by the executive director, response actions must proceed using the Tier 1 PCL for residential soil lead. If use of a model is approved for a site, appropriate TCEQ staff will ensure that the model is properly calibrated for site-specific conditions and that appropriately conservative input values (e.g., exposure factors) are utilized such that the calculated Tier 3 residential soil PCL for lead is expected to be protective of both current and future residential exposure. Proposed site-specific inputs which are less conservative than default model inputs will be rigorously evaluated and must**

**be scientifically defensible and consider potential future residential exposure, since in many cases institutional controls are not required for Remedy Standard A response actions at residential properties. To aid in ensuring that model assumptions result in the calculation of a Tier 3 PCL which is adequately protective of potential future residential exposure, the proposed rule language was revised for adopted §350.76(c)(2) to indicate that consistent with the procedure used to develop residential human health risk-based exposure limits (RBELs) for chemicals without a chemical-specific approach in accordance with §350.74, variance from certain model default exposure factors such as soil/dust ingestion rates and exposure frequency to less conservative (i.e., lower) numerical values will not be allowed. Additionally, because it is often difficult to anticipate the future use of different areas of a residential property, the use of area-specific model inputs (e.g., exposure factors for a lawn versus a garden) to derive different residential soil lead PCLs for the various areas of a residential property will not be allowed. Incorporation of site-specific inputs (e.g., bioavailability) could result in either a higher or lower residential soil PCL for lead, which in either case would be more scientifically defensible than use of default input values.**

TCC submitted a comment in support of proposed §350.76(e). Section 350.76(e) directs the use of the same approach currently being used to demonstrate attainment of the critical PCL for 2,3,7,8-TCDD in soil for attainment of the critical PCL for 2,3,7,8-TCDD in other media (e.g., groundwater, sediment).

**The commission recognizes TCC's support of adopted §350.76(e).**

*§350.77(a), Ecological Risk Assessment and Development of Ecological Protective Concentration Levels*

URS commented that they are concerned that the impact of this proposed change might differ from

agency expectations. As they understand the process, the change does not “end” the ecological risk assessment, but effectively moves it downstream. This then would require a person to collect more data, in the form of additional samples, or apply dilution factors to develop alternate ecological PCLs.

**The primary purpose of this revision is to acknowledge in the rule the expedited stream evaluation process that is being implemented through the commission’s ecological risk assessment guidance.**

**The conditions under which this type of evaluation can be conducted are specified in detail in the guidance. URS is correct that the expedited stream evaluation itself does not end the ecological evaluation in that the primary assessment is moved further downstream. However, the combination of a Tier 1 Exclusion Criteria Checklist that failed because of the surface water/sediment pathway, and a completed expedited stream evaluation for qualifying waters that showed no downstream impacts, does constitute a potential exit point from the ecological risk assessment process that was not previously identified in the rule. The commission has made no changes in response to this comment.**

*§350.90, Spatial and Electronic Information*

Concerning §350.90, which requests the collection and reporting of spatial coordinates and associated data attributes in a format approved or required by the executive director, the TCC commented that they support this proposal.

**The commission appreciates TCC’s support of the proposal.**

*§350.91(b)(7), Affected Property Assessment Report*

Concerning §350.91(b)(7) that amends the information to be submitted in the Affected Property Assessment Report to include an expedited stream evaluation, the TCC commented that they support this proposal.

**The commission appreciates TCC's support of the proposal.**

*§350.91(b)(15), Affected Property Assessment Report*

Concerning §350.91(b)(15), the TCC commented that they support the proposal to provide spatial coordinates, as requested by the agency, for the affected property and any sampling or testing locations.

**The commission appreciates TCC's support of the proposal.**

GSI's recommendation was that, while the proposal is sensible and appropriate, an effective date should be included to clarify that the requirement does not apply to locations sampled prior to adoption of the new requirement. The effective date would prevent problems associated with locating samples prior to adoption of the proposed change for which accurate spatial coordinates may not be available.

**The commission recognizes and agrees that there are many sampling locations, such as borings and surficial soil samples, which can no longer be located. The commission has no intention of requesting spatial data on sampling points that can no longer be located. However, on active cases the commission would expect the collection of spatial data for monitor wells and other obvious sampling points. The commission does not expect spatial data on sites where the case has been closed with no further action. For these reasons, the commission disagrees that an effective date**

**for the rule provision is necessary, and therefore the commission has made no changes in response to this comment.**

An individual requested clarification on this proposed revision. He asks if it means that persons will need to provide longitude and latitude, Universal Transverse Mercator, or other coordinates for each sampling location. He further inquires as to what other data attributes are envisioned. He asks if the new provision would require that actual global positioning system coordinates for each sample location be provided in a table. Finally, he inquires as to what problems TCEQ is trying to address with these regulations.

**The commission will address the last question first. The commission is requesting spatial data in order to utilize geographic information system mapping capabilities. With spatial data on sites and other points of interest, the commission will be able to conduct spatial evaluations of release sites. This information will provide more complete knowledge of regional problems and provide the ability to manage programs and cases on a strategic basis.**

**The commission is in the process of procuring a data management system. At this time the exact data attributes and database structure have not yet been determined. Once the data management system is implemented, the agency will provide instructions on how to submit spatial coordinates and other data, and the precise data which will need to be submitted under the rule.**

*§350.95(b), Response Action Completion Report*

Concerning §350.95(b), Lowerre & Frederick opposed the proposed revisions. Lowerre & Frederick indicated that the reasons for opposing the proposed revisions are similar to those which they raised in

addressing §350.34(l). Lowerre & Frederick commented that the current rule structure was derived from the predecessor rule, the Texas Risk Reduction Standards, at Chapter 335, Subchapter S.

Lowerre & Frederick further commented that the Risk Reduction Standards required that any form of institutional control, other than land use, fell under Risk Reduction Standard No. 3. Lowerre & Frederick also commented that Risk Reduction Standard No. 3 included the derivation of medium-specific concentrations based upon site-specific factors, and that an equivalent structure should be retained in the TRRP rule so that land owners and prospective purchasers can continue to believe that Remedy Standard A is a "no strings attached" closure except for specified commercial/industrial land use.

**The commission disagrees with the comments for reasons similar to those noted in the response to the comments to the proposed revisions to §350.34(l). The adopted revisions are intended to clarify the rule by adding the appropriate references to rule provisions under which an institutional control may be required. The structure of the prior rule is unaffected by the adopted revisions to §350.95(b), because the institutional control requirements of the prior rule would not be changed; however, due to the apparent misunderstanding as to the intent of the proposed changes, the adopted §350.95(b) contains additional clarification to that provided in the originally proposed revisions. The additional clarification spells out the basis, as contained in the prior rule, for the need for the newly-referenced institutional controls (e.g., that an institutional control is required for the use of a non-default exposure area, the use of occupational inhalation criteria as RBELs, or the use of non-default RBEL exposure factors).**

**The commission considers the adopted revisions to §350.95(b) to be reasonably justified because the only change to prior §350.95(b) was to add references to rule provisions which were already present in the prior rule.**

Concerning §350.95(b) TCC commented that the proposed rule language contained a typographical error which should have read “§350.51(1)(3) or (4)” rather than “§350.51(1), (3) or (4).”

**The TCEQ agrees with this comment and has made the change to the adopted rule.**

*§350.111(c), Use of Institutional Controls*

Concerning §350.111(c) and (c)(4), Lowerre & Frederick commented that the preamble for the 1999 TRRP rulemaking noted commission concerns regarding potential takings and slander of title arguments that could be lodged against the agency for the filing of deed notices without consent. The comment suggested that the TCEQ should consider these potential claims in this current rule undertaking. In a general comment to the rule, Lowerre & Frederick argued that the change to the rule attempts to provide regulatory backing for the filing of a deed notice without consent and will subject the agency to claims of takings.

**In the 1999 adoption preamble to the TRRP rule, the agency did, in fact, note a concern regarding the risk of potential takings claims associated with implementing a rule that allowed persons conducting cleanups to file deed notices on affected property without obtaining consent. In that preamble, the commission also recognized that its statements regarding the requirement for obtaining consent for the filing of a deed notice were being made out of an abundance of caution. Additionally, in the 1999 adoption preamble the agency acknowledged that its Takings**

**Impact Analysis for the adopted TRRP rule supported the argument that a regulatory taking could not be claimed based solely on the impact of a deed notice because the institutional control provisions of the rule are “not the producing cause of any diminution of property” since “levels of COC are already present at the affected property; and it is the presence of these chemicals that may have caused any property devaluation” (March 26, 1999, issue of the *Texas Register* (24 TexReg 2452)). At that time, without a compelling reason otherwise, the commission could not justify allowing for even a minimal risk of exposure to takings claims by crafting a rule that would establish the filing of deed notices without consent as the normal practice for all persons conducting cleanups.**

**Even during the initial stage of the development of the original TRRP rule, however, the commission recognized that the rule would be unworkable if it required governmental entities conducting cleanups for which they were not responsible to secure either a restrictive covenant or consent for the filing of a deed notice. To address the problem of the finite state and federal public resources for remediation efforts, the agency opted to define non-responsible party governmental entities out of the purview of the 1999 TRRP rule altogether. As mentioned in the section discussing the definition of “Person,” the agency now recognizes that the prior definitional solution for dealing with the institutional control issue is no longer ideal; yet, the need is still present for exceptions to the institutional control requirements as they apply to non-responsible governmental entities. Therefore, the agency is changing the rule to mirror the current practice and policy related to institutional controls and more clearly deal with that subject in §350.111(c).**

**As was true at the time of the 1999 adoption of the TRRP rule, the agency does not believe that a viable regulatory taking claim can be made based on the rule’s provision for non responsible**

**governmental entities to file a deed notice on the rare occasion when consent cannot be obtained.**

**In addition to those factors listed in the 1999 adoption preamble, the grounds for a taking claim would not exist where a governmental entity that did not cause or contribute to the contamination is performing the remediation and arguably greatly improving the value of the land through those remediation efforts. Further, the adopted rule does not prevent the pursuit of damages by the affected property owners from the responsible parties. Additionally, the Private Real Property Rights Preservation Act creates an exception for governmental actions taken in response to a real and substantial threat to public health and safety. The remediation and institutional control actions are being taken to address the real and substantial threats to public health and safety posed by the Site, and these response actions squarely fit within the “taking” exception (Texas Government Code, §2007.003(b)(13)).**

Concerning §350.111(c) and §350.111(c)(4), Lowerre & Frederick commented that the inclusion of non-responsible party governmental entities in the TRRP rule can only water down the existing rule because responsible parties will seek to apply the same standards used by these non-responsible governmental entities. The comment argued that omitting governmental entities who are not responsible parties from the entirety of the rule is the wiser option. In a general, yet related, comment to the rulemaking, Lowerre & Frederick argued that this change will create an arbitrary distinction between governmental agencies who are not responsible parties and those governmental agencies that are responsible parties (and responsible parties in general).

**The revision of the rule to include governmental entities which are not responsible parties within the framework of TRRP, while excluding them from certain specific process requirements of**

**§350.111, strengthens the TRRP rule rather than weakens it. As discussed in the section related to the definition of “Person,” the inclusion of non-responsible party governmental entities in this definition is an important change in the effort to require the consistent application of TRRP substantive requirements to NPL sites. However, the necessary definitional change dictates this corresponding change to the institutional control requirements to maintain the status quo for these non-responsible party governmental entities which are using finite state and federal public funds to remediate property contaminated by others. In other words, this rule provision is necessary to maintain the existing condition of the rule and extend these funds so that more sites can be addressed, rather than expending excessive funds to complete an unwarranted removal/decontamination remedy, when a control-based remedy that is fully protective of human health and the environment is the lowest cost remedial alternative. Given this policy rationale, the varied treatment of these non-responsible party governmental entities is logical, rather than arbitrary. Further, the language of the rule is unambiguous in its sole application to governmental entities which are not responsible parties. Neither the language nor the supporting policy of the rule would apply to any entity apart from one that qualifies as a governmental entity which is not a responsible party; therefore, the dilution of the rule is not a warranted concern.**

Concerning §350.111(c), in a general comment to the rule, Lowerre & Frederick commented that allowing a non-responsible party governmental entity to file a deed notice rather than a restrictive covenant will undermine the agency’s historical assertion that restrictive covenants are superior to deed notices in terms of protectiveness.

**The agency has firmly established a regulatory preference for restrictive covenants for innocent**

**landowners in the TRRP rule, and that priority remains intact, and even bolstered, with the amendment to §350.111. The TRRP rule favors the restrictive covenant because this mechanism provides the agency with enforcement power over activity of innocent landowners that could potentially interfere with controls implemented in the remediation process. Again, this preference remains unchanged in the rule, and is underscored by the requirement that was added to the rule whereby non-responsible party governmental entities must first seek to obtain consent for the implementation of a restrictive covenant. Only after the non-responsible party governmental entity has sought and is denied the consent for a restrictive covenant does the rule allow for that party to initiate the implementation of a deed notice. While the preference for a restrictive covenant has consistently been the policy followed by the agency for cleanups implemented by non-responsible party governmental entities, no such requirement was previously contained in rule. This addition to §350.111 underscores, rather than undermines, the agency's preference for the protection afforded by the restrictive covenant.**

Concerning §350.111(c) and §350.111(c)(4), Lowerre & Frederick commented that the TCEQ model deed notice language borders on being restrictive in a manner which is inappropriate for a deed notice. The comment opposed the use of these notices as quasi-restrictive covenants.

**The TCEQ has crafted model deed notice language such that current and prospective lessees and landowners of property will be sufficiently warned of the residual chemicals of concern or other environmental issues associated with the affected property and will employ necessary precaution in property use. The cautionary language in the model deed notice clearly delineates the environmental concerns and the corresponding precautions that should be understood by those**

**associated with affected property; however, unlike a restrictive covenant, the deed notice does not add to the cautionary language words of prohibition that would unduly restrict the property. The agency does not employ deed notices as quasi-restrictive covenants. As previously noted, the TRRP rule strongly favors the use of restrictive covenants for innocent landowner property by all parties conducting cleanups whether or not the party is a governmental entity or a non-responsible party.**

Concerning §350.111(c) and §350.111(c)(4), Lowerre & Frederick commented that it is unnecessary to include Voluntary Cleanup Program certificates in the exception to the requirement for landowner consent in deed notices secured by non-responsible party governmental entities given the unlikelihood that a landowner would object to the filing given the benefits of a certificate of completion.

**The TRRP rule requires consent not only for deed notices and restrictive covenants but also Voluntary Cleanup Program certificates of completion. Therefore, providing this exception to consent for Voluntary Cleanup Program certificates of completion in the amended rule is appropriate.**

Concerning §350.111(c) and §350.111(c)(4), TCC submitted a comment supporting this change.

**The TCEQ acknowledges the support for the adoption of this rule.**

## **SUBCHAPTER A: GENERAL INFORMATION**

### **§§350.2 - 350.4**

#### **STATUTORY AUTHORITY**

The amended rules are adopted under the following statutory authority: TWC, §5.103 and §26.011, which provide the commission with authority to adopt any rules necessary to carry out its powers, duties, and policies and to protect water quality in the state; TWC, §5.103(c), which states the commission must adopt rules when adopting, repealing, or amending any agency statement of general applicability that interprets or prescribes law or policy or describes the practice and procedure requirements of the agency, and Texas Health and Safety Code (THSC), Texas Solid Waste Disposal Act, §361.017 and §361.024, which provide the commission the authority to regulate industrial solid waste and municipal hazardous wastes and all other powers necessary or convenient to carry out its responsibilities. In addition, the amended rules are adopted under 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 preventive 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 committing any other act or engaging in any other activity which in itself or in conjunction with any other discharge or activity causes, continues to cause, or will cause pollution of any of the water in the state; TWC, §26.262, which states that it is the policy of this state to prevent the spill or discharge of hazardous substances into the waters in the state and to cause the removal of such spills and discharges without undue delay; and TWC, §26.264, which provides the commission with authority to issue rules necessary and

convenient to carry out the policy referenced in TWC, §26.262. Authority to adopt the amended rules is also provided by TWC, §26.341, which states that it is the policy of this state to maintain and protect the quality of groundwater and surface water resources in the state from certain substances in underground and aboveground storage tanks that may pollute groundwater and surface water resources, and requires the use of all reasonable methods, including risk-based corrective action to implement this policy; TWC, §26.345, which provides the commission with the authority to adopt rules necessary to carry out the policy referenced in TWC, §26.341; and 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 regulation by state agencies be conducted in a manner that will maintain present uses and not impair potential uses of groundwater or pose a public health hazard, and that the quality of groundwater be restored if feasible.

The adopted amendments implement TWC, §§5.103, 26.011, 26.039, 26.262, 26.264, 26.341, 26.345, and 26.401, and THSC, §361.017 and §361.024.

### **§350.2. Applicability.**

(a) General applicability. On May 1, 2000, persons shall comply with the requirements of this chapter to the extent not modified by the provisions of this section. Before May 1, 2000, the person may use this chapter upon the effective date of the chapter. The rules in this chapter specify objectives for response actions for affected properties and further specify the mechanism to evaluate such response actions once an obligation is established to take a response action via other applicable rules, orders, permits or statutes. All actions undertaken and demonstrations required by this chapter must be performed and documented to the reasonable satisfaction of the executive director. Additionally, no

person shall submit information to the executive director or to parties who are required to be provided information under this chapter which they know or reasonably should have known to be false or intentionally misleading, or fail to submit available information which is critical to the understanding of the matter at hand or to the basis of critical decisions which reasonably would have been influenced by that information. This chapter does not establish requirements for reporting releases to program areas. The regulations in this chapter address releases of chemicals of concern (COCs) as defined by various programs subject to this chapter as specified in subsections (b) - (m) of this section. However, the regulations in this chapter do not eliminate the need for the person to meet any more stringent or additional requirements found in the particular rules for the covered program areas or applicable federal requirements.

(b) Property where a release of COCs occurs that is regulated under Chapter 327 of this title (relating to Spill Prevention and Control), as amended. The person shall first complete notification for releases under §327.3 of this title (relating to Notification Requirements), as amended, and then conduct response actions under §327.5 of this title (relating to Actions Required), as amended. The person shall utilize this chapter to conduct response actions when either the conditions of paragraphs (1) or (2) of this subsection apply.

(1) The person chooses to respond under this chapter to a release of COCs within the first six months after the release is reported to the executive director.

(2) The person determines that the response action to the release of COCs cannot be completed to the satisfaction of the executive director within the first six months following notification to the executive director.

(c) Property regulated under Chapter 330 of this title (relating to Municipal Solid Waste). Persons shall comply with the requirements of this chapter for those municipal solid waste properties except when subject to the requirements of 40 Code of Federal Regulations Parts 257 and/or 258, as amended. However, for those municipal solid waste properties subject to the requirements of 40 Code of Federal Regulations Parts 257 and/or 258, as amended, the executive director may establish an alternative health-based groundwater protection standard for a COC in accordance with §350.409 of this title (relating to Assessment Monitoring Program), as amended. Determination of such an alternative standard shall be made using the procedures of Subchapter D of this chapter (relating to Development of Protective Concentration Levels).

(d) Property regulated under Chapter 331 of this title (relating to Underground Injection Control). The person shall address unauthorized releases of COCs from associated tankage and equipment utilizing the procedures of this chapter. Excursions of injected mining solutions at in-situ mining properties or injection of waste which is confined below all underground sources of drinking water as defined in §331.2 of this title (relating to Definitions), as amended, are not subject to the requirements of this chapter.

(e) Property regulated under Chapter 332 of this title (relating to Composting). The person shall comply with the requirements of this chapter to conduct assessments, response actions, and post-

response action care for releases of COCs in environmental media at a compost facility, mulching facility or land application property authorized under Chapter 332 of this title, as amended.

(f) Property regulated under Chapter 333 of this title (relating to Brownfields Initiatives). The person entering the Voluntary Cleanup Program (VCP) shall comply with all requirements found in the Texas Health and Safety Code, Chapter 361, Subchapter S, as amended, concerning the Voluntary Cleanup Program; Subchapter A of Chapter 333 of this title (relating to Voluntary Cleanup Program Section), as amended; and the requirements of this chapter. Where there is a conflict between the requirements of this chapter and the requirements in the Texas Health and Safety Code, Chapter 361, Subchapter S, as amended, and Chapter 333, Subchapter A of this title, as amended, the requirements of the Texas Health and Safety Code, Chapter 361, Subchapter S, as amended, and Chapter 333, Subchapter A of this title, as amended, shall apply.

(g) Property regulated under Chapter 334 of this title (relating to Underground and Aboveground Storage Tanks). The person shall comply with the requirements of this chapter for the assessment, response actions, and post-response action care for releases of regulated substances from underground storage tanks (USTs) as specified in Chapter 334, Subchapter A of this title (relating to General Provisions), as amended, and for releases of petroleum products from aboveground storage tanks (ASTs) as specified in Chapter 334, Subchapter F of this title (relating to Aboveground Storage Tanks), as amended, which are reported to the executive director in accordance with Chapter 334, Subchapter D of this title (relating to Release Reporting and Corrective Action), as amended, on or after September 1, 2003, unless a variance is granted in accordance with the requirements in paragraphs (1) – (7) of this subsection. Additional corrective action requirements for these facilities are found in

Chapter 334, Subchapters D, J, and K of this title (relating to Release Reporting and Corrective Action; Leaking Petroleum Storage Tank Corrective Action Specialist Registration and Project Manager Licensing; and Storage, Treatment<sub>2</sub> and Reuse Procedures for Petroleum-Substance Contaminated Soil, respectively), as amended. For releases discovered and reported to the executive director before September 1, 2003, the person shall continue to comply with Chapter 334, Subchapters D, G, H, J, K, and M of this title (relating to Release Reporting and Corrective Action; Target Concentration Criteria; Reimbursement Program; Leaking Petroleum Storage Tank Corrective Action Specialist Registration and Project Manager Licensing; Storage, Treatment<sub>2</sub> and Reuse Procedures for Petroleum-Substance Contaminated Soil; and Reimbursable Cost Specifications for the Petroleum Storage Tank Reimbursement Program, respectively), as amended, which were in effect prior to the effective date of this chapter, not to preclude compliance with a subsequent amendment of Chapter 334 of this title.

(1) The executive director may consider requests for a variance to applicability of this chapter, as amended, upon submission of a written request for a variance from applicability of this chapter that includes the following documentation in a form prescribed or allowed by the executive director:

(A) documents, either submitted in accordance with the requirements of Chapter 334, Subchapters A, C, D, and F of this title, as amended and as applicable, or otherwise credible and appropriate documented evidence as determined by the executive director demonstrating that, before September 1, 2003, the UST system at the property for which the variance is sought was permanently removed from service and the AST at the property for which the variance is sought was removed from the property;

(B) a draft restrictive covenant to be filed in the property records of the county where the property is located upon granting of the variance by the executive director that:

(i) prohibits use of ASTs or USTs at the property or at any subsequent subdivision of the property;

(ii) is written in favor of the TCEQ and the State of Texas; and

(iii) runs with the land;

(C) documents identifying UST or AST release sites addressed under Chapter 334, Subchapters D and G of this title, as amended, that are within 1/4 mile from the property for which the variance is sought, with an accompanying description comparing the release, site, and receptor conditions at the release sites located within 1/4 mile and any other relevant factors that demonstrate any regulatory inequity that may occur as the result of compliance with this chapter; and

(D) any other information requested by the executive director that is reasonably necessary for appropriate consideration of the request.

(2) The executive director may grant a variance requested in accordance with paragraph (1) of this subsection if:

(A) before September 1, 2003, the UST system at the site for which the

variance is sought was permanently removed from service and the AST at the site for which the variance is sought was removed from the property;

(B) a UST or AST release site addressed under Chapter 334, Subchapters D and G of this title, as amended, is within 1/4 mile from the site for which a variance is sought;

(C) within 45 calendar days of a request for additional information by the executive director, or within a time period directed or agreed upon by the executive director in writing, the person seeking a variance submitted the requested information; and

(D) the variance request documents an unjustifiable degree of regulatory inequity between the site for which a variance is sought and a UST or AST release site addressed under Chapter 334, Subchapters D and G of this title, based on a comparison of the release, site, and receptor conditions and any other relevant factors at the release sites located within 1/4 mile.

(3) The executive director must provide written notice to the person seeking the variance that the variance is granted, denied, or repealed. The executive director may direct the person seeking the variance to make changes to the draft restrictive covenant described in paragraph (1)(B) of this subsection if necessary to ensure that the restrictive covenant conforms with the intent of this subsection. If the executive director denies the request or repeals the variance, the notice required by this paragraph must include the reason(s) the variance has been denied or repealed.

(4) Within 45 calendar days of issuance of the written notice described in paragraph (3)

of this subsection that grants the variance, the person who sought the variance shall provide:

(A) proof that the restrictive covenant, with any changes directed by the executive director, described in paragraph (1)(B) of this subsection was filed in the property records of the county where the property is located; and

(B) a copy of the restrictive covenant filed in the property records of the county where the property is located.

(5) Upon the effective date indicated in the notice granting a variance, the person who sought the variance shall comply with Chapter 334, Subchapters D and G of this title, as amended, in lieu of this chapter.

(6) The executive director shall repeal a variance if the person who sought the variance fails to comply with paragraph (4) of this subsection unless the person who sought the variance provides compelling evidence that uncontrollable circumstances, including, but not limited to, an act of God, an act of war, severe meteorological conditions, or other similar occurrences beyond the reasonable control of the person seeking the variance, led to their inability to comply within the time frame provided in paragraph (4) of this subsection.

(7) Regardless of whether the release has been fully addressed and closed under Chapter 334, Subchapters D and G of this title, a variance granted under this subsection is automatically repealed, and this chapter becomes immediately applicable to the release, if the property or subdivision

of the property is used for UST or AST purposes as regulated under Chapter 334 of this title.

(h) Property regulated under Chapter 335 of this title (relating to Industrial Solid Waste and Municipal Hazardous Waste). The person shall comply with the requirements of this chapter when undertaking the remediation of affected property at facilities used for the storage, processing or disposal of industrial solid waste or municipal hazardous waste, or for the remediation of environmental media containing COCs resulting from releases from waste management facility components (e.g., tank, container storage area, surface impoundment, etc.), either as part of closure or at any time before or after closure. The person shall close a waste management facility component in a manner that minimizes or eliminates the need for further maintenance and controls. The manner of closure shall also minimize or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of waste, contaminants, leachate, run-off, or decomposition products to the surrounding environmental media. Waste management facility components undergoing closure for which the person can demonstrate that no release of COCs to surrounding environmental media has occurred are subject to this chapter only with regard to this closure performance standard and the removal, decontamination or control requirements for waste as specified in Subchapter B of this chapter (relating to Remedy Standards). In the event a release of COCs to surrounding environmental media has occurred, then the person shall comply with this chapter for response to the release. The person shall comply with §335.118(b) of this title (relating to Closure Plan; Submission and Approval of Plan), as amended, or applicable permit provisions regarding requirements for public participation in the corrective action process for permitted hazardous waste facilities. The person shall also comply with the requirements of paragraphs (1) - (3) of this subsection, as applicable.

(1) Any person who stores, processes, or disposes of industrial solid waste or municipal hazardous waste at a facility permitted under §335.2(a) of this title (relating to Permit Required), as amended, shall, unless specifically modified by other order of the commission, close the facility in accordance with the closing provisions of the permit.

(2) Any person who stores, processes, or disposes of hazardous waste is also subject to the applicable provisions relating to closure and post-closure in Chapter 335, Subchapters E and F of this title (relating to Interim Standards for Owners and Operators of Hazardous Waste Storage, Processing, or Disposal Facilities; and Permitting Standards for Owners and Operators of Hazardous Waste Storage, Processing, or Disposal Facilities, respectively), as amended.

(3) The person may utilize this chapter to determine if COCs, specifically listed hazardous waste or hazardous constituents, exceed concentrations protective of human health and the environment when making “contained-in” determinations for environmental media being managed as wastes (e.g., excavated soils, investigation derived wastes such as monitor well purge water, etc.) for purposes of treatment or disposal in a different location. In such cases, the person must still perform a waste classification in response to Chapter 335, Subchapters A and R of this title (relating to Industrial Solid Waste and Municipal Hazardous Waste Management in General; and Waste Classification, respectively), as amended.

(4) The person may propose a facility operations area (FOA) to address multiple sources of COCs within an active facility that is required to perform corrective action for releases

pursuant to a permit or commission corrective action order. The requirements for establishing a FOA are specified in Subchapter G of this chapter (relating to Establishing a Facility Operations Area).

(i) Affected property regulated under Chapter 335, Subchapter K of this title (relating to Hazardous Substance Facilities Assessment and Remediation). The person shall comply with all requirements found in the Texas Health and Safety Code, Chapter 361, Subchapter F, as amended; Chapter 335, Subchapter K of this title, as amended; and the requirements of this chapter for any release or threatened release of hazardous substances into the environment that may constitute an imminent and substantial endangerment to public health and safety or the environment. Where there is a conflict between the requirements in this chapter and the requirements of Texas Health and Safety Code, Chapter 361, Subchapter F, as amended, and Chapter 335, Subchapter K of this title, as amended, the requirements of Texas Health and Safety Code, Chapter 361, Subchapter F and Chapter 335, Subchapter K of this title shall apply.

(j) Property regulated under Chapter 336 of this title (relating to Radioactive Substance Rules). The person shall comply with the requirements of Chapter 336 of this title, as amended, regarding contamination limits for radioactive material in environmental media. In instances involving remediation of releases in media containing both radioactive material and other COCs, the person shall use the contamination limits determined in accordance with Chapter 336 of this title, as amended, for radioactive material and PCLs determined by the procedures of this chapter for other COCs.

(k) Property regulated under Chapter 312 of this title (relating to Sludge Use, Disposal, and Transportation). The executive director may reference this chapter in permits subject to Chapter 312 of

this title, as amended, when specifying closure provisions to address releases of COCs from facility components at municipal wastewater treatment plants.

(l) Other releases. The executive director may require the use of this chapter to address other releases of COCs subject to Texas Water Code, Chapter 26, as amended.

(m) Use of this chapter on or after May 1, 2000. The person who started a response action under Chapter 335, Subchapters A and S of this title (relating to Industrial Solid Waste and Municipal Hazardous Waste in General; Risk Reduction Standards, respectively), as amended, may qualify to continue under those previous commission rules subject to the limitations specified in paragraphs (1) – (4) of this subsection. Any person desiring to remain under Chapter 335 of this title may not use any of the provisions of this chapter. If a person elects to proceed under this chapter, then they shall not be allowed to return to Chapter 335 of this title. Also, the person shall respond as described in §350.35 of this title (relating to Substantial Change in Circumstances) in the event a substantial change in circumstance occurs which results in an unacceptable threat to human health or the environment.

(1) The person who has submitted an initial notification of intent to conduct a Risk Reduction Standard 1 or 2 response action (i.e., §335.8(c)(1) and (2) of this title (relating to Closure and Remediation), as amended) prior to May 1, 2000, and has submitted a final report within five years after that date may request that the response action be reviewed according to the regulations in effect at the time of initial notification. Persons will automatically qualify for this grandfathering provision if they have previously received a letter from the agency acknowledging receipt of the initial notification,

or submit other forms of documentation by May 1, 2001, that proper and timely notification had been made.

(2) The person who has submitted a remedial investigation report that fully complies with §335.553(b)(1) of this title (relating to Required Information), as amended, prior to May 1, 2001, may elect to either continue under those rules or to proceed under this chapter.

(3) Any closure plans approved as part of a permit issued prior to May 1, 2000, but not implemented at the time of permit renewal are subject to review for compliance with this chapter as part of the permit renewal process.

(4) The person may resubmit plans or reports that the person has revised voluntarily to conform with the requirements of this chapter, unless such resubmittal would result in noncompliance with a previously approved or imposed schedule of compliance.

### **§350.3. Process.**

Once a release of COCs as defined by various programs has been identified and reported pursuant to rules or procedures established by one of the program areas identified in §350.2 of this title (relating to Applicability), this chapter controls the assessment and any action taken in response to that release. Upon initial notification to the appropriate program, the person will follow the general process as stated in paragraphs (1) - (5) of this section to demonstrate compliance with this chapter.

(1) The person shall conduct an affected property assessment, classify groundwater, determine land use, and notify affected property owners in accordance with this subchapter and Subchapter C of this chapter (relating to Affected Property Assessment).

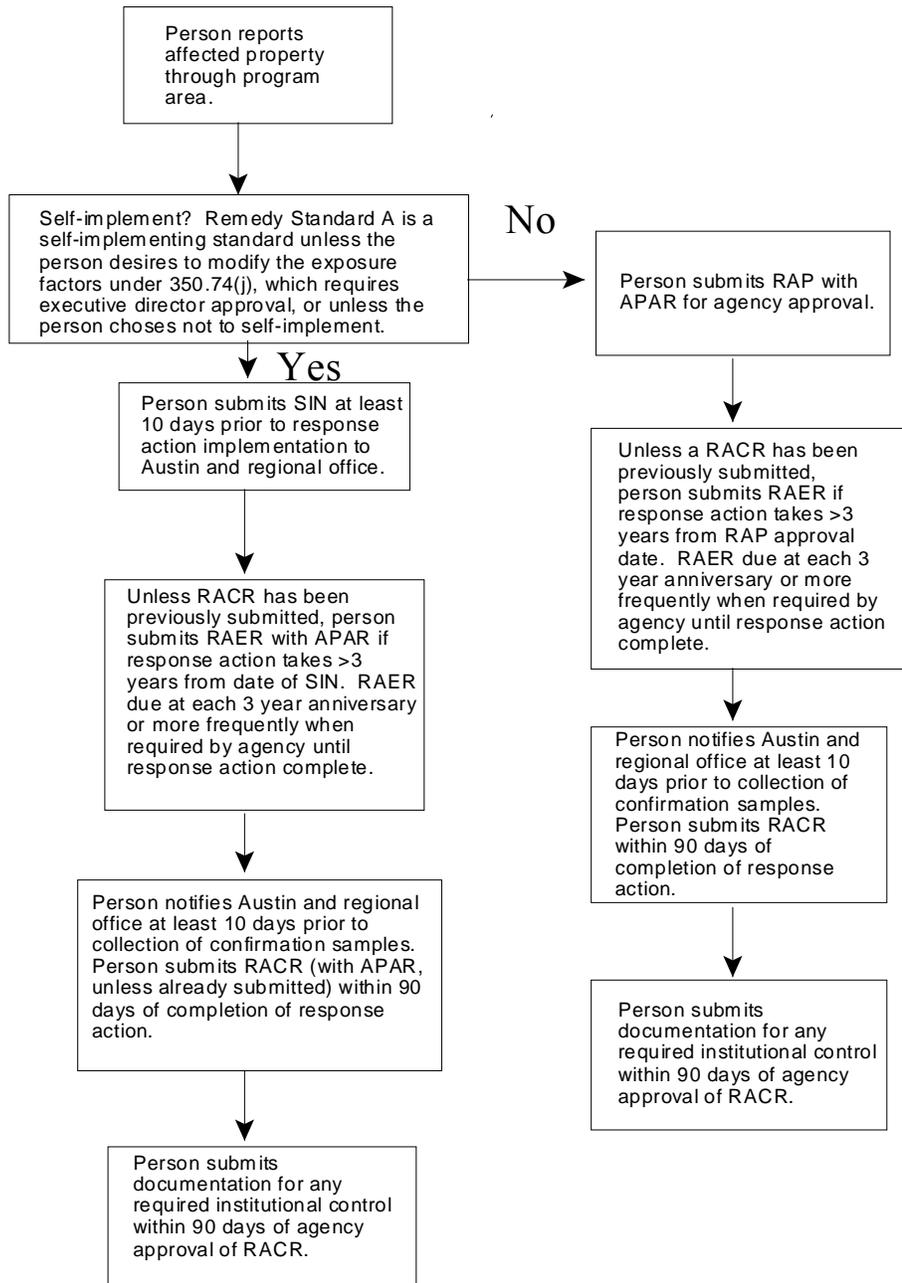
(2) The person shall determine critical protective concentration levels in accordance with Subchapter D of this chapter (relating to Development of Protective Concentration Levels) for the appropriate environmental media.

(3) The person shall develop a response action capable of attaining the response objectives under Remedy Standard A or B in accordance with Subchapter B of this chapter (relating to Remedy Standards).

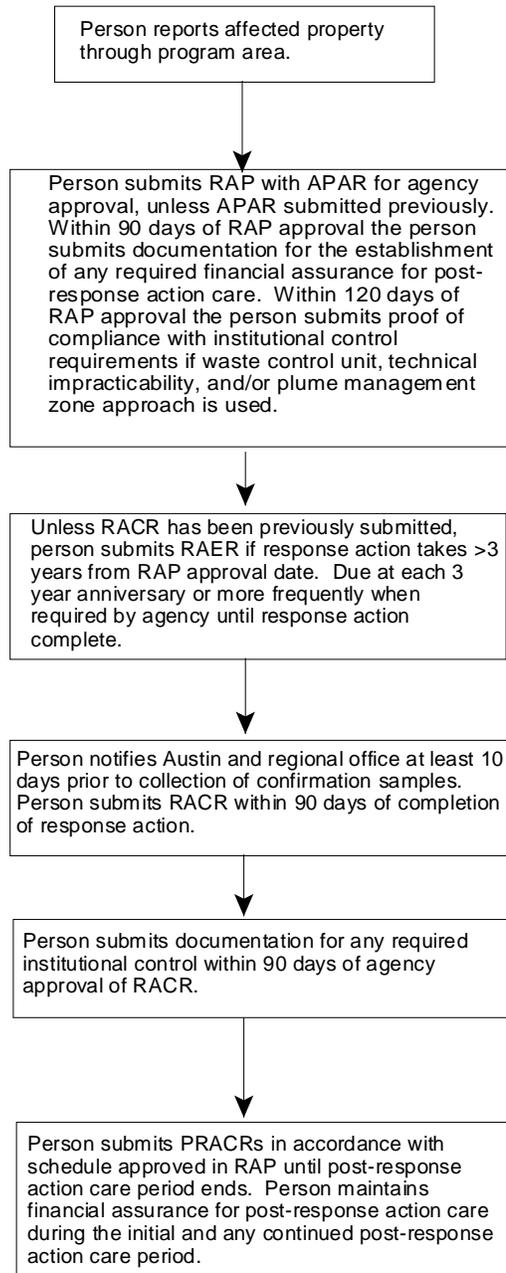
(4) The person shall develop and submit the reports required in Subchapter B of this chapter (relating to Remedy Standards) which contain the information specified for each report in Subchapter E of this chapter (relating to Reports). The sequencing of report submission is illustrated in the following figure.

**Figure: 30 TAC §350.3(4)**

### Remedy Standard A Reporting



## Remedy Standard B Reporting



(5) The person shall implement the response action, document conformance with the response objectives, and if required, file institutional controls, perform post-response action care, and establish financial assurance in accordance with Subchapter B of this chapter (relating to Remedy Standards).

#### **§350.4. Definitions and Acronyms.**

(a) Definitions.

(1) **Affected property**--The entire area (i.e., on-site and off-site; including all environmental media) which contains releases of chemicals of concern at concentrations equal to or greater than the assessment level applicable for residential land use and groundwater classification.

(2) **Alternate point of exposure**--A location other than the prescribed point of exposure where an individual human or population will be assumed to have a reasonable potential to come into contact with chemicals of concern based on property-specific considerations.

(3) **Assessment level**--A critical protective concentration level for a chemical of concern used for affected property assessments where the human health protective concentration level is established under a Tier 1 evaluation as described in §350.75(b) of this title (relating to Tiered Human Health Protective Concentration Level Evaluation), except for the protective concentration level for the soil-to-groundwater exposure pathway which may be established under Tier 1, 2, or 3 as described in §350.75(i)(7) of this title, and ecological protective concentration levels which are developed, when

necessary, under Tier 2 and/or 3 in accordance with §350.77(c) and/or (d), respectively, of this title (relating to Ecological Risk Assessment and Development of Ecological Protective Concentration Levels).

(4) **Attenuation action level**--The maximum concentration of a chemical of concern which can be present at an attenuation monitoring point and not exceed the applicable critical protective concentration level at the points of exposure over time.

(5) **Attenuation monitoring point**--A location within the migration pathway of a chemical of concern which is used to verify that the critical PCL will not be exceeded at the points of exposure.

(6) **Background**--A population of concentrations characterized from samples in an environmental medium containing a chemical of concern that is naturally occurring (i.e., the concentration is not due to a release of chemicals of concern from human activities) or anthropogenic (i.e., the presence of a chemical of concern in the environment which is due to human activities, but is not the result of site-specific use or release of waste or products, or industrial activity). Examples of anthropogenic sources include non-site specific sources such as lead from automobile emissions, arsenic from use of defoliants, and polynuclear aromatic hydrocarbons resulting from combustion of hydrocarbons. There are some commonalities regardless of the activity; specifically, the chemicals of concern have resulted from the use of a product in its intended manner and may be present at generally low levels over large areas (tens of square miles up to hundreds of square miles). Background is required for use in a statistical model appropriate for testing the hypothesis that the background area

characterized by these kinds of models has the same concentrations of the chemical of concern as the affected property. The background area characterized is as “close” as possible to the affected property, in either space or time, as required.

(7) **Bedrock**--The solid rock (i.e., consolidated, coherent, and relatively hard naturally formed material that cannot normally be excavated by manual methods alone) that underlies gravel, soil or other surficial material.

(8) **Bioaccumulative chemical of concern**--A chemical of concern which has the tendency to accumulate in the tissues of an organism as a result of food consumption or dietary exposure and/or direct exposure (e.g., gills and epithelial tissue) to an environmental medium.

(9) **Carcinogen**--A chemical of concern which causes an increased incidence of benign or malignant neoplasms, or substantially decreases the time to develop neoplasms, in animals or humans (a chemical of concern can act as both a carcinogen and a noncarcinogen).

(10) **Carcinogenic risk level**--The probability of development of a neoplasm due to continuous lifetime exposure to a single carcinogen acting through an individual or combined exposure pathway.

(11) **Chemical of concern**--Any chemical that has the potential to adversely affect ecological or human receptors due to its concentration, distribution, and mode of toxicity. Depending on the program area, chemicals of concern may include the following: solid waste, industrial solid

waste, municipal solid waste, and hazardous waste as defined in the Texas Health and Safety Code, §361.003, as amended; hazardous constituents as listed in 40 Code of Federal Regulations Part 261, Appendix VIII, as amended; constituents on the groundwater monitoring list in 40 Code of Federal Regulations Part 264, Appendix IX, as amended; constituents as listed in 40 Code of Federal Regulations Part 258 Appendices I and II, as amended; pollutant as defined in Texas Water Code, §26.001, as amended; hazardous substance as defined in the Texas Health and Safety Code, §361.003, as amended, and Texas Water Code, §26.263, as amended; regulated substance as defined in Texas Water Code, §26.342, as amended, and §334.2 of this title (relating to Definitions), as amended; petroleum product as defined in Texas Water Code, §26.342, as amended, and §334.122(b)(12) of this title (relating to Definitions for ASTs), as amended; other substances as defined in Texas Water Code, §26.039(a), as amended; and daughter products of the aforementioned constituents.

(12) **Closure**--The act of permanently taking a waste management unit or facility out of service.

(13) **Commercial/industrial land use**--Any real property or portions of a property not used for human habitation or for other purposes with a similar potential for human exposure as defined for residential land. Examples of commercial/industrial land use include manufacturing; industrial research and development; utilities; commercial warehouse operations; lumber yards; retail gas stations; auto service stations; auto dealerships; equipment repair and service stations; professional offices (lawyers, architects, engineers, real estate, insurance, etc.); medical/dental offices and clinics (not including hospitals); financial institutions; office buildings; any retail business whose principal activity is the sale of food or merchandise; personal service establishments (health clubs, barber/beauty salons,

mortuaries, photographic studios, etc.); churches (not including churches providing day care or school services other than during normal worship services); motels/hotels (not including those which allow residence); agricultural lands; and portions of government-owned land (local, state, or federal) that have commercial/industrial activities occurring. Land use activities consistent with this classification have the North American Industrial Classification System code numbers 11 - 21 inclusive; 22 except 22131; 23 - 56 inclusive; 61 except 61111, 61121, and 61131; 62 except 62211, 62221, 62231, 62311, 62322, 623311, 623312, 62399, and 62441; 71 except 71219; 72 except 721211 and 72131; 81 except 814; and 92 excluding 92214.

(14) **Community**--An assemblage of plant and animal populations occupying the same habitat in which the various species interact via spatial and trophic relationships (e.g., a desert community or a pond community).

(15) **Compensatory ecological restoration**--The creation of ecological services by or through restoration or the setting aside of, preferably, a comparable type of habitat as that which is impacted to offset residual ecological risk at an affected property. A net environmental benefits analysis or similar evaluation of ecological services may be used in the determination of the appropriate level of compensation.

(16) **Complete exposure pathway**--An exposure pathway where a human or ecological receptor is exposed to a chemical of concern via an exposure route (e.g., incidental soil ingestion, inhalation of volatiles and particulates, consumption of prey, etc.)

(17) **Construction zone**--The typical depth of construction within soil for an affected property considering the planned or historical installation of subsurface utilities, foundations, basements, or other such subsurface structures within the vicinity of the affected property not to extend below the top of bedrock.

(18) **Control**--To apply physical or institutional controls to prevent exposure to chemicals of concern. Control measures must be combined with appropriate maintenance, monitoring, and any necessary further response action to be protective of human health and the environment.

(19) **Critical protective concentration level**--The lowest protective concentration level for a chemical of concern within a source medium determined from all of the applicable human health exposure pathways as described in §350.71 of this title (relating to General Requirements), and when necessary, protective concentration levels for applicable ecological exposure pathways as required in §350.77 of this title (relating to Ecological Risk Assessment and Development of Ecological Protective Concentration Levels).

(20) **Cumulative carcinogenic risk**--The aggregate risk due to exposure of an individual human receptor to multiple carcinogens originating from a single affected property and acting through an individual or combined exposure pathway.

(21) **Decontaminate**--Application or occurrence of a permanent and irreversible treatment process to a waste or environmental medium so that the threat of release of chemicals of concern at concentrations above the critical protective concentration levels is eliminated.

(22) **Deed notice**--An instrument filed in the real property records of the county where the affected property is located that is intended to provide to owners, prospective buyers and others notice and information regarding, but which does not, by itself, restrict use of the affected property.

(23) **De minimus**--The description of an area of affected property comprised of one acre or less where the ecological risk is considered to be insignificant because of the small extent of contamination, the absence of protected species, the availability of similar unimpacted habitat nearby, and the lack of adjacent sensitive environmental areas.

(24) **Ecological benchmark**--A state standard, federal guideline, or other exposure level for a chemical of concern in water, sediment, or soil that represents a protective threshold from adverse ecological effects. An ecological benchmark may also be a toxicity reference value that is established by the person based on scientific studies in the literature.

(25) **Ecological hazard index**--The sum of individual ecological hazard quotients of COCs within a class of compounds that exert ecological effects which have the same toxicological mechanism or endpoint (e.g., PAHs, PCBs).

(26) **Ecological hazard quotient**--The ratio of an exposure level to a chemical of concern to a toxicity value selected for the risk assessment for that chemical of concern (e.g., a no observed adverse effects level).

(27) **Ecological protective concentration level**--The concentration of a chemical of concern at the point of exposure within an exposure medium (e.g., soil, sediment, groundwater, or surface water) which is determined in accordance with §350.77(c) or (d) of this title (relating to Ecological Risk Assessment and Development of Ecological Protective Concentration Levels) to be protective for ecological receptors. These concentration levels are primarily intended to be protective for more mobile or wide-ranging ecological receptors and, where appropriate, benthic invertebrate communities within the waters in the state. These concentration levels are not intended to be directly protective of receptors with limited mobility or range (e.g., plants, soil invertebrates, and small rodents), particularly those residing within active areas of a facility, unless these receptors are threatened/endangered species or unless impacts to these receptors result in disruption of the ecosystem or other unacceptable consequences for the more mobile or wide-ranging receptors (e.g., impacts to an off-site grassland habitat eliminate rodents which causes a desirable owl population to leave the area).

(28) **Ecological risk assessment**--The process that evaluates the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more stressors; however, as used in this context, only chemical stressors (i.e., COCs) are evaluated.

(29) **Ecological services**--The physical, chemical, or biological functions of natural resources that one natural resource provides for another or to the public. Examples include provision of food, protection from predation, and nesting habitat, among others.

(30) **Ecological services analysis**--A measurement of the potential change in ecological services based on considerations which may include, but are not limited to: the percent change in

ecological services at the affected property that are attributable to COCs and/or potential response actions; the spatial extent of the affected property; and the recovery period.

(31) **Environmental medium**--A material found in the natural environment such as soil (including non-waste fill materials), groundwater, air, surface water, and sediments, or a mixture of such materials with liquids, sludges, gases, or solids, including hazardous waste which is inseparable by simple mechanical removal processes, and is made up primarily of natural environmental material.

(32) **Exclusion criteria**--Those conditions at an affected property which preclude the need to establish a protective concentration level for an ecological exposure pathway because the exposure pathway between the chemical of concern and the ecological receptors is not complete or is insignificant.

(33) **Exposure area**--The smallest property surface area within which it is believed that exposure to chemicals of concern in soil or air by a receptor would be limited under reasonably anticipated current or future use scenarios.

