REGION 1

RECORD OF DECISION

CENTREDALE MANOR RESTORATION PROJECT SUPERFUND SITE NORTH PROVIDENCE, RHODE ISLAND

SEPTEMBER 2012

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PART 1: THE DECLARATION

PART 2: DECISION SUMMARY FOR THE RECORD OF DECISION

LIST OF APPENDICES

DECLARATION FOR THE RECORD OF DECISION

A. SITE NAME AND LOCATION

Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island
CERCLIS ID No. RID981203755

B. STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Centredale Manor Restoration Project Superfund Site (Site), in North Providence, Rhode Island, which was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 USC §§ 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300 et seq., as amended. The Director of the Office of Site Remediation and Restoration (OSRR) has been delegated the authority to approve this Record of Decision.

This decision was based on the Administrative Record, which has been developed in accordance with Section 113 (k) of CERCLA, and which is available for review at the North Providence Union Free Library in North Providence, Rhode Island, the Marian J. Mohr Memorial Library in Johnston, Rhode Island, and at the United States Environmental Protection Agency (EPA) Region 1 OSRR Records Center in Boston, Massachusetts. The Administrative Record Index (Appendix C to the Record of Decision [ROD]) identifies each of the items comprising the Administrative Record upon which the selection of the remedial action is based.

The State of Rhode Island concurs with the selected remedy.

C. ASSESSMENT OF THE SITE

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

D. DESCRIPTION OF THE SELECTED REMEDY

This ROD sets forth the selected remedy at the Centredale Manor Restoration Project Superfund Site. The selected remedy generally requires:

1. Removal and off-site treatment and/or disposal of buried waste material from the Source Area (where contamination release originally occurred) and installation of a

Resource Conservation and Recovery Act (RCRA) C cap over remaining contamination in the Source Area;

2. Excavation of the majority of contaminated Woonasquatucket River sediment and floodplain soil in the Allendale and Lyman Mill reaches of the River and placement into an upland confined disposal facility (CDF) with off-site treatment and/or disposal of dewatered sediment and floodplain soil that exceeds the Land Disposal Restrictions' (LDRs) alternative treatment standards (estimated 10 percent);
3. Placement of a thin layer soil cover over the remaining contamination in the Oxbow to facilitate enhanced natural recovery and preserve valuable habitat;
4. Implementation of institutional controls (ICs) to prevent exposure and preserve the integrity of components of the selected remedy;
5. Long-term monitoring and maintenance to protect the integrity of the RCRA cap, upland CDF, Allendale and Lyman Mill dams and thin-layer wetland cover; and
6. Mitigation of wetlands and floodplains.

The proposed plan and feasibility study (FS) assumed that the upland CDF would be constructed on-site as that term is defined in CERCLA (areas in very close proximity to the Site) and a number of potential locations in the Town of Johnston were identified. Since then, significant concerns were raised by the public during the public comment period regarding the possible locations for the upland CDF identified by EPA. Because EPA continues to believe the upland CDF disposal option is the best approach to address contaminated sediment/soil, this component remains in the selected remedy. However, EPA has expanded the area where an upland CDF could be located to beyond what is in close proximity to the Site, including locations outside the Town of Johnston. By expanding the area where the upland CDF can be located, EPA believes a location can be identified that addresses most or all of the concerns raised by the public.

The selected remedy is a comprehensive approach that addresses all current and potential future risks caused by soil, sediment, groundwater and surface water contamination. For purposes of the ROD, the Site has been divided into five areas: Source Area Soil, Groundwater, Allendale Pond and Lyman Mill Pond Sediment, Allendale Floodplain Soil, and Lyman Mill Stream Sediment and Floodplain Soil (including the Oxbow wetland).

The remedial measures selected in this ROD will prevent direct contact with contaminated soil and sediment that presents an unacceptable risk; prevent movement of contaminants into the Woonasquatucket River that could result in exceedances of water quality criteria; comply with federal drinking water standards at the Source Area; allow fish consumption and contact and additional non-contact recreational use of the Woonasquatucket River; and reduce risk to wildlife.

The major components of this remedy are:

1. Removal of potential buried waste in the Source Area and off-site disposal and/or treatment; relocation of underground utilities into clean corridors; and conversion of existing surfaces (soil caps, parking lots, paved areas, and landscape areas) into a RCRA C cap.
2. Excavation of sediment and floodplain soil in the Allendale and Lyman Mill reaches of the Woonasquatucket River; containment of excavated material in an upland CDF with contamination that exceeds the LDRs' alternative treatment standards (estimated 10 percent) shipped off-site for disposal and/or treatment; placement of a thin-layer cover over remaining contaminated sediment in the River, if needed; and placement of a thin-layer cover over remaining contamination in the Oxbow wetland.
3. Placement, monitoring and enforcement of ICs to permanently prohibit future excavation, restrict access to buried utilities, prevent the construction of buildings with pilings or basements or any other disturbance of the cap or other remedial components in the Source Area; permanently restrict the use of groundwater at the Source Area; permanently prevent excavation/construction or other activities that could damage the upland CDF; temporarily prevent excavation or other activities that could damage the thin-layer soil cover and Allendale Dam; temporarily restrict recreational access in the Oxbow wetland; and temporarily restrict fish consumption.
4. Long-term inspections, maintenance and monitoring of the RCRA C cap in the Source Area; installation of additional groundwater monitoring wells and groundwater monitoring at the edge of the Source Area cap; inspections, maintenance and monitoring of the upland CDF and dams, including groundwater monitoring; monitoring of sediment, surface water and biota, and monitoring and maintenance to control invasive species.
5. Wetlands and floodplain mitigation.

This remedial action follows three time-critical and one non-time critical removal actions performed at the Site from 1999 to 2010.

All buried waste material at the Source Area, and all soil and sediment at the Site are principal threat wastes. The selected response action addresses principal threat wastes at the Site by: removal and off-site disposal and/or treatment of the toxic and mobile potential buried waste material at the Source Area, capping remaining Source Area soils in-place to prevent direct contact and leaching of contaminants into groundwater and the River, excavation of sediment and soil from the River and floodplain and placing them in a permanent and secure upland containment facility, with the highest levels of contamination shipped off-site for disposal and/or treatment, and placing a thin-layer cover in the Oxbow wetland to facilitate natural recovery while preserving valuable habitat.

E. STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action (unless justified by a waiver), is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduce the toxicity, mobility, or volume of materials comprising principal threats through treatment).

Because this remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure (and groundwater and/or land use restrictions are necessary), a review will be conducted within five years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

F. SPECIAL FINDINGS

Issuance of this ROD embodies the following specific determinations:

Wetland Clean Water Act Impacts

Pursuant to Section 404 of the Clean Water Act (CWA) and Executive Order 11990 (Protection of Wetlands), EPA has determined that there is no practicable alternative to conducting work that will impact wetlands and/or result in the discharge of dredged or fill material into waters of the United States because significant levels of contamination exist within wetlands and waters of the United States and these areas are included within the Site's cleanup areas.

For those areas impacted by cleanup activities, EPA has also determined that the cleanup alternatives that have been selected are the least damaging practicable alternatives.

EPA will minimize potential harm and avoid adverse impacts on resources, to the extent practical, by using best management practices to minimize harmful impacts on the wetlands, wildlife or habitat. Impacted areas will be mitigated consistent with the requirements of federal and state laws.

Floodplain Impacts

The cleanup plan selected by EPA includes activities that result in the occupancy and modification of the floodplain. Pursuant to Executive Order 11988 (Floodplain Management), EPA has determined that there is no practicable alternative to doing so. EPA has determined there is no practicable alternative to occupancy and modification of the floodplain at the Source Area.

EPA will avoid or minimize potential harmful impacts on floodplain resources to the extent practicable. In addition, any lost flood storage capacity from cleanup activities within the 100-year floodplain would be addressed as appropriate.

Waiver of Hazardous Waste Facility Requirements

The location and closure of facilities containing hazardous waste is regulated by the following federal and state hazardous waste laws that specify how hazardous waste should be covered and how hazardous waste located in a floodplain should be addressed: Sections 264.18, 264.301, 264.302 and 264.310 of the Subtitle C regulations of the RCRA, and the State of Rhode Island equivalent regulations.

Alternative 3A for Lyman Mill Stream Sediment and Floodplain Soil includes the placement of a three-inch thin-layer of soil over contamination that will remain in this area. This soil cover in this area would not meet the requirements of these federal and state environmental regulations. EPA has determined that meeting these requirements in this area of the Site would result in greater risk to human health and the environment and is waiving these by using a "protectiveness waiver" under Section 121(d)(4)(B) of the CERCLA.

Toxic Substances Control Act

Consistent with Section 761.61(c) of the Toxic Substances Control Act (TSCA), EPA has made a finding that the on-site disposal of polychlorinated biphenyls (PCBs) contaminated material as set out in this ROD does not result in an unreasonable risk of injury to human health or the environment as long as the following conditions are met:

- If sediment excavated from the River contains PCB levels greater than 1 milligrams per kilogram (mg/kg; or 1 part per million [ppm]), it shall be disposed of in an upland CDF that complies with the requirements of Subtitle C of RCRA.
- If contaminated soil from the Source Area contains PCB levels greater than 1 mg/kg, it shall be disposed of in place using a cap that complies with the requirements of Subtitle C of RCRA.
- All excavated sediment is disposed of based on *in situ* (pre-excavation) PCB levels and are not subject to dilution.
- Rules will be developed in accordance with TSCA and be followed for the decontamination of all equipment used when handling TSCA-contaminated material to avoid mixing with non-TSCA material. Stockpiled material shall be covered and bermed while awaiting transport and any runoff shall be collected and disposed of, so that the requirements of TSCA are met.
- Air monitoring and dust suppression measures for PCBs shall be maintained until excavation and transport of PCB contaminated sediment and capping of contaminated sediment and soil is complete.

- Once capping is complete, the caps shall be monitored annually at a minimum to insure that their integrity is maintained. A plan shall be developed which details the long-term monitoring and maintenance activities for the caps.
- Land use restrictions shall be put in place to insure the long-term effectiveness of the caps and upland CDF. These may include, but not be limited to, restricting future excavation, restricting access for buried utilities, preventing the construction of buildings with pilings or basements and maintaining the caps and upland CDF.

G. ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for this site.

1. Contaminants and their respective concentrations
2. Baseline risk represented by the contaminants
3. Cleanup levels established for contaminants and the basis for the levels
4. Current and reasonably anticipated future land use assumptions used in the baseline risk assessment and this ROD
5. Land and groundwater use that will be available at the Site as a result of the selected remedy
6. Estimated capital, operation and maintenance (O&M), and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected
7. Decisive factor(s) that led to selecting the remedy

H. AUTHORIZING SIGNATURES

This ROD documents the selected remedy for soil, sediment, groundwater and surface water at the Centredale Manor Restoration Project Superfund Site. This remedy was selected by EPA with concurrence of the Rhode Island Department of Environmental Management (RIDEM). A copy of the State's concurrence letter is attached to this ROD.

U.S. Environmental Protection Agency

By: [signature] Date: 9/28/12

James T. Owens, III
Director
Office of Site Remediation and Restoration
Region 1-New England

DECISION SUMMARY FOR THE RECORD OF DECISION

A. SITE NAME, LOCATION AND BRIEF DESCRIPTION

- Centredale Manor Restoration Project Superfund Site
  2072 and 2074 Smith Street (Route 44)
  North Providence, Providence County, Rhode Island 02911
- CERCLIS ID No. RID981203755
- EPA Lead RI/FS (Remedial Investigation/Feasibility Study) and ROD

The Site encompasses parts of two Rhode Island towns, North Providence and Johnston, and free-flowing reaches and impoundments of the Woonasquatucket River (Figure A-1). The main part of the Site, which is referred to as the Source Area, consists of approximately nine acres on the eastern shore of the Woonasquatucket River, just south of Route 44 in a densely-populated area of downtown North Providence, Rhode Island (Figure A-2). The entire Site extends down the Woonasquatucket River with the River centerline being the North Providence/Johnston municipal boundary. The Site consists of all contaminated areas within the River, its impoundments and floodplain, as well as any other location to which contamination from that area has come to be located, or from which that contamination came. A chemical manufacturer, Metro-Atlantic, Inc. (initially known as Atlantic Chemical Company), and the New England Container Company, Inc., an incinerator-based drum reconditioning facility, operated at the Source Area for several decades in the mid-20th century. The Brook Village apartments and the Centredale Manor apartments, two subsidized senior citizen high-rises housing about 335 residents, currently occupy the Source Area.

A more complete description of the Site can be found in Section 1.3 of the Remedial Investigation Report.

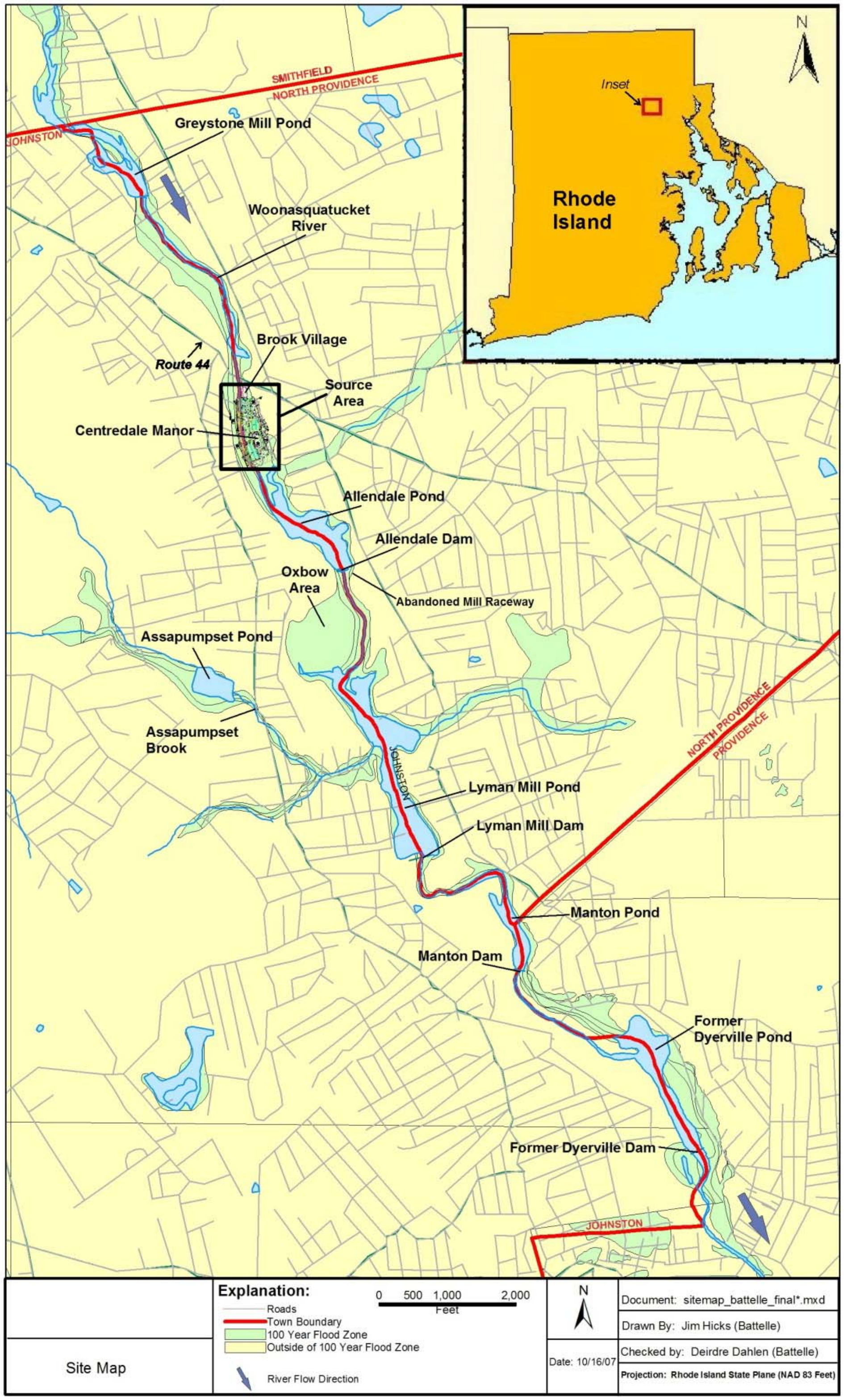

Figure A-1. Site Map

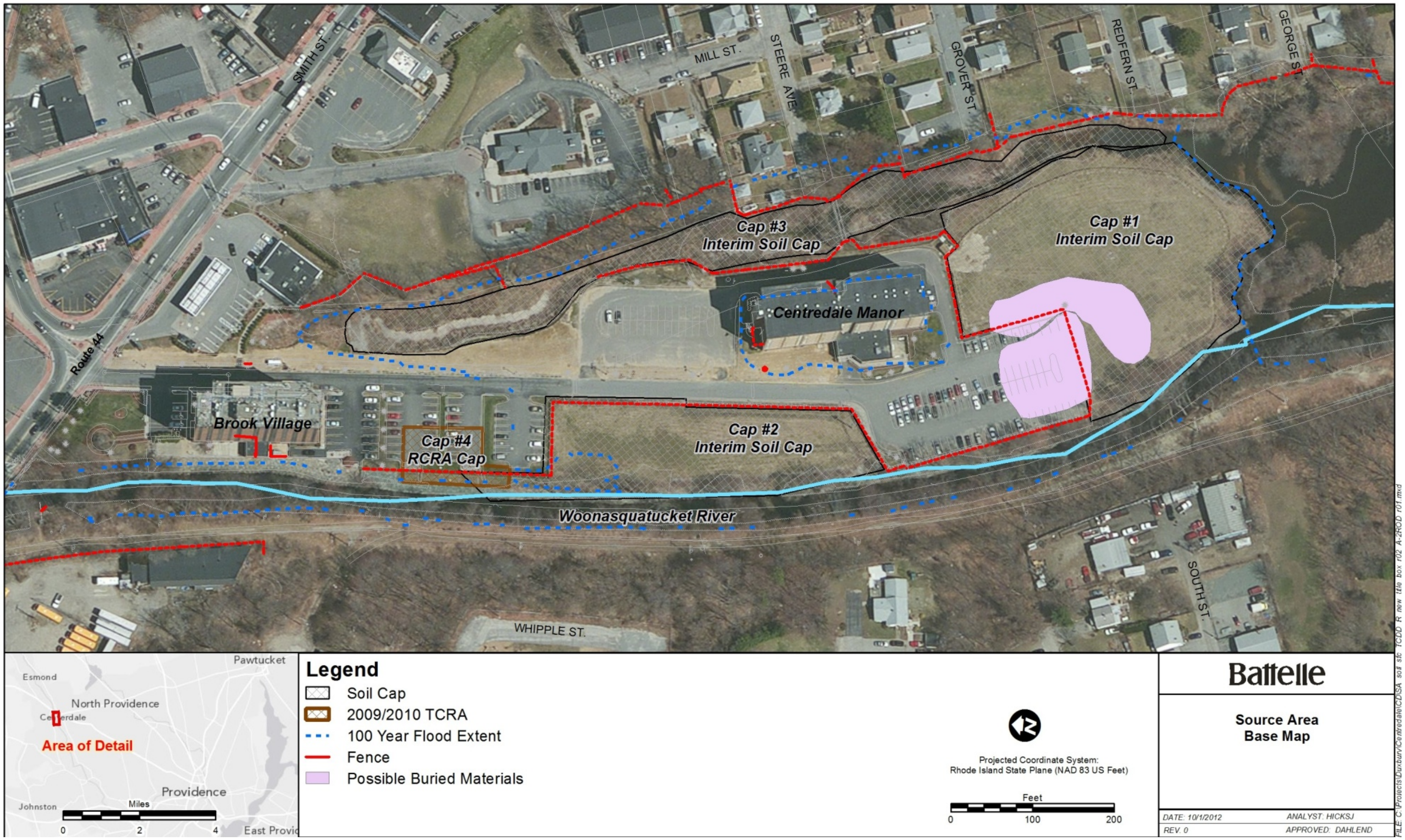

Figure A-2. Source Area Base Map

B. SITE HISTORY AND ENFORCEMENT ACTIVITIES

1. History of Site Activities

Prior to 1936, Centredale Worsted Mills, a woolens mill was located at the Source Area. Atlantic Chemical Company began operating on the Source Area in approximately 1943. Atlantic Chemical Company changed its name in 1953 to Metro-Atlantic, Inc. and continued to operate until the early 1970s. Among other activities, Metro-Atlantic manufactured hexachlorophene from trichlorophenols shipped to the Site. Dioxin (2,3,7,8- tetrachlorodibenzo-*p*-dioxin [TCDD]) is a contaminant present in trichlorophenols; hexachloroxanthene (HCX) is a contaminant that results from this production of hexachlorophene. The manufacturing building where this process took place was located adjacent to the River, see Figure B-1. Direct discharges into the River as well as overland and groundwater discharges appear to have taken place.

The New England Container Company, Inc. (NECC) operated an incinerator-based drum reconditioning facility, including drums from various companies including Metro-Atlantic, on a portion of the Source Area from 1952 until about 1971. The facility was located in the central portion of the Source Area with the southern portion used by the company as a dump. Chemical residues were dumped on the ground and/or burned prior or as part of drum reconditioning. Historical aerial photographs indicate waste disposal activities and the presence of drums and surface impoundments on the Source Area, with significant waste disposal features observed in the 1960s. Drainage features from waste disposal areas leading into the Woonasquatucket River and the eastern tailrace are also evident. Numerous complaints and fires were reported to local and state authorities during the time chemical manufacturing operations were conducted on the Source Area. A major fire in 1972 destroyed most of the structures at the Source Area and remaining buildings were then demolished.

