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**PART 742**  
**TIERED APPROACH TO CORRECTIVE ACTION OBJECTIVES**

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**AUTHORITY:** Implementing Sections 22.4, 22.12, Title XVI, and Title XVII and authorized by Sections 27 and 58.5 of the Environmental Protection Act [415 ILCS 5/22.4, 22.12, 27, and 58.5 and Title XVI and Title XVII].

**SOURCE:** Adopted in R97-12(A) at 21 Ill. Reg. 7942, effective July 1, 1997; amended in R97-12(B) at 21 Ill. Reg. 16391, effective December 8, 1997; amended in R97-12(C) at 22 Ill. Reg. 10847, effective June 8, 1998; amended in R00-19(A) at 25 Ill. Reg. 651, effective January 6, 2001; amended in R00-19(B) at 25 Ill. Reg. 10374, effective August 15, 2001; amended in R00-19(C) at 26 Ill. Reg. 2683, effective February 5, 2002.

**NOTE:** Capitalization indicates statutory language.

## SUBPART A: INTRODUCTION

### Section 742.100 Intent and Purpose

- a) This Part sets forth procedures for evaluating the risk to human health posed by environmental conditions and developing remediation objectives that achieve acceptable risk levels.
- b) The purpose of these procedures is to provide for the adequate protection of human health and the environment based on the risks to human health posed by environmental conditions while incorporating site related information.

### Section 742.105 Applicability

- a) Any person, including a person required to perform an investigation pursuant to the Illinois Environmental Protection Act (415 ILCS 5) (Act), may elect to proceed under this Part to the extent allowed by State or federal law and regulations and the provisions of this Part. A person proceeding under this Part may do so to the extent such actions are consistent with the requirements of the program under which site remediation is being addressed.
- b) This Part is to be used in conjunction with the procedures and requirements applicable to the following programs:

- 1) Leaking Underground Storage Tanks (35 Ill. Adm. Code 731 and 732);
  - 2) Site Remediation Program (35 Ill. Adm. Code 740); and
  - 3) RCRA Part B Permits and Closure Plans (35 Ill. Adm. Code 724 and 725).
- c) The procedures in this Part may not be used if their use would delay response action to address imminent and substantial threats to human health and the environment. This Part may only be used after actions to address such threats have been completed.
  - d) This Part may be used to develop remediation objectives to protect surface waters, sediments or ecological concerns, when consistent with the regulations of other programs, and as approved by the Agency.
  - e) A no further remediation determination issued by the Agency prior to July 1, 1997 pursuant to Section 4(y) of the Act or one of the programs listed in subsection (b) of this Section that approves completion of remedial action relative to a release shall remain in effect in accordance with the terms of that determination.
  - f) Site specific groundwater remediation objectives determined under this Part for contaminants of concern may exceed the groundwater quality standards established pursuant to the rules promulgated under the Illinois Groundwater Protection Act (415 ILCS 55) as long as done in accordance with Sections 742.805 and 742.900(c)(9). (See 415 ILCS 5/58.5(d)(4))
  - g) Where contaminants of concern include polychlorinated byphenyls (PCBs), a person may need to evaluate the applicability of regulations adopted under the Toxic Substances Control Act (15 U.S.C. 2601).

SOURCE: Amended at 21 Ill. Reg. 16391, effective December 8, 1997.

#### Section 742.110 Overview of Tiered Approach

- a) This Part presents an approach for developing remediation objectives (see Appendix A, Illustrations A and B) that include an option for exclusion of pathways from further consideration, use of area background concentrations as remediation objectives and three tiers for selecting applicable remediation objectives. An understanding of human exposure routes is necessary to properly conduct an evaluation under this approach. In some cases, applicable human exposure route(s) can be excluded from further consideration prior to any tier evaluation. Selecting which tier or combination of tiers to be used to develop remediation objectives is dependent on the site-specific conditions and

remediation goals. Tier 1 evaluations and Tier 2 evaluations are not prerequisites to conducting Tier 3 evaluations.

- b) A Tier 1 evaluation compares the concentration of contaminants detected at a site to the corresponding remediation objectives for residential and industrial/commercial properties contained in Appendix B, Tables A, B, C, D and E. To complete a Tier 1 evaluation, the extent and concentrations of the contaminants of concern, the groundwater class, the land use classification, human exposure routes at the site, and, if appropriate, soil pH, must be known. If remediation objectives are developed based on industrial/commercial property use, then institutional controls under Subpart J are required.
- c) A Tier 2 evaluation uses the risk based equations from the Soil Screening Level (SSL) and Risk Based Corrective Action (RBCA) listed in Appendix C, Tables A and C, respectively. In addition to the information that is required for a Tier 1 evaluation, site-specific information is used to calculate Tier 2 remediation objectives. As in Tier 1, Tier 2 evaluates residential and industrial/commercial properties only. If remediation objectives are developed based on industrial/commercial property use, then institutional controls under Subpart J are required.
- d) A Tier 3 evaluation allows alternative parameters and factors, not available under a Tier 1 or Tier 2 evaluation, to be considered when developing remediation objectives. Remediation objectives developed for conservation and agricultural properties can only be developed under Tier 3.
- e) Remediation objectives may be developed using area background concentrations or any of the three tiers if the evaluation is conducted in accordance with applicable requirements in Subparts D through I. When contaminant concentrations do not exceed remediation objectives developed under one of the tiers or area background procedures under Subpart D, further evaluation under any of the other tiers is not required.

#### Section 742.115      Key Elements

To develop remediation objectives under this Part, the following key elements shall be addressed.

- a) Exposure Routes
  - 1) This Part identifies the following as potential exposure routes to be addressed:
    - A) Inhalation;

- B) Soil ingestion;
  - C) Groundwater ingestion; and
  - D) Dermal contact with soil.
- 2) The evaluation of exposure routes under subsections (a)(1)(A),(a)(1)(B) and (a)(1)(C) of this Section is required for all sites when developing remediation objectives or excluding exposure pathways. Evaluation of the dermal contact exposure route is required for use of RBCA equations in Appendix C, Table C or use of formal risk assessment under Section 742.915.
  - 3) The groundwater ingestion exposure route is comprised of two components:
    - A) Migration from soil to groundwater (soil component); and
    - B) Direct ingestion of groundwater (groundwater component).
- b) Contaminants of Concern

The contaminants of concern to be remediated depend on the following:

- 1) The materials and wastes managed at the site;
- 2) The extent of the no further remediation determination being requested from the Agency pursuant to a specific program; and
- 3) The requirements applicable to the specific program, as listed at Section 742.105(b) under which the remediation is being performed.

c) Land Use

The present and post-remediation uses of the site where exposures may occur shall be evaluated. The land use of a site, or portion thereof, shall be classified as one of the following:

- 1) Residential property;
- 2) Conservation property;
- 3) Agricultural property; or
- 4) Industrial/commercial property.

Section 742.120 Site Characterization

Characterization of the extent and concentrations of contamination at a site shall be performed before beginning development of remediation objectives. The actual steps and methods taken to characterize a site are determined by the requirements applicable to the specific program under which site remediation is being addressed.

SUBPART B: GENERAL

Section 742.200 Definitions

Except as stated in this Section, or unless a different meaning of a word or term is clear from the context, the definition of words or terms in this Part shall be the same as that applied to the same words or terms in the Act.

"Act" means the Illinois Environmental Protection Act [415 ILCS 5] .

"ADL" means Acceptable Detection Limit, which is the detectable concentration of a substance that is equal to the lowest appropriate Practical Quantitation Limit (PQL) as defined in this Section.

"Agency" means the Illinois Environmental Protection Agency.

"Agricultural Property" means any real property for which its present or post-remediation use is for growing agricultural crops for food or feed either as harvested crops, cover crops or as pasture. This definition includes, but is not limited to, properties used for confinement or grazing of livestock or poultry and for silviculture operations. Excluded from this definition are farm residences, farm outbuildings and agrichemical facilities.

"Area Background" means *concentrations of regulated substances that are consistently present in the environment in the vicinity of a site that are the result of natural conditions or human activities, and not the result solely of releases at the site.* [415 ILCS 5/58.2]

"ASTM" means the American Society for Testing and Materials.

"Board" means the Illinois Pollution Control Board.

"Cancer Risk" means a unitless probability of an individual developing cancer from a defined exposure rate and frequency.

"Cap" means a barrier designed to prevent the infiltration of precipitation or other surface water, or impede the ingestion or inhalation of contaminants.



"Carcinogen" means *a contaminant that is classified as a category A1 or A2 carcinogen by the American Conference of Governmental Industrial Hygienists; a category 1 or 2A/2B carcinogen by the World Health Organization's International Agency for Research on Cancer; a "human carcinogen" or "anticipated human carcinogen" by the United States Department of Health and Human Service National Toxicological Program; or a category A or B1/B2 carcinogen by the United States Environmental Protection Agency in the integrated risk information system or a final rule issued in a Federal Register notice by the USEPA.* [415 ILCS 5/58.2]

"Class I Groundwater" means groundwater that meets the Class I: Potable Resource Groundwater criteria set forth in 35 Ill. Adm. Code 620.

"Class II Groundwater" means groundwater that meets the Class II: General Resource Groundwater criteria set forth in 35 Ill. Adm. Code 620.

"Conservation Property" means any real property for which present or post-remediation use is primarily for wildlife habitat.

"Construction Worker" means a person engaged on a temporary basis to perform work involving invasive construction activities including, but not limited to, personnel performing demolition, earth-moving, building, and routine and emergency utility installation or repair activities.

"Contaminant of Concern" or "Regulated Substance of Concern" means *any contaminant that is expected to be present at the site based upon past and current land uses and associated releases that are known to the person conducting a remediation based upon reasonable inquiry* [415 ILCS 5/58.2]

"Engineered Barrier" means a barrier designed or verified using engineering practices that limits exposure to or controls migration of the contaminants of concern.

"Environmental Land Use Control" means an instrument that meets the requirements of this Part and is placed in the chain of title to real property that limits or places requirements upon the use of the property for the purpose of protecting human health or the environment, is binding upon the property owner, heirs, successors, assigns, and lessees, and runs in perpetuity or until the Agency approves, in writing, removal of the limitation or requirement from the chain of title.

"Exposure Route" means the transport mechanism by which a contaminant of concern reaches a receptor.

"Federally Owned Property" means real property owned in fee by the United States of America on which institutional controls are sought to be placed in accordance with this Subpart.

“Federal Landholding Entity” means that federal department, agency, or instrumentality with the authority to occupy and control the day-to-day use, operation and management of Federally Owned Property.

"Free Product" means a contaminant that is present as a non-aqueous phase liquid for chemicals whose melting point is less than 30° C (e.g., liquid not dissolved in water).

“GIS” means Geographic Information System.

“GPS” means Global Positioning System.

*“Groundwater” means underground water which occurs within the saturated zone and geologic materials where the fluid pressure in the pore space is equal to or greater than atmospheric pressure. [415 ILCS 5/3.64]*

"Groundwater Quality Standards" means the standards for groundwater as set forth in 35 Ill. Adm. Code 620.

"Hazard Quotient" means the ratio of a single substance exposure level during a specified time period to a reference dose for that substance derived from a similar exposure period.

*"Highway" means any public way for vehicular travel which has been laid out in pursuance of any law of this State, or of the Territory of Illinois, or which has been established by dedication, or used by the public as a highway for 15 years, or which has been or may be laid out and connect a subdivision or platted land with a public highway and which has been dedicated for the use of the owners of the land included in the subdivision or platted land where there has been an acceptance and use under such dedication by such owners, and which has not been vacated in pursuance of law. The term "highway" includes rights of way, bridges, drainage structures, signs, guard rails, protective structures and all other structures and appurtenances necessary or convenient for vehicular traffic. A highway in a rural area may be called a "road", while a highway in a municipal area may be called a "street". (Illinois Highway Code [605 ILCS 5/2-202])*

*"Highway Authority" means with respect to a State highway; the County Board with respect to a county highway or a county unit district road if a discretionary function is involved and the County Superintendent of Highways if a ministerial function is involved; the Highway Commissioner with respect to a township or district road not in a county unit road district; or the corporate authorities of a municipality with respect to a municipal street. (Illinois Highway Code [605 ILCS 5/2-213])*

"Human Exposure Pathway" means a physical condition which may allow for a risk to human health based on the presence of all of the following: contaminants

of concern; an exposure route; and a receptor activity at the point of exposure that could result in contaminant of concern intake.

"Industrial/Commercial Property" means any real property that does not meet the definition of residential property, conservation property or agricultural property.

"Infiltration" means the amount of water entering into the ground as a result of precipitation.

"Institutional Control" means a legal mechanism for imposing a restriction on land use, as described in Subpart J.

"Land Use Control Memorandums of Agreement" mean agreements entered into between one or more agencies of the United States and the Illinois Environmental Protection Agency that limit or place requirements upon the use of Federally Owned Property for the purpose of protecting human health or the environment.

"Man-Made Pathways" means *constructed* physical conditions *that may allow for the transport of regulated substances including, but not limited to, sewers, utility lines, utility vaults, building foundations, basements, crawl spaces, drainage ditches, or previously excavated and filled areas.* [415 ILCS 5/58.2]

"Natural Pathways" means *natural* physical conditions that may allow for the transport of regulated substances including, but not limited to, soil, groundwater, sand seams and lenses, and gravel seams and lenses. [415 ILCS 5/58.2]

"Person" means an *individual, trust, firm, joint stock company, joint venture, consortium, commercial entity, corporation (including a government corporation), partnership, association, state, municipality, commission, political subdivision of a state, or any interstate body including the United States government and each department, agency, and instrumentality of the United States.* [415 ILCS 5/58.2]

"Point of Human Exposure" means the points at which human exposure to a contaminant of concern may reasonably be expected to occur. The point of human exposure is at the source, unless an institutional control limiting human exposure for the applicable exposure route has been or will be in place, in which case the point of human exposure will be the boundary of the institutional control. Point of human exposure may be at a different location than the point of compliance.

"PQL" means practical quantitation limit or estimated quantitation limit, which is the lowest concentration that can be reliably measured within specified limits of precision and accuracy for a specific laboratory analytical method during routine laboratory operating conditions in accordance with "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods", EPA Publication No. SW-846, incorporated by reference in Section 742.210. When applied to filtered water

samples, PQL includes the method detection limit or estimated detection limit in accordance with the applicable method revision in: "Methods for the Determination of Organic Compounds in Drinking Water", Supplement II", EPA Publication No. EPA/600/4-88/039; "Methods for the Determination of Organic Compounds in Drinking Water, Supplement III", EPA Publication No. EPA/600/R-95/131, all of which are incorporated by reference in Section 742.210.

"RBCA" means Risk Based Corrective Action as defined in ASTM E-1739-95, as incorporated by reference in Section 742.210.

"RCRA" means the Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6921).

"Reference Concentration (RfC)" means an estimate of a daily exposure, in units of milligrams of chemical per cubic meter of air (mg/m<sup>3</sup>), to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects during a portion of a lifetime (up to approximately seven years, subchronic) or for a lifetime (chronic).

"Reference Dose (RfD)" means an estimate of a daily exposure, in units of milligrams of chemical per kilogram of body weight per day (mg/kg/d), to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects during a portion of a lifetime (up to approximately seven years, subchronic) or for a lifetime (chronic).

"Regulated Substance" means *any hazardous substance as defined under Section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (P.L. 96-510) and petroleum products including crude oil or any fraction thereof, natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).* [415 ILCS 5/58.2]

"Residential Property" means *any real property that is used for habitation by individuals, or where children have the opportunity for exposure to contaminants through soil ingestion or inhalation at educational facilities, health care facilities, child care facilities or outdoor recreational areas.* [415 ILCS 5/58.2]

"Right of Way" means *the land, or interest therein, acquired for or devoted to a highway.* (Illinois Highway Code) [605 ILCS 5/2-217])

"Similar-Acting Chemicals" are chemical substances that have toxic or harmful effect on the same specific organ or organ system (see Appendix A.Tables E and F for a list of similar-acting chemicals with noncarcinogenic and carcinogenic effects).

"Site" means *any single location, place, tract of land or parcel of property, or portion thereof, including contiguous property separated by a public right-of-way.* 415 ILCS 5/58.2]

"Slurry Wall" means a man-made barrier made of geologic material which is constructed to prevent or impede the movement of contamination into a certain area.

"Soil Saturation Limit (C[sat])" means the contaminant concentration at which soil pore air and pore water are saturated with the chemical and the adsorptive limits of the soil particles have been reached.

"Solubility" means a chemical specific maximum amount of solute that can dissolve in a specific amount of solvent (groundwater) at a specific temperature.

"SPLP" means Synthetic Precipitation Leaching Procedure (Method 1312) as published in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", USEPA Publication No. SW-846, as incorporated by reference in Section 742.210.

"SSL" means Soil Screening Levels as defined in USEPA's Soil Screening Guidance: User's Guide and Technical Background Document, as incorporated by reference in Section 742.210.

"Stratigraphic Unit" means a site-specific geologic unit of native deposited material and/or bedrock of varying thickness (e.g., sand, gravel, silt, clay, bedrock, etc.). A change in stratigraphic unit is recognized by a clearly distinct contrast in geologic material or a change in physical features within a zone of gradation. For the purposes of this Part, a change in stratigraphic unit is identified by one or a combination of differences in physical features such as texture, cementation, fabric, composition, density, and/or permeability of the native material and/or bedrock.

"TCLP" means Toxicity Characteristic Leaching Procedure (Method 1311) as published in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", USEPA Publication No. SW-846, as incorporated by reference in Section 742.210.

"Total Petroleum Hydrocarbon (TPH)" means the additive total of all petroleum hydrocarbons found in an analytical sample.

"Volatile Organic Compounds (VOCs)" means organic chemical analytes identified as volatiles as published in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", USEPA Publication No. SW-846 (incorporated by reference in Section 742.210), method numbers 8010, 8011, 8015, 8020, 8021, 8030, 8031, 8240, 8260, 8315, and 8316. For analytes not listed in any category

in those methods, those analytes which have a boiling point less than 200°C and a vapor pressure greater than 0.1 Torr (mm Hg) at 20° C.

(Source: Amended at 25 Ill. Reg. 651, effective January 6, 2001)

Section 742.205 Severability

If any provision of this Part or its application to any person or under any circumstances is adjudged invalid, such adjudication shall not affect the validity of this Part as a whole or any portion not adjudged invalid.

Section 742.210 Incorporations by Reference

- a) The Board incorporates the following material by reference:

ASTM. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103 (215) 299-5400.

ASTM D 2974-87, Standard Test Methods for Moisture, Ash and Organic Matter of Peat and Other Organic Soils, approved May 29, 1987 (reapproved 1995).

ASTM D 2488-93, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), approved September 15, 1993.

ASTM D 1556-90, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method, approved June 29, 1990.

ASTM D 2167-94, Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method, approved March 15, 1994.

ASTM D 2922-91, Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth), approved December 23, 1991.

ASTM D 2937-94, Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method, approved June 15, 1994.

ASTM D 854-92, Standard Test Method for Specific Gravity of Soils, approved November 15, 1992.

ASTM D 2216-92, Standard Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock, approved June 15, 1992.

ASTM D 4959-89, Standard Test Method for Determination of Water (Moisture) Content of Soil by Direct Heating Method, approved June 30, 1989 (reapproved 1994).

ASTM D 4643-93, Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method, approved July 15, 1993.

ASTM D 5084-90, Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter, approved June 29, 1990.

ASTM D 422-63, Standard Test Method for Particle-Size Analysis of Soils, approved November 21, 1963 (reapproved 1990).

ASTM D 1140-92, Standard Test Method for Amount of Material in Soils Finer than the No. 200 (75  $\mu\text{m}$ ) Sieve, approved November 15, 1992.

ASTM D 3017-88, Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth), approved May 27, 1988.

ASTM D 4525-90, Standard Test Method for Permeability of Rocks by Flowing Air, approved May 25, 1990.

ASTM D 2487-93, Standard Test Method for Classification of Soils for Engineering Purposes, approved September 15, 1993.

ASTM E 1527-93, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process, approved March 15, 1993. Vol. 11.04.

ASTM E 1739-95, Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites, approved September 10, 1995.

Barnes, Donald G. and Dourson, Michael. (1988). Reference Dose (RfD): Description and Use in Health Risk Assessments. *Regulatory Toxicology and Pharmacology*. 8, 471-486.

GPO. Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20401, (202) 783-3238.

USEPA Guidelines for Carcinogenic Risk Assessment, 51 Fed. Reg. 33992-34003 (September 24, 1986).

"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", USEPA Publication number SW-846 (Third Edition, Final Update IIIA,

April 1998), as amended by Updates I, IIA, III, and IIIA (Document No. 955-001-00000-1).

"Methods for the Determination of Organic Compounds in Drinking Water", EPA Publication No. EPA/600/4-88/039 (December 1988 (Revised July 1991)).

"Methods for the Determination of Organic Compounds in Drinking Water, Supplement II", EPA Publication No. EPA/600/R-92/129 (August 1992).

"Methods for the Determination of Organic Compounds in Drinking Water, Supplement III", EPA Publication No. EPA/600/R-95/131 (August 1995).

IRIS. Integrated Risk Information System, National Center for Environmental Assessment, U.S. Environmental Protection Agency, 26 West Martin Luther King Drive, MS-190, Cincinnati, OH 45268, (513) 569-7254.

"Reference Dose (RfD): Description and Use in Health Risk Assessments", Background Document 1A (March 15, 1993).

"EPA Approach for Assessing the Risks Associated with Chronic Exposures to Carcinogens", Background Document 2 (January 17, 1992).

Nelson, D.W., and L.E. Sommers. (1982). Total carbon, organic carbon, and organic matter. In: A.L. Page (ed.), Methods of Soil Analysis. Part 2. Chemical and Microbiological Properties. 2nd Edition, pp. 539-579, American Society of Agronomy. Madison, WI.

NTIS. National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161, (703) 487-4600.

"Dermal Exposure Assessment: Principles and Applications", EPA Publication No. EPA/600/8-91/011B (January 1992).

"Exposure Factors Handbook", EPA Publication No. EPA/600/8-89/043 (July 1989).

"Risk Assessment Guidance for Superfund, Vol. I; Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors", OSWER Directive 9285.6-03 (March 1991).

"Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites," EPA Publication No. EPA/600/8-85/002 (February 1985), PB 85-192219.



"Risk Assessment Guidance for Superfund, Volume I; Human Health Evaluation Manual (Part A)", Interim Final, EPA Publication No. EPA/540/1-89/002 (December 1989).

"Risk Assessment Guidance for Superfund, Volume I; Human Health Evaluation Manual, Supplemental Guidance, Dermal Risk Assessment Interim Guidance", Draft (August 18, 1992).

"Soil Screening Guidance: Technical Background Document", EPA Publication No. EPA/540/R-95/128, PB 96-963502 (May 1996).

"Soil Screening Guidance: User's Guide", EPA Publication No. EPA/540/R-96/018, PB 96-963505 (April 1996).

"Superfund Exposure Assessment Manual", EPA Publication No. EPA/540/1-88/001 (April 1988).

RCRA Facility Investigation Guidance, Interim Final, developed by USEPA (EPA 530/SW-89-031), 4 volumes (May 1989).

- b) CFR (Code of Federal Regulations). Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (202)783-3238:

40 CFR 761 (1998).

- c) This Section incorporates no later editions or amendments.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

#### Section 742.215      Determination of Soil Attenuation Capacity

- a) The concentrations of organic contaminants of concern remaining in the soil shall not exceed the attenuation capacity of the soil, as determined under subsection (b) of this Section.
- b) The soil attenuation capacity is not exceeded if:
  - 1) The sum of the organic contaminant residual concentrations analyzed for the purposes of the remediation program for which the analysis is performed, at each discrete sampling point, is less than the natural organic carbon fraction of the soil. If the information relative to the concentration of other organic contaminants is available, such information shall be included in the sum. The natural organic carbon fraction ( $f_{oc}$ ) shall be either:

- A) A default value of 6000 mg/kg for soils within the top meter and 2000 mg/kg for soils below one meter of the surface; or
  - B) A site-specific value as measured by ASTM D2974-87, Nelson and Sommers, or by SW-846 Method 9060: Total Organic Carbon, as incorporated by reference in Section 742.210;
- 2) The total petroleum hydrocarbon concentration is less than the natural organic carbon fraction of the soil as demonstrated using a method approved by the Agency. The method selected shall be appropriate for the contaminants of concern to be addressed; or
  - 3) Another method, approved by the Agency, shows that the soil attenuation capacity is not exceeded.

Section 742.220 Determination of Soil Saturation Limit

- a) For any organic contaminant that has a melting point below 30°C, the remediation objective for the inhalation exposure route developed under Tier 2 shall not exceed the soil saturation limit, as determined under subsection (c) of this Section.
- b) For any organic contaminant, the remediation objective under Tier 2 for the soil component of the groundwater ingestion exposure route shall not exceed the soil saturation limit, as determined under subsection (c) of this Section.
- c) The soil saturation limit shall be:
  - 1) The value listed in Appendix A, Table A for that specific contaminant;
  - 2) A value derived from Equation S29 in Appendix C, Table A; or
  - 3) A value derived from another method approved by the Agency.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

Section 742.225 Demonstration of Compliance with Remediation Objectives

Compliance is achieved if each sample result does not exceed that respective remediation objective unless a person elects to proceed under subsections (c), (d) and (e) of this Section.

- a) Compliance with groundwater remediation objectives developed under Subparts D through F and H through I shall be demonstrated by comparing the contaminant concentrations of discrete samples at each sample point to the applicable groundwater remediation objective. Sample points shall be determined by the program under which remediation is performed.

- b) Unless the person elects to composite samples or average sampling results as provided in subsections (c) and (d) of this Section, compliance with soil remediation objectives developed under Subparts D through G and I shall be demonstrated by comparing the contaminant concentrations of discrete samples to the applicable soil remediation objective.
- 1) Except as provided in subsections (c) and (d) of this Section, compositing of samples is not allowed.
  - 2) Except as provided in subsections (c) and (d) of this Section, averaging of sample results is not allowed.
  - 3) Notwithstanding subsections (c) and (d) of this Section, compositing of samples and averaging of sample results is not allowed for the construction worker population.
  - 4) The number of sampling points required to demonstrate compliance is determined by the requirements applicable to the program under which remediation is performed.
- c) If a person chooses to composite soil samples or average soil sample results to demonstrate compliance relative to the soil component of the groundwater ingestion exposure route, the following requirements apply:
- 1) A minimum of two sampling locations for every 0.5 acre of contaminated area is required, with discrete samples at each sample location obtained at every two feet of depth, beginning at six inches below the ground surface and continuing through the zone of contamination. Alternatively, a sampling method may be approved by the Agency based on an appropriately designed site-specific evaluation. Samples obtained at or below the water table shall not be used in compositing or averaging.
  - 2) For contaminants of concern other than volatile organic contaminants:
    - A) Discrete samples from the same boring may be composited.
    - B) Discrete sample results from the same boring may be averaged.
  - 3) For volatile organic contaminants:
    - A) Compositing of samples is not allowed.
    - B) Discrete sample results from the same boring may be averaged.
- d) If a person chooses to composite soil samples or average soil sample results to demonstrate compliance relative to the inhalation exposure route or ingestion exposure route, the following requirements apply:

- 1) A person shall submit a sampling plan for Agency approval, based upon a site-specific evaluation;
  - 2) For volatile organic compounds, compositing of samples is not allowed; and
  - 3) All samples shall be collected within the contaminated area.
- e) When averaging under this Section, if no more than 50% of sample results are reported as "non-detect", "no contamination", "below detection limits", or similar terms, such results shall be included in the averaging calculation as one-half of the reported analytical detection limit for the contaminant. However, when performing a test for normal or lognormal distribution for the purpose of calculating a 95% Upper Confidence Limit of the mean for a contaminant, a person may substitute for each non-detect value a randomly generated value between, but not including, zero and the reported analytical detection limit. If more than 50% of sample results are "non-detect", another statistically valid procedure approved by the Agency may be used to determine an average.
- f) All soil samples collected after August 15, 2001, shall be reported on a dry weight basis for the purpose of demonstrating compliance, with the exception of the TCLP and SPLP and the property pH.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

#### Section 742.230 Agency Review and Approval

- a) Documents and requests filed with the Agency under this Part shall be submitted in accordance with the procedures applicable to the specific program under which remediation is performed.
- b) Agency review and approval of documents and requests under this Part shall be performed in accordance with the procedures applicable to the specific program under which the remediation is performed.

### SUBPART C: EXPOSURE ROUTE EVALUATIONS

#### Section 742.300 Exclusion of Exposure Route

- a) This Subpart sets forth requirements to demonstrate that an actual or potential impact to a receptor or potential receptor from a contaminant of concern can be excluded from consideration from one or more exposure routes. If an evaluation under this Subpart demonstrates the applicable requirements for excluding an exposure route are met, then the exposure route is excluded from consideration and no remediation objective(s) need be developed for that exposure route.

- b) No exposure route may be excluded from consideration until characterization of the extent and concentrations of contaminants of concern at a site has been performed. The actual steps and methods taken to characterize a site shall be determined by the specific program requirements under which the site remediation is being addressed.
- c) As an alternative to the use of the requirements in this Subpart, a person may use the procedures for evaluation of exposure routes under Tier 3 as set forth in Section 742.925.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

#### Section 742.305 Contaminant Source and Free Product Determination

No exposure route shall be excluded from consideration relative to a contaminant of concern unless the following requirements are met:

- a) The sum of the concentrations of all organic contaminants of concern shall not exceed the attenuation capacity of the soil as determined under Section 742.215;
- b) The concentrations of any organic contaminants of concern remaining in the soil shall not exceed the soil saturation limit as determined under Section 742.220;
- c) Any soil which contains contaminants of concern shall not exhibit any of the characteristics of reactivity for hazardous waste as determined under 35 Ill. Adm. Code 721.123;
- d) Any soil which contains contaminants of concern shall not exhibit a pH less than or equal to 2.0 or greater than or equal to 12.5, as determined by SW-846 Method 9040B: pH Electrometric for soils with 20% or greater aqueous (moisture) content or by SW-846 Method 9045C: Soil pH for soils with less than 20% aqueous (moisture) content as incorporated by reference in Section 742.210;
- e) Any soil which contains contaminants of concern in the following list of inorganic chemicals or their salts shall not exhibit any of the characteristics of toxicity for hazardous waste as determined by 35 Ill. Adm. Code 721.124, or an alternative method approved by the Agency: arsenic, barium, cadmium, chromium, lead, mercury, selenium or silver; and
- f) If contaminants of concern include polychlorinated biphenyls (PCBs), the concentration of any PCBs in the soil shall not exceed 50 parts per million as determined by SW-846 Methods.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

#### Section 742.310 Inhalation Exposure Route

The inhalation exposure route may be excluded from consideration if:

- a) The requirements of Sections 742.300 and 742.305 are met;
- b) An approved engineered barrier is in place that meets the requirements of Subpart K;
- c) Safety precautions for the construction worker are taken if the Tier 1 construction worker remediation objectives are exceeded; and
- d) An institutional control, in accordance with Subpart J, will be placed on the property.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

#### Section 742.315 Soil Ingestion Exposure Route

The soil ingestion exposure route may be excluded from consideration if:

- a) The requirements of Sections 742.300 and 742.305 are met;
- b) An approved engineered barrier is in place that meets the requirements of Subpart K;
- c) Safety precautions for the construction worker are taken if the Tier 1 construction worker remediation objectives are exceeded; and
- d) An institutional control, in accordance with Subpart J, will be placed on the property.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

#### Section 742.320 Groundwater Ingestion Exposure Route

The groundwater ingestion exposure route may be excluded from consideration if:

- a) The requirements of Sections 742.300 and 742.305 are met;
- b) The corrective action measures have been completed to remove any free product to the maximum extent practicable;
- c) The source of the release is not located within the minimum or designated maximum setback zone or within a regulated recharge area of a potable water supply well;

- d) As demonstrated in accordance with Section 742.1015, for any area within 2500 feet from the source of the release, an ordinance adopted by a unit of local government is in place that effectively prohibits the installation of potable water supply wells (and the use of such wells);
- e) As demonstrated using Equation R26, in Appendix C, Table C, in accordance with Section 742.810, the concentration of any contaminant of concern in groundwater within the minimum or designated maximum setback zone of an existing potable water supply well will meet the applicable Tier 1 groundwater remediation objective; and
- f) As demonstrated using Equation R26, in Appendix C, Table C, in accordance with Section 742.810, the concentration of any contaminant of concern in groundwater discharging into a surface water will meet the applicable surface water quality standard under 35 Ill. Adm. Code 302.

#### SUBPART D: DETERMINING AREA BACKGROUND

##### Section 742.400 Area Background

This Subpart provides procedures for determining area background concentrations for contaminants of concern. Except as described in Section 742.415(c) and (d) of this Subpart, area background concentrations may be used as remediation objectives for contaminants of concern at a site.

##### Section 742.405 Determination of Area Background for Soil

- a) Soil sampling results shall be obtained for purposes of determining area background levels in accordance with the following procedures:
  - 1) For volatile organic contaminants, sample results shall be based on discrete samples;
  - 2) Unless an alternative method is approved by the Agency, for contaminants other than volatile organic contaminants, sample results shall be based on discrete samples or composite samples. If a person elects to use composite samples, each 0.5 acre of the area to be sampled shall be divided into quadrants and 5 aliquots of equal volume per quadrant shall be composited into 1 sample;
  - 3) Samples shall be collected from similar depths and soil types, which shall be consistent with the depths and soil types in which maximum levels of contaminants are found in the areas of known or suspected releases; and

- 4) Samples shall be collected from areas of the site or adjacent to the site that are unaffected by known or suspected releases at or from the site. If the sample results show an impact from releases at or from the site, then the sample results shall not be included in determining area background levels under this Part.
- b) Area background shall be determined according to one of the following approaches:
- 1) Statewide Area Background Approach:
    - A) The concentrations of inorganic chemicals in background soils listed in Appendix A, Table G may be used as the upper limit of the area background concentration for the site. The first column to the right of the chemical name presents inorganic chemicals in background soils for counties within Metropolitan Statistical Areas. Counties within Metropolitan Statistical Areas are identified in Appendix A, Table G, Footnote a. Sites located in counties outside Metropolitan Statistical Areas shall use the concentrations of inorganic chemicals in background soils shown in the second column to the right of the chemical name.
    - B) Soil area background concentrations determined according to this statewide area background approach shall be used as provided in Section 742.415(b) of this Part. For each parameter whose sampling results demonstrate concentrations above those in Appendix A, Table G, the person shall develop appropriate soil remediation objectives in accordance with this Part, or may determine area background in accordance with subsection (b)(2) of this Section.
  - 2) A statistically valid approach for determining area background concentrations appropriate for the characteristics of the data set, and approved by the Agency.

Section 742.410 Determination of Area Background for Groundwater

- a) Groundwater sampling results shall be obtained for purposes of determining area background in accordance with the following procedures:
- 1) Samples shall be collected from areas of the site or adjacent to the site that are unaffected by releases at the site;
  - 2) The background monitoring wells shall be sufficient in number to account for the spatial and temporal variability, size, and number of known or



suspected off-site releases of contaminants of concern, and the hydrogeological setting of the site;

- 3) The samples shall be collected in consecutive quarters for a minimum of one year for each well unless another sample schedule is approved by the Agency;
  - 4) The samples shall be collected from the same stratigraphic unit(s) as the groundwater contamination at the site; and
  - 5) The background monitoring wells shall be located hydraulically upgradient from the release(s) of contaminants of concern, unless a person demonstrates to the Agency that the upgradient location is undefinable or infeasible.
- b) Area background shall be determined according to one of the following approaches:
- 1) Prescriptive Approach:
    - A) If more than 15% of the groundwater sampling results for a chemical obtained in accordance with subsection (a) of this Section are less than the appropriate detection limit for that chemical, the Prescriptive Approach may not be used for that chemical. If 15% or less of the sampling results are less than the appropriate detection limit, a concentration equal to one-half the detection limit shall be used for that chemical in the calculations contained in this Prescriptive Approach.
    - B) The groundwater sampling results obtained in accordance with subsection (a) of this Section shall be used to determine if the sample set is normally distributed. The Shapiro-Wilk Test of Normality shall be used to determine whether the sample set is normally distributed, if the sample set for the background well(s) contains 50 or fewer samples. Values necessary for the Shapiro-Wilk Test of Normality shall be determined using Appendix A, Tables C and D. If the computed value of W is greater than the 5% Critical Value in Appendix A, Table D, the sample set shall be assumed to be normally distributed, and the Prescriptive Approach is allowed. If the computed value of W is less than 5% Critical Value in Appendix A, Table D, the sample set shall be assumed to not be normally distributed, and the Prescriptive Approach shall not be used.
    - C) If the sample set contains at least ten sample results, the Upper Tolerance Limit (UTL) of a normally distributed sample set may

be calculated using the mean ( $\bar{x}$ ) and standard deviation(s), from:

$$UTL = \bar{x} + (K \cdot s),$$

where  $K$  = the one-sided normal tolerance factor for estimating the 95% upper confidence limit of the 95th percentile of a normal distribution. Values for  $K$  shall be determined using Appendix A, Table B.

- D) If the sample set contains at least ten sample results, the UTL shall be the upper limit of the area background concentration for the site. If the sample set contains fewer than ten sample results, the maximum value of the sample set shall be the upper limit of the area background concentration for the site.
  - E) This Prescriptive Approach shall not be used for determining area background for the parameter pH.
- 2) Another statistically valid approach for determining area background concentrations appropriate for the characteristics of the data set, and approved by the Agency.

Section 742.415 Use of Area Background Concentration

- a) A person may request that area background concentration determined pursuant to Sections 742.405 and 742.410 be used according to the provisions of subsection (b) of this Section. Such request shall address the following:
  - 1) The natural or man-made pathways of any suspected off-site contamination reaching the site;
  - 2) Physical and chemical properties of suspected off-site contaminants of concern reaching the site; and
  - 3) The location and justification of all background sampling points.
- b) Except as specified in subsections (c) and (d) of this Section, an area background concentration may be used as follows:
  - 1) To support a request to exclude a chemical as a contaminant of concern from further consideration for remediation at a site due to its presence as a result of background conditions; or
  - 2) As a remediation objective for a contaminant of concern at a site in lieu of an objective developed pursuant to the other procedures of this Part.

