

TITLE 35: ENVIRONMENTAL PROTECTION
SUBTITLE G: WASTE DISPOSAL
CHAPTER I: POLLUTION CONTROL BOARD
SUBCHAPTER f: RISK BASED CLEANUP OBJECTIVES

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].

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NOTE: Italics 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 and subject to the exceptions listed in subsection (h) below. 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 734);
 - 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 USC 2601).
- h) This Part may not be used in lieu of the procedures and requirements applicable to landfills under 35 Ill. Adm. Code 807 or 811 through 814.

- i) An evaluation of the indoor inhalation exposure route under this Part addresses the potential of contaminants present in soil gas or groundwater to reach human receptors within buildings. This Part does not address the remediation or mitigation of any contamination within a building from a source other than soil gas or groundwater, such as the building structure itself and products within the building.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

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 routes 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, E, G, H and I. 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. For the indoor inhalation exposure route, institutional controls under Subpart J are required to use remediation objectives in Appendix B, Table H or Table I.
- c) A Tier 2 evaluation uses the risk based equations from the Soil Screening Level (SSL) model, Risk Based Corrective Action (RBCA) model and modified Johnson and Ettinger (J&E) model documents listed in Appendix C, Tables A, C and L, 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. For the indoor inhalation exposure route, institutional controls under

Subpart J are required to develop remediation objectives pursuant to Appendix C, Table L.

- 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.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

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) Outdoor inhalation;
 - B) Indoor inhalation;
 - C) Soil ingestion;
 - D) Groundwater ingestion; and
 - E) Dermal contact with soil.
 - 2) The evaluation of exposure routes under subsections (a)(1)(A), (a)(1)(B), (a)(1)(C) and (a)(1)(D) 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).
- 4) The outdoor inhalation route is comprised of two components:
- A) Migration from soil through soil gas to outdoor air (soil component); and
 - B) Migration from soil gas to outdoor air (soil gas component).
- 5) The indoor inhalation exposure route is comprised of two components:
- A) Migration from soil gas to indoor air (soil gas component); and
 - B) Migration from groundwater through soil gas to indoor air (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.

d) Environmental Media of Concern

This Part provides procedures for developing remediation objectives for the following environmental media:

- 1) Soil;
- 2) Soil gas;
- 3) Groundwater.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

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.

“Aquifer” means *saturated (with groundwater) soils and geologic materials which are sufficiently permeable to readily yield economically useful quantities of*

water to wells, springs, or streams under ordinary hydraulic gradients. (Illinois Groundwater Protection Act [415 ILCS 55/3(a)])

“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.

“Building” means a man-made structure with an enclosing roof and enclosing walls (except for windows and doors) that is fit for any human occupancy for at least six consecutive months.

“Building Control Technology” means any technology or barrier that affects air flow or air pressure within a building for purposes of reducing or preventing contaminant migration to the indoor air.

“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.

“Capillary Fringe” means the zone above the water table in which water is held by surface tension. Water in the capillary fringe is under a pressure less than atmospheric.

“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 or as “carcinogenic to humans” or “likely to be carcinogenic to humans” 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]

“County Highway” means county highway as defined in the Illinois Highway Code [605 ILCS 5].

“District Road” means district road as defined in the Illinois Highway Code [605 ILCS 5].

“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 *the Department of Transportation with respect to a State highway; the Illinois State Toll Highway with respect to a toll 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.

“Intrusive activities” means activities that would affect potential flow of contaminants into a building (e.g., breaching the integrity of a foundation due to repairs or installation of utilities).

“Land Use Control Memoranda 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 or elevator vaults, building foundations, basements, crawl spaces, drainage ditches, previously excavated and filled areas* or sumps. [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.

“Populated Area” means:

an area within the boundaries of a municipality that has a population of 10,000 or greater based on the year 2000 or most recent census; or

an area less than three miles from the boundary of a municipality that has a population of 10,000 or greater based on the year 2000 or most recent census.

“Potable” means *generally fit for human consumption in accordance with accepted water supply principles and practices*. (Illinois Groundwater Protection Act [415 ILCS 55/3(h)])

“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.

“ Q_{soil} ” means the volumetric flow rate of soil gas from the subsurface into the enclosed building space.

“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 USC 6921).

“Reference Concentration” or “RfC” means an estimate of a daily exposure, in units of milligrams of chemical per cubic meter of air (mg/m^3), 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” or “RfD” means an estimate of a daily exposure, in units of milligrams of chemical per kilogram of body weight per day ($\text{mg}/\text{kg}/\text{d}$), 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]

“Rendered inoperable” means having become unable to operate effectively, including, but not limited to, being shut down as part of routine maintenance or due to a malfunction, power failure, or vandalism.

“Residential Property” *means any real property that is used for habitation by individuals, or where children have the opportunity for exposure to contaminants through ingestion or inhalation (indoor or outdoor) at educational facilities, health care facilities, child care facilities or 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])

“Saturated Zone” means a subsurface zone in which all the interstices or voids are filled with water under pressure greater than that of the atmosphere.

“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 Gas” means the air existing in void spaces in the soil between the groundwater table and the ground surface.

“Soil Saturation Limit” or “ C_{sat} ” means the contaminant 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 that are liquid at ambient soil temperatures) do not apply, and alternative modeling approaches are required.

“Soil Vapor Saturation Limit” or “ $C_{\text{v}}^{\text{sat}}$ ” means the maximum vapor concentration that can exist in the soil pore air at a given temperature and pressure.

“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.

“State Highway” means State highway as defined in the Illinois Highway Code [605 ILCS 5].

“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.

“Street” means street as defined in the Illinois Highway Code [605 ILCS 5].

“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.

“Toll Highway” means toll highway as defined in the Illinois Highway Code [605 ILCS 5].

“Total Petroleum Hydrocarbon” or “TPH” means the additive total of all petroleum hydrocarbons found in an analytical sample.

“Township Road” means township road as defined in the Illinois Highway Code [605 ILCS 5].

“Unconfined Aquifer” means an aquifer whose upper surface is a water table free to fluctuate under atmospheric pressure.

“Volatile Chemicals” means chemicals with a Dimensionless Henry’s Law Constant of greater than 1.9×10^{-2} or a vapor pressure greater than 0.1 Torr

(mmHg) at 25°C. For purposes of the indoor inhalation exposure route, elemental mercury is included in this definition.

“Water Table” means the top water surface of an unconfined aquifer at atmospheric pressure.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

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:

Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs), U.S. Environmental Protection Agency, 1600 Clifton Road, Mailstop F32, Atlanta, Georgia 30333, (770) 488-3357 (November 2007).

ASTM International. 100 Barr Harbor Drive, West Conshohocken PA 19428-2959, (610) 832-9585.

ASTM D 2974-00, Standard Test Methods for Moisture, Ash and Organic Matter of Peat and Other Organic Soils, approved August 10, 2000.

ASTM D 2488-00, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), approved February 10, 2000.

ASTM D 1556-00, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method, approved March 10, 2000.

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 2922-01, Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth), approved June 10, 2001.

ASTM D 2937-00e1, Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method, approved June 10, 2000.

ASTM D 854-02, Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer, approved July 10, 2002.

ASTM D 2216-98, Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass, approved February 10, 1998.

ASTM D 4959-00, Standard Test Method for Determination of Water (Moisture) Content of Soil by Direct Heating, approved March 10, 2000.

ASTM D 4643-00, Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method, approved February 10, 2000.

ASTM D 5084-03, Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter, approved November 1, 2003.

ASTM D 422-63 (2002), Standard Test Method for Particle-Size Analysis of Soils, approved November 10, 2002.

ASTM D 1140-00, Standard Test Methods for Amount of Material in Soils Finer than the No. 200 (75 μm) Sieve, approved June 10, 2000.

ASTM D 3017-01, Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth), approved June 10, 2001.

ASTM D 4525-90 (2001), Standard Test Method for Permeability of Rocks by Flowing Air, approved May 25, 1990.

ASTM D 2487-00, Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System), approved March 10, 2000.

ASTM D 1945-03, Standard Test Method for Analysis of Natural Gas by Gas Chromatography, approved May 10, 2003.

ASTM D 1946-90, Standard Practice for Analysis of Reformed Gas by Gas Chromatography, approved June 1, 2006.

ASTM E 1527-00, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process, approved May 10, 2000. Vol. 11.04.

ASTM E 1739-95 (2002), Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites, approved September 10, 1995.

ASTM E 2121-09, Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings, approved November 1, 2009.

ASTM E 2600-10, Standard Practice for Assessment for Vapor Intrusion into Structures on Property Involved in Real Estate Transactions, approved June 2010.

API. American Petroleum Institute, 1220 L Street, NW, Washington DC 20005-4070 (202) 682-8000.

BIOVAPOR-A 1-D Vapor Intrusion Model with Oxygen-Limited Aerobic Biodegradation, Version 2.0 (January 2010).

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

EPRI. Electric Power Research Institute. 3420 Hillview Avenue, Palo Alto, California 94304. (650) 855-2121.

Polycyclic Aromatic Hydrocarbons (PAHs) in Surface Soil in Illinois: Background PAHs, EPRI, Palo Alto CA, We Energies, Milwaukee WI and IEPA, Springfield IL: 2004. 1011376.

Reference Handbook for Site-Specific Assessment of Subsurface Vapor Intrusion to Indoor Air, Electric Power Research Institute (EPRI), Inc., Program No. 1008492 (March 2005).

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 I", EPA Publication No. EPA/600/4-90/020 (July 1990).

"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).

"Guidance for Data Quality Assessment, Practical Methods for Data Analysis, EPA QA/G-9, QAOO Update", EPA/600/R-96/084 (July 2000). Available at www.epa.gov/quality/qs-docs/g9-final.pdf.

"Assessment of Vapor Intrusion in Homes Near the Raymark Superfund Site Using Basement and Sub-Slab Air Samples", EPA Publication No. EPA/600/R-05/147 (March 2006).

"Model Standards and Techniques for Control of Radon in New Residential Buildings" EPA Publication No. EPA/402/R-94/009 (March 1994).

"Radon Reduction Techniques for Existing Detached Houses: Technical Guidance (Third Edition) for Active Soil Depressurization Systems", EPA Publication No. EPA/625/R-93/011 (October 1993).

Illinois Environmental Protection Agency, 2520 West Iles Avenue, PO Box 19276, Springfield, Illinois 62794-9276, (217) 785-0830.

"A Summary of Selected Background Conditions for Inorganics in Soil", Publication No. IEPA/ENV/94-161 (August 1994).

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).

Johnson, Paul C. (2005). Identification of Application Specific Critical Inputs for the 1991 Johnson and Ettinger Vapor Intrusion Algorithm. *Ground Water Monitoring and Remediation*. 25(1), 63-78.

Murray, Donald M. and Burmaster, David E. (1995). Residential Air Exchange Rates in the United States: Empirical and Estimated Parametric Distributions by Season and Climatic Region. *Risk Analysis*. 15(4), 459-465.

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.

"Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites", USEPA Office of Emergency and Remedial Response, OSWER 9285.6-10 (December 2002), PB 2003-104982.

"Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils", OSWER Draft Guidance. EPA Publication No. EPA/530D-02/004 (November 2002).

"Exposures Factors Handbook, Vol. I: General Factors", EPA Publication No. EPA/600/P-95/002Fa (August 1997).

"Exposures Factors Handbook, Vol. II: Food Ingestion Factors", EPA Publication No. EPA/600/P-95/002Fb (August 1997).

"Exposures Factors Handbook, Vol. III: Activity Factors", EPA Publication No. EPA/600/P-95/002Fc (August 1997).

"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, Vol. I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final", EPA Publication No. EPA/540/R/99/005 (July 2004).

"Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) Final", EPA Publication No. 540-R-070-002 (January 2009).

"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).

"Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites", OSWER Directive 9355.4-24 (December 2002).

"User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings", EPA Publication No. EPA/68/W-02/33 (February 2004).

Polynuclear Aromatic Hydrocarbon Background Study, City of Chicago, Illinois, Tetra Tech Em Inc., 200 E. Randolph Drive, Suite 4700, Chicago IL 60601, February 24, 2003.

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

United States Environmental Protection Agency, 1200 Pennsylvania Avenue, N.W., Washington, DC 20460 (202) 564-4700.

Office of Environmental Information (2000). "Guidance for Data Quality Assessment, Practical Methods for Data Analysis", EPA QA/G-9, QAOO update. EPA Publication No. EPA/600/R-96-084. (Available at <https://semspub.epa.gov/work/06/217322.pdf>).

Office of Solid Waste and Emergency Response (2003). "Human Health Toxicity Values in Superfund Risk Assessments", OSWER Directive 9285.7-53. (Available at <http://www.epa.gov/oswer/riskassessment/pdf/hhmemo.pdf>)

Compendium of Methods for Determination of Toxic Organic Compounds in Ambient Air, Second Edition, EPA Publication No. EPA/625/R-96/010b, January 1999, available at <http://www.epa.gov/ttnamti1/files/ambient/airtox/tocomp99.pdf>.

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846 through Revision IVB (February 2007).

CFR Promulgated Test Methods, Methods 3C and 16, Technology Transfer Network, Emission Measurement Center (2007).

"Guidelines for Carcinogen Risk Assessment (2005)". U. S. Environmental Protection Agency, Washington, DC, EPA Publication No. EPA/630/P-03/001F, 2005. (Available at <http://cfpub.epa.gov/ncea/raf/recordisplay.cfm?deid=116283>.)

"Vapor Intrusion Pathway: A Practical Guide", Technical and Regulatory Guidance. Interstate Technology and Regulatory Council (January 2007).

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 49 Ill. Reg. 12746, effective September 23, 2025)

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 the analytical method referenced in Appendix C, Table F, multiplied by 0.58 to estimate the fraction of organic carbon, as stated in, Nelson and Sommers (1982), 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.

(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

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 outdoor inhalation exposure route developed under Tier 2 shall not exceed the soil saturation limit, as determined under subsection (c).
- b) For any organic contaminant that has a melting point below 30°C, 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).
- 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 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.222 Determination of Soil Vapor Saturation Limit

- a) For any volatile chemical, the soil gas remediation objective for the indoor and outdoor inhalation exposure routes developed under Tier 2 shall not exceed the soil vapor saturation limit, as determined under subsection (b).
- b) The soil vapor saturation limit shall be:
 - 1) The value listed in Appendix A, Table K for that specific contaminant;
 - 2) A value derived from Equation J&E5 in Appendix C, Table L; or
 - 3) A value derived from another method approved by the Agency.

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.225 Demonstration of Compliance with Soil and Groundwater Remediation Objectives

Compliance with soil and groundwater remediation objectives 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).

- 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), 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), compositing of samples is not allowed.
 - 2) Except as provided in subsections (c) and (d), averaging of sample results is not allowed.
 - 3) Notwithstanding subsections (c) and (d), 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 for surface contamination and at the upper limit of contamination for subsurface contamination 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 chemicals:

- A) Discrete samples from the same boring may be composited; or
 - B) Discrete sample results from the same boring may be averaged.
- 3) For volatile chemicals:
- A) Compositing of samples is not allowed.
 - B) Discrete sample results from the same boring may be averaged.
- 4) Composite samples may not be averaged. An arithmetic average may be calculated for discrete samples collected at every two feet of depth through the zone of contamination as specified in subsection (c)(1).
- d) If a person chooses to composite soil samples or average soil sample results to demonstrate compliance relative to the outdoor 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 chemicals, compositing of samples is not allowed;
 - 3) All samples shall be collected within the contaminated area;
 - 4) Composite samples may not be averaged. Procedures specified in “Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites”, USEPA Office of Emergency and Remedial Response, OSWER 9285.6-10 (December 2002), as incorporated by reference in Section 742.210, or an alternative procedure approved by the Agency, shall be used to determine sample averages.
- e) When averaging under this Section, if no more than 15% of sample results are reported as “non-detect”, “no contamination”, “below detection limits”, or similar terms, such results shall be included in the averaging calculations as one-half 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 15% of sample results are "non-detect", procedures specified in “Guidance for Data Quality Assessment, Practical Methods for Data Analysis, EPA QA/G-9, QA00 Update”, EPA/600/R-96/084 (July 2000), as incorporated by reference in Section 742.210, or an alternative procedure approved by the Agency

shall be used to address the non-detect values, or 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 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.227 Demonstration of Compliance with Soil Gas Remediation Objectives for the Outdoor and Indoor Inhalation Exposure Routes

- a) For purposes of the outdoor inhalation exposure route and the indoor inhalation exposure route, compliance with soil gas remediation objectives developed under any tier shall be demonstrated in accordance with this Section by comparing the contaminant concentrations of discrete samples at each sample point to the applicable soil gas remediation objective.
- b) This Section applies to exterior soil gas samples for the outdoor inhalation exposure route, near-slab soil gas samples collected outside of an existing building for the indoor inhalation exposure route, and exterior soil gas samples collected at the footprint of a potential building for the indoor inhalation exposure route. Proposals to use sub-slab soil gas data for the indoor inhalation exposure route shall follow Section 742.935(c).
- c) Sample points shall be determined by the program under which remediation is performed.
- d) When collecting soil gas samples:
 - 1) Use rigid-wall tubing made of nylon or Teflon® or other material approved by the Agency;
 - 2) Use gas-tight, inert containers to hold the sample. For light sensitive or halogenated volatile chemicals, these containers shall be opaque or dark-colored;
 - 3) Purge three volumes before obtaining each discrete soil gas sample;
 - 4) Use a helium tracer or other leak apparatus detection system approved by the Agency; and
 - 5) Limit the flow rate to 200 ml/min.
- e) Soil gas samples shall be analyzed using a National Environmental Laboratory Accreditation Program (NELAP) certified laboratory.

- f) Soil gas remediation objectives shall be compared to concentrations of soil gas collected at a depth at least 3 feet below ground surface and above the saturated zone.

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

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: arsenic, barium, cadmium, chromium, lead, mercury, selenium or silver;
- 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; and
- g) The concentration of any contaminant of concern in soil gas shall not exceed 10% of its Lower Explosive Limit (LEL) as measured by a hand held combustible gas indicator that has been calibrated to manufacturer specifications.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.310 Outdoor Inhalation Exposure Route

The outdoor inhalation exposure route may be excluded from consideration if:

- a) The requirements in subsection (a)(1) or (a)(2) are met:
 - 1) An approved engineered barrier is in place that meets the requirements of Subpart K; or
 - 2) The only contaminants of concern are benzene, toluene, ethylbenzene, and total xylenes, and a demonstration of active biodegradation has been made for benzene, toluene, ethylbenzene, and total xylenes such that no outdoor inhalation exposure will occur. This demonstration shall be submitted to the Agency for review and approval;
- b) The requirements of Sections 742.300 and 742.305 are met;

- 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 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.312 Indoor Inhalation Exposure Route

The indoor inhalation exposure route may be excluded from consideration if:

- a) None of the contaminants of concern are listed on Appendix A, Table J and none of the contaminants of concern are volatile chemicals, as defined in Section 742.200; or
- b) The requirements in subsections (b)(1)(A), (B) or (C) and (b)(2) and (b)(3) are met:
 - 1) Exclusion options when the contaminants of concern are volatile chemicals:
 - A) No building or man-made pathway exists or will be placed above contaminated soil gas or groundwater exceeding Tier 1 remediation objectives for residential property (Appendix B, Table H), provided, however, that there is also no soil or groundwater contamination exceeding Tier 1 remediation objectives for residential property (Appendix B, Table A) or Class I groundwater (Appendix B, Table E) located 5 feet or less, horizontally, from any existing or potential building or man-made pathway; or
 - B) An approved building control technology is in place or will be placed that meets the requirements of Subpart L; or
 - C) If the contaminants of concern are benzene, toluene, ethylbenzene, and total xylenes only, a demonstration of active biodegradation has been made for benzene, toluene, ethylbenzene, and total xylenes such that no indoor inhalation exposure will occur. This demonstration shall be submitted to the Agency for review and approval;
 - 2) The requirements of Sections 742.300 and 742.305 are met; and
 - 3) An institutional control, in accordance with Subpart J, will be placed on the property.

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

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 the measured and modeled extent of groundwater contamination above what would otherwise be the applicable Tier 1 groundwater remediation objectives, 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.

(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

SUBPART D: DETERMINING AREA BACKGROUNDS

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 chemicals, sample results shall be based on discrete samples;
 - 2) Unless an alternative method is approved by the Agency, for contaminants other than volatile chemicals, 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).

2) A statistically valid approach for determining area background concentrations appropriate for the characteristics of the data set, and approved by the Agency.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

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 Concentrations

- 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)

(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

SUBPART E: TIER 1 EVALUAION

Section 742.500 Tier 1 Evaluation Overview

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, E, G, H and I. 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) For the indoor inhalation exposure route:
 - 1) Appendix B, Tables H and I apply only when the existing or potential building has a full concrete slab-on-grade or a full concrete basement floor and walls; and
 - 2) Institutional controls under Subpart J are required to use remediation objectives in Appendix B, Table H or Table I.
- d) 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.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.505 Tier 1 Soil, Soil Gas and Groundwater Remediation Objectives

- a) Soil
 - 1) Outdoor 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.
 - C) For this exposure route, it is acceptable to determine compliance by meeting either the soil or soil gas remediation objectives.

- 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) Soil Gas

- 1) Outdoor Inhalation Exposure Route
 - A) The Tier 1 soil gas remediation objectives for this exposure route based upon residential property use are listed in Appendix B, Table G.
 - B) The Tier 1 soil gas remediation objectives for this exposure route based upon industrial/commercial property use, including the construction worker population, are listed in Appendix B, Table G.

Soil gas remediation objective determinations relying on an industrial/commercial scenario require use of institutional controls in accordance with Subpart J.

- C) For this exposure route, it is acceptable to determine compliance by meeting either the soil or soil gas remediation objectives.

2) Indoor Inhalation Exposure Route

- A) The Tier 1 soil gas remediation objectives for this exposure route are listed in Appendix B, Tables H and I.
- B) The Tier 1 soil gas remediation objectives for this exposure route are based on a default water-filled soil porosity value of $0.15 \text{ cm}^3/\text{cm}^3$ and the assumed presence of a building with a 10-cm thick, full concrete slab-on-grade.
- C) Appendix B, Table H shall be used when any soil or groundwater contamination is located 5 feet or less, vertically or horizontally, from the existing or potential building or man-made pathway. In this scenario, the mode of contaminant transport is both diffusion and advection, which sets the Q_{soil} value at $83.33 \text{ cm}^3/\text{sec}$. Appendix B, Table H applies only when the existing or potential building has a full concrete slab-on-grade or a full concrete basement floor and walls. Pursuant to Section 742.1000(a)(9), soil gas remediation objective determinations relying on Appendix B, Table H require the use of institutional controls in accordance with Subpart J.
- D) Appendix B, Table I may be used only when all soil and groundwater contamination is located more than 5 feet, vertically and horizontally, from the existing or potential building or man-made pathway. In this scenario, the mode of contaminant transport is diffusion only, which sets the Q_{soil} value at $0.0 \text{ cm}^3/\text{sec}$. Appendix B, Table I applies only when the existing or potential building has a full concrete slab-on-grade or a full concrete basement floor and walls. Pursuant to Section 742.1000(a)(7) and (a)(9), soil gas remediation objective determinations relying on Appendix B, Table I require the use of institutional controls in accordance with Subpart J. As an alternative to using Appendix B, Table I, it is permissible to use Appendix B, Table H.
- E) To determine whether the Q_{soil} value can be set at $0.0 \text{ cm}^3/\text{sec}$, the site evaluator shall demonstrate that all soil and groundwater located 5 feet or less, vertically or horizontally, from the existing or potential building or man-made pathway meets the Tier 1

remediation objectives for residential property listed in Appendix B, Table A, and the Tier 1 remediation objectives for Class I groundwater listed in Appendix B, Table E, respectively.

c) 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 I 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 (c)(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.
- 5) For the groundwater component of the indoor inhalation exposure route, the Tier 1 groundwater remediation objectives are listed in Appendix B, Tables H and I.
 - A) The Tier 1 groundwater remediation objectives for this exposure route are based on a default water-filled soil porosity value of 0.15 cm^3/cm^3 and the assumed presence of a building with a 10-cm thick, full concrete slab-on-grade.

- B) Appendix B, Table H shall be used when any soil or groundwater contamination is located 5 feet or less, vertically or horizontally, from the existing or potential building or man-made pathway. In this scenario, the mode of contaminant transport is both diffusion and advection, which sets the Q_{soil} value at $83.33 \text{ cm}^3/\text{sec}$. Appendix B, Table H applies only when the existing or potential building has a full concrete slab-on-grade or a full concrete basement floor and walls. Pursuant to Section 742.1000(a)(9), groundwater remediation objective determinations relying on Appendix B, Table H require the use of institutional controls in accordance with Subpart J.
- C) Appendix B, Table I may be used only when all soil and groundwater contamination is located more than 5 feet, vertically and horizontally, from the existing or potential building or man-made pathway. In this scenario, the mode of contaminant transport is diffusion only, which sets the Q_{soil} value at $0.0 \text{ cm}^3/\text{sec}$. Appendix B, Table I applies only when the existing or potential building has a full concrete slab-on-grade or a full concrete basement floor and walls. Pursuant to Section 742.1000(a)(7) and (a)(9), groundwater remediation objective determinations relying on Appendix B, Table I require the use of institutional controls in accordance with Subpart J. As an alternative to using Appendix B, Table I, it is permissible to use Appendix B, Table H.
- D) To determine whether the Q_{soil} value can be set at $0.0 \text{ cm}^3/\text{sec}$, the site evaluator shall demonstrate that all soil and groundwater located 5 feet or less, vertically or horizontally, from the existing or potential building or man-made pathway meets the Tier 1 remediation objectives for residential property listed in Appendix B, Table A, and the Tier 1 remediation objectives for Class I groundwater listed in Appendix B, Table E, respectively.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.510 Tier 1 Remediation Objectives Tables for the Ingestion, Outdoor Inhalation and Soil Component of the Groundwater Ingestion Exposure Routes

- 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 outdoor 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 when 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 outdoor 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.
 - D) The final column lists the acceptable detection limit (ADL), only when applicable.

- 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 9.0, 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, outdoor 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 outdoor inhalation exposure routes, 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(c)(3) and (c)(4).
 - 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) Soil gas remediation objectives for the outdoor inhalation exposure route are listed in Appendix B, Table G.
 - 1) The first column to the right of the chemical name lists the soil gas remediation objectives for residential populations.
 - 2) The second and third columns to the right of the chemical names list the soil gas remediation objectives for the outdoor inhalation exposure route based on two receptor populations:
 - A) Industrial/commercial; and
 - B) Construction worker.
- d) For contaminants of concern not listed in Appendix B, Tables A, B, E, and G, 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.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.515 Tier 1 Remediation Objectives Tables for the Indoor Inhalation Exposure Route

- a) For the indoor inhalation exposure route:

- 1) Appendix B, Tables H and I apply only when the existing or potential building has a full concrete slab-on-grade or a full concrete basement floor and walls; and
 - 2) Institutional controls under Subpart J are required to use remediation objectives in Appendix B, Table H or Table I.
- b) When the mode of contaminant transport is both diffusion and advection as described in Section 742.505 (i.e., any soil or groundwater contamination is located 5 feet or less, vertically or horizontally, from the existing or potential building or man-made pathway), the remediation objectives for soil gas or groundwater listed in Appendix B, Table H shall be used.
- 1) The first column to the right of the chemical name lists the soil gas remediation objectives for residential receptors.
 - 2) The second column lists the soil gas remediation objectives for industrial/commercial receptors.
 - 3) The third column lists the groundwater remediation objectives for residential receptors.
 - 4) The fourth column lists the groundwater remediation objectives for industrial/commercial receptors.
- c) Only when the mode of contaminant transport is diffusion only as described in Section 742.505 (i.e., all soil and groundwater contamination is located more than 5 feet, vertically and horizontally, from the existing or potential building or man-made pathway), the remediation objectives for soil gas and groundwater listed in Appendix B, Table I may be used.
- 1) The first column to the right of the chemical name lists the soil gas remediation objectives for residential receptors.
 - 2) The second column lists the soil gas remediation objectives for industrial/commercial receptors.
 - 3) The third column lists the groundwater remediation objectives for residential receptors.
 - 4) The fourth column lists the groundwater remediation objectives for industrial/commercial receptors.
- d) If using Appendix B, Table H, compliance is determined by meeting either the soil gas remediation objectives or the groundwater remediation objectives.

- e) If using Appendix B, Table I, compliance is determined by meeting both the soil gas remediation objectives and the groundwater remediation objectives.
- f) For volatile chemicals not listed in Appendix B, Table H or I, a person may request site-specific remediation objectives from the Agency or propose site-specific remediation objectives in accordance with Subpart I, or both.
- g) As an alternative to using Appendix B, Table I pursuant to subsection (c), it is permissible to use Appendix B, Table H pursuant to subsection (b).

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

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, C, and L 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, D, and M.
- 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 outdoor inhalation exposure route and the soil component of the groundwater ingestion exposure routes shall not exceed the soil saturation limit as provided in Section 742.220.
 - 4) The soil gas remediation objectives based on the indoor and outdoor inhalation exposure routes shall not exceed the soil vapor saturation limit provided pursuant to Section 742.222.
- f) Tier 2 remediation objectives for the indoor inhalation exposure route shall be calculated for either soil gas or groundwater if a Q_{soil} value of $83.33 \text{ cm}^3/\text{sec}$ is used.
 - g) Tier 2 remediation objectives for the indoor inhalation exposure route shall be calculated for both soil gas and groundwater if a Q_{soil} value of $0.0 \text{ cm}^3/\text{sec}$ is used.
 - h) 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.
 - i) If the calculated Tier 2 soil remediation objective for an exposure route is more stringent than the Tier 1 soil remediation objectives 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.
 - j) 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 routes and the most stringent Tier 2 calculated value applies.
 - k) If a contaminant has both carcinogenic and noncarcinogenic effects for any applicable exposure route or receptor, remediation objectives shall be calculated for each effect and the more stringent remediation objective shall apply. The toxicological-specific information is described in Section 742.705(d).
 - l) For the indoor inhalation exposure route:
 - 1) Appendix C, Table L applies only when the existing or potential building has a full concrete slab-on-grade or a full concrete basement floor and walls; and
 - 2) Institutional controls under Subpart J are required to develop remediation objectives pursuant to Appendix C, Table L.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

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, D, and M. Use of exposure factors different from those in Appendix C, Tables B, D, and M 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, except for the indoor inhalation exposure route; and
 - 2) Institutional controls are required in accordance with Subpart J.
- c) For the indoor inhalation exposure route, institutional controls under Subpart J are required to develop remediation objectives pursuant to Appendix C, Table L.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

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, D, and M. 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 units 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, D, and M 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, D, and M for the rest of the parameters.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

SUBPART G: TIER 2 SOIL EVALUATION

Section 742.700 Tier 2 Soil and Soil Gas 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, C, and L list equations that shall be used under a Tier 2 evaluation to calculate soil remediation objectives prescribed by the SSL, RBCA, and modified J&E 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) Outdoor Inhalation exposure route; 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 outdoor inhalation of vapors and particulates, soil ingestion and dermal contact with soil;
 - 2) The outdoor inhalation exposure route from subsurface soils;
 - 3) Soil component of the groundwater ingestion exposure route; and
 - 4) Groundwater ingestion exposure route.
- e) Appendix C, Table L lists equations that are used under the modified J&E model. The modified J&E model has equations to evaluate human exposure by the indoor inhalation exposure route. The modified model allows for the development of soil gas remediation objectives. For the indoor inhalation exposure route:
- 1) Appendix C, Table L applies only when the existing or potential building has a full concrete slab-on-grade or a full concrete basement floor and walls; and
 - 2) Institutional controls under Subpart J are required to develop soil gas remediation objectives pursuant to Appendix C, Table L.
- f) The equations in either Appendix C, Table A, C, or L 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 or soil gas remediation objectives for the ingestion and outdoor inhalation exposure routes shall use the applicable equations from the same approach (i.e., SSL equations in Appendix C, Table C). For the indoor inhalation exposure route, only the J&E equations can be used.
 - 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 outdoor 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, C, and L to form a new model is not allowed. In addition, Appendix C, Tables A, C, and L must use their own applicable parameters identified in Appendix C, Tables B, D, and M, respectively.
- g) In calculating soil or soil gas 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 or soil gas remediation objectives derived from these calculations must be used for further Tier 2 evaluations. The indoor inhalation exposure route does not apply to the construction worker population.
- h) 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.
- i) 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.
- j) For the outdoor inhalation exposure route, it is acceptable to use either Section 742.710 to develop a soil remediation objective or Section 742.712 to develop a soil gas remediation objective to determine compliance with the pathway.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.705 Parameters for Soil Remediation Objective Equations

- a) Appendix C, Tables B, D, and M list the input parameters for the SSL, RBCA, and J&E 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 equations, 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, D, and M denotes if the default values

are from the SSL model, RBCA model, modified J&E model or some other source. The last column of Appendix C, Tables B, D, and M lists the numerical values for the default values used in the SSL, RBCA, and J&E 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, D, and M 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, D, and M 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 $(\text{mg}/\text{kg}\cdot\text{d})^{-1}$);
 - D) Inhalation Unit Risk Factor (URF expressed in $(\mu\text{g}/\text{m}^3)^{-1}$);
 - E) Inhalation Chronic Reference Concentration (RfC , expressed in mg/m^3);

- F) Inhalation Subchronic Reference Concentration (RfC_s, expressed in mg/m³, 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 by following the guidelines in OSWER Directive 9285.7-53, 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, Tables A, C, and L. The parameters that are calculated are listed in Appendix C, Tables B, D, and M.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

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) Outdoor Inhalation Exposure Route

- 1) Equations S4 through S16, S26 and S27 are used to calculate Tier 2 soil remediation objectives for the outdoor 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), 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 outdoor 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). 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 by following the guidelines in OSWER Directive 9285.7-53, as incorporated by reference in Section 742.210 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). 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 by following the guidelines in OSWER Directive 9285.7-53, as incorporated by reference in Section 742.210 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). 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 by following the guidelines in OSWER Directive 9285.7-53, as incorporated by reference in Section 742.210 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). 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 by following the guidelines in OSWER Directive 9285.7-53, as incorporated by reference in Section 742.210 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

outdoor 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 by following the guidelines in OSWER Directive 9285.7-53, as incorporated by reference in Section 742.210 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 by following the guidelines in OSWER Directive 9285.7-53, as incorporated by reference in Section 742.210 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 by following the guidelines in OSWER Directive 9285.7-53, as incorporated by reference in Section 742.210 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 by following the guidelines in OSWER Directive 9285.7-

53, as incorporated by reference in Section 742.210 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 θ_w and Air-Filled Soil Porosity θ_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 (ρ_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 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.712 SSL Soil Gas Equation for the Outdoor Inhalation Exposure Route

- a) This Section sets forth the equation and parameters used to develop Tier 2 soil gas remediation objectives for the outdoor inhalation exposure route using the SSL approach.
- b) Equation S30 is used to calculate Tier 2 soil gas remediation objectives for the outdoor inhalation exposure route for residential, industrial/commercial, and construction worker populations.
- c) Equations S4 through S16, S26 and S27, which calculate Tier 2 soil remediation objectives as described in Section 742.710(c), form the basis for developing the Tier 2 soil gas remediation objectives for the outdoor inhalation exposure route using the SSL model.
- d) The remaining parameters used to calculate Equation S30 are listed in Appendix C, Table B, except for Dimensionless Henry's Law Constant (25°C), a chemical specific value listed in Appendix C, Table E.

