April 2005

RRD OPERATIONAL MEMORANDUM NO. 1

SUBJECT: TECHNICAL SUPPORT DOCUMENT - ATTACHMENT 6
PART 201 SOIL DIRECT CONTACT CRITERIA
PART 213 TIER I SOIL DIRECT CONTACT RISK-BASED SCREENING LEVELS

Developed under R 299.5720

Key definitions for terms used in this document:

NREPA:	**The Natural Resources and Environmental Protection Act, 1994 PA 451, as amended**
Part 201:	**Part 201, Environmental Remediation, of NREPA**
Part 213:	**Part 213, Leaking Underground Storage Tanks, of NREPA**
MDEQ:	**Michigan Department of Environmental Quality**
RRD:	**Remediation and Redevelopment Division**
CAP/RAP:	**Corrective Action Plan pursuant to provisions of Part 213 of NREPA and Remedial Action Plans pursuant to provisions of Part 201 of NREPA**
Criteria or criterion:	**Includes the cleanup criteria for Part 201 of NREPA and Risk-Based Screening Levels as defined in Part 213 of NREPA and R 299.5706a(4)**
DCC:	**Direct contact criteria or criterion**
Facility:	**Includes "facility" as defined by Part 201 of NREPA and "site" as defined by Part 213 of NREPA**
TSD:	**Technical Support Document**
U.S. EPA:	**United States Environmental Protection Agency**

This TSD presents the methodology for development of the soil DCC. The soil DCC represents a soil concentration that is protective against adverse health effects due to long-term ingestion of and dermal contact with contaminated soil. The DCC were developed pursuant to Sections 20120a(1)(a), (b), and (d); 20120(a)(3); and 21304a(1)(2) of NREPA. The method and equations for the soil DCC are presented in R 299.5720. This TSD supercedes previous MDEQ documents regarding the DCC.

In addition to the Part 201 Administrative Rules (R 299.5746 and R 299.5748), the soil DCC are presented in Attachment 1 of the RRD Operational Memorandum No. 1: Part 201 Generic Cleanup Criteria/Part 213 Tier I Risk-Based Screening Levels. The residential and commercial I DCC are presented in column 19 of the Soil: Residential and Commercial I Table. The industrial and commercial II, commercial III, and commercial IV DCC are presented in columns 27, 28, and 29, respectively, of the Soil: Industrial and Commercial II, III, and IV Table.

IMPLEMENTATION OF THE DIRECT CONTACT CRITERIA (DCC)

If the target detection limit (TDL) is greater than the risk-based cleanup criterion for a hazardous substance in a given environmental medium, the TDL is used in place of the risk-based value as the cleanup criterion (R 299.5707). A background concentration may be substituted for the generic cleanup criterion when the cleanup criterion is less than background (R 299.5707, R 299.5706a(5)(b)). Additional guidance on establishing background is available in RRD Operational Memorandum No. 1. For hazardous substances with criteria greater than their respective soil saturation concentrations (C_{sat}), the C_{sat} becomes the generic criterion unless a facility-specific C_{sat} concentration is established using facility-specific soil characteristics (R 299.718(2)). Refer to the C_{sat} TSD (MDEQ, 2004a) C_{sat} TSD for details on how this demonstration may be made.

The RAPs/CAPs based on soil DCC cannot be approved without a demonstration that all other relevant pathways have been addressed (R 299.5532(7) and Section 21304a). Since the soil DCC only address long-term ingestion of and long-term dermal contact with contaminated soil, other concerns such as acute human health effects, odors, ocular irritation, dermal irritation or sensitization; physical hazards such as reactivity, corrosivity, or ignitability; nuisance dust conditions; and/or ecological impacts may need to be addressed (R 299.5728).

Compliance with soil DCC is required throughout the soil column for generic land use categories (R 299.5720(4)). However, exposure controls and land use restrictions may be employed to prevent or limit exposures using the limited land use categories. Site-specific DCC may also be developed (Section 20120a(2) of NREPA and R 299.5732).

The 95 percent upper confidence level (UCL) on the arithmetic mean of soil concentrations may be used to determine compliance with the soil DCC. The 95 percent UCLs must reasonably represent the areas over which exposures are expected to occur. The generic size of an exposure unit for a residential property is 1/4 acre and 2 acres for a commercial/industrial property. The distribution of the data (i.e., normal, lognormal, or other) must be identified before the 95 percent UCL can be properly calculated. Refer to DEQ Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria (S3TM) (MDEQ, 2002) on how to appropriately calculate the 95 percent UCL. Sample results from hot spots or significantly elevated areas should be addressed separately and not included in the calculation of the 95 percent UCL. See S3TM for additional details on identifying hot spots.