(34) **Exposure medium**--The environmental medium or biologic tissue in which or by which exposure to chemicals of concern by ecological or human receptors occurs.

(35) **Exposure pathway**--The course that a chemical of concern takes from a source area to ecological or human receptors and includes a source area, a point of exposure, and an exposure

route (e.g., ingestion), as well as a transport mechanism if the point of exposure is different from the source area.

(36) **Facility**--The installation associated with the affected property where the release of chemicals of concern occurred.

(37) **Facility Operations Area**--One or more areas (lateral and vertical extent) of an operational chemical or petroleum manufacturing plant with North American Industrial Classification System code numbers 325 or 324, respectively, with a hazardous waste permit or commission corrective action order within which response actions to multiple releases of COCs can be consolidated for purposes of compliance with this chapter on an area-wide basis by using interim or permanent response actions. The lateral extent of the facility operations area is limited to the contiguous area actively used for the development, manufacture, process, transfer, storage, and management of chemical or refinery products, hazardous materials, substances and wastes subject to Resource Conservation and Recovery Act regulation, and includes ancillary components such as, but not necessarily limited to, power plants and cooling units.

(38) **Feeding guilds**--Groups of ecological receptors used to represent the variety of species that may be exposed to chemicals of concern at the affected property. The feeding guilds are generally based on function within an ecosystem, potential for exposure, and physiological and taxonomic similarity. Examples include carnivorous mammals, carnivorous birds, and piscivorous birds.

(39) **Functioning cap**--A low permeability layer or other approved cover meeting its design specifications to minimize water infiltration and chemical of concern migration, and prevent ecological or human receptor exposure to chemicals of concern, and whose design requirements are routinely maintained.

(40) **Groundwater-bearing unit**--A saturated geologic formation, group of formations, or part of a formation which has a hydraulic conductivity equal to or greater than  $1 \times 10^{-5}$  centimeters/second.

(41) **Groundwater production zone**--The groundwater-bearing unit(s) which contributes water to a well. For example, if a well penetrates four distinct groundwater-bearing units isolated by competent aquitards, but the well is screened in only two of the units and has a competent annular seal to isolate the other two units, then the groundwater production zone consists of only the two units that contribute water to the well.

(42) **Groundwater protective concentration level exceedence zone**--A protective concentration level exceedence zone within a groundwater-bearing unit.

(43) **Hazard index**--The sum of two or more hazard quotients for multiple noncarcinogens originating from a single affected property.

(44) **Hazard quotient**--The ratio of the level of exposure of a noncarcinogen acting through an individual or combined exposure pathway over a specified time period to a reference dose for the noncarcinogen derived for a similar exposure period.

(45) **Implementation Procedures**--The most current version of *Procedures to Implement the Texas Surface Water Quality Standards*, as amended.

(46) **Innocent Owner or Operator**--Those persons so designated in accordance with Texas Health and Safety Code, Chapter 361, Subchapter V, Immunity From Liability of Innocent Owner or Operator, as amended.

(47) **Institutional control**--A legal instrument placed in the property records in the form of a deed notice, Voluntary Cleanup Program Certificate of Completion (VCP Certificate of Completion), or restrictive covenant which indicates the limitations on or the conditions governing use of the property which ensures protection of human health and the environment or equivalent zoning and governmental ordinances.

(48) **Judgmental sample**--An investigative sample of an environmental medium which is purposefully located based upon property-specific information.

(49) **Laboratory Control Sample**--A spiked blank sample analyzed by the laboratory to assess laboratory ability to successfully recover chemicals of concern from a control matrix.

(50) **Landscaped area**--An area of ornamental, introduced, commercially installed, or manicured vegetation which is routinely maintained.

(51) **Long-term effectiveness**--The ability of a remedy to maintain the required level of protection of human health and the environment over time.

(52) **Lower explosive limit**--The lowest concentration of a vapor or gas in air that will produce a flash of fire when an ignition source (heat, arc, or flame) is present.

(53) **Method detection limit**--The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined for each COC from the analysis of a sample of a given matrix type containing the COC.

(54) **Method quantitation limit**--The lowest non-zero concentration standard in the laboratory's initial calibration curve and is based on the final volume of extract (or sample) used by the laboratory.

(55) **Monitored natural attenuation**--The use of natural attenuation within the context of a carefully controlled and monitored response action to achieve protective concentration levels at the point of exposure.

(56) **Natural attenuation**--The reduction in mass or concentration of a chemical of concern over time or distance from the source of a chemical of concern due to naturally occurring

physical, chemical, and biological processes, such as: biodegradation, dispersion, dilution, adsorption, and volatilization.

(57) **Natural attenuation factor**--The numerical value which represents the natural attenuation (i.e., reduction) in chemical of concern concentrations during transport from the source area to the point of exposure. The natural attenuation factor is the concentration at the source area divided by the concentration at the point of exposure. The natural attenuation factor is always greater than or equal to one for the purposes of this rule.

(58) **Natural Resource Trustees**--The federal agencies as designated by the President and the state agencies as designated by the Governor pursuant to the National Contingency Plan, Oil Pollution Act, and CERCLA §107(f)(2)(A) and (B) to act on behalf of the public as trustees of natural resources (e.g., water, air, land, wildlife). The Trustees include TCEQ, Texas Parks and Wildlife Department, Texas General Land Office, National Oceanic and Atmospheric Administration, and the Department of the Interior.

(59) **Off-site property (off-site)**--All environmental media which is outside of the legal boundaries of the on-site property.

(60) **On-site property (on-site)**--All environmental media within the legal boundaries of a property owned or leased by a person who has filed a self-implementation notice or a response action plan for that property or who has become subject to such action through one of the agency's program areas for that property.

(61) **Permanence/permanent/permanently**--The property of a response action which is capable of enduring indefinitely without posing the threat of any future release of chemicals of concern above the critical protective concentration levels established for the property.

(62) **Person**--An individual, corporation, organization, government or governmental subdivision or agency, business trust, partnership, association, or any other legal entity.

(63) **Physical barrier**--Any structure or system, natural or manmade, that prevents exposure or prevents migration of chemicals of concern to the points of exposure.

(64) **Physical control**--A structure or hydraulic containment action which prevents exposure to and/or migration of chemicals of concern when combined with appropriate post-response action care to protect human health and the environment. Examples of physical controls are caps, slurry walls, sheet piling, hydraulic containment wells, and interceptor trenches, but typically not fences.

(65) **Plume management zone**--The area of the groundwater protective concentration level exceedence zone at the time of response action plan submittal, plus any additional area allowed in accordance with §350.33(f)(4) of this title (relating to Remedy Standard B).

(66) **Point of exposure**--The location within an environmental medium where a receptor will be assumed to have a reasonable potential to come into contact with chemicals of concern. The point of exposure may be a discrete point, plane, or an area within or beyond some location.

(67) **Prescribed points of exposure**--The prescribed on-site and off-site locations within an environmental medium where an individual human or population will be assumed to come into contact with chemicals of concern from an affected property.

(68) **Protective concentration level**--The concentration of a chemical of concern which can remain within the source medium and not result in levels which exceed the applicable human health risk-based exposure limit or ecological protective concentration level at the point of exposure for that exposure pathway.

(69) **Protective concentration level exceedence zone**--The lateral and vertical extent of all wastes and environmental media which contain chemicals of concern at concentrations greater than the critical protective concentration level determined for that medium, as well as, hazardous waste. A protective concentration level exceedence zone can be thought of as the volume of waste and environmental media which must be removed, decontaminated, and/or controlled in some fashion to adequately protect human health and the environment.

(70) **Reasonably anticipated to be completed exposure pathway**--A situation with a credible chance of occurrence in which an ecological or human receptor may become exposed to a chemical of concern (i.e., complete exposure pathway) without consideration of circumstances which are extreme or improbable based on property characteristics.

(71) **Release**--Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment, with the exception of:

(A) A release that results in an exposure to a person solely within a workplace, concerning a claim that the person may assert against the person's employer;

(B) An emission from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, or pipeline pumping station engine;

(C) A release of source, by-product, or special nuclear material from a nuclear incident, as those terms are defined by the Atomic Energy Act of 1954, as amended (42 U.S.C. §2011 *et seq.*), if the release is subject to requirements concerning financial protection established by the Nuclear Regulatory Commission under §170 of that Act;

(D) For the purposes of the environmental response law §104, as amended, or other response action, a release of source, by-product, or special nuclear material from a processing site designated under §102(a)(1) or §302(a) of the Uranium Mill Tailings Radiation Control Act of 1978 (42 U.S.C. §7912 and §7942), as amended; and

(E) The normal application of fertilizer.

(72) **Remediation**--The act of eliminating or reducing the concentration of chemicals of concern in environmental media.

(73) **Remove**--To take waste or environmental media away from the affected property to another location for storage, processing or disposal in accordance with all applicable requirements. Removal is an irreversible process that results in permanent risk reduction at an affected property.

(74) **Residential land use**--Property used for dwellings such as single family houses and multi-family apartments, children's homes, nursing homes, and residential portions of government-owned lands (local, state, or federal). Because of the similarity of exposure potential and the sensitive nature of the potentially exposed population, day care facilities, educational facilities, hospitals, and parks (local, state or federal) shall also be considered residential.

(75) **Response action**--Any activity taken to comply with these regulations to remove, decontaminate and/or control (i.e., physical controls and institutional controls) chemicals of concern in excess of critical PCLs in environmental media, including actions taken in response to releases to environmental media from a waste management unit before, during, or after closure.

(76) **Restrictive covenant**--An instrument filed in the real property records of the county where the affected property is located which ensures that the restrictions will be legally enforceable by the executive director when the person owning the property is an innocent landowner.

(77) **Risk-based exposure limit**--The concentration of a chemical of concern at the point of exposure within an exposure medium (e.g., soil, sediment, vegetables, groundwater, surface water, or air) which is protective for human health. Risk-based exposure limits are the fundamental

risk-based values which are initially determined and used in the development of protective concentration levels. Risk-based exposure limits do not account for cumulative effects from exposure to multiple chemicals of concern, combined exposure pathways, and cross-media or lateral transport of chemicals of concern within environmental media.

(78) **Sample detection limit**--The method detection limit, as defined in this section, adjusted to reflect sample-specific actions, such as dilution or use of smaller aliquot sizes than prescribed in the analytical method, and to take into account sample characteristics, sample preparation, and analytical adjustments. The term, as used in this rule, is analogous to the sample-specific detection limit.

(79) **Sediment**--Non-suspended particulate material lying below surface waters such as bays, the ocean, rivers, streams, lakes, ponds, or other similar surface water body (including intermittent streams). Dredged sediments which have been removed from below surface water bodies and placed on land shall be considered soils.

(80) **Selected ecological receptors**--Species that are to be carried through the ecological risk assessment as representatives of the different feeding guilds and communities that are being evaluated. These species may not actually occur at the affected property, but may be used to represent those within the feeding guild or community that may feed on the affected property.

(81) **Sensitive environmental areas**--Areas that provide unique and often protected habitat for wildlife species. These areas are typically used during critical life stages such as breeding,

hatching, rearing of young, and overwintering. Examples include critical habitat for threatened and endangered species, wilderness areas, parks, and wildlife refuges.

(82) **Soil protective concentration level exceedence zone**--A protective concentration level exceedence zone within the surface soil or subsurface soil which may extend down to a groundwater-bearing unit(s). These protective concentration level exceedence zones may also be present below or between groundwater-bearing units.

(83) **Source area**--The volume of a chemical of concern in environmental media (e.g., soil or groundwater) which is leaching, dissolving or emitting chemicals of concern. Of primary regulatory concern are the source areas that are leaching, dissolving or emitting chemicals of concern at unprotective concentrations under natural conditions, and not in consideration of any physical controls (e.g., slurry walls, caps), that will result in protective concentrations being exceeded at the point of exposure. The source area need not be the horizontal and vertical extent of the protective concentration level exceedence zone when cross-media or lateral chemical of concern transport is required for a point of exposure to be reached. Generally, a source area is located in the vicinity of or below primary release sources (e.g., tanks, pipelines, drums, lagoons, landfills, etc.).

(84) **Source medium**--An environmental medium containing chemicals of concern which must be removed, decontaminated and/or controlled in order to protect human health and the environment. The source medium may be the exposure medium for some exposure pathways.

(85) **Stressor**--Any physical, chemical, or biological entity that can induce an adverse response; however, as used in this context, only chemical entities apply.

(86) **Subsurface soil**--For human health exposure pathways, the portion of the soil zone between the base of surface soil and the top of the groundwater-bearing unit(s). For ecological exposure pathways, the portion of the soil zone between 0.5 feet and 5 feet in depth.

(87) **Surface cover**--A layer of artificially placed utility material (e.g., shell, gravel).

(88) **Surface soil**--For human health exposure pathways, the soil zone extending from ground surface to 15 feet in depth for residential land use and from ground surface to 5 feet in depth for commercial/industrial land use; or to the top of the uppermost groundwater-bearing unit or bedrock, whichever is less in depth. For ecological exposure pathways, the soil zone extending from ground surface to 0.5 feet in depth.

(89) **Surface water**--Any water meeting the definition of surface water in the state as defined in §307.3 of this title (relating to Definitions and Abbreviations), as amended.

(90) **Toxicity reference value**--An exposure level from a valid scientific study that represents a conservative threshold for adverse ecological effects.

(91) **Waste control unit**--A municipal or industrial solid waste landfill, including those Resource Conservation and Recovery Act regulated units closed as landfills, with a liner system (i.e., synthetic or clay) and an engineered cap, that have been closed pursuant to an approved closure plan, previous regulations, or will be implemented pursuant to an approved response action plan.

(b) Acronyms.

- (1) APAR--Affected property assessment report;
- (2) COC--Chemical of concern;
- (3) FOA--Facility Operations Area;
- (4)  $K_d$ --Soil-water partition coefficient;
- (5)  $K_{oc}$ --Octanol-water partition coefficient;
- (6) LOAEL--Lowest observed adverse effect level;
- (7) MCL--Maximum contaminant level;
- (8) NAPLs--Nonaqueous phase liquids;
- (9) NOAEL--No observed adverse effect level;
- (10) PCL--Protective concentration level;

(11) PCLE zone--Protective concentration level exceedence zone;

(12) POE--Point of exposure;

(13) PRACR--Post-response action care report;

(14) RACR -- Response action completion report;

(15) RAER--Response action effectiveness report;

(16) RAP--Response action plan;

(17) RBEL--Risk-based exposure limit;

(18) SIN--Self-implementation notice;

(19) TAC--Texas Administrative Code;

(20) TCEQ--Texas Commission on Environmental Quality;

(21) TPDES--Texas Pollutant Discharge Elimination System; and

(22) U.S. EPA--United States Environmental Protection Agency.

(c) Risk-based exposure limit nomenclature. A nomenclature is used in Subchapter D of this chapter (relating to the Development of Protective Concentration Levels) to refer to specific RBELs. The RBEL nomenclature reflects the exposure medium and the exposure route. The exposure medium appears first in superscript text, followed by RBEL in regular text and lastly the exposure route in subscript text. For example <sup>Soil</sup>RBEL<sub>Ing</sub> is a RBEL where soil is the exposure medium and ingestion is the exposure route.

(1) <sup>Air</sup>RBEL<sub>Inh</sub>--air inhalation RBEL;

(2) <sup>Soil</sup>RBEL<sub>Derm</sub>--dermal contact with soil RBEL;

(3) <sup>Soil</sup>RBEL<sub>Ing</sub>--ingestion of soil RBEL;

(4) <sup>GW</sup>RBEL<sub>Ing</sub>--ingestion of groundwater RBEL;

(5) <sup>GW</sup>RBEL<sub>Class 3</sub>--class 3 groundwater RBEL;

(6) <sup>SW</sup>RBEL--surface water RBEL;

(7) <sup>AbgVeg</sup>RBEL<sub>Ing</sub>--ingestion of aboveground vegetables RBEL; and

(8) <sup>BgVeg</sup>RBEL<sub>Ing</sub>--ingestion of below-ground vegetables RBEL.

(d) Protective concentration level nomenclature. A nomenclature is used in Subchapter D of this chapter (relating to the Development of Protective Concentration Levels) to refer to specific PCLs.

The PCL nomenclature reflects the exposure medium, source medium and the exposure route. The exposure medium appears first in superscript text, followed by the source medium in regular text and lastly the exposure route in subscript text. For example,  $^{GW}GW_{Ing}$  is a PCL where groundwater is the source medium (GW), groundwater is the exposure medium ( $^{GW}$ ), and ingestion is the exposure route ( $_{Ing}$ ). Cross-media transfer is indicated when exposure occurs in a different medium than the source medium. For example,  $^{Air}Soil_{Inh-v}$  is a PCL where soil is the source medium and air is the exposure medium.

(1)  $^{GW}GW_{Ing}$ --PCL for groundwater ingestion;

(2)  $^{GW}GW_{Class\ 3}$ --PCL for class 3 groundwater;

(3)  $^{Air}GW_{Inh-v}$ --PCL for inhalation of volatiles from groundwater;

(4)  $^{SW}GW$ --PCL for groundwater discharge to surface water;

(5)  $^{Tot}Soil_{Comb}$ --surface soil PCL for combined soil ingestion, dermal contact, inhalation of volatiles and particulates, and for residential land use, ingestion of aboveground and below-ground vegetables;

- (6) <sup>Air</sup>Soil<sub>Inh-VP</sub>--PCL for inhalation of volatiles and particulates from surface soil;
- (7) <sup>Soil</sup>Soil<sub>Derm</sub>--PCL for dermal contact with surface soil;
- (8) <sup>Soil</sup>Soil<sub>Ing</sub>--PCL for ingestion of surface soil;
- (9) <sup>Veg</sup>Soil<sub>Ing-Inorg</sub>--surface soil PCL for ingestion of inorganic COCs in vegetables;
- (10) <sup>Veg</sup>Soil<sub>Ing-Org</sub>--surface soil PCL for ingestion of organic COCs in vegetables;
- (11) <sup>GW</sup>Soil--PCL for surface and subsurface soil to protect groundwater;
- (12) <sup>Air</sup>Soil<sub>Inh-V</sub>--PCL for inhalation of volatiles from subsurface soil;
- (13) <sup>Air</sup>Air<sub>Inh</sub>--air PCL for inhalation; and
- (14) <sup>SW</sup>SW--surface water PCL.

## **SUBCHAPTER B: REMEDY STANDARDS**

### **§§350.33, 350.34, 350.37**

#### **STATUTORY AUTHORITY**

The amended rules are adopted under the following statutory authority: TWC, §5.103 and §26.011, which provide the commission with authority to adopt any rules necessary to carry out its powers, duties, and policies and to protect water quality in the state; TWC, §5.103(c), which states the commission must adopt rules when adopting, repealing, or amending any agency statement of general applicability that interprets or prescribes law or policy or describes the practice and procedure requirements of the agency, and Texas Health and Safety Code (THSC), Texas Solid Waste Disposal Act, §361.017 and §361.024, which provide the commission the authority to regulate industrial solid waste and municipal hazardous wastes and all other powers necessary or convenient to carry out its responsibilities. In addition, the amended rules are adopted under 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 preventive 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 committing any other act or engaging in any other activity which in itself or in conjunction with any other discharge or activity causes, continues to cause, or will cause pollution of any of the water in the state; TWC, §26.262, which states that it is the policy of this state to prevent the spill or discharge of hazardous substances into the waters in the state and to cause the removal of such spills and discharges without undue delay; and TWC, §26.264, which provides the commission with authority to issue rules necessary and

convenient to carry out the policy referenced in TWC, §26.262. Authority to adopt the amended rules is also provided by TWC, §26.341, which states that it is the policy of this state to maintain and protect the quality of groundwater and surface water resources in the state from certain substances in underground and aboveground storage tanks that may pollute groundwater and surface water resources, and requires the use of all reasonable methods, including risk-based corrective action to implement this policy; TWC, §26.345, which provides the commission with the authority to adopt rules necessary to carry out the policy referenced in TWC, §26.341; and 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 regulation by state agencies be conducted in a manner that will maintain present uses and not impair potential uses of groundwater or pose a public health hazard, and that the quality of groundwater be restored if feasible.

The adopted amendments implement TWC, §§5.103, 26.011, 26.039, 26.262, 26.264, 26.341, 26.345, and 26.401, and THSC, §361.017 and §361.024.

**§350.33. Remedy Standard B.**

(a) To attain Remedy Standard B, the person shall:

(1) Remove, decontaminate, and/or control the surface soil, subsurface soil, and groundwater human health PCLE zones, other environmental media, and hazardous and non-hazardous waste in accordance with the provisions of this section such that humans will not be exposed to concentrations of COCs in the exposure media in excess of the residential or commercial/industrial critical human health PCLs, as applicable, at the prescribed, or any approved alternate POEs

established for environmental media in accordance with §350.37 of this title (relating to Human Health Points of Exposure);

(2) Ensure that leachate from the surface and subsurface soil PCLE zones does not increase the concentration of COCs in class 2 groundwater above the measured concentration at the time of RAP submittal in circumstances when an alternate POE to class 2 groundwater is authorized in response to subsection (f)(4) of this section; and

(3) Use either subparagraph (A) or (B) of this paragraph to respond to an affected property when either the initial concentrations of COCs within environmental media exceed only the ecological PCLs (i.e., there is no exceedence of human health PCLs) or when there will be residual concentrations of COCs above the ecological PCLs following completion of a human health response action. When human health PCLs are exceeded within environmental media at an affected property, a person must perform a response action pursuant to paragraph (1) of this subsection to address these risks to human health unless the person adequately demonstrates that the threats to human health are minimal and that a human health-based response action would have a significant and highly disproportionate effect on ecological receptors.

(A) The person shall remove, decontaminate, and/or control the environmental media, and hazardous and non-hazardous waste in accordance with the provisions of this section such that ecological receptors will not be exposed to concentrations of COCs in the exposure medium in excess of the ecological PCLs at the POEs determined in accordance with §350.77 of this title (relating to Ecological Risk Assessment and Development of Ecological Protective Concentration Levels).

(B) When, after consultation with the Natural Resource Trustees, it is determined appropriate by the executive director, the person may use the results of a Tier 2 or 3 ecological risk assessment performed in accordance with §350.77 of this title (relating to Ecological Risk Assessment and Development of Ecological Protective Concentration Levels) and other appropriate information or data to conduct an ecological services analysis of the affected property. However, an ecological services analysis must be conducted whenever concentrations of COCs which exceed ecological PCLs are proposed to be left in place with the potential for continuing exposure. The ecological services analysis must, at a minimum, include an evaluation of the effects of reasonable and feasible remediation alternatives, including complete removal/decontamination to PCLs and a control measure to prevent ecological exposure to COCs in excess of ecological PCLs, with respect to present and predicted losses of ecological services; and clear justification for leaving COCs in place above ecological PCLs. Furthermore, the person shall also ensure, where appropriate, that the ecological services analysis includes a plan to provide compensatory ecological restoration which may also be combined with some type of active response action (e.g., hot spot removal) or passive response action (e.g., natural attenuation) for the affected property. The ecological services produced by the restoration activity must exceed the future ecological service decreases potentially associated with the continued exposure to COCs and/or any selected response action at the affected property. The person must conduct the compensatory ecological restoration and other activities associated with the ecological services analysis with the approval of and in cooperation with the Natural Resource Trustees. The executive director may develop guidance which further describes the ecological services analysis process.

(b) As defined further by the surface and subsurface soil response objectives in subsection (e) of this section and the groundwater response objectives in subsection (f) of this section, the person performing a response action to attain Remedy Standard B may use removal and/or decontamination, removal and/or decontamination with controls, or controls only, with the exception of response actions for Class 1 groundwater PCLE zones which must be removed and/or decontaminated to the critical groundwater PCL for each COC.

(1) The person may use both physical and institutional controls.

(2) For all actions to attain Remedy Standard B, the person shall demonstrate that the response actions which they propose to use will attain the requirements of subsection (a) of this section within a reasonable time frame given the particular circumstances of an affected property. Remedial alternatives, including the use of monitored natural attenuation as a decontamination or control remedy, must be appropriate considering the hydrogeologic characteristics of the affected property, COC characteristics, and the potential for unprotective exposure conditions to continue or result during the remedial period.

(c) PCLs for Remedy Standard B are determined through consideration of on-site and off-site POEs, or alternate POEs.

(d) Remedy Standard B is not a self-implementing standard. The person must receive the executive director's written approval of a RAP and an APAR, either submitted at the same time as the

RAP or previously, before commencing response actions to attain the standard, but this does not preclude the person from taking interim measures.

(e) The following are the Remedy Standard B surface and subsurface soil response objectives and associated requirements for response actions performed in accordance with subsections (a)(1) - (2), and (a)(3)(A) of this section to address human health and/or ecological risks at an affected property. A person may choose to attain the surface and subsurface soil response objectives for an affected property either by conducting a response action which makes use of removal and/or decontamination or by conducting a response action which makes use of removal and/or decontamination with controls or controls only.

(1) When all surface and subsurface soil response objectives specified in subsection (a) of this section are met through removal and/or decontamination, then the person shall fulfill any post-response action care obligations described in the approved RAP, but shall not be required to provide financial assurance for the soils.

(2) When a person chooses to attain the surface and subsurface soil response objectives specified in subsection (a) of this section for an affected property by conducting a response action which uses removal and/or decontamination with controls or controls only, then the person must also comply with the requirements of this paragraph.

(A) The person shall demonstrate that any physical control or combination of measures proposed to be used (e.g., waste control unit, cap, slurry wall, treatment that does not attain

decontamination; or a landfill) will reliably contain COCs within and/or derived from the surface and subsurface soil PCLE zone materials over time.

(B) The person shall fulfill the post-response action care obligations described in the approved RAP.

(C) The person shall provide financial assurance in accordance with subsections (l) and (m) of this section.

(f) The following are the Remedy Standard B groundwater response objectives and associated requirements for response actions performed in accordance with subsections (a)(1) - (2), and (a)(3)(A) of this section to address human health or environmental risk at an affected property. The person shall achieve the Remedy Standard B groundwater PCLE zone response objectives stated in paragraph (1) of this subsection, unless the person demonstrates that an affected property meets the qualifying criteria for one, or a combination, of the modified groundwater response approaches described in paragraphs (2) - (4) of this subsection. A person who satisfactorily demonstrates technical impracticability as described in paragraph (3) of this subsection, may use technical impracticability to establish a plume management zone as described in paragraph (4) of this subsection for instances when a plume management zone would not otherwise be authorized by the executive director, except that the person shall not allow the groundwater plume management zone to expand beyond the existing boundary of the groundwater PCLE zone. A person who uses one, or a combination, of the modified groundwater response approaches shall fulfill the post-response action care obligations described in the approved RAP. A person who uses one, or a combination, of the modified groundwater response approaches

which utilizes a physical control(s) shall provide financial assurance as specified in subsections (l) and (m) of this section.

(1) General groundwater response objectives. For all groundwater classes, the person must:

(A) use either an active restoration approach or monitored natural attenuation (if appropriate considering the hydrogeologic characteristics of the affected property, chemical-specific data for the COCs, and whether the anticipated time frame to achieve the critical groundwater PCLs is reasonable) to reduce the concentration of COCs to the critical groundwater PCLs throughout the groundwater PCLE zone;

(B) while achieving subparagraph (A) of this paragraph, prevent COCs at concentrations above the critical groundwater PCLs from migrating beyond the existing boundary of the groundwater PCLE zone;

(C) prevent COCs from migrating to air at concentration levels above the PCLs for air (i.e.,  $^{Air}Air_{Inh}$ );

(D) prevent COCs from migrating to surface water at concentration levels above the PCLs for groundwater discharges to surface water (i.e.,  $^{SW}GW$ ); and

(E) prevent human and ecological receptor exposure to the groundwater PCLE zone.

(2) Waste control unit. When the approved RAP includes an existing or planned waste control unit which overlies an existing groundwater PCLE zone, the person may, with the executive director's approval, exclude the groundwater throughout that portion of the groundwater PCLE zone directly underlying the waste control unit from the requirement to meet the groundwater response objectives provided in paragraph (1) of this subsection. To use this approach, the person shall comply with the institutional control requirements in §350.31(g) of this title (relating to General Requirements for Remedy Standards), with the exception that proof of compliance with the institutional control requirements must be submitted to the executive director within 120 days of approval of the RAP, which provides notice of the existence and location of the groundwater PCLE zone beneath the waste control unit and which prevents usage of and exposure to this groundwater until such time as the COCs may reduce to the critical groundwater PCLs. Beyond the perimeter of the waste control unit, the groundwater response objectives must be met.

(3) Technical impracticability. A technical impracticability demonstration can be used for all three classes of groundwater under Remedy Standard B. To use this approach, the person must:

(A) demonstrate in accordance with the United States Environmental Protection Agency (EPA) "Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration" (Office of Solid Waste and Emergency Response Directive 9234.2-25 or subsequent version), as amended, or other method approved by the executive director, that it is not feasible from a physical

perspective using currently available remediation technologies due either to hydrogeologic or chemical-specific factors to reduce the concentration of COCs throughout all or a portion of the groundwater PCLE zone to the applicable critical groundwater PCLs within a reasonable time frame;

(B) use removal or decontamination actions to reduce the concentrations of COCs to the critical groundwater PCLs for any portion of the groundwater PCLE zone for which it is technically practicable;

(C) prevent migration of COCs from that portion of the groundwater PCLE zone which satisfies the technical impracticability demonstration in subparagraph (A) of this paragraph;

(D) achieve the performance criteria in subsection (f)(4)(E) of this section for NAPLs;

(E) establish a plume management zone for the area where COCs cannot be removed so as to attain the critical PCLs, and prevent COCs at concentrations above the critical groundwater PCLs from spreading beyond the existing boundary of the groundwater PCLE zone; and

(F) comply with the institutional control requirements in §350.31(g) of this title (relating to General Requirements for Remedy Standards), with the exception that proof of compliance with the institutional control requirements must be submitted to the executive director within 120 days of the approval of the RAP, which provides notice of the existence and location of the groundwater

PCLE zone and which prevents usage of and exposure to groundwater from this zone until such time as the COCs may reduce to the critical groundwater PCLs.

(4) Plume management zones. With the approval of the executive director, the person may use a plume management zone under Remedy Standard B for class 2 and 3 groundwater-bearing units which presently contain a groundwater PCLE zone.

(A) To use a plume management zone, the person must demonstrate that the COCs will not pose a substantial present or potential hazard to human health or the environment as long as the attenuation action levels are not exceeded at the respective attenuation monitoring points based upon a consideration of the following factors:

(i) potentially adverse effects on groundwater quality, considering:

(I) the physical and chemical characteristics of the COC,  
including its potential for migration;

(II) the hydrogeological characteristics of the affected property  
and surrounding land;

(III) the quantity of groundwater and the direction of  
groundwater flow;

(IV) the proximity and withdrawal rates of groundwater users;

(V) the current and future uses of groundwater in the area;

(VI) the existing quality of groundwater, including other sources of COCs and their cumulative impact on the groundwater quality;

(VII) the potential for health risks caused by human exposure to COCs;

(VIII) the potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to COCs;

(IX) the persistence and permanence of the potentially adverse effects; and

(ii) potentially adverse effects on hydraulically-connected surface water quality, considering:

(I) the volume and physical and chemical characteristics of the COCs present at the affected property;

(II) the hydrogeological characteristics of the affected property and surrounding land;

(III) the quantity and quality of groundwater, and the direction of groundwater flow;

(IV) the patterns of rainfall in the region;

(V) the proximity of the source area to surface water;

(VI) the current and future uses of surface waters in the area and any water quality standards established for these surface waters;

(VII) the existing quality of surface water, including other sources of COCs and their cumulative impact on surface-water quality;

(VIII) the potential for health risks caused by human exposure to COCs;

(IX) the potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to COCs; and

(X) the persistence and permanence of the potentially adverse effects.

(B) Provided the person demonstrates that the establishment of a plume management zone is appropriate, the POE to groundwater may be changed from throughout the groundwater PCLE zone to an alternate location established in accordance with §350.37(l) or (m) of this title (relating to Human Health Points of Exposure) as applicable, or at the POE for ecological receptors determined in accordance with §350.77 of this title (relating to Ecological Risk Assessment and Development of Ecological Protective Concentration Levels), where that location is more restrictive.

(C) In order to establish a plume management zone, the person must:

(i) comply with the institutional control requirements in §350.31(g) of this title, with the exception that proof of compliance with the institutional control requirements shall be submitted to the executive director within 120 days of the approval of the RAP, which provides notice of the existence and location of the plume management zone and which prevents exposure to groundwater from this zone until such time as COCs may reduce to the critical groundwater PCLs;

(ii) demonstrate through an appropriate technical presentation that COCs will not migrate beyond the downgradient boundary of the plume management zone at concentrations above the critical groundwater PCLs; and

(iii) demonstrate through the performance of a field survey in the plume management zone that there are no artificial penetrations (e.g., abandoned wells or wells with open-hole completions) which can allow COCs at concentrations which exceed the critical groundwater PCLs to migrate from the groundwater PCLE zone to currently unaffected groundwater-bearing units.

(D) The person shall establish groundwater attenuation monitoring points beginning at an appropriate hydraulically upgradient location within the groundwater PCLE zone and continuing down the approximate central flow path of the COCs to the downgradient extent of the plume management zone.

(i) The number and location of attenuation monitoring points shall be demonstrated to be adequate to reliably verify over time the current and future conformance with the plume management zone response objectives. The number and location of attenuation monitoring points shall depend upon a site-specific evaluation of the hydrogeologic conditions of an affected property, the fate and transport characteristics of the COCs, and the length and configuration of the plume management zone.

(ii) The person shall calculate attenuation action levels for each COC at each attenuation monitoring point that cannot be exceeded in order for the critical groundwater PCLs to not be exceeded at the POE. The person shall periodically evaluate the adequacy of the attenuation action levels using any newly acquired empirical monitoring data and reestablish them as necessary to ensure the critical groundwater PCLs are not exceeded at the groundwater POE.

(iii) The person shall monitor concentrations of COCs in groundwater at the attenuation monitoring points and the POE in accordance with a schedule approved by the executive director which is adequate to reliably demonstrate conformance with the applicable groundwater response objectives. If an attenuation action level is exceeded at its respective attenuation monitoring point, or a critical groundwater PCL is exceeded at the groundwater POE, then the person shall take an active response action to meet the response objectives presented in subparagraph (F) of this paragraph. The executive director may authorize the person to implement an accelerated monitoring program prior to initiating an active response action in order to verify that a response action is warranted.

(E) The person is required to reduce NAPLs which contain COCs in excess of PCLs within a plume management zone to the extent practicable. In the determination of adequate NAPL reduction, the executive director may consider conformance with the following criteria and other relevant factors:

(i) readily recoverable NAPLs have been recovered;

(ii) the NAPLs will not generate explosive conditions as defined in §350.31(c) of this title (relating to General Requirements for Remedy Standards);

(iii) the NAPLs will not discharge to the ground surface, to surface waters, to structures, or to other groundwater-bearing units;

(iv) the vertical and lateral extent of NAPLs will not increase under natural conditions, or sufficient NAPLs have been recovered such that an active recovery system can be demonstrated to effectively control or contain migration of NAPLs (i.e., no increased NAPL extent); and

(v) the NAPLs will not result in the critical groundwater PCLs being exceeded at the downgradient boundary of the plume management zone or in the critical PCLs for other environmental media being exceeded at the applicable POE.

(F) The person shall have the continuing obligation to assess whether changes to local hydraulic gradients would increase the likelihood that COCs can migrate beyond the plume management zone at concentrations above the critical groundwater PCLs. If such changed conditions occur, the person must take any necessary corrective action to ensure that concentrations of COCs exceeding the critical groundwater PCLs do not migrate beyond the boundary of the plume management zone and report the changed condition to the executive director in a timely manner. The person may demonstrate that the hydrogeologic characteristics of a property are such that off-site activities cannot influence an on-site plume management zone and, thus, not be required to monitor changes in the hydraulic gradient.

(i) A person may choose to attain the groundwater response objectives for a plume management zone at an affected property either by conducting a response action, if necessary, which makes use of removal and/or decontamination, or with use of removal and/or decontamination with controls or controls only. For both of these approaches, in situations where the

PCLE zone extends beyond the limits of an institutional control and the POE to groundwater is thus located within the existing limits of the groundwater PCLE zone, a person may use monitored natural attenuation as a decontamination process provided the person shall demonstrate that the groundwater PCLE zone is not expanding and that the critical groundwater PCL will be met at the POE within a reasonable time frame given the particular circumstances of an affected property. In the situation where the groundwater PCLE zone has not reached steady-state conditions and is migrating downgradient within the plume management zone, the person must use a response action other than monitored natural attenuation, unless it can be demonstrated that the critical groundwater PCL and any other critical PCLs will not be exceeded at the respective POEs.

(ii) When a person chooses to attain the groundwater response objectives for a plume management zone at an affected property by conducting a removal and/or decontamination response action, the person must comply with the requirements of this clause.

(I) The person must remove and/or decontaminate the groundwater PCLE zone to the extent necessary so that the critical groundwater PCLs will not be exceeded at the POE and the attenuation action levels are not exceeded at their respective attenuation monitoring points, and so that the critical PCLs for other environmental media will not be exceeded at their applicable POEs.

(II) The person shall fulfill the post-response action care obligations described in the approved RAP.

(III) Provided the person adequately documents attainment of the groundwater plume management zone response objectives provided in subclause (I) of this clause, there are no financial assurance requirements.

(iii) When a person chooses to attain the groundwater response objectives for a plume management zone at an affected property by conducting a response action which uses removal and/or decontamination with controls or controls only, the person must comply with the requirements of this clause.

(I) The person must remove, decontaminate, and/or control the groundwater PCLE zone to the extent necessary so that the critical groundwater PCLs will not be exceeded at the POE and so that the critical PCLs for other environmental media will not be exceeded at their applicable POEs.

(II) The person may use physical controls (e.g., slurry walls, sheet piling, interceptor trenches, or hydraulic control wells) which are capable of reliably containing and preventing the expansion over time of the groundwater source area.

(III) For any portion of a groundwater PCLE zone within class 2 or 3 groundwater which is outside of any physical control constructed in accordance with subclause (II) of this clause, the person must reduce the concentration of COCs such that the remaining COCs will satisfy the conditions specified in clause (ii)(I) of this subparagraph.

(IV) The person shall fulfill the post-response action care obligations described in the approved RAP.

(V) The person shall provide financial assurance for post-response action care in accordance with subsections (l) and (m) of this section.

(g) The type, method and extent of post-response action care will be defined on a site-specific basis in the approved RAP and shall be a function of the long-term effectiveness of the response action used to address the soil and/or groundwater PCLE zones or other environmental media containing COCs, the nature and design of any physical controls, the physical and chemical characteristics of the COCs, the geology and hydrogeology of the affected property, and the adjacent land use. The person shall conduct post-response action care as appropriate which includes, but is not limited to:

(1) monitoring of environmental media to verify response action effectiveness over time;

(2) inspection, operation, and maintenance of physical controls to ensure the effectiveness and integrity of the controls over time; and

(3) any other actions after the initial completion of the response action at an affected property which are necessary to protect human health or the environment.

(h) The post-response action care period begins upon approval of the RACR by the executive director. The person shall perform post-response action care for 30 years unless the person demonstrates that a shorter post-response action care period would be appropriate due to:

- (1) the nature of the response action;
- (2) the persistence, migration potential, and toxicity of the COCs; and
- (3) the physical characteristics and location of the affected property.

(i) The post-response action care activities shall continue throughout the initial post-response action care period in response to subsection (h) of this section and during any continued post-response action care period in response to subsection (j) of this section until a demonstration is made that there is no longer a threat to human health or the environment from the presence of COCs in any environmental media or physical controls. If the person submits a demonstration which documents that post-response action care is no longer necessary then, upon written approval by the executive director, the remainder of the initial or any continued post-response action care period will be canceled and the person will be released from the requirement to maintain financial assurance, and the financial assurance will be returned. The demonstration of no threat to human health or the environment shall be made by adequately documenting one of the following conditions:

- (1) the concentrations of COCs in soils are less than or equal to the critical surface and subsurface soil PCLs, as applicable, and the concentrations of COCs in groundwater are less than or

equal to the critical groundwater PCLs as documented with three consecutive years of groundwater monitoring data, unless an alternate monitoring period is approved by the executive director;

(2) the post-response action care activity consists entirely of monitoring the effectiveness of a physical control, and the physical control has been proven successful and secure (i.e., the physical control is permanent and does not require any inspections or maintenance);

(3) an affected property contains only a groundwater PCLE zone and such groundwater PCLE zone has been demonstrated to be reducing in size and to have boundaries which are sufficiently smaller than the boundaries of an institutional control so as to preclude any potential for the groundwater PCLE zone to migrate beyond the boundaries of the institutional control considering both natural hydrogeologic conditions and changes to hydraulic gradients by off-site activities; or

(4) the COC concentrations in surface and subsurface soils exceed only <sup>GW</sup>Soil, but the groundwater PCLE zone has been demonstrated to be reducing in size and to have boundaries which are sufficiently smaller than the boundaries of an institutional control so as to preclude any potential for the groundwater PCLE zone to migrate beyond the boundaries of the institutional control considering both natural hydrogeologic conditions and potential changes to hydraulic gradients by off-site activities.

(j) If the person cannot make one of the demonstrations specified in subsection (i) of this section by the end of the initial post-response action care period specified in subsection (h) of this section, then the person shall be required to continue post-response action care for additional 30-year periods or until a demonstration of no threat to human health or the environment can be made under subsection (i) of

this section. A shorter continued post-response action care period can be used provided the person demonstrates that such period would be appropriate due to:

- (1) the nature of the response action;
- (2) the persistence, migration potential, and toxicity of the COCs; and
- (3) the physical characteristics and location of the affected property.

(k) The person shall perform the following record keeping and reporting requirements during the initial and any continued post-response action care period:

- (1) keep a copy of the approved RAP at the property, or specified alternative location;
- (2) keep records of all monitoring data, inspection and maintenance reports, and unexpected occurrences affecting any waste control unit or post-response action care systems;
- (3) submit Post-Response Action Care Reports (PRACRs) in accordance with the schedule in the approved RAP; and
- (4) notify the executive director in writing within 30 days after an unexpected event occurs, or a condition is detected, during the post-response action care period which indicates that additional response actions will be required at an affected property.

(l) For properties using physical control measures in response to subsections (e)(2) and/or (f) of this section, financial assurance shall be established and maintained for the post-response action care period specified in subsection (h) of this section. The person shall prepare and include in the RAP a written cost estimate in current dollars of the total cost of the post-response action care activities for the post-response action care period specified in subsection (h) of this section. The cost estimate shall be based on the costs of hiring a third party to conduct the post-response action care activities. Within 90 days after the executive director's approval of the RAP and before commencing work indicated in the RAP, an acceptable financial assurance mechanism must be submitted to the commission for post-response action care in the amount specified in the approved RAP. If the total post-response action care cost estimate is \$100,000 or less, the executive director may choose to exempt the person from providing a financial assurance demonstration. For persons meeting the requirements of subsection (n) of this section, the amount of financial assurance demonstrated may be less than the total post-response action care cost estimate. Financial assurance for post-response action care shall be demonstrated in compliance with Chapter 37, Subchapter N of this title (relating to Financial Assurance Requirements for the Texas Risk Reduction Program Rules). The executive director may perform the post-response action care activities at an affected property using the funds provided for this purpose when the executive director determines that a person has failed to provide the post-response action care described in an approved RAP.

(m) For properties using physical control measures in response to subsections (e)(2) and/or (f) of this section that require post-response action care beyond the initial post-response action care period, financial assurance shall continue to be demonstrated for the post-response action care period specified in subsection (j) of this section. At least 180 days before the end of the preceding post-response action

care period, a written cost estimate in current dollars shall be prepared and submitted for the cost of continuing the post-response action care activities specified in the approved RAP for the additional post-response action care period specified in subsection (j) of this section. The cost estimate shall be based on the costs of hiring a third party to conduct the post-response action care activities. At least 90 days before the end of the preceding post-response action care period, an acceptable financial assurance mechanism shall be submitted for the continued post-response action care period in an amount approved by the executive director. If the total post-response action care cost estimate is \$100,000 or less, the executive director may choose to exempt the person from providing a financial assurance demonstration. For persons meeting the requirements of subsection (n) of this section, the amount of financial assurance demonstrated may be less than the total post-response action care estimate. Financial assurance for post-response action care shall be demonstrated in compliance with Chapter 37, Subchapter N of this title (relating to Financial Assurance Requirements for the Texas Risk Reduction Program Rule). The executive director may perform the continued post-response action care activities at an affected property using the funds provided for this purpose when the executive director determines that a person has failed to provide the post-response action care described in an approved RAP.

(n) The owner or an authorized officer of a small business, as defined in this subsection, may seek to reduce the amount of financial assurance demonstrated under this subsection if the initial post-response action care period or subsequent post-response action care periods specified in subsections (h) - (j) of this section are greater than ten years. If the executive director determines a person meets the definition as specified in paragraph (2) of this subsection, the person shall submit the affidavit required by paragraph (1) of this subsection and establish and maintain financial assurance for the post-response action care period in an amount based on the following equation:  $((\text{total cost estimate})/(\text{number of years}$

in total response action care period)) X 10. The owner shall continue demonstrating subsequent post-response action care in ten year periods or as directed by the executive director. The owner or an authorized officer is required to notify the executive director when the definition specified in paragraph (2) of this subsection is no longer met. A small business must comply with subsections (l) and (m) of this section relating to financial assurance.

(1) An affidavit signed by the owner or an authorized officer stating the business meets the definition of a small business as defined in paragraph (2) of this section shall be submitted to the executive director.

(2) Definition of small business.

(A) For purposes of financial assurance, a small business shall be defined as any person, firm, or business which employs, by direct payroll and/or through contract, fewer than 100 full-time employees and has net annual receipts of less than \$3 million. Net annual receipts are defined as annual gross receipts less returns, discounts, and adjustments. The period used to determine net annual receipts shall be the preceding 12-month accounting year and can be either a calendar or fiscal-based period.

(B) A business that is a wholly-owned subsidiary of a corporation shall not qualify as a small business under this section if the parent organization does not qualify as a small business under this section.

**§350.34. No Further Action.**

Particular agency program areas covered by this rule will confirm that a person has completed all necessary response actions at an affected property and that no further action is required. The program areas may issue other letters acknowledging conditional or partial completion of response actions, as appropriate.

(1) For Remedy Standard A, such confirmation will be issued subsequent to approval of the RACR by the executive director and, when applicable, receipt by the agency of proof that any required institutional control noting commercial/industrial land use is in effect for the affected property in accordance with §350.31(g) of this title (relating to General Requirements for Remedy Standards), or noting the use of a non-default exposure area is in effect in accordance with §350.51(1)(3) or 4 of this title (relating to Affected Property Assessment), or noting the use of occupational inhalation criteria as RBELs is in effect in accordance with §350.74(b)(1) or noting the use of non-default RBEL exposure factors is in effect in accordance with §350.74(j)(2) of this title (relating to Development of Risk-Based Exposure Limits).

(2) For Remedy Standard B, a conditional no further action letter will be issued subsequent to approval of the RACR by the executive director and, when applicable, receipt by the agency of proof that any required institutional control noting commercial/industrial land use is in effect for the affected property in accordance with §350.31(g) of this title (relating to General Requirements for Remedy Standards), or noting the use of a non-default exposure area is in effect in accordance with §350.51(1)(3) or 4 of this title, or noting the use of occupational inhalation criteria as RBELs is in effect

in accordance with §350.74(b)(1) or noting the use of non-default RBEL exposure factors is in effect in accordance with §350.74(j)(2) of this title. The letter will indicate that the person has conditionally completed response actions at the affected property but must perform post-response action care obligations as described in the approved RAP throughout the initial and any continued post-response action care period in response to §350.33(h) - (j) of this title (relating to Remedy Standard B). The letter will also indicate whether the person must establish and maintain financial assurance in response to §350.33(l) and/or (m) of this title for post-response action care for affected properties which use physical controls.

(3) For Remedy Standard B, a final no further action letter will be issued subsequent to termination of the post-response action care period by the executive director as described in §350.33(i) of this title.

**§350.37. Human Health Points of Exposure.**

(a) General. The person shall use the prescribed on-site and off-site POEs for humans to environmental media to determine PCLs under Remedy Standard A in response to §350.32 of this title (relating to Remedy Standard A) and under Remedy Standard B in response to §350.33 of this title (relating to Remedy Standard B). In order to establish on-site or off-site POEs for commercial/industrial land use, or alternate POEs for on-site or off-site properties, the person must comply with §350.111 of this title (relating to Use of Institutional Controls). Consideration of competent, existing physical controls during the pathway analysis described in §350.71(d) of this title (relating to General Requirements) does not negate or otherwise supercede the POE locations specified

in this section. Subsections (b) - (k) of this section identify the media-specific prescribed, on-site and off-site POEs while subsections (l) and (m) of this section establish alternate POEs for class 2 and 3 groundwater under Remedy Standard B. When establishing on-site and off-site POEs for residential or commercial/industrial land use, persons shall use the appropriate receptor as required in §350.71(b) of this title (relating to General Requirements) for the designated land use.

(b) Air human health POEs.

(1) On-site POEs. The prescribed on-site POE to air is within the breathing zone (2 meter height) directly over the soil or groundwater COCs.

