ESS Group, Inc.

Method 3 Risk Characterization

Wetland Areas

FORMER McCOY FIELD

NEW BEDFORD, MASSACHUSETTS

RTN 4-15685

PREPARED FOR

Beta Group, Inc.
315 Norwood Park South
Norwood, Massachusetts 02062

PREPARED BY

ESS Group, Inc.
401 Wampanoag Trail, Suite 400
East Providence, Rhode Island 02915

Project No. B345-000

June 2005

ESS Group, Inc.

Engineers
Scientists
Consultants

401 Wampanoag Trail
Suite 400
East Providence
Rhode Island
02915
p 401.434.5560
f 401.434.8158

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EXECUTIVE SUMMARY

A Method 3 Risk Characterization was performed for the former McCoy Field wetland area located on the property bounded by Hathaway Boulevard to the east, Durfee Street to the north, Summit Street to the west, and Ruggles Street to the south, in New Bedford, Massachusetts [Release Tracking Number (RTN) 4-15685] (the Site). The Method 3 Risk Characterization evaluated the potential risk of harm to human health, the environment, public welfare, and safety in accordance with the Massachusetts Contingency Plan (310 CMR 40.0000) (MCP) and *Guidance for Disposal Site Risk Characterization in Support of the Massachusetts Contingency Plan* [Massachusetts Department of Environmental Protection (MADEP), July 1995]. The conclusion of the Method 3 Risk Characterization is that, despite slight exceedances of the baseline hazard index of 1.0 for some environmental receptors, the Site is concluded to pose ***No Significant Risk of harm to human health, the environment, public welfare, and safety.*** No activity and use limitations (AULs) or use of engineered barriers were assumed in the risk characterization.

McCoy Field is a former recreational field located in a residential section of New Bedford. The property consists of two distinct areas: an upland area that is being developed as the new Keith Middle School, and a vegetated, deciduous wooded swamp wetland area located north and west of the upland area. Only the wetland area is addressed in this risk characterization. The wetland area contains an unnamed stream that originates from another wetland area about 1.5 miles north of the Site and terminates on the Site. The wetland area typically dries up in summer.

McCoy Field was constructed in the 1960s by filling a low area with fill material obtained from the site of the high school during the high school's construction. The high school site was historically operated as a burning dump; fill material from this site consisted of black fine sand and organic silt containing ash, asphalt, concrete, brick, glass, metal, and wood materials. During planning activities for the new middle school, subsurface investigations identified the presence of fill material in the upland area and, in it, chemical constituents above MADEP reportable concentrations. Historic filling of the wetland area did not occur, but some chemical constituents in the fill material may have reached the wetland area through atmospheric dispersion, erosion, or other pathways.

One hundred twenty two (122) to 124 soil/sediment samples were collected from the wetland area in December 2004, January 2005, and April 2005 from a depth interval of 0 to 6 inches. Samples were analyzed for polychlorinated biphenyls (PCBs, as various Aroclor types), polycyclic aromatic hydrocarbons (PAHs), pesticides (which were not detected), and metals. These data were applied to the risk characterization.

The human health risk characterization assessed the potential risk posed by the Site to recreational receptors, pedestrians, and trespassers, all of which were assessed for the same level of exposure. These receptors were assessed for exposure through soil/sediment ingestion, soil/sediment dermal contact, inhalation of entrained soil particles (dust), surface water ingestion, and surface water dermal contact. Constituents of concern (COCs) included PCBs (as Aroclor 1254), thirteen PAHs, and the metals barium, cadmium, total chromium, lead, mercury, and selenium. The numerical results of the human health risk characterization are summarized below:

RECREATIONAL/PEDESTRIAN/TRESPASSER RISK CHARACTERIZATION SUMMARY

Exposure Pathway	Child		Youth		Adult		Combined Ages
	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk	Cancer Risk
Total (all pathways)	0.3	9×10^{-7}	0.07	2×10^{-7}	0.04	3×10^{-7}	1×10^{-6}
Maximum Acceptable Level	1.0	1×10^{-5}	1.0	1×10^{-5}	1.0	1×10^{-5}	1×10^{-5}

Total HIs and total cancer risks are below maximum acceptable levels for all age groups, indicating that the Site poses no significant risk of harm to human health for these receptor groups.

The environmental risk characterization assessed terrestrial and aquatic invertebrates for survival, and assessed amphibians, two avian species (American robins and red-tailed hawks), and two mammalian species (short-tailed shrew and raccoons) for survival, growth and reproduction. Terrestrial invertebrates were assessed for direct exposure to COCs in soil. Aquatic invertebrates were assessed for direct exposure to COCs in sediment interstitial (pore) water impacted by COCs in soil/sediment. Amphibians were assessed for direct exposure to COCs in surface water impacted by COCs in soil/sediment. Avian and mammalian receptors were assessed for exposure to COCs through soil/sediment ingestion, surface water ingestion, and COCs in their diet. For avian and mammalian receptors, high and low hazard indices (HI-High and HI-Low) were calculated. Numerical results of the environmental risk characterization are summarized below:

Receptor Group	Hazard Index –High	Hazard Index-Low
Terrestrial Invertebrates	0.7	-- [1]
Aquatic Invertebrates	0.5	-- [1]
Amphibians	1.1	-- [1]
American Robin	5	0.4
Red-Tailed Hawk	0.001	0.0001
Short-tailed Shrew	3	1
Raccoon	0.005	0.002
Benchmark Hazard Index	**1.0**	**1.0**

1. A "low" scenario was not assessed for this receptor group.

Both high and, when calculated, low total HIs for terrestrial invertebrates, aquatic invertebrates, red-tailed hawk, and raccoons are below the maximum acceptable HI benchmark of 1.0, indicating that the Site poses no significant risk of harm to these receptor groups.

The HI of 1.1 for amphibians slightly exceeds the maximum acceptable HI benchmark of 1.0. However, the risk characterization concludes that this HI is conservative and that a significant risk of harm is not posed to amphibians for the following reasons:

- The HI exceedance is minimal (total HI of 1.1 versus maximum acceptable HI of 1.0);
- The highest chemical-specific HI, for lead, is 0.9, below the maximum acceptable HI of 1.0;
- Lead's toxicity reference value (TRV) of 0.4 µg/L is based on the lowest reported toxicity value identified in the literature, to which an uncertainty factor of 100 was applied;
- Lead's TRV of 0.4 µg/L is below the federal ambient water quality criterion of 0.54 µg/L calculated at the lowest considered water hardness of 25 mg/L;
- Lead's surface water exposure point concentration (EPC) was based on one-tenth of the predicted interstitial water concentration, whereas the overlying water column may be much more diluted from on-flowing surface water; and,
- The predicted interstitial water concentration was based on the 95th upper confidence limit (UCL) of the mean soil/sediment lead concentration of 138 mg/kg, while the mean soil/sediment lead concentration is 98 mg/kg and the median concentration is 46 mg/kg.

The HI-High of 5 and an HI-Low of 0.4 calculated for the American robin were primarily associated with exposure to PCBs. However, the risk characterization concludes that these HIs are conservative and a significant risk of harm is not posed to American robins for the following reasons:

- Robins were assumed to feed nowhere else but at the Site;
- There was no consideration of the periodic inaccessibility of wetland soil due to submergence;

- The soil/sediment EPC for PCBs is a 97.5% UCL mean concentration;
- PCBs were assumed 100% absorbed through the ingestion route;
- Bioaccumulation and bioconcentration factors did not consider the high binding capacity of the soil/sediment (the average total organic carbon content of the soil/sediment is 31.4%);
- The TRV-Low value for PCBs applied to calculate the HI-High is on the low end of the range of values available. Using the highest TRV-Low value, the HI-High would be reduced from 5 to 3; and,
- The difference between the HI of 5 and the maximum acceptable HI of 1 is within the range of uncertainty associated with the assessment.

The HI-High of 3 and an HI-Low of 1 calculated for short-tailed shrew were primarily associated with exposure to PCBs. However, the risk characterization concludes that these HIs are conservative and that a significant risk of harm is not posed to short-tailed shrew for the following reasons:

- Shrew were assumed to feed nowhere else but at the Site;
- There was no consideration of the periodic inaccessibility of wetland soil due to submergence;
- The soil/sediment EPC for PCBs is a 97.5% UCL mean concentration;
- PCBs were assumed 100% absorbed through the ingestion route;
- Bioconcentration factors do not consider the high binding capacity of the soil/sediment;
- The TRV-Low value PCBs applied to calculate the HI-High is in the center of the range of relevant values available. Using the highest TRV-Low value, the HI-High would be reduced from 3 to 1.
- The difference between the HI of 3 and the maximum acceptable HI of 1 is within the range of uncertainty associated with the assessment.

The potential risk of harm to safety and public welfare were assessed according to MADEP guidance. These assessments concluded that the Site poses no significant risk of harm to safety or public welfare.

Prepared by:

Cynthia Fuller, MPH
Health Risk Assessor

1.0 INTRODUCTION

This report presents a Method 3 Risk Characterization for the wetland area of the former McCoy Field property in New Bedford, Massachusetts (the Site) [Release Tracking Number (RTN) 4-15685]. The Method 3 Risk Characterization evaluates the potential risk of harm to human health, the environment, public welfare, and safety in accordance with requirements of the Massachusetts Contingency Plan (MCP) (310 CMR 40.0000) and guidance provided in *Guidance for Disposal Site Risk Characterization in Support of the Massachusetts Contingency Plan* [Massachusetts Department of Environmental Protection (MADEP), July 1995]. In addition, risk assessment guidance developed by the U.S. Environmental Protection Agency (U.S. EPA) was applied.

This risk characterization is based upon the results of soil and sediment sampling conducted in the wetland area in December 2004, January 2005, and April 2005, as presented in this report.

The report is presented in the following sections:

- Site Background (Section 2.0)
- Site Environmental Conditions (Section 3.0)
- Characterization of the Risk of Harm to Human Health (Section 4.0)
- Characterization of the Risk of Harm to the Environment (Section 5.0)
- Characterization of the Risk of Harm to Public Welfare (Section 6.0)
- Characterization of the Risk of Harm to Safety (Section 7.0)
- Summary and Conclusions (Section 8.0)

2.0 SITE BACKGROUND

2.1 Site and Vicinity Location and Use

McCoy Field is a former recreational field previously occupied by three soccer fields. This property is located in a primarily residential area and is bounded by Hathaway Boulevard to the east, Durfee Street to the north, Summit Street to the west, and Ruggles Street to the south (Figure 1). The New Bedford High School is located east of the Site across Hathaway Boulevard and is classified as protected open space.

The former McCoy Field property consists of two distinct areas: an upland area that is undergoing development for the new Keith Middle School, and a deciduous wooded swamp wetland area located north and west of the upland area that will remain undeveloped (Figure 2). This risk characterization addresses the wetland area only, which is referred to as "the Site" in this report.

2.2 Site Physical and Hydrological Setting

The topography of the former McCoy Field property varies. The upland area is and will be elevated above the wetland area by an exposure management barrier (primarily a soil cap, paved areas, and the new school). The downward slope from the upland area to the wetland area has been graded, stabilized, and covered with a soil cap. The wetland area is heavily vegetated and contains an unnamed stream that originates from another wetland area about 1.5 miles north of the Site and terminates at the Site. The wetland area typically dries up in summer. The Site is not located within Zone II of a public water supply, within an interim wellhead protection area, within Zone A of a Class A surface water body, or overlying a high- or medium-yield aquifer (Figure 3).

3.0 SITE ENVIRONMENTAL CONDITIONS

3.1 History of Releases

McCoy Field was constructed in the 1960s by filling a low area with fill material. This fill material was obtained from the site of the high school during the high school's construction. The high school site was historically operated as a burning dump and fill material from this site consisted of black fine sand and organic silt containing ash, asphalt, concrete, brick, glass, metal, and wood materials. In the 1970s, during construction of the McCoy Field playing fields, the fill material was graded with a layer of gravel and capped with imported clean fill.

During planning activities for the new middle school, subsurface investigations identified the presence of fill material in the upland area and, in it, chemical constituents above MADEP reportable concentrations. These findings are discussed further in Section 3.3. While historic filling of the wetland area is believed not to have occurred (an opinion supported by aerial photographs and historic records), the potential exists for fill material to have reached the wetland area through atmospheric dispersion, erosion, or other pathways.

3.2 Categorization of Site Soil and Groundwater

The MCP establishes categories of soil and groundwater for use in characterizing risks posed by a Site. Soil is categorized as S-1, S-2, and/or S-3 on the basis of four factors: potential frequency of contact with soil, intensity of contact with soil, accessibility of soil, and the presence of children. Under the current and planned future undeveloped condition of the Site, soil is categorized as S-1 because children may be present with a high intensity of soil contact when present at the Site.

Groundwater can be categorized as GW-1, GW-2, and/or GW-3, depending on location and use. Category GW-1 is associated with current or potential drinking water source areas. Category GW-2 is associated with groundwater located within 30 feet of an existing occupied building if the average annual depth to groundwater is 15 feet or less. Category GW-3 is associated with groundwater that is a potential source of discharge to surface water. The Site does not overlay any feature triggering a GW-1 category. Site groundwater may be located within 30 feet of a building at the periphery of the Site and is located at a depth of less than 15 feet, so a GW-2 category applies. All groundwater in Massachusetts is categorized as GW-3. Therefore, categories of GW-2 and GW-3 apply to the Site.

Combined soil and groundwater categories applicable to the Site under current and planned future uses are S-1/GW-2 and S-1/GW-3.

3.3 Summary of Current Site Conditions

3.3.1 Adjacent Upland Soil/Fill

Site investigations in the upland area identified constituents in soil and fill material at concentrations above MADEP Method 1 soil standards. Table 1 summarizes analytical results of this sampling; some results represent soil/fill that has been removed from the Site. While these results do not represent conditions in the wetland area, they describe historical upgradient conditions. The following constituents were detected above Method 1 S-1 soil standards:

- PCBs (as Aroclor 1254)
- Benzidine (detected once)
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(a)pyrene
- Chrysene
- Dibenzo(a,h)anthracene
- Indeno(1,2,3-cd)pyrene
- Total petroleum hydrocarbons (TPH)
- Arsenic
- Barium
- Lead

3.3.2 Wetland Area Soil/Sediment

Table 2 summarizes analytical results of soil/sediment sampling in the wetland area; sampling locations are shown on Figure 4. These data were reviewed and qualified, as appropriate, according to U.S. EPA's Contract Laboratory Program National Functional Guidelines (U.S. EPA 1999b; 2004c), with respect to surrogate recovery and presence in sampling or laboratory blanks. Since the wetland area dries out in summer, the results are evaluated as both soil and sediment. When evaluated as soil, the following constituents were detected at concentrations above Method 1 S-1 soil standards:

Constituent	Locations of Exceedances	Range of Detected Concentrations (mg/kg)	Method 1 S-1 Soil Standard[1] (mg/kg)	U.S. EPA Residential Cleanup Level (mg/kg)
PCBs (as Aroclor 1254)	IW-2, WC.5-4.5, WC.5-27.5, WD-5, WD.5-2.5, WD.5-17.57, WD-6, WD-11, WD-12, WD-14, WD-15, WD-19, WD-23, WD-24, WD-25, WD-26, WD-27, WH-5	0.014 – 11.8	2	--
	(above, plus) WC.5-22.5, WC.5-24.5, WD.5-3.5, WD-10, WD-17, WD-21, WE-3, WG-4.5, WI.5-5		--	1
Benzo(a)anthracene	IW-1, IW-2, WB-4, WC.5-14.5, WD.5-17.57	0.1 – 2.3	0.7	--
Benzo(b)fluoranthene	IW-1, IW-2, WC.5-14.5, WC.5-17.28, WD.5-17.57	0.12 – 2.9	0.7	--
Benzo(a)pyrene	IW-1, IW-2, WC.5-14.5, WD.5-17.57	0.11 – 2.3	0.7	--
Indeno(1,2,3-cd)pyrene	IW-2, WC.5-14.5	0.55 – 1.1	0.7	--
Lead	IW-2, WB-7, WC.5-14.5, WD.5-17.57, WD-7, WD-12, WD-23, WD-25, WE-3, WF-8	1.7 – 810	300	--

1. Applicable to both S-1/GW-2 and S-1/GW-3 categories.

When evaluated as sediment and compared with the screening sediment benchmarks shown below, constituents detected above benchmarks are those presented in the following table:

- Freshwater Sediment Screening Benchmarks (MADEP 2002b);
- If the above was not available, Effect Range-Low (ERL) Values (NOAA 1999); and,
- If neither of the above was available, values calculated from chronic surface water benchmark concentrations using the equilibrium partitioning approach and the 5th percentile organic carbon content of Site soil/sediment (Table 3).

Constituent	No. Locations With Exceedances	Range of Detected Concentrations (mg/kg)	Chronic Sediment Screening Benchmark (mg/kg)
PCBs (as Aroclor 1254)	92 / 124	0.014 – 11.8	0.0598 [1]
Anthracene	4 / 122	0.25 – 0.74	0.0572 [1]
Benzo(a)anthracene	13 / 122	0.1 – 2.3	0.108 [1]
Benzo(b)fluoranthene	5 / 122	0.12 – 2.9	1.116 [2]
Benzo(k)fluoranthene	2 / 122	0.13 – 1.4	0.617 [2]
Benzo(g,h,i)perylene	4 / 122	0.49 – 1.1	0.226 [2]
Benzo(a)pyrene	9 / 122	0.11 – 2.3	0.15 [1]
Chrysene	11 / 122	0.11 – 1.2	0.166 [1]
Fluoranthene	9 / 122	0.11 – 3.6	0.423 [1]
Fluorene	2 / 122	0.089 – 0.14	0.0774 [1]
Phenanthrene	8 / 122	0.095 – 2.6	0.204 [1]
Pyrene	19 / 122	0.12 – 5.6	0.195 [1]
Cadmium	48 / 123	0.2 – 5.75	0.99 [1]
Chromium (total)	7 / 123	3.07 – 79	43.4 [1]
Lead	70 / 123	1.7 – 810	35.8 [1]
Mercury	28 / 123	0.015 – 2.06	0.18 [1]

1. MADEP (2002b).
2. Calculated value.

The chronic sediment screening benchmarks are based on the protection of sediment-dwelling organisms and represent a concentration below which adverse effects of sediment dwelling organisms are not expected to occur. Except for calculated values, these benchmarks do not consider site-specific factors, such as the organic carbon content of the sediment (that strongly influences the bioavailability of the constituent). Therefore, exceedance of a screening benchmark does not necessarily indicate that the constituent is causing harm at the Site. The organic carbon content of Site soil/sediments is high (the average total organic carbon content is 31.4%; Table 4), suggesting that most organic constituents would be strongly bound to sediment particles and not readily bioavailable.

3.3.3 Wetland Area Groundwater

Groundwater has not been sampled in the wetland area. Limited groundwater sampling has been conducted in the upland area; detected constituents are presented on Table 5. The presence of constituents in groundwater was very limited, and all detected concentrations were below all applicable Method 1 groundwater standards.

3.3.4 Wetland Area Surface Water

Surface water has not been sampled in the wetland area. In Section 4.2.4.3, sediment interstitial water and overlying surface water concentrations are predicted from soil/sediment concentrations using the equilibrium partitioning approach.

3.4 Potential Site Constituents of Concern

Based on the data for the wetland area presented in Table 2, the following constituents are adopted as constituents of concern (COCs) for the human health and environmental risk characterizations:

- PCBs (as Aroclor 1254)
- Acenaphthene
- Anthracene
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(a)pyrene
- Chrysene
- Fluoranthene
- Fluorene
- Indeno(1,2,3-cd)pyrene
- Phenanthrene
- Pyrene
- Barium
- Cadmium
- Chromium
- Lead
- Mercury
- Selenium

These COCs are all of the constituents detected in soil/sediment from the wetland area except for the following for the reasons provided:

Arsenic. Arsenic was not detected above either its Method 1 soil standard or its chronic sediment screening benchmark. All detected concentrations were at or below arsenic's natural soil background level (MADEP 2002c).

Silver. Silver was not detected above either its Method 1 soil standard or its chronic sediment screening benchmark. All detected concentrations were at or below silver's natural soil background level (MADEP 2002c).

Note that detected concentrations of acenaphthene, anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, benzo(a)pyrene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene, all of which are polycyclic aromatic hydrocarbons (PAHs), are all at or below background levels in natural soil. These constituents are retained because they are also assessed in sediment and there is no generally recognized background level for constituents in sediment.

4.0 HUMAN HEALTH RISK CHARACTERIZATION

The objective of the human health risk characterization is to assess if Site conditions in the wetland area pose a potential health risk to exposed humans.

4.1 Hazard Identification

This section discusses environmental fate and transport potential of the COCs, identifies COC toxicity values applied to the human health risk characterization; and identifies applicable or suitably analogous standards, when available.

4.1.1 Environmental Fate and Transport Characteristics

Chemical properties describing the fate and transport potential of the COCs are summarized in Table 6.

4.1.1.1 Mobility

Mobility describes the movement of a chemical in the environment. Volatilization and leaching are two primary mobility mechanisms.

Volatilization potential can be described both by a constituent's vapor pressure (the constituent's inherent volatility) and Henry's Law Constant (the ratio of vapor pressure to water solubility, describing the tendency to volatilize from water). The higher the vapor pressure and its Henry's Law Constant, the higher the volatilization potential. For comparison, acetone (which is volatile) has a vapor pressure of 0.3 atmospheres and a Henry's Law Constant of 0.0015 cm^3/cm^3 (U.S. EPA 1994). As Table 6 shows, the organic COCs generally have a low volatility. This indicates that significant volatilization of the organic COCs to air is unlikely.

Leaching potential can be described by a constituent's water solubility and tendency to adsorb to organic carbon in soil (described by its organic carbon/water partition coefficient; K_{OC}). The higher the water solubility and the lower the K_{OC} value, the more likely the constituent is to desorb from soil or sediment particles and transfer to groundwater or surface water. For comparison, acetone (which is mobile) has a water solubility of 1,000,000 mg/L and a K_{OC} value of 0.58 cm^3/g. As Table 6 shows, the water solubility of the organic COCs is low to moderate, and the K_{OC} values are high (all above 10^4). This indicates that significant desorption of organic COCs from soil or sediment to groundwater or surface water is not likely.

Metals vary in their water solubility depending on the form that exists in the soil or sediment; which is not known. However, most metals generally have a low water solubility, are strongly bound to soil and, with the exception of mercury, are considered non-volatile. Mercury can be volatile; however, this is typically seen at higher than ambient temperatures.

4.1.1.2 Persistence

PCBs, PAHs, and metals are generally considered to be persistent in the environment. Degradation of these constituents will occur slowly over time, or not at all (metals).

4.1.1.3 Bioaccumulation

PCBs, PAHs, and metals are generally considered to have the potential to bioaccumulate in animal or plant tissue. This is illustrated by the higher n-octanol/water partition coefficients (K_{ow}) of the COCs; K_{ow} values above 10^3 generally indicate a potential to bioaccumulate.

4.1.2 Toxicity Values

Eight of the COCs are known or probable human carcinogens and are assessed as such: PCBs, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, indeno(1,2,3-cd)pyrene, and cadmium (inhalation route only). The remaining COCs are assessed as non-carcinogens. Toxicity values used to quantify the potential carcinogenic and non-carcinogenic human health risks of the COCs are presented on Table 7 and were obtained from the following sources:

- Integrated Risk Information System (IRIS) (U.S. EPA 2005);
- Proposed Revised Method 1 Numerical Standards and supporting documentation (MADEP 2004); and,
- Revisions to Dose-Response Values Used in Human Health Risk Assessment (MADEP 2004a).

Toxicity values used to assess non-carcinogenic health impacts are reference doses (RfD) for oral and dermal exposures and reference concentrations (RfC) for inhalation exposures. Toxicity values used to assess excess lifetime cancer risks are cancer slope factors (SF) for oral and dermal exposures and inhalation unit risk values (UR) for inhalation exposures. Inter-route extrapolations were made (e.g., deriving inhalation toxicity values from oral values), where necessary, to quantify exposures. Toxicity profiles for the COCs are presented in Appendix A.

4.1.3 Applicable or Suitably Analogous Standards

Applicable or suitably analogous standards potentially include the following:

- Drinking Water Standards (310 CMR 22). These regulations establish drinking water standards for GW-1 areas. Groundwater at the Site is not categorized as GW-1, so drinking water standards do not apply.
- Air Quality Standards (310 CMR 6.00). This regulation establishes air quality standards for criteria pollutants (sulfur oxides, particulate matter, carbon monoxide, ozone, nitrogen dioxide, and lead). No COCs of the form found at the Site are addressed in this regulation.
- Surface Water Quality Standards (314 CMR 4.00). This regulation identifies specific standards for general or non-chemical parameters (such as temperature), as well as specifying "freedom" from pollutants in concentrations or combinations that are toxic to humans, aquatic life, or wildlife. The regulation does not provide chemical-specific water quality standards applicable to this risk characterization, but references U.S. EPA ambient water quality criteria. There are no surface water data from the wetland area; however, COC concentrations in sediment interstitial water and surface water in the wetland area are estimated from soil/sediment data and compared with surface water benchmark concentrations in Section 5.0.

4.2 Exposure Assessment

This section identifies human receptor groups potentially exposed to COCs, identifies pathways and routes by which these receptor groups may be exposed, calculates exposure point concentrations for each COC, and quantifies potential exposure.

4.2.1 Potentially Exposed Human Receptors

Human receptor groups quantitatively assessed in the risk characterization include the following:

Pedestrians/Recreators/Trespassers. Pedestrians, recreators, or trespassers may be exposed to COCs during recreational activities, dog-walking, and similar activities conducted on the Site. Pedestrians, recreators, or trespassers are assessed in four ages groups: children (between the ages of 1 to 8), youth (between the ages of 8 to 15), adults (over 15), and a combined age group (ages 1 to 30).

The following receptor groups are not quantitatively assessed for the reasons provided:

Residents. The Site is not currently used for residential purposes, nor is such use anticipated in the near future. Given the presence of the wetlands, there is little likelihood that any residential structures will be built on the Site. Therefore, residential use of the wetlands is not assessed.

Commercial Workers. The Site is not currently used for occupational purposes, nor is such use anticipated in the near future. Given the presence of the wetlands, there is little likelihood that any occupational structures will be built on the Site. Therefore, occupational use of the wetlands is not assessed.

Construction Workers. Since it is not likely that any construction in the wetland area will occur, the potential for construction worker exposure does not exist and is not assessed.

4.2.2 Potentially Complete Exposure Pathways

Potential exposure pathways that are quantitatively assessed are:

- Soil/sediment ingestion
- Soil/sediment dermal contact
- Inhalation of entrained soil/sediment particles
- Surface water ingestion
- Surface water dermal contact

All soil/sediment samples are assessed as soil since the wetland area typically dries up in summer, humans are more likely to have contact with soil than submerged sediment, and are more likely to access the Site during the warmer months when the wetlands have dried up. Since groundwater has not been sampled at the Site and is not likely to be impacted or contacted, exposure to groundwater is not assessed. Furthermore, since the COCs have a low volatility potential, exposure through volatilization pathways is not assessed.

4.2.3 Exposure Factors

Exposure factors used to quantify human exposures are summarized on Table 8. Exposure factors were obtained from MADEP (2004; 2002a; 1995), U.S. EPA (2004; 1997; 1996), or other, generally recognized guidance. In the absence of specific guidance, assumptions were made regarding the degree of exposure. Relative absorption factors (RAFs) used to modify absorption through dermal intake are presented on Table 7; all constituents are conservatively assumed to be 100% absorbed through the oral exposure route. Estimation of the dermal intake of constituents from surface water is estimated using approaches described in U.S. EPA (2004) and presented on Table 9.