The Brook Village apartments were constructed in 1977 and the Centredale Manor apartments were constructed in 1982 on the Source Area where chemical manufacturing and drum reconditioning activities previously took place. These two buildings, parking lots and driveways occupy a large portion of the Source Area. About 400 drums and 6,000 cubic yards (cy) of contaminated soil were removed during the 1982 construction of Centredale Manor, following issuance of a RIDEM Notice of Violation and Order in 1981. From drum labels observed during the 1982 removal and sampling of drum contents, substances present at the Site included caustics, halogenated solvents, PCBs, and inks. Testing of the contents of the drums indicated elevated levels of volatile organic compounds (VOCs, including benzene, toluene, ethylbenzene and toluene [BTEX]) compounds and metals. EPA's geophysical surveys in 1999 suggest that buried waste material may still be present at the southern end of the Source Area.

A more detailed description of the Site history can be found in Section 1.3.2 of the Remedial Investigation Report.

2. History of Federal and State Investigations and Removal and Remedial Actions

Dioxin was first identified in the Woonasquatucket River in 1996 in fish samples. Since then, numerous investigations of soil, groundwater, sediment, surface water and biota have been conducted. Elevated levels of dioxins[1] (primarily 2,3,7,8 –TCDD), furans, PCBs, pesticides, VOCs, semivolatile organic compounds (SVOCs), and metals have been detected in all of these media and the analyte patterns are consistent with the historical account of waste handling within the Source Area. Following initial investigations of the River in 1996 and an expanded site investigation in 1998, Rhode Island Department of Health (RIDOH) issued a fish consumption advisory in 1999.

EPA conducted a number of environmental investigations to evaluate conditions at the Site and the impacts on the Woonasquatucket River. Most of the investigations were performed following the detection of dioxin in fish tissue samples collected from the River in 1996. EPA conducted a Preliminary Assessment (PA) in June 1986, a Screening Site Inspection (SSI) in March 1990, and an Expanded Site Inspection (ESI) in July-September, 1998. The Site was listed on the National Priorities List (NPL) in 2000. From 1999 to 2005, while investigations were ongoing, EPA conducted several removal actions to reduce the immediate threats to residents on and near the Source Area and along the River and to minimize potential erosion and downstream transport of contaminated soil and sediment**.** An additional removal action was conducted in 2009-2010 under EPA oversight to minimize the movement of contamination through groundwater into the River.

Removal Actions

The first Time Critical Removal Action (TCRA) was conducted in 1999-2000 and included construction of fencing in portion of the Source Area and in residential areas adjoining Allendale Pond, construction of two interim soil caps with a geotextile fabric liner and two-foot thick soil cover in the undeveloped portions of the Source Area prone to flooding, and placement of rip-rap along the eastern shore of the Woonasquatucket River (First Removal Action).

A second TCRA (Second Removal Action) was conducted in 2003-2004 and addressed the tailrace along the eastern side of the Source Area. The Second Removal Action included re-grading and capping the drainage swale with a permeable one-foot thick soil and stone aggregate cellular confinement cap.

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1 Dioxins and dioxin-like compounds are a diverse range of chemicals which are known to exhibit dioxin-like toxicity. Each of these compounds has its own level of toxicity described using weighted values called toxic equivalents (TEQs). To account for how these compounds vary in toxicity, the toxic effects of dioxins are measured in fractional equivalencies of TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin), the most toxic and best studied congener. In order to calculate a TEQ, a toxic equivalency factor (TEF) is assigned to each member of the dioxin and dioxin-like compounds category. The TEF is the ratio of the toxicity of one of the dioxin or dioxin-like compounds to the toxicity of of 2,3,7,8-TCDD, which is assigned a TEF of 1. Established TEFs, most recently revised in 2005 and adopted by the World Health Organization (WHO), currently range from 1 to 0.0001.

A third TCRA (Third Removal Action) was performed in 2009-2010 and required that contaminated soil in the Brook Village parking lot adjacent to the Woonasquatucket River be excavated and disposed of off-site and a RCRA cap be installed over the impacted area.

A Non-Time Critical Removal Action (NTCRA) was conducted in 2000-2003 to reconstruct the breached Allendale Dam (the first dam downstream from the Source Area), restore Allendale Pond, and remove floodplain soil impacted with dioxin TEQ above 1,000 nanograms per kilogram (ng/kg; or part per trillion [ppt]) from eleven residential-use areas along Allendale and Lyman Mill Ponds. Table B-1 summarizes Removal Actions performed at the Site.

More information on these removal actions is included in the Administrative Record.

Remedial Investigation

EPA conducted a series of investigations from 1999 to 2004 to characterize the nature and extent of contamination in Source Area soil and groundwater, sediment, floodplain soil, surface water, and biota at the Site. In addition, these investigations focused on evaluation of contaminant fate and transport processes and collecting data to support the baseline human health and ecological risk assessments. These investigations included:

- A vapor-to-water diffusion survey to characterize contaminated groundwater discharge from the Source Area to the Woonasquatucket River;
- Characterization of contaminants on residential use properties adjacent to the river and in river sediments and surface water;
- Characterization of soil and groundwater contamination and hydrology at the Source Area;
- An investigation to characterize floodplain soil contamination in a forested wetland (Oxbow), located below Allendale Dam;
- A geomorphology investigation to identify morphological features and changes along the Woonasquatucket River in the Allendale and Lyman Mill Ponds areas;
- A geophysical survey to map water depth and soft sediment thickness in Allendale and Lyman Mill Ponds;
- Sediment coring to assess the vertical and spatial extent of contamination, estimate the rate of sediment accumulation, and identify the relationship between depth, age and dioxin contamination in the Allendale and Lyman Mill Ponds; and
- A sediment stability evaluation (modeling) to assess the impacts of sediment erosion, transport, and deposition processes on surficial sediment bed and water column concentrations of dioxin within Allendale and Lyman Mill Ponds.

An environmental forensic review of soil and sediment chemistry data was also performed to differentiate chemical contamination signatures from the Site from those in upstream background and reference samples. The RI report was completed in June 2005, with additional investigations conducted while the FS was in progress to address data gaps identified in the RI. These supplemental studies included:

- An evaluation of dioxin migration into the Woonasquatucket River associated with the contaminated groundwater plume in the vicinity of the Brook Village parking lot;
- A sediment coring study to further assess the vertical and spatial extent of contamination at Lyman Mill Pond, estimate the rate of sediment accumulation, and identify relationships between depth, age, and dioxin contamination;
- A surface water investigation to verify that no net transport of dioxin is occurring downstream of Lyman Mill Dam under non-suspending (low-flow) conditions;
- A sediment stability evaluation (modeling) to support certain Feasibility Study alternatives; and
- Additional surface and subsurface floodplain soil data collection in the Oxbow.

More details regarding the results of the RI are included in Section E of this ROD and in the Administrative Record.

3. History of CERCLA Enforcement Activities

Since January 1999, EPA has conducted a number of potentially responsible party (PRP) search activities. First, EPA located and interviewed persons familiar with former operations at the Site and conditions of the properties at 2072 and 2074 Smith Street prior to and during construction of the apartment complexes. EPA also obtained a title search and reviewed RIDEM files, old newspapers and fire department records to determine historic information about releases at the Site. In addition, from 1999 through 2009, EPA issued at least 100 104(e) information request letters to former customers of NECC; potential successors to former customers of NECC; and companies that currently operate, or previously operated, along the River. EPA also conducted several administrative depositions with various parties.

EPA notified several parties who either owned or operated facilities at the Site, generated wastes that were shipped to the Site, arranged for the disposal of wastes at the Site, or transported wastes to the Site of their potential liability with respect to the Site. The enforcement history is summarized below:

- On September 15, 1999, EPA mailed Notices of Potential Liability letters to three parties: Brook Village Associates Limited Partnership; Centerdale Manor Associates Limited Partnership; and New England Container Company, Inc. On November 26, 1999, EPA issued a proposed Administrative Order on Consent (AOC) for a RI/FS to Brook Village Associates Limited Partnership and Centerdale Manor Associates Limited Partnership, the two parties who indicated a willingness to participate in Site activities. The subsequent negotiations were unsuccessful. On December 2, 1999, EPA issued a proposed AOC to Brook Village Associates Limited Partnership and Centerdale Manor Associates Limited Partnership for time critical removal activities including installation of interim soil caps and flood control measures. These negotiations were unsuccessful as well. On February 3, 2000, EPA issued a letter to Brook Village Associates Limited Partnership, Centerdale Manor Associates Limited Partnership and NECC requesting that the parties perform or finance an Engineering Evaluation/Cost Analysis (EE/CA) for a portion of the Site. The parties declined to negotiate.

- On February 28, 2000, EPA mailed two additional Notice of Potential Liability letters to Emhart Industries, Inc. and Crown-Metro, Inc. Negotiations with these two parties and the three parties previously identified to perform or fund the time critical removal activities at the Site were unsuccessful.
- On April 12, 2000, EPA issued a Unilateral Administrative Order (UAO) to the five parties listed above, ordering these parties to complete the First Removal Action, including completion of the second interim soil cap and implementation of flood control measures. These PRPs complied with the UAO. EPA approved the PRPs' Completion of Work Report on September 11, 2000.
- On April 27, 2000, EPA issued a letter to all five PRPs requesting that they indicate their interest in completing the RI/FS at the Site. Subsequent negotiations were unsuccessful.
- On February 13, 2001, EPA issued a proposed AOC for non-time critical removal activities, including restoration of the Allendale Dam and removal of contaminated soil and sediment from properties subject to residential and recreational use. Negotiations were unsuccessful and, on March 26, 2001, EPA issued a Second UAO for this work to the five parties listed above. These PRPs complied with the UAO and EPA approved the PRPs' Completion of Work Report on May 13, 2005.
- On May 16, 2002, EPA mailed a Notice of Potential Liability letter to Bernard V. Buonanno, Sr. On that same day, EPA issued an amendment to the second UAO adding Mr. Buonanno to the list of Respondents. EPA withdrew the amendment on October 30, 2002.
- On March 3, 2003, EPA mailed Notice of Potential Liability letters to eleven additional parties: American Hoechst Corporation, American Mineral Spirits Company, Ciba Geigy, Cranston Print Works Company, Eastern Color and Chemical Company, Eastern Smelting, Organic Dyestuffs Corporation, The Original Bradford Soap Works, Inc., Warwick Chemical Company, T.H. Baylis, Co., and Teknor Apex Company. EPA mailed an additional Notice of Potential Liability letter to Refinity Corporation on March 31, 2003.
- In September 2003, EPA entered into a third AOC with ten parties who agreed to implement and finance the Second Removal Action (reconstruction and capping of the former tailrace). In October 2003, EPA issued a third UAO, ordering two additional companies to participate in this removal action. All parties complied with the Order. EPA approved the PRPs' Completion of Work Report on June 27, 2006.
- In 2005, EPA issued additional 104(e) information request letters to further learn about activities along the Woonasquatucket River.

- In January 2006, the Unites States moved to enter two consent decrees (CDs): one with Brook Village Associates Limited Partnership and the second with Centerdale Manor Associates. The CDs provide for contribution to future site-related costs and natural resource damages of over $3.9 million. After Emhart's intervention into the CD proceedings and subsequent hearings, the Rhode Island District Court entered the two CDs in November 2006 and Emhart appealed. In February 2007, the United States and Emhart reached a settlement pursuant to which Emhart agreed to withdraw its appeal and EPA agreed to use any CD proceeds for work performed after the ROD is issued. The settlements became effective in April 2007.
- On August 7, 2007, EPA mailed Notice of Potential Liability letters to two additional parties: United States Navy and Northeast Products Company, Inc.
- On September 20, 2007, EPA mailed one additional Notice of Potential Liability letter to United States Air Force.
- In September 2007, EPA entered into a fourth AOC with Emhart Industries, Inc., who agreed to perform certain studies and investigations to assist EPA with its evaluation of the potential conditions that could result from FS alternatives that include removal of the Allendale and Lyman Mill Dams.
- On August 6, 2008, EPA mailed Notice of Potential Liability Letters to six additional parties: A. Harrison & Co., Inc., BNS Co., Cal Chemical Corporation, Duro Industries, Division of Duro Textiles LLC., Eastern Resins Corp., and Indusol, Inc.
- On August 6, 2009, EPA entered into a fifth AOC with Emhart Industries, Inc. to implement and finance the Third Removal Action (excavation and off-site disposal of contaminated soil in the Brook Village parking lot adjacent to the Woonasquatucket River and installation of a RCRA hazardous waste cap over the impacted area). EPA approved the PRP's Completion of Work Report on July 27, 2010.
- On September 23, 2011, EPA mailed Notice of Potential Liability letters to three additional parties (Lonza Inc., Woburn Steel Drum, and Exxon Mobil Corporation).
- On October 20, 2011, EPA mailed Notice of Potential Liability letters to Black & Decker Corporation and Black & Decker Inc.
- On October 21, 2011, EPA mailed Notice of Potential Liability letters to four additional parties: Univar USA Inc., Olin Corporation, Phibro Animal Health Corporation, and Arch Chemicals, Inc.

The PRPs have been active in the remedy selection process for this Site. PRPs and their representatives participated in the RI/FS public dialogue meetings with other stakeholders and submitted a number of memorandums and comments that are included in the Administrative Record. The PRPs also submitted a number of proposals for additional remedial alternatives to be considered in the FS. The PRPs performed some technical studies related to the FS and conducted some soil and sediment sampling under agreements with EPA.

In 2006, Emhart filed a lawsuit against NECC and its insurance carriers seeking response costs under CERCLA § 107(a), and contribution under CERCLA § 113(f)(1). Emhart v. NECC, Civ.

Act. No. 06-218-S (D.R.I.). In response to a motion filed by NECC, the District Court of Rhode Island dismissed Emhart's contribution claim but allowed its 107(a) claim to proceed as one for an implied right of contribution. This lawsuit is still ongoing.

In February 2011, Emhart filed a lawsuit against the U.S. Navy, the United States Air Force and the Department of Defense under Sections 107 and 113 of CERCLA for cost recovery and contribution to the costs Emhart has incurred at the Site. The United States moved to dismiss four out of five counts in Emhart's complaint. On November 1, the District Court of Rhode Island denied the government's motion to dismiss Emhart's 107(a) claim, but granted its motion to dismiss the counts for divisibility, equitable indemnification, and declaratory judgment (as it corresponds to divisibility and equitable indemnity).

On February 13, 2012, the United States filed a counterclaim against Emhart on behalf of the United States Air Force and Navy for contribution under CERCLA § 113(f) and a counterclaim on behalf of EPA for cost recovery under CERCLA § 107(a). On February 24, 2012, the United States filed a third party complaint against Black & Decker, Inc., as a successor to Emhart, on behalf of the United States Air Force and Navy for contribution under CERCLA § 113(f) and on behalf of EPA for cost recovery under CERCLA § 107(a).

On March 23, 2012, Emhart filed a motion to consolidate Emhart v. NECC and Emhart v. U.S. Air Force. The Court granted Emhart's motion. Pursuant to the current case management order, trial is scheduled for late 2013 early 2014.

Table B-1. Removal Actions Taken at the Site

Dates	Removal Action	Legal Authority	Who Undertook	Problems Addressed	Related Documents
1999–2000	TCRA: Fence in portions of Source Area and along Allendale Pond; two interim soil caps, rip-rap, and a flood control berm in the Source Area	EPA, Region I	Combination of Fund-lead and PRP-lead	Restrict access to river and surface soil; reduce/erosion and runoff	EPA Action Memorandum, May 4, 1999, as amended September 13, 1999, June 1, 2000, and June 1, 2005; EPA Notice of Completion September 11, 2000
2000–2003	NTCRA: Reconstruction of the Allendale Dam and restoration of Allendale Pond; excavation of residential-use soils in eleven action areas along Allendale and Lyman Mill Ponds	EPA, Region I	PRP-lead	Minimize further downstream migration of contamination; minimize exposure to site-related contaminants	EPA Action Memorandum January 18, 2001; EPA Notice of Completion May 13, 2005
2003–2004	TCRA: An interim cap in reconstructed former tailrace	EPA, Region I	PRP-lead	Minimize erosion and downstream transport of contaminants	EPA Action Memorandum Amendment, September 30, 2003; EPA Notice of Completion June 27, 2006
2009–2010	TCRA: Excavation of soils and groundwater at the Brook Village parking lot and construction of a RCRA C cap	EPA, Region I	PRP-lead	Addressed groundwater/minimize discharge of contaminants to the River	EPA Action Memorandum, July 17, 2009; EPA Notice of Completion July 27, 2010

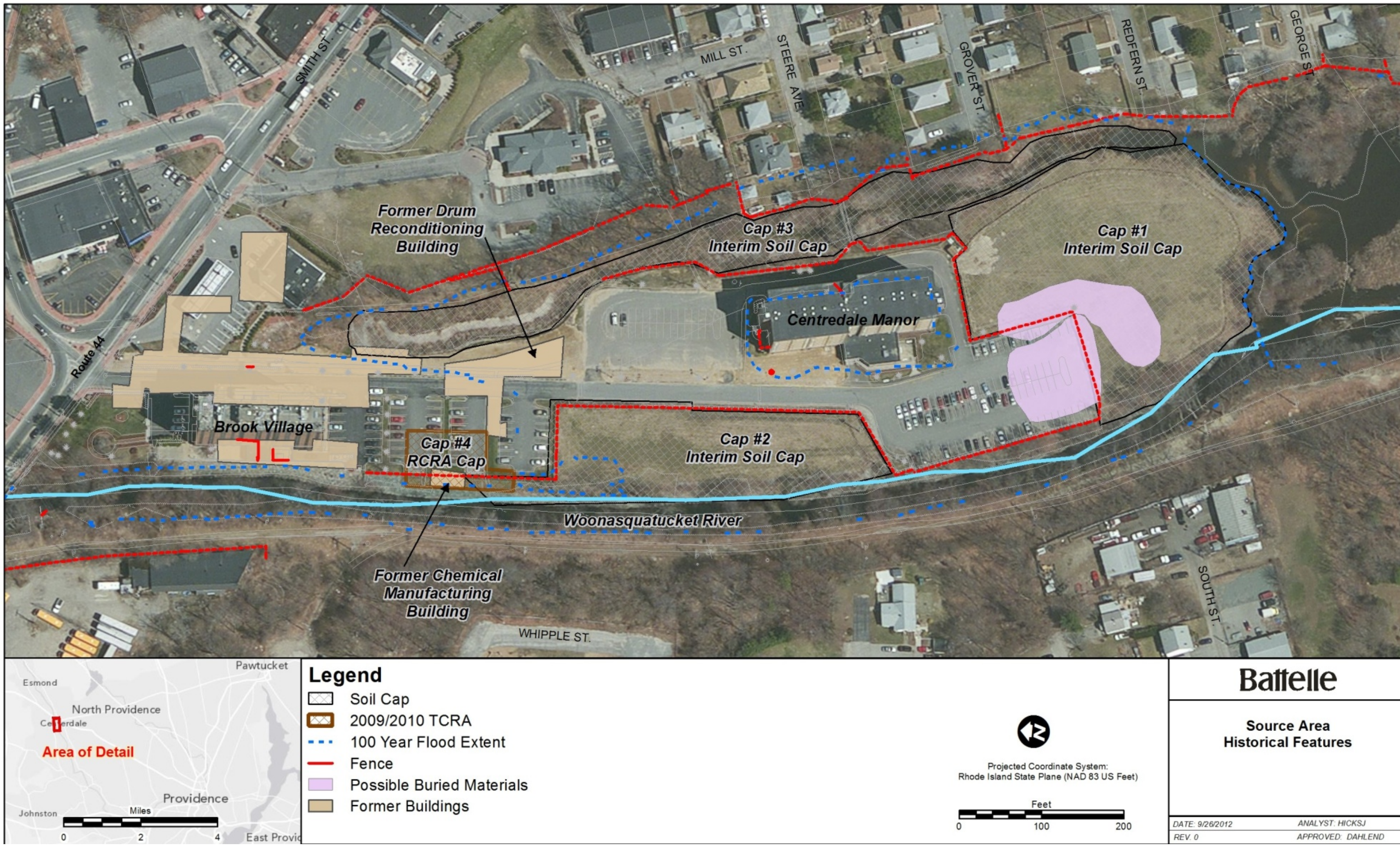


Figure B-1. Source Area Historical Features

C. COMMUNITY PARTICIPATION

Throughout the Site's history, community concern and involvement has been very high. EPA and RIDEM have kept the community and other interested parties apprised of Site activities through informational meetings, fact sheets, press releases and public meetings. Below is a brief chronology of public outreach efforts.