(2) Off-site POEs. The prescribed off-site POE to air is within the breathing zone (2 meter height) starting at the nearest boundary with and continuing throughout neighboring off-site properties.

(c) Soil human health POEs.

(1) On-site POEs. The prescribed on-site POE to soil is throughout the surface soil.

(2) Off-site POEs. The prescribed off-site POE to soil is throughout the surface soil starting at the nearest boundary with and continuing throughout neighboring off-site properties.

(d) Human health POEs for class 1, 2, and 3 groundwaters which do not contain any COCs in excess of the critical groundwater PCLs.

(1) On-site POE. The prescribed on-site POE is throughout the upper-most groundwater-bearing unit.

(2) Off-site POE. The prescribed off-site POE is throughout the upper-most groundwater-bearing unit on the nearest boundary with the closest hydraulically downgradient off-site property.

(e) General provisions for human health POEs for class 1, 2, or 3 groundwater.

(1) Whenever there is an existing class 1, 2, or 3 groundwater PCLE zone beneath an existing waste control unit or a waste control unit planned as part of an approved RAP, under Remedy Standard B the person may, with the executive director's approval, exclude the area underlying the waste control unit as a POE to class 1, 2, or 3 groundwater.

(2) Groundwater travel time setback distances for class 1, 2, and 3 groundwater shall be determined based on groundwater seepage velocity which is dependent upon prevailing hydraulic gradient, hydraulic conductivity, and effective porosity.

(f) Human health POEs for class 1 groundwater.

(1) On-site POEs. The prescribed on-site POE to class 1 groundwater is a well which may be completed at all locations throughout the on-site groundwater PCLE zone. For on-site commercial/industrial land use, the person shall establish an additional on-site POE for class 1 groundwater for residents unless the residential-based groundwater PCLE zone already extends off-site. The residential POE shall be set at a distance of two-year groundwater travel time upgradient of the nearest boundary with the closest hydraulically downgradient off-site property. If the residential-based groundwater PCLE zone already extends beyond the two-year groundwater travel time setback distance but not off-site, then the residential POE shall be set at the existing limit of the residential-based groundwater PCLE zone.

(2) Off-site POEs. The prescribed off-site POE to class 1 groundwater is a well which may be completed at all locations throughout an off-site groundwater PCLE zone. For off-site commercial/industrial land use, the person shall establish an additional POE for class 1 groundwater for residents at, and all locations beyond, the existing limit of the off-site residential-based groundwater PCLE zone.

(g) Human health POEs for class 2 groundwater.

(1) On-site POEs. The prescribed on-site POE to class 2 groundwater is a well which may be completed at all locations throughout the on-site groundwater PCLE zone. For on-site commercial/industrial land use, the person shall establish an additional on-site POE for class 2 groundwater for residents unless the residential-based groundwater PCLE zone already extends off-site. The residential POE shall be set at a distance of two years groundwater travel time upgradient of the

nearest boundary with the closest hydraulically downgradient off-site property. If the residential-based groundwater PCLE zone already extends beyond the two-year groundwater travel time setback distance but not off-site, then the residential POE shall be set at the existing limit of the residential-based groundwater PCLE zone.

(2) Off-site POEs. The prescribed off-site POE to class 2 groundwater is a well which may be completed at all locations throughout an off-site groundwater PCLE zone. For off-site commercial/industrial land use, the person shall establish an additional POE for class 2 groundwater for residents at, and all locations beyond, the existing limit of the off-site residential-based groundwater PCLE zone.

(h) POEs for class 3 groundwater.

(1) On-site POEs. The prescribed on-site POE to class 3 groundwater is at all locations throughout an on-site groundwater PCLE zone defined by concentrations greater than  $^{GW}GW_{Class3}$  for the applicable on-site land use.

(2) Off-site POEs. The prescribed off-site POE to class 3 groundwater is at all locations throughout an off-site groundwater PCLE zone defined by concentrations greater than  $^{GW}GW_{Class3}$  for the applicable off-site land use which is sourced from an on-site release of COCs. If commercial/industrial land use is assumed for the off-site property, then the person shall establish an

additional POE for class 3 groundwater for residents at, and all locations beyond, the existing limit of the off-site residential-based groundwater PCLE zone.

(i) POEs for surface water runoff or groundwater discharges to surface water. The prescribed POE to surface water will be at the point of surface water runoff or groundwater discharge (i.e., within the groundwater) into and throughout the extent of any on-site or off-site surface water body meeting the definition of surface water in the state as defined in §307.4 of this title (relating to General Criteria), as amended. This includes the surface water body at the initial point of entry and other water bodies that may be impacted by COCs.

(j) POEs for releases of COCs directly to surface water. The prescribed POE for releases directly to surface water is at the point of entry of COCs into and throughout the extent of any surface water body meeting the definition of surface water in the state as defined in §307.4 of this title, as amended.

(k) POEs for sediment. The prescribed POE to sediment is within the upper one-foot of sediment beneath any surface water body meeting the definition of surface water in the state as defined in §307.4 of this title, as amended. For intermittent water bodies, both sediment and surface soil POEs may apply.

(l) Alternate POEs to class 2 groundwater under Remedy Standard B. Provided the person is authorized by the executive director to establish a plume management zone in response to §350.33(f)(4) of this title (relating to Remedy Standard B), the person may establish an alternate on-site POE or off-

site POE to class 2 groundwater in accordance with paragraph (1), (2), or (3) of this subsection as dictated by the particular circumstances at the affected property. The current length of the residential-based groundwater PCLE zone shall be determined as of the submittal date of the RAP.

(1) On-site POEs.

(A) The on-site POE to class 2 groundwater may be modified to be a well for residents completed at the on-site downgradient boundary of a plume management zone which includes the current length of the residential-based groundwater PCLE zone plus an additional length determined in accordance with paragraph (4) of this subsection.

(B) In the situation where multiple on-site plume management zones exist, and have commingled, or are within 500 feet of one another such that the management as a combined plume management zone is more feasible and appropriate, with site-specific approval from the executive director, the person may combine the separate plume management zones into a single, combined plume management zone provided the alternate POE for the combined plume management zone satisfies paragraph (4) of this subsection.

(2) Off-site POEs for off-site properties with class 2 groundwater which currently contains the residential-based groundwater PCLE zone. The person may establish an alternate off-site POE to class 2 groundwater as a well for residents completed at the off-site downgradient boundary of a plume management zone which includes the current length of the groundwater PCLE zone plus an additional length determined in accordance with paragraph (4) of this subsection.

(3) Off-site POEs for off-site properties with class 2 groundwater which currently do not contain the residential-based groundwater PCLE zone.

(A) If the person can demonstrate that the subject groundwater-bearing unit has no reasonably anticipated future beneficial use, then the person may allow a plume management zone to extend onto an off-site property. The person shall establish an alternate off-site POE to class 2 groundwater as a well for residents completed at the off-site boundary of a plume management zone which includes the current length of the groundwater PCLE zone plus an additional length determined in accordance with paragraph (4) of this subsection.

(B) Unless the demonstration discussed in subparagraph (A) of this paragraph is made, the person shall not allow a plume management zone within class 2 groundwater to extend onto any off-site property which does not currently contain a residential-based groundwater PCLE zone.

(C) The determination of future beneficial use under subparagraph (A) of this paragraph shall be based upon the existing quality of groundwater, considering non-point sources of COCs and their cumulative impact on the groundwater quality, the lack of use of the groundwater based on the presence of superior water supplies, proximity and withdrawal rates of groundwater users, or the property is subject to a zoning or governmental ordinance which is equivalent to the deed notice, VCP certificate of completion or restrictive covenant that otherwise would have been required. The executive director may require the collection of groundwater samples to document the presence of the COCs originating from non-point sources.

(4) The maximum additional length of the plume management zone for the situations described in paragraphs (1), (2), and (3) of this subsection shall be established as the smallest of the following applicable distances, unless the affected property is subject to zoning or a governmental ordinance which is equivalent to the deed notice, VCP certificate of completion or restrictive covenant that otherwise would have been required, in which case subparagraphs (C) and (D) of this paragraph do not apply:

(A) up to 500 feet beyond the current length of the residential-based groundwater PCLE zone;

(B) a length of up to 0.25 times the current length of the residential-based groundwater PCLE zone (i.e., up to 25% additional plume length);

(C) to within two years groundwater travel time of the closest hydraulically downgradient off-site property:

(i) for which the owner has not provided written concurrence to allow the recording of an institutional control; or

(ii) which does not contain the residential-based PCLE zone and the groundwater has a reasonably anticipated future beneficial use;

(D) at the current downgradient extent of the residential-based PCLE zone when the residential-based groundwater PCLE zone is already within the two-year travel time setback distance for POEs under subparagraph (C) of this paragraph; or

(E) the distance to a surface water POE as described in subsection (i) of this section.

(m) Alternate POEs to class 3 groundwater under Remedy Standard B. Provided the person is authorized by the executive director to establish a plume management zone in response to §350.33(f)(4) of this title (relating to Remedy Standard B), the person may establish an alternate on-site or off-site POE to class 3 groundwater. The  $^{GW}_{Class\ 3}$  PCL to be applied at this alternate POE shall be based upon residential land use. The boundary of the plume management zone may be established up to the lesser of:

(1) To within two years groundwater travel time upgradient of:

(A) The closest hydraulically downgradient off-site property for which the landowner has not provided written concurrence to allow the recording of an institutional control for situations where zoning or a governmental ordinance does not serve as the institutional control; or

(B) The downgradient limit of a zoning or governmental ordinance that serves as the institutional control; or

(2) The distance to a surface water POE as described in subsection (i) of this section.

**SUBCHAPTER C: AFFECTED PROPERTY ASSESSMENT**

**§350.51, §350.54**

**STATUTORY AUTHORITY**

The amended rules are adopted under the following statutory authority: TWC, §5.103 and §26.011, which provide the commission with authority to adopt any rules necessary to carry out its powers, duties, and policies and to protect water quality in the state; TWC, §5.103(c), which states the commission must adopt rules when adopting, repealing, or amending any agency statement of general applicability that interprets or prescribes law or policy or describes the practice and procedure requirements of the agency, and Texas Health and Safety Code (THSC), Texas Solid Waste Disposal Act, §361.017 and §361.024, which provide the commission the authority to regulate industrial solid waste and municipal hazardous wastes and all other powers necessary or convenient to carry out its responsibilities. In addition, the amended rules are adopted under 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 preventive 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 committing any other act or engaging in any other activity which in itself or in conjunction with any other discharge or activity causes, continues to cause, or will cause pollution of any of the water in the state; TWC, §26.262, which states that it is the policy of this state to prevent the spill or discharge of hazardous substances into the waters in the state and to cause the removal of such spills and discharges without undue delay; and TWC, §26.264, which provides the commission with authority to issue rules necessary and

convenient to carry out the policy referenced in TWC, §26.262. Authority to adopt the amended rules is also provided by TWC, §26.341, which states that it is the policy of this state to maintain and protect the quality of groundwater and surface water resources in the state from certain substances in underground and aboveground storage tanks that may pollute groundwater and surface water resources, and requires the use of all reasonable methods, including risk-based corrective action to implement this policy; TWC, §26.345, which provides the commission with the authority to adopt rules necessary to carry out the policy referenced in TWC, §26.341; and 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 regulation by state agencies be conducted in a manner that will maintain present uses and not impair potential uses of groundwater or pose a public health hazard, and that the quality of groundwater be restored if feasible.

The adopted amendments implement TWC, §§5.103, 26.011, 26.039, 26.262, 26.264, 26.341, 26.345, and 26.401, and THSC, §361.017 and §361.024.

**§350.51. Affected Property Assessment.**

(a) The person shall conduct an affected property assessment in a manner appropriate for the affected property considering the hydrogeology, physical and chemical properties of the COCs, location of human and ecological receptors, and the complete or reasonably anticipated to be completed exposure pathways identified in §350.71 of this title (relating to General Requirements). The assessment shall be designed to collect information necessary to support notification of affected landowners and remedy selection, determine whether or not water resources have been affected or are threatened, and may also evaluate the effectiveness of existing physical controls. Additionally, when

existing physical controls will be used as part of the response action in accordance with Remedy Standard B, then the assessment may be conducted such that the primary focus is placed beyond the limits of the existing physical control in order to reduce the degree of assessment within the limits of the physical control. The assessment shall be conducted in a manner most likely to detect the presence and distribution of COCs above the concentration levels defined in subsections (b) - (e) of this section considering the nature of the release and subsequent modifications to the affected property (e.g., judgmental samples in hot spots, stratified random sampling, systematic grid, etc.), and shall use appropriate quality assurance/quality control. The geology and hydrogeology of the affected property shall be adequately characterized, such that COC fate and transport can be reliably predicted in order to confidently locate existing environmental media containing COCs above the concentration levels defined in subsections (b) - (e) of this section and an appropriate response action can be designed. The person shall use sample collection techniques that meet the data quality needs and are acceptable to the executive director. The results of the assessment shall be documented in an Affected Property Assessment Report in accordance with §350.91 of this title (relating to Affected Property Assessment Report). The person shall conduct an assessment in a manner which is timely considering the size and complexity of the situation, and shall comply with an assessment schedule established in any commission rule, order, or permit, or any assessment schedule approved by the executive director.

(b) The person shall perform an affected property assessment through the collection and analysis of a sufficient number of samples from environmental media to reliably characterize the nature and degree of COCs in the source area(s), as well as the horizontal and vertical extent of COCs in soil and groundwater, which equals or exceeds the applicable concentration of COCs as specified in subsections (c), (d) and (e) of this section, unless the executive director determines on a site-specific

basis that additional assessment of the extent of COCs is necessary to evaluate a potential threat to human health and the environment. Information obtained from attempts to attain Remedy Standard A may be submitted for this purpose. The person shall characterize the nature, degree and extent of COCs in other environmental media as required by the executive director in consideration of property-specific factors. The executive director may require the person to determine the concentrations of COCs in outdoor or indoor air on a property-specific basis.

(c) The person shall demonstrate that all COCs in environmental media (except for on-site soils as noted below) which exceed the residential assessment level have been characterized horizontally in all directions. If the assessment level is based upon background concentrations, then the assessment shall only extend to the background concentration level. For soils only, the person can focus the horizontal on-site assessment to define the area exceeding the applicable critical PCL (i.e., residential or commercial/industrial). However, the person shall investigate environmental media, including soils, using adequate on-site or off-site data to determine whether off-site properties have been affected with concentrations of COCs which exceed the residential assessment levels. The requirement to use an assessment level based upon a residential receptor (i.e., residential assessment level) pertains to all off-site properties (i.e., both residential and commercial/industrial land use).

(d) For the vertical soil assessment to adequately determine if groundwater has been or will be affected, the person shall complete the requirements of paragraph (1), (2), (3) or (4) of this subsection.

(1) The person shall demonstrate that the vertical limit of COCs in soil which exceed the higher of the method quantitation limit or background concentrations has been characterized. If the person satisfactorily demonstrates that all reasonably available analytical technology has been used to

show that the COC cannot be measured to the method quantitation limit due to sample specific interferences, then the sample detection limit may be used in lieu of the method quantitation limit.

(2) If an adequate groundwater assessment has been conducted (i.e., COC concentrations in groundwater have been measured from appropriate locations), then the person shall characterize the vertical limits of COCs in soil which exceed the residential assessment level. The <sup>GW</sup>Soil PCL may not be applicable in the determination of the residential assessment level if the person has conducted an adequate groundwater assessment and can meet the requirements of §350.75(i)(7)(C) of this title (relating to Tiered Human Health Protective Concentration Level Evaluation). The executive director may omit or modify the requirement for a groundwater assessment under this paragraph for use of §350.75(i)(7)(C) of this title on a site-specific determination based upon a combination of supporting evidence including, but not necessarily limited to, probable depth to groundwater, presence of soils or bedrock that prohibit or impede vertical migration of COCs, and physical and chemical properties of the COCs.

(3) If the uppermost groundwater-bearing unit is encountered before the vertical limit of COCs is determined to the higher of the method quantitation limit or background concentrations, then representative groundwater samples (i.e., a groundwater sample does not have to be collected from each boring) must be collected to evaluate potential groundwater impacts. The vertical extent of the soil assessment shall continue beyond the uppermost groundwater-bearing unit as appropriate based on the likelihood that COCs have migrated deeper considering the chemical and physical properties of the COCs (e.g., dense non-aqueous phase liquids) and the hydrogeology of the affected property. The executive director may omit or modify this requirement on a site-specific basis if the vertical assessment would exacerbate the vertical migration of COCs.

(4) If a person has already determined that the groundwater is impacted, then they may satisfy the requirements of this subsection by declaring the entire soil column to the top of the lowest impacted groundwater bearing unit as a soil PCLE zone.

(e) The person shall define the vertical extent of COCs in groundwater to below the residential assessment level by collecting a representative sample from a deeper groundwater-bearing unit with concentrations less than the residential assessment levels, unless the person demonstrates that vertical migration to a lower groundwater-bearing unit is not possible. The person shall base such demonstration on the hydrogeology and the chemical and physical properties of the COCs. The person shall take proper precautions to prevent cross-contamination when collecting a sample from a deeper groundwater-bearing unit. The executive director may omit or modify this requirement on a site-specific basis if the vertical assessment would exacerbate the vertical migration of COCs.

(f) The person shall use concentrations measured in groundwater at or immediately upgradient of the zone of groundwater discharge to surface water to determine if COCs in groundwater have discharged to surface waters.

(g) For affected properties with response actions which are designed and approved under Remedy Standard B for the use of a plume management zone, the person shall characterize the geology and hydrogeology throughout all areas of the plume management zone (i.e., including those areas of the plume management zone which are currently beyond the limits of the groundwater which contains COCs in excess of the assessment level).

(h) The person shall attempt to identify all surface and subsurface structures at the affected property which may influence COC migration, including subsurface utilities.

(i) The person shall conduct a field survey to locate potential receptors, including water wells and surface waters to at least 500 feet beyond the boundary of the affected property; and conduct a records survey to identify all water wells and surface water bodies within 1/2 mile of the limits of groundwater which contains COCs in excess of the residential assessment level. The person shall also attempt to identify any off-site properties within 1/4 mile of the affected property that have environmental information (e.g., soil boring logs, analytical results from samples of environmental media, etc.) collected for submission to the agency which may be useful in fulfilling the requirements of this section, although collection and submittal of this information by the person is not required.

(j) When determining concentrations of COCs in an environmental medium, the person shall collect and handle samples in accordance with sampling methodologies which will yield representative concentrations of COCs present in the sampled medium.

(k) When determining concentrations of COCs in surface water and sediment, the person shall collect and handle samples in accordance with the requirements in the agency's *Surface Water Quality Monitoring Procedures, Volume I*, as amended, or shall use an alternative methodology approved by the executive director.

(l) The person shall determine concentrations of COCs within the environmental media at the affected property. The executive director may approve the use of statistical or geostatistical methods to

determine representative concentrations of COCs at the affected property or within areas representative of site-specific background conditions as long as the following conditions are satisfied.

(1) The person shall ensure that all assumptions for the selected statistical or geostatistical method are met or critically examined and explained if the assumptions cannot be met (e.g., random sampling design, normal or log-normal distribution, etc.). Judgmental samples may be used, as long as it can be demonstrated that the resulting estimated representative concentration is not biased low.

(2) An appropriate number of samples for the statistical method shall be used. If site-specific background is determined using the upper confidence limit or similar statistical method, then a minimum of eight samples shall be used. If the person uses an arithmetic average to determine the background concentration, then a minimum of five samples shall be used.

(3) The soil exposure area for existing residential yards or platted residential properties shall not exceed 1/8th acre or the size of the front or back yard of the affected residential lot, unless it is demonstrated that a larger area, not to exceed 1/2 acre, is appropriate based upon the activity patterns of residents at a specific affected property. For other properties classified as residential (e.g., parks, hospitals), the executive director may approve a larger exposure area if justified based on site-specific conditions. If an area larger than 1/8th acre or the size of the front or back yard of the existing affected residential lot is approved by the executive director, then the person shall comply with the applicable institutional control in requirements §350.111(b), (b)(8) or (10) of this title (relating to Use of Institutional Controls). If COCs are relatively homogeneous over an area larger than the residential

default size, the executive director may allow concentrations to be averaged over this larger area, in which case the institutional control would not be required.

(4) The soil exposure area for commercial/industrial properties shall not exceed 1/2 acre, unless it is demonstrated that a larger area is appropriate based upon documented activity patterns for commercial/industrial workers at an active commercial/industrial facility (the assumed exposure area should represent the smallest area over which an individual can be expected to move randomly). In approving an exposure area for an active commercial/industrial facility, the executive director may consider any appropriate site-specific information which documents typical worker activity patterns. If an area larger than 1/2 acre is approved by the executive director, then the person shall comply with the institutional control requirements in §350.111(b), (b)(9) or (11) of this title (relating to Use of Institutional Controls), as applicable. If COCs are relatively homogeneous over an area larger than 1/2 acre, the executive director may allow concentrations to be averaged over this larger area, in which case the institutional control provision would not be required.

(5) The executive director may require a separate assessment of smaller but notable areas of soil contamination (i.e., “hot spots”) at sites where site-specific features are present such that there is likely to be preferential exposure to this smaller area (e.g., worker exposures around the physical infrastructure of a work space, soils within a child’s play area). The presence of hot spots with respect to ecological risk shall be determined on a site-specific basis.

(m) If a person does not desire to determine a site-specific soil background concentration, then they may use the Texas-specific median background concentrations for metals provided in the following

figure. The Texas-specific background concentrations may be used to determine the critical PCL and then used in comparisons to individual measurements of COCs or representative concentrations of COCs in accordance with §350.79(1) or (2)(A) of this title (relating to Comparison of Chemical of Concern Concentrations to Protective Concentration Levels), respectively.

**Figure: 30 TAC §350.51(m)**

Texas-Specific Soil Background Concentrations milligrams per kilogram (mg/kg) <sup>1</sup>	
Metal	Median Background Concentration (mg/kg)
Aluminum	30,000
Antimony	1
Arsenic	5.9
Barium	300
Beryllium	1.5
Boron	30
Total Chromium	30
Cobalt	7
Copper	15
Fluoride	190
Iron	15,000
Lead	15
Manganese	300
Mercury	0.04
Nickel	10
Selenium	0.3
Strontium	100

Tin	0.9
Titanium	2,000
Thorium	9.3
Vanadium	50
Zinc	30

<sup>1</sup> Source: "Background Geochemistry of Some Rocks, Soils, Plants, and Vegetables in the Conterminous United States", by Jon J. Connor, Hansford T. Shacklette, et al., Geological Survey Professional Paper 574-F, US Geological Survey.

(n) Analytical results, including non-detected analytical results, should be considered whether doing direct comparisons of individual measurements or when using statistical or geostatistical approaches. In cases where there is reason to believe, based on available analytical data, that the COC could be present at that sampling location and that the concentration of the COC is suspected to be near but below the sample detection limit, the full value of the sample detection limit should be used as a proxy for the non-detected result. If there is reason to believe, based on available analytical data, that the COC could be present at that sampling location and that the concentration of the COC is suspected to be below, but not near to, the sample detection limit, then 1/2 the sample detection limit should be used as a proxy for the non-detected result. Other statistically-based approaches for handling non-detected results or assigning proxy values may be appropriate and approved if there is sufficient technical basis. If greater than 15 percent non-detected results are reported for a particular medium, and the exposure area cannot be definitively identified based on documented and verifiable site-specific information, the executive director may require persons to utilize alternative statistical methods for calculating the concentration term.

(o) When required by the executive director, the person shall classify an affected property in accordance with a risk-based system established by the executive director. The classification shall consider all information collected during the affected property assessment, any historical knowledge concerning the conditions at the affected property, and the short-term or long-term potential for human or ecological receptors to be exposed to COCs.

**§350.54. Data Acquisition and Reporting Requirements.**

(a) The person submitting data to the agency is responsible for the quality of the data.

(b) The person shall provide data that are of sufficient and documented quality to meet the program and project objectives. The data package, including the supporting quality control data generated by the laboratory, shall be available upon a reasonable request by the agency within and up to three years after submittal of the report. The project data quality objectives should be included in the APAR, unless a response action is self-implemented in which case the project data quality objectives should be included in the RACR. These data quality objectives should include, but are not limited to:

(1) the rationale for the sampling design, including the number, type, location and intended use of samples;

(2) the levels of required performance (e.g., assessment level, critical PCL, attenuation action level) and the applicable method quantitation limit in accordance with subsection (e)(3) of this section for each COC; and

(3) the precision, accuracy, representativeness, comparability, and data completeness objectives for the project.

(c) The report shall indicate the type of sample (e.g., composite or discrete sample) that was collected and the method or standard operating procedure by which it was collected. Samples shall represent the environmental media of the affected property being monitored or assessed. Field quality control shall be adequate to demonstrate that the COC is present or absent from the environmental media.

(d) The person shall ensure that the laboratory selected to perform the analyses of samples has in place an adequate and documented quality assurance program and the capability to meet the project and measurement objectives. The laboratory's quality assurance program must be compliant with the requirements in Chapter 25 of this title (relating to Environmental Testing Laboratory Accreditation and Certification), as amended, by July 1, 2008. For data generated on or before July 1, 2008, the person shall ensure the laboratory's quality assurance program is consistent with:

(1) the International Organization for Standardization "Guide 25: General Requirements for the Competence of Calibration and Testing Laboratories (ISO 25, 3rd edition, 1990)", as amended,  
or

(2) the quality standards outlined in the National Environmental Laboratory Accreditation Program, as amended.

(e) The person shall ensure the data are generated by a laboratory performing the analytical methods that meet the intralaboratory performance standards for the method and that those performance standards are sufficient to meet the bias, precision, sensitivity, representativeness, comparability, and completeness, as specified in the project data quality objectives.

(1) The bias of the method may be demonstrated through the use of reference materials, comparison to alternative methods, or spiked samples.

(2) The precision of the method may be determined by evaluation of relative standard deviation or the relative percent difference through the use of replicate analyses.

(3) In order to address sensitivity requirements, the person shall select a standard available analytical method that provides a method quantitation limit below the necessary level of required performance for purposes of assessment as well as demonstration of conformance with critical PCLs. If it is not possible to achieve a method quantitation limit below the necessary level of required performance, and the COC does not meet the conditions of §350.71(k) of this title (relating to General Requirements), then the person shall select the standard available analytical method that provides the lowest possible method quantitation limit for that COC. The executive director may require that the person demonstrate that a lower method quantitation limit is not achievable or is not practicable, using standard available analytical methods.

(4) The method detection limit shall be verified after major instrument maintenance or major changes in instrumentation or instrument conditions. The person shall ensure that the laboratory

has performed and has documented an initial demonstration of proficiency for the analysis of each COC and each method used, and has also demonstrated, in a scientifically valid manner, and has documented the method detection limit the laboratory can achieve. This demonstration and documentation shall be preparatory and method specific and include any cleanup method used. The method detection limit should be routinely checked for reasonableness.

(5) The representativeness of the method may be demonstrated by the laboratory through the use of proper storage, preparation, and subsampling techniques.

(6) The standard available method may either be a documented method from the U. S. EPA, American Society for Testing and Materials, other organizations nationally recognized as having scientifically acceptable methods, or the executive director, or a laboratory method that is completely documented in an appropriate Standard Operating Procedure. All methods derived by a laboratory must meet the quality control criteria recommended in U.S. EPA Test Methods for Evaluation of Solid Waste, Update III, as amended, unless the project and/or samples require less stringent quality control requirements than those recommended in U.S. EPA Test Methods for Evaluation of Solid Waste, Update III, as amended. Such projects or samples which require less stringent quality control shall be clearly identified and the rationale for lower levels of quality control shall be documented.

(A) Application of the method shall include the use of instrument calibration that brackets the value reported or includes a low standard that is below the necessary level of required performance, unless the method quantitation limit has been determined to be the necessary level of required performance in accordance with §350.78(c) of this title (relating to Determination of Critical

Protective Concentration Levels). The calibration range shall yield results which demonstrate that the sample reporting level has not exceeded the necessary level of required performance after correction for sample weight or volume.

(B) Laboratory control samples must be used to demonstrate that the method can produce results for the COCs that meet the bias and precision requirements at or below the necessary level of required performance or at the method quantitation limit in a clean laboratory matrix. The matrix must be similar to the medium of the environmental samples. Results for a sample spike may be substituted for the laboratory control samples, if the bias and precision criteria have been met.

(f) The person shall identify any data that may be affected by laboratory deviations from the analytical method or by the laboratory's performance not meeting the project-required and/or method-required quality control acceptance criteria. The person shall also identify any data that may be affected by improper field procedures.

(g) The person shall be responsible for having all documentation readily available to demonstrate that the sample integrity has not been compromised and that an appropriate analytical method has been used, and shall provide all reasonable information requested by the executive director.

(h) The person shall:

(1) report all results (corrected for sample weight or volume, sample preparations, and/or laboratory adjustments) greater than the method detection limit that meet the qualitative

identification criteria recommended in the analytical method used, and shall use a qualifier flag on all those results reported as greater than the method detection limit and less than the method quantitation limit; and

(2) report all non-detected results as less than the value of the sample detection limit; or

(3) report as otherwise requested by the executive director when such reporting as specified in paragraphs (1) and (2) of this subsection is not warranted.

(i) When reasonably appropriate, the executive director shall require persons to perform confirmation analysis for tentatively identified compounds.

## **SUBCHAPTER D: DEVELOPMENT OF PROTECTIVE CONCENTRATION LEVELS**

### **§§350.71, 350.73 - 350.77, 350.79**

#### **STATUTORY AUTHORITY**

The amended rules are adopted under the following statutory authority: TWC, §5.103 and §26.011, which provide the commission with authority to adopt any rules necessary to carry out its powers, duties, and policies and to protect water quality in the state; TWC, §5.103(c), which states the commission must adopt rules when adopting, repealing, or amending any agency statement of general applicability that interprets or prescribes law or policy or describes the practice and procedure requirements of the agency, and Texas Health and Safety Code (THSC), Texas Solid Waste Disposal Act, §361.017 and §361.024, which provide the commission the authority to regulate industrial solid waste and municipal hazardous wastes and all other powers necessary or convenient to carry out its responsibilities. In addition, the amended rules are adopted under 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 preventive 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 committing any other act or engaging in any other activity which in itself or in conjunction with any other discharge or activity causes, continues to cause, or will cause pollution of any of the water in the state; TWC, §26.262, which states that it is the policy of this state to prevent the spill or discharge of hazardous substances into the waters in the state and to cause the removal of such spills and discharges without undue delay; and TWC, §26.264, which provides the commission with authority to issue rules necessary and

convenient to carry out the policy referenced in TWC, §26.262. Authority to adopt the amended rules is also provided by TWC, §26.341, which states that it is the policy of this state to maintain and protect the quality of groundwater and surface water resources in the state from certain substances in underground and aboveground storage tanks that may pollute groundwater and surface water resources, and requires the use of all reasonable methods, including risk-based corrective action to implement this policy; TWC, §26.345, which provides the commission with the authority to adopt rules necessary to carry out the policy referenced in TWC, §26.341; and 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 regulation by state agencies be conducted in a manner that will maintain present uses and not impair potential uses of groundwater or pose a public health hazard, and that the quality of groundwater be restored if feasible.

The adopted amendments implement TWC, §§5.103, 26.011, 26.039, 26.262, 26.264, 26.341, 26.345, and 26.401, and THSC, §361.017 and §361.024.

**§350.71. General Requirements.**

(a) This subchapter describes separate tiered processes for establishing protective concentration levels of COCs that can remain in the source medium and be protective of human and ecological receptors at the point of exposure within the exposure medium. The tiered process for the calculation of human health protective concentration levels (PCLs) is set forth in §350.75 of this title (relating to Tiered Human Health Protective Concentration Level Evaluation) and is structured conceptually in terms of Tiers 1, 2, and 3. Each tier sets forth conditions to calculate PCLs and each successive tier incrementally provides for more consideration of site-specificity and sophistication in the PCL

calculation process. The person can move through the tiered process or start at any tier, but must conduct the cumulative check in accordance with §350.72(b) of this title (relating to Carcinogenic Risk Levels and Hazard Indices for Human Health Exposure Pathways). The human health PCLs under Tiers 1, 2 and 3 are set based on the receptors and exposure pathways as specified in subsections (b) and (c) of this section in consideration of the land use classification of the affected property, the classification of groundwater, the distribution of COCs in environmental media, and the presence of receptors. The tiered process for ecological evaluations is different. Tier 1 is an exclusion criteria checklist that is used to exclude sites which do not pose potential ecological risk from further evaluation. If a site is not excluded from Tier 1, then the person must further evaluate the site for ecological risk, and possibly establish ecological PCLs are under Tiers 2 or 3. The lowest of the human health and any applicable ecological PCLs determined for each COC for the soil, groundwater, surface water, sediment, or air as required, and are then respectively compared with representative concentrations of COCs in the soil, groundwater, surface water, sediment, or air as appropriate to determine if the PCLs are exceeded or not. If PCLs are exceeded for certain COCs, then PCLs may be further evaluated under the respective tiered process and compared again to representative site concentrations to determine if further action is needed; otherwise a response action must be initiated. No further action is required for those COCs which do not exceed the PCLs, and the cumulative criteria of §350.72(b) of this title.

(b) The person shall:

(1) ensure PCLs are protective of human health and the environment;

(2) determine human health PCLs based on residential or commercial/industrial exposure as appropriate for the land use of each affected on-site and off-site property;

(3) assume the human receptor is a resident for residential property; and

(4) assume the human receptor is a commercial/industrial worker for commercial/industrial property.

(c) The person shall develop PCLs for each of the following human health exposure pathways which are complete or reasonably anticipated to be completed based on the provided criteria.

(1) Ingestion of COCs in class 1 or 2 groundwater. The person shall consider the ingestion of COCs in class 1 or 2 groundwater to be a complete or reasonably anticipated to be completed exposure pathway when class 1 or 2 groundwater is affected.

(2) COCs in class 3 groundwater. The person shall establish PCLs for class 3 groundwater as necessary to protect human health and safety, and the environment, and to comply with the groundwater response objectives in accordance with Subchapter B of this chapter (relating to Remedy Standards).

(3) Inhalation of volatile emissions in outdoor air from COCs in groundwater-bearing units. The person shall at a minimum consider this to be a complete or reasonably anticipated to be

completed exposure pathway when a plume management zone is established in accordance with §350.33(f) of this title (relating to Remedy Standard B) unless the person:

(A) demonstrates with representative and appropriate vapor monitoring data or other technically appropriate method that volatile emissions from groundwater are protective; or

(B) otherwise demonstrates that the pathway is incomplete at the affected property. A competent, existing physical control which prevents the release of COCs from groundwater into air above the PCLs may be considered in accordance with subsection (d) of this section.

(4) Combined inhalation of volatile emissions and particulates from COCs in surface soil, dermal contact with COCs in surface soil, ingestion of COCs in surface soil, and for affected residential properties, ingestion of above and below-ground vegetables grown in surface soils containing COCs. Other than within a waste control unit, the person shall consider this combined exposure pathway to be a complete or reasonably anticipated to be completed exposure pathway; however, competent existing physical controls may be considered in accordance with subsection (d) of this section.

(5) Leaching of COCs in surface and subsurface soils to groundwater. The person shall consider this to be a complete or reasonably anticipated to be completed exposure pathway; however, a competent existing physical control which prevents the release of COCs from soils to groundwater above the PCLs may be considered in accordance with subsection (d) of this section.

(6) Inhalation of volatile emissions from COCs in subsurface soils. Other than below a waste control unit, the person shall consider this to be a complete or reasonably anticipated to be completed exposure pathway unless the person demonstrates with representative and appropriate vapor monitoring data, or other technically appropriate method that the exposure pathway is incomplete. A competent existing physical control which prevents the release of COCs from subsurface soils to air above the PCLs may be considered in accordance with subsection (d) of this section.

(7) Contact with surface water or sediment containing COCs originating from the source area. The person shall evaluate this exposure pathway to determine if it is a complete or reasonably anticipated to be completed exposure pathway when a COC has been discharged or will discharge to a surface water body or sediment.

(8) Other complete or reasonably anticipated to be completed exposure pathways. The person shall reasonably evaluate other potentially applicable exposure pathways and identify the ones which are complete or are reasonably anticipated to be completed.

(d) In accordance with subsection (c)(3) - (6) of this section, and §350.77 of this title (relating to Ecological Risk Assessment and Development of Ecological Protective Concentration Levels), the presence of a competent existing physical control which prevents the exposure of receptors to COCs may be considered as sufficient proof that the exposure pathway is incomplete for the geographic area covered by the control when the person is able and willing to incorporate that physical control as a Remedy Standard B response action meeting all associated performance, institutional control, and post-

response action care requirements, including financial assurance, for that physical control. The existing physical control shall not be considered to be a remedy for or remove the exposure pathway from consideration for the geographic area which extends beyond the existing limits of the competent existing physical control. Consideration of physical controls during the exposure pathway analysis does not negate or otherwise supercede the soil or groundwater response objectives as set forth in Subchapter B of this chapter (relating to Remedy Standards).

(e) The person shall establish the human health POE(s) for each environmental media in accordance with §350.37 of this title (relating to Human Health Points of Exposure). Consideration of physical controls during the exposure pathway analysis does not negate or otherwise supercede the POE criteria of §350.37 of this title.

(f) The person shall establish the risk-based exposure limits in accordance with §350.74 of this title (relating to Development of Risk-Based Exposure Limits) when establishing PCLs.

(g) For COCs which have both carcinogenic and noncarcinogenic effects for an exposure pathway, the person shall establish separate PCLs for both carcinogenic and noncarcinogenic effects for the individual and combined exposure pathways. The person shall then use the lower of the carcinogenic or noncarcinogenic PCL for that COC and exposure pathway.

(h) The person shall ensure that PCLs developed are protective for both on-site and off-site human receptors at the carcinogenic risk levels and hazard quotient and index as specified in §350.72 of

this title (relating to Carcinogenic Risk Levels and Hazard Indices for Human Health Exposure Pathways), as well as for applicable ecological receptors.

(i) The person shall establish critical PCLs in accordance with §350.78 of this title (relating to Determination of Critical Protective Concentration Levels).

(j) The person is not required to combine exposure pathways across source media (e.g., soil exposure pathways combined with groundwater exposure pathways) unless the executive director determines such combination is necessary to address actual situations where receptors are simultaneously exposed to COCs present in multiple source media.

(k) For Tiers 1, 2, and 3 as explained in §350.75 of this title (relating to Tiered Human Health Protective Concentration Level Evaluation) and §350.77 of this title (relating to Ecological Risk Assessment and Development of Ecological Protective Concentration Levels), the person shall establish PCLs for each individual COC within each environmental medium unless the conditions of paragraphs (1), (2), (3), or (4) of this subsection are met or unless the use of paragraphs (1), (2), (3), or (4) of this subsection is prohibited by the individual program area listed in §350.2 of this title (relating to Applicability). For the purposes of determining whether a COC meets the conditions of paragraphs (1), (2), (3), or (4) of this subsection, a COC should be considered detected in a particular environmental medium if the analytical measurement is greater than the method detection limit and the analytical response meets the qualitative identification criteria recommended in the analytical method.

(1) The COC is detected in at least one sample, but all detected COC concentrations and sample detection limits for the COC are less than the residential assessment level in the

environmental medium being evaluated under this paragraph, as well as in all other environmental media from which samples were collected.

(2) The COC is detected in at least one sample in the environmental medium, but the conditions described in one of subparagraphs (A) - (E) of this paragraph are met and all nondetected results for the COC are less than the residential assessment level in the environmental medium being evaluated under this paragraph.

(A) The COC meets all of the conditions in the following clauses (i) - (iii) of this subparagraph:

(i) twenty or more representative samples analyzed for that COC have been collected from the environmental medium evaluated under this subparagraph;

(ii) the COC is detected in less than 5% of the twenty or more samples required in clause (i) of this subparagraph; and

(iii) the executive director determines that a PCL is not warranted for the COC in order to protect human health and the environment in consideration of, but not limited to, the concentration and distribution of the COC in environmental media, source area information, knowledge of on-site historical operations, characteristics of the COC and the affected property, and companion and daughter product relationships to the COC.

(B) The COC is a common laboratory contaminant (i.e., methylene chloride, acetone, toluene, 2-butanone (methyl ethyl ketone), dimethyl phthalate, diethyl phthalate, di-n-butyl phthalate, butylbenzyl phthalate, bis (2-ethylhexyl) phthalate, and di-n-octyl phthalate), and the concentration of the COC detected in each sample for that environmental medium does not exceed 10 times the maximum amount detected in any associated blank, and the COC is not anticipated to be present based on knowledge of on-site historical operations including consideration of companion and daughter products.

(C) The COC is not a common laboratory contaminant, as defined in subparagraph (B) of this paragraph, and the concentration of the COC detected in each sample for that environmental medium does not exceed five times the maximum amount detected in any associated blank, and the COC is not anticipated to be present based on knowledge of on-site historical operations including consideration of companion and daughter products.

(D) The maximum concentration of the COC detected at the affected property does not exceed the property-specific or Texas-specific background concentration as specified in Figure: 30 TAC §350.51(m). For the purpose of determining whether the COC meets the conditions of this paragraph, the person shall consider the maximum concentration of the COC to be the higher of the maximum detected concentration or the appropriate proxy value as determined in accordance with §350.51(n) of this title (relating to Affected Property Assessment).

(E) The person sufficiently demonstrates that the release of COCs did not result from activity at the on-site property based on appropriate evidence, including, but not limited to, the

concentration and distribution of the COC in environmental media, source area information, consideration of companion and daughter products, and knowledge of on-site historical operations.

(3) The COC is known or is reasonably anticipated to be associated with historical or current activities conducted at the on-site property, but the COC is not detected in any sample in the environmental medium, and all sample detection limits for the COC are less than the residential assessment level for the environmental medium.

(4) The COC is not known or is not reasonably anticipated to be associated with historical or current activities conducted at the on-site property, and is not detected in any sample in the environmental medium.

**§350.73. Determination and Use of Human Toxicity Factors and Chemical Properties.**

(a) In all cases, the toxicity factors used must be protective of human health and the environment. The person shall use the chronic human toxicity factors taken from the following hierarchy of sources (unless otherwise specified in §350.76 of this title (relating to Approaches for Specific Chemicals of Concern to Determine Human Health Protective Concentration Levels)) unless the specific provision contained in subsection (b) of this section applies. The person shall use the source in paragraph (1) of this subsection and only if the relevant chronic human toxicity factor is not available in that source, proceed to the source in paragraph (2) of this section and, only if the toxicity factor is not available in that source, proceed in the same fashion through sources in paragraphs (3) – (7) of this subsection. The chronic human toxicity factors, in order of hierarchy of sources in

paragraphs (1) - (7) of this subsection, which are most current as of the submittal date of the SIN or the RAP are presumed to be protective of human health and the environment, unless a person rebuts this presumption by published credible authority. In addition, the executive director may determine during review of the RACR that a change in a toxicity factor since the submittal of the SIN or RAP has been of such a magnitude that the PCLs previously developed for a COC would clearly not be protective of human health and the environment, then the adequacy of the response action must be reevaluated. Likewise, if the executive director determines at any time that a subsequent change in a toxicity factor is of such a magnitude such that the proposed response action is no longer warranted to protect human health and the environment, then a response action based on that previous chronic toxicity factor consideration shall no longer be required.

(1) United States Environmental Protection Agency (EPA) Integrated Risk Information System (IRIS);

(2) EPA Provisional Peer Reviewed Toxicity Values (i.e., Superfund Health Risk Technical Support Center);

(3) EPA Health Effects Assessment Summary Tables;

(4) EPA National Center for Environmental Assessment (i.e., Superfund Technical Support Center);

(5) the TCEQ Chronic Remediation-Specific Effects Screening Levels;

(6) Agency for Toxic Substances and Disease Registry; and

(7) other scientifically valid sources as approved by the executive director.

(b) The executive director may direct a person to use a chronic human toxicity factor from a source other than that selected in accordance with the source hierarchy list provided in subsection (a) of this section in cases where the executive director has determined it to be necessary to use a more scientifically valid chronic human toxicity factor than that from the source identified in accordance with subsection (a) of this section.

(c) If the executive director determines that it is necessary to evaluate COCs which do not have any human chronic toxicity factors provided in the sources listed in subsection (a) of this section, then the executive director will provide chronic toxicity factors. The person may provide toxicological information to the executive director for consideration in the derivation of the chronic toxicity factors. The person shall provide all toxicological data from any toxicological studies conducted for the person when such information is requested by the executive director. The person shall use the TCEQ Chronic Remediation-Specific Effects Screening Level value as the reference concentration in evaluating the inhalation pathway for both residential and commercial/industrial land use in accordance with §350.75(i)(3), (6) and (8) of this title (relating to Tiered Human Health Protective Concentration Level Evaluation), and all chronic inhalation exposure pathways for which PCLs are established in accordance with §350.75(i)(5) and (11) of this title, but only in cases where neither an EPA unit risk factor nor an EPA reference concentration is available for that COC from the hierarchy list provided in subsection (a)

of this section, and the executive director has not directed the person to use a toxicity factor in accordance with subsection (b) of this section.

(d) Unless prior approval is provided by the executive director in accordance with §350.74(j)(2) of this title (relating to Development of Risk-Based Exposure Limits) to use a subchronic exposure duration (i.e., <seven years) for a commercial/industrial property, the person shall not use subchronic toxicity factors.

(e) In the situation where different reference doses have been established for a COC based on water ingestion and food consumption, the person shall use the reference dose for water ingestion for the water ingestion exposure pathway and the reference dose for food consumption for all soil exposure pathways.

(f) The person shall use the COC chemical/physical parameter values for COCs provided in the following figure to calculate PCLs, unless the executive director approves the use of a more representative alternative value in accordance with paragraphs (1) and (2) of this subsection. For those COCs not included in the figure in this subsection, the person may provide chemical/physical information to the executive director for consideration in developing appropriate chemical/physical parameters.