4.2.4 Exposure Point Concentrations

This section evaluates the presence of hot spots and describes the derivation of exposure point concentrations (EPCs) for COCs in soil and groundwater.

4.2.4.1 Evaluation of Hot Spots

Soil/sediment analytical data are presented on Table 2. No hot spots, as defined in 310 CMR 40.0006, are contained within the data set.

4.2.4.2 Soil/Sediment Exposure Point Concentrations

COC EPCs in soil/sediment are arithmetic mean concentrations for all COCs, as presented on Table 2. Non-detected constituents are included in the arithmetic mean at a concentration equal to one-half the quantitation limit.

The maximum detected concentration of PCBs at WD-25 (11.8 mg/kg) was further characterized by supplemental sampling at four locations immediately surrounding the original sample location (WD-25A, -25B, -25C, and –25D). Lower PCB concentrations were detected in these samples (0.419 mg/kg to 0.987 mg/kg). To avoid over-representing this location, the average of these five sample results was used to represent WD-25.

Sample location WE-6 was sampled on two occasions. The highest detected COC concentrations or lowest quantitation limits (if not detected) were used to represent this location.

The MCP allows use of the arithmetic mean as an EPC under certain conditions:

- Longer-term exposures are assessed;
- Constituents assessed are not lethal or associated with severe health effects from short-term exposures;
- Data available to characterize the Site are sufficient;
- The data do not exhibit a high degree of variability; and,
- The arithmetic mean is unlikely to underestimate the true mean.

Responses to these conditions are presented below:

- Chronic exposures are assessed for all receptors.
- None of the COCs is believed associated with acute health effects at the environmental concentrations detected; all detected concentrations are below upper concentration limits.
- The amount of data available for the Site is judged sufficient and the scope of analyses is appropriate for the type of release that occurred.
- While a certain amount of variability exists in the data, it is judged to represent spatial distribution of the contamination. All COCs meet the criteria in 310 CMR 40.0926(b) for demonstrating low variability, using the Method 1 S-1 soil standard as the applicable standard.
- Since environmental data are often log-normally distributed, the arithmetic mean concentration is likely to overestimate the true central tendency of the data.

4.2.4.3 Sediment Interstitial Water and Surface Water Exposure Point Concentrations

Interstitial water EPCs were calculated from soil/sediment EPCs using the equilibrium partitioning approach, as follows:

For organic COCs: $C_{SWi} = C_{SED} / (f_{OC} \times K_{OC})$

For inorganic COCs: $C_{SWi} = C_{SED} / K_D$

where:

C_{SWI} = Predicted sediment interstitial water concentration (mg/L)
C_{SED} = Soil/sediment EPC (mg/kg)
f_{OC} = Fraction of organic carbon in soil/sediment (kg/kg)
K_{OC} = Constituent-specific organic carbon/water partition coefficient (L/kg)
K_D = Constituent-specific soil- or sediment/water partition coefficient (L/kg)

The Site average f_{OC} value of 31.4% was applied (Table 4).

Overlying surface water EPCs were calculated from the predicted sediment interstitial water concentration, as follows:

$$C_{SW} = C_{SWi}/10$$

where:

C_{SWI} = Predicted sediment interstitial water concentration (mg/L)
10 = Assumed dilution between interstitial and overlying water (unitless)

These predicted water concentrations are presented on Table 10.

4.2.4.4 Air Exposure Point Concentrations

EPCs for soil particles in air were derived by combining the soil EPCs with an air PM_{10} concentration (particles with an aerodynamic diameter of 10 microns or less) of 32 $\mu g/m^3$.

$$C_{air\text{-}PM10} = C_{SOIL/SED} \times PM_{10} \times CF$$

Where:

$C_{air\text{-}PM10}$ = Exposure point concentration of soil particles in air (mg/m^3)
$C_{SOIL/SED}$ = Exposure point concentration in soil/sediment (mg/kg)
PM_{10} = PM_{10} concentration in ambient air ($\mu g/m^3$)
CF = Unit conversion factor ($kg/\mu g$)

This approach is recommended by MADEP (1995) to represent soil particle concentrations in air under "open field" conditions.

4.2.5 Quantitation of Exposure

COC exposure was quantified by combining exposure factors with EPCs to derive an average daily exposure (ADE) or dose (ADD). Risk characterization equations presented in MADEP (1995) were used to quantify exposures and are presented in the risk characterization spreadsheets in Appendix B.

4.3 Risk Characterization

4.3.1 Methodology

Potential cancer risks and non-carcinogenic health hazards were quantified by combining estimated COC intakes with the COC's appropriate toxicity value for the exposure under consideration.

The risk characterization procedure for carcinogenic chemicals derives an excess lifetime cancer risk, which is the excess lifetime risk (i.e., over background risk levels) of incurring cancer from exposure to carcinogens. Cancer risks for each COC, pathway, and age group are summed to derive a total excess lifetime cancer risk, which is compared with the maximum acceptable cancer risk adopted by MADEP: a risk of one-in-one-hundred-thousand, denoted as $1x10^{-5}$. A total excess lifetime cancer risk at or below $1x10^{-5}$ represents no significant risk to human health.

The risk characterization procedure for non-carcinogenic chemicals derives a Hazard Quotient (HQ), which is the ratio of the estimated exposure or intake to an exposure or intake judged to pose no health hazard. HQs are derived separately for each age group. HQs for each COC and pathway are summed to derive a total Hazard Index (HI), which is compared with the maximum acceptable HI adopted by MADEP: 1.0. An HI at or below 1.0 represents no significant risk to human health.

4.3.2 Human Health Risk Characterization Results

Risk characterization calculations are presented in Appendix B and summarized below.

Recreational/Pedestrian/Trespasser Risk Characterization Summary							
Exposure Pathway	Child		Youth		Adult		Combined
	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk	Cancer Risk
Soil/sediment ingestion	0.2	$5x10^{-7}$	0.05	$1x10^{-7}$	0.03	$2x10^{-7}$	$8x10^{-7}$
Soil/sediment dermal contact	0.08	$3x10^{-7}$	0.02	$8x10^{-8}$	0.01	$9x10^{-8}$	$5x10^{-7}$
Inhalation of entrained soil particles	0.0006	$4x10^{-10}$	0.0006	$4x10^{-10}$	0.0006	$1x10^{-9}$	$2x10^{-9}$
Surface water ingestion	0.0005	$4x10^{-10}$	0.0002	$2x10^{-10}$	0.0001	$3x10^{-10}$	$9x10^{-10}$
Surface water dermal contact	0.0001	$1x10^{-8}$	0.00009	$1x10^{-8}$	0.00006	$2x10^{-8}$	$5x10^{-8}$
Total (all pathways)	**0.3**	**9×10^{-7}**	**0.07**	**2×10^{-7}**	**0.04**	**3×10^{-7}**	**1×10^{-6}**
Maximum Acceptable Level	**1.0**	**1×10^{-5}**	**1.0**	**1×10^{-5}**	**1.0**	**1×10^{-5}**	**1×10^{-5}**

Total HIs for adults, youth, and children are below the maximum acceptable HI. Total excess lifetime cancer risks for individual and combined age groups are below the maximum acceptable cancer risk. Therefore, the Site poses no significant risk of harm to human health to pedestrians, recreators, or trespassers.

4.4 Uncertainty Assessment

The human health risk characterization applied available site-specific data, risk characterization approaches recommended by MADEP and U.S. EPA, and reasonable assumptions to assess Site risks. Nonetheless, uncertainties in these factors can contribute to uncertainty in the overall quantitative risk estimates. This section identifies some uncertainties in the quantitative human health risk characterization and discusses the impact of these uncertainties.

4.4.1 Uncertainties Associated with Site Data

One hundred twenty two (122) to 124 soil/sediment samples collected from a depth interval of 0 to 6 inches were applied to the risk characterization, depending on the analyte. These samples were collected from throughout the wetland area. The number, location, and depth of the soil/sediment samples are judged to contribute a low degree of uncertainty to the risk characterization.

Soil samples were analyzed for PCBs (as various Aroclor types), PAHs, pesticides (which were not detected), and RCRA metals. The analytical suite was based on the release type and results from sampling conducted in the upland area and is judged appropriate. A low degree of uncertainty is associated with the scope of analyses.

Overall, the uncertainty associated with Site data is judged low.

4.4.2 Uncertainties Associated with the Toxicity Assessment

Toxicity values were obtained from U.S. EPA or MADEP sources. These toxicity values are typically derived from human studies or from animal studies conducted at high dose levels, from which potential human health effects at low doses are extrapolated and to which conservative uncertainty factors are applied. Therefore, these values provide a conservative estimate of potential human health impacts and are not likely to underestimate health risks. The uncertainty associated with the toxicity values is moderate.

4.4.3 Uncertainties Associated with Exposure Point Concentrations

Soil/sediment EPCs were the arithmetic mean concentration of each COC. When a COC was not detected in a sample, it was presumed present at a concentration equal to one-half of the quantitation limit attained in the analyses. This approach is consistent with MADEP guidance and all COCs meet MADEP's criteria for use of an arithmetic mean concentration as an EPC.

Surface water EPCs were estimated from soil/sediment EPCs by the equilibrium partitioning approach, using the arithmetic average organic carbon content of Site soil/sediment and each constituent's organic carbon/water or soil-sediment/water partition coefficient. This approach estimates interstitial water concentrations; one-tenth of this concentration was used to represent overlying surface water. The uncertainty associated with surface water EPCs is moderate.

Overall, uncertainty associated with exposure point concentrations is low to moderate.

4.4.4 Uncertainties Associated with Exposure Scenarios and Exposure Factors

Three human receptor groups were assessed for exposure to COCs: pedestrians, recreators, and trespassers. Since the degree of exposure of each receptor group was anticipated to be similar, the same exposure factors were used for all three groups. These receptor groups represent current and future potentially exposed receptor groups. The uncertainty associated with the scope of receptors assessed is low.

Humans were assumed to have a high degree of exposure to Site media. Exposure factors obtained from U.S. EPA or MADEP guidance or from best professional judgment will conservatively estimate COC intake and risk. The uncertainty associated with the selection and use of exposure factors is moderate.

Overall, the uncertainty associated with exposure scenarios and factors is low to moderate.

4.4.5 Uncertainties Associated with the Risk Characterization Approach

By combining conservative estimates of exposure and toxicity, results of the risk characterization reflect conservative conditions that may not represent typical exposures. Health risks, particularly to an average exposed individual, may be overestimated.

5.0 ENVIRONMENTAL RISK CHARACTERIZATION

The objective of the environmental risk characterization is to assess if Site conditions in the wetland area pose a potential health risk to exposed environmental receptors. These potential health risks are assessed by performing a risk characterization consistent with MADEP and U.S. EPA guidance for environmental risk characterizations.

5.1 Problem Formulation

5.1.1 Description of Site Environmental Habitat

The area of the former McCoy Field property that is occupied by wetlands consists of land running along the northern and western perimeters of the property; measuring about 400 feet wide along the northern end of the property and 100 feet wide along the southern end of the property. The total estimated acreage of the wetland area is about four acres. The area is heavily vegetated with mature trees and underbrush and is described as a deciduous wooded swamp wetland. Figure 2 shows the appearance of the Site and upland area when previous used as a recreational field.

The Site's wetland area is isolated from other regional natural areas by developed areas. It is bordered by residentially developed land along Durfee Street to the north, Nashua and Summit streets to the west, Ruggles Street to the south, and Hathaway Boulevard (and the future school) to the east. There are several areas near the Site that offer a higher quality environmental habitat than the Site but also serve to attract environmental receptors to the area. These include:

- Apponagansett Swamp, located about 4,000 feet northwest of the Site at its closest point;
- Acushnet Cedar Swamp (a State reservation), located about 2.5 miles northwest of the Site at its closest point; and,
- Buzzards Bay, located about three miles southwest of the Site at its closest point.

The Site is not identified as a core habitat or supporting natural landscape for either plants or animals by the Massachusetts Division of Fisheries and Wildlife's Natural Heritage and Endangered Species Program (NHESP) (www.mass.gov/dfwele/dfw/nhesp/nhesp.htm).

5.1.2 Constituents of Concern

The constituents of concern adopted for the environmental risk characterization are the same as those selected for the human health risk characterization. Fate and transport potential of the COCs was discussed in Section 4.1.1.

5.1.3 Exposure Assessment

5.1.3.1 Potential Receptors

A number of threatened or endangered species or species of special concern have been identified in the New Bedford area (Table 11). These species include terrestrial, avian, reptilian, and amphibian species. Although not specifically identified on the Site, some of these species have the potential to be located on the Site where the species' preferred habitat is consistent with the Site's.

Environmental receptors for which exposure and toxicological information is readily available have been selected to serve as surrogates for similar environmental species that may be present on Site but for which exposure and toxicological information is not readily available. These are identified on Table 12 and summarized below:

- Earthworms (terrestrial invertebrates)
- Crustaceans (benthic aquatic invertebrates)
- Green frog (amphibians)
- American robin (omnivorous avian species)
- Red-tailed hawk (carnivorous avian species)
- Short-tailed shrew (insectivorous mammals)
- Raccoon (omnivorous mammals)

This set of surrogate receptors spans several trophic levels; including those in intimate contact with potentially impacted Site media (terrestrial and aquatic invertebrates and the green frog in its embryonic or juvenile form), organisms that feed on these organisms (shrew, raccoon, and robin) and organisms that feed on these primary feeders (raccoon and hawk). These organisms are also consistent with the limited environmental habitat offered by the Site because of its urban setting, future planned use, limited size, and isolated character.

Because the wetlands are dry for a portion of the year, the wetlands are not believed to support a fish population. Therefore, species that feed primarily on fish (such as mink or heron) or inhabit primarily aquatic environments (sea otter, muskrat) are not assessed. Similarly, species that tend to inhabit habitats different from the Site (e.g. prairie voles), or have a similar or "less at risk" dietary habit (e.g., are primarily vegetarian) as the selected receptors (e.g., rabbits) are not assessed.

Appropriate toxicological values could not be located for reptilian species, such as turtles, so potential risks to reptiles cannot be quantitatively assessed. It is assumed that assessment of the target surrogate species is adequately protective of reptiles.

5.1.3.2 Potentially Complete Exposure Pathways and Factors

Exposure pathways by which the selected surrogate receptors are assessed are summarized on Table 12. In general, invertebrates and amphibian species are directly exposed to impacted media, whereas higher trophic level species are exposed primarily through direct ingestion of media and the diet. Exposure factors applied to quantify exposure of these organisms are summarized on Table 13.

5.1.4 Identification of Assessment Endpoints

The following assessment endpoints have been selected for this Site:

- Survival of aquatic and terrestrial invertebrates. This assessment endpoint is selected because of the potentially limited habitat for both types of receptors as a result of the intermittent submergence and drying up of the wetland area. Theses receptors are assessed primarily for their role as a food source for other organisms.
- Survival, growth, and reproduction of terrestrial, avian, and amphibian species. This assessment endpoint is selected because the Site may be suitable for full use by these receptors.

5.2 Analysis

5.2.1 Potential Exposure Point Concentrations

5.2.1.1 Soil/Sediment

As in the human health risk characterization, constituent EPCs in soil/sediment for the environmental risk characterization are the arithmetic mean concentration of the COC, unless the constituent does not meet the criteria of 310 CMR 40.0926(b) for applying a mean as an EPC. Using the sediment screening values in Table 2 as the applicable criterion for this purpose, the following constituents do not meet the criteria in 310 CMR 40.0926(b):

- PCBs (as Aroclor 1254)
- Anthracene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Chrysene
- Fluorene
- Phenanthrene
- Pyrene
- Cadmium
- Lead
- Mercury

A 95th percentile upper confidence limit (UCL) on the mean concentration was calculated for these COCs using U.S. EPA's ProUCL (Version 3, 2004), as presented on Table 14 and referenced on Table 2. For PCBs, a 97.5th percentile UCL was recommended by ProUCL. ProUCL printouts are presented in Appendix C.

5.2.1.2 Sediment Interstitial Water and Surface Water

Sediment interstitial water concentrations were estimated from soil/sediment concentrations using the equilibrium partitioning approach. The environmental soil/sediment EPCs were combined with the arithmetic mean soil/sediment total organic carbon content (31.4%) of

the soil/sediment and the organic carbon/water partition coefficient for organic COCs or soil/water partition coefficient for inorganic COCs, as follows:

For organic constituents: $C_{SWi} = C_{sed}/(f_{oc} \times K_{oc})$

For inorganic constituents: $C_{SWi} = C_{sed}/K_D$

For both: $C_{SW} = C_{SWi}/10$

where:

C_{SWi} =	COC EPC in sediment interstitial water (mg/L)
C_{SW} =	COC EPC in overlying surface water (mg/L)
C_{sed} =	COC EPC in soil/sediment (mg/kg)
f_{oc} =	Fraction of organic carbon in soil/sediment (g/g)
K_{oc}=	Organic carbon/water partition coefficient (organic COCs)
K_D =	Soil/water partition coefficient (inorganic COCs)

Calculations are presented in Table 10. Predicted sediment interstitial water COC concentrations are applied as EPCs to assess aquatic invertebrates; predicted overlying surface water COC concentrations are applied as EPCs to assess amphibians, avian, and mammalian receptor groups.

5.2.1.3 Vegetation

COC concentrations in vegetation were estimated by the following model:

$$C_{vegetation} = C_{Soil} \times BCF_r \times 0.12$$

where:

$C_{vegetation}$ =	COC EPC in vegetation [mg/kg, wet weight (WW)]
C_{Soil} =	COC EPC in soil/sediment [mg/kg, dry weight (DW)]
BCF_r =	COC-specific plant-soil biotransfer factor [(mg/kgDW)/(mg/kgDW soil)]
0.12 =	Dry weight to wet weight conversion factor, assuming an 88% vegetation moisture content (unitless)

BCF_r values for organic COCs were estimated by the following regression equation (U.S. EPA 1999):

$$Log\ BCF_r = 1.588 - 0.578\ log\ K_{ow}$$

where K_{ow} is the COC's n-octanol/water partition coefficient (Table 6). For metals, BCF_r values were obtained from U.S. EPA (1999).

5.2.1.4 Prey Species

COC concentrations in soil invertebrates were estimated by the following equation (U.S. EPA 1999):

$$C_{invertebrate} = C_{soil} \times BCF_{ssi}$$

where:

$C_{invertebrate}$ =	COC EPC in soil invertebrate (mg/kg, WW)
C_{Soil} =	COC EPC in soil/sediment (mg/kg, DW)
BCF_{ssi} =	COC-specific soil-to-soil-invertebrate bioconcentration factor [(mg/kgWW)/(mg/kgDW soil)])

BCF_{ssi} values for most COCs were obtained from U.S. EPA (1999). For PAHs without a recommended value, the midpoint value for other PAHs (0.05) was applied. For two metals that reportedly do not bioaccumulate (barium and selenium) (U.S. EPA 2005b), the lowest value of all assessed metals with values was applied.

COC concentrations in mammalian prey species, represented by shrew, were estimated by the following equation:

$$C_{Shrew} = BA_{mammal} \times [(C_{soil} \times BCF_{ssi} \times BA_{soil/food} \times IR_{food\text{-}shrew}) + (C_{soil} \times BA_{soil/food} \times IR_{soil\text{-}shrew}) + (C_{SW} \times IR_{SW\text{-}shrew})]$$

Where:

C_{Shrew} =	COC concentration in shrew (mg/kg, wet weight)
BA_{mammal}=	Mammal biotransfer factor (dy/kg tissue)
C_{Soil} =	COC concentration in soil (mg/kg, dry weight)
BCF_{ssi} =	COC soil-to-soil-invertebrate bioconcentration factor (mg/kgWW)/(mg/kgDW soil)]
$BA_{soil/food}$ =	COC bioavailability in soil and food (unitless)
$IR_{food\text{-}shrew}$ =	Shrew food ingestion rate (assumed all worms) (kg/dy)
$IR_{soil\text{-}shrew}$ =	Shrew soil ingestion rate (kg/dy)
C_{SW} =	COC concentration in surface water (mg/L)
$IR_{SW\text{-}shrew}$ =	Shrew surface water ingestion rate (L/dy)

BA_{mammal} values for organic COCs were estimated by the following regression equation (U.S. EPA 1999):

$$\log BA_{mammal} = -7.6 + \log K_{ow}$$

where K_{ow} is the COC's n-octanol/water partition coefficient (Table 6). For metals, BA_{mammal} values were back-calculated from BCF values presented in U.S. EPA (1999), Table D-3,

assuming a shrew soil ingestion rate of 0.0145 kg/kg-dy and a body weight of 0.015 kg. Input values for this model are summarized in Table 13.

5.2.2 Toxicity Assessment

5.2.2.1 Terrestrial Invertebrates

Toxicity reference values (TRVs) for terrestrial invertebrates are presented on Table 15. Since the assessment endpoint for this receptor group is survival, TRVs based on acute toxicity in the form of soil concentrations (in mg/kg) were selected. The TRV located for benzo(a)pyrene was a no-observed-effect-level (NOEL, for growth efficiency) for the common wood louse; this value was also applied to remaining carcinogenic PAHs for which appropriate TRVs were not located: benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene. The TRV for fluorene was similarly applied to other non-carcinogenic PAHs for which appropriate TRVs were not located: acenaphthene, anthracene, benzo(g,h,i)perylene, fluoranthene, phenanthrene, and pyrene. Acute TRVs could not be located for barium and chromium, so chronic TRVs were used.

5.2.2.2 Aquatic Invertebrates

TRVs for aquatic invertebrates are presented on Table 16. Since the assessment endpoint for this receptor group is survival, TRVs based on acute toxicity in the form of water concentrations (in µg/L) were selected. These TRVs are later compared with predicted sediment interstitial water concentrations. This form of the TRV was selected rather than bulk sediment concentrations (such as probable effects levels), because bulk sediment benchmark values do not consider Site-specific factors, such as the organic carbon content of the sediment. In addition, the constituent concentration in sediment interstitial water is typically considered the bioavailable fraction.

The TRV for dibenzo(a,h)anthracene (which was not detected in soil/sediment) was applied to benzo(a)pyrene and indeno(1,2,3-cd)pyrene, for which appropriate TRVs were not located. The TRV for pyrene was similarly applied to phenanthrene. TRVs for cadmium, chromium, lead, and mercury were based on the U.S. EPA acute ambient water quality criteria calculated at a water calcium carbonate hardness of 100 mg/L. The actual hardness of Site surface water is not known.

5.2.2.3 Amphibians

Available toxicological data for amphibians were obtained from the Reptile and Amphibian Toxicological Literature database (RATL, version 6), maintained by the Environment Canada's National Wildlife Research Centre.[1] Toxicological information was located for Aroclor 1254, benzo(a)pyrene, fluoranthene, cadmium, chromium, lead, mercury, and selenium. Species tested included various frogs, toads, and salamanders, typically tested in the egg or tadpole

[1] In presentation of lab data, the database states that results are expressed as "µg/L or ppm unless otherwise specified." Since µg/L and ppm differ by three orders of magnitude, the units were sometimes unclear if the data were not specifically labeled. Data associated with uncertain presentation of units were typically not used.

stage. The assessment endpoints for these receptors are survival, growth, and reproduction, so preference was given to studies identifying a no-observed-adverse-effect-level (NOAEL). However, since most information was based on acute effects, the following scheme was applied to approximate a chronic effects-based TRV:

$$\textit{Chronic TRV} = LC_{50}/100$$
$$\textit{Chronic TRV} = EC_{50}/100$$
$$\textit{Chronic TRV} = \textit{NOAEL}/10$$

Where LC_{50} is the median lethal concentration and EC_{50} is the median effective concentration (for effects other than lethality). The available toxicity values and resultant TRVs are summarized on Table 17. The TRV for benzo(a)pyrene was applied to the other carcinogenic PAHs: benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene. The TRV for fluoranthene was applied to the other non-carcinogenic PAHs: acenaphthene, anthracene, benzo(g,h,i)perylene, fluorene, phenanthrene, and pyrene. No value was located for barium; one-tenth of the acute aquatic TRV was applied.

5.2.2.4 Avian Species

TRVs for avian species are presented on Table 18. The assessment endpoints for this receptor group are survival, growth, and reproduction. TRVs are based on chronic toxicity and are in the form of an intake (in mg/kgBW-dy). Unlike benthic and aquatic invertebrates and amphibians, two TRVs were selected for use: one TRV representing a more conservative level of protection (TRV-Low) and one representing a more moderate level of protection (TRV-High). Several sources of avian TRVs were identified, including TRVs from U.S. EPA, U.S. Department of Energy, and other sources.

In general, when two or more TRV values were available for a TRV type (i.e., low or high), the more commonly adopted value or a value representing the middle of the distribution was typically (but not always) selected for use. In some cases [as in the U.S. EPA (1999) value for PAHs, discussed in the footnote to Table 18], the study design was judged to be inappropriate for use in the risk characterization and was not applied. If a TRV-High value was not available for a COC (all of the PAHs), the TRV-Low value was applied for both risk characterization calculations.

5.2.2.5 Mammalian Species

TRVs for mammalian species are presented on Table 19. The assessment endpoints for this receptor group are survival, growth, and reproduction. TRVs are based on chronic toxicity and are in the form of an intake (mg/kgBW-dy). Two TRVs were selected for use: one TRV representing a more conservative level of protection (TRV-Low) and one representing a more moderate level of protection (TRV-High). Several sources of mammalian TRVs were identified, including TRVs from U.S. EPA, U.S. Department of Energy, and other sources.

In general, when two or more TRV values were available for a TRV type (i.e., low or high), the more commonly adopted value or a value representing the middle of the distribution was

typically selected for use. Since mink is not a target receptor for the Site, TRVs for PCBs based on exposure of mink (which has a high sensitivity to PCBs) were not applied. The TRV-Low for anthracene was applied to phenanthrene, and the TRV-Low for fluoranthene was applied to fluorene, based on structure similarity. If a TRV-High value was not available for a COC (most PAHs and chromium), the TRV-Low value was applied for both risk characterization calculations.

5.2.3 Exposure and Risk Characterization Equations

Potential environmental risks for terrestrial and aquatic invertebrates and amphibians were quantified by comparing estimated soil, sediment interstitial water, or surface water EPCs with the appropriate TRV for each COC, then summing the results, as follows:

For terrestrial invertebrates: $HQ = C_{Soil} / TRV$

For aquatic invertebrates: $HQ = C_{SWi} / TRV$

For amphibian species: $HQ = C_{SW} / TRV$

For all: $Total\ HI = \Sigma HQ$

where:

HQ = Hazard quotient; measure of potential adverse health impact from an individual COC (unitless)

C_{soil} = EPC in soil (mg/kg)

C_{SWi} = EPC in sediment interstitial water (µg/L)

C_{SW} = EPC in surface water (µg/L)

TRV = Toxicity reference value for soil (mg/kg) or water (µg/L)

HI = Sum of COC-specific HQs

Potential environmental risks for mammalian and avian species were quantified by calculating route-specific intakes for each COC, summing the route-specific intakes across all COCs and all intake routes, and comparing the total intake to the appropriate TRV, in the following manner:

$$Intake_{soil} = C_{soil} \times IR_{soil} \times BA_{soil/food} \times A/FA$$

$$Intake_{food} = \Sigma(C_{food} \times F_{food}) \times IR_{food} \times BA_{soil/food} \times A/FA$$

$$Intake_{SW} = C_{SW} \times IR_{SW} \times A/FA$$

$$Intake_{Total} = Intake_{Soil} + Intake_{Food} + Intake_{SW}$$

$$HI\text{-}Low = Intake_{Total}/TRV\text{-}High$$

$$HI\text{-}High = Intake_{Total}/TRV\text{-}Low$$

where:

$Intake_{Soil}$ =	COC intake from consumption of soil/sediment (mg/kg-dy)
$Intake_{Food}$ =	COC intake from consumption of one or more food sources (mg/kg-dy)
$Intake_{SW}$ =	COC intake from consumption of surface water (mg/kg-dy)
IR_{soil} =	Receptor ingestion rate of soil (mg/kg-dy)
IR_{Food} =	Receptor ingestion rate of one or more food types (mg/kg-dy)
IR_{SW} =	Receptor ingestion rate of surface water (mg/kg-dy)
F_{Food} =	Fraction of total food intake contributed by a specific food type (unitless)
$BA_{soil/food}$ =	The COC bioavailability (unitless)
FA =	Foraging area of receptor (acres)
A =	Available foraging area of Site (acres)
$Intake_{Total}$ =	COC intake from all assessed exposure routes (mg/kg-dy)
HI =	Hazard index; measure of potential adverse health impacts, low or high (unitless)
TRV =	COC-specific toxicity reference value, high or low (mg/kg-dy)

The specific equation for each receptor varies; the equations applied are presented in risk characterization spreadsheets in Appendices D and E for avian and mammalian receptors, respectively.