- The Management Action Committee (MAC) formed in January 1999, was co-chaired by the North Providence Mayor and EPA and included representatives from EPA, RIDEM, RIDOH, Agency for Toxic Substances and Disease Registry (ATSDR), PRPs, Office of the Governor of Rhode Island, North Providence and Johnston Mayors' offices, the Woonasquatucket River Watershed Council, the Providence Urban River Team, and others. MAC served as an important forum for community involvement at the Site throughout the removal and the RI activities. MAC generally met monthly for presentations of major milestones and discussions of Site activities. Through MAC, EPA disseminated to the affected community site-specific information regarding the on-going field activities and planned future actions to address community concerns and keep citizens informed about and involved in response activities.
- On July 14 and 15, 2004, EPA's technical advisory group called the Contaminated Sediments Technical Advisory Group (CSTAG) held a consultation about the Site. Five of the invited stakeholder groups participated in the meeting and made presentations to the CSTAG. They were the Mayor of North Providence, the Woonasquatucket River Watershed Council (WRWC), two PRP groups, and the EPA Urban River Team. Written comments were also provided to CSTAG by RIDEM and National Oceanic and Atmospheric Administration (NOAA),
- In the fall of 2004, EPA engaged a neutral facilitator to engage key parties who had been participating in activities associated with the Site to help EPA explore the possibility of a public dialogue regarding possible remedies for the Site. Following EPA's introductory letter to the stakeholders, the facilitator interviewed a total of 31 people between January 20 and February 28, 2005 including PRPs and their representatives; organized interest groups; local elected and appointed officials in jurisdictions associated with the Site; and local, state, and federal agency representatives, to gauge the parties' interest in participating in a dialogue group. A summary of the interviews were distributed to all the participants. Using the results of the interviews and subsequent discussions, the facilitator developed a dialogue process.
- During the RI/FS activities, the public dialogue participants convened for four facilitated meetings where EPA and other stakeholders presented data and information and exchanged ideas and concerns, including follow-ups. Summary notes of the meetings were distributed to all the participants. An additional dialogue group meeting was held on October 27, 2011, at the time of the Proposed Plan release.

- The Woonasquatucket River Watershed Council applied for and in February 2005 was awarded a Technical Assistance Grant (TAG) to assist in interpreting information related to Superfund response activities at the Site. The Council has retained a TAG consultant that attends dialogue meetings.
- From 1999 to the present, EPA issued numerous press releases for Site activities, Site Updates for major milestones, and held open houses and informational meetings at the North Providence Town Hall and the Brook Village and Centredale Manor apartments.
- From the late 1990s to the present EPA has been working with the Woonasquatucket River Watershed Council on "Do's and Don'ts" for the Woonasquatucket River educating public to use the River responsibly. These EPA's activities include issuance of annual spring press releases reminding the public of restrictions on recreational activities and the fishing advisory in the River, and posting warning signs along the River access points in the Allendale and Lyman Mill Ponds areas.
- In 2010, EPA's National Remedy Review Board (NRRB) and CSTAG evaluated the work EPA Region 1 had done to support a remedy decision for the Site. As part of this evaluation, numerous stakeholders including the PRPs, the municipalities, the Woonasquatucket River Watershed Council, other environmental groups, as well as RIDEM and Natural Resources Trustees, submitted comments to the Boards for consideration regarding the Site.
- On July 21, 2011, EPA held an informational meeting at the North Providence Town Hall to discuss the results of the RI and to update the community on Site activities prior to issuance of the Proposed Plan.
- On October 27, 2011, EPA made the administrative record including the Proposed Plan available for public review at EPA's offices in Boston and at the North Providence Union Free Library at 1810 Mineral Spring Ave, North Providence, Rhode Island and the Marian L. Mohr Memorial Library at 1 Memorial Ave in Johnston, Rhode Island. These are the primary information repositories for local residents. The Proposed Plan was also mailed to the Site mailing list and made available on-line.
- In the October 26 – November 1, 2011 and November 2 – 8, 2011 weekly issues of the North Providence Valley Breeze and in the November 3, 2011 Johnston Sun Rise, EPA published a notice of availability and announcement of public meetings for the Proposed Plan. EPA published an announcement of public hearings and a brief analysis of the Proposed Plan on November 30, 2011 in the Johnston Insider, in the November 30 – December 6, 2011 weekly issue of the North Providence Valley Breeze, on December 2, 2011 in the Johnston Sun Rise, and on December 1, 2011 in the Providence Journal.
- From November 14, 2011 to January 12, 2012, EPA held a 60-day public comment period to accept public comment on the alternatives presented in the FS and the Proposed Plan and on any other documents previously released to the public. An extension to the public comment period was requested and as a result, the public comment period was extended to February 13, 2012. Another extension to the public

comment period was requested and as a result, the public comment period was extended to March 2, 2012. EPA published notices of the first comment period extension in the January 25 – 31, 2012 weekly issue of the North Providence Valley Breeze and on February 2, 2012 in the Johnston Sun Rise. For the second comment period extension, EPA published notices on February 12, 2012 in the Providence Journal, in the February 15 – 21, 2012 weekly issue of the North Providence Valley Breeze, and on February 16, 2012 in the Johnston Sun Rise.

- On November 8, 9, and 10, 2012, EPA held informational meetings at the North Providence Town Hall, the Johnston Senior Center and Centredale Manor to discuss the results of the RI and the cleanup alternatives presented in the FS and Addendum (collectively FS) and to present EPA's Proposed Plan.
- On December 7, 2011, EPA held public hearings at Centredale Manor and the North Providence Town Hall to accept comments on the Proposed Plan. A transcript of these meetings, the comments, and the Agency's response to comments are included in the Responsiveness Summary, which is part of this ROD.
- On July 19, 2012, EPA issued the Proposed Plan Amendment and made the administrative record for the Proposed Plan Amendment available for public review at EPA's offices in Boston and at the North Providence Union Free Library at 1810 Mineral Spring Avenue, North Providence, Rhode Island and the Marian L. Mohr Memorial Library at 1 Memorial Avenue in Johnston, Rhode Island. The Proposed Plan Amendment was also mailed to the Site mailing list and made available on-line.
- EPA published an announcement of public hearings and a notice and brief analysis of the Proposed Plan Amendment in the July 19 – 25, 2012 weekly issue of the North Providence Valley Breeze, and on July 19 and July 26, 2012 in the Johnston Sun Rise. EPA and ATSDR also held individual meetings with the affected property owners/residents during the month of July.
- From July 19, 2012 to August 17, 2012**,** EPA held a 30-day public comment period to accept public comment on the Proposed Plan Amendment. An extension to the public comment period was requested and as a result, the public comment period was extended to September 17, 2012. EPA published notices of the public comments extension in the August 22 – 28, 2012 weekly issue of the North Providence Valley Breeze, and on August 16, 2012 in the Johnston Sun Rise.
- On July 30 and July 31, 2012, EPA held combined informational meetings and public hearings at the Pocasset Bay Retirement Living facility in Johnston, at the North Providence Town Hall and at Centredale Manor to present EPA's Proposed Plan Amendment including the proposed dioxin cleanup level change, changes to the human health risk assessment, and the resulting modifications to Site cleanup alternatives. On July 30 and 31, 2012, public hearings at Pocasset Bay Retirement Living facility in Johnston, Rhode Island, at the North Providence Town Hall and at Centredale Manor were held and EPA accepted formal comments on the Proposed Plan Amendment. A transcript of these meetings, the comments, and the Agency's response to comments are included in the Responsiveness Summary, which is part of this ROD.

D. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

Prior to the selection of the remedy, several removal actions were conducted at the Site. These removal actions are discussed in more detail in Section B.2 of the ROD. The selected remedy was developed by combining components of different alternatives to address sediment, soil, surface water and groundwater contamination. This selected remedy addresses Source Area soil and groundwater as well as sediment, surface water and floodplain soil in the Allendale and Lyman Mill reaches of the River. The River below Lyman Mill Dam into the Providence area will be monitored as part of the action under this ROD to determine if other response actions will be required. Consistent with EPA guidance on using a phased approach to making decisions at sediment sites, EPA will evaluate the impact of cleanup implementation on areas further downstream, as information becomes available from sampling these downstream areas. This information will guide EPA's involvement in downstream reaches of the River. A subsequent decision document will be issued based upon this information.

E. SITE CHARACTERISTICS

Chapter 2 of the FS contains an overview of the RI. The significant findings of the Remedial Investigation are summarized below.

1. Conceptual Site Model

The sources of contamination, release mechanisms, exposure pathways to receptors for the Site, as well as other site-specific factors, are diagrammed in a Conceptual Site Model (CSM), see Figure E-1. The CSM is a three-dimensional "picture" of Site conditions that illustrates contaminant sources, release mechanisms, exposure pathways, migration routes, and potential human and ecological receptors. It documents current and potential future Site conditions and shows what is known about human and environmental exposure through contaminant release and migration to potential receptors. The risk assessment and response action described in this ROD for the Site is based on this CSM. The sources of contamination for the Site, including dioxin, are the result of releases at the Source Area. Releases are consistent with past chemical manufacturing and an incinerator-based drum reconditioning facility operating until early 1970s. HCX and 2,3,7,8-TCDD (or dioxin), are present in the Source Area and this contamination is consistent with hexachlorophene manufacturing. 2,3,7,8-TCDD is a contaminant within the trichlorophenol that was used to manufacture hexachlorophene. HCX was one of the contaminants from the process used to create hexachlorophene. The chemical manufacturing facility was the main customer of the incinerator-based drum reconditioning facility and likely sent drums contaminated with HCX and 2,3,7,8-TCDD there.

High levels of contamination found at the Source Area are consistent with evidence of past disposal. Chemicals from both facilities were released directly to the ground and wetlands, buried, and discharged directly into the River. Direct infiltration of chemicals and leaching led to contamination of surface and subsurface soil as well as groundwater contamination. These discharges, along with erosion and transport of contaminated Source Area soil by surface runoff and during flooding, resulted in contaminant migration into surface water and sediment in the adjacent Woonasquatucket River and its floodplain downstream from the Source Area of the Site.

During RI/FS activities, significant flooding events in the Source Area were documented in 1998, 2005 and 2010. It is likely that similar flooding took place at the Source Area prior to EPA's initial investigation of the Site. During these events, nearly the entire Source Area was submerged with significant water currents rushing across the landscaped and paved areas. The 100-yr flood elevation follows a gradient of 101.2 ft at the Route 44 Bridge to 97 ft at Allendale Dam. The ground surface elevations in a significant percentage of existing interim cap areas (Cap Areas #1, #2, and #3), see Figure A-2, at the Source Area are below the 100-year flood elevation, as are some of the parking lots, paved surfaces and landscaped areas. Approximately 85 percent of the 9 acre Source Area is below the 100-year flood elevation, indicating that these areas may be subject to erosion during flooding. Photo documentation from the October 2005 flood shows that flood waters approached the steps of the Centredale Manor building (located at the 98-ft elevation) and that there was approximately 1 ½ ft of standing water at the Centredale Manor south parking lot (located at the 97 ft elevation; water reached the wheel wells in parked cars). A post-flood inspection performed in April 2006 also revealed evidence of the high-flow event. For example, in some areas, the fence separating the parking lots from the cap area had grass and leaves trapped within the chain-link. In addition, many of the trees and shrubs along the Woonasquatucket River had debris in branches two to three feet above the normal water level. This debris may be associated with the October 2005 event, which resulted in over-bank flooding in some areas. A post-flood inspection revealed downed fences and some areas of erosion.

Contaminated sediments have accumulated in fine-grained depositional impoundments, primarily the Allendale and Lyman Mill Ponds where they are being eroded, resuspended and redistributed by high flows. The breach of the Allendale Dam in 1991 and further deterioration in 2001 resulted in further transport of contaminated sediment from Allendale Pond to Lyman Mill Pond. Interim capping of the Source Area from 2000 to 2004, restoration of the Allendale Dam in early 2002, and removal of contaminated soil in the Source Area adjacent to the River in 2009 has reduced further migration of contaminants into the River.

The RI found that the vast majority of the vadose zone soil (average thickness of vadose zone in the Source Area is about 5 feet) is impacted with dioxin, VOCs, PCBs, SVOCs, pesticides and metals. The contamination is spread throughout the Source Area with much of the contamination located in the central and southern portions of the Source Area that are paved or have interim caps. The highest levels of 2,3,7,8-TCDD found in surface soils and the highest PCB levels at depths of 1-3 feet are now beneath these interim caps. Groundwater contamination in the Source Area is spatially widespread. Dioxin was also detected at a high concentration (prior to the 2009-2010 removal action) in monitoring wells near the Woonasquatucket River close to the former location of the hexachlorophene manufacturing facility. Dioxin appears to have been mobilized by elevated levels of trichloroethylene (TCE) and tetrachloroethylene (PCE) found at this location which is currently the Brook Village parking lot. The Source Area groundwater data from the early 2000's indicated the potential presence of two PCE plumes.

The uppermost one foot of the Allendale and Lyman Mill Pond sediments is most significantly impacted by dioxin and to various extents by PCBs, pesticides and other compounds. Sediment dioxin concentrations decrease in a downstream direction, but continue to exceed background levels below the Manton Dam which is about 3,100 feet (meandering River flow) below the Lyman Mill dam. The investigations show that sediments scoured during the high-flow events are re-deposited within each pond and the Oxbow Area, with some suspended sediments moving further downstream. Vertical dioxin profiles in sediment cores indicate that natural recovery (i.e., burial) may be occurring in some areas of the Ponds, but not in others. Capping of the Source Area soils was conducted mainly to address direct contact threats but also to minimize dioxin and other contamination entering the River via surface runoff and erosion of floodplain soils. The most recent excavation and capping done as part of the groundwater removal action in 2009-2010 are expected to minimize dioxin and other contamination entering the River via surface runoff, erosion of floodplain soils, and leaching.

2. Site Overview

Section A of this ROD describes the Site. The Woonasquatucket River was recognized as one of fourteen American Heritage Rivers in 1998, and is currently the focus of urban revitalization and watershed protection efforts. The River was chosen in part because of the significant role it played in the Industrial Revolution. Attached Figure A-1 depicts the area in the vicinity of the Site.

Geomorphology

The Centredale Manor and Brook Village Apartments are located at the Source Area of the Site and are constructed on artificial fill on the floodplain of the River. Surficial deposits in the Woonasquatucket watershed are classified as glacial till. The Woonasquatucket River is entrenched in a valley terrain, a glacially-carved north-sound trending bedrock valley filled with outwash. The man-made alterations of the River channel flow from the construction of the mill dams in the 1800s greatly influenced the River morphology and sedimentation regime. The east bank of the River in the Allendale Pond area was developed as a residential neighborhood between 1888 and 1935. The west bank of the River is disturbed by cutting or filling, and is currently largely occupied by industrial facilities and an abandoned railway bed running along the River bank. During the breach of the Allendale Dam (1991 and 2001), as the water levels in the Allendale Pond subsided and more sediment was exposed, the River assumed the characteristics of a braided channel. Anthropogenic influences are also evident downstream from the Allendale Dam. The River channel has been channelized with a levee and a meander channel was located in the forested wetland (Oxbow). The meander channel was abandoned although it apparently still carries water during high flow events.

The river channel from the Route 44 bridge to the head of Allendale Pond is straight and approximately 1,500 feet long. This channel is a perennial riverine habitat. The western bank of the channel, across from the Centredale Manor and Brook Village properties, is steep and is overgrown with trees and scrub shrub vegetation. Remaining undeveloped areas of the Allendale Pond constitute a riverine wetland bordered by palustrine emergent and scrub shrub wetland habitat. Lyman Mill reach includes riverine, palustrine, and lacustine wetland habitats. A large forest borders the western bank below the Allendale Dam, while a thin strip of scrub shrub habitat, residential properties and a ball field are located on the east shore.

Geology and Hydrogeology

The Source Area of the Site, currently covered by buildings, pavement and recently installed soil caps, consists of 6-8 ft thick fill overlaying relatively coarse sands and gravel with thin layers of silt, fine sands and organic rich silt found in former wetland or floodplain areas. Thickness of the sand and gravel unit ranges from 12.5 to 43 feet, with bedrock located at a 40 to 60 foot depth in the Source Area. Soil in the Allendale reach is generally fine sandy loam. Apparent bedrock outcrop is evident on the east side of the Allendale Pond. A forested wetland northwest of the Lyman Mill Pond consists of moderately to well-drained fine sandy loam soils that formed in recent alluvium on floodplains. At the north end of the reach, the soil is very poorly drained and is composed of black muck at the surface and fine sand in the subsurface. The remainder of the reach is primarily gravely sandy loam and sandy loam soils formed in depressions on terraces and outwash plains.

The direction of shallow groundwater flow is generally to the south. Under normal flow conditions, groundwater discharges to the tailrace along the eastern boundary of the Source Area as well as to the River. Under high flow conditions, groundwater flow is apparently reversed and the River recharges the aquifer everywhere except a potential small groundwater mound located beneath the Brook Village parking lot. This groundwater mound no longer appears to be present following the Third Removal Action at that location. Installation of the interim caps may have also altered shallow groundwater flow elsewhere in the Source Area. Groundwater flow through the deep overburden and bedrock is generally to the south-southwest. The average groundwater velocity in the shallow overburden is estimated at 0.21 ft/d, in the deeper overburden at 0.55 ft/d, and in the bedrock at 27 ft/d.

Surface Water and Sediment

Stream flows in the Woonasquatucket River have been monitored by the United States Geological Survey (USGS) Centredale gauge station (011145600) since October 1, 1942 (i.e., water year 1943). Stream flow is from north to south. Over the last 70 years, annual mean stream flow for the River has ranged from 50 cubic feet per second (cfs) to 100 cfs in most years. Since 1942, peak stream flow ranged between 250 cfs and 750 cfs approximately 60 percent of the time. Between 1943 and 1966, peak stream flow was fairly consistent and fell within this specified range, except in September 1954 and October 1955 when peak stream flow exceeded 950 cfs. Since 1966, peak stream flow has been somewhat variable, with values ranging from 190 cfs to 1,530 cfs. The highest recorded peak stream flows were recorded during the March 2010 (1,750 cfs based on provisional USGS data) and October 2005 (1,530 cfs based on USGS) flood events. Comparable high-flow events also occurred during 1968, 1979, 1983 and 1998.

A flood frequency analysis was conducted as part of the RI/FS using historical data collected at the Centredale gauging station. This analysis calculated flow rates for a range of flood return periods ranging from 5 to 1,000 years, and established the 100-year peak probability flow at 2,300 cfs at the Site. Based on that flood frequency analysis, the peak flow rate during the October 2005 flood corresponds to a 25-yr flood while the peak flow rate during the March 2010 flood corresponds to a return period that ranges between 25 and 50 years (i.e., a probability that this flow will occur in a particular year that ranges between 2 and 4 percent).

Allendale Pond has an area of approximately 15 acres with water depths ranging from less than 0.5 feet to a maximum of about 10 feet. On average, the depth of the Pond is 4-6 feet in the southern part of the pond. Soft sediment with an average thickness of 3-4 feet is underlain by relatively hard sediment, which may represent an historic gravel and sand river channel. The thickest soft sediments, up to 10 feet, occur in shallow water depths or in deeper waters. Sediments are coarser near the inlet to Allendale Pond and in the flow channel, and are finer in the Pond sediments on either side of the flow channel. A surface peat layer of variable thickness is also present in Allendale Pond. A sedimentation rate of 0.5 to 0.8 centimeters per year (cm/yr) is expected to occur in this Pond based on modeling predictions.

Below the reconstructed Allendale Dam, the Woonasquatucket River is channelized where the former Allendale Mill still stands. The former Allendale Mill has been converted into the Allendale Mill condominium complex. A 40-acre complex of riverine, emergent, scrub-shrub, and forested wetland (Oxbow, approximately 27 acres) and adjacent uplands is located below Allendale Dam. Lyman Mill Pond is approximately 24 acres with water depths similar to Allendale Pond. A deep flow channel is apparent along the eastern side of the Pond. Thicker soft sediments correspond to shallow water at the south end of the Pond as well as behind Lyman Mill Dam. The soft sediments are underlain by hard sediment and possibly bedrock. Sediment grain size distribution is similar to Allendale Pond, except a gelatinous, highly organic silt surface layer is present in the pond, ranging in thickness from 1.0 to greater than 3.5 feet, with average thickness of 2 feet. The estimated sedimentation rates of 0.5 to 0.6 cm/year are somewhat lower compared to Allendale Pond.

More detailed information is available in Section 3 of the RI and Section 2 of FS reports.

3. Remedial Investigation Sampling Strategy

As noted previously, significant Site investigations and sampling data were available prior to the start of the RI. This included data collected for the NPL-listing investigation activities and time-critical and non-time critical removal actions. These data, studies and results were incorporated into the RI evaluations. The RI was implemented in a phased iterative approach, to allow evaluation of any “data gaps” (i.e., missing pertinent information) and to guide the scope of work, including completion of the FS. The data was also used to evaluate human health and ecological risk. Major RI activities are summarized in this Section.

Source Area Investigations

The Source Area investigations were conducted to characterize the nature and extent of soil and groundwater contamination and to evaluate the Site hydrogeologic setting. A review of Aerial Photographic Analysis from 1935 to 2000 was used to identify historical Site features and potential sources of contamination and to guide the sampling program. To characterize the discharge of VOC-contaminated groundwater in the Source Area, 165 water-to-vapor diffusion samplers were deployed in September of 1999 in the River adjacent to the Source Area, in the former tailrace, and cross-channel in the south end of the Source Area. The vapor samples were analyzed in an on-site mobile laboratory for selected VOCs, including BTEX, PCE and TCE.

Field investigation activities from September 2000 to August 2001 included surface geophysical surveys (ground penetrating radar), 2-D resistivity imaging, seismic refraction studies, soil and bedrock borings, monitoring well installation, and groundwater sampling and analysis.