- c) An area background concentration shall not be used IN THE EVENT THAT THE AGENCY HAS DETERMINED IN WRITING THAT THE BACKGROUND LEVEL FOR A REGULATED SUBSTANCE POSES AN ACUTE THREAT TO HUMAN HEALTH OR THE ENVIRONMENT AT THE SITE WHEN CONSIDERING THE POST-REMEDIAL ACTION LAND USE. (Section 58.5(b)(3) of the Act)
- d) IN THE EVENT THAT THE CONCENTRATION OF A REGULATED SUBSTANCE OF CONCERN ON THE SITE EXCEEDS A REMEDIATION OBJECTIVE ADOPTED BY THE BOARD FOR RESIDENTIAL LAND USE, THE PROPERTY MAY NOT BE CONVERTED TO RESIDENTIAL USE UNLESS SUCH REMEDIATION OBJECTIVE OR AN ALTERNATIVE RISK-BASED REMEDIATION OBJECTIVE FOR THAT REGULATED SUBSTANCE OF CONCERN IS FIRST ACHIEVED. If the land use is restricted, there shall be an institutional control in place in accordance with Subpart J. (Section 58.5(b)(2) of the Act)

#### SUBPART E: TIER 1 EVALUATION

##### Section 742.500 Tier 1 Evaluation Overview

- a) A Tier 1 evaluation compares the concentration of each contaminant of concern detected at a site to the baseline remediation objectives provided in Appendix B, Tables A, B, C, D and E. Use of Tier 1 remediation objectives requires only limited site-specific information: concentrations of contaminants of concern, groundwater classification, land use classification, and, if appropriate, soil pH. (See Appendix B, Illustration A.)
- b) Although Tier 1 allows for differentiation between residential and industrial/commercial property use of a site, an institutional control under Subpart J is required where remediation objectives are based on an industrial/commercial property use.
- c) Any given exposure route is not a concern if the concentration of each contaminant of concern detected at the site is below the Tier 1 value of that given route. In such a case, no further evaluation of that route is necessary.

##### Section 742.505 Tier 1 Soil and Groundwater Remediation Objectives

- a) Soil
  - 1) Inhalation Exposure Route

- A) The Tier 1 soil remediation objectives for this exposure route based upon residential property use are listed in Appendix B, Table A.
  - B) The Tier 1 soil remediation objectives for this exposure route based upon industrial/commercial property use are listed in Appendix B, Table B. Soil remediation objective determinations relying on this table require use of institutional controls in accordance with Subpart J.
- 2) Ingestion Exposure Route
- A) The Tier 1 soil remediation objectives for this exposure route based upon residential property use are listed in Appendix B, Table A.
  - B) The Tier 1 soil remediation objectives for this exposure route based upon industrial/commercial property use are listed in Appendix B, Table B. Soil remediation objective determinations relying on this table require use of institutional controls in accordance with Subpart J.
- 3) Soil Component of the Groundwater Ingestion Route
- A) The Tier 1 soil remediation objectives for this exposure route based upon residential property use are listed in Appendix B, Table A.
  - B) The Tier 1 soil remediation objectives for this exposure route based upon industrial/commercial property use are listed in Appendix B, Table B.
  - C) The pH-dependent Tier 1 soil remediation objectives for identified ionizable organics or inorganics for the soil component of the groundwater ingestion exposure route (based on the total amount of contaminants present in the soil sample results and groundwater classification) are provided in Appendix B, Tables C and D.
  - D) Values used to calculate the Tier 1 soil remediation objectives for this exposure route are listed in Appendix B, Table F.
- 4) Evaluation of the dermal contact with soil exposure route is not required under Tier 1.
- b) Groundwater

- 1) The Tier 1 groundwater remediation objectives for the groundwater component of the groundwater ingestion route are listed in Appendix B, Table E.
- 2) The Tier 1 groundwater remediation objectives for this exposure route are given for Class I and Class II groundwaters, respectively.
- 3) The evaluation of 35 Ill. Adm. Code 620.615 regarding mixtures of similar-acting chemicals shall be considered satisfied for Class I groundwater at the point of human exposure if:
  - A) No more than one similar-acting noncarcinogenic chemical as listed in Appendix A, Table E is detected in the groundwater at the site; and
  - B) No carcinogenic contaminant of concern as listed in Appendix A, Table H is detected in any groundwater sample associated with the site, using analytical procedures capable of achieving either the 1 in 1,000,000 cancer risk concentration or the ADL, whichever is greater.
- 4) If the conditions of subsection (b)(3) of this Section are not met, the Class I groundwater remediation objectives set forth in Appendix B, Table E shall be corrected for the cumulative effect of mixtures of similar-acting chemicals using the following methodologies:
  - A) For noncarcinogenic chemicals, the methodologies set forth at Section 742.805(c) or Section 742.915(h) shall be used; and
  - B) For carcinogenic chemicals, the methodologies set forth at Section 742.805(d) or Section 742.915(h) shall be used.

SOURCE: Amended at 21 Ill. Reg. 16391, effective December 8, 1997.

Section 742.510 Tier 1 Remediation Objectives Tables

- a) Soil remediation objectives are listed in Appendix B, Tables A, B, C and D.
  - 1) Appendix B, Table A is based upon residential property use.
    - A) The first column to the right of the chemical name lists soil remediation objectives for the soil ingestion exposure route.
    - B) The second column lists the soil remediation objectives for the inhalation exposure route.

- C) The third and fourth columns list soil remediation objectives for the soil component of the groundwater ingestion exposure route for the respective classes of groundwater:
    - i) Class I groundwater; and
    - ii) Class II groundwater.
  - D) The final column lists the Acceptable Detection Limit (ADL), only where applicable.
- 2) Appendix B, Table B is based upon industrial/commercial property use.
- A) The first and third columns to the right of the chemical name list the soil remediation objectives for the soil ingestion exposure route based on two receptor populations:
    - i) Industrial/commercial; and
    - ii) Construction worker.
  - B) The second and fourth columns to the right of the chemical name list the soil remediation objectives for the inhalation exposure route based on two receptor populations:
    - i) Industrial/commercial; and
    - ii) Construction worker.
  - C) The fifth and sixth columns to the right of the chemical name list the soil remediation objectives for the soil component of the groundwater ingestion exposure route for two classes of groundwater:
    - i) Class I groundwater; and
    - ii) Class II groundwater.
- 3) Appendix B, Tables C and D set forth pH specific soil remediation objectives for inorganic and ionizing organic chemicals for the soil component of the groundwater ingestion route.
- A) Table C sets forth remediation objectives based on Class I groundwater and Table D sets forth remediation objectives based on Class II groundwater.

- B) The first column in Tables C and D lists the chemical names.
  - C) The second through ninth columns to the right of the chemical names list the pH based soil remediation objectives.
- 4) For the inorganic chemicals listed in Appendix B, Tables A and B, the soil component of the groundwater ingestion exposure route shall be evaluated using TCLP (SW-846 Method 1311) or SPLP (SW-846 Method 1312), incorporated by reference at Section 742.210 unless a person chooses to evaluate the soil component on the basis of the total amount of contaminant in a soil sample result in accordance with subsection (a)(5) of this Section.
  - 5) For those inorganic and ionizing organic chemicals listed in Appendix B, Tables C and D, if a person elects to evaluate the soil component of the groundwater ingestion exposure route based on the total amount of contaminant in a soil sample result (rather than TCLP or SPLP analysis), the person shall determine the soil pH at the site and then select the appropriate soil remediation objectives based on Class I and Class II groundwaters from Tables C and D, respectively. If the soil pH is less than 4.5 or greater than 8.0, then Tables C and D cannot be used.
  - 6) Unless one or more exposure routes are excluded from consideration under Subpart C, the most stringent soil remediation objective of the exposure routes (i.e., soil ingestion exposure route, inhalation exposure route, and soil component of the groundwater ingestion exposure route) shall be compared to the concentrations of soil contaminants of concern measured at the site. When using Appendix B, Table B to select soil remediation objectives for the ingestion exposure route and inhalation exposure route, the remediation objective shall be the more stringent soil remediation objective of the industrial/commercial populations and construction worker populations.
  - 7) Confirmation sample results may be averaged or soil samples may be composited in accordance with Section 742.225.
  - 8) If a soil remediation objective for a chemical is less than the ADL, the ADL shall serve as the soil remediation objective.
- b) Groundwater remediation objectives for the groundwater component of the groundwater ingestion exposure route are listed in Appendix B, Table E. However, Appendix B, Table E must be corrected for cumulative effect of mixtures of similar-acting noncarcinogenic chemicals as set forth in Section 742.505(b)(3).

- 1) The first column to the right of the chemical name lists groundwater remediation objectives for Class I groundwater, and the second column lists the groundwater remediation objectives for Class II groundwater.
  - 2) To use Appendix B, Table E of this Part, the 35 Ill. Adm. Code 620 classification for groundwater at the site shall be determined. The concentrations of groundwater contaminants of concern at the site are compared to the applicable Tier 1 groundwater remediation objectives for the groundwater component of the groundwater ingestion exposure route in Appendix B, Table E.
- c) For contaminants of concern not listed in Appendix B, Tables A, B and E, a person may request site-specific remediation objectives from the Agency or propose site-specific remediation objectives in accordance with 35 Ill. Adm. Code 620, Subpart I of this Part, or both.

#### SUBPART F: TIER 2 GENERAL EVALUATION

##### Section 742.600 Tier 2 Evaluation Overview

- a) Tier 2 remediation objectives are developed through the use of equations which allow site-specific data to be used. (See Appendix C, Illustrations A and B.) The equations, identified in Appendix C, Tables A and C may be used to develop Tier 2 remediation objectives.
- b) Tier 2 evaluation is only required for contaminants of concern and corresponding exposure routes (except where excluded from further consideration under Subpart C) exceeding the Tier 1 remediation objectives. When conducting Tier 2 evaluations, the values used in the calculations must have the appropriate units of measure as identified in Appendix C, Tables B and D.
- c) Any development of remediation objectives using site-specific information or equations outside the Tier 2 framework shall be evaluated under Tier 3.
- d) Any development of a remediation objective under Tier 2 shall not use a target hazard quotient greater than one at the point of human exposure or a target cancer risk greater than 1 in 1,000,000 at the point of human exposure.
- e) In conducting a Tier 2 evaluation, the following conditions shall be met:
  - 1) For each discrete sample, the total soil contaminant concentration of either a single contaminant or multiple contaminants of concern shall not exceed the attenuation capacity of the soil as provided in Section 742.215.



- 2) Remediation objectives for noncarcinogenic compounds which affect the same target organ, organ system or similar mode of action shall meet the requirements of Section 742.720.
  - 3) The soil remediation objectives based on the inhalation and the soil component of the groundwater ingestion exposure routes shall not exceed the soil saturation limit as provided in Section 742.220.
- f) If the calculated Tier 2 soil remediation objective for an applicable exposure route is more stringent than the corresponding Tier 1 remediation objective, then the Tier 1 remediation objective applies.
  - g) If the calculated Tier 2 soil remediation objective for an exposure route is more stringent than the Tier 1 soil remediation objective(s) for the other exposure routes, then the Tier 2 calculated soil remediation objective applies and Tier 2 soil remediation objectives for the other exposure routes are not required.
  - h) If the calculated Tier 2 soil remediation objective is less stringent than one or more of the soil remediation objectives for the remaining exposure routes, then the Tier 2 values are calculated for the remaining exposure route(s) and the most stringent Tier 2 calculated value applies.

Section 742.605      Land Use

- a) Present and post-remediation land use is evaluated in a Tier 2 evaluation. Acceptable exposure factors for the Tier 2 evaluation for residential, industrial/commercial, and construction worker populations are provided in the far right column of Appendix C, Tables B and D. Use of exposure factors different from those in Appendix C, Tables B and D must be approved by the Agency as part of a Tier 3 evaluation.
- b) If a Tier 2 evaluation is based on an industrial/commercial property use, then:
  - 1) Construction worker populations shall also be evaluated; and
  - 2) Institutional controls are required in accordance with Subpart J.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

Section 742.610      Chemical and Site Properties

- a) Physical and Chemical Properties of Contaminants

Tier 2 evaluations require information on the physical and chemical properties of the contaminants of concern. The physical and chemical properties used in a Tier 2 evaluation are contained in Appendix C, Table E. If the site has contaminants

not included in this table, a person may request the Agency to provide the applicable physical and chemical input values or may propose input values under Subpart I. If a person proposes to apply values other than those in Appendix C, Table E, or those provided by the Agency, the evaluation shall be considered under Tier 3.

b) Soil and Groundwater Parameters

- 1) A Tier 2 evaluation requires examination of soil and groundwater parameters. The parameters that may be varied, and the conditions under which these parameters are determined as part of Tier 2, are summarized in Appendix C, Tables B and D. If a person proposes to vary site-specific parameters outside of the framework of these tables, the evaluation shall be considered under Tier 3.
- 2) To determine site-specific physical soil parameters, a minimum of one boring per 0.5 acre of contamination shall be collected. This boring must be deep enough to allow the collection of the required field measurements. The site-specific physical soil parameters must be determined from the portion of the boring representing the stratigraphic unit(s) being evaluated. For example, if evaluating the soil component of the groundwater ingestion exposure route, two samples from the boring will be required:
  - A) A sample of the predominant soil type for the vadose zone; and
  - B) A sample of the predominant soil type for the saturated zone.
- 3) A site-specific SSL dilution factor (used in developing soil remediation objectives based upon the protection of groundwater) may be determined by substituting site information in Equation S22 in Appendix C, Table A. To make this demonstration, a minimum of three monitoring wells shall be used to determine the hydraulic gradient. As an alternative, the default dilution factor value listed in Appendix C, Table B may be used. If monitoring wells are used to determine the hydraulic gradient, the soil taken from the borings shall be visually inspected to ensure there are no significant differences in the stratigraphy. If there are similar soil types in the field, one boring shall be used to determine the site-specific physical soil parameters. If there are significant differences, all of the borings shall be evaluated before determining the site-specific physical soil parameters for the site.
- 4) Not all of the parameters identified in Appendix C, Tables B and D need to be determined on a site-specific basis. A person may choose to collect partial site-specific information and use default values as listed in Appendix C, Tables B and D for the rest of the parameters.

## SUBPART G: TIER 2 SOIL EVALUATION

### Section 742.700 Tier 2 Soil Evaluation Overview

- a) Tier 2 remediation objectives are developed through the use of models which allow site-specific data to be considered. Appendix C, Tables A and C list equations that shall be used under a Tier 2 evaluation to calculate soil remediation objectives prescribed by SSL and RBCA models, respectively. (See also Appendix C, Illustration A.)
- b) Appendix C, Table A lists equations that are used under the SSL model. (See also Appendix C, Illustration A.) The SSL model has equations to evaluate the following human exposure routes:
  - 1) Soil ingestion exposure route;
  - 2) Inhalation exposure route for:
    - A) Organic contaminants;
    - B) Fugitive dust; and
  - 3) Soil component of the groundwater ingestion exposure route.
- c) Evaluation of the dermal exposure route is not required under the SSL model.
- d) Appendix C, Table C lists equations that are used under the RBCA model. (See also Appendix C, Illustration A.) The RBCA model has equations to evaluate human exposure based on the following:
  - 1) The combined exposure routes of inhalation of vapors and particulates, soil ingestion and dermal contact with soil;
  - 2) The ambient vapor inhalation (outdoor) route from subsurface soils;
  - 3) Soil component of the groundwater ingestion route; and
  - 4) Groundwater ingestion exposure route.
- e) The equations in either Appendix C, Table A or C may be used to calculate remediation objectives for each contaminant of concern under Tier 2, if the following requirements are met:
  - 1) The Tier 2 soil remediation objectives for the ingestion and inhalation exposure routes shall use the applicable equations from the same approach (i.e., SSL equations in Appendix C, Table C).

- 2) The equations used to calculate soil remediation objectives for the soil component of the groundwater ingestion exposure route are not dependent on the approach utilized to calculate soil remediation objectives for the other exposure routes. For example, it is acceptable to use the SSL equations for calculating Tier 2 soil remediation objectives for the ingestion and inhalation exposure routes, and the RBCA equations for calculating Tier 2 soil remediation objectives for the soil component of the groundwater ingestion exposure route.
  - 3) Combining equations from Appendix C, Tables A and C to form a new model is not allowed. In addition, Appendix C, Tables A and C must use their own applicable parameters identified in Appendix C, Tables B and D, respectively.
- f) In calculating soil remediation objectives for industrial/commercial property use, applicable calculations shall be performed twice: once using industrial/commercial population default values and once using construction worker population default values. The more stringent soil remediation objectives derived from these calculations must be used for further Tier 2 evaluations.
  - g) Tier 2 data sheets provided by the Agency shall be used to present calculated Tier 2 remediation objectives, if required by the particular program for which remediation is being performed.
  - h) The RBCA equations which rely on the parameter Soil Water Sorption Coefficient ( $k_s$ ) can only be used for ionizing organics and inorganics by substituting values for  $k_s$  from Appendix C, Tables I and J, respectively. This will also require the determination of a site-specific value for soil pH.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

#### Section 742.705 Parameters for Soil Remediation Objective Equations

- a) Appendix C, Tables B and D list the input parameters for the SSL and RBCA equations, respectively. The first column lists each symbol as it is presented in the equation. The next column defines the parameters. The third column shows the units for the parameters. The fourth column identifies where information on the parameters can be obtained (i.e., field measurement, applicable equation(s), reference source, or default value). The last column identifies how the parameters can be generated.
- b) Default Values

Default values are numerical values specified for use in the Tier 2 equations. The fourth column of Appendix C, Tables B and D denotes if the default values are

from the SSL model, RBCA model, or some other source. The last column of Appendix C, Tables B and D lists the numerical values for the default values used in the SSL and RBCA equations, respectively.

c) Site-specific Information

Site-specific information is a parameter measured, obtained, or determined from the site to calculate Tier 2 remediation objectives. The fourth column of Appendix C, Tables B and D identifies those site-specific parameters that may require direct field measurement. For some parameters, numerical default inputs have been provided in the last column of Appendix C, Tables B and D to substitute for site-specific information. In some cases, information on the receptor or soil type is required to select the applicable numerical default inputs. Site-specific information includes:

- 1) Physical soil parameters identified in Appendix C, Table F. The second column identifies the location where the sample is to be collected. Acceptable methods for measuring or calculating these soil parameters are identified in the last column of Appendix C, Table F;
- 2) Institutional controls or engineered barriers, pursuant to Subparts J and K, describe applicable institutional controls and engineered barriers under a Tier 2 evaluation; and
- 3) Land use classification

d) Toxicological-specific Information

- 1) Toxicological-specific information is used to calculate Tier 2 remediation objectives for the following parameters, if applicable:
  - A) Oral Chronic Reference Dose ( $RfD_o$ , expressed in mg/kg-d);
  - B) Oral Subchronic Reference Dose ( $RfD_s$ , expressed in mg/kg-d, shall be used for construction worker remediation objective calculations);
  - C) Oral Slope Factor ( $SF_o$ , expressed in  $(\text{mg/kg-d})^{-1}$ );
  - D) Inhalation Unit Risk Factor (URF expressed in  $(\mu\text{g}/\text{m}^3)^{-1}$ );
  - E) Inhalation Chronic Reference Concentration ( $RfC$ , expressed in  $\text{mg}/\text{m}^3$ );

- F) Inhalation Subchronic Reference Concentration ( $RfC_s$ , expressed in  $mg/m^3$ , shall be used for construction worker remediation objective calculations);
  - G) Inhalation Chronic Reference Dose ( $RfD_i$ , expressed in  $mg/kg-d$ );
  - H) Inhalation Subchronic Reference Dose ( $RfD_{is}$ , expressed in  $mg/kg-d$ , shall be used for construction worker remediation objective calculations); and
  - I) Inhalation Slope Factor ( $SF_i$ , expressed in  $(mg/kg-d)^{-1}$ );
- 2) Toxicological information can be obtained from IRIS, as incorporated by reference in Section 742.210, or the program under which the remediation is being performed.
- e) Chemical-specific Information
- Chemical-specific information used to calculate Tier 2 remediation objectives is listed in Appendix C, Table E.
- f) Calculations
- Calculating numerical values for some parameters requires the use of equations listed in Appendix C, Table A or C. The parameters that are calculated are listed in Appendix C, Tables B and D.

#### Section 742.710      SSL Soil Equations

- a) This Section sets forth the equations and parameters used to develop Tier 2 soil remediation objectives for the three exposure routes using the SSL approach.
- b) Soil Ingestion Exposure Route
  - 1) Equations S1 through S3 form the basis for calculating Tier 2 remediation objectives for the soil ingestion exposure route using the SSL approach. Equation S1 is used to calculate soil remediation objectives for noncarcinogenic contaminants. Equations S2 and S3 are used to calculate soil remediation objectives for carcinogenic contaminants for residential populations and industrial/commercial and construction worker populations, respectively.
  - 2) For Equations S1 through S3, the SSL default values cannot be modified with site-specific information.
- c) Inhalation Exposure Route

- 1) Equations S4 through S16, S26 and S27 are used to calculate Tier 2 soil remediation objectives for the inhalation exposure route using the SSL approach. To address this exposure route, organic contaminants and mercury must be evaluated separately from fugitive dust using their own equations set forth in subsections (c)(2) and (c)(3) of this Section, respectively.
- 2) Organic Contaminants
  - A) Equations S4 through S10 are used to calculate Tier 2 soil remediation objectives for organic contaminants and mercury based on the inhalation exposure route. Equation S4 is used to calculate soil remediation objectives for noncarcinogenic organic contaminants in soil for residential and industrial/commercial populations. Equation S5 is used to calculate soil remediation objectives for noncarcinogenic organic contaminants and mercury in soil for construction worker populations. Equation S6 is used to calculate soil remediation objectives for carcinogenic organic contaminants in soil for residential and industrial/commercial populations. Equation S7 is used to calculate soil remediation objectives for carcinogenic organic contaminants in soil for construction worker populations. Equations S8 through S10, S27 and S28 are used for calculating numerical values for some of the parameters in Equations S4 through S7.
  - B) For Equation S4, a numerical value for the Volatilization Factor (VF) can be calculated in accordance with subsection (c)(2)(F) of this Section. The remaining parameters in Equation S4 have either SSL default values listed in Appendix C, Table B or toxicological-specific information (i.e., RfC), which can be obtained from IRIS or requested from the program under which the remediation is being performed.
  - C) For Equation S5, a numerical value for the Volatilization Factor adjusted for Agitation (VF') can be calculated in accordance with subsection (c)(2)(G) of this Section. The remaining parameters in Equation S5 have either SSL default values listed in Appendix C, Table B or toxicological-specific information (i.e., RfC), which can be obtained from IRIS or requested from the program under which the remediation is being performed.
  - D) For Equation S6, a numerical value for VF can be calculated in accordance with subsection (c)(2)(F) of this Section. The remaining parameters in Equation S6 have either default values listed in Appendix C, Table B or toxicological-specific information (i.e., URF), which can be obtained from IRIS or requested from the program under which the remediation is being performed.

- E) For Equation S7, a numerical value for VF' can be calculated in accordance with subsection (c)(2)(G) of this Section. The remaining parameters in Equation S7 have either default values listed in Appendix C, Table B or toxicological-specific information (i.e., URF), which can be obtained from IRIS or requested from the program under which the remediation is being performed.
- F) The VF can be calculated for residential and industrial/commercial populations using one of the following equations based on the information known about the contaminant source and receptor population:
  - i) Equation S8, in conjunction with Equation S10, is used to calculate VF assuming an infinite source of contamination; or
  - ii) If the area and depth of the contaminant source are known or can be estimated reliably, mass limit considerations may be used to calculate VF using Equation S26.
- G) The VF' can be calculated for the construction worker populations using one of the following equations based on the information known about the contaminant source:
  - i) Equation S9 is used to calculate VF' assuming an infinite source of contamination; or
  - ii) If the area and depth of the contaminant source are known or can be estimated reliably, mass limit considerations may be used to calculate VF' using Equation S27.

### 3) Fugitive Dust

- A) Equations S11 through S16 are used to calculate Tier 2 soil remediation objectives using the SSL fugitive dust model for the inhalation exposure route. Equation S11 is used to calculate soil remediation objectives for noncarcinogenic contaminants in fugitive dust for residential and industrial/commercial populations. Equation S12 is used to calculate soil remediation objectives for noncarcinogenic contaminants in fugitive dust for construction worker populations. Equation S13 is used to calculate soil remediation objectives for carcinogenic contaminants in fugitive dust for residential and industrial/commercial populations. Equation S14 is used to calculate soil remediation objectives for carcinogenic contaminants in fugitive dust for construction worker populations. Equations S15 and S16 are used for calculating



numerical quantities for some of the parameters in Equations S11 through S14.

- B) For Equation S11, a numerical value can be calculated for the Particulate Emission Factor (PEF) using Equation S15. This equation relies on various input parameters from a variety of sources. The remaining parameters in Equation S11 have either SSL default values listed in Appendix C, Table B or toxicological-specific information (i.e., RfC), which can be obtained from IRIS or requested from the program under which the remediation is being performed.
- C) For Equation S12, a numerical value for the Particulate Emission Factor for Construction Worker (PEF') can be calculated using Equation S16. The remaining parameters in Equation S12 have either SSL default values listed in Appendix C, Table B or toxicological-specific information (i.e., RfC), which can be obtained from IRIS or requested from the program under which the remediation is being performed.
- D) For Equation S13, a numerical value for PEF can be calculated using Equation S15. The remaining parameters in Equation S13 have either default values listed in Appendix C, Table B or toxicological-specific information (i.e., URF), which can be obtained from IRIS or requested from the program under which the remediation is being performed.
- E) For Equation S14, a numerical value for PEF' can be calculated using Equation S16. The remaining parameters in Equation S14 have either default values listed in Appendix C, Table B or toxicological-specific information (i.e., URF), which can be obtained from IRIS or requested from the program under which the remediation is being performed.

d) Soil Component of the Groundwater Ingestion Exposure Route

The Tier 2 remediation objective for the soil component of the groundwater ingestion exposure route can be calculated using one of the following equations based on the information known about the contaminant source and receptor population:

- 1) Equation S17 is used to calculate the remediation objective assuming an infinite source of contamination.
  - A) The numerical quantities for four parameters in Equation S17, the Target Soil Leachate Concentration ( $C_w$ ), Soil-Water Partition Coefficient ( $K_d$ ) for non-ionizing organics, Water-Filled Soil

Porosity  $\theta_w$  and Air-Filled Soil Porosity  $\theta_a$ , are calculated using Equations S18, S19, S20 and S21, respectively. Equations S22, S23, S24 and S25 are also needed to calculate numerical values for Equations S18 and S21. The pH-dependent  $K_d$  values for ionizing organics can be calculated using Equation S19 and the pH-dependent  $K_{oc}$  values in Appendix C, Table I.

- B) The remaining parameters in Equation S17 are Henry's Law Constant ( $H'$ ), a chemical specific value listed in Appendix C, Table E and Dry Soil Bulk Density ( $\rho_b$ ), a site-specific based value listed in Appendix C, Table B.
- C) The default value for  $GW_{obj}$  is the Tier 1 groundwater objective. For chemicals for which there is no Tier 1 groundwater remediation objective, the value for  $GW_{obj}$  shall be the concentration determined according to the procedures specified in 35 Ill. Adm. Code 620, Subpart F. As an alternative to using Tier 1 groundwater remediation objectives or concentrations determined according to the procedures specified in 35 Ill. Adm. Code 620, Subpart F.  $GW_{obj}$  may be developed using Equations R25 and R26, if approved institutional controls are in place as required in Subpart J.

- 2) If the area and depth of the contaminant source are known or can be estimated reliably, mass limit considerations may be used to calculate the remediation objective for this exposure route using Equation S28. The parameters in Equation S28 have default values listed in Appendix C, Table B.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

#### Section 742.715 RBCA Soil Equations

- a) This Section presents the RBCA model and describes the equations and parameters used to develop Tier 2 soil remediation objectives.
- b) Ingestion, Inhalation, and Dermal Contact
  - 1) The two sets of equations in subsections (b)(2) and (b)(3) of this Section shall be used to generate Tier 2 soil remediation objectives for the combined ingestion, inhalation, and dermal contact with soil exposure routes.
  - 2) Combined Exposure Routes of Soil Ingestion, Inhalation of Vapors and Particulates, and Dermal Contact with Soil

- A) Equations R1 and R2 form the basis for deriving Tier 2 remediation objectives for the set of equations that evaluates the combined exposure routes of soil ingestion, inhalation of vapors and particulates, and dermal contact with soil using the RBCA approach. Equation R1 is used to calculate soil remediation objectives for carcinogenic contaminants. Equation R2 is used to calculate soil remediation objectives for noncarcinogenic contaminants. Soil remediation objectives for the ambient vapor inhalation (outdoor) route from subsurface soils must also be calculated in accordance with the procedures outlined in subsection (b)(3) of this Section and compared to the values generated from Equations R1 or R2. The smaller value (i.e., R1 and R2 compared to R7 and R8, respectively) from these calculations is the Tier 2 soil remediation objective for the combined exposure routes of soil ingestion, inhalation, and dermal contact with soil.
- B) In Equation R1, numerical values are calculated for two parameters:
- i) The volatilization factor for surficial soils ( $VF_{ss}$ ) using Equations R3 and R4; and
  - ii) The volatilization factor for subsurface soils regarding particulates ( $VF_p$ ) using Equation R5.
- C)  $VF_{ss}$  uses Equations R3 and R4 to derive a numerical value. Equation R3 requires the use of Equation R6. Both equations must be used to calculate the  $VF_{ss}$ . The lowest calculated value from these equations must be substituted into Equation R1.
- D) The remaining parameters in Equation R1 have either default values listed in Appendix C, Table D or toxicological-specific information (i.e.,  $SF_o$ ,  $SF_i$ ), which can be obtained from IRIS or requested from the program under which the remediation is being performed.
- E) For Equation R2, the parameters  $VF_{ss}$  and  $VF_p$  are calculated. The remaining parameters in Equation R2 have either default values listed in Appendix C, Table D or toxicological-specific information (i.e.,  $RfD_o$ ,  $RfD_i$ ), which can be obtained from IRIS or requested from the program under which the remediation is being performed.
- F) For chemicals other than inorganics which do not have default values for the dermal absorption factor ( $RAF_d$ ) in Appendix C, Table D, a dermal absorption factor of 0.5 shall be used for

Equations R1 and R2. For inorganics, dermal absorption may be disregarded (i.e.,  $RAF_d = 0$ ).

- 3) Ambient Vapor Inhalation (outdoor) route from Subsurface Soils (soil below one meter)
  - A) Equations R7 and R8 form the basis for deriving Tier 2 remediation objectives for the ambient vapor inhalation (outdoor) route from subsurface soils using the RBCA approach. Equation R7 is used to calculate soil remediation objectives for carcinogenic contaminants. Equation R8 is used to calculate soil remediation objectives for noncarcinogenic contaminants.
  - B) For Equation R7, the carcinogenic risk-based screening level for air ( $RBSL_{air}$ ) and the volatilization factor for soils below one meter to ambient air ( $VF_{samb}$ ) have numerical values that are calculated using Equations R9 and R11, respectively. Both equations rely on input parameters from a variety of sources.
  - C) The noncarcinogenic risk-based screening level for air ( $RBSL_{air}$ ) and the volatilization factor for soils below one meter to ambient air ( $VF_{samb}$ ) in Equation R8 have numerical values that can be calculated using Equations R10 and R11, respectively.
- c) Soil Component of the Groundwater Ingestion Exposure Route
  - 1) Equation R12 forms the basis for deriving Tier 2 remediation objectives for the soil component of the groundwater ingestion exposure route using the RBCA approach. The parameters, groundwater at the source ( $GW_{source}$ ) and Leaching Factor ( $LF_{sw}$ ), have numerical values that are calculated using Equations R13 and R14, respectively.
  - 2) Equation R13 requires numerical values that are calculated using Equation R15.
  - 3) Equation R14 requires numerical values that are calculated using Equations R21, R22, and R24. For non-ionizing organics, the Soil Water Sorption Coefficient  $k_s$  shall be calculated using Equation R20. For ionizing organics and inorganics, the values for ( $k_s$ ) are listed in Appendix C, Tables I and J, respectively. The pH-dependent  $k_s$  values for ionizing organics can be calculated using Equation R20 and the pH-dependent  $K_{oc}$  values in Appendix C, Table I. The remaining parameters in Equation R14 are field measurements or default values listed in Appendix C, Table D.
- d) The default value for  $GW_{comp}$  is the Tier 1 groundwater remediation objective. For chemicals for which there is no Tier 1 groundwater remediation objective, the

value for  $GW_{comp}$  shall be the concentration determined according to the procedures specified in 35 Ill. Adm. Code 620, Subpart F. As an alternative to using the above concentrations,  $GW_{comp}$  may be developed using Equations R25 and R26, if approved institutional controls are in place as may be required in Subpart J.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

Section 742.720 Chemicals with Cumulative Noncarcinogenic Effects

Appendix A, Table E lists the groups of chemicals from Appendix B, Tables A and B that have remediation objectives based on noncarcinogenic toxicity and that affect the same target organ. If more than one chemical detected at a site affects the same target organ (i.e., has the same critical effect as defined by the RfD), the initially calculated remediation value for each chemical in the group shall be corrected for cumulative effects by one of the following two methods:

- a) Calculate the weighted average using the following equations:

$$W_{ave} = \frac{x_1}{CUO_{x_1}} + \frac{x_2}{CUO_{x_2}} + \frac{x_3}{CUO_{x_3}} + \dots + \frac{x_a}{CUO_{x_a}}$$

where:

$W_{ave}$  = Weighted Average

$x_1$  through  $x_a$  = Concentration of each individual contaminant at the location of concern. Note that, depending on the target organ/mode of action, the actual number of contaminants will range from 2 to 14.

$CUO_{x_a}$  = A Tier 2 remediation objective must be developed for each  $x_a$ .

If the value of the weighted average calculated in accordance with the equations above is less than or equal to 1.0, then the remediation objectives are met for those chemicals.

If the value of the weighted average calculated in accordance with the equations above is greater than 1.0, then additional remediation must be carried out until the level of contaminants remaining in the remediated area has a weighted average calculated in accordance with the equation above less than or equal to one.

- b) Divide each individual chemical's remediation objective by the number of chemicals in that specific target organ group that were detected at the site. Each of the contaminant concentrations at the site is then compared to the remediation objectives that have been adjusted to account for this potential additivity. For the noncarcinogenic contaminants listed in Appendix A, Table E, a respective soil remediation objective need be no lower than the respective value listed in Appendix B, Table A or B.

## SUBPART H: TIER 2 GROUNDWATER EVALUATION

### Section 742.800 Tier 2 Groundwater Evaluation Overview

If the contaminant concentrations in the groundwater exceed the applicable Tier 1 remediation objectives, a person has the following options:

- a) Demonstrate that the groundwater ingestion exposure route is excluded from consideration pursuant to Subpart C;
- b) Demonstrate that the groundwater contamination is at or below area background concentrations in accordance with Subpart D and, if necessary, an institutional control restricting usage of the groundwater is in place in accordance with Subpart J;
- c) Remediate to Tier 1 remediation objectives;
- d) Propose and obtain approval of Tier 2 groundwater remediation objectives in accordance with Section 742.805 and remediate to that level, if necessary;
- e) Conduct a Tier 3 evaluation in accordance with Subpart I; or
- f) Obtain approval from the Board to:
  - 1) Reclassify the groundwater pursuant to 35 Ill. Adm. Code 620.260; or
  - 2) Use an adjusted standard pursuant to Section 28.1 of the Act. [415 ILCS 5/28.1].

### Section 742.805 Tier 2 Groundwater Remediation Objectives

- a) To develop a groundwater remediation objective under this Section that exceeds the applicable Tier 1 groundwater remediation objective, or for which there is no Tier I groundwater remediation objective, a person may request approval from the Agency if the person has performed the following:

- 1) Identified the horizontal and vertical extent of groundwater for which the Tier 2 groundwater remediation objective is sought;
  - 2) Taken corrective action, to the maximum extent practicable to remove any free product;
  - 3) Using Equation R26 in accordance with Section 742.810, demonstrated that the concentration of any contaminant of concern in groundwater will meet:
    - A) The applicable Tier 1 groundwater remediation objective at the point of human exposure; or
    - B) For any contaminant of concern for which there is no Tier 1 groundwater remediation objective, the concentration determined according to the procedures specified in 35 Ill. Adm. Code 620 at the point of human exposure. A person may request the Agency to provide these concentrations or may propose these concentrations under Subpart I;
  - 4) Using Equation R26 in accordance with Section 742.810, demonstrated that the concentration of any contaminant of concern in groundwater within the minimum or designated maximum setback zone of an existing potable water supply well will meet the applicable Tier 1 groundwater remediation objective or, if there is no Tier 1 groundwater remediation objective, the concentration determined according to the procedures specified in 35 Ill. Adm. Code 620. A person may request the Agency to provide these concentrations or may propose these concentrations under Subpart I;
  - 5) Using Equation R26 in accordance with Section 742.810, demonstrated that the concentration of any contaminant of concern in groundwater discharging into a surface water will meet the applicable water quality standard under 35 Ill. Adm. Code 302;
  - 6) Demonstrated that the source of the release is not located within the minimum or designated maximum setback zone or within a regulated recharge area of an existing potable water supply well; and
  - 7) If the selected corrective action includes an engineered barrier as set forth in Subpart K to minimize migration of contaminant of concern from the soil to the groundwater, demonstrated that the engineered barrier will remain in place for post-remediation land use through an institutional control as set forth in Subpart J.
- b) A groundwater remediation objective that exceeds the water solubility of that chemical (refer to Appendix C, Table E for solubility values) is not allowed.

- c) The contaminants of concern for which a Tier 1 remediation objective has been developed shall be included in any mixture of similar-acting chemicals under consideration in Tier 2. The evaluation of 35 Ill. Adm. Code 620.615 regarding mixtures of similar-acting chemicals shall be considered satisfied for Class I groundwater at the point of human exposure if either of the following requirements are achieved:

- 1) Calculate the weighted average using the following equations:

$$W_{ave} = \frac{x_1}{CUO_{x_1}} + \frac{x_2}{CUO_{x_2}} + \frac{x_3}{CUO_{x_3}} + \dots + \frac{x_a}{CUO_{x_a}}$$

where:

$W_{ave}$  = Weighted Average

$x_1$  through  $x_a$  = Concentration of each individual contaminant at the location of concern. Note that, depending on the target organ, the actual number of contaminants will range from 2 to 14.

$CUO_{x_a}$  = A Tier 1 or Tier 2 remediation objective must be developed for each  $x_a$ .

- A) If the value of the weighted average calculated in accordance with the equations above is less than or equal to 1.0, then the remediation objectives are met for those chemicals.
- B) If the value of the weighted average calculated in accordance with the equations above is greater than 1.0, then additional remediation must be carried out until the level of contaminants remaining in the remediated area have a weighted average calculated in accordance with the equation above less than or equal to one; or
- 2) Divide each individual chemical's remediation objective by the number of chemicals in that specific target organ group that were detected at the site. Each of the contaminant concentrations at the site is then compared to the remediation objectives that have been adjusted to account for this potential additivity.
- d) The evaluation of 35 Ill. Adm. Code 620.615 regarding mixtures of similar-acting chemicals are considered satisfied if the cumulative risk from any contaminant(s) of concern listed in Appendix A, Table H, plus any other contaminant(s) of concern detected in groundwater and listed in Appendix A, Table F as affecting the same target organ/organ system as the contaminant(s) of concern detected from Appendix A, Table H, does not exceed 1 in 10,000.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)



Section 742.810      Calculations to Predict Impacts from Remaining Groundwater Contamination

a) Equation R26 predicts the contaminant concentration along the centerline of a groundwater plume emanating from a vertical planar source in the aquifer (dimensions  $S_w$  wide and  $S_d$  deep). This model accounts for both three-dimensional dispersion ( $x$  is the direction of groundwater flow,  $y$  is the other horizontal direction, and  $z$  is the vertical direction) and biodegradation.