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

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, Outdoor Inhalation, and Dermal Contact
 - 1) The two sets of equations in subsections (b)(2) and (b)(3) shall be used to generate Tier 2 soil remediation objectives for the combined ingestion, outdoor inhalation, and dermal contact with soil exposure routes.
 - 2) Combined Exposure Routes of Soil Ingestion, Outdoor 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, outdoor 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 outdoor inhalation exposure 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, outdoor 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 surficial 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 by following the guidelines in OSWER Directive 9285.7-53, as incorporated by reference in Section 742.210 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 by following the guidelines in OSWER Directive 9285.7-53, as incorporated by reference in Section 742.210 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) Outdoor Inhalation Exposure Route from Subsurface Soils (soil below one meter)
- A) Equations R7 and R8 form the basis for deriving Tier 2 remediation objectives for the outdoor inhalation exposure 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 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.717 J&E Soil Gas Equations for the Indoor Inhalation Exposure Route

- a) This Section sets forth the equations and parameters to be used to develop Tier 2 soil gas remediation objectives for the indoor inhalation exposure route using the modified J&E model.
- b) Equations J&E1 and J&E2 calculate, for carcinogens and noncarcinogens, respectively, an acceptable concentration of the contaminant of concern in indoor air that adequately protects humans who inhale this air. Equation J&E3 converts indoor air concentrations from parts per million volume to milligrams per cubic meter.
- c) Equation J&E4 calculates an acceptable concentration of the contaminant of concern in the soil gas at the source of contamination. This calculation is made using:
 - 1) an attenuation factor developed in accordance with Equations J&E7 through 18; and
 - 2) the acceptable concentration of the contaminant of concern in indoor air calculated in accordance with Equation J&E1 (for carcinogens) or J&E2 (for noncarcinogens).
- d) The attenuation factor (Equation J&E7 or J&E8) accounts for the following processes:
 - 1) Migration of contaminants from the source upwards through the vadose zone;
 - 2) Migration of contaminants through the earthen filled cracks in the building's full concrete slab-on-grade or full concrete basement floor and walls; and
 - 3) Mixing of the contaminants with air inside the building.
- e) Equation J&E7 must be used when the mode of contaminant transport is both diffusion and advection. In this scenario, the Q_{soil} value equals $83.33 \text{ cm}^3/\text{sec}$ as described in Section 742.505.
- f) Equation J&E8 may be used only when the mode of contaminant transport is diffusion only. In this scenario, the Q_{soil} value equals $0.0 \text{ cm}^3/\text{sec}$ as described in Section 742.505. As an alternative to using Equation J&E8 pursuant to this subsection, it is permissible to use Equation J&E7, in which case the Q_{soil} value equals $83.33 \text{ cm}^3/\text{sec}$ as described in Section 742.505.

- g) Equations J&E9a through J&E18 calculate input parameters for either Equation J&E7 or J&E8 (the equations used to calculate an attenuation factor). These equations assume there are “n” different soil layers between the source of the contamination and the floor of the building. Equations J&E11, 16, 17 and 18 shall be used to calculate the needed parameters for each of the n layers (the general soil layer is referred to as soil layer “i” and $i = 1, 2, \dots n$). Equations J&E16, 17, and 18 shall also be used to calculate needed parameters for the soil in the cracks of the building’s full concrete slab-on-grade or full concrete basement floor and walls (it is through these cracks that contaminated soil gas is assumed to flow from the subsurface into the building). As reflected in Equation J&E14, the only crack assumed to be present is the floor-wall seam gap. To calculate the surface area of the enclosed space at or below grade, Equation J&E12a shall be used for a building with a full concrete slab-on-grade and Equation J&E12b shall be used for a building with a full concrete basement floor and walls.
- h) The default representative subsurface temperature for Henry’s Law Constant is 13°C. This value shall be used, as appropriate, in all calculations needed to represent the system by which contaminants migrate through the subsurface.
- i) The calculated soil gas remediation objective shall be compared with the soil vapor saturation limit (C_v^{sat} , Equation J&E5) for each volatile chemical. The calculated C_v^{sat} shall use the default representative subsurface temperature specified in subsection (h). If the calculated soil gas remediation objective is greater than C_v^{sat} , then C_v^{sat} is used as the soil gas remediation objective.
- j) The calculated soil gas remediation objective shall be compared to concentrations of soil gas collected at a depth at least 3 feet below ground surface and above the saturated zone. If a valid sample cannot be collected, a soil gas sampling plan shall be approved by the Agency under Tier 3.

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

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 contaminants 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 33.

$CUO_{x_a} =$ 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 has 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 is considered satisfied if the cumulative risk from any contaminants of concern listed in Appendix A, Table I, plus any other contaminants of concern detected in groundwater and listed in Appendix A, Table F as affecting the same target organ/organ system as the contaminants of concern detected from Appendix A, Table I, does not exceed 1 in 10,000.
- e) Groundwater remediation objectives for the indoor inhalation exposure route shall be developed in accordance with Section 742.812. For the indoor inhalation exposure route:
- 1) Appendix C, Table L applies only when the existing or potential building has a full concrete slab-on-grade or a full concrete basement floor and walls; and
 - 2) Institutional controls under Subpart J are required to develop groundwater remediation objectives pursuant to Appendix C, Table L.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.810 RBCA 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

$C_{\text{source}} =$ 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 θ_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 , θ_T , S_w , S_d .

- A) The determination of values for U , K , I and θ_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_{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 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.812 J&E Groundwater Equations for the Indoor Inhalation Exposure Route

Groundwater remediation objectives for the indoor inhalation exposure route are calculated using the modified J&E model as described in Section 742.717, except as follows:

- a) In Equation J&E9a, the total number of layers of soil that contaminants migrate through from the source to the building shall include a capillary fringe layer.

- b) The thickness of the capillary fringe layer is 37.5 cm.
- c) The volumetric water content of the capillary fringe shall be 90 % of the total porosity of the soil that comprises the capillary fringe.
- d) Equations J&E7 and J&E8 calculate an acceptable groundwater remediation objective.
 - 1) This calculation is made using:
 - A) the soil gas remediation objective calculated in accordance with Equation J&E4; and
 - B) the assumption that this gas is in equilibrium with any contamination in the groundwater.
 - 2) Equation J&E7 must be used when the mode of contaminant transport is both diffusion and advection. In this scenario, the Q_{soil} value equals 83.33 cm^3/sec as described in Section 742.505.
 - 3) Equation J&E8 may be used only when the mode of contaminant transport is diffusion only. In this scenario, the Q_{soil} value equals 0.0 cm^3/sec as described in Section 742.505. As an alternative to using Equation J&E8 pursuant to this subsection, it is permissible to use Equation J&E7, in which case the Q_{soil} value equals 83.33 cm^3/sec as described in Section 742.505.
- e) A groundwater remediation objective that exceeds the water solubility of that chemical (refer to Appendix C, Table E for solubility values) is not allowed. If the calculated groundwater remediation objective is greater than the water solubility of that chemical, then the solubility is used as the groundwater remediation objective.

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

SUBPART I: TIER 3 EVALUATION

Section 742.900 Tier 3 Evaluation Overview

- 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, such as results of indoor air sampling, 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 pathways 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 Tier 1 or 2);
 - 9) Requests for site-specific remediation objectives that 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)]; and*
 - 10) Use of building control technologies, other than those described in Subpart L, to prevent completion of the indoor inhalation exposure route.

- 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 37 Ill. Reg. 7506, effective July 15, 2013)

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. Any request for site-specific remediation objectives due to impracticality of remediation that involves the indoor inhalation exposure route shall follow Section 742.935 in lieu of this Section. A submittal under this Section shall include the following information:

- a) The reasons why the remediation is impractical;
- b) The current extent and modeled migration of contamination;
- c) Geology, including soil types and parameters;
- 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.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

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 demonstration that involves the indoor inhalation exposure route shall follow Section 742.935 in lieu of this Section. 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 37 Ill. Reg. 7506, effective July 15, 2013)

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.

Section 742.935 Indoor Inhalation Exposure Route

- a) Exclusion of Exposure Route

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

- 1) A description of the site, physical site characteristics, existing and planned buildings, and existing and planned man-made pathways; and
- 2) A discussion of the possibility of the route becoming active in the future.

- b) Exclusion of Exposure Route Using Building Control Technologies

Any proposals to use building control technologies as a means to prevent or mitigate human exposures under the indoor inhalation exposure route that differ from the requirements of Subpart L shall be submitted to the Agency for review and approval. A submittal under this Section shall include the following information:

- 1) A description of the site and physical site characteristics;
- 2) The current extent and modeled migration of contamination;
- 3) Geology, including soil types and parameters;

- 4) Results and locations of sampling events;
- 5) Scaled map of the area, including all buildings and man-made pathways;
- 6) A description of building characteristics and methods of construction, including a description of man-made pathways;
- 7) Present and post-remediation uses of the land that are at issue due to the area of contamination, including human receptors at risk;
- 8) A description of any building control technologies currently in place or proposed for installation that can reduce or eliminate the potential for completion of the exposure route, including design and construction specifications;
- 9) Information regarding the effectiveness of any building control technologies currently in place or proposed for installation and a schedule for performance testing to show the effectiveness of the control technology. For buildings not yet constructed, an approved building control technology shall be in place and operational prior to human occupancy;
- 10) Identification of documents reviewed and the criteria used in the documents for determining whether building control technologies are effective and how those criteria compare to existing or potential buildings or man-made pathways at the site; and
- 11) A description as to how the effectiveness of the building control technologies will be operated and maintained for the life of the buildings and man-made pathways, or until soil gas and groundwater contaminant concentrations have reached remediation objectives that are approved by the Agency. This includes provisions for potential extended system inoperability due to power failure or other disruption.

c) Calculations and Modeling Used to Establish Soil Gas Remediation Objectives

The calculations and modeling shall account for contaminant transport through the mechanisms of diffusion and advection. Proposals to use soil gas data, including sub-slab samples, to establish remediation objectives for the indoor inhalation exposure route that differ from the requirements of Section 742.227 shall be submitted to the Agency for review and approval. A submittal under this Section shall include the following information:

- 1) Scaled map of the area, showing all buildings and man-made pathways (current and planned);

- 2) The current extent and modeled migration of contamination;
- 3) Geology, including soil types and parameters;
- 4) Depth to groundwater (including seasonal variation) and flow direction;
- 5) Location of soil gas sampling points;
- 6) A discussion of soil gas sampling procedures that, at a minimum, addresses the following:
 - A) sampling equipment;
 - B) soil gas collection protocol, including field tests and weather conditions; and
 - C) laboratory analytical methods.

d) Calculations and Modeling Used to Establish Soil Remediation Objectives

The calculations and modeling shall account for contaminant transport through the mechanisms of diffusion and advection. Any proposals to use soil data in lieu of soil gas data to establish remediation objectives for the indoor inhalation exposure route shall be submitted to the Agency for review and approval. A submittal under this Section shall include the following information:

- 1) Scaled map of the area, showing all buildings and man-made pathways (current and planned);
- 2) The current extent and modeled migration of contamination;
- 3) Geology, including soil types and parameters;
- 4) Location of soil sampling points;
- 5) A discussion of soil sampling procedures that, at a minimum, addresses the following:
 - A) sampling equipment;
 - B) soil collection protocol, including field tests and weather conditions; and
 - C) laboratory analytical methods;

- 6) Mathematical and technical justification for the model proposed; and
 - 7) Demonstration that the model was correctly applied.
- e) Calculations and Modeling Used to Establish Groundwater Remediation Objectives

The calculations and modeling shall account for contaminant transport through the mechanisms of diffusion and advection. Proposals to use groundwater data to establish remediation objectives for the indoor inhalation exposure route that differ from the requirements of Sections 742.805 and 742.812 shall be submitted to the Agency for review and approval. A submittal under this Section shall include the following information:

- 1) Scaled map of the area, showing all buildings and man-made pathways (current and planned);
- 2) The current extent and modeled migration of contamination;
- 3) Geology, including soil types and parameters and the thickness of the capillary fringe;
- 4) Depth to groundwater (including seasonal variation) and flow direction;
- 5) Results and locations of groundwater sampling events;
- 6) Mathematical and technical justification for the model proposed; and
- 7) Demonstration that the model was correctly applied.

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

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;
 - 7) A diffusion only mode of contaminant transport for the indoor inhalation exposure route;
 - 8) Use of an indoor inhalation building control technology;
 - 9) For the indoor inhalation exposure route, the presence of a building with a full concrete slab-on-grade or a full concrete basement floor and walls; or
 - 10) 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 Memoranda of Agreement;
 - 4) Ordinances adopted and administered by a unit of local government;
 - 5) Agreements between a property owner (or, in the case of a petroleum leaking underground storage tank, the owner or operator of the tank) and a highway authority with respect to any contamination remaining under highways; and
 - 6) Agreements between a highway authority that is also the property owner (or, in the case of a petroleum leaking underground storage tank, the owner or operator of the tank) and the Agency with respect to any contamination remaining under the 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 37 Ill. Reg. 7506, effective July 15, 2013)

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, indoor inhalation building control technologies, 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 734 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 also modified under the 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 if there is also 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 submitted to the Agency must match the form and contain the same substance, except for variable elements (e.g., name of property owner), as the model in Appendix F and 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 determines that there is no longer a need for the ELUC;
 - B) The Agency, upon written request, issues to the site that received the no further remediation determination that relies on the ELUC a new no further remediation determination approving modification or removal of the limitations or requirements;
 - C) The new no further remediation determination is filed on the chain of title of the site subject to the no further remediation determination; and
 - D) 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, groundwater, and soil gas to which the ELUC applies;
 - C) Any physical features to which an ELUC applies (e.g., engineered barriers, monitoring wells, caps, indoor inhalation building control technologies); 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 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.1012 Federally Owned Property: Land Use Control Memoranda 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 the institutional control that shall 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 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.
- a) 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: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

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. A model ordinance is found in Appendix G. 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. For purposes of this Section, a unit of local government is considered to be expressly prohibited from installing and using potable water supply wells only if the unit of local government is included in the prohibition provision by name. The prohibition required by this Section shall satisfy the following requirements at a minimum:
- 1) The prohibition shall not allow exceptions for potable water well installation and use other than for the adopting unit of local government;
 - 2) The prohibition shall apply at all depths and shall not be limited to particular aquifers or other geologic formations;
 - 3) If the prohibition does not apply everywhere within the boundaries of the unit of local government, the limited area to which the prohibition applies

shall be easily identifiable and clearly defined by the ordinance (e.g., narrative descriptions accompanied by maps with legends or labels showing prohibition boundaries, or narrative descriptions using fixed, common reference points such as street names). Boundaries of prohibitions limited by area shall be fixed by the terms of the ordinance and shall not be subject to change without amending the ordinance in which the prohibition has been adopted (e.g., no boundaries defined with reference to zoning districts or the availability of the public water supply); and

- 4) The prohibition shall not in any way restrict or limit the Agency's approval of the use of the ordinance as an institutional control pursuant to this Part (e.g., no restrictions based on remediation program participation, no restrictions on persons performing remediation within the prohibition area who may use the ordinance).
- 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 or maps delineating the area and extent of groundwater contamination modeled 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 that exceeds the applicable groundwater remediation objectives;
 - 4) Information identifying the current owners of each property identified in subsection (b)(3); and
 - 5) A copy of the proposed written notification to the unit of local government that adopted the ordinance and to the current owners identified in subsection (b)(4) that includes the following information:
 - A) The name and address of the unit of local government that adopted the ordinance;

- B) The ordinance's citation;
 - C) A description of the property being sent notice by adequate legal description, reference to a plat showing the boundaries of the property, or accurate street address;
 - D) Identification of the party requesting to use the groundwater ordinance as an institutional control, and a statement that the party has requested approval from the Agency to use the ordinance as an institutional control;
 - E) A statement that use of the ordinance as an institutional control allows contamination above groundwater ingestion remediation objectives to remain in groundwater beneath the affected properties, and that the ordinance strictly prohibits human and domestic consumption of the groundwater;
 - F) A statement as to the nature of the release and response action with the site name, site address, and Agency site number or Illinois inventory identification number; and
 - G) A statement that more information about the remediation site may be obtained by contacting the party requesting the use of the groundwater ordinance as an institutional control or by submitting a FOIA request to the Agency.
- c) Written notification proposed pursuant to subsection (b)(5) must be sent to the unit of local government that adopted the ordinance, as well as to all current property owners identified in subsection (b)(4). Written proof that the notification was sent to the unit of local government and the property owners shall be submitted to the Agency within 45 days from the date the Agency's no further remediation determination is recorded. Such proof may consist of the return card from certified mail, return receipt requested, a notarized certificate of service, or a notarized affidavit.
- d) Unless the Agency and the unit of local government have entered into a MOU under subsection (i), 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); 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) 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). 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);
 - 3) Violation of the terms of an institutional control recorded under Section 742.1005 or Section 742.1010; or
 - 4) Failure to provide notification and proof of such notification pursuant to subsection (c).
- 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) and if the requirements of this subsection are met. The MOU submitted to the Agency must match the form and contain the same substance as the model in Appendix H and 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) 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.
- j) A groundwater ordinance may not be used to exclude the indoor inhalation exposure route.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.1020 Highway Authority Agreements and Highway Authority Agreement Memoranda of Agreement

- 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. Highway Authority Agreements submitted to the Agency, except for those agreements with the Illinois Department of Transportation, must match the form and contain the same substance, except for variable elements, as the model in Appendix D.
- 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 or construction worker remediation objectives, whichever is less, 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.
- g) In instances in which the highway authority is also the property owner of the site, a Highway Authority Agreement may not be used. In such cases, the highway authority shall instead enter into a Highway Authority Agreement Memorandum of Agreement (HAA MOA) between the highway authority and the Agency. An HAA MOA 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. HAA MOAs submitted to the Agency must match the form and contain the same substance, except for variable elements, as the model in Appendix E.
- h) As part of the HAA MOA 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 or construction worker remediation

objectives, whichever are less, 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 or construction worker remediation objectives, whichever are less, from the release. Access to soil contamination may be allowed if, during and after any access, public health and the environment are protected.
- i) The HAA MOA shall provide the following:
- 1) Information identifying the site by common address or legal description or both;
 - 2) The Illinois Emergency Management Agency's (IEMA) incident number for the site, if one has been assigned;
 - 3) A scaled map delineating the current and estimated future area and extent of soil and groundwater contamination above the applicable Tier 1 or construction worker remediation objectives, whichever are less, or a statement that either soil or groundwater is not contaminated above the applicable Tier 1 residential remediation objectives;
 - 4) Information prepared by the highway authority that lists each contaminant of concern that exceeds its Tier 1 residential or construction worker remediation objective, its Tier 1 residential remediation objective, and its concentrations within the zone where Tier 1 residential or construction worker remediation objectives, whichever is less, are exceeded;
 - 5) A scaled map prepared by the highway authority showing the area of the highway authority's right of way that is governed by the HAA MOA;
 - 6) If samples have not been collected within the right of way because of impracticability, a stipulation by the parties that, based on modeling, soil and groundwater contamination exceeding Tier 1 residential or construction worker remediation objectives, whichever is less, does not and will not extend beyond the boundaries of the right-of-way;
 - 7) A stipulation by the highway authority that it has jurisdiction over the right of way that gives it sole control over the use of the groundwater and access to the soil located within or beneath the right of way;
 - 8) A stipulation by the highway authority that it agrees to limit access by itself and others to soil within the right of way exceeding Tier 1 residential or construction worker remediation objectives, whichever is less. Access may only be allowed if human health (including worker safety) and the environment are protected during and after any access. The highway authority may construct, reconstruct, improve, repair, maintain, and operate a highway upon the right of way, or allow others to do the same by permit. The highway authority and others using or working in the right of way under permit have the right to remove soil or groundwater from the right of way and dispose of the same in accordance with applicable

environmental laws and regulations. The highway authority agrees to issue all permits for work in the right of way, and make all existing permits for work in the right of way, subject to the following or substantially similar conditions:

- A) As a condition of this permit the permittee shall request the office issuing this permit to identify sites in the right of way where a HAA MOA governs access to soil that exceeds the Tier 1 residential remediation objectives of 35 Ill. Adm. Code 742; and
 - B) The permittee shall take all measures necessary to protect human health (including worker safety) and the environment during and after any access to such soil;
- 9) A stipulation that the HAA MOA shall be referenced in the Agency's no further remediation determination issued for the release(s);
 - 10) A stipulation that the highway authority shall notify the Agency of any transfer of jurisdiction over the right of way at least 30 days prior to the date the transfer takes effect. The HAA MOA shall be null and void upon the transfer unless the transferee agrees to be bound by the agreement as if the transferee were an original party to the agreement. The transferee's agreement to be bound by the terms of the agreement shall be memorialized at the time of transfer as a rider to this agreement that references the HAA MOA and is signed by the highway authority, or subsequent transferor, and the transferee;
 - 11) A stipulation that the HAA MOA will become effective on the date the Agency issues a no further remediation determination for the release(s). It shall remain effective until the right of way is demonstrated to be suitable for unrestricted use and the Agency issues a new no further remediation determination to reflect there is no longer a need for the HAA MOA, or until the agreement is otherwise terminated or voided;
 - 12) A stipulation that in addition to any other remedies that may be available, the Agency may bring suit to enforce the terms of the HAA MOA or may, at its sole discretion, declare the HAA MOA null and void if the highway authority or a transferee violates any term of the HAA MOA. The highway authority or transferee shall be notified in writing of any such declaration; and
 - 13) A fully executed signature block by the highway authority and a block for the Agency's Director.

(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

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 outdoor 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).

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

SUBPART L: BUILDING CONTROL TECHNOLOGIES

Section 742.1200 Building Control Technologies

- a) Any person who develops remediation objectives under this Part based on building control technologies 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 building control technologies unless the person has proposed building control technologies meeting the requirements of the following:
 - 1) This Subpart L or Subpart I; and
 - 2) Subpart J relative to institutional controls.
- c) The use of building control technologies can be recognized in determining remediation objectives only if the building control technologies are intended for use as part of the final corrective action.
- d) An approved building control technology shall be in place and operational prior to human occupancy.
- e) Any no further remediation determination based upon the use of building control technologies shall require effective maintenance of the building control technology. The maintenance requirements shall be included in an institutional control under Subpart J. This institutional control shall address provisions for inoperability by requiring the following if the building control technology is rendered inoperable:
 - 1) The site owner/operator shall notify building occupants and workers in advance of intrusive activities. The notification shall enumerate the contaminant of concern known to be present;

- 2) The site owner/operator shall require building occupants and workers to implement protective measures consistent with good industrial hygiene practice; and
 - 3) For a school, the school administrator shall notify the Agency, the school board, and every parent or legal guardian for all enrolled students when a building control technology is rendered inoperable for a period of five consecutive calendar days during the school year when school is in session. For purposes of the preceding sentence, any occurrence of inoperability, regardless of its duration, results in the date of the occurrence constituting a day of inoperability. For purposes of this subsection (e)(3), the term “school” means any public educational facility in Illinois, including grounds and/or campus, consisting of students, comprising one or more grade groups or other identifiable groups, organized as one unit with one or more teachers to give instruction of a defined type. Public educational facility includes, but is not limited to, primary and secondary (kindergarten-12th grade), charter, vocational, alternative, and special education schools. Public educational facility does not include junior colleges, colleges, or universities. For purposes of this subsection (e)(3), the term “school administrator” means the school’s principal, or similar administrator responsible for the school’s operations, or his or her designee.
- f) Failure to install or maintain a building control technology in accordance with a no further remediation determination shall be grounds for voidance of the determination and the instrument memorializing the Agency’s no further remediation determination.

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.1205 Building Control Technology Proposals

A proposal to use a building control technology under this Subpart shall include the following information:

- a) A description of the site and physical site characteristics;
- b) The current extent and modeled migration of contamination;
- c) Geology, including soil types and parameters;
- d) Results and locations of sampling events;
- e) Scaled map of the area, including all buildings and man-made pathways;

- f) A description of building characteristics and methods of construction, including a description of man-made pathways; and
- g) Present and post-remediation uses of the land that are at issue due to the area of contamination, including human receptors at risk.

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.1210 Building Control Technology Requirements

- a) Natural attenuation, access controls, and point of use treatment shall not be considered building control technologies.
- b) For purposes of determining compliance with remediation objectives under Tier 1, building control technologies are not recognized.
- c) The following building control technologies are recognized for purposes of pathway exclusion under Section 742.312.
 - 1) Sub-slab depressurization (SSD) systems meeting the following requirements:
 - A) A suction pit is installed that is at least two cubic feet and extends at least 6 inches below the slab (larger suction pits may be excavated as needed to achieve the performance criteria in subsection (c)(1)(B));
 - B) A PVC pipe of at least 3 inches in diameter extends from the suction pit to the intake side of an in-line fan capable of achieving a static vacuum of at least 0.25 inches water column (wc) at the suction point and measureable vacuum at the farthest edges of the area served by the suction pit under worst case conditions (all exhaust fans and heating systems running, during cold weather) as determined by a differential pressure reading of at least -0.003 inches wc below the slab or visible downward flow of air at test holes using chemical or smoke sticks;
 - C) All visible cracks and joints in the slab (including the place where the pipe exits the slab) and foundation walls are sealed;
 - D) The pipe exhausts outside the building at least 10 feet above ground and at least 10 feet from any door or window; and
 - E) Additional suction pits meeting the requirements of subsection (c)(1)(A) shall be installed as necessary to achieve measureable vacuum below the slab in all areas, including in any area where

subsurface or foundation conditions (e.g., a sub-slab grade beam) prevent adequate suction field extension.

- 2) Sub-membrane depressurization (SMD) systems meeting the following requirements:
 - A) A non-woven geotextile is installed on the exposed earthen material;
 - B) A cross-laminated polyethylene membrane liner at least 0.10 mm (or 4 mil) thick is placed over the geotextile and sealed to foundation walls using a low volatile adhesive that is recommended by the liner manufacturer (e.g., acrylic latex adhesive);
 - C) A 3 inch diameter PVC pipe extends from a hole cut in the liner to the intake side of an in-line fan capable of achieving a static vacuum of at least 0.25 inches water column (wc) at the riser pipe and measureable vacuum at the farthest edges of the liner under worst case conditions (all exhaust fans running during cold weather) as determined by a differential pressure reading of at least -0.003 inches wc below the liner or visible downward flow of air in test holes using chemical or smoke sticks;
 - D) The pipe is sealed to the liner;
 - E) The pipe exhausts outside the building at least 10 feet above ground and at least 10 feet from any door or window; and
 - F) No leaks based on smoke stick tests along the entire perimeter of the liner (i.e., at all sealed edges) with the fan running. Where leaks are identified, appropriate repairs are undertaken and smoke stick testing repeated until no leaks are detected.

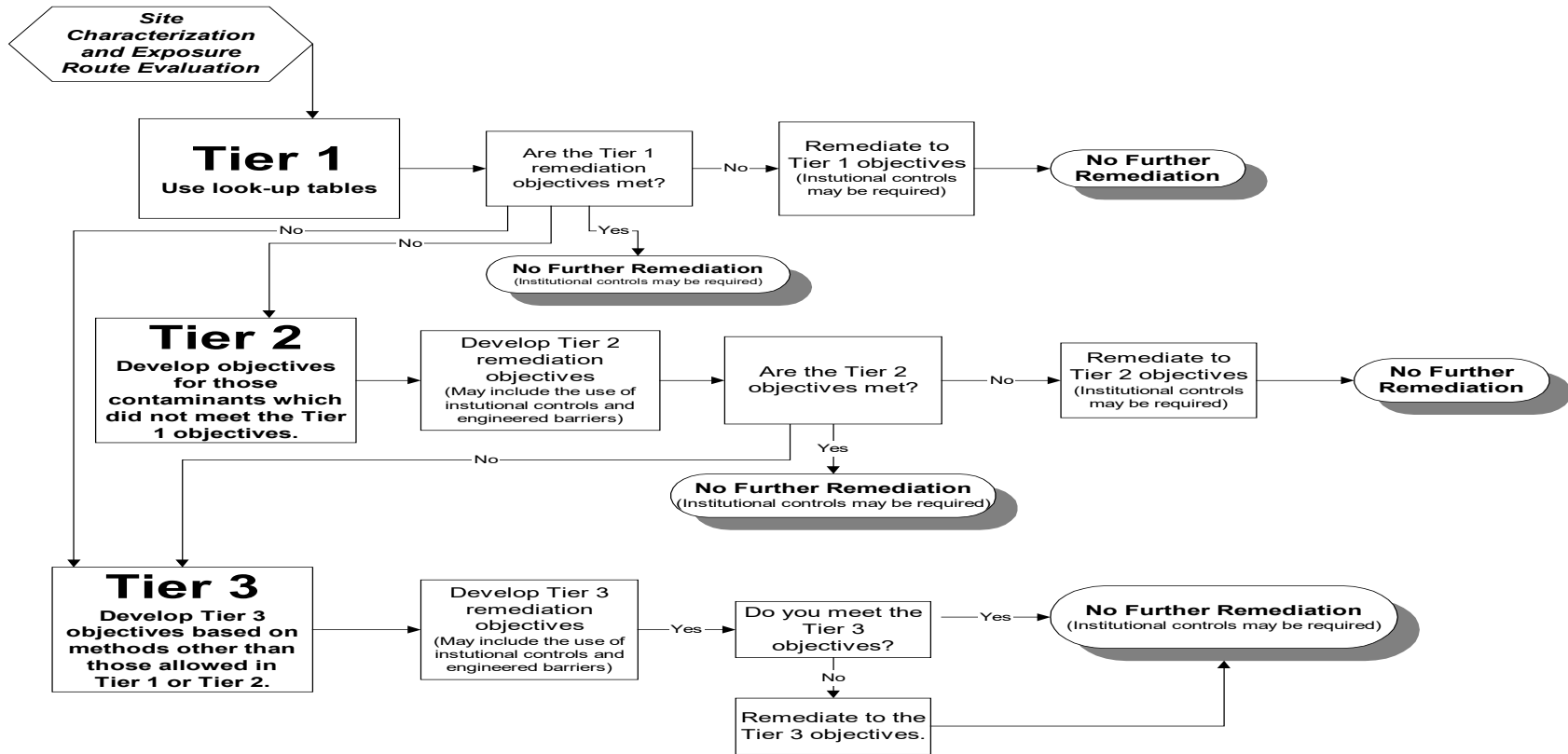
- 3) Membrane barrier systems when placed below concrete slabs meeting the following requirements:
 - A) The membrane is impermeable to volatile chemicals and is not less than 1.5 mm (or 60 mil) thick;
 - B) The membrane is sealed to foundation walls and any penetrating pipes according to membrane manufacturer/installer recommendations;

- C) The membrane is installed in accordance with the manufacturer's requirements and by an applicator trained and approved by the manufacturer;
 - D) A smoke test of the membrane system (where smoke is injected below the installed liner prior to slab installation), in accordance with the manufacturer's requirements, is performed to ensure no leaks exist. Where leaks are identified, appropriate repairs are undertaken and smoke testing repeated until no leaks are detected;
 - E) The membrane is puncture resistant to slab installation construction activities and protected by sand layers or geotextiles as recommended by the manufacturer; and
 - F) Construction activities following membrane installation do not damage, puncture or tear the membrane or otherwise compromise its ability to prevent the migration of volatile chemicals.
- 4) Vented raised floors meeting the following requirements:
- A) An interconnected void system below the slab sufficient to allow free movement of air and communication of negative pressures to all points below the slab;
 - B) Sealing of all construction joints, open cracks, and penetrations through the slab (e.g., for utilities and riser pipes) with a low volatile caulk; and
 - C) At least one 3 inch diameter riser pipe venting to the atmosphere above the roof line (at least 10 feet from any doors or windows) for each 5000 square feet of membrane area, with the capability of converting passively vented floor systems to actively vented or SSD systems meeting the performance requirements of subsection (c)(1).

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

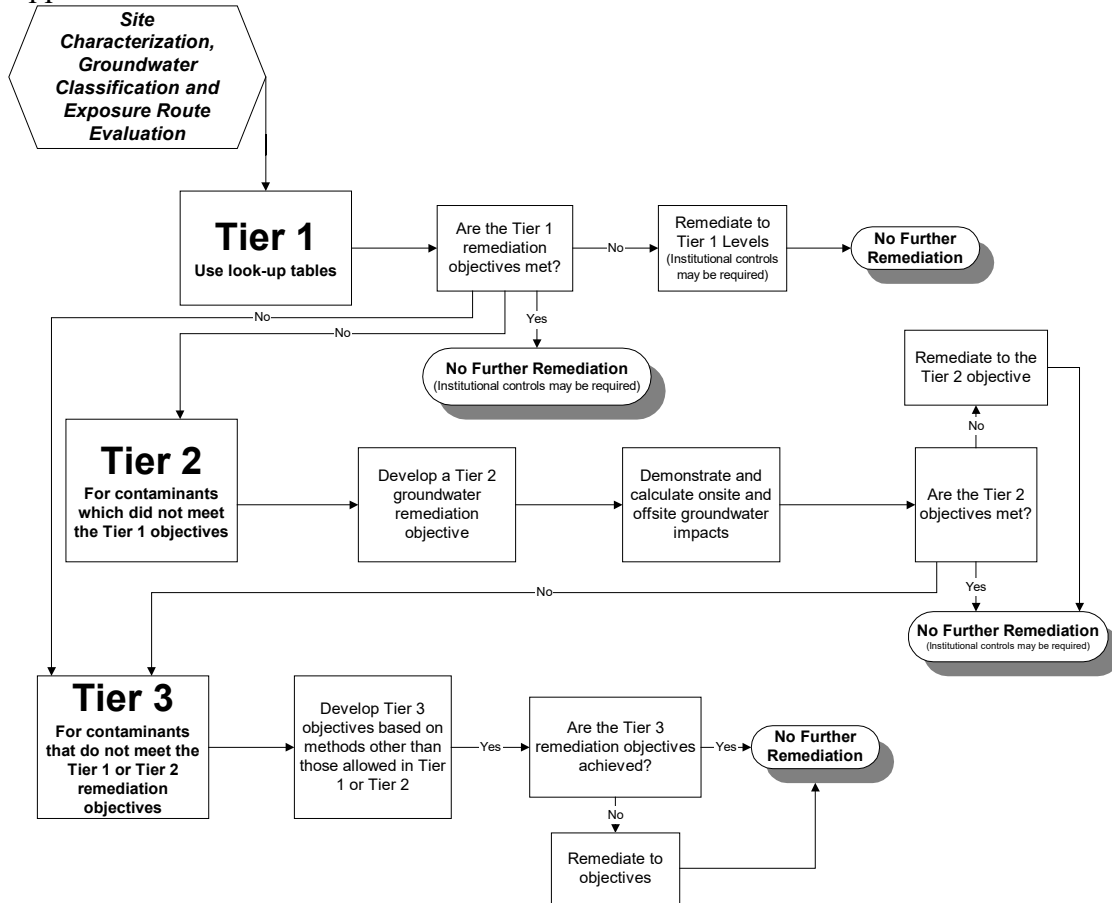
Section 742.APPENDIX A: General

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	For the Outdoor Inhalation Exposure Route ^a C_{sat} (mg/kg)	For the Soil Component of the Groundwater Ingestion Exposure Route ^b C_{sat} (mg/kg)
67-64-1	Acetone	1.00E+05	2.00E+05
71-43-2	Benzene	8.00E+02	5.80E+02
111-44-4	Bis(2-chloroethyl)ether	3.00E+03	3.90E+03
117-81-7	Bis(2-ethylhexyl)phthalate	2.00E+02	6.80E+01
75-27-4	Bromodichloromethane (Dichlorobromomethane)	2.80E+03	2.00E+03
75-25-2	Bromoform	2.00E+03	1.20E+03
71-36-3	Butanol	1.00E+04	1.60E+04
78-93-3	2-Butanone (MEK)	2.50E+04	4.50E+04
85-68-7	Butyl benzyl phthalate	1.00E+03	3.40E+02
75-15-0	Carbon disulfide	8.50E+02	5.20E+02
56-23-5	Carbon tetrachloride	1.20E+03	5.60E+02
108-90-7	Chlorobenzene (Monochlorobenzene)	6.20E+02	2.90E+02
124-48-1	Chlorodibromomethane (Dibromochloromethane)	1.40E+03	8.90E+02
67-66-3	Chloroform	3.40E+03	2.50E+03
95-57-8	2-Chlorophenol ^c (ionizable organic)	1.00E+04	7.10E+03
75-99-0	Dalapon	1.20E+05	1.90E+05
96-12-8	1,2-Dibromo-3-chloropropane	6.90E+02	4.30E+02
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	1.60E+03	1.20E+03

CAS No.	Chemical Name	For the Outdoor Inhalation Exposure Route ^a C _{sat} (mg/kg)	For the Soil Component of the Groundwater Ingestion Exposure Route ^b C _{sat} (mg/kg)
84-74-2	Di- <i>n</i> -butyl phthalate	2.60E+03	8.80E+02
95-50-1	1,2-Dichlorobenzene (o-Dichlorobenzene)	5.60E+02	2.10E+02
75-71-8	Dichlorodifluoromethane	8.70E+02	4.30E+02
75-34-3	1,1-Dichloroethane	1.70E+03	1.40E+03
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	1.90E+03	2.10E+03
75-35-4	1,1-Dichloroethylene	1.40E+03	9.10E+02
156-59-2	<i>cis</i> -1,2-Dichloroethylene	1.30E+03	1.00E+03
156-60-5	<i>trans</i> -1,2-Dichloroethylene	3.00E+03	2.10E+03
78-87-5	1,2-Dichloropropane	1.20E+03	8.70E+02
542-75-6	1,3-Dichloropropene (1,3-Dichloropropylene, <i>cis</i> + <i>trans</i>)	1.00E+03	8.50E+02
84-66-2	Diethyl phthalate	2.20E+03	9.20E+02
105-67-9	2,4-Dimethylphenol	1.00E+04	4.70E+03
117-84-0	Di- <i>n</i> -octyl phthalate	1.60E+01	5.20E+00
123-91-1	p-Dioxane	1.00E+05	2.00E+05
100-41-4	Ethylbenzene	3.50E+02	1.50E+02
77-47-4	Hexachlorocyclopentadiene	1.30E+02	4.40E+01
78-59-1	Isophorone	3.00E+03	3.00E+03
98-82-8	Isopropylbenzene (Cumene)	9.40E+02	4.00E+02
7439-97-6	Mercury (elemental)	3.10E+00	N/A
74-83-9	Methyl bromide (Bromomethane)	3.10E+03	3.60E+03
1634-04-4	Methyl tertiary-butyl ether	8.40E+03	1.10E+04
75-09-2	Methylene chloride (Dichloromethane)	2.50E+03	3.00E+03

CAS No.	Chemical Name	For the Outdoor Inhalation Exposure Route ^a C _{sat} (mg/kg)	For the Soil Component of the Groundwater Ingestion Exposure Route ^b C _{sat} (mg/kg)
98-95-3	Nitrobenzene	7.10E+02	5.90E+02
621-64-7	n-Nitrosodi-n-propylamine	1.90E+03	2.30E+03
100-42-5	Styrene	6.30E+02	2.60E+02
127-18-4	Tetrachloroethylene (Perchloroethylene)	8.00E+02	3.10E+02
108-88-3	Toluene	5.80E+02	2.90E+02
120-82-1	1,2,4-Trichlorobenzene	3.40E+02	1.20E+02
71-55-6	1,1,1-Trichloroethane	1.30E+03	6.70E+02
79-00-5	1,1,2-Trichloroethane	1.80E+03	1.30E+03
79-01-6	Trichloroethylene	1.20E+03	6.50E+02
75-69-4	Trichlorofluoromethane	1.80E+03	8.90E+02
108-05-4	Vinyl acetate	2.60E+03	4.20E+03
75-01-4	Vinyl chloride	2.60E+03	2.90E+03
108-38-3	m-Xylene	4.10E+02	1.60E+02
95-47-6	o-Xylene	3.70E+02	1.50E+02
106-42-3	p-Xylene	3.30E+02	1.40E+02
1330-20-7	Xylenes (total)	2.80E+02	1.10E+02

^a Soil Saturation Limits calculated using an f_{oc} of 0.006 g/g and a system temperature of 25°C.