A total HI of greater than one indicates the potential for adverse health impacts to occur to the environmental receptor. Because an HI is not a probability, an increase of an HI from 0.1 to 1 or one to ten does not represent a ten-fold increase in risk. Each constituent has its own dose/response curve (or rate of adverse impact with increase in exposure), and an HI of one may or may not be distinguishable from an HI of, for example, two. Therefore, any HIs calculated above 1.0 are discussed in light of the likelihood that the HI realistically represents a potential health impact to the environmental receptor. In addition, as with humans, the HI is most meaningful when reflecting a single toxicological endpoint. As a screening, HIs for all COCs and exposure pathways are summed for a given receptor. If an HI above 1.0 is calculated as a result of multiple COCs, the HI can be segregated according to toxicological endpoint.

5.3 Risk Characterization

5.3.1 Terrestrial Invertebrates

Risk characterization calculations for terrestrial invertebrates are presented on Table 20. Soil EPCs are compared with acute effects-based soil TRVs for the assessment endpoint of survival (chronic TRVs were applied when acute TRVs could not be located). None of the COC concentrations in soil exceeds its TRV and the total HI is 0.7, below the maximum acceptable HI of 1.0. This indicates that no significant acute risk is posed to terrestrial invertebrates.

5.3.2 Aquatic Invertebrates

Risk characterization calculations for aquatic invertebrates are presented on Table 21. Since COCs in interstitial water will be more bioavailable than those bound up on sediment particles, predicted interstitial water concentrations are compared with acute effects-based TRVs for the assessment endpoint of survival. None of the COC concentrations in sediment interstitial water exceeds its TRV and the total HI is 0.5, below the maximum acceptable HI of 1.0. This indicates that no significant acute risk is posed to aquatic invertebrates.

5.3.3 Amphibian Receptors

Risk characterization calculations for amphibians are presented on Table 22. Since frogs typically lay their eggs on the water surface or attached to floating or submerged vegetation and tadpoles stay within the water column, one-tenth of predicted interstitial water concentrations are used to represent surface water EPCs. Surface water EPCs are compared with chronic effects-based surface water TRVs for the assessment endpoint of survival, growth, and reproduction.

None of the COC EPCs exceeds its individual TRV; the total HI is 1.1. Based on the conservatisms inherent in the risk characterization, as discussed below, the risk characterization concludes that a significant risk is not posed to amphibians:

- The HI exceedance is minimal (total HI of 1.1 versus maximum acceptable HI of 1.0);
- The highest chemical-specific HI, for lead, is 0.9, below the maximum acceptable HI of 1.0;
- Lead's TRV of 0.4 µg/L is based on lowest reported toxicity value identified in the literature divided by an uncertainty factor of 100. Other available toxicity values included a NOAEL of 2,000 µg/L for Jefferson salamander eggs and an LC_{50} of 1,542 µg/L for adult skipper frogs. This indicates a wide range of responses to lead;
- Lead's TRV of 0.4 µg/L is below the federal ambient water quality criterion of 0.54 µg/L calculated at the lowest considered water hardness of 25 mg/L;
- The surface water EPC was based on one-tenth of the predicted interstitial water concentration, whereas the overlying water column may be much more diluted from on-flowing surface water; and,
- The predicted interstitial water concentration was based on the 95th UCL of the mean soil lead concentration of 138 mg/kg, whereas the mean soil lead concentration is 98 mg/kg and the median concentration is 46 mg/kg.

5.3.4 Avian Receptors

Risk characterization calculations for avian receptors are presented in Appendix D. Surrogate avian receptors are the American robin and the red-tailed hawk. These birds may have direct contact with COCs contained in surface water and soil/sediment in the wetlands, as well as through their diet. Each receptor is discussed separately in the following subsections.

5.3.4.1 American Robin

The American robin is assumed exposed to Site COCs through ingestion of surface water, ingestion of soil/sediment, and through their diet, which is assumed to come entirely from the

Site, with 38% of its diet comprised of soil invertebrates and the remaining 62% comprised of vegetation. Both plants and soil invertebrates are assumed to have bioaccumulated COCs. Exposure and intake calculations are presented on Table D-1 of Appendix D; results are summarized on the following page:

HI Type	HI-High	HI-Low
Total HI	5	0.4
Predominant COC	PCBs	PCBs
COC-specific hazard quotient	5 (92%)	0.2 (64%)
Predominant exposure pathway	Diet	Diet

Using the TRV-Low values, an HI-High of 5 is calculated, with PCBs contributing essentially all of the HI. Using the TRV-High values, an HI-Low of 0.4 is calculated, with PCBs contributing most of the HI.

Despite the numerical results, the risk characterization concludes that a significant risk of harm is not posed to American robins for the following reasons:

- Robins are assumed to feed exclusively at the Site;
- Site soil is assumed to be available throughout a robin's presence in the area to provide food (i.e., there is no consideration of the periodic inaccessibility of wetland soil due to submergence);
- The soil/sediment EPC for PCBs is a 97.5% UCL mean concentration, as recommended by ProUCL;
- PCBs are assumed to be 100% absorbed through the ingestion route;
- Bioaccumulation and bioconcentration factors do not consider the reduction of accumulation that may stem from the high binding capacity of the soil/sediment;
- The TRV-Low value applied for PCBs (0.09 mg/kgBW-dy) is on the low end of the range of values available (0.072, 0.09 and 0.18 mg/kgBW-dy). Using the higher of the TRV-Low value (0.18 mg/kgBW-dy), the HI-High would be reduced from 5 to 3.
- The difference between the HI-High of 5 and the maximum acceptable HI of 1 is within the range of uncertainty associated with the assessment.

5.3.4.2 Red-Tailed Hawk

The red-tailed hawk is assumed exposed to Site COCs through ingestion of surface water, ingestion of soil/sediment, and through their diet, of which 0.2% is obtained from the Site (based on the Site size relative to the hawk's typical foraging area). Exposure and intake calculations are presented on Table D-2 of Appendix D; results are summarized below:

HI Type	HI-High	HI-Low
Total HI	0.001	0.0001
Predominant COCs	PCBs and Lead	Lead and PCBs
COC-specific hazard quotient	PCBs: 0.0005 (55%) Lead: 0.0003 (35%)	Lead: 0.0003 (25%) PCBs: 0.00003 (20%)
Predominant exposure pathway	Soil ingestion	Soil ingestion

Using both the TRV-Low and TRV-High values, total HIs below 1 are calculated. This indicates that the Site poses no significant risk to red-tailed hawks.

5.3.5 Mammalian Receptors

Risk characterization calculations for mammalian receptors are presented in Appendix E. Surrogate mammalian receptors are the short-tailed shrew and raccoons. These animals may have direct contact with COCs contained in surface water and soil/sediment in the wetlands, as well as through their diet. Each receptor is discussed separately in the following subsections.

5.3.5.1 Short-Tailed Shrew

The short-tailed shrew is assumed exposed to Site COCs through ingestion of surface water, ingestion of soil/sediment, and through their diet, of which 83% is comprised of soil invertebrates and 17% is comprised of vegetation. Exposure and intake calculations are presented on Table E-1 of Appendix E; results are summarized below:

HI Type	HI-High	HI-Low
Total HI	3	1
Predominant COC	PCBs	PCBs
COC-specific hazard quotient	3 (87%)	0.8 (83%)
Predominant exposure pathway	Diet	Diet

Using the TRV-Low values, an HI-High of 3 is calculated, with PCBs contributing the majority of the HI. Using the TRV-High values, a HI-Low of 1 is calculated, with PCBs again contributing the majority of the HI.

Despite the numerical results, the risk characterization concludes that these HIs are conservative and that a significant risk of harm is not posed to short-tailed shrew:

- Shrew are assumed to feed exclusively at the Site;
- Site soil is available throughout a shrew's presence in the area (i.e., there is no consideration of the periodic inaccessibility of wetland soil due to submergence);
- The EPC for PCBs is a 97.5% UCL mean concentration, as recommended by ProUCL;
- PCBs are assumed 100% absorbed through the ingestion route;
- Bioconcentration factors do not consider the reduction of accumulation that may stem from the high binding capacity of the soil/sediment;
- The TRV-Low value applied for PCBs (0.36 mg/kgBW-dy) is in the center of the range of relevant values available (0.022, 0.36, and 1.14 mg/kgBW-dy). Using the higher of the TRV-Low values, the HI-High would be reduced from 3 to 1;
- The difference between the HI-High of 3 and the maximum acceptable HI of 1 is within the range of uncertainty associated with the assessment.

5.3.5.2 Raccoon

The raccoon is assumed exposed to Site COCs through ingestion of surface water, ingestion of soil/sediment, and through their diet, of which 1% comes from the Site (based on the Site size relative to the raccoon's typical foraging area). Fifty-eight percent of a raccoon's diet

from the Site is assumed comprised of vegetation, 17% comprised of soil invertebrates, and 25% comprised of small mammals. Exposure and intake calculations are presented on Table E-2 of Appendix E; results are summarized below:

HI Type	HI-High	HI-Low
Total HI	0.005	0.002
Predominant COC	PCBs	PCBs
COC-specific hazard quotient	0.004 (73%)	0.001 (68%)
Predominant exposure pathway	Diet	Diet

Using both the TRV-Low and TRV-High values, total HIs below 1 are calculated. This indicates that the Site poses no significant risk to raccoons.

5.4 Uncertainty Assessment

The environmental risk characterization applied available site-specific data, risk characterization approaches recommended by MADEP and U.S. EPA, and reasonable assumptions to assess Site risks. Nonetheless, uncertainties in these factors can contribute to uncertainty in the overall quantitative risk estimates. This section identifies some uncertainties in the quantitative environmental risk characterization that were not discussed in the human health risk characterization uncertainty assessment and discusses the impact of these uncertainties.

5.4.1 Uncertainties Associated with Site Data

Soil/sediment from the wetland area was sampled in December 2004, January 2005, and April 2005 from 0-6 inches throughout the wetland area. These data are anticipated to provide minimal uncertainty to the risk characterization.

5.4.2 Uncertainties Associated with the Toxicity Assessment

Environmental TRVs were obtained from a variety of sources, including U.S. EPA, MADEP, U.S. DOE, NOAA, and independent sources. For many constituents, there is very little toxicological information available, and what is available is often not for the receptor type expected to be present at the Site. In addition, there is no generally accepted consensus on which is the "appropriate" toxicity value of the available values, and values for some COCs can range a few orders of magnitude. Usually, TRVs applied to the risk characterization were within the range of available values, rather than the lowest or highest value. Because of the inherent uncertainty in the available values, the available TRVs contribute a high degree of uncertainty to the risk characterization.

5.4.3 Uncertainties Associated with Exposure Point Concentrations

Soil/sediment EPCs were either the arithmetic mean concentration (for COCs that met MADEP guidance for using a mean as an EPC) or a UCL on the mean concentration (remaining COCs), depending on the COC, as shown in the following table:

Arithmetic Mean

- Acenaphthene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(g,h,i)perylene
- Fluoranthene
- Indeno(1,2,3-cd)pyrene
- Barium
- Chromium
- Selenium

95th Percentile UCL (except as noted)

- PCBs (97.5th percentile UCL)
- Anthracene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Chrysene
- Fluorene
- Phenanthrene
- Pyrene
- Cadmium
- Lead
- Mercury

When a COC was not detected in an applied sample, it was presumed present at a concentration equal to one-half of its quantitation limit when calculating the EPC. Use of a UCL as an EPC may overestimate typical exposures.

Sediment interstitial water and surface water EPCs were estimated from soil/sediment EPCs by the equilibrium partitioning approach, using the arithmetic average organic carbon content of Site soil/sediment and each constituent's organic carbon/water partition coefficient. Sediment interstitial water concentrations were used to assess aquatic invertebrates; one-tenth of this concentration was used to represent overlying surface water concentrations and assess amphibian, avian, and mammalian receptor groups. The uncertainty associated with sediment interstitial water and surface water EPCs is moderate.

Concentrations of COCs in vegetation and prey species (earthworms and shrew) were estimated using recommended regression equations and the constituent's n-octanol/water partition coefficient or values used in previous U.S. EPA environmental risk characterizations. These approaches provide a generic measure of bioaccumulation potential that does not consider Site factors (such as the high binding capacity of Site soil/sediment) and, since they are based on regression equations, are rough estimates at best. Since the food pathway was the predominant pathway for most receptors, these approaches provide a moderate to high level of uncertainty to the risk characterization.

Overall, uncertainty associated with exposure point concentrations is moderate to high.

5.4.4 Uncertainties Associated with Exposure Scenarios and Exposure Factors

Seven environmental receptor groups were assessed for exposure to COCs. Terrestrial and aquatic invertebrates were assessed for survival only; amphibians, two avian species, and two mammalian species were assessed for survival, growth and reproduction. These receptors groups represent reasonably expected environmental receptor groups on the Site and possessed sufficient information on exposure and toxicity to be assessed and serve as surrogate species for other receptors that may be present on Site. The uncertainty associated with the scope of receptors assessed is low.

Environmental receptors were assumed to have a high degree of exposure to Site media. For invertebrates, amphibians, American robins, and short-tailed shrew, all exposure was assumed to occur on the Site; exposure of red-tailed hawks and raccoons was apportioned according to the size of the Site relative to the receptor's typical foraging area. Other exposure factors represented average to high exposure. The uncertainty associated with the level of exposure is moderate.

No consideration was given to the inaccessibility of soil to terrestrial receptors or inaccessibility of sediment to aquatic receptors when the wetland is flooded or dried up, respectively. Soil/sediment was assumed to exist in both forms simultaneously to allow assessment of both aquatic and terrestrial receptors. Depending on the amount of time the wetland is submerged, the exposure of terrestrial organisms may be greatly reduced (and vice versa for aquatic receptors). This approach has overestimated exposures of both receptor types and provides a moderate to high degree of uncertainty to the risk characterization.

Overall, the uncertainty associated with exposure scenarios and factors is moderate to high.

5.4.5 Uncertainties Associated with the Risk Characterization Approach

By combining conservative estimates of exposure and toxicity, results of the risk characterization reflect conservative conditions that may not represent typical exposures. Health risks, particularly to an average exposed receptor, are likely overestimated.

6.0 CHARACTERIZATION OF RISK OF HARM TO PUBLIC WELFARE

Characterization of the potential risk of a Site to public welfare considers the extent to which the Site poses a nuisance condition, loss of property value, loss of active or passive property uses, or other monetary or non-monetary costs. The Site is not anticipated to pose a nuisance condition by criteria identified in 310 CMR 40.0994 (4)(a), as discussed following:

- The presence of COCs in soil/sediment is not apparent to the public visually or olfactorily. The COCs are not appreciably volatile and have no overt odors or color.
- Potable water is supplied to the Site and surrounding area by municipal sources, so the Site will have no effect upon the drinking water supply.
- There are no known livestock farms in the area, and given the size and location of the Site, it is unlikely that the Site would convert to a farm in the future.
- There is no available information regarding loss of property value or active or passive property uses resulting from the release. However, none of these losses is expected.

Potential public welfare risks were also evaluated by comparing COC EPCs in Table 2 to upper concentration limits (UCLs) specified in 310 CMR 40.0996. An exceedance of a UCL is considered a condition of significant risk under the MCP. No detected COC concentration or COC EPC in soil/sediment exceeded its UCL. Based on the above evaluation, the Site poses no significant risk of harm to public welfare.

7.0 CHARACTERIZATION OF RISK OF HARM TO SAFETY

Characterization of the risk of harm to safety is performed by evaluating Site conditions relative to conditions that could pose a threat of physical harm or bodily injury. Conditions that could pose a threat of risk to safety include the following:

- Presence of rusted or corroded drums, containers, open pits, or lagoons;
- Threat of fire or explosion or presence of explosive vapors; and,
- Uncontained materials exhibiting characteristics of corrosivity, reactivity, or flammability.

None of these conditions currently exists or is anticipated to exist at the Site in relation to the release in the future. Therefore, the Site is judged to pose no significant risk of harm to safety.

8.0 SUMMARY AND CONCLUSION

A human health and environmental risk characterization was conducted for the former McCoy Field wetland area. The human health risk characterization assessed the risk posed by the Site to recreational receptors, pedestrians, and trespassers, all of which were assessed for the same level of exposure. The numerical results of the human health risk characterization are summarized below:

RECREATIONAL/PEDESTRIAN/TRESPASSER RISK CHARACTERIZATION SUMMARY

Exposure Pathway	Child		Youth		Adult		Combined
	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk	Cancer Risk
Total (all pathways)	0.3	9×10^{-7}	0.07	2×10^{-7}	0.04	3×10^{-7}	1×10^{-6}
Maximum Acceptable Level	1.0	1×10^{-5}	1.0	1×10^{-5}	1.0	1×10^{-5}	1×10^{-5}

Total HIs and total cancer risks are below maximum acceptable levels for all age groups. This indicates that the Site poses no significant risk of harm to human health for these receptor groups.

The environmental risk characterization assessed terrestrial and aquatic invertebrates for survival, and amphibians, two avian species, and two mammalian species for survival, growth and reproduction. The numerical results of the risk characterization are summarized in the table below:

Receptor Group	Hazard Index –High	Hazard Index-Low
Terrestrial Invertebrates	0.7	-- [1]
Aquatic Invertebrates	0.5	-- [1]
Amphibians	1.1	-- [1]
American Robin	5	0.4
Red-Tailed Hawk	0.001	0.0001
Short-tailed Shrew	3	1
Raccoon	0.005	0.002
Benchmark HI	**1.0**	**1.0**

1. A "high" scenario was not assessed for this group.

Total HIs for terrestrial invertebrates, aquatic invertebrates, red-tailed hawk, and raccoons are below the maximum acceptable HI benchmark of 1.0, indicating that the Site poses no significant risk of harm to these receptor groups.

The HI of 1.1 for amphibians slightly exceeds the maximum acceptable HI benchmark of 1.0 as a result of potential exposure to lead. However, the risk characterization concludes that this HI is conservative and that a significant risk of harm is not posed to amphibians for the following reasons:

- The HI exceedance is minimal (total HI of 1.1 versus maximum acceptable HI of 1.0);
- The highest chemical-specific HI, for lead, is 0.9, below the maximum acceptable HI of 1.0;
- Lead's toxicity reference value (TRV) of 0.4 µg/L is based on the lowest reported toxicity value identified in the literature, to which an uncertainty factor of 100 was applied;
- Lead's TRV of 0.4 µg/L is below the federal ambient water quality criterion of 0.54 µg/L calculated at the lowest considered water hardness of 25 mg/L;
- The surface water EPC was based on one-tenth of the predicted interstitial water concentration, whereas the overlying water column may be much more diluted from on-flowing surface water; and,
- The predicted interstitial water concentration was based on the 95th upper confidence limit (UCL) of the mean soil/sediment lead concentration of 138 mg/kg, while the mean soil/sediment lead concentration is 98 mg/kg and the median concentration is 46 mg/kg.

For the American robin, an HI-High of 5 and an HI-Low of 0.4 were calculated. PCBs contributed the majority of the HI. Despite the numerical results, the risk characterization concludes that a significant risk of harm is not posed to American robins for the following reasons:

- Robins were assumed to feed exclusively at the Site;
- There is no consideration of the periodic inaccessibility of wetland soil due to submergence;
- The EPC for PCBs is a 97.5% UCL mean concentration, as recommended by ProUCL;
- PCBs are assumed 100% absorbed through the ingestion route;
- Bioaccumulation and bioconcentration factors do not consider the high binding capacity of soil/sediment;
- The TRV-Low value applied for PCBs is on the low end of the range of values available; use of the highest TRV-Low value reduces the HI-High from 5 to 3.
- The difference between the HI-High of 5 and the maximum acceptable HI of 1 is within the range of uncertainty associated with the assessment.

For short-tailed shrew, an HI-High of 3 and an HI-Low of 1 were calculated. PCBs contributed the majority of the HI. Despite the numerical results, the risk characterization concludes that a significant risk of harm is not posed to short-tailed shrew for the following reasons:

- Shrew were assumed to feed exclusively at the Site;
- There is no consideration of the periodic inaccessibility of wetland soil due to submergence;
- The EPC for PCBs is a 97.5% UCL mean concentration;
- PCBs are assumed 100% absorbed through the ingestion route;
- Bioconcentration factors do not consider the high binding capacity of the soil/sediment;

- The TRV-Low value applied for PCBs is in the center of the range of relevant values available; use of the highest TRV-Low value reduces the HI-High 3 to 1.
- The difference between the HI-High of 3 and the maximum acceptable HI of 1 is within the range of uncertainty associated with the assessment.

The potential risk of harm to safety and public welfare were conducted according in MADEP guidance. These assessments concluded that the Site poses no significant risk of harm to safety or public welfare.

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Tables

TABLE 1
SUMMARY OF DETECTED CONSTITUENTS IN UPLAND FILL MATERIAL
Former McCoy Field
New Bedford, Massachusetts

Constituent	Number of Detections/ Number of Samples[1]	Arithmetic Mean Detected Concentration[1] (mg/kg)	Maximum Detected Concentration[1] (mg/kg)	Method 1 S-1 Soil Standards[2] S-1/GW-2 (mg/kg)	S-1/GW-3 (mg/kg)	MCP Upper Concentration Limit[3] (mg/kg)	U.S. EPA Region 9 Preliminary Remediation Goal[4] (Residential Soil) (mg/kg)
Volatile Organic Compounds							
n-Butylbenzene[5]	2/21	0.365	0.63	100	100	5,000	-
sec-Butylbenzene[5]	1/21	0.093	0.093	100	100	5,000	-
Ethylbenzene	1/21	0.73	0.73	500	500	10,000	-
Isopropylbenzene[5]	2/21	0.12	0.13	100	100	5,000	-
p-Isopropyltoluene[5]	2/21	0.14	0.17	100	100	5,000	-
Naphthalene	3/21	2.06	4.3	100	100	10,000	-
n-Propylbenzene[5]	1/21	0.22	0.22	100	100	5,000	-
Tetrachloroethene	1/21	0.21	0.21	20	20	1,000	-
Toluene	1/21	0.53	0.53	500	500	10,000	-
1,2,4-Trimethylbenzene[5]	2/21	1.54	2.5	100	100	5,000	-
1,3,5-Trimethylbenzene[5]	1/21	0.13	0.13	100	100	5,000	-
Xylenes (total)	3/21	0.886	1.71	500	500	10,000	-
Total C9-C10 aromatic hydrocarbons[6]	--	2.61	3.87	100	100	5,000	-
Semi-Volatile Organic Compounds							
Acenaphthene	107/280	2.4	30	1,000	1,000	10,000	-
Acenaphthylene	64/280	1.7	23	100	100	10,000	-
Anthracene	194/280	3.0	27	1,000	1,000	10,000	-
Benzidine	1/227	16	16	NE	NE	NE	0.0021
Benzo(a)anthracene	242/280	5.1	50	0.7	0.7	100	-
Benzo(a)pyrene	239/280	4.1	37	0.7	0.7	100	-
Benzo(b)fluoranthene	238/280	5.4	48	0.7	0.7	100	-
Benzo(g,h,i)perylene	172/280	2.2	13	1,000	1,000	10,000	-
Benzo(k)fluoranthene	193/280	2.2	17	7	7	400	-
4-Bromophenyl phenyl ether	3/280	0.2	0.32	NE	NE	NE	-
Butyl benzyl phthalate	4/280	1.0	2.7	NE	NE	NE	12,000
4-Chloroaniline	1/280	8.2	8.2	NE	NE	NE	240
4-Chloro-3-methylphenol	2/227	1.2	2.3	NE	NE	NE	-
Chrysene	229/280	4.3	43	7	7	400	-
Dibenzo(a,h)anthracene	57/280	1.3	8.7	0.7	0.7	100	-
Dibenzofuran	58/280	1.8	7.5	NE	NE	NE	150
1,4-Dichlorobenzene	2/280	1.3	2.2	40	40	2,000	-
2,4-Dinitrophenol	1/280	3.3	3.3	40	6	900	-
Diethylphthalate	2/280	0.3	0.46	1,000	0.7	10,000	-
Di-n-butylphthalate	63/280	2.4	25	NE	NE	NE	6,100
2,6-Dinitro-2-methylphenol	1/227	2.8	2.8	NE	NE	NE	-
bis(2-Ethylhexyl)phthalate	8/280	2.7	11	200	200	10,000	-
Fluoranthene	232/280	10.5	110	1,000	1,000	10,000	-
Fluorene	120/280	2.2	28	1,000	1,000	10,000	-
Indeno(1,2,3-cd)pyrene	189/280	2.2	14	0.7	0.7	100	-
2-Methylnaphthalene	55/280	1.9	11	500	500	10,000	-
4-Methylphenol	1/280	0.079	0.079	NE	NE	NE	310
Naphthalene	93/280	4.7	64	100	100	10,000	-
Phenanthrene	230/280	9.5	87	1,000	100	10,000	-
Phenol	4/280	0.6	0.69	500	500	10,000	-
Pyrene	235/280	9.7	120	700	700	10,000	-
Pyridine	1/227	0.11	0.11	NE	NE	NE	61
Polychlorinated Biphenyls							
PCBs (Total)	790/1,057	10.5	94.5	2	2	100	-
Total Petroleum Hydrocarbons							
TPH	24/24	459	7,700	800	800	10,000	-
Metals							
Arsenic	319/341	12.5	300	30	30	300	-
Barium	341/341	559	7,020	1,000	1,000	10,000	-
Cadmium	302/341	3.7	14	30	30	800	-
Chromium (total)	341/341	69.8	853	1,000	1,000	10,000	-
Lead	367/368	622	9,080	300	300	6,000	-
Mercury	304/341	0.65	4.09	20	20	600	-
Selenium	10/341	2.2	4.94	400	400	10,000	-
Silver	126/341	1.12	9.74	100	100	2,000	-

mg/kg = milligrams per kilogram.
NE = Not established.

1. Data for PCBs are from soil/fill remaining on the Site. Data for other constituents include soil/fill subsequently removed from the Site, which is conservatively assumed to represent soil/fill remaining on the Site.
2. 310 CMR 40.0975(6)(a).
3. 310 CMR 40.0996(7).
4. Presented, when available, for constituents without MCP soil standards. U.S. EPA (2005a) (http://www.epa.gov/region09/waste/sfund/prg/files/04prgtable.pdf).
5. This constituent has no Method 1 soil standards. Standard presented is that for C9-C10 aromatic hydrocarbons.
6. Sum of detected C9-C10 aromatic hydrocarbon constituents.

