Site Centredale
Area 3.1
Docum 65197

Anna Krasko
04/05/2004 03:01 PM

To: Anna Deherrera/R1/USEPA/US@EPA
cc:
Subject: Re: Centredale AR

Thanks. I'll drop it off. It's good if you can replace pages in the hard copy as well. I don't plan to update CD now for this change.
Anna DeHerrera

Anna DeHerrera
Sent by: Anna Deherrera
04/05/2004 02:32 PM

To: Anna Krasko/R1/USEPA/US@EPA
cc:
Subject: Re: Centredale AR

Yes, we can replace pages in SDMS and the hard copy if necessary. Will you need an updated set of CDs now or is it sufficient to include the changes in the next update?

Anna DeHerrera
Booz Allen Hamilton, Contractor to the
Superfund Records & Information Center
US EPA New England
Boston, MA
617 918-1406
Anna Krasko

Anna Krasko
04/05/2004 02:08 PM

To: Anna Deherrera/R1/USEPA/US@EPA
cc:
Subject: Centredale AR

My contractor submitted replacement pages for the document listed below.

62. WORK PLAN: DRAFT FINAL WORK PLAN, EXPANDED HUMAN HEALTH RISK ASSESSMENT
TO: US ARMY CORPS OF ENGINEERS
AUTHOR: BATTELLE
MACTEC ENGINEERING AND CONSULTING INC
DOC ID: 48799 07/01/2003 58 PAGES

Can these pages be scanned to replace pages already in the system?

Thanks, Anna

SDMS DocID 65197

Battelle
The Business *of* Innovation

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April 2, 2004

Ms. Beverly Lawrence
U.S. Army Corps of Engineers, New England District
696 Virginia Road
Concord, MA 01742-2751

CONTRACT NO. DACW33-01-D-0004
DELIVERY ORDER: 01
SUBMITTAL OF DELIVERABLE – Addendum to the Draft Final Work Plan, Expanded Human Health Risk Assessment – Centredale Manor Restoration Project Superfund Site

Dear Ms. Lawrence:

Enclosed please find three (3) copies of the Addendum to the July 2003 *Draft Final Work Plan Expanded Human Health Risk Assessment, Centredale Manor Restoration Project Superfund Site, North Providence, RI* prepared by MACTEC Engineering and Consulting, Inc. This Addendum consists of replacement pages of text and replacement tables that reflect recent revisions to the technical approach for exposure assessment for the Baseline Human Health Risk Assessment. The revisions to the technical approach are the product of recent discussions among representatives of the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency (EPA), Battelle, and MACTEC Engineering and Consulting, Inc.

The enclosed replacement pages 1-1 through 1-3 and pages 3-1 through 3-7 should replace the corresponding pages of the July 2003 document.

The enclosed Tables 3 through 8 should replace Tables 3 through 8 of the July 2003 document.

Three copies of this Addendum have also been submitted directly to Ms. Anna Krasko at EPA.

April 2, 2004

Please contact me at (781) 952-5253 if you have any questions or comments.

Sincerely,

Deirdre Dahlen
Project Manager

Lisa Lefkovitz
Program Manager

encl.

cc: A. Krasko, USEPA (3 copies)
C. Rosiu, USEPA
A. Beliveau, USEPA
C. Vu, USEPA
P. Cook, USEPA/EERL Duluth
C. Opdyke, USACE
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C. Custer, USGS
M. Murphy, MACTEC

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (USEPA) Region I and U.S. Army Corps of Engineers (USACE) are conducting a Baseline Human Health Risk Assessment (BHHRA) and a Baseline Ecological Risk Assessment for the Centredale Manor Restoration Project Superfund Site located in North Providence, Rhode Island (Site). This Work Plan is a supplement to *Work Plan, Human Health and Ecological Risk Assessment,* Centredale Manor Restoration Superfund Project Site, North Providence, Rhode Island dated March 16, 2001 (Harding ESE, 2001).

1.1 PROJECT OBJECTIVES

The human health risk assessment will include an evaluation of multiple exposure pathways for neighborhood residents and visitors to the Site: ingestion of biota from the reach of the Woonasquatucket River that constitutes the Site; and ingestion and dermal contact with bank soil, surface water, and sediment in the portion of the Woonasquatucket River that constitutes the Site. The primary objectives associated with these pathways will be:

(1) to calculate potential human health risks associated with biota consumption and contact with bank soil, surface water, and sediment from the portion of the river within the Site boundaries; and
(2) to achieve and/or maintain acceptable risks related to biota consumption and contact with bank soil, surface water, and sediment through risk management procedures that may include development of preliminary remediation goals (PRGs) for sediment and possibly for one or more of those other media.

The objective of the baseline human health risk assessment is to analyze potential adverse human health effects for both current and future conditions caused by hazardous substances found at the site in the absence of any actions to control or mitigate these releases (i.e., under an assumption of no action or in the absence of the RI DOH health advisories on fish consumption for this particular site). Currently, there is a fish consumption advisory issued by the State of Rhode Island that is not believed to be a sufficient barrier to precluding exposure to biota from the Woonasquatucket River in the short-term. Current and potential future exposure to fish and other biota (including high lipid content biota such as eels) may occur at the river. EPA's goal is to restore the river to an unrestricted "fishable" river.

This Work Plan presents the approach that will be used to conduct an expanded human health risk assessment for the site. The expanded risk assessment will present the cumulative receptor risks for surface water, sediment, and bank soil in addition to the biota consumption that was to be evaluated per the Work Plan dated March 16, 2001 (Harding ESE, 2001). The expanded scope also includes the neighborhood resident exposures to all of these media and surface soil exposure for employees and clients of the Fogarty Center. The original scope included a visiting recreational angler and a visiting subsistence angler. The expanded risk assessment is a Baseline Human Health Risk Assessment (BHHRA).

Risk assessment activities will be performed in accordance with USEPA guidance documents (1989a-c; 1991a-c; 1992a-d; 1994; 1995; 1996a-b; 1997a-e; 1998a-b, 1999a). Human health risks, in addition to those associated with biota consumption per the original statement of work and addendum, will be

evaluated for ingestion and dermal contact with surface water, sediment, and bank soils in and adjacent to the Woonasquatucket River.

A total of seven exposure points (EPs) will be evaluated: the upstream background location Greystone Mill Pond; the reference area Assapumpset Brook; Allendale Reach; Lyman Mill Reach; Manton Reach; and Dyerville Reach. In addition, the surface soils between the Lyman Mill Reach and the Fogarty Center constitute the seventh EP. Cancer and non-cancer risk estimates will be calculated separately for each of the receptors, exposure media and exposure points (EP) identified in Table 2. These individual risks will then be summed to provide a total risk by media and receptor at each exposure point. Those total risks will then be added to the risks for consumption of fish to derive a cumulative risk estimate for each exposure point (EP) in the BHHRA. Risks for the five site-related exposure points will be compared to the risks for the background exposure point and the reference area exposure point to provide additional perspective for risk management purposes. This comparison will provide information concerning the incremental risks above the background risks identified.

1.2 WORK PLAN ORGANIZATION

This Work Plan does not duplicate information that has been previously provided in the 2001 Work Plan (Harding ESE, 2001). The 2001 Work Plan presents an introduction in Section 1.0, a general site description and background information in Section 2.0, data collection and analysis discussion in Section 3.0, and the methodology for conducting BHHRA in Section 4.0. Other supporting information is provided in the appendices to the 2001 Work Plan.

This Work Plan discusses the specifics of the additional human health risk assessment scope, including any guidance or technical approaches that have been agreed upon with the USEPA since the time of the publication of the 2001 Work Plan. This Work Plan initially identifies the receptors and exposure pathways, (exposure media and exposure routes) to be evaluated and presents the details of the planned exposure assessment for those receptors (exposure profiles). The exposure profiles identify media contact rates, receptor physical characteristics (ages, weights, surface areas), as well as frequencies and duration of exposures. The last section of this Work Plan presents specifics of guidance and technical approaches that have been agreed upon with USEPA since the publication of the 2001 Work Plan.

The other components of the risk assessment will be completed in accordance with the approach described in the 2001 Work Plan and supplemental correspondence with USEPA Region I. Specifically:

- COPCs for sediment and bank soil will be selected using USEPA Region IX Preliminary Remediation Goals (PRGs) for residential soil;
- COPCs for surface water will be selected using USEPA Region IX PRGs for tapwater;
- Exposures to surface water, sediment, and bank surface soil will be quantified using the technical approaches described in RAGS Part E (USEPA, 2001) and RAGS Part A (USEPA, 1989);
- Exposure Point Concentrations will be calculated in accordance with the approach described in Section 4 of this Work Plan;
- Dose-response values will be obtained from the most recent on-line version of the IRIS data base, HEAST (FY 1997), the USEPA Region IX PRG Table (as a source for the National Center for

Environmental Assessment (NCEA) provisional values for chemicals that do not have dose-response values published in IRIS or HEAST) and California EPA (CAL-EPA);

- The risk assessment will be documented using RAGS Part D reporting requirements (USEPA, 2001).

3.0 RECEPTOR EXPOSURE SCENARIOS FOR SURFACE WATER, SEDIMENT, AND BANK SOIL

Using the information summarized in Tables 1 and 2, receptor exposure scenarios are identified below. The following paragraphs discuss the receptor exposure scenarios and exposure parameters identified for the quantitative evaluation of potential COPC exposures. The receptor scenarios are presented in the following sequence: area resident; visiting recreational angler; visiting subsistence angler; commercial/industrial worker.

Exposure parameters for the Reasonable Maximum Exposure (RME) were selected from USEPA guidance documents (USEPA, 1994; 1997; 2001) and were based on professional judgment considering the site-specific exposure conditions. This subsection describes the exposure scenarios and RME exposure parameters in detail. Exposure parameters for the Central Tendency (CT) were based on the RME values, with the following modifications:

- CT values for incidental ingestion of soil, sediment, and surface water were identified as one-half the RME values, based on USEPA Region I guidance (USEPA, 1994) which recommends using one-half the RME value as the CT value for incidental soil ingestion.
- CT values for soil and sediment dermal adherence were the recommended CT parameters for soil from USEPA RAGS Part E guidance (USEPA, 2001).
- CT values for exposure frequency were based on USEPA Region I guidance (USEPA, 1994) or professional judgment. The RME values assume that a receptor uses the Site for all of their outdoor activities (e.g., recreational play/exploration, recreational angling, or subsistence angling). The CT parameters accommodate the assumption that a more "typical" or "average" receptor would spend only a portion of their outdoor time at the Site (i.e., would access other, non-Site related areas for recreational purposes).

3.1 AREA RESIDENT

A resident who lives at the Centredale Manor Apartments, Brook Village Apartments, or a private residence at one of the residential lots close to the shore of the Woonasquatucket River may visit water bodies at the Site for recreational angling, recreational walking, exploring the banks of the river and ponds, and wading and swimming. It is assumed that area residents include young children, older children/adolescents, and adults. Potential exposures to surface water and aquatic (submerged) sediment by incidental ingestion and dermal contact may occur during angling, wading, or swimming at Allendale Pond, Lyman Mill Pond, Manton Reach, and Dyerville Reach. In addition, possible exposures to bank surface soils at Allendale Pond and Lyman Mill Pond by incidental ingestion and dermal contact may occur when area residents access the water bodies for recreational angling, swimming and wading, or when walking or exploring the edges of the ponds. Potential exposures to surface water, sediment, and biota at the background and reference areas, as well as soil at the background area, will be evaluated.