^b Soil Saturation Limits calculated using an f_{oc} of 0.002 g/g and a system temperature of 25°C.

^c C_{sat} for pH of 6.8. If soil pH is other than 6.8, a site-specific C_{sat} should be calculated using equations S19 and S29 and the pH-specific K_{oc} values in Appendix C Table I.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

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 $n=3(1)50$

N	0.01	0.05
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

N	0.01	0.05
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

Isopropylbenzene

Cholinesterase Inhibition

Aldicarb

Carbofuran

Circulatory System

Alachlor

Antimony (ingestion only)

Benzene

Cobalt (ingestion only)

2,4-D

cis-1,2-Dichloroethylene (ingestion only)

2,4-Dimethylphenol

2,4-Dinitrotoluene

2,6-Dinitrotoluene

Enzosulfan

Fluoranthene

Fluorene

Methylene Chloride (inhalation only)

Nickel (Res. & I/C only) (inhalation only)

Nitrate as N

Nitrobenzene (ingestion only)

Selenium

Simazine

Styrene (ingestion only)

1,3,5-Trinitrobenzene

Zinc

Decreased Body Weight Gain

Atrazine

Bis(2-chloroethyl)ether

Cyanide

1,2-Dichlorobenzene (inhalation only)

Diethyl phthalate (ingestion only)

Enzosulfan

2-Methylphenol (o-cresol)

Naphthalene (ingestion only)

Nickel (ingestion only)

n-Nitrosodiphenylamine

Phenol (ingestion only)

Simazine

Tetrachloroethylene (ingestion only)

1,1,1-Trichloroethane (ingestion only)
Vinyl acetate (ingestion only)
Xylenes (Res. & I/C only) (ingestion only)

Endocrine System

Cyanide
1,2-Dibromoethane (ingestion only)
Di-n-octyl phthalate (ingestion only)
Nitrobenzene
1,2,4-Trichlorobenzene (ingestion only)

Eye

2,4-Dinitrophenol
n-Nitrosodiphenylamine
Polychlorinated biphenyls (PCBs)
Trichloroethylene

Gastrointestinal System

Beryllium (ingestion only)
Copper
1,3-Dichloropropene (*cis + trans*) (ingestion only)
Endothall
Fluoride
Hexachlorocyclopentadiene (ingestion only)
Iron
Methyl bromide (ingestion only)
Methyl tertiary-butyl ether (ingestion only)

Immune System

4-Chloroaniline
2,4-Dichlorophenol
Mercury (ingestion only)
Polychlorinated biphenyls (PCBs)

Kidney

Acetone (ingestion only)
Aldrin (CW only)
Barium
Bromodichloromethane (ingestion only)
Cadmium
2,4-D
Dalapon
1,1-Dichloroethane
1,2-Dichloroethane (CW only) (ingestion only)
Enosulfan
Ethylbenzene (ingestion only)
Fluoranthene

gamma-HCH (gamma-BHC)
Hexachloroethane (ingestion only)
Isopropylbenzene
Mecoprop (MCP)
Methyl tertiary-butyl ether (inhalation only)
Pentachlorophenol
Pyrene
Toluene (ingestion only)
2,4,5-Trichlorophenol
Vinyl acetate (ingestion only)

Liver

Acenaphthene
Aldrin (Res. & I/C only)
Bis(2-ethylhexyl)phthalate (Res. & I/C only) (ingestion only)
Bromoform
Butyl Benzyl Phthalate (ingestion only)
Carbon Tetrachloride
Chlordane
Chlorobenzene (ingestion only)
Chlorodibromomethane (ingestion only)
Chloroform
2,4-D
DDT
1,2-Dibromoethane (ingestion only)
1,2-Dichlorobenzene (CW only) (ingestion only)
1,4-Dichlorobenzene
Dichlorodifluoromethane
1,2-Dichloroethane (inhalation only)
1,1-Dichloroethylene
trans-1,2-Dichloroethylene
1,2-Dichloropropane (ingestion only)
Dieldrin (Res. & I/C only)
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Di-n-octyl phthalate (ingestion only)
p-Dioxane
Endrin
Ethylbenzene (ingestion only)
Fluoranthene
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
alpha-HCH (alpha-BHC)
gamma-HCH (gamma-BHC)
High Melting Explosive, Octogen (HMX)
Isophorone (inhalation only)

Methyl tertiary-butyl ether
Methylene Chloride (ingestion only)
Pentachlorophenol
Phenol (inhalation only)
Picloram
Styrene (ingestion only)
Tetrachloroethylene (ingestion only)
Toxaphene (CW only)
2,4,5-TP (Silvex)
1,2,4-Trichlorobenzene (inhalation only)
1,1,1-Trichloroethane (inhalation only)
1,1,2-Trichloroethane (ingestion only)
2,4,5-Trichlorophenol
2,4,6-Trinitrotoluene (TNT)
Vinyl Chloride

Mortality

Di-n-butyl phthalate (ingestion only)
Xylenes (Res. & I/C only) (ingestion only)

Nervous System

Butanol (ingestion only)
Carbon disulfide (inhalation only)
Cyanide
Dieldrin (CW only)
2,4-Dimethylphenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Endrin
Hexachloroethane (inhalation only) (CW only)
Manganese
Mercury (inhalation only)
2-Methylphenol (o-cresol)
Phenol (inhalation only)
Selenium
Styrene (inhalation only)
Tetrachloroethylene (inhalation only)
Toluene (inhalation only)
Trichloroethylene
Xylenes (CW only) (ingestion only)
Xylenes (inhalation only)

Reproductive System

Arsenic (inhalation only)
Bis(2-ethylhexyl)phthalate (CW only) (ingestion only)
Boron
2-Butanone

Carbofuran
Carbon disulfide (ingestion only)
2-Chlorophenol
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane (ingestion only)
Dicamba
Dinoseb
Ethylbenzene (inhalation only)
Isophorone (inhalation only)
Methoxychlor
Royal Demolition Explosive , Cyclonite (RDX)
2,4,6-Trichlorophenol

Respiratory System

Antimony (inhalation only)
Benzoic Acid (inhalation only)
Beryllium (inhalation only)
Cadmium (inhalation only)
Chromium (hex) (inhalation only)
Cobalt (inhalation only)
1,2-Dibromoethane (inhalation only)
trans-1,2-Dichloroethylene (inhalation only)
1,2-Dichloropropane (inhalation only)
1,3-Dichloropropene (*cis + trans*) (inhalation only)
Hexachlorocyclopentadiene (inhalation only)
Methyl bromide (inhalation only)
Naphtalene (inhalation only)
Nickel (inhalation only)
Nitrobenzene (inhalation only)
Vinyl acetate (inhalation only)

Skin

Arsenic (ingestion only)
Polychlorinated biphenyls (PCBs)
Selenium
Silver

Spleen

1,3-Dinitrobenzene
1,3,5-Trinitrobenzene

Notes:

Res. = Residential receptor
I/C = Industrial/Commercial receptor
CW = Construction Worker receptor

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.APPENDIX A: General

Section 742.TABLE F: Similar-Acting Carcinogenic Chemicals

Bladder

1,3-Dichloropropene (*cis + trans*) (ingestion only)
n-Nitrosodiphenylamine

Circulatory System

Benzene
1,2-Dibromoethane
1,2-Dichloroethane
Pentachlorophenol
2,4,6-Trichlorophenol

Gall Bladder

p-Dioxane (inhalation only)

Gastrointestinal System

Benzo(a)anthracene (ingestion only)
Benzo(b)fluoranthene (ingestion only)
Benzo(k)fluoranthene (ingestion only)
Benzo(a)pyrene (ingestion only)
Bromoform
Chrysene (ingestion only)
Dibenzo(a,h)anthracene (ingestion only)
1,2-Dibromoethane (ingestion only)
Indeno(1,2,3-cd)pyrene (ingestion only)

Kidney

Bromodichloromethane (ingestion only)
Chloroform (ingestion only)
1,2-Dibromo-3-chloropropane (ingestion only)
Nitrobenzene

Liver

Aldrin
Bis(2-chloroethyl)ether
Bis(2-ethylhexyl)phthalate
Carbazole
Carbon Tetrachloride

Respiratory System (continued)

Benzo(k)fluoranthene (inhalation only)
Benzo(a)pyrene (inhalation only)
Beryllium
Cadmium

Liver (continued)

Chlordane
Chloroform
DDD
DDE
DDT
1,2-Dichloropropane
Dieldrin
2,4-Dinitrotoluene
2,6-Dinitrotoluene
p-Dioxane
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
alpha-HCH (alpha-BHC)
gamma-HCH (gamma-BHC)
Methylene Chloride
Nitrobenzene
n-Nitrosodiphenylamine (inhalation only)
n-Nitrosodi-n-propylamine
Pentachlorophenol
Polychlorinated biphenyls (PCBs)
Tetrachloroethylene
Toxaphene
Trichloroethylene
Vinyl Chloride (I/C & CW)
Vinyl Chloride (Res.)

Mammary Gland

3,3'-Dichlorobenzidine
2,4-Dinitrotoluene
2,6-Dinitrotoluene

Respiratory System

Arsenic (inhalation only)
Benzo(a)anthracene (inhalation only)
Benzo(b)fluoranthene (inhalation only)

Chromium (hexavalent ion)
Chrysene (inhalation only)
Cobalt
Dibenzo(a,h)anthracene (inhalation only)
1,2-Dibromo-3-chloropropane (inhalation only)
1,2-Dibromoethane (inhalation only)
1,3-Dichloropropene (*cis + trans*) (inhalation only)
p-Dioxane (inhalation only)
Trichloroethylene

Notes:

Res. = Residential receptor

I/C = Industrial/Commercial receptor

CW = Construction Worker receptor

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.APPENDIX A General

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

Chemical Name	Counties Within Metropolitan Statistical Areas (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 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX A: General

Section 742.TABLE H Concentrations of Polynuclear Aromatic Hydrocarbon Chemicals in Background Soils

Chemical Name	Chicago ^a mg/kg	Metropolitan Areas ^b (mg/kg)	Non-Metropolitan Areas ^c (mg/kg)
2-Methylnaphthalene	-----	0.14	0.29
Acenaphthene	0.09	0.13	0.04
Acenaphthylene	0.03	0.07	0.04
Anthracene	0.25	0.40	0.14
Benzo(a)anthracene	1.1	1.8	0.72
Benzo(a)pyrene	1.3	2.1	0.98
Benzo(b)fluoranthene	1.5	2.1	0.70
Benzo(g,h,i)perylene	0.68	1.7	0.84
Benzo(k)fluoranthene	0.99	1.7	0.63
Chrysene	1.2	2.7	1.1
Dibenzo(a,h)anthracene	0.20	0.42	0.15
Fluoranthene	2.7	4.1	1.8
Fluorene	0.10	0.18	0.04
Indeno(1,2,3-c,d)pyrene	0.86	1.6	0.51
Naphthalene	0.04	0.20	0.17
Phenanthrene	1.3	2.5	0.99
Pyrene	1.9	3.0	1.2
<p>^a Chicago means within the corporate limits of the City of Chicago.</p> <p>^b Metropolitan area means a populated area, as defined in Section 742.200, (other than the City of Chicago) that is located within any county in a Metropolitan Statistical Area listed in Appendix A, Table G, footnote a.</p> <p>^c Non-Metropolitan area means a populated area, as defined in Section 742.200, that is not located within any county in a Metropolitan Statistical Area listed in Appendix A, Table G, footnote a.</p>			

(Source: Appendix A, Table H renumbered to Appendix A, Table I and new Appendix A, Table H Added at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX A General

Section 742.TABLE I Chemicals Whose Tier 1 Class I Groundwater Remediation Objective Exceeds the 1 in 1,000,000 Cancer Risk Concentration

Chemical	Class I Groundwater Remediation Objective (mg/L)	1 in 1,000,000 Cancer Risk Concentration (mg/L)	ADL (mg/L)
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	0.00002	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
Ionizable Organics			
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
Inorganics			
Arsenic	0.05	0.000057	0.001

(Source: Appendix A, Table I renumbered from Appendix A, Table H and amended at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742. Table J: List of TACO Volatile Chemicals for the Indoor Inhalation Exposure Route

CAS No.	Chemical
67-64-1	Acetone
71-43-2	Benzene
111-44-4	Bis(2-chloroethyl)ether
75-27-4	Bromodichloromethane
75-25-2	Bromoform
71-36-3	Butanol
78-93-3	2-Butanone (MEK)
75-15-0	Carbon disulfide
56-23-5	Carbon tetrachloride
108-90-7	Chlorobenzene
124-48-1	Chlorodibromomethane
67-66-3	Chloroform
95-57-8	2-Chlorophenol
75-99-0	Dalapon
96-12-8	1,2-dibromo-3-chloropropane
106-93-4	1,2-Dibromoethane
95-50-1	1,2-Dichlorobenzene
106-46-7	1,4-Dichlorobenzene
75-71-8	Dichlorodifluoromethane
75-34-3	1,1-Dichloroethane
107-06-2	1,2-Dichloroethane
75-35-4	1,1-Dichloroethylene
156-59-2	<i>cis</i> -1,2-Dichloroethylene
156-60-5	<i>trans</i> -1,2-Dichloroethylene
78-87-5	1,2-Dichloropropane
542-75-6	1,3-Dichloropropylene (<i>cis</i> + <i>trans</i>)
123-91-1	p-Dioxane
100-41-4	Ethylbenzene
76-44-8	Heptachlor
118-74-1	Hexachlorobenzene
77-47-4	Hexachlorocyclopentadiene
67-72-1	Hexachloroethane
78-59-1	Isophorone
98-82-8	Isopropylbenzene (Cumene)
7439-97-6	Mercury
74-83-9	Methyl bromide
1634-04-4	Methyl tertiary-butyl ether
75-09-2	Methylene chloride
93-65-2	2-Methylnaphthalene
95-48-7	2-Methylphenol (o-cresol)
91-20-3	Naphthalene

CAS No.	Chemical
98-95-3	Nitrobenzene
621-64-7	n-Nitrosodi-n-propylamine
108-95-2	Phenol
1336-36-3	Polychlorinated biphenyls (PCBs)
100-42-5	Styrene
127-18-4	Tetrachloroethylene
108-88-3	Toluene
120-82-1	1,2,4-Trichlorobenzene
71-55-6	1,1,1-Trichloroethane
79-00-5	1,1,2-Trichloroethane
79-01-6	Trichloroethylene
75-69-4	Trichlorofluoromethane
108-05-4	Vinyl acetate
75-01-4	Vinyl chloride
108-38-3	m-Xylene
95-47-6	o-Xylene
106-42-3	p-Xylene
1330-20-7	Xylenes (total)

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.APPENDIX A: General

Section 742.TABLE K: Soil Vapor Saturation Limits (C_v^{sat}) for Volatile Chemicals

CAS No.	Chemical Name	C_v^{sat} (mg/m ³)
67-64-1	Acetone	7.50E+05
71-43-2	Benzene	4.20E+05
111-44-4	Bis(2-chloroethyl)ether	1.20E+04
75-27-4	Bromodichloromethane	4.50E+05
75-25-2	Bromoform	7.80E+04
71-36-3	Butanol	2.90E+04
78-93-3	2-Butanone (MEK)	3.80E+05
75-15-0	Carbon disulfide	1.50E+06
56-23-5	Carbon tetrachloride	1.00E+06
108-90-7	Chlorobenzene	7.40E+04
124-48-1	Chlorodibromomethane	5.70E+04
67-66-3	Chloroform	1.30E+06
95-57-8	2-Chlorophenol (ionizable organic)	1.70E+04
75-99-0	Dalapon	1.50E+03
96-12-8	1,2-Dibromo-3-chloropropane	7.80E+03
106-93-4	1,2-Dibromoethane	1.40E+05
95-50-1	1,2-Dichlorobenzene	1.10E+04
106-46-7	1,4-Dichlorobenzene	8.40E+03
75-71-8	Dichlorodifluoromethane	3.30E+07
75-34-3	1,1-Dichloroethane	1.30E+06
107-06-2	1,2-Dichloroethane	4.40E+05
75-35-4	1,1-Dichloroethylene	3.30E+06
156-59-2	<i>cis</i> -1,2-Dichloroethylene	1.10E+06
156-60-5	<i>trans</i> -1,2-Dichloroethylene	1.80E+06
78-87-5	1,2-Dichloropropane	3.20E+05

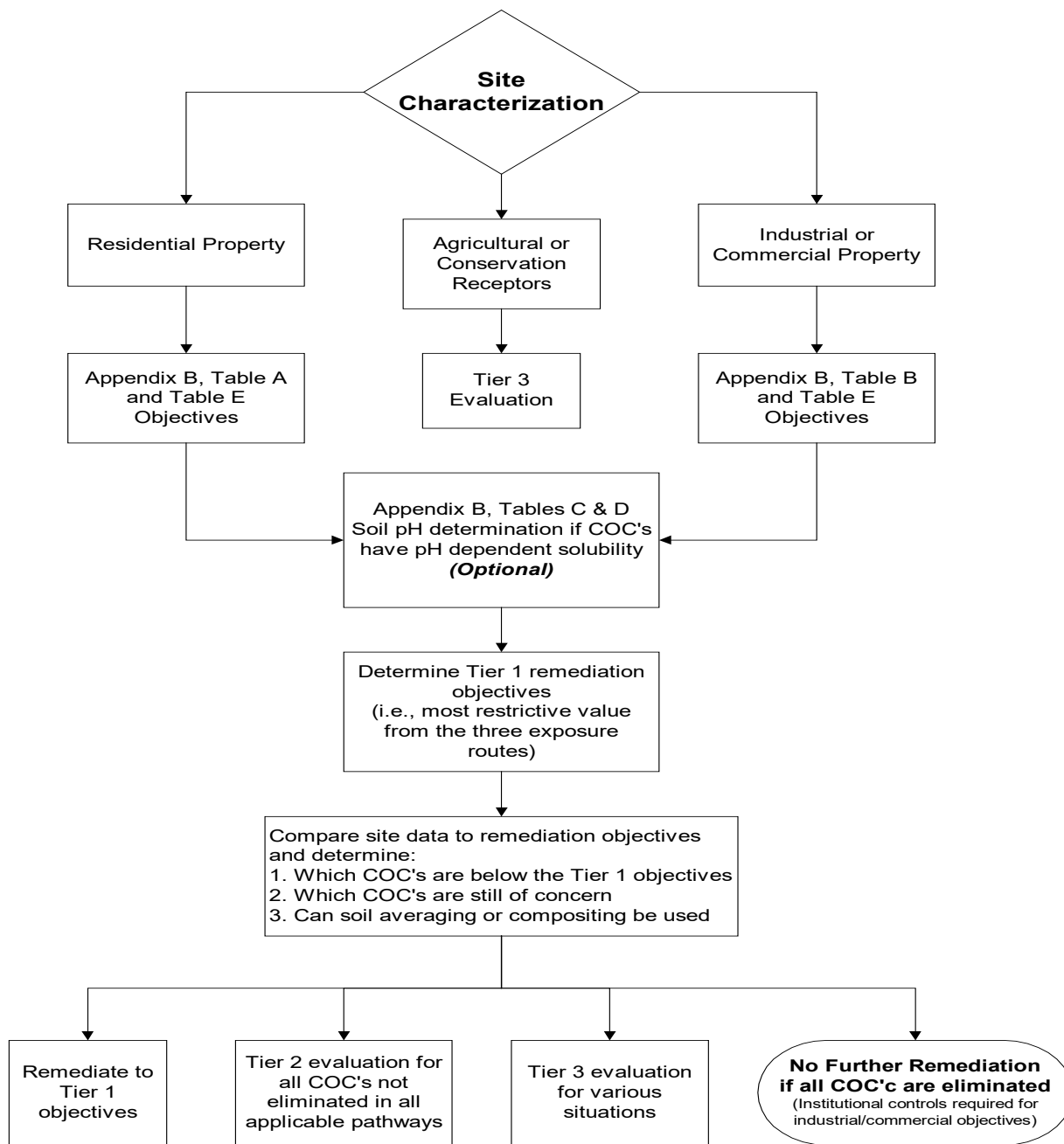
CAS No.	Chemical Name	C_v^{sat} (mg/m ³)
542-75-6	1,3-Dichloropropylene (<i>cis</i> + <i>trans</i>)	2.10E+05
123-91-1	p-Dioxane	1.90E+05
100-41-4	Ethylbenzene	5.90E+04
76-44-8	Heptachlor	8.30E+00
118-74-1	Hexachlorobenzene	2.80E-01
77-47-4	Hexachlorocyclopentadiene	9.10E+02
67-72-1	Hexachloroethane	2.80E+03
78-59-1	Isophorone	3.40E+03
98-82-8	Isopropylbenzene (Cumene)	3.00E+04
7439-97-6	Mercury (elemental)	2.20E+01
74-83-9	Methyl bromide	8.60E+06
1634-04-4	Methyl tertiary-butyl ether	1.20E+06
75-09-2	Methylene chloride	2.00E+06
93-65-2	2-Methylnaphthalene	5.30E+02
1634-04-4	2-Methylphenol (o-cresol)	1.80E+03
91-20-3	Naphthalene	6.20E+02
98-95-3	Nitrobenzene	1.70E+03
621-64-7	n-Nitrosodi-n-propylamine	9.50E+02
108-95-2	Phenol	1.50E+03
1336-36-3	Polychlorinated biphenyls (PCBs)	9.00E+00
100-42-5	Styrene	3.40E+04
127-18-4	Tetrachloroethylene	1.80E+05
108-88-3	Toluene	1.40E+05
120-82-1	1,2,4-Trichlorobenzene	4.30E+03
71-55-6	1,1,1-Trichloroethane	8.70E+05
79-00-5	1,1,2-Trichloroethane	1.70E+05
79-01-6	Trichloroethylene	5.30E+05

CAS No.	Chemical Name	C_v^{sat} (mg/m ³)
75-69-4	Trichlorofluoromethane	6.30E+06
108-05-4	Vinyl acetate	4.30E+05
75-01-4	Vinyl chloride	1.10E+07
108-38-3	m-Xylene	5.20E+04
95-47-6	o-Xylene	4.10E+04
106-42-3	p-Xylene	5.50E+04
1330-20-7	Xylenes (total)	4.90E+04

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.APPENDIX B Tier 1 Illustrations and Tables

Section 742.Illustration A Tier 1 Evaluation



(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX B Tier 1 Illustrations and Tables

Section 742.TABLE A Tier 1 Soil Remediation Objectives^a 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 ^b	--- ^c	570 ^b	2,900	*
67-64-1	Acetone	70,000 ^b	100,000 ^d	25 ^b	25	*
15972-60-8	Alachlor ^o	8 ^e	--- ^c	0.04	0.2	NA
116-06-3	Aldicarb ^o	78 ^b	--- ^c	0.013	0.07	NA
309-00-2	Aldrin	0.04 ^e	3 ^e	0.5 ^e	2.5	0.94
120-12-7	Anthracene	23,000 ^b	--- ^c	12,000 ^b	59,000	*
1912-24-9	Atrazine ^o	2700 ^b	--- ^c	0.066	0.33	NA
71-43-2	Benzene	12 ^e	0.8 ^e	0.03	0.17	*
56-55-3	Benzo(<i>a</i>)anthracene	0.9 ^{e,w}	--- ^c	2	8	*
205-99-2	Benzo(<i>b</i>)fluoranthene	0.9 ^{e,w}	--- ^c	5	25	*

		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)
207-08-9	Benzo(<i>k</i>)fluroanthene	9 ^e	--- ^c	49	250	*
50-32-8	Benzo(<i>a</i>)pyrene	0.09 ^{e, w}	--- ^c	8	82	*
111-44-4	Bis(2-chloroethyl)ether	0.6 ^e	0.2 ^e	0.0004 ^e	0.0004	0.66
117-81-7	Bis(2-ethylhexyl)phthalate	46 ^e	31,000 ^d	3,600	31,000 ^d	*
75-27-4	Bromodichloromethane (Dichlorobromomethane)	10 ^e	3,000 ^d	0.6	0.6	*
75-25-2	Bromoform	81 ^e	53 ^e	0.8	0.8	*
71-36-3	Butanol	7,800 ^b	10,000 ^d	17 ^b	17	NA
85-68-7	Butyl benzyl phthalate	16,000 ^b	930 ^d	930 ^d	930 ^d	*
86-74-8	Carbazole	32 ^e	--- ^c	0.6 ^e	2.8	NA
1563-66-2	Carbofuran ^o	390 ^b	--- ^c	0.22	1.1	NA
75-15-0	Carbon disulfide	7,800 ^b	720 ^{d, x}	32 ^b	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 ^e	0.3 ^e	0.07	0.33	*
57-74-9	Chlordane	1.8 ^e	72 ^{e, x}	10	48	*
106-47-8	4-Chloroaniline (<i>p</i> -Chloroaniline)	310 ^b	--- ^c	0.7 ^b	0.7	*
108-90-7	Chlorobenzene (Monochlorobenzene)	1,600 ^b	130 ^{b, x}	1	6.5	*
124-48-1	Chlorodibromomethane (Dibromochloromethane)	1,600 ^b	1,300 ^d	0.4	0.4	*
67-66-3	Chloroform	100 ^e	0.3 ^e	0.6	2.9	*
218-01-9	Chrysene	88 ^e	--- ^c	160	800	*
94-75-7	2,4-D ^o	780 ^b	--- ^c	1.5	7.7	*
75-99-0	Dalapon ^o	2,300 ^b	--- ^c	0.85	8.5	*
72-54-8	DDD	3 ^e	--- ^c	16 ^e	80	*
72-55-9	DDE	2 ^e	--- ^c	54 ^e	270	*

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)
50-29-3	DDT	2 ^e	--- ^{g, x}	32 ^e	160	*
53-70-3	Dibenzo(<i>a,h</i>)anthracene	0.09 ^{e, w}	--- ^c	2	7.6	*
96-12-8	1,2-Dibromo-3-chloropropane	0.46 ^e	11 ^{b, x}	0.002	0.02	*
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	0.32 ^e	0.06 ^e	0.0004	0.004	0.005
84-74-2	Di- <i>n</i> -butyl phthalate	7,800 ^b	2,300 ^d	2,300 ^d	2,300 ^d	*
95-50-1	1,2-Dichlorobenzene (<i>o</i> -Dichlorobenzene)	7,000 ^b	560 ^{d, x}	17	43	*
106-46-7	1,4-Dichlorobenzene (<i>p</i> -Dichlorobenzene)	--- ^c	11,000 ^{b, x}	2	11	*
91-94-1	3,3'-Dichlorobenzidine	1 ^e	--- ^c	0.007 ^{e,}	0.033	1.3
75-34-3	1,1-Dichloroethane	7,800 ^b	1,300 ^{b, x}	23 ^b	110	*

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)
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	7 ^e	0.4 ^e	0.02	0.1	*
75-35-4	1,1-Dichloroethylene	3,900 ^b	290 ^{b, x}	0.06	0.3	*
156-59-2	<i>cis</i> -1,2-Dichloroethylene	780 ^b	1,200 ^d	0.4	1.1	*
156-60-5	<i>trans</i> -1,2-Dichloroethylene	1,600 ^b	3,100 ^d	0.7	3.4	*
78-87-5	1,2-Dichloropropane	9 ^e	15 ^{b, x}	0.03	0.15	*
542-75-6	1,3-Dichloropropene (1,3-Dichloropropylene, <i>cis + trans</i>)	6.4 ^e	1.1 ^{e, x}	0.004 ^e	0.02	0.005
60-57-1	Dieldrin ⁿ	0.04 ^e	1 ^e	0.004 ^e	0.02	0.603
84-66-2	Diethyl phthalate	63,000 ^b	2,000 ^d	470 ^b	470	*
105-67-9	2,4-Dimethylphenol	1,600 ^b	--- ^c	9 ^b	9	*
121-14-2	2,4-Dinitrotoluene	0.9 ^e	--- ^c	0.0008 ^e	0.0008	0.250

		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)
606-20-2	2,6-Dinitrotoluene	0.9 ^e	--- ^c	0.0007 ^e	0.0007	0.260
117-84-0	Di- <i>n</i> -octyl phthalate	1,600 ^b	10,000 ^d	10,000 ^d	10,000 ^d	*
115-29-7	Endosulfan ^o	470 ^b	--- ^c	18 ^b	90	*
145-73-3	Endothall ^o	1,600 ^b	--- ^c	0.4	0.4	NA
72-20-8	Endrin	23 ^b	--- ^c	1	5	*
100-41-4	Ethylbenzene	7,800 ^b	400 ^{d, x}	13	19	*
206-44-0	Fluoranthene	3,100 ^b	--- ^c	4,300 ^b	21,000	*
86-73-7	Fluorene	3,100 ^b	--- ^c	560 ^b	2,800	*
76-44-8	Heptachlor	0.1 ^e	0.1 ^e	23	110	0.871
1024-57-3	Heptachlor epoxide	0.07 ^e	5 ^e	0.7	3.3	1.005
118-74-1	Hexachlorobenzene	0.4 ^e	1 ^e	2	11	*
319-84-6	<i>Alpha</i> -HCH (<i>alpha</i> -BHC)	0.1 ^e	0.8 ^e	0.0005 ^e	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) ^a	0.5 ^e	--- ^{c, x}	0.009	0.047	*
77-47-4	Hexachlorocyclopentadiene	550 ^b	10 ^{b, x}	400	2,200 ^d	*
67-72-1	Hexachloroethane	78 ^b	--- ^c	0.5 ^b	2.6	*
193-39-5	Indeno(1,2,3- <i>c,d</i>)pyrene	0.9 ^{e,w}	--- ^c	14	69	*
78-59-1	Isophorone	15,600 ^b	4,600 ^d	8 ^b	8	*
72-43-5	Methoxychlor ^o	390 ^b	--- ^c	160	780	*
74-83-9	Methyl bromide (Bromomethane)	110 ^b	10 ^{b, x}	0.2 ^b	1.2	*
1634-04-4	Methyl tertiary-butyl ether	780 ^b	8,800 ^{d, x}	0.32	0.32	*
75-09-2	Methylene chloride (Dichloromethane)	85 ^e	13 ^e	0.02 ^e	0.2	*
95-48-7	2-Methylphenol (<i>o</i> - Cresol)	3,900 ^b	--- ^c	15 ^b	15	*
91-20-3	Naphthalene	1,600 ^b	170 ^{b, x}	12 ^b	18	*
98-95-3	Nitrobenzene	39 ^b	92 ^{b, x}	0.1 ^b	0.1	0.26

		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)
86-30-6	<i>N</i> -Nitrosodiphenylamine	130 ^e	--- ^c	1 ^e	5.6	*
621-64-7	<i>N</i> -Nitrosodi- <i>n</i> -propylamine	0.09 ^e	--- ^c	0.00005 ^e	0.00005	0.0018
108-95-2	Phenol	23,000 ^b	--- ^c	100 ^b	100	*
1918-02-1	Picloram ^o	5,500 ^b	--- ^c	2	20	NA
1336-36-3	Polychlorinated biphenyls (PCBs) ⁿ	1 ^h	--- ^{c,h}	--- ^h	--- ^h	*
129-00-0	Pyrene	2,300 ^b	--- ^c	4,200 ^b	21,000	*
122-34-9	Simazine ^o	390 ^b	--- ^c	0.04	0.37	NA
100-42-5	Styrene	16,000 ^b	1,500 ^{d, x}	4	18	*
127-18-4	Tetrachloroethylene (Perchloroethylene)	12 ^e	11 ^e	0.06	0.3	*
108-88-3	Toluene	16,000 ^b	650 ^{d, x}	12	29	*

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)
8001-35-2	Toxaphene ⁿ	0.6 ^e	89 ^e	31	150	*
120-82-1	1,2,4-Trichlorobenzene	780 ^b	3,200 ^{b, x}	5	53	*
71-55-6	1,1,1-Trichloroethane	--- ^c	1,200 ^d	2	9.6	*
79-00-5	1,1,2-Trichloroethane	310 ^b	1,800 ^d	0.02	0.3	*
79-01-6	Trichloroethylene	58 ^e	5 ^e	0.06	0.3	*
108-05-4	Vinyl acetate	78,000 ^b	1,000 ^{b, x}	170 ^b	170	*
75-01-4	Vinyl chloride	0.46 ^e	0.28 ^e	0.01	0.07	*
108-38-3	m-Xylene	16,000 ^b	420 ^{d, x}	210	210	*
95-47-6	o-Xylene	16,000 ^b	410 ^{d, x}	190	190	*
106-42-3	p-Xylene	16,000 ^b	460 ^{d, x}	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)	16,000 ^b	320 ^{d, x}	150	150	*
	Ionizable Organics					
65-85-0	Benzoic Acid	310,000 ^b	--- ^c	400 ^{b,i}	400 ⁱ	*
95-57-8	2-Chlorophenol	390 ^b	53,000 ^d	4 ^{b,i}	4 ⁱ	*
120-83-2	2,4-Dichlorophenol	230 ^b	--- ^c	1 ^{b,i}	1 ⁱ	*
51-28-5	2,4-Dinitrophenol	160 ^b	--- ^c	0.2 ^b	0.2	3.3
88-85-7	Dinoseb ^o	78 ^b	--- ^c	0.34 ^{b,i}	3.4 ⁱ	*
87-86-5	Pentachlorophenol	3 ^{e,j}	--- ^c	0.03 ⁱ	0.14 ⁱ	*
93-72-1	2,4,5-TP (Silvex)	630 ^b	--- ^c	11 ⁱ	55 ⁱ	*
95-95-4	2,4,5-Trichlorophenol	7,800 ^b	--- ^c	270 ^{b,i}	1,400 ⁱ	*
88-06-2	2,4,6 Trichlorophenol	58 ^e	200 ^e	0.2 ^{e, i}	0.77 ⁱ	0.66