TABLE 2
SUMMARY OF WETLAND SOIL/SEDIMENT ANALYTICAL RESULTS
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Sample Identification	Sample Depth	Sample Date	Total Organic Carbon (%)	Total PCBs (ug/kg)	Acenaphthene (ug/kg)	Anthracene (ug/kg)	Benzo(a)-anthracene (ug/kg)	Benzo(b)-fluoranthene (ug/kg)	Benzo(k)-fluoranthene (ug/kg)	Benzo(g,h,i)-perylene (ug/kg)
IW-1	0-6"	12/23/04	7.37	***270***	110	***250***	***920***	***1,400***	450	***490***
IW-2	0-6"	12/23/04	11.49	***5,710*** J [11]	140	***440***	***1,400***	***2,300***	560	***820***
WA-3	0-6"	12/21/04	2.9	***110***	R	R	R	R	R	R
WB-4	0-6"	12/21/04	12	***68***	120 U	120 U	***750***	120 U	120 U	120 U
WB-5	0-6"	12/21/04	12.6	***80***	180 U	180 U	180 U	180 U	180 U	180 U
WB-6	0-6"	12/21/04	38	***113***	330 U	330 U	330 U	330 U	330 U	330 U
WB-7	0-6"	12/21/04	57.1	25 U	310 U	310 U	310 U	310 U	310 U	310 U
WC-4	0-6"	12/21/04	45.2	36	260 U	260 U	260 U	260 U	260 U	260 U
WC-5	0-6"	12/21/04	58.6	***74***	310 U	310 U	310 U	310 U	310 U	310 U
WC.5-4.5	0-6"	4/22/05	-	***4,069***	4,100 U	4,100 U	4,100 U	4,100 U	4,100 U	4,100 U
WC.5-5.5	0-6"	4/22/05	-	***90***	510 U	510 U	510 U	510 U	510 U	510 U
WC.5-6.5	0-6"	4/22/05	-	85 U	840 U	840 U	840 U	840 U	840 U	840 U
WC.5-8.5	0-6"	4/22/05	-	***94***	650 U	650 U	650 U	650 U	650 U	650 U
WC.5-9.5	0-6"	4/22/05	-	***135***	600 U	600 U	600 U	600 U	600 U	600 U
WC.5-10.5	0-6"	4/20/05	-	44 U	700 U	700 U	700 U	700 U	700 U	700 U
WC.5-11.5	0-6"	4/20/05	-	36	440 U	440 U	440 U	440 U	440 U	440 U
WC.5-12.5	0-6"	4/20/05	-	37 U	540 U	540 U	540 U	540 U	540 U	540 U
WC.5-13.5	0-6"	4/20/05	-	***232***	470 U	470 U	470 U	470 U	470 U	470 U
WC.5-14.5	0-6"	4/20/05	-	***922***	140 U	***540***	***1,400***	***1,500***	***740***	***1,100***
WC.5-15.5	0-6"	4/20/05	-	***175***	340 U	340 U	340 U	340 U	340 U	340 U
WC.5-16.5	0-6"	4/20/05	-	7 U	130 U	130 U	130 U	130 U	130 U	130 U
WC.5-17.14	0-6"	4/20/05	-	***441***	430 U	430 U	430 U	430 U	430 U	430 U
WC.5-17.28	0-6"	4/20/05	-	***546***	440 U	440 U	***540***	***770***	490	440 U
WC.5-18.5	0-6"	4/25/05	-	***135***	140 U	140 U	140 U	140 U	140 U	140 U
WC.5-19.5	0-6"	4/25/05	-	12 U	56 U	56 U	56 U	56 U	56 U	56 U
WC.5-20.5	0-6"	4/25/05	-	19 U	160 U	160 U	160 U	160 U	160 U	160 U
WC.5-21.5	0-6"	4/25/05	-	***72***	95 U	95 U	95 U	95 U	95 U	95 U
WC.5-22.5	0-6"	4/25/05	-	***1,160***	88 U	88 U	88 U	120	88 U	88 U
WC.5-23.5	0-6"	4/25/05	-	***379***	190 U	190 U	190 U	190 U	190 U	190 U
WC.5-24.5	0-6"	4/25/05	-	***1,520***	300 U	300 U	300 U	300 U	300 U	300 U
WC.5-25.5	0-6"	4/25/05	-	***119***	170 U	170 U	170 U	170 U	170 U	170 U
WC.5-26.5	0-6"	4/25/05	-	***140***	200 U	200 U	200 U	200 U	200 U	200 U
WC.5-27.5	0-6"	4/25/05	-	***2,820***	150 U	150 U	***180***	380	180	150 U
WC-6	0-6"	12/21/04	51	***107***	260 U	260 U	260 U	260 U	260 U	260 U
WC-7	0-6"	12/21/04	37.6	***640***	230 UJ	230 UJ	230 UJ	230 UJ	230 UJ	230 UJ
WC-8	0-6"	12/21/04	54.6	58	360 U	360 U	360 U	360 U	360 U	360 U
WC-18	0-6"	12/23/04	3.45	26	79 U	79 U	79 U	79 U	79 U	79 U
WC-19	0-6"	12/23/04	6.97	***110***	92 U	92 U	100	160	92 U	92 U
WC-20	0-6"	12/23/04	14.75	***104***	130 U	130 U	130 U	130 U	130 U	130 U
WC-21	0-6"	12/23/04	15.1	***100***	110 U	110 U	110 U	110 U	110 U	110 U
WC-22	0-6"	12/23/04	5.92	***68***	84 U	84 U	84 U	84 U	84 U	84 U
WC-23	0-6"	12/23/04	16.23	***159***	110 U	110 U	110 U	110 U	110 U	110 U
WC-24	0-6"	12/23/04	6.15	14	84 U	84 U	84 U	84 U	84 U	84 U
WC-25	0-6"	12/23/04	13.28	***71***	110 U	110 U	110 U	110 U	110 U	110 U
WC-26	0-6"	12/23/04	4.94	***76***	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
WC-27	0-6"	12/23/04	6.69	41	130 U	130 U	***140***	130 U	130 U	130 U
WD-3	0-6"	12/22/04	23	***160***	130 U	130 U	130 U	130 U	130 U	130 U
WD-4	0-6"	12/22/04	54.4	***240***	340 U	340 U	340 U	340 U	340 U	340 U
WD-4.5	0-6"	4/22/05	-	***330***	570 U	570 U	570 U	570 U	570 U	570 U
WD-5	0-6"	12/22/04	11.7	***4,730***	140 U	140 U	140 U	140 U	140 U	140 U
WD.5-2.5	0-6"	4/25/05	-	***4,340***	160 U	160 U	160 U	160 U	160 U	160 U
WD.5-3	0-6"	4/25/05	-	***655***	160 U	160 U	160 U	160 U	160 U	160 U
WD.5-3.5	0-6"	4/25/05	-	***1,130***	610 U	610 U	610 U	610 U	610 U	610 U
WD.5-4.5	0-6"	4/22/05	-	83 U	790 U	790 U	790 U	790 U	790 U	790 U
WD.5-5.5	0-6"	4/22/05	-	78 U	730 U	730 U	730 U	730 U	730 U	730 U
WD.5-6.5	0-6"	4/22/05	-	80 U	570 U	570 U	570 U	570 U	570 U	570 U
WD.5-17.14	0-6"	4/20/05	-	***65***	300 U	300 U	300 U	300 U	300 U	300 U
WD.5-17.28	0-6"	4/20/05	-	13 U	200 U	200 U	200 U	200 U	200 U	200 U
WD.5-17.46	0-6"	4/20/05	-	***118***	320 U	320 U	320 U	320 U	320 U	320 U
WD.5-17.57	0-6"	4/20/05	-	***9,380***	240 U	***740***	***2,300***	***2,900***	***1,400***	***700***
WD-6	0-6"	12/22/04	32.2	***2,250***	220 U	220 U	220 U	220 U	220 U	220 U
WD-6.5	0-6"	4/22/05	-	***93***	3,500 U	3,500 U	3,500 U	3,500 U	3,500 U	3,500 U
WD-7	0-6"	12/21/04	24	***571***	170 U	170 U	170 U	170 U	170 U	170 U
WD-8	0-6"	12/21/04	39.9	***151***	270 U	270 U	270 U	270 U	270 U	270 U
WD-9	0-6"	12/22/04	58.7	***560***	280 U	280 U	280 U	280 U	280 U	280 U
WD-10	0-6"	12/22/04	33.4	***1,020***	240 U	240 U	240 U	240 U	240 U	240 U
WD-10.5	0-6"	4/20/05	-	***64***	50 U	50 U	50 U	50 U	50 U	50 U
WD-11	0-6"	12/22/04	46.9	***5,420*** J [10]	310 U	310 U	310 U	310 U	310 U	310 U
WD-12	0-6"	12/22/04	41.9	***4,060***	330 U	330 U	330 U	330 U	330 U	330 U
WD-13	0-6"	12/22/04	48.9	10 U	300 U	300 U	300 U	300 U	300 U	300 U
WD-14	0-6"	12/22/04	41	***8,910*** J [10]	390 U	390 U	390 U	390 U	390 U	390 U
WD-15	0-6"	12/22/04	43.9	***3,900***	260 U	260 U	260 U	260 U	260 U	260 U
WD-15.5	0-6"	4/20/05	-	33	50 U	50 U	50 U	50 U	50 U	50 U
WD-16	0-6"	12/22/04	29.2	10 U	230 U	230 U	230 U	230 U	230 U	230 U
WD-17	0-6"	12/22/04	46.9	***1,080***	220 U	220 U	220 U	220 U	220 U	220 U
WD-17.46	0-6"	4/20/05	-	***282***	360 U	360 U	360 U	360 U	360 U	360 U
WD-17.57	0-6"	4/20/05	-	35	170 U	170 U	170 U	170 U	170 U	170 U
WD-18	0-6"	12/23/04	17.56	***724***	110 U	110 U	***150***	110 U	110 U	110 U
WD-19	0-6"	12/23/04	13.7	***2,090***	130 U	130 U	***180***	460	130	130 U
WD-20	0-6"	12/23/04	2.3	22	87 U	87 U	87 U	87 U	87 U	87 U
WD-21	0-6"	12/23/04	17.09	***1,390*** J [10]	170 U	170 U	170 U	170 U	170 U	170 U
WD-22	0-6"	12/23/04	7.48	***96***	91 UJ	91 UJ	91 UJ	91 UJ	91 UJ	91 UJ
WD-23	0-6"	12/23/04	8.53	***9,480*** J [10]	120 UJ	120 UJ	***360*** J	490 J	200 J	120 UJ
WD-24	0-6"	12/23/04	30.27	***3,850*** J [10]	82 U	82 U	82 U	82 U	82 U	82 U

TABLE 2
SUMMARY OF WETLAND SOIL/SEDIMENT ANALYTICAL RESULTS
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Sample Identification	Sample Depth	Sample Date	Total Organic Carbon (%)	Total PCBs (ug/kg)	Acenaphthene (ug/kg)	Anthracene (ug/kg)	Benzo(a)-anthracene (ug/kg)	Benzo(b)-fluoranthene (ug/kg)	Benzo(k)-fluoranthene (ug/kg)	Benzo(g,h,i)-perylene (ug/kg)
WD-25 [7]	0-6"	12/23/04	13.14	*11,800*	180 U	180 U	*210*	310	180 U	180 U
WD-25A [7]	0-6"	1/19/05	-	*419*	-	-	-	-	-	-
WD-25B [7]	0-6"	1/19/05	-	*482*	-	-	-	-	-	-
WD-25C [7]	0-6"	1/19/05	-	*459*	-	-	-	-	-	-
WD- 25D [7]	0-6"	1/19/05	-	*987*	-	-	-	-	-	-
WD-26	0-6"	12/23/04	9.36	*2,770*	110 U	110 U	110 U	110 U	110 U	110 U
WD-27	0-6"	12/23/04	17.18	*4,100* J [10]	130 U	130 U	130 U	130 U	130 U	130 U
WE-2.5	0-6"	4/25/05	-	*777*	160 U	160 U	160 U	160 U	160 U	160 U
WE-3	0-6"	12/22/04	62.2	*1,950*	370 U	370 U	370 U	370 U	370 U	370 U
WE-3.5	0-6"	4/25/05	-	83 U	780 U	780 U	780 U	780 U	780 U	780 U
WE-4	0-6"	12/22/04	73.5	*122*	500 U	500 U	500 U	500 U	500 U	500 U
WE-5	0-6"	12/22/04	62.5	*320*	330 U	330 U	330 U	330 U	330 U	330 U
WE.5-2.5	0-6"	4/25/05	-	*601*	510 U	510 U	510 U	510 U	510 U	510 U
WE.5-3	0-6"	4/25/05	-	111 U	1,100 U	1,100 U	1,100 U	1,100 U	1,100 U	1,100 U
WE.5-3.5	0-6"	4/25/05	-	76 U	930 U	930 U	930 U	930 U	930 U	930 U
WE-6 [8]	0-6"	12/21/04	73.4	10 U	270 U	270 U	270 U	270 U	270 U	270 U
WE-7	0-6"	12/21/04	53.7	18 U	220 U	220 U	220 U	220 U	220 U	220 U
WE-8	0-6"	12/21/04	44	44	260 U	260 U	260 U	260 U	260 U	260 U
WF-3	0-6"	12/22/04	39	*740*	340 U	340 U	340 U	340 U	340 U	340 U
WF-4	0-6"	12/22/04	48.6	*640*	340 U	340 U	340 U	340 U	340 U	340 U
WF-5	0-6"	12/22/04	33.5	10 U	360 U	360 U	360 U	360 U	360 U	360 U
WF-6	0-6"	12/22/04	46	*270*	440 U	440 U	440 U	440 U	440 U	440 U
WF-7	0-6"	12/21/04	61.8	*104*	260 U	260 U	260 U	260 U	260 U	260 U
WF-8	0-6"	12/21/04	28	*325*	210 U	210 U	*510*	540	210	210 U
WG-3	0-6"	12/22/04	28.6	10 U	300 U	300 U	300 U	300 U	300 U	300 U
WG-4	0-6"	12/22/04	50.5	*280*	360 U	360 U	360 U	360 U	360 U	360 U
WG-4.5	0-6"	4/22/05	-	*1,162*	180 U	180 U	180 U	180 U	180 U	180 U
WG-5	0-6"	12/22/04	37	1,000 UE	140 U	140 U	140 U	140 U	140 U	140 U
WG-6	0-6"	4/22/05	-	12 U	140 U	140 U	140 U	140 U	140 U	140 U
WH-4	0-6"	4/22/05	-	*113*	240 U	240 U	240 U	240 U	240 U	240 U
WH-4.5	0-6"	4/22/05	-	15 U	130 U	130 U	130 U	130 U	130 U	130 U
WH-5	0-6"	12/22/04	44.4	*3,940*	220 U	220 U	220 U	220 U	220 U	220 U
WH-5.5	0-6"	4/22/05	-	*100*	240 U	240 U	240 U	240 U	240 U	240 U
WH.5-4.5	0-6"	4/22/05	-	*86*	1,800 U	1,800 U	1,800 U	1,800 U	1,800 U	1,800 U
WH.5-5	0-6"	4/22/05	-	*77*	110 U	110 U	110 U	110 U	110 U	110 U
WH.5-5.5	0-6"	4/22/05	-	56	280 U	280 U	280 U	280 U	280 U	280 U
WH-6	0-6"	4/22/05	-	35 U	--	--	--	--	--	--
WI-4	0-6"	4/22/05	-	*240*	620 U	620 U	620 U	620 U	620 U	620 U
WI-5	0-6"	4/22/05	-	*90*	250 U	250 U	250 U	250 U	250 U	250 U
WI-6	0-6"	4/22/05	-	*254*	430 U	430 U	430 U	430 U	430 U	430 U
WI.5-4	0-6"	4/22/05	-	45	240 U	240 U	240 U	240 U	240 U	240 U
WI.5-4.5	0-6"	4/22/05	-	*85*	2,300 U	2,300 U	2,300 U	2,300 U	2,300 U	2,300 U
WI.5-5	0-6"	4/22/05	-	*1,123*	530 U	530 U	530 U	530 U	530 U	530 U
WI.5-5.5	0-6"	4/22/05	-	*74*	480 U	480 U	480 U	480 U	480 U	480 U
Number of Samples			63	124	122	122	122	122	122	122
Number of Detections			63	100	2	4	14	12	9	4
Arithmetic Mean Concentration [1]			31.4	*908*	191	*203*	*255*	274	218	213
Median Concentration [1]				*116*	130	130	150	145	135	130
Maximum Detected Concentration			73.5	*11,800*	140	*740*	*2,300*	2,900	*1,400*	*1,100*
Upper Concentration Limit [2]			--	100,000	10,000,000	10,000,000	100,000	100,000	400,000	10,000,000
Natural Soil Background Level [3]			NE	NE	500	1,000	2,000	2,000	1,000	1,000
Method 1 S-1 Soil Standard [4]			NE	2,000	1,000,000	1,000,000	700	700	7,000	1,000,000
Percentage Above S-1 Soil Standard			NA	14.5%	0%	0%	4%	4%	0%	0%
Human Health Exposure Point Concentration			**NA**	**908**	**191**	**203**	**255**	**274**	**218**	**213**
Chronic Sediment Screening Level [5]			NE	59.8	1,993 [6]	57.2	108	1,116 [6]	617 [6]	226 [6]
Percentage Above Sediment Screening Level			NA	74%	0%	3.3%	11%	3%	0.8%	3.3%
Environmental Exposure Point Concentration			**NA**	**2.09** [9]	**191**	**221** [9]	**401** [9]	**274**	**218**	**213**

µg/kg = micrograms per kilogram.
mg/kg = milligrams per kilogram.
U = Undetected at quantitation limit presented.
J = Estimated concentration below quantitation limit.
R = Rejected; surrogate recovery < 10%.
E = Calibration range of instrument exceeded.
NE = Not established.
NA = Not applicable.

1. Non-detections included at one-half quantitation limit.
2. 310 CMR 40.0996(7).
3. MADEP (2002c). Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil. May.
4. 310 CMR 40.0975(a). Lower of S-1/GW-2 or S-1/GW-3 presented. Exceedances are shaded.
5. MADEP (2002b) Freshwater Sediment Screening Benchmarks for Use Under the Massachusetts Contingency Plan. May (unless otherwise noted). *Exceedances in italics.*
6. Calculated value; see associated spreadsheet.
7. Mean concentration at WD-25, -25A, -25B, -25C, and -25D used to avoid over-representing location.
8. Location sampled on two discrete days; the highest detected value or lowest quantitation limit presented.
9. Calculated by ProUCL (U.S. EPA 2004a).
10. Surrogates obscured by contaminants in sample.
11. Surrogates diluted out.
12. ER-L value (NOAA, 1999).

TABLE 2
SUMMARY OF WETLAND SOIL/SEDIMENT ANALYTICAL RESULTS
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Sample Identification	Sample Depth	Sample Date	Benzo(a)-pyrene (ug/kg)	Chrysene (ug/kg)	Fluoranthene (ug/kg)	Fluorene (ug/kg)	Indeno(1,2,3-cd)pyrene (ug/kg)	Phenanthrene (ug/kg)	Pyrene (ug/kg)	Arsenic (mg/kg)
IW-1	0-6"	12/23/04	***930***	***880***	***2,200***	***89***	550	***1,400***	***1,600***	1.81
IW-2	0-6"	12/23/04	***1,400***	***1,000***	***3,000***	***140***	**780**	***1,900***	110 U	6.38
WA-3	0-6"	12/21/04	R	R	R	R	R	R	R	1.09
WB-4	0-6"	12/21/04	120 U	***810***	***2,200***	120 U	120 U	***1,000***	***1,500***	0.27
WB-5	0-6"	12/21/04	180 U	180 U	***470***	180 U	180 U	180 U	***350***	0.58
WB-6	0-6"	12/21/04	330 U	330 U	330 U	330 U	330 U	330 U	330 U	0.64 U
WB-7	0-6"	12/21/04	310 U	310 U	310 U	310 U	310 U	310 U	310 U	1.11
WC-4	0-6"	12/21/04	260 U	260 U	260 U	260 U	260 U	260 U	***260***	0.71
WC-5	0-6"	12/21/04	310 U	310 U	310 U	310 U	310 U	310 U	310 U	0.54 U
WC.5-4.5	0-6"	4/22/05	4,100 U	4,100 U	4,100 U	4,100 U	4,100 U	4,100 U	4,100 U	0.75 U
WC.5-5.5	0-6"	4/22/05	510 U	510 U	510 U	510 U	510 U	510 U	510 U	0.52 U
WC.5-6.5	0-6"	4/22/05	840 U	840 U	840 U	840 U	840 U	840 U	840 U	0.68 U
WC.5-8.5	0-6"	4/22/05	650 U	650 U	650 U	650 U	650 U	650 U	650 U	0.6 U
WC.5-9.5	0-6"	4/22/05	600 U	600 U	600 U	600 U	600 U	600 U	600 U	0.69 U
WC.5-10.5	0-6"	4/20/05	700 U	700 U	700 U	700 U	700 U	700 U	700 U	0.62 U
WC.5-11.5	0-6"	4/20/05	440 U	440 U	440 U	440 U	440 U	440 U	440 U	0.38 U
WC.5-12.5	0-6"	4/20/05	540 U	540 U	540 U	540 U	540 U	540 U	540 U	0.83
WC.5-13.5	0-6"	4/20/05	470 U	470 U	470 U	470 U	470 U	470 U	470 U	0.46 U
WC.5-14.5	0-6"	4/20/05	***1,400***	***1,200***	***1,800***	140 U	**1,100**	***2,200***	***4,200***	5.27
WC.5-15.5	0-6"	4/20/05	340 U	340 U	340 U	340 U	340 U	340 U	340 U	0.82
WC.5-16.5	0-6"	4/20/05	130 U	130 U	130 U	130 U	130 U	130 U	130 U	0.1 U
WC.5-17.14	0-6"	4/20/05	430 U	430 U	430 U	430 U	430 U	430 U	430 U	1.7
WC.5-17.28	0-6"	4/20/05	***680***	***540***	***760***	440 U	440 U	440 U	***1,500***	0.4 U
WC.5-18.5	0-6"	4/25/05	140 U	140 U	140 U	140 U	140 U	140 U	140 U	0.38
WC.5-19.5	0-6"	4/25/05	56 U	56 U	56 U	56 U	56 U	56 U	56 U	1.03
WC.5-20.5	0-6"	4/25/05	160 U	160 U	160 U	160 U	160 U	160 U	160 U	0.78
WC.5-21.5	0-6"	4/25/05	95 U	95 U	95 U	95 U	95 U	95 U	95 U	0.96
WC.5-22.5	0-6"	4/25/05	88 U	88 U	110	88 U	88 U	88 U	170	1.08
WC.5-23.5	0-6"	4/25/05	190 U	190 U	190 U	190 U	190 U	190 U	190 U	2.6
WC.5-24.5	0-6"	4/25/05	300 U	300 U	300 U	300 U	300 U	300 U	***400***	1.03
WC.5-25.5	0-6"	4/25/05	170 U	170 U	170 U	170 U	170 U	170 U	170 U	0.96
WC.5-26.5	0-6"	4/25/05	200 U	200 U	200 U	200 U	200 U	200 U	200 U	0.84
WC.5-27.5	0-6"	4/25/05	***250***	160	310	150 U	150 U	160	***420***	1.91
WC-6	0-6"	12/21/04	260 U	260 U	260 U	260 U	260 U	260 U	260 U	0.5 U
WC-7	0-6"	12/21/04	230 UJ	230 UJ	230 UJ	230 UJ	230 UJ	230 UJ	230 UJ	0.47 U
WC-8	0-6"	12/21/04	360 U	360 U	360 U	360 U	360 U	360 U	360 U	0.62 U
WC-18	0-6"	12/23/04	79 U	79 U	79 U	79 U	79 U	79 U	79 U	0.94
WC-19	0-6"	12/23/04	110	110	180	92 U	92 U	95	170	1.37
WC-20	0-6"	12/23/04	130 U	130 U	130 U	130 U	130 U	130 U	130 U	2.38
WC-21	0-6"	12/23/04	110 U	110 U	110 U	110 U	110 U	110 U	110 U	1.17
WC-22	0-6"	12/23/04	84 U	84 U	120	84 U	84 U	84 U	140	1.23
WC-23	0-6"	12/23/04	110 U	110 U	110	110 U	110 U	110 U	120	1.91
WC-24	0-6"	12/23/04	84 U	84 U	84 U	84 U	84 U	84 U	84 U	0.65
WC-25	0-6"	12/23/04	110 U	110	220	110 U	110 U	130	***230***	2.25
WC-26	0-6"	12/23/04	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	1.94
WC-27	0-6"	12/23/04	130 U	140	260	130 U	130 U	140	***240***	1.94
WD-3	0-6"	12/22/04	130 U	130 U	130 U	130 U	130 U	130 U	130 U	0.19 U
WD-4	0-6"	12/22/04	340 U	340 U	340 U	340 U	340 U	340 U	340 U	0.45 U
WD-4.5	0-6"	4/22/05	570 U	570 U	570 U	570 U	570 U	570 U	570 U	0.76
WD-5	0-6"	12/22/04	140 U	140 U	140 U	140 U	140 U	140 U	140 U	1.75
WD.5-2.5	0-6"	4/25/05	160 U	160 U	170	160 U	160 U	160 U	190	2.35
WD.5-3	0-6"	4/25/05	160 U	160 U	160 U	160 U	160 U	160 U	160 U	2.27
WD.5-3.5	0-6"	4/25/05	610 U	610 U	610 U	610 U	610 U	610 U	610 U	0.9 U
WD.5-4.5	0-6"	4/22/05	790 U	790 U	790 U	790 U	790 U	790 U	790 U	0.74 U
WD.5-5.5	0-6"	4/22/05	730 U	730 U	730 U	730 U	730 U	730 U	730 U	0.67 U
WD.5-6.5	0-6"	4/22/05	570 U	570 U	570 U	570 U	570 U	570 U	570 U	0.7 U
WD.5-17.14	0-6"	4/20/05	300 U	300 U	300 U	300 U	300 U	300 U	***330***	1.29
WD.5-17.28	0-6"	4/20/05	200 U	200 U	200 U	200 U	200 U	200 U	200 U	0.59
WD.5-17.46	0-6"	4/20/05	320 U	320 U	320 U	320 U	320 U	320 U	320 U	0.44
WD.5-17.57	0-6"	4/20/05	***2,300***	***1,800***	***3,600***	240 U	240 U	***2,600***	***5,600***	5.57
WD-6	0-6"	12/22/04	220 U	220 U	220 U	220 U	220 U	220 U	220 U	0.31 U
WD-6.5	0-6"	4/22/05	3,500 U	3,500 U	3,500 U	3,500 U	3,500 U	3,500 U	3,500 U	0.63 U
WD-7	0-6"	12/21/04	170 U	170 U	190	170 U	170 U	170 U	190	0.6
WD-8	0-6"	12/21/04	270 U	270 U	270 U	270 U	270 U	270 U	270 U	0.51 U
WD-9	0-6"	12/22/04	280 U	280 U	280 U	280 U	280 U	280 U	280 U	0.39 U
WD-10	0-6"	12/22/04	240 U	240 U	240 U	240 U	240 U	240 U	240 U	0.36 U
WD-10.5	0-6"	4/20/05	50 U	50 U	50 U	50 U	50 U	50 U	50 U	0.67
WD-11	0-6"	12/22/04	310 U	310 U	310 U	310 U	310 U	310 U	310 U	0.42 U
WD-12	0-6"	12/22/04	330 U	330 U	330 U	330 U	330 U	330 U	330 U	0.44 U
WD-13	0-6"	12/22/04	300 U	300 U	300 U	300 U	300 U	300 U	300 U	0.41 U
WD-14	0-6"	12/22/04	390 U	390 U	390 U	390 U	390 U	390 U	390 U	5.23
WD-15	0-6"	12/22/04	260 U	260 U	260 U	260 U	260 U	260 U	260 U	0.37 U
WD-15.5	0-6"	4/20/05	50 U	50 U	50 U	50 U	50 U	50 U	50 U	0.25
WD-16	0-6"	12/22/04	230 U	230 U	230 U	230 U	230 U	230 U	230 U	2.93
WD-17	0-6"	12/22/04	220 U	220 U	220 U	220 U	220 U	220 U	220 U	0.68
WD-17.46	0-6"	4/20/05	360 U	360 U	360 U	360 U	360 U	360 U	***590***	6.57
WD-17.57	0-6"	4/20/05	170 U	170 U	170 U	170 U	170 U	170 U	170 U	1.05
WD-18	0-6"	12/23/04	110 U	130	260	110 U	110 U	180	***260***	1.61
WD-19	0-6"	12/23/04	***330***	***190***	310	130 U	130 U	180	***430***	1.15
WD-20	0-6"	12/23/04	87 U	87 U	87 U	87 U	87 U	87 U	87 U	0.17
WD-21	0-6"	12/23/04	170 U	170 U	260	170 U	170 U	170 U	***250***	1.26
WD-22	0-6"	12/23/04	91 UJ	91 UJ	91 UJ	91 UJ	91 UJ	91 UJ	91 UJ	0.74
WD-23	0-6"	12/23/04	***380*** J	***300*** J	***690*** J	120 UJ	120 UJ	***470*** J	***760*** J	3.85
WD-24	0-6"	12/23/04	82 U	82 U	82 U	82 U	82 U	82 U	82 U	3.18