The RME and CT exposure parameters for surface water are presented in Tables 3 and 4, for sediment in Tables 5 and 6, and for bank soil in Tables 7 and 8.

Exposure Duration. It is assumed that an area resident is raised at and remains at the same residence over a 30-year period (USEPA, 1994). The 30-year duration is segregated into three age periods: young-child (ages 1 through 6) for 6 years; older child/adolescent (ages 7 through 18) for 12 years; and adult (ages 19 and above) for 12 years. The CT exposure duration values are based on the recommended CT parameters for exposure duration published in USEPA RAGS Part E of 9 years for adults and 6 years for children. The 9-year exposure duration values were applied to both the adult and older child/adolescent receptors.

Exposure Frequency. It is assumed that an area resident visits the water bodies or banks of the river for walking/exploring or recreational angling May through October, and for wading or swimming June, July and August. It is further assumed that during summer months, wading (defined as standing or walking in water to a depth of the knees) occurs more frequently than swimming (defined as total submersion of the body in water). The exposure frequency associated with these various activities is broken down as follows:

Activity	RME Frequency/Period	RME Total No. Days per Year
Walking/Exploring banks and recreational angling	2x/week; May, Sept, Oct 4x/week; June – Aug	78
Swimming	1x/week; Jun – Aug	13
Wading 1	3x/week; Jun – Aug	39
Swimming and Wading 2	4x/week; Jun – Aug	52

Activity	CT Frequency / Period	CT Total No. Days per Year
Walking/Exploring banks and recreational angling	1x/week; May, Sept, Oct 2x/week; June – Aug	39
Swimming	1x/week; Jun – Aug	13
Wading 1	1x/week; Jun – Aug	13
Swimming and Wading 2	2x/week; Jun – Aug	26

[1] Used to estimate potential exposure to sediment (adult/older child-adolescent).
[2] Used to estimate potential exposure to surface water (adult/older child-adolescent/child) and sediment (child).

The exposure frequency during the summer months assumes that walking/exploring banks, recreational angling, and wading/swimming each occur on the same day, such that a total of four visits to the water bodies occur each week.

For the young child receptor, it is assumed that all time spent in the water during the summer months would be associated with wading rather than swimming (as young children are usually not able to swim), such that the exposure frequency for wading is 52 days per year, and the exposure frequency for swimming is 0 days per year.

It is assumed that potential exposures to bank soil (Allendale and Lyman Mill ponds only) occur each day that access to the Site occurs (78 days per year). Contact with submerged sediment is not likely to be substantial under any of the scenarios, as explained under "Ingestion Rate" below. However, if contact with sediment were to occur, it would be during wading activities when a person is standing in the water

(i.e., standing in the sediment), and not when a person is swimming (i.e., when body parts do not contact the sediment for more than a minute or two). Therefore, the exposure frequency for sediment is based on the exposure frequency for wading (39 days per year for adults/adolescents, and 52 days per year for young children). The exposure frequency for surface water is based on the total frequency for wading and swimming (52 days per year).

Exposure Time and Event Frequency. Exposures to surface water during swimming or wading activities are assumed to occur 1 hour per event, 1 event per day (i.e., 1 hour per day), based on the recommended exposure time for recreational swimming (USEPA, 1997a).

Body Weight. The RME and CT body weight values are based on USEPA Region I guidance (USEPA, 1994) and Region I's practice in risk assessment.

Incidental Ingestion Rate and Fraction Ingested. The incidental ingestion rate for surface water is based on the recommended value for incidental ingestion of water during swimming of 50 ml per hour (USEPA, 1988). The fraction ingested parameter for surface water is 100%, indicating that 100% of surface water intake on the day-exposed is assumed to occur at the Site.

The incidental ingestion rates for the area resident for bank surface soil are the default residential ingestion rate values for soil recommended in USEPA (1994) guidance; the ingestion rate for adults is applied to older children/adolescents who are less likely than young children to place soil-covered hands in the mouth. The fraction ingested parameter for bank surface soil is 100%, based on the assumption that all of the daily intake of soil would occur from soil at the Site.

Human exposure parameter values specifically applicable to sediment are not provided in USEPA Region I or USEPA national guidance. Since incidental ingestion exposure to soil (or sediment) primarily occurs through hand-to-mouth transfer of material that has adsorbed to the skin, it is unlikely that ingestion exposure to COPCs in submerged sediment would occur through hand-mouth contact because sediment would wash off of the hand while the hand was being removed from the water. Nonetheless, it is possible that some sediment would adhere to the skin when leaving a water body (i.e., some sediment may not wash off), and it is possible that sediment entrained in the surface water could be ingested if surface water is incidentally ingested. Given these considerations, the soil ingestion rates published by USEPA Region I (USEPA, 1994) are used as sediment ingestion rates. The fraction ingested parameter for sediment is 100% to account for that fact that all of the daily exposure to sediment would be derived from contact with sediment at the Site.

Dermal Surface Area and Adherence Factor. The dermal surface area for surface water differs between wading and swimming exposures. Wading exposures would involve contact with only the lower legs, feet, and hands, whereas swimming exposures would involve contact with the entire body. For adults and older children/adolescents, the surface water exposures are quantified using the dermal surface area associated with swimming. This provides a conservative estimate of surface water contact, and streamlines the risk assessment by characterizing potential surface water risks using one calculation, rather than separate calculations for wading and swimming exposures. If risks associated with surface water are found to be a substantial contributor to risk, separate calculations for wading exposures and swimming exposures may be performed to reduce the conservative uncertainty associated with

quantifying risks for this exposure medium. For the young child, the dermal surface area is based on the areas of the legs, feet, and hands (average of 50th percentile values for males ages 1 through 6), as these are the body parts that would contact surface water during wading.

Exposures to aquatic sediments that are submerged beneath the water are unlikely to be substantial. In order for dermal absorption of COPCs from sediment to occur, the material must adhere to the skin (USEPA, 2001). Sediment that is submerged would not adhere to skin, as the surrounding surface water would prevent binding of the sediment to the skin. In addition, when a body part that contacts sediment is removed from the surface water body, the majority of sediment would wash off, thereby preventing adherence of the material. Hence, although dermal exposures to COPCs in sediment are likely to be negligible, they are quantified to account for the possibility that some sediment may remain adhered to the skin following contact with surface water.

Dermal surface area and adherence values for sediment are:

- Child recreational wader: USEPA RAGS Part E child resident default values for body surface area and soil adherence. These variables account for the possibility that a child may play in shallow water and contact sediment with body parts other than just feet and lower legs.
- Older child/adolescent and adult wader: Body surface area values for feet, lower legs, and hands (average of 50th percentile values for males), and RAGS Part E resident default values for soil adherence are applied for sediment exposure. These values account for the fact that upper legs, arms, and face would not contact sediment.

The dermal surface area and adherence factor values for bank surface soil are based on the RAGS Part E default values for residential exposures to soil.

3.2 VISITING RECREATIONAL ANGLER

A person who lives in the vicinity (but not in the residential neighborhood adjacent to the river) of the Site may access the water bodies for recreational fishing under current and future use. It is assumed that recreational anglers would include older children/adolescents and adults; young children would not participate in fishing, but are assumed to eat the fish that may be caught by older siblings and parents. Potential exposures to surface water and aquatic (submerged) sediment by incidental ingestion and dermal contact at Allendale Pond, Lyman Mill Pond, Manton Reach, and Dyerville Reach may occur during angling under the assumption that the receptor also wades during/in-support of angling. This scenario assumes that a recreational angler does not use waders while standing in the water. In addition, possible exposures to bank surface soils at Allendale Pond and Lyman Mill Pond by incidental ingestion and dermal contact may occur when recreational anglers access the water bodies for angling. Potential exposures to surface water, sediment, and biota at the background and reference areas, as well as soil at the background area, will be evaluated.

The RME and CT exposure parameters for surface water are presented in Tables 3 and 4, for sediment in Tables 5 and 6, and for bank soil in Tables 7 and 8.

Exposure Duration. It is assumed that the visiting recreational angler is an area resident that accesses the water bodies at the Site while growing up and throughout their life. The RME exposure duration values, therefore, are based on a 70-year duration segregated into three age periods: young-child (ages 1 through 6) for 6 years; older child/adolescent (ages 7 through 18) for 12 years; and adult (ages 19 and older) for 52 years. These exposure parameters are consistent with those used to evaluate potential risks associated with biota consumption. The CT exposure duration values are based on the assumption that a recreational angler lives in the vicinity of the Site for 30-years (consistent with USEPA Region I assumption for the RME exposure duration of a resident). The 30-year duration is segregated into three age periods: young-child (ages 1 through 6) for 6 years; older child/adolescent (ages 7 through 18) for 12 years; and adult (ages 19 and older) for 12 years.

Since the angling activity for the visiting recreational angler is assumed to involve only the older child/adolescent and adult populations, only those age groups are quantitatively evaluated for this receptor.

Fraction Ingested. The fraction ingested parameter for sediment and bank soil is established for each medium at 100% for area resident and 50% for non-resident (i.e., visiting recreational angler, visiting subsistence angler, and commercial/industrial worker). The fraction ingested value of 50% accommodates the likelihood that visiting receptors who do not live immediately near the Site would incur only a portion (50%) of their daily exposure to soil or sediment at the Site, and the remainder at off-site locations such as residential yards.

Exposure Frequency. It is assumed that a recreational angler visits the Site once per week from May through October. However, contact with surface water and sediment is assumed to occur only during the warmer months (i.e., June through August). Therefore, the exposure frequency for surface water and sediment is 13 days per year.

Exposure Time and Event Frequency. Exposures to surface water are assumed to occur 1 hour per event, 1 event per day (i.e., 1 hour per day). It is unlikely that a person who is angling for recreation would stand in the water for more than one hour without the use of waders.

Body Weight, Incidental Ingestion Rate, Dermal Surface Area and Adherence Factor. The values for these parameters are the same as those used for the area resident (above), with the following exceptions:

- *Surface water ingestion rate*: It is assumed that a recreational angler would have little, if any, incidental ingestion of water. Therefore, the surface water ingestion rate used for the recreational angler was estimated at 5 ml/hour, representing one-tenth the USEPA-published value for incidental ingestion of surface water during swimming activities.
- *Dermal surface area for surface water*: It is assumed that the feet, legs, and hands of a recreational angler standing in surface water would be exposed to surface water (values based on the average of 50th percentile values for males).

3.3 VISITING SUBSISTENCE ANGLER

Presently, subsistence angling at the Site cannot be ruled out. Potential future subsistence angling at the Site can also occur. Because of the uncertainty associated with this exposure scenario, the risk assessment for this scenario will be presented in an appendix to the BHHRA. It is assumed that subsistence anglers include older children/adolescents and adults; young children would not participate in fishing, but are assumed to eat the fish that may be caught by older siblings and parents. Potential exposures to surface water and aquatic (submerged) sediment by incidental ingestion and dermal contact are assumed to occur during angling (e.g., if wading occurs as part of the angling) at Allendale Pond, Lyman Mill Pond, Manton Reach, and Dyerville Reach. This scenario assumes that a subsistence angler does not use waders while standing in the water. In addition, possible exposures to bank surface soils at Allendale Pond and Lyman Mill Pond by incidental ingestion and dermal contact may occur when subsistence anglers access the water bodies for angling. Potential exposures to surface water, sediment, and biota at the background and reference areas, as well as soil at the background area, will be evaluated.