1) The parameters in this equation are:

$X =$  distance from the planar source to the location of concern, along the centerline of the groundwater plume (i.e.,  $y=0$ ,  $z=0$ )

$C_x =$  the concentration of the contaminant at a distance  $X$  from the source, along the centerline of the plume

$C_{source} =$  the greatest potential concentration of the contaminant of concern in the groundwater at the source of the contamination, based on the concentrations of contaminants in groundwater due to the release and the projected concentration of the contaminant migrating from the soil to the groundwater. As indicated above, the model assumes a planar source discharging groundwater at a concentration equal to  $C_{source}$ .

$\alpha_x =$  dispersivity in the  $x$  direction (i.e., Equation R16)

$\alpha_y =$  dispersivity in the  $y$  direction (i.e., Equation R17)

$\alpha_z =$  dispersivity in the  $z$  direction (i.e., Equation R18)

$U =$  specific discharge (i.e., actual groundwater flow velocity through a porous medium; takes into account the fact that the groundwater actually flows only through the pores of the subsurface materials) where the aquifer hydraulic conductivity ( $K$ ), the hydraulic gradient ( $I$ ) and the total soil porosity  $\theta_T$  must be known (i.e., Equation R19)

$\lambda =$  first order degradation constant obtained from Appendix C, Table E or from measured groundwater data

$S_w =$  width of planar groundwater source in the  $y$  direction

$S_d =$  depth of planar groundwater source in the  $z$  direction

- 2) The following parameters are determined through field measurements:  $U$ ,  $K$ ,  $I$ ,  $\theta_T$ ,  $S_w$ ,  $S_d$ .
  - A) The determination of values for  $U$ ,  $K$ ,  $I$  and  $\theta_T$  can be obtained through the appropriate laboratory and field techniques;
  - B) From the immediate down-gradient edge of the source of the groundwater contamination values for  $S_w$  and  $S_d$  shall be determined.  $S_w$  is defined as the width of groundwater at the source which exceeds the Tier 1 groundwater remediation objective.  $S_d$  is defined as the depth of groundwater at the source which exceeds the Tier 1 groundwater remediation objective; and
  - C) Total soil porosity can also be calculated using Equation R23.
- b) Once values are obtained for all the input parameters identified in subsection (a) of this Section, the contaminant concentration  $C_x$  along the centerline of the plume at a distance  $X$  from the source shall be calculated so that  $X$  is the distance from the down-gradient edge of the source of the contamination at the site to the point where the contaminant concentration is equal to the Tier 1 groundwater remediation objective or concentration determined according to the procedures specified in 35 Ill. Adm. Code 620, Subpart F.
  - 1) If there are any potable water supply wells located within the calculated distance  $X$ , then the Tier 1 groundwater remediation objective or concentration shall be met at the edge of the minimum or designated maximum setback zone of the nearest potable water supply down-gradient of the source. To demonstrate that a minimum or maximum setback zone of a potable water supply well will not be impacted above the applicable Tier 1 groundwater remediation objective or concentration determined according to the procedures specified in 35 Ill. Adm. Code 620, Subpart F,  $X$  shall be the distance from the  $C_{\text{source}}$  location to the edge of the setback zone.
  - 2) To demonstrate that no surface water is adversely impacted,  $X$  shall be the distance from the down-gradient edge of the source of the contamination site to the nearest surface water body. This calculation must show that the contaminant in the groundwater at this location ( $C_x$ ) does not exceed the applicable water quality standard.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

#### SUBPART I: TIER 3 EVALUATION

- a) Tier 3 sets forth a flexible framework to develop remediation objectives outside of the requirements of Tiers 1 and 2. Although Tier 1 and Tier 2 evaluations are not prerequisites to conduct Tier 3 evaluations, data from Tier 1 and Tier 2 can assist in developing remediation objectives under a Tier 3 evaluation.
- b) The level of detail required to adequately characterize a site depends on the particular use of Tier 3. Tier 3 can require additional investigative efforts beyond those described in Tier 2 to characterize the physical setting of the site. However, in situations where remedial efforts have simply reached a physical obstruction additional investigation may not be necessary for a Tier 3 submittal.
- c) Situations that can be considered for a Tier 3 evaluation include, but are not limited to:
  - 1) Modification of parameters not allowed under Tier 2;
  - 2) Use of models different from those used in Tier 2;
  - 3) Use of additional site data to improve or confirm predictions of exposed receptors to contaminants of concern;
  - 4) Analysis of site-specific risks using formal risk assessment, probabilistic data analysis, and sophisticated fate and transport models (e.g., requesting a target hazard quotient greater than 1 or a target cancer risk greater than 1 in 1,000,000);
  - 5) Requests for site-specific remediation objectives because an assessment indicates further remediation is not practical;
  - 6) Incomplete human exposure pathway(s) not excluded under Subpart C;
  - 7) Use of toxicological-specific information not available from the sources listed in Tier 2;
  - 8) Land uses which are substantially different from the assumed residential or industrial/commercial property uses of a site (e.g., a site will be used for recreation in the future and cannot be evaluated in Tiers 1 or 2); and
  - 9) Requests for site-specific remediation objectives which exceed Tier 1 groundwater remediation objectives so long as the following is demonstrated:
    - A) *To the extent practical, the exceedance of the groundwater quality standard has been minimized and beneficial use appropriate to the groundwater that was impacted has been returned; and*
    - B) *Any threat to human health or the environment has been minimized. [415 ILCS 5/58.5(D)(4)(A)]*

- d) For requests of a target cancer risk ranging between 1 in 1,000,000 and 1 in 10,000 at the point of human exposure or a target hazard quotient greater than 1 at the point of human exposure, the requirements of Section 742.915 shall be followed. Requests for a target cancer risk exceeding 1 in 10,000 at the point of human exposure are not allowed.
- e) Requests for approval of a Tier 3 evaluation must be submitted to the Agency for review under the specific program under which remediation is performed. When reviewing a submittal under Tier 3, the Agency shall consider *whether the interpretations and conclusions reached are supported by the information gathered*. [415 ILCS 58.7(e)(1)]. The Agency shall approve a Tier 3 evaluation if the person submits the information required under this Part and establishes through such information that public health is protected and that specified risks to human health and the environment have been minimized.
- f) If contaminants of concern include polychlorinated biphenyls (PCBs), requests for approval of a Tier 3 evaluation must additionally address the applicability of 40 CFR 761.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

#### Section 742.905      Modifications of Parameters

Any proposed changes to Tier 2 parameters which are not provided for in Tier 2 shall be submitted to the Agency for review and approval. A submittal under this Section shall include the following information:

- a) The justification for the modification; and
- b) The technical and mathematical basis for the modification.

#### Section 742.910      Alternative Models

Any proposals for the use of models other than those specified in Tier 2 shall be submitted to the Agency for review and approval. A submittal under this Section shall include the following information:

- a) Physical and chemical properties of contaminants of concern;
- b) Contaminant movement properties;
- c) Contaminant availability to receptors;
- d) Receptor exposure to the contaminants of concern;

- e) Mathematical and technical justification for the model proposed;
- f) A licensed copy of the model, if the Agency does not have a licensed copy of the model currently available for use; and
- g) Demonstration that the models were correctly applied.

#### Section 742.915 Formal Risk Assessments

A comprehensive site-specific risk assessment shall demonstrate that contaminants of concern at a site do not pose a significant risk to any human receptor. All site-specific risk assessments shall be submitted to the Agency for review and approval. A submittal under this Section shall address the following factors:

- a) Whether the risk assessment procedure used is nationally recognized and accepted including, but not limited to, those procedures incorporated by reference in Section 742.210;
- b) Whether the site-specific data reflect actual site conditions;
- c) The adequacy of the investigation of present and post-remediation exposure routes and risks to receptors identified at the site;
- d) The appropriateness of the sampling and analysis;
- e) The adequacy and appropriateness of toxicity information;
- f) The extent of contamination;
- g) Whether the calculations were accurately performed;
- h) Similar-acting chemicals shall be specifically addressed. At a minimum, the chemicals subject to this requirement are identified in Appendix A, Tables E and F; and
- i) Proposals seeking to modify the target risk consistent with Section 742.900(d) shall address the following factors:
  - 1) the presence of sensitive populations;
  - 2) the number of receptors potentially impacted;
  - 3) the duration of risk at the differing target levels; and
  - 4) the characteristic of the chemicals of concern.

SOURCE: Amended at 21 Ill. Reg. 16391, effective December 8, 1997.

#### Section 742.920      Impractical Remediation

Any request for site-specific remediation objectives due to impracticality of remediation shall be submitted to the Agency for review and approval. A submittal under this Section shall include the following information:

- a) The reason(s) why the remediation is impractical;
- b) The extent of contamination;
- c) Geology, including soil types;
- d) The potential impact to groundwater;
- e) Results and locations of sampling events;
- f) Map of the area, including all utilities and structures; and
- g) Present and post-remediation uses of the area of contamination, including human receptors at risk.

#### Section 742.925      Exposure Routes

Technical information may demonstrate that there is no actual or potential impact of contaminants of concern to receptors from a particular exposure route. In these instances, a demonstration excluding an exposure route shall be submitted to the Agency for review and approval. A submittal under this Section shall include the following information:

- a) A description of the route evaluated;
- b) A description of the site and physical site characteristics;
- c) A discussion of the result and possibility of the route becoming active in the future; and
- d) Technical support that may include, but is not limited to, the following:
  - 1) a discussion of the natural or man-made barriers to that exposure route;
  - 2) calculations and modeling;
  - 3) physical and chemical properties of contaminants of concern; and

- 4) contaminant migration properties.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

Section 742.930 Derivation of Toxicological Data

If toxicological-specific information is not available for one or more contaminants of concern from the sources incorporated by reference in Section 742.210, the derivations of toxicological-specific information shall be submitted for Agency review and approval.

SUBPART J: INSTITUTIONAL CONTROLS

Section 742.1000 Institutional Controls

- a) Institutional controls in accordance with this Subpart must be placed on the property when remediation objectives are based on any of the following assumptions:
  - 1) Industrial/Commercial property use;
  - 2) Target cancer risk greater than 1 in 1,000,000;
  - 3) Target hazard quotient greater than 1;
  - 4) Engineered barriers;
  - 5) The point of human exposure is located at a place other than at the source;
  - 6) Exclusion of exposure routes; or
  - 7) Any combination of the above.
- b) The Agency shall not approve any remediation objective under this Part that is based on the use of institutional controls unless the person has proposed institutional controls meeting the requirements of this Subpart and the requirements of the specific program under which the institutional control is proposed. A proposal for approval of institutional controls shall provide identification of the selected institutional controls from among the types recognized in this Subpart.
- c) The following instruments may be institutional controls subject to the requirements of this Subpart J and the requirements of the specific program under which the institutional control is proposed:
  - 1) No Further Remediation Letters;

- 2) Environmental Land Use Controls;
  - 3) Land Use Control Memorandums of Agreement;
  - 4) Ordinances adopted and administered by a unit of local government; and
  - 5) Agreements between a property owner and a highway authority with respect to any contamination remaining under highways.
- d) No Further Remediation Letters and Environmental Land Use Controls that meet the requirements of this Subpart and the recording requirements of the program under which remediation is being performed are transferred with the property.

(Source: Amended at 25 Ill. Reg. 651, effective January 6, 2001)

#### Section 742.1005 No Further Remediation Letters

- a) A No Further Remediation Letter issued by the Agency under 35 Ill. Adm. Code 732 or 740 may be used as an institutional control under this Part if the requirements of subsection (b) of this Section are met.
- b) A request for approval of a No Further Remediation Letter as an institutional control shall meet the requirements applicable to the specific program under which the remediation is performed.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

#### Section 742.1010 Environmental Land Use Controls

- a) An Environmental Land Use Control (ELUC) is an institutional control that may be used under this Part to impose land use limitations or requirements related to environmental contamination. ELUCs are only effective when approved by the Agency in accordance with this Part. Activities or uses that may be limited or required include, but are not limited to, prohibition of use of groundwater for potable purposes, restriction to industrial/commercial uses, operation or maintenance of engineered barriers, or worker safety plans. ELUCs may be used in the following circumstances:
  - 1) When No Further Remediation Letters are not available, including but not limited to when contamination has migrated off-site or outside the remediation site; or
  - 2) When No Further Remediation Letters are not issued under the program for which a person is undergoing remediation.



b) Recording requirements:

- 1) An ELUC approved by the Agency pursuant to this Section must be recorded in the Office of the Recorder or Registrar of Titles for the county in which the property that is the subject of the ELUC is located. A copy of the ELUC demonstrating that it has been recorded must be submitted to the Agency before the Agency will issue a no further remediation determination.
- 2) An ELUC approved under this Section will not become effective until officially recorded in the chain of title for the property that is the subject of the ELUC in accordance with subsection (b)(1) of this Section.
- 3) Reference to the recorded ELUC must be made in the instrument memorializing the Agency's no further remediation determination. Recording of the no further remediation determination and confirmation of recording must be in accordance with the requirements of the program under which the determination was issued.
- 4) The requirements of this Section do not apply to Federally Owned Property for which the Federal Landholding Entity does not have the authority under federal law to record land use limitations on the chain of title.
- 5) The requirements of this Section apply only to those sites for which a request for a no further remediation determination has not yet been made to the Agency by January 6, 2001.

c) Duration:

- 1) Except as provided in this subsection (c), an ELUC shall remain in effect in perpetuity.
- 2) *At no time shall any site for which an ELUC has been imposed as a result of remediation activities under this Part be used in a manner inconsistent with the land use limitation unless attainment of objectives appropriate for the new land use is achieved and a new no further remediation determination has been obtained and recorded in accordance with the program under which the ELUC was first imposed or the Site Remediation Program (35 Ill. Adm. Code 740). [415 ILCS 58.8(c)].* In addition, the appropriate release or modification of the ELUC must be prepared by the Agency and filed on the chain of title for the property that is the subject of the ELUC.
  - A) For a Leaking Underground Storage Tank (LUST) site under 35 Ill. Adm. Code 731 or 732 or a Site Remediation Program site under 35 Ill. Adm. Code 740, an ELUC may be released or

modified only if the NFR Letter is modified under the LUST or Site Remediation Program to reflect the change;

- B) For a RCRA site under 35 Ill. Adm. Code 721 730, an ELUC may be released or modified only by an amended certification of closure or a permit modification.
- 3) In addition to any other remedies that may be available, a failure to comply with the limitations or requirements of an ELUC may result in avoidance of an Agency no further remediation determination in accordance with the program under which the determination was made. The failure to comply with the limitations or requirements of an ELUC may also be grounds for an enforcement action pursuant to Title VIII of the Act.
- d) An ELUC must contain the following elements:
- 1) Name of property owners and declaration of property ownership;
  - 2) Identification of the property to which the ELUC applies by common address, legal description, and Real Estate Tax Index/Parcel Index Number;
  - 3) A reference to the Bureau of Land LPC numbers or 10-digit identification numbers under which the remediation was conducted;
  - 4) A statement of the reason for the land use limitation or requirement relative to protecting human health and the surrounding environment from soil, groundwater, and/or other environmental contamination;
  - 5) The language instituting such land use limitations or requirements;
  - 6) A statement that the limitations or requirements apply to the current owners, occupants, and all heirs, successors, assigns, and lessees;
  - 7) A statement that the limitations or requirements apply in perpetuity or until:
    - A) The Agency issues a new no further remediation determination approving modification or removal of the limitations or requirements; and
    - B) A release or modification of the land use limitation is filed on the chain of title for the property that is the subject of the ELUC;
  - 8) Scaled site maps showing:
    - A) The legal boundary of the property to which the ELUC applies;

- B) The horizontal and vertical extent of contaminants of concern above applicable remediation objectives for soil and groundwater to which the ELUC applies;
  - C) Any physical features to which an ELUC applies (e.g., engineered barriers, monitoring wells, caps); and
  - D) The nature, location of the source, and direction of movement of the contaminants of concern;
- 9) A statement that any information regarding the remediation performed on the property for which the ELUC is necessary may be obtained from the Agency through a request under the Freedom of Information Act [5 ILCS 140] and rules promulgated thereunder; and
  - 10) The dated, notarized signatures of the property owners or authorized agent.

(Source: Amended at 25 Ill. Reg. 651, effective January 6, 2001)

Section 742.1012 Federally Owned Property: Land Use Control Memorandums of Agreement

- a) A Land Use Control Memorandum of Agreement (LUC MOA) between one or more agencies of the federal government and the Illinois Environmental Protection Agency is an institutional control that may be used under this Part to impose land use limitations or restrictions related to environmental contamination on Federally Owned Property. A LUC MOA may be used only for Federally Owned Property. Each LUC MOA, at a minimum, must require that the Federal Landholding Entities responsible for the Federally Owned Property do the following:
  - 1) Provide adequate identification of the location on the Federally Owned Property of each site with land use limitations or requirements. Such identification shall be by means of common address, notations in any available facility master land use plan, site specific GIS or GPS coordinates, plat maps, or any other means which identifies the site in question with particularity;
  - 2) Implement periodic site inspection procedures to ensure adequate oversight by the Federal Landholding Entities of such land use limitation or requirement;
  - 3) Implement procedures for the Federal Landholding Entities to periodically advise the Agency of continued compliance with the

maintenance of the land use control and site inspection requirements included in the LUC MOA;

- 4) Implement procedures for the Federal Landholding Entities to notify the Agency of any planned or emergency changes in land use that may adversely impact any site with land use limitations or requirements; and
  - 5) Notify the Agency at least 60 days in advance of a conveyance by deed or fee simple title, by the Federal Landholding Entities, of a site(s) with land use limitations or requirements, to any entity that will not remain or become a Federal Landholding Entity, and provide the Agency with information about how the Federal Landholding Entities will ensure that the requirements of Section 742.1010-are to be satisfied upon conveyance of that site(s).
- b) Any LUC MOA entered into pursuant to this Section remains effective only so long as title to the affected property is retained by the United States.

(Source: Added at 25 Ill. Reg. 651, effective January 6, 2001)

#### Section 742.1015 Ordinances

- a) An ordinance adopted by a unit of local government that effectively prohibits the installation of potable water supply wells (and the use of such wells) may be used as an institutional control to meet the requirements of Section 742.320(d) or 742.805(a)(3) if the requirements of this Section are met. Ordinances prohibiting the installation of potable water supply wells (and the use of such wells) that do not expressly prohibit the installation of potable water supply wells (and the use of such wells) by units of local government may be acceptable as institutional controls if the requirements of this Section are met and a Memorandum of Understanding (MOU) is entered into under subsection (i) of this Section.
- b) A request for approval of a local ordinance as an institutional control shall provide the following:
  - 1) A copy of the ordinance restricting groundwater use certified by an official of the unit of local government in which the site is located that it is a true and accurate copy of the ordinance, unless the Agency and the unit of local government have entered an agreement under subsection (i) of this Section, in which case the request may alternatively reference the MOU. The ordinance must demonstrate that potable use of groundwater from potable water supply wells is prohibited;
  - 2) A scaled map(s) delineating the area and extent of groundwater contamination above the applicable remediation objectives including any

measured data showing concentrations of contaminants of concern in which the applicable remediation objectives are exceeded;

- 3) A scaled map delineating the boundaries of all properties under which groundwater is located which exceeds the applicable groundwater remediation objectives;
  - 4) Information identifying the current owner(s) of each property identified in subsection (b)(3) of this Section; and
  - 5) A copy of the proposed submission to the current owners identified in subsection (b)(4) of this Section of the information required in subsections (b)(1) through (b)(4). Within 45 days from the date the Agency's no further remediation determination is recorded, the person who requested to use the ordinance as an institutional control must submit proof to the Agency of the notice to the property owners identified in subsection (b)(4).
- c) Each of the property owners identified in subsection (b)(4) of this Section and the unit of local government must receive written notification from the party desiring to use the institutional control that groundwater remediation objectives have been approved by the Agency. Written proof of this notification shall be submitted to the Agency within 45 days from the date the Agency's no further remediation determination is recorded. The notification shall include:
- 1) The name and address of the unit of local government;
  - 2) The citation to the ordinance;
  - 3) A description of the property being sent notice by adequate legal description or by reference to a plat showing the boundaries;
  - 4) A statement that the ordinance restricting groundwater use has been used by the Agency in reviewing a request for a groundwater remediation objective;
  - 5) A statement as to the nature of the release and response action with the site name, address, and Agency site number or Illinois inventory identification number; and
  - 6) A statement as to where more information may be obtained regarding the ordinance.
- d) Unless the Agency and the unit of local government have entered into a MOU under subsection (i) of this Section, the current owner or successors in interest of a site who have received approval of use of an ordinance as an institutional control under this Section shall:

- 1) Monitor activities of the unit of local government relative to variance requests or changes in the ordinance relative to the use of potable groundwater at properties identified in subsection (b)(3) of this Section; and
  - 2) Notify the Agency of any approved variance requests or ordinance changes within 30 days after the date such action has been approved.
- e) The information required in subsections (b)(1) through (b)(5) of this Section and the Agency letter approving the groundwater remediation objective shall be submitted to the unit of local government. Proof that the information has been filed with the unit of local government shall be provided to the Agency.
- f) Any ordinance or MOU used as an institutional control pursuant to this Section shall be recorded in the Office of the Recorder or Registrar of Titles of the county in which the site is located together with the instrument memorializing the Agency's no further remediation determination pursuant to the specific program within 45 days after receipt of the Agency's no further remediation determination.
- g) An institutional control approved under this Section shall not become effective until officially recorded in accordance with subsection (f) of this Section. The person receiving the approval shall obtain and submit to the Agency within 30 days after recording a copy of the institutional control demonstrating that it has been recorded.
- h) The following shall be grounds for voidance of the ordinance as an institutional control and the instrument memorializing the Agency's no further remediation determination:
- 1) Modification of the ordinance by the unit of local government to allow potable use of groundwater;
  - 2) Approval of a site-specific request, such as a variance, to allow potable use of groundwater at a site identified in subsection (b)(3) of this Section; or
  - 3) Violation of the terms of an institutional control recorded under Section 742.1005 or Section 742.1010.
- i) The Agency and a unit of local government may enter into a MOU under this Section if the unit of local government has adopted an ordinance satisfying subsection (a) of this Section and if the requirements of this subsection are met. The MOU shall include the following:
- 1) Identification of the authority of the unit of local government to enter the MOU;

- 2) Identification of the legal boundaries, or equivalent, under which the ordinance is applicable;
- 3) A certified copy of the ordinance;
- 4) A commitment by the unit of local government to notify the Agency of any variance requests or proposed ordinance changes at least 30 days prior to the date the local government is scheduled to take action on the request or proposed change;
- 5) A commitment by the unit of local government to maintain a registry of all sites within the unit of local government that have received no further remediation determinations pursuant to specific programs; and
- 6) If the ordinance does not expressly prohibit the installation of potable water supply wells (and the use of such wells) by units of local government, a commitment by the unit of local government:
  - A) To review the registry of sites established under subsection (i)(5) of this Section prior to siting potable water supply wells within the area covered by the ordinance;
  - B) To determine whether the potential source of potable water may be or has been affected by contamination left in place at those sites; and
  - C) To take whatever steps are necessary to ensure that the potential source of potable water is protected from the contamination or treated before it is used as a potable water supply.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

#### Section 742.1020 Highway Authority Agreements

- a) An agreement with a highway authority may be used as an institutional control where the requirements of this Section are met and the Agency has determined that no further remediation is required as to the property(ies) to which the agreement is to apply.
- b) As part of the agreement the highway authority shall agree to:
  - 1) Prohibit the use of groundwater under the highway right of way that is contaminated above residential Tier 1 remediation objectives from the release as a potable supply of water; and
  - 2) Limit access to soil contamination under the highway right of way that is contaminated above residential Tier 1 remediation objectives from the

release. Access to soil contamination may be allowed if, during and after any access, public health and the environment are protected.

- c) The agreement shall provide the following:
  - 1) Fully executed signature blocks by the highway authority and the owner of the property (or, in the case of a petroleum leaking underground storage tank, the owner or operator of the tank) from which the release occurred;
  - 2) A scaled map delineating the area and extent of soil and groundwater contamination above the applicable Tier 1 remediation objectives or a statement that either soil or groundwater is not contaminated above the applicable Tier 1 residential remediation objectives;
  - 3) Information showing the concentration of contaminants of concern within the zone in which the applicable Tier 1 remediation objectives are exceeded;
  - 4) A stipulation of the information required by subsections (c)(2) and (3) of this Section in the agreement if it is not practical to obtain the information by sampling the highway right-of-way; and
  - 5) Information identifying the highway authority having jurisdiction.
- d) Highway Authority Agreements must be referenced in the instrument that is to be recorded on the chain of title for the remediation property.
- e) Violation of the terms of an Agreement approved by the Agency as an institutional control under this Section shall be grounds for voidance of the Agreement as an institutional control and the instrument memorializing the Agency's no further remediation determination.
- f) Failure to provide all of the information required in subsections (b) and (c) of this Section will be grounds for denial of the Highway Authority Agreement as an institutional control.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

## SUBPART K: ENGINEERED BARRIERS

### Section 742.1100 Engineered Barriers

- a) Any person who develops remediation objectives under this Part based on engineered barriers shall meet the requirements of this Subpart and the requirements of Subpart J relative to institutional controls.



- b) The Agency shall not approve any remediation objective under this Part that is based on the use of engineered barriers unless the person has proposed engineered barriers meeting the requirements of this Subpart.
- c) The use of engineered barriers can be recognized in calculating remediation objectives only if the engineered barriers are intended for use as part of the final corrective action.
- d) Any no further remediation determination based upon the use of engineered barriers shall require effective maintenance of the engineered barrier. The maintenance requirements shall be included in an institutional control under Subpart J. This institutional control shall address provisions for temporary breaches of the barrier by requiring the following if intrusive construction work is to be performed in which the engineered barrier is to be temporarily breached:
  - 1) The construction workers shall be notified by the site owner/operator in advance of intrusive activities. Such notification shall enumerate the contaminant of concern known to be present; and
  - 2) The site owner/operator shall require construction workers to implement protective measures consistent with good industrial hygiene practice.
- e) Failure to maintain an engineered barrier in accordance with that no further remediation determination shall be grounds for voidance of the determination and the instrument memorializing the Agency's no further remediation determination.

Section 742.1105 Engineered Barrier Requirements

- a) Natural attenuation, access controls, and point of use treatment shall not be considered engineered barriers. Engineered barriers may not be used to prevent direct human exposure to groundwater without the use of institutional controls.
- b) For purposes of determining remediation objectives under Tier 1, engineered barriers are not recognized.
- c) The following engineered barriers are recognized for purposes of calculating remediation objectives that exceed residential remediation objectives:
  - 1) For the soil component of the groundwater ingestion exposure route, the following engineered barriers are recognized if they prevent completion of the exposure pathway:
    - A) Caps or walls constructed of compacted clay, asphalt, concrete or other material approved by the Agency; and
    - B) Permanent structures such as buildings and highways.

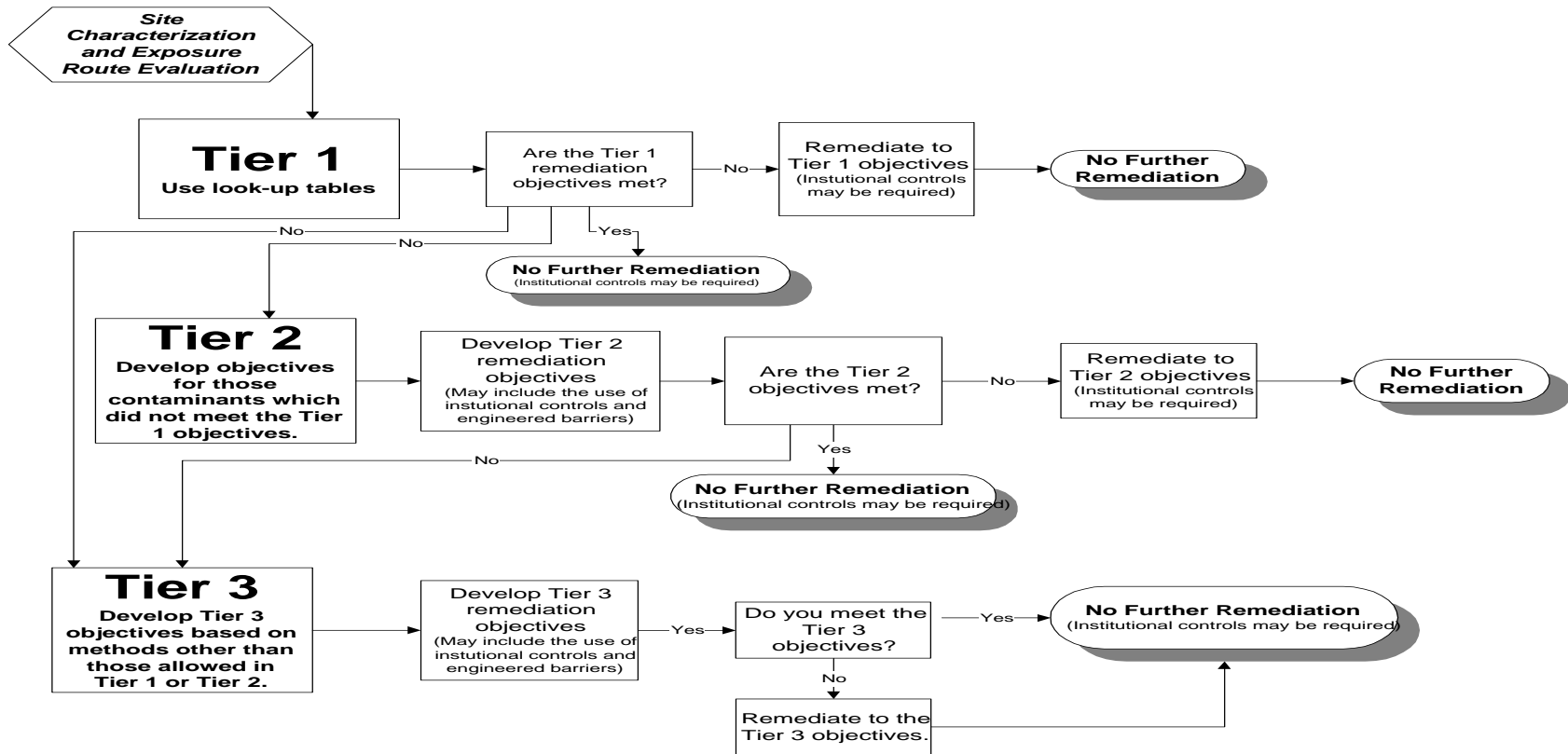
- 2) For the soil ingestion exposure route, the following engineered barriers are recognized if they prevent completion of the exposure pathway:
  - A) Caps or walls constructed of compacted clay, asphalt, concrete, or other material approved by the Agency;
  - B) Permanent structures such as buildings and highways; and
  - C) Soil, sand, gravel, or other geologic materials that:
    - i) Cover the contaminated media;
    - ii) Meet the soil remediation objectives under Subpart E for residential property for contaminants of concern; and
    - iii) Are a minimum of three feet in depth.
- 3) For the inhalation exposure route, the following engineered barriers are recognized if they prevent completion of the exposure pathway:
  - A) Caps or walls constructed of compacted clay, asphalt, concrete, or other material approved by the Agency;
  - B) Permanent structures such as buildings and highways; and
  - C) Soil, sand, gravel, or other geologic materials that:
    - i) Cover the contaminated media;
    - ii) Meet the soil remediation objectives under Subpart E for residential property for contaminants of concern; and
    - iii) Are a minimum of ten feet in depth and not within ten feet of any manmade pathway.
- 4) For the ingestion of groundwater exposure route, the following engineered barriers are recognized if they prevent completion of the exposure pathway:
  - A) Slurry walls; and
  - B) Hydraulic control of groundwater.
- d) Unless otherwise prohibited under Section 742.1100, any other type of engineered barrier may be proposed if it will be as effective as the options listed in subsection (c) of this Section.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)



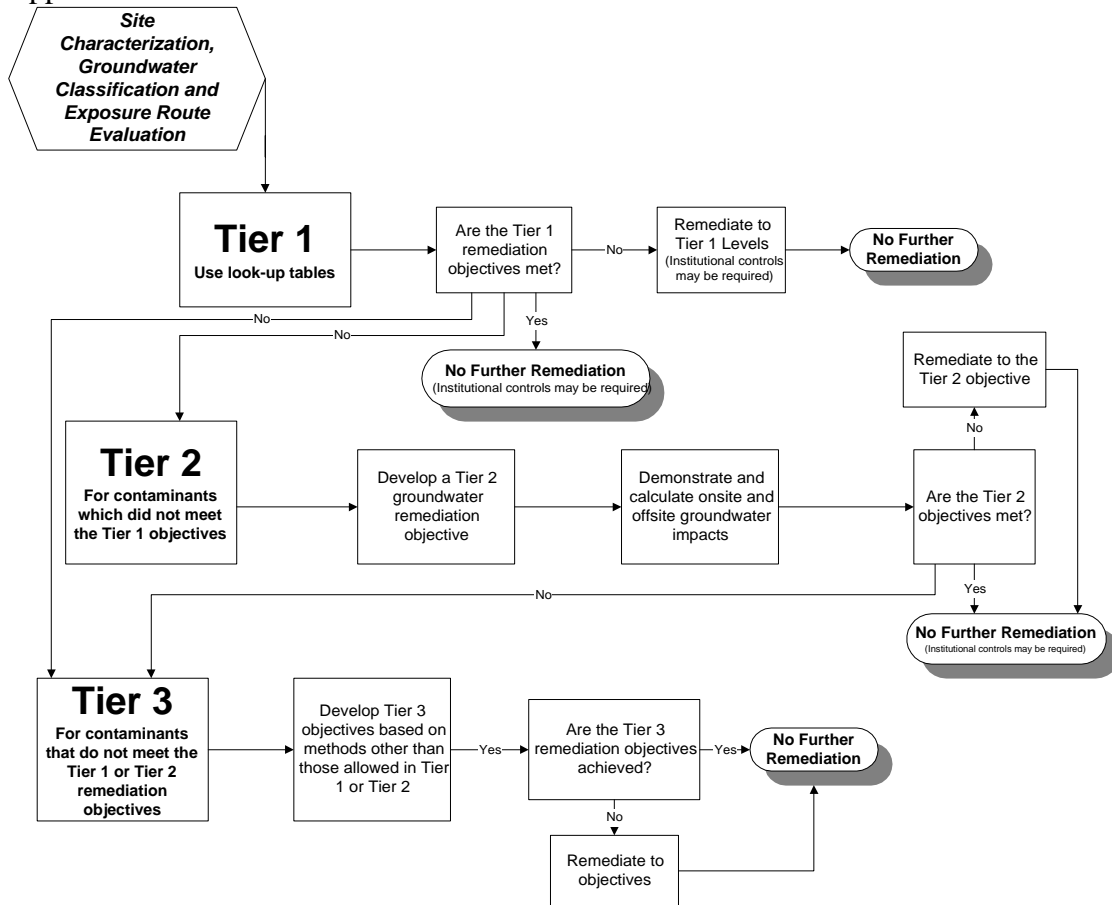
Section 742.APPENDIX A: General

Section 742.Illustration A: Developing Soil Remediation Objectives Under the Tiered Approach



Section 742.APPENDIX A: General

Section 742.Illustration B: Developing Groundwater Remediation Objectives Under the Tiered Approach



Section 742.APPENDIX A: General

Section 742.TABLE A: Soil Saturation Limits ( $C_{sat}$ )for Chemicals Whose Melting Point is Less than 30° C

CAS No.	Chemical Name	$C_{sat}$ (mg/kg)
67-64-1	Acetone	100,000
71-43-2	Benzene	870
111-44-4	Bis(2-chloroethyl)ether	3,300
117-81-7	Bis(2-ethylhexyl)phthalate	31,000
75-27-4	Bromodichloromethane (Dichlorobromomethane)	3,000
75-25-2	Bromoform	1,900
71-36-3	Butanol	10,000
85-68-7	Butyl benzyl phthalate	930
75-15-0	Carbon disulfide	720
56-23-5	Carbon tetrachloride	1,100
108-90-7	Chlorobenzene (Monochlorobenzene)	680
124-48-1	Chlorodibromomethane (Dibromochloromethane)	1,300
67-66-3	Chloroform	2,900
96-12-8	1,2-Dibromo-3-chloropropane	1,400
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	2,800
84-74-2	Di- <i>n</i> -butyl phthalate	2,300
95-50-1	1,2-Dichlorobenzene (o-Dichlorobenzene)	560
75-34-3	1,1-Dichloroethane	1,700
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	1,800
75-35-4	1,1-Dichloroethylene	1,500
156-59-2	<i>cis</i> -1,2-Dichloroethylene	1,200
156-60-5	<i>trans</i> -1,2-Dichloroethylene	3,100
78-87-5	1,2-Dichloropropane	1,100
542-75-6	1,3-Dichloropropene (1,3-Dichloropropylene, <i>cis</i> + <i>trans</i> )	1,400
84-66-2	Diethyl phthalate	2,000
117-84-0	Di- <i>n</i> -octyl phthalate	10,000
100-41-4	Ethylbenzene	400

77-47-4	Hexachlorocyclopentadiene	2,200
78-59-1	Isophorone	4,600
74-83-9	Methyl bromide (Bromomethane)	3,200
1634-04-4	Methyl tertiary-butyl ether	8,800
75-09-2	Methylene chloride (Dichloromethane)	2,400
98-95-3	Nitrobenzene	1,000
100-42-5	Styrene	1,500
127-18-4	Tetrachloroethylene (Perchloroethylene)	240
108-88-3	Toluene	650
120-82-1	1,2,4-Trichlorobenzene	3,200
71-55-6	1,1,1-Trichloroethane	1,200
79-00-5	1,1,2-Trichloroethane	1,800
79-01-6	Trichloroethylene	1,300
108-05-4	Vinyl acetate	2,700
75-01-4	Vinyl chloride	1,200
108-38-3	m-Xylene	420
95-47-6	o-Xylene	410
106-42-3	p-Xylene	460
1330-20-7	Xylenes (total)	320
	<b>Ionizable Organics</b>	
95-57-8	2-Chlorophenol	53,000

(Source: Amended at 26 Ill. Reg. 2683, effective February 5, 2002)

Section 742.APPENDIX A: General

Section 742.TABLE B: Tolerance Factor (K)

Tolerance factors (K) for one-sided normal tolerance intervals with probability level (confidence factor)  $Y = 0.95$  and coverage  $P = 95\%$ .  $n$  = number of samples collected.