		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/L)	Class II (mg/L)	ADL (mg/kg)
	Inorganics					
7440-36-0	Antimony	31 ^b	--- ^c	0.006 ^m	0.024 ^m	*
7440-38-2	Arsenic ^{l,n}	--- ^t	750 ^e	0.05 ^m	0.2 ^m	*
7440-39-3	Barium	5,500 ^b	690,000 ^b	2.0 ^m	2.0 ^m	*
7440-41-7	Beryllium	160 ^b	1,300 ^e	0.004 ^m	0.5 ^m	*
7440-42-8	Boron	16,000 ^b	--- ^c	2.0 ^m	2.0 ^m	*
7440-43-9	Cadmium ^{l,n}	78 ^{b, r}	1,800 ^e	0.005 ^m	0.05 ^m	*
7440-70-2	Calcium ⁿ	--- ^g	--- ^c	--- ^c	--- ^c	*
16887-00-6	Chloride	--- ^c	--- ^c	200 ^m	200 ^m	*
7440-47-3	Chromium, total	230 ^b	270 ^e	0.1 ^m	1.0 ^m	*
16065-83-1	Chromium, ion, trivalent	120,000 ^b	--- ^c	--- ^g	--- ^g	*
18540-29-9	Chromium, ion, hexavalent	230 ^b	270 ^e	---	---	*

		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/L)	Class II (mg/L)	ADL (mg/kg)
7440-48-4	Cobalt	4,700 ^b	--- ^c	1.0 ^m	1.0 ^m	*
7440-50-8	Copper ⁿ	2,900 ^b	--- ^c	0.65 ^m	0.65 ^m	*
57-12-5	Cyanide (amenable)	1,600 ^b	--- ^c	0.2 ^{q,m}	0.6 ^{q,m}	*
7782-41-4	Fluoride	4,700 ^b	--- ^c	4.0 ^m	4.0 ^m	*
15438-31-0	Iron	--- ^c	--- ^c	5.0 ^m	5.0 ^m	*
7439-92-1	Lead	400 ^k	--- ^c	0.0075 ^m	0.1 ^m	*
7439-95-4	Magnesium ⁿ	325,000	--- ^c	--- ^c	--- ^c	*
7439-96-5	Manganese	1,600 ^{b,v}	69,000 ^{b,x}	0.15 ^m	10.0 ^m	*
7439-97-6	Mercury ^{l,n,s}	23 ^b	10 ^{b,x}	0.002 ^m	0.01 ^m	*
7440-02-0	Nickel ^l	1,600 ^b	13,000 ^e	0.1 ^m	2.0 ^m	*
14797-55-8	Nitrate as N ^p	130,000 ^b	--- ^c	10.0 ^{q,m}	100 ^q	*
7723-14-0	Phosphorus ⁿ	--- ^g	--- ^c	--- ^c	--- ^c	*

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)	
7440-09-7	Potassium ⁿ	--- ^g	--- ^c	--- ^c	--- ^c	*
7782-49-2	Selenium ^{l,n}	390 ^b	--- ^c	0.05 ^m	0.05 ^m	*
7440-22-4	Silver	390 ^b	--- ^c	0.05 ^m	--- ^c	*
7440-23-5	Sodium ⁿ	--- ^g	--- ^c	--- ^c	--- ^c	*
14808-79-8	Sulfate	--- ^c	--- ^c	400 ^m	400 ^m	*
7440-28-0	Thallium	6.3 ^{b,u}	--- ^c	0.002 ^m	0.02 ^m	*
7440-62-2	Vanadium	550 ^b	--- ^c	0.049 ^m	0.1 ^m	*
7440-66-6	Zinc ^l	23,000 ^b	--- ^c	5.0 ^m	10 ^m	*

“*” 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

- ^a Soil remediation objectives based on human health criteria only.
- ^b Calculated values correspond to a target hazard quotient of 1.
- ^c No toxicity criteria available for the route of exposure.
- ^d 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.
- ^e Calculated values correspond to a cancer risk level of 1 in 1,000,000.
- ^g Chemical-specific properties are such that this route is not of concern at any soil contaminant concentration.
- ^h 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.
- ^l 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.
- ^j Ingestion soil remediation objective adjusted by a factor of 0.5 to account for dermal route.
- ^k 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.
- ^l Potential for soil-plant-human exposure.
- ^m 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; 2) where applicable, 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); or 3) the appropriate background value listed in Appendix A, Table G. 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.
- ⁿ The Agency reserves the right to evaluate the potential for remaining contaminant concentrations to pose significant threats to crops, livestock, or wildlife.
- ^o For agricultural 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.
- ^p For agricultural 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.
- ^q The TCLP extraction must be done using water at a pH of 7.0.
- ^r Value based on dietary Reference Dose.

- ^s 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). Inhalation remediation objective only applies at sites where elemental mercury is a contaminant of concern.
- ^t For the ingestion route for arsenic, see 742.Appendix A, Table G.
- ^u Value based on Reference Dose for Thallium sulfate (CAS No. 7446-18-6).
- ^v Value based on Reference Dose adjusted for dietary intake.
- ^w For sites located in any populated area as defined in Section 742.200, Appendix A, Table H may be used.
- ^x The remediation objectives for these chemicals must also include the construction worker inhalation objective in Appendix B, Table B.

(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX B Tier 1 Illustrations and Tables

Section 742.Table B Tier 1 Soil Remediation Objectives^a for Industrial/Commercial Properties

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/kg)	ClassII (mg/kg)	
		Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)			
83-32-9	Acenaphthene	120,000 ^b	----- ^c	120,000 ^b	----- ^c	570 ^b	2,900	*
67-64-1	Acetone	----- ^g	100,000 ^d	----- ^g	100,000 ^d	25 ^b	25	*
15972-60-8	Alachlor ^o	72 ^e	----- ^c	1,600 ^e	----- ^c	0.04	0.2	NA
116-06-3	Aldicarb ^o	2,000 ^b	----- ^c	200 ^b	----- ^c	0.013	0.07	NA
309-00-2	Aldrin	0.3 ^e	6.6 ^e	6.1 ^b	9.3 ^e	0.5 ^e	2.5	0.94
120-12-7	Anthracene	610,000 ^b	----- ^c	610,000 ^b	----- ^c	12,000 ^b	59,000	*
1912-24-9	Atrazine ^o	72,000 ^b	----- ^c	7,100 ^b	----- ^c	0.066	0.33	NA
71-43-2	Benzene	100 ^e	1.6 ^e	2,300 ^e	2.2 ^e	0.03	0.17	*

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

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/kg)	ClassII (mg/kg)	
		Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)			
1563-66-2	Carbofuran ^o	10,000 ^b	----- ^c	1,000 ^b	----- ^c	0.22	1.1	NA
75-15-0	Carbon disulfide	200,000 ^b	720 ^d	20,000 ^b	9.0 ^b	32 ^b	160	*
56-23-5	Carbon tetrachloride	44 ^e	0.64 ^e	410 ^b	0.90 ^e	0.07	0.33	*
57-74-9	Chlordane	16 ^e	140 ^e	100 ^b	22 ^b	10	48	*
106-47-8	4 – Chloroaniline (<i>p</i> -Chloroaniline)	8,200 ^b	----- ^c	820 ^b	----- ^c	0.7 ^b	0.7	*
108-90-7	Chlorobenzene (Monochlorobenzene)	41,000 ^b	210 ^b	4,100 ^b	1.3 ^b	1	6.5	*
124-48-1	Chlorodibromomethane (Dibromochloromethane)	41,000 ^b	1,300 ^d	41,000 ^b	1,300 ^d	0.4	0.4	*
67-66-3	Chloroform	940 ^e	0.54 ^e	2,000 ^b	0.76 ^e	0.6	2.9	*
218-01-9	Chrysene	780 ^e	----- ^c	17,000 ^e	----- ^e	160	800	*
94-75-7	2,4-D ^o	20,000 ^b	----- ^c	2,000 ^b	----- ^c	1.5	7.7	*

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/kg)	ClassII (mg/kg)	
		Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)			
75-99-0	Dalapon ^o	61,000 ^b	----- ^c	6,100 ^b	----- ^c	0.85	8.5	*
72-54-8	DDD	24 ^e	----- ^c	520 ^e	----- ^c	16 ^e	80	*
72-55-9	DDE	17 ^e	----- ^c	370 ^e	----- ^c	54 ^e	270	*
50-29-3	DDT	17 ^e	1,500 ^e	100 ^b	2,100 ^e	32 ^e	160	*
53-70-3	Dibenzo(<i>a,h</i>)anthracene	0.8 ^e	----- ^c	17 ^e	----- ^c	2	7.6	*
96-12-8	1,2-Dibromo-3-chloropropane	4 ^e	17 ^b	89 ^e	0.11 ^b	0.002	0.02	*
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	2.9 ^e	0.12 ^e	62 ^e	0.16 ^e	0.0004	0.004	0.005
84-74-2	Di- <i>n</i> -butyl phthalate	200,000 ^b	2,300 ^d	200,000 ^b	2,300 ^d	2,300 ^d	2,300 ^d	*
95-50-1	1,2-Dichlorobenzene (<i>o</i> – Dichlorobenzene)	180,000 ^b	560 ^d	18,000 ^b	310 ^b	17	43	*
106-46-7	1,4-Dichlorobenzene (<i>p</i> – Dichlorobenzene)	----- ^c	17,000 ^b	----- ^c	340 ^b	2	11	*

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	ClassII (mg/kg)	ADL (mg/kg)
91-94-1	3,3'-Dichlorobenzidine	13 ^e	----- ^c	280 ^e	----- ^c	0.007 ^e	0.033	1.3
75-34-3	1,1-Dichloroethane	200,000 ^b	1,700 ^d	200,000 ^b	130 ^b	23 ^b	110	*
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	63 ^e	0.70 ^e	1,400 ^e	0.99 ^e	0.02	0.1	*
75-35-4	1,1-Dichloroethylene	100,000 ^b	470 ^b	10,000 ^b	3.0 ^b	0.06	0.3	*
156-59-2	<i>cis</i> -1,2-Dichloroethylene	20,000 ^b	1,200 ^d	20,000 ^b	1,200 ^d	0.4	1.1	*
156-60-5	<i>Trans</i> -1,2-Dichloroethylene	41,000 ^b	3,100 ^d	41,000 ^b	3,100 ^d	0.7	3.4	*
78-87-5	1,2-Dichloropropane	84 ^e	23 ^b	1,800 ^e	0.50 ^b	0.03	0.15	*
542-75-6	1,3-Dichloropropene (1,3-Dichloropropylene, <i>cis</i> + <i>trans</i>)	57 ^e	2.1 ^e	1,200 ^e	0.39 ^b	0.004 ^e	0.02	0.005
60-57-1	Dieldrin ⁿ	0.4 ^e	2.2 ^e	7.8 ^e	3.1 ^e	0.004 ^e	0.02	0.603
84-66-2	Diethyl phthalate	1,000,000 ^b	2,000 ^d	1,000,000 ^b	2,000 ^d	470 ^b	470	*

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/kg)	ClassII (mg/kg)	
		Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)			
105-67-9	2,4-Dimethylphenol	41,000 ^b	----- ^c	41,000 ^b	----- ^c	9 ^b	9	*
121-14-2	2,4-Dinitrotoluene	8.4 ^e	----- ^c	180 ^e	----- ^c	0.0008 ^e	0.0008	0.250
606-20-2	2,6-Dinitrotoluene	8.4 ^e	----- ^c	180 ^e	----- ^c	0.0007 ^e	0.0007	0.260
117-84-0	Di- <i>n</i> -octyl phthalate	41,000 ^e	10,000 ^d	4,100 ^b	10,000 ^d	10,000 ^d	10,000 ^d	*
115-29-7	Endosulfan ^o	12,000 ^b	----- ^c	1,200 ^b	----- ^c	18 ^b	90	*
145-73-3	Endothall ^o	41,000 ^c	----- ^c	4,100 ^b	----- ^c	0.4	0.4	NA
72-20-8	Endrin	610 ^b	----- ^c	61 ^b	----- ^c	1	5	*
100-41-4	Ethylbenzene	200,000 ^b	400 ^d	20,000 ^b	58 ^b	13	19	*
206-44-0	Fluoranthene	82,000 ^b	----- ^c	82,000 ^b	----- ^c	4,300 ^b	21,000	*
86-73-7	Fluorene	82,000 ^b	----- ^c	82,000 ^b	----- ^c	560 ^b	2,800	*
76-44-8	Heptachlor	1 ^e	11 ^e	28 ^e	16 ^e	23	110	*

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

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	ClassII (mg/kg)	ADL (mg/kg)
1634-04-4	Methyl tertiary-butyl ether	20,000 ^b	8,800 ^d	2,000 ^b	140 ^b	0.32	0.32	*
75-09-2	Methylene chloride (Dichloromethane)	760 ^e	24 ^e	12,000 ^b	34 ^e	0.02 ^e	0.2	*
95-48-7	2-Methylphenol (<i>o</i> – Cresol)	100,000 ^b	----- ^c	100,000 ^b	----- ^c	15 ^b	15	*
86-30-6	<i>N</i> -Nitrosodiphenylamine	1,200 ^e	----- ^c	25,000 ^e	----- ^c	1 ^e	5.6	*
621-64-7	<i>N</i> -Nitrosodi- <i>n</i> -propylamine	0.8 ^e	----- ^c	18 ^e	----- ^c	0.00005 ^e	0.00005	0.0018
91-20-3	Naphthalene	41,000 ^b	270 ^b	4,100 ^b	1.8 ^b	12 ^b	18	*
98-95-3	Nitrobenzene	1,000 ^b	140 ^b	1,000 ^b	9.4 ^b	0.1 ^b	0.1	0.26
108-95-2	Phenol	610,000 ^b	----- ^c	61,000 ^b	----- ^c	100 ^b	100	*
1918-02-1	Picloram ^o	140,000 ^b	----- ^c	14,000 ^b	----- ^c	2	20	NA
1336-36-3	Polychlorinated biphenyls (PCBs) ⁿ	1 ^h	----- ^{c,h}	1 ^h	----- ^{c,h}	----- ^h	----- ^h	*
129-00-0	Pyrene	61,000 ^b	----- ^c	61,000 ^b	----- ^c	4,200 ^b	21,000	*

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

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	ClassII (mg/kg)	ADL (mg/kg)
75-01-4	Vinyl chloride	7.9 ^e	1.1 ^e	170 ^e	1.1 ^b	0.01	0.07	*
108-38-3	m-Xylene	410,000 ^b	420 ^d	41,000 ^b	6.4 ^b	210	210	*
95-47-6	o-Xylene	410,000 ^b	410 ^d	41,000 ^b	6.5 ^b	190	190	*
106-42-3	p-Xylene	410,000 ^b	460 ^d	41,000 ^b	5.9 ^b	200	200	*
1330-20-7	Xylenes (total)	410,000 ^b	320 ^d	41,000 ^b	5.6 ^b	150	150	*
	Ionizable Organics							
65-85-0	Benzoic Acid	1,000,000 ^b	----- ^c	820,000 ^b	----- ^c	400 ^{b,i}	400 ⁱ	*
95-57-8	2-Chlorophenol	10,000 ^b	53,000 ^d	10,000 ^b	53,000 ^d	4 ^{b,i}	20 ⁱ	*
120-83-2	2,4-Dichlorophenol	6,100 ^b	----- ^c	610 ^b	----- ^c	1 ^{b,i}	1 ⁱ	*
51-28-5	2,4-Dinitrophenol	4,100 ^b	----- ^c	410 ^b	----- ^c	0.2 ^{b,i}	0.2 ⁱ	3.3
88-85-7	Dinoseb ^o	2,000 ^b	----- ^c	200 ^b	----- ^c	0.34 ^{b,i}	3.4 ⁱ	*

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	ClassII (mg/kg)	ADL (mg/kg)
87-86-5	Pentachlorophenol	24 ^{e,j}	----- ^c	520 ^{e,j}	----- ^c	0.03 ⁱ	0.14 ⁱ	*
93-72-1	2,4,5-TP (Silvex)	16,000 ^b	----- ^c	1,600 ^b	----- ^c	11 ⁱ	55 ⁱ	*
95-95-4	2,4,5-Trichlorophenol	200,000 ^b	----- ^c	200,000 ^b	----- ^c	270 ^{b,i}	1,400 ⁱ	*
88-06-2	2,4,6- Trichlorophenol	520 ^e	390 ^e	11,000 ^e	540 ^e	0.2 ^{e,i}	0.77 ⁱ	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)			
	Inorganics							
7440-36-0	Antimony	820 ^b	----- ^c	82 ^b	----- ^c	0.006 ^m	0.024 ^m	*
7440-38-2	Arsenic ^{l,n}	--- ^t	1,200 ^e	61 ^b	25,000 ^e	0.05 ^m	0.2 ^m	*
7440-39-3	Barium	140,000 ^b	910,000 ^b	14,000 ^b	870,000 ^b	2.0 ^m	2.0 ^m	*
7440-41-7	Beryllium	4,100 ^b	2,100 ^e	410 ^b	44,000 ^e	0.004 ^m	0.5 ^m	*
7440-42-8	Boron	410,000 ^b	--- ^c	41,000 ^b	--- ^c	2.0 ^m	2.0 ^m	*
7440-43-9	Cadmium ^{l,n}	2,000 ^{b,r}	2,800 ^e	200 ^{b,r}	59,000 ^e	0.005 ^m	0.05 ^m	*
7440-70-2	Calcium ⁿ	--- ^g	--- ^c	--- ^g	--- ^c	--- ^c	--- ^c	*
16887-00-6	Chloride	----- ^c	----- ^c	----- ^c	----- ^c	200 ^m	200 ^m	*
7440-47-3	Chromium, total	6,100 ^b	420 ^e	4,100 ^b	690 ^b	0.1 ^m	1.0 ^m	*
16065-83-1	Chromium, ion, trivalent	1,000,000 ^b	----- ^c	310,000 ^b	----- ^c	----- ^g	----- ^g	*
18540-29-9	Chromium, ion, hexavalent	6,100 ^b	420 ^e	4,100 ^b	690 ^b	-----	-----	*

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 ^b	----- ^c	12,000 ^b	----- ^c	1.0 ^m	1.0 ^m	*
7440-50-8	Copper ⁿ	82,000 ^b	----- ^c	8,200 ^b	----- ^c	0.65 ^m	0.65 ^m	*
57-12-5	Cyanide (amenable)	41,000 ^b	----- ^c	4,100 ^b	----- ^c	0.2 ^{q,m}	0.6 ^{q,m}	*
7782-41-4	Fluoride	120,000 ^b	----- ^c	12,000 ^b	----- ^c	4.0 ^m	4.0 ^m	*
15438-31-0	Iron	----- ^c	----- ^c	----- ^c	----- ^c	5.0 ^m	5.0 ^m	*
7439-92-1	Lead	800 ^y	----- ^c	700 ^y	----- ^c	0.0075 ^m	0.1 ^m	*
7439-95-4	Magnesium ⁿ	--- ^g	--- ^c	730,000	--- ^c	--- ^c	--- ^c	*
7439-96-5	Manganese	41,000 ^{b,w}	91,000 ^b	4,100 ^{b,w}	8,700 ^b	0.15 ^m	10.0 ^m	*
7439-97-6	Mercury ^{l,n,s}	610 ^b	16 ^b	61 ^b	0.1 ^b	0.002 ^m	0.01 ^m	*
7440-02-0	Nickel ^l	41,000 ^b	21,000 ^e	4,100 ^b	440,000 ^e	0.1 ^m	2.0 ^m	*
14797-55-8	Nitrate as N ^p	1,000,000 ^b	----- ^c	330,000 ^b	----- ^c	10.0 ^{q,m}	100 ^q	*
7723-14-0	Phosphorus ⁿ	--- ^g	--- ^c	--- ^g	--- ^c	--- ^c	--- ^c	*

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)			
7440-09-7	Potassium ⁿ	--- ^g	--- ^c	--- ^g	--- ^c	--- ^c	--- ^c	*
7782-49-2	Selenium ^{l,n}	10,000 ^b	---- ^c	1,000 ^b	---- ^c	0.05 ^m	0.05 ^m	*
7440-22-4	Silver	10,000 ^b	---- ^c	1,000 ^b	---- ^c	0.05 ^m	----	*
7440-23-5	Sodium ⁿ	--- ^g	--- ^c	--- ^g	--- ^c	--- ^c	--- ^c	*
14808-79-8	Sulfate	---- ^c	---- ^c	---- ^c	---- ^c	400 ^m	400 ^m	*
7440-28-0	Thallium	160 ^{b,u}	---- ^c	160 ^{b,u}	---- ^c	0.002 ^m	0.02 ^m	*
7440-62-2	Vanadium	14,000 ^b	---- ^c	1,400 ^b	---- ^c	0.049 ^m	0.1 ^m	*
7440-66-6	Zinc ^l	610,000 ^b	---- ^c	61,000 ^b	---- ^c	5.0 ^m	10 ^m	*

“*” 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)

^a oil remediation objectives based on human health criteria only.

^b Calculated values correspond to a target hazard quotient of 1.

^c No toxicity criteria available for this route of exposure.

- ^d 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.
- ^e Calculated values correspond to a cancer risk level of 1 in 1,000,000.
- ^g Chemical-specific properties are such that this route is not of concern at any soil contaminant concentration.
- ^h 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.
- ⁱ 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.
- ^j Ingestion soil remediation objective adjusted by a factor of 0.5 to account for dermal route.
- ^l Potential for soil-plant-human exposure.
- ^m 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; (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); or (3) the appropriate background value listed in Appendix A, Table G. 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.
- ⁿ The Agency reserves the right to evaluate the potential for remaining contaminant concentrations to pose significant threats to crops, livestock, or wildlife.
- ^o For agricultural 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.
- ^p For agricultural 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.
- ^q The TCLP extraction must be done using water at a pH of 7.0.
- ^r Value based on dietary Reference Dose.
- ^s 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). Inhalation remediation objective only applies at sites where elemental mercury is a contaminant of concern.
- ^t For the ingestion route for arsenic for industrial/commercial, see 742.Appendix A, Table G.
- ^u Value based on Reference Dose for Thallium sulfate (CAS No. 7446-18-6).
- ^w Value based on Reference Dose adjusted for dietary intake.
- ^x For any populated areas as defined in Section 742.200, Appendix A, Table H may be used.

^y Value based on maintaining fetal blood lead below 10 ug/dl, using the USEPA adults Blood Lead Model.

(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX B Tier 1 Illustrations and Tables

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
Inorganics											
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	a	a
Beryllium	1.1	2.1	3.4	6.6	22	63	140	1,000	8,000	a	a
Cadmium	1.0	1.7	2.7	3.7	5.2	7.5	11	59	430	a	a
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	a	a
Cyanide	40	40	40	40	40	40	40	40	40	40	40
Lead	23	23	23	23	107	107	107	107	107	107	282
Mercury	0.01	0.01`	0.03	0.15	0.89	2.1	3.3	6.4	8.0	a	a
Nickel	20	36	56	76	100	130	180	700	3,800	a	a
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	a	a

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	— ^a	— ^a
Organics											
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

^a No data available for this pH range.

(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX B Tier 1 Illustrations and Tables

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
Inorganics											
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	a	a
Beryllium	140	260	420	820	2,800	7,900	17,000	130,000	1,000,000	a	a
Cadmium	10	17	27	37	52	75	110	590	4,300	a	a
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	a	a
Cyanide	120	120	120	120	120	120	120	120	120	120	120
Lead	300	300	300	300	1,420	1,420	1,420	1,420	1,420	1,420	3,760
Mercury	0.05	0.06	0.14	0.75	4.4	10	16	32	40	a	a
Nickel	400	730	1,100	1,500	2,000	2,600	3,500	14,000	76,000	a	a
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

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
Zinc	2,000	3,600	5,200	7,200	10,000	12,000	15,000	32,000	110,000	a	a
Organics											
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

^a No data available for this pH range.

(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX B Tier 1 Illustrations and Tables

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

CAS No.	Chemical Name Organics	Groundwater Remediation Objective	
		Class I (mg/L)	Class II (mg/L)
83-32-9	Acenaphthene	0.42	2.1
67-64-1	Acetone	6.3	6.3
15972-60-8	Alachlor	0.002 ^c	0.01 ^c
116-06-3	Aldicarb	0.003 ^c	0.015 ^c
309-00-2	Aldrin	0.014 ^a	0.07
120-12-7	Anthracene	2.1	10.5
1912-24-9	Atrazine	0.003 ^c	0.015 ^c
71-43-2	Benzene	0.005 ^c	0.025 ^c
56-55-3	Benzo(<i>a</i>)anthracene	0.00013 ^a	0.00065
205-99-2	Benzo(<i>b</i>)fluoranthene	0.00018 ^a	0.0009
207-08-9	Benzo(<i>k</i>)fluoroanthene	0.00017 ^a	0.00085
50-32-8	Benzo(<i>a</i>)pyrene	0.0002 ^{a,c}	0.002 ^c
65-85-0	Benzoic Acid	28	28
111-44-4	Bis(2-chloroethyl)ether	0.01 ^a	0.01
117-81-7	Bis(2-ethylhexyl)phthalate (Di(2-ethylhexyl)phthalate)	0.006 ^c	0.06 ^c
75-27-4	Bromodichloromethane (Dichlorobromomethane)	0.0002 ^a	0.0002
75-25-2	Bromoform	0.001 ^a	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 ^c	0.2 ^c
75-15-0	Carbon disulfide	0.7	3.5
56-23-5	Carbon tetrachloride	0.005 ^c	0.025 ^c
57-74-9	Chlordane	0.002 ^c	0.01 ^c

CAS No.	Chemical Name	Groundwater Remediation Objective	
		Class I (mg/L)	Class II (mg/L)
106-47-8	4-Chloroaniline (<i>p</i> -Chloroaniline)	0.028	0.028
108-90-7	Chlorobenzene (Monochlorobenzene)	0.1 ^c	0.5 ^c
124-48-1	Chlorodibromomethane (Dibromochloromethane)	0.14	0.14
67-66-3	Chloroform	0.0002 ^a	0.001
95-57-8	2-Chlorophenol (pH 4.9-7.3)	0.035	0.175
	2-Chlorophenol (pH 7.4-8.0)	0.035	0.035
218-01-9	Chrysene	0.0015 ^a	0.0075
94-75-7	2,4-D	0.07 ^c	0.35 ^c
75-99-0	Dalapon	0.2 ^c	2.0 ^c
72-54-8	DDD	0.014 ^a	0.07
72-55-9	DDE	0.01 ^a	0.05
50-29-3	DDT	0.006 ^a	0.03
53-70-3	Dibenzo(<i>a,h</i>)anthracene	0.0003 ^a	0.0015
96-12-8	1,2-Dibromo-3-chloropropane	0.0002 ^c	0.002 ^c
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	0.00005 ^c	0.0005 ^c
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 ^c	1.5 ^c
106-46-7	1,4-Dichlorobenzene (<i>p</i> -Dichlorobenzene)	0.075 ^c	0.375 ^c
91-94-1	3,3'-Dichlorobenzidine	0.02 ^a	0.1
75-34-3	1,1-Dichloroethane	0.7	3.5
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	0.005 ^c	0.025 ^c
75-35-4	1,1-Dichloroethylene ^b	0.007 ^c	0.035 ^c
156-59-2	<i>cis</i> -1,2-Dichloroethylene	0.07 ^c	0.2 ^c
156-60-5	<i>trans</i> -1,2-Dichloroethylene	0.1 ^c	0.5 ^c
120-83-2	2,4-Dichlorophenol	0.021	0.021

78-87-5	1,2-Dichloropropane	0.005 ^c	0.025 ^c
542-75-6	1,3-Dichloropropene (1,3-Dichloropropylene, <i>cis</i> + <i>trans</i>)	0.001 ^a	0.005

CAS No.	Chemical Name	Groundwater Remediation Objective	
		Class I (mg/L)	Class II (mg/L)
60-57-1	Dieldrin	0.009 ^a	0.045
84-66-2	Diethyl phthalate	5.6	5.6
105-67-9	2,4-Dimethylphenol	0.14	0.14
51-28-5	2,4-Dinitrophenol	0.014	0.014
121-14-2	2,4-Dinitrotoluene	0.00002 ^a	0.00002
606-20-2	2,6-Dinitrotoluene	0.00031 ^a	0.00031
88-85-7	Dinoseb	0.007 ^c	0.07 ^c
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 ^c	0.1 ^c
72-20-8	Endrin	0.002 ^c	0.01 ^c
100-41-4	Ethylbenzene	0.7 ^c	1.0 ^c
206-44-0	Fluoranthene	0.28	1.4
86-73-7	Fluorene	0.28	1.4
76-44-8	Heptachlor	0.0004 ^c	0.002 ^c
1024-57-3	Heptachlor epoxide	0.0002 ^c	0.001 ^c
118-74-1	Hexachlorobenzene	0.00006 ^a	0.0003
319-84-6	<i>alpha</i> -HCH (<i>alpha</i> -BHC)	0.00011 ^a	0.00055
58-89-9	<i>Gamma</i> -HCH (Lindane)	0.0002 ^c	0.001 ^c
77-47-4	Hexachlorocyclopentadiene	0.05 ^c	0.5 ^c
67-72-1	Hexachloroethane	0.007	0.035
193-39-5	Indeno(1,2,3- <i>c,d</i>)pyrene	0.00043 ^a	0.00215
78-59-1	Isophorone	1.4	1.4
72-43-5	Methoxychlor	0.04 ^c	0.2 ^c
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 ^c	0.05 ^c
95-48-7	2-Methylphenol (<i>o</i> -Cresol)	0.35	0.35
91-20-3	Naphthalene	0.14	0.22

98-95-3	Nitrobenzene ^b	0.0035	0.0035
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CAS No.	Chemical Name	Groundwater Remediation Objective	
		Class I (mg/L)	Class II (mg/L)
86-30-6	<i>N</i> -Nitrosodiphenylamine	0.0032 ^a	0.016
621-64-7	<i>N</i> -Nitrosodi- <i>n</i> -propylamine	0.0018 ^a	0.0018
87-86-5	Pentachlorophenol	0.001 ^c	0.005 ^c
108-95-2	Phenol	0.1 ^c	0.1 ^c
1918-02-1	Picloram	0.5 ^c	5.0 ^c
1336-36-3	Polychlorinated biphenyls (PCBs)	0.0005 ^c	0.0025 ^c
129-00-0	Pyrene	0.21	1.05
122-34-9	Simazine	0.004 ^c	0.04 ^c
100-42-5	Styrene	0.1 ^c	0.5 ^c
93-72-1	2,4,5-TP (Silvex)	0.05 ^c	0.25 ^c
127-18-4	Tetrachloroethylene (Perchloroethylene)	0.005 ^c	0.025 ^c
108-88-3	Toluene	1.0 ^c	2.5 ^c
8001-35-2	Toxaphene	0.003 ^c	0.015 ^c
120-82-1	1,2,4-Trichlorobenzene	0.07 ^c	0.7 ^c
71-55-6	1,1,1-Trichloroethane ^b	0.2 ^c	1.0 ^c
79-00-5	1,1,2-Trichloroethane	0.005 ^c	0.05 ^c
79-01-6	Trichloroethylene	0.005 ^c	0.025 ^c
95-95-4	2,4,5-Trichlorophenol (pH 4.9- 7.8)	0.7	3.5
	2,4,5-Trichlorophenol (pH 7.9- 8.0)	0.7	0.7
88-06-2	2,4,6-Trichlorophenol (pH 4.9- 6.8)	0.01 ^a	0.05
	2,4,6-Trichlorophenol (pH 6.9- 8.0)	0.01	0.01
108-05-4	Vinyl acetate	7.0	7.0
75-01-4	Vinyl chloride	0.002 ^c	0.01 ^c
1330-20-7	Xylenes (total)	10.0 ^c	10.0 ^c

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		Groundwater Remediation Objective	
CAS No.	Chemical Name	Class I (mg/L)	Class II (mg/L)
	Inorganics		
7440-36-0	Antimony	0.006 ^c	0.024 ^c
7440-38-2	Arsenic	0.05 ^c	0.2 ^c
7440-39-3	Barium	2.0 ^c	2.0 ^c
7440-41-7	Beryllium	0.004 ^c	0.5 ^c
7440-42-8	Boron	2.0 ^c	2.0 ^c
7440-43-9	Cadmium	0.005 ^c	0.05 ^c
7440-70-2	Calcium	--- ^d	--- ^d
16887-00-6	Chloride	200 ^c	200 ^c
7440-47-3	Chromium, total	0.1 ^c	1.0 ^c
18540-29-9	Chromium, ion, hexavalent	---	---
7440-48-4	Cobalt	1.0 ^c	1.0 ^c
7440-50-8	Copper	0.65 ^c	0.65 ^c
57-12-5	Cyanide	0.2 ^c	0.6 ^c
7782-41-4	Fluoride	4.0 ^c	4.0 ^c
15438-31-0	Iron	5.0 ^c	5.0 ^c
7439-92-1	Lead	0.0075 ^c	0.1 ^c
7439-95-4	Magnesium	--- ^d	--- ^d
7439-96-5	Manganese	0.15 ^c	10.0 ^c
7439-97-6	Mercury	0.002 ^c	0.01 ^c
7440-02-0	Nickel	0.1 ^c	2.0 ^c
14797-55-8	Nitrate as N	10.0 ^c	100 ^c
7723-14-0	Phosphorus	--- ^d	--- ^d
7440-09-7	Potassium	--- ^d	--- ^d
7782-49-2	Selenium	0.05 ^c	0.05 ^c

CAS No.	Chemical Name	Groundwater Remediation Objective	
		Class I (mg/L)	Class II (mg/L)
7440-22-4	Silver	0.05 ^c	---
7440-23-5	Sodium	--- ^d	--- ^d
14808-79-8	Sulfate	400 ^c	400 ^c
7440-28-0	Thallium	0.002 ^c	0.02 ^c
7440-62-2	Vanadium ^b	0.049	0.1
7440-66-6	Zinc	5.0 ^c	10 ^c

Chemical Name and Groundwater Remediation Objective Notations

- ^a The groundwater remediation objective is equal to the ADL for carcinogens according to the procedures specified in 35 Ill. Adm. Code 620.
- ^b Oral Reference Dose and/or Reference Concentration under review by USEPA. Listed values subject to change.
- ^c 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.
- ^d This chemical is included in the Total Dissolved Solids (TDS) Groundwater Quality Standard of 1,200 mg/l 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 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX B Tier 1 Illustrations and Tables