The RME and CT exposure parameters for surface water are presented in Tables 3 and 4, for sediment in Tables 5 and 6, and for bank soil in Tables 7 and 8.

The exposure parameter values for a subsistence angler are the same as those used for the recreational angler, with the following exceptions:

- *Exposure frequency:* It is assumed that a subsistence angler would access the Site year round (i.e., ice fishing would be performed in the winter months). However, contact with bank surface soil would only occur during months when the ground is not frozen or snow covered (April through November). Contact with surface water and sediment would potentially occur only during warmer months when the surface water is at a temperature that allows prolonged contact (assumed to be May through September). It is assumed that a subsistence angler would access the Site six days per week. Therefore, the exposure frequency for bank surface soil would be 208 days per year, and the exposure frequency for surface water and sediment would be 130 days per year.
- *Exposure time (surface water):* It is assumed that a subsistence angler would tolerate a longer exposure time in the water (2 hours per event) than recreational receptors as the subsistence angler depends on catching fish for subsistence.

3.4 COMMERCIAL/INDUSTRIAL WORKER

Exposure parameters are presented for an evaluation of potential current and future risks to a commercial/industrial worker at the Fogarty Center.

A commercial/industrial worker employed at the Fogarty Center or adult center could contact surface soils during work-day breaks, lunch hour, etc. It is assumed that the worker would contact the soil via incidental ingestion and dermal contact each work-day when the weather is not inclement or the ground is not frozen or snow covered (assumed to be approximately 150 days per year per USEPA Region I guidance [USEPA, 1994]). Since potential contact with the soil would only be through incidental exposure during short periods (e.g., when on work breaks), it is not reasonable to assume that an

employees entire daily incidental intake of soil would occur at the Fogarty Center. Therefore, the fraction ingested value is established at 0.5. Values for other exposure parameters are USEPA default values for commercial/industrial land use (USEPA, 1994; 2001). There is no direct access to surface water or sediment in Lyman Mill Pond for the workers/clients at this location.

Table 3
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Surface Water

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
Ingestion	Area Resident	Adult	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-INGESTION =
		(ages 19 and above)	Assapumpset Brook	IR-W	Ingestion Rate of Water	0.05	l/hour	USEPA, 1988 [1]	CW x IR-W x FI x EF x EV x ED x ET x 1/BW x 1/AT
		(Swimming)	Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	52	day/yr	Professional judgment [3]	
			Manton Reach,	EV	Event Frequency	1	event/day	Professional judgment	
			Dyerville Reach	ED	Exposure Duration	12	yr	USEPA, 1994 [4]	
				ET	Exposure Time	1	hr/event	USEPA, 1997 [5]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
		Adolescent	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)	Assapumpset Brook	IR-W	Ingestion Rate of Water	0.05	l/hour	USEPA, 1988 [1]	CW x IR-W x FI x EF x EV x ED x ET x 1/BW x 1/AT
		(Swimming)	Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	52	day/yr	Professional judgment [3]	
			Manton Reach,	EV	Event Frequency	1	event/day	Professional judgment	
			Dyerville Reach	ED	Exposure Duration	12	yr	Ages 7 - 18	
				ET	Exposure Time	1	hr/event	USEPA, 1997 [5]	
				BW	Body Weight	45	kg	USEPA, 1997 [7]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
		Child	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-INGESTION =
		(ages 1 - 6)	Assapumpset Brook	IR-W	Ingestion Rate of Water	0.05	l/hour	USEPA, 1988 [1]	CW x IR-W x FI x EF x EV x ED x ET x 1/BW x 1/AT
		(Wading)	Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	52	day/yr	Professional judgment [3]	
			Manton Reach,	EV	Event Frequency	1	event/day	Professional judgment	
			Dyerville Reach	ED	Exposure Duration	6	yr	USEPA, 1994	
				ET	Exposure Time	1	hr/event	USEPA, 1997 [5]	
				BW	Body Weight	15	kg	USEPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	day	USEPA, 1989	

Table 3
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Surface Water

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
	Visiting	Adult	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-INGESTION =
	Recreational Angler	(ages 19 and above)	Assapumpset Brook	IR-W	Ingestion Rate of Water	0.005	l/hour	USEPA, 1988 [10]	CW x IR-W x FI x EF x EV x ED x ET x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	13	day/yr	Professional judgment [11]	
			Manton Reach,	EV	Event Frequency	1	event/day	Professional judgment	
			Dyerville Reach	ED	Exposure Duration	52	yr	Assumes lifetime [6]	
				ET	Exposure Time	1	hr/event	Professional judgment [12]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	18980	day	USEPA, 1989	
		Adolescent	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)	Assapumpset Brook	IR-W	Ingestion Rate of Water	0.005	l/hour	USEPA, 1988 [10]	CW x IR-W x FI x EF x EV x ED x ET x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	13	day/yr	Professional judgment [11]	
			Manton Reach,	EV	Event Frequency	1	event/day	Professional judgment	
			Dyerville Reach	ED	Exposure Duration	12	yr	Ages 7 - 18	
				ET	Exposure Time	1	hr/event	Professional judgment [12]	
				BW	Body Weight	45	kg	USEPA, 1997 [7]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
	Visiting	Adult	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-INGESTION =
	Subsistence Angler	(ages 19 and above)	Assapumpset Brook	IR-W	Ingestion Rate of Water	0.005	l/hour	USEPA, 1988 [10]	CW x IR-W x FI x EF x EV x ED x ET x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	130	day/yr	Professional judgment [13]	
			Manton Reach,	EV	Event Frequency	1	event/day	Professional judgment	
			Dyerville Reach	ED	Exposure Duration	52	yr	Assumes lifetime [6]	
				ET	Exposure Time	2	hr/event	Professional judgment [12]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	18980	day	USEPA, 1989	

Table 3
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Surface Water

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
		Adolescent	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)	Assapumpset Brook	IR-W	Ingestion Rate of Water	0.005	l/hour	USEPA, 1988 [10]	CW x IR-W x FI x EF x EV x ED x ET x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	130	day/yr	Professional judgment [13]	
			Manton Reach,	EV	Event Frequency	1	event/day	Professional judgment	
			Dyerville Reach	ED	Exposure Duration	12	yr	Ages 7 - 18	
				ET	Exposure Time	2	hr/event	Professional judgment [12]	
				BW	Body Weight	45	kg	USEPA, 1997 [7]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
Dermal	Area Resident	Adult	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-DERMAL =
		(ages 19 and above)	Assapumpset Brook	PCevent	Permeability Constant Per Event	chemical-specific	cm	USEPA, 2001	CW x SA x Pevent x EF x ED x EV x CF x 1/BW x 1/AT
		(Swimming)	Allendale Pond,	SA	Skin Surface Area Available for Contact	18000	cm^2	USEPA, 2001 [8]	PCevent = PC x ET; calculated in PCevent table
			Lyman Mill Pond,	ET	Exposure Time	1	hr/event	USEPA, 1997 [5]	
			Manton Reach,	EF	Exposure Frequency	52	day/yr	Professional judgment [3]	
			Dyerville Reach	EV	Event Frequency	1	event/day	Professional judgment	
				ED	Exposure Duration	12	yr	USEPA, 1994 [4]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	0.001	l/cm^3		
		Adolescent	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-DERMAL =
		(ages 7 - 18)	Assapumpset Brook	PCevent	Permeability Constant Per Event	chemical-specific	cm	USEPA, 2001	CW x SA x Pevent x EF x ED x EV x CF x 1/BW x 1/AT
		(Swimming)	Allendale Pond,	SA	Skin Surface Area Available for Contact	14200	cm^2	USEPA, 2001 [8]	PCevent = PC x ET; calculated in PCevent table
			Lyman Mill Pond,	ET	Exposure Time	1	hr/event	USEPA, 1997 [5]	
			Manton Reach,	EF	Exposure Frequency	52	day/yr	Professional judgment [3]	
			Dyerville Reach	EV	Event Frequency	1	event/day	Professional judgment	
				ED	Exposure Duration	12	yr	Ages 7 - 18	
				BW	Body Weight	45	kg	USEPA, 1997 [7]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	0.001	l/cm^3		

Table 3
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Surface Water

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
		Child	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-DERMAL =
		(ages 1 - 6)	Assapumpset Brook	PCevent	Permeability Constant Per Event	chemical-specific	cm	USEPA, 2001	CW x SA x Pevent x EF x ED x EV x CF x 1/BW x 1/AT
		(Wading)	Allendale Pond,	SA	Skin Surface Area Available for Contact	2678	cm^2	USEPA, 1997 [9]	PCevent = PC x ET; calculated in PCevent table
			Lyman Mill Pond,	ET	Exposure Time	1	hr/event	USEPA, 1997 [5]	
			Manton Reach,	EF	Exposure Frequency	52	day/yr	Professional judgment [3]	
			Dyerville Reach	EV	Event Frequency	1	event/day	Professional judgment	
				ED	Exposure Duration	6	yr	USEPA, 1994	
				BW	Body Weight	15	kg	USEPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	day	USEPA, 1989	
				CF	Conversion Factor	0.001	l/cm^3		
	Visiting	Adult	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-DERMAL =
	Recreational Angler	(ages 19 and above)	Assapumpset Brook	PCevent	Permeability Constant Per Event	chemical-specific	cm	USEPA, 2001	CW x SA x Pevent x EF x ED x EV x CF x 1/BW x 1/AT
			Allendale Pond,	SA	Skin Surface Area Available for Contact	8700	cm^2	USEPA, 1997 [14]	PCevent = PC x ET; calculated in PCevent table
			Lyman Mill Pond,	ET	Exposure Time	1	hr/event	Professional judgment [12]	
			Manton Reach,	EF	Exposure Frequency	13	day/yr	Professional judgment [11]	
			Dyerville Reach	EV	Event Frequency	1	event/day	Professional judgment	
				ED	Exposure Duration	52	yr	Assumes lifetime [6]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	18980	day	USEPA, 1989	
				CF	Conversion Factor	0.001	l/cm^3		
		Adolescent	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-DERMAL =
		(ages 7 - 18)	Assapumpset Brook	PCevent	Permeability Constant Per Event	chemical-specific	cm	USEPA, 2001	CW x SA x Pevent x EF x ED x EV x CF x 1/BW x 1/AT
			Allendale Pond,	SA	Skin Surface Area Available for Contact	6260	cm^2	USEPA, 1997 [14]	PCevent = PC x ET; calculated in PCevent table
			Lyman Mill Pond,	ET	Exposure Time	1	hr/event	Professional judgment [12]	
			Manton Reach,	EF	Exposure Frequency	13	day/yr	Professional judgment [11]	
			Dyerville Reach	EV	Event Frequency	1	event/day	Professional judgment	
				ED	Exposure Duration	12	yr	Ages 7 - 18	
				BW	Body Weight	45	kg	USEPA, 1997 [7]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	0.001	l/cm^3		

Table 3
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Surface Water

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
	Visiting Subsistence Angler	Adult (ages 19 and above)	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-DERMAL =
			Assapumpset Brook	PCevent	Permeability Constant Per Event	chemical-specific	cm	USEPA, 2001	CW x SA x Pevent x EF x ED x EV x CF x 1/BW x 1/AT
			Allendale Pond,	SA	Skin Surface Area Available for Contact	8700	cm^2	USEPA, 1997 [14]	PCevent = PC x ET; calculated in PCevent table
			Lyman Mill Pond,	ET	Exposure Time	2	hr/event	Professional judgment [12]	
			Manton Reach,	EF	Exposure Frequency	130	day/yr	Professional judgment [13]	
			Dyerville Reach	EV	Event Frequency	1	event/day	Professional judgment	
				ED	Exposure Duration	52	yr	Assumes lifetime [6]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	18980	day	USEPA, 1989	
				CF	Conversion Factor	0.001	l/cm^3		
		Adolescent (ages 7 - 18)	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-DERMAL =
			Assapumpset Brook	PCevent	Permeability Constant Per Event	chemical-specific	cm	USEPA, 2001	CW x SA x Pevent x EF x ED x EV x CF x 1/BW x 1/AT
			Allendale Pond,	SA	Skin Surface Area Available for Contact	6260	cm^2	USEPA, 1997 [14]	PCevent = PC x ET; calculated in PCevent table
			Lyman Mill Pond,	ET	Exposure Time	2	hr/event	Professional judgment [12]	
			Manton Reach,	EF	Exposure Frequency	130	dey/yr	Professional judgment [13]	
			Dyerville Reach	EV	Event Frequency	1	event/day	Professional judgment	
				ED	Exposure Duration	12	yr	Ages 7 - 18	
				BW	Body Weight	45	kg	USEPA, 1997 [7]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	0.001	l/cm^3		

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USEPA, 1989. "Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A)"; Office of Emergency and Remedial Response; EPA-540/1-89/002 (interim final); Washington, D.C., December.