TABLE 2
SUMMARY OF WETLAND SOIL/SEDIMENT ANALYTICAL RESULTS
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Sample Identification	Sample Depth	Sample Date	Benzo(a)-pyrene (ug/kg)	Chrysene (ug/kg)	Fluoranthene (ug/kg)	Fluorene (ug/kg)	Indeno(1,2,3-cd)pyrene (ug/kg)	Phenanthrene (ug/kg)	Pyrene (ug/kg)	Arsenic (mg/kg)
WD-25 [7]	0-6"	12/23/04	180 U	***180***	380	180 U	180 U	***220***	***460***	6.9
WD-25A [7]	0-6"	1/19/05	-	-	-	-	-	-	-	-
WD-25B [7]	0-6"	1/19/05	-	-	-	-	-	-	-	-
WD-25C [7]	0-6"	1/19/05	-	-	-	-	-	-	-	-
WD- 25D [7]	0-6"	1/19/05	-	-	-	-	-	-	-	-
WD-26	0-6"	12/23/04	110 U	110 U	140	110 U	110 U	110 U	130	0.98
WD-27	0-6"	12/23/04	130 U	130 U	150	130 U	130 U	130 U	180	1.25
WE-2.5	0-6"	4/25/05	160 U	160 U	160 U	160 U	160 U	160 U	190	1.86
WE-3	0-6"	12/22/04	370 U	370 U	370 U	370 U	370 U	370 U	370 U	0.51 U
WE-3.5	0-6"	4/25/05	780 U	780 U	780 U	780 U	780 U	780 U	780 U	0.63 U
WE-4	0-6"	12/22/04	500 U	500 U	500 U	500 U	500 U	500 U	500 U	0.77 U
WE-5	0-6"	12/22/04	330 U	330 U	330 U	330 U	330 U	330 U	330 U	0.63
WE.5-2.5	0-6"	4/25/05	510 U	510 U	510 U	510 U	510 U	510 U	510 U	0.99 U
WE.5-3	0-6"	4/25/05	1,100 U	1,100 U	1,100 U	1,100 U	1,100 U	1,100 U	1,100 U	1.87 U
WE.5-3.5	0-6"	4/25/05	930 U	930 U	930 U	930 U	930 U	930 U	930 U	0.68 U
WE-6 [8]	0-6"	12/21/04	270 U	270 U	270 U	270 U	270 U	270 U	270 U	0.51 U
WE-7	0-6"	12/21/04	220 U	220 U	220 U	220 U	220 U	220 U	220 U	0.42 U
WE-8	0-6"	12/21/04	260 U	260 U	260 U	260 U	260 U	260 U	260 U	0.49 U
WF-3	0-6"	12/22/04	340 U	340 U	340 U	340 U	340 U	340 U	340 U	0.51 U
WF-4	0-6"	12/22/04	340 U	340 U	340 U	340 U	340 U	340 U	340 U	0.48 U
WF-5	0-6"	12/22/04	360 U	360 U	360 U	360 U	360 U	360 U	360 U	0.47 U
WF-6	0-6"	12/22/04	440 U	440 U	440 U	440 U	440 U	440 U	440 U	0.88
WF-7	0-6"	12/21/04	260 U	260 U	260 U	260 U	260 U	260 U	260 U	0.48 U
WF-8	0-6"	12/21/04	***430***	***390***	***1,000***	210 U	210 U	***700***	***1,200***	4.13
WG-3	0-6"	12/22/04	300 U	300 U	300 U	300 U	300 U	300 U	300 U	0.45 U
WG-4	0-6"	12/22/04	360 U	360 U	360 U	360 U	360 U	360 U	360 U	0.5 U
WG-4.5	0-6"	4/22/05	180 U	180 U	180 U	180 U	180 U	180 U	180 U	0.33
WG-5	0-6"	12/22/04	140 U	140 U	140 U	140 U	140 U	140 U	150	0.4 U
WG-6	0-6"	4/22/05	140 U	140 U	140 U	140 U	140 U	140 U	140 U	0.12 U
WH-4	0-6"	4/22/05	240 U	240 U	240 U	240 U	240 U	240 U	240 U	0.24 U
WH-4.5	0-6"	4/22/05	130 U	130 U	130 U	130 U	130 U	130 U	130 U	0.12 U
WH-5	0-6"	12/22/04	220 U	220 U	220 U	220 U	220 U	220 U	220 U	0.33 U
WH-5.5	0-6"	4/22/05	240 U	240 U	240 U	240 U	240 U	240 U	240 U	0.22 U
WH.5-4.5	0-6"	4/22/05	1,800 U	1,800 U	1,800 U	1,800 U	1,800 U	1,800 U	1,800 U	0.14 U
WH.5-5	0-6"	4/22/05	110 U	110 U	110 U	110 U	110 U	110 U	110 U	0.24 U
WH.5-5.5	0-6"	4/22/05	280 U	***280***	280 U	280 U	280 U	280 U	280 U	0.16 U
WH-6	0-6"	4/22/05	--	--	--	--	--	--	--	-
WI-4	0-6"	4/22/05	620 U	620 U	620 U	620 U	620 U	620 U	620 U	0.65 U
WI-5	0-6"	4/22/05	250 U	250 U	250 U	250 U	250 U	250 U	250 U	0.79
WI-6	0-6"	4/22/05	430 U	430 U	430 U	430 U	430 U	430 U	430 U	0.36 U
WI.5-4	0-6"	4/22/05	240 U	240 U	240 U	240 U	240 U	240 U	240 U	0.49
WI.5-4.5	0-6"	4/22/05	2,300 U	2,300 U	2,300 U	2,300 U	2,300 U	2,300 U	2300 U	2.62
WI.5-5	0-6"	4/22/05	530 U	530 U	530 U	530 U	530 U	530 U	530 U	0.47 U
WI.5-5.5	0-6"	4/22/05	480 U	480 U	480 U	480 U	480 U	480 U	480 U	0.8
Number of Samples			122	122	122	122	122	122	122	123
Number of Detections			10	16	24	2	3	14	29	66
Arithmetic Mean Concentration [4]			***249***	***246***	329	***191***	208	***274***	***351***	1.05
Median Concentration [1]			138	150	163	130	130	150	170	0.49
Maximum Detected Concentration			***2,300***	***1,200***	***3,600***	***140***	***1,100***	***2,600***	***5,600***	6.9
Upper Concentration Limit [2]			100,000	400,000	10,000,000	10,000,000	100,000	10,000,000	10,000,000	300
Natural Soil Background Level [3]			2,000	2,000	4,000	1,000	1,000	3,000	4,000	20
Method 1 S-1 Soil Standard [4]			700	7,000	1,000,000	1,000,000	700	100,000	700,000	30
Percentage Above S-1 Soil Standard			3%	0%	0%	0%	1.6%	0%	0%	0%
Human Health Exposure Point Concentration			**249**	**246**	**329**	**191**	**208**	**274**	**351**	**NA**
Chronic Sediment Screening Level [5]			150	166	423	77.4	4,077 [6]	204	195	9.79
Percentage Above Sediment Screening Level			7%	9%	7%	2%	0%	7%	15%	0%
Environmental Exposure Point Concentration			**395** [9]	**377** [9]	**329**	**203** [9]	**208**	**446** [9]	**623** [9]	**NA**

µg/kg = micrograms per kilogram.
mg/kg = milligrams per kilogram.
U = Undetected at quantitation limit presented.
J = Estimated concentration below quantitation limit.
R = Rejected; surrogate recovery < 10%.
E = Calibration range of instrument exceeded.
NE = Not established.
NA = Not applicable.

1. Non-detections included at one-half quantitation limit.
2. 310 CMR 40.0996(7).
3. MADEP (2002c). Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil. May.
4. 310 CMR 40.0975(a). Lower of S-1/GW-2 or S-1/GW-3 presented. Exceedances are shaded.
5. MADEP (2002b) Freshwater Sediment Screening Benchmarks for Use Under the Massachusetts Contingency Plan. May (unless otherwise noted). *Exceedances in italics.*
6. Calculated value; see associated spreadsheet.
7. Mean concentration at WD-25, -25A, -25B, -25C, and -25D used to avoid over-representing location.
8. Location sampled on two discrete days; the highest detected value or lowest quantitation limit presented.
9. Calculated by ProUCL (U.S. EPA 2004a).
10. Surrogates obscured by contaminants in sample.
11. Surrogates diluted out.
12. ER-L value (NOAA, 1999).

TABLE 2
SUMMARY OF WETLAND SOIL/SEDIMENT ANALYTICAL RESULTS
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Sample Identification	Sample Depth	Sample Date	Barium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)
IW-1	0-6"	12/23/04	19	0.81	7.14	***44***	0.063	0.12 U	0.06 U
IW-2	0-6"	12/23/04	584	***3.77***	***57***	***560***	***0.835***	0.15 U	0.38
WA-3	0-6"	12/21/04	23	***1.04***	13	***198***	0.037	0.14 U	0.07 U
WB-4	0-6"	12/21/04	55	***1.76***	38	***134***	0.094	0.22 U	0.11
WB-5	0-6"	12/21/04	62	***2.05***	42	***127***	0.096	0.32 U	0.16 U
WB-6	0-6"	12/21/04	99	***1.8***	18	***170***	0.136	0.64 U	0.32 U
WB-7	0-6"	12/21/04	40	0.98	11	***502***	***0.235***	0.86	0.37
WC-4	0-6"	12/21/04	88	***1.56***	17	***178***	***0.181***	0.96	0.25 U
WC-5	0-6"	12/21/04	62	0.98	11	***50***	0.079	2.18	0.27 U
WC.5-4.5	0-6"	4/22/05	44	0.53	5.94	20	0.081 U	1.73	0.38 U
WC.5-5.5	0-6"	4/22/05	52	0.83	5.67	***43***	0.11	1.08	0.26 U
WC.5-6.5	0-6"	4/22/05	62	0.75	5.94	14	0.083	2.12	0.34 U
WC.5-8.5	0-6"	4/22/05	48	0.66	5.89	27	0.078	2.34	0.3 U
WC.5-9.5	0-6"	4/22/05	78	0.76	7.12	23	0.075	2.21	0.35 U
WC.5-10.5	0-6"	4/20/05	80	***1.18***	6.27	***63***	0.088	1.86	0.31 U
WC.5-11.5	0-6"	4/20/05	44	0.45	6.01	15	0.056	3.61	0.19 U
WC.5-12.5	0-6"	4/20/05	78	0.78	16	26	0.117	4.04	0.23 U
WC.5-13.5	0-6"	4/20/05	86	***1.15***	12	***55***	0.114	2.89	0.23 U
WC.5-14.5	0-6"	4/20/05	275	***4.73***	26	***524***	***0.457***	0.38	0.4
WC.5-15.5	0-6"	4/20/05	35	0.7	26	13	0.039	0.32 U	0.16 U
WC.5-16.5	0-6"	4/20/05	5.2	0.22	3.9	1.7	0.011 U	0.1 U	0.05 U
WC.5-17.14	0-6"	4/20/05	0.28	0.71	34	12	0.091	1.08	0.21 U
WC.5-17.28	0-6"	4/20/05	30	0.96	20	14	***0.238***	0.4 U	0.2 U
WC.5-18.5	0-6"	4/25/05	6.59	0.29	3.71	7.41	0.026	0.13 U	0.07 U
WC.5-19.5	0-6"	4/25/05	9.3	0.6	5.97	4.22	0.02 U	0.1 U	0.05 U
WC.5-20.5	0-6"	4/25/05	9.31	0.31	4.16	7.1	0.022	0.13 U	0.07 U
WC.5-21.5	0-6"	4/25/05	23	0.41	4.94	18	0.101	0.24	0.07 U
WC.5-22.5	0-6"	4/25/05	13	0.63	8.38	34	0.056	0.15 U	0.08 U
WC.5-23.5	0-6"	4/25/05	20	0.8	8.39	***46***	0.078	0.3	0.08 U
WC.5-24.5	0-6"	4/25/05	25	0.65	7.9	***57***	0.128	0.45	0.11
WC.5-25.5	0-6"	4/25/05	11	0.31	5.41	17	0.046	0.43	0.08 U
WC.5-26.5	0-6"	4/25/05	23	0.69	11	***41***	0.073	0.25	0.08 U
WC.5-27.5	0-6"	4/25/05	83	0.91	18	***107***	***2.06***	0.13 U	0.11
WC-6	0-6"	12/21/04	99	***1.58***	3.37	18	0.065	0.5 U	0.25 U
WC-7	0-6"	12/21/04	102	***1.31***	12	***184***	0.128	0.47 U	0.23 U
WC-8	0-6"	12/21/04	73	***1.11***	9.84	***112***	***0.197***	0.62 U	0.31 U
WC-18	0-6"	12/23/04	9.27	0.78	5.26	19	0.029	0.12 U	0.06 U
WC-19	0-6"	12/23/04	23	0.68	6.95	***47***	0.062	0.16 U	0.08 U
WC-20	0-6"	12/23/04	23	0.66	5.14	***43***	0.06	0.18 U	0.09 U
WC-21	0-6"	12/23/04	12	0.65	3.26	16	0.058	0.15 U	0.08 U
WC-22	0-6"	12/23/04	13	0.46	4.62	28	0.067	0.14 U	0.07 U
WC-23	0-6"	12/23/04	16	0.6	7.96	***36***	0.096	0.74	0.08 U
WC-24	0-6"	12/23/04	10	0.26	3.42	9.42	0.025	0.11 U	0.06 U
WC-25	0-6"	12/23/04	49	0.78	10	***54***	0.111	0.14 U	0.07 U
WC-26	0-6"	12/23/04	163	***1.64***	25	***119***	0.055	0.19 U	0.09 U
WC-27	0-6"	12/23/04	109	***1.24***	16	***120***	0.033	0.2	0.06 U
WD-3	0-6"	12/22/04	28	0.36	3.71	23	0.06	0.83	0.09 U
WD-4	0-6"	12/22/04	83	***1.38***	15	***64***	0.123	0.45 U	0.22 U
WD-4.5	0-6"	4/22/05	55	0.6	9.19	27	0.093	2.5	0.27 U
WD-5	0-6"	12/22/04	35	***1.1***	7.2	***61***	0.103	0.2 U	0.1 U
WD.5-2.5	0-6"	4/25/05	24	***1.03***	5.44	***77***	0.046	0.19 U	0.09 U
WD.5-3	0-6"	4/25/05	26	0.75	4.64	***64***	0.043	0.12 U	0.06
WD.5-3.5	0-6"	4/25/05	38	***1.17***	6.32	***73***	0.052 U	0.9 U	0.45 U
WD.5-4.5	0-6"	4/22/05	39	0.37	3.99	11	0.077 U	1.62	0.37 U
WD.5-5.5	0-6"	4/22/05	48	0.53	8.14	23	0.087	2.54	0.33 U
WD.5-6.5	0-6"	4/22/05	37	0.49	10	5.04	0.125	2.8	0.35 U
WD.5-17.14	0-6"	4/20/05	46	0.43	17	***54***	0.159	2.7	0.12 U
WD.5-17.28	0-6"	4/20/05	40	0.42	8.59	11	0.134	1.13	0.09 U
WD.5-17.46	0-6"	4/20/05	51	0.56	4.79	14	***0.278***	2.19	0.15 U
WD.5-17.57	0-6"	4/20/05	363	***3.86***	***52***	658	***0.411***	0.79	0.17
WD-6	0-6"	12/22/04	82	***1.15***	7.48	***128***	0.177	0.31 U	0.16 U
WD-6.5	0-6"	4/22/05	68	***1.07***	4.64	***36***	0.077	1.57	0.31 U
WD-7	0-6"	12/21/04	104	***2.62***	26	***477***	***0.245***	0.34 U	0.17 U
WD-8	0-6"	12/21/04	150	***2.44***	16	***162***	0.155	0.51 U	0.25 U
WD-9	0-6"	12/22/04	77	0.86	4.26	33	0.117	0.78	0.2 U
WD-10	0-6"	12/22/04	223	0.79	3.07	25	0.091	0.36 U	0.18 U
WD-10.5	0-6"	4/20/05	25	0.29	7.17	4.16	0.077	1.43	0.24 U
WD-11	0-6"	12/22/04	109	***1.18***	12	***112***	***0.201***	0.42 U	0.21 U
WD-12	0-6"	12/22/04	138	***1.9***	15	***386***	***0.293***	1.32	0.31
WD-13	0-6"	12/22/04	156	***1.23***	6.37	***59***	0.141	1.19	0.21 U
WD-14	0-6"	12/22/04	136	***1.46***	***70***	***81***	***0.339***	3.62	0.27 U
WD-15	0-6"	12/22/04	147	***1.86***	13	***144***	***0.218***	0.37 U	0.18 U
WD-15.5	0-6"	4/20/05	14	0.2	8.8	4.41	0.035	0.12 U	0.06 U
WD-16	0-6"	12/22/04	77	0.81	40	***47***	0.164	1.97	0.16 U
WD-17	0-6"	12/22/04	84	***1.26***	19	***107***	0.145	0.32 U	0.16 U
WD-17.46	0-6"	4/20/05	63	0.48	***70***	22	0.111	0.8 U	0.4 U
WD-17.57	0-6"	4/20/05	89	***1.05***	13	***97***	0.072	1.16	0.18 U
WD-18	0-6"	12/23/04	36	0.79	8.8	***70***	0.115	0.17 U	0.08 U
WD-19	0-6"	12/23/04	69	***1.03***	16	***93***	0.136	0.17 U	0.09
WD-20	0-6"	12/23/04	11	0.4	6.76	6.14	0.015 U	0.11 U	0.05 U
WD-21	0-6"	12/23/04	70	0.65	8.12	***93***	***0.221***	0.25 U	0.13 U
WD-22	0-6"	12/23/04	26	0.51	6.99	***50***	0.072	0.12 U	0.06 U
WD-23	0-6"	12/23/04	278	***3.04***	***51***	***325***	***0.507***	0.17 U	0.28
WD-24	0-6"	12/23/04	344	***2.11***	26	***264***	***0.341***	2.46	0.16 U

TABLE 2
SUMMARY OF WETLAND SOIL/SEDIMENT ANALYTICAL RESULTS
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Sample Identification	Sample Depth	Sample Date	Barium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)
WD-25 [7]	0-6"	12/23/04	966	***4.3***	***79***	***810***	***0.648***	0.25 U	0.5
WD-25A [7]	0-6"	1/19/05	-	-	-	-	-	-	-
WD-25B [7]	0-6"	1/19/05	-	-	-	-	-	-	-
WD-25C [7]	0-6"	1/19/05	-	-	-	-	-	-	-
WD- 25D [7]	0-6"	1/19/05	-	-	-	-	-	-	-
WD-26	0-6"	12/23/04	13	0.37	4.59	7.34	0.164	0.15 U	0.07 U
WD-27	0-6"	12/23/04	21	0.52	4.81	24	***0.204***	0.18 U	0.09 U
WE-2.5	0-6"	4/25/05	28	***1.11***	5.58	***105***	0.085	0.11 U	0.05
WE-3	0-6"	12/22/04	95	***1.9***	12	***431***	***0.194***	0.51 U	0.26 U
WE-3.5	0-6"	4/25/05	50	0.56	4.01	10	0.101	1.63	0.31 U
WE-4	0-6"	12/22/04	107	***1***	7	***53***	0.172	1.77	0.38 U
WE-5	0-6"	12/22/04	86	***1.16***	11	***167***	***0.235***	1.94	0.24 U
WE.5-2.5	0-6"	4/25/05	57	***1***	6.96	***105***	0.158	0.99 U	0.5 U
WE.5-3	0-6"	4/25/05	51	0.93	4.67	15	0.101	1.87 U	0.93 U
WE.5-3.5	0-6"	4/25/05	65	0.48	6.64	9.65	0.106	3.08	0.34 U
WE-6 [8]	0-6"	12/21/04	106	***1.12***	14	25	***0.185***	4.44	0.26 U
WE-7	0-6"	12/21/04	48	0.54	3.64	15	0.108	1.3	0.21 U
WE-8	0-6"	12/21/04	71	0.78	4.7	29	0.108	0.88	0.24 U
WF-3	0-6"	12/22/04	64	0.72	4.3	***42***	***0.244***	2.05	0.26 U
WF-4	0-6"	12/22/04	129	***1.62***	6.09	***251***	0.175	0.48 U	0.24 U
WF-5	0-6"	12/22/04	84	0.99	8.31	***231***	***0.294***	0.47 U	0.23 U
WF-6	0-6"	12/22/04	210	***3.33***	13	***177***	***0.188***	2.11	0.29 U
WF-7	0-6"	12/21/04	112	***1.26***	7.34	***106***	0.135	1.69	0.24 U
WF-8	0-6"	12/21/04	426	***5.75***	***78***	***633***	***0.36***	0.41 U	0.58
WG-3	0-6"	12/22/04	83	***1.04***	10	***139***	***0.188***	0.45 U	0.23 U
WG-4	0-6"	12/22/04	116	***1.21***	7.2	***92***	***0.212***	1.46	0.25 U
WG-4.5	0-6"	4/22/05	51	0.43	4.7	***48***	0.064	0.55	0.08 U
WG-5	0-6"	12/22/04	141	***1.37***	6.6	***134***	0.141	1.41	0.2 U
WG-6	0-6"	4/22/05	8.73	0.22	4.24	2.48	0.012 U	0.12 U	0.06 U
WH-4	0-6"	4/22/05	17	0.33	4.72	16	0.032	0.24 U	0.12 U
WH-4.5	0-6"	4/22/05	8.91	0.22	3.51	3.41	0.011 U	0.12 U	0.06 U
WH-5	0-6"	12/22/04	94	0.82	6.07	***46***	0.17	1.38	0.16 U
WH-5.5	0-6"	4/22/05	34	0.35	4.49	13	0.04	0.77	0.11 U
WH.5-4.5	0-6"	4/22/05	17	0.34	4.3	11	0.024	0.14 U	0.07 U
WH.5-5	0-6"	4/22/05	37	0.44	5.4	15	0.047	0.93	0.12 U
WH.5-5.5	0-6"	4/22/05	12	0.25	3.12	12	0.024	0.16 U	0.08 U
WH-6	0-6"	4/22/05	-	-	-	-	-	-	-
WI-4	0-6"	4/22/05	93	***1.18***	6.09	***71***	0.128	3.01	0.33
WI-5	0-6"	4/22/05	27	0.51	8.86	6.72	0.031	1.64	0.12 U
WI-6	0-6"	4/22/05	88	0.97	5.26	***100***	0.114	1.36	0.18 U
WI.5-4	0-6"	4/22/05	14	0.19	3.73	5.44	0.038	0.71	0.11 U
WI.5-4.5	0-6"	4/22/05	54	0.48	11	14	0.13	2.18	0.22 U
WI.5-5	0-6"	4/22/05	63	0.65	11	***63***	0.12	2.43	0.23 U
WI.5-5.5	0-6"	4/22/05	51	0.56	6.57	13	0.08	2.15	0.2 U
Number of Samples			123	123	123	123	123	123	123
Number of Detections			123	123	123	123	116	62	15
Arithmetic Mean Concentration [1]			83	***1.05***	13.0	***98***	0.15	0.92	0.12
Median Concentration [1]			54	0.79	7.2	46	0.11	0.38	0.10
Maximum Detected Concentration			966	***5.75***	***79***	***810***	***2.06***	4.44	0.58
Upper Concentration Limit [2]			100,000	800	10,000	6,000	600	10,000	2,000
Natural Soil Background Level [3]			50	2	30	100	0.3	0.5	0.6
Method 1 S-1 Soil Standard [4]			1,000	30	1,000	300	20	400	100
Percentage Above S-1 Soil Standard			0%	0%	0%	8%	0%	0%	0%
Human Health Exposure Point Concentration			**83**	**1.05**	**13**	**98**	**0.15**	**0.92**	**NA**
Chronic Sediment Screening Level [5]			163,221 [6]	0.99	43.4	35.8	0.18	19.9 [6]	1 [12]
Percentage Above Sediment Screening Level			0%	39%	6%	54%	23%	0%	0%
Environmental Exposure Point Concentration			**83**	**1.17** [9]	**13**	**138** [9]	**0.18** [9]	**0.92**	**NA**

µg/kg = micrograms per kilogram.
mg/kg = milligrams per kilogram.
U = Undetected at quantitation limit presented.
J = Estimated concentration below quantitation limit.
R = Rejected; surrogate recovery < 10%.
E = Calibration range of instrument exceeded.
NE = Not established.
NA = Not applicable.

1. Non-detections included at one-half quantitation limit.
2. 310 CMR 40.0996(7).
3. MADEP (2002c). Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil. May.
4. 310 CMR 40.0975(a). Lower of S-1/GW-2 or S-1/GW-3 presented. Exceedances are shaded.
5. MADEP (2002b) Freshwater Sediment Screening Benchmarks for Use Under the Massachusetts Contingency Plan. May (unless otherwise noted). *Exceedances in italics.*
6. Calculated value; see associated spreadsheet.
7. Mean concentration at WD-25, -25A, -25B, -25C, and -25D used to avoid over-representing location.
8. Location sampled on two discrete days; the highest detected value or lowest quantitation limit presented.
9. Calculated by ProUCL (U.S. EPA 2004a).
10. Surrogates obscured by contaminants in sample.
11. Surrogates diluted out.
12. ER-L value (NOAA, 1999).

TABLE 3
CALCULATION OF CHRONIC SEDIMENT SCREENING VALUES
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Constituent	Organic Carbon/Water Partition Coefficient [1] (K_{OC}) (L/kg)	Fraction of Organic Carbon [2] (f_{OC}) (unitless)	Soil/Water Partition Coefficient [3] (K_D) (L/kg)	Chronic Surface Water Benchmark Concentration [4] (C_{SW}) (µg/L)	Calculated Chronic Sediment Screening Value [5] (C_{SED}) (µg/kg)
Acenaphthene	2,380	0.0364	--	23	1,993
Benzo(b)fluoranthene	73,000	0.0364	--	0.42	1,116
Benzo(k)fluoranthene	121,000	0.0364	--	0.14	617
Benzo(g,h,i)perylene	311,000	0.0364	--	0.02	226
Indeno(1,2,3-cd)pyrene	800,000	0.0364	--	0.14	4,077
Barium	--	--	316	41,000	163,221,000
Selenium	--	--	3,981	5	19,905

L/kg = liters per kilogram.