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 Organics	GW _{obj} Concentration used to Calculate Tier 1 Soil Remediation Objectives ^a	
		Class I (mg/L)	Class II (mg/L)
83-32-9	Acenaphthene	2.0 ^b	10
67-64-1	Acetone	6.3	6.3
15972-60-8	Alachlor	0.002 ^c	0.01 ^c
116-06-3	Aldicarb	0.003 ^c	0.015 ^c
309-00-2	Aldrin	5.0E-6 ^b	2.5E-5
120-12-7	Anthracene	10 ^b	50
1912-24-9	Atrazine	0.003 ^c	0.015 ^c
71-43-2	Benzene	0.005 ^c	0.025 ^c
56-55-3	Benzo(<i>a</i>)anthracene	0.0001 ^b	0.0005
205-99-2	Benzo(<i>b</i>)fluoranthene	0.0001 ^b	0.0005
207-08-9	Benzo(<i>k</i>)fluroanthene	0.001 ^b	0.005
50-32-8	Benzo(<i>a</i>)pyrene	0.0002 ^{a,c}	0.002 ^c
65-85-0	Benzoic Acid	100 ^b	100
111-44-4	Bis(2-chloroethyl)ether	8.0E-5 ^b	8.0E-5
117-81-7	Bis(2-ethylhexyl)phthalate (Di(2-ethylhexyl)phthalate)	0.006 ^{a,c}	0.06 ^c
75-27-4	Bromodichloromethane (Dichlorobromomethane)	0.1 ^b	0.1
75-25-2	Bromoform	0.1 ^b	0.01
71-36-3	Butanol	4.0 ^b	4.0
85-68-7	Butyl benzyl phthalate	7.0 ^b	35
86-74-8	Carbazole	0.004 ^b	0.02
1563-66-2	Carbofuran	0.04 ^c	0.2 ^c
75-15-0	Carbon disulfide	4.0 ^b	20
56-23-5	Carbon tetrachloride	0.005 ^c	0.025 ^c
57-74-9	Chlordane	0.002 ^c	0.01 ^c

CAS No.	Chemical Name	GW _{obj} Concentration used to Calculate Tier 1 Soil Remediation Objectives ^a	
		Class I (mg/L)	Class II (mg/L)
106-47-8	4-Chloroaniline (<i>p</i> -Chloroaniline)	0.1 ^b	0.1
108-90-7	Chlorobenzene (Monochlorobenzene)	0.1 ^c	0.5 ^c
124-48-1	Chlorodibromomethane (Dibromochloromethane)	0.06 ^b	0.06
67-66-3	Chloroform	0.1 ^b	0.5
95-57-8	2-Chlorophenol (pH 4.9-7.3)	0.2 ^b	1.0
	2-Chlorophenol (pH 7.4-8.0)	0.2	0.2
218-01-9	Chrysene	0.1 ^b	0.05
94-75-7	2,4-D	0.07 ^c	0.35 ^c
75-99-0	Dalapon	0.2 ^c	2.0 ^c
72-54-8	DDD	0.0004 ^b	0.002
72-55-9	DDE	0.0003 ^b	0.0015
50-29-3	DDT	0.0003 ^b	0.0015
53-70-3	Dibenzo(<i>a,h</i>)anthracene	1.0E-5 ^b	5.0E-5
96-12-8	1,2-Dibromo-3-chloropropane	0.0002 ^c	0.002 ^c
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	0.00005 ^{a,c}	0.0005 ^c
84-74-2	Di- <i>n</i> -butyl phthalate	4.0 ^b	20
95-50-1	1,2-Dichlorobenzene (<i>o</i> -Dichlorobenzene)	0.6 ^c	1.5 ^c
106-46-7	1,4-Dichlorobenzene (<i>p</i> -Dichlorobenzene)	0.075 ^c	0.375 ^c
91-94-1	3,3'-Dichlorobenzidine	0.0002 ^b	0.001
75-34-3	1,1-Dichloroethane	4.0 ^b	20
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	0.005 ^c	0.025 ^c
75-35-4	1,1-Dichloroethylene	0.007 ^c	0.035 ^c
156-59-2	<i>cis</i> -1,2-Dichloroethylene	0.07 ^c	0.2 ^c
156-60-5	<i>trans</i> -1,2-Dichloroethylene	0.1 ^c	0.5 ^c

120-83-2	2,4-Dichlorophenol	0.1 ^b	0.1
78-97-5	1,2-Dichloropropane	0.005 ^c	0.025 ^c
542-75-6	1,3-Dichloropropene (1,3-Dichloropropylene, <i>cis</i> + <i>trans</i>)	0.0005 ^b	0.0025

CAS No.	Chemical Name	GW _{obj} Concentration used to Calculate Tier 1 Soil Remediation Objectives ^a	
		Class I (mg/L)	Class II (mg/L)
60-57-1	Dieldrin	5.0E-6 ^b	2.5E-5
84-66-2	Diethyl phthalate	30 ^b	30
105-67-9	2,4-Dimethylphenol	0.7 ^b	0.7
51-28-5	2,4-Dinitrophenol	0.04 ^b	0.04
121-14-2	2,4-Dinitrotoluene	0.0001 ^b	0.0001
606-20-2	2,6-Dinitrotoluene	0.0001	0.0001
88-85-7	Dinoseb	0.007 ^c	0.07 ^c
117-84-0	Di- <i>n</i> -octyl phthalate	0.7 ^b	3.5
115-29-7	Endosulfan	0.2 ^b	1.0
145-73-3	Endothall	0.1 ^c	0.1 ^c
72-20-8	Endrin	0.002 ^c	0.01 ^c
100-41-4	Ethylbenzene	0.7 ^c	1.0 ^c
206-44-0	Fluoranthene	1.0 ^b	5.0
86-73-7	Fluorene	1.0 ^b	5.0
76-44-8	Heptachlor	0.0004 ^c	0.002 ^c
1024-57-3	Heptachlor epoxide	0.0002 ^c	0.001 ^c
118-74-1	Hexachlorobenzene	0.001 ^b	0.005
319-84-6	<i>alpha</i> -HCH (<i>alpha</i> -BHC)	1.0E-5 ^b	5.0E-5
58-89-9	<i>Gamma</i> -HCH (Lindane)	0.0002 ^c	0.001 ^c
77-47-4	Hexachlorocyclopentadiene	0.05 ^c	0.5 ^c
67-72-1	Hexachloroethane	0.007	0.035
193-39-5	Indeno(1,2,3- <i>c,d</i>)pyrene	0.0001 ^b	0.0005
78-59-1	Isophorone	1.4	1.4
72-43-5	Methoxychlor	0.04 ^c	0.2 ^c
74-83-9	Methyl bromide (Bromomethane)	0.05 ^b	0.25
1634-04-4	Methyl tertiary-butyl ether	0.07	0.07
75-09-2	Methylene chloride (Dichloromethane)	0.005 ^c	0.05 ^c
95-48-7	2-Methylphenol (<i>o</i> -Cresol)	2.0 ^b	2.0

91-20-3	Naphthalene	0.14	0.22
98-95-3	Nitrobenzene	0.02 ^b	0.02

CAS No.	Chemical Name	GW _{obj} Concentration used to Calculate Tier 1 Soil Remediation Objectives ^a	
		Class I (mg/L)	Class II (mg/L)
86-30-6	<i>N</i> -Nitrosodiphenylamine	0.02 ^b	0.1
621-64-7	<i>N</i> -Nitrosodi- <i>n</i> -propylamine	1.0E-5 ^b	1.0E-5
87-86-5	Pentachlorophenol	0.001 ^{a,c}	0.005 ^c
108-95-2	Phenol	0.1 ^c	0.1 ^c
1918-02-1	Picloram	0.5 ^c	5.0 ^c
1336-36-3	Polychlorinated biphenyls (PCBs)	---	---
129-00-0	Pyrene	1.0 ^b	5.0
122-34-9	Simazine	0.004 ^c	0.04 ^c
100-42-5	Styrene	0.1 ^c	0.5 ^c
93-72-1	2,4,5-TP (Silvex)	0.05 ^c	0.25 ^c
127-18-4	Tetrachloroethylene (Perchloroethylene)	0.005 ^c	0.025 ^c
108-88-3	Toluene	1.0 ^c	2.5 ^c
8001-35-2	Toxaphene	0.003 ^c	0.015 ^c
120-82-1	1,2,4-Trichlorobenzene	0.07 ^c	0.7 ^c
71-55-6	1,1,1-Trichloroethane	0.2 ^c	1.0 ^c
79-00-5	1,1,2-Trichloroethane	0.005 ^c	0.05 ^c
79-01-6	Trichloroethylene	0.005 ^c	0.025 ^c
95-95-4	2,4,5-Trichlorophenol (pH 4.9-7.8)	4.0 ^b	20
	2,4,5-Trichlorophenol (pH 7.9-8.0)	4.0	4.0
88-06-2	2,4,6-Trichlorophenol (pH 4.9-6.8)	0.008 ^b	0.04
	2,4,6-Trichlorophenol (pH 6.9-8.0)	0.008	0.008
108-05-4	Vinyl acetate	40 ^b	40
75-01-4	Vinyl chloride	0.002 ^c	0.01 ^c
1330-20-7	Xylenes (total)	10.0 ^c	10.0 ^c

CAS No.	Chemical Name	GW _{obj} Concentration used to Calculate Tier 1 Soil Remediation Objectives ^a	
		Class I (mg/L)	Class II (mg/L)
	Inorganics		
7440-36-0	Antimony	0.006 ^c	0.024 ^c
7440-38-2	Arsenic	0.05 ^c	0.2 ^c
7440-39-3	Barium	2.0 ^c	2.0 ^c
7440-41-7	Beryllium	0.004 ^c	0.5 ^c
7440-42-8	Boron	2.0 ^c	2.0 ^c
7440-43-9	Cadmium	0.005 ^c	0.05 ^c
7440-70-2	Calcium	---	---
16887-00-6	Chloride	200 ^c	200 ^c
7440-47-3	Chromium, total	0.1 ^c	1.0 ^c
18540-29-9	Chromium, ion, hexavalent	---	---
7440-48-4	Cobalt	1.0 ^c	1.0 ^c
7440-50-8	Copper	0.65 ^c	0.65 ^c
57-12-5	Cyanide	0.2 ^c	0.6 ^c
7782-41-4	Fluoride	4.0 ^c	4.0 ^c
15438-31-0	Iron	5.0 ^c	5.0 ^c
7439-92-1	Lead	0.0075 ^c	0.1 ^c
7439-95-4	Magnesium	---	---
7439-96-5	Manganese	0.15 ^c	10.0 ^c
7439-97-6	Mercury	0.002 ^c	0.01 ^c
7440-02-0	Nickel	0.1 ^c	2.0 ^c
14797-55-8	Nitrate as N	10.0 ^c	100 ^c

CAS No.	Chemical Name	GW _{obj} Concentration used to Calculate Tier 1 Soil Remediation Objectives ^a	
		Class I (mg/L)	Class II (mg/L)
7723-14-0	Phosphorus	---	---
7440-09-7	Potassium	---	---
7782-49-2	Selenium	0.05 ^c	0.05 ^c
7440-22-4	Silver	0.05 ^c	---
7440-23-5	Sodium	---	---
14808-79-8	Sulfate	400 ^c	400 ^c
7440-28-0	Thallium	0.002 ^c	0.02 ^c
7440-62-2	Vanadium	0.049	0.1
7440-66-6	Zinc	5.0 ^c	10 ^c

Chemical Name and Groundwater Remediation Objective Notations

- ^a 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: $C_w = DF \times GW_{obj}$.
- ^b 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_{obj} 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.
- ^c 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 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX B: Tier 1 Illustrations and Tables

Section 742.TABLE G: Tier 1 Soil Gas Remediation Objectives for the Outdoor Inhalation Exposure Route^a

CAS No.	Chemical Name	Residential (mg/m ³)	Industrial/Commercial (mg/m ³)	Construction Worker (mg/m ³)
67-64-1	Acetone	750,000 ^c	750,000 ^e	750,000 ^e
71-43-2	Benzene	420 ^c	800 ^c	1,100 ^c
111-44-4	Bis(2-chloroethyl)ether	1.3 ^c	2.4 ^c	3.4 ^c
75-27-4	Bromodichloromethane	450,000 ^e	450,000 ^e	450,000 ^e
75-25-2	Bromoform	1,800 ^c	3,500 ^c	4,900 ^c
71-36-3	Butanol	29,000 ^e	29,000 ^e	29,000 ^e
78-93-3	2-Butanone (MEK)	380,000 ^e	380,000 ^e	15,000 ^b
75-15-0	Carbon disulfide	1,500,000 ^e	1,500,000 ^e	48,000 ^b
56-23-5	Carbon tetrachloride	290 ^c	550 ^c	770 ^c
108-90-7	Chlorobenzene	36,000 ^b	57,000 ^b	3,700 ^b
124-48-1	Chlorodibromomethane	57,000 ^e	57,000 ^e	150 ^b
67-66-3	Chloroform	110 ^c	200 ^c	290 ^c
95-57-8	2-Chlorophenol	17,000 ^e	17,000 ^e	17,000 ^e
75-99-0	Dalapon	1,500 ^e	1,500 ^e	1,500 ^e
96-12-8	1,2-Dibromo-3-chloropropane	0.14 ^c	0.27 ^c	0.38 ^c
106-93-4	1,2-Dibromoethane	2.9 ^c	5.6 ^c	7.9 ^c
95-50-1	1,2-Dichlorobenzene	11,000 ^e	11,000 ^e	6,700 ^b
106-46-7	1,4-Dichlorobenzene	8,400 ^e	8,400 ^e	6,400 ^b
75-71-8	Dichlorodifluoromethane	890,000 ^b	1,400,000 ^b	92,000 ^b
75-34-3	1,1-Dichloroethane	870,000 ^b	1,300,000 ^e	90,000 ^b
107-06-2	1,2-Dichloroethane	67 ^c	130 ^c	180 ^c
75-35-4	1,1-Dichloroethylene	520,000 ^b	820,000 ^b	5,300 ^b

CAS No.	Chemical Name	Residential (mg/m ³)	Industrial/Commercial (mg/m ³)	Construction Worker (mg/m ³)
156-59-2	<i>cis</i> -1,2-Dichloroethylene	1,100,000 ^c	1,100,000 ^c	1,100,000 ^c
156-60-5	<i>trans</i> -1,2-Dichloroethylene	120,000 ^b	190,000 ^b	12,000 ^b
78-87-5	1,2-Dichloropropane	240 ^c	470 ^c	110 ^c
542-75-6	1,3-Dichloropropylene (<i>cis</i> + <i>trans</i>)	1,900 ^c	3,700 ^c	1,400 ^c
123-91-1	p-Dioxane	16 ^c	30 ^c	42 ^c
100-41-4	Ethylbenzene	59,000 ^e	59,000 ^e	8,500 ^b
76-44-8	Heptachlor	0.40 ^c	0.76 ^c	1.1 ^c
118-74-1	Hexachlorobenzene	0.26 ^c	0.28 ^e	0.28 ^e
77-47-4	Hexachlorocyclopentadiene	85 ^b	140 ^b	440 ^b
67-72-1	Hexachloroethane	2,800 ^e	2,800 ^e	2,800 ^e
78-59-1	Isophorone	3,400 ^e	3,400 ^e	1,500 ^b
98-82-8	Isopropylbenzene (Cumene)	30,000 ^e	30,000 ^e	30,000 ^e
7439-97-6	Mercury ^f	22 ^e	22 ^e	0.62 ^b
74-83-9	Methyl bromide	12,000 ^b	19,000 ^b	2,400 ^b
1634-04-4	Methyl tertiary-butyl ether	1,200,000 ^e	1,200,000 ^e	23,000 ^b
75-09-2	Methylene chloride	6,100 ^c	12,000 ^c	5,100 ^b
91-57-6	2-Methylnaphthalene	530 ^e	530 ^e	530 ^e
95-48-7	2-Methylphenol (<i>o</i> -cresol)	1,800 ^e	1,800 ^e	410 ^b
91-20-3	Naphthalene	560 ^b	620 ^e	5.8 ^b
98-95-3	Nitrobenzene	6.5 ^c	12 ^c	10 ^b
621-64-7	n-Nitrosodi-n-propylamine	0.056 ^c	0.11 ^c	0.15 ^c
108-95-2	Phenol	1,500 ^e	1,500 ^e	79 ^b
1336-36-3	Polychlorinated biphenyls (PCBs)	--- ^d	--- ^d	--- ^d
100-42-5	Styrene	34,000 ^e	34,000 ^e	16,000 ^b
127-18-4	Tetrachloroethylene	360 ^c	690 ^c	970 ^c
108-88-3	Toluene	140,000 ^e	140,000 ^e	50,000 ^b
120-82-1	1,2,4-Trichlorobenzene	1,000 ^b	1,600 ^b	110 ^b
71-55-6	1,1,1-Trichloroethane	870,000 ^e	870,000 ^e	89,000 ^b

CAS No.	Chemical Name	Residential (mg/m ³)	Industrial/Commercial (mg/m ³)	Construction Worker (mg/m ³)
79-00-5	1,1,2-Trichloroethane	170,000 ^e	170,000 ^e	170,000 ^e
79-01-6	Trichloroethylene	1,700 ^c	3,300 ^c	1,500 ^b
75-69-4	Trichlorofluoromethane	2,100,000 ^b	3,400,000 ^b	220,000 ^b
108-05-4	Vinyl acetate	160,000 ^b	250,000 ^b	1,600 ^b
75-01-4	Vinyl chloride	780 ^c	3,000 ^c	3,000 ^b
108-38-3	m-Xylene	52,000 ^e	52,000 ^e	3,100 ^b
95-47-6	o-Xylene	41,000 ^e	41,000 ^e	2,600 ^b
106-42-3	p-Xylene	55,000 ^e	55,000 ^e	3,300 ^b
1330-20-7	Xylenes (total)	49,000 ^e	49,000 ^e	2,900 ^b

Chemical Name and Remediation Objective Notations

- ^a For the outdoor inhalation exposure route, it is acceptable to determine compliance by meeting either the soil or soil gas remediation objectives. The soil remediation objectives for the outdoor inhalation route are located in Appendix B, Tables A and B.
- ^b Calculated values correspond to a target hazard quotient of 1.
- ^c Calculated values correspond to a cancer risk level of 1 in 1,000,000.
- ^d PCBs are a mixture of different congeners. The appropriate values to use for the physical/chemical and toxicity parameters depend on the congeners present at the site. Persons remediating sites should consult with IEPA Bureau of Land (BOL) if calculation of Tier 2 or 3 remediation objectives is desired.

- e The value shown is the C_v^{sat} value of the chemical in soil gas. The C_v^{sat} of the chemical becomes the remediation objective if the calculated value exceeds the C_v^{sat} value or if there are no toxicity criteria available for the inhalation route of exposure.
- f Value for the inhalation exposure route is based on Reference Concentration for elemental Mercury (CAS No. 7439-97-6). Inhalation remediation objectives only apply at sites where elemental Mercury is a contaminant of concern.

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.APPENDIX B: Tier 1 Illustrations and Tables

Section 742.TABLE H: Tier 1 Soil Gas and Groundwater Remediation Objectives for the Indoor Inhalation Exposure Route – Diffusion and Advection^j

Q_{soil} equals 83.33 cm³/sec^a

CAS No.	Chemical Name	Soil Gas		Groundwater	
		Residential (mg/m ³)	Industrial/Commercial (mg/m ³)	Residential (mg/L)	Industrial/Commercial (mg/L)
67-64-1	Acetone	750,000 ^f	750,000 ^f	1,000,000 ^g	1,000,000 ^g
71-43-2	Benzene	0.37 ^c	2.8 ^c	0.11 ^c	0.41 ^c
111-44-4	Bis(2-chloroethyl)ether	0.014 ^c	0.087 ^c	0.083 ^c	0.43 ^c
75-27-4	Bromodichloromethane	450,000 ^f	450,000 ^f	6,700 ^g	6,700 ^g
75-25-2	Bromoform	11 ^c	52 ^c	3.1 ^c	12 ^c
71-36-3	Butanol	29,000 ^f	29,000 ^f	74,000 ^g	74,000 ^g
78-93-3	2-Butanone (MEK)	6,400 ^b	40,000 ^b	10,000 ^b	48,000 ^b
75-15-0	Carbon disulfide	780 ^b	5,300 ^b	67 ^b	210 ^b
56-23-5	Carbon tetrachloride	0.21 ^c	1.5 ^c	0.020 ^c	0.076 ^c
108-90-7	Chlorobenzene	69 ^b	420 ^b	26 ^b	82 ^b
124-48-1	Chlorodibromomethane	57,000 ^f	57,000 ^f	2,600 ^g	2,600 ^g
67-66-3	Chloroform	0.11 ^c	0.92 ^c	0.07 ⁱ	0.15 ^c
95-57-8	2-Chlorophenol	17,000 ^f	17,000 ^f	22,000 ^g	22,000 ^g
75-99-0	Dalapon ^e	1,500 ^f	1,500 ^f	900,000 ^g	900,000 ^g
96-12-8	1,2-Dibromo-3-chloropropane ^e	0.0012 ^c	0.0062 ^c	0.00065 ^c	0.0027 ^c
106-93-4	1,2-Dibromoethane	0.0078 ^c	0.048 ^c	0.0035 ^c	0.014 ^c
95-50-1	1,2-Dichlorobenzene	290 ^b	1,700 ^b	140 ^b	160 ^g
106-46-7	1,4-Dichlorobenzene	1,200 ^b	6,800 ^b	79 ^g	79 ^g
75-71-8	Dichlorodifluoromethane	270 ^b	1,700 ^b	3.0 ^b	9.2 ^b
75-34-3	1,1-Dichloroethane	690 ^b	4,200 ^b	180 ^b	580 ^b
107-06-2	1,2-Dichloroethane	0.099 ^c	0.81 ^c	0.054 ^c	0.22 ^c
75-35-4	1,1-Dichloroethylene	240 ^b	1,600 ^b	24 ^b	74 ^b

CAS No.	Chemical Name	Soil Gas		Groundwater	
		Residential (mg/m ³)	Industrial/Commercial (mg/m ³)	Residential (mg/L)	Industrial/Commercial (mg/L)
156-59-2	<i>cis</i> -1,2-Dichloroethylene	1,100,000 ^f	1,100,000 ^f	3,500 ^g	3,500 ^g
156-60-5	<i>trans</i> -1,2-Dichloroethylene	85 ^b	510 ^b	16 ^b	51 ^b
78-87-5	1,2-Dichloropropane	0.31 ^c	2.3 ^c	0.12 ^c	0.48 ^c
542-75-6	1,3-Dichloropropylene (<i>cis</i> + <i>trans</i>)	0.90 ^c	6.2 ^c	0.14 ^c	0.52 ^c
123-91-1	p-Dioxane	0.22 ^c	2.3 ^c	2.9 ^c	25 ^c
100-41-4	Ethylbenzene	1.3 ^c	9.3 ^c	0.37 ^c	1.4 ^c
76-44-8	Heptachlor	0.0063 ^c	0.032 ^c	0.0025 ^c	0.0096 ^c
118-74-1	Hexachlorobenzene	0.0087 ^c	0.057 ^c	0.0059 ^c	0.0062 ^g
77-47-4	Hexachlorocyclopentadiene	0.58 ^b	2.6 ^b	0.084 ^b	0.26 ^b
67-72-1	Hexachloroethane	2,800 ^f	2,800 ^f	50 ^g	50 ^g
78-59-1	Isophorone	2,900 ^b	3,400 ^f	12,000 ^g	12,000 ^g
98-82-8	Isopropylbenzene (Cumene)	600 ^b	3,500 ^b	2.7 ^b	8.4 ^b
7439-97-6	Mercury ^h	0.42 ^b	2.5 ^b	0.053 ^b	0.060 ^g
74-83-9	Methyl bromide	6.9 ^b	42 ^b	1.5 ^b	4.8 ^b
1634-04-4	Methyl tertiary-butyl ether	3,700 ^b	24,000 ^b	1,900 ^b	6,800 ^b
75-09-2	Methylene chloride	5.6 ^c	45 ^c	2.1 ^c	8.2 ^c
91-57-6	2-Methylnaphthalene	530 ^f	530 ^f	25 ^g	25 ^g
95-48-7	2-Methylphenol (o-cresol)	600 ^b	1,800 ^f	26,000 ^g	26,000 ^g
91-20-3	Naphthalene	0.11 ^c	0.75 ^c	0.075 ^c	0.32 ^c
98-95-3	Nitrobenzene	0.077 ^c	0.57 ^c	0.34 ^c	2.0 ^c
621-64-7	n-Nitrosodi-n-propylamine	0.0016 ^c	0.012 ^c	0.044 ^c	0.27 ^c
108-95-2	Phenol	140 ^b	1,300 ^b	28,000 ^b	83,000 ^g
1336-36-3	Polychlorinated biphenyls (PCBs)	--- ^d	--- ^d	--- ^d	--- ^d
100-42-5	Styrene	1,400 ^b	8,500 ^b	310 ^g	310 ^g
127-18-4	Tetrachloroethylene	0.55 ^c	4.0 ^c	0.091 ^c	0.34 ^c
108-88-3	Toluene	6,200 ^b	40,000 ^b	530 ^g	530 ^g

CAS No.	Chemical Name	Soil Gas		Groundwater	
		Residential (mg/m ³)	Industrial/Commercial (mg/m ³)	Residential (mg/L)	Industrial/Commercial (mg/L)
120-82-1	1,2,4-Trichlorobenzene	5.4 ^b	25 ^b	1.8 ^b	5.9 ^b
71-55-6	1,1,1-Trichloroethane	6,600 ^b	41,000 ^b	1,000 ^b	1,300 ^g
79-00-5	1,1,2-Trichloroethane	170,000 ^f	170,000 ^f	4,400 ^g	4,400 ^g
79-01-6	Trichloroethylene	1.5 ^c	12 ^c	0.34 ^c	1.3 ^c
75-69-4	Trichlorofluoromethane	860 ^b	5,600 ^b	26 ^b	82 ^b
108-05-4	Vinyl acetate	250 ^b	1,600 ^b	160 ^b	550 ^b
75-01-4	Vinyl chloride	0.29 ^c	4.8 ^c	0.028 ^c	0.21 ^c
108-38-3	m-Xylene	140 ^b	850 ^b	43 ^b	130 ^b
95-47-6	o-Xylene	120 ^b	790 ^b	40 ^b	130 ^b
106-42-3	p-Xylene	130 ^b	820 ^b	38 ^b	120 ^b
1330-20-7	Xylenes (total) ^e	140 ^b	840 ^b	30 ^b	93 ^b

Chemical Name and Remediation Objective Notations

- ^a Compliance is determined by meeting either the soil gas remediation objectives or the groundwater remediation objectives. See Sections 742.505 and 742.515.
- ^b Calculated values correspond to a target hazard quotient of 1.
- ^c Calculated values correspond to a cancer risk level of 1 in 1,000,000.
- ^d PCBs are a mixture of different congeners. The appropriate values to use for the physical/chemical and toxicity parameters depend on the congeners present at the site. Persons remediating sites should consult with BOL if calculation of Tier 2 or 3 remediation objectives is desired.
- ^e Groundwater remediation objective calculated at 25°C. For Dalapon and 1,2-Dibromo-3-chloropropane, the critical temperature (T_c) and enthalpy of vaporization at the normal boiling point (H_{v,b}) are not available. For Xylenes (total), the enthalpy of vaporization at the normal boiling point (H_{v,b}) is not available.

- f The value shown is the C_v^{sat} value of the chemical in soil gas. The C_v^{sat} of the chemical becomes the remediation objective if the calculated value exceeds the C_v^{sat} value or if there are no toxicity criteria available for the inhalation route of exposure.
- g The value shown is the solubility of the chemical in water. The solubility of the chemical becomes the remediation objective if the calculated value exceeds the solubility or if there are no toxicity criteria available for the ingestion route of exposure.
- h Value for the inhalation exposure route is based on Reference Concentration for elemental Mercury (CAS No. 7439-97-6). Inhalation remediation objectives only apply at sites where elemental Mercury is a contaminant of concern.
- i The value shown is the Groundwater Remediation Objective listed in Appendix B, Table E.
- j Calculated values for the remediation objectives in this table are based on the assumption that the existing or potential building has a full concrete slab-on-grade, though the remediation objectives in this table are also considered protective of occupants of buildings with full concrete basement floors and walls. This table applies only when the existing or potential building has a full concrete slab-on-grade or a full concrete basement floor and walls. Institutional controls under Subpart J are required to use remediation objectives in this table. This table does not apply when the existing or potential building has neither a full concrete slab-on-grade nor a full concrete basement floor and walls, such as a building with an earthen crawl space, an earthen floor, a stone foundation, a partial concrete floor, or a sump. In such cases, site evaluators have the option of excluding the indoor inhalation exposure route under Section 742.312, meeting the building control technology requirements under Subpart L, or proposing an alternative approach under Tier 3.

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.APPENDIX B: Tier 1 Illustrations and Tables

Section 742.TABLE I: Tier 1 Soil Gas and Groundwater Remediation Objectives for the Indoor Inhalation Exposure Route – Diffusion Only^j

Q_{soil} equals 0.0 cm³/sec^{a,b}

CAS No.	Chemical Name	Soil Gas		Groundwater	
		Residential (mg/m ³)	Industrial/Commercial (mg/m ³)	Residential (mg/L)	Industrial/Commercial (mg/L)
67-64-1	Acetone	750,000 ^g	750,000 ^g	1,000,000 ^h	1,000,000 ^h
71-43-2	Benzene	41 ^d	300 ^d	0.41 ^d	2.6 ^d
111-44-4	Bis(2-chloroethyl)ether	1.9 ^d	14 ^d	6.6 ^d	48 ^d
75-27-4	Bromodichloromethane	450,000 ^g	450,000 ^g	6,700 ^h	6,700 ^h
75-25-2	Bromoform	1,800 ^d	13,000 ^d	170 ^d	1,300 ^d
71-36-3	Butanol	29,000 ^g	29,000 ^g	74,000 ^h	74,000 ^h
78-93-3	2-Butanone (MEK)	380,000 ^g	380,000 ^g	220,000 ^h	220,000 ^h
75-15-0	Carbon disulfide	81,000 ^c	500,000 ^c	170 ^c	820 ^c
56-23-5	Carbon tetrachloride	24 ^d	180 ^d	0.052 ^d	0.31 ^d
108-90-7	Chlorobenzene	8,300 ^c	51,000 ^c	130 ^c	470 ^h
124-48-1	Chlorodibromomethane	57,000 ^g	57,000 ^g	2,600 ^h	2,600 ^h
67-66-3	Chloroform	12 ^d	87 ^d	0.17 ^d	1.1 ^d
95-57-8	2-Chlorophenol	17,000 ^g	17,000 ^g	22,000 ^h	22,000 ^h
75-99-0	Dalapon ^f	1,500 ^g	1,500 ^g	900,000 ^h	900,000 ^h
96-12-8	1,2-Dibromo-3-chloropropane ^f	0.17 ^d	1.3 ^d	0.029 ^d	0.21 ^d
106-93-4	1,2-Dibromoethane	1.1 ^d	7.9 ^d	0.073 ^d	0.52 ^d
95-50-1	1,2-Dichlorobenzene	11,000 ^g	11,000 ^g	160 ^h	160 ^h
106-46-7	1,4-Dichlorobenzene	8,400 ^g	8,400 ^g	79 ^h	79 ^h
75-71-8	Dichlorodifluoromethane	32,000 ^c	200,000 ^c	6.8 ^c	33 ^c
75-34-3	1,1-Dichloroethane	81,000 ^c	500,000 ^c	750 ^c	4,100 ^c
107-06-2	1,2-Dichloroethane	10 ^d	76 ^d	0.50 ^d	3.5 ^d
75-35-4	1,1-Dichloroethylene	27,000 ^c	160,000 ^c	61 ^c	300 ^c

CAS No.	Chemical Name	Soil Gas		Groundwater	
		Residential (mg/m ³)	Industrial/Commercial (mg/m ³)	Residential (mg/L)	Industrial/Commercial (mg/L)
156-59-2	<i>cis</i> -1,2-Dichloroethylene	1,100,000 ^g	1,100,000 ^g	3,500 ^h	3,500 ^h
156-60-5	<i>trans</i> -1,2-Dichloroethylene	10,000 ^c	63,000 ^c	58 ^c	310 ^c
78-87-5	1,2-Dichloropropane	36 ^d	260 ^d	0.67 ^d	4.5 ^d
542-75-6	1,3-Dichloropropylene (<i>cis</i> + <i>trans</i>)	110 ^d	830 ^d	0.42 ^d	2.6 ^d
123-91-1	p-Dioxane	15 ^d	110 ^d	140 ^d	1,000 ^d
100-41-4	Ethylbenzene	150 ^d	1,100 ^d	1.3 ^d	8.1 ^d
76-44-8	Heptachlor	0.97 ^d	7.1 ^d	0.058 ^d	0.18 ^h
118-74-1	Hexachlorobenzene	0.28 ^g	0.28 ^g	0.0062 ^h	0.0062 ^h
77-47-4	Hexachlorocyclopentadiene	86 ^c	530 ^c	0.29 ^c	1.5 ^c
67-72-1	Hexachloroethane	2,800 ^g	2,800 ^g	50 ^h	50 ^h
78-59-1	Isophorone	3,400 ^g	3,400 ^g	12,000 ^h	12,000 ^h
98-82-8	Isopropylbenzene (Cumene)	30,000 ^g	30,000 ^g	6.2 ^c	30 ^c
7439-97-6	Mercury ⁱ	22 ^g	22 ^g	0.060 ^h	0.060 ^h
74-83-9	Methyl bromide	830 ^c	5,100 ^c	6.1 ^c	33 ^c
1634-04-4	Methyl tertiary-butyl ether	420,000 ^c	1,200,000 ^g	30,000 ^c	51,000 ^h
75-09-2	Methylene chloride	590 ^d	4,400 ^d	12 ^d	84 ^d
91-57-6	2-Methylnaphthalene	530 ^g	530 ^g	25 ^h	25 ^h
95-48-7	2-Methylphenol (o-cresol)	1,800 ^g	1,800 ^g	26,000 ^h	26,000 ^h
91-20-3	Naphthalene	14 ^d	100 ^d	1.8 ^d	13 ^d
98-95-3	Nitrobenzene	9.0 ^d	66 ^d	23 ^d	170 ^d
621-64-7	n-Nitrosodi-n-propylamine	0.18 ^d	1.3 ^d	3.3 ^d	24 ^d
108-95-2	Phenol	1,500 ^g	1,500 ^g	83,000 ^h	83,000 ^h
1336-36-3	Polychlorinated biphenyls (PCBs)	--- ^e	--- ^e	--- ^e	--- ^e
100-42-5	Styrene	34,000 ^g	34,000 ^g	310 ^h	310 ^h
127-18-4	Tetrachloroethylene	66 ^d	490 ^d	0.26 ^d	1.6 ^d
108-88-3	Toluene	140,000 ^g	140,000 ^g	530 ^h	530 ^h

CAS No.	Chemical Name	Soil Gas		Groundwater	
		Residential (mg/m ³)	Industrial/Commercial (mg/m ³)	Residential (mg/L)	Industrial/Commercial (mg/L)
120-82-1	1,2,4-Trichlorobenzene	800 ^c	4,300 ^g	35 ^h	35 ^h
71-55-6	1,1,1-Trichloroethane	770,000 ^c	870,000 ^g	1,300 ^h	1,300 ^h
79-00-5	1,1,2-Trichloroethane	170,000 ^g	170,000 ^g	4,400 ^h	4,400 ^h
79-01-6	Trichloroethylene	180 ^d	1,300 ^d	1.1 ^d	6.7 ^d
75-69-4	Trichlorofluoromethane	97,000 ^c	600,000 ^c	62 ^c	300 ^c
108-05-4	Vinyl acetate	28,000 ^c	170,000 ^c	2,500 ^c	15,000 ^c
75-01-4	Vinyl chloride	30 ^d	440 ^d	0.065 ^d	0.75 ^d
108-38-3	m-Xylene	17,000 ^d	52,000 ^c	160 ^c	160 ^h
95-47-6	o-Xylene	14,000 ^d	41,000 ^c	170 ^c	180 ^h
106-42-3	p-Xylene	16,000 ^d	55,000 ^c	140 ^c	160 ^h
1330-20-7	Xylenes (total) ^f	17,000 ^d	49,000 ^c	96 ^c	110 ^h

Chemical Name and Remediation Objective Notations

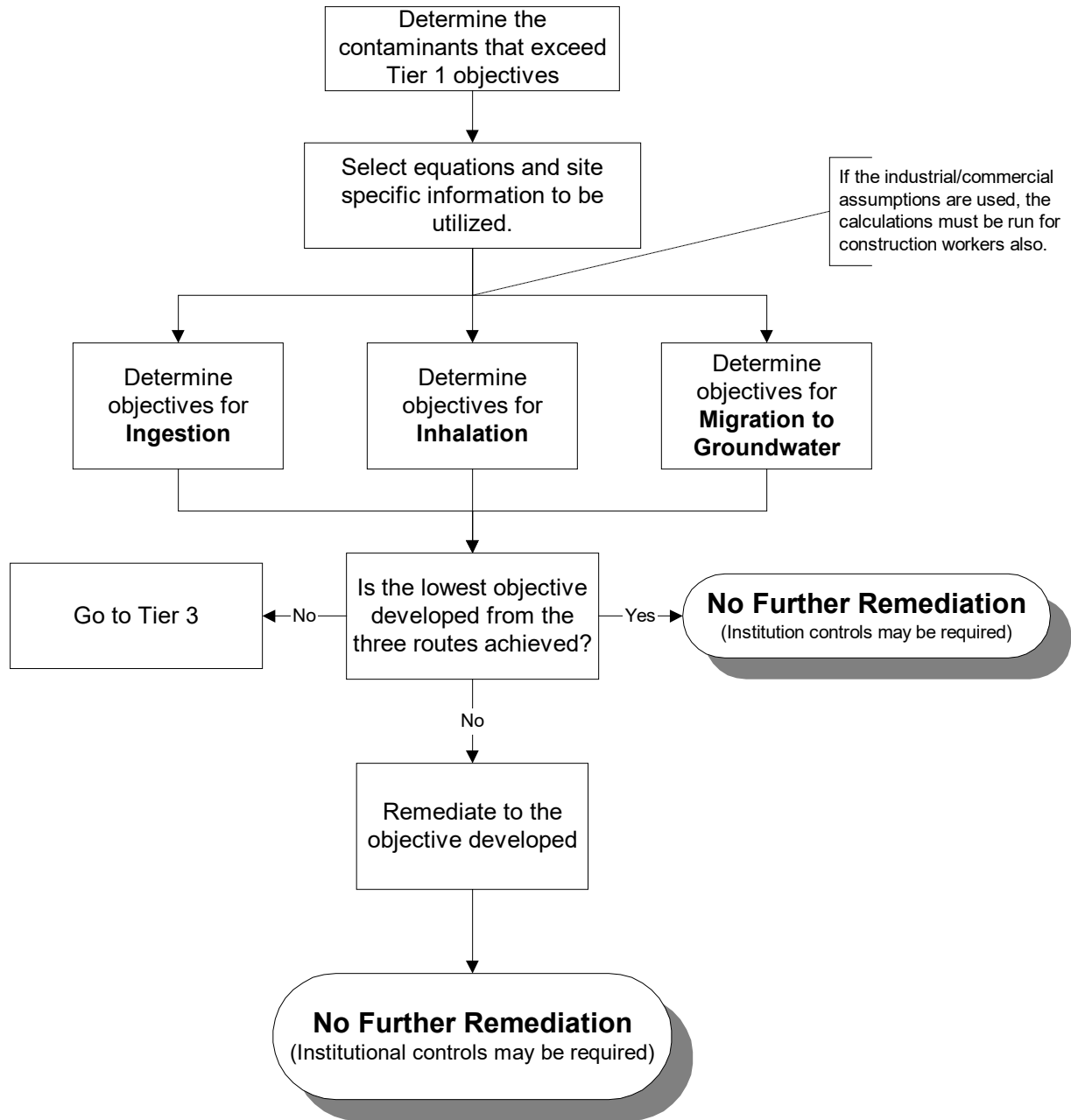
- ^a Compliance is determined by meeting both the soil gas remediation objectives and the groundwater remediation objectives. See Sections 742.505 and 742.515.
- ^b Remediation objectives relying on this table require use of institutional controls in accordance with Subpart J.
- ^c Calculated values correspond to a target hazard quotient of 1.
- ^d Calculated values correspond to a cancer risk level of 1 in 1,000,000.
- ^e PCBs are a mixture of different congeners. The appropriate values to use for the physical/chemical and toxicity parameters depend on the congeners present at the site. Persons remediating sites should consult with BOL if calculation of Tier 2 or 3 remediation objectives is desired.
- ^f Groundwater remediation objective calculated at 25°C. For Dalapon and 1,2-Dibromo-3-chloropropane, the critical temperature (T_c) and enthalpy of vaporization at the normal boiling point (H_{v,b}) are not available. For Xylenes (total), the enthalpy of vaporization at the normal boiling point (H_{v,b}) is not available.