<u>n</u>	<u>K</u>
3	7.655
4	5.145
5	4.202
6	3.707
7	3.399
8	3.188
9	3.031
10	2.911
11	2.815
12	2.736
13	2.670
14	2.614
15	2.566
16	2.523
17	2.486
18	2.543
19	2.423
20	2.396
21	2.371
22	2.350
23	2.329
24	2.309
25	2.292
30	2.220
35	2.166
40	2.126
45	2.092
50	2.065
55	2.036
60	2.017
65	2.000
70	1.986
75	1.972
100	1.924
125	1.891
150	1.868
175	1.850



200	1.836
225	1.824
250	1.814
275	1.806
300	1.799
325	1.792
350	1.787
375	1.782
400	1.777
425	1.773
450	1.769

<u>n</u>	<u>K</u>
475	1.766
500	1.763
525	1.760
550	1.757
575	1.754
600	1.752
625	1.750
650	1.748
675	1.746
700	1.744
725	1.742
750	1.740
775	1.739
800	1.737
825	1.736
850	1.734
875	1.733
900	1.732
925	1.731
950	1.729
975	1.728
1000	1.727

Section 742.APPENDIX A: General

Section 742.TABLE C: Coefficients  $\{A_{N-i+1}\}$  for W Test of Normality, for  $N=2(1)50$

i/n	2	3	4	5	6	7	8	9	10	
1	0.7071	0.7071	0.6872	0.6646	0.6431	0.6233	0.6052	0.5888	0.5739	
2	---	0000	1677	2413	2806	3031	3164	3244	3291	
3	---	---	---	0000	0875	1401	1743	1976	2141	
4	---	---	---	---	---	0000	0561	0947	1224	
5	---	---	---	---	---	---	---	0000	0399	
i/n	11	12	13	14	15	16	17	18	19	20
1	0.5601	0.5475	0.5359	0.5251	0.5150	0.5056	0.4968	0.4886	0.4808	0.4734
2	3315	3325	3325	3318	3306	3290	3273	3253	3232	3211
3	2260	2347	2412	2460	2495	2521	2540	2553	2561	2565
4	1429	1586	1707	1802	1878	1939	1988	2027	2059	2085
5	0695	0922	1099	1240	1353	1447	1524	1587	1641	1686
6	0.0000	0.0303	0.0539	0.0727	0.0880	0.1005	0.1109	0.1197	0.1271	0.1334
7	---	---	0000	0240	0433	0593	0725	0837	0932	1013
8	---	---	---	---	0000	0196	0359	0496	0612	0711
9	---	---	---	---	---	---	0000	0163	0303	0422
10	---	---	---	---	---	---	---	---	0000	0140

i/n	21	22	23	24	25	26	27	28	29	30
1	0.4643	0.4590	0.4542	0.4493	0.4450	0.4407	0.4366	0.4328	0.4291	0.4254
2	3185	3156	3126	3098	3069	3043	3018	2992	2968	2944
3	2578	2571	2563	2554	2543	2533	2522	2510	2499	2487
4	2119	2131	2139	2145	2148	2151	2152	2151	2150	2148
5	1736	1764	1787	1807	1822	1836	1848	1857	1864	1870
6	0.1399	0.1443	0.1480	0.1512	0.1539	0.1563	0.1584	0.1601	0.1616	0.1630
7	1092	1150	1201	1245	1283	1316	1346	1372	1395	1415
8	0804	0878	0941	0997	1046	1089	1128	1162	1192	1219
9	0530	0618	0696	0764	0823	0876	0923	0965	1002	1036
10	0263	0368	0459	0539	0610	0672	0728	0778	0822	0862
11	0.0000	0.0122	0.0228	0.0321	0.0403	0.0476	0.0540	0.0598	0.0650	0.0697
12	---	---	0000	0107	0200	0284	0358	0424	0483	0537
13	---	---	---	---	0000	0094	0178	0253	0320	0381
14	---	---	---	---	---	---	0000	0084	0159	0227
15	---	---	---	---	---	---	---	---	0000	0076

i/n	31	32	33	34	35	36	37	38	39	40
1	0.4220	0.4188	0.4156	0.4127	0.4096	0.4068	0.4040	0.4015	0.3989	0.3964
2	2921	2898	2876	2854	2834	2813	2794	2774	2755	2737
3	2475	2463	2451	2439	2427	2415	2403	2391	2380	2368
4	2145	2141	2137	2132	2127	2121	2116	2110	2104	2098
5	1874	1878	1880	1882	1883	1883	1883	1881	1880	1878
i/n	31	32	33	34	35	36	37	38	39	40
6	0.1641	0.1651	0.1660	0.1667	0.1673	0.1678	0.1683	0.1686	0.1689	0.1691
7	1433	1449	1463	1475	1487	1496	1503	1513	1520	1526
8	1243	1265	1284	1301	1317	1331	1344	1356	1366	1376
9	1066	1093	1118	1140	1160	1179	1196	1211	1225	1237
10	0899	0931	0961	0988	1013	1036	1056	1075	1092	1108
11	0.0739	0.0777	0.0812	0.0844	0.0873	0.0900	0.0924	0.0947	0.0967	0.0986
12	0585	0629	0669	0706	0739	0770	0798	0824	0848	0870
13	0435	0485	0530	0572	0610	0645	0677	0706	0733	0759
14	0289	0344	0395	0441	0484	0523	0559	0592	0622	0651
15	0144	0206	0262	0314	0361	0404	0444	0481	0515	0546

16	0.0000	0.0068	0.0131	0.0187	0.0239	0.0287	0.0331	0.0372	0.0409	0.0444
17	---	---	0000	0062	0119	0172	0220	0264	0305	0343
18	---	---	---	---	0000	0057	0110	0158	0203	0244
19	---	---	---	---	---	---	0000	0053	0101	0146
20	---	---	---	---	---	---	---	---	0000	0049
i/n	41	42	43	44	45	46	47	48	49	50
1	0.3940	0.3917	0.3894	0.3872	0.3850	0.3830	0.3808	0.3789	0.3770	0.3751
2	2719	2701	2684	2667	2651	2635	2620	2604	2589	2574
3	2357	2345	2334	2323	2313	2302	2291	2281	2271	2260
4	2091	2085	2078	2072	2065	2058	2052	2045	2038	2032
5	1876	1874	1871	1868	1865	1862	1859	1855	1851	1847
i/n	41	42	43	44	45	46	47	48	49	50
6	0.1693	0.1694	0.1695	0.1695	0.1695	0.1695	0.1695	0.1693	0.1692	0.1691
7	1531	1535	1539	1542	1545	1548	1550	1551	1553	1554
8	1384	1392	1398	1405	1410	1415	1420	1423`	1427	1430
9	1249	1259	1269	1278	1286	1293	1300	1306	1312	1317
10	1123	1136	1149	1160	1170	1180	1189	1197	1205	1212

11	0 1004	0 1020	0 1035	0 1049	0 1062	0 1073	0 1085	0 1095	0 1105	0 1113
12	0891	0909	0927	0943	0959	0972	0986	0998	1010	1020
13	0782	0804	0824	0842	0860	0876	0892	0906	0919	0932
14	0677	0701	0724	0745	0775	0785	0801	0817	0832	0846
15	0575	0602	0628	0651	0673	0694	0713	0731	0748	0764
16	0 0476	0 0506	0 0534	0 0560	0 0584	0 0607	0 0628	0 0648	0 0667	0 0685
17	0379	0411	0442	0471	0497	0522	0546	0568	0588	0608
18	0283	0318	0352	0383	0412	0439	0465	0489	0511	0532
19	0188	0227	0263	0296	0328	0357	0385	0411	0436	0459
20	0094	0136	0175	0211	0245	0277	0307	0335	0361	0386
21	0 0000	0 0045	0 0087	0 0126	0 0163	0 0197	0 0229	0 0259	0 0288	0 0314
22	---	---	0000	0042	0081	0118	0153	0185	0215	0244
23	---	---	---	---	0000	0039	0076	0111	0143	0174
24	---	---	---	---	---	---	0000	0037	0071	0104
25	---	---	---	---	---	---	---	---	0000	0035

Section 742.APPENDIX A: General

Section 742.TABLE D: Percentage Points of the W Test for n=3(1)50

<b>N</b>	<b>0.01</b>	<b>0.05</b>
3	0.753	0.767
4	0.687	0.748
5	0.686	0.762
6	0.713	0.788
7	0.730	0.803
8	0.749	0.818
9	0.764	0.829
10	0.781	0.842
11	0.792	0.850
12	0.805	0.859
13	0.814	0.866
14	0.825	0.874
15	0.835	0.881
16	0.844	0.887
17	0.851	0.892
18	0.858	0.897
19	0.863	0.901
20	0.868	0.905
21	0.873	0.908
22	0.878	0.911
23	0.881	0.914
24	0.884	0.916
25	0.888	0.918
26	0.891	0.920
27	0.894	0.923
28	0.896	0.924
29	0.898	0.926
30	0.900	0.927
31	0.902	0.929
32	0.904	0.930
33	0.906	0.931
34	0.908	0.933
35	0.910	0.934

(Source: Amended at 25 Ill. Reg. 10374, effective August 15,2001)

Section 742.APPENDIX A: General

Section 742.TABLE E: Similar-Acting Noncarcinogenic Chemicals

### Adrenal Gland

Nitrobenzene  
1,2,4-Trichlorobenzene (Ingestion only)

### Kidney

Acetone (Ingestion only)  
Cadmium (Ingestion only)  
Chlorobenzene  
Dalapon  
1,1-Dichloroethane  
Di-n-octyl phthalate (Ingestion only)  
Endosulfan  
Ethylbenzene  
Fluoranthene  
Methyl tertiary-butyl ether (Inhalation only)  
Nitrobenzene  
Pyrene  
Toluene (Ingestion only)  
2,4,5-Trichlorophenol  
Vinyl acetate (Ingestion only)

### Liver

Acenaphthene  
Acetone (Ingestion only)  
Butylbenzyl phthalate (Ingestion only)  
Chlorobenzene (Ingestion only)  
1,1-Dichloroethylene (Ingestion only)  
Di-n-octyl phthalate (Ingestion only)  
Endrin  
Ethylbenzene  
Fluoranthene  
Methyl tertiary-butyl ether (Inhalation only)  
Nitrobenzene  
Picloram  
Styrene (Ingestion only)  
2,4,5-TP (Silvex)  
Toluene (Ingestion only)  
1,2,4-Trichlorobenzene (Inhalation only)  
2,4,5-Trichlorophenol

### Central Nervous System

Butanol (Ingestion only)  
Cyanide (amenable)  
2,4-Dimethylphenol  
Endrin  
Manganese  
2-Methylphenol  
Mercury (Inhalation only)  
Styrene (Inhalation only)  
Toluene (Inhalation only)  
Xylenes (Ingestion only)

### Circulatory System

Antimony  
Barium (Ingestion only)  
2,4-D  
cis-1,2-Dichloroethylene (Ingestion only)  
Nitrobenzene  
trans-1,2-Dichloroethylene (Ingestion only)  
2,4-Dimethylphenol  
Fluoranthene  
Fluorene  
Styrene (Ingestion only)  
Zinc

### Gastrointestinal System

Beryllium (Ingestion only)  
Endothall  
Hexachlorocyclopentadiene (Ingestion only)  
Methyl bromide (Ingestion only)  
Methyl tertiary-butyl ether (Ingestion only)



### Immune System

2,4-Dichlorophenol

p-Chloroaniline

Mercury (Ingestion only)

### Reproductive System

Barium (Inhalation only)

Boron (Ingestion only)

Carbon disulfide

2-Chlorophenol (Ingestion only)

1,2 Dibromo-3-Chloropropane (Inhalation only)

Dinoseb

Ethylbenzene (Inhalation only)

Methoxychlor

Phenol

### Respiratory System

1,2-Dichloropropane (Inhalation only)

1,3-Dichloropropylene (Inhalation only)

Hexachlorocyclopentadiene (Inhalation only)

Methyl bromide (Inhalation only)

Naphthalene (Inhalation only)

Toluene (Inhalation only)

Vinyl acetate (Inhalation only)

### Cholinesterase Inhibition

Aldicarb

Carbofuran

### Decreased Body Weight Gains and Circulatory System Effects

Atrazine

Simazine

(Source: Amended at 26 Ill. Reg. 2683, effective February 5, 2002)

Section 742.APPENDIX A: General

Section 742.TABLE F: Similar-Acting Carcinogenic Chemicals

Kidney

Bromodichloromethane (Ingestion only)  
Chloroform (Ingestion only)  
1,2-Dibromo-3-chloropropane (Ingestion only)  
2,4-Dinitrotoluene  
2,6-Dinitrotoluene  
Hexachlorobenzene

Liver

Aldrin  
Bis(2-chloroethyl)ether  
Bis(2-ethylhexyl)phthalate (Ingestion only)  
Carbazole  
Carbon tetrachloride  
Chlordane  
Chloroform (Inhalation only)  
DDD  
DDE  
DDT  
1,2-Dibromo-3-chloropropane (Ingestion only)  
1,2-Dibromoethane(Ingestion only)  
3,3'-Dichlorobenzidine  
1,2-Dichloroethane  
1,2-Dichloropropane (Ingestion only)  
1,3-Dichloropropylene (Ingestion only)  
Dieldrin  
2,4-Dinitrotoluene  
2,6-Dinitrotoluene  
Heptachlor  
Heptachlor epoxide  
Hexachlorobenzene  
alpha-HCH  
gamma-HCH (Lindane)  
Methylene chloride  
N-Nitrosodiphenylamine  
N-Nitrosodi-n-propylamine  
Pentachlorophenol  
Tetrachloroethylene  
Trichloroethylene  
2,4,6-Trichlorophenol  
Toxaphene

Vinyl chloride

Circulatory System

Benzene

2,4,6-Trichlorophenol

### Gastrointestinal System

Benzo(a)anthracene  
Benzo(b)fluoranthene  
Benzo(k)fluoranthene  
Benzo(a)pyrene  
Chrysene  
Dibenzo(a,h)anthracene  
Indeno(1,2,3-c,d)pyrene  
Bromodichloromethane (Ingestion only)  
Bromoform  
1,2-Dibromo-3-chloropropane (Ingestion only)  
1,2-Dibromoethane (Ingestion only)  
1,3-Dichloropropylene (Ingestion only)

### Lung

Arsenic (Inhalation only)  
Beryllium (Inhalation only)  
Cadmium (Inhalation only)  
Chromium, hexavalent (Inhalation only)  
1,3-Dichloropropylene (Inhalation only)  
Methylene chloride (Inhalation only)  
N-Nitrosodi-n-propylamine  
Nickel (Inhalation only)  
Vinyl chloride

### Nasal Cavity

1,2-Dibromo-3-chloropropane (Inhalation only)  
1,2-Dibromoethane (Inhalation only)  
N-Nitrosodi-n-propylamine

### Bladder

3,30-Dichlorobenzidine  
1,3-Dichloropropylene (Ingestion only)  
N-Nitrosodiphenylamine

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

Section 742.APPENDIX A: General

Section 742.TABLE G: Concentrations of Inorganic Chemicals in Background Soils

Chemical Name	Counties Within Metropolitan Statistical Areas <sup>†</sup> (mg/kg)	Counties Outside Metropolitan Statistical Areas (mg/kg)
Aluminum	9,500	9,200
Antimony	4.0	3.3
Arsenic	13.0	11.3
Barium	110`	122
Beryllium	0.59	0.56
Cadmium	0.6	0.50
Calcium	9,300	5,525
Chromium	16.2	13.0
Cobalt	8.9	8.9
Copper	19.6	12.0
Cyanide	0.51	0.50
Iron	15,900	15,000
Lead	36.0	20.9
Magnesium	4,820	2,700
Manganese	636	630
Mercury	0.06	0.05

Nickel	18.0	13.0
Potassium	1,268	1,100
Selenium	0.48	0.37
Silver	0.55	0.50
Sodium	130	130.0
Sulfate	85.5	110
Sulfide	3.1	2.9
Thallium	0.32	0.42
Vanadium	25.2	25.0
Zinc	95.0	60.2

\*BOARD NOTE: Counties within Metropolitan Statistical Areas: Boone, Champaign, Clinton, Cook, DuPage, Grundy, Henry, Jersey, Kane, Kankakee, Kendall, Lake, Macon, Madison, McHenry, McLean, Menard, Monroe, Peoria, Rock Island, Sangamon, St. Clair, Tazewell, Will, Winnebago and Woodford.

(Source: Amended at 25 Ill. Reg. 651, effective January 6, 2001)

Section 742.APPENDIX A: General

TABLE H: Chemicals Whose Tier 1 Class I Groundwater Remediation Objective Exceeds the 1 in 1,000,000 Cancer Risk Concentration

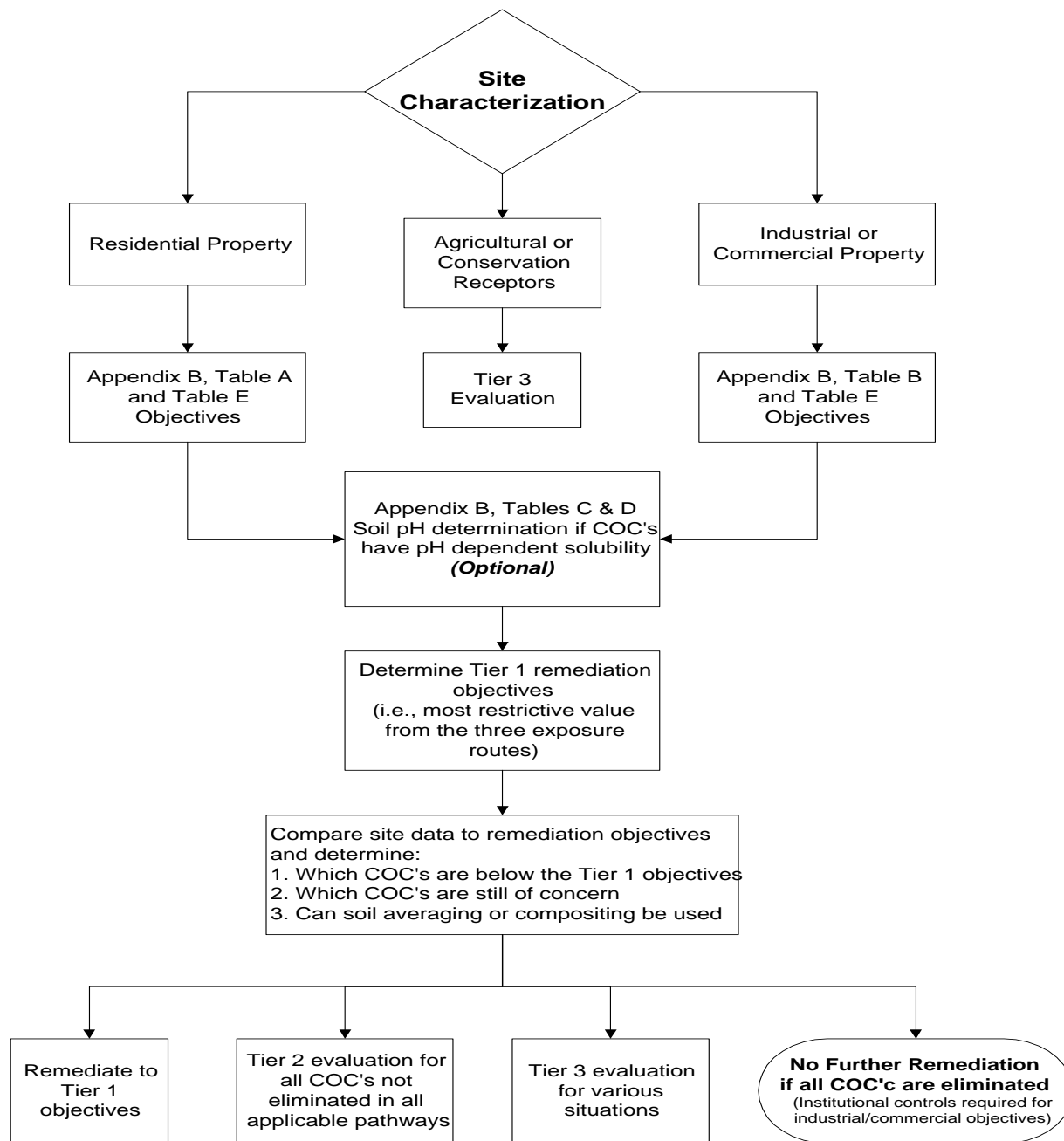
<u>Chemical</u>	<u>Class I Groundwater Remediation Objective (mg/l)</u>	<u>1 in 1,000,000 Cancer Risk Concentration (mg/l)</u>	<u>ADL (mg/l)</u>
Aldrin	0.014	0.000005	0.014
Benzo(a)pyrene	0.0002	0.000012	0.00023
Bis(2-chloroethyl)ether	0.01	0.000077	0.01
Bis(2-ethylhexyl)phthalate (Di(2-ethylhexyl)phthalate)	0.006	0.0061	0.0027
Carbon Tetrachloride	0.005	0.00066	0.0001
Chlordane	0.002	0.000066	0.00014
DDD	0.014	0.00023	0.014
DDE	0.01	0.00023	0.01
DDT	0.006	0.00023	0.006
Dibenzo(a,h)anthracene	0.0003	0.000012	0.0003
1,2-Dibromo-3-chloropropane	0.0002	0.000061	0.001
1,2-dibromoethane	0.00005	0.0000010	0.001
3,3'-Dichlorobenzidine	0.02	0.00019	0.02
1,2-Dichloroethane	0.005	0.00094	0.0003
Dieldrin	0.009	0.0000053	0.009
2,6-Dinitrotoluene	0.00031	0.0001	0.00031
Heptachlor	0.0004	0.000019	0.013
Heptachlor epoxide	0.0002	0.0000094	0.015
Hexachlorobenzene	0.00006	0.000053	0.00006
Alpha-HCH	0.00011	0.000014	0.000111
Tetrachloroethylene	0.005	0.0016	0.0004
Toxaphene	0.003	0.000077	0.00086
Vinyl chloride	0.002	0.000045	0.0002
<u>Ionizable Organics</u>			
N-Nitrosodi-n-propylamine	0.0018	0.000012	0.0018
Pentachlorophenol	0.001	0.00071	0.000076
2,4,6-Trichlorophenol	0.01	0.007	0.01
<u>Inorganics Organics</u>			
Arsenic	0.05	0.000057	0.001
Beryllium	0.004	0.00002	0.004

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

Section 742.APPENDIX B: Tier 1 Tables and Illustrations

Section 742.Illustration A: Tier 1 Evaluation





Section 742.APPENDIX B: Tier 1 Tables and Illustrations

Section 742.TABLE A: Tier 1 Soil Remediation Objectives<sup>a</sup> for Residential Properties

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		ADL (mg/kg)
		Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	
83-32-9	Acenaphthene	4,700 <sup>b</sup>	--- <sup>c</sup>	570 <sup>b</sup>	2,900	*
67-64-1	Acetone	7,800 <sup>b</sup>	100,000 <sup>d</sup>	16 <sup>b</sup>	16	*
15972-60-8	Alachlor <sup>o</sup>	8 <sup>e</sup>	--- <sup>c</sup>	0.04	0.2	NA
116-06-3	Aldicarb <sup>o</sup>	78 <sup>b</sup>	--- <sup>c</sup>	0.013	0.07	NA
309-00-2	Aldrin	0.04 <sup>e</sup>	3 <sup>e</sup>	0.5 <sup>e</sup>	2.5	0.94
120-12-7	Anthracene	23,000 <sup>b</sup>	--- <sup>c</sup>	12,000 <sup>b</sup>	59,000	*
1912-24-9	Atrazine <sup>o</sup>	2700 <sup>b</sup>	--- <sup>c</sup>	0.066	0.33	NA
71-43-2	Benzene	12 <sup>e</sup>	0.8 <sup>e</sup>	0.03	0.17	*
56-55-3	Benzo(a)anthracene	0.9 <sup>e</sup>	--- <sup>c</sup>	2	8	*
205-99-2	Benzo(b)fluoranthene	0.9 <sup>e</sup>	--- <sup>c</sup>	5	25	*

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		ADL (mg/kg)
		Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	
207-08-9	Benzo(k)fluroanthene	9 <sup>e</sup>	--- <sup>c</sup>	49	250	*
50-32-8	Benzo(a)pyrene	0.09 <sup>e,f</sup>	--- <sup>c</sup>	8	82	*
111-44-4	Bis(2-chloroethyl)ether	0.6 <sup>e</sup>	0.2 <sup>e,f</sup>	0.0004 <sup>e,f</sup>	0.0004	0.66
117-81-7	Bis(2-ethylhexyl)phthalate	46 <sup>e</sup>	31,000 <sup>d</sup>	3,600	31,000 <sup>d</sup>	*
75-27-4	Bromodichloromethane (Dichlorobromomethane)	10 <sup>e</sup>	3,000 <sup>d</sup>	0.6	0.6	*
75-25-2	Bromoform	81 <sup>e</sup>	53 <sup>e</sup>	0.8	0.8	*
71-36-3	Butanol	7,800 <sup>b</sup>	10,000 <sup>d</sup>	17 <sup>b</sup>	17	NA
85-68-7	Butyl benzyl phthalate	16,000 <sup>b</sup>	930 <sup>d</sup>	930 <sup>d</sup>	930 <sup>d</sup>	*
86-74-8	Carbazole	32 <sup>e</sup>	--- <sup>c</sup>	0.6 <sup>e</sup>	2.8	NA
1563-66-2	Carbofuran <sup>o</sup>	390 <sup>b</sup>	--- <sup>c</sup>	0.22	1.1	NA
75-15-0	Carbon disulfide	7,800 <sup>b</sup>	720 <sup>d</sup>	32 <sup>b</sup>	160	*

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		ADL (mg/kg)
		Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	
56-23-5	Carbon tetrachloride	5 <sup>e</sup>	0.3 <sup>e</sup>	0.07	0.33	*
57-74-9	Chlordane	1.8 <sup>e</sup>	72 <sup>e</sup>	10	48	*
106-47-8	4-Chloroaniline ( <i>p</i> -Chloroaniline)	310 <sup>b</sup>	--- <sup>c</sup>	0.7 <sup>b</sup>	0.7	*
108-90-7	Chlorobenzene (Monochlorobenzene)	1,600 <sup>b</sup>	130 <sup>b</sup>	1	6.5	*
124-48-1	Chlorodibromomethane (Dibromochloromethane)	1,600 <sup>b</sup>	1,300 <sup>d</sup>	0.4	0.4	*
67-66-3	Chloroform	100 <sup>e</sup>	0.3 <sup>e</sup>	0.6	2.9	*
218-01-9	Chrysene	88 <sup>e</sup>	--- <sup>c</sup>	160	800	*
94-75-7	2,4-D <sup>g</sup>	780 <sup>b</sup>	--- <sup>c</sup>	1.5	7.7	*
75-99-0	Dalapon <sup>o</sup>	2,300 <sup>b</sup>	--- <sup>c</sup>	0.85	8.5	*
72-54-8	DDD	3 <sup>e</sup>	--- <sup>c</sup>	16 <sup>e</sup>	80	*
72-55-9	DDE	2 <sup>e</sup>	--- <sup>c</sup>	54 <sup>e</sup>	270	*

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		ADL (mg/kg)
		Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	
50-29-3	DDT	2 <sup>e</sup>	--- <sup>g</sup>	32 <sup>e</sup>	160	*
53-70-3	Dibenzo( <i>a,h</i> )anthracene	0.09 <sup>e,f</sup>	--- <sup>c</sup>	2	7.6	*
96-12-8	1,2-Dibromo-3-chloropropane	0.46 <sup>e</sup>	11 <sup>b</sup>	0.002	0.002	*
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	0.0075 <sup>e</sup>	0.17 <sup>e</sup>	0.0004	0.004	0.005
84-74-2	Di- <i>n</i> -butyl phthalate	7,800 <sup>b</sup>	2,300 <sup>d</sup>	2,300 <sup>d</sup>	2,300 <sup>d</sup>	*
95-50-1	1,2-Dichlorobenzene ( <i>o</i> -Dichlorobenzene)	7,000 <sup>b</sup>	560 <sup>d</sup>	17	43	*
106-46-7	1,4-Dichlorobenzene ( <i>p</i> -Dichlorobenzene)	--- <sup>c</sup>	11,000 <sup>b</sup>	2	11	*
91-94-1	3,3'-Dichlorobenzidine	1 <sup>e</sup>	--- <sup>c</sup>	0.007 <sup>e,f</sup>	0.033	1.3
75-34-3	1,1-Dichloroethane	7,800 <sup>b</sup>	1,300 <sup>b</sup>	23 <sup>b</sup>	110	*

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		ADL (mg/kg)
		Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	7 <sup>e</sup>	0.4 <sup>e</sup>	0.02	0.1	*
75-35-4	1,1-Dichloroethylene	700 <sup>b</sup>	1,500 <sup>d</sup>	0.06	0.3	*
156-59-2	<i>cis</i> -1,2-Dichloroethylene	780 <sup>b</sup>	1,200 <sup>d</sup>	0.4	1.1	*
156-60-5	<i>trans</i> -1,2-Dichloroethylene	1,600 <sup>b</sup>	3,100 <sup>d</sup>	0.7	3.4	*
78-87-5	1,2-Dichloropropane	9 <sup>e</sup>	15 <sup>b</sup>	0.03	0.15	*
542-75-6	1,3-Dichloropropene (1,3-Dichloropropylene, <i>cis</i> + <i>trans</i> )	6.4 <sup>e</sup>	1.1 <sup>e</sup>	0.004 <sup>e</sup>	0.02	0.005
60-57-1	Dieldrin <sup>n</sup>	0.04 <sup>e</sup>	1 <sup>e</sup>	0.004 <sup>e</sup>	0.02	0.603
84-66-2	Diethyl phthalate	63,000 <sup>b</sup>	2,000 <sup>d</sup>	470 <sup>b</sup>	470	*
105-67-9	2,4-Dimethylphenol	1,600 <sup>b</sup>	--- <sup>c</sup>	9 <sup>b</sup>	9	*
121-14-2	2,4-Dinitrotoluene	0.9 <sup>e</sup>	--- <sup>c</sup>	0.0008 <sup>e,f</sup>	0.0008	0.250

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		
		Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
606-20-2	2,6-Dinitrotoluene	0.9 <sup>e</sup>	--- <sup>c</sup>	0.0007 <sup>e,f</sup>	0.0007	0.260
117-84-0	Di- <i>n</i> -octyl phthalate	1,600 <sup>b</sup>	10,000 <sup>d</sup>	10,000 <sup>d</sup>	10,000 <sup>d</sup>	*
115-29-7	Endosulfan <sup>o</sup>	470 <sup>b</sup>	--- <sup>c</sup>	18 <sup>b</sup>	90	*
145-73-3	Endothall <sup>o</sup>	1,600 <sup>b</sup>	--- <sup>c</sup>	0.4	0.4	NA
72-20-8	Endrin	23 <sup>b</sup>	--- <sup>c</sup>	1	5	*
100-41-4	Ethylbenzene	7,800 <sup>b</sup>	400 <sup>d</sup>	13	19	*
206-44-0	Fluoranthene	3,100 <sup>b</sup>	--- <sup>c</sup>	4,300 <sup>b</sup>	21,000	*
86-73-7	Fluorene	3,100 <sup>b</sup>	--- <sup>c</sup>	560 <sup>b</sup>	2,800	*
76-44-8	Heptachlor	0.1 <sup>e</sup>	0.1 <sup>e</sup>	23	110	0.871
1024-57-3	Heptachlor epoxide	0.07 <sup>e</sup>	5 <sup>e</sup>	0.7	3.3	1.005
118-74-1	Hexachlorobenzene	0.4 <sup>e</sup>	1 <sup>e</sup>	2	11	*
319-84-6	<i>Alpha</i> -HCH ( <i>alpha</i> -BHC)	0.1 <sup>e</sup>	0.8 <sup>e</sup>	0.0005 <sup>e,f</sup>	0.003	0.0074

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		ADL (mg/kg)
		Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	
58-89-9	<i>Gamma</i> -HCH (Lindane) <sup>a</sup>	0.5 <sup>e</sup>	--- <sup>c</sup>	0.009	0.047	*
77-47-4	Hexachlorocyclopentadiene	550 <sup>b</sup>	10 <sup>b</sup>	400	2,200 <sup>d</sup>	*
67-72-1	Hexachloroethane	78 <sup>b</sup>	--- <sup>c</sup>	0.5 <sup>b</sup>	2.6	*
193-39-5	Indeno(1,2,3- <i>c,d</i> )pyrene	0.9 <sup>e</sup>	--- <sup>c</sup>	14	69	*
78-59-1	Isophorone	15,600 <sup>b</sup>	4,600 <sup>d</sup>	8 <sup>b</sup>	8	*
72-43-5	Methoxychlor <sup>o</sup>	390 <sup>b</sup>	--- <sup>c</sup>	160	780	*
74-83-9	Methyl bromide (Bromomethane)	110 <sup>b</sup>	10 <sup>b</sup>	0.2 <sup>b</sup>	1.2	*
1634-04-4	Methyl tertiary-butyl ether	780 <sup>b</sup>	8,800 <sup>d</sup>	0.32	0.32	*
75-09-2	Methylene chloride (Dichloromethane)	85 <sup>e</sup>	13 <sup>e</sup>	0.02 <sup>e</sup>	0.2	*
95-48-7	2-Methylphenol ( <i>o</i> - Cresol)	3,900 <sup>b</sup>	--- <sup>c</sup>	15 <sup>b</sup>	15	*
91-20-3	Naphthalene	1,600 <sup>b</sup>	170 <sup>b</sup>	12 <sup>b</sup>	18	*
98-95-3	Nitrobenzene	39 <sup>b</sup>	92 <sup>b</sup>	0.1 <sup>b,f</sup>	0.1	0.26



CAS No.	Chemical Name	Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		ADL (mg/kg)
		Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	
86-30-6	<i>N</i> -Nitrosodiphenylamine	130 <sup>e</sup>	--- <sup>c</sup>	1 <sup>e</sup>	5.6	*
621-64-7	<i>N</i> -Nitrosodi- <i>n</i> -propylamine	0.09 <sup>e,f</sup>	--- <sup>c</sup>	0.00005 <sup>e,f</sup>	0.00005	0.0018
108-95-2	Phenol	47,000 <sup>b</sup>	--- <sup>c</sup>	100 <sup>b</sup>	100	*
1918-02-1	Picloram <sup>o</sup>	5,500 <sup>b</sup>	--- <sup>c</sup>	2	20	NA
1336-36-3	Polychlorinated biphenyls (PCBs) <sup>n</sup>	1 <sup>h</sup>	--- <sup>c,h</sup>	--- <sup>h</sup>	--- <sup>h</sup>	*
129-00-0	Pyrene	2,300 <sup>b</sup>	--- <sup>c</sup>	4,200 <sup>b</sup>	21,000	*
122-34-9	Simazine <sup>o</sup>	390 <sup>b</sup>	--- <sup>c</sup>	0.04	0.37	NA
100-42-5	Styrene	16,000 <sup>b</sup>	1,500 <sup>d</sup>	4	18	*
127-18-4	Tetrachloroethylene (Perchloroethylene)	12 <sup>e</sup>	11 <sup>e</sup>	0.06	0.3	*
108-88-3	Toluene	16,000 <sup>b</sup>	650 <sup>d</sup>	12	29	*

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		ADL (mg/kg)
		Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	
8001-35-2	Toxaphene <sup>a</sup>	0.6 <sup>e</sup>	89 <sup>e</sup>	31	150	*
120-82-1	1,2,4-Trichlorobenzene	780 <sup>b</sup>	3,200 <sup>b</sup>	5	53	*
71-55-6	1,1,1-Trichloroethane	--- <sup>c</sup>	1,200 <sup>d</sup>	2	9.6	*
79-00-5	1,1,2-Trichloroethane	310 <sup>b</sup>	1,800 <sup>d</sup>	0.02	0.3	*
79-01-6	Trichloroethylene	58 <sup>e</sup>	5 <sup>e</sup>	0.06	0.3	*
108-05-4	Vinyl acetate	78,000 <sup>b</sup>	1,000 <sup>b</sup>	170 <sup>b</sup>	170	*
75-01-4	Vinyl chloride	0.46 <sup>e</sup>	0.28 <sup>e</sup>	0.01 <sup>f</sup>	0.07	*
108-38-3	m-Xylene	160,000 <sup>b</sup>	420 <sup>d</sup>	210	210	*
95-47-6	o-Xylene	160,000 <sup>b</sup>	410 <sup>d</sup>	190	190	*
106-42-3	p-Xylene	160,000 <sup>b</sup>	460 <sup>d</sup>	200	200	*

		Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
1330-20-7	Xylenes (total)	160,000 <sup>b</sup>	320 <sup>d</sup>	150	150	*
	<b>Ionizable Organics</b>					
65-85-0	Benzoic Acid	310,000 <sup>b</sup>	--- <sup>c</sup>	400 <sup>b,i</sup>	400 <sup>i</sup>	*
95-57-8	2-Chlorophenol	390 <sup>b</sup>	53,000 <sup>d</sup>	4 <sup>b,i</sup>	4 <sup>i</sup>	*
120-83-2	2,4-Dichlorophenol	230 <sup>b</sup>	--- <sup>c</sup>	1 <sup>b,i</sup>	1 <sup>i</sup>	*
51-28-5	2,4-Dinitrophenol	160 <sup>b</sup>	--- <sup>c</sup>	0.2 <sup>b,f</sup>	0.2	3.3
88-85-7	Dinoseb <sup>o</sup>	78 <sup>b</sup>	--- <sup>c</sup>	0.34 <sup>b,i</sup>	3.4 <sup>i</sup>	*
87-86-5	Pentachlorophenol	3 <sup>e,j</sup>	--- <sup>c</sup>	0.03 <sup>f,i</sup>	0.14 <sup>i</sup>	*
93-72-1	2,4,5-TP (Silvex)	630 <sup>b</sup>	--- <sup>c</sup>	11 <sup>i</sup>	55 <sup>i</sup>	*
95-95-4	2,4,5-Trichlorophenol	7,800 <sup>b</sup>	--- <sup>c</sup>	270 <sup>b,i</sup>	1,400 <sup>i</sup>	*
88-06-2	2,4,6 Trichlorophenol	58 <sup>e</sup>	200 <sup>e</sup>	0.2 <sup>e,f,i</sup>	0.77 <sup>i</sup>	0.66

CAS No.	Chemical Name	Exposure Route-specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		ADL (mg/kg)
		Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/L)	Class II (mg/L)	
	<b>Inorganics</b>					
7440-36-0	Antimony	31 <sup>b</sup>	--- <sup>c</sup>	0.006 <sup>m</sup>	0.024 <sup>m</sup>	*
7440-38-2	Arsenic <sup>l,n</sup>	t	750 <sup>e</sup>	0.05 <sup>m</sup>	0.2 <sup>m</sup>	*
7440-39-3	Barium	5,500 <sup>b</sup>	690,000 <sup>b</sup>	2.0 <sup>m</sup>	2.0 <sup>m</sup>	*
7440-41-7	Beryllium	160 <sup>b</sup>	1,300 <sup>e</sup>	0.004 <sup>m</sup>	0.5 <sup>m</sup>	*
7440-42-8	Boron	7,000 <sup>b</sup>	--- <sup>g</sup>	2.0 <sup>m</sup>	2.0 <sup>m</sup>	*
7440-43-9	Cadmium <sup>l,n</sup>	78 <sup>b,r</sup>	1,800 <sup>e</sup>	0.005 <sup>m</sup>	0.05 <sup>m</sup>	*
16887-00-6	Chloride	--- <sup>c</sup>	--- <sup>c</sup>	200 <sup>m</sup>	200 <sup>m</sup>	*
7440-47-3	Chromium, total	230 <sup>b</sup>	270 <sup>e</sup>	0.1 <sup>m</sup>	1.0 <sup>m</sup>	*
16065-83-1	Chromium, ion, trivalent	120,000 <sup>b</sup>	--- <sup>c</sup>	--- <sup>g</sup>	--- <sup>g</sup>	*
18540-29-9	Chromium, ion, hexavalent	230 <sup>b</sup>	270 <sup>e</sup>	---	---	*
7440-48-4	Cobalt	4,700 <sup>b</sup>	--- <sup>c</sup>	1.0 <sup>m</sup>	1.0 <sup>m</sup>	*

CAS No.	Chemical Name	Exposure Route-specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		ADL (mg/kg)
		Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/L)	Class II (mg/L)	
7440-50-8	Copper <sup>n</sup>	2,900 <sup>b</sup>	--- <sup>c</sup>	0.65 <sup>m</sup>	0.65 <sup>m</sup>	*
57-12-5	Cyanide (amenable)	1,600 <sup>b</sup>	--- <sup>c</sup>	0.2 <sup>q,m</sup>	0.6 <sup>q,m</sup>	*
7782-41-4	Fluoride	4,700 <sup>b</sup>	--- <sup>c</sup>	4.0 <sup>m</sup>	4.0 <sup>m</sup>	*
15438-31-0	Iron	--- <sup>c</sup>	--- <sup>c</sup>	5.0 <sup>m</sup>	5.0 <sup>m</sup>	*
7439-92-1	Lead	400 <sup>k</sup>	--- <sup>c</sup>	0.0075 <sup>m</sup>	0.1 <sup>m</sup>	*
7439-96-5	Manganese	3,700 <sup>b</sup>	69,000 <sup>b</sup>	0.15 <sup>m</sup>	10.0 <sup>m</sup>	*
7439-97-6	Mercury <sup>l,n,s</sup>	23 <sup>b</sup>	10 <sup>b</sup>	0.002 <sup>m</sup>	0.01 <sup>m</sup>	*
7440-02-0	Nickel <sup>l</sup>	1,600 <sup>b</sup>	13,000 <sup>e</sup>	0.1 <sup>m</sup>	2.0 <sup>m</sup>	*
14797-55-8	Nitrate as N <sup>p</sup>	130,000 <sup>b</sup>	--- <sup>c</sup>	10.0 <sup>q</sup>	100 <sup>q</sup>	*
7782-49-2	Selenium <sup>l,n</sup>	390 <sup>b</sup>	--- <sup>c</sup>	0.05 <sup>m</sup>	0.05 <sup>m</sup>	*

CAS No.	Chemical Name	Exposure Route-specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		ADL (mg/kg)
		Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/L)	Class II (mg/L)	
7440-22-4	Silver	390 <sup>b</sup>	--- <sup>c</sup>	0.05 <sup>m</sup>	---	*
14808-79-8	Sulfate	--- <sup>c</sup>	--- <sup>c</sup>	400 <sup>m</sup>	400 <sup>m</sup>	*
7440-28-0	Thallium	6.3 <sup>b,u</sup>	--- <sup>c</sup>	0.002 <sup>m</sup>	0.02 <sup>m</sup>	*
7440-62-2	Vanadium	550 <sup>b</sup>	--- <sup>c</sup>	0.049 <sup>m</sup>	0.1 <sup>m</sup>	*
7440-66-6	Zinc <sup>1</sup>	23,000 <sup>b</sup>	--- <sup>c</sup>	5.0 <sup>m</sup>	10 <sup>m</sup>	*

"\*" indicates that the ADL is less than or equal to the specified remediation objective.  
 NA means not available; no PQL or EQL available in USEPA analytical methods.