Two long-term groundwater level monitoring programs, including one high water table event and one low water table event, were conducted using 21 shallow piezometers with electronic transducers and staff gauge in the River. Two soil borings and 26 monitoring wells were installed. Soil samples from subsurface borings were analyzed for dioxin/furans, HCX, VOCs, SVOCs, metals, pesticides, and PCBs. Three shallow monitoring wells were installed in the former tailrace and 9 well clusters, in combinations of shallow overburden, deep overburden and bedrock wells, were installed around the perimeter and downgradient of the contaminated zones in the Source Area.

Two groundwater sampling events were conducted and samples were analyzed for dioxin/furans, HCX, VOCs, SVOCs, pesticides, PCBs, metals (total and dissolved), alkalinity, sulfides, and TOC in the early 2000s. Initial sampling was conducted in the spring of 2001 at seven shallow overburden wells. Seven existing monitoring wells installed in the Brook Village parking lot as part of its earlier underground storage tank (UST) removal project, were also sampled. The second round of groundwater sampling was conducted in the summer of 2001 at all 33 monitoring wells. Hydraulic conductivity tests were performed in each well to estimate groundwater velocities.

Additional soil testing and groundwater monitoring were performed in the fall of 2002. A total of 27 surface and subsurface soil samples were collected to better characterize the depositional history and dioxin contamination and screen for presence of other Site-related contaminants in the former tailrace within the Source Area. Nine soil borings were advanced to a depth of 9 feet in the tailrace. The samples were analyzed for dioxin/furans and HCX. Two samples were also analyzed for PCBs, pesticides, SVOCs, metals, methyl mercury, TOC and grain size. Groundwater samples were collected from all 33 monitoring wells and analyzed for VOCs (one well, MW-05S, with the highest VOC levels, was also sampled for dioxin/furans).

An additional groundwater to surface water discharge investigation utilizing semi-permeable membrane devices (SPMDs) was performed in 2005 at Well MW-05S and at five nearby sampling locations in the River, both in the water column and buried in the River sediment, where SPMDs were deployed for 27 days in June 2005. In addition, co-located sediments were collected at the five river SPMD sampling locations and a groundwater sample was collected from Well MW-05S. SPMD and sediment samples were analyzed for 2,3,7,8-TCDD, while the groundwater sample from MW-05S was analyzed for dioxin/furan isomers (including 2,3,7,8-TCDD) and VOCs. In 2006, additional water level measurements were collected from two surface water locations in the River and 23 monitoring wells and 14 shallow overburden piezometers to estimate potential flux of TCDD from the groundwater to the River.

In the winter of 2008, three additional groundwater monitoring wells were installed along the east embankment of the River at locations within VOC-impacted groundwater near MW-05S. The soil borings for these wells were advanced to a depth of 10 to 14 feet. Filtered and unfiltered groundwater samples from each of these wells and well MW-05S were collected. The unfiltered groundwater samples were analyzed for dioxins/furans, VOCs, total suspended solids (TSS) and total dissolved solids (TDS). The filtered groundwater samples were analyzed for dioxins/furans and TDS. A composite sample of soil drill cuttings was also collected and analyzed for dioxin/furans. Nineteen discrete soil samples collected from each boring were archived and later analyzed for dioxin/furans.

1999-2000 Woonasquatucket River Investigations

All residential lots abutting the Woonasquatucket River were sampled within the 100-year floodplain between the Rt. 44 Bridge and Lyman Mill Dam to determine the location of Site-related contamination on properties downstream from the Source Area. In addition, the depositional sediment samples were collected from upstream background locations, the reference area of Assapumpset Pond and Brook, Lyman Mill, Allendale, Manton and Dyerville reaches of the River. Subsurface sediment samples were collected at 15 locations (at 0.5-2 feet and 2-4 feet depth intervals). In total, these investigations involved:

- 65 aquatic and floodplain sediment samples, analyzed for dioxin/furans, HCX, SVOCs, metals, pesticides, PCBs, grain size, TOC, and acid volatile sulfides/simultaneously extracted metals (AVS/SEM);
- 36 surface water samples, analyzed for dioxin/furans, HCX, SVOCs, metals (total and dissolved), pesticides, and PCBs;
- 24 bank sediment samples, analyzed for dioxin/furans, HCX, SVOCs, pesticides, and PCBs; and
- 126 surface soil samples from residential-use properties, with all samples analyzed for dioxin/furans and HCX, and one sample from each property was also analyzed for SVOCs, metals, pesticides, and PCBs.

This sampling program was conducted to supplement earlier testing done by the removal program to provide additional information about the extent of contamination on residential-use properties and in the Woonasquatucket River. In addition, 3 surface soil samples were collected from the John E. Fogarty Center property on the southeast shore of Lyman Mill Pond in the fall of 2002 to evaluate risks to the users of that property. Samples were analyzed for dioxin/furans, HCX, SVOCs, metals, PCBs, pesticides, methyl mercury, TOC and grain size.

2001 Woonasquatucket River Investigation

To support ecological and human health risk assessments, sediment, soil, and surface water samples were collected in April-July 2001. Extensive biota testing and evaluations were also conducted at the Site to evaluate human health and ecological risks from the food chain and fish consumption. The following testing was performed:

- 19 sediment samples from upstream locations, Greystone Mill Pond, Allendale Reach (before Allendale Dam was restored), Lyman Mill Reach, and Assapumpset Brook, with samples analyzed for dioxins/furans, HCX, PCBs, pesticides, SVOCs, metals, methyl mercury, AVS/SEM, grain size and TOC. Approximately 20 percent of the samples were also analyzed for PCB congeners;
- 11 floodplain soil samples from upstream locations, Allendale Reach (before Allendale Dam was restored) and Lyman Mill Reach, analyzed same as above sediments;
- 9 surface water samples from upstream locations, Allendale Reach (before Allendale Dam was restored), Lyman Mill Reach, and Assapumpset Brook, analyzed for PCBs, pesticides, SVOCs, VOCs, metals (total and dissolved), hardness, BOD, and nutrients; and
- Biota (99 fish, 12 crayfish, 12 earthworm, and 2 composite emerging insects) from Greystone Mill Pond, Allendale Reach (before Allendale Dam was restored), Lyman Mill Reach, Manton Reach and Dyerville Reach, and Assapumset Brook. For an emerging insect productivity study, five replicate traps were placed in each pond and trapped insects were collected, categorized and weighed. Biota samples were analyzed for dioxins/furans, HCX, PCBs, pesticides, metals, and lipid content; fish were also analyzed for SVOCs. Approximately 20 percent of the samples were also analyzed for PCB congeners.

A fish community study in both free-flowing and quiescent habitats within the Woonasquatucket River and a fish ichthyoplankton survey were also performed to assess the general health of the fish community.

In summer 2001, an early life stage (ELS) test was conducted with catfish embryos exposed in the laboratory to a dilution series of a chemical mixture of dioxin, furan and PCB congeners similar to concentrations detected in adult fish in the Woonasquatucket River to evaluate the potential effects of contaminants known to be toxic to early life stages of fish. Thirty-nine ELS egg and 14 catfish fry samples were collected for dioxin/furans, PCB congeners 77 and 126, and lipid content analysis.

Surficial sediment samples were collected from eight locations in the Woonasquatucket River (including upriver background in Greystone Mill Pond) and a reference location in Assapumpsett Pond in 2001 and submitted to laboratories for chemical analysis and toxicity testing for the sediment bioassays analysis. Two freshwater invertebrates test species (amphipod and midge larvae) were chronically exposed to whole sediments in the laboratory and their survival, growth and reproduction effects assessed.

As part of these studies, the aquatic macroinvertebrate community associated with free-flowing portions of the Woonasquatucket River (including locations adjacent to the source area and below the Allendale Dam) were sampled, organisms identified and enumerated and various statistical metrics related to taxonomic diversity and percentage of sensitive organisms were calculated. The floodplain soil macroinvertebrate community was also sampled at 11 locations in

Allendale Pond, Lyman Mill Pond, below Greystone Mill Pond and Assapumpsett Pond. Similar to the aquatic community study, organisms were collected, identified and counted and the data used to calculate various community metrics.

2002-2004 Woonasquatucket River Investigations

Additional sediment-related studies in 2002-2004 were conducted to address EPA's 2002 guidance on *Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites*. In 2002, a geomorphology investigation of the Woonasquatucket River was conducted to identify morphological features (e.g., floodplains, terraces, abandoned channels) and changes along the River over time. Geomorphic data, from historical aerial photographs and maps along with field mapping, was used to identify features where sediment contamination is likely to accumulate. This information was used in conjunction with the 2002 geophysical surveys to target areas for sediment coring.

In fall 2002, EPA conducted waterborne geophysical surveys at Allendale and Lyman Mill Ponds using ground penetrating radar (GPR) imaging. GPR was used to map soft sediment thickness and to collect bathymetric data, in order to locate sediment depositional areas for coring study. In May 2003, 20 sediment vibracores were collected from Allendale Pond and 10 sediment vibracores from Lyman Mill Pond to a depth of at least 4 feet, or refusal. Six hand-push cores were also collected from the forested wetland below Allendale Dam. Sediment lithology was recorded and selected samples from discrete intervals were analyzed for radiometric age dating (^{210}Pb and ^{137}Cs), TOC, dioxin/furans, and geotechnical parameters (water content, specific gravity, Atterberg limits, grain size, moisture content, ash and organic content). Sample intervals for dioxin analysis were selected based on sediment lithology and radiometric dating results. Age-dating results were also used to estimate sediment accumulation rates. Data was also used to identify any relationships between sediment depth, age, and dioxin (2,3,7,8-TCDD) concentration. Selected samples from Lyman Mill Pond were analyzed for total petroleum hydrocarbon (TPH) content, alkanes, isoprenoids, polycyclic aromatic hydrocarbons (PAHs), and biomarkers to characterize the nature and possible origin of petroleum hydrocarbons found in a gelatinous, organic silt layer in Lyman Mill Pond.

Seven additional floodplain sediment samples, targeting topographically low areas in and near the abandoned channel, were collected in June 2004 from the forested wetland (Oxbow) below the Allendale Dam to assist in human health and ecological risk evaluations of that area. All samples were analyzed for dioxin/furans, and three samples were also analyzed for PCBs, pesticides, metals, and TOC.

From 2004 to 2006, a multi-phased approach to sediment stability evaluations was used to develop a hydrodynamic model. The model predicted the potential impacts of flood events (up to 100-year flood) and of upstream reservoir periodic releases on sediment bed stability, and identified areas of potential scour in Allendale and Lyman Mill Ponds during these events. Site-specific data from sediment evaluations and historical flow rate data collected at the USGS gaging station were used to develop and apply a hydrodynamic model to assess the impacts of sediment erosion, transport and deposition processes on sediment bed and water column concentrations of dioxin. As part of this study, surface water samples were collected in the River in December 2004 to address key data gaps identified in the RI. These surface water samples were collected at three locations, including an upstream location, during low to moderate flow conditions. Three samples were collected at each location over a two-week period and were analyzed for dioxin/furans to estimate low-flow dioxin loads at the Site. In addition, hydrodynamic analysis was developed in 2007 to evaluate the water flow and flooding potential impacts that might result from implementation of evaluated remedial alternatives involving Near Shore CDFs, involving removing the dams and channeling the river flow, or replacing the dams with smaller weir structures.

In the fall of 2004, an environmental forensic review of soil and sediment chemistry data from the Source Area and the Woonasquatucket River was conducted to compare the chemical composition of chlorinated organic compounds (dioxins, HCX, PCBs, and chlorinated pesticides). The purpose of the forensics review was to support source identification, help define nature and extent of site-related contamination, and to identify any other potential sources of dioxin contamination.

In March 2005, an additional 10 sediment vibracores were collected from Lyman Mill Pond to address data gaps identified in the RI. Similar to the May 2003 study, sediment cores were sub-sampled for chemical, radioisotope and geotechnical testing. Three vertical strata samples were collected from each core for dioxin/furan analysis. Surface samples were also analyzed for PCBs, as Aroclor, pesticides, PAHs, and metals. Selected Lyman Mill sediment samples from the May 2003 sediment investigation were removed from frozen storage and analyzed for dioxin/furans, PCBs, pesticides, PAHs and metals. A subset of the March 2005 sediment core samples were also analyzed for Atterberg Limits, grain size, specific gravity, and percent solids. Radiometric age dating was done on four sediment cores.

Tree Swallow Study

To support the ecological risk assessment, a tree swallow study was conducted annually by USGS from 2000 to 2003. Tree swallows were monitored upstream and downstream from the Source Area to determine whether bird populations were being exposed to bioaccumulating compounds at levels that could result in reproductive impairment. Nest boxes were installed along the shore of Allendale, Lyman Mill and Greystone Mill Ponds and egg hatchability and nestling success rates measured during each of four years.

- Summer 2000 - tree swallow samples at two reaches: 5 nestling, 1 diet and 7 unhatched eggs at Greystone Mill Pond; 5 nestlings, 2 diet and 13 eggs at Allendale Pond. Samples analyzed for dioxins/furans, HCX, PCB congeners, and lipid content;
- Summer 2001 - tree swallow samples at three reaches: 5 nestling, 1 diet, 5 nestling liver, and 9 eggs at Greystone Mill Pond; 5 nestling, 1 diet, 5 nestling liver, and 16 eggs at Allendale Pond; 5 nestling, 1 diet, 5 nestling liver, and 11 eggs at Lyman Mill Pond. Most samples analyzed for dioxin/furans and HCX. 10 percent of all samples also analyzed for PCB congeners. A subset of samples was also analyzed for PCB Aroclor, chlorinated pesticides and lipid content. Nestling liver samples were only analyzed for metals and methyl mercury;

- Summer 2002 - tree swallow samples at four reaches: 4 eggs and 1 nestling at Greystone Mill Pond; 7 eggs at the Woonasquatucket Reservoir in Smithfield, Rhode Island; 5 eggs at Allendale Pond; and 3 eggs at Lyman Mill Pond. Samples were analyzed for dioxin/furans only; and
- Summer 2003 - tree swallow samples at four locations: 1 egg at Greystone Mill Pond and Fire station, 2 eggs at Allendale Pond; and 4 eggs, 4 nestlings and 1 diet at Manton Pond. Samples were analyzed for dioxin/furans only.

2010 Oxbow Area Investigation

In September and November of 2010, 44 floodplain soil and 28 sediment samples were collected in the Lyman Mill Reach area, most of these in the Oxbow Area. Floodplain soil samples included 41 surface (0-12 inch) soil samples and 3 subsurface (12-24 inch) soil samples. Oxbow wetland samples were collected from 0-12 inch (12 samples), 12-24 inch (10 samples) and 24-36 inch (6 samples) depth intervals. Samples were analyzed for dioxin/furans, PCBs, pesticides, SVOCs, metals, TOC, pH and grain size (sediment samples at 24-36 inch depth were analyzed only for dioxin/furans).

4. Nature and Extent of Contamination

Soil

Dioxin TEQ above the background level of 50 ng/kg[2] and PCBs above EPA's recommended residential level of 1 mg/kg are spatially widespread in surface soils at the Source Area where the volume of contaminated soil in vadose zone above cleanup levels is estimated at 63,300 cubic yards. Contaminant concentrations in vadose zone soils are also above RIDEM's residential exposure criteria and RIDEM's GA leachability criteria at numerous locations. The most common contaminants with concentrations above the leachability criteria are PCB, PCE, and TCE. Concentrations of total PCBs also exceeded the TSCA criteria of 50 mg/kg at 15 locations. The RI data collection and evaluation for the Source Area soils were primarily done prior to the 2009-2010 removal action when an area beneath the Brook Village parking lot was excavated.

The Site dioxin signature is typically dominated by high levels of 2,3.7.8-TCDD relative to the other congeners, whereas the dioxin signature at background is typically dominated by octachlorinated dibenzo-p-dioxin. Because of the difference in site-related and background dioxin signature and the dominance of 2.3.7.8-TCDD in dioxin levels at the Site itself, data evaluation includes both dioxin TEQ and 2,3,7,8-TCDD data. The geometric mean dioxin TEQ concentration in Source Area soil is 120 ng/kg. Dioxin contamination above 50 ng/kg is spatially widespread at the Source Area, with the highest concentrations in areas currently beneath Cap Areas #1 and #2, as well as the tailrace cap and in the vicinity of the Brook Village parking lot (prior to excavation at this area). Concentrations of dioxin generally decrease with increasing depth. Seven PCB Aroclors were detected, with Aroclor 1254 detected most frequently and at the highest concentrations (the maximum detected concentration of Aroclor 1254 is 1,300 mg/kg, detected in sub-surface soil at Cap Area #1). Aroclors were most prevalent

2 The mean concentration of dioxin at the upstream floodplain soil background is 50 ng/kg for dioxin TEQ and 17 ng/kg for 2,3,7,8-TCDD.

in the area underneath Cap Area #1 adjacent to the Centredale Manor south parking lot. The pesticides pattern in the Source Area contains a combination signature of a mixture of chlorinated pesticides in background area samples with additional presence of dieldrin, endrin, and benzene hexachloride (BHC).

VOCs were detected in less than 50 percent of the Source Area soil samples. Six VOCs, including benzene, chlorobenzene, PCE, TCE, vinyl chloride, and xylenes, exceeded the RIDEM residential direct exposure criteria in more than one soil sample. Maximum detected concentrations of these six VOCs are one to two orders of magnitude higher than the RIDEM residential direct exposure criteria. Elevated VOC levels were found in areas that are currently paved or capped. The highest levels of VOCs were found at a location under the Brook Village parking lot. Six PAHs were detected in more than 50 percent of the Source Area soil samples. Nine PAHs exceeded the RIDEM residential direct exposure criteria in more than one soil sample. Chrysene and benzo(a)pyrene were the most frequently detected PAHs. Three chlorinated benzenes also exceeded the criteria in a couple of locations that also contained elevated VOCs.

Seven inorganics exceeded RIDEM residential direct exposure criteria that represent background concentrations for Rhode Island. Beryllium and lead had the highest frequency of exceedances, with beryllium exceeding criteria in 62 out of 114 soil samples and lead exceeding the criteria in 40 out of 116 soil samples in the Source Area.

Soil samples were collected from residential use areas along the east bank of the Woonasquatucket River along Allendale and Lyman Mill Ponds, downstream from the Source Area, as well as from the Fogarty Center property. Residential use floodplain areas with dioxin TEQ concentrations exceeding 1,000 ng/kg were delineated and excavated as part of the 2002-2003 NTCRA. Supplemental risk evaluations were performed in 2012 to evaluate human health risks from exposure to residential-use soil along the eastern shore of Allendale and Lyman Mill Ponds. These risk evaluations focused on contaminants associated with elevated risk for direct exposure to the sediments of Allendale and Lyman Mill Ponds, which could be transported from the ponds and deposited in the floodplain during flood and high-flow events. These risk evaluations identified human health risks associated with the exposure to dioxin, Coplanar PCB TEQ, arsenic, benzo(a)pyrene and dibenz(a,h)anthracene in residential-use soils.

Groundwater

Several fuel- and solvent-related VOCs were detected in monitoring wells. Groundwater contamination at the Source Area is spatially widespread relative to federal maximum contaminant levels (MCLs). Groundwater sampled at 25 out of 37 wells contained one or more contaminants with detected concentrations above MCLs. The most common contaminant detected at concentrations above the federal MCLs is tetrachloroethene (PCE), followed by trichloroethene (TCE), and 2,3,7,8 -TCDD.

The most significant groundwater contamination was found on the east bank of the Woonasquatucket River, adjacent to the Brook Village parking lot (prior to excavation and dewatering of this area). In that location, PCE and TCE in shallow groundwater were found at

61,000 micrograms per liter (µg/L) and 2,500 µg/L, respectively in initial sampling rounds performed in 2001-2002. Elevated levels of PCE and TCE were also found in vapor diffusion samples in the River, adjacent and downstream from this location. The highest dioxin (2,3,7,8-TCDD) level in groundwater at 4,200 picograms per liter (pg/L) was also found at this location at that time, see Figure B-1. The 2005-2006 SPMD groundwater discharge investigation results showed that the River sediment and pore water/groundwater in that vicinity have substantially higher 2,3,7,8-TCDD concentrations than other nearby river sediment locations. The sediment data results (bulk sediment/pore water concentrations correlations) also indicate that the sediments themselves are likely not the primary source of the dioxin sampled by the buried SPMDs; rather groundwater flowing from the Source Area through contaminated sediment/soil was an on-going source to the River.

Elevated VOCs were also detected in each of the groundwater samples collected in three wells in 2008 on the bank of the Woonasquatucket River in the vicinity of the Brook Village parking lot. The highest PCE concentration was reported at 220,000 µg/L in well MW-LEA-01. Other VOCs detected in that monitoring well included cis-1,2-DCE at a concentration of 21,000 µg/L, TCE at 10,000 µg/L and vinyl chloride at 480 µg/L. These VOCs were found at lower concentrations or were not detected at the other three monitoring wells (MW-05S, MW-LEA-02 and MW-LEA-03). Laboratory data quality of this VOC data was considered poor and was used qualitatively only. 2,3,7,8-TCDD was detected in each of the unfiltered groundwater samples at concentrations ranging from 68 pg/L (MW-LEA-01) to 6,200 pg/L (MW-LEA-02). Also, 2,3,7,8-TCDD was detected in the duplicate pair of filtered samples obtained from monitoring well MW-LEA-02 (730 pg/L and 290 pg/L). Analysis of 19 soil samples collected at discrete intervals during installations of these three 2008 wells showed highest dioxin TEQ concentration of 33,000 ng/kg. A composite soil drill cuttings sample from these wells installation was reported at 40,000 ng/kg 2,3,7,8-TCDD. This area was the subject of the 2009-2010 Removal Action and the above-described groundwater data evaluation reflect conditions prior to that action. At the conclusion of the Removal Action, no dioxin was detected in the two new shallow monitoring wells installed and sampled at the groundwater discharge points to the Woonasquatucket River near the edge of the excavated/capped area.