µg/L = micrograms per liter.

µg/kg = micrograms per kilogram.

1. TPHCWG (1998). Composition of Petroleum Mixtures. Amherst Scientific Publishing. May.
2. For screening values, the 5th percentile organic carbon concentration in Site soil/sediment samples was applied (Table 4).
3. U.S. EPA (1999a). Partition Coefficients for Metals in Surface Water, Soil, and Waste (draft). June 22.
4. MADEP (2004). Proposed revised Method 1 Numerical Standards (and supporting documentation). September.
5. $C_{sed} = C_{SW} \times (K_{oc} \times f_{oc})$ (for organic constituents) or $C_{SED} = C_{SW} \times K_D$ (for metals).

TABLE 4
CALCULATION OF UPPER AND LOWER PERCENTILES
OF SOIL/SEDIMENT TOTAL ORGANIC CARBON CONTENT
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Total Organic Carbon Data		
Ordered Data (%)	Rank	Percentile
2.3	1	1.6%
2.9	2	3.2%
3.45	3	4.8%
4.94	4	6.4%
5.92	5	8.0%
6.15	6	9.6%
6.69	7	11.2%
6.97	8	12.8%
7.37	9	14.4%
7.48	10	16.0%
8.53	11	17.6%
9.36	12	19.2%
11.49	13	20.8%
11.7	14	22.4%
12	15	24.0%
12.6	16	25.6%
13.14	17	27.2%
13.28	18	28.8%
13.7	19	30.4%
14.75	20	32.0%
15.1	21	33.6%
16.23	22	35.2%
17.09	23	36.8%
17.18	24	38.4%
17.56	25	40.0%
23	26	41.6%
24	27	43.2%
28	28	44.8%
28.6	29	46.4%
29.2	30	48.0%
30.27	31	49.6%
32.2	32	51.2%
33.4	33	52.8%
33.5	34	54.4%
37	35	56.0%
37.6	36	57.6%
38	37	59.2%
39	38	60.8%
39.9	39	62.4%
41	40	64.0%
41.9	41	65.6%
43.9	42	67.2%
44	43	68.8%
44.4	44	70.4%
45.2	45	72.0%
46	46	73.6%
46.9	47.5	76.0%
46.9	47.5	76.0%
48.6	48.5	77.6%
48.9	49.5	79.2%
50.5	50.5	80.8%
51	51.5	82.4%
53.7	52.5	84.0%
54.4	53.5	85.6%
54.6	54.5	87.2%
57.1	55.5	88.8%
58.6	56.5	90.4%
58.7	57.5	92.0%
61.8	58.5	93.6%
62.2	59.5	95.2%
62.5	60.5	96.8%
73.4	61.5	98.4%
73.5	62.5	100.0%
Mean Concentration		31.4
Median Concentration		32.2
5th percentile concentration[1]		3.64
95th percentile concentration[1]		62.2

1. Interpolated value.

TABLE 5
SUMMARY OF UPLAND GROUNDWATER ANALYTICAL RESULTS
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Sample No.	Sample Date	Benzene µg/L	Methyl tert-butyl ether µg/L	Naphthalene (VOC) µg/L	Toluene µg/L	Naphthalene (PAH) µg/L	Barium (total) µg/L	Vanadium (total) µg/L
TB/OW-22	10/31/02	U	1.1	2.5	1.7	U	260	U
TB/OW-2	10/31/02	U	U	U	1.8	U	80	U
TB/OW-18	10/31/02	U	U	U	1.4	U	140	10
TB/OW-6	10/31/02	0.76	U	6.5	1.9	3.6	1,300	U
Method 1 GW-2 Groundwater Standard [1]		2,000	50,000	6,000	6,000	6,000	NE	NE
Method 1 GW-3 Groundwater Standard [1]		7,000	50,000	6,000	50,000	6,000	30,000	2,000

Only detected constituents are presented.
Samples analyzed for:
- Extractable petroleum hydrocarbons
- Volatile organic compounds (VOCs)
- Polycyclic aromatic hydrocarbons (PAHs)
- PCBs as Aroclors
- Priority pollutant metals

µg/L = micrograms per liter.
U = Undetected (quantitation limits unavailable).
NE = Standard not established.
1. 310 CMR 40.0974(2).

TABLE 6
PROPERTIES OF CONSTITUENTS OF CONCERN
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Constituent	Water Solubility (S) (mg/L)	Vapor Pressure (VP) (atm)	Henry's Law Constant (H) (cm^3/cm^3)	Organic Carbon/ Water Partition Coefficient (K_{oc}) (cm^3/g)	n-Octanol/Water Partition Coefficient (K_{ow}) (cm^3/g)	Soil/Water Partition Coefficient (K_D) (cm^3/g)
PCBs (as Aroclor 1254)	0.01 [3]	0.0000001 [3]	0.155 [3]	998,000 [2]	1,070,000 [4]	NA
Acenaphthene	3.8 [1]	0.00002 [1]	0.0049 [1]	2,380 [1]	8,320 [1]	NA
Anthracene	0.045 [1]	0.0000008 [1]	0.0016 [1]	7,690 [1]	34,700 [1]	NA
Benzo(a)anthracene	0.011 [1]	0.000000006 [1]	0.00023 [1]	102,000 [1]	871,000 [1]	NA
Benzo(b)fluoranthene	0.0015 [1]	0.00000007 [1]	0.0000065 [5]	73,000 [1]	631,000 [1]	NA
Benzo(k)fluoranthene	0.0008 [1]	0.00000000004 [1]	0.0000065 [1]	121,000 [1]	1,000,000 [1]	NA
Benzo(g,h,i)perylene	0.0003 [1]	0.0000000002 [1]	0.000030 [1]	311,000 [1]	3,160,000 [1]	NA
Benzo(a)pyrene	0.0038 [1]	0.0000000002 [1]	0.000019 [1]	131,000 [1]	1,100,000 [1]	NA
Chrysene	0.0015 [1]	0.000000001 [1]	0.00018 [1]	81,400 [1]	309,000 [1]	NA
Fluoranthene	0.26 [1]	0.00000009 [1]	0.00042 [1]	27,800 [1]	166,000 [1]	NA
Fluorene	1.9 [1]	0.000007 [1]	0.0032 [1]	3,900 [1]	15,100 [1]	NA
Indeno(1,2,3-cd)pyrene	0.062 [1]	0.000000001 [1]	2.07E-11 [1]	800,000 [1]	10,000,000 [1]	NA
Phenanthrene	1.1 [1]	0.000001 [1]	0.0013 [1]	8,140 [1]	37,200 [1]	NA
Pyrene	0.132 [1]	0.0000001 [1]	0.00037 [1]	25,700 [1]	151,000 [1]	NA
Barium	NA	NA	NA	NA	NA	316 [6]
Cadmium	NA	NA	NA	NA	NA	1,995 [6]
Chromium (total)	NA	NA	NA	NA	NA	75,433 [6]
Lead	NA	NA	NA	NA	NA	39,810 [6]
Mercury	NA	NA	NA	NA	NA	7,943 [6]
Selenium	NA	NA	NA	NA	NA	3,981 [6]

mg/L = milligrams per liter.

atm = atmospheres.

cm^3/cm^3 = cubic centimeters per cubic centimeter (also, unitless).

cm^3/g = cubic centimeters per gram (also, liters per kilogram).

NA = Not applicable or not available.

1. Total Petroleum Hydrocarbon Criteria Working Group (1998). Composition of Petroleum Mixtures. May. Amherst Scientific Publishing. May.
2. U.S. EPA (1999). Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, EPA-530-D-99-001A, August.
3. U.S. EPA (1998). Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Peer Review Draft. EPA-530-D-98-001A, July.
4. U.S. EPA (2004b). Water9, Version 2.0.0, Database.
5. Assumed the same as benzo(k)fluoranthene.
6. U.S. EPA (1999a). Partition Coefficients for Metals in Surface Water, Soil, and Waste (Draft). June 22.

TABLE 7
SUMMARY OF HUMAN HEALTH TOXICITY VALUES AND RELATIVE ABSORPTION FACTORS
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Constituent	Carcinogenic Weight of Evidence Category [1]	Chronic Oral Reference Dose (RfD) (mg/kg-dy)		Chronic Inhalation Reference Concentration (RfC) (mg/m^3)		Oral Cancer Slope Factor (SF) $[(mg/kg\text{-}dy)^{-1}]$		Inhalation Cancer Unit Risk (UR) $[(mg/m^3)^{-1}]$		Relative Absorption Factors[3] (RAF) (unitless)		
										Soil		Surface Water
										Oral	Dermal	Oral
PCB (as Aroclor 1254)	B2	0.00002	[2]	0.00002	[4]	2	[2]	0.1	[2]	0.85	0.16	1
Acenaphthene	Not assessed	0.06	[2]	0.05	[4]	--		--		0.36	0.1	1
Anthracene	D	0.3	[2]	0.05	[4]	--		--		0.36	0.1	1
Benzo(a)anthracene	B2	0.03	[4]	0.05	[4]	0.73	[5]	0.21	[5,6]	0.28	0.02	1
Benzo(b)fluoranthene	B2	0.03	[4]	0.05	[4]	0.73	[5]	0.21	[5,6]	0.28	0.02	1
Benzo(k)fluoranthene	B2	0.03	[4]	0.05	[4]	0.073	[5]	0.021	[5,6]	0.28	0.02	1
Benzo(g,h,i)perylene	D	0.03	[4]	0.05	[4]	--		--		0.36	0.1	0.91
Benzo(a)pyrene	B2	0.03	[4]	0.05	[4]	7.3	[2]	2.1	[6]	0.28	0.02	1
Chrysene	B2	0.03	[4]	0.05	[4]	0.073	[5]	0.021	[5,6]	0.28	0.02	1
Fluoranthene	D	0.04	[2]	0.05	[4]	--		--		0.36	0.1	1
Fluorene	D	0.04	[2]	0.05	[4]	--		--		0.36	0.1	1
Indeno(1,2,3-cd)pyrene	B2	0.03	[4]	0.05	[4]	0.73	[5]	0.21	[5,6]	0.28	0.02	1
Phenanthrene	D	0.03	[4]	0.05	[4]	--		--		0.36	0.1	0.91
Pyrene	D	0.03	[2]	0.05	[4]	--		--		0.36	0.1	1
Barium	D	0.07	[2]	0.0005	[4]	--		--		1	0.05	1
Cadmium	B1 (inhal)	0.001	[2,7]	0.00002	[4]	--		1.8	[2]	1	0.14	1
Chromium (total)	D	1.5	[2]	5	[6]	--		--		1	0.04	1
Lead	B2	0.00075	[3]	0.001	[4]	--		--		0.5	0.006	0.5
Mercury	D/C	0.0003	[2,8]	0.0003	[2]	--		--		1	0.05	1
Selenium	D	0.005	[2]	0.003	[4]	--		--		1	0.002	1

"--- " No information available

mg/kg-dy = milligrams per kilogram per day.

mg/m^3 = milligrams per cubic meter.

$(mg/kg\text{-}dy)^{-1}$ = risk per (milligram per kilogram per day).

$(mg/m^3)^{-1}$ = risk per (milligram per cubic meter).

1. U.S. EPA's Weight of Evidence Category with respect to human carcinogenicity:
   - B1/B2 = Probable human carcinogen
   - C = Possible human carcinogen
   - D = Not classifiable as to human carcinogenicity
2. U.S. EPA (2005). Integrated Risk Information System (IRIS), online database accessed March.
3. MADEP (2004). Proposed revised Method 1 Numerical Standards and supporting documentation. September.
4. MADEP (2004a). Revisions to Dose-Response Values Used in Human Health Risk Assessment. August 18.
5. Extrapolated from benzo(a)pyrene SF, using toxicity equivalency factors in MADEP (1995) Guidance for Disposal Site Risk Characterization.
6. No inhalation value available; calculated from oral RfD or SF, assuming a 20 m^3/day inhalation rate for a 70 kg adult.
7. Value for "food."
8. Value for mercuric chloride.

TABLE 8
SUMMARY OF HUMAN HEALTH EXPOSURE FACTORS
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Exposure Factor	Value	Reference
Soil/Sediment exposure point concentration (C_{soil})	Constituent-specific	The arithmetic mean concentration of each constituent of concern (COC) in soil/sediment is applied as the soil exposure point concentration, consistent with MCP guidance [310 CMR 40.0926(3)].
Surface water exposure point concentration (C_{SW})	Constituent-specific	Potential surface water concentrations are estimated from soil/sediment EPCs using equilibrium partitioning (Table 10).
Air particle exposure point concentration (C_{air})	Constituent-specific	Air particle exposure point concentrations are derived from soil/sediment EPCs, assuming an air particle concentration of 32 $\mu g/m^3$, per MADEP guidance (MADEP 1995).
Soil/sediment ingestion rate (IR_S)	100 mg/day (child) 50 mg/day (youth) 50 mg/day (adult)	Values recommended by MADEP (1995).
Surface water ingestion rate (IR_{SW})	50 mL/day	Value recommended in MADEP (1995).
Relative absorption factor, oral, soil/water (RAFo)	1	All constituents assumed 100% absorbed through the oral route.
Exposed skin surface area, soil/sediment) (SA_{soil})	1,351 cm^2 (child) 2,928 cm^2 (youth) 3,107 cm^2 (adult)	Values correspond to exposure of hands, forearms and feet, using guidance from MADEP (1995) and MADEP (2002a).
Soil adherence factor, (AF_{soil})	0.52 mg/cm^2 (child) 0.14 mg/cm^2 (youth) 0.1 mg/cm^2 (adult)	Calculated from body part-specific adherence factors (MADEP 2002a).
Dermal absorption per exposure event (DA_{Event})	Constituent-specific	Calculated by method described in U.S. EPA (2004) (Table 9).
Relative absorption factor, dermal (RAFd)	Constituent-specific	Values used in MADEP (2004).
Particulate matter concentration in air (PM_{10})	32 $\mu g/m^3$	Value recommended for non-excavation-type scenarios (MADEP 1995).

TABLE 8 (continued)
SUMMARY OF HUMAN HEALTH EXPOSURE FACTORS
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Exposure Factor	Value	Reference
Exposure frequency (EF)	80 events per year	Value is assumed, corresponding to exposure four times per week in June, July and August and twice per week in April, May, September, and October.
Exposure duration (ED)	1 day/event (soil/sediment) 5.6 hours per event (air)	Soil/sediment value is conventional value. Air exposure duration for trespassers is based on data on trespassing activities presented in U.S. EPA (1997).
Exposure period (EP)	7 years (child) 7 years (youth) 16 years (adult)	Age-specific breakdown used by MADEP (2004) for a 30-year total exposure.
Body weight (BW)	17 kg (child) 39.9 kg (youth) 58.7 kg (adult)	Values used in MADEP (2004).
Averaging period (AP)	Non-carcinogens: 7 years (child) 7 years (youth) 16 years (adult) Carcinogens: 70 years	Conventional averaging time for non-carcinogens (same as exposure period) and carcinogens (lifetime).

MADEP (2004). Proposed revised Method 1 Numerical Standards and Supporting Documentation, September.
MADEP (2002a). Technical Update: Weighted Skin-Soil Adherence Factors. April.
MADEP (1995). Guidance for Disposal Site Risk Characterization in Support of the Massachusetts Contingency Plan. Interim Final Policy WSC/ORS-95-141, July.
U.S. EPA (2004). Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual (Part E: Supplemental Guidance for Dermal Risk Assessment). Final. EPA/540/R/99/005, July.
U.S. EPA (1997). Exposure Factors Handbook. EPA/600/P-95/002Fb. August.
U.S. EPA (1996). Soil Screening Guidance: Technical Background Document. Publication 9355.4-17A, May.

TABLE 9
CALCULATION OF DERMAL ABSORPTION FROM SURFACE WATER CONTACT
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Organic constituents with $t_{event} < t^*$

$$DA_{event} = 2 \cdot FA \cdot K_p \cdot C_w \cdot \sqrt{\frac{6 \cdot \tau \cdot t_{event}}{\pi}}$$

$t^* = 2.4\tau$ for B <= 0.6

$t^* = \tau \cdot \left(b - \sqrt{b^2 - c^2}\right)$ for B > 0.6

Inorganic constituents

$$DA_{event} = K_p \cdot C_w \cdot t_{event})$$

(All equations from reference 1).

$$B = K_p \frac{\sqrt{MW}}{2.6}$$

$$b = \frac{2 \cdot (1+B)^2}{\pi} - c$$

$$\text{Log } K_p = -2.8 + 0.66 \cdot \text{Log } K_{ow} - 0.0056\ MW$$

$$c = \frac{1 + 3B + 3B^2}{3 \cdot (1+b)}$$

$$\tau = 0.105 \cdot 10^{(0.0056MW)}$$

where:

DA_{event} =	Dermal absorption per event per mg/cm^3 [(mg/cm^2-event)/(mg/cm^3)]	t^* =	Time to reach steady state (= 2.4 x t_{event})
FA =	Fraction of dose absorbed (unitless)	MW =	Constituent molecular weight (g/g-mole)
K_p =	Dermal permeability constant (cm/hr)	K_{ow} =	Constituent octanol/water partition coefficient (unitless)
C_w =	Chemical concentration in water (1 mg/cm^3 assumed)	B =	Ratio of constituent permeability constant through stratum corneum relative to its permeability constant across viable epidermis (unitless)
τ =	Lag time per event (hr/event)		
t_{event} =	Event duration (hr/event)	b =	Empirical correlation coefficent (unitless)
π =	Pi (3.14)	c =	Empirical correlation coefficent (unitless)

Constituent	MW[2] (g/mole)	log Kow[2] (cm^3/g)	Kp (cm/hr)	B (cm/hr)	b (unitless)	c (unitless)	τ (hr/event)	t_{event}[3] (hr/event)	t^* (hr)	FA[1] (unitless)	DA_{event} [mg/cm^2-event]/[mg/cm^3]	DA_{event} [mg/cm^2-event]/[mg/L]
Acenaphthene	154.21	3.92	0.08	0.4	-	-	0.77	0.25	1.84	1	0.10	1.02E-04
Anthracene	178.2	4.54	0.16	0.8	1	1.0	1.04	0.25	4.01	1	0.22	2.23E-04
Benzo(a)anthracene	228.3	5.94	0.69	4.0	12	4.1	1.99	0.25	8.61	1	1.36	1.36E-03
Benzo(b)fluoranthene	252	5.80	0.41	2.5	5	2.6	2.71	0.25	11.26	1	0.94	9.41E-04
Benzo(k)fluoranthene	252	6.00	0.56	3.4	9	3.5	2.71	0.25	11.55	1	1.28	1.28E-03
Benzo(g,h,i)perylene	268.4	6.50	0.97	6.1	26	6.2	3.34	0.25	14.81	1	2.45	2.45E-03
Benzo(a)pyrene	250	6.04	0.61	3.7	10	3.8	2.64	0.25	11.32	1	1.37	1.37E-03
Chrysene	228.3	5.49	0.35	2.0	4	2.1	1.99	0.25	8.14	1	0.68	6.84E-04
Fluoranthene	202.3	5.22	0.33	1.78	3	1.9	1.43	0.25	5.75	1	0.54	5.37E-04
Fluorene	166.2	4.18	0.11	0.53	-	-	0.90	0.25	2.15	1	0.14	1.40E-04
Indeno(1,2,3-cd)pyrene	276.3	7.00	1.87	12.0	95	12.0	3.70	0.25	16.86	0.6	2.99	2.99E-03
Phenanthrene	178.2	4.57	0.165	0.8	1	1.0	1.04	0.25	4.01	1	0.23	2.34E-04
Pyrene	202.3	5.18	0.306	1.7	3	1.8	1.43	0.25	5.71	1	0.51	5.05E-04
Barium	-	-	0.001	-	-	-	-	0.25	-	1	0.0003	2.50E-07
Cadmium	-	-	0.001	-	-	-	-	0.25	-	1	0.0003	2.50E-07
Chromium (total)	-	-	0.001	-	-	-	-	0.25	-	1	0.0003	2.50E-07
Lead	-	-	0.001	-	-	-	-	0.25	-	1	0.0003	2.50E-07
Mercury	-	-	0.001	-	-	-	-	0.25	-	1	0.0003	2.50E-07
Selenium	-	-	0.001	-	-	-	-	0.25	-	1	0.0003	2.50E-07
PCB (Aroclor 1254)	361	6.03	0.144	1.1	1	1.2	11.04	0.25	42.62	0.5	0.33	3.31E-04

1. U.S. EPA (2004). Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual (Part E: Supplemental Guidance for Dermal Risk Assessment). Final. EPA/540/R/99/005, July.
2. Molecular weights and octanol/water partition coefficients from:
   TPHCWG (1998). Composition of Petroleum Mixtures. Amherst Scientific Publishing. May.
   U.S. EPA (2004b), Water9, Version 2.2.0 database. (for PCBs).
3. Assumed 15 minute cumulative exposure to surface water per event.

TABLE 10
CALCULATION OF SEDIMENT INTERSTITIAL WATER AND SURFACE WATER CONCENTRATIONS OF COCS
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Constituent	Sediment Exposure Point Concentration (Human Health) C_{SED} (mg/kg)	Sediment Exposure Point Concentration (Environmental) C_{SED} (mg/kg)	Organic Carbon/Water Partition Coefficient K_{oc} (L/kg)	Sediment/Water Partition Coefficient K_D (L/kg)	Organic Carbon Fraction of Sediment f_{oc} (fraction)	Sediment Interstitial Water Concentration [1] (Human Health) C_{SWi} (mg/L)	Estimated Surface Water Concentration [2] (Human Health) C_{SW} (mg/L)	Sediment Interstitial Water Concentration [1] (Aquatic Invertebrates) C_{SWi} (mg/L)	Estimated Surface Water Concentration [2] (Amphibian/Avian/ Mammalian) C_{SW} (mg/L)
PCBs (as Aroclor 1254)	0.908	2.09	998,000 [3]	--	0.314	2.90E-06	2.90E-07	6.67E-06	6.67E-07
Acenaphthene	0.191	0.191	2,380 [4]	--	0.314	2.56E-04	2.56E-05	2.56E-04	2.56E-05
Anthracene	0.203	0.221	7,690 [4]	--	0.314	8.41E-05	8.41E-06	9.15E-05	9.15E-06
Benzo(a)anthracene	0.255	0.401	102,000 [4]	--	0.314	7.96E-06	7.96E-07	1.25E-05	1.25E-06
Benzo(b)fluoranthene	0.274	0.274	73,000 [4]	--	0.314	1.20E-05	1.20E-06	1.20E-05	1.20E-06
Benzo(k)fluoranthene	0.218	0.218	121,000 [4]	--	0.314	5.74E-06	5.74E-07	5.74E-06	5.74E-07
Benzo(g,h,i)perylene	0.213	0.213	311,000 [4]	--	0.314	2.18E-06	2.18E-07	2.18E-06	2.18E-07
Benzo(a)pyrene	0.249	0.395	131,000 [4]	--	0.314	6.05E-06	6.05E-07	9.60E-06	9.60E-07
Chrysene	0.246	0.377	81,400 [4]	--	0.314	9.62E-06	9.62E-07	1.47E-05	1.47E-06
Fluoranthene	0.329	0.329	27,800 [4]	--	0.314	3.77E-05	3.77E-06	3.77E-05	3.77E-06
Fluorene	0.191	0.203	3,900 [4]	--	0.314	1.56E-04	1.56E-05	1.66E-04	1.66E-05
Indeno(1,2,3-cd)pyrene	0.208	0.208	800,000 [4]	--	0.314	8.28E-07	8.28E-08	8.28E-07	8.28E-08
Phenanthrene	0.274	0.446	8,140 [4]	--	0.314	1.07E-04	1.07E-05	1.74E-04	1.74E-05
Pyrene	0.351	0.623	25,700 [4]	--	0.314	4.35E-05	4.35E-06	7.72E-05	7.72E-06
Barium	83	83	--	316 [5]	0.314	2.63E-01	2.63E-02	2.63E-01	2.63E-02
Cadmium	1.05	1.17	--	1,995 [5]	0.314	5.26E-04	5.26E-05	5.86E-04	5.86E-05
Chromium	13	13	--	75,433 [5]	0.314	1.72E-04	1.72E-05	1.72E-04	1.72E-05
Lead	98	138	--	39,810 [5]	0.314	2.46E-03	2.46E-04	3.47E-03	3.47E-04
Mercury	0.15	0.18	--	7,943 [5]	0.314	1.89E-05	1.89E-06	2.27E-05	2.27E-06
Selenium	0.92	0.92	--	3,981 [5]	0.314	2.31E-04	2.31E-05	2.31E-04	2.31E-05

mg/kg = milligrams per kilogram.
L/kg = liters per kilogram.
mg/L = milligrams per liter.
"--" = Value not applicable.

1. Estimated for organic constituents as as $C_{SWi} = C_{sed}/(f_{OC} \times K_{OC})$. Estimated for inorganic constituents as $C_{SWi} = C_{sed}/K_D$
2. One-tenth of the predicted sediment interstitial water concentration.
3. U.S. EPA (1999). Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. EPA-530-D-99-001A, August.
4. Total Petroleum Hydrocarbon Criteria Working Group (1998). Composition of Petroleum Mixtures. Amherst Scientific Publishing.
5. U.S. EPA (1999a) Partition Coefficients for Metals in Surface Water, Soil, and Waste (draft). June 22.

TABLE 11
SUMMARY OF THREATENED OR ENDANGERED ENVIRONMENTAL SPECIES
OR SPECIES OF SPECIAL CONCERN IN NEW BEDFORD
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Common (Scientific) Name	Taxonomic Group	State or Federal Rank	Habitat[1]
Marbled salamander (Ambystoma opacum)	Amphibian	Threatened (state)	Largely terrestrial, generally occurring in deciduous woods of the southern hardwood type, dominated by oak and hickory species with White Pine. Wooded vernal ponds or shallow depressions are required for breeding sites.
Eastern worm snake (Carphophis amoenus)	Reptile	Threatened (state)	Inhabits damp hilly woodlands, farmland that borders woodland, and partially wooded/grassy hillsides above streams. During dry periods they retreat underground where the soil is moister.[2]
Spotted turtle (Clemmys guttata)	Reptile	Species of special concern (state)	Inhabit both forested and non-forested wetlands, require a soft substrate for burrowing, and prefer areas with aquatic vegetation. Hatchlings consume land and water insects, worms, and snails; adults feed exclusively underwater.
Eastern box turtle (Terrapene Carolina)	Reptile	Species of special concern (state)	Terrestrial; inhabits both dry and moist woodlands, brushy fields, thickets, marshes, bogs, stream banks, and well-drained bottomland.
Least Tern (Sterna antillarum)	Bird	Species of special concern (state); Endangered (federal)	Inhabits coastal beaches and barrier islands; not found inland.
Arctic tern (Sterna paradisaea)	Bird	Species of special concern (state)	Inhabits sandy, gravelly areas on island and barrier spits and, occasionally, on mainland shores.
Mystic Valley amphipod (Crangonyx aberrans)	Crustacean	Species of special concern (state)	Proposed for removal from state list.[3]
American clam shrimp (Limnadia lenticularis)	Crustacean	Species of special concern (state)	Inhabits ephemeral (vernal) ponds.
Coastal swamp amphipod (Synurella chamberlaini)	Crustacean	Species of special concern (state)	Inhabits heavily vegetated, coastal wetland outlet streams of red maple and white cedar swamps in Buzzards Bay moraine deposits; elsewhere, in small streams, bogs, ponds, ditches.
Attenuated bluet damselfly (Enallagma daeckii)	Damselfly	Species of special concern (state)	Semi-aquatic insect; inhabits wetlands, most numerous on highly vegetated lakes and ponds. Also found in swamps, sandy ponds and vegetated stream backwaters. Nymphs are aquatic.
Pale green pinion moth (Lithophane viridipallens)	Moth	Species of special concern (state)	Inhabits moderately dry to wet pine and hardwood forests and in swamps.
Narrow-leaved spring beauty (Claytonia virginica)	Vascular plant	Endangered (state)	Grows in rich mesic (moderately moist), deciduous woods, thickets, and clearings composed of alluvial soils that are seasonally flooded.
Lesser snakeroot (Eupatorium aromaticum)	Vascular plant	Endangered (state)	Herbaceous perennial; grows in open, dry oak/hickory/white pine/red maple woods which were recently subjected to recent burns; it is believed that fire plays an important role in seed germination and establishment of colonies.