### Chemical Name and Soil Remediation Objective Notations

- <sup>a</sup> Soil remediation objectives based on human health criteria only.
- <sup>b</sup> Calculated values correspond to a target hazard quotient of 1.
- <sup>c</sup> No toxicity criteria available for the route of exposure.
- <sup>d</sup> Soil saturation concentration ( $C_{[sat]}$ ) = the concentration at which the absorptive limits of the soil particles, the solubility limits of the available soil moisture, and saturation of soil pore air have been reached. Above the soil saturation concentration, the assumptions regarding vapor transport to air and/or dissolved phase transport to groundwater (for chemicals which are liquid at ambient soil temperatures) have been violated, and alternative modeling approaches are required.
- <sup>e</sup> Calculated values correspond to a cancer risk level of 1 in 1,000,000.
- <sup>f</sup> Level is at or below Contract Laboratory Program required quantitation limit for Regular Analytical Services (RAS).
- <sup>g</sup> Chemical-specific properties are such that this route is not of concern at any soil contaminant concentration.
- <sup>h</sup> 40 CFR 761 contains applicability requirements and methodologies for the development of PCB remediation objectives. Requests for approval of a Tier 3 evaluation must address the applicability of 40 CFR 761.
- <sup>i</sup> Soil remediation objective for pH of 6.8. If soil pH is other than 6.8, refer to Appendix B, Tables C and D of this Part.
- <sup>j</sup> Ingestion soil remediation objective adjusted by a factor of 0.5 to account for dermal route.
- <sup>k</sup> A preliminary remediation goal of 400 mg/kg has been set for lead based on *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*, OSWER Directive #9355.4-12.
- <sup>l</sup> Potential for soil-plant-human exposure.
- <sup>m</sup> The person conducting the remediation has the option to use: 1) TCLP or SPLP test results to compare with the remediation objectives listed in this Table; or 2) the total amount of contaminant in the soil sample results to compare with pH specific remediation objectives listed in Appendix B, Table C or D of this Part. (See Section 742.510.) If the person conducting the remediation wishes to calculate soil remediation objectives based on background concentrations, this should be done in accordance with Subpart D of this Part.
- <sup>n</sup> The Agency reserves the right to evaluate the potential for remaining contaminant concentrations to pose significant threats to crops, livestock, or wildlife.
- <sup>o</sup> For agrichemical facilities, remediation objectives for surficial soils which are based on field application rates may be more appropriate for currently registered pesticides. Consult the Agency for further information.
- <sup>p</sup> For agrichemical facilities, soil remediation objectives based on site-specific background concentrations of Nitrate as N may be more appropriate. Such determinations shall be conducted in accordance with the procedures set forth in Subparts D and I of this Part.
- <sup>q</sup> The TCLP extraction must be done using water at a pH of 7.0.
- <sup>r</sup> Value based on dietary Reference Dose.
- <sup>s</sup> Value for Ingestion based on Reference Dose for Mercuric chloride (CAS No. 7487-94-7); value for Inhalation based on Reference Concentration for elemental Mercury (CAS No. 7439-97-6).
- <sup>t</sup> For the ingestion route for arsenic, see 742.Appendix A, Table G.
- <sup>u</sup> Value based on Reference Dose for Thallium sulfate (CAS No. 7446-18-6).

((Source: Amended at 26 Ill. Reg. 2683, effective February 5, 2002))

Section 742.APPENDIX B: Tier 1 Tables and Illustrations

Section 742.Table B: Tier 1 Soil Remediation Objectives<sup>a</sup> for Industrial/Commercial Properties

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route		ADL (mg/kg)
		Industrial-Commercial		Construction Worker		Values		
		Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	ClassII (mg/kg)	
83-32-9	Acenaphthene	120,000 <sup>b</sup>	---- <sup>c</sup>	120,000 <sup>b</sup>	---- <sup>c</sup>	570 <sup>b</sup>	2,900	*
67-64-1	Acetone	200,000 <sup>b</sup>	100,000 <sup>d</sup>	200,000 <sup>b</sup>	100,000 <sup>d</sup>	16 <sup>b</sup>	16	*
15972-60-8	Alachlor <sup>o</sup>	72 <sup>e</sup>	---- <sup>c</sup>	1,600 <sup>e</sup>	---- <sup>c</sup>	0.04	0.2	NA
116-06-3	Aldicarb <sup>o</sup>	2,000 <sup>b</sup>	---- <sup>c</sup>	200 <sup>b</sup>	---- <sup>c</sup>	0.013	0.07	NA
309-00-2	Aldrin	0.3 <sup>e</sup>	6.6 <sup>e</sup>	6.1 <sup>b</sup>	9.3 <sup>e</sup>	0.5 <sup>e</sup>	2.5	0.94
120-12-7	Anthracene	610,000 <sup>b</sup>	---- <sup>c</sup>	610,000 <sup>b</sup>	---- <sup>c</sup>	12,000 <sup>b</sup>	59,000	*
1912-24-9	Atrazine <sup>o</sup>	72,000 <sup>b</sup>	---- <sup>c</sup>	7,100 <sup>b</sup>	---- <sup>c</sup>	0.066	0.33	NA
71-43-2	Benzene	100 <sup>e</sup>	1.6 <sup>e</sup>	2,300 <sup>e</sup>	2.2 <sup>e</sup>	0.03	0.17	*



		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route		
		Industrial-Commercial		Construction Worker		Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
56-55-3	Benzo(a)anthracene	8 <sup>e</sup>	---- <sup>c</sup>	170 <sup>e</sup>	---- <sup>c</sup>	2	8	*
205-99-2	Benzo(b)fluoranthene	8 <sup>e</sup>	---- <sup>c</sup>	170 <sup>e</sup>	---- <sup>c</sup>	5	25	*
207-08-9	Benzo(k)fluroanthene	78 <sup>e</sup>	---- <sup>c</sup>	1,700 <sup>e</sup>	---- <sup>c</sup>	49	250	*
50-32-8	Benzo(a)pyrene	0.8 <sup>e</sup>	---- <sup>c</sup>	17 <sup>e</sup>	---- <sup>c</sup>	8	82	*
111-44-4	Bis(2-chloroethyl)ether	5 <sup>e</sup>	0.47 <sup>e</sup>	75 <sup>e</sup>	0.66 <sup>e</sup>	0.0004 <sup>e,f</sup>	0.0004	0.66
117-81-7	Bis(2-ethylhexyl)phthalate	410 <sup>e</sup>	31,000 <sup>d</sup>	4,100 <sup>b</sup>	31,000 <sup>d</sup>	3,600	31,000 <sup>d</sup>	*
75-27-4	Bromodichloromethane (Dichlorobromomethane)	92 <sup>e</sup>	3,000 <sup>d</sup>	2,000 <sup>e</sup>	3,000 <sup>d</sup>	0.6	0.6	*
75-25-2	Bromoform	720 <sup>e</sup>	100 <sup>e</sup>	16,000 <sup>e</sup>	140 <sup>e</sup>	0.8	0.8	*
71-36-3	Butanol	200,000 <sup>b</sup>	10,000 <sup>d</sup>	200,000 <sup>b</sup>	10,000 <sup>d</sup>	17 <sup>b</sup>	17	NA
85-68-7	Butyl benzyl phthalate	410,000 <sup>b</sup>	930 <sup>d</sup>	410,000 <sup>b</sup>	930 <sup>d</sup>	930 <sup>d</sup>	930 <sup>d</sup>	*
86-74-8	Carbazole	290 <sup>e</sup>	---- <sup>c</sup>	6,200 <sup>e</sup>	---- <sup>c</sup>	0.6 <sup>e</sup>	2.8	NA

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route		
		Industrial-Commercial		Construction Worker		Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
1563-66-2	Carbofuran <sup>o</sup>	10,000 <sup>b</sup>	----- <sup>c</sup>	1,000 <sup>b</sup>	----- <sup>c</sup>	0.22	1.1	NA
75-15-0	Carbon disulfide	200,000 <sup>b</sup>	720 <sup>d</sup>	20,000 <sup>b</sup>	9.0 <sup>b</sup>	32 <sup>b</sup>	160	*
56-23-5	Carbon tetrachloride	44 <sup>e</sup>	0.64 <sup>e</sup>	410 <sup>b</sup>	0.90 <sup>e</sup>	0.07	0.33	*
57-74-9	Chlordane	1.6 <sup>e</sup>	140 <sup>e</sup>	100 <sup>b</sup>	22 <sup>b</sup>	10	48	*
106-47-8	4 – Chloroaniline ( <i>p</i> -Chloroaniline)	8,200 <sup>b</sup>	----- <sup>c</sup>	820 <sup>b</sup>	----- <sup>c</sup>	0.7 <sup>b</sup>	0.7	*
108-90-7	Chlorobenzene (Monochlorobenzene)	41,000 <sup>b</sup>	210 <sup>b</sup>	4,100 <sup>b</sup>	1.3 <sup>b</sup>	1	6.5	*
124-48-1	Chlorodibromomethane (Dibromochloromethane)	41,000 <sup>b</sup>	1,300 <sup>d</sup>	41,000 <sup>b</sup>	1,300 <sup>d</sup>	0.4	0.4	*
67-66-3	Chloroform	940 <sup>e</sup>	0.54 <sup>e</sup>	2,000 <sup>b</sup>	0.76 <sup>e</sup>	0.6	2.9	*
218-01-9	Chrysene	780 <sup>e</sup>	----- <sup>c</sup>	17,000 <sup>e</sup>	----- <sup>e</sup>	160	800	*
94-75-7	2,4-D <sup>o</sup>	20,000 <sup>b</sup>	----- <sup>c</sup>	2,000 <sup>b</sup>	----- <sup>c</sup>	1.5	7.7	*

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route		
		Industrial-Commercial		Construction Worker		Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
75-99-0	Dalapon <sup>o</sup>	61,000 <sup>b</sup>	----- <sup>c</sup>	6,100 <sup>b</sup>	----- <sup>c</sup>	0.85	8.5	*
72-54-8	DDD	24 <sup>e</sup>	----- <sup>c</sup>	520 <sup>e</sup>	----- <sup>c</sup>	16 <sup>e</sup>	80	*
72-55-9	DDE	17 <sup>e</sup>	----- <sup>c</sup>	370 <sup>e</sup>	----- <sup>c</sup>	54 <sup>e</sup>	270	*
50-29-3	DDT	17 <sup>e</sup>	1,500 <sup>e</sup>	100 <sup>b</sup>	2,100 <sup>e</sup>	32 <sup>e</sup>	160	*
53-70-3	Dibenzo( <i>a,h</i> )anthracene	0.8 <sup>e</sup>	----- <sup>c</sup>	17 <sup>e</sup>	----- <sup>c</sup>	2	7.6	*
96-12-8	1,2-Dibromo-3-chloropropane	4 <sup>e</sup>	17 <sup>b</sup>	89 <sup>e</sup>	0.11 <sup>b</sup>	0.002	0.002	*
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	0.07 <sup>e</sup>	0.32 <sup>e</sup>	1.5 <sup>e</sup>	0.45 <sup>e</sup>	0.0004	0.004	0.005
84-74-2	Di- <i>n</i> -butyl phthalate	200,000 <sup>b</sup>	2,300 <sup>d</sup>	200,000 <sup>b</sup>	2,300 <sup>d</sup>	2,300 <sup>d</sup>	2,300 <sup>d</sup>	*
95-50-1	1,2-Dichlorobenzene ( <i>o</i> – Dichlorobenzene)	180,000 <sup>b</sup>	560 <sup>d</sup>	18,000 <sup>b</sup>	310 <sup>b</sup>	17	43	*
106-46-7	1,4-Dichlorobenzene ( <i>p</i> – Dichlorobenzene)	----- <sup>c</sup>	17,000 <sup>b</sup>	----- <sup>c</sup>	340 <sup>b</sup>	2	11	*

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		ADL (mg/kg)
		Industrial-Commercial	Inhalation (mg/kg)	Construction Worker	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	
91-94-1	3,3'-Dichlorobenzidine	13 <sup>e</sup>	----- <sup>c</sup>	280 <sup>e</sup>	----- <sup>c</sup>	0.007 <sup>e,f</sup>	0.033	1.3
75-34-3	1,1-Dichloroethane	200,000 <sup>b</sup>	1,700 <sup>d</sup>	200,000 <sup>b</sup>	130 <sup>b</sup>	23 <sup>b</sup>	110	*
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	63 <sup>e</sup>	0.70 <sup>e</sup>	1,400 <sup>e</sup>	0.99 <sup>e</sup>	0.02	0.1	*
75-35-4	1,1-Dichloroethylene	18,000 <sup>b</sup>	1,500 <sup>d</sup>	1,800 <sup>b</sup>	300 <sup>v</sup>	0.06	0.3	*
156-59-2	<i>cis</i> -1,2-Dichloroethylene	20,000 <sup>b</sup>	1,200 <sup>d</sup>	20,000 <sup>b</sup>	1,200 <sup>d</sup>	0.4	1.1	*
156-60-5	<i>Trans</i> -1,2-Dichloroethylene	41,000 <sup>b</sup>	3,100 <sup>d</sup>	41,000 <sup>b</sup>	3,100 <sup>d</sup>	0.7	3.4	*
78-87-5	1,2-Dichloropropane	84 <sup>e</sup>	23 <sup>b</sup>	1,800 <sup>e</sup>	0.50 <sup>b</sup>	0.03	0.15	*
542-75-6	1,3-Dichloropropene (1,3-Dichloropropylene, <i>cis</i> + <i>trans</i> )	57 <sup>e</sup>	2.1 <sup>e</sup>	1,200 <sup>e</sup>	0.39 <sup>b</sup>	0.004 <sup>e</sup>	0.02	0.005
60-57-1	Dieldrin <sup>n</sup>	0.4 <sup>e</sup>	2.2 <sup>e</sup>	7.8 <sup>e</sup>	3.1 <sup>e</sup>	0.004 <sup>e</sup>	0.02	0.603
84-66-2	Diethyl phthalate	1,000,000 <sup>b</sup>	2,000 <sup>d</sup>	1,000,000 <sup>b</sup>	2,000 <sup>d</sup>	470 <sup>b</sup>	470	*

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route		ADL (mg/kg)
		Industrial-Commercial	Inhalation (mg/kg)	Construction Worker	Inhalation (mg/kg)	Values		
		Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	
105-67-9	2,4-Dimethylphenol	41,000 <sup>b</sup>	---- <sup>c</sup>	41,000 <sup>b</sup>	---- <sup>c</sup>	9 <sup>b</sup>	9	*
121-14-2	2,4-Dinitrotoluene	8.4 <sup>e</sup>	---- <sup>c</sup>	180 <sup>e</sup>	---- <sup>c</sup>	0.0008 <sup>e,f</sup>	0.0008	0.250
606-20-2	2,6-Dinitrotoluene	8.4 <sup>e</sup>	---- <sup>c</sup>	180 <sup>e</sup>	---- <sup>c</sup>	0.0007 <sup>e,f</sup>	0.0007	0.260
117-84-0	Di- <i>n</i> -octyl phthalate	41,000 <sup>e</sup>	10,000 <sup>d</sup>	4,100 <sup>b</sup>	10,000 <sup>d</sup>	10,000 <sup>d</sup>	10,000 <sup>d</sup>	*
115-29-7	Endosulfan <sup>o</sup>	12,000 <sup>b</sup>	---- <sup>c</sup>	1,200 <sup>b</sup>	---- <sup>c</sup>	18 <sup>b</sup>	90	*
145-73-3	Endothall <sup>o</sup>	41,000 <sup>c</sup>	---- <sup>c</sup>	4,100 <sup>b</sup>	---- <sup>c</sup>	0.4	0.4	NA
72-20-8	Endrin	610 <sup>b</sup>	---- <sup>c</sup>	61 <sup>b</sup>	---- <sup>c</sup>	1	5	*
100-41-4	Ethylbenzene	200,000 <sup>b</sup>	400 <sup>d</sup>	20,000 <sup>b</sup>	58 <sup>b</sup>	13	19	*
206-44-0	Fluoranthene	82,000 <sup>b</sup>	---- <sup>c</sup>	82,000 <sup>b</sup>	---- <sup>c</sup>	4,300 <sup>b</sup>	21,000	*
86-73-7	Fluorene	82,000 <sup>b</sup>	---- <sup>c</sup>	82,000 <sup>b</sup>	---- <sup>c</sup>	560 <sup>b</sup>	2,800	*
76-44-8	Heptachlor	1 <sup>e</sup>	11 <sup>e</sup>	28 <sup>e</sup>	16 <sup>e</sup>	23	110	*

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route		
		Industrial-Commercial		Construction Worker		Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
1024-57-3	Heptachlor epoxide	0.6 <sup>e</sup>	9.2 <sup>e</sup>	2.7 <sup>b</sup>	13 <sup>e</sup>	0.7	3.3	1.005
118-74-1	Hexachlorobenzene	4 <sup>e</sup>	1.8 <sup>e</sup>	78 <sup>e</sup>	2.6 <sup>e</sup>	2	11	*
319-84-6	<i>Alpha</i> -HCH ( <i>alpha</i> -BHC)	0.9 <sup>e</sup>	1.5 <sup>e</sup>	20 <sup>e</sup>	2.1 <sup>e</sup>	0.0005 <sup>e,f</sup>	0.003	0.0074
58-89-9	<i>Gamma</i> -HCH (Lindane) <sup>n</sup>	4 <sup>e</sup>	----- <sup>c</sup>	96 <sup>e</sup>	----- <sup>c</sup>	0.009	0.047	*
77-47-4	Hexachlorocyclopentadiene	14,000 <sup>b</sup>	16 <sup>b</sup>	14,000 <sup>b</sup>	1.1 <sup>b</sup>	400	2,200 <sup>d</sup>	*
67-72-1	Hexachloroethane	2,000 <sup>b</sup>	----- <sup>c</sup>	2,000 <sup>b</sup>	----- <sup>c</sup>	0.5 <sup>b</sup>	2.6	*
193-39-5	Indeno(1,2,3- <i>c,d</i> )pyrene	8 <sup>e</sup>	----- <sup>c</sup>	170 <sup>e</sup>	----- <sup>c</sup>	14	69	*
78-59-1	Isophorone	410,000 <sup>b</sup>	4,600 <sup>d</sup>	410,000 <sup>b</sup>	4,600 <sup>d</sup>	8 <sup>b</sup>	8	*
72-43-5	Methoxychlor <sup>o</sup>	10,000 <sup>b</sup>	----- <sup>c</sup>	1,000 <sup>b</sup>	----- <sup>c</sup>	160	780	*
74-83-9	Methyl bromide (Bromomethane)	2,900 <sup>b</sup>	15 <sup>b</sup>	1,000 <sup>b</sup>	3.9 <sup>b</sup>	0.2 <sup>b</sup>	1.2	*

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route		ADL (mg/kg)
		Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	
1634-04-4	Methyl tertiary-butyl ether	20,000 <sup>b</sup>	8,800 <sup>d</sup>	2,000 <sup>b</sup>	140 <sup>b</sup>	0.32	0.32	*
75-09-2	Methylene chloride (Dichloromethane)	760 <sup>e</sup>	24 <sup>e</sup>	12,000 <sup>b</sup>	34 <sup>e</sup>	0.02 <sup>e</sup>	0.2	*
95-48-7	2-Methylphenol ( <i>o</i> -Cresol)	100,000 <sup>b</sup>	----- <sup>c</sup>	100,000 <sup>b</sup>	----- <sup>c</sup>	15 <sup>b</sup>	15	*
86-30-6	<i>N</i> -Nitrosodiphenylamine	1,200 <sup>e</sup>	----- <sup>c</sup>	25,000 <sup>e</sup>	----- <sup>c</sup>	1 <sup>e</sup>	5.6	*
621-64-7	<i>N</i> -Nitrosodi- <i>n</i> -propylamine	0.8 <sup>e</sup>	----- <sup>c</sup>	18 <sup>e</sup>	----- <sup>c</sup>	0.00005 <sup>e,f</sup>	0.00005	0.0018
91-20-3	Naphthalene	41,000 <sup>b</sup>	270 <sup>b</sup>	4,100 <sup>b</sup>	1.8 <sup>b</sup>	12 <sup>b</sup>	18	*
98-95-3	Nitrobenzene	1,000 <sup>b</sup>	140 <sup>b</sup>	1,000 <sup>b</sup>	9.4 <sup>b</sup>	0.1 <sup>b,f</sup>	0.1	0.26
108-95-2	Phenol	1,000,000 <sup>b</sup>	----- <sup>c</sup>	120,000 <sup>b</sup>	----- <sup>c</sup>	100 <sup>b</sup>	100	*
1918-02-1	Picloram <sup>o</sup>	140,000 <sup>b</sup>	----- <sup>c</sup>	14,000 <sup>b</sup>	----- <sup>c</sup>	2	20	NA
1336-36-3	Polychlorinated biphenyls (PCBs) <sup>n</sup>	1 <sup>h</sup>	----- <sup>c,h</sup>	1 <sup>h</sup>	----- <sup>c,h</sup>	----- <sup>h</sup>	----- <sup>h</sup>	*
129-00-0	Pyrene	61,000 <sup>b</sup>	----- <sup>c</sup>	61,000 <sup>b</sup>	----- <sup>c</sup>	4,200 <sup>b</sup>	21,000	*

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route		ADL (mg/kg)
		Industrial-Commercial	Construction Worker	Class I (mg/kg)	Class II (mg/kg)			
122-34-9	Simazine <sup>o</sup>	10,000 <sup>b</sup>	----- <sup>c</sup>	1,000 <sup>b</sup>	----- <sup>c</sup>	0.04	0.37	NA
100-42-5	Styrene	410,000 <sup>b</sup>	1,500 <sup>d</sup>	41,000 <sup>b</sup>	430 <sup>b</sup>	4	18	*
127-18-4	Tetrachloroethylene (Perchloroethylene)	110 <sup>e</sup>	20 <sup>e</sup>	2,400 <sup>e</sup>	28 <sup>e</sup>	0.06	0.3	*
108-88-3	Toluene	410,000 <sup>b</sup>	650 <sup>d</sup>	410,000 <sup>b</sup>	42 <sup>b</sup>	12	29	*
8001-35-2	Toxaphene <sup>n</sup>	5.2 <sup>e</sup>	170 <sup>e</sup>	110 <sup>e</sup>	240 <sup>e</sup>	31	150	*
120-82-1	1,2,4-Trichlorobenzene	20,000 <sup>b</sup>	3,200 <sup>d</sup>	2,000 <sup>b</sup>	920 <sup>b</sup>	5	53	*
71-55-6	1,1,1-Trichloroethane	----- <sup>c</sup>	1,200 <sup>d</sup>	----- <sup>c</sup>	1,200 <sup>d</sup>	2	9.6	*
79-00-5	1,1,2-Trichloroethane	8,200 <sup>b</sup>	1,800 <sup>d</sup>	8,200 <sup>b</sup>	1,800 <sup>d</sup>	0.02	0.3	*
79-01-6	Trichloroethylene	520 <sup>e</sup>	8.9 <sup>e</sup>	1,200 <sup>b</sup>	12 <sup>e</sup>	0.06	0.3	*
108-05-4	Vinyl acetate	1,000,000 <sup>b</sup>	1,600 <sup>b</sup>	200,000 <sup>b</sup>	10 <sup>b</sup>	170 <sup>b</sup>	170	*



		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route		
		Industrial-Commercial		Construction Worker		Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
75-01-4	Vinyl chloride	7.9 <sup>e</sup>	1.1 <sup>e</sup>	170 <sup>e</sup>	1.1 <sup>b</sup>	0.01 <sup>f</sup>	0.07	*
108-38-3	m-Xylene	1,000,000	420 <sup>d</sup>	410,000 <sup>b</sup>	420 <sup>d</sup>	210	210	*
95-47-6	o-Xylene	1,000,000	410 <sup>d</sup>	410,000 <sup>b</sup>	410 <sup>d</sup>	190	190	*
106-42-3	p-Xylene	1,000,000	460 <sup>d</sup>	410,000 <sup>b</sup>	460 <sup>d</sup>	200	200	*
1330-20-7	Xylenes (total)	1,000,000 <sup>b</sup>	320 <sup>d</sup>	410,000 <sup>b</sup>	320 <sup>d</sup>	150	150	*
	<b>Ionizable Organics</b>							
65-85-0	Benzoic Acid	1,000,000 <sup>b</sup>	----- <sup>c</sup>	820,000 <sup>b</sup>	----- <sup>c</sup>	400 <sup>b,i</sup>	400 <sup>i</sup>	*
95-57-8	2-Chlorophenol	10,000 <sup>b</sup>	53,000 <sup>d</sup>	10,000 <sup>b</sup>	53,000 <sup>d</sup>	4 <sup>b,i</sup>	20 <sup>i</sup>	*
120-83-2	2,4-Dichlorophenol	6,100 <sup>b</sup>	----- <sup>c</sup>	610 <sup>b</sup>	----- <sup>c</sup>	1 <sup>b,i</sup>	1 <sup>i</sup>	*
51-28-5	2,4-Dinitrophenol	4,100 <sup>b</sup>	----- <sup>c</sup>	410 <sup>b</sup>	----- <sup>c</sup>	0.2 <sup>b,f,i</sup>	0.2 <sup>i</sup>	3.3
88-85-7	Dinoseb <sup>o</sup>	2,000 <sup>b</sup>	----- <sup>c</sup>	200 <sup>b</sup>	----- <sup>c</sup>	0.34 <sup>b,i</sup>	3.4 <sup>i</sup>	*

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route		
		Industrial-Commercial		Construction Worker		Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
87-86-5	Pentachlorophenol	24 <sup>e,j</sup>	----- <sup>c</sup>	520 <sup>e,j</sup>	----- <sup>c</sup>	0.03 <sup>f,i</sup>	0.14 <sup>i</sup>	*
93-72-1	2,4,5-TP (Silvex)	16,000 <sup>b</sup>	----- <sup>c</sup>	1,600 <sup>b</sup>	----- <sup>c</sup>	11 <sup>i</sup>	55 <sup>i</sup>	*
95-95-4	2,4,5-Trichlorophenol	200,000 <sup>b</sup>	----- <sup>c</sup>	200,000 <sup>b</sup>	----- <sup>c</sup>	270 <sup>b,i</sup>	1,400 <sup>i</sup>	*
88-06-2	2,4,6- Trichlorophenol	520 <sup>e</sup>	390 <sup>e</sup>	11,000 <sup>e</sup>	540 <sup>e</sup>	0.2 <sup>e,f,i</sup>	0.77 <sup>i</sup>	0.66

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		ADL (mg/kg)
		Industrial-Commercial		Construction Worker		Class I (mg/L)	Class II (mg/L)	
		Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)			
	<b>Inorganics</b>							
7440-36-0	Antimony	820 <sup>b</sup>	---- <sup>c</sup>	82 <sup>b</sup>	---- <sup>c</sup>	0.006 <sup>m</sup>	0.024 <sup>m</sup>	*
7440-38-2	Arsenic <sup>l,n</sup>	<sup>t</sup>	1,200 <sup>e</sup>	61 <sup>b</sup>	25,000 <sup>e</sup>	0.05 <sup>m</sup>	0.2 <sup>m</sup>	*
7440-39-3	Barium	140,000 <sup>b</sup>	910,000 <sup>b</sup>	14,000 <sup>b</sup>	870,000 <sup>b</sup>	2.0 <sup>m</sup>	2.0 <sup>m</sup>	*
7440-41-7	Beryllium	4,100 <sup>b</sup>	2,100 <sup>e</sup>	410 <sup>b</sup>	44,000 <sup>e</sup>	0.004 <sup>m</sup>	0.5 <sup>m</sup>	*
7440-42-8	Boron	180,000 <sup>b</sup>	1,000,000	18,000 <sup>b</sup>	1,000,000	2.0 <sup>m</sup>	2.0 <sup>m</sup>	*
7440-43-9	Cadmium <sup>l,n</sup>	2,000 <sup>b,r</sup>	2,800 <sup>e</sup>	200 <sup>b,r</sup>	59,000 <sup>e</sup>	0.005 <sup>m</sup>	0.05 <sup>m</sup>	*
16887-00-6	Chloride	----- <sup>c</sup>	---- <sup>c</sup>	---- <sup>c</sup>	---- <sup>c</sup>	200 <sup>m</sup>	200 <sup>m</sup>	*
7440-47-3	Chromium, total	6,100 <sup>b</sup>	420 <sup>e</sup>	4,100 <sup>b</sup>	690 <sup>b</sup>	0.1 <sup>m</sup>	1.0 <sup>m</sup>	*
16065-83-1	Chromium, ion, trivalent	1,000,000 <sup>b</sup>	---- <sup>c</sup>	310,000 <sup>b</sup>	---- <sup>c</sup>	---- <sup>g</sup>	---- <sup>g</sup>	*
18540-29-9	Chromium, ion, hexavalent	6,100 <sup>b</sup>	420 <sup>e</sup>	4,100 <sup>b</sup>	690 <sup>b</sup>	----	----	*

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		ADL (mg/kg)
		Industrial-Commercial		Construction Worker		Class I (mg/L)	Class II (mg/L)	
		Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)			
7440-48-4	Cobalt	120,000 <sup>b</sup>	----- <sup>c</sup>	12,000 <sup>b</sup>	----- <sup>c</sup>	1.0 <sup>m</sup>	1.0 <sup>m</sup>	*
7440-50-8	Copper <sup>n</sup>	82,000 <sup>b</sup>	----- <sup>c</sup>	8,200 <sup>b</sup>	----- <sup>c</sup>	0.65 <sup>m</sup>	0.65 <sup>m</sup>	*
57-12-5	Cyanide (amenable)	41,000 <sup>b</sup>	----- <sup>c</sup>	4,100 <sup>b</sup>	----- <sup>c</sup>	0.2 <sup>q,m</sup>	0.6 <sup>q,m</sup>	*
7782-41-4	Fluoride	120,000 <sup>b</sup>	----- <sup>c</sup>	12,000 <sup>b</sup>	----- <sup>c</sup>	4.0 <sup>m</sup>	4.0 <sup>m</sup>	*
15438-31-0	Iron	----- <sup>c</sup>	----- <sup>c</sup>	----- <sup>c</sup>	----- <sup>c</sup>	5.0 <sup>m</sup>	5.0 <sup>m</sup>	*
7439-92-1	Lead	400 <sup>k</sup>	----- <sup>c</sup>	400 <sup>k</sup>	----- <sup>c</sup>	0.0075 <sup>m</sup>	0.1 <sup>m</sup>	*
7439-96-5	Manganese	96,000 <sup>b</sup>	91,000 <sup>b</sup>	9,600 <sup>b</sup>	8,700 <sup>b</sup>	0.15 <sup>m</sup>	10.0 <sup>m</sup>	*
7439-97-6	Mercury <sup>l,n,s</sup>	610 <sup>b</sup>	540,000 <sup>b</sup>	61 <sup>b</sup>	52,000 <sup>b</sup>	0.002 <sup>m</sup>	0.01 <sup>m</sup>	*
7440-02-0	Nickel <sup>l</sup>	41,000 <sup>b</sup>	21,000 <sup>c</sup>	4,100 <sup>b</sup>	440,000 <sup>c</sup>	0.1 <sup>m</sup>	2.0 <sup>m</sup>	*
14797-55-8	Nitrate as N <sup>p</sup>	1,000,000 <sup>b</sup>	----- <sup>c</sup>	330,000 <sup>b</sup>	----- <sup>c</sup>	10.0 <sup>q</sup>	100 <sup>q</sup>	*
7782-49-2	Selenium <sup>l,n</sup>	10,000 <sup>b</sup>	----- <sup>c</sup>	1,000 <sup>b</sup>	----- <sup>c</sup>	0.05 <sup>m</sup>	0.05 <sup>m</sup>	*

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		ADL (mg/kg)
		Industrial-Commercial		Construction Worker		Class I (mg/L)	Class II (mg/L)	
		Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)			
7440-22-4	Silver	10,000 <sup>b</sup>	----- <sup>c</sup>	1,000 <sup>b</sup>	----- <sup>c</sup>	0.05 <sup>m</sup>	-----	*
14808-79-8	Sulfate	----- <sup>c</sup>	----- <sup>c</sup>	----- <sup>c</sup>	----- <sup>c</sup>	400 <sup>m</sup>	400 <sup>m</sup>	*
7440-28-0	Thallium	160 <sup>b,u</sup>	----- <sup>c</sup>	160 <sup>b,u</sup>	----- <sup>c</sup>	0.002 <sup>m</sup>	0.02 <sup>m</sup>	*
7440-62-2	Vanadium	14,000 <sup>b</sup>	----- <sup>c</sup>	1,400 <sup>b</sup>	----- <sup>c</sup>	0.049 <sup>m</sup>	0.1 <sup>m</sup>	*
7440-66-6	Zinc <sup>1</sup>	610,000 <sup>b</sup>	----- <sup>c</sup>	61,000 <sup>b</sup>	----- <sup>c</sup>	5.0 <sup>m</sup>	10 <sup>m</sup>	*

"\*" indicates that the ADL is less than or equal to the specified remediation objective.

NA means Not Available; no PQL or EQL available in USEPA analytical methods.

Chemical Name and Soil Remediation Objective Notations (2nd, 5th thru 8th Columns)

- <sup>a</sup> Soil remediation objectives based on human health criteria only.
- <sup>b</sup> Calculated values correspond to a target hazard quotient of 1.
- <sup>c</sup> No toxicity criteria available for this route of exposure.
- <sup>d</sup> Soil saturation concentration ( $C_{[sat]}$ ) = the concentration at which the absorptive limits of the soil particles, the solubility limits of the available soil moisture, and saturation of soil pore air have been reached. Above the soil saturation concentration, the assumptions regarding vapor transport to air and/or dissolved phase transport to groundwater (for chemicals which are liquid at ambient soil temperatures) have been violated, and alternative modeling approaches are required.
- <sup>e</sup> Calculated values correspond to a cancer risk level of 1 in 1,000,000.
- <sup>f</sup> Level is at or below Contract Laboratory Program required quantitation limit for Regular Analytical Services (RAS).
- <sup>g</sup> Chemical-specific properties are such that this route is not of concern at any soil contaminant concentration.
- <sup>h</sup> 40 CFR 761 contains applicability requirements and methodologies for the development of PCB remediation objectives. Requests for approval of a Tier 3 evaluation must address the applicability of 40 CFR 761.
- <sup>i</sup> Soil remediation objective for pH of 6.8. If soil pH is other than 6.8, refer to Appendix B, Tables C and D in this Part.
- <sup>j</sup> Ingestion soil remediation objective adjusted by a factor of 0.5 to account for dermal route.
- <sup>k</sup> A preliminary remediation goal of 400 mg/kg has been set for lead based on *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*, OSWER Directive #9355.4-12.
- <sup>l</sup> Potential for soil-plant-human exposure.
- <sup>m</sup> The person conducting the remediation has the option to use: (1) TCLP or SPLP test results to compare with the remediation objectives listed in this Table; or (2) the total amount of contaminant in the soil sample results to compare with pH specific remediation objectives listed in Appendix B, Table C or D of this Part. (See Section 742.510.) If the person conducting the remediation wishes to calculate soil remediation objectives based on background concentrations, this should be done in accordance with Subpart D of this Part.
- <sup>n</sup> The Agency reserves the right to evaluate the potential for remaining contaminant concentrations to pose significant threats to crops, livestock, or wildlife.
- <sup>o</sup> For agrichemical facilities, remediation objectives for surficial soils which are based on field application rates may be more appropriate for currently registered pesticides. Consult the Agency for further information.
- <sup>p</sup> For agrichemical facilities, soil remediation objectives based on site-specific background concentrations of Nitrate as N may be more appropriate. Such determinations shall be conducted in accordance with the procedures set forth in Subparts D and I of this Part.
- <sup>q</sup> The TCLP extraction must be done using water at a pH of 7.0.
- <sup>r</sup> Value based on dietary Reference Dose.
- <sup>s</sup> Value for Ingestion based on Reference Dose for Mercuric chloride (CAS No. 7487-94-7); value for Inhalation based on Reference Concentration for elemental Mercury (CAS No. 7439-97-6).
- <sup>t</sup> For the ingestion route for arsenic for industrial/commercial, see 742.Appendix A, Table G.
- <sup>u</sup> Value based on Reference Dose for Thallium sulfate (CAS No. 7446-18-6).
- <sup>v</sup> Calculated values correspond to soil concentrations that should not result in air concentrations that exceed criteria for workplace air.