**Figure: 30 TAC §350.73(f)**

**Figure: 30 TAC §350.73(f) Chemical/Physical Properties of COCs (Legend on last page of Table)**

	COMPOUND	Physical State	CAS number	Type	M.W. (g/mole)	H' (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)	LogK <sub>oc</sub>	Log K <sub>d</sub>	D <sub>air</sub> (cm <sup>2</sup> /s)	D <sub>wat</sub> (cm <sup>2</sup> /s)	Solubility (mg/l)	Vapor Pressure (mm Hg)	Log K <sub>ow</sub>	Br <sub>Abg</sub> (g soil/g D.W.)	Br <sub>Bg</sub> (g soil/g D.W.)
1	Acenaphthene	s	83-32-9	O	154.21	6.44E-03	3.60	-----	4.21E-02	7.69E-06	4.24E+00	3.75E-03	4.15		
2	Acenaphthylene	s	208-96-8	O	152.20	4.74E-03	3.84	-----	4.39E-02	7.07E-06	3.93E+00	2.90E-02	3.94		
3	Acetaldehyde	g	75-07-0	O	44.05	2.75E-03	0.42	-----	1.24E-01	1.23E-05	1.00E+06	9.00E+02	0.43		
4	Acetone	l	67-64-1	O	58.08	1.61E-03	-0.24	-----	1.24E-01	1.14E-05	6.00E+05	2.27E+02	-0.24		
5	Acetone cyanohydrin	l	75-86-5	O	85.11	1.34E-04	-0.22	-----	8.12E-02	9.09E-06	1.83E+06	8.00E-01	-0.03		
6	Acetonitrile	l	75-05-8	O	41.05	1.21E-03	-0.33	-----	1.28E-01	1.45E-05	2.05E+05	9.00E+01	-0.34		
7	Acetophenone	l	98-86-2	O	120.15	4.45E-04	1.56	-----	6.00E-02	8.73E-06	5.50E+03	3.95E-01	1.67		
8	Acifluorfen, sodium	s	62476-59-9	O	383.64	< 8.31E-13	2.05	-----	1.45E-02	4.40E-06	> 2.50E+05	< 9.75E-09	0.37		
9	Acrolein	l	107-02-8	O	56.06	1.83E-04	-0.28	-----	1.05E-01	1.12E-05	2.00E+05	2.65E+02	-0.10		
10	Acrylamide	s	79-06-1	O	71.08	1.33E-08	-0.66	-----	9.70E-02	1.28E-05	2.20E+06	7.00E-03	-0.81		
11	Acrylic acid	l	79-10-7	O	72.06	1.32E-05	0.05	-----	9.08E-02	1.06E-05	1.00E+06	3.72E+00	0.44		
12	Acrylonitrile	l	107-13-1	O	53.06	4.57E-03	0.04	-----	1.22E-01	1.34E-05	7.50E+04	1.10E+02	0.21		
13	Alachlor	s	15972-60-8	O	269.77	8.62E-07	2.28	-----	1.94E-02	5.83E-06	2.40E+02	2.20E-05	3.37		
14	Aldicarb	s	116-06-3	O	190.27	5.82E-08	1.20	-----	3.05E-02	7.20E-06	6.00E+03	2.90E-05	1.36		
15	Aldicarb sulfone	s	1646-88-4	O	222.27	1.10E-07	0.23	-----	5.55E-02	5.79E-06	8.00E+03	9.00E-05	-0.67		
16	Aldrin	s	309-00-2	O	364.91	7.07E-03	4.68	-----	1.32E-02	4.86E-06	7.84E-02	1.67E-05	6.75		
17	Allyl alcohol	l	107-18-6	O	58.08	2.08E-04	0.51	-----	1.14E-01	1.10E-05	3.20E+05	2.63E+01	0.17		
18	Allyl chloride	l	107-05-1	O	76.53	4.57E-01	1.43	-----	9.80E-02	1.08E-05	3.40E+03	3.60E+02	1.93		
19	Aluminum	s	7429-90-5	M	26.98	0.00E+00		2.55	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.33	1.5E-03	6.50E-04
20	Aminopyridine, 4-	s	504-24-5	O	94.12	2.44E-07	-0.32	-----	8.02E-02	1.08E-05	7.66E+04	2.00E-03	-0.11		
21	Ammonia	g	7664-41-7	I	17.03	1.36E-02	0.49	-----	2.59E-01	6.93E-05	5.31E+05	7.47E+03	0.23		
22	Ammonium sulfamate	s	7773-06-0	I	114.13	0.00E+00	-----	CE	9.81E-02	1.04E-05	2.00E+06	0.00E+00	-4.34		
23	Aniline	l	62-53-3	O	93.13	5.82E-05	0.96	-----	7.00E-02	8.30E-06	3.60E+04	6.69E-01	1.08		
24	Anthracene	s	120-12-7	O	178.23	4.61E-03	4.37	-----	3.24E-02	7.74E-06	4.34E-02	2.55E-05	4.35		
25	Antimony		7440-36-0	M	121.75	0.00E+00	-----	1.65	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	7.0E-02	3.00E-02
26	Aramite	l	140-57-8	O	334.86	CE	4.00	-----	4.23E-02	4.45E-06	CE	1.23E-04	4.82		
27	Aroclor 1016	l	12674-11-2	O	257.55	2.27E-02	4.87	-----	2.05E-02	6.80E-06	4.20E-01	7.12E-04	5.69		
28	Aroclor 1254	L	11097-69-1	O	327.00	1.12E-01	5.72	-----	CE	5.60E-06	3.45E-02	8.82E-05	5.61		
29	Arsenic	s	7440-38-2	M	74.92	0.00E+00	-----	1.40	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.68	1.00E-02	8.00E-03

	COMPOUND	Physical State	CAS number	Type	M.W. (g/mole)	H' (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)	LogK <sub>oc</sub>	Log K <sub>d</sub>	D <sub>air</sub> (cm <sup>2</sup> /s)	D <sub>wat</sub> (cm <sup>2</sup> /s)	Solubility (mg/l)	Vapor Pressure (mm Hg)	Log K <sub>ow</sub>	Br <sub>Abg</sub> (g soil/g D.W.)	Br <sub>Bg</sub> (g soil/g D.W.)
30	Arsine	g	7784-42-1	I	77.95	2.41E-01	-----	CE	CE	CE	2.00E+05	1.13E+04	CE		
31	Asbestos	s	1332-21-4	I	varies	0.00E+00	-----	5.00	CE	CE	0.00E+00	0.00E+00	CE		
32	Atrazine	s	1912-24-9	O	215.69	1.09E-07	2.20	-----	5.64E-02	5.58E-06	3.00E+01	3.00E-07	2.82		
33	Barium	s	7440-39-3	M	137.33	0.00E+00	-----	1.04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	4.9E-02	1.50E-02
34	Barium cyanide	s	542-62-1	I	189.37	CE	-----	1.78	CE	CE	8.00E+05	CE	CE	4.9E-02	1.50E-02
35	Benzene	l	71-43-2	O	78.11	2.27E-01	1.82	-----	8.80E-02	9.80E-06	1.77E+03	9.50E+01	1.99		
36	Benzenethiol	l	108-98-5	O	110.18	1.83E-02	1.32	-----	7.60E-02	8.68E-06	7.60E+02	2.40E+00	2.69		
37	Benzidine	s	92-87-5	O	184.24	1.62E-09	1.32	-----	3.40E-02	1.50E-05	5.20E+02	8.36E-08	1.34		
38	Benzo-a-anthracene	s	56-55-3	O	228.29	1.39E-04	5.55	-----	5.10E-02	9.00E-06	1.00E-02	1.54E-07	5.52		
39	Benzo-a-pyrene	s	50-32-8	O	252.32	4.70E-05	5.98	-----	4.30E-02	9.00E-06	1.62E-03	4.89E-09	6.11		
40	Benzo-b-fluoranthene	s	205-99-2	O	252.32	4.99E-04	6.08	-----	2.26E-02	5.56E-06	1.50E-03	8.06E-08	6.11		
41	Benzo-j-fluoranthene	s	205-82-3	O	252.32	4.63E-04	5.72	-----	4.15E-02	5.48E-06	2.50E-03	8.39E-08	6.11		
42	Benzo-k-fluoranthene	s	207-08-9	O	252.32	4.45E-07	6.09	-----	2.26E-02	5.56E-06	5.50E-04	9.59E-11	6.11		
43	Benzo-(g,h,i)-perylene	s	191-24-2	O	276.34	5.82E-06	6.20	-----	4.90E-02	5.65E-05	2.60E-04	1.00E-10	6.70		
44	Benzoic acid	s	65-85-0	OA	122.12	1.39E-05	-0.30	-----	5.36E-02	7.97E-06	3.50E+03	6.51E-03	1.87		
45	Benzotrichloride	l	98-07-7	O	195.48	2.03E-02	3.16	-----	5.91E-02	7.02E-06	1.00E+02	1.90E-01	3.90		
46	Benzyl alcohol	l	100-51-6	O	108.14	1.62E-05	1.08	-----	8.00E-02	8.00E-06	4.00E+04	1.06E-01	1.08		
47	Benzyl chloride	l	100-44-7	O	126.59	1.66E-02	2.26	-----	7.50E-02	7.80E-06	4.93E+02	1.20E+00	2.79		
48	Beryllium	s	7440-41-7	M	9.01	0.00E+00	-----	1.36	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.57	3.60E-03	1.50E-03
49	Biphenyl, 1,1-	s	92-52-4	O	154.21	1.25E-02	3.71	-----	5.73E-02	6.71E-06	7.50E+00	2.94E-02	3.76		
50	Bis (2-chloro-ethyl) ether	l	111-44-4	O	143.01	8.90E-04	1.19	-----	6.92E-02	7.53E-06	1.02E+04	1.34E+00	1.56		
51	Bis (2-chloroisopropyl) ether	l	108-60-1	O	171.07	4.16E-03	2.50	-----	6.00E-02	6.40E-06	1.70E+03	8.50E-01	2.58		
52	Bis (2-chloromethyl) ether	l	542-88-1	O	114.96	4.99E-03	0.08	-----	8.32E-02	9.59E-06	3.80E+04	3.00E+01	0.58		
53	Bis (2-ethyl-hexyl) phthalate	l	117-81-7	O	390.56	4.57E-04	5.83	-----	3.51E-02	3.66E-06	3.00E-01	6.45E-06	8.39		
54	Bis (tri-n-butyltin) oxide	l	56-35-9	O	596.11	2.08E-03	CE	-----	CE	CE	1.80E+01	6.91E-05	5.80		
55	Bromodichloromethane	l	75-27-4	O	163.83	1.32E-01	1.74	-----	2.98E-02	1.06E-05	4.50E+03	5.84E+01	1.61		
56	Bromoform	l	75-25-2	O	252.73	2.56E-02	1.94	-----	1.49E-02	1.03E-05	3.20E+03	5.60E+00	1.79		

	COMPOUND	Physical State	CAS number	Type	M.W. (g/mole)	H' (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)	LogK <sub>oc</sub>	Log K <sub>d</sub>	D <sub>air</sub> (cm <sup>2</sup> /s)	D <sub>wat</sub> (cm <sup>2</sup> /s)	Solubility (mg/l)	Vapor Pressure (mm Hg)	Log K <sub>ow</sub>	Br <sub>Abg</sub> (g soil/g D.W.)	Br <sub>Bg</sub> (g soil/g D.W.)
57	Bromomethane	g	74-83-9	O	94.94	5.90E-01	1.02	-----	7.28E-02	1.21E-05	1.52E+04	1.64E+03	1.18		
58	Butadiene, 1,3-	g	106-99-0	O	54.09	2.61E+00	2.11	-----	1.79E-01	1.02E-05	7.35E+02	2.11E+03	2.03		
59	Butanol, n-	l	71-36-3	O	74.12	3.55E-04	0.77	-----	8.00E-02	9.30E-06	7.47E+04	6.54E+00	0.84		
60	Butylate	l	2008-41-5	O	217.38	3.50E-03	2.10	-----	4.89E-02	5.14E-06	4.60E+01	1.30E-02	3.85		
61	Butyl benzyl phthalate	l	85-68-7	O	312.37	7.94E-05	4.14	-----	1.74E-02	4.83E-06	2.90E+00	1.20E-05	4.84		
62	Cacodylic acid	s	75-60-5	O	138.00	0.00E+00	0.38	-----	CE	CE	2.00E+06	0.00E+00	0.00		
63	Cadmium	s	7440-43-9	M	112.41	0.00E+00	-----	1.18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-0.07	1.40E-01	6.40E-02
64	Calcium cyanide	s	592-01-8	I	92.11	CE	-----	CE	CE	CE	CE	CE	-2.41		
65	Captan	s	133-06-2	O	300.59	2.99E-04	3.81	-----	1.83E-02	4.90E-06	5.00E-01	7.50E-06	1.84		
66	Carbaryl	s	63-25-2	O	201.22	5.32E-07	2.37	-----	2.78E-02	5.60E-06	3.00E+01	1.36E-06	2.35		
67	Carbazole	s	86-74-8	O	167.21	3.38E-03	3.39	-----	3.90E-02	7.03E-06	7.21E-01	2.66E-04	3.23		
68	Carbofuran	s	1563-66-2	O	221.26	1.62E-07	1.46	-----	5.35E-02	5.40E-06	7.00E+02	8.30E-06	2.30		
69	Carbosulfan	l	55285-14-8	O	380.55	2.15E-05	4.41	-----	3.76E-02	3.88E-06	3.00E-01	3.10E-07	5.57		
70	Carbon disulfide	l	75-15-0	O	76.14	6.13E-01	1.72	-----	1.04E-01	1.00E-05	2.30E+03	3.40E+02	1.94		
71	Carbon tetrachloride	l	56-23-5	O	153.82	1.20E+00	2.27	-----	7.80E-02	8.80E-06	8.05E+02	1.12E+02	2.44		
72	Chloral	l	75-87-6	O	147.39	2.66E-05	0.80	-----	3.85E-02	9.70E-06	8.30E+06	3.50E+01	1.19		
73	Chlordane	s	57-74-9	O	409.78	2.02E-03	5.08	-----	1.18E-02	4.37E-06	5.60E-02	1.00E-05	6.60		
74	Chlorfenvinphos	l	470-90-6	O	359.57	2.31E-08	3.11	-----	CE	CE	1.45E+02	1.70E-07	4.15		
75	Chlorine	g	7782-50-5	I	70.91	2.86E+00	-----	CE	1.20E-01	1.48E-05	7.00E+03	5.17E+03	0.85		
76	Chlorine cyanide	g	506-77-4	O	61.47	1.12E-01	-----	CE	1.20E-01	1.39E-05	3.00E+04	1.00E+03	-0.38		
77	Chloroaniline, p-	s	106-47-8	O	127.57	4.86E-05	1.82	-----	4.83E-02	1.01E-05	3.90E+03	2.35E-02	1.72		
78	Chlorobenzene	l	108-90-7	O	112.56	1.82E-01	2.33	-----	7.30E-02	8.70E-06	5.02E+02	1.21E+01	2.64		
79	Chlorobenzilate	s	510-15-6	O	325.19	3.78E-06	2.90	-----	8.00E-02	8.00E-06	1.30E+01	2.20E-06	3.99		
80	Chloro-1,3-butadiene, 2-	l	126-99-8	O	88.54	1.33E+00	2.00	-----	1.00E-01	1.00E-05	6.30E+02	2.12E+02	2.53		
81	Chlorodifluoromethane	g	75-45-6	O	86.47	1.22E+00	0.79	-----	1.13E-01	1.32E-05	2.90E+03	7.83E+03	0.89		
82	Chloroethane	l	75-00-3	O	64.51	2.12E-01	1.25	-----	1.50E-01	1.18E-05	2.00E+04	1.20E+03	1.58		
83	Chloroform	l	67-66-3	O	119.38	1.53E-01	1.67	-----	1.04E-01	1.00E-05	7.92E+03	1.98E+02	1.52		
84	Chloromethane	g	74-87-3	O	50.49	1.44E+00	0.78	-----	1.26E-01	6.50E-06	7.25E+03	3.77E+03	1.09		
85	Chloronaphthalene, 2-	s	91-58-7	O	162.62	2.54E-02	3.93	-----	6.18E-02	6.98E-06	6.74E+00	1.70E-02	3.81		
86	Chlorophenol, 2-	l	95-57-8	OA	128.56	7.40E-04	2.46	-----	5.01E-02	9.46E-06	2.80E+04	1.42E+00	2.16		

	COMPOUND	Physical State	CAS number	Type	M.W. (g/mole)	H' (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)	LogK <sub>oc</sub>	Log K <sub>d</sub>	D <sub>air</sub> (cm <sup>2</sup> /s)	D <sub>wat</sub> (cm <sup>2</sup> /s)	Solubility (mg/l)	Vapor Pressure (mm Hg)	Log K <sub>ow</sub>	Br <sub>Abg</sub> (g soil/g D.W.)	Br <sub>Bg</sub> (g soil/g D.W.)
87	Chlorotoluene, 2-	l	95-49-8	O	126.59	1.35E-01	2.61	-----	7.01E-02	-----	1.54E+02	3.9E-03	3.20		
88	Chlorpyrifos	s	2921-88-2	O	350.59	1.73E-04	3.70	-----	4.85E-02	5.11E-06	9.00E-01	1.87E-05	4.66		
89	Chromium (III)/Chromium (total)	s	7440-47-3	M	52.00	0.00E+00	-----	3.08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	5.20E-03	4.50E-03
90	Chromium (VI)	s	18540-29-9	M	52.00	0.00E+00	-----	1.15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	5.20E-03	4.50E-03
91	Chrysene	s	218-01-9	O	228.29	5.03E-05	5.49	-----	2.48E-02	6.21E-06	2.00E-03	7.80E-09	5.52		
92	Cobalt	s	7440-48-4	M	58.93	0.00E+00	-----	1.65	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	1.00E-02	7.00E-03
93	Copper	s	7440-50-8	M	63.55	0.00E+00	-----	1.60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-0.57	2.90E-01	2.50E-01
94	Copper cyanide	s	544-92-3	I	115.58	CE	-----	1.54	CE	CE	0.00E+00	0.00E+00	-1.49	2.90E-01	2.50E-01
95	Cresol, m-	l	108-39-4	O	108.14	3.62E-05	1.94	-----	7.40E-02	1.00E-05	2.30E+04	1.40E-01	2.06		
96	Cresol, o-	s	95-48-7	O	108.14	6.65E-05	1.99	-----	7.40E-02	8.30E-06	2.04E+04	3.20E-01	2.06		
97	Cresol, p-	s	106-44-5	O	108.14	3.99E-05	1.91	-----	7.40E-02	1.00E-05	2.30E+04	1.30E-01	2.06		
98	Crotonaldehyde	l	123-73-9	O	70.09	8.15E-04	0.21	-----	9.37E-02	1.02E-05	1.60E+05	1.90E+01	0.60		
99	Cumene	l	98-82-8	O	120.19	6.07E-01	3.54	-----	6.50E-02	7.10E-06	5.00E+01	4.60E+00	3.45		
100	Cyanide	CE	57-12-5	I	26.02	CE	-----	1.00	5.21E-01	2.28E-05	1.00E+05	1.38E+01	-0.69		
101	Cyanogen	g	460-19-5	O	52.04	2.06E-01	0.13	-----	2.04E-01	1.37E-05	1.00E+04	3.88E+03	0.07		
102	Cyanogen bromide	s	506-68-3	O	105.92	4.41E+02	-0.49	-----	6.24E-02	1.13E-05	1.31E+00	1.00E+02	-0.29		
103	Cyclohexanone	l	108-94-1	O	98.14	4.99E-04	0.74	-----	7.72E-02	8.73E-06	2.30E+04	4.00E+00	1.13		
104	Cyclotrimethylenetrinitramine	s	121-82-4	O	222.12	4.99E-04	1.80	-----	6.65E-02	6.39E-06	3.87E+01	1.00E-09	0.87		
105	DDD	s	72-54-8	O	320.05	1.66E-04	4.93	-----	1.69E-02	4.76E-06	9.00E-02	8.66E-07	5.87		
106	DDE	s	72-55-9	O	241.93	8.73E-04	5.04	-----	1.44E-02	5.87E-06	6.50E-02	5.66E-06	6.00		
107	DDT	s	50-29-3	O	354.49	2.23E-03	5.14	-----	1.37E-02	4.95E-06	3.10E-03	3.93E-07	6.79		
108	Di-n-butyl phthalate	l	84-74-2	O	278.35	5.94E-05	4.53	-----	4.38E-02	7.86E-06	1.12E+01	4.25E-05	4.61		
109	Di-n-octyl phthalate	l	117-84-0	O	390.56	2.78E-03	7.92	-----	1.51E-02	3.90E-06	2.00E-02	4.47E-06	8.54		
110	Diallate	s	2303-16-4	O	270.22	1.58E-04	3.28	-----	8.00E-02	8.00E-06	1.40E+01	1.50E-04	4.08		
111	Diazinon	l	333-41-5	O	304.35	4.70E-06	2.12	-----	1.80E-02	4.90E-06	4.00E+01	8.40E-05	3.86		
112	Dibenz-a,h-anthracene	s	53-70-3	O	278.35	4.66E-07	6.28	-----	2.00E-02	5.18E-06	5.00E-04	2.10E-11	6.70		
113	Dibromo-3-chloropropane, 1,2-	l	96-12-8	O	236.33	8.31E-03	2.23	-----	8.00E-02	8.00E-06	1.00E+03	7.60E-01	2.68		

	COMPOUND	Physical State	CAS number	Type	M.W. (g/mole)	H' (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)	LogK <sub>oc</sub>	Log K <sub>d</sub>	D <sub>air</sub> (cm <sup>2</sup> /s)	D <sub>wat</sub> (cm <sup>2</sup> /s)	Solubility (mg/l)	Vapor Pressure (mm Hg)	Log K <sub>ow</sub>	Br <sub>Abg</sub> (g soil/g D.W.)	Br <sub>Bg</sub> (g soil/g D.W.)
114	Dibromochloromethane	l	124-48-1	O	208.28	3.25E-02	1.80	-----	1.96E-02	1.05E-05	5.25E+03	1.50E+01	1.70		
115	Dicamba	s	1918-00-9	O	209.03	3.28E-07	0.34	-----	6.02E-02	6.69E-06	5.60E+03	9.70E-05	2.14		
116	Dichlorobenzene, 1,2-	l	95-50-1	O	147.00	8.73E-02	2.84	-----	6.90E-02	7.90E-06	1.50E+02	1.36E+00	3.28		
117	Dichlorobenzene, 1,3-	l	541-73-1	O	147.00	1.95E-01	2.23	----	6.80E-02	8.13E-06	1.10E+02	2.30E+00	3.28		
118	Dichlorobenzene, 1,4-	s	106-46-7	O	147.00	1.17E-01	2.81	-----	6.90E-02	7.90E-06	7.38E+01	1.06E+00	3.28		
119	Dichlorobenzidine, 3,3-	s	91-94-1	O	253.13	8.65E-07	2.86	-----	1.94E-02	6.74E-06	3.11E+00	2.20E-07	3.21		
120	Dichloro-2-butene, 1,4	l	764-41-0	O	125.00	1.24E-02	2.26	-----	7.43E-02	8.62E-06	6.91E+03	1.26E+01	2.60		
121	Dichlorodifluoromethane	l	75-71-8	O	120.91	1.67E+01	2.11	----	5.20E-02	1.05E-05	2.80E+02	4.80E+03	1.82		
122	Dichloroethane, 1,1-	l	75-34-3	O	98.96	2.39E-01	1.50	-----	7.42E-02	1.05E-05	5.50E+03	2.28E+02	1.76		
123	Dichloroethane, 1,2-	l	107-06-2	O	98.96	5.32E-02	1.24	-----	1.04E-01	9.90E-06	8.70E+03	8.13E+01	1.83		
124	Dichloroethylene, 1,1-	l	75-35-4	O	96.94	1.06E+00	1.81	-----	9.00E-02	1.04E-05	2.40E+03	5.91E+02	2.12		
125	Dichloroethylene, cis-1,2-	l	156-59-2	O	96.94	1.87E-01	1.46	-----	7.35E-02	1.13E-05	4.93E+03	1.75E+02	1.86		
126	Dichloroethylene, trans-1,2	l	156-60-5	O	96.94	3.90E-01	1.70	-----	7.07E-02	1.19E-05	6.30E+03	3.52E+02	2.07		
127	Dichlorophenol, 2,4-	s	120-83-2	OA	163.00	1.31E-04	1.86	-----	3.46E-02	8.77E-06	4.50E+03	7.15E-02	2.80		
128	Dichlorophenoxyacetic acid, 2,4-	s	94-75-7	O	221.04	5.82E-09	2.95	-----	5.90E-02	6.50E-06	8.90E+02	2.40E-05	2.62		
129	Dichloropropane, 1,2	l	78-87-5	O	112.99	1.17E-01	1.77	-----	7.82E-02	8.73E-06	2.80E+03	5.00E+01	2.25		
130	Dichloro-1-propanol, 2,3-	l	616-23-9	O	128.99	3.97E-05	1.53	-----	4.84E-02	9.84E-06	2.95E+05	5.82E-01	0.78		
131	Dichloropropene, 1,3-	l	542-75-6	O	110.97	1.23E-01	1.72	-----	6.26E-02	1.00E-05	1.55E+03	3.12E+01	1.75		
132	Dichloropropene, 1,3-cis	l	10061-01-5	O	110.97	9.15E-02	1.65	-----	7.94E-02	8.00E-06	2.70E+03	3.70E+01	1.53		
133	Dichloropropene, 1,3-trans	l	10061-02-6	O	110.97	9.15E-02	1.65	-----	7.94E-02	9.20E-06	2.80E+03	3.00E+01	1.53		
134	Dichlorvos	l	62-73-7	O	220.98	3.98E-05	9.59	-----	2.32E-02	7.80E-06	1.60E+04	5.27E-02	1.40		
135	Dieldrin	s	60-57-1	O	380.91	1.11E-04	4.33	-----	1.25E-02	4.74E-06	1.95E-01	9.96E-07	5.45		

	COMPOUND	Physical State	CAS number	Type	M.W. (g/mole)	H' (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)	LogK <sub>oc</sub>	Log K <sub>d</sub>	D <sub>air</sub> (cm <sup>2</sup> /s)	D <sub>wat</sub> (cm <sup>2</sup> /s)	Solubility (mg/l)	Vapor Pressure (mm Hg)	Log K <sub>ow</sub>	Br <sub>Abg</sub> (g soil/g D.W.)	Br <sub>Bg</sub> (g soil/g D.W.)
136	Diethylhexyl adipate	l	103-23-1	O	370.57	9.78E-01	5.58	-----	3.56E-02	3.72E-06	1.71E-03	8.25E-05	8.12		
137	Diethyl phthalate	l	84-66-2	O	222.24	1.87E-05	2.18	-----	2.56E-02	6.35E-06	1.08E+03	1.65E-03	2.65		
138	Diethylstilbestrol	s	56-53-1	O	268.36	2.62E-13	4.88	-----	4.43E-02	8.00E-06	1.30E+04	1.06E-09	5.64		
139	Dimethoate	s	60-51-5	O	229.26	2.58E-09	0.63	-----	8.00E-02	8.00E-06	2.50E+04	5.09E-06	0.28		
140	Dimethoxybenzidine, 3,3'-	s	119-90-4	O	244.29	1.66E-08	1.78	-----	2.42E-02	5.50E-06	2.40E+02	2.50E-07	2.08		
141	Dimethylbenzidine, 3,3'-	s	119-93-7	O	212.29	5.40E-09	2.30	-----	5.10E-02	8.00E-06	2.40E+02	3.70E-07	3.02		
142	Dimethylhydrazine, 1,1-	l	57-14-7	O	60.10	4.16E-06	-0.70	-----	1.06E-01	1.04E-05	1.24E+08	1.57E+02	-1.19		
143	Dimethylhydrazine, 1,2-	l	540-73-8	O	60.10	1.72E-04	0.59	-----	1.04E-01	1.10E-05	1.18E+07	6.63E+01	-0.54		
144	Dimethyl phenol, 2,4-	s	105-67-9	O	122.17	8.31E-05	2.07	-----	5.84E-02	8.69E-06	6.20E+03	1.26E-01	2.61		
145	Dimethyl phthalate	l	131-11-3	O	194.19	2.40E-05	1.50	-----	5.68E-02	6.30E-06	4.19E+03	9.12E-03	1.66		
146	Dinitrobenzene, 1,3-	s	99-65-0	O	168.11	4.57E-06	1.48	-----	2.80E-01	7.60E-06	5.40E+02	2.49E-04	1.63		
147	Dinitrobenzene, 1,4-	s	100-25-4	O	168.11	4.44E-06	1.42	-----	6.15E-02	7.18E-06	1.00E+02	4.83E-05	1.63		
148	Dinitrophenol, 2,4-	s	51-28-5	OA	184.11	2.01E-07	-2.00	-----	2.73E-02	9.06E-06	5.80E+03	1.14E-04	1.73		
149	Dinitrotoluene, 2,4-	s	121-14-2	O	182.14	3.60E-05	1.71	-----	2.03E-01	7.06E-06	2.85E+02	1.74E-04	2.18		
150	Dinitrotoluene, 2,6-	s	606-20-2	O	182.14	3.11E-05	1.62	-----	3.27E-02	7.26E-06	1.82E+02	5.70E-04	2.18		
151	Dinoseb	s	88-85-7	O	240.22	2.08E-02	3.08	-----	2.25E-02	6.25E-06	5.20E+01	7.52E-02	3.67		
152	Dioxane, 1,4-	l	123-91-1	O	88.11	2.04E-04	-0.27	-----	2.30E-01	1.00E-05	9.00E+05	3.80E+01	-0.32		
153	TCDDioxins, 2,3,7,8-	s	1746-01-6	O	321.97	1.47E-03	7.15	-----	4.70E-02	8.00E-06	1.93E-05	7.40E-10	7.02		
154	TCDDioxins, 1,2,3,7-	s	67028-18-6	O	321.97	3.16E-04	5.98	-----	4.80E-02	5.28E-06	4.20E-05	5.25E-08	6.91		
155	TCDDioxins, 1,3,6,8-	s	33423-92-6	O	321.97	2.91E-04	4.36	-----	4.80E-02	5.28E-06	3.20E-04	5.25E-09	7.20		
156	TCDDioxins, 1,2,3,4-	s	30746-58-8	O	321.97	1.55E-03	CE	-----	4.80E-02	5.28E-06	4.70E-04	4.73E-08	7.18		
157	PeCDDioxins, 1,2,3,7,8-	s	40321-76-4	O	356.42	1.08E-04	5.70	-----	4.64E-02	5.07E-06	1.20E-04	9.48E-10	7.56		
158	PeCDDioxins, 1,2,3,4,7-	s	39227-61-7	O	356.42	1.08E-04	5.80	-----	4.64E-02	5.07E-06	1.20E-04	7.50E-10	7.56		
159	HxCDDioxins, 1,2,3,4,7,8-	s	39227-28-6	O	390.86	1.85E-03	6.02	-----	4.49E-02	4.87E-06	4.42E-06	8.80E-11	8.21		
160	HpCDDioxins, 1,2,3,4,6,7,8-	s	35822-46-9	O	425.31	3.12E-04	7.00	-----	4.35E-02	4.70E-06	2.40E-06	3.21E-11	8.85		

	COMPOUND	Physical State	CAS number	Type	M.W. (g/mole)	H' (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)	LogK <sub>oc</sub>	Log K <sub>d</sub>	D <sub>air</sub> (cm <sup>2</sup> /s)	D <sub>wat</sub> (cm <sup>2</sup> /s)	Solubility (mg/l)	Vapor Pressure (mm Hg)	Log K <sub>ow</sub>	Br <sub>Abg</sub> (g soil/g D.W.)	Br <sub>Bg</sub> (g soil/g D.W.)
161	OCDDioxins	s	3268-87-9	O	459.75	2.80E-04	7.08	-----	4.30E-02	4.54E-06	4.00E-07	8.25E-13	9.50		
162	Diphenylamine	s	122-39-4	O	169.23	1.83E-04	2.54	-----	6.80E-02	6.30E-06	3.00E+02	4.26E-03	3.29		
163	Diphenylhydrazine, 1,2-	s	122-66-7	O	184.24	1.42E-07	2.82	-----	5.62E-02	5.70E-06	1.84E+03	2.60E-05	3.06		
164	Diquat dibromide	s	85-00-7	O	344.05	2.69E-12	2.31	-----	5.52E-02	5.52E-06	7.00E+05	1.00E-07	-2.82		
165	Disulfoton	s	298-04-4	O	274.41	2.58E-04	3.95	-----	8.00E-02	8.00E-06	1.60E+01	2.30E-04	3.86		
166	Diuron	s	330-54-1	O	233.10	3.04E-08	2.63	-----	5.40E-02	5.30E-06	4.20E+01	1.00E-07	2.67		
167	Endosulfan	s	115-29-7	O	406.93	4.66E-04	2.87	-----	1.15E-02	4.55E-06	5.10E-01	9.96E-06	3.84		
168	Endothall	s	145-73-3	O	230.13	1.08E-08	1.93	-----	CE	CE	1.00E+05	1.80E-04	1.89		
169	Endrin	s	72-20-8	O	380.91	4.95E-05	3.97	-----	1.25E-02	4.74E-06	2.50E-01	5.84E-07	5.45		
170	Epichlorohydrin	l	106-89-8	O	92.53	1.37E-03	0.30	-----	8.60E-02	9.80E-06	6.60E+04	1.67E+01	0.63		
171	Ethion	l	563-12-2	O	384.48	2.87E-05	4.19	-----	CE	CE	1.20E+00	1.50E-06	4.75		
172	Ethoxy ethanol, 2-	l	110-80-5	O	90.12	1.04E-05	2.10E-01	-----	7.77E-02	8.30E-06	5.29E+05	1.12E+00	1.66E-01		
173	Ethoxyethanol acetate, 2-	l	111-15-9	O	132.16	3.77E-05	0.20	-----	6.10E-02	7.29E-06	2.30E+05	2.00E+00	0.59		
174	Ethyl acetate	l	141-78-6	O	88.11	5.57E-03	0.72	-----	7.30E-02	9.70E-06	7.90E+04	9.41E+01	0.86		
175	Ethyl acrylate	l	140-88-5	O	100.12	1.06E-02	2.03	-----	7.40E-02	8.68E-06	2.00E+04	2.95E+01	1.22		
176	Ethyl benzene	l	100-41-4	O	106.17	3.28E-01	2.31	-----	7.50E-02	7.80E-06	1.69E+02	9.60E+00	3.03		
177	S-Ethyl dipropylthiocarbamate	l	759-94-4	O	189.32	4.57E-03	2.38	-----	5.35E-02	5.65E-06	3.70E+02	1.60E-01	3.02		
178	Ethyl ether	l	60-29-7	O	74.12	2.70E-02	0.88	-----	7.40E-02	9.30E-06	6.10E+04	5.40E+02	1.05		
179	Ethyl methacrylate	l	97-63-2	O	114.14	6.65E-03	1.57	-----	8.00E-02	8.00E-06	1.90E+04	1.75E+01	1.77		
180	Ethyl-2-methylbenzene, 1-	l	611-14-3	O	120.19	2.19E-01	3.03	---	6.76E-02	7.29E-06	7.46E+01	2.48E+00	3.53		
181	Ethyl-4-methylbenzene, 1-	l	622-96-8	O	120.19	3.27E-01	3.07	---	6.70E-02	7.18E-06	9.49E+01	2.95E+00	3.58		
182	Ethylenediamine	l	107-15-3	O	60.10	7.19E-08	0.67	-----	1.53E-01	1.12E-05	7.95E+06	1.10E+01	-1.62		
183	Ethylene dibromide	l	106-93-4	O	187.86	2.93E-02	1.73	-----	2.17E-02	1.90E-05	4.32E+03	1.10E+01	2.01		
184	Ethylene glycol	l	107-21-1	O	62.07	2.49E-06	-0.90	-----	1.08E-01	1.22E-05	1.00E+06	7.00E-02	-1.20		
185	Ethylene oxide	g	75-21-8	O	44.05	4.92E-03	0.34	-----	1.04E-01	1.45E-05	3.83E+05	1.32E+03	-0.05		
186	Ethylene thiourea	s	96-45-7	O	102.16	4.99E-05	-0.66	-----	7.15E-02	1.02E-05	1.20E+04	8.36E-02	-0.49		
187	Fluoranthene	s	206-44-0	O	202.26	3.88E-04	4.69	-----	3.02E-02	6.35E-06	2.60E-01	8.13E-06	4.93		

	COMPOUND	Physical State	CAS number	Type	M.W. (g/mole)	H' (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)	LogK <sub>oc</sub>	Log K <sub>d</sub>	D <sub>air</sub> (cm <sup>2</sup> /s)	D <sub>wat</sub> (cm <sup>2</sup> /s)	Solubility (mg/l)	Vapor Pressure (mm Hg)	Log K <sub>ow</sub>	Br <sub>Abg</sub> (g soil/g D.W.)	Br <sub>Bg</sub> (g soil/g D.W.)
188	Fluorene	s	86-73-7	O	166.22	2.64E-03	3.88	-----	3.63E-02	7.88E-06	1.98E+00	3.24E-03	4.02		
189	Fluorine (soluble Fluoride)	g	7782-41-4	I	38.00	CE	-----	2.18	CE	CE	NA/reacts	7.60E+02	0.22		
190	Formaldehyde	g	50-00-0	O	30.03	1.37E-05	0.34	-----	1.80E-01	2.00E-05	5.50E+05	3.88E+03	0.35		
191	Formic acid	l	64-18-6	O	46.03	1.79E-04	-0.54	-----	7.90E-02	1.40E-06	1.00E+06	4.10E+01	-0.46		
192	TCDFurans, 2,3,7,8-	s	51207-31-9	O	305.98	6.16E-04	5.20	-----	4.86E-02	5.41E-06	4.19E-04	1.50E-08	6.29		
193	PeCDFuran, 1,2,3,7,8-	s	57117-41-6	O	340.42	2.11E-04	6.73	-----	4.69E-02	5.18E-06	2.40E-04	2.72E-09	6.94		
194	PeCDFuran, 2,3,4,7,8-	s	57117-31-4	O	340.42	2.44E-04	7.40	-----	4.69E-02	5.18E-06	2.36E-04	2.63E-09	6.94		
195	HxCDFurans, 1,2,3,4,7,8-	s	70648-26-9	O	374.87	5.97E-04	7.40	-----	4.50E-02	4.97E-06	8.25E-06	2.40E-10	7.92		
196	HxCDFurans, 1,2,3,6,7,8-	s	57117-44-9	O	374.87	2.54E-04	7.55	-----	4.50E-02	4.97E-06	1.77E-05	2.20E-10	7.92		
197	HxCDFurans, 2,3,4,6,7,8-	s	60851-34-5	O	374.87	1.70E-03	7.54	-----	4.50E-02	4.97E-06	1.30E-05	2.00E-10	7.92		
198	HpCDFurans, 1,2,3,4,6,7,8-	s	67562-39-4	O	409.31	1.54E-03	6.37	-----	4.30E-02	4.79E-06	1.35E-06	3.82E-10	8.23		
199	HpCDFurans, 1,2,3,4,7,8,9-	s	55673-89-7	O	409.31	1.58E-03	5.00	-----	4.30E-02	4.79E-06	1.40E-06	1.07E-10	6.90		
200	OCDFurans	s	39001-02-0	O	443.76	7.90E-05	6.75	-----	4.27E-02	4.62E-06	1.20E-06	3.75E-12	8.87		
201	Furan	l	110-00-9	O	68.08	2.24E-01	1.32	-----	1.04E-01	1.20E-05	1.00E+04	6.00E+02	1.36		
202	Fufural	l	98-01-1	O	96.09	1.25E-04	0.44	-----	8.72E-02	1.12E-05	8.60E+04	2.00E+00	0.83		
203	Glycidylaldehyde	l	765-34-4	O	72.06	1.08E-05	0.96	-----	9.64E-02	1.16E-05	8.55E+07	2.70E+01	-0.12		
204	Heptachlor	s	76-44-8	O	373.32	2.44E-02	4.07	-----	1.12E-02	5.69E-06	1.80E-01	3.26E-04	6.21		
205	Heptachlor epoxide	s	1024-57-3	O	389.32	3.45E-04	3.86	-----	1.32E-02	4.23E-06	2.75E-01	4.34E-06	4.91		
206	Hexachlorobenzene	s	118-74-1	O	284.78	2.22E-02	4.45	-----	5.42E-02	5.91E-06	6.00E-03	1.23E-05	5.86		
207	Hexachloro-1,3-butadiene	l	87-68-3	O	260.76	9.94E-01	3.84	-----	5.61E-02	6.16E-06	2.55E+00	1.77E-01	4.72		
208	Hexachlorocyclohexane, techn	CE	608-73-1	O	290.83	5.99E-05	3.38	-----	1.42E-02	7.34E-06	4.35E+01	1.64E-04	4.26		
209	Hexachlorocyclohexane, alpha	s	319-84-6	O	290.83	2.82E-04	3.12	-----	1.42E-02	7.34E-06	2.00E+00	4.26E-05	4.26		

	COMPOUND	Physical State	CAS number	Type	M.W. (g/mole)	H' (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)	LogK <sub>oc</sub>	Log K <sub>d</sub>	D <sub>air</sub> (cm <sup>2</sup> /s)	D <sub>wat</sub> (cm <sup>2</sup> /s)	Solubility (mg/l)	Vapor Pressure (mm Hg)	Log K <sub>ow</sub>	Br <sub>Abg</sub> (g soil/g D.W.)	Br <sub>Bg</sub> (g soil/g D.W.)
210	Hexachlorocyclohexane, beta	s	319-85-7	O	290.83	1.44E-05	3.14	-----	1.42E-02	7.34E-06	5.42E-01	4.90E-07	4.26		
211	Hexachlorocyclohexane, gamma	s	58-89-9	O	290.83	1.41E-04	3.04	-----	1.42E-02	7.34E-06	5.75E+00	3.72E-05	4.26		
212	Hexachlorocyclopentadiene	l	77-47-4	O	273.78	7.15E-01	3.98	-----	1.61E-02	7.21E-06	1.80E+00	7.32E-02	4.63		
213	Hexachloroethane	s	67-72-1	O	236.74	1.62E-01	3.26	-----	2.50E-03	6.80E-06	5.00E+01	4.72E-01	4.03		
214	Hexachlorophene	s	70-30-4	O	406.91	2.54E-09	7.30	-----	8.00E-02	8.00E-06	3.00E-03	2.74E-12	6.92		
215	Hexane, n-	l	110-54-3	O	86.18	4.66E+01	2.68	-----	2.00E-01	7.77E-06	1.30E+01	1.52E+02	3.29		
216	Hexazinone	s	51235-04-2	O	252.32	8.62E-11	1.57	-----	5.08E-02	5.11E-06	3.30E+04	2.03E-07	2.15		
217	Hydrazine	l	302-01-2	O	32.05	7.20E-08	-1.00	-----	4.16E-01	1.90E-05	3.41E+08	1.40E+01	-1.47		
218	Hydrogen chloride	g	7647-01-0	I	36.46	9.30E-02	-----	CE	1.67E-01	2.05E-05	6.60E+05	3.08E+04	0.54		
219	Hydrogen cyanide	g	74-90-8	I	27.03	5.40E-03	-----	CE	1.73E-01	1.96E-05	1.00E+06	6.20E+02	-0.69		
220	Hydrogen sulfide	g	7783-06-4	I	34.08	9.56E-01	-----	CE	1.76E-01	1.61E-05	4.13E+03	1.52E+04	0.23		
221	Indene	l	95-13-6	O	116.16	2.08E-02	2.50	-----	6.82E-02	7.97E-06	3.90E+02	1.30E+00	2.80		
222	Indeno-(1,2,3-cd)-pyrene	s	193-39-5	O	276.34	2.85E-06	6.54	-----	1.90E-02	5.66E-06	3.75E-03	1.40E-10	6.70		
223	Isobutyl alcohol	l	78-83-1	O	74.12	4.99E-04	0.75	-----	8.60E-02	8.00E-06	9.49E+04	1.00E+01	0.77		
224	Isophorone	l	78-59-1	O	138.21	2.57E-04	1.48	-----	6.23E-02	6.76E-06	1.20E+04	4.10E-01	2.62		
225	Kepon	s	143-50-0	O	490.64	1.04E-06	4.43	-----	4.22E-02	4.30E-06	7.60E+00	2.25E-07	4.91		
226	Lead	s	7439-92-1	M	207.20	0.00E+00	-----	1.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.73		
227	Malathion	l	121-75-5	O	330.36	9.98E-07	2.46	-----	1.50E-02	4.40E-06	1.45E+02	7.90E-06	2.29		
228	Maleic anhydride	s	108-31-6	O	98.06	8.31E-06	1.41	-----	9.50E-02	1.11E-05	8.65E+02	1.34E-03	1.62		
229	Maleic hydrazide	s	123-33-1	O	112.09	< 1.03E-10	1.40	-----	8.75E-02	8.75E-06	6.00E+03	< 7.50E-08	-0.89		
230	Malononitrile	s	109-77-3	O	66.06	1.97E-07	0.69	-----	9.97E-02	1.09E-05	6.96E+06	3.79E-01	-0.18		
231	Manganese	s	7439-96-5	M	54.94	0.00E+00	-----	1.70	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	1.00E-01	5.00E-02
232	Mercury	l	7439-97-6	M	200.59	4.74E-01	-----	-1.40	3.07E-02	6.30E-06	3.00E-02	1.30E-03	-0.47	5.50E-03	1.40E-02
233	Methacrylonitrile	l	126-98-7	O	67.09	3.03E-03	0.53	-----	8.00E-02	8.00E-06	2.50E+04	6.80E+01	0.76		
234	Methanol	l	67-56-1	O	32.04	1.94E-04	-0.74	-----	1.50E-01	1.64E-05	1.00E+06	1.22E+02	-0.63		
235	Methomyl	s	16752-77-5	O	162.21	7.48E-09	2.20	-----	4.07E-02	7.20E-06	5.80E+04	5.00E-05	0.61		
236	Methoxychlor	s	72-43-5	O	345.65	6.57E-04	4.89	-----	1.56E-02	4.46E-06	4.50E-02	1.23E-06	5.67		
237	Methoxyethanol	l	109-86-4	O	76.10	1.28E+00	0.93	-----	9.15E-02	1.02E-05	2.01E+01	6.20E+00	-0.91		

	COMPOUND	Physical State	CAS number	Type	M.W. (g/mole)	H' (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)	LogK <sub>oc</sub>	Log K <sub>d</sub>	D <sub>air</sub> (cm <sup>2</sup> /s)	D <sub>wat</sub> (cm <sup>2</sup> /s)	Solubility (mg/l)	Vapor Pressure (mm Hg)	Log K <sub>ow</sub>	Br <sub>Abg</sub> (g soil/g D.W.)	Br <sub>Bg</sub> (g soil/g D.W.)
238	Methoxyethanol acetate	l	110-49-6	O	118.13	1.28E+00	1.40	-----	7.22E-02	8.10E-06	3.52E+01	7.00E+00	0.10		
239	Methyl ethyl ketone	l	78-93-3	O	72.11	1.94E-03	0.28	-----	8.08E-02	9.80E-06	2.40E+05	9.10E+01	0.26		
240	Methyl isobutyl ketone	l	108-10-1	O	100.16	5.82E-03	1.18	-----	7.50E-02	7.80E-06	1.90E+04	1.45E+01	1.16		
241	Methyl mercury	CE	22967-92-6	I	215.62	CE	-----	CE	CE	CE	CE	CE	0.08		
242	Methyl methacrylate	l	80-62-6	O	100.12	1.33E-02	1.36	-----	7.70E-02	8.60E-06	1.60E+04	3.80E+01	1.28		
243	Methyl naphthalene, 1-	s	90-12-0	O	142.20	1.64E-02	3.36	-----	6.31E-02	7.13E-06	2.80E+01	6.62E-02	3.72		
244	Methyl naphthalene, 2-	s	91-57-6	O	142.20	1.85E-02	3.64	-----	6.29E-02	7.20E-06	2.54E+01	6.75E-02	3.72		
245	Methyl parathion	s	298-00-0	O	263.21	5.82E-06	2.81	-----	8.00E-02	8.00E-06	5.00E+01	1.52E-05	2.75		
246	Methylene-bis (2-chloroaniline), 4,4'-	s	101-14-4	O	267.16	1.40E-05	3.90	-----	1.99E-02	5.80E-06	7.24E+01	6.94E-05	3.47		
247	Methylene bromide	l	74-95-3	O	173.83	3.49E-02	2.26	-----	8.00E-02	8.00E-06	1.10E+04	4.56E+01	1.52		
248	Methylene chloride	l	75-09-2	O	84.93	9.10E-02	1.07	-----	1.01E-01	1.17E-05	1.54E+04	4.55E+02	1.34		
249	Molinate	l	2212-67-1	O	187.31	5.25E-05	1.70	-----	5.65E-02	6.00E-06	9.00E+02	5.60E-03	2.91		
250	Molybdenum	s	7439-98-7	M	95.94	0.00E+00	-----	1.30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	1.00E-01	6.00E-02
251	MTBE	l	1634-04-4	O	88.15	2.44E-02	1.15	-----	7.92E-02	9.41E-05	4.80E+04	2.49E+02	1.43		
252	Naled	l	300-76-5	O	380.78	2.71E-03	2.12	-----	CE	6.80E-06	1.50E+00	2.00E-04	1.60		
253	Naphthalene	s	91-20-3	O	128.17	2.00E-02	3.19	-----	5.90E-02	7.50E-06	3.14E+01	8.89E-02	3.17		
254	Nickel and compounds (soluble salts)	s	7440-02-0	M	58.69	0.00E+00	-----	1.20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-0.57	2.50E-02	8.00E-03
255	Nickel, refinery dust	CE	No CASNUM	I	CE	CE	-----	CE	CE	CE	CE	CE	CE	2.50E-02	8.00E-03
256	Nitrate	CE	14797-55-8	I	62.00	CE	-----	CE	CE	CE	CE	CE	0.21		
257	Nitrite	CE	14797-65-0	I	46.01	CE	-----	CE	CE	CE	CE	CE	0.06		
258	Nitroaniline 2-	s	88-74-4	O	138.13	2.08E-05	1.43	-----	5.99E-02	7.18E-06	1.26E+03	4.75E-03	2.02		
259	Nitrobenzene	l	98-95-3	O	123.11	8.56E-04	2.12	-----	7.60E-02	8.60E-06	1.90E+03	2.44E-01	1.81		
260	Nitropropane, 2-	l	79-46-9	O	89.09	5.15E-03	0.54	-----	9.23E-02	1.01E-05	1.70E+04	1.82E+01	0.87		