TABLE 11 (Continued)
SUMMARY OF THREATENED OR ENDANGERED ENVIRONMENTAL SPECIES
OR SPECIES OF SPECIAL CONCERN IN NEW BEDFORD
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Common (Scientific) Name	Taxonomic Group	State or Federal Rank	Habitat[1]
Purple cudweed (Gamochaeta purpurea)	Vascular plant	Endangered (state)	Grows in old fields, thickets, prairies, stream banks, open woodlands.[4]
Saltpond pennywort (Hydrocotyle verticillata)	Vascular plant	Threatened (state)	Member of parsley family; an aquatic herb growing along sandy to peaty margins or brackish ponds very near the ocean.
Bead pinweed (Lechea pulchella var moniliformis)	Vascular plant	Endangered (state)	Dry to moist sandy plains, shores, and open woods.[5]
New England blazing star (Liatris scariosa var . novae-angliae; syn borealis)	Vascular plant	Species of special concern (state)	Grows in open areas with dry, sandy, low nutrient soil, usually sand plain grasslands and coastal heathlands, or areas with early to mid-successional communities (e.g., absence of trees).
Rigid flax (Linum medium var texanum)	Vascular plant	Threatened (state)	Also called stiff yellow flax. No habitat information located.
Heartleaf twayblade (Listera cordata)	Vascular plant	Endangered (state)	Grows in wet, mossy coniferous woods.
Adder's-tongue fern (Phioglossum pusillum)	Vascular plant	Threatened (state)	Grows in boggy meadows, acidic fens, borders of marshes, wet fields, and moist woodland clearings.
Pale green orchis (Platanthera flava var herbiola)	Vascular plant	Threatened (state)	Prefers sunny to semi-shaded habitat where soils are rich, moderately acidic, and wet, and where periodic flooding or water level fluctuations are common.
Canadian sanicle (Sanicula canadensis)	Vascular plant	Threatened (state)	Grows in moist or dry open woods, preferring mesic slopes in stream valleys or lake margins.
Swamp oats (Sphenipholis pensylvanica)	Vascular plant)	Threatened (state)	Grows in a variety of wet places in full sun; swamps, along streams, wet woods, wet meadows. Sensitive to drainage modifications.[6]

1. From the Massachusetts National Heritage and Endangered Species Program (www.mass.gov/dfwele/dfw/nhesp/nhesp.htm), unless otherwise noted.
2. Ohio Public Library Information Network (2001). www.oplin.org/snake/fact%20pages/worm_snake_eastern/worm_snake_eastern.html.
3. Massachusetts Department of Fish and Game (2003). Press release, January 28. (www.mass.gov/dfwele/press/prs0301.htm#ItemB).
4. U.S. Geological Survey Northern Prairie Wildlife Research Center (undated). (www.npwrc.usgs.gov/resource/1999/soutflor/species/8/gamopurp.htm).
5. Ohio Department of Natural Resources (1993) (www.ohiodnr.com/dnap/heritage/..%5CAbstracts%5CK-L%5CLECHPULC.htm).
6. Ohio Department of Natural Resources (1984). (www.ohiodnr.com/dnap/heritage/..%5CAbstracts%5CS%5Csphepens.htm).

TABLE 12
SUMMARY OF REPRESENTATIVE ENVIRONMENTAL RECEPTORS AND EXPOSURE PATHWAYS
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Class	Species (Common name)	Assessment endpoint	Feeding Habit [1]	Exposure Pathways [1]	Basis of Exposure
Oligochaete	Terrestrial invertebrates (earthworms)	Survival	--	Direct exposure	Constituent concentrations in soil
Crustacean	Aquatic invertebrates (e.g., scuds)	Survival	--	Direct exposure	Constituent concentrations in sediment interstitial water
Amphibian	Green Frog (embryonic/juvenile)	Survival, growth, reproducibility	--	Direct exposure	Constituent concentrations in surface water
Avian	American Robin	Survival, growth, reproducibility	Omnivore	Diet: 62% vegetation 38% terrestrial invertebrates Surface water ingestion Soil ingestion	Constituent concentrations in vegetation Constituent concentrations in terrestrial invertebrates Constituent concentrations in surface water Constituent concentrations in soil
	Red-tailed Hawk	Survival, growth, reproducibility	Carnivore	Diet: 100% Small mammals Surface water ingestion Soil ingestion	Constituent concentrations in mammalian prey species Constituent concentrations in surface water Constituent concentrations in soil
Mammalian	Short-tailed Shrew	Survival, growth, reproducibility	Insectivore	Diet: 83% Terrestrial invertebrates 17% Vegetation Surface water ingestion Soil ingestion	Constituent concentration in terrestrial invertebrates Constituent concentrations in vegetation Constituent concentrations in surface water Constituent concentrations in soil
	Raccoon	Survival, growth, reproducibility	Omnivore	Diet: 58% Vegetation 25% Small mammals 17% Terrestrial invertebrates Surface water ingestion Soil ingestion	Constituent concentrations in vegetation Constituent concentrations in mammalian prey species Constituent concentrations in terrestrial invertebrates Constituent concentrations in surface water Constituent concentrations in soil

1. Refer to risk calculation sheets in Appendices D and E for reference sources.

TABLE 13
SUMMARY OF ENVIRONMENTAL EXPOSURE FACTORS
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Exposure Factor	Value	Reference
American Robin		
Soil ingestion rate (IR_{soil})	0.0143 kgDW/kgBW-dy	From Table 5-1 of U.S. EPA (1999).
Food ingestion rate (IR_{food})	0.44 kgWW/kgBW-dy	From Table 5-1 of U.S. EPA (1999).
Water ingestion rate (IR_{SW})	0.137 L/kgBW-dy	From Table 5-1 of U.S. EPA (1999).
Fraction in diet of i^{th} food type (F_i)	0.62 (62%) vegetation 0.38 (38%) invertebrates	Average values for spring, summer, fall and spring in the eastern United States (U.S. EPA 1993).
Total organism foraging area (FA)	1.2 acres	Average value of 0.5 hectares for adult male and females (U.S. EPA 1993).
Red-Tailed Hawk		
Soil ingestion rate (IR_{soil})	0.00995 kgDW/kgBW-dy	From Table 5-1 of U.S. EPA (1999), assuming soil is 10% of diet.
Food ingestion rate (IR_{food})	0.185 kgWW/kgBW-dy	From Table 5-1 of U.S. EPA (1999).
Fraction in diet of i^{th} food type (F_i)	1.0 (100%) small mammals	Has an all animal diet, consuming primarily rabbits and squirrels (U.S. EPA 1993).
Water ingestion rate (IR_{SW})	0.057 L/kgBW-dy	From U.S. EPA (1999).
Total organism foraging area (FA)	1,700 acres	Based on an average winter foraging area in Michigan of 697 hectares (ha), with a range of 381 to 989 ha (U.S. EPA 1993).

TABLE 13
SUMMARY OF ENVIRONMENTAL EXPOSURE FACTORS (Continued)
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Exposure Factor	Value	Reference
Short-tailed shrew		
Soil ingestion rate (IR_{soil})	0.0145 kgDW/kgBW-dy (0.00022 kgDW/dy)	Assuming 10% of food ingestion rate and an average 71% food moisture (68% for invertebrates and 88% for vegetation) [=(0.5)(0.1)(1-0.71)].
Food ingestion rate (IR_{food})	0.5 kgWW/kgBW-dy (0.0075 kgWW/dy)	Average reported value (U.S. EPA 1993).
Water ingestion rate (IR_{SW})	0.151 L/kgBW-dy (0.0023 L/dy)	From Table 5-1 of U.S. EPA (1999).
Body Weight (BW)	0.015 kgBW	Representative value from U.S. EPA (1993).
Fraction in diet of i^{th} food type (F_i)	0.83 (83%) invertebrates 0.17 (17%) vegetation	Reportedly consumes primarily invertebrates, including earthworms, slugs, snails, beetles, and moth larvae, in addition to fungi and vegetation (U.S. EPA 1993).
Total organism foraging area (FA)	0.9-acre	Midpoint of home ranges for Michigan and New York (U.S. EPA 1993).
Raccoon		
Soil ingestion rate (IR_{soil})	0.0058 kgDW/kgBW-dy	Assuming 10% of food ingestion rate and an average 80% food moisture (68% for invertebrates and 88% for vegetation) [=(0.29)(0.1)(1-0.8)].
Food ingestion rate (IR_{food})	0.29 kg/kgBW-dy	Estimated from the regression equation $IR = 0.0687(wt)^{0.822}$ and an average body weight of 5.8 kg (average of mean reported values for adult male and females) (U.S. EPA 1993).
Water ingestion rate (IR_{SW})	0.08 L/kgBW-dy	U.S. EPA (1993). Mean value for adult males and females.
Fraction in diet of i^{th} food type (F_i)	0.58 (58%) vegetation 0.25 (25%) mammals 0.17 (17%) invertebrates	U.S. EPA (1993). From a study of summer diet of raccoons in New York.
Total organism foraging area (FA)	390 acres	U.S. EPA (1993). Average of mean values for adult males and females in a Michigan riparian environment.

TABLE 13
SUMMARY OF ENVIRONMENTAL EXPOSURE FACTORS (Continued)
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Exposure Factor	Value	Reference
All Receptors		
Bioavailability from soil and food ($BA_{soil/food}$)	All organics: 1 Metals: Constituent-specific	Values for metals obtained from Risk Assessment Information System (RAIS) (http://risk.lsd.ornl.gov/index.shtml) and are presented on calculation spreadsheets. Assumed applicable to both mammals and avian species.
Soil-to-Plant soil bioconcentration factor (BCF_r)	Constituent-specific [(mg/kgDW)/(mg/kg soil)]	From values listed in Appendix C of U.S. EPA (1999) or calculated by the following regression equation: log BCF = 1.588 - 0.578 x log K_{ow} (U.S. EPA 1999).
Soil-to-Soil invertebrate bioconcentration factor (BCF_{ssi})	Constituent-specific [(mg/kgWW)/(mg/kg soil)]	From values listed in Appendix C of U.S. EPA (1999) or surrogate values based on structural similarities.
Food-to-Wildlife bioaccumulation factor (BA_{mammal})	Constituent-specific (dy/kgWW)	Calculated for organic constituents by: BA_{mammal} =-7.6 + log K_{ow}, (U.S. EPA 1993). Values for inorganic constituents back-calculated from BCF values for short-tailed shrew, using a soil ingestion rate of 0.0145 kgDW/kgbw-dy and a body weight of 0.015 kg (U.S. EPA 1999).

mg = milligram.
kg = kilogram.
kgBW = kilograms body weight.
dy = day.
L = liter.
DW = dry weight.
WW = wet (fresh) weight.
ORNL (2005). Risk Assessment Information System (http://risk.lsd.ornl.gov/index.shtml).
U.S. EPA (1999). Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. EPA 530-D-99-001A, August.
U.S. EPA (1993). Wildlife Exposure Factors Handbook. EPA/600/R-93/187a, December.

TABLE 14
SUMMARY OF 95th PERCENTILE UPPER CONFIDENCE LIMITS
FOR ENVIRONMENTAL RISK CHARACTERIZATION
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Constituent	No. Samples[1]	Model-Recommended Statistical Distribution[2]	Upper Confidence Limit (UCL) on Mean[2] (mg/kg)	Model-Recommended UCL Method[2]
PCBs	124	Non-parametric	2.089	97.5% Chebyshev (Mean, SD) UCL
Anthracene	122	Log-normal	0.221	95% H-UCL
Benzo(a)anthracene	122	Non-parametric	0.401	95% Chebyshev (Mean, SD) UCL
Benzo(a)pyrene	122	Non-parametric	0.395	95% Chebyshev (Mean, SD) UCL
Chrysene	122	Non-parametric	0.377	95% Chebyshev (Mean, SD) UCL
Fluorene	122	Log-normal	0.203	95% H-UCL
Phenanthrene	122	Non-parametric	0.446	95% Chebyshev (Mean, SD) UCL
Pyrene	122	Non-parametric	0.623	95% Chebyshev (Mean, SD) UCL
Cadmium	123	Log-normal	1.17	95% H-UCL
Lead	123	Log-normal	138	95% H-UCL
Mercury	123	Log-normal	0.18	95% H-UCL

mg/kg = milligrams per kilogram.

1. The average of WD-25, WD-25A, WD-25B, WD-25C, and WD-25D is applied as one data point.
   The maximum detected concentration or lowest quantitation limit (if not detected) is applied for WE-6, which was sampled twice.
2. Through application of ProUCL Version 3.0 (U.S. EPA 2004a) (Appendix C).

TABLE 15
SUMMARY OF TOXICITY REFERENCE VALUES
FOR TERRESTRIAL INVERTEBRATES
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Constituent	U.S. EPA (1999)[1]	U.S. DOE (1997)[2]	U.S. EPA ECO-SSL[3]	Selected Toxicity Reference Value (TRV)
	Acute	Acute	Chronic	
	(mg/kg)			
PCBs (as Aroclor 1254)	251 [4]	--	--	251
Acenaphthene	--	--	--	170 [6]
Anthracene	--	--	--	170 [6]
Benzo(a)anthracene	--	--	--	25 [7]
Benzo(b)fluoranthene	--	--	--	25 [7]
Benzo(k)fluoranthene	--	--	--	25 [7]
Benzo(g,h,i)perylene	--	--	--	170 [6]
Benzo(a)pyrene	--	25 [5]	--	25
Chrysene	--	--	--	25 [7]
Fluoranthene	--	--	--	170 [6]
Fluorene	--	170	--	170
Indeno(1,2,3-cd)pyrene	--	--	--	25 [7]
Phenanthrene	--	--	--	170 [6]
Pyrene	--	--	--	170 [6]
Barium	--	--	330	330
Cadmium	--	440	140	440
Chromium (total)	--	--	57 [8]	57
Lead	--	5,491	1,700	5,491
Mercury	--	2.5	--	2.5
Selenium	77	--	--	77

mg/kg = milligram per kilogram.

1. U.S. EPA (1999). Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Volume 3, Appendix E, Table E-6. EPA-530-DD-99-001A, August.
2. Efroymson RA et al. (1997). Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process. Lowest LC50 value listed in Table A-1, unless otherwise noted.
3. U.S. EPA (2005b). Ecological Soil Screening Levels (http://www.epa.gov/ecotox/ecossl/).
4. Median LC50 (median lethal concentration) value.
5. No values for earthworms; value presented is no observed effect level (NOEL) for common wood louse (endpoint: change in growth efficiency).
6. Value for fluorene applied to all non-carcinogenic PAHs.
7. Value for benzo(a)pyrene applied to all carcinogenic PAHs.
8. Not EcoSSL, but study cited in source document [maximum acceptable toxicant concentration (MATC)] (U.S. EPA 2005b).

TABLE 16
SUMMARY OF TOXICITY REFERENCE VALUES
FOR AQUATIC INVERTEBRATES
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Constituent	U.S. EPA Ambient Water Quality Standard [1]	U.S. EPA Region 4 Ecological Screening Level[2]	MADEP Surface Water Benchmark Concentration[3]	Selected Toxicity Reference Value (TRV)
	Acute	Acute	Acute	
	(µg/L)			
PCBs (as Aroclor 1254)	--	0.2	--	0.2
Acenaphthene	--	170	80	80
Anthracene	--	--	1.27	1.27
Benzo(a)anthracene	--	--	10	10
Benzo(b)fluoranthene	--	--	4.2	4.2
Benzo(k)fluoranthene	--	--	1.4	1.4
Benzo(g,h,i)perylene	--	--	0.2	0.2
Benzo(a)pyrene	--	--	--	0.4 [6]
Chrysene	--	--	0.7	0.7
Fluoranthene	--	398	33.6	33.6
Fluorene	--	--	33	33
Indeno(1,2,3-cd)pyrene	--	--	--	0.4 [6]
Phenanthrene	--	--	--	4 [7]
Pyrene	--	--	4	4
Barium	--	--	26,000	26,000
Cadmium	4.3 [4,5]	1.79	0.9	4.3
Chromium	570 [4,5]	984	183	570
Lead	65 [4,5]	33.78	14	65
Mercury	1.4 [4,5]	2.4	1.4	1.4
Selenium	--	20	12.83	12.83

µg/L = micrograms per liter.

1. U.S. EPA (2002). National Recommended Water Quality Criteria: 2002. EPA-822-R-02-047, November.
2. U.S. EPA (undated). Region 4 Ecological Screening Values (http://www.epa.gov/Region4/waste/ots/ epatab4.pdf).
3. MADEP (2004). Proposed Revised Method 1 Numerical Standards and supporting documentation (basis of proposed GW-3 standards). September.
4. Value is based on the dissolved form of constituent.
5. Value is based on a water hardness of 100 mg/L; hardness of Site surface water is not known.
6. Value for dibenzo(a,h)anthracene applied (reference 3).
7. Value for pyrene applied.

TABLE 17
SUMMARY OF TOXICOLOGICAL DATA FOR AMPHIBIAN SPECIES
AND CALCULATION OF TOXICITY REFERENCE VALUES
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Constituent	Species	Life Stage	Time	Endpoint	Water Concentration (ug/L)	Reference	Toxicity Reference Value (TRV) (ug/L)	Basis
Aroclor 1254	Northern leopard frog	Egg	96 hr	LC50	1.03	[1]	0.02	[14]
Aroclor 1254	American toad	Egg	96 hr	LC50	2.02	[1]		
Aroclor 1254	Fowler's toad	Egg	96 hr	LC50	3.74	[1]		
Benzo(a)pyrene	African clawed frog	Egg	96 hr	EC50	170	[2]	1.7	[15]
Fluoranthene	Northern leopard frog	Egg	1 hr	LC50	90	[3]	0.9	[14]
Cadmium (unspecified form)	Northwestern salamander	Tadpole	10 dy	NOAEL	12.8	[6]	1.3	[16]
Cadmium (unspecified form)	Northwestern salamander	Tadpole	24 dy	NOAEL	48.9	[6]		
Cadmium (unspecified form)	Northwestern salamander	Tadpole	10 dy	NOAEL	106	[8]		
Cadmium (unspecified form)	Northwestern salamander	Tadpole	24 dy	NOAEL	49	[8]		
Cadmium chloride	African clawed frog	Tadpole	48 hr	LOEL-development	1,000	[4]		
Cadmium sulfate	African clawed frog	Tadpole	48 hr	LOEL-development	1,000	[4]		
Chromium (unspecified valence)	Black spined toad	Tadpole	96 hr	LC50	49.3	[7]	0.4	[14]
Chromium (unspecified valence)	Eastern narrowmouth toad	Tadpole	7 dy	LC50	30	[5]		
Lead	Eastern narrowmouth toad	Tadpole	7 dy	LC50	40	[5]	0.4	[17]
Lead	Jefferson salamander	Egg	NR	NOAEL-development	2,000	[13]		
Lead (as nitrate)	Adult skipper frog	Adult	72 hr	LC50	1,542	[9]		
Mercury	Indian green frog	Tadpole	7 dy	LC50	59,900	[10]	0.24	[15]
Mercury	Marbled salamander	Tadpole	7 dy	LC50	1,075	[10]		
Methylmercury	African clawed frog	Egg	96 hr	EC50 - development	24	[11]		
Selenium	Eastern narrowmouth toad	Tadpole	7 dy	LC50	90	[5]	0.9	[18]
Selenium	African clawed frog	Tadpole	72 hr	LC50	8,040	[12]		

µg/L = micrograms per liter. NOAEL = No observed adverse effect lelve.
LC50 = median lethal concentration. LOEL = lowest observed effect level.
EC50 = median effective concentration. NR = not reported.

All data obtained from *Reptile and Amphibian Toxicological Literature Database (RATL), Version 6*. National Wildlife Research Centre, Canada Wildlife Service, Environment Canada. Preference was given to studies defining a no observed adverse effect level (NOAEL) or lowest observed effect level (LOEL). If not available, median effective or lethal concentrations (EC50 and LC50, respectively) were used with uncertainty factors applied. Certain studies were not used including: studies in which multiple constituents were or may have been present, studies measuring only residues, *in vitro* tissue studies, studies using an injection route of administration, and studies for which concentration units were unclear.

1. Birge, W.J., J.A. Black and A. G.Westerman. 1978. Effects of polychlorinated biphenyl compounds and proposed PCB-replacement products on embryo-larval stages of fish and amphibians. University of Kentucky Water Resources Research Institute, Lexington, Kentucky, Research Rep No 118. 33 pp. [1769].
2. Fort, D.J., B.L. James and J.A. Bantle. 1989. Evaluation of the developmental toxicity of five compounds with the frog embryo teratogenesis assay: Xenopus (FETAX) and a metabolic activation system. J.Appl.Toxicol. 9(6): 377-388. [237].
3. Kagan, J., E.D. Kagan, I.A. Kagan, P.A. Kagan, and S. Quigley. 1985. The phototoxicity of non-carcinogenic polycyclic aromatic hydrocarbons in aquatic organisms. Chemosphere. 14(11/12).
4. Sakamoto, M., T. Kihara, T. Matsuo, Y. Yasuda and T. Tanimura. The initial screening of developmental toxicity of environmental chemicals using Xenopus laevis. Japanese Teratology Society Abstracts.
5. Birge, W.J., J.A. Black and A.G. Westerman. 1979. Evaluation of aquatic pollutants using fish and amphibian eggs as bioassay organisms. In S.W. Neilsen, G. Migaki and D.G. Scarpelli (eds.) Animals as Monitors of Environmental Pollutants, National Academy of Science, Washington DC, USA. 108-118. [T024].
6. Nebeker, A. V., G.S. Schuytema and S.L. Ott. 1994. Effects of cadmium on limb regeneration in the northwestern salamander Ambystoma gracile. Arch.Environ.Contam.Toxicol. 27: 318-322. [066].
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8. Nebeker, A.V., G.S. Schuytema and S.L. Ott. 1995. Effects of cadmium on growth and bioaccumulation in the northwestern salamander Ambystoma gracile. Arch.Environ.Contam.Toxicol. 29: 492-499. [247].
9. Mudgall, C.F. and S.S. Patil. 1988. Toxicity of lead and mercury to frogs Rana cyanophlyctis and Rana tigerina. Environ.Ecol. 6(2): 506-508. [152].
10. Birge, W.J., et al. (1979). The effects of mercury on reproduction of fish and amphibians. In J.O. Nriagu (ed.) The Biogeochemistry of Mercury in the Environment, Elsevier/North-Holland Biomedical Press. 629-655.
11. Rayburn, J.R., D.J. DeYoung, J.A. Bantle, D.J. Fort and R. McNew. 1991. Altered developmental toxicity caused by three carrier solvents. J.Appl.Toxicol. 11(4): 253-260. [101].
12. Browne, C.L. and J.N. Dumont. 1979. Toxicity of selenium to developing Xenopus laevis embryos. J.Toxicol.Environ. Health. 5: 699-709. [T032].
13. Horne, M.T. and W.A. Dunson. 1994. Exclusion of the Jefferson salamander, Ambystoma jeffersonianum, from some potential breeding ponds in Pennsylvania: effects of pH, temperature, and metals on embryonic development. Arch.Environ.Contam.Toxicol. 27: 323-330. [076]
14. Average LC50 divided by 100.
15. Average EC50 divided by 100.
16. Lowest NOAEL divided by 10.
17. LC50 for tadpole divided by 100.
18. Lowest LC50 divided by 100.

TABLE 18
SUMMARY OF TOXICITY REFERENCE VALUES FOR AVIAN SPECIES
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Avian								
Constituent	U.S. EPA (1999)[1] (Low)	U.S. DOE (1996)[2] (Low)	U.S. EPA Region 9 BTAG (2002)[3] (Low)	Other (Low)	Selected Low Toxicity Reference Value (TRV-Low)	U.S. EPA Region 9 BTAG (2002)[3] (High)	U.S. EPA DOE (1996)[2] (High)	Selected High Toxicity Reference Value (TRV-High)
	(mg/kg-BW-dy)							
PCBs (as Aroclor 1254)	0.072	0.18	0.09	--	0.09	1.27	1.8	1.8
Acenaphthene	--	--	--	2 [4]	2	--	--	2
Anthracene	--	--	--	1 [5]	1	--	--	1
Benzo(a)anthracene	0.00079 [6]	--	--	1.1 [5]	1.1	--	--	1.1
Benzo(b)fluoranthene	0.00014 [6]	--	--	2 [4]	2	--	--	2
Benzo(k)fluoranthene	0.00014 [6]	--	--	2 [4]	2	--	--	2
Benzo(g,h,i)perylene	--	--	--	2 [4]	2	--	--	2
Benzo(a)pyrene	0.001 [6]	--	--	2 [4]	2	--	--	2
Chrysene	0.001 [6]	--	--	2 [4]	2	--	--	2
Fluoranthene	--	--	--	2 [4]	2	--	--	2
Fluorene	--	--	--	1 [5]	1	--	--	1
Indeno(1,2,3-cd)pyrene	0.001 [6]	--	--	2 [4]	2	--	--	2
Phenanthrene	--	--	--	1.1 [5]	1.1	--	--	1.1
Pyrene	--	--	--	2 [4]	2	--	--	2
Barium	20.8	20.8	--	--	20.8	--	47.1	47.1
Cadmium	1.45	1.45	0.08	--	1.45	10.4	20	20
Chromium	1	1	--	--	1	--	5	5
Lead	0.025	1.13	0.014	--	1.13	8.75	11.3	11.3
Mercury	3.25	0.45	0.039	--	0.039	0.18	0.9	0.9
Selenium	0.5	0.5	0.23	--	0.5	0.93	1	1

mg/kgBW-dy = milligrams per kilogram of body weight per day.

1. U.S. EPA (1999). Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Volume One. EPA-530-DD-99-001A, August.
2. Sample et al. (1996). Toxicological Benchmarks for Wildlife: 1996 Revision. U.S. DOE ES/ER/TM-86/R-3, June. Low value is based on no observed adverse effect level (NOAEL); high value based on lowest observed adverse effect level (LOAEL).
3. U.S. EPA (2002a). Region 9 Biological Technical Assistance Group (BTAG) Recommended Toxicity Reference Values for Birds (Revision Date 11/21/02).
4. Applied in U.S. DOE (2003) Final Quantico Creek Risk Screening Assessment, Quantico Watershed Study (February 13, 2003). Source cited is Trust et al., (1993) (no further citation provided). (http://web.ead.anl.gov/ecorisk/case/docs/Appendix_b_final.pdf).
5. Presented in Table 3.3.2-1. of U.S. Navy (1999). Screening Ecological Risk Assessment, Pearl Harbor Sediment RI/FS (December). Source cited is Schaefer et al.(1983) The acute oral toxicity, repellency, and hazard potential of 998 chemicals to one or more species of wild and domestic birds. Archives of Environmental Contamination and Toxicology, 12:355-382 (http://web.ead.anl.gov/ecorisk/cse/docs/study5docs/Table_332_1.pdf).
6. These values were derived from Brunston B, Broman D, Naf C (1991) Toxicity and EROD-inducing potency of 24 polycyclic aromatic hydrocarbons (PAHs) in chick embryos. Arch. Toxicol. 1991; 65(6):485-9. In this study, PAHs dissolved in peanut oil were directly injected into the air sacs of eggs; the LD50 values were reported as ug constituent/kg egg (i.e., the value for benzo(k)fluoranthene was 0.14 ug/kg egg). In the citation of this study in various ecological risk assessment documents, the LD50 has been reported at ug/(kg body weight-day). Given these factors, the appropriateness and applicability of this study to dietary intakes by juvenile or adult birds is suspect. For this reason, these TRVs are not applied.