DIRECT CONTACT ALGORITHMS

The DCC are calculated using a target risk level (TR) for carcinogens or a hazard quotient (HQ) for noncarcinogens. The TR represents the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a carcinogenic hazardous substance. The required level of protection is no greater than 1 additional cancer above the background cancer rate per 100,000 individuals (Section 20120a(4)). A HQ is the ratio of the chronic daily dose of a hazardous substance (reasonable maximum exposure) divided by the chronic reference dose for that substance. The DCC are calculated using a TR of 1 in 100,000 (10^{-5}) (Section 20120a(4) and Section 21304a(3) of NREPA) and a target hazard quotient (THQ) of 1 (Section 20120a(4) of NREPA).

The algorithms used to generate the soil DCC are presented below. The direct contact equations yield values that represent concentrations of contaminants in soil in units of

micrograms per kilogram (ug/kg) or parts per billion (ppb) unless otherwise noted. To convert to units of milligrams per kilogram (mg/kg) or parts per million (ppm) in soil, divide by 1,000. A discussion of the parameters used in the algorithms follows the equations.

Generic Residential and Commercial I Algorithms:

CARCINOGENS:

$$DCC = \frac{TR \times AT \times CF}{SF \times \left[\left(EF_i \times IF \times AE_i\right) + \left(EF_d \times DF \times AE_d\right)\right]}$$

where,

DCC	(Direct contact criterion)	= chemical-specific, ug/kg (ppb)
TR	(Target risk level)	= 10^{-5}
AT	(Averaging time)	= 25,550 days (70 years x 365 days/year)
CF	(Conversion factor)	= 1E+9 ug/kg
SF	(Oral cancer slope factor)	= chemical-specific $(mg/kg\text{-}day)^{-1}$
EF_i	(Ingestion exposure frequency)	= 350 days/year
IF	(Age-adjusted soil ingestion factor)	= 114 mg-year/kg-day*
AE_i	(Ingestion absorption efficiency)	= chemical-specific or default specified at R 299.5720(3) (see text)
EF_d	(Dermal exposure frequency)	= 245 days/year
DF	(Age-adjusted soil dermal factor)	= 353 mg-year/kg-day**
AE_d	(Dermal absorption efficiency)	= chemical-specific or default specified at R 299.5720(3) (see text)

NONCARCINOGENS:

$$DCC = \frac{THQ \times RfD \times AT \times CF \times RSC}{\left[\left(EF_i \times IF \times AE_i\right) + \left(EF_d \times DF \times AE_d\right)\right]}$$

where,

DCC	(Direct contact criterion)	= chemical-specific, ug/kg (ppb)
THQ	(Target hazard quotient)	= 1
RfD	(Oral reference dose)	= chemical-specific, mg/kg-day
AT	(Averaging time)	= 10,950 days (30 years x 365 days/year)
CF	(Conversion factor)	= 1E+9 ug/kg
RSC	(Relative source contribution)	= 1
EF_i	(Ingestion exposure frequency)	= 350 days/year
IF	(Age-adjusted soil ingestion factor)	= 114 mg-year/kg-day*
AE_i	(Ingestion absorption efficiency)	= chemical-specific or default specified at R 299.5720(3) (see text)
EF_d	(Dermal exposure frequency)	= 245 days/year
DF	(Age-adjusted soil dermal factor)	= 353 mg-year/kg-day**
AE_d	(Dermal absorption efficiency)	= chemical-specific or default specified at R 299.5720(3) (see text)

and,

$$*IF = \left(\frac{IR_{age1\text{-}6} \times ED_{age1\text{-}6}}{BW_{age1\text{-}6}}\right) + \left(\frac{IR_{adult} \times ED_{adult}}{BW_{adult}}\right)$$

where,

$IR_{age\ 1\text{-}6}$	(Soil ingestion rate)	= 200 mg/day
$ED_{age\ 1\text{-}6}$	(Exposure duration)	= 6 years
$BW_{age\ 1\text{-}6}$	(Body weight)	= 15 kg
IR_{adult}	(Soil ingestion rate)	= 100 mg/day
ED_{adult}	(Exposure duration)	= 24 years
BW_{adult}	(Body weight)	= 70 kg