	COMPOUND	Physical State	CAS number	Type	M.W. (g/mole)	H' (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)	LogK <sub>oc</sub>	Log K <sub>d</sub>	D <sub>air</sub> (cm <sup>2</sup> /s)	D <sub>wat</sub> (cm <sup>2</sup> /s)	Solubility (mg/l)	Vapor Pressure (mm Hg)	Log K <sub>ow</sub>	Br <sub>Abg</sub> (g soil/g D.W.)	Br <sub>Bg</sub> (g soil/g D.W.)
261	Nitroso-n-ethylurea, n-	s	759-73-9	O	117.11	1.05E-04	1.51	-----	8.08E-02	8.25E-06	4.85E+04	7.97E-01	-0.02		
262	Nitroso-n-methylurea, n-	CE	684-93-5	O	103.08	1.08E-06	1.23	-----	7.06E-02	1.02E-05	4.21E+06	8.04E-01	-0.52		
263	Nitroso-methyl-ethyl-amine, n-	CE	10595-95-6	O	88.11	3.70E-05	1.32	-----	8.00E-02	8.00E-06	3.00E+05	2.28E+00	-0.15		
264	Nitrosodi-n-butylamine, n-	CE	924-16-3	O	158.24	3.58E-03	2.36	-----	8.00E-02	8.00E-06	1.20E+03	2.89E-01	2.31		
265	Nitrosodi-n-propylamine, n-	s	621-64-7	O	130.19	9.35E-05	1.30	-----	5.45E-02	8.17E-06	9.89E+03	4.00E-01	1.35		
266	Nitrosodiethanolamine	l	1116-54-7	O	134.14	2.05E-09	0.48	-----	7.27E-02	7.70E-06	7.33E+07	5.00E-04	-1.28		
267	Nitrosodiethylamine, N-	l	55-18-5	O	102.14	3.60E-05	0.48	-----	8.00E-02	8.00E-06	1.47E+05	1.42E+00	0.34		
268	Nitrosodimethylamine, N-	l	62-75-9	O	74.08	2.16E-05	0.56	-----	1.34E-01	9.72E-06	1.00E+06	5.37E+00	-0.64		
269	Nitrosodiphenylamine	s	86-30-6	O	198.22	2.08E-04	2.52	-----	3.12E-02	6.35E-06	3.51E+01	9.88E-02	3.16		
270	Nitrosopyrrolidine, n-	l	930-55-2	O	100.12	7.48E-07	-0.19	-----	8.00E-02	8.00E-06	7.80E+05	1.75E-01	0.23		
271	Nitrotoluene, m	l	99-08-1	O	137.14	2.24E-03	2.15	-----	6.42E-02	7.69E-06	4.98E+02	1.50E-01	2.36		
272	Nitrotoluene, o	l	88-72-2	O	137.14	1.87E-03	2.15	-----	6.47E-02	7.73E-06	6.00E+02	1.50E-01	2.36		
273	Nitrotoluene, p	s	99-99-0	O	137.14	2.29E-03	2.15	-----	6.40E-02	7.70E-06	4.00E+02	1.20E-01	2.36		
274	Octamethylpyrophosphoramidate	l	152-16-9	O	286.25	1.16E-08	-0.51	-----	8.00E-02	8.00E-06	1.00E+06	9.88E-04	-1.01		
275	Oxamyl	s	23135-22-0	O	219.26	1.60E-11	0.70	-----	5.57E-02	5.75E-06	2.80E+05	3.83E-07	-1.20		
276	Parathion	s	56-38-2	O	291.26	2.37E-05	3.75	-----	1.70E-02	5.80E-06	1.18E+01	1.73E-05	3.73		
277	Pebulate	l	1114-71-2	O	203.35	9.85E-04	2.63	-----	5.10E-02	5.38E-06	9.20E+01	8.85E-03	3.51		
278	Pentachlorobenzene	s	608-93-5	O	250.34	3.16E-02	4.50	-----	6.70E-02	6.30E-06	6.50E-01	1.67E-03	5.22		
279	Pentachloronitrobenzene	s	82-68-8	O	295.34	2.57E-02	4.11	-----	1.59E-02	6.10E-06	7.11E-02	1.13E-04	5.03		
280	Pentachlorophenol	s	87-86-5	OA	266.34	1.16E-05	2.61	-----	5.60E-02	6.10E-06	1.40E+01	1.70E-05	4.74		
281	Phenanthrene	s	85-01-8	O	178.23	5.40E-03	4.15	-----	3.33E-02	7.47E-06	9.94E-01	6.80E-04	4.35		
282	Phenol	s	108-95-2	O	94.11	2.47E-05	1.24	-----	8.20E-02	9.10E-06	8.70E+04	4.63E-01	1.51		
283	Phenyl mercuric acetate	s	62-38-4	O	336.74	3.41E-09	2.20	-----	8.00E-02	8.00E-06	4.37E+03	3.04E-06	0.89		

	COMPOUND	Physical State	CAS number	Type	M.W. (g/mole)	H' (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)	LogK <sub>oc</sub>	Log K <sub>d</sub>	D <sub>air</sub> (cm <sup>2</sup> /s)	D <sub>wat</sub> (cm <sup>2</sup> /s)	Solubility (mg/l)	Vapor Pressure (mm Hg)	Log K <sub>ow</sub>	Br <sub>Abg</sub> (g soil/g D.W.)	Br <sub>Bg</sub> (g soil/g D.W.)
284	Phenylene diamine, m-	s	108-45-2	O	108.14	9.56E-07	0.04	-----	6.63E-02	9.90E-06	3.51E+05	2.28E-02	-0.39		
285	Phenylene diamine, p-	s	106-50-3	O	108.14	5.24E-08	0.04	-----	7.15E-02	8.92E-06	3.80E+04	4.60E-03	-0.39		
286	Phorate	l	298-02-2	O	260.38	4.99E-04	3.74	-----	8.00E-02	8.00E-06	4.40E+01	1.30E-03	3.37		
287	Phosphine	g	7803-51-2	I	34.00	1.46E+02	-----	CE	3.81E-01	1.82E-05	4.00E+02	3.14E+04	-0.27		
288	Phosphoric acid	s	7664-38-2	I	98.00	CE	-----	CE	CE	CE	CE	3.00E-02	-0.77		
289	Phosphorus, white	s	7723-14-0	I	123.90	5.65E-02	3.05	-----	CE	CE	3.00E+00	2.50E-02	3.08		
290	Phthalic anhydride	s	85-44-9	O	148.12	2.54E-07	1.90	-----	6.36E-02	7.90E-06	6.20E+03	2.00E-04	2.07		
291	Polybrominated biphenyls	s	67774-32-7	O	627.59	1.62E-04	3.33	-----	CE	4.63E-06	1.10E-02	5.20E-08	6.39		
292	Polychlorinated biphenyls	l	1336-36-3	O	290.00	1.75E-02	5.72	-----	1.04E-01	1.00E-05	5.55E-02	7.60E-05	6.30		
293	Potassium cyanide	s	151-50-8	I	65.12	0.00E+00	-----	CE	CE	CE	7.20E+05	0.00E+00	-1.69		
294	Pronamide	s	23950-58-5	O	256.13	3.74E-04	2.30	-----	8.00E-02	8.00E-06	1.50E+01	4.00E-04	3.57		
295	Propargite	l	2312-35-8	O	350.48	1.44E-06	3.75	-----	3.94E-02	4.20E-06	5.00E-01	4.48E-08	3.73		
296	Propargyl alcohol	l	107-19-7	O	56.06	1.34E-05	0.73	-----	1.04E-01	1.24E-05	5.57E+06	1.20E+01	-0.42		
297	Propham	s	122-42-9	O	179.22	5.30E-06	1.71	-----	5.71E-02	6.28E-06	2.50E+02	1.35E-04	2.66		
298	Propylene oxide	l	75-56-9	O	58.08	3.47E-03	0.10	-----	1.04E-01	1.16E-05	4.76E+05	5.32E+02	0.03		
299	Pyrene	s	129-00-0	O	202.26	4.57E-04	4.58	-----	2.72E-02	7.24E-06	1.35E-01	4.25E-06	4.93		
300	Pyridine	l	110-86-1	O	79.10	2.91E-01	0.64	-----	9.10E-02	7.60E-06	3.00E+02	2.00E+01	0.80		
301	Quinoline	l	91-22-5	O	129.16	1.15E-04	2.76	-----	5.46E-02	8.31E-06	6.78E+03	9.60E-02	2.14		
302	Selenious acid	s	7783-00-8	I	128.97	1.27E-05	-----	CE	CE	CE	1.67E+06	3.00E+00	-3.18	1.50E-02	2.20E-02
303	Selenium	s	7782-49-2	M	78.96	0.00E+00	-----	0.34	CE	CE	0.00E+00	0.00E+00	0.24	1.50E-02	2.20E-02
304	Selenourea	CE	630-10-4	O	118.98	CE	CE	-----	CE	CE	CE	CE	-2.63		
305	Silver	s	7440-22-4	M	107.87	0.00E+00	-----	-1.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	1.70E-01	1.00E-01
306	Sodium azide	s	26628-22-8	I	65.01	CE	-----	CE	CE	CE	4.20E+05	CE	0.86		
307	Sodium cyanide	s	143-33-9	I	49.01	0.00E+00	-----	CE	CE	CE	5.80E+05	0.00E+00	-1.69		
308	Sodium diethyldithiocarbamate	s	148-18-5	O	171.26	CE	CE	-----	CE	CE	CE	CE	0.27		
309	Sodium fluoride	s	7681-49-4	I	41.99	0.00E+00	-----	CE	CE	CE	4.00E+04	0.00E+00	-0.77		
310	Strychnine	s	57-24-9	O	334.42	6.65E-12	1.90	-----	8.00E-02	8.00E-06	1.43E+02	1.67E-10	1.85		
311	Styrene	l	100-42-5	O	104.15	1.14E-01	2.88	-----	7.10E-02	8.00E-06	3.10E+02	6.24E+00	2.90		

	COMPOUND	Physical State	CAS number	Type	M.W. (g/mole)	H' (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)	LogK <sub>oc</sub>	Log K <sub>d</sub>	D <sub>air</sub> (cm <sup>2</sup> /s)	D <sub>wat</sub> (cm <sup>2</sup> /s)	Solubility (mg/l)	Vapor Pressure (mm Hg)	Log K <sub>ow</sub>	Br <sub>Abg</sub> (g soil/g D.W.)	Br <sub>Bg</sub> (g soil/g D.W.)
312	Tetrachlorobenzene, 1,2,4,5-	s	95-94-3	O	215.89	4.99E-02	3.20	-----	2.11E-02	8.80E-06	3.00E-01	5.40E-03	4.57		
313	Tetrachloroethane, 1,1,1,2-	s	630-20-6	O	167.85	9.98E-02	2.98	-----	7.10E-02	7.90E-06	1.10E+03	1.22E+01	2.93		
314	Tetrachloroethane, 1,1,2,2-	l	79-34-5	O	167.85	1.55E-02	1.89	-----	7.10E-02	7.90E-06	2.97E+03	5.17E+00	2.19		
315	Tetrachloroethylene	l	127-18-4	O	165.83	7.65E-01	2.19	-----	7.20E-02	8.20E-06	2.00E+02	1.84E+01	2.97		
316	Tetrachlorophenol, 2,3,4,6-	s	58-90-2	OA	231.89	2.54E-04	2.02	-----	2.17E-02	7.10E-06	1.00E+02	5.02E-03	4.09		
317	Tetraethyl dithiopyrophosphate	l	3689-24-5	O	322.32	1.75E-04	2.87	-----	1.50E-02	5.50E-06	2.50E+01	1.70E-04	3.98		
318	Tetraethyl lead	l	78-00-2	O	323.45	3.31E+00	3.69	-----	1.32E-02	6.40E-06	8.00E-01	1.50E-01	4.88		
319	Thallium chloride	s	7791-12-0	I	239.84	0.00E+00	-----	CE	CE	CE	2.90E+03	0.00E+00	CE	1.00E-03	4.00E-04
320	Thallium nitrate	s	10102-45-1	I	266.39	7.19E-11	-----	CE	CE	CE	9.55E+04	4.71E-07	CE		
321	Thallium sulfate	s	7446-18-6	I	504.83	0.00E+00	-----	CE	CE	CE	4.87E+04	0.00E+00	CE		
322	Thiofanox	s	39196-18-4	O	218.32	3.90E-07	1.77	-----	2.55E-02	6.62E-06	5.20E+03	3.10E-04	2.16		
323	Thiophanatemethyl	s	23564-05-8	O	342.40	< 3.82E-07	0.95	-----	4.55E-02	4.68E-06	3.50E+00	< 7.50E-08	1.50		
324	Thiram	s	137-26-8	O	240.44	< 3.28E-06	2.83	-----	2.25E-02	6.24E-06	3.00E+01	< 7.50E-06	1.70		
325	Tin	s	7440-31-5	M	118.71	0.00E+00	-----	CE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29	1.00E-02	6.00E-03
326	Toluene	l	108-88-3	O	92.14	2.76E-01	2.15	-----	8.70E-02	8.60E-06	5.30E+02	2.82E+01	2.54		
327	Toluenediamine, 2,4-	s	95-80-7	O	122.17	7.48E-08	3.11	-----	8.00E-02	8.00E-06	7.47E+03	8.36E-05	0.16		
328	Toluenediamine, 2,6-	s	823-40-5	O	122.17	5.15E-10	CE	-----	6.87E-02	7.97E-06	4.80E+04	1.98E-05	0.16		
329	Toluene diisocyanate, 2,4/2,6-	l	26471-62-5	O	174.16	6.86E-06	3.35	-----	6.09E-02	6.80E-06	1.11E+05	8.00E-02	3.74		
330	Toluidine, p-	s	106-49-0	O	107.16	3.82E-04	1.40	-----	8.00E-02	8.00E-06	7.20E+03	3.30E-01	1.62		
331	Toxaphene	s	8001-35-2	O	413.81	1.40E-04	4.98	-----	1.16E-02	4.34E-06	7.40E-01	4.19E-06	6.79		
332	TP Silvex, 2,4,5-	s	93-72-1	O	269.51	5.45E-07	3.41	-----	1.94E-02	5.80E-06	1.40E+02	5.20E-06	3.68		
333	Triallate	s	2303-17-5	O	304.67	4.53E-04	3.16	-----	4.58E-02	4.84E-06	4.00E+00	1.20E-04	4.57		
334	Trichloro-1,2,2-trifluoroethane, 1,1,2	l	76-13-1	O	187.38	2.20E+01	3.11	-----	7.80E-02	8.20E-06	2.00E+02	3.60E+02	3.09		
335	Trichlorobenzene, 1,2,4-	l	120-82-1	O	181.45	5.90E-02	3.22	-----	3.00E-02	8.23E-06	4.88E+01	3.36E-01	3.93		

	COMPOUND	Physical State	CAS number	Type	M.W. (g/mole)	H' (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)	LogK <sub>oc</sub>	Log K <sub>d</sub>	D <sub>air</sub> (cm <sup>2</sup> /s)	D <sub>wat</sub> (cm <sup>2</sup> /s)	Solubility (mg/l)	Vapor Pressure (mm Hg)	Log K <sub>ow</sub>	Br <sub>Abg</sub> (g soil/g D.W.)	Br <sub>Bg</sub> (g soil/g D.W.)
336	Trichloroethane, 1,1,1-	l	71-55-6	O	133.40	7.15E-01	2.04	-----	7.80E-02	8.80E-06	1.33E+03	1.24E+02	2.68		
337	Trichloroethane, 1,1,2-	l	79-00-5	O	133.40	3.80E-02	1.70	-----	7.92E-02	8.80E-06	4.42E+03	2.52E+01	2.01		
338	Trichloroethylene	l	79-01-6	O	131.39	4.28E-01	1.97	-----	7.90E-02	9.10E-06	1.10E+03	7.20E+01	2.47		
339	Trichlorofluoromethane	l	75-69-4	O	137.37	4.03E+00	2.13	-----	8.70E-02	9.70E-06	1.10E+03	6.87E+02	2.13		
340	Trichlorophenol, 2,4,5-	s	95-95-4	OA	197.45	1.78E-04	2.47	-----	2.91E-02	7.03E-06	1.20E+03	1.63E-02	3.45		
341	Trichlorophenol, 2,4,6-	s	88-06-2	OA	197.45	3.19E-04	2.12	-----	3.18E-02	6.25E-06	9.82E+02	1.18E-02	3.45		
342	Trichlorophenoxyacetic acid, 2,4,5-	s	93-76-5	O	255.48	3.62E-07	1.72	-----	8.00E-02	8.00E-06	2.78E+02	3.61E-06	3.26		
343	Trichloropropane, 1,1,2-	l	598-77-6	O	147.43	1.21E+00	2.24	-----	3.96E-02	9.30E-06	4.44E+01	6.64E+00	2.43		
344	Trichloropropane, 1,2,3-	l	96-18-4	O	147.43	1.58E-02	2.59	-----	7.10E-02	7.90E-06	1.90E+03	3.70E+00	2.50		
345	Triethylamine	l	121-44-8	O	101.19	1.99E-02	1.12	-----	7.54E-02	7.51E-06	1.50E+04	5.00E+01	1.51		
346	Trifluralin	s	1582-09-8	O	335.28	2.01E-03	4.14	-----	1.49E-02	4.70E-06	6.00E-01	1.10E-04	5.31		
347	Trimethylbenzene, 1,2,3-	l	526-73-8	O	120.19	1.33E-01	2.77	-----	6.77E-02	7.41E-06	7.52E+01	1.49E+00	3.55		
348	Trinitrobenzene, 1,3,5-	s	99-35-4	O	213.11	2.87E-06	1.15	-----	8.00E-02	8.00E-06	3.53E+02	9.90E-05	1.45		
349	Trinitrophenylmethylnitramine, 2,4,6-	s	479-45-8	O	287.15	8.31E-11	2.37	-----	5.69E-02	6.40E-06	7.50E+01	4.00E-10	2.04		
350	Trinitrotoluene, 2,4,6-	s	118-96-7	O	227.13	1.90E-05	2.48	-----	5.41E-02	6.57E-06	1.30E+02	1.24E-04	1.99		
351	Uranium	s	7440-61-1	M	238.03	0.00E+00	-----	3.47	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	5.00E-03	4.00E-03
352	Vanadium	s	7440-62-2	M	50.94	0.00E+00	-----	3.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	3.60E-03	3.00E-03
353	Vanadium pentoxide	s	1314-62-1	I	181.88	0.00E+00	-----	CE	CE	CE	8.00E+03	0.00E+00	CE	3.60E-03	3.00E-03
354	Vernam	l	1929-77-7	O	203.35	7.36E-04	3.44	-----	5.10E-02	5.39E-06	9.85E+01	1.04E-02	3.51		
355	Vinyl acetate	l	108-05-4	O	86.09	2.29E-02	0.72	-----	8.50E-02	9.20E-06	2.00E+04	1.09E+02	0.73		
356	Vinyl chloride	g	75-01-4	O	62.50	3.49E+00	1.04	-----	1.06E-01	1.23E-05	2.76E+03	2.80E+03	1.62		
357	Warfarin	s	81-81-2	O	308.33	1.15E-07	2.96	-----	1.63E-02	4.40E-06	1.70E+01	1.16E-07	3.20		

	COMPOUND	Physical State	CAS number	Type	M.W. (g/mole)	H' (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)	LogK <sub>oc</sub>	Log K <sub>d</sub>	D <sub>air</sub> (cm <sup>2</sup> /s)	D <sub>wat</sub> (cm <sup>2</sup> /s)	Solubility (mg/l)	Vapor Pressure (mm Hg)	Log K <sub>ow</sub>	Br <sub>Abg</sub> (g soil/g D.W.)	Br <sub>Bg</sub> (g soil/g D.W.)	
358	Xylenes	l	1330-20-7	O	106.17	2.93E-01	2.38	-----	7.40E-02	8.50E-06	1.98E+02	8.06E+00	3.09			
359	Xylene, m-	l	108-38-3	O	106.17	3.05E-01	2.29	-----	7.00E-02	7.80E-06	1.60E+02	8.00E+00	3.20			
360	Xylene, o-	l	95-47-6	O	106.17	7.36E-04	2.11	-----	8.70E-02	1.00E-05	1.78E+02	6.75E+00	3.13			
361	Xylene, p-	l	106-42-3	O	106.17	3.18E-01	2.49	-----	7.69E-02	8.44E-06	1.85E+02	8.76E+00	3.17			
362	Zinc	s	7440-66-6	M	65.39	0.00E+00	-----	1.20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-0.47	9.00E-02	4.40E-02	
363	Zinc cyanide	s	557-21-1	I	117.43	CE	-----	1.60	CE	CE	0.00E+00	CE	-2.31			
364	Zinc phosphide	s	1314-84-7	I	258.12	0.00E+00	-----	1.60	CE	CE	0.00E+00	0.00E+00	CE			
365	6 C aliphatics (TPH)	l	---	O	81	3.3E+01	2.9	-----	1.0E-01	1.0E-05	3.6E+01	2.7E+02	---			
366	> 6-8 C aliphatics (TPH)	l	---	O	100	5.0E+01	3.6	-----	1.0E-01	1.0E-05	5.4E+00	4.8E+01	---			
367	> 8-10 C aliphatics (TPH)	l	---	O	130	8.0E+01	4.5	-----	1.0E-01	1.0E-05	4.3E-01	4.8E+00	---			
368	> 10-12 C aliphatics (TPH)	l	---	O	160	1.2E+02	5.4	-----	1.0E-01	1.0E-05	3.4E-02	4.8E-01	---			
369	> 12-16 C aliphatics (TPH)	l	---	O	200	5.2E+02	6.7	-----	1.0E-01	1.0E-05	7.6E-04	3.6E-02	---			
370	> 16-35 C aliphatics (TPH)	l	---	O	270	4.9E+03	8.8	-----	1.0E-01	1.0E-05	2.5E-06	8.4E-04	---			
371	5-7 C aromatics (TPH) - Benzene	l		O	78	2.27E-01	1.82	-----	8.8E-02	9.8E-06	1.77E+03	9.50E+01	---			
372	> 7-8 C aromatics (TPH) - Toluene	l	---	O	92	2.76E-01	2.15	-----	8.7E-02	8.6E-06	5.30E+02	2.82E+01	---			
370	> 8-10 C aromatics (TPH)	l	---	O	120	4.8E-01	3.2	-----	1.0E-01	1.0E-05	6.5E+01	4.8E+00	---			
371	> 10-12 C aromatics (TPH)	l	---	O	130	1.4E-01	3.4	-----	1.0E-01	1.0E-05	2.5E+01	4.8E-01	---			
375	> 12-16 C aromatics (TPH)	l	---	O	150	5.3E-02	3.7	-----	1.0E-01	1.0E-05	5.8E+00	3.6E-02	---			
376	> 16-21 C aromatics (TPH)	l	---	O	190	1.3E-02	4.2	-----	1.0E-01	1.0E-05	6.5E-01	8.4E-04	---			
377	> 21-35 C aromatics (TPH)	s	---	O	240	6.7E-04	5.1	-----	1.0E-01	1.0E-05	6.6E-03	3.3E-07	---			
Legend																
	s	compound solid at @ 20 °C								D <sub>air</sub>	Diffusion coefficient in air (cm <sup>2</sup> /s)					

COMPOUND	Physical State	CAS number	Type	M.W. (g/mole)	H' (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)	LogK <sub>oc</sub>	Log K <sub>d</sub>	D <sub>air</sub> (cm <sup>2</sup> /s)	D <sub>wat</sub> (cm <sup>2</sup> /s)	Solubility (mg/l)	Vapor Pressure (mm Hg)	Log K <sub>ow</sub>	Br <sub>Abg</sub> (g soil/g D.W.)	Br <sub>Bg</sub> (g soil/g D.W.)
l	compound liquid at @ 20 °C								D <sub>wat</sub>					Diffusion coefficient in water (cm <sup>2</sup> /s)
g	compound gaseous at @ 20 °C								K <sub>ow</sub>					Octanol-water partition coefficient (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -Octanol)
H'	Dimensionless Henry's Law Constant H' = H x 41.57 @ 20 °C (cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -air)								Br <sub>Abg</sub>					Soil-to-above ground plant biotransfer factor (g soil/g plant tissue dry weight)
H	Henry's Law Constant (atm-m <sup>3</sup> /mole)								Br <sub>Bg</sub>					Soil-to-below ground plant biotransfer factor (g soil/g plant tissue dry weight)
MW	Molecular Weight (g/mole)								Type					O: Organic, I: Inorganic, M: Metal, OA: Organic Acids
K <sub>oc</sub>	Soil organic carbon-water partition coefficient (cm <sup>3</sup> -H <sub>2</sub> O/g-Carbon)								CE					Not found, Can not estimate
K <sub>d</sub>	Soil-water partition coefficient (cm <sup>3</sup> -H <sub>2</sub> O/g-Soil)								NA/reacts					Not applicable because reacts with water
									<i>Values in italic</i>					Estimated by TCEQ

(1) For Tiers 2 and 3, the person may determine property-specific soil pH in order to account for the high pH dependence of the soil-water partition coefficient ( $K_d$ ) of inorganic compounds and the organic carbon-water partition coefficient ( $K_{oc}$ ) of ionizing organic compounds. Once the property-specific pH is determined, the person shall apply subparagraphs (A) - (C) of this paragraph as applicable to determine pH-dependent  $K_d$  and  $K_{oc}$  values unless another appropriate method is approved by the executive director. The executive director may also approve the use of data from appropriately-conducted tests in determining a site-specific  $K_d$  or  $K_{oc}$ .

(A) For aluminum and lead, the person shall select a  $K_d$  from the following figure in accordance with the pH range and the total weight percent of clay, organic matter, iron, and aluminum oxyhydroxide representative of the affected property soils.

**Figure: 30 TAC §350.73(f)(1)(A)**

<b>Soil-Water Distribution Coefficients (<math>K_d</math>) for Aluminum and Lead</b>									
	pH $\leq$ 5			pH 5-9			pH $\geq$ 9		
	Sandy Soil	Loamy Soil	Clayey Soil	Sandy Soil	Loamy Soil	Clayey Soil	Sandy Soil	Loamy Soil	Clayey Soil
Aluminum	3,980	3,980	44,600	35,300	35,300	35,300	353	353	353
Lead	10	10	12	234	597	1,830	234	597	1,830
Sandy Soil: < 10% by weight clay, organic matter, and iron and aluminum oxyhydroxides. Loamy Soil: 10-30% by weight clay, organic matter, and iron and aluminum oxyhydroxides. Clayey Soil: > 30% by weight clay, organic matter, and iron and aluminum oxyhydroxides.									

(B) The person shall use the following figure to determine the pH-dependent  $K_{oc}$

value for the ionizing organic COCs listed.

**Figure: 30 TAC §350.73(f)(1)(B)**

<b><math>K_{oc}</math> Values for Ionizing Organic COCs as a Function of pH</b>									
pH	Benzoic Acid	2-Chloro-phenol	2,4-Dichloro-phenol	2,4 - Dinitro-phenol	Penta-chloro-phenol	2,3,4,5-Tetra-chloro-phenol	2,3,4,6-Tetra-chloro-phenol	2,4,5-Tri-chloro-phenol	2,4,6-Tri-chloro-phenol
4.9	5.54E+00	3.98E+02	1.59E+02	2.94E-02	9.05E+03	1.73E+04	4.45E+03	2.37E+03	1.04E+03
5.0	4.64E+00	3.98E+02	1.59E+02	2.55E-02	7.96E+03	1.72E+04	4.15E+03	2.36E+03	1.03E+03
5.1	3.88E+00	3.98E+02	1.59E+02	2.23E-02	6.93E+03	1.70E+04	3.83E+03	2.36E+03	1.02E+03
5.2	3.25E+00	3.98E+02	1.59E+02	1.98E-02	5.97E+03	1.67E+04	3.49E+03	2.35E+03	1.01E+03
5.3	2.72E+00	3.98E+02	1.59E+02	1.78E-02	5.10E+03	1.65E+04	3.14E+03	2.34E+03	9.99E+02
5.4	2.29E+00	3.98E+02	1.58E+02	1.62E-02	4.32E+03	1.61E+04	2.79E+03	2.33E+03	9.82E+02
5.5	1.94E+00	3.97E+02	1.58E+02	1.50E-02	3.65E+03	1.57E+04	2.45E+03	2.32E+03	9.62E+02
5.6	1.65E+00	3.97E+02	1.58E+02	1.40E-02	3.07E+03	1.52E+04	2.13E+03	2.31E+03	9.38E+02
5.7	1.42E+00	3.97E+02	1.58E+02	1.32E-02	2.58E+03	1.47E+04	1.83E+03	2.29E+03	9.10E+02
5.8	1.24E+00	3.97E+02	1.58E+02	1.25E-02	2.18E+03	1.40E+04	1.56E+03	2.27E+03	8.77E+02
5.9	1.09E+00	3.97E+02	1.57E+02	1.20E-02	1.84E+03	1.32E+04	1.32E+03	2.24E+03	8.39E+02
6.0	9.69E-01	3.96E+02	1.57E+02	1.16E-02	1.56E+03	1.24E+04	1.11E+03	2.21E+03	7.96E+02
6.1	8.75E-01	3.96E+02	1.57E+02	1.13E-02	1.33E+03	1.15E+04	9.27E+02	2.17E+03	7.48E+02
6.2	7.99E-01	3.96E+02	1.56E+02	1.10E-02	1.15E+03	1.05E+04	7.75E+02	2.12E+03	6.97E+02
6.3	7.36E-01	3.95E+02	1.55E+02	1.08E-02	9.98E+02	9.51E+03	6.47E+02	2.06E+03	6.44E+02
6.4	6.89E-01	3.94E+02	1.54E+02	1.06E-02	8.77E+02	8.48E+03	5.42E+02	1.99E+03	5.89E+02
6.5	6.51E-01	3.93E+02	1.53E+02	1.05E-02	7.81E+02	7.47E+03	4.55E+02	1.91E+03	5.33E+02
6.6	6.20E-01	3.92E+02	1.52E+02	1.04E-02	7.03E+02	6.49E+03	3.84E+02	1.82E+03	4.80E+02
6.7	5.95E-01	3.90E+02	1.50E+02	1.03E-02	6.40E+02	5.58E+03	3.27E+02	1.71E+03	4.29E+02
6.8	5.76E-01	3.88E+02	1.47E+02	1.02E-02	5.92E+02	4.74E+03	2.80E+02	1.60E+03	3.81E+02
6.9	5.60E-01	3.86E+02	1.45E+02	1.02E-02	5.52E+02	3.99E+03	2.42E+02	1.47E+03	3.38E+02
7.0	5.47E-01	3.83E+02	1.41E+02	1.02E-02	5.21E+02	3.33E+03	2.13E+02	1.34E+03	3.00E+02
7.1	5.38E-01	3.79E+02	1.38E+02	1.02E-02	4.96E+02	2.76E+03	1.88E+02	1.21E+03	2.67E+02
7.2	5.32E-01	3.75E+02	1.33E+02	1.01E-02	4.76E+02	2.28E+03	1.69E+02	1.07E+03	2.39E+02
7.3	5.25E-01	3.69E+02	1.28E+02	1.01E-02	4.61E+02	1.87E+03	1.53E+02	9.43E+02	2.15E+02
7.4	5.19E-01	3.62E+02	1.21E+02	1.01E-02	4.47E+02	1.53E+03	1.41E+02	8.19E+02	1.95E+02
7.5	5.16E-01	3.54E+02	1.14E+02	1.01E-02	4.37E+02	1.25E+03	1.31E+02	7.03E+02	1.78E+02
7.6	5.13E-01	3.44E+02	1.07E+02	1.01E-02	4.29E+02	1.02E+03	1.23E+02	5.99E+02	1.64E+02
7.7	5.09E-01	3.33E+02	9.84E+01	1.00E-02	4.23E+02	8.31E+02	1.17E+02	5.07E+02	1.53E+02
7.8	5.06E-01	3.19E+02	8.97E+01	1.00E-02	4.18E+02	6.79E+02	1.13E+02	4.26E+02	1.44E+02
7.9	5.06E-01	3.04E+02	8.07E+01	1.00E-02	4.14E+02	5.56E+02	1.08E+02	3.57E+02	1.37E+02
8.0	5.06E-01	2.86E+02	7.17E+01	1.00E-02	4.10E+02	4.58E+02	1.05E+02	2.98E+02	1.31E+02

(C) The person shall use the following figure to determine the pH-dependent  $K_d$  value for the inorganic COCs listed.

**Figure: 30 TAC §350.73(f)(1)(C)**

<b>K<sub>d</sub> Values (L/kg) for Inorganic COCs as a Function of pH<sup>a</sup></b>													
pH	Sb	As	Ba	Be	Cd	Cr (3)	Cr(6)	Hg	Ni	Ag	Se	Tl	Zn
4.9	9.6E+01	2.5E+01	1.1E+01	2.3E+01	1.5E+01	1.2E+03	3.1E+01	4.0E-02	1.6E+01	1.0E-01	1.8E+01	4.4E+01	1.6E+01
5.0	9.1E+01	2.5E+01	1.2E+01	2.6E+01	1.7E+01	1.9E+03	3.1E+01	6.0E-02	1.8E+01	1.3E-01	1.7E+01	4.5E+01	1.8E+01
5.1	8.7E+01	2.5E+01	1.4E+01	2.8E+01	1.9E+01	3.0E+03	3.0E+01	9.0E-02	2.0E+01	1.6E-01	1.6E+01	4.6E+01	1.9E+01
5.2	8.3E+01	2.6E+01	1.5E+01	3.1E+01	2.1E+01	4.9E+03	2.9E+01	1.4E-01	2.2E+01	2.1E-01	1.5E+01	4.7E+01	2.1E+01
5.3	7.9E+01	2.6E+01	1.7E+01	3.5E+01	2.3E+01	8.1E+03	2.8E+01	2.0E-01	2.4E+01	2.6E-01	1.4E+01	4.8E+01	2.3E+01
5.4	7.6E+01	2.6E+01	1.9E+01	3.8E+01	2.5E+01	1.3E+04	2.7E+01	3.0E-01	2.6E+01	3.3E-01	1.3E+01	5.0E+01	2.5E+01
5.5	7.2E+01	2.6E+01	2.1E+01	4.2E+01	2.7E+01	2.1E+04	2.7E+01	4.6E-01	2.8E+01	4.2E-01	1.2E+01	5.1E+01	2.6E+01
5.6	6.9E+01	2.6E+01	2.2E+01	4.7E+01	2.9E+01	3.5E+04	2.6E+01	6.9E-01	3.0E+01	5.3E-01	1.1E+01	5.2E+01	2.8E+01
5.7	6.5E+01	2.7E+01	2.4E+01	5.3E+01	3.1E+01	5.5E+04	2.5E+01	1.0E+00	3.2E+01	6.7E-01	1.1E+01	5.4E+01	3.0E+01
5.8	6.2E+01	2.7E+01	2.6E+01	6.0E+01	3.3E+01	8.7E+04	2.5E+01	1.6E+00	3.4E+01	8.4E-01	9.8E+00	5.5E+01	3.2E+01
5.9	6.0E+01	2.7E+01	2.8E+01	6.9E+01	3.5E+01	1.3E+05	2.4E+01	2.3E+00	3.6E+01	1.1E+00	9.2E+00	5.6E+01	3.4E+01
6.0	5.7E+01	2.7E+01	3.0E+01	8.2E+01	3.7E+01	2.0E+05	2.3E+01	3.5E+00	3.8E+01	1.3E+00	8.6E+00	5.8E+01	3.6E+01
6.1	5.4E+01	2.7E+01	3.1E+01	9.9E+01	4.0E+01	3.0E+05	2.3E+01	5.1E+00	4.0E+01	1.7E+00	8.0E+00	5.9E+01	3.9E+01
6.2	5.2E+01	2.8E+01	3.3E+01	1.2E+02	4.2E+01	4.2E+05	2.2E+01	7.5E+00	4.2E+01	2.1E+00	7.5E+00	6.1E+01	4.2E+01
6.3	4.9E+01	2.8E+01	3.5E+01	1.6E+02	4.4E+01	5.8E+05	2.2E+01	1.1E+01	4.5E+01	2.7E+00	7.0E+00	6.2E+01	4.4E+01
6.4	4.7E+01	2.8E+01	3.6E+01	2.1E+02	4.8E+01	7.7E+05	2.1E+01	1.6E+01	4.7E+01	3.4E+00	6.5E+00	6.4E+01	4.7E+01
6.5	4.5E+01	2.8E+01	3.7E+01	2.8E+02	5.2E+01	9.9E+05	2.0E+01	2.2E+01	5.0E+01	4.2E+00	6.1E+00	6.6E+01	5.1E+01
6.6	4.3E+01	2.8E+01	3.9E+01	3.9E+02	5.7E+01	1.2E+06	2.0E+01	3.0E+01	5.4E+01	5.3E+00	5.7E+00	6.7E+01	5.4E+01
6.7	4.1E+01	2.9E+01	4.0E+01	5.5E+02	6.4E+01	1.5E+06	1.9E+01	4.0E+01	5.8E+01	6.6E+00	5.3E+00	6.9E+01	5.8E+01
6.8	3.9E+01	2.9E+01	4.1E+01	7.9E+02	7.5E+01	1.8E+06	1.9E+01	5.2E+01	6.5E+01	8.3E+00	5.0E+00	7.1E+01	6.2E+01
6.9	3.7E+01	2.9E+01	4.2E+01	1.1E+03	9.1E+01	2.1E+06	1.8E+01	6.6E+01	7.4E+01	1.0E+01	4.7E+00	7.3E+01	6.8E+01
7.0	3.5E+01	2.9E+01	4.2E+01	1.7E+03	1.1E+02	2.5E+06	1.8E+01	8.2E+01	8.8E+01	1.3E+01	4.3E+00	7.4E+01	7.5E+01
7.1	3.4E+01	2.9E+01	4.3E+01	2.5E+03	1.5E+02	2.8E+06	1.7E+01	9.9E+01	1.1E+02	1.6E+01	4.1E+00	7.6E+01	8.3E+01
7.2	3.2E+01	3.0E+01	4.4E+01	3.8E+03	2.0E+02	3.1E+06	1.7E+01	1.2E+02	1.4E+02	2.0E+01	3.8E+00	7.8E+01	9.5E+01
7.3	3.1E+01	3.0E+01	4.4E+01	5.7E+03	2.8E+02	3.4E+06	1.6E+01	1.3E+02	1.8E+02	2.5E+01	3.5E+00	8.0E+01	1.1E+02
7.4	2.9E+01	3.0E+01	4.5E+01	8.6E+03	4.0E+02	3.7E+06	1.6E+01	1.5E+02	2.5E+02	3.1E+01	3.3E+00	8.2E+01	1.3E+02
7.5	2.8E+01	3.0E+01	4.6E+01	1.3E+04	5.9E+02	3.9E+06	1.6E+01	1.6E+02	3.5E+02	3.9E+01	3.1E+00	8.5E+01	1.6E+02
7.6	2.6E+01	3.1E+01	4.6E+01	2.0E+04	8.7E+02	4.1E+06	1.5E+01	1.7E+02	4.9E+02	4.8E+01	2.9E+00	8.7E+01	1.9E+02
7.7	2.5E+01	3.1E+01	4.7E+01	3.0E+04	1.3E+03	4.2E+06	1.5E+01	1.8E+02	7.0E+02	5.9E+01	2.7E+00	8.9E+01	2.4E+02
7.8	2.4E+01	3.1E+01	4.9E+01	4.6E+04	1.9E+03	4.3E+06	1.4E+01	1.9E+02	9.9E+02	7.3E+01	2.5E+00	9.1E+01	3.1E+02
7.9	2.3E+01	3.1E+01	5.0E+01	6.9E+04	2.9E+03	4.3E+06	1.4E+01	1.9E+02	1.4E+03	8.9E+01	2.4E+00	9.4E+01	4.0E+02
8.0	2.2E+01	3.1E+01	5.2E+01	1.0E+05	4.3E+03	4.3E+06	1.4E+01	2.0E+02	1.9E+03	1.1E+02	2.2E+00	9.6E+01	5.3E+02

<sup>a</sup> non pH-dependent inorganic K<sub>d</sub> values for cyanide, and vanadium are 9.9, and 50 respectively.

(2) For Tiers 2 and 3, the person may establish alternate soil-to-plant biotransfer factors ( $Br_{abg}$  and  $Br_{bg}$ ) by establishing the pH of the soil and the soil type, and then identifying a biotransfer factor in the published literature appropriate for those soil conditions. Alternatively, the person can measure the biotransfer factor in accordance with procedures acceptable to the executive director.

**§350.74. Development of Risk-Based Exposure Limits.**

(a) General requirement. The person shall use the criteria provided in subsections (b) - (j) of this section and the RBEL equations provided in the following figures, as applicable, to establish RBELs appropriate for the type of COC, the complete and reasonably anticipated to be completed exposure pathways, receptors, and land uses. The person shall establish RBELs for carcinogenic COCs and noncarcinogenic COCs using the default exposure factors provided in the following figure for residents and commercial/industrial workers, unless the executive director approves the use of alternate exposure factors in accordance with subsection (j) of this section.

**Figure: 30 TAC §350.74(a)**

**Risk-Based Exposure Limit Equations and Default Exposure Factors for Residents**

<p><b>RBEL-1:</b>                  Inhalation of carcinogenic COCs - RBEL (mg/m<sup>3</sup>)</p> ${}^{\text{Air}}\text{RBEL}_{\text{Inh-c}} = \frac{\text{RL} \times \text{ATc} \times 365 \text{ days/yr}}{\text{URF} \times 1000 \mu\text{g/mg} \times \text{EF.res} \times \text{ED.A.res}}$ <p>Inhalation of noncarcinogenic COCs - RBEL (mg/m<sup>3</sup>)</p> ${}^{\text{Air}}\text{RBEL}_{\text{Inh-nc}} = \frac{\text{RfC} \times \text{HQ} \times \text{AT.A.res} \times 365 \text{ days/yr}}{\text{EF.res} \times \text{ED.A.res}}$	<p><b>RBEL-5:</b>                  Class 3 Groundwater RBEL</p> ${}^{\text{GW}}\text{RBEL}_{\text{Class 3}} = 100 \times \text{RBEL-4}$
<p><b>RBEL-2:</b>                  Dermal contact with carcinogenic COCs in soil - RBEL (mg/kg)</p> ${}^{\text{Soil}}\text{RBEL}_{\text{Derm-c}} = \frac{\text{RL} \times \text{ATc} \times 365 \text{ days/yr}}{\text{MF} \times 10^6 \text{ kg/mg} \times \text{EF.res} \times \text{DF.adj} \times \text{ABS.d}} \quad \text{SF}_d \times$ <p>where: <math>\text{SF}_d = \text{SF}_o</math> when <math>\text{ABS}_{\text{Gt}} &lt; 50\%</math>, otherwise <math>\text{SF}_d = \text{SF}_o</math>; and  <math>\text{ABS}_{\text{Gt}}</math></p> $\text{DF.adj} = \frac{(\text{SA}_{0<6})(\text{AF}_{0<6})(\text{ED}_{0<6})}{(\text{BW}_{0<6})} + \frac{(\text{SA}_{6<18})(\text{AF}_{6<18})(\text{ED}_{6<18})}{(\text{BW}_{6<18})} + \frac{(\text{SA}_{18<30})(\text{AF}_{18<30})(\text{ED}_{18<30})}{(\text{BW}_{18<30})}$ <p>Dermal contact with noncarcinogenic COCs in soil - RBEL (mg/kg)</p> ${}^{\text{Soil}}\text{RBEL}_{\text{Derm-nc}} = \frac{\text{HQ} \times \text{RfD}_d \times \text{BW.C} \times \text{AT.C.res} \times 365 \text{ days/yr}}{10^6 \text{ kg/mg} \times \text{ED.C.res} \times \text{EF.res} \times \text{SA.C.res} \times \text{AF.C.res} \times \text{ABS.d}}$ <p>where <math>\text{RfD}_d = (\text{RfD}_o) (\text{ABS}_{\text{Gt}})</math> when <math>\text{ABS}_{\text{Gt}} &lt; 50\%</math>, otherwise <math>\text{RfD}_d = \text{RfD}_o</math></p>	<p><b>RBEL-7:</b>                  Ingestion of carcinogenic COCs in above-ground vegetables - RBEL (mg/kg)</p> ${}^{\text{AbgVeg}}\text{RBEL}_{\text{Ing-c}} = \frac{\text{RL} \times \text{ATc} \times 365 \text{ day/yr}}{\text{EF.res} \times \text{SF}_o \times \text{MF} \times \text{IRabg.AgeAdj.res}}$ <p>Ingestion of noncarcinogenic COCs in above-ground vegetables - RBEL (mg/kg)</p> ${}^{\text{AbgVeg}}\text{RBEL}_{\text{Ing-nc}} = \frac{\text{HQ} \times \text{RfD}_o \times \text{BW.C} \times \text{AT.C.res} \times 365 \text{ day/yr}}{\text{EF.res} \times \text{ED.C.res} \times \text{IRabg.C.res}}$ <p>Ingestion of carcinogenic COCs in below-ground vegetables - RBEL (mg/kg)</p> ${}^{\text{BgVeg}}\text{RBEL}_{\text{Ing-c}} = \frac{\text{RL} \times \text{ATc} \times 365 \text{ day/yr}}{\text{EF.res} \times \text{SF}_o \times \text{MF} \times \text{IRbg.AgeAdj.res}}$ <p>Ingestion of noncarcinogenic COCs in below-ground vegetables - RBEL (mg/kg)</p> ${}^{\text{BgVeg}}\text{RBEL}_{\text{Ing-nc}} = \frac{\text{HQ} \times \text{RfD}_o \times \text{BW.C} \times \text{AT.C.res} \times 365 \text{ day/yr}}{\text{EF.res} \times \text{ED.C.res} \times \text{IRbg.C.res}}$
<p><b>RBEL-3:</b>                  Ingestion of carcinogenic COCs in soil - RBEL (mg/kg)</p> ${}^{\text{Soil}}\text{RBEL}_{\text{Ing-c}} = \frac{\text{RL} \times \text{ATc} \times 365 \text{ days/yr}}{\text{MF} \times 10^6 \text{ kg/mg} \times \text{EF.res} \times \text{IRsoil.AgeAdj.res} \times \text{RBAF}} \quad \text{SF}_o \times$ <p>Ingestion of noncarcinogenic COCs in soil - RBEL (mg/kg)</p> ${}^{\text{Soil}}\text{RBEL}_{\text{Ing-nc}} = \frac{\text{HQ} \times \text{BW.C} \times \text{RfD}_o \times \text{AT.C.res} \times 365 \text{ days/yr}}{10^6 \text{ kg/mg} \times \text{EF.res} \times \text{ED.C.res} \times \text{IRsoil.C.res} \times \text{RBAF}}$	

**Risk-Based Exposure Limit Equations and Default Exposure Factors for Residents**

**RBEL-4:**

Ingestion of carcinogenic COCs in water - RBEL (mg/L)

$^{GW}RBEL_{ing-c}$  = primary MCL when available, or a secondary MCL under the conditions described in §350.74(f)(3), otherwise

$$\frac{RL \times AT_c \times 365 \text{ days/yr}}{SF_o \times MF \times IRw.AgeAdj.res \times EF.res}$$

Ingestion of noncarcinogenic COCs in water - RBEL (mg/L)

$^{GW}RBEL_{ing-nc}$  = primary MCL when available, or a secondary MCL under the conditions described in §350.74(f)(3), otherwise

$$\frac{RfD_o \times HQ \times BW.C \times AT.C.res \times 365 \text{ days/yr}}{IRw.C.res \times EF.res \times ED.C.res}$$

**RBEL-6: Surface Water RBEL**

$^{SW}RBEL$  = the lowest value of each COC established under §350.74(h)(1) - (5), unless the person has sufficient property-specific surface water quality information specific to the particular surface water body at the affected property to support an adjustment to the RBEL in accordance with §350.74(h)(6).  $^{SW}RBEL$  determined pursuant to §350.74(h)(1) - (5) may require modification in response to §350.74(h)(7) - (8).

<b>Risk-Based Exposure Limit Equations and Default Exposure Factors for Residents</b>				
<u>Term</u>	<u>Exposure Factor</u>	<u>Default Exposure Factor</u>	<u>Change to Default Exposure Factor Allowed?</u>	<u>Citation for Change</u>
ABS.d**	Dermal Absorption Fraction (unitless)	(Figure: 30 TAC §350.74(c))	Tier 2/3	§350.74(j)(1)(B)
ABS <sub>GI</sub>	Gastrointestinal Absorption Fraction (unitless)	(Figure: 30 TAC §350.74(c))	Tier 2/3	§350.74(j)(1)(A)
AF.C.res	Soil-to-Skin Adherence Factor (mg/cm <sup>2</sup> -event) - Child	0.2	No	NA
AF <sub>(0&lt;6)</sub>	Age-Specific Adherence Factor (mg/cm <sup>2</sup> -event)	0.2	No	NA
AF <sub>(6&lt;18)</sub>	Age-Specific Adherence Factor (mg/cm <sup>2</sup> -event)	0.1	No	NA
AF <sub>(18&lt;30)</sub>	Age-Specific Adherence Factor (mg/cm <sup>2</sup> -event)	0.1	No	NA
AT.A.res	Averaging Time - noncarcinogens (yr)-Adult	30	No	NA
ATc	Averaging Time - carcinogens (yr)	70	No	NA
AT.C.res	Averaging Time - noncarcinogens (yr) -Child	6	No	NA
BW.C	Body Weight (kg) - Child	15	No	NA
BW <sub>(0&lt;6)</sub>	Age-Specific Body Weight (kg)	15	No	NA
BW <sub>(6&lt;18)</sub>	Age-Specific Body Weight (kg)	45	No	NA
BW <sub>(18&lt;30)</sub>	Age-Specific Body Weight (kg)	70	No	NA
DF.adj	Dermal Adjustment Factor (mg-yr/kg-event)	352	No	NA
ED.A.res	Exposure Duration (yr) - Adult	30	No	NA
ED.C.res	Exposure Duration (yr) - Child	6	No	NA
ED <sub>(0&lt;6)</sub>	Age-Specific Exposure Duration (yr)	6	No	NA
ED <sub>(6&lt;18)</sub>	Age-Specific Exposure Duration (yr)	12	No	NA
ED <sub>(18&lt;30)</sub>	Age-Specific Exposure Duration (yr)	12	No	NA
EF.res	Exposure Frequency (days/yr) (event/yr for dermal soil)	350	No	NA
HQ	Hazard Quotient (unitless)	1	No	NA
IRsoil.AgeAdj.res	Age-Adjusted Soil Ingestion Rate (mg-yr/kg-day)	120	No	NA
IRsoil.C.res	Soil Ingestion Rate (mg/day) - Child	191	No	NA
IRw.AgeAdj.res	Age-Adjusted Water Ingestion Rate (L-yr/kg-day)	0.80	No	NA
IRw.C.res	Water Ingestion Rate (L/Day) - Child	0.64	No	NA
MF	Modifying Factor for SFo (unitless)	1	No	NA
	for Arsenic	0.1	No	
RBAF	Relative Bioavailability Factor (unitless)	1	Tier 2/3	§350.74(j)(1)(C)
	for Arsenic	0.78	Tier 2/3	§350.74(j)(1)(C)
RfC*	Reference Concentration (mg/m <sup>3</sup> )	Chemical Specific	NA	§350.73 (a) and (c)

<b>Risk-Based Exposure Limit Equations and Default Exposure Factors for Residents</b>				
<u>Term</u>	<u>Exposure Factor</u>	<u>Default Exposure Factor</u>	<u>Change to Default Exposure Factor Allowed?</u>	<u>Citation for Change</u>
RfD <sub>o</sub>	Oral Reference Dose (mg/kg-day)	Chemical Specific	NA	§350.73(a)
RfD <sub>d</sub>	Dermal Reference Dose (mg/kg-day)	Chemical Specific	NA	§350.73(a)
RL	Risk Level (unitless)	10 <sup>-5</sup>	No	NA
SA.C.res	Skin Surface Area (cm <sup>2</sup> )- Child	2200	No	NA
SA <sub>(0&lt;6)</sub>	Age-specific Skin Surface Area (cm <sup>2</sup> )	2200	No	NA
SA <sub>(6&lt;18)</sub>	Age-specific Skin Surface Area (cm <sup>2</sup> )	3500	No	NA
SA <sub>(18&lt;30)</sub>	Age-specific Skin Surface Area (cm <sup>2</sup> )	4800	No	NA
SF <sub>d</sub>	Dermal Slope Factor (mg/kg-day) <sup>-1</sup>	Chemical Specific	NA	§350.73(a)
SF <sub>o</sub>	Oral Slope Factor (mg/kg-day) <sup>-1</sup>	Chemical Specific	NA	§350.73(a)
URF*	Inhalation Unit Risk Factor (μg/m <sup>3</sup> ) <sup>-1</sup>	Chemical Specific	NA	§350.73 (a) and (c)
Vegetable Ingestion Rate - Age-Adjusted (kg-yr/kg-day)				
	IRabg.AgeAdj.res Aboveground Vegetables	0.0028	No	NA
	IRbg.AgeAdj.res Below-Ground Vegetables	0.0012	No	NA
Vegetable Ingestion Rate - Child (kg/day)				
	IRabg.C.res Aboveground Vegetables	0.0024	No	NA
	IRbg.C.res Below-Ground Vegetables	0.0010	No	NA
Footnote:				
* When no RfC or URF is available, then the person shall use the most current TCEQ Chronic Remediation-Specific Effects Screening Level value as the RfC unless §350.73(b) applies.				
** It is not necessary to calculate a soil dermal contact RBEL for COCs with a vapor pressure in mm HG $\geq$ 1.				
NA means not applicable.				