Sediment and Floodplain Soil

The dioxin (TEQ and 2,3,7,8-TCDD) sediment data from all sampling depths indicate that concentrations are lowest in the Assapumsett (reference) and upstream (background) areas (mean concentrations of 1.2 ng/kg and 15 ng/kg 2,3,7,8-TCDD, respectively). The Site dioxin signature is different from the background upstream conditions and is typically dominated by high levels of TCDD relative to the other congeners, whereas the dioxin signature at background is typically dominated by octachlorinated dibenzo-p-dioxin[3]. Sediment dioxin concentrations in reaches of the River immediately downstream of the Source Area are significantly higher compared to the upstream background area. The highest dioxin concentrations in sediment were measured at Allendale Pond (110,000 ng/kg 2,3,7,8-TCDD), followed by Lyman Mill Pond (49,000 ng/kg 2,3,7,8-TCDD). Geometric mean dioxin (2,3,7,8-TCDD) concentrations in sediment decrease in

3 The mean concentration of dioxin at the upstream sediment background is 34 ng/kg for dioxin TEQ and 15 ng/kg for 2,3,7,8-TCDD.

a downstream direction, 880 ng/kg in Allendale, 430 ng/kg in Lyman Mill, 170 ng/kg in Manton, and 68 ng/kg downstream of Manton. In the forested wetland below the Allendale Dam (Oxbow Area) the highest dioxin (2,3,7,8-TCDD) concentrations were measured at 15,000 ng/kg in the surface floodplain soil and wetland sediment, with geometric mean concentrations of 71 ng/kg in floodplain soil and 510 ng/kg in wetland sediment. Dioxin (primarily 2,3,7,8-TCDD) and HCX contamination in sediment extended from the Source Area downstream to approximately half of the sampling locations below Manton Dam. In residential-use floodplain soil along eastern shore of the Allendale and Lyman Mill Ponds, approximately half of soil samples had 2,3,7,8-TCDD concentrations above the background level of 17 ng/kg.

Because the Site-specific soil and sediment dioxin signature differs from the background conditions, cleanup goals were originally developed for both dioxin total TEQ and 2,3,7,8-TCDD, where such data is available. Where background conditions had to be taken into account due to the risk-based Preliminary Remediation Goals (PRGs) and/or Applicable or Relevant and Appropriate Requirements (ARARs) and/or to be considered (TBC) values being below background levels, then both dioxin TEQ and 2,3,7,8-TCDD background concentrations were taken into consideration in originally developing cleanup levels to account for the Site-related 2,3,7,8-TCDD dominance.

Dioxin concentrations in Allendale and Lyman Mill Ponds decrease with increasing depth, with the highest levels found within the top 1-2 feet of sediment. In Allendale and Lyman Mill Ponds, dioxin concentrations in surface sediment in many areas of the Ponds are between 1,000 and 10,000 ng/kg, with localized areas of higher concentrations throughout the Ponds. Radiometric age dating of sediment cores show a good correlation with dioxin concentrations, with maximum dioxin levels corresponding to depositions of an estimated age of 40 to 60 years. The dioxin maximum contamination in the Allendale Pond generally corresponds to sediments deposited between about 1950 and 1970. This period corresponds with Site industrial operations, including hexachlorophene manufacturing and drum reconditioning at the Site. For Lyman Mill Pond, the maximum dioxin concentrations generally correspond to sediment deposited between 1960 and 2000, which corresponds with the time that chemical and drum reconditioning activities occurred at the Site and likely also reflects downstream transport of contaminated sediments following the breach of the Allendale Dam in 1991 and again in 2001. The dioxin/furan fingerprint from the Source Area samples was most evident in the top 2 feet of sediment and was also observed in the sediments downstream, including sediments below Manton Dam.

Among PAHs, benzo(a)pyrene and dibenz(a,h)anthracene were found to contribute to human health risk at the Site. The average concentration of benzo(a)pyrene at 1.4 mg/kg is highest in the upstream background sediment and lowest in the Assapumpset (reference) at 0.53 mg/kg. Concentrations in the reaches adjacent to and downstream from the Source Area are comparable to background sediments. Fingerprinting analysis of PAH composition in gelatinous organic silt layer of surface sediment in the Allendale and Lyman Mill Ponds indicate presence of combustion byproducts (soot) and residual petroleum (asphalt, motor oil) consistent with an urban background.

Aroclor concentrations in Woonasquatucket River sediments downstream from the Source Area were not significantly higher than upstream background concentrations with the exception of Aroclor 1254 in Allendale Pond. Maximum concentrations of Aroclor 1254 were 28 mg/kg in Allendale Pond, 2.6 mg/kg in Lyman Mill Pond, 2.2 mg/kg in Manton Pond, 1.3 mg/kg downstream from Manton, 7.8 mg/kg in upstream background sediment, and 0.058 mg/kg at Assapumpset (reference). Maximum concentrations of Aroclor 1254 in Oxbow floodplain soil and sediment were 0.64 mg/kg and 3.6 mg/kg, respectively. Below Lyman Mill Dam, concentrations and patterns of pesticides were consistent with background conditions. Inorganics in sediment adjacent to and downstream of the Source Area are not significantly higher than background upstream concentrations. The estimated area of contaminated sediment and floodplain soil above all cleanup levels is 74.2 acres or approximately 210,000 cy.

Surface Water

Source Area surface water samples were collected from the former tailrace, which since then has been reconstructed and capped. No dioxin was detected in the Assapumpset Brook reference location. Median dioxin (2,3,7,8-TCDD) concentrations in surface water samples from the Allendale and Lyman Mill reaches were similar (1.9 and 3.6 pg/L, respectively), with the maximum concentration of 4,000 pg/L measured in Allendale Pond. These levels exceed federal and state dioxin Water Quality Criteria (WQC) of 0.5 pg/L.

Biota

Biota tissue samples (including fish, earthworms, emerging insects, tree swallow eggs, nestlings and stomach content) had elevated dioxins and furans, HCX, and Aroclor 1254 in site-related sampling compared to upstream background and reference areas. In addition, similar to the Site sediment and soil, a distinctive dioxin/furan "signature" characterized white sucker, American eel, largemouth bass, crayfish, emerging insects, earthworms and samples from tree swallow study. The average dioxin (TEQ and 2,3,7,8-TCDD) concentrations were generally 10 to 100 times higher in tissue samples in Allendale and Lyman Mill Ponds compared to the background and reference areas. Other contaminants contributing to elevated levels in biota tissue include coplanar PCBs, Aroclor 1254, Total Aroclors, 4,4'-DDD, 4,4'-DDE, dieldrin, technical chlordane, antimony, aluminum, barium, cadmium, lead, selenium, vanadium, and zinc. For 2,3,7,8-TCDD, the highest fish tissue concentrations (whole fish unless indicated otherwise and wet weight [ww]), were found in the White Sucker at 800 ng/kg and 1,400 ng/kg in Allendale and Lyman Mill Ponds, respectively. Fish tissue arithmetic mean concentrations of 2,3,7,8-TCDD were found at 110 ng/kg in American Eel and 350 ng/kg in White Sucker in Allendale Pond, and 140 ng/kg in American Eel, 580 ng/kg in White Sucker and 22 ng/kg in Largemouth Bass (fillet) in Lyman Mill Pond. For other contaminants, maximum levels detected in fish tissue in Allendale Pond were Aroclor 1254 at 3.2 mg/kg, Aroclor 1268 at 0.077 mg/kg, Dieldrin at 0.014 mg/kg, Technical Chlordane at 1.2 mg/kg, and Coplanar PCBs TEQ at 42 ng/kg. In Lyman Mill Pond, maximum levels detected in fish tissue were Benzo(a)pyrene at 0.015 mg/kg, 4,4'-DDE at 0.29 mg/kg, Aroclor 1254 at 7.1 mg/kg, Aroclor 1268 at 0.1 mg/kg, Dieldrin at 0.01 mg/kg, Technical Chlordane at 2.6 mg/kg, and Coplanar PCBs TEQ at 60 ng/kg.

In the 2000-2003 tree swallow study, geometric mean 2,3,7,8-TCDD concentrations in tree swallow eggs ranged from 310 to greater than 1,000 ng/kg wet weight at Allendale and Lyman

Mill ponds, respectively. Mean egg concentrations at Greystone, the upstream background pond, were significantly lower, ranging from 17 and 96 ng/kg. Dioxin TEQs in swallow eggs were also significantly different between background and Allendale and Lyman Mill Ponds (52 and 960 ng/kg – Greystone and Allendale in 2000 and 94, 500, and 1,100 ng/kg for Greystone, Allendale and Lyman Mill Ponds in 2001, respectively). Although concentrations of most other dioxin and furan congeners were also significantly different, the average concentrations in eggs from background and the ponds downstream of the Source Area were much less than the order of magnitude differences observed for 2,3,7,8-TCDD. 2,3,7,8-TCDD also accounted for greater than 89 percent of the TEQs estimated in Allendale and Lyman Mill Ponds in both 2000 and 2001. Concentrations of PCBs in swallow eggs collected in 2001 from Allendale and Lyman Mill Ponds did not differ significantly.

Similarly, 2,3,7,8-TCDD concentrations were two orders of magnitude greater in Allendale and Lyman Mill Pond tree swallow nestling tissues compared to Greystone samples (e.g., 5.7 versus 570 ng/kg wet weight in Greystone and Allendale samples, respectively in 2000 and 9.3, 990 and 840 ng/kg wet weight in Greystone, Allendale and Lyman Mill Ponds, respectively in 2001). As observed with the tree swallow egg tissue, concentrations of other dioxin and furan congeners were also elevated in samples collected downgradient of the Source Area but typically by no more than 2- to 3-times greater than concentrations detected in Greystone nestlings. Compared to Greystone, total PCBs were significantly elevated in Allendale nestling samples collected in 2000 (0.11 versus 0.41 mg/kg respectively); total PCB nestling tissue concentrations in Greystone, Allendale, and Lyman Mill collected in 2001 were 0.21, 0.71, and 1.7 mg/kg, respectively. Concentrations of p,p’-DDE, p,p’-DDD and p,p’-DDT in nestlings varied significantly among the ponds in 2001 (e.g., p,p’-DDE concentrations in Greystone, Allendale and Lyman Mill Ponds were 0.017, 0.025, and 0.036 mg/kg wet weight, respectively). Relatively small, but significant differences were also observed in the concentrations of cadmium, manganese, and thallium in nestling livers – in all cases, concentrations detected in Allendale Pond tissues were significantly higher than in either Greystone or Lyman Mill samples. In addition, daily survival probabilities during egg laying and incubation were significantly different between Greystone and Allendale nests in both 2000 and 2001 but not between Greystone and Lyman Mill nests in 2001. Geometric mean percent hatchability between 2000 and 2003 were 89 percent, 59 percent, and 49 percent for Greystone, Allendale and Lyman Mill Ponds, respectively. The study concluded that hatching success was reduced in both Allendale Pond and Lyman Mill Ponds as compared to background. The study findings were used to develop an egg tissue concentration threshold for TCDD TEQ that was used to assess risks to insectivorous birds.

A fish community study was also conducted. Fish were electroshocked, identified to species, weight and length measured, and inspected for visual abnormalities. Although the study determined that the Woonasquatucket River provides only low to moderate quality fish habitat, the majority of the samples collected indicated that the overall fish community health was in relatively good condition. Larval fish were also sampled to evaluate potential differences in population. Although the survey was limited in scope, no significant differences in the diversity or abundance of fish larvae were observed between the study areas and background and reference ponds. In addition, levels of embryonic abnormalities observed in the samples were low.

An early life stage (ELS) bioassay study was done where catfish embryos were exposed in the laboratory to a dilution series (prepared from laboratory water) of a chemical mixture of dioxin, furan and PCB congeners similar to concentrations detected in adult fish in the Woonasquatucket River to evaluate the potential effects of contaminants known to be toxic to early life stages of fish. A strong dose response relationship between TCDD TEQ and fry survival was observed and threshold concentrations developed that were comparable to levels reported in the literature. In addition to survival effects, gross pathological abnormalities were found to be more prevalent in TCDD TEQ exposed embryos.

5. Potential Routes of Migration

Potentially important fate and transport processes at the Site include:

- Erosion and surface runoff of contaminated soils
- Erosion and transport of contaminated soil during flooding
- Volatilization of VOCs from vadose zone soils
- Leaching of contaminants from soil into groundwater
- Resuspension and downstream transport of contaminated sediment particles
- Partitioning of contaminants from sediment to water and transport via diffusion and advection
- Transformation and/or biodegradation of contaminants in the soil/sediment
- Bioaccumulation (transfer of contaminants into the tissues of organisms from direct contact or ingestion of sediments and water)

Major contaminants at the Site include dioxins and furans, coplanar PCBs, Aroclors 1254 and 1268, Total Aroclors, HCX, VOCs, several PAHs, pesticides, and inorganics. Dioxins, furans and coplanar PCBs are highly hydrophobic, lipophilic, and very stable in environment. Binding to and transport on particulates and sediment and bioaccumulation by aquatic organisms are their most significant fate and transport processes.

Source Area Soil and Groundwater

Dioxins (primarily 2,3,7,8-TCDD), furans, and HCX were contaminants associated with hexachlorophene manufacturing that were discharged directly or indirectly into the Woonasquatucket River around 1965. Other chemical processes also occurred from approximately 1940 until the early 1970s that could be the source of contaminants at the Site. The former drum reconditioning operation is believed to have dumped chemical residues that leached through the ground surface and led to pesticide, PCBs, and other contamination of surface and subsurface soils. Incineration of waste material may have also produced dioxins and furans. Improper storage and waste disposal practices, including disposal and burial of waste material, resulted in variable and wide-spread waste deposition in different surface and subsurface areas.

The majority of the Source Area is currently either capped or paved, thus minimizing near-term erosion and runoff, provided the capped and paved surfaces are maintained. Volatilization of VOCs from soil was not a significant pathway of contaminants for the Centredale Manor and Brook Village apartment buildings. Volatilized VOCs and dust particles may impact ambient air if the contaminated soil and groundwater become exposed and measures are not taken to address these releases. Leaching of contamination from soil to groundwater and advection of contaminants from groundwater to the surface water and river sediment on the west side of the Brook Village parking lot may no longer be as significant a pathway given the removal actions performed to temporarily address contaminated soil and minimize contamination from soil and groundwater from further migrating into the Woonasquatucket River at that location.

Woonasquatucket River

Contaminants may enter the Woonasquatucket River upstream and downstream from the Source Area. The current and historical releases from the upstream sources are reflected in the background chemical signature. The RI included identification of other possible sources of contamination and identified the forensic signature of Site-related contamination.

Dioxin (2,3,7,8-TCDD) is the primary signature of the Site contamination. Dioxin and HCX as well as other contaminants directly or indirectly discharged to the Woonasquatucket River from the Source Area would be carried by River currents in the dissolved phase and absorb to organic and fine-grained suspended sediment particles. These particles would then be deposited downstream in lower velocity impoundments. Contamination (e.g., PCBs, pesticides, and dioxins/furans) would enter the River via surface runoff and flooding erosion of contaminated Source Area soils. These chemicals would tend to attenuate by adsorption to fine-grained sediment particles in Allendale Pond. This transport would have primarily occurred from the time of waste disposal and continued to a lesser extent after Source Area soils were either paved or capped.

Sediments in the River can be resuspended and the eroded particles would deposit further downstream. A sediment stability evaluation, including a hydrodynamic model, Environmental Fluid Dynamics Code (EFDC), found Allendale and Lyman Mill Ponds to be net depositional impoundments. During high-flow events (i.e., 100 year return period), erosion (bed scour) greater than 1 cm or more is predicted to occur over a relatively small portion (i.e., 3 to 8 percent of pond areas) in upper areas of each pond. A portion of the eroded sediment will be redeposited in downstream areas within each Pond where currents velocities decrease. The model suggests that deposition occurs over large portions of Allendale and Lyman Mill Ponds during high-flow events. Resuspended sediment will also be transported downstream of Allendale and Lyman Mill Dams, however, the hydrodynamic model was unable to predict the proportional amount of sediment redeposited within the ponds. The model was also unable to evaluate sediment transport conditions during the Allendale Dam breach from 1991 to early 2001.

Transport of dioxin from the sediment to the surface water can occur due to a combination of processes, including diffusion, bioturbation and groundwater flux. Calculated dioxin loads suggest that minimal net export of dioxin in the water column from Allendale and Lyman Mill

Ponds occurs during low-flow, non-resuspending conditions, i.e., background dioxin load of 4.6 mg/day is approximately equal to the load leaving Lyman Mill Dam.

Bioaccumulation is a significant transport pathway for transfer of contaminants in food webs. Contaminants (such as dioxin) present in sediment and surface water bioaccumulate in fish and other biota. The fish and biota may be consumed by individuals who catch it from the River.

6. Routes of Exposure

Several potential routes of human and ecological exposures were considered in the baseline human health and ecological risk assessments conducted as part of the RI[4]. Exposure points at Allendale Pond, Lyman Mill Pond, Greystone Mill Pond (background), and Assapumpset Pond and Brook (reference) were evaluated. In addition, risk calculations were performed for the downstream exposure points of Manton Pond and Dyerville Pond for comparative purposes. In addition, groundwater was evaluated based upon comparison to federal drinking water standards. The following summarizes the pathways evaluated for each human health and ecological scenario that were associated with *unacceptable* risks:

Human Health

- Resident Living Along Allendale Pond and Lyman Mill Pond, Current and Future
  - Combined Fish Diet;
  - Skin contact and incidental ingestion of sediment; and
  - Skin contact and incidental ingestion of floodplain soil.

- Resident Living at the Source Area, Future
  - Skin contact and incidental ingestion of soil.

- Worker at the Source Area, Future
  - Skin contact and incidental ingestion of soil.

- Visiting Recreational Angler at the Allendale Pond and Lyman Mill Pond, Current and Future
  - Combined Fish Diet;

- Passive Recreational Visitor at the Allendale and Lyman Mill floodplain (including Oxbow Area), Current and Future
  - Skin contact and incidental ingestion of floodplain soil.

4 For groundwater containing contaminants in excess of ARARs (e.g., federal drinking water standards), routes of exposure include skin contact and ingestion of groundwater by receptors within the Source Area. Risk screening of indoor air at the Centredale Manor and Brook Village apartment buildings indicated no exceedances of EPA risk-based levels for residential use. Migration of contaminants from the Source Area to surface water also resulted in surface water contamination in excess of ARARs (e.g., federal and state WQCs).

Ecological

- Direct contact with sediment, and consumption of aquatic prey by fish;
- Consumption of fish by piscivorous birds and mammals;
- Consumption of emerging insects by insectivorous birds and mammals; and
- Incidental soil ingestion and consumption of soil invertebrates by insectivorous birds and mammals.

7. Principal Threat Waste

Principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied. Wastes generally considered to be principal threats are liquid, mobile and/or highly-toxic source material.

After review of the nature of contaminated soil at the Source Area, buried waste material and soil at the Source Area, and all floodplain soil and sediment at the Site, EPA has determined that all of this material constitutes principal threat waste. Dioxin and other contaminants are present in Source Area soil, floodplain soil and sediment at high levels which would present a significant risk to human health or the environment should exposure occur (see Section G, Summary of Site Risks). Based on the presence of dioxins, listed wastes under RCRA (such as the F020 listing) have been designated as acutely toxic under RCRA. Other contaminants are present in these media as well supporting the designation of this material as principal threat waste. The locations of this contamination and concentrations of contaminants indicate that these source materials are highly mobile in the environment and could present significant risk to human health or the environment should exposure occur. In addition, based upon prior investigations, buried waste material at the Source Area is likely to contain a number of hazardous substances potentially at high concentrations. This material could be highly mobile and not reliably contained given conditions at the Site.

Low-level threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. Wastes that are generally considered to be low-level threat wastes include non-mobile contaminated source material of low to moderate toxicity, surface soil containing chemicals of concern that are relatively immobile in air or ground water, low leachability contaminants or low toxicity source material. Source Area groundwater is a low level threat waste. Tables E-1 and E-2 summarize Principal and Low-level Threats waste at the Site.