and,

$$**DF = \left(\frac{SA_{age\ 1\text{-}6} \times EV \times AF_{age1\text{-}6} \times ED_{age\ 1\text{-}6}}{BW_{age\ 1\text{-}6}}\right) + \left(\frac{SA_{adult} \times EV \times AF_{adult} \times ED_{adult}}{BW_{adult}}\right)$$

where,

$SA_{age\ 1\text{-}6}$	(Skin surface area)	= 2,670 cm^2/event
EV	(Event frequency)	= 1 event/day
$AF_{age\ 1\text{-}6}$	(Soil adherence factor)	= 0.2 mg/cm^2
$ED_{age\ 1\text{-}6}$	(Exposure duration)	= 6 years
$BW_{age\ 1\text{-}6}$	(Body weight)	= 15 kg
SA_{adult}	(Skin surface area)	= 5,800 cm^2/event
AF_{adult}	(Soil adherence factor)	= 0.07 mg/cm^2
ED_{adult}	(Exposure duration)	= 24 years
BW_{adult}	(Body weight)	= 70 kg

Generic Industrial and Commercial II, III, and IV Algorithms:

CARCINOGENS:

$$DCC = \frac{TR \times BW \times AT \times CF}{SF \times ED \times \left[\left(EF_i \times IR_s \times AE_i\right) + \left(EF_d \times SA \times EV \times AF \times AE_d\right)\right]}$$

where,

DCC	(Direct contact criterion)	= chemical-specific, ug/kg (ppb)
TR	(Target risk level)	= 10^{-5}
BW	(Body weight)	= 70 kg
AT	(Averaging time)	= 25,550 days (70 years x 365 days/year)
CF	(Conversion factor)	= 1E+9 ug/kg
SF	(Oral cancer slope factor)	= chemical-specific $(mg/kg\text{-}day)^{-1}$
ED	(Exposure duration)	= 21 years
EF_i	(Ingestion exposure frequency)	= 245 days/year
IR_s	(Soil ingestion rate)	= 100 mg/day
AE_i	(Ingestion absorption efficiency)	= chemical-specific or default specified at R 299.5720(3) (see text)
EF_d	(Dermal exposure frequency)	= 160 days/year
SA	(Skin surface area)	= 3,300 cm^2/event
EV	(Event frequency)	= 1 event/day

AF	(Soil adherence factor)	= 0.2 mg/cm^2 (industrial and commercial II) = 0.01 mg/cm^2 (commercial III) = 0.1 mg/cm^2 (commercial IV)
AE_d	(Dermal absorption efficiency)	= chemical-specific or default specified at R 299.5720(3) (see text)

NONCARCINOGENS:

$$DCC = \frac{THQ \times RfD \times BW \times AT \times CF \times RSC}{ED \times \left[\left(EF_i \times IR_s \times AE_i\right) + \left(EF_d \times SA \times EV \times AF \times AE_d\right)\right]}$$

where,

DCC	(Direct contact criterion)	= chemical-specific, ug/kg (ppb)
THQ	(Target hazard quotient)	= 1
RfD	(Oral reference dose)	= chemical-specific, mg/kg-day
BW	(Body weight)	= 70 kg
AT	(Averaging time)	= 7,665 days (21 years x 365 days/year)
CF	(Conversion factor)	= 1E+9 ug/kg
RSC	(Relative source contribution)	= 1
ED	(Exposure duration)	= 21 years
EF_i	(Ingestion exposure frequency)	= 245 days/year
IR_s	(Soil ingestion rate)	= 100 mg/day
AE_i	(Ingestion absorption efficiency)	= chemical-specific or default specified at R 299.5720(3) (see text)
EF_d	(Dermal exposure frequency)	= 160 days/year
SA	(Skin surface area)	= 3,300 cm^2/event
EV	(Event frequency)	= 1 event/day
AF	(Soil adherence factor)	= 0.2 mg/cm^2 (industrial and commercial II) = 0.01 mg/cm^2 (commercial III) = 0.1 mg/cm^2 (commercial IV)
AE_d	(Dermal absorption efficiency)	= chemical-specific or default specified at R 299.5720(3) (see text)

Toxicity Values

The oral reference dose (RfD) is defined in R 299.5703(c) as a conservative estimate of the daily intake of the human population, including sensitive subgroups, that is likely to be without appreciable risk of deleterious effect during a lifetime. The RfD is expressed in units of mg/kg body weight per day. The RfD is used to evaluate noncarcinogenic effects. Because the soil DCC represents a soil concentration that is protective against adverse health effects due to long-term ingestion of and dermal contact with contaminated soil, a chronic RfD is generally used to calculate the DCC. The RfDs were obtained from the U.S. EPA Integrated Risk Information System (IRIS) or developed by the MDEQ. The RfDs used to develop the generic DCC are presented in RRD Operational Memorandum No. 1, Attachment 1, Table 4 (MDEQ, 2004b).