Figure: 30 TAC §350.74(a)

<b>Risk Based Exposure Limit Equations and Default Exposure Factors for Commercial/Industrial Worker</b>	
<p><b>RBEL-1:</b>                      Inhalation of carcinogenic COCs - RBEL (mg/m<sup>3</sup>)</p> ${}^{\text{Air}}\text{RBEL}_{\text{Inh-c}} = \frac{\text{RL} \times \text{ATc} \times 365 \text{ days/yr}}{\text{URF} \times 1000 \mu\text{g/mg} \times \text{EF.w} \times \text{ED.w}}$ <p>Inhalation of noncarcinogenic COCs - RBEL (mg/m<sup>3</sup>)</p> ${}^{\text{Air}}\text{RBEL}_{\text{Inh-nc}} = \frac{\text{RfC} \times \text{HQ} \times \text{AT.w} \times 365 \text{ days/yr}}{\text{EF.w} \times \text{ED.w}}$	<p><b>RBEL-4:</b>                      Ingestion of carcinogenic COCs in water - RBEL (mg/L)</p> <p><sup>GW</sup>RBEL<sub>ing-c</sub> = primary MCL when available, or a secondary MCL under the conditions described in §350.74(f)(3), otherwise</p> $\frac{\text{RL} \times \text{BW.A} \times \text{ATc} \times 365 \text{ days/yr}}{\text{SF}_o \times \text{MF} \times \text{IRw.w} \times \text{EF.w} \times \text{ED.w}}$ <p>Ingestion of noncarcinogenic COCs in water - RBEL (mg/L)</p> <p><sup>GW</sup>RBEL<sub>ing-nc</sub> = primary MCL when available, or a secondary MCL under the conditions described in §350.74(f)(3), otherwise</p> $\frac{\text{RfD}_o \times \text{HQ} \times \text{BW.A} \times \text{AT.w} \times 365 \text{ days/yr}}{\text{IRw.w} \times \text{EF.w} \times \text{ED.w}}$

**Figure: 30 TAC §350.74(a)**

<b>Risk-Based Exposure Limit Equations and Default Exposure Factors for Commercial/Industrial Worker</b>	
<p><b>RBEL-3:</b>                      Ingestion of carcinogenic COCs in soil - RBEL (mg/kg)  <math display="block">{}^{\text{Soil}}\text{RBEL}_{\text{ing-c}} = \frac{\text{RL} \times \text{BW.A} \times \text{AT}_c \times 365 \text{ days/yr}}{\text{SF}_o \times \text{MF} \times 10^{-6} \text{ kg/mg} \times \text{EF.w} \times \text{ED.w} \times \text{IRsoil.w} \times \text{RBAF}}</math></p> <p>Ingestion of noncarcinogenic COCs in soil - RBEL (mg/kg)  <math display="block">{}^{\text{Soil}}\text{RBEL}_{\text{ing-nc}} = \frac{\text{HQ} \times \text{BW.A} \times \text{RfD}_o \times \text{AT.w} \times 365 \text{ days/yr}}{10^{-6} \text{ kg/mg} \times \text{EF.w} \times \text{ED.w} \times \text{IRsoil.w} \times \text{RBAF}}</math></p>	<p><b>RBEL-6: Surface Water RBEL</b></p> <p><math>{}^{\text{SW}}\text{RBEL}</math> = the lowest value of each COC established under §350.74(h)(1) - (5), unless the person has sufficient property-specific surface water quality information specific to the particular surface water body at the affected property to support an adjustment to the RBEL in accordance with §350.74(h)(6). <math>{}^{\text{SW}}\text{RBEL}</math> determined pursuant to §350.74(h)(1) - (5) may require modification in response to §350.74(h)(7) - (8).</p>

Risk-Based Exposure Limit Equations and Default Exposure Factors for Commercial/Industrial Worker					
Term	Exposure Factor	Default Exposure Factor	Change to Default Exposure Factor Allowed?	Citation for Change	
ABS.d**	Dermal Absorption Fraction (unitless)	(Figure: 30 TAC §350.74(c))		Tier 2/3	§350.74(j)(1)(B)
ABS <sub>GI</sub>	Gastrointestinal Absorption Fraction (unitless)	(Figure: 30 TAC §350.74(c))		Tier 2/3	§350.74(j)(1)(A)
AF.w	Soil-to-Skin Adherence Factor (mg/cm <sup>2</sup> -event)	0.2	No		NA
ATc	Averaging Time - carcinogens (yr)	70	No		NA
AT.w	Averaging Time - noncarcinogens (yr)	25	Tier 2/3		§350.74(j)(2)
BW.A	Body Weight, adult (kg)	70	No		NA
ED.w	Exposure Duration (yr)	25	Tier 2/3		§350.74(j)(2)
EF.w	Exposure Frequency (days/yr) (event/yr for dermal soil)	250	Tier 2/3		§350.74(j)(2)
HQ	Hazard Quotient (unitless)	1	No		NA
IR <sub>soil.w</sub>	Soil Ingestion Rate (mg/day)	100	No		NA
IR <sub>w.w</sub>	Water Ingestion Rate (L/day)	1.4	No		NA
MF	Modifying Factor for SF <sub>o</sub> (unitless)	1	No		NA
	for Arsenic	0.1	No		NA
RBAF	Relative Bioavailability Factor (unitless)	1	Tier 2/3		§350.74(j)(1)(D)
	for Arsenic	0.78	Tier 2/3		§350.74(j)(1)(D)
RfC*	Reference Concentration (mg/m <sup>3</sup> )	Chemical-Specific	NA		§350.73 (a) and (c)
RfD <sub>o</sub>	Oral Reference Dose (mg/kg-day)	Chemical-Specific	NA		§350.73(a)
RfD <sub>d</sub>	Dermal Reference Dose (mg/kg-day)	Chemical-Specific	NA		§350.73(a)
RL	Risk Level (unitless)	10 <sup>-5</sup>	No		NA
SA.w	Skin Surface Area (cm <sup>2</sup> )	2500	No		NA
SF <sub>d</sub>	Dermal Slope Factor (mg/kg-day) <sup>-1</sup>	Chemical-Specific	NA		§350.73(a)
SF <sub>o</sub>	Oral Slope Factor (mg/kg-day) <sup>-1</sup>	Chemical-Specific	NA		§350.73(a)
URF*	Inhalation Unit Risk Factor (µg/m <sup>3</sup> ) <sup>-1</sup>	Chemical-Specific	NA		§350.73 (a) and (c)

Footnote:  
 \* When no RfC or URF is available, then the person shall use the most current TCEQ Chronic Remediation-Specific Effects Screening Level value as the RfC unless §350.73(b) applies.  
 \*\* It is not necessary to calculate a soil dermal contact RBEL for COCs with a vapor pressure in mm HG  $\geq$  1.  
 NA means not applicable.

(b) Air inhalation RBEL. The air inhalation RBEL ( $^{Air}RBEL_{inh}$ ) is the protective concentration of a COC in air at the POE for human inhalation.

(1) Under Tiers 2 and 3 as described in §350.75 of this title (relating to Tiered Human Health Protective Concentration Level Evaluation), the person may use the lower of available eight hour time-weighted average occupational inhalation criteria; (i.e., Occupational Safety and Health Administration Permissible Exposure Limits, or American Conference of Governmental Industrial Hygienists Threshold Limit Values), as  $^{Air}RBEL_{inh}$  for inhalation pathways for commercial/industrial workers within the limits of affected commercial/industrial properties which have a health and safety plan in place. The health and safety plan shall be designed to ensure compliance with the applicable occupational inhalation criteria and require the monitoring of COC levels in the working air environment, and specify actions that will be taken in the event of exceedance of the occupational inhalation criteria. When occupational inhalation criteria are used, the person shall provide documentation of the health and safety plan, certify that the plan is followed, and demonstrate that the off-site receptors are protected as required by §350.71(h) of this title (relating to General Requirements). The use of occupational inhalation criteria as RBELs shall require the person to comply with the institutional control requirements in §350.111(b) and (b)(14) of this title (relating to Use of Institutional Controls).

(2) The air RBELs may not exceed any other applicable federal or state air quality standards.

(c) Soil dermal contact RBEL. The soil dermal contact RBEL ( $^{Soil}RBEL_{Derm}$ ) is the protective concentration of a COC at the POE in soil based upon direct dermal contact to soil by humans. The soil dermal contact RBEL shall also be based on COC-specific values for dermal absorption fraction ( $ABS.d$ ) and gastrointestinal absorption fraction ( $ABS_{GI}$ ) provided in the following figure, unless the executive director approves the use of alternate  $ABS.d$  and  $ABS_{GI}$  values in accordance with subsection (j)(1)(A) and (B) of this section. It is not necessary to calculate a soil dermal contact RBEL for COCs with vapor pressure in mm of Hg greater than or equal to 1.

**Figure: 30 TAC §350.74(c)**

**Dermal Absorption Fraction and Gastrointestinal Absorption Fraction**

<b>COC</b>	<b>CAS #</b>	<b>ABS<sub>GI</sub> (unitless)</b>	<b>ABS.d (unitless)</b>
Acenaphthene	83-32-9	8.90E-01	1.30E-01
Acenaphthylene	208-96-8	8.90E-01	1.30E-01
Acetone cyanohydrin	75-86-5	5.00E-01	1.00E-01
Acetophenone	98-86-2	5.00E-01	1.00E-01
Acifluorfen, sodium	62476-59-9	5.00E-01	1.00E-01
Acrylamide	79-06-1	5.00E-01	1.00E-01
Alachlor	15972-60-8	5.00E-01	1.00E-01
Aldicarb	116-06-3	5.00E-01	1.00E-01
Aldicarb sulfone	1646-88-4	5.00E-01	1.00E-01
Aldrin	309-00-2	5.00E-01	1.00E-01
Aluminum	7429-90-5	1.00E-01	1.00E-02
Aminopyridine, 4-	504-24-5	5.00E-01	1.00E-01
Ammonia	7664-41-7	2.00E-01	1.00E-02
Aniline	62-53-3	5.00E-01	1.00E-01
Anthracene	120-12-7	8.90E-01	1.30E-01
Antimony	7440-36-0	1.50E-01	1.00E-02
Aramite	140-57-8	5.00E-01	1.00E-01
Arsenic	7440-38-2	9.50E-01	3.00E-02
Arsine	7784-42-1	2.00E-01	1.00E-02
Asbestos	1332-21-4	2.00E-01	1.00E-02
Atrazine	1912-24-9	5.00E-01	1.00E-01
Barium	7440-39-3	7.00E-01	1.00E-02
Benzidine	92-87-5	8.00E-01	1.00E-01
Benz-a-anthracene	56-55-3	8.90E-01	1.30E-01
Benzo-a-pyrene	50-32-8	8.90E-01	1.30E-01
Benzo-b-fluoranthene	205-99-2	8.90E-01	1.30E-01
Benzo-k-fluoranthene	207-08-9	8.90E-01	1.30E-01
Benzo-g,h,i-perylene	191-24-2	8.90E-01	1.30E-01
Benzoic acid	65-85-0	1.00E-01	1.00E-01
Benzotrichloride	98-07-7	5.00E-01	1.00E-01
Benzyl alcohol	100-51-6	6.60E-01	1.00E-01
Beryllium	7440-41-7	7.00E-03	1.00E-02
Biphenyl, 1,1-	92-52-4	5.00E-01	1.00E-01
Bis (2-chloroisopropyl) ether	108-60-1	5.00E-01	1.00E-01
Bis (2-ethyl-hexyl) phthalate	117-81-7	1.90E-01	1.00E-01
Butylate	2008-41-5	5.00E-01	1.00E-01
Butyl benzyl phthalate	85-68-7	6.10E-01	1.00E-01

COC	CAS #	ABS <sub>GI</sub> (unitless)	ABS.d (unitless)
Cacodylic acid	75-60-5	5.00E-01	1.00E-01
Cadmium	7440-43-9	2.50E-02	1.00E-02
Captan	133-06-2	5.00E-01	1.00E-01
Carbaryl	63-25-2	5.00E-01	1.00E-01
Carbazole	86-74-8	7.00E-01	1.00E-01
Carbofuran	1563-66-2	5.00E-01	1.00E-01
Carbosulfan	55285-14-8	5.00E-01	1.00E-01
Chlordane	57-74-9	8.00E-01	4.00E-02
Chlorine	7782-50-5	2.00E-01	1.00E-02
Chloroaniline, p-	106-47-8	5.00E-01	1.00E-01
Chlorobenzilate	510-15-6	5.00E-01	1.00E-01
Chloronaphthalene, 2-	91-58-7	8.90E-01	1.30E-01
Chlorpyrifos	2921-88-2	5.00E-01	1.00E-01
Chromium (III)/Chromium total	16065-83-1 / 7440-47-3	1.30E-02	1.00E-02
Chromium (VI)	18540-29-9	2.50E-02	1.00E-02
Chrysene	218-01-9	8.90E-01	1.30E-01
Cobalt	7440-48-4	8.00E-01	1.00E-02
Copper	7440-50-8	5.70E-01	1.00E-02
Cresol, m-	108-39-4	5.00E-01	1.00E-01
Cresol, o-	95-48-7	5.00E-01	1.00E-01
Cresol, p-	106-44-5	6.50E-01	1.00E-01
Cyanide	57-12-5	5.00E-01	1.00E-02
Cyclotrimethylenetrinitramine	121-82-4	1.00E+00	1.00E-01
Diethyl phthalate	84-66-2	9.00E-01	1.00E-01
Diethylstilbestrol	56-53-1	5.00E-01	1.00E-01
Dimethoate	60-51-5	5.00E-01	1.00E-01
Dimethoxybenzidine, 3,3'-	119-90-4	5.00E-01	1.00E-01
Dimethylbenzidine, 3,3'-	119-93-7	5.00E-01	1.00E-01
Dimethyl phenol, 2,4-	105-67-9	5.00E-01	1.00E-01
Dinitrobenzene, 1,3-	99-65-0	6.50E-01	1.00E-01
Dinitrobenzene, 1,4-	100-25-4	5.00E-01	1.00E-01
Dinitrophenol, 2,4-	51-28-5	1.00E+00	1.00E-01

COC	CAS #	ABS <sub>GI</sub> (unitless)	ABS.d (unitless)
Dinitrotoluene, 2,4-	121-14-2	8.50E-01	1.00E-01
Dinitrotoluene, 2,6-	606-20-2	8.50E-01	1.00E-01
Dinoseb	88-85-7	5.00E-01	1.00E-01
Diphenylamine	122-39-4	5.00E-01	1.00E-01
Diphenylhydrazine, 1,2-	122-66-7	5.00E-01	1.00E-01
Diquat	85-00-7	5.00E-01	1.00E-01
Disulfoton	298-04-4	5.00E-01	1.00E-01
Diuron	330-54-1	5.00E-01	1.00E-01
Endosulfan	115-29-7	5.00E-01	1.00E-01
Endothall	145-73-3	5.00E-01	1.00E-01
Endrin	72-20-8	5.00E-01	1.00E-01
Epichlorohydrin	106-89-8	8.00E-01	0.00E+00
Ethion	563-12-2	5.00E-01	1.00E-01
Ethyl dipropylthiocarbamate, S-	759-94-4	5.00E-01	1.00E-01
Ethylene glycol	107-21-1	5.00E-01	1.00E-01
Ethylene thiourea	96-45-7	5.00E-01	1.00E-01
Fluoranthene	206-44-0	8.90E-01	1.30E-01
Fluorene	86-73-7	8.90E-01	1.30E-01
Fluorine (soluble fluoride)	7782-41-4	9.70E-01	1.00E-02
Heptachlor	76-44-8	7.20E-01	1.00E-01
Heptachlor epoxide	1024-57-3	7.20E-01	1.00E-01
Hexachlorobenzene	118-74-1	5.00E-01	1.00E-01
Hexachlorobutadiene	87-68-3	5.00E-01	1.00E-01
Hexachlorocyclohexane, alpha	319-84-6	9.70E-01	4.00E-02
Hexachlorocyclohexane, beta	319-85-7	9.10E-01	4.00E-02
Hexachlorocyclohexane, gamma	58-89-9	9.70E-01	4.00E-02
Hexachlorocyclohexane, techn	608-73-1	9.70E-01	4.00E-02
Hexachlorocyclopentadiene	77-47-4	5.00E-01	1.00E-01
Hexachloroethane	67-72-1	5.00E-01	1.00E-01
Hexachlorophene	70-30-4	5.00E-01	1.00E-01
Hexazinone	51235-04-2	5.00E-01	1.00E-01
Indeno-1,2,3-cd-pyrene	193-39-5	8.90E-01	1.30E-01
Isophorone	78-59-1	5.00E-01	1.00E-01
Kepone	143-50-0	5.00E-01	1.00E-01
Lead (inorganic)	7439-92-1	---	---

COC	CAS #	ABS <sub>GI</sub> (unitless)	ABS.d (unitless)
Malathion	121-75-5	5.00E-01	1.00E-01
Maleic anhydride	108-31-6	5.00E-01	1.00E-01
Maleic hydrazide	123-33-1	5.00E-01	1.00E-01
Malononitrile	109-77-3	5.00E-01	1.00E-01
Manganese	7439-96-5	6.00E-02	1.00E-02
Mercury	7439-97-6	7.00E-02	1.00E-02
Methomyl	16752-77-5	5.00E-01	1.00E-01
Methoxychlor	72-43-5	5.00E-01	1.00E-01
Methyl mercury	22967-92-6	9.00E-01	1.00E-02
Methylnaphthalene, 2-	91-57-6	8.90E-01	1.30E-01
Methyl parathion	298-00-0	5.00E-01	1.00E-01
Methylene-bis (2-chloroaniline) 4,4' -	101-14-4	5.00E-01	1.00E-01
Molinate	2212-67-1	5.00E-01	1.00E-01
Molybdenum	7439-98-7	3.80E-01	1.00E-02
Naled	300-76-5	5.00E-01	1.00E-01
Naphthalene	91-20-3	8.90E-01	1.30E-01
Nickel and compounds (soluble salts)	7440-02-0	4.00E-02	1.00E-02
Nitrate	14797-55-8	5.00E-01	1.00E-02
Nitrite	14797-65-0	5.00E-01	1.00E-02
Nitroaniline, 2-	88-74-4	5.00E-01	1.00E-01
Nitrobenzene	98-95-3	9.70E-01	1.00E-01
Nitroso-n-ethylurea, n-	759-73-9	5.00E-01	1.00E-01
Nitrosodi-n-butylamine, n-	924-16-3	5.00E-01	1.00E-01
Nitrosodi-n-propylamine, n-	621-64-7	2.50E-01	1.00E-01
Nitrosodiethanolamine	1116-54-7	5.00E-01	1.00E-01
Nitrosodiphenylamine	86-30-6	2.50E-01	1.00E-01
Nitrosopyrrolidine, n-	930-55-2	5.00E-01	1.00E-01
Nitrotoluene, m-	99-08-1	5.00E-01	1.00E-01
Nitrotoluene, o-	88-72-2	5.00E-01	1.00E-01
Nitrotoluene, p-	99-99-0	5.00E-01	1.00E-01
Octamethylpyrophosphoramidate	152-16-9	5.00E-01	1.00E-01
Oxamyl	23135-22-0	5.00E-01	1.00E-01
Parathion	56-38-2	5.00E-01	1.00E-01
Pebulate	1114-71-2	5.00E-01	1.00E-01
Pentachlorobenzene	608-93-5	5.00E-01	1.00E-01

COC	CAS #	ABS <sub>GI</sub> (unitless)	ABS.d (unitless)
Pentachloronitrobenzene	82-68-8	5.00E-01	1.00E-01
Pentachlorophenol	87-86-5	7.60E-01	2.50E-01
Phenanthrene	85-01-8	8.90E-01	1.30E-01
Phenol	108-95-2	9.00E-01	1.00E-01
Phenyl mercuric acetate	62-38-4	5.00E-01	1.00E-01
Phenylene diamine, m-	108-45-2	5.00E-01	1.00E-01
Phenylene diamine, p-	106-50-3	5.00E-01	1.00E-01
Phorate	298-02-2	5.00E-01	1.00E-01
Phosphine	7803-51-2	2.00E-01	1.00E-02
Phosphorus, white	7723-14-0	2.00E-01	1.00E-02
Phthalic anhydride	85-44-9	5.00E-01	1.00E-01
Polybrominated biphenyls	67774-32-7	9.30E-01	1.00E-01
Polychlorinated biphenyls	1336-36-3	8.10E-01	1.40E-01
Pronamide	23950-58-5	5.00E-01	1.00E-01
Propargite	2312-35-8	5.00E-01	1.00E-01
Propham	122-42-9	5.00E-01	1.00E-01
Pyrene	129-00-0	8.90E-01	1.30E-01
Quinoline	91-22-5	5.00E-01	1.00E-01
Selenium	7782-49-2	5.00E-01	1.00E-02
Selenourea	630-10-4	---	---
Silver	7440-22-4	4.00E-02	1.00E-02
Sodium diethyldithiocarbamate	148-18-5	---	---
Strychnine	57-24-9	5.00E-01	1.00E-01
TCDD, 2,3,7,8- (dioxin)	1746-01-6	---	---
Tetrachlorobenzene, 1,2,4,5-	95-94-3	5.00E-01	1.00E-01
Tetrachlorophenol, 2,3,4,6-	58-90-2	5.00E-01	1.00E-01
Tetraethyl dithiopyrophosphate	3689-24-5	5.00E-01	1.00E-01
Tetraethyl lead	78-00-2	5.00E-01	1.00E-01
Thallium and compounds (as thallium chloride)	7791-12-0	1.00E+00	1.00E-02
Thiofanox	39196-18-4	5.00E-01	1.00E-01
Thiophanate-methyl	23564-05-8	5.00E-01	1.00E-01
Thiram	137-26-8	5.00E-01	1.00E-01
Tin	7440-31-5	1.00E-01	1.00E-02
Toluenediamine, 2,4-	95-80-7	5.00E-01	1.00E-01

COC	CAS #	ABS <sub>GI</sub> (unitless)	ABS.d (unitless)
Toluenediamine, 2,6-	823-40-5	5.00E-01	1.00E-01
Toluene diisocyanate, 2,4/2,6-	26471-62-5	5.00E-01	1.00E-01
Toluidine, p-	106-49-0	5.00E-01	1.00E-01
Toxaphene	8001-35-2	5.00E-01	1.00E-01
TP Silvex, 2,4,5-	93-72-1	5.00E-01	1.00E-01
Triallate	2303-17-5	5.00E-01	1.00E-01
Tributyltin oxide	56-35-9	5.00E-01	1.00E-01
Trichlorobenzene, 1,2,4-	120-82-1	9.70E-01	1.00E-01
Trichlorophenol, 2,4,5-	95-95-4	5.00E-01	1.00E-01
Trichlorophenol, 2,4,6-	88-06-2	5.00E-01	1.00E-01
Trichlorophenoxyacetic acid, 2,4,5-	93-76-5	5.00E-01	1.00E-01
Trifluralin	1582-09-8	5.00E-01	1.00E-01
Trinitrobenzene, 1,3,5-	99-35-4	6.50E-01	1.00E-01
Trinitrophenylmethylnitramine	479-45-8	5.00E-01	1.00E-01
Trinitrotoluene, 2,4,6-	118-96-7	6.00E-01	1.00E-01
Uranium (soluble salts)	7440-61-1	8.50E-01	1.00E-02
Vanadium	7440-62-2	2.60E-02	1.00E-02
Vernam	1929-77-7	5.00E-01	1.00E-01
Warfarin	81-81-2	5.00E-01	1.00E-01
Zinc	7440-66-6	2.00E-01	1.00E-02
> 10-12 C aliphatics (TPH)	NA	5.00E-01	1.00E-01
> 12-16 C aliphatics (TPH)	NA	5.00E-01	1.00E-01
> 16-21 C aliphatics (TPH)	NA	5.00E-01	1.00E-01
> 16-21 C, > 21-35 C aliphatics (TPH) (for transformer mineral oil releases only)	NA	5.00E-01	1.00E-01
> 10-12 C aromatics (TPH)	NA	5.00E-01	1.00E-01
> 12-16 C aromatics (TPH)	NA	5.00E-01	1.00E-01
> 16-21 C aromatics (TPH)	NA	8.90E-01	1.30E-01
> 21-35 C aromatics (TPH)	NA	8.90E-01	1.30E-01

(d) Soil ingestion RBEL. The soil ingestion RBEL ( $^{Soil}RBEL_{Ing}$ ) is protective concentration of a COC at the POE in soil based upon human ingestion.

(e) Vegetable ingestion RBELs. The vegetable RBELs ( $^{AbgVeg}RBEL_{Ing}$  and  $^{BgVeg}RBEL_{Ing}$ ) are the protective concentration of a COC in aboveground vegetables and below-ground vegetables, respectively, for ingestion by residents. The person shall establish RBELs for ingestion of aboveground vegetables for all carcinogenic and noncarcinogenic COCs which are metals. In addition, the person shall establish RBELs for ingestion of below-ground vegetables for all carcinogenic and noncarcinogenic COCs with a dimensionless Henry's Law Constant less than 0.03, as shown in the figure in §350.73(f) of this title (relating to Determination and Use of Human Toxicity Factors and Chemical Properties), when either of the following criteria are met:

(1) the COC is a metal; or

(2) the COC has a logarithmic octanol-water partition coefficient ( $\text{Log } K_{ow}$ ) greater than four as shown in the figure in §350.73(f) of this title (relating to Determination and Use of Human Toxicity Factors and Chemical Properties); or

(f) Groundwater ingestion RBEL.

(1) The groundwater ingestion RBEL ( $^{GW}RBEL_{Ing}$ ) is the protective concentration of a COC at the POE in groundwater based upon human ingestion of groundwater. However, if available,

the person shall use the lower of the two values established under paragraphs (2) and (3) of this subsection instead.

(2) The person shall use the primary MCL as provided in 40 Code of Federal Regulations Part 141, as amended, or the most currently available federal action level for drinking water (e.g., lead and copper) as the RBEL when available for the COC.

(3) The person shall use the secondary MCLs established for individual COCs as provided in 40 Code of Federal Regulations Part 143, as amended, as RBELs, or other scientifically valid published criteria in cases where COCs are present at concentrations which present objectionable characteristics such as taste or odor (e.g., methyl tertiary butyl ether) under the following circumstances:

(A) when the COCs are present in class 1 groundwater;

(B) when the COCs are present in class 2 groundwater that is within 1/2 mile of a well used to supply drinking water and is also within or is likely to migrate, based upon the chemical properties of the COCs and the hydrogeology, to the groundwater production zone of such drinking water supply well; or

(C) when the COCs are present in class 2 groundwater and there are no alternative water supplies available.

(g) Class 3 groundwater RBEL. The class 3 groundwater RBEL ( $^{GW}RBEL_{Class\ 3}$ ) is the acceptable concentration of a COC at the POE in class 3 groundwater.

(h) Surface water RBEL. The surface water RBEL ( $^{SW}RBEL$ ) is the protective concentration of a COC at the POE in surface water. To establish  $^{SW}RBEL$  for a COC, the person shall determine the lowest value from paragraphs (1) - (5) of this subsection for each COC, unless the person has sufficient surface water quality information specific to the particular surface water body to support an adjustment to the RBEL in accordance with paragraph (6) of this subsection. The  $^{SW}RBEL$  value determined pursuant to paragraphs (1) - (6) of this subsection may require modification in response to the requirements of paragraphs (7) and (8) of this subsection. The  $^{SW}RBEL$  value for a given COC shall be protective of relevant downgradient water bodies in consideration of the water body use (e.g., designated drinking water supply or sustainable fishery), the water body type (e.g., estuary or perennial freshwater stream), the standards applicable to the type of water body/use, and the fate and transport characteristics of the COC in question at the particular affected property.

(1) The person shall apply the lower of the acute or chronic criteria for fresh or marine waters as applicable, based on the classification of the surface water, to protect aquatic life as provided in §307.6, Table 1 of this title (relating to Toxic Materials), as amended. The person shall determine the applicability of aquatic life criteria related to the water body aquatic life use and flow conditions in accordance with the procedures contained in §307.3, §307.4, and §307.6 of this title (relating to Definitions and Abbreviations, General Criteria, and Toxic Materials, respectively), and the agency's

*Implementation Procedures*, as amended, as defined in §350.4 of this title (relating to Definitions and Acronyms), as amended. For fresh waters, the person shall calculate aquatic life criteria for metals with hardness-dependent criteria using the hardness value for the nearest downstream classified segment, as listed in the agency's *Implementation Procedures*, as amended. Where no value is provided in the *Implementation Procedures*, a hardness value of 50 mg/l CaCO<sub>3</sub> shall be used. When applicable, the person shall convert total metal concentrations in surface water or groundwater to dissolved concentrations as described in the agency's *Implementation Procedures*, as amended. The person may use the basin-specific pH values provided in §307.6, Table 2 of this title, as amended, relevant to the particular affected property for purposes of determining the appropriate values for the pH dependent criteria. The person shall use the total suspended solids concentration for the nearest classified segment, as listed in the agency's *Implementation Procedures*, as amended.

(2) The person shall apply the human health criteria to protect drinking water and fisheries as provided in Table 3 of §307.6 of this title, as amended. When applicable, the person shall convert total metal concentrations in surface water or groundwater to dissolved concentrations as described in the agency's *Implementation Procedures*, as amended. The person shall determine the applicability of human health criteria according to the water body uses (e.g., public water supply, sustainable fishery, incidental fishery, and contact recreation) in accordance with the procedures contained in §307.3 and §307.6 of this title, as amended, and the *Implementation Procedures*, as amended. When a water body is not being evaluated as a drinking water source, the person must determine the necessity to evaluate exposure pathways associated with contact recreation such as incidental ingestion of surface water and dermal contact with surface water. The person shall use the

total suspended solids concentration for the nearest classified segment, as listed in the agency's

*Implementation Procedures*, as amended.

(3) The person shall apply the effluent limitations specified in Texas Pollutant Discharge Elimination System (TPDES) General Permit Number TXG830000, as amended, for any release of groundwater or storm water that has been impacted by petroleum fuel (as defined in the general permit).

(4) The person shall apply United States EPA guidelines or alternate provisions in accordance with §307.6(c)(7) of this title, as amended, when criteria for aquatic life protection are not provided for a COC in §307.6 of this title, Table 1, as amended. In addition, the person shall apply federal guidance criteria (i.e., lower of a federal numerical criterion, MCL, or equivalent state drinking water guideline) or alternate provisions in accordance with §307.6(d)(8) of this title, as amended, when human health criteria for a COC are not provided in Table 3 of §307.6 of this title, as amended.

(5) The person shall apply the numerical criteria, as appropriate, for chlorides, sulfates, total dissolved solids, and pH for classified segments as specified in §307.10(1) of this title (relating to Appendices A - E), as amended.

(6) The person may apply additional provisions where data on surface water quality for a specific surface water body at the affected property is available or can be reasonably obtained.

(A) The person may determine property-specific hardness, based on sampling data, for calculating metals criteria in accordance with the procedures contained in the agency's *Implementation Procedures*, as amended.

(B) The person may determine property-specific total suspended solids, based on sampling data, for estimating "dissolved" metals in accordance with the *Implementation Procedures*, as amended.

(C) The person may determine the actual pH of the particular surface water body at the affected property.

(7) The additional numeric and narrative criteria listed in subparagraphs (A) and (B) of this paragraph may require development of a surface water RBEL (e.g., where a nutrient is a COC) or modification to the surface water RBEL (e.g., lower a RBEL value to minimize foaming on the water's surface) determined pursuant to paragraphs (1) - (5) of this subsection.

(A) General criteria related to aesthetic parameters, nutrient parameters, and salinity in accordance with §307.4(b), (e), and (g) of this title (relating to General Criteria), as amended.

(B) General provisions related to the preclusion of adverse toxic effects on aquatic and terrestrial life, livestock, or domestic animals in accordance with §307.6(b) of this title, as amended.

(8) If the executive director determines that the release has the potential to lower the surface water dissolved oxygen, then the executive director may require the person to apply the dissolved oxygen criteria for classified segments specified in §307.10(1) of this title, as amended, or the dissolved oxygen criteria for unclassified waters specified in §307.10(4) of this title, as amended, §307.4(h) of this title, as amended, and §307.7(b)(3)(A) of this title (relating to Site Specific Uses and Criteria), as amended.

(i) Aesthetics. For COCs for which a RBEL cannot be calculated by the procedures of this section, or the RBEL concentration for the COC otherwise adversely impacts environmental quality or public welfare and safety, presents objectionable characteristics (e.g., taste, odor), or makes a natural resource unfit for use, the person shall comply with paragraphs (1) - (3) of this subsection as appropriate. For response actions which are triggered for an area solely for purposes of this subsection (i.e., there is no other human health or ecological hazard remaining), the executive director will evaluate the seriousness, probable longevity of the matter, and suitability of the proposed remedy with the landowner in order to site-specifically determine whether or not institutional controls and financial assurance are warranted. The person shall provide all information reasonably necessary to support such a determination to the executive director. The default presumption is that financial assurance and institutional controls are required for exposure prevention remedies. If the executive director determines that institutional controls and financial assurance are not warranted, then persons shall not

be required to comply with the provisions of §350.31(g), §350.33(e)(2)(C) and §350.111(b)(3) or (6) of this title (relating to General Requirements for Remedy Standards, Remedy Standard B, and Use of Institutional Controls), specifically relating to the physical control matters for the portion of affected property with the aesthetics issue.

(1) In accordance with §101.4 of this title (relating to Nuisance), as amended, the person may be required by the executive director to address COCs which present objectionable odors.

(2) The maximum total soil concentration of COCs which are liquid at standard temperature and pressure shall not exceed 10,000 mg/kg within the soil interval of 0 - 10 feet, unless it can be demonstrated that:

(A) no free liquids (e.g., no mobile NAPL) or sludges exist; or

(B) higher concentrations do not adversely impair surface use of the affected property.

(3) Other scientifically valid published criteria such as, but not limited to, non-COC specific secondary MCLs for water may be required by the executive director to be used as the RBEL.

(j) Requirements for variance to default RBEL exposure factors.

(1) Under Tiers 2 or 3 as provided in §350.75 of this title (relating to Tiered Human Health Protective Concentration Level Evaluation) and with prior executive director approval, the person may vary the following default exposure factors shown in the figures in subsections (a) and (c) of this section based on conditions or exposure levels at a particular affected property and in accordance with the conditions specified. A person shall provide the supporting documentation to justify the use of such alternative factors to the executive director.

(A) Gastrointestinal absorption fraction ( $ABS_{GI}$ ). A person or the executive director may use an alternative scientifically justifiable gastrointestinal absorption fraction value. Only in cases where the gastrointestinal absorption fraction is less than 50% shall the oral slope factor and oral reference dose be adjusted using equation RBEL-2 as shown in the figure in subsection (a) of this section, as applicable, to calculate the corresponding dermal slope factor and dermal reference dose. The person shall not use the gastrointestinal absorption fraction to modify the oral slope factor or oral reference dose for any exposure pathway other than the dermal exposure pathway. In the event the executive director determines a more scientifically valid gastrointestinal absorption fraction, that fraction shall be presumed to be the appropriate fraction and the person shall use that fraction unless a person rebuts that value with a scientifically valid study or by other credible published authority.

(B) Dermal absorption fraction ( $ABS.d$ ). A person or the executive director may conduct a scientifically valid study using property-specific soils or may use alternative scientifically justifiable dermal absorption values. In the event the executive director determines a more scientifically valid dermal absorption fraction, that fraction shall be presumed to be the appropriate

fraction and the person shall use that fraction unless a person rebuts that fraction with a scientifically valid study using property-specific soils or by other credible published authority.

(C) Relative bioavailability factor (RBAF). A person or the executive director may conduct a scientifically valid bioavailability study using property-specific soils or may conduct mineralogical evaluations of the chemical form of a COC present in soils at the affected property. In the event the executive director determines a more scientifically valid relative bioavailability factor, that factor shall be presumed to be the appropriate relative bioavailability factor and the person shall use that factor unless a person rebuts that factor with a scientifically valid bioavailability study using property-specific soils, mineralogical evaluation of the chemical form of a chemical of concern present in soils at the affected property, or by other credible published authority.

(2) Under Tiers 2 or 3 as provided in §350.75 of this title (relating to Tiered Human Health Protective Concentration Level Evaluation), a person may request that the executive director allow a variance to the following default commercial/industrial exposure factors for the affected property as shown in the figure in subsection (a) of this section: averaging time for noncarcinogens (AT.w), exposure duration (ED.w), and exposure frequency (EF.w). This shall only be allowed for facilities that have or will have, as a condition of the approval of this variance, restricted property access. The executive director shall not delegate this decision to agency staff.

(A) The person shall submit information to the executive director which demonstrates that variance from the default exposure factors is supported by property-specific information; historical, current, and probable future land use; redevelopment potential; and

compatibility with surrounding land use. The person shall also provide written concurrence from the landowner for the placement of the institutional control in the county deed records, as required in subparagraph (L) of this paragraph, unless the property is subject to zoning or governmental ordinance which is equivalent to the deed notice, VCP certificate of completion or restrictive covenant that otherwise would have been required.

(B) The person requesting such variance shall provide public notification as described in subparagraphs (D) and (E) of this paragraph for any request to vary the default exposure factors at the same time that variance-based PCLs are submitted to the executive director for approval. If the natural physical condition of the on-site commercial/industrial area for which the variance is sought essentially prohibits full commercial/industrial use (e.g., marshes and cliffs), and the variance would not necessitate a lesser commercial/industrial use of that area, then the executive director will determine the need for public notice on a site-specific basis for the prohibited use area. The person may request the executive director or his staff to review the variance-based PCLs or the variance request for completeness (e.g., administratively complete, mathematical accuracy, compliance with other PCL development procedures) in advance of initiating the public notification process. The required public notice shall be completed prior to consideration of the variance request for approval by the executive director. The public notice provisions may be performed in conjunction with or as part of another public participation/notification process required for permitting or other applicable state or federal statute or regulation provided the requirements of subparagraph (E) of this paragraph are also met. Additionally, an alternative mechanism that may exist under the other public participation/notification process which effectively provides broad public notice of the variance request,

such as notification to an existing citizens' advisory board for the affected property/facility, may substitute for the requirements of subparagraph (D) of this paragraph, provided the completion of the notification is sufficiently documented.

(C) The notice shall contain, at a minimum, the following information:

(i) the name, address and telephone number of the person requesting the variance;

(ii) the address and the physical description for the location of the property and the agency case designation number;

(iii) the modified value(s) the person seeks to use and the associated default exposure factor(s) as shown in the figure in subsection (a) of this section without any statements or other indications that such variance has been approved or otherwise considered favorably by the executive director or the executive director's staff other than that it has been reviewed for completeness;

(iv) a clear and concise explanation as to the effect the variance will have on the future use of the subject property and on surrounding properties;

(v) a statement that more detailed information regarding the variance request is available for review at the agency's central office in Austin, Texas, 8:00 am - 5:00 pm Monday thru Friday; and

(vi) a notice to the public of the opportunity to submit written information, within 30 calendar days after the date of the initial published notice (publish the actual date), to the executive director which demonstrates that the proposal for variance from the default exposure factors would be compatible or incompatible with existing neighboring land uses and preservation of the active and productive land use of the subject property.

(D) The notice shall be published in a newspaper distributed daily, if available, and generally circulated in the county or area where the property is located. The notice shall be published once a week for three weeks, with at least one of the notices appearing in a Sunday edition, if available.

(E) The notice shall be sent to the following persons in clauses (i) - (viii) of this subparagraph by certified mail, return receipt requested:

(i) all adjacent landowners;

(ii) the local municipality planning board or similar governmental unit, if applicable;

(iii) local taxing authorities;

(iv) the mayor and health authorities of the city in which the property is located, if applicable;

(v) the county judge and county health authority of the county in which the property is located;

(vi) the agency's Public Interest Counsel;

(vii) all persons or organizations who have requested the notice or expressed interest; and

(viii) other persons or organizations specified by the executive director.

(F) The person shall provide copies of each notice sent by mail, copies of the published notice, and copies of the signed publisher's affidavit for the initial notice to the agency's Austin office and to the appropriate agency region office within 10 calendar days after the initial publication and mailing. Copies of the signed publisher's affidavits for the subsequent notices shall be provided to the agency's Austin office and to the appropriate agency region office within 10 days of both subsequent notices.

(G) At the executive director's request, and at the expense of the person, the person shall schedule and hold a public meeting at a time and place which are convenient for persons identified in subparagraph (E) of this paragraph. The forum chosen for the meeting shall comply with the Americans with Disabilities Act. Prior to scheduling the public meeting, the person shall coordinate the scheduling of the public meeting with the executive director's office to ensure the availability of agency personnel for the meeting. The person shall confirm with the executive director's office the date, time, and location of the meeting not less than 15 days prior to the meeting. The meeting shall be open to the public to provide information on the request to vary the default exposure factors and to allow for comments by the public. The person shall again confirm with the executive director's office on the time and place of the meeting at least 72 hours prior to the meeting.

(H) In order to inform persons of the public meeting, the person shall, at least 30 calendar days prior to the public meeting, follow the notification process required in subparagraphs (C) - (F) of this paragraph with the following exceptions:

(i) the notice shall be supplemented to include the date, time, and location of the public meeting and to indicate that the meeting is open to the public for the purposes of providing information on the request to vary default exposure factors and to provide the public the opportunity to provide comments on the request;

(ii) the notice shall indicate that the public shall have 15 calendar days after the date of the public meeting to submit written information to the executive director which

demonstrates that the proposal for variance from the default exposure factors would be compatible or incompatible with existing neighboring land uses and preservation of the active and productive land use of the subject property; and

(iii) the notice by publication of the public meeting shall only be published once and shall be placed in a Sunday edition, if available.

(I) The executive director's decision on the request for a variance from the default exposure factors shall occur at least 15 calendar days after any public meeting or if no public meeting is held, at least 45 days after the date of the initial published notice. The executive director's decision shall be based upon property-specific data; historical, current, and probable future land use; redevelopment potential; and compatibility with surrounding land use. The executive director shall not consider the costs incurred for any actions taken by the person in anticipation that the variance would be approved by the executive director.

(J) At the same time that the executive director's decision is mailed to the person requesting the variance, a copy of this decision shall also be mailed to all persons identified in subparagraph (E) of this paragraph. The notice of the executive director's decision shall explain the method for submitting a motion for reconsideration of the executive director's decision by the commission.

(K) The person requesting the variance and persons identified in subparagraph (E) of this paragraph may file with the chief clerk a motion for reconsideration of the executive director's decision related to the request for variance, in accordance with §50.39(b) - (f) of this title (relating to Motion for Reconsideration), as amended.

(L) A person who receives a variance from the default exposure factors shall comply with the institutional control requirements in §350.111(b), (b)(12), or (13) of this title (relating to Use of Institutional Controls), as applicable, and provide proof of compliance with the institutional control requirements within 90 days of the approval by the executive director of the RACR.

(3) The person shall not vary the following exposure factors shown in the figure in subsection (a) of this section.

(A) averaging time for residents for noncarcinogens (AT.A.res and AT.C.res) or carcinogens (ATc);

(B) body weight for adults and children (BW.A, BW.C,  $BW_{(0<6)}$ ,  $BW_{(6<18)}$ , and  $BW_{(18<30)}$ );

(C) exposure duration for residents (ED.A.res, ED.C.res,  $ED_{(0<6)}$ ,  $ED_{(6<18)}$ , and  $ED_{(18<30)}$ );

(D) exposure frequency for residents (EF.res);

(E) ingestion rate for soil, water, or vegetables (IRsoil.AgeAdj.res, IRsoil.C.res, IRsoil.w, IRw.AgeAdj.res, IRw.C.res, IRw.w, IRabg.AgeAdj.res, IRbg.AgeAdj.res, IRabg.C.res, IRbg.C.res);

(F) toxicity modifying factor (MF);

(G) skin surface area (SA.C.res, SA<sub>(0<6)</sub>, SA<sub>(6<18)</sub>, SA<sub>(18<30)</sub>, SA.w);

(H) soil-to-skin adherence factors (AF.C.res, AF<sub>(0<6)</sub>, AF<sub>(6<18)</sub>, AF<sub>(18<30)</sub>, and AF.w).

**§350.75. Tiered Human Health Protective Concentration Level Evaluation.**

(a) General.

(1) The person shall decide whether to use Tier 1, 2, and/or 3 to determine the PCLs for an affected property, except as provided in paragraph (2) of this subsection and unless required by subsection (b), (c), or (d) of this section.

(2) The executive director may require the person to establish PCLs in accordance with Tier 1, 2, and/or 3 for state-funded response actions at affected properties.

(b) Tier 1 PCLs.

(1) Tier 1 is a risk-based analysis to derive non-site-specific PCLs for complete or reasonably anticipated to be completed exposure pathways. Tier 1 is based on default exposure factors and affected property parameters in the applicable PCL equations provided in the following figure and assumes exposure occurs at, above or below the source area (i.e., no lateral transport).