USEPA, 1994. "Risk Updates No. 2"; USEPA Region I, Waste Management Division; August. Values from "Attachment 2" to Risk Updates No. 2.

USEPA, 1997. "Exposure Factors Handbook, Volume 1"; Office of Research and Development; EPA-600/P-95/002Fa; Washington, D.C.; August.

USEPA, 2001. "Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidanca for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

1 - Value for swimming used

2 - 100% of daily incidental intake of surface water is attributable to incidental ingestion at the Site.

3 - Receptor assumed to visit area to wade or swim 4 days per week, June through August. Wading is expected to occur 3 of the 4 days each week and swimming 1 of the days each week. Sediment contact would only occur during wading (not swimming) activities. The child value is based on assumed wading exposure 4 days per week, June through August (the child is assumed to wade while adolescents and adults are swimming). Since contact with surfece water would occur during both wading and swimming activities, but a larger portion of the body would be exposed to surface water during swimming, contact with surface water is evaluated using parameters for swimming exposures to provide a conservative assessment.

4 - Representing ages 19 and above of a 30-year residential exposure duration.

5 - Recommended value for swimming exposures.

6 - Assumes lifetime exposure (to age 70) and is consistent with exposure assumptions used to estimate risks for consumption of biota.

7 - Values are the average of 50th percentile body weights for males and females ages 7 through 18.

8 - Whole-body surface area values used for exposures during swimming; value for adolescents is the average of 50th percentile whole-body surface areas of males ages 7 through 18.

Table 3
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Surface Water

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	*Receptor* Population	Receptor Age	Exposure Points	*Parameter* Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name

9 - Values are the average of 50th percentile body surface areas for body parts that may substantially contact surface water while wading (sum of areas for hands, legs, and feet) for males ages 1 through 6.
10 - It is assumed that anglers would wade during fishing; incidental ingestion of surface water during this activity assumed to occur; 1/10 value for swimming exposures (USEPA, 1988) is used.
11 - Value based on assumed exposure 1 day per week, June through August. Potential contact with surface water and sediment would not occur during months when the weather and water temperature are colder.
12 - It is assumed that wading to catch fish may occur for one hour (recreational) and two hours (subsistence).
13 - Value based on assumed exposure 6 days per week, May through September, under assumption that subsistence anglers would tolerate colder (spring/fall) water temperatures.
14 - It is assumed that receptors may wade during fishing. Exposure to water assumed to occur across feet, legs, and hands. Values are the average of 50th percentile body surface areas for those body parts for ages indicated.

mg - milligrams
cm^2 - square centimeters
cm^3 - cubic centimeters
l - liter
kg - kilograms

Prepared by: MJM
Checked by: JHP

Table 4
Values Used for Daily Intake Calculations
Central Tendency Exposure - Surface Water

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
Ingestion	Area Resident	Adult	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-INGESTION =
		(ages 19 and above)	Assapumpset Brook	IR-W	Ingestion Rate of Water	0.025	l/hour	USEPA, 1988 [1]	CW x IR-W x FI x EF x EV x ED x ET x 1/BW x 1/AT
		(Swimming)	Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	26	day/yr	Professional judgment [3]	
			Manton Reach,	EV	Event Frequency	1	event/day	Professional judgment	
			Dyerville Reach	ED	Exposure Duration	9	yr	USEPA, 1994 [4]	
				ET	Exposure Time	1	hr/event	USEPA, 1997 [5]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	day	USEPA, 1989	
		Adolescent	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)	Assapumpset Brook	IR-W	Ingestion Rate of Water	0.025	l/hour	USEPA, 1988 [1]	CW x IR-W x FI x EF x EV x ED x ET x 1/BW x 1/AT
		(Swimming)	Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	26	day/yr	Professional judgment [3]	
			Manton Reach,	EV	Event Frequency	1	event/day	Professional judgment	
			Dyerville Reach	ED	Exposure Duration	9	yr	USEPA, 1994	
				ET	Exposure Time	1	hr/event	USEPA, 1997 [5]	
				BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	day	USEPA, 1989	
		Child	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-INGESTION =
		(ages 1 - 6)	Assapumpset Brook	IR-W	Ingestion Rate of Water	0.025	l/hour	USEPA, 1988 [1]	CW x IR-W x FI x EF x EV x ED x ET x 1/BW x 1/AT
		(Wading)	Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	26	day/yr	Professional judgment [3]	
			Manton Reach,	EV	Event Frequency	1	event/day	Professional judgment	
			Dyerville Reach	ED	Exposure Duration	6	yr	USEPA, 1994	
				ET	Exposure Time	1	hr/event	USEPA, 1997 [5]	
				BW	Body Weight	15	kg	USEPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	day	USEPA, 1989	

Table 4
Values Used for Daily Intake Calculations
Central Tendency Exposure - Surface Water

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
	Visiting Recreational Angler	Adult (ages 19 and above)	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-INGESTION =
			Assapumpset Brook	IR-W	Ingestion Rate of Water	0.0025	l/hour	USEPA, 1988 [9]	CW x IR-W x FI x EF x EV x ED x ET x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	6	day/yr	Professional judgment [10]	
			Manton Reach,	EV	Event Frequency	1	event/day	Professional judgment	
			Dyerville Reach	ED	Exposure Duration	12	yr	USEPA, 1994 [15]	
				ET	Exposure Time	1	hr/event	Professional judgment [11]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
		Adolescent (ages 7 - 18)	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-INGESTION =
			Assapumpset Brook	IR-W	Ingestion Rate of Water	0.0025	l/hour	USEPA, 1988 [9]	CW x IR-W x FI x EF x EV x ED x ET x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	6	day/yr	Professional judgment [10]	
			Manton Reach,	EV	Event Frequency	1	event/day	Professional judgment	
			Dyerville Reach	ED	Exposure Duration	12	yr	USEPA, 1994 [15]	
				ET	Exposure Time	1	hr/event	Professional judgment [11]	
				BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
	Visiting Subsistence Angler	Adult (ages 19 and above)	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-INGESTION =
			Assapumpset Brook	IR-W	Ingestion Rate of Water	0.0025	l/hour	USEPA, 1988 [9]	CW x IR-W x FI x EF x EV x ED x ET x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	65	day/yr	Professional judgment [12]	
			Manton Reach,	EV	Event Frequency	1	event/day	Professional judgment	
			Dyerville Reach	ED	Exposure Duration	12	yr	USEPA, 1994 [15]	
				ET	Exposure Time	2	hr/event	Professional judgment [13]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	

Table 4
Values Used for Daily Intake Calculations
Central Tendency Exposure - Surface Water

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
		Adolescent	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)	Assapumpset Brook	IR-W	Ingestion Rate of Water	0.0025	l/hour	USEPA, 1988 [9]	CW x IR-W x FI x EF x EV x ED x ET x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	65	day/yr	Professional judgment [12]	
			Manton Reach,	EV	Event Frequency	1	event/day	Professional judgment	
			Dyerville Reach	ED	Exposure Duration	12	yr	USEPA, 1994 [15]	
				ET	Exposure Time	2	hr/event	Professional judgment [13]	
				BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
Dermal	Area Resident	Adult	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-DERMAL =
		(ages 19 and above)	Assapumpset Brook	PCevent	Permeability Constant Per Event	chemical-specific	cm	USEPA, 2001	CW x SA x Pevent x EF x ED x EV x CF x 1/BW x 1/AT
		(Swimming)	Allendale Pond,	SA	Skin Surface Area Available for Contact	18000	cm^2	USEPA, 2001 [7]	PCevent = PC x ET; calculated in PCevent table
			Lyman Mill Pond,	ET	Exposure Time	1	hr/event	USEPA, 1997 [5]	
			Manton Reach,	EF	Exposure Frequency	26	day/yr	Professional judgment [3]	
			Dyerville Reach	EV	Event Frequency	1	event/day	Professional judgment	
				ED	Exposure Duration	9	yr	USEPA, 1994 [4]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	day	USEPA, 1989	
				CF	Conversion Factor	0.001	l/cm^2		
		Adolescent	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-DERMAL =
		(ages 7 - 18)	Assapumpset Brook	PCevent	Permeability Constant Per Event	chemical-specific	cm	USEPA, 2001	CW x SA x Pevent x EF x ED x EV x CF x 1/BW x 1/AT
		(Swimming)	Allendale Pond,	SA	Skin Surfaca Area Available for Contact	14200	cm^2	USEPA, 2001 [7]	PCevent = PC x ET; calculated in PCevent table
			Lyman Mill Pond,	ET	Exposure Time	1	hr/event	USEPA, 1997 [5]	
			Manton Reach,	EF	Exposure Frequency	26	day/yr	Professional judgment [3]	
			Dyerville Reach	EV	Event Frequency	1	event/day	Professional judgment	
				ED	Exposure Duration	9	yr	USEPA, 1994	
				BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	day	USEPA, 1989	
				CF	Conversion Factor	0.001	l/cm^2		

Table 4
Values Used for Daily Intake Calculations
Central Tendency Exposure - Surface Water