- ^g The value shown is the C_v^{sat} value of the chemical in soil gas. The C_v^{sat} of the chemical becomes the remediation objective if the calculated value exceeds the C_v^{sat} value or if there are no toxicity criteria available for the inhalation route of exposure.
- ^h The value shown is the solubility of the chemical in water. The solubility of the chemical becomes the remediation objective if the calculated value exceeds the solubility or if there are no toxicity criteria available for the inhalation route of exposure.
- ⁱ Value for the inhalation exposure route is based on Reference Concentration for elemental Mercury (CAS No. 7439-97-6). Inhalation remediation objectives only apply at sites where elemental Mercury is a contaminant of concern.
- ^j Calculated values for the remediation objectives in this table are based on the assumption that the existing or potential building has a full concrete slab-on-grade, though the remediation objectives in this table are also considered protective of occupants of buildings with full concrete basement floors and walls. This table applies only when the existing or potential building has a full concrete slab-on-grade or a full concrete basement floor and walls. Institutional controls under Subpart J are required to use remediation objectives in this table. This table does not apply when the existing or potential building has neither a full concrete slab-on-grade nor a full concrete basement floor and walls, such as a building with an earthen crawl space, an earthen floor, a stone foundation, a partial concrete floor, or a sump. In such cases, site evaluators have the option of excluding the indoor inhalation exposure route under Section 742.312, meeting the building control technology requirements under Subpart L, or proposing an alternative approach under Tier 3.

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.APPENDIX C Tier 2 Illustrations and Tables

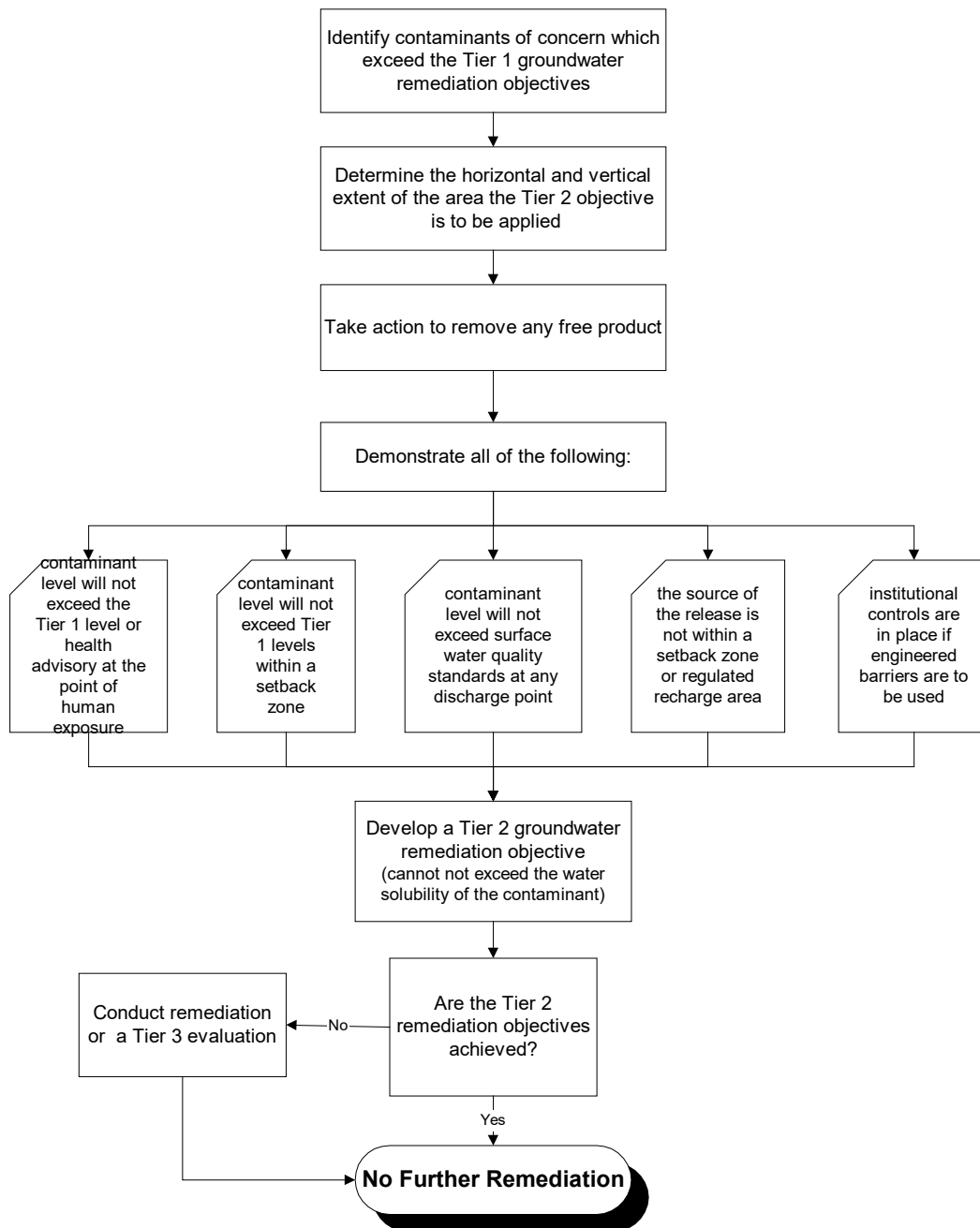
Section 742.Illustration A Tier 2 Evaluation for Soil



(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX C Tier 2 Illustrations and Tables

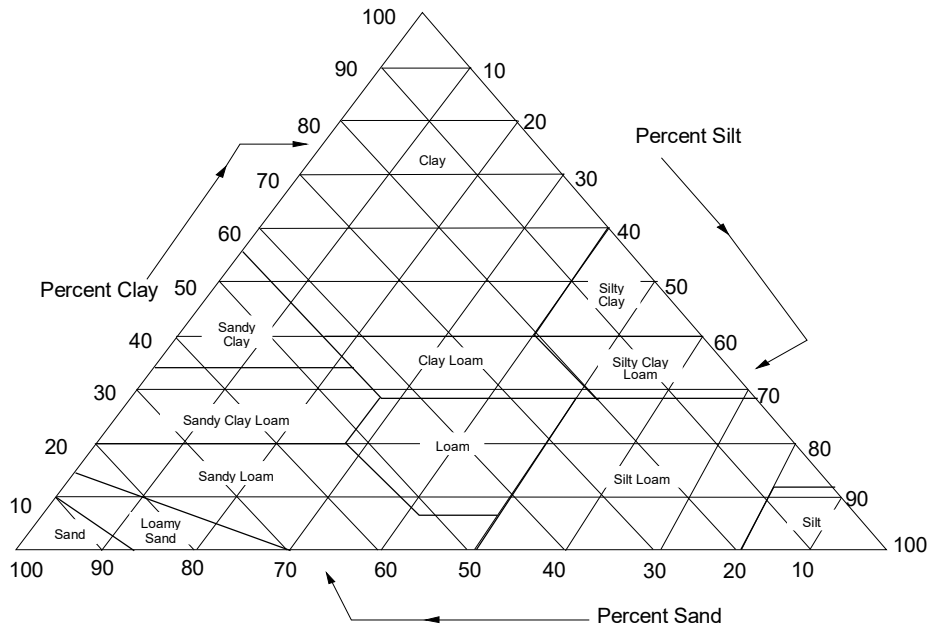
Section 742.Illustration B Tier 2 Evaluation for Groundwater



(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX C Tier 2 Illustrations and Tables

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	Slightly 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						

(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX C: Tier 2 Illustrations and Tables

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 ³ /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 ³ /kg)	$VF' = \frac{VF}{10}$	S9
	Equation for Derivation of Apparent Diffusivity, D _A (cm ² /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 ³ /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 ³ /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 _w (mg/L)	$C_w = DF \cdot GW_{obj}$	S18

	Soil-Water Partition Coefficient, K_d (cm^3/g)	$K_d = K_{oc} \cdot f_{oc}$	S19
	Water-Filled Soil Porosity, θ_w ($L_{\text{water}}/L_{\text{soil}}$)	$\theta_w = \eta \cdot \left(\frac{I}{K_s} \right)^{1/(2b+3)}$	S20
	Air-Filled Soil Porosity, θ_a ($L_{\text{air}}/L_{\text{soil}}$)	$\theta_a = \eta - \theta_w$	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, η ($L_{\text{pore}}/L_{\text{soil}}$)	$\eta = 1 - \frac{\rho_b}{\rho_s}$	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

<p>Mass-Limit Equations for Inhalation Exposure Route and Soil Component of the Groundwater Ingestion Exposure Route</p>	<p>Mass-Limit Volatilization Factor for the Inhalation Exposure Route - Residential, Industrial/ Commercial, VF (m³/kg)</p>	$VF_{M-L} = \frac{Q}{C} \cdot \frac{\left[T_{M-L} \cdot \left(3.15 \cdot 10^7 \frac{s}{yr} \right) \right]}{\rho_b \cdot d_s \cdot 10^6 \frac{cm^3}{m^3}}$ <p>NOTE: This equation may be used when vertical thickness of contamination is known or can be estimated reliably.</p>	<p>S26</p>
	<p>Mass-Limit Volatilization Factor for Inhalation Exposure Route - Construction Worker, VF' - (m³/kg)</p>	$VF'_{M-L} = \frac{VF_{M-L}}{10}$	<p>S27</p>
	<p>Mass-Limit Remediation Objective for Soil Component of the Groundwater Ingestion Exposure Route (mg/kg)</p>	$\frac{(C_w \cdot I_{M-L} \cdot ED_{M-L})}{\rho_b \cdot d_s}$ <p>NOTE: This equation may be used when vertical thickness is known or can be estimated reliably.</p>	<p>S28</p>

Equation for Derivation of the Soil Saturation Limit, C_{sat}	$C_{sat} = \frac{S}{\rho_b} \cdot [(K_d \cdot \rho_b) + \theta_w + (H' \cdot \theta_a)]$	S29
Equation for the soil gas component of the Outdoor Inhalation Exposure Route	$RO_{soil\ gas} = \frac{RO_{soil} \times H \times \rho_b \times 1000}{H' \times \theta_a + \theta_w + K_d \times \rho_b}$	S30

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.APPENDIX C: Tier 2 Illustrations and Tables

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 _c	Averaging Time for Carcinogens	yr	SSL	70
BW	Body Weight	kg		Residential = 15, noncarcinogens 70, carcinogens Industrial/Commercial = 70 Construction Worker = 70
C _{sat}	Soil Saturation Concentration	mg/kg	Appendix A, Table A or Equation S29 in Appendix C, Table A	Chemical-Specific or Calculated Value
C _w	Target Soil Leachate Concentration	mg/L	Equation S18 in Appendix C, Table A	Groundwater Standard, Health Advisory concentration, or Calculated Value

Symbol	Parameter	Units	Source	Parameter Value(s)
d	Mixing Zone Depth	m	SSL or Equation S25 in Appendix C, Table A	2 m or Calculated Value
d _a	Aquifer Thickness	m	Field Measurement	Site-Specific
d _s	Depth of Source (Vertical thickness of contamination)	m	Field Measurement or Estimation	Site-Specific
D _A	Apparent Diffusivity	cm ² /s	Equation S10 in Appendix C, Table A	Calculated Value
D _i	Diffusivity in Air	cm ² /s	Appendix C, Table E	Chemical-Specific
D _w	Diffusivity in Water	cm ² /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

Symbol	Parameter	Units	Source	Parameter Value(s)
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
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

Symbol	Parameter	Units	Source	Parameter Value(s)
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
$IF_{soil-adj}$ (residential)	Age Adjusted Soil Ingestion Factor for Carcinogens	(mg-yr)/(kg-d)	SSL	114
IR_{soil}	Soil Ingestion Rate	mg/d		Residential = 200 Industrial/Commercial = 50 Construction Worker = 480
IR_w	Daily Water Ingestion Rate	L/d		Residential = 2 Industrial/Commercial = 1

Symbol	Parameter	Units	Source	Parameter Value(s)
K	Aquifer Hydraulic Conductivity	m/yr	Field Measurement (See Appendix C, Table F)	Site-Specific
K _d (Non-ionizing organics)	Soil-Water Partition Coefficient	cm ³ /g or L/kg	Equation S19 in Appendix C, Table A	Calculated Value
K _d (Ionizing organics)	Soil-Water Partition Coefficient	cm ³ /g or L/kg	Equation S19 in Appendix C, Table A	Chemical and pH-Specific (see Appendix C, Table I)
K _d (Inorganics)	Soil-Water Partition Coefficient	cm ³ /g or L/kg	Appendix C, Table J	Chemical and pH-Specific
K _{oc}	Organic Carbon Partition Coefficient	cm ³ /g or L/kg	Appendix C, Table E or Appendix C, Table I	Chemical-Specific
K _s	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 ³ /kg	SSL or Equation S15 in Appendix C, Table A	Residential = $1.32 \cdot 10^9$ or Site-Specific Industrial/Commercial = $1.24 \cdot 10^9$ or Site-Specific

Symbol	Parameter	Units	Source	Parameter Value(s)
PEF'	Particulate Emission Factor adjusted for Agitation (construction worker)	m ³ /kg	Equation S16 in Appendix C, Table A using PEF (industrial/commercial)	1.24 • 10 ⁸ or Site-Specific
Q/C (used in VF equations)	Inverse of the mean concentration at the center of a square source	(g/m ² -s)/(kg/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	(g/m ² -s)/(kg/m ³)	SSL or Appendix C, Table H	Residential = 90.80 Industrial/Commercial = 85.81 Construction Worker = 85.81
RfC	Inhalation Reference Concentration	mg/m ³	Illinois EPA: http://www.epa.state.il.us/land/taco/toxicity-values.xls	Toxicological-Specific (Note: for Construction Workers use subchronic reference concentrations)
RfD _o	Oral Reference Dose	mg/(kg-d)	Illinois EPA: http://www.epa.state.il.us/land/taco/toxicity-values.xls	Toxicological-Specific (Note: for Construction Worker use subchronic reference doses)
RO _{soil}	Soil remediation objective	mg/kg	Equation S30 in Appendix C, Table A	Calculated value

Symbol	Parameter	Units	Source	Parameter Value(s)
RO _{soil gas}	Soil gas remediation objective	mg/m ³	Equation S30 in Appendix C, Table A	Calculated value
S	Solubility in Water	mg/L	Appendix C, Table E	Chemical-Specific
SF _o	Oral Slope Factor	(mg/kg-d) ⁻¹	Illinois EPA: http://www.epa.state.il.us/land/taco/toxicity-values.xls	Toxicological-Specific
T	Exposure Interval	s		Residential = $9.5 \cdot 10^8$ Industrial/Commercial = $7.9 \cdot 10^8$ Construction Worker = $3.6 \cdot 10^6$
T _{M-L}	Exposure Interval for Mass-Limit Volatilization Factor Equation S26	yr	SSL	30
THQ	Target Hazard Quotient	unitless	SSL	1
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

Symbol	Parameter	Units	Source	Parameter Value(s)
URF	Inhalation Unit Risk Factor	$(\mu\text{g}/\text{m}^3)^{-1}$	Illinois EPA: http://www.epa.state.il.us/land/taco/toxicity-values.xls	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	m^3/kg	Equation S8 in Appendix C, Table A	Calculated Value
VF'	Volatilization Factor adjusted for Agitation	m^3/kg	Equation S9 in Appendix C, Table A	Calculated Value
VF _{M-L}	Mass-Limit Volatilization Factor	m^3/kg	Equation S26 in Appendix C, Table A	Calculated Value
VF' _{M-L}	Mass-Limit Volatilization Factor adjusted for Agitation	m^3/kg	Equation S27 in Appendix C, Table A	Calculated Value

Symbol	Parameter	Units	Source	Parameter Value(s)
η	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
θ_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
θ_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)
ρ_b	Dry Soil Bulk Density	kg/L or g/cm ³	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
ρ_s	Soil Particle Density	g/cm ³	SSL or Field Measurement (See Appendix C, Table F)	2.65, or Site-Specific
ρ_w	Water Density	g/cm ³	SSL	1
1/(2b+3)	Exponential in Equation S20	unitless	Appendix C, Table K Appendix C, Illustration C	Site-Specific

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.APPENDIX C Tier 2 Illustrations and Tables

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)	$\frac{TR \cdot BW \cdot AT_c \cdot 365 \frac{d}{yr}}{EF \cdot ED \cdot \left\{ \left[SF_o \cdot 10^{-6} \frac{kg}{mg} \cdot \left((IR_{soil} \cdot RAF_o) + (SA \cdot M \cdot RAF_d) \right) \right] + \left[SF_i \cdot IR_{air} \cdot (VF_{ss} + VF_p) \right] \right\}}$	R1
	Remediation Objectives for Non-carcinogenic Contaminants (mg/kg)	$EF \cdot ED \cdot \left[\frac{THQ \cdot BW \cdot AT_n \cdot 365 \frac{d}{yr}}{10^{-6} \frac{kg}{mg} \left[(IR_{soil} \cdot RAF_o) + (SA \cdot M \cdot RAF_d) \right]} + \frac{IR_{air} \cdot (VF_{ss} + VF_p)}{RfD_i} \right]$	R2
	Volatilization Factor for Surficial Soils, VF_{ss} (kg/m ³) Whichever is less between R3 and R4	$VF_{ss} = \frac{2 \cdot W \cdot \rho_s \cdot 10^3 \frac{cm^3 \cdot kg}{m^3 \cdot g}}{U_{air} \cdot \delta_{air}} \cdot \sqrt{\frac{D_s^{eff} \cdot H'}{\pi \cdot [\theta_{ws} + (k_s \cdot \rho_s) + (H' \cdot \theta_{as})] \cdot \tau}}$	R3
	$VF_{ss} = \frac{W \cdot \rho_s \cdot d \cdot 10^3 \frac{cm^3 \cdot kg}{m^3 \cdot g}}{U_{air} \cdot \delta_{air} \cdot \tau}$	R4	

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

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

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

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

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

(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX C Tier 2 Illustrations and Tables

Section 742.Table D RBCA Parameters

Symbol	Parameter	Units	Source	Parameter Value(s)
AT _c	Averaging Time for Carcinogens	yr	RBCA	70
AT _n	Averaging Time for Noncarcinogens	yr	RBCA	Residential = 30 Industrial/Commercial = 25 Construction Worker = 0.115
BW	Adult Body Weight	kg	RBCA	70
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.	mg/L	Field Measurement	Site-Specific
C _(x)	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^{air}	Diffusion Coefficient in Air	cm^2/s	Appendix C, Table E	Chemical-Specific
D^{water}	Diffusion Coefficient in Water	cm^2/s	Appendix C, Table E	Chemical-Specific
D_s^{eff}	Effective Diffusion Coefficient in Soil Based on Vapor-Phase Concentration	cm^2/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	cm ³ /g or L/kg	Appendix C, Table E or Appendix C, Table I	Chemical-Specific
k _s (non-ionizing organics)	Soil Water Sorption Coefficient	cm ³ _{water} /g _{soil}	Equation R20 in Appendix C, Table C	Calculated Value
k _s (ionizing organics)	Soil Water Sorption Coefficient	cm ³ _{water} /g _{soil}	Equation R20 in Appendix C, Table C	Chemical and pH-Specific (See Appendix C, Table I)
k _s (inorganics)	Soil Water Sorption Coefficient	cm ³ _{water} /g _{soil}	Appendix C, Table J	Chemical and pH-Specific
L _s	Depth to Subsurface Soil Sources	cm	RBCA	100
LF _{sw}	Leaching Factor	(mg/L _{water})/ (mg/kg _{soil})	Equation R14 in Appendix C, Table C	Calculated Value
M	Soil to Skin Adherence Factor	mg/cm ²	RBCA	0.5

Symbol	Parameter	Units	Source	Parameter Value(s)
Pe	Particulate Emission Rate	g/cm ² -s	RBCA	6.9 • 10 ⁻¹⁴
RAF _d	Dermal Relative Absorption Factor	unitless	RBCA	0.5
RAF _d (PNAs)	Dermal Relative Absorption Factor	unitless	RBCA	0.05
RAF _d (inorganics)	Dermal Relative Absorption Factor	unitless	RBCA	0
RAF _o	Oral Relative Absorption Factor	unitless	RBCA	1.0
RBSL _{air}	Carcinogenic Risk-Based Screening Level for Air	ug/m ³	Equation R9 in Appendix C, Table C	Chemical-, Media-, and Exposure Route-Specific
RBSL _{air}	Noncarcinogenic Risk-Based Screening Level for Air	ug/m ³	Equations R10 in Appendix C, Table C	Chemical-, Media-, and Exposure Route-Specific
RfD _i	Inhalation Reference Dose	mg/kg-d	IEPA (IRIS/HEAST ^a)	Toxicological-Specific
RfD _o	Oral Reference Dose	mg/(kg-d)	IEPA (IRIS/HEAST ^a)	Toxicological-Specific (Note: for Construction Worker use subchronic reference doses)
SA	Skin Surface Area	cm ² /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	(mg/kg-d) ⁻¹	IEPA (IRIS/HEAST ^a)	Toxicological-Specific
SF _o	Oral Slope Factor	(mg/kg-d) ⁻¹	IEPA (IRIS/HEAST ^a)	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_{air}	Average Wind Speed Above Ground Surface in Ambient Mixing Zone	cm/s	RBCA	225
U_{gw}	Groundwater Darcy Velocity	cm/yr	Equation R24 in Appendix C, Table C	Calculated Value
VF_p	Volatilization Factor for Surficial Soils Regarding Particulates	kg/m^3	Equation R5 in Appendix C, Table C	Calculated Value
VF_{samb}	Volatilization Factor (Subsurface Soils to Ambient Air)	$(mg/m^3_{air})/(mg/kg_{soil})$ or kg/m^3	Equation R11 in Appendix C, Table C	Calculated Value
VF_{ss}	Volatilization Factor for Surficial Soils	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	$g_{\text{water}}/g_{\text{soil}}$	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
α_x	Longitudinal Dispersivity	cm	Equation R16 in Appendix C, Table C	Calculated Value
α_y	Transverse Dispersivity	cm	Equation R17 in Appendix C, Table C	Calculated Value
α_z	Vertical Dispersivity	cm	Equation R18 in Appendix C, Table C	Calculated Value
δ_{air}	Ambient Air Mixing Zone Height	cm	RBCA	200

Symbol	Parameter	Units	Source	Parameter Value(s)
δ_{gw}	Groundwater Mixing Zone Thickness	cm	RBCA	200
θ_{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	<p>Surface Soil (top 1 meter) = 0.28 Subsurface Soil (below 1 meter) = 0.13, Or</p> <p>Gravel = 0.05 Sand = 0.14 Silt = 0.16 Clay = 0.17, or</p> <p>Calculated Value</p>
θ_{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	<p>Surface Soil (top 1 meter) = 0.15 Subsurface Soil (below 1 meter) = 0.30, or</p> <p>Gravel = 0.20 Sand = 0.18 Silt = 0.16 Clay = 0.17, or</p> <p>Calculated Value</p>

Symbol	Parameter	Units	Source	Parameter Value(s)
θ_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
λ	First Order Degradation Constant	d^{-1}	Appendix C, Table E	Chemical-Specific
π	pi			3.1416
ρ_b	Soil Bulk Density	g/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
ρ_w	Water Density	g/cm^3	RBCA	1
τ	Averaging Time for Vapor Flux	s	RBCA	$9.46 \cdot 10^8$

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

(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX C: Tier 2 Illustrations and Tables

Section 742.Table E: Default Physical and Chemical Parameters^e

CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (D _i) (cm ² /s)	Diffusivity in Water (D _w) (cm ² /s)	Dimensionless Henry's Law Constant (H') (25°C)	Dimensionless Henry's Law Constant (H') (13°C) For the indoor inhalation exposure route	Organic Carbon Partition Coefficient (K _{oc}) (L/kg)	First Order Degradation Constant (λ) (d ⁻¹)	Vapor Pressure (mm/Hg)
Neutral Organics									
83-32-9	Acenaphthene	3.60E+00	4.76E-02	7.69E-06	6.60E-03	----- ^b	6.30E+03	3.40E-03	2.50E-03
67-64-1	Acetone	1.00E+06	1.24E-01	1.14E-05	1.60E-03	9.73E-04	7.80E-01	4.95E-02	2.30E+02
15972-60-8	Alachlor	2.40E+02	2.13E-02	5.28E-06	3.40E-06	----- ^b	3.20E+03	No Data	2.20E-05
116-06-3	Aldicarb	6.03E+03	3.18E-02	7.24E-06	5.90E-08	----- ^b	1.29E+01	1.09E-03	3.47E-05
309-00-2	Aldrin	1.70E-02	1.96E-02	4.86E-06	7.00E-03	----- ^b	2.50E+05	5.90E-04	6.00E-06
120-12-7	Anthracene	4.30E-02	3.85E-02	7.74E-06	2.70E-03	----- ^b	2.50E+04	7.50E-04	2.70E-06
1912-24-9	Atrazine	7.00E+01	2.59E-02	6.67E-06	9.68E-08	----- ^b	3.63E+02	No Data	2.70E-07
71-43-2	Benzene	1.80E+03	8.80E-02	1.02E-05	2.30E-01	1.34E-01	5.00E+01	9.00E-04	9.50E+01
56-55-3	Benzo(a)anthracene	9.40E-03	5.10E-02	9.00E-06	1.39E-04	----- ^b	4.00E+05	5.10E-04	1.10E-07
205-99-2	Benzo(b)fluoranthene	1.50E-03	2.23E-02	5.56E-06	4.55E-03	----- ^b	1.05E+06	5.70E-04	5.00E-07
207-08-9	Benzo(k)fluoranthene	8.00E-04	2.23E-02	5.56E-06	3.40E-05	----- ^b	1.00E+06	1.60E-04	2.00E-09

CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (D _i) (cm ² /s)	Diffusivity in Water (D _w) (cm ² /s)	Dimensionless Henry's Law Constant (H') (25°C)	Dimensionless Henry's Law Constant (H') (13°C) For the indoor inhalation exposure route	Organic Carbon Partition Coefficient (K _{oc}) (L/kg)	First Order Degradation Constant (λ) (d ⁻¹)	Vapor Pressure (mm/Hg)
65-85-0	Benzoic Acid	3.40E+03	7.02E-02	7.97E-06	1.56E-06	----- ^b	1.21E+00 ^d	No Data	7.00E-04
50-32-8	Benzo(a)pyrene	1.60E-03	4.30E-02	9.49E-06	4.50E-05	----- ^b	7.90E+05	6.50E-04	5.50E-09
111-44-4	Bis(2-chloroethyl)ether	1.72E+04	4.13E-02	7.53E-06	7.40E-04	2.94E-04	1.26E+01	1.90E-03	1.55E+00
117-81-7	Bis(2-ethylhexyl) phthalate	3.40E-01	3.51E-02	3.66E-06	4.10E-06	----- ^b	1.00E+05	1.80E-03	6.80E-08
75-27-4	Bromodichloro-methane	6.70E+03	5.61E-02	1.06E-05	6.60E-02	3.71E-02	5.00E+01	No Data	5.00E+01
75-25-2	Bromoform	3.10E+03	1.49E-02	1.03E-05	2.19E-02	1.06E-02	9.12E+01	1.90E-03	5.51E+00
71-36-3	Butanol	7.40E+04	8.00E-02	9.30E-06	3.61E-04	1.55E-04	6.00E+00	1.28E-02	7.00E+00
78-93-3	2-Butanone (MEK)	2.20E+05	8.08E-02	9.8E-06	2.30E-03	1.32E-03	2.00E+00	4.95E-02	9.50E+01
85-68-7	Butyl Benzyl Phthalate	2.70E+00	1.99E-02	4.89E-06	5.30E-05	----- ^b	6.30E+04	3.85E-03	8.30E-06
86-74-8	Carbazole	1.20E+00	4.17E-02	7.45E-06	3.60E-06	----- ^b	4.00E+03	No Data	7.00E-04
1563-66-2	Carbofuran	3.20E+02	2.37E-02	5.95E-06	1.27E-07	----- ^b	1.91E+02	No Data	4.85E-06
75-15-0	Carbon Disulfide	1.20E+03	1.04E-01	1.00E-05	1.23E+00	8.06E-01	6.30E+01	No Data	3.60E+02
56-23-5	Carbon Tetrachloride	7.90E+02	7.80E-02	8.80E-06	1.23E+00	7.48E-01	2.00E+02	1.90E-03	1.20E+02
57-74-9	Chlordane	5.60E-02	1.79E-02	4.37E-06	2.00E-03	----- ^b	2.50E+05	2.50E-04	9.80E-06

CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (D _i) (cm ² /s)	Diffusivity in Water (D _w) (cm ² /s)	Dimensionless Henry's Law Constant (H') (25°C)	Dimensionless Henry's Law Constant (H') (13°C) For the indoor inhalation exposure route	Organic Carbon Partition Coefficient (K _{oc}) (L/kg)	First Order Degradation Constant (λ) (d ⁻¹)	Vapor Pressure (mm/Hg)
106-47-8	p-Chloroaniline	5.30E+03	6.99E-02	1.01E-05	4.76E-05	----- ^b	6.31E+01	No Data	1.23E-02
108-90-7	Chlorobenzene	4.70E+02	7.30E-02	8.70E-06	1.50E-01	7.93E-02	2.00E+02	2.30E-03	1.20E+01
124-48-1	Chlorodibromomethane	2.60E+03	3.66E-02	1.05E-05	3.20E-02	2.07E-02	6.92E+01	3.85E-03	4.90E+00
67-66-3	Chloroform	7.90E+03	1.04E-01	1.00E-05	1.50E-01	9.18E-02	5.00E+01	3.90E-04	2.00E+02
95-57-8	2-Chlorophenol	2.20E+04	6.61E-02	9.46E-06	1.60E-02	7.28E-03	5.93E+01 ^d	No Data	2.34E+00
218-01-9	Chrysene	6.30E-03	2.44E-02	6.21E-06	3.90E-03	----- ^b	4.00E+05	3.50E-04	6.20E-09
94-75-7	2,4-D	6.77E+02	5.88E-02	6.49E-06	4.18E-07	----- ^b	5.75E+02	3.85E-03	6.00E-07
72-54-8	4,4'-DDD	9.00E-02	2.27E-02	5.79E-06	1.60E-04	----- ^b	7.90E+05	6.20E-05	6.70E-07
72-55-9	4,4'-DDE	1.20E-01	2.38E-02	5.87E-06	8.60E-04	----- ^b	4.00E+05	6.20E-05	6.00E-06
50-29-3	4,4'-DDT	2.50E-02	1.99E-02	4.95E-06	3.30E-04	----- ^b	2.00E+06	6.20E-05	1.60E-07
75-99-0	Dalapon	9.00E+05	6.08E-02	9.45E-06	2.64E-06	NA	4.80E+00	5.78E-03	1.90E-01
53-70-3	Dibenzo(a,h)anthracene	2.50E-03	2.11E-02	5.24E-06	6.10E-07	----- ^b	2.50E+06	3.70E-04	1.00E-10
96-12-8	1,2-Dibromo-3-chloropropane	1.20E+03	2.68E-02	7.02E-06	6.20E-03 ^c	NA	7.90E+01	1.93E-03	5.80E-01
106-93-4	1,2-Dibromoethane	4.00E+03	4.37E-02	8.44E-06	3.00E-02	1.54E-02	5.00E+01	5.78E-03	1.30E+01