Table E-1. Principal and Low-level Threats at the Site

Principal Threats	Medium	Contaminant(s) Found in Media	Action To Be Taken
Buried waste material	Soil/Liquid	Chemicals potentially on site identified based on drum labels and drum contents, waste disposal practices included dioxins, caustics, halogenated solvents, PCBs, and inks	Targeted excavation and off-site treatment; convert existing cap to RCRA cap.
Leaching, Erosion, and Run-off	Source Area Soil	Dioxin, PCBs, Pesticides, SVOCs, and Metals	Targeted excavation and off-site treatment; convert existing cap to RCRA cap.
Resuspension and Transport	Sediment and floodplain soil	Dioxin, PCBs, Pesticides, SVOCs, and Metals	Excavation and placement of dewatered sediment into an upland CDF with off-site treatment of contamination that exceeds the LDRs' alternative treatment standards for contaminated soil (estimated 10 percent).determined during excavation. Targeted excavation of floodplain soil with enhanced natural recovery (thin-layer cover); upland CDF with off-site treatment of contamination that exceeds the LDRs' alternative treatment standards for contaminated soil (estimated 10 percent).
Fish Consumption and Dermal Contact	Biota, sediment, floodplain soil, and surface water	Dioxin, PCBs, Pesticides, SVOCs, and Metals	Excavation and placement of dewatered sediment into an upland CDF with off-site treatment of contamination that exceeds the LDRs' alternative treatment standards for contaminated soil (estimated 10 percent). Targeted excavation of floodplain soil with enhanced natural recovery (thin-layer cover); upland CDF with off-site treatment of contamination that exceeds the LDRs' alternative treatment standards for contaminated soil (estimated 10 percent).
Low-level Threats	**Medium**	**Contaminant(s) Found in Media**	**Action To Be Taken**
Groundwater discharge to Woonasquatucket River	Groundwater	Dioxin, VOCs, and Metals	Dewatering and treatment prior to on-site discharge; convert existing cap to RCRA cap. (Contaminated soil and groundwater discharge to the River at the Brook Village parking lot was subject of 2009-2010 removal action)

Table E-2. Principal and Low-level Threats: Source Media, Affected Media, Contaminants, Reasons, Concentrations, and Impacted Receptors

Source Media	Affected Media	Contaminant(s) Found in Media	Reason(s)	Concentration(s) of Contaminant(s) Found in Media	Receptors
Principal Threats					
Buried waste material	Source Area soil and groundwater	Chemicals that were potentially on site were identified based on drum labels/waste disposal practices and included dioxins, caustics, halogenated solvents, PCBs, and inks	Potentially highly toxic or highly mobile cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Buried waste may leach into soil and groundwater and migrate to surface water	Unknown	Residents living along the river/Source Area and ecological receptors
Source Area soil	Soil (surface and subsurface), groundwater, surface water, and sediment	Dioxin, PCBs, Pesticides, VOCs, SVOCs, and Metals	Potentially highly toxic or highly mobile cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Exceeds RIDEM criteria, EPA's standards for PCBs, TSCA criteria, and risk-based levels, including dioxin Contaminants may leach into groundwater and migrate to surface water	140,000 ng/kg (dioxin TEQ); 1,300 mg/kg (total Aroclors); 9.9 mg/kg (dieldrin); 10.6 mg/kg (technical chlordane); 8.5 mg/kg (benzo(a)anthracene); 8.9 mg/kg (benzo(a)pyrene); 10 mg/kg (benzo(b)fluoranthene); 5.3 mg/kg (benzo(g,h,i)perylene); 8.8 mg/kg (benzo(k)fluoranthene); 1.61 mg/kg (biphenyl); 460 mg/kg (bis(2-ethylhexyl)phthalate); 11 mg/kg (chrysene); 2.2 mg/kg (dibenzo(a,h)anthracene); 24 mg/kg (fluoranthene); 5.3 mg/kg (indeno(1,2,3-c,d)pyrene); 84 mg/kg (naphthalene); 18 mg/kg (pentachlorophenol); 23 mg/kg (pyrene); 27.8 mg/kg (antimony); 49.3 mg/kg (arsenic); 3.9 mg/kg (beryllium); 180 mg/kg (cadmium); 3,160 mg/kg (lead); 6,420 mg/kg (manganese);	Residents living along the river/Source Area and ecological receptors

Table E–2. (Continued)

Principal Threats					
Source Media	**Affected Media**	**Contaminant(s) Found in Media**	**Reason(s)**	**Concentration(s) of Contaminant(s) Found in Media**	**Receptors**
Source Area soil	Soil (surface and subsurface), groundwater, surface water, and sediment	Dioxin, PCBs, Pesticides, VOCs, SVOCs, and Metals	Potentially highly toxic or highly mobile cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Exceeds RIDEM criteria, EPA's standards for PCBs, TSCA criteria, and risk-based levels, including dioxin Contaminants may leach into groundwater and migrate to surface water	13.4 mg/kg (thallium); 480 mg/kg (benzene); 1,000 mg/kg (chlorobenzene); 1.7 mg/kg (1,2-dichloroethane); 500 mg/kg (dichloroethene (cis-1,2); 81 mg/kg (ethyl benzene); 1,700 mg/kg (PCE); 430 mg/kg (toluene); 2,400 mg/kg (TCE); 2.3 mg/kg (vinyl chloride); 380 mg/kg (total xylenes); 110 mg/kg (trichloroethane (1,1,1)); 0.12 mg/kg (trichloroethane (1,1,2)); 2,800 mg/kg (dichlorobenzene (1,2)); 10 mg/kg (styrene); 8.4 mg/kg (dichloroethene (trans-1,2))	Residents living along the river/Source Area and ecological receptors
Sediment	Biota, sediment, floodplain soil, and surface water	Dioxin, PCBs, Pesticides, SVOCs, and Metals	Potentially highly toxic or highly mobile cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Resuspension and transport, bioaccumulation hazard and toxicity, unacceptable risk	110,000 ng/kg (2,3,7,8-TCDD and TEQ); 147 ng/kg (coplanar PCB TEQ); 28 mg/kg (total Aroclors); 28 mg/kg (Aroclor 1254); 0.31 mg/kg (Aroclor 1268); 0.046 mg/kg (4,4'-DDE); 0.050 mg/kg (4,4'-DDD); 0.17 mg/kg (dieldrin); 2.2 mg/kg (technical chlordane); 9.6 mg/kg (benzo(a)pyrene); 2.6 mg/kg (dibenzo(a,h)anthracene); 2.1 mg/kg (N-nitroso-di-n-propylamine); 27,773 mg/kg (aluminum); 18 mg/kg (arsenic); 380 mg/kg (barium); 4.7 mg/kg (selenium); 91.7 mg/kg (vanadium); 2,088 mg/kg (zinc)	Residents living along the river, visiting recreational anglers, and ecological receptors

Table E–2. (Continued)

Source Media	Affected Media	Contaminant(s)	Reason(s)	Concentration(s)	Receptors
Principal Threats					
Floodplain Soil	Biota, sediment, and surface water	Dioxin, Pesticides, SVOCs, and Metals	Potentially highly toxic or highly mobile cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Resuspension and transport, bioaccumulation hazard and toxicity Exceeds RIDEM criteria and levels for dioxin unacceptable risk	14,633 ng/kg (dioxin TEQ); 14,600 ng/kg (2,3,7,8-TCDD); 1.3 mg/kg (4,4’-DDT); 1 mg/kg (4,4’-DDE); 2.8 mg/kg (benzo(a)pyrene); 38.2 mg/kg (antimony); 13.3 mg/kg (arsenic); 2,350 mg/kg (copper)	Passive recreational visitor and ecological receptors/ Residents living along the river
Low-level Threats					
Groundwater (non source material)	Surface water and sediment, and Source Area groundwater	Dioxin, VOCs, and Metals	Exceeds federal MCLs and/or non-zero MCLGs (maximum contaminant level goals)	6,154 pg/L (2,3,7,8-TCDD); 21 µg/L (benzene); 190 µg/L (chlorobenzene); 850 µg/L (DBCP); 1,600 µg/L (cis-1,2-DCE); 61,000 µg/L (PCE); 2,500 µg/L (TCE); 27 µg/L (vinyl chloride); 1 µg/L (ethlyene dibromide); 20 µg/L (arsenic); 114 µg/L (chromium); 70 µg/L (lead); 8.6 µg/L (thallium)	Residents living along the river/Source Area, visiting recreational anglers, and ecological receptors

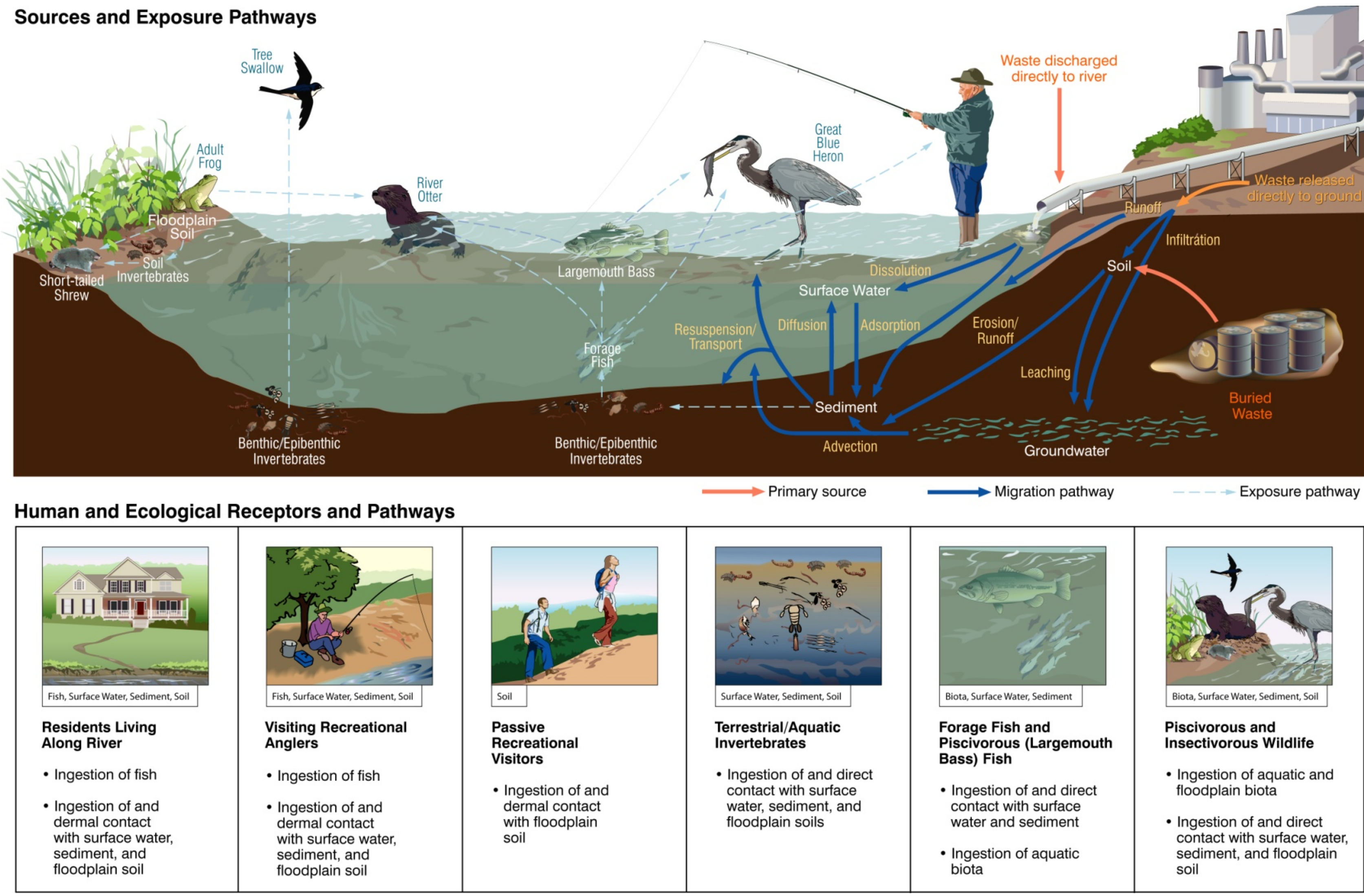
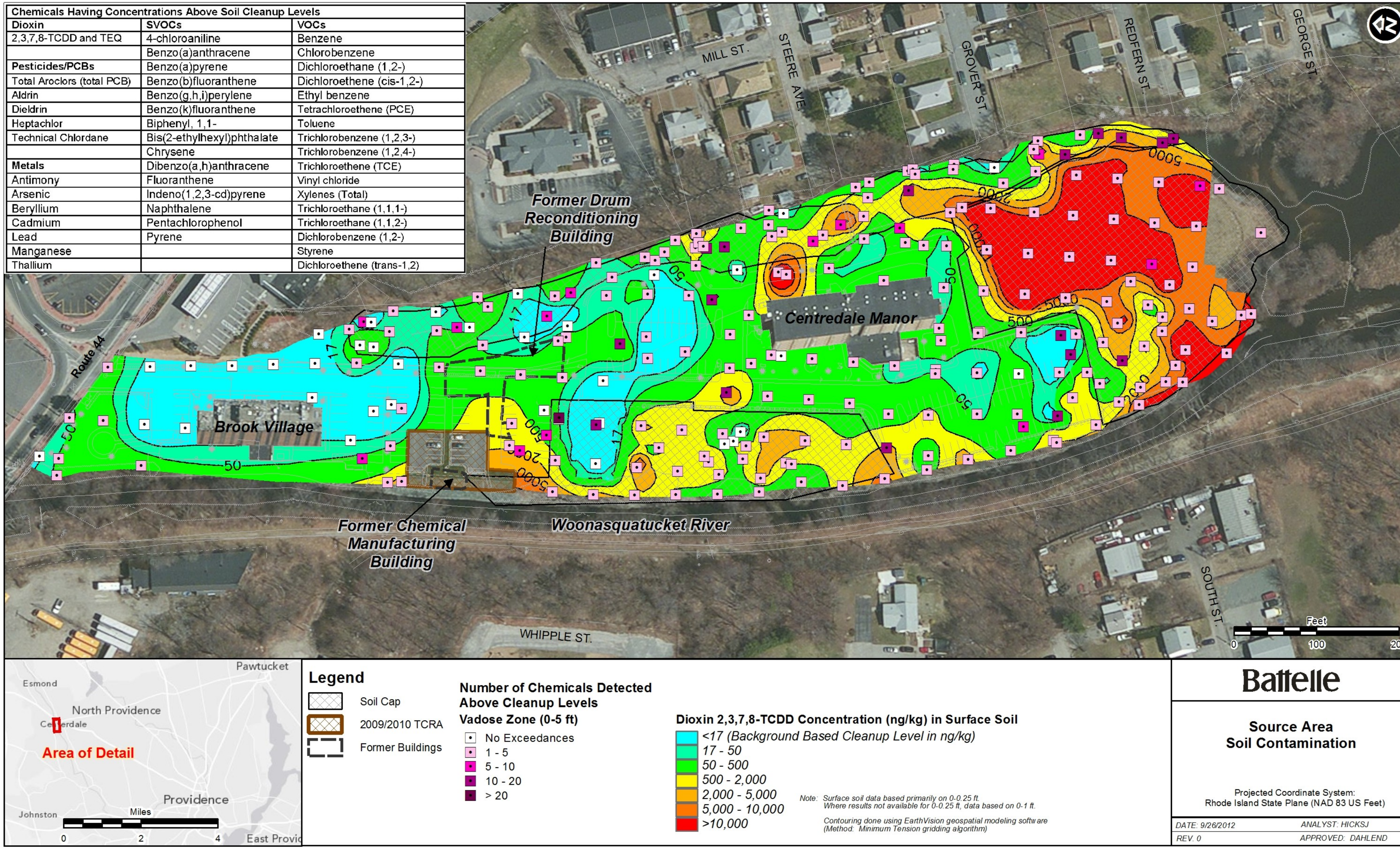
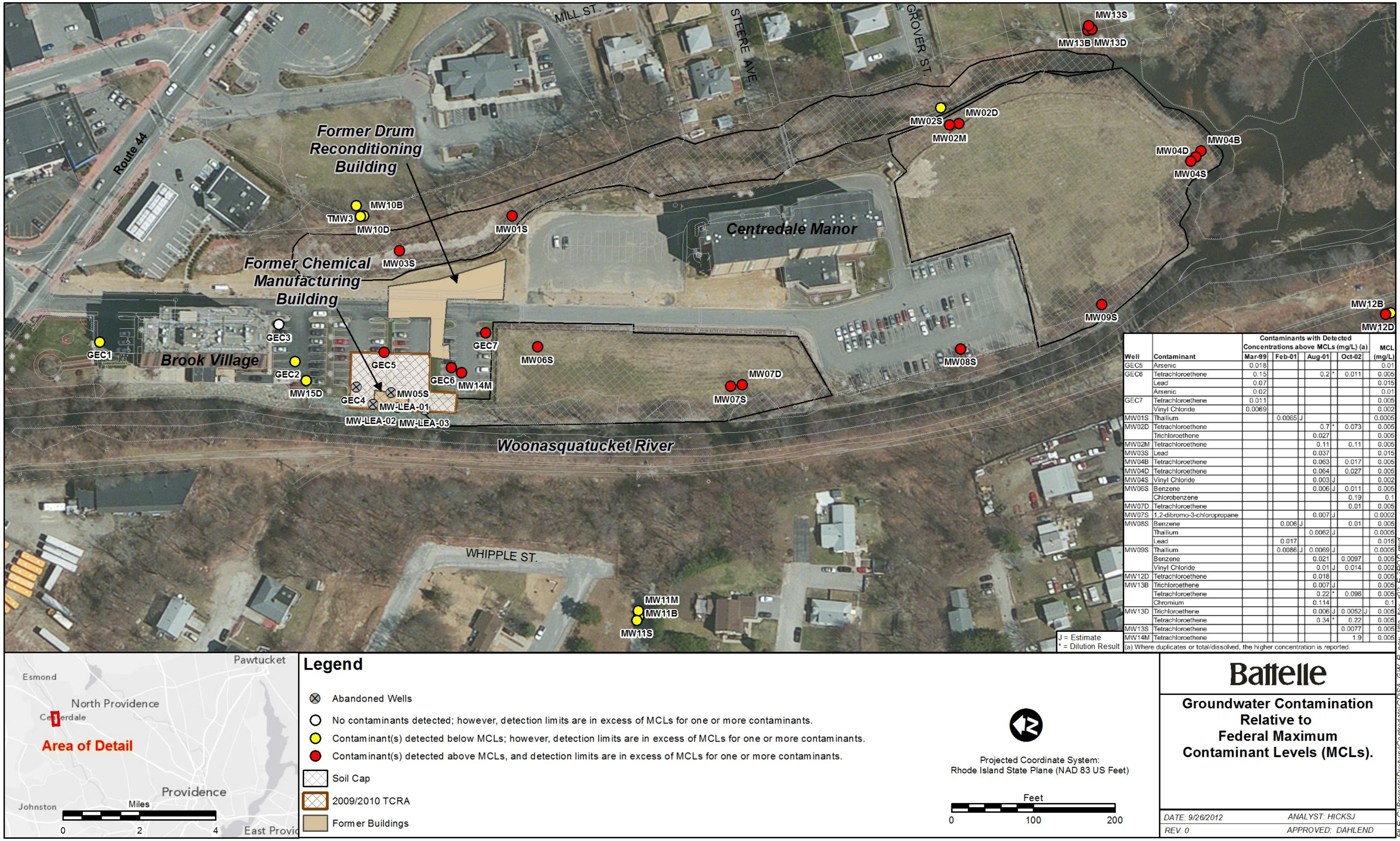


Figure E-1. Conceptual Site Model



Chemicals Having Concentrations Above Soil Cleanup Levels		
Dioxin	**SVOCs**	**VOCs**
2,3,7,8-TCDD and TEQ	4-chloroaniline	Benzene
	Benzo(a)anthracene	Chlorobenzene
Pesticides/PCBs	Benzo(a)pyrene	Dichloroethane (1,2-)
Total Aroclors (total PCB)	Benzo(b)fluoranthene	Dichloroethene (cis-1,2-)
Aldrin	Benzo(g,h,i)perylene	Ethyl benzene
Dieldrin	Benzo(k)fluoranthene	Tetrachloroethene (PCE)
Heptachlor	Biphenyl, 1,1-	Toluene
Technical Chlordane	Bis(2-ethylhexyl)phthalate	Trichlorobenzene (1,2,3-)
	Chrysene	Trichlorobenzene (1,2,4-)
Metals	Dibenzo(a,h)anthracene	Trichloroethene (TCE)
Antimony	Fluoranthene	Vinyl chloride
Arsenic	Indeno(1,2,3-cd)pyrene	Xylenes (Total)
Beryllium	Naphthalene	Trichloroethane (1,1,1-)
Cadmium	Pentachlorophenol	Trichloroethane (1,1,2-)
Lead	Pyrene	Dichlorobenzene (1,2-)
Manganese		Styrene
Thallium		Dichloroethene (trans-1,2)

Figure E-2. Source Area Soil Contamination: Contour Plot Showing Dioxin (2,3,7,8-TCDD) Contamination in Surface (0-0.25 ft and 0-1 ft) Soil and Point Data Showing the Number of Contaminants with Concentrations Above the Cleanup Levels in Vadose Zone (0-5 ft) Soil



Well	Contaminant	Contaminants with Detected Concentrations above MCLs (mg/L) (a) Mar-99	Feb-01	Aug-01	Oct-02	MCL (mg/L)
GEC5	Arsenic	0.018				0.01
GEC6	Tetrachloroethene	0.15		0.2 *	0.011	0.005
	Lead	0.07				0.015
	Arsenic	0.02				0.01
GEC7	Tetrachloroethene	0.011				0.005
	Vinyl Chloride	0.0069				0.002
MW01S	Thallium		0.0065 J			0.0005
MW02D	Tetrachloroethene			0.7 *	0.073	0.005
	Trichloroethene			0.027		0.005
MW02M	Tetrachloroethene			0.11	0.11	0.005
MW03S	Lead			0.037		0.015
MW04B	Tetrachloroethene			0.063	0.017	0.005
MW04D	Tetrachloroethene			0.064	0.027	0.005
MW04S	Vinyl Chloride			0.003 J		0.002
MW06S	Benzene			0.006 J	0.011	0.005
	Chlorobenzene				0.19	0.1
MW07D	Tetrachloroethene				0.01	0.005
MW07S	1,2-dibromo-3-chloropropane			0.007 J		0.0002
MW08S	Benzene		0.006 J		0.01	0.005
	Thallium			0.0062 J		0.0005
	Lead		0.017			0.015
MW09S	Thallium		0.0086 J	0.0069 J		0.0005
	Benzene			0.021	0.0097	0.005
	Vinyl Chloride			0.01 J	0.014	0.002
MW12D	Tetrachloroethene			0.018		0.005
MW13B	Trichloroethene			0.007 J		0.005
	Tetrachloroethene			0.22 *	0.096	0.005
	Chromium			0.114		0.1
MW13D	Trichloroethene			0.006 J	0.0052 J	0.005
	Tetrachloroethene			0.34 *	0.22	0.005
MW13S	Tetrachloroethene				0.0077	0.005
MW14M	Tetrachloroethene				1.9	0.005

(a) Where duplicates or total/dissolved, the higher concentration is reported.