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
		Child	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-DERMAL =
		(ages 1 - 6)	Assapumpset Brook	PCevent	Permeability Constant Per Event	chemical-specific	cm	USEPA, 2001	CW x SA x Pevent x EF x ED x EV x CF x 1/BW x 1/AT
		(Wading)	Allendale Pond,	SA	Skin Surface Area Available for Contact	2678	cm^2	USEPA, 1997 [5]	PCevent = PC x ET; calculated in PCevent table
			Lyman Mill Pond,	ET	Exposure Time	1	hr/event	USEPA, 1997 [5]	
			Manton Reach,	EF	Exposure Frequency	26	day/yr	Professional judgment [3]	
			Dyerville Reach	EV	Event Frequency	1	event/day	Professional judgment	
				ED	Exposure Duration	6	yr	USEPA, 1994	
				BW	Body Weight	15	kg	USEPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	day	USEPA, 1989	
				CF	Conversion Factor	0.001	l/cm^3		
	Visiting	Adult	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-DERMAL =
	Recreational Angler	(ages 19 and above)	Assapumpset Brook	PCevent	Permeability Constant Per Event	chemical-specific	cm	USEPA, 2001	CW x SA x Pevent x EF x ED x EV x CF x 1/BW x 1/AT
			Allendale Pond,	SA	Skin Surface Area Available for Contact	8700	cm^2	USEPA, 1997 [14]	PCevent = PC x ET; calculated in PCevent table
			Lyman Mill Pond,	ET	Exposure Time	1	hr/event	Professional judgment [11]	
			Manton Reach,	EF	Exposure Frequency	6	day/yr	Professional judgment [10]	
			Dyerville Reach	EV	Event Frequency	1	event/day	Professional judgment	
				ED	Exposure Duration	12	yr	USEPA, 1994 [15]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	0.001	l/cm^3		
		Adolescent	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-DERMAL =
		(ages 7 - 18)	Assapumpset Brook	PCevent	Permeability Constant Per Event	chemical-specific	cm	USEPA, 2001	CW x SA x Pevent x EF x ED x EV x CF x 1/BW x 1/AT
			Allendale Pond,	SA	Skin Surface Area Available for Contact	6260	cm^2	USEPA, 1997 [14]	PCevent = PC x ET; calculated in PCevent table
			Lyman Mill Pond,	ET	Exposure Time	1	hr/event	Professional judgment [11]	
			Manton Reach,	EF	Exposure Frequency	6	day/yr	Professional judgment [10]	
			Dyerville Reach	EV	Event Frequency	1	event/day	Professional judgment	
				ED	Exposure Duration	12	yr	USEPA, 1994 [15]	
				BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	0.001	l/cm^3		

Table 4
Values Used for Daily Intake Calculations
Central Tendency Exposure - Surface Water

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
	Visiting	Adult	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-DERMAL =
	Subsistence Angler	(ages 19 and above)	Assapumpset Brook	PCevent	Permeability Constant Per Event	chemical-specific	cm	USEPA, 2001	CW x SA x Pevent x EF x ED x EV x CF x 1/BW x 1/AT
			Allendale Pond,	SA	Skin Surface Area Available for Contact	8700	cm^2	USEPA, 1997 [14]	PCevent = PC x ET; calculated in PCevent table
			Lyman Mill Pond,	ET	Exposure Time	2	hr/event	Professional judgment [13]	
			Manton Reach,	EF	Exposure Frequency	65	day/yr	Professional judgment [12]	
			Dyerville Reach	EV	Event Frequency	1	event/day	Professional judgment	
				ED	Exposure Duration	12	yr	USEPA, 1994 [15]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	0.001	l/cm^3		
		Adolescent	Greystone Mill Pond	CW	Chemical Concentration in Water	chemical-specific	mg/l	EPC Table	INTAKE-DERMAL =
		(ages 7 - 18)	Assapumpset Brook	PCevent	Permeability Constant Per Event	chemical-specific	cm	USEPA, 2001	CW x SA x Pevent x EF x ED x EV x CF x 1/BW x 1/AT
			Allendale Pond,	SA	Skin Surface Area Available for Contact	6260	cm^2	USEPA, 1997 [14]	PCevent = PC x ET; calculated in PCevent table
			Lyman Mill Pond,	ET	Exposure Time	2	hr/event	Professional judgment [13]	
			Manton Reach,	EF	Exposure Frequency	65	day/yr	Professional judgment [12]	
			Dyerville Reach	EV	Event Frequency	1	event/day	Professional judgment	
				ED	Exposure Duration	12	yr	USEPA, 1994 [15]	
				BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	0.001	l/cm^3		

USEPA, 1988. Superfund Exposure Assessment Manual. Office of Remedial Response; EPA/540/1-88/001; Washington, D.C.

USEPA, 1989. "Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A)"; Office of Emergency and Remedial Response; EPA-540/1-89/002 (interim final); Washington, D.C., December.

USEPA, 1994. "Risk Updates No. 2"; USEPA Region I, Waste Management Division; August. Values from "Attachment 2" to Risk Updates No. 2.

USEPA, 1997. "Exposure Factors Handbook, Volume 1"; Office of Research and Development; EPA-600/P-95/002Fa; Washington, D.C.; August.

USEPA, 2001. "Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

1 - One-half the value for swimming used; use of one-half the RME value is based on USEPA Region I guidance that specifies use of 1/2 RME value as the CT value for soil ingestion (USEPA, 1994)

2 - 100% of daily incidental intake of surface water is attributable to incidental ingestion at the Site.

3 - Receptor assumed to visit area to wade or swim 2 days per week, June through August. Wading is expected to occur 1 of the 2 days each week and swimming 1 of the days each week. Sediment contact would only occur during wading (not swimming) activities. The child value is based on assumed wading exposure 2 days per week, June through August (the child is assumed to wade while adolescents and adults are swimming). Since contact with surface water would occur during both wading and swimming activities, but a larger portion of the body would be exposed to surface water during swimming, contact with surface water is evaluated using parameters for swimming exposures to provide a conservative assessment.

4 - Representing a 9 year exposure duration during ages 19 and above.

5 - Recommended value for swimming exposures.

6 - Values are the average of 50th percentile body weights for males and females ages 7 - 18.

7 - Whole-body surface area values used for exposures during swimming; value for adolescents is the average of 50th percentile whole-body surface areas of males ages 7 through 18.

8 - Values are the average of 50th percentile body surface areas for body parts that may substantially contact surface water while wading (sum of areas for hands, legs, and feet) for males ages 1 through 8.

9 - It is assumed that anglers would wade during fishing; incidental ingestion of surface water during this activity assumed to occur; 1/10 CT value for swimming exposures is used.

Table 4
Values Used for Daily Intake Calculations
Central Tendency Exposure - Surface Water

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name

10 - Value based on assumed exposure 1 day every other week, June through August. Potential contact with surface water and sediment would not occur during months when the weather and water temperature are colder.
11 - It is assumed that a recreational angler would not wade for more than one hour.
12 - Value assumes that one-half of subsistence fishing occurs at the Site; therefore, one-half of an assumed exposure 6 days per week, May through September.
13 - It is assumed that wading to catch fish may occur for two hours.
14 - It is assumed that receptors may wade during fishing. Exposure to water assumed to occur across feet, legs, and hands. Values are the average of 50th percentile body surface areas for those body parts for ages indicated.
15 - Representing ages 7 - 18 (12 years) and ages 19 and above (12 years) of a 30-year residential exposure duration (the young child, representing the first 6 years, is not evaluated for the angling activity).

mg - milligrams
cm^2 - square centimeters
cm^3 - cubic centimeters
l - liter
kg - kilograms

Prepared by: MJM
Checked by: JHP

Table 5
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Sediment

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Aquatic (submerged) Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation / Model Name
Ingestion	Area Resident	Adult	Greystone Mill Pond,	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
		(ages 19 and above)	Assapumpset Brook,	IR-S	Ingestion Rate of Sediment	100	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
		(Wading)	Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment	
			Lyman Mill Pond,	EF	Exposure Frequency	39	day/yr	Professional judgment [3]	
			Manton Reach,	ED	Exposure Duration	12	yr	USEPA, 1994 [4]	
			Dyerville Reach	BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Adolescent	Greystone Mill Pond,	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)	Assapumpset Brook,	IR-S	Ingestion Rate of Sediment	100	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
		(Wading)	Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment	
			Lyman Mill Pond,	EF	Exposure Frequency	39	day/yr	Professional judgment [3]	
			Manton Reach,	ED	Exposure Duration	12	yr	Ages 7 - 18	
			Dyerville Reach	BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Child	Greystone Mill Pond,	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
		(ages 1 - 6)	Assapumpset Brook,	IR-S	Ingestion Rate of Sediment	200	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
		(Wading)	Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment	
			Lyman Mill Pond,	EF	Exposure Frequency	52	day/yr	Professional judgment [3]	
			Manton Reach,	ED	Exposure Duration	6	yr	USEPA, 1994	
			Dyerville Reach	BW	Body Weight	15	kg	USEPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
	Visiting	Adult	Greystone Mill Pond,	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
	Recreational Angler	(ages 19 and above)	Assapumpset Brook,	IR-S	Ingestion Rate of Sediment	100	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	13	day/yr	Professional judgment [11]	
			Manton Reach,	ED	Exposure Duration	52	yr	USEPA, 1994 [5]	
			Dyerville Reach	BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	18980	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

Table 5
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Sediment

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Aquatic (submerged) Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation / Model Name
		Adolescent	Greystone Mill Pond,	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)	Assapumpset Brook,	IR-S	Ingestion Rate of Sediment	100	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	13	day/yr	Professional judgment [11]	
			Manton Reach,	ED	Exposure Duration	12	yr	Ages 7 - 18	
			Dyerville Reach	BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
	Visiting	Adult	Greystone Mill Pond,	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
	Subsistence Angler	(ages 19 and above)	Assapumpset Brook,	IR-S	Ingestion Rate of Sediment	100	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	130	day/yr	Professional judgment [12]	
			Manton Reach,	ED	Exposure Duration	52	yr	USEPA, 1994 [5]	
			Dyerville Reach	BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	18980	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Adolescent	Greystone Mill Pond,	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)	Assapumpset Brook,	IR-S	Ingestion Rate of Sediment	100	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	130	day/yr	Professional judgment [12]	
			Manton Reach,	ED	Exposure Duration	12	yr	Ages 7 - 18	
			Dyerville Reach	BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

Table 5
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Sediment

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Aquatic (submerged) Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation / Model Name
Dermal	Area Resident Wading	Adult (ages 19 and above) (Wading)	Greystone Mill Pond, Assapumpset Brook, Allendale Pond, Lyman Mill Pond, Manton Reach, Dyerville Reach	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	4860	cm^2	USEPA, 1997 [7]	
				EF	Exposure Frequency	39	day/yr	Professional judgment [3]	Where DAevent =
				ED	Exposure Duration	12	yr	USEPA, 1994 [4]	CS x AF x AbF x CF
				AF	Adherence Factor	0.07	mg/cm^2	USEPA, 2001 [8]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [9]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Adolescent (ages 7 - 18) (Wading)	Greystone Mill Pond, Assapumpset Brook, Allendale Pond, Lyman Mill Pond, Manton Reach, Dyerville Reach	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	3574	cm^2	USEPA, 1997 [7]	
				EF	Exposure Frequency	39	day/yr	Professional judgment [3]	Where DAevent =
				ED	Exposure Duration	12	yr	Ages 7 - 18	CS x AF x AbF x CF
				AF	Adherence Factor	0.2	mg/cm^2	USEPA, 2001 [8]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [9]	
				BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Child (ages 1 - 6) (Wading)	Greystone Mill Pond, Assapumpset Brook, Allendale Pond, Lyman Mill Pond, Manton Reach, Dyerville Reach	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	2800	cm^2	USEPA, 2001 [10]	
				EF	Exposure Frequency	52	day/yr	Professional judgment [3]	Where DAevent =
				ED	Exposure Duration	6	yr	USEPA, 1994	CS x AF x AbF x CF
				AF	Adherence Factor	0.2	mg/cm^2	USEPA, 2001 [8]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [9]	
				BW	Body Weight	15	kg	USEPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