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84-74-2	Di-n-butyl Phthalate	1.10E+01	4.38E-02	7.86E-06	7.40E-05	----- ^a	4.00E+04	3.01E-02	7.30E-05
1918-00-9	Dicamba	4.50E+03	2.37E-02	5.95E-06	2.18E-09	----- ^a	2.95E+00	No Data	3.38E-05
95-50-1	1,2-Dichlorobenzene	1.56E+02	6.90E-02	7.90E-06	7.79E-02	3.56E-02	5.75E+02	1.90E-03	1.36E+00
106-46-7	1,4-Dichlorobenzene	7.90E+01	6.90E-02	7.90E-06	9.80E-02	4.69E-02	7.90E+02	1.90E-03	1.00E+00
91-94-1	3,3-Dichlorobenzidine	3.10E+00	2.59E-02	6.74E-06	1.60E-07	----- ^a	2.82E+03	1.90E-03	3.71E-08
75-71-8	Dichlorodifluoromethane	2.80E+02	7.60E-02	1.08E-05	1.41E+01	8.14E+00	6.17E+01	1.92E-03	4.85E+03
75-34-3	1,1-Dichloroethane	5.10E+03	7.42E-02	1.05E-05	2.30E-01	1.42E-01	3.20E+01	1.90E-03	2.30E+02
107-06-2	1,2-Dichloroethane	8.50E+03	1.04E-02	9.90E-06	4.00E-02	2.29E-02	2.00E+01	1.90E-03	7.90E+01
75-35-4	1,1-Dichloroethylene	2.30E+03	9.00E-02	1.04E-05	1.10E+00	7.10E-01	5.00E+01	5.30E-03	6.00E+02
156-59-2	<i>cis</i> -1,2-Dichloroethylene	3.50E+03	8.86E-02	1.13E-05	1.70E-01	1.00E-01	4.00E+01	2.40E-04	2.00E+02
156-60-5	<i>trans</i> -1,2-Dichloroethylene	6.30E+03	7.03E-02	1.19E-05	3.90E-01	2.43E-01	5.00E+01	2.40E-04	3.30E+02
120-83-2	2,4-Dichlorophenol	4.50E+03	4.89E-02	8.77E-06	1.30E-04	----- ^a	7.32E+02 ^d	2.70E-04	6.70E-02

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78-87-5	1,2-Dichloropropane	2.80E+03	7.82E-02	8.73E-06	1.10E-01	6.52E-02	5.00E+01	2.70E-04	5.20E+01
542-75-6	1,3-Dichloropropylene (<i>cis + trans</i>)	2.80E+03	6.26E-02	1.00E-05	7.40E-01	3.98E-01	2.00E+01	6.10E-02	3.40E+01
60-57-1	Dieldrin	2.00E-01	1.92E-02	4.74E-06	6.2E-04	----- ^a	2.50E+04	3.20E-04	5.9E-06
84-66-2	Diethyl Phthalate	1.10E+03	2.49E-02	6.35E-06	1.80E-05	----- ^a	3.20E+02	6.19E-03	1.60E-03
105-67-9	2,4-Dimethylphenol	7.90E+03	6.43E-02	8.69E-06	8.20E-05	----- ^a	2.00E+02	4.95E-02	9.80E-02
75-71-8	1,3-Dinitrobenzene	8.60E+02	4.55E-02	8.46E-06	2.30E-07	----- ^a	3.20E+01	1.92E-03	9.00E-04
51-28-5	2,4-Dinitrophenol	2.79E+03	2.73E-02	9.06E-06	1.82E-05	----- ^a	3.24E+01	1.32E-03	5.10E-03
121-14-2	2,4-Dinitrotoluene	2.70E+02	2.03E-01	7.06E-06	3.80E-06	----- ^a	8.90E+01	1.92E-03	1.47E-04
606-20-2	2,6-Dinitrotoluene	1.82E+02	3.70E-02	7.76E-06	3.06E-05	----- ^a	4.90E+01	1.92E-03	5.67E-04
88-85-7	Dinoseb	5.20E+01	2.45E-02	6.25E-06	1.87E-05	----- ^a	9.17E+01 ^d	2.82E-03	7.50E-05
117-84-0	Di-n-octyl Phthalate	2.00E-02	1.73E-02	4.17E-06	2.74E-03	----- ^a	1.30E+05	1.90E-03	2.60E-06
123-91-1	p-Dioxane	1.00E+06	2.29E-01	1.02E-05	1.97E-04	1.07E-04	7.20E-01	1.92E-03	3.81E+01
115-29-7	Endosulfan	5.10E-01	1.85E-02	4.55E-06	4.51E-04	----- ^a	5.00E+03	7.63E-02	1.00E-05

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145-73-3	Endothall	2.10E+04	2.91E-02	8.07E-06	1.58E-14	----- ^a	7.59E+01	No Data	1.57E-10
72-20-8	Endrin	2.50E-01	1.92E-02	4.74E-6	3.08E-04	----- ^a	3.20E+04	3.20E-04	3.00E-06
100-41-4	Ethylbenzene	1.70E+02	7.50E-02	7.80E-06	3.24E-01	1.64E-01	3.20E+02	3.00E-03	9.60E+00
206-44-0	Fluoranthene	2.06E-01	2.51E-02	6.35E-06	6.60E-04	----- ^a	7.40E+04	1.90E-04	1.23E-08
86-73-7	Fluorene	2.00E+00	4.40E-02	7.88E-06	2.62E-03	----- ^a	1.30E+04	6.91E-04	6.30E-04
76-44-8	Heptachlor	1.80E-01	2.23E-02	5.69E-06	6.07E-02	1.73E-02	3.00E+03	1.30E-01	4.00E-04
1024-57-3	Heptachlor epoxide	2.00E-01	2.19E-02	5.57E-06	3.90E-04	----- ^a	2.00E+05	6.30E-04	1.90E-05
118-74-1	Hexachlorobenzene	6.20E-03	5.42E-02	5.91E-06	5.33E-02	1.35E-02	2.00E+04	1.70E-04	1.80E-05
319-84-6	Alpha-HCH (alpha-BHC)	2.00E+00	2.04E-02	5.04E-06	4.51E-04	----- ^a	5.00E+03	2.50E-03	4.50E-05
58-89-9	Gamma-HCH (Lindane)	7.30E+00	2.75E-02	7.34E-06	5.74E-04	----- ^a	3.00E+03	2.90E-03	4.10E-04
2691-41-0	High Melting Explosive, Octogen (HMX)	5.00E+00	2.69E-02	7.15E-06	8.67E-10	3.55E-08	1.40E+00	No Data	3.30E-14
77-47-4	Hexachlorocyclopentadiene	1.80E+00	2.79E-02	7.21E-06	1.11E+00	4.22E-01	1.20E+04	1.20E-02	5.96E-02
67-72-1	Hexachloroethane	5.00E+01	2.50E-03	6.80E-06	1.59E-01	7.26E-02	1.50E+03	1.92E-03	2.10E-01

CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (D _i) (cm ² /s)	Diffusivity in Water (D _w) (cm ² /s)	Dimensionless Henry's Law Constant (H') (25°C)	Dimensionless Henry's Law Constant (H') (13°C) For the indoor inhalation exposure route	Organic Carbon Partition Coefficient (K _{oc}) (L/kg)	First Order Degradation Constant (λ) (d ⁻¹)	Vapor Pressure (mm/Hg)
193-39-5	Indeno(1,2,3-c,d)pyrene	2.20E-05	2.25E-02	5.66E-06	6.56E-05	----- ^a	3.10E+06	4.70E-04	1.00E-10
78-59-1	Isophorone	1.20E+04	6.23E-02	6.76E-06	2.72E-04	1.12E-04	2.50E+01	1.24E-02	4.38E-01
98-82-8	Isopropylbenzene (Cumene)	6.10E+01	6.50E-02	7.10E-06	4.92E+01	2.10E+01	1.02E+03	4.33E-02	4.50E+00
93-65-2	Mecoprop (MCP)	8.95E+02	2.40E-02	6.05E-06	7.70E-09	----- ^a	1.84E+01 ^d	3.85E-03	2.44E-05
7439-97-6	Mercury	6.00E-02	7.14E-02	3.01E-05	4.51E-01	1.59E-01	8.70E+03	No Data	2.00E-03
72-43-5	Methoxychlor	4.50E-02	1.84E-02	4.46E-06	6.56E-04	----- ^a	5.00E+04	1.90E-03	6.00E-07
74-83-9	Methyl Bromide	1.50E+04	7.28E-02	1.21E-05	2.56E-01	1.79E-01	1.00E+01	1.82E-02	1.62E+03
1634-04-4	Methyl tertiary-butyl ether	5.10E+04	8.59E-02	1.10E-05	2.42E-02	1.50E-02	1.00E+01	No Data	2.50E+02
75-09-2	Methylene Chloride	1.30E+04	1.01E-01	1.17E-05	9.02E-02	5.70E-02	1.30E+01	1.20E-02	4.30E+02
93-65-2	2-Methyl-naphthalene	2.50E+01	5.22E-02	7.75E-06	2.10E-02	6.95E-03	1.60E+03	No Data	6.80E-02
95-48-7	2-Methylphenol (o-cresol)	2.60E+04	7.40E-02	8.30E-06	4.92E-05	2.00E-05	4.20E+01	4.95E-02	2.99E-01
91-20-3	Naphthalene	3.10E+01	5.90E-02	7.50E-06	1.97E-02	8.29E-03	5.00E+02	2.70E-03	8.50E-02
98-95-3	Nitrobenzene	2.09E+03	7.60E-02	8.60E-06	9.84E-04	3.99E-04	4.00E+01	1.76E-03	2.40E-01

CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (D _i) (cm ² /s)	Diffusivity in Water (D _w) (cm ² /s)	Dimensionless Henry's Law Constant (H') (25°C)	Dimensionless Henry's Law Constant (H') (13°C) For the indoor inhalation exposure route	Organic Carbon Partition Coefficient (K _{oc}) (L/kg)	First Order Degradation Constant (λ) (d ⁻¹)	Vapor Pressure (mm/Hg)
86-30-6	N-Nitrosodiphenylamine	3.50E+01	2.83E-02	7.19E-06	2.10E-04	----- ^a	1.00E+03	1.00E-02	6.70E-04
621-64-7	N-Nitrosodi-n-propylamine	9.89E+03	5.87E-02	8.17E-06	9.20E-05	5.48E-05	1.45E+01	1.90E-03	1.30E-01
87-86-5	Pentachlorophenol	2.00E+03	5.60E-02	6.10E-06	9.84E-07	----- ^a	2.77E+03 ^d	4.50E-04	3.20E-05
108-95-2	Phenol	8.30E+04	8.20E-02	9.10E-06	1.64E-05	6.67E-06	2.00E+01	9.90E-02	2.80E-01
1918-02-1	Picloram	4.30E+02	2.26E-02	5.64E-06	2.19E-12	----- ^a	2.00E+00	No Data	7.21E-11
1336-36-3	Polychlorinated biphenyls (PCBs)	----- ^a	----- ^a	----- ^a	----- ^a	----- ^a	----- ^a	----- ^a	----- ^a
129-00-0	Pyrene	1.40E+00	2.77E-02	7.24E-06	4.51E-04	----- ^a	6.31E+04	1.80E-04	4.60E-06
121-82-4	Royal Demolition Explosive, Cyclonite (RDX)	5.97E+01	3.11E-02	8.49E-06	2.01E-11	----- ^a	7.20E+00	No Data	4.10E-09
122-34-9	Simazine	6.20E+00	2.48E-02	6.28E-06	3.80E-08	----- ^a	1.32E+02	No Data	2.21E-08
100-42-5	Styrene	3.10E+02	7.10E-02	8.00E-06	1.11E-01	5.48E-03	3.16E+02	3.30E-03	6.10E+00
93-72-1	2,4,5-TP (Silvex)	7.10E+01	2.30E-02	5.83E-06	3.71E-07	----- ^a	5.50E+03	No Data	9.97E-06
127-18-4	Tetrachloroethylene	2.00E+02	7.20E-02	8.20E-06	7.38E-01	4.00E-01	6.31E+02	9.60E-04	1.90E+01
108-88-3	Toluene	5.30E+02	8.70E-02	8.60E-06	2.71E-01	1.49E-01	1.58E+02	1.10E-02	2.80E+01

CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (D _i) (cm ² /s)	Diffusivity in Water (D _w) (cm ² /s)	Dimensionless Henry's Law Constant (H') (25°C)	Dimensionless Henry's Law Constant (H') (13°C) For the indoor inhalation exposure route	Organic Carbon Partition Coefficient (K _{oc}) (L/kg)	First Order Degradation Constant (λ) (d ⁻¹)	Vapor Pressure (mm/Hg)
8001-35-2	Toxaphene	7.40E-01	2.16E-02	5.51E-06	2.46E-04	----- ^a	5.01E+04	No Data	9.80E-07
120-82-1	1,2,4-Trichlorobenzene	3.50E+01	3.00E-02	8.23E-06	5.74E-02	2.38E-02	1.58E+03	1.90E-03	4.30E-01
71-55-6	1,1,1-Trichloroethane	1.30E+03	7.80E-02	8.80E-06	6.97E-01	4.21E-01	1.26E+02	1.30E-03	1.20E+02
79-00-5	1,1,2-Trichloroethane	4.40E+03	7.80E-02	8.80E-06	3.73E-02	1.98E-02	5.01E+01	9.50E-04	2.30E+01
79-01-6	Trichloroethylene	1.50E+03	7.90E-02	9.10E-06	4.10E-01	2.41E-01	1.00E+02	4.20E-04	7.30E+01
75-69-4	Trichlorofluoromethane	1.10E+03	8.70E-02	9.70E-06	3.98E+00	2.69E+00	1.30E+02	9.63E-04	8.00E+02
95-95-4	2,4,5-Trichlorophenol	1.20E+03	2.91E-02	7.03E-06	1.78E-04	----- ^a	2.68E+03 ^d	3.80E-04	2.40E-02
88-06-2	2,4,6-Trichlorophenol	8.00E+02	2.61E-02	6.36E-06	3.53E-04	----- ^a	8.78E+02 ^d	3.80E-04	2.00E-02
108-05-4	Vinyl Acetate	2.00E+04	8.50E-02	9.20E-06	2.09E-02	1.18E-02	4.57E+00	No Data	9.00E+01
99-35-4	1,3,5-Trinitrobenzene	2.80E+02	2.41E-02	6.08E-06	3.30E-10	----- ^a	1.60E+01	No Data	6.40E-06
118-96-7	2,4,6-Trinitrotoluene (TNT)	1.24E+02	2.94E-02	7.90E-06	4.87E-09	----- ^a	3.72E+01	1.92E-03	2.02E-06
57-01-4	Vinyl Chloride	8.80E+03	1.06E-01	1.23E-06	1.11E+00	8.14E-01	1.58E+01	2.40E-04	3.00E+03
108-38-3	m-Xylene	1.60E+02	7.00E-02	7.80E-06	2.99E-01	1.52E-01	3.98E+02	1.90E-03	8.50E+00

CAS No.	Chemical	Solubility in Water (S) (mg/L)	Diffusivity in Air (D _i) (cm ² /s)	Diffusivity in Water (D _w) (cm ² /s)	Dimensionless Henry's Law Constant (H') (25°C)	Dimensionless Henry's Law Constant (H') (13°C) For the indoor inhalation exposure route	Organic Carbon Partition Coefficient (K _{oc}) (L/kg)	First Order Degradation Constant (λ) (d ⁻¹)	Vapor Pressure (mm/Hg)
95-47-6	o-Xylene	1.80E+02	8.70E-02	1.00E-05	2.13E-01	1.07E-01	3.16E+02	1.90E-03	6.60E+00
106-42-3	p-Xylene	1.60E+02	7.69E-02	8.44E-06	3.16E-01	1.59E-01	3.16E+02	1.90E-03	8.90E+00
1330-20-7	Xylenes (total)	1.10E+02	7.35E-02	9.23E-06	2.71E-01	NA	3.98E+02	1.90E-03	8.00E+00

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.

- ^a Soil remediation objectives are determined pursuant to 40 CFR 761, as incorporated by reference at Section 742.210(b) (the USEPA "PCB Spill Cleanup Policy"), for most sites; persons remediating sites should consult with BOL if calculation of Tier 2 or 3 remediation objectives is desired. PCBs are a mixture of different congeners. The appropriate values to use for the physical/chemical parameters depend on congeners present at the site.
- ^b Dimensionless Henry's Law Constant at 13°C is not calculated because the chemical is not volatile and does not require evaluation under the indoor inhalation exposure route.
- ^c Dimensionless Henry's Law Constant = 20°C
- ^d These chemicals are ionizing and its K_{oc} value will change with pH. The K_{oc} values listed in this table is the effective K_{oc} at pH of 6.8. If the site-specific pH is values other than 6.8, the K_{oc} value listed in Section 742, Appendix C, Table I should be used.
- ^e The values in this table were taken from the following sources (in order of preference): SCDMS online database (<http://www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm>); CHEMFATE online database (<http://www.srcinc.com/what-we-do/databaseforms.aspx?id=381>); PhysProp online database (<http://www.srcinc.com/what-we-do/databaseforms.aspx?id=386>); Water9

(<http://www.epa.gov/ttn/chief/software/water/>) for diffusivity values; and Handbook of Environmental Degradation Rates by P.H. Howard (1991) for first order degradation constant values.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.APPENDIX C: Tier 2 Illustrations and Tables

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

Methods for Determining Physical Soil Parameters		
Parameter	Sampling Location ^a	Method
ρ_b (soil bulk density)	Surface	ASTM - D 1556-90 Sand Cone Method ^b
		ASTM - D 2167-94 Rubber Balloon Method ^b
		ASTM - D 2922-91 Nuclear Method ^b
	Subsurface	ASTM - D 2937-94 Drive Cylinder Method ^b
ρ_s (soil particle density)	Surface or Subsurface	ASTM - D 854-92 Specific Gravity of Soil ^b
w (moisture content)	Surface or Subsurface	ASTM - D 4959-89 (Reapproved 1994) Standard ^b
		ASTM - D 4643-93 Microwave Oven ^b
		ASTM - D2216-92 Laboratory Determination ^b
		ASTM - D3017-88 (Reapproved 1993) Nuclear Method ^b
		Equivalent USEPA Method (e.g., sample preparation procedures described in methods 3541 or 3550)
f_{oc} (fraction organic carbon content)	Surface or Subsurface	ASTM - D 2974-00 Moisture, Ash, and Organic Matter appropriately adjusted to estimate the fraction of organic carbon as stated in Nelson and Sommers (1982) ^b

Methods for Determining Physical Soil Parameters		
Parameter	Sampling Location ^a	Method
η or θ_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, or Equation J&E 16 in Appendix C, Table L for J&E Model
θ_a or θ_{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, or Equation J&E 18 in Appendix C, Table L for J&E Model
θ_w or θ_{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, or Equation J&E 17 in Appendix C, Table L for J&E Model
K (hydraulic conductivity)	Surface or Subsurface	ASTM - D 5084-90 Flexible Wall Permeameter ^b
		Pump Test
		Slug Test
i (hydraulic gradient)	Surface or Subsurface	Field Measurement

^a This is the location where the sample is collected

^b As incorporated by reference in Section 742.120.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.APPENDIX C: Tier 2 Tables and Illustrations

Section 742.Table G: Error Function (erf)

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

β	$\text{erf}(\beta)$
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

Section 742.APPENDIX C Tier 2 Illustrations and Tables

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

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

(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX C TABLE I: K_{oc} Values for Ionizing Organics as a Function of pH (cm^3/g or L/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	2,4,5-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	4.62E+00	3.98E+02	1.59E+02	7.96E+03	2.36E+03	1.03E+03	1.59E+04	7.76E+03
5.1	3.86E+00	3.98E+02	1.59E+02	6.93E+03	2.36E+03	1.02E+03	1.36E+04	7.30E+03
5.2	3.23E+00	3.98E+02	1.59E+02	5.97E+03	2.35E+03	1.01E+03	1.15E+04	6.91E+03
5.3	2.70E+00	3.98E+02	1.59E+02	5.10E+03	2.34E+03	9.99E+02	9.66E+03	6.60E+03
5.4	2.27E+00	3.98E+02	1.58E+02	4.32E+03	2.33E+03	9.82E+02	8.10E+03	6.36E+03
5.5	1.92E+00	3.97E+02	1.58E+02	3.65E+03	2.32E+03	9.62E+02	6.77E+03	6.16E+03
5.6	1.63E+00	3.97E+02	1.58E+02	3.07E+03	2.31E+03	9.38E+02	5.65E+03	6.00E+03
5.7	1.40E+00	3.97E+02	1.58E+02	2.58E+03	2.29E+03	9.10E+02	4.73E+03	5.88E+03
5.8	1.22E+00	3.97E+02	1.58E+02	2.18E+03	2.27E+03	8.77E+02	3.97E+03	5.78E+03
5.9	1.07E+00	3.97E+02	1.57E+02	1.84E+03	2.24E+03	8.39E+02	3.35E+03	5.70E+03
6.0	9.50E-01	3.96E+02	1.57E+02	1.56E+03	2.21E+03	7.96E+02	2.84E+03	5.64E+03
6.1	8.54E-01	3.96E+02	1.57E+02	1.33E+03	2.17E+03	7.48E+02	2.43E+03	5.59E+03
6.2	7.78E-01	3.96E+02	1.56E+02	1.15E+03	2.12E+03	6.97E+02	2.10E+03	5.55E+03
6.3	7.19E-01	3.95E+02	1.55E+02	9.98E+02	2.06E+03	6.44E+02	1.83E+03	5.52E+03

pH	Benzoic Acid	2-Chloro-phenol	2,4-Dichloro-phenol	Pentachloro-phenol	2,4,5-Trichloro-phenol	2,4,6-Trichloro-phenol	Dinoseb	2,4,5-TP (Silvex)
6.4	6.69E-01	3.94E+02	1.54E+02	8.77E+02	1.99E+03	5.89E+02	1.62E+03	5.50E+03
6.5	6.31E-01	3.93E+02	1.53E+02	7.81E+02	1.91E+03	5.33E+02	1.45E+03	5.48E+03
6.6	6.00E-01	3.92E+02	1.52E+02	7.03E+02	1.82E+03	4.80E+02	1.32E+03	5.46E+03
6.7	5.74E-01	3.90E+02	1.50E+02	6.40E+02	1.71E+03	4.29E+02	1.21E+03	5.45E+03
6.8	5.55E-01	3.88E+02	1.47E+02	5.92E+02	1.60E+03	3.81E+02	1.12E+03	5.44E+03
6.9	5.39E-01	3.86E+02	1.45E+02	5.52E+02	1.47E+03	3.38E+02	1.05E+03	5.43E+03
7.0	5.28E-01	3.83E+02	1.41E+02	5.21E+02	1.34E+03	3.00E+02	9.96E+02	5.43E+03
7.1	5.18E-01	3.79E+02	1.38E+02	4.96E+02	1.21E+03	2.67E+02	9.52E+02	5.42E+03
7.2	5.10E-01	3.75E+02	1.33E+02	4.76E+02	1.07E+03	2.39E+02	9.18E+02	5.42E+03
7.3	5.04E-01	3.69E+02	1.28E+02	4.61E+02	9.43E+02	2.15E+02	8.90E+02	5.42E+03
7.4	4.99E-01	3.62E+02	1.21E+02	4.47E+02	8.19E+02	1.95E+02	8.68E+02	5.41E+03
7.5	4.95E-01	3.54E+02	1.14E+02	4.37E+02	7.03E+02	1.78E+02	8.50E+02	5.41E+03
7.6	4.92E-01	3.44E+02	1.07E+02	4.29E+02	5.99E+02	1.64E+02	8.36E+02	5.41E+03
7.7	4.86E-01	3.33E+02	9.84E+01	4.23E+02	5.07E+02	1.53E+02	8.25E+02	5.41E+03
7.8	4.86E-01	3.19E+02	8.97E+01	4.18E+02	4.26E+02	1.44E+02	8.17E+02	5.41E+03
7.9	4.85E-01	3.04E+02	8.07E+01	4.14E+02	3.57E+02	1.37E+02	8.10E+02	5.41E+03
8.0	4.85E-01	2.86E+02	7.17E+01	4.10E+02	2.98E+02	1.31E+02	8.04E+02	5.41E+03
8.1	4.84E-01	2.67E+02	6.30E+01	4.09E+02	2.49E+02	1.26E+02	8.00E+02	5.40E+03
8.2	4.84E-01	2.46E+02	5.47E+01	4.07E+02	2.08E+02	1.22E+02	7.97E+02	5.40E+03
8.3	4.83E-01	2.24E+02	4.40E+01	4.05E+02	1.75E+02	1.19E+02	7.93E+02	5.40E+03

pH	Benzoic Acid	2-Chloro-phenol	2,4-Dichloro-phenol	Pentachloro-phenol	2,4,5-Trichloro-phenol	2,4,6-Trichloro-phenol	Dinoseb	2,4,5-TP (Silvex)
8.4	4.83E-01	2.02E+02	4.00E+01	4.04E+02	1.48E+02	1.17E+02	7.91E+02	5.40E+03
8.5	4.82E-01	1.80E+02	3.38E+01	4.03E+02	1.25E+02	1.15E+02	7.89E+02	5.40E+03
8.6	4.82E-01	1.58E+02	2.84E+01	4.02E+02	1.08E+02	1.13E+02	7.88E+02	5.40E+03
8.7	4.82E-01	1.37E+02	2.38E+01	4.02E+02	9.31E+02	1.12E+02	7.87E+02	5.40E+03
8.8	4.81E-01	1.18E+02	1.99E+01	4.01E+02	8.16E+02	1.11E+02	7.86E+02	5.40E+03
8.9	4.81E-01	1.00E+02	1.66E+01	4.01E+02	7.23E+01	1.10E+02	7.85E+02	5.40E+03
9.0	4.80E-01	8.47E+01	1.39E+01	4.00E+02	6.48E+01	1.09E+02	7.85E+02	5.40E+03

(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX C: Tier 2 Illustrations and Tables

Section 742.TABLE J Values to be Substituted for k_d or k_s when Evaluating Inorganics as a Function of pH (cm^3/g or L/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	Pb
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	1.5E+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	1.5E+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	1.5E+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	1.5E+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	1.5E+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	1.5E+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	1.5E+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	1.5E+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	1.5E+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	1.5E+01

pH	As	Ba	Be	Cd	Cr (+3)	Cr (+6)	Hg	Ni	Ag	Se	Tl	Zn	Pb
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	1.5E+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	1.5E+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	1.5E+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	1.5E+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	1.5E+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	7.1E+02
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	7.1E+02
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	7.1E+02
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	7.1E+02
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	7.1E+02
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	7.1E+02
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	7.1E+02

pH	As	Ba	Be	Cd	Cr (+3)	Cr (+6)	Hg	Ni	Ag	Se	Tl	Zn	Pb
7.1	2.9E+01	4.3E+01	2.5E+03	1.5E+02	2.8E+06	1.7E+01	9.9E+0 1	1.1E+02	1.6E+0 1	4.1E+00	7.6E+01	8.3E+01	7.1E+02
7.2	3.0E+01	4.4E+01	3.8E+03	2.0E+02	3.1E+06	1.7E+01	1.2E+0 2	1.4E+02	2.0E+0 1	3.8E+00	7.8E+01	9.5E+01	7.1E+02
7.3	3.0E+01	4.4E+01	5.7E+03	2.8E+02	3.4E+06	1.6E+01	1.3E+0 2	1.8E+02	2.5E+0 1	3.5E+00	8.0E+01	1.1E+02	7.1E+02
7.4	3.0E+01	4.5E+01	8.6E+03	4.0E+02	3.7E+06	1.6E+01	1.5E+0 2	2.5E+02	3.1E+0 1	3.3E+00	8.2E+01	1.3E+02	7.1E+02
7.5	3.0E+01	4.6E+01	1.3E+04	5.9E+02	3.9E+06	1.6E+01	1.6E+0 2	3.5E+02	3.9E+0 1	3.1E+00	8.5E+01	1.6E+02	7.1E+02
7.6	3.1E+01	4.6E+01	2.0E+04	8.7E+02	4.1E+06	1.5E+01	1.7E+0 2	4.9E+02	4.8E+0 1	2.9E+00	8.7E+01	1.9E+02	7.1E+02
7.7	3.1E+01	4.7E+01	3.0E+04	1.3E+03	4.2E+06	1.5E+01	1.8E+0 2	7.0E+02	5.9E+0 1	2.7E+00	8.9E+01	2.4E+02	7.1E+02
7.8	3.1E+01	4.9E+01	4.6E+04	1.9E+03	4.3E+06	1.4E+01	1.9E+0 2	9.9E+02	7.3E+0 1	2.5E+00	9.1E+01	3.1E+02	7.1E+02
7.9	3.1E+01	5.0E+01	6.9E+04	2.9E+03	4.3E+06	1.4E+01	1.9E+0 2	1.4E+03	8.9E+0 1	2.4E+00	9.4E+01	4.0E+02	7.1E+02
8.0	3.1E+01	5.2E+01	1.0E+05	4.3E+03	4.3E+06	1.4E+01	2.0E+0 2	1.9E+03	1.1E+0 2	2.2E+00	9.6E+01	5.3E+02	7.1E+02
8.1	3.2E+01	--- ^a	--- ^a	--- ^a	--- ^a	1.3E+01	--- ^a	--- ^a	--- ^a	2.1E+00	1.0E+02	--- ^a	7.1E+02
8.2	3.2E+01	--- ^a	--- ^a	--- ^a	--- ^a	1.3E+01	--- ^a	--- ^a	--- ^a	1.9E+00	1.0E+02	--- ^a	7.1E+02

pH	As	Ba	Be	Cd	Cr (+3)	Cr (+6)	Hg	Ni	Ag	Se	Tl	Zn	Pb
8.3	3.2E+01	--- ^a	--- ^a	--- ^a	--- ^a	1.3E+01	--- ^a	--- ^a	--- ^a	1.8E+00	1.0E+02	--- ^a	7.1E+02
8.4	3.2E+01	--- ^a	--- ^a	--- ^a	--- ^a	1.2E+01	--- ^a	--- ^a	--- ^a	1.7E+00	1.1E+02	--- ^a	7.1E+02
8.5	3.2E+01	--- ^a	--- ^a	--- ^a	--- ^a	1.2E+01	--- ^a	--- ^a	--- ^a	1.6E+00	1.1E+02	--- ^a	7.1E+02
8.6	3.3E+01	--- ^a	--- ^a	--- ^a	--- ^a	1.2E+01	--- ^a	--- ^a	--- ^a	1.5E+00	1.1E+02	--- ^a	7.1E+02
8.7	3.3E+01	--- ^a	--- ^a	--- ^a	--- ^a	1.2E+01	--- ^a	--- ^a	--- ^a	1.4E+00	1.2E+02	--- ^a	7.1E+02
8.8	3.3E+01	--- ^a	--- ^a	--- ^a	--- ^a	1.1E+01	--- ^a	--- ^a	--- ^a	1.3E+00	1.2E+02	--- ^a	1.9E+03
8.9	3.3E+01	--- ^a	--- ^a	--- ^a	--- ^a	1.1E+01	--- ^a	--- ^a	--- ^a	1.2E+00	1.2E+02	--- ^a	1.9E+03
9.0	3.3E+01	--- ^a	--- ^a	--- ^a	--- ^a	1.0E+01	--- ^a	--- ^a	--- ^a	1.1E+00	1.2E+02	--- ^a	1.9E+03

^a No data available for this pH.

(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX C Tier 2 Illustrations and Tables

Section 742.TABLE K Parameter Estimates for Calculating Water-Filled Soil Porosity (θ_w)

Soil Texture ^a	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

^a 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.

^b Where b is the soil-specific exponential parameter (unitless)

(Source: Amended at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX C: Tier 2 Tables

Section 742.Table L: J&E Equations^a

Indoor air remediation objectives (mg/m ³)	For carcinogenic contaminants	$RO_{indoor\ air} = \frac{TR \times AT_c \times 365 \frac{days}{yr}}{ED \times EF \times URF \times 1000 \frac{\mu g}{mg}}$	J&E1
	For noncarcinogenic contaminants	$RO_{indoor\ air} = \frac{THQ \times AT_{nc} \times 365 \frac{days}{yr} \times RfC}{ED \times EF}$	J&E2
To convert mg/m ³ from parts per million volume		$mg / m^3 = \frac{ppmv \times MW}{24.45}$ <p>Note: 24.45 equals the molar volume of air in liters at normal temperature (25°C) and pressure (760 mm Hg).</p>	J&E3

Soil gas remediation objective (mg/m ³)		$RO_{soil\ gas} = \frac{RO_{indoor\ air}}{\alpha}$	J&E4
Soil Vapor Saturation Limit (mg/m ³ -air)		$C_v^{sat} = \frac{P \times MW}{R \times T} \times 10^6$	J&E5
Groundwater remediation objectives		$RO_{gw} = \frac{RO_{soil\ gas}}{H'_{TS} \times 1000 \frac{L}{m^3}}$	J&E6
Attenuation factor	<p>Attenuation factor when the mode of contaminant transport is both diffusion and advection</p> <p>$Q_{soil} = 83.33$ cm³/sec</p>	$\alpha = \frac{\left[\left(\frac{D_T^{eff} \times A_B}{Q_{bldg} \times L_T} \right) \times \exp\left(\frac{Q_{soil} \times L_{crack}}{D_{crack}^{eff} \times A_{crack}} \right) \right]}{\left[\exp\left(\frac{Q_{soil} \times L_{crack}}{D_{crack}^{eff} \times A_{crack}} \right) + \left(\frac{D_T^{eff} \times A_B}{Q_{bldg} \times L_T} \right) + \left(\frac{D_T^{eff} \times A_B}{Q_{soil} \times L_T} \right) \left[\exp\left(\frac{Q_{soil} \times L_{crack}}{D_{crack}^{eff} \times A_{crack}} \right) - 1 \right] \right]}$	J&E7

	<p>Attenuation factor when the mode of contaminant transport is diffusion only</p> <p>$Q_{soil} = 0 \text{ cm}^3/\text{sec}$</p>	$\alpha = \frac{\left(\frac{D_T^{eff} \times A_B}{Q_{bldg} \times L_T} \right)}{\left[1 + \left(\frac{D_T^{eff} \times A_B}{Q_{bldg} \times L_T} \right) + \left(\frac{D_T^{eff} \times A_B \times L_{crack}}{L_T \times D_{crack}^{eff} \times A_{crack}} \right) \right]}$	<p>J&E8</p>
<p>Total overall effective diffusion coefficient for vapor transport in porous media for multiple soil layers (cm^2/s)</p>	<p>In Equation J&E9a, the following condition must be satisfied:</p>	$D_T^{eff} = \frac{L_T}{\sum_{i=1}^n L_i / D_i^{eff}}$	<p>J&E9a</p>
<p>Source to building separation (cm)</p>		$L_T = D_{source} - L_F$	<p>J&E10</p>
<p>Effective diffusion coefficient for each soil layer (cm^2/s)</p>		$D_i^{eff} = D_i \left(\frac{\theta_{a,i}^{3.33}}{\theta_{T,i}^2} \right) + \left(\frac{D_w}{H'_{TS}} \right) \left(\frac{\theta_{w,i}^{3.33}}{\theta_{T,i}^2} \right)$	<p>J&E11</p>

Surface area of enclosed space at or below grade (cm ²)	For a building with a full concrete slab-on-grade	$A_B = (L_B \times W_B)$	J&E12a
Surface area of enclosed space at or below grade (cm ²)	For a building with a full concrete basement floor and walls	$A_B = (L_B \times W_B) + (2 \times L_F \times L_B) + (2 \times L_F \times W_B)$	J&E12b
Building ventilation rate (cm ³ /s)		$Q_{bldg} = \left(\frac{L_B \times W_B \times H_B \times ER}{3600 \frac{sec}{hr}} \right)$	J&E13
Area of total cracks (cm ²)		$A_{crack} = 2 \times (L_B + W_B) \times w$	J&E14
Effective diffusion coefficient through the cracks (cm ² /s)		$D_{crack}^{eff} = D_i \left(\frac{\theta_{a,crack}^{3.33}}{\theta_{T,crack}^2} \right) + \left(\frac{D_w}{H'_{TS}} \right) \left(\frac{\theta_{w,crack}^{3.33}}{\theta_{T,crack}^2} \right)$	J&E15

Total porosity		$\theta_{T_i} = 1 - \frac{\rho_{bi}}{\rho_s}$	J&E16
Water-filled soil porosity		$\theta_w = (W) \left(\frac{\rho_b}{\rho_w} \right)$	J&E17
Air-filled soil porosity		$\theta_a = \theta_T - \theta_w$	J&E18

^a This table contains equations based on the assumption that the existing or potential building has a full concrete slab-on-grade or a full concrete basement floor and walls. This table applies only when the existing or potential building has a full concrete slab-on-grade or a full concrete basement floor and walls. Institutional controls under Subpart J are required to develop remediation objectives pursuant to this table. This table does not apply when the existing or potential building has neither a full concrete slab-on-grade nor a full concrete basement floor and walls, such as a building with an earthen crawl space, an earthen floor, a stone foundation, a partial concrete floor, or a sump. In such cases, site evaluators have the option of excluding the indoor inhalation exposure route under Section 742.312, meeting the building control technology requirements under Subpart L, or proposing an alternative approach under Tier 3.