(Source: Amended at 26 Ill. Reg. 2683, effective February 5, 2002)

Section 742.APPENDIX B: Tier 1 Tables and Illustrations

Section 742.Table C: pH Specific Soil Remediation Objectives for Inorganics and Ionizing Organics for the Soil Component of the Groundwater Ingestion Route (Class I Groundwater)

Chemical (totals) (mg/kg)	pH 4.5 to 4.74	pH 4.75 to 5.24	pH 5.25 to 5.74	pH 5.75 to 6.24	pH 6.25 to 6.64	pH 6.65 to 6.89	pH 6.9 to 7.24	pH 7.25 to 7.74	pH 7.75 to 8.24	pH 8.25 to 8.74	pH 8.75 to 9.0
<b>Inorganics</b>											
Antimony	5	5	5	5	5	5	5	5	5	5	5
Arsenic	25	26	27	28	29	29	29	30	31	32	33
Barium	260	490	850	1,200	1,500	1,600	1,700	1,800	2,100	___ <sup>a</sup>	___ <sup>a</sup>
Beryllium	1.1	2.1	3.4	6.6	22	63	140	1,000	8,000	___ <sup>a</sup>	___ <sup>a</sup>
Cadmium	1.0	1.7	2.7	3.7	5.2	7.5	11	59	430	___ <sup>a</sup>	___ <sup>a</sup>
Chromium (+6)	70	62	54	46	40	38	36	32	28	24	21
Copper	330	580	2,100	11,000	59,000	130,000	200,000	330,000	330,000	___ <sup>a</sup>	___ <sup>a</sup>
Cyanide	40	40	40	40	40	40	40	40	40	40	40
Mercury	0.01	0.01 <sup>1</sup>	0.03	0.15	0.89	2.1	3.3	6.4	8.0	___ <sup>a</sup>	___ <sup>a</sup>
Nickel	20	36	56	76	100	130	180	700	3,800	___ <sup>a</sup>	___ <sup>a</sup>
Selenium	24	17	12	8.8	6.3	5.2	4.5	3.3	2.4	1.8	1.3
Silver	0.24	0.33	0.62	1.5	4.4	8.5	13	39	110	___ <sup>a</sup>	___ <sup>a</sup>

Chemical (totals) (mg/kg)	pH 4.5 to 4.74	pH 4.75 to 5.24	pH 5.25 to 5.74	pH 5.75 to 6.24	pH 6.25 to 6.64	pH 6.65 to 6.89	pH 6.9 to 7.24	pH 7.25 to 7.74	pH 7.75 to 8.24	pH 8.25 to 8.74	pH 8.75 to 9.0
Thallium	1.6	1.8	2.0	2.4	2.6	2.8	3.0	3.4	3.8	4.4	4.9
Vanadium	980	980	980	980	980	980	980	980	980	980	980
Zinc	1,000	1,800	2,600	3,600	5,100	6,200	7,500	16,000	53,000	— <sup>a</sup>	— <sup>a</sup>
<b>Organics</b>											
Benzoic Acid	440	420	410	400	400	400	400	400	400	400	400
2-Chlorophenol	4.0	4.0	4.0	4.0	3.9	3.9	3.9	3.6	3.1	2.2	1.5
2,4-Dichlorophenol	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.86	0.69	0.56	0.48
Dinoseb	8.4	4.5	1.9	0.82	0.43	0.34	0.31	0.27	0.25	0.25	0.25
Pentachlorophenol	0.54	0.32	0.15	0.07	0.04	0.03	0.02	0.02	0.02	0.02	0.02
2,4,5-TP (Silvex)	26	16	12	11	11	11	11	11	11	11	11
2,4,5- Trichlorophenol	400	390	390	370	320	270	230	130	64	36	26
2,4,6- Trichlorophenol	0.37	0.36	0.34	0.29	0.20	0.15	0.13	0.09	0.07	0.07	0.07

<sup>a</sup> No data available for this pH range.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)



Section 742.APPENDIX B

Section 742.Table D: pH Specific Soil Remediation Objectives for Inorganics and Ionizing Organics for the Soil Component of the Groundwater Ingestion Route (Class II Groundwater)

Chemical (totals) (mg/kg)	pH 4.5 to 4.74	pH 4.75 to 5.24	pH 5.25 to 5.74	pH 5.75 to 6.24	pH 6.25 to 6.64	pH 6.65 to 6.89	pH 6.9 to 7.24	pH 7.25 to 7.74	pH 7.75 to 8.24	pH 8.25 to 8.74	pH 8.75 to 9.0
<b>Inorganics</b>											
Antimony	20	20	20	20	20	20	20	20	20	20	20
Arsenic	100	100	100	110	110	120	120	120	120	130	130
Barium	260	490	850	1,200	1,500	1,600	1,700	1,800	2,100	___ <sup>a</sup>	___ <sup>a</sup>
Beryllium	140	260	420	820	2,800	7,900	17,000	130,000	1,000,000	___ <sup>a</sup>	___ <sup>a</sup>
Cadmium	10	17	27	37	52	75	110	590	4,300	___ <sup>a</sup>	___ <sup>a</sup>
Chromium (+6)	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
Copper	330	580	2,100	11,000	59,000	130,000	200,000	330,000	330,000	___ <sup>a</sup>	___ <sup>a</sup>
Cyanide	120	120	120	120	120	120	120	120	120	120	120
Mercury	0.05	0.06	0.14	0.75	4.4	10	16	32	40	___ <sup>a</sup>	___ <sup>a</sup>
Nickel	400	730	1,100	1,500	2,000	2,600	3,500	14,000	76,000	___ <sup>a</sup>	___ <sup>a</sup>
Selenium	24	17	12	8.8	6.3	5.2	4.5	3.3	2.4	1.8	1.3
Thallium	16	18	20	24	26	28	30	34	38	44	49
Zinc	2,000	3,600	5,200	7,200	10,000	12,000	15,000	32,000	110,000	___ <sup>a</sup>	___ <sup>a</sup>

Chemical (totals) (mg/kg)	pH 4.5 to 4.74	pH 4.75 to 5.24	pH 5.25 to 5.74	pH 5.75 to 6.24	pH 6.25 to 6.64	pH 6.65 to 6.89	pH 6.9 to 7.24	pH 7.25 to 7.74	pH 7.75 to 8.24	pH 8.25 to 8.74	pH 8.75 to 9.0
<b>Organics</b>											
Benzoic Acid	440	420	410	400	400	400	400	400	400	400	400
2-Chlorophenol	20	20	20	20	20	20	19	3.6	3.1	2.2	1.5
2,4-Dichlorophenol	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.86	0.69	0.56	0.48
Dinoseb	84	45	19	8.2	4.3	3.4	3.1	2.7	2.5	2.5	2.5
Pentachlorophenol	2.7	1.6	0.75	0.33	0.18	0.15	0.12	0.11	0.10	0.10	0.10
2,4,5-TP (Silvex)	130	79	62	57	55	55	55	55	55	55	55
2,4,5- Trichlorophenol	2,000	2,000	1,900	1,800	1,600	1,400	1,200	640	64	36	26
2,4,6- Trichlorophenol	1.9	1.8	1.7	1.4	1.0	0.77	0.13	0.09	0.07	0.07	0.07

<sup>a</sup> No data available for this pH range.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

Section 742.APPENDIX B: Tier 1 Tables and Illustrations

Section 742.TABLE E: Tier 1 Groundwater Remediation Objectives for the Groundwater Component of the Groundwater Ingestion Route

CAS No.	Chemical Name	Groundwater Remediation Objective	
		Class I (mg/L)	Class II (mg/L)
83-32-9	Acenaphthene	0.42	2.1
67-64-1	Acetone	0.7	0.7
15972-60-8	Alachlor	0.002 <sup>c</sup>	0.01 <sup>c</sup>
116-06-3	Aldicarb	0.003 <sup>c</sup>	0.015 <sup>c</sup>
309-00-2	Aldrin	0.014 <sup>a</sup>	0.07
120-12-7	Anthracene	2.1	10.5
1912-24-9	Atrazine	0.003 <sup>c</sup>	0.015 <sup>c</sup>
71-43-2	Benzene	0.005 <sup>c</sup>	0.025 <sup>c</sup>
56-55-3	Benzo( <i>a</i> )anthracene	0.00013 <sup>a</sup>	0.00065
205-99-2	Benzo( <i>b</i> )fluoranthene	0.00018 <sup>a</sup>	0.0009
207-08-9	Benzo( <i>k</i> )fluoroanthene	0.00017 <sup>a</sup>	0.00085
50-32-8	Benzo( <i>a</i> )pyrene	0.0002 <sup>a,c</sup>	0.002 <sup>c</sup>
111-44-4	Bis(2-chloroethyl)ether	0.01 <sup>a</sup>	0.01
117-81-7	Bis(2-ethylhexyl)phthalate (Di(2-ethylhexyl)phthalate)	0.006 <sup>c</sup>	0.06 <sup>c</sup>
75-27-4	Bromodichloromethane (Dichlorobromomethane)	0.0002 <sup>a</sup>	0.0002
75-25-2	Bromoform	0.001 <sup>a</sup>	0.001
71-36-3	Butanol	0.7	0.7
85-68-7	Butyl benzyl phthalate	1.4	7.0
86-74-8	Carbazole	---	---
1563-66-2	Carbofuran	0.04 <sup>c</sup>	0.2 <sup>c</sup>
75-15-0	Carbon disulfide	0.7	3.5
56-23-5	Carbon tetrachloride	0.005 <sup>c</sup>	0.025 <sup>c</sup>
57-74-9	Chlordane	0.002 <sup>c</sup>	0.01 <sup>c</sup>

CAS No.	Chemical Name	Groundwater Remediation Objective	
		Class I (mg/L)	Class II (mg/L)
108-90-7	Chlorobenzene (Monochlorobenzene)	0.1 <sup>c</sup>	0.5 <sup>c</sup>
124-48-1	Chlorodibromomethane (Dibromochloromethane)	0.14	0.14
67-66-3	Chloroform	0.0002 <sup>a</sup>	0.001
218-01-9	Chrysene	0.0015 <sup>a</sup>	0.0075
94-75-7	2,4-D	0.07 <sup>c</sup>	0.35 <sup>c</sup>
75-99-0	Dalapon	0.2 <sup>c</sup>	2.0 <sup>c</sup>
72-54-8	DDD	0.014 <sup>a</sup>	0.07
72-55-9	DDE	0.01 <sup>a</sup>	0.05
50-29-3	DDT	0.006 <sup>a</sup>	0.03
53-70-3	Dibenzo( <i>a,h</i> )anthracene	0.0003 <sup>a</sup>	0.0015
96-12-8	1,2-Dibromo-3-chloropropane	0.0002 <sup>c</sup>	0.0002 <sup>c</sup>
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	0.00005 <sup>c</sup>	0.0005 <sup>c</sup>
84-74-2	Di- <i>n</i> -butyl phthalate	0.7	3.5
95-50-1	1,2-Dichlorobenzene ( <i>o</i> – Dichlorobenzene)	0.6 <sup>c</sup>	1.5 <sup>c</sup>
106-46-7	1,4-Dichlorobenzene ( <i>p</i> – Dichlorobenzene)	0.075 <sup>c</sup>	0.375 <sup>c</sup>
91-94-1	3,3'-Dichlorobenzidine	0.02 <sup>a</sup>	0.1
75-34-3	1,1-Dichloroethane	0.7	3.5
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	0.005 <sup>c</sup>	0.025 <sup>c</sup>
75-35-4	1,1-Dichloroethylene <sup>b</sup>	0.007 <sup>c</sup>	0.035 <sup>c</sup>
156-59-2	<i>cis</i> -1,2-Dichloroethylene	0.07 <sup>c</sup>	0.2 <sup>c</sup>
156-60-5	<i>trans</i> -1,2-Dichloroethylene	0.1 <sup>c</sup>	0.5 <sup>c</sup>
78-87-5	1,2-Dichloropropane	0.005 <sup>c</sup>	0.025 <sup>c</sup>
542-75-6	1,3-Dichloropropene (1,3-Dichloropropylene, <i>cis</i> + <i>trans</i> )	0.001 <sup>a</sup>	0.005

CAS No.	Chemical Name	Groundwater Remediation Objective	
		Class I (mg/L)	Class II (mg/L)
60-57-1	Dieldrin	0.009 <sup>a</sup>	0.045
84-66-2	Diethyl phthalate	5.6	5.6
121-14-2	2,4-Dinitrotoluene <sup>a</sup>	0.00002 <sup>a</sup>	0.00002
606-20-2	2,6-Dinitrotoluene <sup>a</sup>	0.00031 <sup>a</sup>	0.00031
88-85-7	Dinoseb	0.007 <sup>c</sup>	0.07 <sup>c</sup>
117-84-0	Di- <i>n</i> -octyl phthalate	0.14	0.7
115-29-7	Endosulfan	0.042	0.21
145-73-3	Endothall	0.1 <sup>c</sup>	0.1 <sup>c</sup>
72-20-8	Endrin	0.002 <sup>c</sup>	0.01 <sup>c</sup>
100-41-4	Ethylbenzene	0.7 <sup>c</sup>	1.0 <sup>c</sup>
206-44-0	Fluoranthene	0.28	1.4
86-73-7	Fluorene	0.28	1.4
76-44-8	Heptachlor	0.0004 <sup>c</sup>	0.002 <sup>c</sup>
1024-57-3	Heptachlor epoxide	0.0002 <sup>c</sup>	0.001 <sup>c</sup>
118-74-1	Hexachlorobenzene	0.00006 <sup>d</sup>	0.0003
319-84-6	<i>alpha</i> -HCH ( <i>alpha</i> -BHC)	0.00011 <sup>a</sup>	0.00055
58-89-9	<i>Gamma</i> -HCH (Lindane)	0.0002 <sup>c</sup>	0.001 <sup>c</sup>
77-47-4	Hexachlorocyclopentadiene	0.05 <sup>c</sup>	0.5 <sup>c</sup>
67-72-1	Hexachloroethane	0.007	0.035
193-39-5	Indeno(1,2,3- <i>c,d</i> )pyrene	0.00043 <sup>a</sup>	0.00215
78-59-1	Isophorone	1.4	1.4
72-43-5	Methoxychlor	0.04 <sup>c</sup>	0.2 <sup>c</sup>
74-83-9	Methyl bromide (Bromomethane)	0.0098	0.049
1634-04-4	Methyl tertiary-butyl ether	0.07	0.07
75-09-2	Methylene chloride (Dichloromethane)	0.005 <sup>c</sup>	0.05 <sup>c</sup>
91-20-3	Naphthalene	0.14	0.22-
98-95-3	Nitrobenzene <sup>b</sup>	0.0035	0.0035

CAS No.	Chemical Name	Groundwater Remediation Objective	
		Class I (mg/L)	Class II (mg/L)
86-30-6	<i>N</i> -Nitrosodiphenylamine	0.0032 <sup>a</sup>	0.016
621-64-7	<i>N</i> -Nitrosodi- <i>n</i> -propylamine	0.0018 <sup>a</sup>	0.0018
87-86-5	Pentachlorophenol	0.001 <sup>c</sup>	0.005 <sup>c</sup>
108-95-2	Phenol	0.1 <sup>c</sup>	0.1 <sup>c</sup>
1918-02-1	Picloram	0.5 <sup>c</sup>	5.0 <sup>c</sup>
1336-36-3	Polychlorinated biphenyls (PCBs)	0.0005 <sup>c</sup>	0.0025 <sup>c</sup>
129-00-0	Pyrene	0.21	1.05
122-34-9	Simazine	0.004 <sup>c</sup>	0.04 <sup>c</sup>
100-42-5	Styrene	0.1 <sup>c</sup>	0.5 <sup>c</sup>
93-72-1	2,4,5-TP (Silvex)	0.05 <sup>c</sup>	0.25 <sup>c</sup>
127-18-4	Tetrachloroethylene (Perchloroethylene)	0.005 <sup>c</sup>	0.025 <sup>c</sup>
108-88-3	Toluene	1.0 <sup>c</sup>	2.5 <sup>c</sup>
8001-35-2	Toxaphene	0.003 <sup>c</sup>	0.015 <sup>c</sup>
120-82-1	1,2,4-Trichlorobenzene	0.07 <sup>c</sup>	0.7 <sup>c</sup>
71-55-6	1,1,1-Trichloroethane <sup>b</sup>	0.2 <sup>c</sup>	1.0 <sup>c</sup>
79-00-5	1,1,2-Trichloroethane	0.005 <sup>c</sup>	0.05 <sup>c</sup>
79-01-6	Trichloroethylene	0.005 <sup>c</sup>	0.025 <sup>c</sup>
108-05-4	Vinyl acetate	7.0	7.0
75-01-4	Vinyl chloride	0.002 <sup>c</sup>	0.01 <sup>c</sup>
1330-20-7	Xylenes (total)	10.0 <sup>c</sup>	10.0 <sup>c</sup>
	<b>Ionizable Organics</b>		
65-85-0	Benzoic Acid	28	28
106-47-8	4-Chloroaniline ( <i>p</i> -Chloroaniline)	0.028	0.028
95-57-8	2-Chlorophenol	0.035	0.175
120-83-2	2,4-Dichlorophenol	0.021	0.021
105-67-9	2,4-Dimethylphenol	0.14	0.14
51-28-5	2,4-Dinitrophenol	0.014	0.014
95-48-7	2-Methylphenol ( <i>o</i> – Cresol)	0.35	0.35

		Groundwater Remediation Objective	
CAS No.	Chemical Name	Class I (mg/L)	Class II (mg/L)
95-95-4	2,4,5-Trichlorophenol	0.7	3.5
88-06-2	2,4,6 Trichlorophenol	0.01 <sup>a</sup>	0.05-
	<b>Inorganics</b>		
7440-36-0	Antimony	0.006 <sup>c</sup>	0.024 <sup>c</sup>
7440-38-2	Arsenic	0.05 <sup>c</sup>	0.2 <sup>c</sup>
7440-39-3	Barium	2.0 <sup>c</sup>	2.0 <sup>c</sup>
7440-41-7	Beryllium	0.004 <sup>c</sup>	0.5 <sup>c</sup>
7440-42-8	Boron	2.0 <sup>c</sup>	2.0 <sup>c</sup>
7440-43-9	Cadmium	0.005 <sup>c</sup>	0.05 <sup>c</sup>
16887-00-6	Chloride	200 <sup>c</sup>	200 <sup>c</sup>
7440-47-3	Chromium, total	0.1 <sup>c</sup>	1.0 <sup>c</sup>
18540-29-9	Chromium, ion, hexavalent	---	---
7440-48-4	Cobalt	1.0 <sup>c</sup>	1.0 <sup>c</sup>
7440-50-8	Copper	0.65 <sup>c</sup>	0.65 <sup>c</sup>
57-12-5	Cyanide	0.2 <sup>c</sup>	0.6 <sup>c</sup>
7782-41-4	Fluoride	4.0 <sup>c</sup>	4.0 <sup>c</sup>
15438-31-0	Iron	5.0 <sup>c</sup>	5.0 <sup>c</sup>
7439-92-1	Lead	0.0075 <sup>c</sup>	0.1 <sup>c</sup>
7439-96-5	Manganese	0.15 <sup>c</sup>	10.0 <sup>c</sup>
7439-97-6	Mercury	0.002 <sup>c</sup>	0.01 <sup>c</sup>
7440-02-0	Nickel	0.1 <sup>c</sup>	2.0 <sup>c</sup>
14797-55-8	Nitrate as N	10.0 <sup>c</sup>	100 <sup>c</sup>
7782-49-2	Selenium	0.05 <sup>c</sup>	0.05 <sup>c</sup>
7440-22-4	Silver	0.05 <sup>c</sup>	---
14808-79-8	Sulfate	400 <sup>c</sup>	400 <sup>c</sup>

CAS No.	Chemical Name	Groundwater Remediation Objective	
		Class I (mg/L)	Class II (mg/L)
7440-28-0	Thallium	0.002 <sup>c</sup>	0.02 <sup>c</sup>
7440-62-2	Vanadium <sup>b</sup>	0.049	0.1
7440-66-6	Zinc	5.0 <sup>c</sup>	10 <sup>c</sup>

Chemical Name and Groundwater Remediation Objective Notations

<sup>a</sup> The groundwater remediation\_objective is equal to the ADL for carcinogens according to the procedures specified in 35 Ill. Adm. Code 620.

<sup>b</sup> Oral Reference Dose and/or Reference Concentration under review by USEPA. Listed values subject to change.

<sup>c</sup> Value listed is also the Groundwater Quality Standard for this chemical pursuant to 35 Ill. Adm. Code 620.410 for Class I Groundwater or 35 Ill. Adm. Code 620.420 for Class II Groundwater.

(Source: Amended at 26 Ill. Reg. 2683, effective February 5, 2002)



Section 742.APPENDIX B: Tier 1 Tables and Illustrations

Section 742.TABLE F: Values Used to Calculate the Tier 1 Soil Remediation Objectives for the Soil Component of the Groundwater Ingestion Route

CAS No.	Chemical Name	GW <sub>obj</sub> Concentration used to Calculate Tier 1 Soil Remediation Objectives <sup>a</sup>	
		Class I (mg/L)	Class II (mg/L)
83-32-9	Acenaphthene	2.0 <sup>b</sup>	10
67-64-1	Acetone	4.0 <sup>b</sup>	4.0
15972-60-8	Alachlor	0.002 <sup>c</sup>	0.01 <sup>c</sup>
116-06-3	Aldicarb	0.003 <sup>c</sup>	0.015 <sup>c</sup>
309-00-2	Aldrin	5.0E-6 <sup>b</sup>	2.5E-5
120-12-7	Anthracene	10 <sup>b</sup>	50
1912-24-9	Atrazine	0.003 <sup>c</sup>	0.015 <sup>c</sup>
71-43-2	Benzene	0.005 <sup>c</sup>	0.025 <sup>c</sup>
56-55-3	Benzo( <i>a</i> )anthracene	0.0001 <sup>b</sup>	0.0005
205-99-2	Benzo( <i>b</i> )fluoranthene	0.0001 <sup>b</sup>	0.0005
207-08-9	Benzo( <i>k</i> )fluroanthene	0.001 <sup>b</sup>	0.005
50-32-8	Benzo( <i>a</i> )pyrene	0.0002 <sup>a,c</sup>	0.002 <sup>c</sup>
111-44-4	Bis(2-chloroethyl)ether	8.0E-5 <sup>b</sup>	8.0E-5
117-81-7	Bis(2-ethylhexyl)phthalate (Di(2-ethylhexyl)phthalate)	0.006 <sup>a,c</sup>	0.06 <sup>c</sup>
75-27-4	Bromodichloromethane (Dichlorobromomethane)	0.1 <sup>b</sup>	0.1
75-25-2	Bromoform	0.1 <sup>b</sup>	0.01
71-36-3	Butanol	4.0 <sup>b</sup>	4.0
85-68-7	Butyl benzyl phthalate	7.0 <sup>b</sup>	35
86-74-8	Carbazole	0.004 <sup>b</sup>	0.02
1563-66-2	Carbofuran	0.04 <sup>c</sup>	0.2 <sup>c</sup>
75-15-0	Carbon disulfide	4.0 <sup>b</sup>	20
56-23-5	Carbon tetrachloride	0.005 <sup>c</sup>	0.025 <sup>c</sup>
57-74-9	Chlordane	0.002 <sup>c</sup>	0.01 <sup>c</sup>

CAS No.	Chemical Name	GW <sub>obj</sub> Concentration used to Calculate Tier 1 Soil Remediation Objectives <sup>a</sup>	
		Class I (mg/L)	Class II (mg/L)
108-90-7	Chlorobenzene (Monochlorobenzene)	0.1 <sup>c</sup>	0.5 <sup>c</sup>
124-48-1	Chlorodibromomethane (Dibromochloromethane)	0.06 <sup>b</sup>	0.06
67-66-3	Chloroform	0.1 <sup>b</sup>	0.5
218-01-9	Chrysene	0.1 <sup>b</sup>	0.05
94-75-7	2,4-D	0.07 <sup>c</sup>	0.35 <sup>c</sup>
75-99-0	Dalapon	0.2 <sup>c</sup>	2.0 <sup>c</sup>
72-54-8	DDD	0.0004 <sup>b</sup>	0.002
72-55-9	DDE	0.0003 <sup>b</sup>	0.0015
50-29-3	DDT	0.0003 <sup>b</sup>	0.0015
53-70-3	Dibenzo( <i>a,h</i> )anthracene	1.0E-5 <sup>b</sup>	5.0E-5
96-12-8	1,2-Dibromo-3-chloropropane	0.0002 <sup>c</sup>	0.0002 <sup>c</sup>
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	0.00005 <sup>a,c</sup>	0.0005 <sup>c</sup>
84-74-2	Di- <i>n</i> -butyl phthalate	4.0 <sup>b</sup>	20
95-50-1	1,2-Dichlorobenzene ( <i>o</i> – Dichlorobenzene)	0.6 <sup>c</sup>	1.5 <sup>c</sup>
106-46-7	1,4-Dichlorobenzene ( <i>p</i> – Dichlorobenzene)	0.075 <sup>c</sup>	0.375 <sup>c</sup>
91-94-1	3,3'-Dichlorobenzidine	0.0002 <sup>b</sup>	0.001
75-34-3	1,1-Dichloroethane	4.0 <sup>b</sup>	20
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	0.005 <sup>c</sup>	0.025 <sup>c</sup>
75-35-4	1,1-Dichloroethylene	0.007 <sup>c</sup>	0.035 <sup>c</sup>
156-59-2	<i>cis</i> -1,2-Dichloroethylene	0.07 <sup>c</sup>	0.2 <sup>c</sup>
156-60-5	<i>trans</i> -1,2-Dichloroethylene	0.1 <sup>c</sup>	0.5 <sup>c</sup>
78-97-5	1,2-Dichloropropane	0.005 <sup>c</sup>	0.025 <sup>c</sup>
542-75-6	1,3-Dichloropropene (1,3-Dichloropropylene, <i>cis</i> + <i>trans</i> )	0.0005 <sup>b</sup>	0.0025

CAS No.	Chemical Name	GW <sub>obj</sub> Concentration used to Calculate Tier 1 Soil Remediation Objectives <sup>a</sup>	
		Class I (mg/L)	Class II (mg/L)
60-57-1	Dieldrin	5.0E-6 <sup>b</sup>	2.5E-5
84-66-2	Diethyl phthalate	30 <sup>b</sup>	30
121-14-2	2,4-Dinitrotoluene	0.0001 <sup>b</sup>	0.0001
606-20-2	2,6-Dinitrotoluene	0.0001	0.0001
88-85-7	Dinoseb	0.007 <sup>c</sup>	0.07 <sup>c</sup>
117-84-0	Di- <i>n</i> -octyl phthalate	0.7 <sup>b</sup>	3.5
115-29-7	Endosulfan	0.2 <sup>b</sup>	1.0
145-73-3	Endothall	0.1 <sup>c</sup>	0.1 <sup>c</sup>
72-20-8	Endrin	0.002 <sup>c</sup>	0.01 <sup>c</sup>
100-41-4	Ethylbenzene	0.7 <sup>c</sup>	1.0 <sup>c</sup>
206-44-0	Fluoranthene	1.0 <sup>b</sup>	5.0
86-73-7	Fluorene	1.0 <sup>b</sup>	5.0
76-44-8	Heptachlor	0.0004 <sup>c</sup>	0.002 <sup>c</sup>
1024-57-3	Heptachlor epoxide	0.0002 <sup>c</sup>	0.001 <sup>c</sup>
118-74-1	Hexachlorobenzene	0.001 <sup>b</sup>	0.005
319-84-6	<i>alpha</i> -HCH ( <i>alpha</i> -BHC)	1.0E-5 <sup>b</sup>	5.0E-5
58-89-9	<i>Gamma</i> -HCH (Lindane)	0.0002 <sup>c</sup>	0.001 <sup>c</sup>
77-47-4	Hexachlorocyclopentadiene	0.05 <sup>c</sup>	0.5 <sup>c</sup>
67-72-1	Hexachloroethane	0.007	0.035
193-39-5	Indeno(1,2,3- <i>c,d</i> )pyrene	0.0001 <sup>b</sup>	0.0005
78-59-1	Isophorone	1.4	1.4
72-43-5	Methoxychlor	0.04 <sup>c</sup>	0.2 <sup>c</sup>
74-83-9	Methyl bromide (Bromomethane)	0.05 <sup>b</sup>	0.25
1634-04-4	Methyl tertiary-butyl ether	0.07	0.07
75-09-2	Methylene chloride (Dichloromethane)	0.005 <sup>c</sup>	0.05 <sup>c</sup>
91-20-3	Naphthalene	0.14	0.22
98-95-3	Nitrobenzene	0.02 <sup>b</sup>	0.02

CAS No.	Chemical Name	GW <sub>obj</sub> Concentration used to Calculate Tier 1 Soil Remediation Objectives <sup>a</sup>	
		Class I (mg/L)	Class II (mg/L)
1918-02-1	Picloram	0.5 <sup>c</sup>	5.0 <sup>c</sup>
1336-36-3	Polychlorinated biphenyls (PCBs)	---	---
129-00-0	Pyrene	1.0 <sup>b</sup>	5.0
122-34-9	Simazine	0.004 <sup>c</sup>	0.04 <sup>c</sup>
100-42-5	Styrene	0.1 <sup>c</sup>	0.5 <sup>c</sup>
93-72-1	2,4,5-TP (Silvex)	0.05 <sup>c</sup>	0.25 <sup>c</sup>
127-18-4	Tetrachloroethylene (Perchloroethylene)	0.005 <sup>c</sup>	0.025 <sup>c</sup>
108-88-3	Toluene	1.0 <sup>c</sup>	2.5 <sup>c</sup>
8001-35-2	Toxaphene	0.003 <sup>c</sup>	0.015 <sup>c</sup>
120-82-1	1,2,4-Trichlorobenzene	0.07 <sup>c</sup>	0.7 <sup>c</sup>
71-55-6	1,1,1-Trichloroethane	0.2 <sup>c</sup>	1.0 <sup>c</sup>
79-00-5	1,1,2-Trichloroethane	0.005 <sup>c</sup>	0.05 <sup>c</sup>
79-01-6	Trichloroethylene	0.005 <sup>c</sup>	0.025 <sup>c</sup>
108-05-4	Vinyl acetate	40 <sup>b</sup>	40
75-01-4	Vinyl chloride	0.002 <sup>c</sup>	0.01 <sup>c</sup>
1330-20-7	Xylenes (total)	10.0 <sup>c</sup>	10.0 <sup>c</sup>
	<b>Ionizable Organics</b>		
65-85-0	Benzoic Acid	100 <sup>b</sup>	100
106-47-8	4-Chloroaniline ( <i>p</i> -Chloroaniline)	0.1 <sup>b</sup>	0.1
95-57-8	2-Chlorophenol	0.2 <sup>b</sup>	1.0
120-83-2	2,4-Dichlorophenol	0.1 <sup>b</sup>	0.1
105-67-9	2,4-Dimethylphenol	0.7 <sup>b</sup>	0.7
51-28-5	2,4-Dinitrophenol	0.04 <sup>b</sup>	0.04
95-48-7	2-Methylphenol ( <i>o</i> -Cresol)	2.0 <sup>b</sup>	2.0
86-30-6	<i>N</i> -Nitrosodiphenylamine	0.02 <sup>b</sup>	0.1

CAS No.	Chemical Name	GW <sub>obj</sub> Concentration used to Calculate Tier 1 Soil Remediation Objectives <sup>a</sup>	
		Class I (mg/L)	Class II (mg/L)
621-64-7	<i>N</i> -Nitrosodi- <i>n</i> -propylamine	1.0E-5 <sup>b</sup>	1.0E-5
87-86-5	Pentachlorophenol	0.001 <sup>a,c</sup>	0.005 <sup>c</sup>
108-95-2	Phenol	0.1 <sup>c</sup>	0.1 <sup>c</sup>
95-95-4	2,4,5-Trichlorophenol	4.0 <sup>b</sup>	20
88-06-2	2,4,6-Trichlorophenol	0.008 <sup>b</sup>	0.04
	<b>Inorganics</b>		
7440-36-0	Antimony	0.006 <sup>c</sup>	0.024 <sup>c</sup>
7440-38-2	Arsenic	0.05 <sup>c</sup>	0.2 <sup>c</sup>
7440-39-3	Barium	2.0 <sup>c</sup>	2.0 <sup>c</sup>
7440-41-7	Beryllium	0.004 <sup>c</sup>	0.5 <sup>c</sup>
7440-42-8	Boron	2.0 <sup>c</sup>	2.0 <sup>c</sup>
7440-43-9	Cadmium	0.005 <sup>c</sup>	0.05 <sup>c</sup>
16887-00-6	Chloride	200 <sup>c</sup>	200 <sup>c</sup>
7440-47-3	Chromium, total	0.1 <sup>c</sup>	1.0 <sup>c</sup>
18540-29-9	Chromium, ion, hexavalent	---	---
7440-48-4	Cobalt	1.0 <sup>c</sup>	1.0 <sup>c</sup>
7440-50-8	Copper	0.65 <sup>c</sup>	0.65 <sup>c</sup>
57-12-5	Cyanide	0.2 <sup>c</sup>	0.6 <sup>c</sup>
7782-41-4	Fluoride	4.0 <sup>c</sup>	4.0 <sup>c</sup>
15438-31-0	Iron	5.0 <sup>c</sup>	5.0 <sup>c</sup>
7439-92-1	Lead	0.0075 <sup>c</sup>	0.1 <sup>c</sup>
7439-96-5	Manganese	0.15 <sup>c</sup>	10.0 <sup>c</sup>
7439-97-6	Mercury	0.002 <sup>c</sup>	0.01 <sup>c</sup>
7440-02-0	Nickel	0.1 <sup>c</sup>	2.0 <sup>c</sup>
14797-55-8	Nitrate as N	10.0 <sup>c</sup>	100 <sup>c</sup>
7782-49-2	Selenium	0.05 <sup>c</sup>	0.05 <sup>c</sup>
7440-22-4	Silver	0.05 <sup>c</sup>	---
14808-79-8	Sulfate	400 <sup>c</sup>	400 <sup>c</sup>

CAS No.	Chemical Name	GW <sub>obj</sub> Concentration used to Calculate Tier 1 Soil Remediation Objectives <sup>a</sup>	
		Class I (mg/L)	Class II (mg/L)
7440-28-0	Thallium	0.002 <sup>c</sup>	0.02 <sup>c</sup>
7440-62-2	Vanadium	0.049	0.1
7440-66-6	Zinc	5.0 <sup>c</sup>	10 <sup>c</sup>

Chemical Name and Groundwater Remediation Objective Notations

<sup>a</sup> The Equation S17 is used to calculate the Soil Remediation Objective for the Soil Component of the Groundwater Ingestion Route; this equation requires calculation of the Target Soil Leachate Concentration ( $C_w$ ) from Equation S18:  $C_w = DF \times GW_{obj}$ .

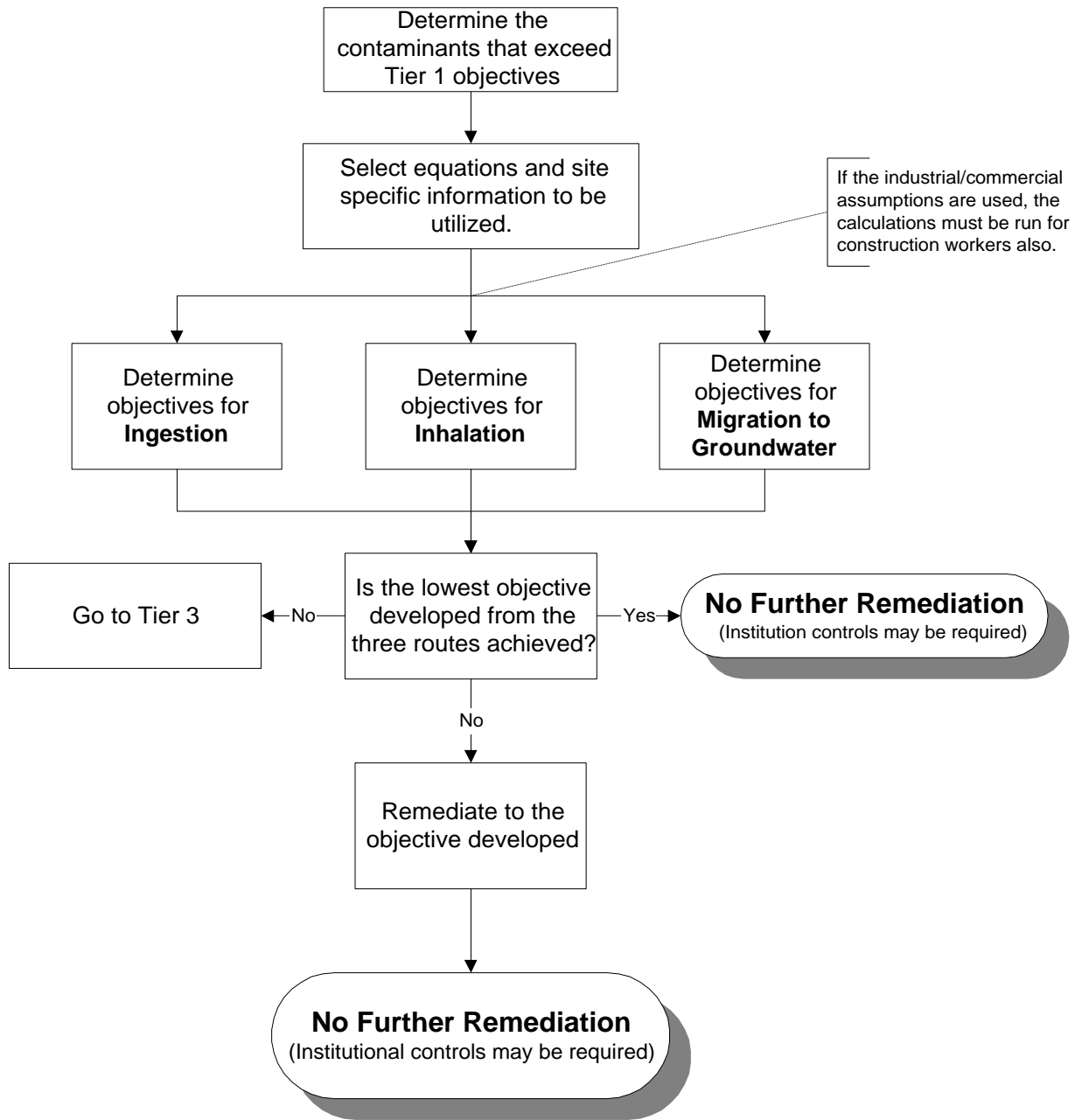
<sup>b</sup> Value listed is the Water Health Based Limit (HBL) for this chemical from Soil Screening Guidance: User's Guide, incorporated by reference at Section 742.210. The HBL is equal to the non-zero MCLG (if available); the MCL (if available); or, for carcinogens, a cancer risk of 1.0E-6, and for noncarcinogens is equal to a Hazard Quotient of 1.0. NOTE: These GW<sub>obj</sub> concentrations are not equal to the Tier 1 Groundwater Remediation Objectives for the Direct Ingestion of Groundwater Component of the Groundwater Ingestion Route, listed in Section 742.Appendix B, Table E.