Table 5
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Sediment

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Aquatic (submerged) Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation / Model Name
	Visiting Recreational Angler	Adult (ages 19 and above)	Greystone Mill Pond, Assapumpset Brook, Allendale Pond, Lyman Mill Pond, Manton Reach, Dyerville Reach	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	4860	cm^2	USEPA, 1997 [7]	
				EF	Exposure Frequency	13	day/yr	Professional judgment [11]	Where DAevent =
				ED	Exposure Duration	52	yr	USEPA, 1994 [5]	CS x AF x AbF x CF
				AF	Adherence Factor	0.07	mg/cm^2	USEPA, 2001 [8]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [9]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	18980	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Adolescent (ages 7 - 18)	Greystone Mill Pond, Assapumpset Brook, Allendale Pond, Lyman Mill Pond, Manton Reach, Dyerville Reach	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	3574	cm^2	USEPA, 1997 [7]	
				EF	Exposure Frequency	13	day/yr	Professional judgment [11]	Where DAevent =
				ED	Exposure Duration	12	yr	Ages 7 - 18	CS x AF x AbF x CF
				AF	Adherence Factor	0.2	mg/cm^2	USEPA, 2001 [8]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [9]	
				BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
	Visiting Subsistence Angler	Adult (ages 19 and above)	Greystone Mill Pond, Assapumpset Brook, Allendale Pond, Lyman Mill Pond, Manton Reach, Dyerville Reach	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	4860	cm^2	USEPA, 1997 [7]	
				EF	Exposure Frequency	130	day/yr	Professional judgment [12]	Where DAevent =
				ED	Exposure Duration	52	yr	USEPA, 1994 [5]	CS x AF x AbF x CF
				AF	Adherence Factor	0.07	mg/cm^2	USEPA, 2001 [8]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [9]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	18980	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

Table 5
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Sediment

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Aquatic (submerged) Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation / Model Name
		Adolescent	Greystone Mill Pond,	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
		(ages 7 - 18)	Assapumpset Brook,	DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
			Allendale Pond,	SA	Skin Surface Area Available for Contact	3574	cm^2	USEPA, 1997 [7]	
			Lyman Mill Pond,	EF	Exposure Frequency	130	day/yr	Professional judgment [12]	Where DAevent =
			Manton Reach,	ED	Exposure Duration	12	yr	Ages 7 - 18	CS x AF x AbF x CF
			Dyerville Reach	AF	Adherence Factor	0.2	mg/cm^2	USEPA, 2001 [8]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [9]	
				BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

USEPA, 1989. "Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A)"; Office of Emergency and Remedial Response; EPA-540/1-89/002 (interim final); Washington, D.C., December.

USEPA, 1994. "Risk Updates No. 2"; USEPA Region I, Waste Management Division; August. Values from "Attachment 2" to Risk Updates No. 2.

USEPA, 1997. "Exposure Factors Handbook, Volume 1"; Office of Research and Development; EPA-600/P-95/002Fa; Washington, D.C.; August.

USEPA, 2001. "Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

1 - Soil ingestion rate used because ingestion rates for sediment are not available.

2 - 50% of daily incidental intake of soil and sediment is attributable to incidental sediment ingestion.

3 - Receptor assumed to visit area to wade or swim 4 days per week, June through August. Wading is expected to occur 3 of the 4 days each week and swimming 1 of the days each week. Sediment contact would only occur during wading (not swimming) activities. The child value is based on assumed wading exposure 4 days per week, June through August (the child is assumed to wade while adolescents and adults are swimming).

4 - Representing ages 19 and above of a 30-year residential exposure duration.

5 - Assumes lifetime exposure (to age 70) and is consistent with exposure assumptions used to estimate risks for consumption of biota.

6 - Values are the average of 50th percentile body weights for males and females ages 7 through 18.

7 - Values are the average of 50th percentile body surface areas (sum of areas for hands, lower legs, and feet) for males in the various age groups indicated.

8 - Values for residential exposure to soil used as conservative estimate of potential sediment adherence; sediment is submerged, so adherence is unlikely.

9 - Values are provided (Table 3-4 of USEPA, 2001) for arsenic, cadmium, chlordane, 2,4-D, DDT (used for DDD, DDE), TCDD, lindane (used for other BHC isomers), PAHs, PCBs, and pentachlorophenol. A single value is listed for all other SVOCs. No values are listed for VOCs, other pesticides, or other inorganics and, subsequently, no value will be assigned to the ABSd term for COPCs falling into those categories.

10 - Value is the residential soil RME value; it is used to accommodate the possibility that a young child may play in shallow water and contact sediment over more body parts than just feet, lower legs, and hands.

11 - Value based on assumed exposure 1 day per week, June through August. Potential contact with surface water and sediment would not occur during months when the weather and water temperature are colder.

12 - Value based on assumed exposure 6 days per week, May through September. Potential contact with surface water and sediment would not occur during months when the weather and water temperature are colder.

mg - milligrams
cm^2 - square centimeters
kg - kilograms

Prepared by: MJM
Checked by: JHP

Table 6
Values Used for Daily Intake Calculations
Central Tendency Exposure - Sediment

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Aquatic (submerged) Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
Ingestion	Area Resident	Adult	Greystone Mill Pond,	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
		(ages 19 and above)	Assapumpset Brook,	IR-S	Ingestion Rate of Sediment	50	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
		(Wading)	Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment	
			Lyman Mill Pond,	EF	Exposure Frequency	13	day/yr	Professional judgment [3]	
			Manton Reach,	ED	Exposure Duration	9	yr	USEPA, 1994 [4]	
			Dyerville Reach	BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Adolescent	Greystone Mill Pond,	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)	Assapumpset Brook,	IR-S	Ingestion Rate of Sediment	50	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
		(Wading)	Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment	
			Lyman Mill Pond,	EF	Exposure Frequency	13	day/yr	Professional judgment [3]	
			Manton Reach,	ED	Exposure Duration	9	yr	USEPA, 1994	
			Dyerville Reach	BW	Body Weight	45	kg	USEPA, 1997 [5]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Child	Greystone Mill Pond,	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
		(ages 1 - 6)	Assapumpset Brook,	IR-S	Ingestion Rate of Sediment	100	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
		(Wading)	Allendale Pond,	FI	Fraction Ingested	1	unitless	Professional judgment	
			Lyman Mill Pond,	EF	Exposure Frequency	26	day/yr	Professional judgment [3]	
			Manton Reach,	ED	Exposure Duration	6	yr	USEPA, 1994	
			Dyerville Reach	BW	Body Weight	15	kg	USEPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
	Visiting	Adult	Greystone Mill Pond,	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
	Recreational Angler	(ages 19 and above)	Assapumpset Brook,	IR-S	Ingestion Rate of Sediment	50	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	6	day/yr	Professional judgment [10]	
			Manton Reach,	ED	Exposure Duration	12	yr	USEPA, 1994 [12]	
			Dyerville Reach	BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

Table 6
Values Used for Daily Intake Calculations
Central Tendency Exposure - Sediment

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Aquatic (submerged) Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
		Adolescent	Greystone Mill Pond,	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)	Assapumpset Brook,	IR-S	Ingestion Rate of Sediment	50	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	6	day/yr	Professional judgment [10]	
			Manton Reach,	ED	Exposure Duration	12	yr	USEPA, 1994 [12]	
			Dyerville Reach	BW	Body Weight	45	kg	USEPA, 1997 [5]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
	Visiting	Adult	Greystone Mill Pond,	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
	Subsistence Angler	(ages 19 and above)	Assapumpset Brook,	IR-S	Ingestion Rate of Sediment	50	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	65	day/yr	Professional judgment [11]	
			Manton Reach,	ED	Exposure Duration	12	yr	USEPA, 1994 [12]	
			Dyerville Reach	BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Adolescent	Greystone Mill Pond,	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)	Assapumpset Brook,	IR-S	Ingestion Rate of Sediment	50	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	65	day/yr	Professional judgment [11]	
			Manton Reach,	ED	Exposure Duration	12	yr	USEPA, 1994 [12]	
			Dyerville Reach	BW	Body Weight	45	kg	USEPA, 1997 [5]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

Table 6
Values Used for Daily Intake Calculations
Central Tendency Exposure - Sediment

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Aquatic (submerged) Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
Dermal	Area Resident Wading	Adult (ages 19 and above) (Wading)	Greystone Mill Pond, Assapumpset Brook, Allendale Pond, Lyman Mill Pond, Manton Reach, Dyerville Reach	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	4860	cm^2	USEPA, 1997 [6]	
				EF	Exposure Frequency	13	day/yr	Professional judgment [3]	Where DAevent =
				ED	Exposure Duration	9	yr	USEPA, 1994 [4]	CS x AF x AbF x CF
				AF	Adherence Factor	0.01	mg/cm^2	USEPA, 2001 [7]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [8]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Adolescent (ages 7 - 18) (Wading)	Greystone Mill Pond, Assapumpset Brook, Allendale Pond, Lyman Mill Pond, Manton Reach, Dyerville Reach	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	3574	cm^2	USEPA, 1997 [6]	
				EF	Exposure Frequency	13	day/yr	Professional judgment [3]	Where DAevent =
				ED	Exposure Duration	9	yr	USEPA, 1994	CS x AF x AbF x CF
				AF	Adherence Factor	0.04	mg/cm^2	USEPA, 2001 [7]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [8]	
				BW	Body Weight	45	kg	USEPA, 1997 [5]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Child (ages 1 - 6) (Wading)	Greystone Mill Pond, Assapumpset Brook, Allendale Pond, Lyman Mill Pond, Manton Reach, Dyerville Reach	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	2800	cm^2	USEPA, 2001 [9]	
				EF	Exposure Frequency	26	day/yr	Professional judgment [3]	Where DAevent =
				ED	Exposure Duration	6	yr	USEPA, 1994	CS x AF x AbF x CF
				AF	Adherence Factor	0.04	mg/cm^2	USEPA, 2001 [7]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [8]	
				BW	Body Weight	15	kg	USEPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

Table 6
Values Used for Daily Intake Calculations
Central Tendency Exposure - Sediment

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Aquatic (submerged) Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
	Visiting Recreational Angler	Adult (ages 19 and above)	Greystone Mill Pond, Assapumpset Brook, Allendale Pond, Lyman Mill Pond, Manton Reach, Dyerville Reach	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	4860	cm^2	USEPA, 1997 [6]	
				EF	Exposure Frequency	6	day/yr	Professional judgment [10]	Where DAevent =
				ED	Exposure Duration	12	yr	USEPA, 1994 [12]	CS x AF x AbF x CF
				AF	Adherence Factor	0.01	mg/cm^2	USEPA, 2001 [7]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [8]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Adolescent (ages 7 - 18)	Greystone Mill Pond, Assapumpset Brook, Allendale Pond, Lyman Mill Pond, Manton Reach, Dyerville Reach	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	3574	cm^2	USEPA, 1997 [6]	
				EF	Exposure Frequency	6	day/yr	Professional judgment [10]	Where DAevent =
				ED	Exposure Duration	12	yr	USEPA, 1994 [12]	CS x AF x AbF x CF
				AF	Adherence Factor	0.04	mg/cm^2	USEPA, 2001 [7]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [8]	
				BW	Body Weight	45	kg	USEPA, 1997 [5]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
	Visiting Subsistence Angler	Adult (ages 19 and above)	Greystone Mill Pond, Assapumpset Brook, Allendale Pond, Lyman Mill Pond, Manton Reach, Dyerville Reach	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	4860	cm^2	USEPA, 1997 [6]	
				EF	Exposure Frequency	65	day/yr	Professional judgment [11]	Where DAevent =
				ED	Exposure Duration	12	yr	USEPA, 1994 [12]	CS x AF x AbF x CF
				AF	Adherence Factor	0.01	mg/cm^2	USEPA, 2001 [7]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [8]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

Table 6
Values Used for Daily Intake Calculations
Central Tendency Exposure - Sediment

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Aquatic (submerged) Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
		Adolescent	Greystone Mill Pond,	CS	Chemical Concentration in Sediment	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
		(ages 7 - 18)	Assapumpset Brook,	DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
			Allendale Pond,	SA	Skin Surface Area Available for Contact	3574	cm^2	USEPA, 1997 [6]	
			Lyman Mill Pond,	EF	Exposure Frequency	65	day/yr	Professional judgment [11]	Where DAevent =
			Manton Reach,	ED	Exposure Duration	12	yr	USEPA, 1994 [12]	CS x AF x AbF x CF
			Dyerville Reach	AF	Adherence Factor	0.04	mg/cm^2	USEPA, 2001 [7]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [8]	
				BW	Body Weight	45	kg	USEPA, 1997 [5]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

USEPA, 1989. "Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A)"; Office of Emergency and Remedial Response; EPA-540/1-89/002 (interim final); Washington, D.C., December.