The cancer slope factor (SF) is defined in R 299.5701(d) as a plausible upper bound estimate of the probability of a response per unit dose of a hazardous substance over a lifetime. The SF is

used to estimate an upper bound probability of an individual developing cancer as a result of a lifetime exposure to a particular level of a known carcinogen. The SFs were obtained from the U.S. EPA's IRIS or developed by the MDEQ. The SFs used to develop the generic DCC are presented in RRD Operational Memorandum No. 1, Attachment 1, Table 4 (MDEQ, 2004b).

Reasonable Maximum Exposure (RME) and Exposure Assumptions

The U.S. EPA provides general guidance on how to characterize exposures and risks when conducting risk assessments. For exposure assessments, intake and exposure values should be selected so that the combination of all variables results in an estimate of the RME for that pathway. The RME represents the maximum exposure that is reasonably expected to occur at a site.

The U.S. EPA (1997) presents summaries of published studies that provide information on intake rates and time-activity patterns of the national population and various subpopulations in the United States. These data were considered when developing intake and exposure duration (ED) estimates for specific exposure scenarios. Each exposure variable may have a range of values. The U.S. EPA (U.S. EPA, 1992b) recommends estimating the high-end exposure by "…identifying the most sensitive parameters and using maximum or near-maximum values for one or a few of these variables, leaving others at their mean values." Under this approach, some intake variables may not be at their individual maximum values, but when in combination with other variables, will result in estimates of the RME (U.S. EPA, 1989). The U.S. EPA guidance applies when only limited information on the distribution of the exposure or dose factors is available. The recommendation is based on the fact that maximizing all variables will result in an estimate that is above the range of actual values seen in the population. The algorithms presented in this document follow the U.S. EPA guidance (U.S. EPA, 1992b) by combining exposure assumptions which represent a mix of high-end and mid-range values. The algorithms use a life span, body weight, and surface area that represent mid-range values and ED, exposure frequency, soil ingestion rate, and soil adherence factors (AF) that represent high-end values.

Averaging Time (AT) and Exposure Duration (ED)

The AT represents the number of days over which an exposure is averaged. The AT differs for carcinogens, noncarcinogens, and developmental toxicants.

Carcinogens: For carcinogens, exposures are calculated by prorating the total dose of a hazardous substance over a lifetime of 70 years (also called lifetime average daily dose). The approach for carcinogens is based on the assumption that a high dose of a carcinogen received over a short period of time is equivalent to a corresponding low dose spread over a lifetime (U.S. EPA, 1989). An AT of 25,550 days (70 years x 365 days/year) is used to calculate the generic DCC for carcinogens.

Noncarcinogens: For noncarcinogens, the AT is equal to the ED. The residential ED of 30 years represents the national upper bound time (90^{th} percentile) at one residence (U.S. EPA, 1989). The industrial/commercial ED is 21 years (estimated to be 90^{th} percentile) and is based on 1991 statistics from the United States Department of Labor (U.S. EPA, 1991a). Long-term exposures to noncarcinogens are averaged over the period of exposure (i.e., subchronic or chronic exposures). An AT of 10,950 days (30 years x 365 days/year) is used to calculate the generic residential and commercial I DCC for noncarcinogens and an AT of 7,665 days

(21 years x 365 days/year) is used to calculate the generic industrial and commercial II, III, and IV DCC.

Developmental Toxicants: The timing of exposure to developmental toxicants may affect both the type and severity of effect on the developing organism. Some compounds may exert these effects after only a single exposure, particularly during the more susceptible periods of development such as organogenesis, while others may require a longer period of exposure before effects are manifested. In the absence of information concerning the critical period of time in which a developmental toxicant may exert its effects and given the vulnerability of the potentially affected population (i.e., human infants), it is reasonable to assume that any exposure may result in undesirable effects. The U.S. EPA guidance (U.S. EPA, 1991b; 1989) indicates that assessment of the risks of exposure to developmental toxicants should be based on a daily dose that is not adjusted for duration or pattern of exposure. Therefore, the acceptable daily dose is not averaged over the ED (R 299.5734(3)(a) and R 299.5750(1)(DD)). For developmental toxicants, AT and the exposure parameters (exposure frequency and ED) are each equal to 1.