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.APPENDIX C: Tier 2 Tables

Section 742.Table M: J&E Parameters

Symbol	Parameter	Units	Source	Tier 1 or Calculated Value
A_B	Surface area of enclosed space at or below grade	cm^2	Equation J&E 12a or 12b, Appendix C, Table L	Residential = 1×10^6 Industrial/Commercial = 4.0×10^6
A_{crack}	Area of total cracks	cm^2	Equation J&E 14, Appendix C, Table L	Calculated Value
AT_c	Averaging time for carcinogens	year	SSL, May 1996	70
AT_{nc}	Averaging time for noncarcinogens	year	$AT_{nc} = ED$	Residential = 30 Industrial/Commercial = 25
C_v^{sat}	Soil vapor saturation limit	mg/m^3 -air	Equation J&E 5, Appendix C, Table L	Chemical-Specific or Calculated Value
D_{crack}^{eff}	Effective diffusion coefficient through the cracks	cm^2 / s	Equation J&E 15, Appendix C, Table L	Calculated Value
D_i	Diffusivity in air	cm^2 / s	Appendix C, Table E	Chemical-Specific

Symbol	Parameter	Units	Source	Tier 1 or Calculated Value
D_i^{eff}	Effective diffusion coefficient for each soil layer	cm^2 / s	Equation J&E 11, Appendix C, Table L	Calculated Value
D_{source}	Distance from ground surface to top of contamination	cm	Field Measurement	Soil Gas Contamination = 152.4 Groundwater Contamination = 304.8 Site-Specific
D_T^{eff}	Total overall effective diffusion coefficient	cm^2 / s	Equation J&E 9a, Appendix C, Table L	Calculated Value
D_w	Diffusivity in water	cm^2 / s	Appendix C, Table E	Chemical-Specific
ED	Exposure duration	year	Residential: SSL, May 1996 Industrial/Commercial: SSL 2002	Residential = 30 Industrial/Commercial = 25
EF	Exposure frequency	day/year	Residential: SSL, May 1996 Industrial/Commercial: SSL 2002	Residential = 350 Industrial/Commercial = 250

Symbol	Parameter	Units	Source	Tier 1 or Calculated Value
ER	Air exchange rate	exchanges per hour	Illinois EPA	Residential = 0.53 Industrial/Commercial = 0.93
f_{oc}	Fraction organic carbon content	g/g	SSL, May 1996, or Field Measurement Appendix C, Table F	0.002 or Site-Specific
H_B	Height of building	cm	Illinois EPA	Slab on Grade Residential = 244 Industrial/Commercial = 305 or Site-Specific in Tier 3 Basement Residential = 427 Industrial/Commercial = 488 or Site-Specific in Tier 3
H'_{TS}	Dimensionless Henry's law constant at the system (soil) temperature 13°C	unitless	Appendix C, Table E	Chemical-Specific

Symbol	Parameter	Units	Source	Tier 1 or Calculated Value
L_B	Length of building	cm	Illinois EPA	Residential = 1000 Industrial/Commercial = 2000 or Site-Specific in Tier 3
L_{crack}	Slab thickness	cm	US EPA, Users Guide 2004	10
L_F	Distance from ground surface to bottom of slab	cm	US EPA, Users Guide 2004	10 (slab on grade) 200 (basement)
L_i	Thickness of soil layer i	cm	Field Measurement For capillary fringe, USEPA, 2004	Site-Specific For capillary fringe, 37.5 cm
L_T	Distance from bottom of slab to top of contamination	cm	Field Measurement or Equation J&E 10, Appendix C, Table L	142.4 or Site-Specific
MW	Molecular weight	g/mole	Illinois EPA	Chemical-Specific

Symbol	Parameter	Units	Source	Tier 1 or Calculated Value
n	Total number of layers of different types of soil vapors migrate through from source to building (if source is groundwater, include a capillary fringe layer of 37.5 cm as one of the layers)	unitless	Field measurement	Site-Specific
P	Vapor Pressure	atm	Appendix C, Table E	Chemical-Specific
Q _{bldg}	Building ventilation rate	cm ³ /s	Equation J&E 13, Appendix C, Table L	Slab on Grade Residential = 3.59×10^4 Industrial/Commercial = 3.15×10^5 or Site-Specific in Tier 3 Basement Residential = 6.28×10^4 Industrial/Commercial = 5.04×10^5 or Site-Specific in Tier 3

Symbol	Parameter	Units	Source	Tier 1 or Calculated Value
Q_{soil}	Volumetric flow rate of soil gas into the enclosed space	cm^3/s	US EPA, Users Guide for Evaluating Subsurface Vapor Intrusion into Buildings 2004	<p>If L_T is less than 5 feet (152 cm), Q_{soil} equals 83.33</p> <p>If L_T is 5 feet (152 cm) or greater, Q_{soil} equals zero</p> <p>An input value of zero requires an institutional control. See Section 742.505(b) and (c).</p>
R	Ideal gas constant	atm-L/mol-K	US EPA, Users Guide 2004	0.08206
RfC	Reference concentration	ug/m^3	Illinois EPA: http://www.epa.state.il.us/land/taco/toxicity-values.xls	Toxicological-Specific
RO_{gw}	Groundwater remediation objective	mg/L	Appendix B, Table E, or Equation J&E 6, Appendix C, Table L	Chemical-Specific or Calculated Value
$RO_{\text{indoor air}}$	Indoor air remediation objective	mg/m^3	Equations J&E 1 and 2, Appendix C, Table L	Calculated Value

Symbol	Parameter	Units	Source	Tier 1 or Calculated Value
RO _{soil gas}	Soil gas remediation objective	mg/m ³	Equation J&E 4, Appendix C, Table L	Calculated Value
S	Solubility in water	mg/L	Appendix C, Table E	Chemical-Specific
T	Temperature	K	US EPA, Users Guide 2004	286 (converted from 13°C)
THQ	Target hazard quotient for a chemical	unitless	SSL, May 1996	1
TR	Target risk or the increased chance of developing cancer over a lifetime due to exposure to a chemical	unitless	SSL, May 1996	Residential = 10 ⁻⁶ at the point of human exposure Industrial/Commercial = 10 ⁻⁶ at the point of human exposure
URF	Unit risk factor	(ug/m ³) ⁻¹	Illinois EPA: http://www.epa.state.il.us/land/taco/toxicity-values.xls	Toxicological- Specific

Symbol	Parameter	Units	Source	Tier 1 or Calculated Value
w	Floor-wall seam gap	cm	US EPA, Users Guide 2004	0.1
W	Moisture content	g of water/g of soil	Field Measurement, Appendix C, Table F	Site-Specific
W _B	Width of building	cm	Illinois EPA	Residential = 1000 Industrial/Commercial = 2000 or Site-Specific in Tier 3
α	Attenuation factor	unitless	Equations J&E 7 or 8, Appendix C, Table L	Site-Specific
θ_a	Air-filled soil porosity	cm ³ /cm ³	SSL, May 1996 or Equation J&E 18, Appendix C, Table L	0.28 or Calculated Value
$\theta_{a,crack}$	Air-filled porosity for soil in cracks	cm ³ /cm ³	SSL, May 1996 or Equation J&E 18, Appendix C, Table L	0.13
$\theta_{a,i}$	Air-filled porosity of soil layer i	cm ³ /cm ³	SSL, May 1996 or Equation J&E 18, Appendix C, Table L	0.13 or Calculated Value For capillary fringe, $\theta_{a,i} = 0.1 \theta_{T,i}$

Symbol	Parameter	Units	Source	Tier 1 or Calculated Value
$\theta_{T,crack}$	Total porosity for soil in cracks	cm^3/cm^3	SSL, May 1996 or Equation J&E 16, Appendix C, Table L	0.43
$\theta_{T,i}$	Total porosity of soil layer i	cm^3/cm^3	SSL, May 1996 or Equation J&E 16, Appendix C, Table L	0.43 or Calculated Value
θ_w	Water-filled soil porosity	cm^3/cm^3	SSL, May 1996 or Equation J&E 17, Appendix C, Table L	0.15 or Calculated Value
$\theta_{w,crack}$	Water-filled porosity for soil in cracks	cm^3/cm^3	SSL, May 1996 or Equation J&E 17, Appendix C, Table L	0.15
$\theta_{w,i}$	Water-filled porosity of soil layer i	cm^3/cm^3	SSL, May 1996 or Equation J&E 17, Appendix C, Table L For capillary fringe, US EPA, Users Guide 2004	0.15 or Calculated Value For capillary fringe = 0.375 or 0.9 $\theta_{T,i}$

Symbol	Parameter	Units	Source	Tier 1 or Calculated Value
ρ_b	Dry soil bulk density	g/cm^3	SSL, May 1996 or Field Measurement, Appendix C, Table F	1.5 or Calculated Value
$\rho_{s,i}$	Soil particle density	g/cm^3	SSL, May 1996 or Field Measurement, Appendix C, Table F	2.65 or Calculated Value
ρ_w	Density of water	g/cm^3	Illinois EPA	1

(Source: Added at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.APPENDIX D Highway Authority Agreement

HIGHWAY AUTHORITY AGREEMENT

This Agreement is entered into this ____ day of _____, 200_ pursuant to 35 Ill. Adm. Code 742.1020 by and between the (1) _____ (“Property Owner”) [*or, in the case of a petroleum leaking underground storage tank, the owner/operator of the tank (“Owner/Operator”)*] and (2) *Name of Entity in Control of the Right-of-Way* (“Highway Authority”), collectively known as the “Parties.”

[Use this paragraph for sites with petroleum leaking underground storage tank(s)]
WHEREAS, _____ is the owner or operator of one or more leaking underground storage tanks presently or formerly located at *common address or description of Site location* (“the Site”);

[Use this paragraph for sites that do not have petroleum leaking underground storage tanks] **WHEREAS**, _____ is the owner of the property located at *common address or description of Site location* (“the Site”);

WHEREAS, as a result of one or more releases of contaminants [*insert either “from the above referenced underground storage tanks” or “at the above referenced Site”*] (“the Release(s)”), soil and/or groundwater contamination at the Site exceeds the Tier 1 residential remediation objectives of 35 Ill. Adm. Code 742;

WHEREAS, the soil and/or groundwater contamination exceeding Tier 1 residential remediation objectives extends or may extend into the Highway Authority’s right-of-way;

WHEREAS, the Owner/Operator or Property Owner is conducting corrective action in response to the Release(s);

WHEREAS, the Parties desire to prevent groundwater beneath the Highway Authority’s right-of-way that exceeds Tier 1 remediation objectives from use as a supply of potable or domestic water and to limit access to soil within the right-of-way that exceeds Tier 1 residential remediation objectives so that human health and the environment are protected during and after any access;

NOW, THEREFORE, the Parties agree as follows:

1. The recitals set forth above are incorporated by reference as if fully set forth herein.
2. *[Use this paragraph if IEMA has issued an incident number]* The Illinois Emergency Management Agency has assigned incident number(s) _____ to the Release(s).
3. Attached as Exhibit A is a scaled map(s) prepared by the *[Owner/Operator or Property Owner]* that shows the Site and surrounding area and delineates the

current and estimated future extent of soil and groundwater contamination above the applicable Tier 1 residential remediation objectives as a result of the Release(s). *[Use the following sentence if either soil or groundwater is not contaminated above applicable Tier 1 residential remediation objectives: [Soil] [Groundwater] is not contaminated above the applicable Tier 1 residential remediation objectives.]*

4. Attached as Exhibit B is a table(s) prepared by the *[Owner/Operator or Property Owner]* that lists each contaminant of concern that exceeds its Tier 1 residential remediation objective, its Tier 1 residential remediation objective and its concentrations within the zone where Tier 1 residential remediation objectives are exceeded. The locations of the concentrations listed in Exhibit B are identified on the map(s) in Exhibit A.
5. Attached as Exhibit C is a scaled map prepared by the *[Owner/Operator or Property Owner]* showing the area of the Highway Authority's right-of-way that is governed by this agreement ("Right-of-Way"). Because Exhibit C is not a surveyed plat, the Right-of-Way boundary may be an approximation of the actual Right-of-Way lines.
6. *[Use this paragraph if samples have not been collected within the Right-of-Way, sampling within the Right-of-Way is not practical, and contamination does not extend beyond the Right-of-Way].* Because the collection of samples within the Right-of-Way is not practical, the Parties stipulate that, based on modeling, soil and groundwater contamination exceeding Tier 1 residential remediation objectives does not and will not extend beyond the boundaries of the Right-of-Way.
7. The Highway Authority stipulates it has jurisdiction over the Right-of-Way that gives it sole control over the use of the groundwater and access to the soil located within or beneath the Right-of-Way.
8. The Highway Authority agrees to prohibit within the Right-of-Way all potable and domestic uses of groundwater exceeding Tier 1 residential remediation objectives.
9. The Highway Authority further agrees to limit access by itself and others to soil within the Right-of-Way exceeding Tier 1 residential remediation objectives. Access shall be allowed only if human health (including worker safety) and the environment are protected during and after any access. The Highway Authority may construct, reconstruct, improve, repair, maintain and operate a highway upon the Right-of-Way, or allow others to do the same by permit. In addition, the Highway Authority and others using or working in the Right-of-Way under permit have the right to remove soil or groundwater from the Right-of-Way and dispose of the same in accordance with applicable environmental laws and regulations. The Highway Authority agrees to issue all permits for work in the

Right-of-Way, and make all existing permits for work in the Right-of-Way, subject to the following or a substantially similar condition:

As a condition of this permit the permittee shall request the office issuing this permit to identify sites in the Right-of-Way where a Highway Authority Agreement governs access to soil that exceeds the Tier 1 residential remediation objectives of 35 Ill. Adm. Code 742. The permittee shall take all measures necessary to protect human health (including worker safety) and the environment during and after any access to such soil.

10. This agreement shall be referenced in the Agency's no further remediation determination issued for the Release(s).
11. The Agency shall be notified of any transfer of jurisdiction over the Right-of-Way at least 30 days prior to the date the transfer takes effect. This agreement shall be null and void upon the transfer unless the transferee agrees to be bound by this agreement as if the transferee were an original party to this agreement. The transferee's agreement to be bound by the terms of this agreement shall be memorialized at the time of transfer in a writing ("Rider") that references this Highway Authority Agreement and is signed by the Highway Authority, or subsequent transferor, and the transferee.
12. This agreement shall become effective on the date the Agency issues a no further remediation determination for the Release(s). It shall remain effective until the Right-of-Way is demonstrated to be suitable for unrestricted use and the Agency issues a new no further remediation determination to reflect there is no longer a need for this agreement, or until the agreement is otherwise terminated or voided.
13. In addition to any other remedies that may be available, the Agency may bring suit to enforce the terms of this agreement or may, in its sole discretion, declare this agreement null and void if any of the Parties or any transferee violates any term of this agreement. The Parties or transferee shall be notified in writing of any such declaration.
14. This agreement shall be null and void if a court of competent jurisdiction strikes down any part or provision of the agreement.
15. This agreement supersedes any prior written or oral agreements or understandings between the Parties on the subject matter addressed herein. It may be altered, modified or amended only upon the written consent and agreement of the Parties.
16. Any notices or other correspondence regarding this agreement shall be sent to the Parties at following addresses:

Manager, Division of Remediation Management
Bureau of Land
Illinois Environmental Protection Agency

Property Owner or Owner/Operator
[Address]

P.O. Box 19276
Springfield, IL 62974-9276

[Contact at Highway Authority]

[Address]

IN WITNESS WHEREOF, the Parties have caused this agreement to be signed by their duly authorized representatives.

[NAME OF LOCAL GOVERNMENT]

Date: _____ By: _____

Its: _____

Property Owner or Owner/Operator

Date: _____ By: _____

Title

(Source: Added at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX E Highway Authority Agreement Memorandum of Agreement

HIGHWAY AUTHORITY AGREEMENT MEMORANDUM OF AGREEMENT

This Memorandum of Agreement is entered by and between the Illinois Environmental Protection Agency (“Agency”) and *Name of Local Government* (“Highway Authority”), collectively known as the “Parties.”

[Use this paragraph for sites with petroleum leaking underground storage tank(s)]
WHEREAS, the Highway Authority is the owner or operator of one or more leaking underground storage tanks presently or formerly located at *common address or description of Site location* (“the Site”);

[Use this paragraph for sites where the highway authority is also the property owner]
WHEREAS, the Highway Authority is the owner of the property located at *common address or description of Site location* (“the Site”);

WHEREAS, as a result of one or more releases of contaminants *[insert either “from the above referenced underground storage tanks” or “at the above referenced Site”]* (“the Release(s)”), soil and/or groundwater contamination at the Site exceeds the Tier 1 residential remediation objectives of 35 Ill. Adm. Code 742;

WHEREAS, the soil and/or groundwater contamination exceeding Tier 1 residential remediation objectives extends or may extend into the Highway Authority’s right-of-way adjacent to the Site;

WHEREAS, the Highway Authority is conducting corrective action in response to the Release(s);

WHEREAS, the Parties desire to prevent groundwater beneath the Highway Authority’s right-of-way that exceeds Tier 1 residential remediation objectives from use as a supply of potable or domestic water and to limit access to soil within the right-of-way that exceeds Tier 1 residential remediation objectives so that human health and the environment are protected during and after any access;

NOW, THEREFORE, the Parties agree as follows:

1. The recitals set forth above are incorporated by reference as if fully set forth herein.
2. *[Use this paragraph if IEMA has issued an incident number]* The Illinois Emergency Management Agency has assigned incident number(s) to the Release(s).

3. Attached as Exhibit A is a scaled map(s) prepared by the Highway Authority that shows the Site and surrounding area and delineates the current and estimated future extent of soil and groundwater contamination above the applicable Tier 1 residential remediation objectives as a result of the Release(s). [Use the following sentence if either soil or groundwater is not contaminated above applicable Tier 1 residential remediation objectives: [Soil] [Groundwater] is not contaminated above the applicable Tier 1 residential remediation objectives.]
4. Attached as Exhibit B is a table(s) prepared by the Highway Authority that lists each contaminant of concern that exceeds its Tier 1 residential remediation objective, its Tier 1 residential remediation objective and its concentrations within the zone where Tier 1 residential remediation objectives are exceeded. The locations of the concentrations listed in Exhibit B are identified on the map(s) in Exhibit A.
5. Attached as Exhibit C is a scaled map prepared by the Highway Authority showing the area of the Highway Authority's right-of-way that is governed by this agreement ("Right-of-Way"). Because Exhibit C is not a surveyed plat, the Right-of-Way boundary may be an approximation of the actual Right-of-Way lines.
6. *[Use this paragraph if samples have not been collected within the Right-of-Way, sampling within the Right-of-Way is not practical, and contamination does not extend beyond the Right-of-Way].* Because the collection of samples within the Right-of-Way is not practical, the Parties stipulate that, based on modeling, soil and groundwater contamination exceeding Tier 1 residential remediation objectives does not and will not extend beyond the boundaries of the Right-of-Way.
7. The Highway Authority stipulates it has jurisdiction over the Right-of-Way that gives it sole control over the use of the groundwater and access to the soil located within or beneath the Right-of-Way.
8. The Highway Authority agrees to prohibit within the Right-of-Way all potable and domestic uses of groundwater exceeding Tier 1 residential remediation objectives.
9. The Highway Authority further agrees to limit access by itself and others to soil within the Right-of-Way exceeding Tier 1 residential remediation objectives. Access shall be allowed only if human health (including worker safety) and the environment are protected during and after any access. The Highway Authority may construct, reconstruct, improve, repair, maintain and operate a highway upon the Right-of-Way, or allow others to do the same by permit. In addition, the Highway Authority and others using or working in the Right-of-Way under permit have the right to remove soil or groundwater from the Right-of-Way and dispose of the same in accordance with applicable environmental laws and regulations. The Highway Authority agrees to issue all permits for work in the

Right-of-Way, and make all existing permits for work in the Right-of-Way, subject to the following or a substantially similar condition:

As a condition of this permit the permittee shall request the office issuing this permit to identify sites in the Right-of-Way where a Highway Authority Memorandum of Agreement governs access to soil that exceeds the Tier 1 residential remediation objectives of 35 Ill. Adm. Code 742. The permittee shall take all measures necessary to protect human health (including worker safety) and the environment during and after any access to such soil.

10. This agreement shall be referenced in the Agency's no further remediation determination issued for the Release(s).
11. The Agency shall be notified of any transfer of jurisdiction over the Right-of-Way at least 30 days prior to the date the transfer takes effect. This agreement shall be null and void upon the transfer unless the transferee agrees to be bound by this agreement as if the transferee were an original party to this agreement. The transferee's agreement to be bound by the terms of this agreement shall be memorialized at the time of transfer in a writing ("Rider") that references this Highway Authority Memorandum of Agreement and is signed by the Highway Authority, or subsequent transferor, and the transferee.
12. This agreement shall become effective on the date the Agency issues a no further remediation determination for the Release(s). It shall remain effective until the Right-of-Way is demonstrated to be suitable for unrestricted use and the Agency issues a new no further remediation determination to reflect there is no longer a need for this agreement, or until the agreement is otherwise terminated or voided.
13. In addition to any other remedies that may be available, the Agency may bring suit to enforce the terms of this agreement or may, in its sole discretion, declare this agreement null and void if the Highway Authority or a transferee violates any term of this agreement. The Highway Authority or transferee shall be notified in writing of any such declaration.
14. This agreement shall be null and void if a court of competent jurisdiction strikes down any part or provision of the agreement.
15. This agreement supersedes any prior written or oral agreements or understandings between the Parties on the subject matter addressed herein. It may be altered, modified or amended only upon the written consent and agreement of the Parties.
16. Any notices or other correspondence regarding this agreement shall be sent to the Parties at following addresses:

Manager, Division of Remediation Management
Bureau of Land
Illinois Environmental Protection Agency

P.O. Box 19276
Springfield, IL 62974-9276

[Contact at Highway Authority]

[Address]

IN WITNESS WHEREOF, the Parties have caused this agreement to be signed by their duly authorized representatives.

[NAME OF LOCAL GOVERNMENT]

Date: _____ By: _____

Its: _____

ILLINOIS ENVIRONMENTAL PROTECTION
AGENCY

Date: _____ By: _____

Director

(Source: Added at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX F: Environmental Land Use Control

PREPARED BY:

Name: _____

Address: _____

RETURN TO:

Name: _____

Address: _____

THE ABOVE SPACE FOR RECORDER'S OFFICE

Model Environmental Land Use Control

THIS ENVIRONMENTAL LAND USE CONTROL ("ELUC"), is made this _____ day of _____, 20__, by _____, ("Property Owner") of the real property located at _____ the common address _____ ("Property").

WHEREAS, 415 ILCS 5/58.17 and 35 Ill. Adm. Code 742 provide for the use of an ELUC as an institutional control in order to impose land use limitations or requirements related to environmental contamination so that persons conducting remediation can obtain a No Further Remediation determination from the Illinois Environmental Protection Agency ("IEPA"). The reason for an ELUC is to ensure protection of human health and the environment. The limitations and requirements contained herein are necessary in order to protect against exposure to contaminated soil, groundwater, or soil gas that may be present on the property as a result of [VARIABLE] activities. Under 35 Ill. Adm. Code 742, the use of risk-based, site-specific remediation objectives may require the use of an ELUC on real property, and the ELUC may apply to certain physical features (e.g., engineered barriers, indoor inhalation building control technologies, monitoring wells, caps, etc.).

WHEREAS, _____ [the party performing remediation] intends to request risk-based, site specific soil, groundwater, or soil gas remediation objectives from IEPA under 35 Ill. Adm. Code 742 to obtain risk-based closure of the site, identified by Bureau of Land [10-digit LPC or Identification number] _____, utilizing an ELUC.

NOW, THEREFORE, the recitals set forth above are incorporated by reference as if fully

set forth herein, and the Property Owner agrees as follows:

Date: _____ By: _____

Director

Section One. Property Owner does hereby establish an ELUC on the real estate, situated in the County of _____, State of Illinois and further described in Exhibit A attached hereto and incorporated herein by reference (the "Property").

Attached as Exhibit B are site maps that show the legal boundary of the Property, any physical features to which the ELUC applies, the horizontal and vertical extent of the contaminants of concern above the applicable remediation objectives for soil, groundwater, or soil gas, and the nature, location of the source, and direction of movement of the contaminants of concern, as required under 35 Ill. Adm. Code 742.

Section Two. Property Owner represents and warrants **he/she** is the current owner of the Property and has the authority to record this ELUC on the chain of title for the Property with the Office of the Recorder or Registrar of Titles in _____ County, Illinois.

Section Three. The Property Owner hereby agrees, for **himself/herself**, and **his/her** heirs, grantees, successors, assigns, transferees and any other owner, occupant, lessee, possessor or user of the Property or the holder of any portion thereof or interest therein, that **[INSERT RESTRICTION (e.g. the groundwater under the Property shall not be used as a potable supply of water, and any contaminated groundwater or soil that is removed, excavated, or disturbed from the Property described in Exhibit A herein must be handled in accordance with all applicable laws and regulations)]**.

Section Four. This ELUC is binding on the Property Owner, **his/her** heirs, grantees, successors, assigns, transferees and any other owner, occupant, lessee, possessor or user of the Property or the holder of any portion thereof or interest therein. This ELUC shall apply in perpetuity against the Property and shall not be released until the IEPA determines there is no longer a need for this ELUC as an institutional control; until the IEPA, upon written request, issues to the site that received the no further remediation determination a new no further remediation determination approving modification or removal of the limitation(s) or requirement(s); the new no further remediation determination is filed on the chain of title of the site subject to the no further remediation determination; and until a release or modification of the land use limitation or requirement is filed on the chain of title for the Property.

Section Five. Information regarding the remediation performed on the Property may be obtained from the IEPA through a request under the Freedom of Information Act (5 ILCS 140) and rules promulgated thereunder by providing the IEPA with the [10-digit LPC or identification number] listed above.

Section Six. The effective date of this ELUC shall be the date that it is officially recorded in the chain of title for the Property to which the ELUC applies.

WITNESS the following signatures:

Property Owner(s)

By: _____

Its: _____

Date: _____

STATE OF ILLINOIS)
) SS:
COUNTY OF)

I, _____ the undersigned, a Notary Public for said County and State, DO HEREBY CERTIFY, that _____ and _____, personally known to me to be the Property Owner(s) of _____, and personally known to me to be the same persons whose names are subscribed to the foregoing instrument, appeared before me this day in person and severally acknowledged that in said capacities they signed and delivered the said instrument as their free and voluntary act for the uses and purposes therein set forth.

Given under my hand and official seal, this _____ day of _____, 20__.

Notary Public

STATE OF _____)
) S.S.
COUNTY OF _____)

I, _____, a notary public, do hereby certify that before me this day in person appeared _____, personally known to me to be the Property Owner(s), of _____, each severally acknowledged that they signed and delivered the foregoing instrument as the Property Owner(s) herein set forth, and as their own free and voluntary act, for the uses and purposes herein set forth.

Given under my hand and seal this _____ day of _____, 20__.

Notary Public

PIN NO. XX-XX-XXX-XXX-XXXX
(Parcel Index Number)

Exhibit A

The subject property is located in the City of _____, _____ County, State of Illinois, commonly known as _____, _____, Illinois and more particularly described as:

**LIST THE COMMON ADDRESS;
LEGAL DESCRIPTION; AND
REAL ESTATE TAX INDEX OR PARCEL #
(PURSUANT TO SECTION 742. 1010(d)(2))**

Exhibit B

IN ACCORDANCE WITH SECTION 742.1010(d)(8)(A) through (D), PROVIDE ALL THE FOLLOWING ELEMENTS. ATTACH SEPARATE SHEETS, LABELED AS EXHIBIT B, WHERE NECESSARY.

- (A) A scaled map showing the legal boundary of the property to which the ELUC applies.
- (B) Scaled maps showing the horizontal and vertical extent of contaminants of concern above the applicable remediation objectives for soil, groundwater, and soil gas to which the ELUC applies.
- (C) Scaled maps showing the physical features to which an ELUC applies (e.g., engineered barriers, indoor inhalation building control technologies, monitoring wells, caps, etc.).
- (D) Scaled maps showing the nature, location of the source, and direction of movement of the contaminants of concern.

(Source: Amended at 37 Ill. Reg. 7506, effective July 15, 2013)

Section 742.APPENDIX G Model Ordinance

ORDINANCE NUMBER _____

AN ORDINANCE PROHIBITING THE USE OF GROUNDWATER AS A POTABLE WATER SUPPLY BY THE INSTALLATION OR USE OF POTABLE WATER SUPPLY WELLS OR BY ANY OTHER METHOD

WHEREAS, certain properties in the City [Village] of _____, Illinois have been used over a period of time for commercial/industrial purposes; and

WHEREAS, because of said use, concentrations of certain chemical constituents in the groundwater beneath the City [Village] may exceed Class I groundwater quality standards for potable resource groundwater as set forth in 35 Illinois Administrative Code 620 or Tier 1 remediation objectives as set forth in 35 Illinois Administrative Code 742; and

WHEREAS, the City [Village] of _____ desires to limit potential threats to human health from groundwater contamination while facilitating the redevelopment and productive use of properties that are the source of said chemical constituents;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY [VILLAGE] OF _____, ILLINOIS:

Section One. Use of groundwater as a potable water supply prohibited.

[Except for such uses or methods in existence before the effective date of this ordinance,] The use or attempt to use as a potable water supply groundwater from within the corporate limits of the City [Village] of _____, as a potable water supply, by the installation or drilling of wells or by any other method is hereby prohibited. This prohibition [expressly includes] [does not include] the City [Village] of _____.

Section Two. Penalties.

Any person violating the provisions of this ordinance shall be subject to a fine of up to _____ for each violation.

Section Three. Definitions.

“Person” is any individual, partnership, co-partnership, firm, company, limited liability company, corporation, association, joint stock company, trust, estate, political subdivision, or any other legal entity, or their legal representatives, agents or assigns.

“Potable water” is any water used for human or domestic consumption, including, but not limited to, water used for drinking, bathing, swimming, washing dishes, or preparing foods.

Section Four. Memorandum of Understanding.

[This Section is only necessary if ordinance does not expressly prohibit installation of potable water supply wells by the city or village--could be separate resolution]

The Mayor of the City [Village] of _____ is hereby authorized and directed to enter into a Memorandum of Understanding with the Illinois Environmental Protection Agency (“Illinois EPA”) in which the City [Village] of _____ assumes responsibility for tracking all sites that have received no further remediation determinations from the Illinois EPA, notifying the Illinois EPA of changes to this ordinance, and taking certain precautions when siting public potable water supply wells.

Section Five. Repealer.

All ordinances or parts of ordinances in conflict with this ordinance are hereby repealed insofar as they are in conflict with this ordinance.

Section Six. Severability.

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

Section Seven. Effective date.

This ordinance shall be in full force and effect from and after its passage, approval and publication as required by law.

ADOPTED: _____
(Date)

APPROVED: _____
(Date)

(City Clerk)

(Mayor)

Officially published this _____ day of _____, 20__.

(Source: Added at 31 Ill. Reg. 4063, effective February 23, 2007)

Section 742.APPENDIX H Memorandum of Understanding

MEMORANDUM OF UNDERSTANDING BETWEEN _____
AND THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY REGARDING THE
USE OF A LOCAL GROUNDWATER OR WATER WELL ORDINANCE AS AN
ENVIRONMENTAL INSTITUTIONAL CONTROL

I. PURPOSE AND INTENT

- A. This Memorandum of Understanding (“MOU”) between _____ and the Illinois Environmental Protection Agency (“Illinois EPA”) is entered into for the purpose of satisfying the requirements of 35 Ill. Adm. Code 742.1015 for the use of groundwater or water well ordinances as environmental institutional controls. The Illinois EPA has reviewed the groundwater or water well ordinance of _____ (Attachment A) and determined that the ordinance prohibits the use of groundwater for potable purposes and/or the installation and use of new potable water supply wells by private entities but does not expressly prohibit those activities by the unit of local government itself. In such cases, 35 Ill. Adm. Code 742.1015(a) provides that the unit of local government may enter into an MOU with the Illinois EPA to allow the use of the ordinance as an institutional control.
- B. The intent of this Memorandum of Understanding is to specify the responsibilities that must be assumed by the unit of local government to satisfy the requirements for MOUs as set forth at 35 Ill. Adm. Code 742.1015(i).

II. DECLARATIONS AND ASSUMPTION OF RESPONSIBILITY

In order to ensure the long-term integrity of the groundwater or water well ordinance as an environmental institutional control and that risk to human health and the environment from contamination left in place in reliance on the groundwater or water well ordinance is effectively managed, _____ hereby assumes the following responsibilities pursuant to 35 Ill. Adm. Code 742.1015(d)(2) and (i):

- A. _____ will notify the Illinois EPA Bureau of Land of any proposed ordinance changes or requests for variance at least 30 days prior to the date the local government is scheduled to take action on the proposed change or request (35 Ill. Adm. Code 742.1015(i)(4));
- B. _____ will maintain a registry of all sites within its corporate limits that have received “No Further Remediation” determinations in reliance on the ordinance from the Illinois EPA (35 Ill. Adm. Code 742.1015(i)(5));

- C. _____ will review the registry of sites established under paragraph II. B. prior to siting public potable water supply wells within the area covered by the ordinance (35 Ill. Adm. Code 742.1015(i)(6)(A));
- D. _____ will determine whether the potential source of potable water has been or may be affected by contamination left in place at the sites tracked and reviewed under paragraphs II. B. and C. (35 Ill. Adm. Code 742.1015(i)(6)(B)); and
- E. _____ will take action as necessary to ensure that the potential source of potable water is protected from contamination or treated before it is used as a potable water supply (35 Ill. Adm. Code 742.1015(i)(6)(C)).

NOTE: Notification under paragraph II. A. above or other communications concerning this MOU should be directed to:

Manager, Division of Remediation Management
Bureau of Land
Illinois Environmental Protection Agency
P.O. Box 19276
Springfield, IL 62794-9276

III. SUPPORTING DOCUMENTATION

The following documentation is required by 35 Ill. Adm. Code 742.1015(i) and is attached to this MOU:

- A. Attachment A: A copy of the groundwater or water well ordinance certified by the city clerk or other official as the current, controlling law (35 Ill. Adm. Code 742.1015(i)(3));
- B. Attachment B: Identification of the legal boundaries within which the ordinance is applicable (certification by city clerk or other official that the ordinance is applicable everywhere within the corporate limits; if ordinance is not applicable throughout the entire city or village, legal description and map of area showing sufficient detail to determine where ordinance is applicable) (35 Ill. Adm. Code 742.1015(i)(2));
- C. Attachment C: A statement of the authority of the unit of local government to enter into the MOU (council resolution, code of ordinances, inherent powers of mayor or other official signing MOU -- attach copies) (35 Ill. Adm. Code 742.1015(i)(1)).

IN WITNESS WHEREOF, the lawful representatives of the parties have caused this MOU to be signed as follows:

FOR: _____
(Name of city or village)

BY: _____
(Name and title of signatory)

DATE: _____

FOR: Illinois Environmental Protection Agency

BY: _____ DATE: _____
Manager, Division of Remediation Management
Bureau of Land

(Source: Added at 31 Ill. Reg. 4063, effective February 23, 2007)