USEPA, 1994. "Risk Updates No. 2"; USEPA Region I, Waste Management Division; August. Values from "Attachment 2" to Risk Updates No. 2.

USEPA, 1997. "Exposure Factors Handbook, Volume 1"; Office of Research and Development; EPA-600/P-95/002Fa; Washington, D.C.; August.

USEPA, 2001. "Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

1 - CT soil ingestion rate used because ingestion rates for sediment are not available.

2 - 50% of daily incidental intake of soil and sediment is attributable to incidental sediment ingestion.

3 - Receptor assumed to visit area to wade or swim 2 days per week, June through August. Wading is expected to occur 1 of the 2 days each week and swimming 1 of the days each week. Sediment contact would only occur during wading (not swimming) activities. The child value is based on assumed wading exposure 2 days per week, June through August (the child is assumed to wade while adolescents and adults are swimming).

4 - Representing a 9 year exposure duration during ages 19 and above

5 - Values are the average of 50th percentile body weights for males and females ages 7 - 18.

6 - Values are the average of 50th percentile body surface areas (sum of areas for hands, lower legs, and feet) for males in the various age groups indicated.

7 - CT values for residential exposure to soil used as conservative estimate of potential sediment adherence; sediment is submerged, so adherence is unlikely.

8 - Values are provided (Table 3-4 of USEPA, 2001) for arsenic, cadmium, chlordane, 2,4-D, DDT (used for DDD, DDE), TCDD, lindane (used for other BHC isomers), PAHs, PCBs, and pentachlorophenol. A single value is listed for all other SVOCs. No values are listed for VOCs, other pesticides, or other inorganics and, subsequently, no value will be assigned to the ABSd term for COPCs falling into those categories.

9 - Value is the residential soil CT value; it is used to accommodate the possibility that a young child may play in shallow water and contact sediment over more body parts than just feet, lower legs, and hands.

10 - Value based on assumed exposure 1 day every other week, June through August. Potential contact with surface water and sediment would not occur during months when the weather and water temperature are colder.

11 - Value assumes that one-half of subsistence fishing occurs at the Site; therefore, one-half of an assumed exposure 6 days per week, May through September. Potential contact with surface water and sediment would not occur during months when the weather and water temperature are colder.

12 - Representing ages 7 - 18 (12 years) and ages 19 and above (12 years) of a 30-year residential exposure duration (the young child, representing the first 6 years, is not evaluated for the angling activity).

mg - milligrams
cm^2 - square centimeters
kg - kilograms

Prepared by: MJM
Checked by: JHP

Table 7
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Bank Surface Soil

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Bank Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation / Model Name
Ingestion	Area Resident Swimming, Wading, Walking	Adult (ages 19 and above)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION = CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
				IR-S	Ingestion Rate of Soil	100	mg/day	USEPA, 1994 [1]	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	78	day/yr	Professional judgment [3]	
				ED	Exposure Duration	12	yr	USEPA, 1994 [4]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Adolescent (ages 7 - 18)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION = CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
				IR-S	Ingestion Rate of Soil	100	mg/day	USEPA, 1994 [1]	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	78	day/yr	Professional judgment [3]	
				ED	Exposure Duration	12	yr	Ages 7 - 18	
				BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Child (ages 1 - 6)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION = CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
				IR-S	Ingestion Rate of Soil	200	mg/day	USEPA, 1994 [1]	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	78	day/yr	Professional judgment [3]	
				ED	Exposure Duration	6	yr	USEPA, 1994	
				BW	Body Weight	15	kg	USEPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
	Visiting Recreational Angler	Adult (ages 19 and above)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION = CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
				IR-S	Ingestion Rate of Soil	100	mg/day	USEPA, 1994 [1]	
				FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
				EF	Exposure Frequency	13	day/yr	Professional judgment [11]	
				ED	Exposure Duration	52	yr	Lifetime exposure [5]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	18980	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

Table 7
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Bank Surface Soil

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Bank Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation / Model Name
		Adolescent	Greystone Mill Pond	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)	East Bank of:	IR-S	Ingestion Rate of Soil	100	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	13	day/yr	Professional judgment [11]	
				ED	Exposure Duration	12	yr	Ages 7 - 18	
				BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
	Visiting	Adult	Greystone Mill Pond	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
	Subsistence Angler	(ages 19 and above)	East Bank of:	IR-S	Ingestion Rate of Soil	100	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	208	day/yr	Professional judgment [12]	
				ED	Exposure Duration	52	yr	Lifetime exposure [5]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	18980	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Adolescent	Greystone Mill Pond	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)	East Bank of:	IR-S	Ingestion Rate of Soil	100	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	208	day/yr	Professional judgment [12]	
				ED	Exposure Duration	12	yr	Ages 7 - 18	
				BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
	Commercial /	Adult	Fogarty Center	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
	Industrial Worker			IR-S	Ingestion Rate of Soil	100	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
				FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
				EF	Exposure Frequency	150	day/yr	USEPA, 1994	
				ED	Exposure Duration	25	yr	USEPA, 1994	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

Table 7
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Bank Surface Soil

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Bank Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation / Model Name
Dermal	Area Resident Swimming or Wading	Adult (ages 19 and above)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	5700	cm^2	USEPA, 2001 [10]	
				EF	Exposure Frequency	78	day/yr	Professional judgment [3]	Where DAevent =
				ED	Exposure Duration	12	yr	USEPA, 1994 [4]	CS x AF x AbF x CF
				AF	Adherence Factor	0.07	mg/cm^2	USEPA, 2001 [8]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [9]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Adolescent (ages 7 - 18)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemicel-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	4800	cm^2	USEPA, 1997 [7]	
				EF	Exposure Frequency	78	day/yr	Professional judgment [3]	Where DAevent =
				ED	Exposure Duration	12	yr	Ages 7 - 18	CS x AF x AbF x CF
				AF	Adherence Factor	0.2	mg/cm^2	USEPA, 2001 [8]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [9]	
				BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Child (ages 1 - 6)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surfaca Area Available for Contact	2800	cm^2	USEPA, 2001 [10]	
				EF	Exposure Frequency	78	day/yr	Professional judgment [3]	Where DAevent =
				ED	Exposure Duration	6	yr	USEPA, 1994	CS x AF x AbF x CF
				AF	Adherence Factor	0.2	mg/cm^2	USEPA, 2001 [8]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [9]	
				BW	Body Weight	15	kg	USEPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

Table 7
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Bank Surface Soil

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Bank Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation / Model Name
	Visiting Recreational Angler	Adult (ages 19 and above)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL = DAevent x SA x EF x ED x 1/BW x 1/AT
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	
				SA	Skin Surface Area Available for Contact	5700	cm^2	USEPA, 2001 [10]	
				EF	Exposure Frequency	13	day/yr	Professional judgment [11]	Where DAevent = CS x AF x AbF x CF
				ED	Exposure Duration	52	yr	Lifetime exposure [5]	
				AF	Adherence Factor	0.07	mg/cm^2	USEPA, 2001 [8]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [9]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	18980	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Adolescent (ages 7 - 18)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL = DAevent x SA x EF x ED x 1/BW x 1/AT
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	
				SA	Skin Surface Area Available for Contact	4800	cm^2	USEPA, 1997 [7]	
				EF	Exposure Frequency	13	day/yr	Professional judgment [11]	Where DAevent = CS x AF x AbF x CF
				ED	Exposure Duration	12	yr	Ages 7 - 18	
				AF	Adherence Factor	0.2	mg/cm^2	USEPA, 2001 [8]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [9]	
				BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
	Visiting Subsistence Angler	Adult (ages 19 and above)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL = DAevent x SA x EF x ED x 1/BW x 1/AT
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	
				SA	Skin Surface Area Available for Contact	5700	cm^2	USEPA, 2001 [10]	
				EF	Exposure Frequency	208	day/yr	Professional judgment [12]	Where DAevent = CS x AF x AbF x CF
				ED	Exposure Duration	52	yr	Lifetime exposure [5]	
				AF	Adherence Factor	0.07	mg/cm^2	USEPA, 2001 [8]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [9]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	18980	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

Table 7
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Bank Surface Soil

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Bank Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation / Model Name
		Adolescent	Greystone Mill Pond	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
		(ages 7 - 18)	East Bank of:	DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
			Allendale Pond,	SA	Skin Surface Area Available for Contact	4800	cm^2	USEPA, 1997 [7]	
			Lyman Mill Pond,	EF	Exposure Frequency	208	day/yr	Professional judgment [12]	Where DAevent =
				ED	Exposure Duration	12	yr	Ages 7 - 18	CS x AF x AbF x CF
				AF	Adherence Factor	0.2	mg/cm^2	USEPA, 2001 [8]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [9]	
				BW	Body Weight	45	kg	USEPA, 1997 [6]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
	Commercial /	Adult	Fogarty Center	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
	Industrial Worker			DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	3300	cm^2	USEPA, 2001	
				EF	Exposure Frequency	150	day/yr	USEPA, 1994	Where DAevent =
				ED	Exposure Duration	25	yr	USEPA, 1994	CS x AF x AbF x CF
				AF	Adherence Factor	0.2	mg/cm^2	USEPA, 2001	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [9]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

USEPA, 1989. "Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A)"; Office of Emergency and Remedial Response; EPA-540/1-89/002 (interim final); Washington, D.C., December.

USEPA, 1994. "Risk Updates No. 2"; USEPA Region I, Waste Management Division; August. Values from "Attachment 2" to Risk Updates No. 2.

USEPA, 1997. "Exposure Factors Handbook, Volume 1"; Office of Research and Development; EPA-600/P-95/002Fa; Washington, D.C.; August.

USEPA, 2001. "Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

1 - Soil ingestion rate used.

2 - 50% of daily incidental intake of soil and sediment is attributable to incidental ingestion of soil at bank.

3 - Value based on exposure during wading, swimming, and walking/exploring banks (4 days per week June - August), and walking/exploring banks (2 days per week May, Sept, Oct).

4 - Representing ages 19 and above of a 30-year residential exposure duration.

5 - Assumes lifetime exposure (to age 70) and is consistent with exposure assumptions used to estimate risks for consumption of biota.

6 - Values are the average of 50th percentile body weights for males and females ages 7 through 18.