Exposure Frequency

The ingestion exposure frequency (EF_i) value for exposures to soil/dust is 350 days per year for residential exposures and 245 days per year for industrial/commercial exposures. The residential EF_i of 350 days per year represents the number of days per year that a resident is exposed to soil at their home; it assumes that people spend approximately 15 days per year away from their homes for vacations or other reasons. The U.S. EPA recommends an EF_i of 250 days per year for industrial/commercial scenarios. An additional 5 days as sick leave or vacation time away from the work place was used by the MDEQ to give an EF_i of 245 days. The EF_i is linked to the soil ingestion rate. The recommended soil ingestion rates account for ingestion of both outdoor soil and indoor dust (U.S. EPA, 1991a).

The exposure frequency for dermal contact, dermal exposure frequency (EF_d) is 245 days per year for the residential scenario and represents outdoor soil exposure. The residential EF_d takes into account the U.S. EPA's recommendation to consider local weather conditions (e.g., snow cover, frozen soil). It is assumed that Michigan winters last 4 months (120 days) making soil unavailable for contact. The EF_d for the industrial/commercial scenario is 160 days per year. The industrial/commercial EF_d takes into account 120 days of winter, 3 weeks off for vacations and sick leave, and an adjustment for a standard 5-day work week. The calculation for the EF_d is shown below:

$$(365 - 120 - 21) \times 5/7 = 160$$

Relative Source Contribution (RSC)

The RSC is the portion of a person's total daily intake of a noncarcinogen that comes from the medium being addressed by the cleanup criterion (R 299.5703(d)). The RSC for the soil DCC is assumed to be 1, i.e., 100 percent of the exposure to the hazardous substance comes from contaminated soil. A site-specific RSC may be developed in accordance with R 299.5706a(9)(a)(iv).

Absorption Efficiency (AE)

The AE parameter within the DCC algorithm represents the fraction of the intake (oral or dermal) that is assumed to penetrate the exchange boundaries (e.g., gastrointestinal tract, skin) of an organism after contact (U.S. EPA, 1989). The AE multiplied by the intake provides an estimate of the absorbed dose (i.e., the mass of a substance absorbed into the body).
The ingestion absorption efficiency (AE_i) is assumed to be 50 percent for organic hazardous substances which exhibit a log octanol water partitioning coefficient greater than 5 and a molecular weight greater than 200 grams per mole or which are not ionizing organic hazardous substances (R 299.5720(3)(b)(i)). The AE_i is assumed to be 100 percent for all other organic hazardous substances and 50 percent for inorganic hazardous substances (R 299.5720(3)(b)(i) and R 299.5720(3)(b)(ii)).

The default absorption efficiency applicable to dermal contact, dermal absorption efficiency (AE_d) is 10 percent for organic hazardous substances and 1 percent for inorganic hazardous substances (R 299.5720(3)(iii) and R 299.5720(3)(b)(iv)).

A site-specific AE may be developed in accordance with R 299.5706a(9)(a)(ii) and (iii).

Soil Adherence Factor (AF)

The AF represents the amount of soil that adheres to the surface of the skin. The AF is multiplied by the skin surface area and AE_d to derive the dermal absorbed dose for a hazardous substance. The AF default values are presented in Table 1 below:

Table 1. Default Soil Adherence Factors used to Develop Part 201 Generic Soil Direct Contact Criteria.

Land Use Category	Receptor	Adherence Factor (mg/cm^2)
Residential	Adult	0.07
Residential	Child	0.2
Commercial III	Adult worker (low soil intensive)	0.01
Commercial IV	Adult worker (high soil intensive)	0.1
Industrial	Adult worker	0.2

More details on the AF are provided in MDEQ, 2001.

Event Frequency (EV)

The U.S. EPA guidance (1992c; 1997) recommends that soil adherence to skin should be interpreted on an event basis. This recommendation is based on the assumption that soil adherence can occur as the result of a single soil-related activity and soil residence time (time that soil is in contact with the skin) cannot be adequately predicted. The U.S. EPA generic value of one event per day is used in the soil DCC equations, as recommended by the U.S. EPA (1992c; 1998).

Ingestion and Dermal Contact Rates

Ingestion and dermal contact rates used in the residential soil direct contact algorithm are adjusted to account for differences between children and adults. It is assumed that during the 30-year exposure period, 6 years are spent as a child (U.S. EPA, 1991a). The child receptor is assumed to ingest more soil per day than an adult based on behavior (U.S. EPA, 1991a).