Figure E-3. Groundwater Contamination Relative to Federal Maximum Contaminant Levels

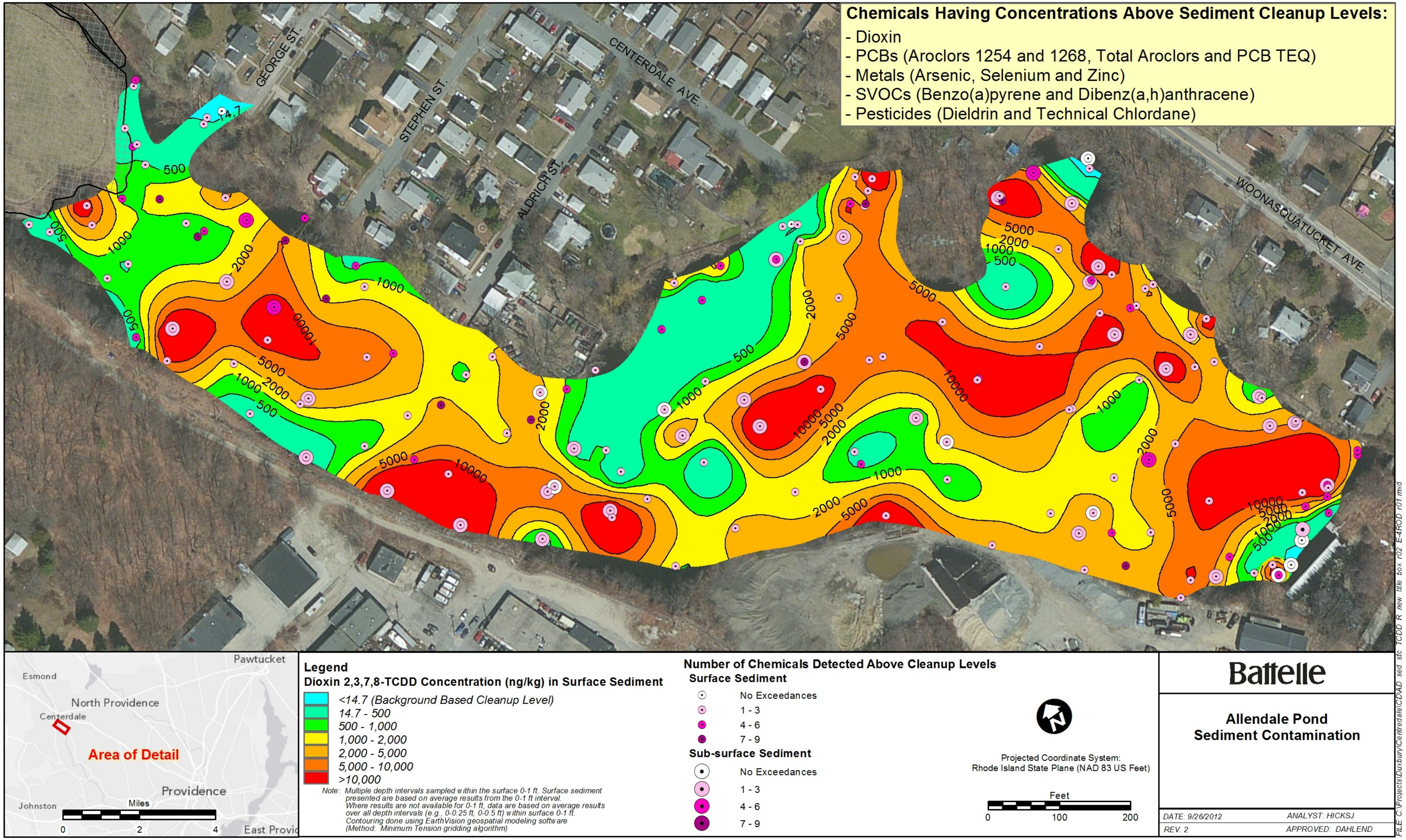


Figure E-4. Allendale Pond Sediment Contamination: Contour Plot Showing Dioxin (2,3,7,8-TCDD) Contamination in Surface (0-1 ft) Sediment and Point Data Showing the Number of Contaminants with Concentrations Above the Cleanup Levels in Surface (0-1 ft) and Sub-surface (>1 ft) Sediment

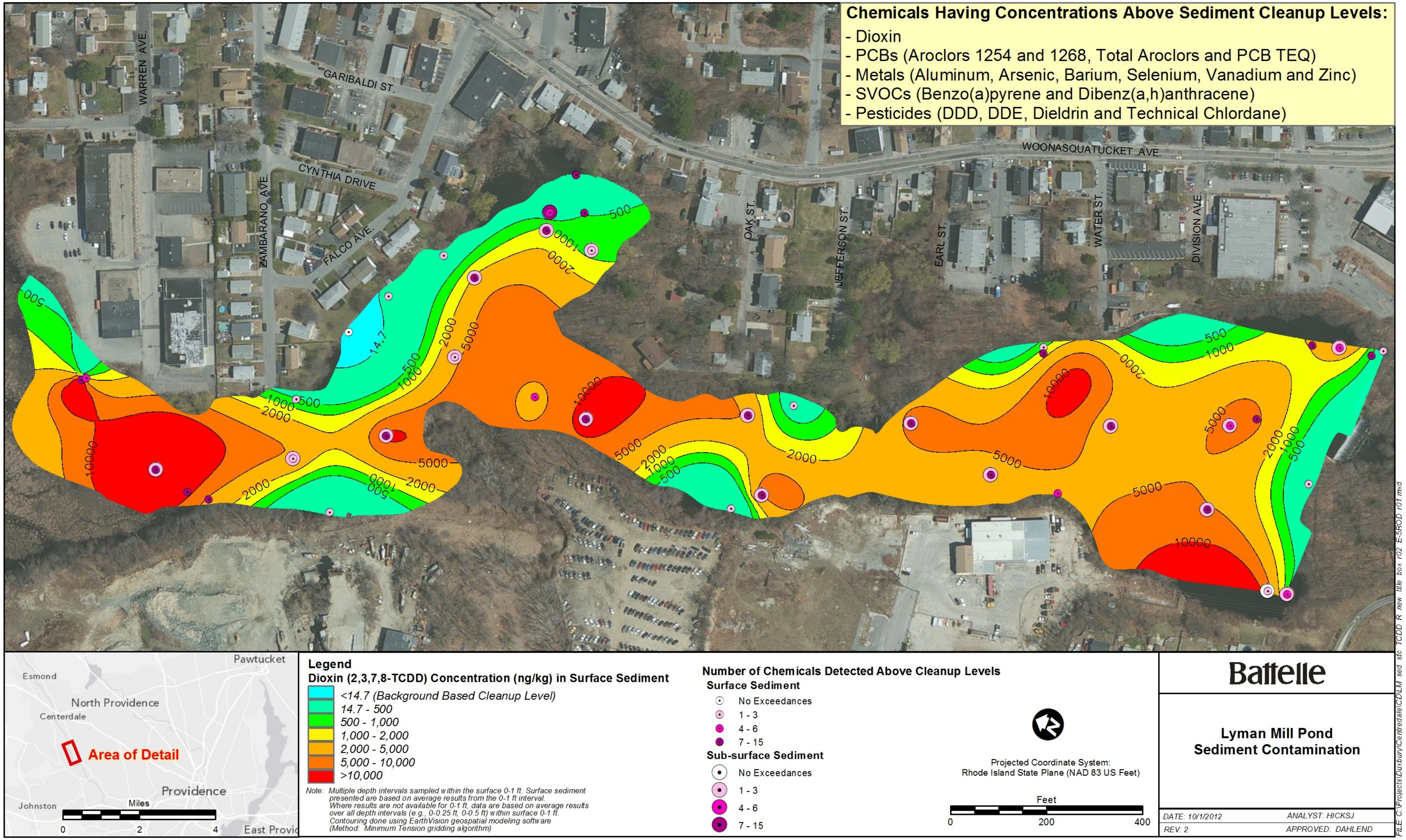


Figure E-5. Lyman Mill Pond Contamination: Contour Plot Showing Dioxin (2,3,7,8-TCDD) Contamination in Surface (0-1 ft) Sediment and Point Data Showing the Number of Contaminants with Concentrations Above the Cleanup Levels in Surface (0-1 ft) and Sub-surface (>1 ft) Sediment

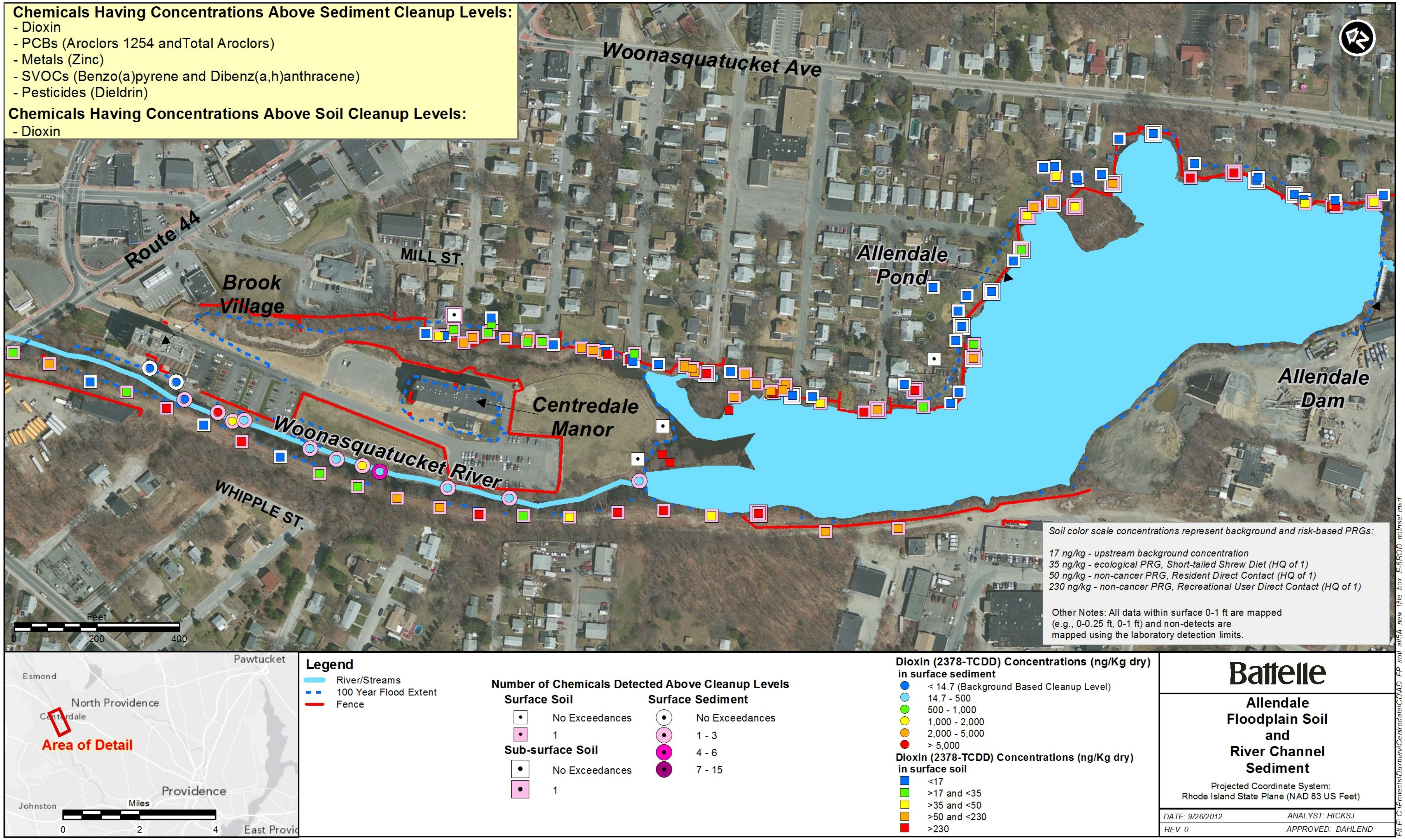


Figure E-6. Allendale Floodplain Soil and River Channel Sediment Contamination: Point Data Showing Dioxin (2,3,7,8-TCDD) Contamination in Surface (0-1 ft) Soil and River Channel Sediment and the Number of Contaminants with Concentrations Above the Cleanup Levels in Surface (0-1 ft) and Sub-surface (>1 ft) Soil and River Channel Sediment

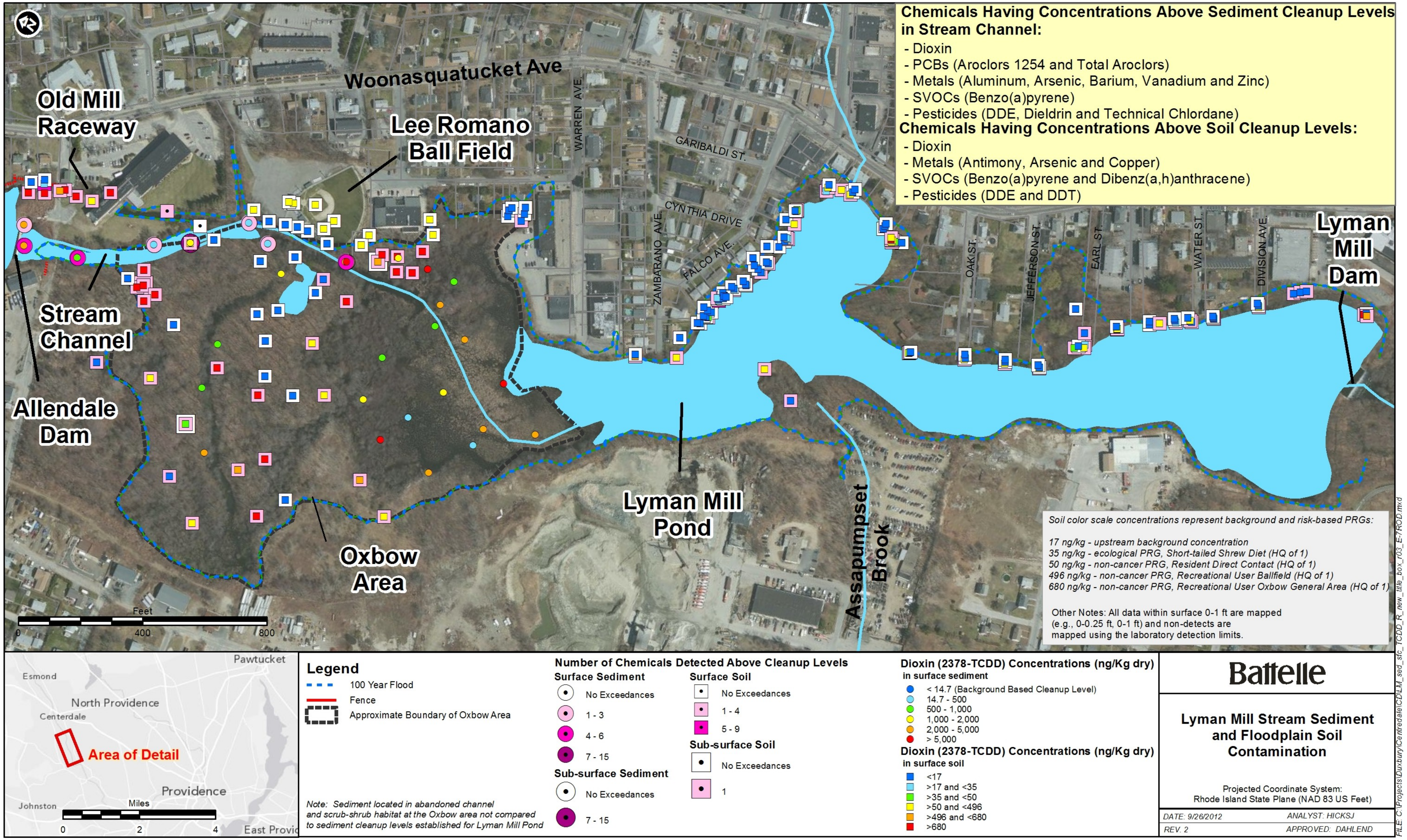


Figure E-7. Lyman Mill Stream Sediment and Floodplain Soil Contamination: Point Data Showing Dioxin (2,3,7,8-TCDD) Contamination in Surface (0-1 ft) Stream Sediment and Floodplain Soil and the Number of Contaminants with Concentrations Above the Cleanup Levels in Surface (0-1 ft) and Sub-surface (>1 ft) Stream Sediment and Floodplain Soil

F. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

1. Land Uses

The Brook Village and Centredale Manor apartments occupy the northern part of the Site (Source Area), bordered by the Woonasquatucket River. This area is currently occupied and covered by buildings, pavement, landscaping, and interim soil caps. Reasonably anticipated future use of the Source Area of the Site is as a multi-family residential use area. The land use on the east side of the Woonasquatucket River in North Providence, Rhode Island is primarily residential, with some commercial and light industrial properties. The west side of the River in Johnston, Rhode Island is characterized by mixed residential, commercial and industrial use. Reasonably anticipated future uses of adjacent land along Woonasquatucket River are expected to remain the same but with increased recreational access and uses.

With the designation of the Woonasquatucket River as an American Heritage River, there is an increased interest in reuse and redevelopment in and along the River. Today, the Audubon Society and the Woonasquatucket River Watershed Council are working with several state and federal agencies to increase opportunities for canoeing, boating, hiking, and fishing in the River lower basin. These uses were taken into account in the Site risk assessment. Scenic trails and heritage trails are being established, and wetland and riverine habitats are being restored, including a Woonasquatucket River Greenway and a bicycle path. There is an interest in extending these into the Allendale and Lyman Mill reaches. There is also interest in future recreational use of the wetland/forested area (Oxbow) below Allendale Dam. For these areas, the future anticipated land use is recreational. The future land use assumptions for the Site and surrounding areas are based on discussions with state and local officials and environmental groups.

2. Groundwater/Surface Water Uses

Groundwater

The majority of residences and businesses in the vicinity of the Site are served by the City of Providence public water supply system. There is no current use of the groundwater at the Site. The nearest public drinking water supply well is located 0.8 miles upgradient and upstream from the Site at Pied Piper Nursery School and serves an estimated 130 people. The nearest private drinking water well is the Yacht Club Bottling Works, Inc., (local bottling water and soda drinks company; the water for the drinks comes from a well drilled under the building in 1923 [the company opened in 1915]) located 0.12 miles upgradient from the Site.

Under State groundwater regulations, the aquifer at the Site is classified as GB (non-drinking water). However, because the State has not obtained EPA approval of a Comprehensive State Ground Water Protection Program, EPA is required to default to the federal groundwater classification system. Groundwater within the Source Area is federally classified as Class IIB (potential source of drinking water). Because the groundwater entirely surrounding the Site has historically (since 1992) been classified as non-drinking water (GB) by the State of Rhode Island

and has been regulated as such for many years, there are numerous non-Superfund sources on both sides of the Woonasquatucket River downstream and upstream from the Site that contribute or have the potential in the future to contribute to exceedances of drinking water standards away from the Source Area.

RIDEM has identified 18 State regulated waste sites along the Woonasquatucket River in the vicinity of the Site within the State GB-classified aquifer. At least six of these waste sites are located close to the Woonasquatucket River and upgradient of the Source Area. Historic groundwater data provided by RIDEM indicates that locations away from the Source Area are influenced by releases (including TCE and PCE) not attributable to the Site. As a result, anthropogenic conditions beyond the Source Area represent background for the aquifer beyond the Source Area. Future groundwater uses are not expected to change significantly.

Surface Water

Native Americans called the River "Woonasquatucket" meaning "the place where the salt water ends" or the meeting of the river and the sea. The River flows from North Smithfield for 19 miles south and east, to Water Place Park in downtown Providence, where it becomes the Providence River, which in turn flows into Narragansett Bay. The upper reaches of the River, including Glocester and North Smithfield, remain pristine and rural, with a number of protected wellhead areas. The middle of the watershed, Smithfield, is predominately suburban. From Greystone (the background area for the Site) to Providence (which includes reaches of this Superfund Site), the River is predominately urban. The Smithfield Waste Water Treatment Plant, which discharges into the River just above the Johnston Town line, currently services most of the industries in the area.