TABLE 19
SUMMARY OF TOXICITY REFERENCE VALUES FOR MAMMALIAN SPECIES
Former McCoy Field Wetland Area
New Bedford, Massachusetts

	Mammalian							
Constituent	U.S. EPA (1999)[1] (Low)	U.S. DOE (1996)[2] (Low)	U.S. EPA Region 9 BTAG[3] (Low)	Other (Low)	Selected Low Toxicity Reference Value (TRV-Low)	U.S. EPA Region 9 BTAG (2002)[3] (High)	U.S. DOE (1996)[2] (High)	Selected High Toxicity Reference Value (TRV-High)
	(mg/kgBW-dy)							
PCBs (as Aroclor 1254)	0.000206 [4]	0.022 [5]	0.36	1.14 [8]	0.36	1.28	0.22	1.28
Acenaphthene	--	--	--	17.5 [7]	17.5	--	--	17.5
Anthracene	--	--	--	100 [7]	100	--	--	100
Benzo(a)anthracene	0.167	--	--	--	0.167	--	--	0.167
Benzo(b)fluoranthene	--	--	--	4 [7]	4	--	--	4
Benzo(k)fluoranthene	--	--	--	7.2 [7]	7.2	--	--	7.2
Benzo(g,h,i)perylene	--	--	--	7.2 [7]	7.2	--	--	7.2
Benzo(a)pyrene	0.1	0.29 [5]	1.31	--	1.31	32.8	2.9	32.8
Chrysene	--	--	--	0.17 [7]	0.17	--	--	0.17
Fluoranthene	--	--	--	12.5 [7]	12.5	--	--	12.5
Fluorene	--	--	--	--	12.5 [10]	--	--	12.5
Indeno(1,2,3-cd)pyrene	--	--	--	7.2	7.2	--	--	7.2
Phenanthrene	--	--	--	--	100 [11]	--	--	100
Pyrene	--	--	--	7.5 [7]	7.5	--	--	7.5
Barium	0.51	2.8 [5]	--	5.1 [7]	2.8	--	10.5	10.5
Cadmium	0.0252	0.51 [5]	0.06	0.19 [8]	0.51	2.64	5.1	5.1
Chromium (total or trivalent)	--	1,445 [5]	--	2.4 [8,9]	2.4	--	--	2.4
Lead	0.0375	4.22 [5]	1	0.48 [8]	4.22	241	42.2	241
Mercury	1.01	0.69 [5]	0.25 [6]	--	0.69	4.0	--	4.0
Selenium	0.076	0.11 [5]	0.05	0.2 [7]	0.076	1.2	0.174	1.2

mg/kgBW-dy = milligams per kilogram of body weight per day.

1. U.S. EPA (1999). Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Volume One. EPA-530-DD-99-001A, August.
2. Sample et al. (1996). Toxicological Benchmarks for Wildlife: 1996 Revision. U.S. DOE ES/ER/TM-86/R3. Low values based on no observed adverse effect levels (NOAELs); high values based on lowest observed adverse effect levels (LOAELs).
3. U.S. EPA (2002b). Region 9 Biological Technical Assistance Group (BTAG) Recommended Toxicity Reference Values for Mammals (Revision Date 11/21/02).
4. Based on mink, which is not a target receptor for the Site.
5. Lowest value presented for little brown bat, short-tailed shrew, white-footed mouse, meadow vole, cottontail rabbit, and red fox.
6. Based on rat.
7. Applied in U.S. DOE (2003) Final Quantico Creek Risk Screening Assessent, Quantico Watershed Study (February 13). Sources cited are PRC (1996) Region 5 Ecological Data Quality Levels, Final Report (August); Samples et al. (1996) (cited above); and IT Corp (1997) Predictive Ecological Risk Assessment Methodology, Environmental Restoration Program, Sandia National Laboratory, New Mexico (November). http://web.ead.anl.gov/ecorisk/case/docs/Appendix_B_final.pdf.
8. Applied in TetraTech (2002). Draft Final Phase I Ecological Risk Assessment, Deseret Chemical Depot, Tooele Chemical Agent Disposal Facility, Utah (September). Sources cited include Auerlich et al. (1985); Schroeder and Mitchner (1971); and MacKenzie et al. (1958) (http://www.hazardouswaste.utah.gov/CDS/PVA_documents/TOCDFEco/Appendix_E/Table_E-5.pdf).
9. Based on hexavalent chromium.
10. No value available; value for fluoranthene applied, based on structural similarity.
11. No value available; value for anthracene applied, based on structural similarity.

TABLE 20
RISK CHARACTERIZATION
TERRESTRIAL INVERTEBRATES
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Constituent	Environmental Soil/Sediment Exposure Point Concentration ($C_{soil-sed}$) (mg/kg)	Acute Terrestrial Invertebrate Toxicity Reference Value[1] (TRV) (mg/kg)	Is TRV Exceeded?	Hazard Quotient[2] (HQ) (unitless)
PCBs (as Aroclor 1254)	2.09	251	No	0.008
Acenaphthene	0.191	170	No	0.001
Anthracene	0.221	170	No	0.001
Benzo(a)anthracene	0.401	25	No	0.02
Benzo(b)fluoranthene	0.274	25	No	0.01
Benzo(k)fluoranthene	0.218	25	No	0.009
Benzo(g,h,i)perylene	0.213	170	No	0.001
Benzo(a)pyrene	0.395	25	No	0.02
Chrysene	0.377	25	No	0.02
Fluoranthene	0.329	170	No	0.002
Fluorene	0.203	170	No	0.001
Indeno(1,2,3-cd)pyrene	0.208	25	No	0.008
Phenanthrene	0.446	170	No	0.003
Pyrene	0.623	170	No	0.004
Barium	83	330	No	0.3
Cadmium	1.17	440	No	0.003
Chromium (total)	13	57	No	0.2
Lead	138	5,491	No	0.03
Mercury	0.18	2.5	No	0.07
Selenium	0.92	77	No	0.01
Total Hazard Index (HI)				**0.7**

mg/kg = milligrams per kilogram.

1. Basis presented on separate table.
2. HQ = $C_{soil-sed}$/TRV; HI = sum of all HQs.

TABLE 21
RISK CHARACTERIZATION
AQUATIC INVERTEBRATES
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Constituent	Predicted Sediment Interstitial Water Concentration [1] C_{SWi} (µg/L)	Acute Aquatic Invertebrate Toxicity Reference Value [2] (TRV) (µg/L)	Is TRV Exceeded?	Hazard Quotient[3] (HQ) (unitless)
PCBs (as Aroclor 1254)	0.0067	0.2	No	0.03
Acenaphthene	0.26	80	No	0.003
Anthracene	0.092	1.27	No	0.07
Benzo(a)anthracene	0.013	10	No	0.001
Benzo(b)fluoranthene	0.012	4.2	No	0.003
Benzo(k)fluoranthene	0.0057	1.4	No	0.004
Benzo(g,h,i)perylene	0.0022	0.2	No	0.01
Benzo(a)pyrene	0.0096	0.4	No	0.02
Chrysene	0.015	0.7	No	0.02
Fluoranthene	0.038	33.6	No	0.001
Fluorene	0.17	33	No	0.005
Indeno(1,2,3-cd)pyrene	0.00083	0.4	No	0.002
Phenanthrene	0.17	4	No	0.04
Pyrene	0.077	4	No	0.02
Barium	263	26,000	No	0.01
Cadmium	0.59	4.3	No	0.1
Chromium	0.17	570	No	0.0003
Lead	3.47	65	No	0.05
Mercury	0.023	1.4	No	0.02
Selenium	0.23	12.83	No	0.02
Total Hazard index (HI)				**0.5**

µg/L = micrograms per liter.

1. Estimated for organic constituents as as $C_{SWi} = C_{sed}/(f_{oc} \times K_{oc})$, using mean Site f_{oc}.
   Estimated for inorganic constituents as $C_{SWi} = C_{sed}/K_D$. Refer to Table 10.
2. Basis presented on separate table.
3. HQ = = C_{SW}/TRV; HI = sum of all HQs.

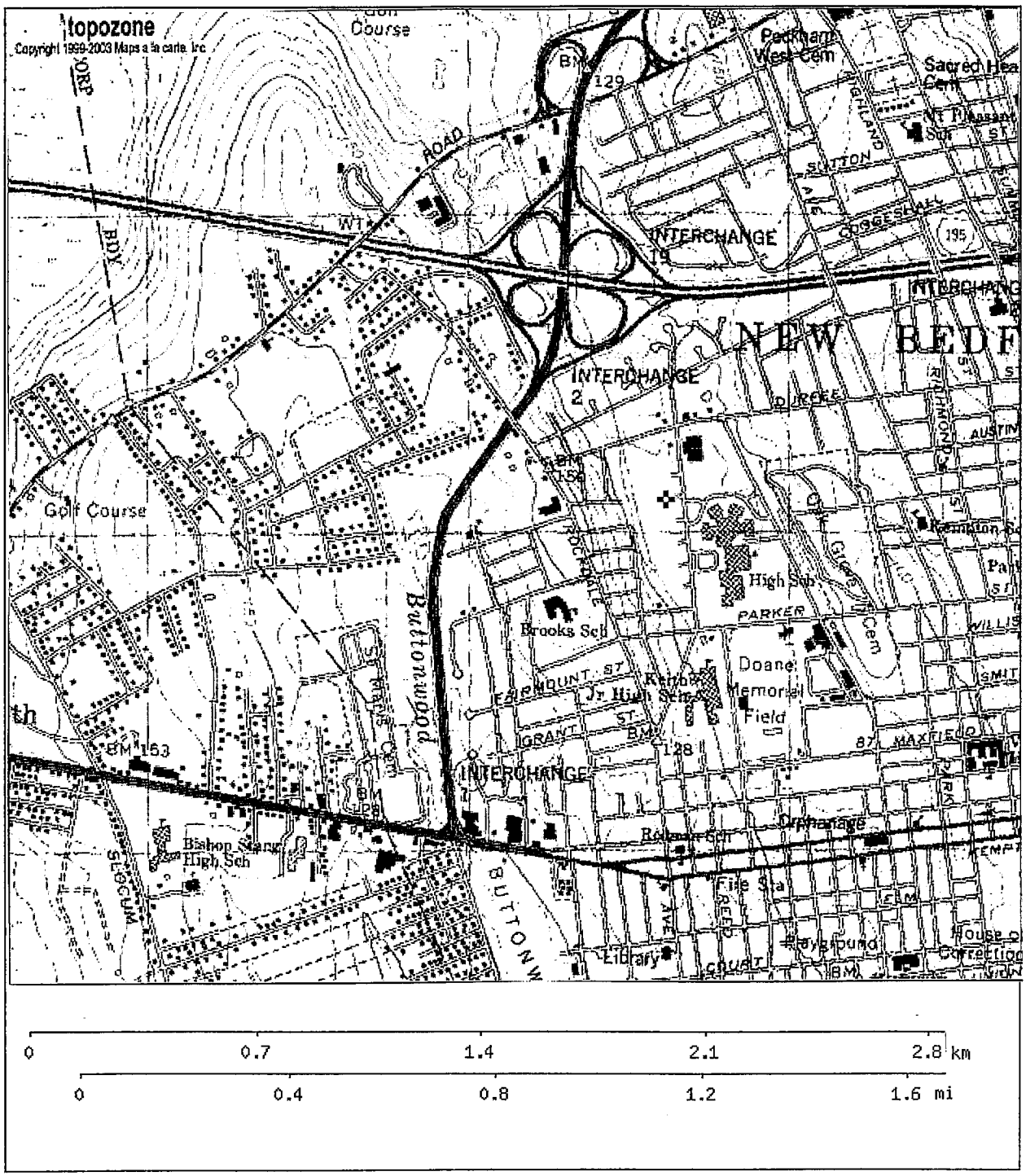
TABLE 22
RISK CHARACTERIZATION
AMPHIBIANS
Former McCoy Field Wetland Area
New Bedford, Massachusetts

Constituent	Estimated Surface Water Concentration [1] C_{SW} (µg/L)	Chronic Amphibian Toxicity Reference Value [2] (TRV) (µg/L)	Is Amphibian TRV Exceeded?	Hazard Quotient[3] (HQ) (unitless)
PCBs (as Aroclor 1254)	0.00067	0.02	No	0.03
Acenaphthene	0.026	0.9	No	0.03
Anthracene	0.0092	0.9	No	0.01
Benzo(a)anthracene	0.0013	1.7	No	0.0007
Benzo(b)fluoranthene	0.0012	1.7	No	0.0007
Benzo(k)fluoranthene	0.00057	1.7	No	0.0003
Benzo(g,h,i)perylene	0.00022	0.9	No	0.0002
Benzo(a)pyrene	0.00096	1.7	No	0.0006
Chrysene	0.0015	1.7	No	0.0009
Fluoranthene	0.0038	0.9	No	0.004
Fluorene	0.017	0.9	No	0.02
Indeno(1,2,3-cd)pyrene	0.000083	1.7	No	0.00005
Phenanthrene	0.017	0.9	No	0.02
Pyrene	0.0077	0.9	No	0.009
Barium	26.3	2,600	No	0.01
Cadmium	0.059	1.3	No	0.05
Chromium	0.017	0.4	No	0.04
Lead	0.35	0.4	No	0.9
Mercury	0.0023	0.24	No	0.009
Selenium	0.023	0.9	No	0.03
Total Hazard Index (HI)				**1.1**

µg/L = micrograms per liter.

1. Estimated as one-tenth of the predicted interstitial water concentration; refer to Table 10.
2. Basis for selection presented on separate table.
3. HQ = $C_{soil\text{-}sed}$/TRV; HI = sum of all HQs.

Figures



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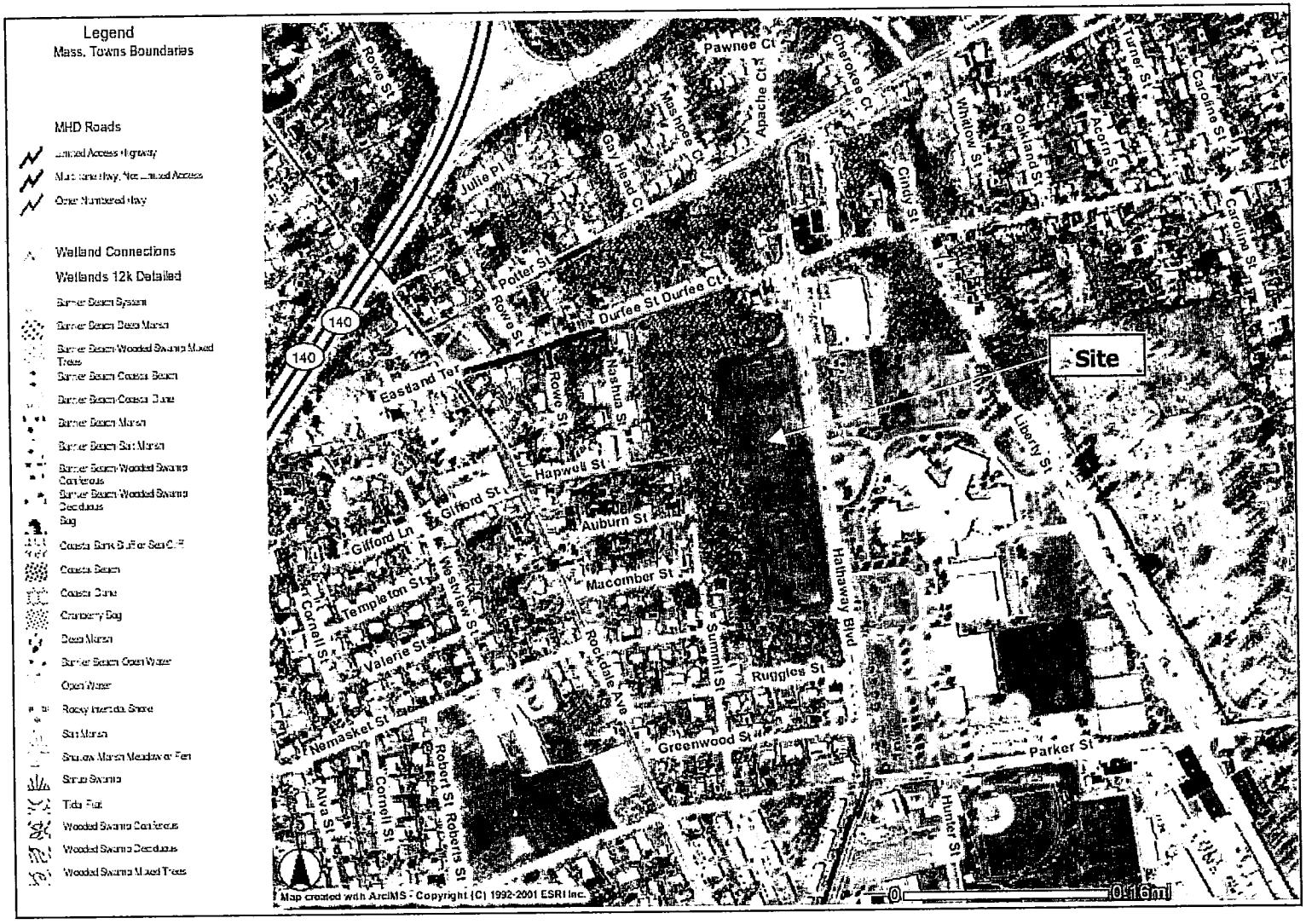
Former McCoy Field
Wetland Area Site
New Bedford, Massachusetts
Scale: As shown

Former McCoy Field Site Setting
Figure 1



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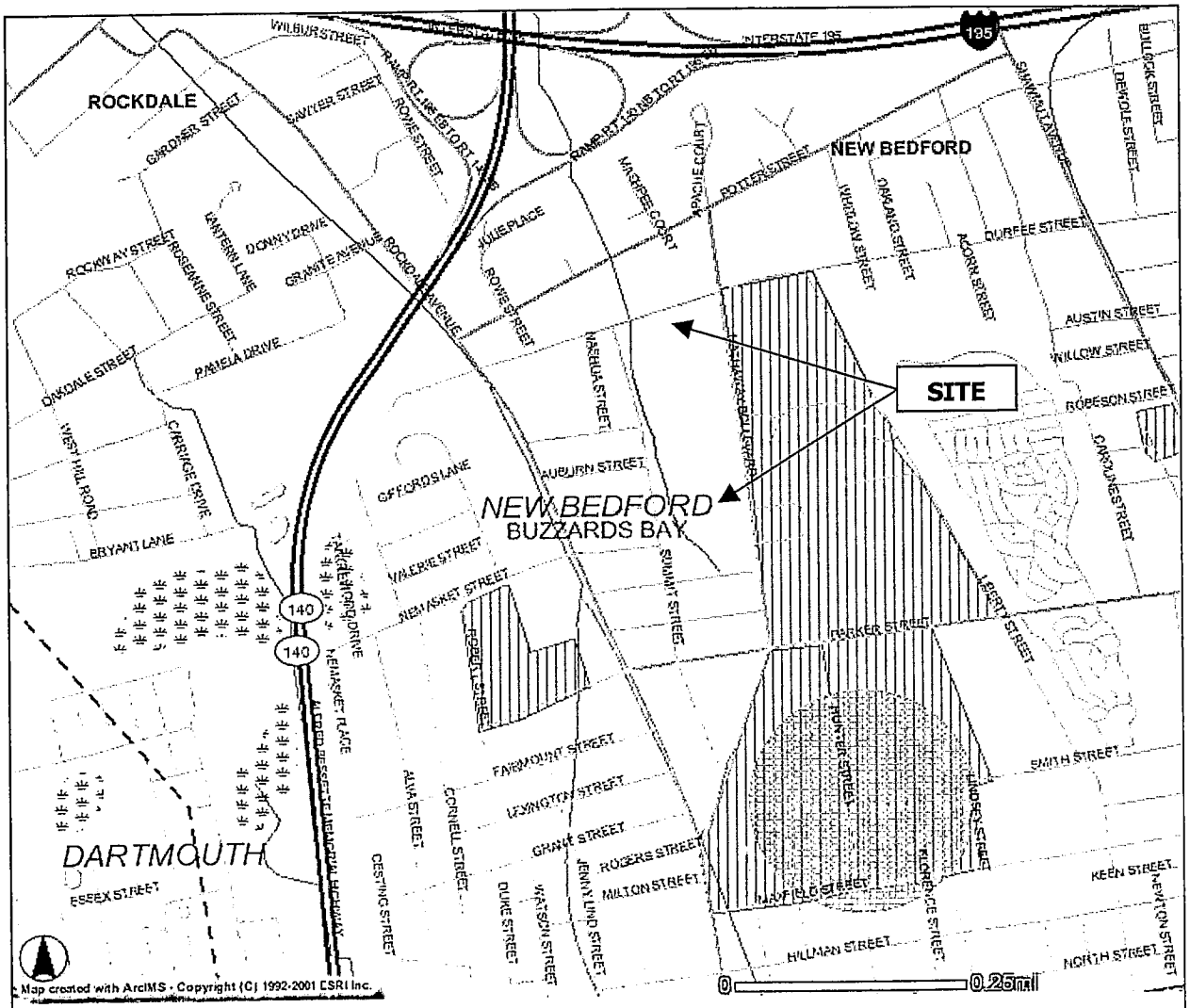
Former McCoy Field
Wetland Area Site
New Bedford, Massachusetts
Scale: As shown

Wetlands Map
Figure 2



DEP MCP 21e Map Legend

- Zone IIs
- IWPAs
- Zone A
- Sole Source Aquifers
- Solid Waste Sites
- Protected Openspace
- ACECs
- NHESP Estimated Habitat of Rare Wildlife in Wetland Areas
- Certified Vernal Pools 2003 NHESP
- Subbasins
- Mass Major Basins
- DEP Region
- Town Arcs
- County Boundaries

Public Water Supplies

- COMMUNITY PUBLIC WATER SUPPLY GROUNDWATER
- COMMUNITY PUBLIC WATER SUPPLY SURFACE WATER
- NON COMMUNITY PUBLIC WATER SUPPLY

Aquifers, By Yield

- HIGH YIELD
- MEDIUM YIELD

Non Potential Drinking Water Source Area

- HIGH YIELD
- MEDIUM YIELD

FEMA Floodplains

- 100 YEAR FLOODPLAIN

Hydrography

- WATER
- RESERVOIR
- WETLANDS
- SALTWATER WETLANDS
- FLATS SHOALS

Rivers and Streams

- PERENNIAL
- INTERMITTENT
- SHORELINE
- MAN MADE SHORE
- DAM
- AQUEDUCT

MHD Roads

- LIMITED ACCESS HIGHWAY
- MULTILANE HWY, NOT LIMITED ACCESS
- OTHER NUMBERED HWY
- MAJOR ROAD COLLECTOR
- MINOR STREET OR ROAD, RAMP

Tracks and Trails MHD

- TRACK
- TRAIL

Transmission Lines

- PIPELINE
- POWERLINE
- TRAIN

MASS GIS

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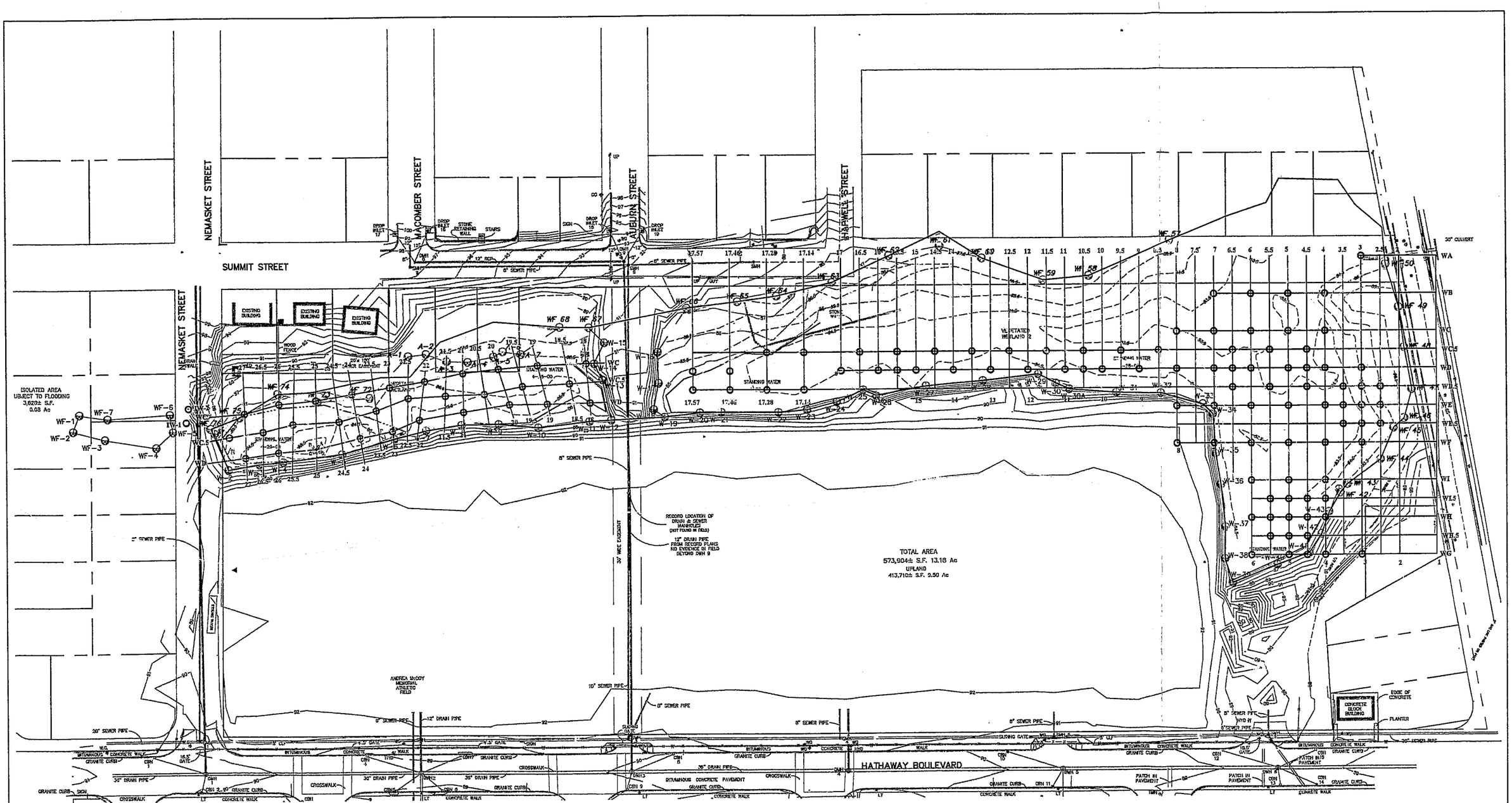
Former McCoy Field
Wetland Area Site
New Bedford, Massachusetts
Scale: As shown

MADEP GIS Map
Figure 3



BETA Group, Inc.
Engineers · Scientists · Planners

315 Norwood Park South
Norwood, MA 02062 781.255.1982
email: BETA@BETA-Inc.com

McCoy Field

New Bedford, Massachusetts

Scale: 1" = 100'

Wetlands Contour Lines (5-26-05)