For soil ingestion, the MDEQ utilizes the U.S. EPA's recommended intake rates of 200 mg/day for children aged 1-6 years of age and 100 mg/day for industrial/commercial workers (U.S. EPA, 1997; 2002a). This daily intake rate reflects the increased ingestion exposures that occur to outdoor workers during landscaping or other activities that disturb the soil. These soil ingestion rates account for ingestion of both outdoor soils and indoor dust. Data suggests that up to 80 percent of indoor dust consists of outdoor soils that have been brought into a residence by air deposition and foot traffic. Therefore, it cannot be assumed that ingestion of contaminated soil is entirely precluded by climatic conditions such as snow cover. The soil intake values are derived primarily from fecal tracer studies that estimate the amount of soil ingested throughout a day's activities. As such, the intake rates are not event-specific (i.e., the rates do not represent the amount of soil ingested only during outdoor activities).

Skin Surface Area (SA)

The SA for children and residential adult receptors is equal to the 50th percentile values of body part-specific SAs for the respective age group (U.S. EPA, 1997). Dermal exposure to soil is expected to occur on the head, hands, forearms, and lower legs of an adult and the head, hands, forearms, lower legs, and feet of a child. The SA for a child aged 0-6 is 2,670 cm^2/event.

The SA for industrial/commercial workers is 3,300 cm^2/event. The SA is strongly correlated with body weight. Since the assumed body weight represents an average value, the SA is also represented as an average value. The amount of exposed SA identified below represents a typical scenario, realizing that at times a worker could have more or less skin exposed. For example, there may be times when a worker is working without a shirt and times when a worker may be working in a long-sleeved shirt and/or a coat. The typical scenario assumes that a worker is working in a short-sleeved shirt, long pants, and shoes.

SA head		1,200
SA hands		900
SA forearms		1,200
Skin surface area (cm^2/event)	=	3,300

Table 2 summarizes the exposure assumptions associated with each land use category or subcategory. Additional information on the commercial land use subcategory can be found in RRD Operational Memorandum No. 1 (MDEQ, 2004b).

This memorandum is intended to provide guidance to foster consistent application of Part 201 and Part 213 of NREPA and the associated Administrative Rules. This document is not intended to convey any rights to any person nor itself create any duties or responsibilities under law. This document and matters addressed herein are subject to revision.

Table 2. Summary of land use categories and the associated exposure assumptions.

LAND USE CATEGORIES	EXPOSURE ASSUMPTIONS				
	Ingestion Exposure Frequency (days/year)	**Dermal Exposure Frequency (days/year)**	**Exposure Duration (years)**	**Soil Ingestion Rate (mg/day)**	**Skin Surface Area (cm^2/event)**
Residential: Primary activity is residential in nature. Remedial actions in compliance with generic residential are safe for any unrestricted use.	350	245	6 (child) 24 (adult)	200 (child) 100 (adult)	2,670 (child) 5,800 (adult)
***Industrial*:** Primary activity is industrial in nature and access to the general public is and will continue to be reliably restricted consistent with its use. Zoning is industrial.	245	160	21	100	3,300
***Commercial*:** Primary activity is commercial in nature. The commercial category is divided into four subcategories to facilitate assessment of potential risk. Zoning is commercial.					
Subcategory I: a property used to house, educate, or provide care for children, the elderly, the infirm, or other sensitive subpopulations (e.g., schools, nursing homes, day cares). Residential cleanup required.	350	245	6 (child) 24 (adult)	200 (child) 100 (adult)	2,670 (child) 5,800 (adult)
Subcategory II: activities similar to industrial category. Access to the public is reliably restricted, consistent to its use, by fences, security, or both. Industrial cleanup required.	245	160	21	100	3,300
Subcategory III: access to the public is unrestricted but less in frequency and duration than workers at the facility (e.g., gas stations, auto dealerships, retail warehouses, auto service stations). The worker population is engaged in activities at the property that are of a low soil intensive nature.	245	160	21	100	3,300
Subcategory IV: access to the public is unrestricted but less in frequency and duration than workers at the facility (e.g., hotel, professional offices, medical/dental offices/clinics, and banks). A groundskeeper worker population has been identified as the appropriate receptor population. The worker population is engaged in activities at the property that are of a high soil intensive nature.	245	160	21	100	3,300

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