**Figure: 30 TAC §350.75(b)(1)**

**Tier 1 PCL Equations**

<b>Groundwater Ingestion PCL Equation: <sup>GW</sup>GW<sub>Ing</sub></b>
Exposure Pathway Description: Ingestion of groundwater Source Medium: Groundwater Exposure Medium: Groundwater  ${}^{GW}GW_{Ing} = {}^{GW}RBEL_{Ing} \text{ (See Eq. RBEL-4, Figure: 30 TAC §350.74(a))}$
<b>Class 3 Groundwater PCL Equation: <sup>GW</sup>GW<sub>Class 3</sub></b>
Exposure Pathway Description: Class 3 groundwater Source Medium: Class 3 groundwater Exposure Medium: Class 3 groundwater  ${}^{GW}GW_{Class\ 3} = {}^{GW}RBEL_{Class\ 3} \text{ (See Eq. RBEL-5, Figure: 30 TAC §350.74(a))}$
<b>Groundwater Volatilization PCL Equation: <sup>Air</sup>GW<sub>Inh-v</sub></b>
Exposure Pathway Description: Inhalation of volatiles from class 1, 2, or 3 groundwater Source Medium: Class 1, 2, or 3 groundwater Exposure Medium: Outdoor air  ${}^{Air}GW_{Inh-v} = {}^{Air}RBEL_{Inh-v} \text{ (See Eq. RBEL-1, Figure: 30 TAC §350.74(a))}$ $VF_{wamb}$ $VF_{wamb} \left[ \frac{mg / m^3 - air}{mg / L - H_2O} \right] = \frac{H'}{1 + \left[ \frac{U_{air} \delta_{air} L_{gw}}{W_g D_{ws}^{eff}} \right]} \cdot \left[ 10^3 \frac{L}{m^3} \right]$ $D_{ws}^{eff} \left[ \frac{cm^2}{s} \right] = (h_{cap} + h_v) \left[ \frac{h_{cap}}{D_{cap}^{eff}} + \frac{h_v}{D_s^{eff}} \right]^{-1}$ $D_{cap}^{eff} \left[ \frac{cm^2}{s} \right] = D^{air} \frac{\theta_{acap}^{3.33}}{\theta_T^2} + \left[ \frac{D^{wat}}{H'} \right] \left[ \frac{\theta_{wcap}^{3.33}}{\theta_T^2} \right]$ $D_s^{eff} \left[ \frac{cm^2}{s} \right] = D^{air} \frac{\theta_{as}^{3.33}}{\theta_T^2} + \left[ \frac{D^{wat}}{H'} \right] \left[ \frac{\theta_{ws}^{3.33}}{\theta_T^2} \right]$

<b>Groundwater-to-Surface Water PCL Equation: <sup>SW</sup>GW</b>				
Exposure Pathway Description: Discharge of class 1, 2, or 3 groundwater to surface water Source Medium: Class 1, 2, or 3 groundwater Exposure Medium: Surface water				
$\frac{{}^{SW}GW}{DF} = \frac{{}^{SW}SW}{DF} \quad \left[ {}^{SW}GW = \frac{({}^{SW}RBEL)}{DF} \right]$				
(See Eq. RBEL-6, Figures: 30 TAC §350.74(a); and 30 TAC §350.75(i)(4))				
<b>Term</b>	<b>COC Chemical/Physical and Affected Property Parameters Definition</b>	<b>Tier 1 Defaults</b>	<b>Change to Tier 1 Default Allowed?</b>	<b>Rule Citation Regarding Change</b>
$\rho_b$	Soil bulk density (g/cm <sup>3</sup> )	1.67	Tier 2, 3	§350.75(c) and (d)
$\theta_{ws}$	Volumetric water content of vadose zone soils (cm <sup>3</sup> -water/cm <sup>3</sup> -soil)	0.16	Tier 2, 3	§350.75(c) and (d)
$\theta_{as}$	Volumetric air content of vadose zone soils (cm <sup>3</sup> -air/cm <sup>3</sup> -soil) = $\theta_T - \theta_{ws}$	0.21	Tier 2, 3	§350.75(c) and (d)
$\theta_T$	Total soil porosity = $1 - (\rho_b/\rho_s)$ (cm <sup>3</sup> -pore space/cm <sup>3</sup> -soil)	0.37	Tier 2, 3	§350.75(c) and (d)
$\rho_s$	Particle density (g/cm <sup>3</sup> )	2.65	Tier 2, 3	§350.75(c) and (d)
H'	Dimensionless Henry's Law Constant	(Figure: 30 TAC §350.73(f))	No	NA
H	Henry's Law Constant (atm-m <sup>3</sup> /mole) (H=H'RT)	(Figure: 30 TAC §350.73(f))	No	NA
R	Universal Gas Constant (atm m <sup>3</sup> mol <sup>-1</sup> °K <sup>-1</sup> )	8.206 x 10 <sup>-5</sup>	No	NA
T	Temperature (°K) = 273 + °C	293	No	NA
U <sub>air</sub>	Windspeed above ground surface in ambient mixing zone (cm/s)	240	Tier 2, 3	§350.75(c) and (d)
$\delta_{air}$	Ambient air mixing zone height (cm)	200	No	NA
L <sub>gw</sub>	Depth to groundwater = h <sub>cap</sub> + h <sub>v</sub> (cm)	305	Tier 2, 3	§350.75(c) and (d)
D <sub>ws</sub> <sup>eff</sup>	Effective diffusivity above water table (cm <sup>2</sup> /s)	COC and affected property specific	Tier 2, 3	§350.73(f) and §350.75(c) and (d)

<i>Term</i>	<i>COC Chemical/Physical and Affected Property Parameters Definition</i>	<i>Tier 1 Defaults</i>	<i>Change to Tier 1 Default Allowed?</i>	<i>Rule Citation Regarding Change</i>
$D_{cap}^{eff}$	Effective diffusivity in the capillary fringe (cm <sup>2</sup> /s)	COC and affected property specific	Tier 2, 3	§350.73(f) and §350.75(c) and (d)
$D_s^{eff}$	Effective diffusivity in vadose zone soils (cm <sup>2</sup> /s)	COC and affected property specific	Tier 2,3	§350.73(f) and §350.75(c) and (d)
$h_{cap}$	Thickness of capillary fringe (cm)	5	Tier 2, 3	§350.75(c) and (d)
$h_v$	Thickness of vadose zone (cm)	300	Tier 2, 3	§350.75(c) and (d)
$W_g$	Width of groundwater source in the direction to the closest off-site property line from the groundwater source (cm) <ul style="list-style-type: none"> <li>• 0.5 acre source</li> <li>• 30 acre source</li> </ul>	4,500 34,800	Tier 2, 3 Tier 2, 3	§350.75(c) and (d)
$\theta_{acap}$	Volumetric air content of capillary fringe soils (cm <sup>3</sup> -air/cm <sup>3</sup> -soil)	0.037	Tier 2, 3	§350.75(c) and (d)
$\theta_{wcap}$	Volumetric water content of capillary fringe soils (cm <sup>3</sup> -water/cm <sup>3</sup> -soil)	0.333	Tier 2, 3	§350.75(c) and (d)
$D^{air}$	Diffusion coefficient in air (cm <sup>2</sup> /s)	(Figure: 30 TAC §350.73(f))	No	NA
$D^{wat}$	Diffusion coefficient in water (cm <sup>2</sup> /s)	(Figure: 30 TAC §350.73(f))	No	NA
DF	Surface Water Dilution Factor	NA	Tier 2, 3	§350.75(i)(4)

<b>Soil PCL Equation: <sup>Tot</sup>Soil<sub>Comb</sub></b>	
Exposure Pathway Description: Combined equation for ingestion of surface soil + dermal contact with surface soil + inhalation of surface soil volatiles and particulates + consumption of garden vegetables grown in contaminated surface soil Source Medium: Surface soils Exposure Medium: Surface soil and air (and vegetables for residential land use only).	
Residential	
${}^{Tot}Soil_{Comb} = \frac{1}{\left[ \frac{1}{Air\ Soil_{Inh-VP}} \right] + \left[ \frac{1}{Soil\ Soil_{Derm}} \right] + \left[ \frac{1}{Soil\ Soil_{Ing}} \right] + \left[ \left( \frac{1}{Veg\ Soil_{Ing-Inorg}} \right) \text{ or } \left( \frac{1}{Veg\ Soil_{Ing-Org}} \right) \right]}$	
Commercial/Industrial Worker	
${}^{Tot}Soil_{Comb} = \frac{1}{\left( \frac{1}{Air\ Soil_{Inh-VP}} \right) + \left( \frac{1}{Soil\ Soil_{Derm}} \right) + \left( \frac{1}{Soil\ Soil_{Ing}} \right)}$	

<b>Soil PCL Equation: <sup>Air</sup>Soil<sub>Inh-VP</sub></b>	
Exposure Pathway Description: Inhalation of surface soil volatiles and particulates Source Medium: Surface soils Exposure Medium: Air	
${}^{Air}Soil_{Inh-VP} = \frac{{}^{Air}RBEL_{Inh}}{VF_{ss} + PEF} \quad \text{(See Eq. RBEL-1, Figure: 30 TAC §350.74(a))}$	
<b>Soil PCL Equation: <sup>Soil</sup>Soil<sub>Derm</sub></b>	
Exposure Pathway Description: Dermal contact with surface soil Source Medium: Surface soil Exposure Medium: Surface soil	
${}^{Soil}Soil_{Derm} = {}^{Soil}RBEL_{Derm} \quad \text{(See Eq. RBEL-2, Figure: 30 TAC §350.74(a))}$	
Exposure Pathway Description: Ingestion of surface soil Source Medium: Surface soil Exposure Medium: Surface soil	
${}^{Soil}Soil_{Ing} = {}^{Soil}RBEL_{Ing} \quad \text{(See Eq. RBEL - 3, Figure: 30 TAC §350.74(a))}$	

**Soil PCL Equation: <sup>Veg</sup>Soil<sub>Ing-Inorg</sub>, & <sup>Veg</sup>Soil<sub>Ing-Org</sub>**  
 (for residential land use only).

Exposure Pathway Description: Consumption of garden vegetables grown in contaminated surface soil  
 Source Medium: Surface soil  
 Exposure Medium: Vegetables

$${}^{Veg}Soil_{Ing-Inorg} = \frac{1}{\frac{Br_{abg}}{AbgVeg RBEL_{Ing}} + \frac{Br_{bg}}{bgVeg RBEL_{Ing}}} \quad (\text{See Eq. RBEL - 7, Figure: 30 TAC §350.74(a)})$$

$${}^{Veg}Soil_{Ing-Org} = \frac{({}^{BgVeg}RBEL_{Ing})(K_{S_{Veg}})}{(RCF)(VG_{bg})} \quad (\text{See Eq. RBEL - 7, Figure: 30 TAC §350.74(a)})$$

**Soil PCL Equation: <sup>Air</sup>Soil<sub>Inh-V</sub>**

Exposure Pathway Description: Inhalation of subsurface soil volatiles  
 Source Medium: Subsurface soils  
 Exposure Medium: Air

$${}^{Air}Soil_{Inh-V} = \frac{{}^{Air}RBEL_{Inh}}{VF_{ss}} \quad (\text{See Eq. RBEL - 1, Figure: 30 TAC §350.74(a)})$$

**Volatilization Factor: VF<sub>ss</sub>**

Where VF<sub>ss</sub> is the smaller of the two following VF<sub>ss</sub> values

$$VF_{ss} \left[ \frac{mg / m^3 - air}{mg / kg - Soil} \right] = \frac{2\rho_b D_A}{(Q/C)[3.14D_A \tau]^{\frac{1}{2}}} \cdot \left( \frac{10^4 cm^2}{m^2} \right)$$

$$D_A = \left[ \frac{\theta_{as}^{3.33} D^{air} H' + \theta_{ws}^{3.33} D^{wat}}{[\theta_{ws} + K_d P_b + \theta_{as} H'] \theta_T^2} \right]$$

or

$$VF_{ss} \left[ \frac{mg / m^3 - air}{mg / kg - soil} \right] = \frac{\rho_b d_s}{(Q/C)\tau} \cdot \left( \frac{10^4 cm^2}{m^2} \right)$$

**Particulate Emission Factor: PEF**

$$PEF \left[ \frac{mg / m^3 - air}{mg / kg - soil} \right] = \frac{(0.036)(1-V) \left( \frac{U_m}{U_1} \right)^3 F(x)}{(Q/C)(3600s/hr)}$$

**Soil-to-Groundwater PCL Equation: <sup>GW</sup>Soil**

Exposure Pathway Description: Soil leachate to groundwater  
 Source Medium: Surface and subsurface soils  
 Exposure Medium: Groundwater

$$^{GW} Soil = \frac{(GroundwaterPCL^*) \cdot LDF}{K_{sw}}$$

$$K_{sw} \left[ \frac{(mg / L - H_2O)}{(mg / kg - soil)} \right] = \frac{\rho_b}{\theta_{ws} + K_d \rho_b + H' \theta_{as}}$$

\*Critical groundwater PCL as determined in accordance with §350.78 of this title (relating to Determination of Critical PCLs) or attenuation action level as determined in accordance with §350.33(f)(4)(D) of this title (relating to Remedy Standard B).

**Theoretical Residual Soil Saturation Limit PCL (Soil<sub>Res</sub>)**

$$Soil_{Res} (mg/kg) = \left( \frac{Res.sat \times \theta_{\tau} \times p}{\rho_b} \right) \times 1,000,000 \text{ mg/kg}$$

<i>Term</i>	<i>COC Chemical/Physical and Affected Property Parameters Definition</i>	<i>Tier 1 Defaults</i>	<i>Change to Tier 1 Default Allowed?</i>	<i>Rule Citation Regarding Change</i>
Br <sub>Abg</sub>	Soil-to-above ground plant biotransfer factor (g soil/g dry weight plant tissue)	(Figure: 30 TAC §350.73(f))	Tier 2, 3	§350.73(f)(2)
Br <sub>Bg</sub>	Soil-to-below ground plant biotransfer factor (g soil/g dry weight plant tissue)	(Figure: 30 TAC §350.73(f))	Tier 2, 3	§350.73(f)(2)
RCF	Ratio of concentration in roots to concentration in soil pore water (mg/kg) (µg/ml)	$(10^{((0.77 \times \log K_{ow}) - 1.52)} + \frac{0.82}{0.222})$	Special Consideration	§350.73(f)
log K <sub>ow</sub>	Octanol-water partition coefficient	(Figure: 30 TAC §350.73(f))	Special Consideration	§350.73(f)
Ks <sub>Veg</sub>	Soil-water partition coefficient (mL/g) = K <sub>oc</sub> x f <sub>oc</sub>	chemical specific	Tier 2, 3	§350.73(f) and §350.75(c) and (d)
VG <sub>Bg</sub>	Below ground vegetable correction factor (unitless)	0.01	No	NA
D <sub>A</sub>	Apparent diffusivity (cm <sup>2</sup> /sec)	chemical specific	Tier 2, 3	§350.73(f) and §350.75(c) and (d)
ρ <sub>b</sub>	Soil bulk density (g/cm <sup>3</sup> )	1.67	Tier 2, 3	§350.75(c) and (d)
Q/C	Inverse of mean concentration in air at center of affected soil area ([g/m <sup>2</sup> -s]/[kg/m <sup>3</sup> ])  Default location assumed: • 0.5 acre source • 30 acre source  Tier 2, 3 may estimate Q/C from the following equation for Houston: Q/C = -9.3087 ln (x) + 69.989, (where x = source area acreage), or other equation representative of Q/C for other city more representative of the affected property conditions and acceptable to the executive director (see USEPA Soil Screening Level Guidance: Technical Background Document, May 1996, EPA/540/R-95/128)	Houston 79.25 40.76	Tier 2, 3 Tier 2, 3 Tier 2, 3	§350.75(c) and (d)
τ	Exposure interval (s)	9.5 x 10 <sup>8</sup>	Tier 2, 3	§350.74(j)(2)
θ <sub>ws</sub>	Volumetric water content of vadose zone soils (cm <sup>3</sup> -water/cm <sup>3</sup> -soil)	0.16	Tier 2, 3	§350.75(c) and (d)

<i>Term</i>	<i>COC Chemical/Physical and Affected Property Parameters Definition</i>	<i>Tier 1 Defaults</i>	<i>Change to Tier 1 Default Allowed?</i>	<i>Rule Citation Regarding Change</i>
$\theta_{as}$	Volumetric air content of vadose zone soils ( $\text{cm}^3\text{-air}/\text{cm}^3\text{-soil}$ ) = $\theta_T - \theta_{ws}$	0.21	Tier 2, 3	§350.75(c) and (d)
$D^{air}$	Diffusion coefficient in air ( $\text{cm}^2/\text{s}$ )	(Figure: 30 TAC §350.73(f))	No	NA
$D^{wat}$	Diffusion coefficient in water ( $\text{cm}^2/\text{s}$ )	(Figure: 30 TAC §350.73(f))	No	NA
$H'$	Dimensionless Henry's Law Constant	(Figure: 30 TAC §350.73(f))	No	NA
$H$	Henry's Law Constant ( $\text{atm}\cdot\text{m}^3/\text{mole}$ ) ( $H = H'RT$ )	(Figure: 30 TAC §350.73(f))	No	NA
$K_d$	Soil-water partition coefficient ( $\text{cm}^3\text{-water}/\text{g}\text{-soil}$ ) <ul style="list-style-type: none"> <li>• for organics</li> <li>• for inorganic</li> </ul>	(Figure: 30 TAC §350.73(f)) $k_d = K_{oc} \cdot f_{oc}$ $k_d = \text{pH dependent value}$	Tier 2, 3	§350.73(f) and (Figures: 30 TAC §350.73(f)(1)(A), (B), (C))
$K_{oc}$	Soil organic carbon-water partition coefficient ( $\text{cm}^3\text{-water}/\text{g}\text{-carbon}$ )	(Figure: 30 TAC §350.73(f))	Tier 2, 3	§350.73(f) and (Figure: 30 TAC §350.73(f)(1)(B))
$f_{oc}$	Fraction of organic carbon in soil ( $\text{g}\text{-carbon}/\text{g}\text{-soil}$ ) <ul style="list-style-type: none"> <li>• <math>VF_{ss}</math></li> <li>• <math>KS_{veg}</math></li> <li>• <math>KS_w</math></li> </ul>	0.008 0.008 0.002	Tier 2, 3 Tier 2, 3	§350.75(c) and (d) §350.75(c) and (d)
$\theta_T$	Total soil porosity = $1 - (\rho_b/\rho_s)$ ( $\text{cm}^3\text{-pore space}/\text{cm}^3\text{-soil}$ )	0.37	Tier 2, 3	§350.75(c) and (d)
$\rho_s$	Particle density ( $\text{g}/\text{cm}^3$ )	2.65	Tier 2, 3	§350.75(c) and (d)
$d_s$	Thickness of affected surficial soil (cm)	305	Tier 2, 3	§350.75(c) and (d)
$V$	Fraction vegetative cover (unitless)	0.5	Tier 2, 3	§350.75(c) and (d)
$U_m$	Mean annual windspeed at 7 m height (m/s)	4.8	Tier 2, 3	§350.75(c) and (d)
$U_t$	Equivalent threshold value of windspeed at 7 m height (m/s)	11.32	Tier 2, 3	§350.75(c) and (d)

**Figure: 30 TAC §350.75(b)(1) - Tier 1 PCL Equations**

<i>Term</i>	<i>COC Chemical/Physical and Affected Property Parameters Definition</i>	<i>Tier 1 Defaults</i>	<i>Change to Tier 1 Default Allowed?</i>	<i>Rule Citation Regarding Change</i>
F(x)	Function dependent on (U <sub>i</sub> /U <sub>m</sub> ) derived using Cowherd et. al. (1985) (unitless)	0.224	Tier 2, 3	§350.75(c) and (d)
R	Universal Gas Constant (atm m <sup>3</sup> mol <sup>-1</sup> °K <sup>-1</sup> )	8.206 x 10 <sup>-5</sup>	No	NA
T	Temperature (°K) = 273 + °C	293	No	NA
K <sub>sw</sub>	Soil-leachate partition factor for COC (mg/L-water/mg/kg-soil)	property-specific	Tier 2, 3	§350.73(f)and §350.75(c) and (d)
LDF	Leachate Dilution Factor 0.5 acre source area 30 acre source area	20 10	Tier 2, 3 Tier 2, 3	§350.75(c) and (d) §350.75(c) and (d)
Res.sat	The residual saturation limit where the NAPL becomes mobile (cm <sup>3</sup> /cm <sup>3</sup> )  Res.sat = $\frac{10,000 \text{ mg/kg} \times \rho_s}{1,000,000 \text{ mg/kg} \times p \times \theta_T^{10T}}$	0.04514	Tier 2, 3	§350.75(c) and (d)
p	The density of the NAPL (g/cm <sup>3</sup> )	1	Tier 2, 3	§350.75(c) and (d)

**Air Source Medium Exposure Pathway PCL Equation**

PCL Eq.:  $^{Air}Air_{Inh}$

Exposure Pathway Description: Inhalation of air

Source Medium: Air

Exposure Medium: Air

$$^{Air}Air_{Inh} = ^{Air}RBEL_{Inh}$$

(See Eq. RBEL-1, Figure: 30 TAC §350.74(a))

**Surface Water Exposure Pathway PCL Equation**

PCL Eq.:  $^{SW}SW$

Exposure Pathway Description: Aquatic life and human health protection ( $^{SW}RBEL$ ) and ecological protection ( $^{SW}SW_{Eco}$ )

Source Medium: Surface water

Exposure Medium: Surface water

$$^{SW}SW = \text{the lesser of } ^{SW}RBEL \text{ and } ^{SW}SW_{Eco}$$

(see RBEL-6, Figure 30 TAC §350.74(a), §350.74(h), and §350.77(a))

(2) No lateral transport equations may be used for a Tier 1 evaluation other than to ensure that receptors at off-site POEs are protected when on-site commercial/industrial land use is assumed. The person shall assume a 0.5 acre source area for an affected property with a 0.5 acre or less source area and a 30 acre source area for an affected property with a source area in excess of 0.5 acres. The size of the source area in soil and groundwater shall be determined using the soil or groundwater assessment level calculated for a 0.5 acre source area. The executive director may require that the source area include all areas of the affected property which exceed the assessment level and not just contiguous areas when such assumption is appropriate considering the distribution of the COCs.

(3) The person shall establish PCLs using parameters which are specific to the affected property when use of the Tier 1 default affected property parameters would not be protective or when requested by the executive director. The person shall then establish PCLs in accordance with subsections (c) or (d) of this section.

(4) The person shall establish PCLs in accordance with subsections (c) or (d) of this section for any groundwater, soil, surface water, air, or sediment human health exposure pathway which is complete or reasonably anticipated to be completed at an affected property and for which an equation is not referenced in this subsection.

(c) Tier 2 PCLs.

(1) Tier 2 is a risk-based analysis to derive site-specific PCLs for complete or reasonably anticipated to be completed exposure pathways utilizing site-specific exposure factors, as allowable, and/or affected property parameters and Tier 1 equations. Tier 2 PCLs may also include lateral transport considerations.

(2) The person shall use:

(A) the relevant RBELs appropriate for the type of COC, exposure pathway, receptor, and land use provided in §350.74 of this title (relating to Development of Risk-Based Exposure Limits);

(B) PCL equations provided by the executive director in guidance, in addition to the PCL equations as shown in the figure in subsection (b)(1) of this section;

(C) the Tier 1 default affected property parameters or appropriately collected and representative site-specific affected property parameters in the PCL equations, unless an entry of "No" in the column titled "Change To Tier 1 Default Allowed?" in the figure as shown in subsection (b)(1) of this section indicates that a particular Tier 1 affected property parameter value shall not be modified under a Tier 2 evaluation; and

(D) PCLs established in accordance with subsection (d) of this section for any groundwater, soil, surface water, air, or sediment exposure pathway which is complete or reasonably anticipated to be completed at an affected property and for which an equation is not referenced either in this subsection or in subsection (b)(1) of this section.

(d) Tier 3 PCLs.

(1) Tier 3 is a risk-based analysis to derive site-specific PCLs for complete or reasonably anticipated to be completed exposure pathways. Tier 3 PCLs are based on measured natural attenuation factors and/or natural attenuation factor models/equations other than those provided for Tier 1 or 2; and may also include site-specific exposure factors, as allowable, and/or affected property parameters.

(2) The person shall use:

(A) field measured natural attenuation factors and/or appropriate natural attenuation factor equations/models other than the Tier 1 and 2 PCL equations;

(B) appropriate equations/models for any remaining surface water, air, or sediment human exposure pathway which is complete or reasonably anticipated to be completed at an affected property and for which an equation is not referenced in subsection (b) or (c) of this section; and

(C) the Tier 1 default affected property parameters or appropriately collected and representative site-specific affected property parameters in the PCL equations, unless an entry of "No" in the column titled "Change To Tier 1 Default Allowed?" in the figure as shown in subsection (b)(1) of this section indicates that a particular Tier 1 affected property parameter value shall not be modified under a Tier 3 evaluation.

(e) Natural attenuation factor documentation. The person must document the use of all natural attenuation factor equations/models other than the natural attenuation factor equations/models provided in this subchapter or agency guidance, such that the derivation of the model and its site-specific application can be understood, and the results of the model reproduced by the executive director. The executive director may require the person to obtain prior approval for the use of alternative natural attenuation factor equations/models in a Tier 3 evaluation.

(f) Decay factors. When the person uses decay factors in any cross-media or lateral transport natural attenuation factor equation in either Tier 2 or 3, the person shall use sufficient monitoring data

(i.e., vapor, soils and groundwater samples for COCs or other degradation indicators) to verify the COC is degrading.

(g) Verification. When natural attenuation factor modeling outputs are inconsistent with monitoring data for environmental media at an affected property, the person and the executive director shall generally place more weight on the monitoring data. The executive director may require the person to provide sufficient monitoring data to verify that PCLs established under any tier are based on an appropriate understanding of conditions at the affected property.

(h) Data adequacy. The person shall collect any additional data necessary to support the development of PCLs under any of the tiers.

(i) Pathway specific PCL Considerations.

(1) PCLs for ingestion of COCs in class 1 or 2 groundwater ( $^{GW}GW_{Ing}$ ). The person shall establish this PCL using the applicable equation shown in the figure in subsection (b)(1) of this section.

(2) PCLs for COCs in class 3 groundwater ( $^{GW}GW_{Class\ 3}$ ). The person shall establish this PCL using the applicable equation in the figure in subsection (b)(1) of this section.

(3) PCLs for inhalation of volatile emissions in outdoor air from COCs in groundwater-bearing units ( $^{Air}GW_{Inh-V}$ ). The person shall establish this PCL using the applicable equations as shown in the figure in subsection (b)(1) of this section for Tier 1.

(4) PCLs for COCs in groundwater discharge to surface water ( $^{SW}GW$ ). The person shall set  $^{SW}GW$  equal to  $^{SW}SW$  divided by the surface water dilution factor. The  $^{SW}SW$  is the lesser of the  $^{SW}RBEL$  established in accordance with §350.74(h) of this title and the  $SW_{Eco}$  established in accordance with §350.77 of this title (relating to Ecological Risk Assessment and Development of Ecological Protective Concentration Levels). The surface water dilution factor shall be determined in accordance with subparagraph (A) or (B) of this paragraph. The person shall use the PCL equation as shown in the figure in subsection (b)(1) of this section to establish  $^{SW}GW$ . In the case that different surface water dilution factors may be applicable to the  $^{SW}RBEL$  and the  $SW_{Eco}$ , the person shall first divide the  $^{SW}RBEL$  and the  $SW_{Eco}$  by their respective surface water dilution factors and set  $^{SW}GW$  equal to the lowest resulting quotient.

(A) The person shall assume a surface water dilution factor of one when the concentration of all COCs in groundwater at the zone of discharge to surface water is less than or equal to the  $^{SW}SW$  for those COCs at the time the affected property assessment required in §350.51 of this title (relating to Affected Property Assessment) is conducted. The person shall also assume a surface water dilution factor of one for those specific COCs which are listed as impairing the nearest classified segment at or downstream of the affected property. Impaired water bodies are provided in the current Clean Water Act, §303(d) list, as amended.

(B) When the concentration of a COC in groundwater at the zone of discharge to surface water exceeds the <sup>SW</sup>SW for that COC at the time the affected property assessment required in §350.51 of this title is conducted, the person may establish a surface water dilution factor in accordance with subparagraph (C), (D), or (E) of this paragraph.

(C) The person may use a surface water dilution factor of 0.15 for non-flowing surface waters such as lakes, estuaries, tidal rivers; and fresh water streams and rivers (where the groundwater discharge is clearly less than 15% of the 7Q2 stream flow as defined in §307.3(a)(34) of this title (relating to Definitions and Abbreviations)), as amended. The person shall use the 7Q2 flows as listed in §307.10(2) of this title (relating to Appendices A - E), as amended, for groundwater discharges directly to a classified segment as listed in §307.10(3) of this title, as amended. For groundwater discharges which are not directly to a classified segment, site-specific 7Q2 values must be determined for the water body directly receiving the groundwater discharge.

(D) For freshwater streams and rivers where the groundwater discharge is clearly greater than 15% of the 7Q2 flow, the person shall estimate property-specific surface water dilution factors based on 7Q2 flows for chronic aquatic-life criteria, 25% of 7Q2 flows for acute aquatic-life criteria, and harmonic mean flows as defined in §307.3(a)(19) of this title, as amended, for human health criteria in accordance with the procedures contained in the *Implementation Procedures*, as amended. The person shall divide the <sup>SW</sup>SW by the estimated property-specific dilution factor. The person shall use the 7Q2 flows listed in §307.10(2) of this title, as amended, for groundwater

discharges directly to a classified segment as listed in §307.10(3) of this title, as amended. For groundwater discharges which are not directly to a classified segment, site-specific 7Q2 values must be determined for the water body directly receiving the groundwater discharge.

(E) As an alternative to using the dilution factor of 0.15 as specified in subparagraph (C) of this paragraph, the person may measure and/or estimate the groundwater dilution in surface water from appropriate models of groundwater plume dispersion, tracer studies, receiving water and sediment sample analyses, analytical calculations, or other techniques upon the executive director's approval using site-specific base flow conditions for groundwater, 7Q2 conditions for receiving streams, and critical mixing conditions for lakes, estuaries, and tidal streams. The executive director may require a receiving water study to ensure that benthic communities in the sediment are not adversely impacted. In cases where groundwater COCs include bioaccumulative COCs, the executive director may require a receiving water study or empirical analysis to ensure that the release of that particular COC is not causing, or will not result in harmful levels in the tissue of aquatic and terrestrial organisms that feed in the water body.

(F) The person may be required by the executive director to take appropriate action to ensure that discharging groundwater plumes do not result in exceedances of surface water quality standards in significant areas of the potentially affected surface water body.

(5) PCLs for other complete or reasonably anticipated to be completed groundwater exposure pathways. The person shall establish PCLs for exposure pathways other than those listed in

paragraphs (1) - (4) of this subsection when, in the executive director's determination, those other exposure pathways are complete or reasonably anticipated to be completed.

(6) PCLs for the combined exposure pathways of inhalation of volatile emissions and particulates from COCs in surface soil, dermal contact with COCs in surface soil, ingestion of COCs in surface soil, and for affected residential properties, ingestion of aboveground and below-ground vegetables grown in surface soil containing COCs ( $^{Tot}Soil_{comb}$ ). The person shall establish this PCL using the applicable equation as shown in the figure in subsection (b)(1) of this section for Tier 1.

(7) PCLs for groundwater protection from leachate containing COCs from surface and subsurface soil ( $^{GW}Soil$ ).

(A) The person shall establish  $^{GW}Soil$  for each COC present in the surface and subsurface soil such that soil leachate is protective for:

(i) the critical groundwater PCL established in §350.78 of this title (relating to Determination of Critical Protective Concentration Levels) when the use of a plume management zone is not authorized in §350.33(f)(4) of this title (relating to Remedy Standard B);

(ii) the attenuation action level for the nearest monitoring point when the use of a plume management zone is authorized under §350.33(f)(4) of this title; and/or

(iii) the maximum concentration of COCs in the groundwater source area at the time of RAP submittal when a plume management zone is authorized for class 2 groundwater in response to §350.33(f)(4) of this title.

(B) The person shall establish this PCL using the applicable equations as shown in the figure in subsection (b)(1) of this section for Tier 1.

(C) The person may not be required to establish a soil leachate-to-groundwater PCL in accordance with subparagraphs (A) and (B) of this paragraph when a demonstration can be made with appropriate soil and groundwater monitoring data that the soils will attain the soil response objectives for groundwater protection set forth in Subchapter B of this chapter (relating to Remedy Standards). The determination that the soils are adequately protective shall be based on soil sample data, the concentration trends of groundwater monitoring data over time when groundwater is impacted, probable time since release occurred, adequate identification of the soil source areas, appropriate leachate test results, or other hydrogeologic or property-specific information. The executive director may also require that the change in soil concentrations over time be documented to support this evaluation in a property-specific situation. The executive director may require the person to install a sufficient number of groundwater monitoring wells to demonstrate that groundwater is not affected when soil COC concentration data are inadequate to sufficiently substantiate that groundwater is not affected.

(8) PCLs for inhalation of volatile emissions in outdoor air from COCs in subsurface soils ( $^{Air}Soil_{Inh-V}$ ). The person shall establish this PCL using the applicable equations as shown in the figure in subsection (b)(1) of this section for Tier 1.

(9) Theoretical soil saturation limit ( $C_{sat}$ ). The person may establish a property-specific theoretical soil saturation limit for the volatilization exposure pathways required in paragraphs (6) and (8) of this subsection under Tiers 2 or 3. The  $C_{sat}$  shall be based on the same property-specific parameters as those used to calculate  $^{Air}Soil_{Inh-V}$ . If the property-specific  $^{Air}Soil_{Inh-VP}$  or  $^{Air}Soil_{Inh-V}$  is greater than the property-specific  $C_{sat}$ , then that exposure pathway shall not be considered a relevant exposure pathway for that COC.

(10) Residual soil saturation limit ( $Soil_{Res}$ ). The person shall establish the residual saturation level for each organic COC present in surface and subsurface soils which is a liquid at standard temperature and pressure using the applicable equation as shown in the figure in subsection (b)(1) of this section to estimate the mobile NAPL concentration and to determine if NAPL may be present.

(11) PCLs for other complete or reasonably anticipated to be completed surface and subsurface soil exposure pathways. The person shall establish PCLs for surface and subsurface soil exposure pathways other than those listed in paragraphs (6) - (8) of this subsection when, in the executive director's determination, those other exposure pathways are complete or reasonably anticipated to be completed.

(12) Air inhalation exposure pathways ( $^{Air}Air_{inh}$ ). For air inhalation exposure pathways, the person may be required by the executive director to establish  $^{Air}Air_{inh}$  solely for the purposes of determining the protective concentration that must be met in air at the POE. The person shall use the applicable equation as shown in the figure in subsection (b)(1) of this section to establish  $^{Air}Air_{inh}$ .

(13) Surface water exposure pathways ( $^{SW}SW$ ). The person may be required by the executive director to establish  $^{SW}SW$  when COCs are present in surface water or when COCs will enter into surface water due to a release, and a surface water response action is necessary to protect human or ecological receptors. The person shall use the applicable equation as shown in the figure in subsection (b)(1) of this section to establish  $^{SW}SW$ .

(14) Other air and surface water exposure pathways. The person shall establish PCLs for air and surface water exposure pathways other than those listed in paragraphs (12) and (13) of this subsection when, in the executive director's determination, those other exposure pathways are complete or reasonably anticipated to be completed.

(15) The person shall establish PCLs for complete or reasonably anticipated to be completed sediment exposure pathways when, in the executive director's determination, those exposure pathways are complete or reasonably anticipated to be completed.

(j) The person is not required to combine exposure pathways for a single environmental medium when determining PCLs with the exception of the combined exposure pathway required in subsection (i)(6) of this section, unless otherwise directed by the executive director.

**§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) ${}^{\text{Soil}}\text{RBEL}_{\text{Derm-nc}} = \frac{\text{HQ} \times \text{RfD}_d \times \text{AT} \cdot \text{AgeAdj.res} \times 365 \text{ days/yr}}{10^{-6} \text{ kg/mg} \times \text{EF.res} \times \text{DF.adj} \times \text{ABS.d}}$		Ingestion of Non-Carcinogenic COCs in Above-Ground Vegetables - RBEL (mg/kg) ${}^{\text{Abg}}\text{RBEL}_{\text{Ing-nc}} = \frac{\text{HQ} \times \text{RfD}_o \times \text{AT} \cdot \text{AgeAdj.res} \times 365 \text{ day/yr}}{\text{EF.res} \times \text{IRabg} \cdot \text{AgeAdj.res}}$	
Ingestion of Non-Carcinogenic COCs in Soil - RBEL (mg/kg) ${}^{\text{Soil}}\text{RBEL}_{\text{Ing-nc}}(\text{mg/kg}) = \frac{\text{HQ} \times \text{RfD}_o \times \text{AT} \cdot \text{AgeAdj.res} \times 365 \text{ days/yr}}{10^{-6} \text{ kg/mg} \times \text{EF.res} \times \text{IRsoil} \cdot \text{AgeAdj.res} \times \text{RBAF}}$		Ingestion of Non-Carcinogenic COCs in Below-Ground Vegetables - RBEL (mg/kg) ${}^{\text{Bg}}\text{RBEL}_{\text{Ing-nc}} = \frac{\text{HQ} \times \text{RfD}_o \times \text{AT} \cdot \text{AgeAdj.res} \times 365 \text{ day/yr}}{\text{EF.res} \times \text{IRbg} \cdot \text{AgeAdj.res}}$	
HQ	Hazard Quotient (unitless)	1	
AT.AgeAdj.res	Averaging Time - (yr)-Age-adjusted	30	
RfD <sub>o</sub>	Oral Reference Dose (mg/kg-day)	Chemical Specific	
RfD <sub>d</sub>	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	
	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)		
$^{Soil}Soil_{Ing} = ^{Soil}RBEL_{Ing}$		
$^{Soil}RBEL_{Ing} (\mu g / g) = \frac{(PbB_{95\text{ fetal}} / (R \times (GSD_i)^{1.645})) - PbB0}{BKSF \times (IR_{sd} \times AF_{sd} \times EF_{sd} / 365)}$		
Parameter	Definition (units)	Default
PbB <sub>95 fetal</sub>	95th Percentile PbB in Fetus ( $\mu\text{g/dL}$ )	10
R	Mean Ratio of Fetal to Maternal PbB	0.9
GSD <sub>i</sub>	Individual Geometric Standard Deviation	1.91
PbB0	Baseline Blood Lead Value ( $\mu\text{g/dL}$ )	1.64
BKSF	Biokinetic Slope Factor ( $\mu\text{g/dL per } \mu\text{g/day}$ )	0.4
IR <sub>sd</sub>	Soil/Dust Ingestion Rate (g/day)	0.05
EF <sub>sd</sub>	Soil/Dust Exposure Frequency (days/yr)	250
AF <sub>sd</sub>	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

<sup>Soil</sup>RBEL<sub>Ing</sub> 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 <sup>Soil</sup>RBEL<sub>Ing</sub> 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)		
$^{Soil}Soil_{Ing} = ^{Soil}RBEL_{Ing}$		
$^{Soil}RBEL_{Ing} (\mu g / g) = \frac{(PbB_{95\ fetal} / (R \times (GSD_i)^{1.645})) - PbB0}{BKSF \times ((IR_{sf} \times AF_s \times EF_{s/365}) + (K_{sd} \times IR_d \times AF_d \times EF_d / 365))}$		
Parameter	Definition (units)	Defaults
PbB <sub>95 fetal</sub>	95th Percentile PbB in Fetus (μg/dL)	10
R	Mean Ratio of Fetal to Maternal PbB	0.9
GSD <sub>i</sub>	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 <sub>s</sub>	Soil Ingestion Rate (g/day)	0.025
IR <sub>d</sub>	Dust Ingestion Rate (g/day)	0.025
K <sub>sd</sub>	Ratio of Concentration in Dust to that in Soil	***

EF <sub>s</sub>	Soil Exposure Frequency (days/yr)	250
EF <sub>d</sub>	Dust Exposure Frequency (days/yr)	250
AF <sub>s</sub>	Absolute Absorption Fraction of Lead in Soil	0.10
AF <sub>d</sub>	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<sub>i</sub>);

(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-day)<sup>-1</sup>) 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 ( $0.4 \text{ (mg/kg-day)}^{-1}$ ) 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 ( $2 \text{ (mg/kg-day)}^{-1}$ ) 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 ( $0.07 \text{ (mg/kg-day)}^{-1}$ ) 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 ( $2 \text{ (mg/kg-day)}^{-1}$ ) 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 ( $2 \text{ (mg/kg-day)}^{-1}$ ) 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 apply the toxicity equivalency factors 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 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)**

<b>Toxicity Equivalency Factors (TEFs) for Dioxin-Like Compounds</b>	
<b>Congener/Class</b>	<b>TEF Value</b>
<b>2,3,7,8-Substituted Dibenzodioxins</b>	
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
<b>2,3,7,8-Substituted Dibenzofurans</b>	
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

<b>Toxicity Equivalency Factors (TEFs) for Dioxin-Like Compounds</b>	
<b>Congener/Class</b>	<b>TEF Value</b>
2,3,7,8-Heptachlorodibenzofurans	0.01
Octachlorodibenzofurans	0.0001
<b>Dioxin-Like PCBs</b>	
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) 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  $\mu\text{g}/\text{m}^3$ ) = oral slope factor x 20  $\text{m}^3/\text{day}$  divided by 70 kg x  $10^{-3}$   $\text{mg}/\mu\text{g}$ .

(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 apply the toxicity equivalency factor as shown in the figure in subsection (d)(2)(B) of this section to the measured concentrations 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 the toxicity equivalency factor specified for the 2, 3, 7, 8-substituted congeners in the homologue class shall be applied to the measured concentrations for that homologue 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 apply the toxicity equivalency factor 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.

(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 critical soil PCL for residential properties 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)**

<b>Relative Potency Factors (RPF) for Carcinogenic PAHs</b>	
<b>Compound</b>	<b>RPF</b>
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

Relative Potency Factors (RPF) for Carcinogenic PAHs	
Compound	RPF
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-day) <sup>-1</sup> $SF_{B[a]P}$ = cancer slope factor for benzo{a}pyrene (mg/kg-day) <sup>-1</sup> $RPF_{PAH}$ = 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 (μg/m <sup>3</sup> ) <sup>-1</sup> $URF_{B[a]P}$ = inhalation unit risk factor for benzo{a}pyrene (μg/m <sup>3</sup> ) <sup>-1</sup> $RPF_{PAH}$ = 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 <sup>1</sup> commercial hexane <sup>2</sup>
$>C_6-C_8$	n-hexane	n-hexane <sup>1</sup> commercial hexane <sup>2</sup>
$>C_8-C_{10}$	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	----
$>C_{21-35}$ <sup>3</sup>	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 <sub>10</sub> -C <sub>12</sub>	multiple aromatic compounds	high flash aromatic naphtha
>C <sub>12</sub> -C <sub>16</sub>	multiple aromatic compounds	multiple aromatic compounds
>C <sub>16</sub> -C <sub>21</sub>	pyrene	----
>C <sub>21</sub> -C <sub>35</sub> <sup>3</sup>	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<sub>28</sub> when there does not appear to be significant mass of >C<sub>28</sub> 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.

**§350.77. Ecological Risk Assessment and Development of Ecological Protective Concentration Levels.**

(a) General. The person shall evaluate the affected property by conducting an ecological risk assessment in a manner appropriate and consistent with subsections (b), (c), or (d) of this section. The process is discussed in the agency's ecological risk assessment guidance. The purpose of the ecological risk assessment will be to characterize the ecological setting of the affected property, identify complete or reasonably anticipated to be completed exposure pathways and representative ecological receptors, scientifically eliminate COCs that pose no unacceptable risk, and develop PCLs for selected ecological receptors where warranted. The POEs for the selected ecological receptors shall be established on a property-specific basis. However, if the person can show that no unacceptable ecological risk exists due to incomplete or insignificant exposure pathways as specified in subsection (b) of this section, or if all COCs can be eliminated as specified in subsection (c)(1), (6), (7), or (8) of this section, or if, after incorporation of site-specific information, it can be shown that there is either no ecological risk or that it is not apparent as specified in subsection (d) of this section, then the ecological risk assessment process will terminate at that point. Also, if after the ecological risk assessment process specified in subsection (b) of this section, or if at anytime during the ecological risk assessment process specified in subsections (c) or (d) of this section, the person can demonstrate to the satisfaction of the executive director that the implementation of a response action will eliminate the ecological exposure pathway or render it insignificant, or that human health PCLs will be protective of ecological receptors, then no further ecological risk assessment evaluation will be required. In addition, if after the ecological risk assessment process specified in subsection (b) of this section, the person can demonstrate to the satisfaction of the executive director that an expedited stream evaluation can determine that the completed surface water and sediment pathways are insignificant, then no further ecological risk assessment evaluation will be required. If no further ecological risk assessment evaluation is required,

then the person shall provide, as appropriate, a reasoned justification and/or an expedited stream evaluation for terminating the ecological risk assessment and place this information in the affected property assessment report as described in §350.91 of this title (relating to Affected Property Assessment Report). Furthermore, after ecological PCLs have been established, the person shall have the option, where determined appropriate, of conducting an ecological services analysis as a means of managing ecological risk at the affected property, in accordance with subsection (f) of this section and §350.33(a)(3)(B) of this title (relating to Remedy Standard B). Subsections (b), (c), and (d) of this section describe a three-tiered approach to conducting an ecological risk assessment, and although there is a logical progression from one tier to the next, the person may begin the ecological evaluation of the affected property at any tier.

(b) Tier 1: exclusion criteria checklist. The person shall conduct a Tier 1 assessment at all affected properties to which this rule is applicable as presented in §350.2 of this title (relating to Applicability), unless the person elects to begin the ecological evaluation at Tier 2 or Tier 3. The person shall use the Tier 1 Exclusion Criteria Checklist provided in the following figure. The person will have fulfilled the ecological risk assessment requirements if the affected property meets the exclusion criteria. However, the person shall re-enter the ecological risk assessment process if changing circumstances result in the affected property not meeting the Tier 1 exclusion criteria. The person is required to continue the ecological risk assessment process as described in subsection (c) or (d) of this section if the affected property fails the exclusion criteria, unless the reasoned justification and/or expedited stream evaluation processes described in subsection (a) of this section are used to demonstrate that no unacceptable ecological risk exists.

**Figure: 30 TAC §350.77(b)**

### **TIER 1: EXCLUSION CRITERIA CHECKLIST**

This exclusion criteria checklist is intended to aid the person and the TCEQ in determining whether or not further ecological evaluation is necessary at an affected property where a response action is being pursued under the Texas Risk Reduction Program (TRRP). Exclusion criteria refer to those conditions at an affected property which preclude the need for a formal ecological risk assessment (ERA) because there are **incomplete or insignificant ecological exposure pathways** due to the nature of the affected property setting and/or the condition of the affected property media. This checklist (and/or a Tier 2 or 3 ERA or the equivalent) must be completed by the person for all affected property subject to the TRRP. The person should be familiar with the affected property but need not be a professional scientist in order to respond, although some questions will likely require contacting a wildlife management agency (i.e., Texas Parks and Wildlife Department or U.S. Fish and Wildlife Service). The checklist is designed for general applicability to all affected property; however, there may be unusual circumstances which require professional judgement in order to determine the need for further ecological evaluation (e.g., cave-dwelling receptors). In these cases, the person is strongly encouraged to contact TCEQ before proceeding.

Besides some preliminary information, the checklist consists of three major parts, **each of which must be completed unless otherwise instructed**. PART I requests affected property identification and background information. PART II contains the actual exclusion criteria and supportive information. PART III is a qualitative summary statement and a certification of the information provided by the person. **Answers should reflect existing conditions and should not consider future remedial actions at the affected property**. Completion of the checklist should lead to a logical conclusion as to whether further evaluation is warranted. Definitions of terms used in the checklist have been provided and users are strongly encouraged to familiarize themselves with these definitions before beginning the checklist.

Name of Facility:

Affected Property Location:

Mailing Address:

TCEQ Case Tracking #s:

Solid Waste Registration #s:

Voluntary Cleanup Program #:

EPA I.D. #s:

## Definitions<sup>1</sup>

**Affected property** - The entire area (i.e., on-site and off-site; including all environmental media) which contains releases of chemicals of concern at concentrations equal to or greater than the assessment level applicable for residential land use and groundwater classification.

**Assessment level** - A critical protective concentration level for a chemical of concern used for affected property assessments where the human health protective concentration level is established under a Tier 1 evaluation as described in §350.75(b) of this title (relating to Tiered Human Health Protective Concentration Level Evaluation), except for the protective concentration level for the soil-to-groundwater exposure pathway which may be established under Tier 1, 2, or 3 as described in §350.75(i)(7) of this title, and ecological protective concentration levels which are developed, when necessary, under Tier 2 and/or 3 in accordance with §350.77(c) and/or (d), respectively, of this title (relating to Ecological Risk Assessment and Development of Ecological Protective Concentration Levels).

**Bedrock** - The solid rock (i.e., consolidated, coherent, and relatively hard naturally formed material that cannot normally be excavated by manual methods alone) that underlies gravel, soil or other surficial material.

**Chemical of concern** - Any chemical that has the potential to adversely affect ecological or human receptors due to its concentration, distribution, and mode of toxicity. Depending on the program area, chemicals of concern may include the following: solid waste, industrial solid waste, municipal solid waste, and hazardous waste as defined in Texas Health and Safety Code, §361.003, as amended; hazardous constituents as listed in 40 Code of Federal Regulations Part 261, Appendix VIII, as amended; constituents on the groundwater monitoring list in 40 Code of Federal Regulations Part 264, Appendix IX, as amended; constituents as listed in 40 CFR Part 258 Appendices I and II, as amended; pollutant as defined in Texas Water Code, §26.001, as amended; hazardous substance as defined in Texas Health and Safety Code, §361.003, as amended, and the Texas Water Code §26.263, as amended; regulated substance as defined in Texas Water Code §26.342, as amended and §334.2 of this title (relating to Definitions), as amended; petroleum product as defined in Texas Water Code §26.342, as amended and §334.122(b)(12) of this title (relating to Definitions for ASTs), as amended; other substances as defined in Texas Water Code §26.039(a), as amended; and daughter products of the aforementioned constituents.

**Community** - An assemblage of plant and animal populations occupying the same habitat in which the various species interact via spatial and trophic relationships (e.g., a desert community or a pond community).

**Complete exposure pathway** - An exposure pathway where a human or ecological receptor is exposed to a chemical of concern via an exposure route (e.g., incidental soil ingestion, inhalation of volatiles and particulates, consumption of prey, etc).

<sup>1</sup> These definitions were taken from 30 TAC §350.4 and may have both ecological and human health applications. For the purpose of this checklist, it is understood that only the ecological applications are of concern.

***De minimus*** - The description of an area of affected property comprised of one acre or less where the ecological risk is considered to be insignificant because of the small extent of contamination, the absence of protected species, the availability of similar unimpacted habitat nearby, and the lack of adjacent sensitive environmental areas.