<sup>c</sup> Value listed is also the Groundwater Quality Standard for this chemical pursuant to 35 Ill. Adm. Code 620.410 for Class I Groundwater or 35 Ill. Adm. Code 620.420 for Class II Groundwater.

(Source: Amended at 26 Ill. Reg. 2683, effective February 5, 2002)

**Section 742.APPENDIX C: Tier 2 Tables and Illustrations**

**Section 742.Illustration A: Tier 2 Evaluation for Soil**

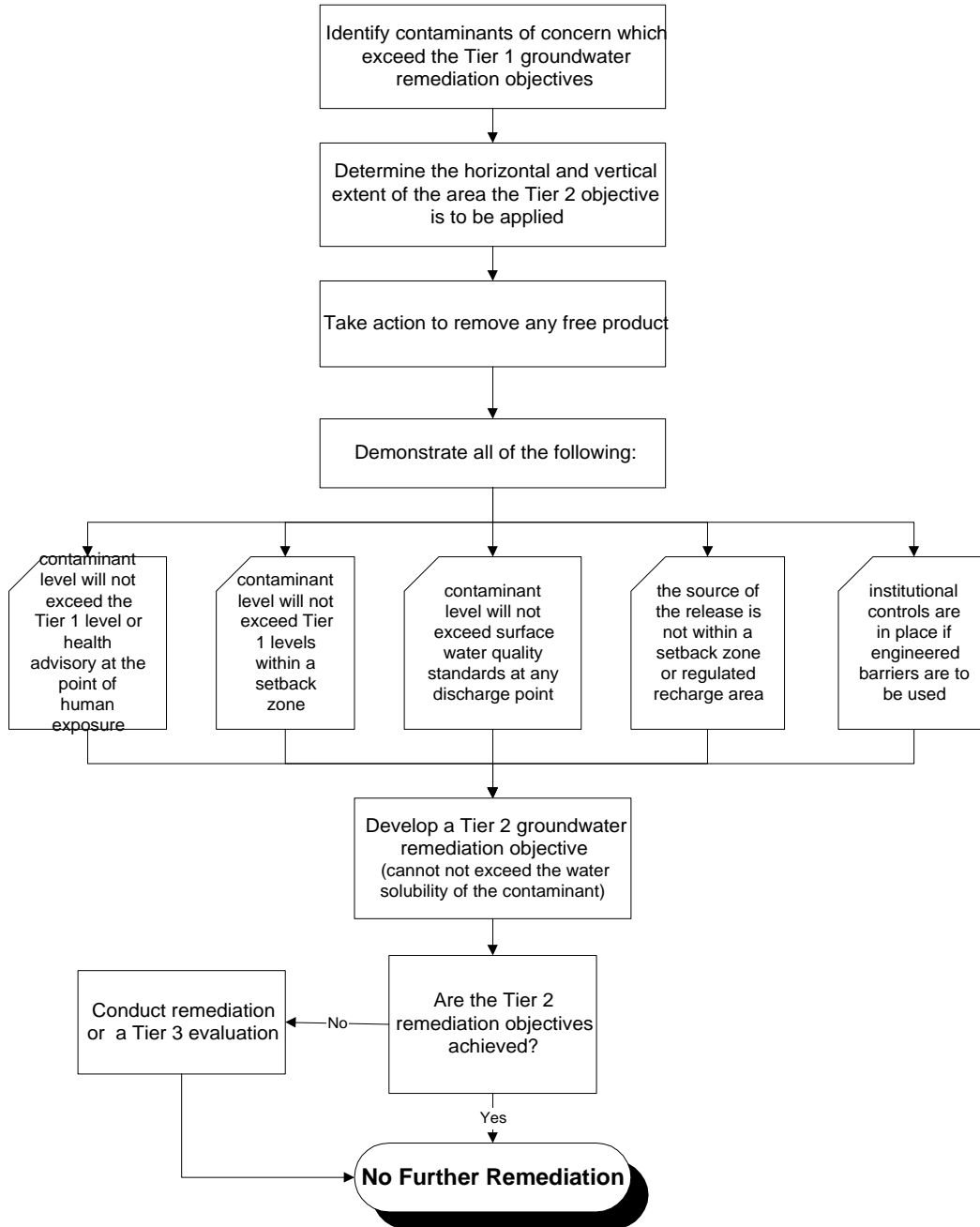






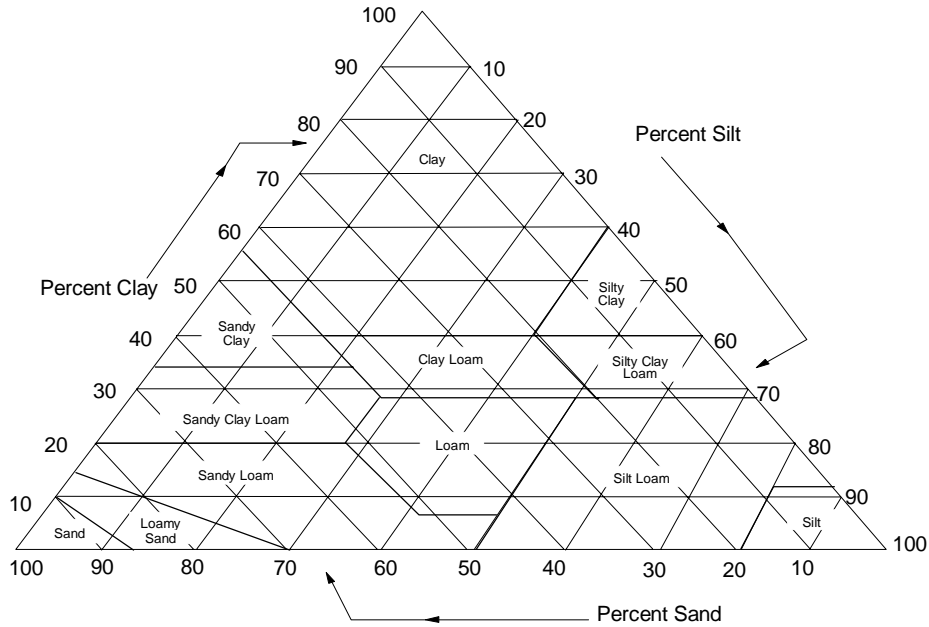
## Section 742.APPENDIX C: Tier 2 Tables and Illustrations

### Section 742.Illustration B: Tier 2 Evaluation for Groundwater



**Section 742.APPENDIX C: Tier 2 Tables and Illustrations**

**Section 742.Illustration C: U.S. Department of Agriculture Soil Texture Classification**



Criteria Used with the Field Method for Determining Soil Texture Classes

Criterion	Sand	Sandy loam	Loam	Slit loam	Clay loam	Clay
1. Individual grains visible to eye	Yes	Yes	Some	Few	No	No
2. Stability of dry clods	Do not form	Do not form	Easily broken	Moderately easily broken	Hard and stable	Very hard and stable
3. Stability of wet clods	Unstable	Slightyl stable	Moderately stable	Stable	Very stable	Very stable
4. Stability of "ribbon" when wet soil rubbed between thumb and fingers	Does not form	Does not form	Does not form	Broken appearance	Thin, will break	Very long, flexible

Particle Size, mm

0.002		0.05		0.10	0.25	0.5	1.0	2.0		
Clay	Silt	Very Fine	Fine	Med.	Coarse	Very Coarse			Gravel	
		Sand								

Section 742.APPENDIX C: Tier 2 Tables and Illustrations

Section 742.Table A: SSL Equations

Equations for Soil Ingestion Exposure Route	Remediation Objectives for Noncarcinogenic Contaminants (mg/kg)	$\frac{THQ \cdot BW \cdot AT \cdot 365 \frac{d}{yr}}{\frac{1}{RfD_o} \cdot 10^{-6} \frac{kg}{mg} \cdot EF \cdot ED \cdot IR_{soil}}$	S1
	Remediation Objectives for Carcinogenic Contaminants - Residential (mg/kg)	$\frac{TR \cdot AT_c \cdot 365 \frac{d}{yr}}{SF_o \cdot 10^{-6} \frac{kg}{mg} \cdot EF \cdot IF_{soil-adj}}$	S2
	Remediation Objectives for Carcinogenic Contaminants - Industrial/ Commercial, Construction Worker (mg/kg)	$\frac{TR \cdot BW \cdot AT_c \cdot 365 \frac{d}{yr}}{SF_o \cdot 10^{-6} \frac{kg}{mg} \cdot EF \cdot ED \cdot IR_{soil}}$	S3
Equations for Inhalation Exposure Route (Organic Contaminants and Mercury)	Remediation Objectives for Noncarcinogenic Contaminants - Residential, Industrial/Commercial (mg/kg)	$\frac{THQ \cdot AT \cdot 365 \frac{d}{yr}}{EF \cdot ED \cdot \left( \frac{1}{RfC} \cdot \frac{1}{VF} \right)}$	S4

Remediation Objectives for Noncarcinogenic Contaminants - Construction Worker (mg/kg)	$\frac{THQ \cdot AT \cdot 365 \frac{d}{yr}}{EF \cdot ED \cdot \left( \frac{1}{RfC} \cdot \frac{1}{VF'} \right)}$	S5
Remediation Objectives for Carcinogenic Contaminants - Residential, Industrial/ Commercial (mg/kg)	$\frac{TR \cdot AT_c \cdot 365 \frac{d}{yr}}{URF \cdot 1,000 \frac{ug}{mg} \cdot EF \cdot ED \cdot \frac{1}{VF}}$	S6
Remediation Objectives for Carcinogenic Contaminants - Construction Worker (mg/kg)	$\frac{TR \cdot AT_c \cdot 365 \frac{d}{yr}}{URF \cdot 1,000 \frac{ug}{mg} \cdot EF \cdot ED \cdot \frac{1}{VF'}}$	S7
Equation for Derivation of the Volatilization Factor - Residential, Industrial/ Commercial, VF (m <sup>3</sup> /kg)	$VF = \frac{Q}{C} \cdot \frac{(3.14 \cdot D_A \cdot T)^{1/2}}{(2 \cdot \rho_b \cdot D_A)} \cdot 10^{-4} \frac{m^2}{cm^2}$	S8
Equation for Derivation of the Volatilization Factor - Construction Worker, VF' (m <sup>3</sup> /kg)	$VF' = \frac{VF}{10}$	S9
Equation for Derivation of Apparent Diffusivity, D <sub>A</sub> (cm <sup>2</sup> /s)	$D_A = \frac{(\theta_a^{3.33} \cdot D_i \cdot H') + (\theta_w^{3.33} \cdot D_w)}{\eta^2} \cdot \frac{1}{(\rho_b \cdot K_d) + \theta_w + (\theta_a \cdot H')}$	S10

Equations for Inhalation Exposure Route (Fugitive Dusts)	Remediation Objectives for Noncarcinogenic Contaminants - Residential, Industrial/Commercial (mg/kg)	$\frac{THQ \cdot AT \cdot 365 \frac{d}{yr}}{EF \cdot ED \cdot \left( \frac{1}{RfC} \cdot \frac{1}{PEF} \right)}$	S11
	Remediation Objectives for Noncarcinogenic Contaminants - Construction Worker (mg/kg)	$\frac{THQ \cdot AT \cdot 365 \frac{d}{yr}}{EF \cdot ED \cdot \left( \frac{1}{RfC} \cdot \frac{1}{PEF'} \right)}$	S12
	Remediation Objectives for Carcinogenic Contaminants - Residential, Industrial/Commercial (mg/kg)	$\frac{TR \cdot AT_c \cdot 365 \frac{d}{yr}}{URF \cdot 1,000 \frac{ug}{mg} \cdot EF \cdot ED \cdot \frac{1}{PEF}}$	S13
	Remediation Objectives for Carcinogenic Contaminants - Construction Worker (mg/kg)	$\frac{TR \cdot AT_c \cdot 365 \frac{d}{yr}}{URF \cdot 1,000 \frac{ug}{mg} \cdot EF \cdot ED \cdot \frac{1}{PEF'}}$	S14
	Equation for Derivation of Particulate Emission Factor, PEF (m <sup>3</sup> /kg)	$PEF = \frac{Q}{C} \cdot \frac{3,600 \frac{s}{hr}}{0.036 \cdot (1-V) \cdot \left( \frac{U_m}{U_t} \right)^3 \cdot F(x)}$	S15

	Equation for Derivation of Particulate Emission Factor, PEF' - Construction Worker (m <sup>3</sup> /kg)	$PEF' = \frac{PEF}{10}$ <p>NOTE: PEF must be the industrial/commercial value</p>	S16
Equations for the Soil Component of the Groundwater Ingestion Exposure Route	Remediation Objective (mg/kg)	$C_w \cdot \left[ K_d + \frac{(\theta_w + \theta_a \cdot H')}{\rho_b} \right]$ <p>NOTE: This equation can only be used to model contaminant migration not in the water bearing unit.</p>	S17
	Target Soil Leachate Concentration, C <sub>w</sub> (mg/L)	$C_w = DF \cdot GW_{obj}$	S18
	Soil-Water Partition Coefficient, K <sub>d</sub> (cm <sup>3</sup> /g)	$K_d = K_{oc} \cdot f_{oc}$	S19
	Water-Filled Soil Porosity, θ <sub>w</sub> (L <sub>water</sub> /L <sub>soil</sub> )	$\theta_w = \eta \cdot \left( \frac{I}{K_s} \right)^{1/(2b+3)}$	S20
	Air-Filled Soil Porosity, θ <sub>a</sub> (L <sub>air</sub> /L <sub>soil</sub> )	$\theta_a = \eta - \theta_w$	S21
	Dilution Factor, DF (unitless)	$DF = 1 + \frac{K \cdot i \cdot d}{I \cdot L}$	S22

	Groundwater Remediation Objective for Carcinogenic Contaminants, $GW_{obj}$ (mg/L)	$\frac{TR \cdot BW \cdot AT_c \cdot 365 \frac{d}{yr}}{SF_o \cdot IR_w \cdot EF \cdot ED}$	S23
	Total Soil Porosity, $\eta$ ( $L_{pore}/L_{soil}$ )	$\eta = 1 - \frac{\rho_b}{\rho_s}$	S24
	Equation for Estimation of Mixing Zone Depth, $d$ (m)	$d = (0.0112 \cdot L^2)^{0.5} + d_a \left[ 1 - \exp\left(\frac{-L \cdot I}{K \cdot i \cdot d_a}\right) \right]$	S25
Mass-Limit Equations for Inhalation Exposure Route and Soil Component of the Groundwater Ingestion Exposure Route	Mass-Limit Volatilization Factor for the Inhalation Exposure Route - Residential, Industrial/Commercial, VF ( $m^3/kg$ )	$VF_{M-L} = \frac{Q}{C} \cdot \frac{\left[ T_{M-L} \cdot \left( 3.15 \cdot 10^7 \frac{s}{yr} \right) \right]}{\rho_b \cdot d_s \cdot 10^6 \frac{cm^3}{m^3}}$ <p>NOTE: This equation may be used when vertical thickness of contamination is known or can be estimated reliably.</p>	S26
	Mass-Limit Volatilization Factor for Inhalation Exposure Route - Construction Worker, VF' ( $m^3/kg$ )	$VF'_{M-L} = \frac{VF_{M-L}}{10}$	S27

	Mass-Limit Remediation Objective for Soil Component of the Groundwater Ingestion Exposure Route (mg/kg)	$\frac{(C_w \cdot I_{M-L} \cdot ED_{M-L})}{\rho_b \cdot d_s}$ <p>NOTE: This equation may be used when vertical thickness is known or can be estimated reliably.</p>	<b>S28</b>
Equation for Derivation of the Soil Saturation Limit, $C_{sat}$	$C_{sat} = \frac{S}{\rho_b} \cdot [(K_d \cdot \rho_b) + \theta_w + (H' \cdot \theta_a)]$	<b>S29</b>	

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)



Section 742.APPENDIX C: Tier 2 Tables and Illustrations

Section 742.Table B: SSL Parameters

Symbol	Parameter	Units	Source	Parameter Value(s)
AT	Averaging Time for Noncarcinogens in Ingestion Equation	yr		Residential = 6 Industrial/Commercial = 25 Construction Worker = 0.115
AT	Averaging Time for Noncarcinogens in Inhalation Equation	yr		Residential = 30 Industrial/Commercial = 25 Construction Worker = 0.115
AT <sub>c</sub>	Averaging Time for Carcinogens	yr	SSL	70
BW	Body Weight	kg		Residential = 15, noncarcinogens 70, carcinogens Industrial/Commercial = 70 Construction Worker = 70
C <sub>sat</sub>	Soil Saturation Concentration	mg/kg	Appendix A, Table A or Equation S29 in Appendix C, Table A	Chemical-Specific or Calculated Value
C <sub>w</sub>	Target Soil Leachate Concentration	mg/L	Equation S18 in Appendix C, Table A	Groundwater Standard, Health Advisory concentration, or Calculated Value
d	Mixing Zone Depth	m	SSL or Equation S25 in Appendix C, Table A	2 m or Calculated Value
d <sub>a</sub>	Aquifer Thickness	m	Field Measurement	Site-Specific

Symbol	Parameter	Units	Source	Parameter Value(s)
$d_s$	Depth of Source (Vertical thickness of contamination)	m	Field Measurement or Estimation	Site-Specific
$D_A$	Apparent Diffusivity	$\text{cm}^2/\text{s}$	Equation S10 in Appendix C, Table A	Calculated Value
$D_i$	Diffusivity in Air	$\text{cm}^2/\text{s}$	Appendix C, Table E	Chemical-Specific
$D_w$	Diffusivity in Water	$\text{cm}^2/\text{s}$	Appendix C, Table E	Chemical-Specific
DF	Dilution Factor	unitless	Equation S22 in Appendix C, Table A	20 or Calculated Value
ED	Exposure Duration for Ingestion of Carcinogens	yr		Industrial/Commercial = 25 Construction Worker = 1
ED	Exposure Duration for Inhalation of Carcinogens	yr		Residential = 30 Industrial/Commercial = 25 Construction Worker = 1
ED	Exposure Duration for Ingestion of Noncarcinogens	yr		Residential = 6 Industrial/Commercial = 25 Construction Worker = 1
ED	Exposure Duration for Inhalation of Noncarcinogens	yr		Residential = 30 Industrial/Commercial = 25 Construction Worker = 1
ED	Exposure Duration for the Direct Ingestion of Groundwater	yr		Residential = 30 Industrial/Commercial = 25 Construction Worker = 1

Symbol	Parameter	Units	Source	Parameter Value(s)
$ED_{M-L}$	Exposure Duration for Migration to Groundwater Mass-Limit Equation S28	yr	SSL	70
EF	Exposure Frequency	d/yr		Residential = 350 Industrial/Commercial = 250 Construction Worker = 30
F(x)	Function dependent on $U_m/U_t$	unitless	SSL	0.194
$f_{oc}$	Organic Carbon Content of Soil	g/g	SSL or Field Measurement (See Appendix C, Table F)	Surface Soil = 0.006 Subsurface soil = 0.002, or Site-Specific
$GW_{obj}$	Groundwater Remediation Remediation Objective	mg/L	Appendix B, Table E, 35 IAC 620.Subpart F, or Equation S23 in Appendix C, Table A	Chemical-Specific or Calculated
H'	Henry's Law Constant	unitless	Appendix C, Table E	Chemical-Specific
i	Hydraulic Gradient	m/m	Field Measurement (See Appendix C, Table F)	Site-Specific
I	Infiltration Rate	m/yr	SSL	0.3
$I_{M-L}$	Infiltration Rate for Migration to Groundwater Mass-Limit Equation S28	m/yr	SSL	0.18

Symbol	Parameter	Units	Source	Parameter Value(s)
IF <sub>soil-adj</sub> (residential)	Age Adjusted Soil Ingestion Factor for Carcinogens	(mg-yr)/(kg-d)	SSL	114
IR <sub>soil</sub>	Soil Ingestion Rate	mg/d		Residential = 200 Industrial/Commercial = 50 Construction Worker = 480
IR <sub>w</sub>	Daily Water Ingestion Rate	L/d		Residential = 2 Industrial/Commercial = 1
K	Aquifer Hydraulic Conductivity	m/yr	Field Measurement (See Appendix C, Table F)	Site-Specific
K <sub>d</sub> (Non-ionizing organics)	Soil-Water Partition Coefficient	cm <sup>3</sup> /g or L/kg	Equation S19 in Appendix C, Table A	Calculated Value
K <sub>d</sub> (Ionizing organics)	Soil-Water Partition Coefficient	cm <sup>3</sup> /g or L/kg	Equation S19 in Appendix C, Table A	Chemical and pH-Specific (see Appendix C, Table I)
K <sub>d</sub> (Inorganics)	Soil-Water Partition Coefficient	cm <sup>3</sup> /g or L/kg	Appendix C, Table J	Chemical and pH-Specific
K <sub>oc</sub>	Organic Carbon Partition Coefficient	cm <sup>3</sup> /g or L/kg	Appendix C, Table E or Appendix C, Table I	Chemical-Specific
K <sub>s</sub>	Saturated Hydraulic Conductivity	m/yr	Appendix C, Table K Appendix C, Illustration C	Site-Specific
L	Source Length Parallel to Groundwater Flow	m	Field Measurement	Site-Specific
PEF	Particulate Emission Factor	m <sup>3</sup> /kg	SSL or Equation S15 in Appendix C, Table A	Residential = 1.32 • 10 <sup>9</sup> or Site-Specific Industrial/Commercial = 1.24 • 10 <sup>9</sup> or Site-Specific
PEF'	Particulate Emission Factor adjusted for Agitation (construction worker)	m <sup>3</sup> /kg	Equation S16 in Appendix C, Table A using PEF (industrial/commercial)	1.24 • 10 <sup>8</sup> or Site-Specific

Symbol	Parameter	Units	Source	Parameter Value(s)
Q/C (used in VF equations)	Inverse of the mean concentration at the center of a square source	$(\text{g}/\text{m}^2\text{-s})/(\text{kg}/\text{m}^3)$	Appendix C, Table H	Residential = 68.81 Industrial/Commercial = 85.81 Construction Worker = 85.81
Q/C (used in PEF equations)	Inverse of the mean concentration at the center of a square source	$(\text{g}/\text{m}^2\text{-s})/(\text{kg}/\text{m}^3)$	SSL or Appendix C, Table H	Residential = 90.80 Industrial/Commercial = 85.81 Construction Worker = 85.81
RfC	Inhalation Reference Concentration	$\text{mg}/\text{m}^3$	IEPA (IRIS/HEAST <sup>a</sup> )	Toxicological-Specific (Note: for Construction Workers use subchronic reference concentrations)
RfD <sub>o</sub>	Oral Reference Dose	$\text{mg}/(\text{kg}\text{-d})$	IEPA (IRIS/HEAST <sup>a</sup> )	Toxicological-Specific (Note: for Construction Worker use subchronic reference doses)
S	Solubility in Water	$\text{mg}/\text{L}$	Appendix C, Table E	Chemical-Specific
SF <sub>o</sub>	Oral Slope Factor	$(\text{mg}/\text{kg}\text{-d})^{-1}$	IEPA (IRIS/HEAST <sup>a</sup> )	Toxicological-Specific
T	Exposure Interval	s		Residential = $9.5 \bullet 10^8$ Industrial/Commercial = $7.9 \bullet 10^8$ Construction Worker = $3.6 \bullet 10^6$
T <sub>M-L</sub>	Exposure Interval for Mass-Limit Volatilization Factor Equation S26	yr	SSL	30
THQ	Target Hazard Quotient	unitless	SSL	1

Symbol	Parameter	Units	Source	Parameter Value(s)
TR	Target Cancer Risk	unitless		Residential = $10^{-6}$ at the point of human exposure Industrial/Commercial = $10^{-6}$ at the point of human exposure Construction Worker = $10^{-6}$ at the point of human exposure
$U_m$	Mean Annual Windspeed	m/s	SSL	4.69
URF	Inhalation Unit Risk Factor	$(\mu\text{g}/\text{m}^3)^{-1}$	IEPA (IRIS/HEAST <sup>a</sup> )	Toxicological-Specific
$U_t$	Equivalent Threshold Value of Windspeed at 7 m	m/s	SSL	11.32
V	Fraction of Vegetative Cover	unitless	SSL or Field Measurement	0.5 or Site-Specific
VF	Volatilization Factor	$\text{m}^3/\text{kg}$	Equation S8 in Appendix C, Table A	Calculated Value
VF'	Volatilization Factor adjusted for Agitation	$\text{m}^3/\text{kg}$	Equation S9 in Appendix C, Table A	Calculated Value
$\text{VF}_{\text{M-L}}$	Mass-Limit Volatilization Factor	$\text{m}^3/\text{kg}$	Equation S26 in Appendix C, Table A	Calculated Value
$\text{VF}'_{\text{M-L}}$	Mass-Limit Volatilization Factor adjusted for Agitation	$\text{m}^3/\text{kg}$	Equation S27 in Appendix C, Table A	Calculated Value

Symbol	Parameter	Units	Source	Parameter Value(s)
$\eta$	Total Soil Porosity	$L_{\text{pore}}/L_{\text{soil}}$	SSL or Equation S24 in Appendix C, Table A	0.43, or Gravel = 0.25 Sand = 0.32 Silt = 0.40 Clay = 0.36, or  Calculated Value
$\theta_a$	Air-Filled Soil Porosity	$L_{\text{air}}/L_{\text{soil}}$	SSL or Equation S21 in Appendix C, Table A	Surface Soil (top 1 meter) = 0.28 Subsurface Soil (below 1 meter) = 0.13, or  Gravel = 0.05 Sand = 0.14 Silt = 0.24 Clay = 0.19, or  Calculated Value
$\theta_w$	Water-Filled Soil Porosity	$L_{\text{water}}/L_{\text{soil}}$	SSL or Equation S20 in Appendix C, Table A	Surface Soil (top 1 meter) = 0.15 Subsurface Soil (below 1 meter) = 0.30, or  Gravel = 0.20 Sand = 0.18 Silt = 0.16 Clay = 0.17, or  Calculated Value

Symbol	Parameter	Units	Source	Parameter Value(s)
$\rho_b$	Dry Soil Bulk Density	kg/L or g/cm <sup>3</sup>	SSL or Field Measurement (See Appendix C, Table F)	1.5, or Gravel = 2.0 Sand = 1.8 Silt = 1.6 Clay = 1.7, or Site-Specific
$\rho_s$	Soil Particle Density	g/cm <sup>3</sup>	SSL or Field Measurement (See Appendix C, Table F)	2.65, or Site-Specific
$\rho_w$	Water Density	g/cm <sup>3</sup>	SSL	1
1/(2b+3)	Exponential in Equation S20	unitless	Appendix C, Table K Appendix C, Illustration C	Site-Specific

a HEAST = Health Effects Assessment Summary Tables. USEPA, Office of Solid Waste and Emergency Response. EPA/SQO/R-95/036. Updated Quarterly.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)



Section 742.Appendix C: Tier 2 Tables and Illustrations

Section 742.Table C: RBCA Equations

Equations for the combined exposures routes of soil ingestion inhalation of vapors and particulates, and dermal contact with soil	Remediation Objectives for Carcinogenic Contaminants (mg/kg)	$\frac{TR \cdot BW \cdot AT_C \cdot 365 \frac{d}{yr}}{EF \cdot ED \cdot \left\{ \left[ SF_o \cdot 10^{-6} \frac{kg}{mg} \cdot \left( (IR_{soil} \cdot RAF_o) + (SA \cdot M \cdot RAF_d) \right) \right] + \left[ SF_i \cdot IR_{air} \cdot (VF_{ss} + VF_p) \right] \right\}}$	<b>R1</b>
	Remediation Objectives for Non-carcinogenic Contaminants (mg/kg)	$EF \cdot ED \cdot \left[ \frac{10^{-6} \frac{kg}{mg} \left[ (IR_{soil} \cdot RAF_o) + (SA \cdot M \cdot RAF_d) \right]}{RfD_o} + \frac{IR_{air} \cdot (VF_{ss} + VF_p)}{RfD_i} \right]$	<b>R2</b>
	Volatilization Factor for Surficial Soils, $VF_{ss}$ (kg/m <sup>3</sup> )  Whichever is less between R3 and R4	$VF_{ss} = \frac{2 \cdot W \cdot \rho_s \cdot 10^3 \frac{cm^3 \cdot kg}{m^3 \cdot g}}{U_{air} \cdot \delta_{air}} \cdot \sqrt{\frac{D_s^{eff} \cdot H'}{\pi \cdot [\theta_{ws} + (k_s \cdot \rho_s) + (H' \cdot \theta_{as})] \cdot \tau}}$	<b>R3</b>
	$VF_{ss} = \frac{W \cdot \rho_s \cdot d \cdot 10^3 \frac{cm^3 \cdot kg}{m^3 \cdot g}}{U_{air} \cdot \delta_{air} \cdot \tau}$	<b>R4</b>	

	Volatilization Factor for Surficial Soils Regarding Particulates, $VF_p$ (kg/m <sup>3</sup> )	$VF_p = \frac{P_e \cdot W \cdot 10^3 \frac{cm^3 \cdot kg}{m^3 \cdot g}}{U_{air} \cdot \delta_{air}}$	<b>R5</b>
	Effective Diffusion Coefficient in Soil Based on Vapor-Phase Concentration $D_s^{eff}$ (cm <sup>2</sup> /s)	$D_s^{eff} = \frac{D^{air} \cdot \theta_{as}^{3.33}}{\theta_T^2} + \frac{D^{water} \cdot \theta_{ws}^{3.33}}{H' \cdot \theta_T^2}$	<b>R6</b>
Equations for the ambient vapor inhalation (outdoor) route from subsurface soils	Remediation Objectives for Carcinogenic Contaminants (mg/kg)	$\frac{RBSL_{air} \cdot 10^{-3}}{VF_{samb}}$	<b>R7</b>
	Remediation Objectives for Non-carcinogenic Contaminants (mg/kg)	$\frac{RBSL_{air} \cdot 10^{-3}}{VF_{samb}}$	<b>R8</b>

<p>Carcinogenic Risk-Based Screening Level for Air, <math>RBSL_{air}</math> (<math>ug/m^3</math>)</p>	$RBSL_{air} = \frac{TR \cdot BW \cdot AT_c \cdot 365 \frac{d}{yr} \cdot 10^3 \frac{ug}{mg}}{SF_i \cdot IR_{air} \cdot EF \cdot ED}$	<p><b>R9</b></p>
<p>Noncarcinogenic Risk-Based Screening Level for Air, <math>RBSL_{air}</math> (<math>ug/m^3</math>)</p>	$RBSL_{air} = \frac{THQ \cdot RfD_i \cdot BW \cdot AT_n \cdot 365 \frac{d}{yr} \cdot 10^3 \frac{ug}{mg}}{IR_{air} \cdot EF \cdot ED}$	<p><b>R10</b></p>
<p>Volatilization Factor - Subsurface Soil to Ambient Air, <math>VF_{samb}</math> (<math>mg/m^3</math>)/(<math>mg/kg_{soil}</math>)</p>	$VF_{samb} = \frac{H' \cdot \rho_s \cdot 10^3 \frac{cm^3 \cdot kg}{m^3 \cdot g}}{[\theta_{ws} + (k_s \cdot \rho_s) + (H' \cdot \theta_{as})] \cdot \left[ 1 + \frac{(U_{air} \cdot \delta_{air} \cdot L_s)}{(D_s^{eff} \cdot W)} \right]}$	<p><b>R11</b></p>

Equations for the Soil Component of the Groundwater Ingestion Exposure Route	Remediation Objective (mg/kg)	$\frac{GW_{source}}{LF_{sw}}$	R12
		NOTE: This equation can only be used to model contaminant migration not in the water bearing unit.	
	Groundwater at the source, $GW_{source}$ (mg/L)	$GW_{source} = \frac{GW_{comp}}{C_{(x)}/C_{source}}$	R13
	Leaching Factor, $LF_{sw}$  (mg/L <sub>water</sub> )/(mg/kg <sub>soil</sub> )	$LF_{sw} = \frac{\rho_s \cdot \frac{cm^3 \cdot kg}{L \cdot g}}{[\theta_{ws} + (k_s \cdot \rho_s) + (H' \cdot \theta_{as})] \cdot \left[ 1 + \frac{(U_{gw} \cdot \delta_{gw})}{(I \cdot W)} \right]}$	R14
	Steady-State Attenuation Along the Centerline of a Dissolved Plume, $C_{(x)}/C_{source}$	$C_{(x)}/C_{source} = \exp \left[ \left( \frac{X}{2\alpha_x} \right) \cdot \left( 1 - \sqrt{1 + \frac{4\lambda \cdot \alpha_x}{U}} \right) \right] \cdot erf \left[ \frac{S_w}{4 \cdot \sqrt{\alpha_y \cdot X}} \right] \cdot erf \left[ \frac{S_d}{2 \cdot \sqrt{\alpha_z \cdot X}} \right]$ <p>NOTE:</p> <ol style="list-style-type: none"> <li>1. This equation does not predict the contaminant flow within bedrock and may not accurately predict downgradient concentrations in the presence of a confining layer.</li> <li>2. If the value of the First Order Degradation Constant (<math>\lambda</math>) is not readily available, then set <math>\lambda = 0</math>.</li> </ol>	R15
Longitudinal Dispersivity, $\alpha_x$ (cm)	$\alpha_x = 0.10 \cdot X$	R16	

Transverse Dispersivity, $\alpha_y$ (cm)	$\alpha_y = \frac{\alpha_x}{3}$	<b>R17</b>
Vertical Dispersivity, $\alpha_z$ (cm)	$\alpha_z = \frac{\alpha_x}{20}$	<b>R18</b>
Specific Discharge, U (cm/d)	$U = \frac{K \cdot i}{\theta_T}$	<b>R19</b>
Soil-Water Sorption Coefficient, $k_s$	$k_s = K_{oc} \cdot f_{oc}$	<b>R20</b>
Volumetric Air Content in Vadose Zone Soils, $\theta_{as}$ (cm <sup>3</sup> <sub>air</sub> /cm <sup>3</sup> <sub>soil</sub> )	$\theta_{as} = \theta_T - \frac{(w \cdot \rho_s)}{\rho_w}$	<b>R21</b>
Volumetric Water Content in Vadose Zone Soils, $\theta_{ws}$ (cm <sup>3</sup> <sub>water</sub> /cm <sup>3</sup> <sub>soil</sub> )	$\theta_{ws} = \frac{w \cdot \rho_s}{\rho_w}$	<b>R22</b>
Total Soil Porosity, $\theta_T$ (cm <sup>3</sup> /cm <sup>3</sup> <sub>soil</sub> )	$\theta_T = \theta_{as} + \theta_{ws}$	<b>R23</b>

	Groundwater Darcy Velocity, $U_{gw}$ (cm/yr)	$U_{gw} = K \cdot i$	<b>R24</b>
Equations for the Groundwater Ingestion Exposure Route	Remediation Objective for Carcinogenic Contaminants (mg/L)	$\frac{TR \cdot BW \cdot AT_c \cdot 365 \frac{d}{yr}}{SF_o \cdot IR_w \cdot EF \cdot ED}$	<b>R25</b>
	Dissolved Hydrocarbon Concentration along Centerline, $C_{(x)}$ (mg/L <sub>water</sub> )	$C_{(x)} = C_{source} \cdot \exp \left[ \left( \frac{X}{2\alpha_x} \right) \cdot \left( 1 - \sqrt{1 + \frac{4\lambda \cdot \alpha_x}{U}} \right) \right] \cdot \operatorname{erf} \left[ \frac{S_w}{4 \cdot \sqrt{\alpha_y \cdot X}} \right] \cdot \operatorname{erf} \left[ \frac{S_d}{2 \cdot \sqrt{\alpha_z \cdot X}} \right]$ <p>NOTE:</p> <ol style="list-style-type: none"> <li>1. This equation does not predict the contaminant flow within bedrock and may not accurately predict downgradient concentrations in the presence of a confining layer.</li> <li>2. If the value of the First Order Degradation Constant (<math>\lambda</math>) is not readily available, then set <math>\lambda = 0</math>.</li> </ol>	<b>R26</b>

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

Section 742.APPENDIX C: Tier 2 Tables and Illustrations

Section 742.Table D: RBCA Parameters

Symbol	Parameter	Units	Source	Parameter Value(s)
AT <sub>c</sub>	Averaging Time for Carcinogens	yr	RBCA	70
AT <sub>n</sub>	Averaging Time for Noncarcinogens	yr	RBCA	Residential = 30 Industrial/Commercial = 25 Construction Worker = 0.115
BW	Adult Body Weight	kg	RBCA	70
C <sub>source</sub>	The greatest potential concentration of the contaminant of concern in the groundwater at the source of the contamination, based on the concentrations of contaminants in groundwater due to the release and the projected concentration of the contaminant migrating from the soil to the groundwater.	mg/L	Field Measurement	Site-Specific
C <sub>(x)</sub>	Concentration of Contaminant in Groundwater at Distance X from the source	mg/L	Equation R26 in Appendix C, Table C	Calculated Value