7 - Values are the average of 50th percentile body surface areas (sum of areas for face, hands, forearms, lower legs, and feet) for males in the various age groups indicated.

8 - Values for residential exposure to soil used as conservative estimate of potential soil adherence associated with recreational walking/exploring.

9 - Values are provided (Table 3-4 of USEPA, 2001) for arsenic, cadmium, chlordane, 2,4-D, DDT (used for DDD, DDE), TCDD, lindane (used for other BHC isomers), PAHs, PCBs, and pentachlorophenol. A single value is listed for all other SVOCs. No values are listed for VOCs, other pesticides, or other inorganics and, subsequently, no value will be assigned to the ABSd term for COPCs falling into those categories.

10 - Values for residential exposure to soil used as conservative estimate of potential surface area exposed to soil during recreational walking/exploring.

11 - Contact with soil assumed to occur when accessing water bodies for angling (assumed exposure 1 day per week, June through August).

Table 7
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure - Bank Surface Soil

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Bank Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation / Model Name

12 - Contact with soil assumed to occur when accessing water bodies for angling; this is assumed to occur 6 days per week, April through November.

mg - milligrams
cm^2 - square centimeters
kg - kilograms

Prepared by: MJM
Checked by: JHP

Table 8
Values Used for Daily Intake Calculations
Central Tendency Exposure - Bank Surface Soil

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Bank Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
Ingestion	Area Resident Swimming, Wading, Walking	Adult (ages 19 and above)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION = CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
				IR-S	Ingestion Rate of Soil	50	mg/day	USEPA, 1994 [1]	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	39	day/yr	Professional judgment [3]	
				ED	Exposure Duration	9	yr	USEPA, 1994 [4]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Adolescent (ages 7 - 18)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION = CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
				IR-S	Ingestion Rate of Soil	50	mg/day	USEPA, 1994 [1]	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	39	day/yr	Professional judgment [3]	
				ED	Exposure Duration	9	yr	USEPA, 1994	
				BW	Body Weight	45	kg	USEPA, 1997 [5]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Child (ages 1 - 6)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION = CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
				IR-S	Ingestion Rate of Soil	100	mg/day	USEPA, 1994 [1]	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	39	day/yr	Professional judgment [3]	
				ED	Exposure Duration	6	yr	USEPA, 1994	
				BW	Body Weight	15	kg	USEPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
	Visiting Recreational Angler	Adult (ages 19 and above)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION = CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
				IR-S	Ingestion Rate of Soil	50	mg/day	USEPA, 1994 [1]	
				FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
				EF	Exposure Frequency	6	day/yr	Professional judgment [10]	
				ED	Exposure Duration	12	yr	USEPA, 1994 [12]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

Table 8
Values Used for Daily Intake Calculations
Central Tendency Exposure - Bank Surface Soil

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Bank Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
		Adolescent	Greystone Mill Pond	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)	East Bank of:	IR-S	Ingestion Rate of Soil	50	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	6	day/yr	Professional judgment [10]	
				ED	Exposure Duration	12	yr	USEPA, 1994 [12]	
				BW	Body Weight	45	kg	USEPA, 1997 [5]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
	Visiting	Adult	Greystone Mill Pond	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
	Subsistence Angler	(ages 19 and above)	East Bank of:	IR-S	Ingestion Rate of Soil	50	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	104	day/yr	Professional judgment [11]	
				ED	Exposure Duration	12	yr	USEPA, 1994 [12]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Adolescent	Greystone Mill Pond	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)	East Bank of:	IR-S	Ingestion Rate of Soil	50	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
			Allendale Pond,	FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
			Lyman Mill Pond,	EF	Exposure Frequency	104	day/yr	Professional judgment [11]	
				ED	Exposure Duration	12	yr	USEPA, 1994 [12]	
				BW	Body Weight	45	kg	USEPA, 1997 [5]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
	Commercial /	Adult	Fogarty Center	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
	Industrial Worker			IR-S	Ingestion Rate of Soil	50	mg/day	USEPA, 1994 [1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
				FI	Fraction Ingested	0.5	unitless	Professional judgment [2]	
				EF	Exposure Frequency	150	day/yr	USEPA, 1994	
				ED	Exposure Duration	9	yr	USEPA, 2001	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

Table 8
Values Used for Daily Intake Calculations
Central Tendency Exposure - Bank Surface Soil

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Bank Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
Dermal	Area Resident Swimming, Wading or Walking	Adult (ages 19 and above)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	5700	cm^2	USEPA, 2001 [9]	
				EF	Exposure Frequency	39	day/yr	Professional judgment [3]	Where DAevent =
				ED	Exposure Duration	9	yr	USEPA, 1994 [4]	CS x AF x AbF x CF
				AF	Adherence Factor	0.01	mg/cm^2	USEPA, 2001 [7]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [8]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Adolescent (ages 7 - 18)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	4800	cm^2	USEPA, 1997 [6]	
				EF	Exposure Frequency	39	day/yr	Professional judgment [3]	Where DAevent =
				ED	Exposure Duration	9	yr	USEPA, 1994	CS x AF x AbF x CF
				AF	Adherence Factor	0.04	mg/cm^2	USEPA, 2001 [7]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [8]	
				BW	Body Weight	45	kg	USEPA, 1997 [5]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Child (ages 1 - 6)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	2800	cm^2	USEPA, 2001 [9]	
				EF	Exposure Frequency	39	day/yr	Professional judgment [3]	Where DAevent =
				ED	Exposure Duration	6	yr	USEPA, 1994	CS x AF x AbF x CF
				AF	Adherence Factor	0.04	mg/cm^2	USEPA, 2001 [7]	
				AbF	Dermal Absorption Fector	chemical-specific	unitless	USEPA, 2001 [8]	
				BW	Body Weight	15	kg	USEPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

Table 8
Values Used for Daily Intake Calculations
Central Tendency Exposure - Bank Surface Soil

Baseline Human Health Risk Assessment - Work Plan Addendum
Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Bank Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
	Visiting Recreational Angler	Adult (ages 19 and above)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	5700	cm^2	USEPA, 2001 [9]	
				EF	Exposure Frequency	6	day/yr	Professional judgment [10]	Where DAevent =
				ED	Exposure Duration	12	yr	USEPA, 1994 [12]	CS x AF x AbF x CF
				AF	Adherence Factor	0.01	mg/cm^2	USEPA, 2001 [7]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [8]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
		Adolescent (ages 7 - 18)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	4800	cm^2	USEPA, 1997 [6]	
				EF	Exposure Frequency	6	day/yr	Professional judgment [10]	Where DAevent =
				ED	Exposure Duration	12	yr	USEPA, 1994 [12]	CS x AF x AbF x CF
				AF	Adherence Factor	0.04	mg/cm^2	USEPA, 2001 [7]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [8]	
				BW	Body Weight	45	kg	USEPA, 1997 [5]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
	Visiting Subsistence Angler	Adult (ages 19 and above)	Greystone Mill Pond East Bank of: Allendale Pond, Lyman Mill Pond,	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
				DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	5700	cm^2	USEPA, 2001 [9]	
				EF	Exposure Frequency	104	day/yr	Professional judgment [11]	Where DAevent =
				ED	Exposure Duration	12	yr	USEPA, 1994 [12]	CS x AF x AbF x CF
				AF	Adherence Factor	0.01	mg/cm^2	USEPA, 2001 [7]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [8]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

Table 8
Values Used for Daily Intake Calculations
Central Tendency Exposure - Bank Surface Soil

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North Providence, Rhode Island

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Bank Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name
		Adolescent	Greystone Mill Pond	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
		(ages 7 - 18)	East Bank of:	DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
			Allendale Pond,	SA	Skin Surface Area Available for Contact	4800	cm^2	USEPA, 1997 [6]	
			Lyman Mill Pond,	EF	Exposure Frequency	104	day/yr	Professional judgment [11]	Where DAevent =
				ED	Exposure Duration	12	yr	USEPA, 1994 [12]	CS x AF x AbF x CF
				AF	Adherence Factor	0.04	mg/cm^2	USEPA, 2001 [7]	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [8]	
				BW	Body Weight	45	kg	USEPA, 1997 [5]	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4380	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		
	Commercial /	Adult	Fogarty Center	CS	Chemical Concentration in Soil	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
	Industrial Worker			DAevent	Dose Absorbed Per Event	chemical-specific	mg/cm^2	USEPA, 2001	DAevent x SA x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	3300	cm^2	USEPA, 2001	
				EF	Exposure Frequency	150	day/yr	USEPA, 1994	Where DAevent =
				ED	Exposure Duration	9	yr	USEPA, 2001	CS x AF x AbF x CF
				AF	Adherence Factor	0.02	mg/cm^2	USEPA, 2001	
				AbF	Dermal Absorption Factor	chemical-specific	unitless	USEPA, 2001 [8]	
				BW	Body Weight	70	kg	EPA, 1994	
				AT-C	Averaging Time (Cancer)	25550	day	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	day	USEPA, 1989	
				CF	Conversion Factor	1E-06	kg/mg		

USEPA, 1989. "Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A)"; Office of Emergency and Remedial Response; EPA-540/1-89/002 (interim final); Washington, D.C., December.
USEPA, 1994. "Risk Updates No. 2"; USEPA Region I, Waste Management Division; August. Values from "Attachment 2" to Risk Updetes No. 2.
USEPA, 1997. "Exposure Factors Handbook, Volume 1"; Office of Research and Development; EPA-600/P-95/002Fa; Washington, D.C.; August.
USEPA, 2001. "Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.
1 - CT soil ingestion rate used.
2 - 50% of daily incidental intake of soil and sediment is attributable to incidental ingestion of soil at bank.
3 - Value based on exposure during wading, swimming, and walking/exploring banks (2 days per week June - August), and walking/exploring banks (1 day per week May, Sept, Oct).
4 - Representing a 9 year exposure duration during ages 19 and above.
5 - Values are the average of 50th percentile body weights for males and females ages 7 - 18.
6 - Values are the average of 50th percentile body surface areas (sum of areas for face, hands, forearms, lower legs, and feet) for males in the various age groups indicated.
7 - CT values for residential exposure to soil used as conservative estimate of potential soil adherence associated with recreational walking/exploring.
8 - Values are provided (Table 3-4 of USEPA, 2001) for arsenic, cadmium, chlordane, 2,4-D, DDT (used for DDD, DDE), TCDD, lindane (used for other BHC isomers), PAHs, PCBs, and pentachlorophenol. A single value is listed for all other SVOCs.
No values are listed for VOCs, other pesticides, or other inorganics and, subsequently, no value will be assigned to the ABSd term for COPCs falling into those categories.
9 - Values for residential exposure to soil used as conservative estimate of potential surface area exposed to soil during recreational walking/exploring.
10 - Contact with soil assumed to occur when accessing water bodies for angling (assumed exposure 1 day every other week, June through August).
11 - Value assumes that one-half of subsistence fishing occurs at the Site; therefore, one-half of an assumed exposure 6 days per week, April through November.
Potential contact with surface water and sediment would not occur during months when the weather and water temperature are colder.
12 - Representing ages 7 - 18 (12 years) and ages 19 and above (12 years) of a 30-year residential exposure duration (the young child, representing the first 6 years, is not evaluated for the engling activity).

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Medium: Soil
Exposure Medium: Bank Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale / Reference	Intake Equation / Model Name

mg - milligrams
cm^2 - square centimeters
kg - kilograms

Prepared by: MJM
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