**Ecological protective concentration level** - The concentration of a chemical of concern at the point of exposure within an exposure medium (e.g., soil, sediment, groundwater, or surface water) which is determined in accordance with §350.77(c) or (d) of this title (relating to Ecological Risk Assessment and Development of Ecological Protective Concentration Levels) to be protective for ecological receptors. These concentration levels are primarily intended to be protective for more mobile or wide-ranging ecological receptors and, where appropriate, benthic invertebrate communities within the waters in the state. These concentration levels are not intended to be directly protective of receptors with limited mobility or range (e.g., plants, soil invertebrates, and small rodents), particularly those residing within active areas of a facility, unless these receptors are threatened/endangered species or unless impacts to these receptors result in disruption of the ecosystem or other unacceptable consequences for the more mobile or wide-ranging receptors (e.g., impacts to an off-site grassland habitat eliminate rodents which causes a desirable owl population to leave the area).

**Ecological risk assessment** - The process that evaluates the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more stressors; however, as used in this context, only chemical stressors (i.e., COCs) are evaluated.

**Environmental medium** - A material found in the natural environment such as soil (including non-waste fill materials), groundwater, air, surface water, and sediments, or a mixture of such materials with liquids, sludges, gases, or solids, including hazardous waste which is inseparable by simple mechanical removal processes, and is made up primarily of natural environmental material.

**Exclusion criteria** - Those conditions at an affected property which preclude the need to establish a protective concentration level for an ecological exposure pathway because the exposure pathway between the chemical of concern and the ecological receptors is not complete or is insignificant.

**Exposure medium** - The environmental medium or biologic tissue in which or by which exposure to chemicals of concern by ecological or human receptors occurs.

**Facility** - The installation associated with the affected property where the release of chemicals of concern occurred.

**Functioning cap** - A low permeability layer or other approved cover meeting its design specifications to minimize water infiltration and chemical of concern migration, and prevent ecological or human receptor exposure to chemicals of concern, and whose design requirements are routinely maintained.

**Landscaped area** - An area of ornamental, or introduced, or commercially installed, or manicured vegetation which is routinely maintained.

**Off-site property (off-site)** - All environmental media which is outside of the legal boundaries of the on-site property.

**On-site property (on-site)** - All environmental media within the legal boundaries of a property owned or leased by a person who has filed a self-implementation notice or a response action plan for that property or who has become subject to such action through one of the agency's program areas for that property.

**Physical barrier** - Any structure or system, natural or manmade, that prevents exposure or prevents migration of chemicals of concern to the points of exposure.

**Point of exposure** - The location within an environmental medium where a receptor will be assumed to have a reasonable potential to come into contact with chemicals of concern. The point of exposure may be a discrete point, plane, or an area within or beyond some location.

**Protective concentration level** - The concentration of a chemical of concern which can remain within the source medium and not result in levels which exceed the applicable human health risk-based exposure limit or ecological protective concentration level at the point of exposure for that exposure pathway.

**Release** - Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment, with the exception of:

(A) A release that results in an exposure to a person solely within a workplace, concerning a claim that the person may assert against the person's employer;

(B) An emission from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, or pipeline pumping station engine;

(C) A release of source, by-product, or special nuclear material from a nuclear incident, as those terms are defined by the Atomic Energy Act of 1954, as amended (42 U.S.C. §2011 *et seq.*), if the release is subject to requirements concerning financial protection established by the Nuclear Regulatory Commission under §170 of that Act;

(D) For the purposes of the environmental response law §104, as amended, or other response action, a release of source, by-product, or special nuclear material from a processing site designated under §102(a)(1) or §302(a) of the Uranium Mill Tailings Radiation Control Act of 1978 (42 U.S.C. §7912 and §7942), as amended; and

(E) The normal application of fertilizer.

**Sediment** - Non-suspended particulate material lying below surface waters such as bays, the ocean, rivers, streams, lakes, ponds, or other similar surface water body (including intermittent streams). Dredged sediments which have been removed from below surface water bodies and placed on land shall be considered soils.

**Sensitive environmental areas** - Areas that provide unique and often protected habitat for wildlife species. These areas are typically used during critical life stages such as breeding, hatching, rearing of young, and overwintering. Examples include critical habitat for threatened and endangered species, wilderness areas, parks, and wildlife refuges.

**Source medium** - An environmental medium containing chemicals of concern which must be removed, decontaminated and/or controlled in order to protect human health and the environment. The source medium may be the exposure medium for some exposure pathways.

**Stressor** - Any physical, chemical, or biological entity that can induce an adverse response; however, as used in this context, only chemical entities apply.

**Subsurface soil** - For human health exposure pathways, the portion of the soil zone between the base of surface soil and the top of the groundwater-bearing unit(s). For ecological exposure pathways, the portion of the soil zone between 0.5 feet and 5 feet in depth.

**Surface cover** - A layer of artificially placed utility material (e.g., shell, gravel).

**Surface soil** - For human health exposure pathways, the soil zone extending from ground surface to 15 feet in depth for residential land use and from ground surface to 5 feet in depth for commercial/industrial land use; or to the top of the uppermost groundwater-bearing unit or bedrock, whichever is less in depth. For ecological exposure pathways, the soil zone extending from ground surface to 0.5 feet in depth.

**Surface water** - Any water meeting the definition of surface water in the state as defined in §307.3 of this title (relating to Abbreviations and Definitions), as amended.

#### **PART I. Affected Property Identification and Background Information**

1) Provide a description of the specific area of the response action and the nature of the release. Include estimated acreage of the affected property and the facility property, and a description of the type of facility and/or operation associated with the affected property. Also describe the location of the affected property with respect to the facility property boundaries and public roadways.

Attach available USGS topographic maps and/or aerial or other affected property photographs to this form to depict the affected property and surrounding area. Indicate attachments:

Topo map                       Aerial photo                       Other

2) Identify environmental media known or suspected to contain chemicals of concern (COCs) at the present time. Check all that apply:

Known/Suspected COC Location	Based on sampling data?	
<input type="checkbox"/> Soil $\leq$ 5 ft below ground surface	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<input type="checkbox"/> Soil $>$ 5 ft below ground surface	<input type="checkbox"/> Yes	<input type="checkbox"/> No



**PART II. Exclusion Criteria and Supportive Information**

**Subpart A. Surface Water/Sediment Exposure**

1) Regarding the affected property where a response action is being pursued under the TRRP, have COCs migrated and resulted in a release or imminent threat of release to either surface waters or to their associated sediments via surface water runoff, air deposition, groundwater seepage, etc.? Exclude wastewater treatment facilities and stormwater conveyances/impoundments authorized by permit. Also exclude conveyances, decorative ponds, and those portions of process facilities which are:

a. Not in contact with surface waters in the State or other surface waters which are ultimately in contact with surface waters in the State; and

b. Not consistently or routinely utilized as valuable habitat for natural communities including birds, mammals, reptiles, etc.

Yes

No

Explain:

If the answer is Yes to Subpart A above, the affected property does not meet the exclusion criteria. However, complete the remainder of Part II to determine if there is a complete and/or significant soil exposure pathway, then complete PART III - Qualitative Summary and Certification. If the answer is No, go to Subpart B.

**Subpart B. Affected Property Setting**

In answering “Yes” to the following question, it is understood that the affected property is not attractive to wildlife or livestock, including threatened or endangered species (i.e., the affected property does not serve as valuable habitat, foraging area, or refuge for ecological communities). (May require consultation with wildlife management agencies.)

1) Is the affected property wholly contained within contiguous land characterized by: pavement, buildings, landscaped area, functioning cap, roadways, equipment storage area, manufacturing or process area, other surface cover or structure, or otherwise disturbed ground?

Yes

No

Explain:

If the answer to Subpart B above is Yes, the affected property meets the exclusion criteria, assuming the answer to Subpart A was No. Skip Subparts C and D and complete PART III - Qualitative Summary and Certification. If the answer to Subpart B above is No, go to Subpart C.

**Subpart C. Soil Exposure**

1) Are COCs which are in the soil of the affected property solely below the first 5 feet beneath ground surface **or** does the affected property have a physical barrier present to prevent exposure of receptors to COCs in surface soil?

Yes

No

Explain:

If the answer to Subpart C above is Yes, the affected property meets the exclusion criteria, assuming the answer to Subpart A was No. Skip Subpart D and complete PART III - Qualitative Summary and Certification. If the answer to Subpart C above is No, proceed to Subpart D.

**Subpart D. *De Minimus* Land Area**

In answering “Yes” to the question below, it is understood that all of the following conditions apply:

- ❖ The affected property is not known to serve as habitat, foraging area, or refuge to threatened/endangered or otherwise protected species. (Will likely require consultation with wildlife management agencies.)
- ❖ Similar but unimpacted habitat exists within a half-mile radius.
- ❖ The affected property is not known to be located within one-quarter mile of sensitive environmental areas (e.g., rookeries, wildlife management areas, preserves). (Will likely require consultation with wildlife management agencies.)
- ❖ There is no reason to suspect that the COCs associated with the affected property will migrate such that the affected property will become larger than one acre.

1) Using human health protective concentration levels as a basis to determine the extent of the COCs, does the affected property consist of one acre or less and does it meet all of the conditions above?

Yes

No

Explain how conditions are met/not met:

If the answer to Subpart D above is Yes, then no further ecological evaluation is needed at this affected property, assuming the answer to Subpart A was No. Complete PART III - Qualitative Summary and Certification. If the answer to Subpart D above is No, proceed to Tier 2 or 3 or comparable ERA.

**PART III. Qualitative Summary and Certification (Complete in all cases.)**

Attach a brief statement (not to exceed 1 page) summarizing the information you have provided in this form. This summary should include sufficient information to verify that the affected property meets or does



characterization, where the likelihood of adverse effects occurring as a result of exposure to a chemical stressor is evaluated. In order to develop a screening-level ecological risk assessment which appropriately evaluates ecological risk, the person shall meet the minimum requirements listed in paragraphs (1) - (10) of this subsection. Additional information on these requirements, as well as case examples, are provided in the agency's ecological assessment guidance. The person shall:

(1) use affected property concentrations of non-bioaccumulative COCs to compare to established ecological benchmarks and/or use approved methodologies to develop benchmarks to determine potential effects and to eliminate COCs that do not pose unacceptable ecological risk (if all COCs are eliminated at this point, the ecological risk assessment process ends and the items listed in paragraphs (2) - (9) of this subsection are not required);

(2) identify communities (e.g., soil invertebrates, benthic invertebrates) and major feeding guilds (e.g., omnivorous mammals, piscivorous birds) and their representative species which are supported by habitats on the affected property for each complete or reasonably anticipated to be completed exposure pathway;

(3) develop a conceptual model which graphically depicts the movement of COCs through media to communities and the feeding guilds;

(4) discuss COC fate and transport and toxicological profiles;

(5) prepare a list of input data which includes values from the literature (e.g., exposure factors, intake equations that account for total exposure, no observed adverse effect level (NOAEL) and lowest observed adverse effect level (LOAEL) values, references), any available site-specific data, and reasonably conservative exposure assumptions, and then calculate the total exposure to selected ecological receptors from each COC not eliminated according to paragraph (1) of this subsection and present these calculations in tables or spreadsheets;

(6) utilize an ecological hazard quotient methodology to compare exposures to the NOAELs in order to eliminate COCs that pose no unacceptable risk (i.e., NOAEL hazard quotient less than or equal to 1); however, when multiple members of a class of COCs are present which exert additive effects, it is also appropriate to utilize an ecological hazard index methodology (if all COCs are eliminated at this point, the ecological risk assessment process ends and the items listed in paragraphs (7) - (9) of this subsection are not required);

(7) justify the use of less conservative assumptions (e.g., a larger home range) to adjust the exposure and repeat the hazard quotient exercise in paragraph (6) of this subsection, once again eliminating COCs that pose no unacceptable risk based on comparisons to the NOAELs and adding another set of comparisons, this time to the LOAELs<sub>2</sub> for those COCs indicating a potential risk (i.e., NOAEL hazard quotient > 1); however, when multiple members of a class of COCs are present which exert additive effects, it is also appropriate to utilize an ecological hazard index methodology (if all COCs are eliminated at this point, the ecological risk assessment process ends and the items listed in paragraphs (8) and (9) of this subsection are not required);

(8) develop an “uncertainty analysis” which discusses the major areas of uncertainty associated with the screening-level ecological risk assessment, including a justification for not developing PCLs for particular COCs/pathways, if appropriate (e.g., NOAEL hazard quotient  $> 1 >$  LOAEL hazard quotient, an evaluation of the likelihood of ecological risk, a discussion of the half-life of the COCs, etc.); however, when multiple members of a class of COCs are present which exert additive effects, it is also appropriate to utilize an ecological hazard index methodology (if all COCs are eliminated at this point, the ecological risk assessment process ends and the item listed in paragraph (9) of this subsection is not required);

(9) calculate medium-specific PCLs bounded by the NOAEL and the LOAEL used in paragraph (7) of this subsection for those COCs that are not eliminated as a result of the hazard quotient exercises or the uncertainty analysis; and

(10) make a recommendation for managing ecological risk at the affected property based on the final ecological PCLs, unless proceeding under Tier 3 (may be included as part of the affected property assessment report, self-implementation notice, or the response action plan).

(d) Tier 3: site-specific ecological risk assessment. When any of the Tier 2 PCLs, as described in subsection (c) of this section, are considered by the person to be inappropriate or not reflective of existing conditions at the affected property, or when otherwise elected, the person may conduct a site-specific ecological risk assessment. If the person elects to begin the ecological evaluation of the affected property by proceeding directly to a site-specific ecological risk assessment, applicable

components of a Tier 2 screening-level ecological risk assessment shall be incorporated, including subsections (c)(2) - (4), (8), and (10) of this section and other requirements of subsection (c) of this section as determined appropriate by the executive director. The purpose of the optional site-specific ecological risk assessment shall be to incorporate additional information obtained through the performance of site-specific studies designed to provide a more empirical evaluation of ecological risk at the affected property. The result of the site-specific ecological risk assessment will be the development of site-specific Tier 3 PCLs, a determination that there is no ecological risk, or a conclusion that ecological risk is not apparent based on site-specific information. Site-specific studies which may be conducted include but are not limited to:

(1) development of site-specific bioaccumulation factors through the collection and analysis of tissue samples from appropriate ecological receptors.

(2) performance of toxicological testing of the impacted media via exposure to an appropriate test species.

(3) comparison of site data (e.g., macroinvertebrate diversity surveys) to like data from a reference area.

(4) other studies designed to obtain a preponderance or “weight-of-evidence” to draw conclusions about ecological risk.

(e) Cross-media transfers of COCs. In situations where cross-media transfer of a COC from a source medium to a POE within an exposure medium must occur for the receptor to be exposed, then the person shall use the cross-media natural attenuation factor equations as shown in the figure in §350.75(b)(1) of this title (relating to Tiered Human Health Protective Concentration Level Evaluation) to calculate the PCL. In lieu of using the human health RBEL referenced in the figures, the person shall use the ecological PCL established under subsections (c) or (d) of this section.

(f) Ecological risk management options. After the ecological risk has been quantified and PCLs have been established as specified in subsections (c) or (d) of this section and it has been determined that the ecological PCL is the critical PCL, or is the only PCL, the person may either:

(1) take action to remove and/or decontaminate the impacted media and COCs as described in §350.32 of this title (relating to Remedy Standard A); or

(2) remove, decontaminate, and/or control the impacted media and COCs or, when after consultation with the Natural Resource Trustees, it is determined appropriate by the executive director, conduct an ecological services analysis in accordance with §350.33 of this title (relating to Remedy Standard B). The ecological services analysis considers the ecological risks and benefits of the potential response actions available under Remedy Standard B at the affected property and, as appropriate, factors in compensatory ecological restoration in lieu of or in addition to remediation as a means of managing residual ecological risk.

**§350.79. Comparison of Chemical of Concern Concentrations to Protective Concentration Levels.**

The person shall follow the procedures of this subsection to determine if a response action under this chapter is necessary to protect human health and the environment, and if a response action is necessary, then to determine if the remedy standard is attained. If the person satisfactorily demonstrates that all reasonably available analytical technology (e.g., selected ion monitoring) has been used to show that the COC cannot be measured to the method quantitation limit due to sample specific interferences, then the person shall be allowed to determine attainment based on the sample detection limit. The person shall make these determinations using the procedures described in either paragraph (1) or (2) of this subsection.

(1) The person may make a direct comparison between individual measurements of COC concentrations within environmental media and the critical PCLs. If the concentrations of a COC within an environmental medium exceeds a critical PCL, then a response action is required.

(2) The person may determine if a response action is required by using appropriate statistical methods provided in subparagraphs (A) or (B) of this paragraph.

(A) In order to determine if the concentrations of the COC at an affected property exceed a critical PCL the person shall conduct a statistical test of the following set of hypotheses:

(i) the null hypothesis ( $H_0$ ) is that the mean of the COC concentrations in the affected property is equal to or greater than the critical PCL;

(ii) the alternative hypothesis ( $H_a$ ) is that the mean COC concentration is less than the critical PCL;

(iii) the test is performed at a Type I error rate of 5%; and

(iv) any statistical model used for testing this hypothesis set must be demonstrated to meet these performance standards.

(B) In order to determine if the concentration of a COC in an environmental medium at the affected property is greater than the COC concentration for background areas, the person will use a statistical test meeting the following performance standards:

(i) the null hypothesis ( $H_0$ ), in conjunction with any supporting assumptions, is equivalent to the statement that the mean of the COC concentrations in the two areas are identical;

(ii) the alternative hypothesis ( $H_a$ ), is equivalent to the statement that the mean of the COC concentrations at the affected property exceeds that population of background concentrations; and

(iii) the test is performed at a Type I error rate of 20% and the test must have a demonstrable power of 80% for an alternative hypothesis equivalent to a 100% difference in population means in the Student's "t" test. Alternative statistical methods for comparing affected property COC concentrations to background COC concentrations may be approved by the executive director.

## **SUBCHAPTER E: REPORTS**

### **§§350.90 - 350.96**

#### **STATUTORY AUTHORITY**

The amended rules are adopted under the following statutory authority: TWC, §5.103 and §26.011, which provide the commission with authority to adopt any rules necessary to carry out its powers, duties, and policies and to protect water quality in the state; TWC, §5.103(c), which states the commission must adopt rules when adopting, repealing, or amending any agency statement of general applicability that interprets or prescribes law or policy or describes the practice and procedure requirements of the agency, and Texas Health and Safety Code (THSC), Texas Solid Waste Disposal Act, §361.017 and §361.024, which provide the commission the authority to regulate industrial solid waste and municipal hazardous wastes and all other powers necessary or convenient to carry out its responsibilities. In addition, the amended rules are adopted under 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 preventive 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 committing any other act or engaging in any other activity which in itself or in conjunction with any other discharge or activity causes, continues to cause, or will cause pollution of any of the water in the state; TWC, §26.262, which states that it is the policy of this state to prevent the spill or discharge of hazardous substances into the waters in the state and to cause the removal of such spills and discharges without undue delay; and TWC, §26.264, which provides the commission with authority to issue rules necessary and

convenient to carry out the policy referenced in TWC, §26.262. Authority to adopt the amended rules is also provided by TWC, §26.341, which states that it is the policy of this state to maintain and protect the quality of groundwater and surface water resources in the state from certain substances in underground and aboveground storage tanks that may pollute groundwater and surface water resources, and requires the use of all reasonable methods, including risk-based corrective action to implement this policy; TWC, §26.345, which provides the commission with the authority to adopt rules necessary to carry out the policy referenced in TWC, §26.341; and 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 regulation by state agencies be conducted in a manner that will maintain present uses and not impair potential uses of groundwater or pose a public health hazard, and that the quality of groundwater be restored if feasible.

The adopted amendments implement TWC, §§5.103, 26.011, 26.039, 26.262, 26.264, 26.341, 26.345, and 26.401, and THSC, §361.017 and §361.024.

**§350.90. Spatial and Electronic Information.**

(a) When required, the person shall provide accurate spatial coordinates and associated data attributes that are reported in a format approved or required by the executive director.

(b) Reports required by this subchapter shall be submitted in a format, including an electronic format, and according to a schedule established by the executive director.

**§350.91. Affected Property Assessment Report.**

(a) The person shall include the contact and identifications as described in paragraphs (1) - (3) of this subsection in an affected property assessment report (APAR):

(1) the name, mailing address, and telephone number of the contact person or office for the on-site affected property;

(2) the program and identification numbers for the project, if any (e.g., Solid Waste Registration number, Leaking Petroleum Storage Tank identification number, Voluntary Cleanup Program number, etc.); and

(3) the physical address or location of the affected property, including accurate latitude and longitude and associated spatial data attributes in a format approved or required by the executive director.

(b) An APAR shall document descriptions of procedures and conclusions of the assessment and shall include all information required to meet the requirements of §350.51 of this title (relating to Affected Property Assessment), §350.52 of this title (relating to Groundwater Resource Classification) and §350.53 of this title (relating to Land Use Classification). This includes, but is not limited to:

(1) the classification of the groundwater(s) at an affected property including all supporting data and results;

(2) the classification of the land use(s) of the affected property;

(3) the identification and characterization of all source areas (e.g., NAPLs);

(4) a characterization of the local geology and hydrogeology;

(5) the direction and rate of movement, composition, and representative concentrations of COCs in environmental media (including the potential for migration to other media);

(6) an identification of all complete or reasonably anticipated to be completed exposure pathways, and an identification of other exposure pathways evaluated in accordance with §350.71(c)(8) of this title (relating to General Requirements) and an explanation of why those pathways were not considered to be complete or reasonably anticipated to be completed;

(7) as required, a completed Tier 1 Exclusion Criteria Checklist and, if appropriate, a reasoned justification and/or an expedited stream evaluation for terminating the ecological risk assessment, or as required a Tier 2 screening-level ecological risk assessment, and/or a Tier 3 site-specific ecological risk assessment as specified in §350.77 of this title (relating to Ecological Risk Assessment and Development of Ecological Protective Concentration Levels);

(8) summaries of sampling methodology;

(9) all analytical data in accordance with §350.54 of this title (relating to Data Acquisition and Reporting Requirements);

(10) documentation that the data necessary to support the development of PCLs and remedy selection have been adequately and appropriately collected;

(11) documentation of the derivation of all RBELs and PCLs and the determination of the critical PCLs for environmental media including all associated assumptions and calculations;

(12) a tabular comparison between concentrations of COCs and the critical PCLs. If statistical or geostatistical methods are used to develop representative concentrations of COCs, then the person shall include the following:

(A) a discussion of the data collection effort from an environmental medium to support this determination (e.g., judgmental samples, random sampling design, etc.);

(B) the statistical or geostatistical methodology applied; and

(C) the assumptions of the statistical or geostatistical method and how those assumptions are met.

(13) graphical representations (e.g., maps and cross-sections) of the soil and/or groundwater PCLE zone(s), location of other environmental media which exceeds the respective critical PCLs, and the plume management zone if applicable;

(14) a description of any exposure conditions which require notice under §350.55(e) of this title (relating to Notification Requirements) and any certification required under §350.55(d) and (e) of this title;

(15) accurate spatial coordinates and associated data attributes, in a format approved or required by the executive director, for all locations where samples of environmental media were collected or where other testing was conducted (e.g., water wells and monitor wells which were sampled or which were used for aquifer testing, soil sampling locations, surface water and sediment sampling locations, and air sampling locations); and

(16) any other reasonable information required by the executive director.

**§350.92. Self-Implementation Notice.**

The person shall include the following information in a self-implementation notice (SIN):

(1) the person shall include the following contact and identifications:

(A) the name, mailing address, and telephone number of the contact person or office for the on-site affected property;

(B) the program and identification numbers for the project, if any (e.g., Solid Waste Registration number, Leaking Petroleum Storage Tank identification number, Voluntary Cleanup Program number, etc.); and

(C) the physical address or location of the affected property;

(2) a list of the COCs which require a response action;

(3) a description of the qualitative and quantitative response action objectives to be achieved by the response action;

(4) a description of any exposure conditions which require notice under §350.55(e) of this title (relating to Notification Requirements) and any certification required under §350.55(d) and (e) of this title;

(5) a description of the response action chosen to achieve Remedy Standard A;

(6) acknowledgment that any permits needed to implement the remedy will be obtained prior to implementation;

(7) a schedule for implementation and completion of the response action;

(8) if applicable, a copy of the proposed institutional control for §350.31(h)(1) of this title (relating to General Requirements for Remedy Standards); and

(9) any other reasonable information required by the executive director.

**§350.93. Response Action Effectiveness Report.**

The person shall include the following information in a response action effectiveness report (RAER):

(1) a summary of the response actions taken since the last reporting period;

(2) for each environmental medium, a comparison among the critical PCL; the initial concentration of COCs; and the current (i.e., at the time of RAER submittal) concentrations of COCs;

(3) an estimate of the percentage of the response action which has been completed;

(4) an estimate in years of the additional time necessary to complete the response actions;

(5) a determination whether sufficient progress is being made to achieve the selected remedy standard within a reasonable time frame given the particular circumstances of an affected property;

(6) if applicable, a copy of the proposed institutional control for §350.31(h) of this title (relating to General Requirements for Remedy Standards); and

(7) any other reasonable information required by the executive director.

**§350.94. Response Action Plan.**

(a) The person shall address all environmental media containing COCs in excess of the critical PCLs in a response action plan (RAP).

(b) The RAP must clearly state property-specific response objectives which are consistent with the response objectives specified in §350.33 of this title (relating to Remedy Standard B), or §350.32 of this title (relating to Remedy Standard A) if a person chooses to await executive director approval of a RAP under Remedy Standard A.

(c) The person must demonstrate that the proposed property-specific response actions are capable of achieving the response action objectives within a reasonable time frame as specified in §350.33 of this title (relating to Remedy Standard B), or §350.32 of this title (relating to Remedy

Standard A) if a person chooses to await executive director approval of a RAP under Remedy Standard A.

(d) If monitoring of environmental media is proposed during the response action, the RAP shall address the proposed monitoring frequencies, parameters, locations, analytical methods, and all associated quality control procedures.

(e) The RAP shall describe any soil and/or groundwater treatment systems proposed as a part of the response actions for the affected property.

(1) The person shall list necessary inspection, operation and maintenance tasks, as well as characterize optimum operating conditions for any treatment system.

(2) The person shall discuss potential problems that can reasonably be expected to occur and indicate how they propose to respond to those potential problems.

(3) The person shall identify any permits needed to construct and/or implement the remedy.

(f) The person shall include a discussion of any sampling to be conducted to demonstrate conformance with the response objectives and to meet all requirements of §350.79 of this title (relating

to Comparison of Chemical of Concern Concentrations to Protective Concentration Levels). This sampling discussion shall include:

- (1) the data collection effort from an environmental medium to support this determination (e.g., judgmental samples, random sampling design, etc.);
- (2) the statistical or geostatistical methodology which will be applied, if any; and
- (3) the assumptions of the statistical or geostatistical method and how those assumptions are met.

(g) The RAP shall specify the type, location, duration, and implementation schedule for the various removal actions, decontamination measures, and any physical and/or institutional controls to be implemented as the response action for the affected property.

(h) The person shall include a schedule for submission of RAERs to the executive director.

(i) The person shall include a copy of the institutional control they plan to use to meet the requirements of §§350.31(g) and (h); 350.74(b)(1); 350.74(j)(2)(L); or 350.51(1)(3) and (4) of this title (relating to General Requirements for Remedy Standards; Development of Risk-Based Exposure Limits; and Affected Property Assessment, respectively).

(j) Cost information for the recommended response action and comparative cost analyses for a number of response actions may be required by specific program areas.

(k) For Remedy Standard B, the person shall include the following information regarding post-response action care in a RAP:

(1) a description of the monitoring program for the post-response action care period including, but not limited to, the following where applicable:

(A) the type of monitoring to be performed (e.g., groundwater, soil, and soil gas);

(B) plot plan(s) indicating monitoring locations (including attenuation monitoring points);

(C) well construction details;

(D) environmental media monitoring frequency;

(E) COCs to be analyzed;

(F) sampling procedures, chain of custody protocols, and laboratory methods;

and

(G) quality assurance/quality control procedures in accordance with §350.54 of this title (relating to Data Acquisition and Reporting Requirements);

(2) a description of and schedule for the inspection, operation, and maintenance of any physical controls for the post-response action care period;

(3) a description of the proposed post-response action land use and a demonstration that the proposed use:

(A) will not compromise the integrity of the physical controls;

(B) will not interfere with the function of the monitoring systems;

(C) will not pose a threat to human health or the environment; and

(D) will be in accordance with any institutional controls.

(4) a written financial assurance cost estimate, when applicable, for performing the post-response action care, which has been prepared in accordance with §350.33(l) of this title (relating to Remedy Standard B);

(5) the affidavit required under §350.33(n)(1) of this title (relating to Remedy Standard B) for the special small business consideration, as applicable;

(6) a reporting schedule for submission of the PRACRs under Remedy Standard B based on annual reporting unless the executive director approves an alternate reporting schedule. Alternate schedules may have a greater or lesser period, or may specify quarterly reporting in the earlier post-response action care period, decreasing to annual, biannual or other appropriate schedule.

(l) Any other reasonable information required by the executive director.

**§350.95. Response Action Completion Report.**

(a) For both Remedy Standard A and B, the person shall include in the response action completion report (RACR):

(1) information specified in §350.111(c) of this title (relating to Use of Institutional Controls) whenever an institutional control will be placed in the real property records of the county for an off-site property or leased lands;

(2) all analytical data prepared and presented in accordance with §350.54 of this title (relating to Data Acquisition and Reporting Requirements);

(3) a description of the volume and final disposal or reuse location, and a copy of any waste manifests or other documentation of disposition for waste or environmental media which were removed from the affected property; and

(4) if statistical or geostatistical methods are used to demonstrate attainment of the response objectives, the person shall include the following:

(A) a discussion of the data collection effort from an environmental medium to support this determination (e.g., judgmental samples, random sampling design, etc.);

(B) the statistical or geostatistical methodology applied; and

(C) the assumptions of the statistical or geostatistical method and how those assumptions are met.

(b) When the person selects Remedy Standard A, the RACR shall include information which documents that the requirements for response actions stated in §350.31 and §350.32 of this title (relating to General Requirements for Remedy Standards and Remedy Standard A, respectively) have been fulfilled. When applicable, the report shall also include a copy of the document that the person

proposes to use to fulfill the institutional control requirements of §350.31(g) of this title (relating to General Requirements for Remedy Standards) when the affected property has been restored for commercial/industrial land use, the requirements of §350.51(l)(3) or (4) of this title (relating to Affected Property Assessment) when a non-default exposure area has been used, the requirements of §350.74(b)(1) of this title (related to Development of Risk-Based Exposure Limits) when occupational inhalation criteria have been used as RBELs, or the requirements of §350.74(j)(2) of this title (related to Development of Risk-Based Exposure Limits) when non-default RBEL exposure factors have been used.

(c) When the person selects Remedy Standard B, the RACR shall include information which documents that the response actions described in the approved RAP have been completed. The report shall:

(1) include a demonstration that the requirements of §350.31 and §350.33 of this title (relating to General Requirements for Remedy Standards and Remedy Standard B, respectively) have been fulfilled for the affected property based upon concentration of COCs remaining at the property and the application of physical and institutional controls; and

(2) document that any physical control, or combination of physical controls, (e.g., caps, slurry walls, treatment which does not constitute decontamination, and/or landfills) has been constructed or completed and is functioning as described in the approved RAP.

(d) In situations where soils which contain COCs are relocated for reuse in accordance with §350.36 of this title (relating to Relocation of Soils Containing Chemicals of Concern for Reuse Purposes), the person shall also provide:

(1) documentation of the prior written landowner consent required in §350.36(d) of this title (relating to Relocation of Soils Containing Chemicals of Concern for Reuse Purposes) for soil reuse on property not owned by the person; and

(2) documentation that any asphalt mix or road base mix meets the specifications required by the user when requested by the executive director.

(e) The person shall provide any other reasonable information required by the executive director.

**§350.96. Post-Response Action Care Reports.**

The person shall include the following information in a post-response action care report (PRACR):

(1) the results of any monitoring program with all analytical data prepared and presented in accordance with §350.54 of this title (relating to Data Acquisition and Reporting Requirements);

(2) a summary of activities related to the inspection, operation, and maintenance of physical controls;

(3) a discussion of any corrective actions taken in response to failure of institutional and/or physical controls; and

(4) any other reasonable information required by the executive director.

## **SUBCHAPTER F: INSTITUTIONAL CONTROLS**

### **§350.111**

#### **STATUTORY AUTHORITY**

The amended rules are adopted under the following statutory authority: TWC, §5.103 and §26.011, which provide the commission with authority to adopt any rules necessary to carry out its powers, duties, and policies and to protect water quality in the state; TWC, §5.103(c), which states the commission must adopt rules when adopting, repealing, or amending any agency statement of general applicability that interprets or prescribes law or policy or describes the practice and procedure requirements of the agency, and Texas Health and Safety Code (THSC), Texas Solid Waste Disposal Act, §361.017 and §361.024, which provide the commission the authority to regulate industrial solid waste and municipal hazardous wastes and all other powers necessary or convenient to carry out its responsibilities. In addition, the amended rules are adopted under 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 preventive 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 committing any other act or engaging in any other activity which in itself or in conjunction with any other discharge or activity causes, continues to cause, or will cause pollution of any of the water in the state; TWC, §26.262, which states that it is the policy of this state to prevent the spill or discharge of hazardous substances into the waters in the state and to cause the removal of such spills and discharges without undue delay;

and TWC, §26.264, which provides the commission with authority to issue rules necessary and convenient to carry out the policy referenced in TWC, §26.262. Authority to adopt the amended rules is also provided by TWC, §26.341, which states that it is the policy of this state to maintain and protect the quality of groundwater and surface water resources in the state from certain substances in underground and aboveground storage tanks that may pollute groundwater and surface water resources, and requires the use of all reasonable methods, including risk-based corrective action to implement this policy; TWC, §26.345, which provides the commission with the authority to adopt rules necessary to carry out the policy referenced in TWC, §26.341; and 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 regulation by state agencies be conducted in a manner that will maintain present uses and not impair potential uses of groundwater or pose a public health hazard, and that the quality of groundwater be restored if feasible.

The adopted amendments implement TWC, §§5.103, 26.011, 26.039, 26.262, 26.264, 26.341, 26.345, and 26.401, and THSC, §361.017 and §361.024.

**§350.111. Use of Institutional Controls.**

(a) Whenever required by this chapter, the person or landowner shall file a copy of the appropriate deed notice, VCP certificate of completion or restrictive covenant in the real property records of the county in which the property is located to notify future owners of any limitations on the use of the property. Deed notices, VCP certificates of completion and restrictive covenants shall include the following information:

(1) a metes and bounds description of the portion(s) of the affected property to which the institutional control applies;

(2) a plat map clearly demarcating the portion(s) of the affected property to which the institutional control applies. The map must contain a north arrow, a correlating map scale, and a legend identifying any used symbols or abbreviations;

(3) a certification by a registered professional land surveyor so registered by the Texas Board of Professional Surveying attesting to the accuracy of the descriptions provided in paragraphs (1) and (2) of this subsection;

(4) a statement discussing the appropriate land use (i.e., residential or commercial/industrial) for the affected property;

(5) an explanation as to which environmental media contain COCs above PCLs;

(6) a statement documenting any property use limitations or any requirements for maintenance of physical and/or institutional controls, or compliance with health and safety plans;

(7) the TCEQ Program and identifier number, and the availability of more detailed information at or through the TCEQ Central Records Office or Web Site; and

(8) the physical address and mailing address for the TCEQ Central Records Office.

(b) The person shall record a deed notice, VCP certificate of completion or by agreement with an innocent landowner cause a restrictive covenant to be recorded in accordance with subsection (c) of this section and the additional applicable requirements detailed in paragraphs (1) - (14) of this subsection, unless the affected property is subject to a zoning or governmental ordinance that is equivalent to the deed notice, VCP certificate of completion or restrictive covenant that would otherwise be required under this subsection.

(1) For on-site and off-site properties where an institutional control is required pursuant to §350.31(h) of this title (relating to General Requirements for Remedy Standards), the person shall file a deed notice or VCP certificate of completion which indicates that long-term response actions are being conducted at the affected property.

(2) For on-site and off-site properties that have achieved Remedy Standard A for commercial/industrial land use, pursuant to §350.31(g) of this title (relating to General Requirements for Remedy Standards) the person shall note in a deed notice or VCP certificate of completion that if any person desires to use the property for residential purposes, they must first notify the commission at least 60 days in advance of such use and that additional response actions may be necessary.

(3) For on-site and off-site properties where an institutional control is required pursuant to §350.31(g) of this title (relating to General Requirements for Remedy Standards) because a physical

and/or institutional control has been used to attain Remedy Standard B, the person shall describe in a deed notice or VCP certificate of completion the physical control (including the physical location and/or the lateral extent) and the reason the physical and/or institutional control must remain in place to be protective of human health and the environment, unless or until the agency approves any modifications.

(4) For any on-site or off-site properties with changes in circumstances as discussed in §350.35 of this title (relating to Substantial Change in Circumstances) that negate the need for a deed notice or VCP certificate of completion, the person shall describe the reason the original deed notice or VCP certificate of completion is no longer necessary to protect human health and the environment. If the executive director agrees, the executive director will execute a superceding deed notice that may be filed in the deed records.

(5) For on-site or off-site properties with a landowner who is an innocent owner or operator and where an institutional control is required under §350.31(g) of this title (relating to General Requirements for Remedy Standards) to limit the property to commercial/industrial land use, a restrictive covenant shall limit the property to commercial/industrial land use. The restrictive covenant shall include a statement indicating that if any person desires in the future to use the property for residential purposes, then the agency must grant approval prior to such use.

(6) For on-site or off-site properties with a landowner who is an innocent owner or operator and where an institutional control is required in response to §350.31(g) of this title (relating to General Requirements for Remedy Standards), because a physical and/or institutional control has been

used to obtain Remedy Standard B, a restrictive covenant shall compel the maintenance of or prohibit the removal of the physical control and shall describe any physical control (including the physical location and/or lateral extent) and the reason the physical control and/or institutional control must remain in place to be protective of human health and the environment. The restrictive covenant shall include a statement indicating that if any person desires in the future to alter the physical or institutional control, the agency must grant prior approval to any such changes.

(7) For any on-site or off-site properties with changes in circumstances as discussed in §350.35 of this title (relating to Substantial Change in Circumstances) that negate the need for a restrictive covenant, the person shall describe the reason the original restrictive covenant is no longer necessary to protect human health and the environment. If the executive director agrees, the executive director will execute a release of restrictive covenant that may be filed in the deed records.

(8) For on-site and off-site properties where an institutional control is required pursuant to §350.51(1)(3) of this title (relating to Affected Property Assessment), the person shall indicate, in a deed notice or VCP certificate of completion, the size of the assumed exposure area for residents and that if future exposures are limited to smaller areas, the affected property should be reevaluated to ensure protection of human health.

(9) For on-site and off-site properties where an institutional control is required pursuant to §350.51(1)(4) of this title (relating to Affected Property Assessment), the person shall indicate, in a deed notice or VCP certificate of completion, the size of the assumed exposure area for

commercial/industrial workers and that if future exposures are limited to smaller areas, the affected property should be reevaluated to ensure protection of human health.

(10) For on-site and off-site properties with a landowner who is an innocent owner or operator and where an institutional control is required pursuant to §350.51(1)(3) of this title (relating to Affected Property Assessment), a restrictive covenant shall indicate the size of the assumed exposure area for residents and prohibit subdivision of the property into individual tracts smaller than the assumed exposure area. The restrictive covenant shall include a statement indicating that if any person desires in the future to subdivide the property, the agency must grant prior approval to any such changes.

(11) For on-site and off-site properties with a landowner who is an innocent owner or operator and where an institutional control is required pursuant to §350.51(1)(4) of this title (relating to Affected Property Assessment), a restrictive covenant shall indicate the size of the assumed exposure area for commercial/industrial workers and prohibit subdivision of the property into individual tracts smaller than the assumed exposure area. The restrictive covenant shall include a statement indicating that if any person desires in the future to subdivide the property, the agency must grant prior approval to any such changes.

(12) For on-site and off-site properties where an institutional control is required pursuant to §350.74(j)(2)(L) of this title (relating to Development of Risk-Based Exposure Limits), the person shall indicate, in a deed notice or VCP certificate of completion, the approved exposure

frequency and duration and that exposures exceeding these approved levels are not protective of human health.

(13) For on-site and off-site properties with a landowner who is an innocent owner or operator and where an institutional control is required pursuant to §350.74(j)(2)(L) of this title (relating to Development of Risk-Based Exposure Limits), a restrictive covenant shall indicate the approved exposure frequency and duration and prohibit exposures exceeding these approved levels. The restrictive covenant shall include a statement indicating that if any person desires to change the exposure frequency and/or duration, the agency must grant approval prior to any such changes.

(14) For on-site and off-site properties where an institutional control is required pursuant to §350.74(b)(1) and §350.31(g) of this title (relating to Development of Risk-Based Exposure Limits, and General Requirements for Remedy Standards, respectively) because occupational inhalation criteria are used as the basis for determining the protective concentration of COCs in the working air environment, the person shall note, in a deed notice or VCP certificate of completion, the fact that the response action taken in response to this chapter relies on monitoring air concentrations of COCs and compliance with occupational inhalation criteria and a required health and safety plan for the affected property.

(c) The person shall submit a written request to the landowner to obtain permission to file the deed notice or VCP certificate of completion or to solicit agreement to have an innocent landowner execute a restrictive covenant. This written request must contain a copy of the proposed deed notice, VCP certificate of completion or restrictive covenant, the address and phone number of the

commission's Public Interest Counsel as someone the landowner may contact, and a clear explanation as to the content and purpose of the institutional control. The person shall obtain written consent from the landowner for the filing of the deed notice or VCP certificate of completion prior to filing of a deed notice or VCP certificate of completion required to be filed under this chapter in the real property records unless the person is a governmental entity that is not a responsible party or subsections (b)(4), (d), or (f) of this section apply. Restrictive covenants shall be executed only by the landowner. A restrictive covenant in favor of TCEQ and the State of Texas which runs with the land shall be the required institutional control with the exception of institutional controls required under §350.31(h) and §350.74(b)(1) of this title (relating to General Requirements for Remedy Standards and Development of Risk-Based Exposure Limits, respectively) unless information is presented which demonstrates that:

(1) the landowner is not an innocent owner or operator as defined in §350.4 of this title (relating to Definitions and Acronyms), in which case the person shall file a deed notice or VCP certificate of completion;

(2) it is technically impracticable to obtain a residential-based Remedy Standard A response action and an innocent landowner refuses to execute a restrictive covenant, or a non-innocent landowner refuses to consent to the filing of a deed notice or VCP certificate of completion; a court of competent jurisdiction has determined the amount of compensation due the landowner as compensation for filing a deed notice or VCP certificate of completion in the real property records for that property; and the person has paid into the court registry compensation, if any, determined by the court, in which case the person shall file a deed notice or VCP certificate of completion;

(3) after extensive and diligent inquiry by the person, the executive director concludes that the landowner cannot be found, in which case the person shall file a deed notice or VCP certificate of completion; or

(4) the person is a governmental entity that is not a responsible party, and the innocent landowner refuses to execute a restrictive covenant.

(d) Landowner consent shall not be required for the filing of deed notice or VCP certificate of completion under this chapter if it is technically impracticable to obtain a residential-based Remedy Standard A response action, and the person demonstrates that:

(1) the non-innocent landowner refuses to grant consent for the filing of a deed notice or VCP certificate of completion, or an innocent landowner refuses to file a restrictive covenant;

(2) a court of competent jurisdiction has determined the amount of compensation due the landowner as compensation for filing a deed notice or VCP certificate of completion in the real property records for that property; and

(3) the person has paid into the court registry compensation, if any, determined by the court.

(e) The person shall provide a copy of the request for landowner consent for filing of a deed notice or VCP certificate of completion or copy of the request for the innocent landowner to execute a restrictive covenant, and proof of the date of receipt by the landowner of the request, with the RACR, unless required earlier in accordance with §350.33(f)(2), (f)(3)(F), or (f)(4)(C) of this title (relating to Remedy Standard B). Proof of written landowner consent for the filing of deed notice or a VCP certificate of completion or the written agreement of the innocent landowner to execute a restrictive covenant shall be provided to the executive director before the executive director will approve the RACR, unless the provisions in subsections (b)(4), (d) or (f) of this section are met.

(f) Landowner consent for deed notice or VCP certificate of completion shall not be required if, after extensive and diligent inquiry by the person, the executive director concludes that the landowner cannot be found.

## **SUBCHAPTER G: ESTABLISHING A FACILITY OPERATIONS AREA**

### **§350.134**

#### **STATUTORY AUTHORITY**

The amended rules are adopted under the following statutory authority: TWC, §5.103 and §26.011, which provide the commission with authority to adopt any rules necessary to carry out its powers, duties, and policies and to protect water quality in the state; TWC, §5.103(c), which states the commission must adopt rules when adopting, repealing, or amending any agency statement of general applicability that interprets or prescribes law or policy or describes the practice and procedure requirements of the agency, and Texas Health and Safety Code (THSC), Texas Solid Waste Disposal Act, §361.017 and §361.024, which provide the commission the authority to regulate industrial solid waste and municipal hazardous wastes and all other powers necessary or convenient to carry out its responsibilities. In addition, the amended rules are adopted under 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 preventive 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 committing any other act or engaging in any other activity which in itself or in conjunction with any other discharge or activity causes, continues to cause, or will cause pollution of any of the water in the state; TWC, §26.262, which states that it is the policy of this state to prevent the spill or discharge of hazardous substances into the waters in the state and to cause the removal of such spills and discharges without undue delay;

and TWC, §26.264, which provides the commission with authority to issue rules necessary and convenient to carry out the policy referenced in TWC, §26.262. Authority to adopt the amended rules is also provided by TWC, §26.341, which states that it is the policy of this state to maintain and protect the quality of groundwater and surface water resources in the state from certain substances in underground and aboveground storage tanks that may pollute groundwater and surface water resources, and requires the use of all reasonable methods, including risk-based corrective action to implement this policy; TWC, §26.345, which provides the commission with the authority to adopt rules necessary to carry out the policy referenced in TWC, §26.341; and 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 regulation by state agencies be conducted in a manner that will maintain present uses and not impair potential uses of groundwater or pose a public health hazard, and that the quality of groundwater be restored if feasible.

The adopted amendments implement TWC, §§5.103, 26.011, 26.039, 26.262, 26.264, 26.341, 26.345, and 26.401, and THSC, §361.017 and §361.024.

**§350.134. Qualifying Criteria.**

(a) The person seeking to obtain a FOA has the burden of providing sufficient evidence to the executive director that the following criteria have been met.

(1) The facility must be an operational chemical or petroleum manufacturing plant with North American Industrial Classification System code numbers 325 or 324, respectively, which is actively in production of a product stream.

(2) The facility must be subject to a hazardous waste permit or commission corrective action order. Facilities that are in operation but that have not received a hazardous waste permit as of the effective date of this rule shall obtain authorization for a FOA by means of a corrective action order.

(3) The facility must restrict access to the FOA such that only workers and authorized visitors who have been provided appropriate training or are subject to controls on their activities are permitted to enter the FOA.

(4) The facility must conduct a worker health and safety program. The facility must be able to document that the worker health and safety program meets or exceeds requirements of the Occupational Safety and Health Administration (OSHA) as demonstrated by:

(A) its OSHA compliance history, or

(B) results of evaluation by a third party certified industrial hygienist and safety specialist.

(5) the facility must have an average of both lost workday injury case rates and injury incidence rates for the most recent three-year period at or below the most recent specific industry national average published by the Bureau of Labor Statistics.

(6) The facility must have an audit of its health and safety programs by the Occupational Safety and Health Administration or a third party certified professional industrial hygienist and safety specialist anytime there is a significant change to the health and safety program, or at a minimum of every three years, the results of which indicate the program is satisfactory.

(7) The facility must have a program to protect workers within the FOA from environmental media having concentrations of COCs greater than PCLs or action levels based on the health and safety program.

(8) The facility must have a pollution prevention program that has as a goal the prevention of releases of COCs to environmental media within the FOA. The facility can satisfy this criterion with one or more of the following options:

(A) conduct a program to inspect and maintain on an appropriate frequency the physical integrity of structures used for the manufacturing, storage and conveyance of products or feed stocks so as to prevent or, if detected, to abate unauthorized releases of COCs to environmental media. These procedures are to be applied within the FOA to all structures with potential to release COCs not

already addressed by commission rules for hazardous waste management facilities (e.g., secondary containment systems for tanks);

(B) some other spill prevention approach for which the facility can demonstrate equivalent performance with the program of subparagraph (A) of this paragraph; or

(C) acceptance of the facility into a commission-sponsored multi-media voluntary pollution prevention program, such as Clean Industries Plus or a program deemed equivalent by the executive director.

(9) The facility must not have any significant outstanding non-compliance issues resulting from inspections for compliance with its Resource Conservation and Recovery Act permit or any commission order.

(10) The facility must be able to meet requirements for financial assurance in accordance with Chapter 37 of this title (relating to Financial Assurance).

(b) Other criteria that may be considered include, but are not limited to, the risk to human health and the environment that would be presented by the granting of a FOA, the compliance history of the facility determined in accordance with Chapter 60 of this title (relating to Compliance History), as amended, and any other pertinent information.