Symbol	Parameter	Units	Source	Parameter Value(s)
$C_{(x)}/C_{\text{source}}$	Steady-State Attenuation Along the Centerline of a Dissolved Plume	unitless	Equation R15 in Appendix C, Table C	Calculated Value
d	Lower Depth of Surficial Soil Zone	cm	Field Measurement	100 or Site-Specific (not to exceed 100)
$D^{\text{air}}$	Diffusion Coefficient in Air	$\text{cm}^2/\text{s}$	Appendix C, Table E	Chemical-Specific
$D^{\text{water}}$	Diffusion Coefficient in Water	$\text{cm}^2/\text{s}$	Appendix C, Table E	Chemical-Specific
$D_s^{\text{eff}}$	Effective Diffusion Coefficient in Soil Based on Vapor-Phase Concentration	$\text{cm}^2/\text{s}$	Equation R6 in Appendix C, Table C	Calculated Value
ED	Exposure Duration	yr	RBCA	Residential = 30 Industrial/Commercial = 25 Construction Worker = 1
EF	Exposure Frequency	d/yr	RBCA	Residential = 350 Industrial/Commercial = 250 Construction Worker = 30
erf	Error Function	unitless	Appendix C, Table G	Mathematical Function



Symbol	Parameter	Units	Source	Parameter Value(s)
$f_{oc}$	Organic Carbon Content of Soil	g/g	RBCA or Field Measurement (See Appendix C, Table F)	Surface Soil = 0.006 Subsurface Soil = 0.002 or  Site-Specific
$GW_{comp}$	Groundwater Objective at the Compliance Point	mg/L	Appendix B, Table E, 35 IAC 620.Subpart F, or Equation R25 in Appendix C, Table C	Site-Specific
$GW_{source}$	Groundwater Concentration at the Source	mg/L	Equation R13 in Appendix C, Table C	Calculated Value
H'	Henry's Law Constant	$cm^3_{water}/cm^3_{air}$	Appendix C, Table E	Chemical-Specific
i	Hydraulic Gradient	cm/cm (unitless)	Field Measurement (See Appendix C, Table F)	Site-Specific
I	Infiltration Rate	cm/yr	RBCA	30
$IR_{air}$	Daily Outdoor Inhalation Rate	$m^3/d$	RBCA	20
$IR_{soil}$	Soil Ingestion Rate	mg/d	RBCA	Residential = 100 Industrial/Commercial = 50 Construction Worker = 480
$IR_w$	Daily Water Ingestion Rate	L/d	RBCA	Residential = 2 Industrial/Commercial = 1

Symbol	Parameter	Units	Source	Parameter Value(s)
K	Aquifer Hydraulic Conductivity	cm/d for Equations R15, R19 and R26 cm/yr for Equation R24	Field Measurement (See Appendix C, Table F)	Site-Specific
$K_{oc}$	Organic Carbon Partition Coefficient	$\text{cm}^3/\text{g}$ or $\text{L}/\text{kg}$	Appendix C, Table E or Appendix C, Table I	Chemical-Specific
$k_s$ (non-ionizing organics)	Soil Water Sorption Coefficient	$\text{cm}^3_{\text{water}}/\text{g}_{\text{soil}}$	Equation R20 in Appendix C, Table C	Calculated Value
$k_s$ (ionizing organics)	Soil Water Sorption Coefficient	$\text{cm}^3_{\text{water}}/\text{g}_{\text{soil}}$	Equation R20 in Appendix C, Table C	Chemical and pH-Specific (See Appendix C, Table I)
$k_s$ (inorganics)	Soil Water Sorption Coefficient	$\text{cm}^3_{\text{water}}/\text{g}_{\text{soil}}$	Appendix C, Table J	Chemical and pH-Specific
$L_s$	Depth to Subsurface Soil Sources	cm	RBCA	100
$LF_{sw}$	Leaching Factor	$(\text{mg}/\text{L}_{\text{water}})/(\text{mg}/\text{kg}_{\text{soil}})$	Equation R14 in Appendix C, Table C	Calculated Value
M	Soil to Skin Adherence Factor	$\text{mg}/\text{cm}^2$	RBCA	0.5

Symbol	Parameter	Units	Source	Parameter Value(s)
Pe	Particulate Emission Rate	g/cm <sup>2</sup> -s	RBCA	6.9 • 10 <sup>-14</sup>
RAF <sub>d</sub>	Dermal Relative Absorption Factor	unitless	RBCA	0.5
RAF <sub>d</sub> (PNAs)	Dermal Relative Absorption Factor	unitless	RBCA	0.05
RAF <sub>d</sub> (inorganics)	Dermal Relative Absorption Factor	unitless	RBCA	0
RAF <sub>o</sub>	Oral Relative Absorption Factor	unitless	RBCA	1.0
RBSL <sub>air</sub>	Carcinogenic Risk-Based Screening Level for Air	ug/m <sup>3</sup>	Equation R9 in Appendix C, Table C	Chemical-, Media-, and Exposure Route-Specific
RBSL <sub>air</sub>	Noncarcinogenic Risk-Based Screening Level for Air	ug/m <sup>3</sup>	Equations R10 in Appendix C, Table C	Chemical-, Media-, and Exposure Route-Specific
RfD <sub>i</sub>	Inhalation Reference Dose	mg/kg-d	IEPA (IRIS/HEAST <sup>d</sup> )	Toxicological-Specific
RfD <sub>o</sub>	Oral Reference Dose	mg/(kg-d)	IEPA (IRIS/HEAST <sup>d</sup> )	Toxicological-Specific (Note: for Construction Worker use subchronic reference doses)
SA	Skin Surface Area	cm <sup>2</sup> /d	RBCA	3,160

Symbol	Parameter	Units	Source	Parameter Value(s)
$S_d$	Source Width Perpendicular to Groundwater Flow Direction in Vertical Plane	cm	Field Measurement	For Migration to Groundwater Route: Use 200 or Site-Specific  For Groundwater remediation objective: Use Site-Specific
$S_w$	Source Width Perpendicular to Groundwater Flow Direction in Horizontal Plane	cm	Field Measurement	Site-Specific
$SF_i$	Inhalation Cancer Slope Factor	$(\text{mg}/\text{kg}\cdot\text{d})^{-1}$	IEPA (IRIS/HEAST <sup>d</sup> )	Toxicological-Specific
$SF_o$	Oral Slope Factor	$(\text{mg}/\text{kg}\cdot\text{d})^{-1}$	IEPA (IRIS/HEAST <sup>d</sup> )	Toxicological-Specific
THQ	Target Hazard Quotient	unitless	RBCA	1
TR	Target Cancer Risk	unitless	RBCA	Residential = $10^{-6}$ at the point of human exposure Industrial/Commercial = $10^{-6}$ at the point of human exposure Construction Worker = $10^{-6}$ at the point of human exposure
U	Specific Discharge	cm/d	Equation R19 in Appendix C, Table C	Calculated Value

Symbol	Parameter	Units	Source	Parameter Value(s)
$U_{\text{air}}$	Average Wind Speed Above Ground Surface in Ambient Mixing Zone	cm/s	RBCA	225
$U_{\text{gw}}$	Groundwater Darcy Velocity	cm/yr	Equation R24 in Appendix C, Table C	Calculated Value
$VF_p$	Volatilization Factor for Surficial Soils Regarding Particulates	$\text{kg/m}^3$	Equation R5 in Appendix C, Table C	Calculated Value
$VF_{\text{samb}}$	Volatilization Factor (Subsurface Soils to Ambient Air)	$(\text{mg/m}^3_{\text{air}})/(\text{mg/kg}_{\text{oil}})$ or $\text{kg/m}^3$	Equation R11 in Appendix C, Table C	Calculated Value
$VF_{\text{ss}}$	Volatilization Factor for Surficial Soils	$\text{kg/m}^3$	Use Equations R3 and R4 in Appendix C, Table C	Calculated Value from Equation R3 or R4 (whichever is less)
$W$	Width of Source Area Parallel to Direction to Wind or Groundwater Movement	cm	Field Measurement	Site-Specific

Symbol	Parameter	Units	Source	Parameter Value(s)
w	Average Soil Moisture Content	$\frac{g_{\text{water}}}{g_{\text{soil}}}$	RBCA or Field Measurement (See Appendix C, Table F)	0.1, or Surface Soil (top 1 meter) = 0.1 Subsurface Soil (below 1 meter) = 0.2, or Site-Specific
X	Distance along the Centerline of the Groundwater Plume Emanating from a Source. The x direction is the direction of groundwater flow	cm	Field Measurement	Site-Specific
$\alpha_x$	Longitudinal Dispersivity	cm	Equation R16 in Appendix C, Table C	Calculated Value
$\alpha_y$	Transverse Dispersivity	cm	Equation R17 in Appendix C, Table C	Calculated Value
$\alpha_z$	Vertical Dispersivity	cm	Equation R18 in Appendix C, Table C	Calculated Value
$\delta_{\text{air}}$	Ambient Air Mixing Zone Height	cm	RBCA	200

Symbol	Parameter	Units	Source	Parameter Value(s)
$\delta_{gw}$	Groundwater Mixing Zone Thickness	cm	RBCA	200
$\theta_{as}$	Volumetric Air Content in Vadose Zone Soils	$\text{cm}^3_{\text{air}}/\text{cm}^3_{\text{soil}}$	RBCA or Equation R21 in Appendix C, Table C	Surface Soil (top 1 meter) = 0.28 Subsurface Soil (below 1 meter) = 0.13, Or  Gravel = 0.05 Sand = 0.14 Silt = 0.16 Clay = 0.17, or  Calculated Value
$\theta_{ws}$	Volumetric Water Content in Vadose Zone Soils	$\text{cm}^3_{\text{water}}/\text{cm}^3_{\text{soil}}$	RBCA or Equation R22 in Appendix C, Table C	Surface Soil (top 1 meter) = 0.15 Subsurface Soil (below 1 meter) = 0.30, or  Gravel = 0.20 Sand = 0.18 Silt = 0.16 Clay = 0.17, or  Calculated Value

Symbol	Parameter	Units	Source	Parameter Value(s)
$\theta_T$	Total Soil Porosity	$\text{cm}^3/\text{cm}^3_{\text{soil}}$	RBCA or Equation R23 in Appendix C, Table C	0.43, or  Gravel = 0.25 Sand = 0.32 Silt = 0.40 Clay = 0.36, or  Calculated Value
$\lambda$	First Order Degradation Constant	$\text{d}^{-1}$	Appendix C, Table E	Chemical-Specific
$\pi$	pi			3.1416
$\rho_s$	Soil Bulk Density	$\text{g}/\text{cm}^3$	RBCA or Field Measurement (See Appendix C, Table F)	1.5, or  Gravel = 2.0 Sand = 1.8 Silt = 1.6 Clay = 1.7, or  Site-Specific
$\rho_w$	Water Density	$\text{g}/\text{cm}^3$	RBCA	1
$\tau$	Averaging Time for Vapor Flux	s	RBCA	$9.46 \cdot 10^8$

<sup>a</sup> HEAST = Health Effects Assessment Summary Tables. USEPA, Office of Solid Waste and Emergency Response. EPA/540/R-95/036. Updated Quarterly.

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)



Section 742.APPENDIX C: Tier 2 Tables and Illustrations

Section 742.Table E: Default Physical and Chemical Parameters

CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (Di) (cm <sup>2</sup> /s)	Diffusivity in Water (D <sub>w</sub> ) (cm <sup>2</sup> /s)	Dimensionless Henry's Law Constant (H') (25°C)	Organic Carbon Partition Coefficient (K <sub>oc</sub> ) (L/kg)	First Order Degradation Constant (λ) (d <sup>-1</sup> )
Neutral Organics							
83-32-9	Acenaphthene	4.24	0.0421	7.69E-6	0.00636	7,080	0.0034
67-64-1	Acetone	1,000,000	0.124	1.14E-5	0.00159	0.575	0.0495
15972-60-8	Alachlor	242	0.0198	5.69E-6	0.00000132	394	No Data
116-06-3	Aldicarb	6,000	0.0305	7.19E-6	0.0000000574	12	0.00109
309-00-2	Aldrin	0.18	0.0132	4.86E-6	0.00697	2,450,000	0.00059
120-12-7	Anthracene	0.0434	0.0324	7.74E-6	0.00267	29,500	0.00075
1912-24-9	Atrazine	70	0.0258	6.69E-6	0.00000005	451	No Data
71-43-2	Benzene	1,750	0.088	9.80E-6	0.228	58.9	0.0009

CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (Di) (cm <sup>2</sup> /s)	Diffusivity in Water (D <sub>w</sub> ) (cm <sup>2</sup> /s)	Dimensionless Henry's Law Constant (H') (25°C)	Organic Carbon Partition Coefficient (K <sub>oc</sub> ) (L/kg)	First Order Degradation Constant (λ) (d <sup>-1</sup> )
56-55-3	Benzo(a)anthracene	0.0094	0.0510	9.00E-6	0.000137	398,000	0.00051
205-99-2	Benzo(b)fluoranthene	0.0015	0.0226	5.56E-6	0.00455	1,230,000	0.00057
207-08-9	Benzo(k)fluoranthene	0.0008	0.0226	5.56E-6	0.000034	1,230,000	0.00016
65-85-0	Benzoic Acid	3,500	0.0536	7.97E-6	0.0000631	0.600	No Data
50-32-8	Benzo(a)pyrene	0.00162	0.043	9.00E-6	0.0000463	1,020,000	0.00065
111-44-4	Bis(2-chloroethyl)ether	17,200	0.0692	7.53E-6	0.000738	15.5	0.0019
117-81-7	Bis(2-ethylhexyl)phthalate	0.34	0.0351	3.66E-6	0.00000418	15,100,000	0.0018
75-27-4	Bromodichloromethane	6,740	0.0298	1.06E-5	0.0656	55.0	No Data
75-25-2	Bromoform	3,100	0.0149	1.03E-5	0.0219	87.1	0.0019
71-36-3	Butanol	74,000	0.0800	9.30E-6	0.000361	6.92	0.01283
85-68-7	Butyl Benzyl Phthalate	2.69	0.0174	4.83E-6	0.0000517	57,500	0.00385
86-74-8	Carbazole	7.48	0.0390	7.03E-6	0.000000626	3,390	No Data

CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (Di) (cm <sup>2</sup> /s)	Diffusivity in Water (D <sub>w</sub> ) (cm <sup>2</sup> /s)	Dimensionless Henry's Law Constant (H') (25°C)	Organic Carbon Partition Coefficient (K <sub>oc</sub> ) (L/kg)	First Order Degradation Constant (λ) (d <sup>-1</sup> )
1563-66-2	Carbofuran	320	0.0249	6.63E-6	.00377	37	No Data
75-15-0	Carbon Disulfide	1,190	0.104	1.00E-5	1.24	45.7	No Data
56-23-5	Carbon Tetrachloride	793	0.0780	8.80E-6	1.25	174	0.0019
57-74-9	Chlordane	0.056	0.0118	4.37E-6	0.00199	120,000	0.00025
106-47-8	p-Chloroaniline	5,300	0.0483	1.01E-5	0.0000136	66.1	No Data
108-09-7	Chlorobenzene	472	0.0730	8.70E-6	0.152	219	0.0023
124-48-1	Chlorodibromomethane	2,600	0.0196	1.05E-5	0.0321	63.1	0.00385
67-66-3	Chloroform	7,920	0.104	1.00E-5	0.15	39.8	0.00039
95-57-8	2-Chlorophenol	22,000	0.0501	9.46E-6	0.016	388	No Data
218-01-9	Chrysene	0.0016	0.0248	6.21E-6	0.00388	398,000	0.00035
94-75-7	2,4-D	680	0.0231	7.31E-6	0.00000041	451	0.00385
72-54-8	4,4'-DDD	0.09	0.0169	4.76E-6	0.000164	1,000,000	0.000062

CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (Di) (cm <sup>2</sup> /s)	Diffusivity in Water (D <sub>w</sub> ) (cm <sup>2</sup> /s)	Dimensionless Henry's Law Constant (H') (25°C)	Organic Carbon Partition Coefficient (K <sub>oc</sub> ) (L/kg)	First Order Degradation Constant (λ) (d <sup>-1</sup> )
72-55-9	4,4'-DDE	0.12	0.0144	5.87E-6	0.000861	4,470,000	0.000062
50-29-3	4,4'-DDT	0.025	0.0137	4.95E-6	0.000332	2,630,000	0.000062
75-99-0	Dalapon	900,000	0.0414	9.46E-6	0.00000264	5.8	0.005775
53-70-3	Dibenzo(a,h)anthracene	0.00249	0.0202	5.18E-6	0.000000603	3,800,000	0.00037
96-12-8	1,2-Dibromo-3-chloropropane	1,200	0.0212	7.02E-6	0.00615	182	0.001925
106-93-4	1,2-Dibromoethane	4,200	0.0287	8.06E-6	0.0303	93	0.005775
84-74-2	Di-n-butyl Phthalate	11.2	0.0438	7.86E-6	0.0000000385	33,900	0.03013
95-50-1	1,2-Dichlorobenzene	156	0.0690	7.90E-6	0.0779	617	0.0019
106-46-7	1,4-Dichlorobenzene	73.8	0.0690	7.90E-6	0.0996	617	0.0019
91-94-1	3,3-Dichlorobenzidine	3.11	0.0194	6.74E-6	0.000000164	724	0.0019

CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (Di) (cm <sup>2</sup> /s)	Diffusivity in Water (D <sub>w</sub> ) (cm <sup>2</sup> /s)	Dimensionless Henry's Law Constant (H') (25°C)	Organic Carbon Partition Coefficient (K <sub>oc</sub> ) (L/kg)	First Order Degradation Constant (λ) (d <sup>-1</sup> )
75-34-3	1,1-Dichloroethane	5,060	0.0742	1.05E-5	0.23	31.6	0.0019
107-06-2	1,2-Dichloroethane	8,520	0.104	9.90E-6	0.0401	17.4	0.0019
75-35-4	1,1-Dichloroethylene	2,250	0.0900	1.04E-5	1.07	58.9	0.0053
156-59-2	Cis-1,2-Dichloroethylene	3,500	0.0736	1.13E-5	0.167	35.5	0.00024
156-60-5	Trans-1,2-Dichloroethylene	6,300	0.0707	1.19E-5	0.385	52.5	0.00024
120-83-2	2,4-Dichlorophenol	4,500	0.0346	8.77E-6	0.00013	147	0.00027
78-87-5	1,2-Dichloropropane	2,800	0.0782	8.73E-6	0.115	43.7	0.00027
542-75-6	1,3-Dichloropropylene (cis + trans)	2,800	0.0626	1.00E-5	0.726	45.7	0.061
60-57-1	Dieldrin	0.195	0.0125	4.74E-6	0.000619	21,400	0.00032
84-66-2	Diethyl Phthalate	1,080	0.0256	6.35E-6	0.0000185	288	0.00619
105-67-9	2,4-Dimethylphenol	7,870	0.0584	8.69E-6	0.000082	209	0.0495
51-28-5	2,4-Dinitrophenol	2,790	0.0273	9.06E-6	0.0000182	0.01	0.00132

CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (Di) (cm <sup>2</sup> /s)	Diffusivity in Water (D <sub>w</sub> ) (cm <sup>2</sup> /s)	Dimensionless Henry's Law Constant (H') (25°C)	Organic Carbon Partition Coefficient (K <sub>oc</sub> ) (L/kg)	First Order Degradation Constant (λ) (d <sup>-1</sup> )
121-14-2	2,4-Dinitrotoluene	270	0.203	7.06E-6	0.0000038	95.5	0.00192
606-20-2	2,6-Dinitrotoluene	182	0.0327	7.26E-6	0.0000306	69.2	0.00192
88-85-7	Dinoseb	52	0.0215	6.62E-6	0.0000189	1,120	0.002817
117-84-0	Di-n-octyl Phthalate	0.02	0.0151	3.58E-6	0.00274	83,200,000	0.0019
115-29-7	Endosulfan	0.51	0.0115	4.55E-6	0.000459	2,140	0.07629
145-73-3	Endothall	21,000	0.0291	8.07E-6	0.0000000107	0.29	No Data
72-20-8	Endrin	0.25	0.0125	4.74E-6	0.000308	12,300	0.00032
100-41-4	Ethylbenzene	169	0.0750	7.80E-6	0.323	363	0.003
206-44-0	Fluoranthene	0.206	0.0302	6.35E-6	0.00066	107,000	0.00019
86-73-7	Fluorene	1.98	0.0363	7.88E-6	0.00261	13,800	0.000691
76-44-8	Heptachlor	0.18	0.0112	5.69E-6	60.7	1,410,000	0.13
1024-57-3	Heptachlor epoxide	0.2	0.0132	4.23E-6	0.00039	83,200	0.00063

CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (Di) (cm <sup>2</sup> /s)	Diffusivity in Water (D <sub>w</sub> ) (cm <sup>2</sup> /s)	Dimensionless Henry's Law Constant (H') (25°C)	Organic Carbon Partition Coefficient (K <sub>oc</sub> ) (L/kg)	First Order Degradation Constant (λ) (d <sup>-1</sup> )
118-74-1	Hexachlorobenzene	6.2	0.0542	5.91E-6	0.0541	55,000	0.00017
319-84-6	Alpha-HCH (alpha-BHC)	2.0	0.0142	7.34E-6	0.000435	1,230	0.0025
58-89-9	Gamma-HCH (Lindane)	6.8	0.0142	7.34E-6	0.000574	1,070	0.0029
77-47-4	Hexachlorocyclo-Pentadiene	1.8	0.0161	7.21E-6	1.11	200,000	0.012
67-72-1	Hexachloroethane	50	0.0025	6.80E-6	0.159	1,780	0.00192
193-39-5	Indeno(1,2,3-c,d)pyrene	0.000022	0.0190	5.66E-6	0.0000656	3,470,000	0.00047
78-59-1	Isophorone	12,000	0.0623	6.76E-6	0.000272	46.8	0.01238
7439-97-6	Mercury	---	0.0307	6.30E-6	0.467	---	No Data
72-43-5	Methoxychlor	0.045	0.0156	4.46E-6	0.000648	97,700	0.0019
74-83-9	Methyl Bromide	15,200	0.0728	1.21E-5	0.256	10.5	0.01824
1634-04-4	Methyl tertiary-butyl ether	51,000	0.102	1.10E-5	0.0241	11.5	No Data
75-09-2	Methylene Chloride	13,000	0.101	1.17E-5	0.0898	11.7	0.012
95-48-7	2-Methylphenol	26,000	0.0740	8.30E-6	0.0000492	91.2	0.0495

CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (Di) (cm <sup>2</sup> /s)	Diffusivity in Water (D <sub>w</sub> ) (cm <sup>2</sup> /s)	Dimensionless Henry's Law Constant (H') (25°C)	Organic Carbon Partition Coefficient (K <sub>oc</sub> ) (L/kg)	First Order Degradation Constant (λ) (d <sup>-1</sup> )
91-20-3	Naphthalene	31.0	0.0590	7.50E-6	0.0198	2,000	0.0027
98-95-3	Nitrobenzene	2,090	0.0760	8.60E-6	0.000984	64.6	0.00176
86-30-6	N-Nitrosodiphenylamine	35.1	0.0312	6.35E-6	0.000205	1,290	0.01
621-64-7	N-Nitrosodi-n-propylamine	9,890	0.0545	8.17E-6	0.0000923	24.0	0.0019
87-86-5	Pentachlorophenol	1,950	0.0560	6.10E-6	0.000001	592	0.00045
108-95-2	Phenol	82,800	0.0820	9.10E-6	0.0000163	28.8	0.099
1918-02-1	Picloram	430	0.0255	5.28E-6	0.00000000166	1.98	No Data
1336-36-3	Polychlorinated biphenyls (PCBs)	0.7	----- <sup>a</sup>	----- <sup>a</sup>	----- <sup>a</sup>	309,000	No Data
129-00-0	Pyrene	0.135	0.0272	7.24E-6	0.000451	105,000	0.00018
122-34-9	Simazine	5	0.027	7.36E-6	0.0000000133	133	No Data
100-42-5	Styrene	310	0.0710	8.00E-6	0.113	776	0.0033
93-72-1	2,4,5-TP (Silvex)	31	0.0194	5.83E-6	0.0000000032	5,440	No Data



CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (Di) (cm <sup>2</sup> /s)	Diffusivity in Water (D <sub>w</sub> ) (cm <sup>2</sup> /s)	Dimensionless Henry's Law Constant (H') (25°C)	Organic Carbon Partition Coefficient (K <sub>oc</sub> ) (L/kg)	First Order Degradation Constant (λ) (d <sup>-1</sup> )
127-18-4	Tetrachloroethylene	200	0.0720	8.20E-6	0.754	155	0.00096
108-88-3	Toluene	526	0.0870	8.60E-6	0.272	182	0.011
8001-35-2	Toxaphene	0.74	0.0116	4.34E-6	0.000246	257,000	No Data
120-82-1	1,2,4-Trichlorobenzene	300	0.0300	8.23E-6	0.0582	1,780	0.0019
71-55-6	1,1,1-Trichloroethane	1,330	0.0780	8.80E-6	0.705	110	0.0013
79-00-5	1,1,2-Trichloroethane	4,420	0.0780	8.80E-6	0.0374	50.1	0.00095
79-01-6	Trichloroethylene	1,100	0.0790	9.10E-6	0.422	166	0.00042
95-95-4	2,4,5-Trichlorophenol	1,200	0.0291	7.03E-6	0.000178	1,600	0.00038
88-06-2	2,4,6-Trichlorophenol	800	0.0318	6.25E-6	0.000319	381	0.00038
108-05-4	Vinyl Acetate	20,000	0.0850	9.20E-6	0.021	5.25	No Data
57-01-4	Vinyl Chloride	2,760	0.106	1.23E-6	1.11	18.6	0.00024
108-38-3	m-Xylene	161	0.070	7.80E-6	0.301	407	0.0019

CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (D <sub>i</sub> ) (cm <sup>2</sup> /s)	Diffusivity in Water (D <sub>w</sub> ) (cm <sup>2</sup> /s)	Dimensionless Henry's Law Constant (H') (25°C)	Organic Carbon Partition Coefficient (K <sub>oc</sub> ) (L/kg)	First Order Degradation Constant (λ) (d <sup>-1</sup> )
95-47-6	o-Xylene	178	0.087	1.00E-5	0.213	363	0.0019
106-42-3	p-Xylene	185	0.0769	8.44E-6	0.314	389	0.0019
1330-20-7	Xylenes (total)	186	0.0720	9.34E-6	0.25	260	0.0019

Chemical Abstracts Service (CAS) registry number. This number in the format xxx-xx-x, is unique for each chemical and allows efficient searching on computerized data bases.

"Soil Remediation objectives are determined pursuant to 40 CFR 761, as incorporated by reference at Section 732.104 (the USEPA "PCB Spill Cleanup Policy"), for most sites; persons remediating sites should consult with BOL if calculation of Tier 2 soil remediation objectives is desired.

(Source: Amended at 26 Ill. Reg. 2683, effective February 5, 2002)

Section 742.APPENDIX C: Tier 2 Tables and Illustrations

Section 742.Table F: Methods for Determining Physical Soil Parameters

Methods for Determining Physical Soil Parameters		
Parameter	Sampling Location <sup>a</sup>	Method
$\rho_b$ (soil bulk density)	Surface	ASTM - D 1556-90 Sand Cone Method <sup>b</sup>
		ASTM - D 2167-94 Rubber Balloon Method <sup>b</sup>
		ASTM - D 2922-91 Nuclear Method <sup>b</sup>
	Subsurface	ASTM - D 2937-94 Drive Cylinder Method <sup>b</sup>
$\rho_s$ (soil particle density)	Surface or Subsurface	ASTM - D 854-92 Specific Gravity of Soil <sup>b</sup>
w (moisture content)	Surface or Subsurface	ASTM - D 4959-89 (Reapproved 1994) Standard <sup>b</sup>
		ASTM - D 4643-93 Microwave Oven <sup>b</sup>
		ASTM - D2216-92 Laboratory Determination <sup>b</sup>
		ASTM - D3017-88 (Reapproved 1993) Nuclear Method <sup>b</sup>
		Equivalent USEPA Method (e.g., sample preparation procedures described in methods 3541 or 3550)
$f_{oc}$ (organic carbon content)	Surface or Subsurface	Nelson and Sommers (1982)
		ASTM - D 2974-87 (Reapproved 1995) Moisture, Ash, and Organic Matter <sup>b</sup>
		USEPA Method 9060A Total Organic Content

Methods for Determining Physical Soil Parameters		
Parameter	Sampling Location <sup>a</sup>	Method
$\eta$ or $\theta_T$ (total soil porosity)	Surface or Subsurface (calculated)	Equation S24 in Appendix C, Table A for SSL Model, or Equation R23 in Appendix C, Table C for RBCA Model
$\theta_a$ or $\theta_{as}$ (air-filled soil porosity)	Surface or Subsurface (calculated)	Equation S21 in Appendix C, Table A for SSL Model, or Equation R21 in Appendix C, Table C for RBCA Model
$\theta_w$ or $\theta_{ws}$ (water-filled soil porosity)	Surface or Subsurface (calculated)	Equation S20 in Appendix C, Table A for SSL Model, or Equation R22 in Appendix C, Table C for RBCA Model
K (hydraulic conductivity)	Surface or Subsurface	ASTM - D 5084-90 Flexible Wall Permeameter
		Pump Test
		Slug Test
i (hydraulic gradient)	Surface or Subsurface	Field Measurement

<sup>a</sup> This is the location where the sample is collected

<sup>b</sup> As incorporated by reference in Section 742.120.



Section 742.APPENDIX C: Tier 2 Tables and Illustrations

Section 742.Table G: Error Function (erf)

$$\operatorname{erf}(\beta) = \frac{2}{\sqrt{\pi}} \int_0^{\beta} e^{-\varepsilon^2} d\varepsilon$$

$\beta$	$erf(\beta)$
0	0
0.05	0.056372
0.1	0.112463
0.15	0.167996
0.2	0.222703
0.25	0.276326
0.3	0.328627
0.35	0.379382
0.4	0.428392
0.45	0.475482
0.5	0.520500
0.55	0.563323
0.6	0.603856
0.65	0.642029
0.7	0.677801
0.75	0.711156
0.8	0.742101
0.85	0.770668
0.9	0.796908
0.95	0.820891
1.0	0.842701
1.1	0.880205
1.2	0.910314
1.3	0.934008
1.4	0.952285
1.5	0.966105
1.6	0.976348
1.7	0.983790
1.8	0.989091

1.9	0.992790
2.0	0.995322
2.1	0.997021
2.2	0.998137
2.3	0.998857
2.4	0.999311
2.5	0.999593
2.6	0.999764
2.7	0.999866
2.8	0.999925
2.9	0.999959
3.0	0.999978

742.APPENDIX C: Tier 2 Tables and Illustrations

Section 742.Table H: Q/C Values by Source Area

Source (Acres)	Area Q/C Value (g/m <sup>2</sup> -s per kg/m <sup>3</sup> )
0.5	97.78
1	85.81
2	76.08
5	65.75
10	59.16
30	50.60



Section 742.APPENDIX C: Tier 2 Tables and Illustrations

Section 742.TABLE I:  $K_{oc}$  Values for Ionizing Organics as a Function of pH ( $\text{cm}^3/\text{g}$  or  $\text{L}/\text{kg}$  or  $\text{cm}^3_{\text{water}}/\text{g}_{\text{soil}}$ )

pH	Benzoic Acid	2-Chloro-phenol	2,4-Dichloro-phenol	Pentachloro-phenol	2,4,5-Trichloro-phenol	2,4,6-Trichloro-phenol	Dinoseb	2,3,5-TP (Silvex)
4.5	1.07E+01	3.98E+02	1.59E+02	1.34E+04	2.37E+03	1.06E+03	3.00E+04	1.28E+04
4.6	9.16E+00	3.98E+02	1.59E+02	1.24E+04	2.37E+03	1.05E+03	2.71E+04	1.13E+04
4.7	7.79E+00	3.98E+02	1.59E+02	1.13E+04	2.37E+03	1.05E+03	2.41E+04	1.01E+04
4.8	6.58E+00	3.98E+02	1.59E+02	1.02E+04	2.37E+03	1.05E+03	2.12E+04	9.16E+03
4.9	5.54E+00	3.98E+02	1.59E+02	9.05E+03	2.37E+03	1.04E+03	1.85E+04	8.40E+03
5.0	4.64E+00	3.98E+02	1.59E+02	7.96E+03	2.36E+03	1.03E+03	1.59E+04	7.76E+03
5.1	3.88E+00	3.98E+02	1.59E+02	6.93E+03	2.36E+03	1.02E+03	1.36E+04	7.30E+03
5.2	3.25E+00	3.98E+02	1.59E+02	5.97E+03	2.35E+03	1.01E+03	1.15E+04	6.91E+03
5.3	2.72E+00	3.98E+02	1.59E+02	5.10E+03	2.34E+03	9.99E+02	9.66E+03	6.60E+03
5.4	2.29E+00	3.98E+02	1.58E+02	4.32E+03	2.33E+03	9.82E+02	8.10E+03	6.36E+03
5.5	1.94E+00	3.97E+02	1.58E+02	3.65E+03	2.32E+03	9.62E+02	6.77E+03	6.16E+03
5.6	1.65E+00	3.97E+02	1.58E+02	3.07E+03	2.31E+03	9.38E+02	5.65E+03	6.00E+03
5.7	1.42E+00	3.97E+02	1.58E+02	2.58E+03	2.29E+03	9.10E+02	4.73E+03	5.88E+03
5.8	1.24E+00	3.97E+02	1.58E+02	2.18E+03	2.27E+03	8.77E+02	3.97E+03	5.78E+03
5.9	1.09E+00	3.97E+02	1.57E+02	1.84E+03	2.24E+03	8.39E+02	3.35E+03	5.70E+03

pH	Benzoic Acid	2-Chloro-phenol	2,4-Dichloro-phenol	Pentachloro-phenol	2,4,5-Trichloro-phenol	2,4,6-Trichloro-phenol	Dinoseb	2,3,5-TP (Silvex)
6.0	9.69E-01	3.96E+02	1.57E+02	1.56E+03	2.21E+03	7.96E+02	2.84E+03	5.64E+03
6.1	8.75E-01	3.96E+02	1.57E+02	1.33E+03	2.17E+03	7.48E+02	2.43E+03	5.59E+03
6.2	7.99E-01	3.96E+02	1.56E+02	1.15E+03	2.12E+03	6.97E+02	2.10E+03	5.55E+03
6.3	7.36E-01	3.95E+02	1.55E+02	9.98E+02	2.06E+03	6.44E+02	1.83E+03	5.52E+03
6.4	6.89E-01	3.94E+02	1.54E+02	8.77E+02	1.99E+03	5.89E+02	1.62E+03	5.50E+03
6.5	6.51E-01	3.93E+02	1.53E+02	7.81E+02	1.91E+03	5.33E+02	1.45E+03	5.48E+03
6.6	6.20E-01	3.92E+02	1.52E+02	7.03E+02	1.82E+03	4.80E+02	1.32E+03	5.46E+03
6.7	5.95E-01	3.90E+02	1.50E+02	6.40E+02	1.71E+03	4.29E+02	1.21E+03	5.45E+03
6.8	5.76E-01	3.88E+02	1.47E+02	5.92E+02	1.60E+03	3.81E+02	1.12E+03	5.44E+03
6.9	5.60E-01	3.86E+02	1.45E+02	5.52E+02	1.47E+03	3.38E+02	1.05E+03	5.43E+03
7.0	5.47E-01	3.83E+02	1.41E+02	5.21E+02	1.34E+03	3.00E+02	9.96E+02	5.43E+03
7.1	5.38E-01	3.79E+02	1.38E+02	4.96E+02	1.21E+03	2.67E+02	9.52E+02	5.42E+03
7.2	5.32E-01	3.75E+02	1.33E+02	4.76E+02	1.07E+03	2.39E+02	9.18E+02	5.42E+03
7.3	5.25E-01	3.69E+02	1.28E+02	4.61E+02	9.43E+02	2.15E+02	8.90E+02	5.42E+03
7.4	5.19E-01	3.62E+02	1.21E+02	4.47E+02	8.19E+02	1.95E+02	8.68E+02	5.41E+03
7.5	5.16E-01	3.54E+02	1.14E+02	4.37E+02	7.03E+02	1.78E+02	8.50E+02	5.41E+03
7.6	5.13E-01	3.44E+02	1.07E+02	4.29E+02	5.99E+02	1.64E+02	8.36E+02	5.41E+03

pH	Benzoic Acid	2-Chloro-phenol	2,4-Dichloro-phenol	Pentachloro-phenol	2,4,5-Trichloro-phenol	2,4,6-Trichloro-phenol	Dinoseb	2,3,5-TP (Silvex)
7.7	5.09E-01	3.33E+02	9.84E+01	4.23E+02	5.07E+02	1.53E+02	8.25E+02	5.41E+03
7.8	5.06E-01	3.19E+02	8.97E+01	4.18E+02	4.26E+02	1.44E+02	8.17E+02	5.41E+03
7.9	5.06E-01	3.04E+02	8.07E+01	4.14E+02	3.57E+02	1.37E+02	8.10E+02	5.41E+03
8.0	5.06E-01	2.86E+02	7.17E+01	4.10E+02	2.98E+02	1.31E+02	8.04E+02	5.41E+03

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

Section 742.APPENDIX C: Tier 2 Tables and Illustrations

Section 742.TABLE J: Values to be Substituted for  $k_d$  or  $k_s$  when Evaluating Inorganics as a Function of pH ( $\text{cm}^3/\text{g}$  or  $\text{L}/\text{kg}$  or  $\text{cm}^3_{\text{water}}/\text{g}_{\text{soil}}$ )

pH	As	Ba	Be	Cd	Cr (+3)	Cr (+6)	Hg	Ni	Ag	Se	Tl	Zn
4.9	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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

pH	As	Ba	Be	Cd	Cr (+3)	Cr (+6)	Hg	Ni	Ag	Se	Tl	Zn
6.7	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	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	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	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	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	3.0E+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	3.0E+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	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	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	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	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	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	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	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

(Source: Amended at 25 Ill. Reg. 10374, effective August 15, 2001)

Section 742.APPENDIX C: Tier 2 Tables and Illustrations

Section 742.TABLE K: Parameter Estimates for Calculating Water-Filled Soil Porosity ( $\theta_w$ )

Soil Texture <sup>a</sup>	Saturated Hydraulic Conductivity, $K_s$ (m/yr)	$1/(2b+3)^b$
Sand	1,830	0.090
Loamy Sand	540	0.085
Sandy Loam	230	0.080
Silt Loam	120	0.074
Loam	60	0.073
Sandy Clay Loam	40	0.058
Silt Clay Loam	13	0.054
Clay Loam	20	0.050
Sandy Clay	10	0.042
Silt Clay	8	0.042
Clay	5	0.039

<sup>a</sup> The appropriate texture classification is determined by a particle size analysis by ASTM D2488-93 as incorporated by reference in Section 742.210 and the U.S. Department of Agriculture Soil Textural Triangle shown in Appendix C, Illustration C.

<sup>b</sup> Where b is the soil-specific exponential parameter (unitless)