The lower reaches of the River have been impacted and physically altered since the industrial revolution. The dams along the industrialized stretch of the River were built to create ponds to supply water and power to the mills, but the River was also used as a cheap and convenient way to dispose of waste. The Woonasquatucket River is currently the focus of urban revitalization and watershed restoration efforts. With the efforts of the Woonasquatucket River Watershed Council, over the last several years remnants of the dams on a lower portion of the River have either been removed or fish ladders have been installed. This includes a fish ladder project at the Rising Sun Mills in 2008, to restore herring and alewife populations and facilitate fish migration up the River. There is also interest in the environmental community to extend the fish migration into the Lyman Mill and Allendale River reaches as well. The Woonasquatucket River Watershed Council is active in organizing water-based activities in the lower portion of the River in Providence, including canoeing, boating, and river clean-ups.

The Woonasquatucket River from the Smithfield/North Providence town line to its convergence with the Moshassuck River in downtown Providence (including Greystone Mill Pond, Allendale, Lyman Mill and Manton Ponds) is currently classified as recreational. Currently, Greystone Mill, Allendale, Lyman Mill, and Manton Ponds are suitable for canoeing and other non-contact-recreational activities. Suitable uses of the surface water at the Site and surrounding areas include non-contact recreational uses, boating, canoeing, and the development of greenways and walking trails. This use is impacted by litter, such as trash, tires, household items, and limited accessibility to the River. A fishing advisory (catch and release policy) has been in effect for this lower reach of the River since 1999. The potential future beneficial uses of surface water at the Site and surrounding areas include increased non-contact use as well as activities with prolonged contact with the River, such as swimming, wading, and water-based fishing once the fishing advisory is removed.

The section of the Woonasquatucket River which is part of the Site is recognized as an important recreational asset by the Rhode Island Statewide Planning Program, Rivers Policy and Classification Plan, which has as a specific goal for the lower segments of the Woonasquatucket River "to complete the removal of dioxin contaminated sediment and restore the river for contact recreational uses by 2020." The Town of Johnston Comprehensive Community Plan also promotes a cooperative effort between Johnston and adjacent towns to protect and improve the Woonasquatucket River and its watershed. Table F-1 summarizes Land Uses at the Site and surrounding areas.

Community and stakeholder input was sought and incorporated through active outreach with the Management Action Committee, including the State, Towns of North Smithfield and Johnston, and environmental groups.

Table F-1. Land Uses

	Current On- Site Use	Current Adjacent Use	Reasonable Potential Future Use	Basis for Potential Future Use	Time Frame to Achieve Potential Future Use
Land	Mixed residential, with some commercial and light industrial	Mixed residential, with some commercial and light industrial	Recreational/ Residential	Rhode Island Statewide Planning Program, Rivers Policy and Classification Plan	3-5 years for areas with currently restricted access
	Undeveloped woods and wetland	Mixed residential, with some commercial and light industrial	Recreational	RI Statewide Planning Program, Rivers Policy and Classification Plan; Oxbow Wetland Analysis; Watershed Initiatives	3-5 years for areas with currently restricted access
Shallow Groundwater	None	None	Potential drinking water source	Guidelines for Ground-Water Classification under the EPA Ground-Water Protection Strategy	N/A
Deep Groundwater	None	Yacht Club Flavored Seltzer & Soda bottling plant			
Surface Water	Recreational- non-contact uses (fishing advisory in effect)	Recreational- non-contact uses (fishing advisory in effect)	Recreational – increased non-contact uses, contact uses, lifting fish consumption advisory	RI Statewide Planning Program, Rivers Policy and Classification Plan; Watershed Initiatives	3-5 years for areas with currently restricted access

G. SUMMARY OF SITE RISKS

A baseline risk assessment was performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the Site assuming no remedial actions were to be taken. It provides the basis for taking remedial action when action is warranted, and identifies the contaminants and exposure pathways that need to be addressed by the remedy. The human health risk assessment followed a four step process: 1) hazard identification, which identified those hazardous substances which, given the specifics of the Site were of significant concern; 2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; 3) toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances; and 4) risk characterization and uncertainty analysis, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the Site, including carcinogenic and non-carcinogenic risks and a discussion of the uncertainty in the risk estimates. A summary of components of the human health and ecological risk assessments which support the need for remedial action are discussed below.

1. Human Health Risk Assessment

The complete baseline human health risk assessments can be found in the November 2005 Interim Final Baseline Human Health Risk Assessment (BHHRA), June 2011 Interim Final Supplemental Baseline Human Health and Ecological Risk Assessment: Oxbow Area Floodplain Soil and Sediment (Supplemental Oxbow Risk Assessment), and May 2012 Technical Memorandum on Impact of Dioxin Reassessment (Technical Memorandum).

Hazard Identification

Data collected for sediment, biota, surface water, soil and floodplain soil at the Site were used to identify contaminants by media. The contaminants were selected to represent potential Site related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment and can be found in Tables 2.1 through 2.14 of the BHHRA, Table 2.1 of the Supplemental Oxbow Risk Assessment (Part 1), and Table 2.1 of the Technical Memorandum. From this, a subset of the chemicals were identified in the FS as presenting a significant current or future risk (cancer risk exceeding one-in-a-million or non-cancer hazard quotient exceeding the threshold level of 1) and were identified at the Site in excess of the appropriate chemical specific ARAR or TBC value and summarized in Tables G-1-1 through G-1-5. These tables contain the exposure point concentrations (EPCs) used to evaluate the reasonable maximum exposure (RME) scenario in the baseline risk assessment for the contaminants in biota, sediment, soil, and floodplain soil. The EPCs were derived through statistical evaluations of the media-specific data for each of the identified exposure points. The statistical evaluations identify maximum and mean concentrations as well as 95% Upper Confidence Limit (UCLs) on the means. EPCs for both RME and average or central tendency exposure (CTE) scenarios for all contaminants can be found in Tables 3.1.RME through 3.8.CT of the BHHRA and Table 3.1 of the Supplemental Oxbow Risk Assessment (Part 1).

Exposure Assessment

Exposure to contaminants was estimated quantitatively or qualitatively through the development of several potential exposure scenarios. Current and potential future site-specific pathways for exposure to chemicals were determined. The extent, frequency, and duration of current or potential future exposure were estimated for each pathway. From these exposure parameters, a daily intake level of each site-related chemical was estimated. Exposure scenarios were developed considering the nature and extent of contamination, the location of the Site, current and future potential Site use, identification of potential receptors and exposure pathways.

The following is a brief summary of the exposure pathways that were found to present a significant risk assuming a reasonable maximum exposure scenario. A more thorough description of all exposure pathways evaluated in past activities and in the risk assessment including estimates for an average exposure scenario, can be found in Section 3.0, Table 1.1 and Tables 4.1.RME through 4.5.CT of the BHHRA, Section 3.0, Table 1.1 and Table 4.1 of the Supplemental Oxbow Risk Assessment.

The following current and future exposure pathways were found to present significant risks[5]:

Source Area

- Future resident exposed to soil above the water table assuming the existing caps not present or not effective in preventing direct contact exposure to soils (via ingestion and dermal contact); and
- Future construction worker exposed to soil above the water table (via ingestion and dermal contact).

Allendale Area

- Current and future resident living along the River (child and adult) exposed to biota – combined fish diet of American eel and white sucker (via ingestion) and sediment (via ingestion and dermal contact);
- Current and future visiting recreational angler (child and adult) exposed to biota – combined fish diet of American eel and white sucker (via ingestion);
- Current and future resident living in the area exposed to residential-use floodplain soil on the eastern shore of Allendale Pond (via ingestion and dermal contact); and
- Current and future passive recreational visitor to the area exposed to recreational-use floodplain soil on the western shore of Allendale Pond (via ingestion and dermal contact).

5 Exceedence of MCLs/non-zero MCLGs (maximum contaminant level goals) is the basis for response to groundwater contamination.

Lyman Mill Area

- Current and future resident living along the River (child and adult) exposed to biota – combined fish diet of American eel, largemouth bass, and white sucker (via ingestion) and sediment (via ingestion and dermal contact);
- Current and future visiting recreational angler (child and adult) exposed to biota – combined fish diet of American eel, largemouth bass, and white sucker (via ingestion);
- Current and future resident living in the area exposed to residential-use floodplain soil on the eastern shore of Lyman Mill Pond (via ingestion and dermal contact); and
- Current and future passive recreational visitor (child and adult) exposed to floodplain soil at the Oxbow General Area (via ingestion and dermal contact).

For contaminated soil exposure at the Source Area assuming the existing caps are not present or not effective, an exposure frequency of 350 days/year was presumed for the resident receptors with 12 years of exposure for adult, 12 years for older child, and 6 years for young child. This would total up to 30 years of exposure to the Site, which is standard for a Superfund site exposure. For construction worker exposure scenario, an exposure time of 8 hours/day for a frequency of 250 days/year for 1 year of duration was presumed to complete a certain construction project at the Source Area.

For contaminated biota exposure, the fish consumption rates were based on the 1993 Maine study because the study was conducted in New England (close to the Site) and because fish species identified at the Site (largemouth bass, white sucker, and brown bullhead) were also identified in the study. Current and future residents living along the River and visiting recreational angler were assumed to consume 14 grams of fish per day for adult, 9.3 g/day for older child, and 4.7 g/day for young child for the RME scenario. This would result in an estimated consumption of two 8-oz meals of fish caught from the Site per month for an adult. The fish consumption rate for the older child receptor was assumed to be 2/3 that of the adult rate and the rate for the young child receptor was assumed to be 1/3 that of the adult rate. A more detailed description of the biota consumption rates can be found in Section 3.2.1 of the BHHRA. Since there is no site-specific information on the consumption rates for each specific species collected for the Site, a combined fish diet approach assuming that a receptor would consume each fish species at an equal rate was used for the risk assessment. The fish EPCs used in the risk assessment are the arithmetic mean values of the EPCs for the fish species sampled at each exposure point. For the fish consumption exposure pathway, an exposure frequency of 350 days/year was presumed for resident and visiting recreational angler with 12 years of exposure for adult, 12 years for older child, and 6 years for young child. This would total up to 30 years of exposure to the Site, which is standard for a Superfund site exposure.

For contaminated sediment exposure, the resident receptors were assumed to visit the area to wade or swim 4 days per week during the warm months of June through August. Wading was expected to occur 3 of the 4 days each week and swimming 1 of the 4 days each week. Sediment contact would only occur during wading activity and not during swimming. The young child receptor was assumed to wade 4 days per week from June through August while the older child and the adult swim during this time period. The visiting recreational angler receptors were assumed to be exposed to contaminated sediment 1 day per week from June through August when the weather and water temperature are warm.

For contaminated residential-use floodplain soil exposure along the eastern shore of Allendale Pond and Lyman Mill Pond, an exposure frequency of 350 days/year was presumed for the resident receptors with 12 years of exposure for adult, 12 years for older child, and 6 years for young child. This would total up to 30 years of exposure to the Site, which is standard for a Superfund site exposure.

For contaminated floodplain soil exposure at the Lyman Mill Oxbow Area, two exposure points were identified for quantitative evaluation of human health risks for the passive recreational visitor receptor, the general area and the human health concern area. The general area is within the 100-year floodplain and more accessible to flooding throughout the year. The human health concern area is an upland area with elevation above the 100-year flood line and more accessible to people than the general area. The passive recreational visitor receptor was assumed to visit this Oxbow Area which is in close proximity to the Woonasquatucket River and to residential properties along the river for hiking, bird-watching, picnicking, and other passive recreational activities. This receptor, including young child, older child, and adult, was assumed to be exposed to contaminated floodplain soil in the human health concern area 2 days per week in May, September, October and 4 days per week in June, July, and August, for a total of 78 days per year. In the Oxbow general area, the area which is less accessible and less desirable for recreational activities, the exposure was assumed to be 26 days per year. The same exposure parameters for recreational visitor at Lyman Mill Oxbow Area –human health concern area of 78 days per year for 30 years were used for a passive recreational visitor in floodplain of the western shore of the Allendale Pond.

Toxicity Assessment

EPA assessed the potential for cancer risks and non-cancer health effects in the human health risk assessment.

Carcinogenic Effects

The potential for carcinogenic effects is generally described by two factors: a statement reflecting the degree of confidence that the compound causes cancer in humans and a potency estimate, indicating how potent the chemical may be at causing cancer, with the general assumption that every exposure has some probability of resulting in cancer. The descriptor reflecting the degree of confidence that the compound causes cancer in humans may be either an alpha-numeric value or a narrative. Both are closely tied to the nature and extent of information available from human and animal studies. The cancer potency estimate is a quantitative measure of a compound’s ability to cause cancer and is generally expressed as either an oral cancer slope factor (CSF) or an inhalation unit risk (IUR) value. Cancer slope factors and inhalation unit risk values are toxicity estimates developed by EPA based on epidemiological and/or animal studies and they reflect a conservative “upper bound” of the potency of the carcinogenic compound. That is, the true potency is unlikely to be greater than the potency described by EPA.

Table G-1-6 presents these cancer toxicity values and cancer classifications for the contaminants identified for the Site.

In some cases, however, EPA may conclude that it is not appropriate to generate a cancer slope factor or an inhalation unit risk value given the mode of action of the known or suspect carcinogen (e.g., chloroform). Currently, EPA's default procedure for characterizing cancer risk for compounds which may exhibit a threshold for carcinogenic effects mirrors the process used to describe the potential for adverse non-cancer effects described in the section which follows.

EPA's 2005 Cancer Guidelines and Supplemental Guidance were not timely published to be used in the BHHRA but were used in the Supplemental Oxbow Risk Assessment completed after the issuance of this guidance, as the basis for EPA's analysis of the addendum carcinogenicity risk assessment for the Site. The Cancer Guidelines and Supplemental Guidance provide specific guidance on potency adjustment to cancer risks associated with early-life exposures for carcinogens acting through a mutagenic mode of action. To evaluate cancer risks caused by such carcinogens, if data are available for a susceptible life stage, they should be used directly to evaluate risks for specific carcinogen and specific life stage on a case-by-case basis. For those mutagenic carcinogens without specific data for specific life stage, EPA recommends use a default approach with estimates from chronic studies with appropriate modifications to address the potential for differential risk of early-life exposure. This is applicable to the older child and young child passive recreational visitor receptor at the Oxbow Area.

For the evaluation of dioxins, furans, and Coplanar PCBs, EPA uses the TEQ approach. In the mixture of dioxins, furans, and dioxin-like compounds, 2,3,7,8-TCDD is identified as the most toxic compound. For the risk assessment, EPA used the 1998 and 2010 recommended TEFs developed by the WHO to calculate dioxin TEQ concentrations. The toxicity equivalents consider the toxicity of the less toxic dioxin-like compounds as fractions of the toxicity of 2,3,7,8,-TCDD and are calculated by multiplying the medium-specific concentration of each compound by the specific TEF assigned for that compound. This factor indicates the degree of toxicity compared to 2,3,7,8-TCDD, which is given a reference value of 1. The total TEQ concentration of the mixture of dioxin and dioxin-like compounds would be the sum of all the calculated TEQs.

Non-Carcinogenic Effects and Non-Linear Carcinogenic Effects

For addressing non-carcinogenic effects and effects of carcinogenic compounds which exhibit a threshold, it is EPA's policy to assume that a safe exposure level exists, which is described by a reference dose (RfD) or a reference concentration (RfC). RfDs and RfCs have been developed by EPA as estimates of a daily exposure that is likely to be without an appreciable risk of an adverse health effect when exposure occurs over the duration of a lifetime. RfDs and RfCs are derived from epidemiological and/or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. The RfDs and RfCs relevant to this Site are presented in Table G-1-7. The TEQ approach used to address cancer effects was also used to evaluate non-cancer effects from exposures to dioxin.

Risk Characterization

The risk characterization section combines the exposure estimate with the toxicity information to estimate the probability or potential that adverse health effects may occur if no action were to be taken at a site. A separate characterization is generated depending on the nature of the adverse effect. Cancer risks are generally expressed as a probability whereas the potential for adverse non-cancer effects and carcinogenic effects resulting from non-linear mode of action compounds are described in terms of what is considered to be a safe exposure level.

For exposure to most known or potentially carcinogenic substances, EPA believes that as the exposure increases, the cancer risk increases. In characterizing risk to these types of carcinogenic compounds, a chemical-specific daily intake level (see Exposure Assessment section) is multiplied with the cancer slope factor or the inhalation unit risk to estimate excess lifetime cancer risk as a result of exposure to that Site contaminant.

These toxicity values are conservative upper bound estimates, approximating a 95% confidence limit, on the increased cancer risk from a lifetime exposure to a compound. Therefore, the true risks are unlikely to be greater than the risks predicted. Typically the resulting cancer risk estimates are expressed in scientific notation as a probability (e.g. 1×10^{-6} or 1E-06 for 1/1,000,000) and indicate (using this example), that an average individual is not likely to have greater than a one-in-a-million chance of developing cancer over a lifetime of 70 years as a result of Site-related exposure as defined to the compound at the stated concentration.

All risks estimated represent an excess lifetime cancer risk from exposures to contamination originating from the Site. These are risks above and beyond that which we face from other non-site related causes such as from cigarettes or ultra-violet radiation from the sun. The chance of an individual developing cancer from all other (non-site related) causes has been estimated to be as high as one in three. EPA generally views site related cancer risks in excess of 10^{-4} to 10^{-6} as unacceptable. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances.

For the Supplemental Oxbow Risk Assessment, to the extent that EPA has deemed that data are sufficient to apply the provisions of the 2005 Children's Supplemental Cancer Risk Guidelines, special consideration of the increased susceptibility to carcinogenic effects that children may have, was included in the risk characterization. The 2005 Children's Supplemental Cancer Guidelines were used to describe any such heightened susceptibility among potentially exposed children.

The cancer risk characterization for all areas except the Source Area, residential-use floodplain soil, and Oxbow Areas of this Site was completed prior to the 2005 Children's Cancer Supplemental Guidance. While not specifically addressed in the risk assessment for the site, it is anticipated that the net impact of the 2005 Supplemental Children's Cancer Risk Guidelines on the cancer risk estimates presented herein would be quite minimal comparing to the total risk. The current risks for the resident living along the River and recreational angler exposed to sediment and biota contaminated with carcinogenic PAH compounds are mostly much lower than 1E-06 risk, for some compounds at many orders of magnitude. By applying the

Supplemental Guidelines to adjust for early-life exposure to carcinogens that act by a mutagenic mode of action, the risks from exposure to these contaminants would slightly increase from the current risk results but would not significantly impact the overall cancer risk results.

In February 2012, EPA released the final non-cancer dioxin reassessment (2012 Dioxin Reanalysis Volume I) with a final oral RfD value for 2,3,7,8-TCDD for use in risk assessment. This value was then used to reassess the impact of the change on the Site human health risk assessments, human health PRGs, identification of target cleanup levels, and calculation of residual risks (2012 Technical Memorandum).

In assessing the potential for adverse non-carcinogenic effects and carcinogenic effects resulting from non-linear mode of action compounds, a hazard quotient (HQ) is calculated by expressing the exposure or the exposure concentration in the case of air exposure as a ratio of the reference value (RfD or RfC). A HQ $\leq$ 1 indicates that a receptor's exposure dose of a single contaminant is less than or equal to the safe value or reference value and that adverse health effects are unlikely to occur. Conversely, a HQ >1 indicates that adverse effects as a result of exposure to the contaminant are possible. To account for additive effects resulting from exposure to more than one compound, a Hazard Index (HI) is generated by adding the HQs for all chemicals that affect the same target organ or have a similar mechanism or mode of action. As a conservative measure and a common practice, HQs are often added for all contaminants that affect the same organ or system (i.e., liver, nervous system) since the mechanism or mode of action is not always known. A HI $\leq$ 1 indicates that adverse effects are unlikely whereas a HI >1 indicates adverse effects are possible. Generally, EPA views HI values based on site-related exposure in excess of unity as unacceptable. It should be noted that the magnitude of the HQ or HI is not proportional to the likelihood that an adverse effect will be observed.

The following is a summary of the media and exposure pathways that were found to present a significant risk exceeding EPA's cancer risk range (10^{-4} to 10^{-6} or E-04 to E-06) and non-cancer threshold (HI of 1). Only those exposure pathways deemed relevant to the remedy being proposed are presented in this ROD. A more comprehensive risk summary of all exposure pathways evaluated for all contaminants and for risk estimates of the central tendency exposure scenario can be found in Section 5.0 and Tables 9.1.RME through 9.37.CT of the BHHRA, Section 5.0 and Tables 9.1 through 9.6 of the Supplemental Oxbow Risk Assessment, and Section 2.0, Table 2-2, and Appendix C of the Technical Memorandum.

Source Area

RESIDENT

Tables G-1-8 and G-1-15 depict the carcinogenic and non-carcinogenic risk summary for the contaminants in soil 0-5 feet to reflect potential future exposures for resident living in the complexes at the Source Area under the RME scenario. For the child and adult resident, carcinogenic risks from exposures to surface soil and subsurface soil both exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6}. The cumulative carcinogenic risks were $4x10^{-3}$ (4E-03) from surface soil and $2x10^{-3}$ (2E-03) from subsurface soil via ingestion and dermal contact. The exceedance was due to VOCs, PCBs, pesticides, PAHs, arsenic, and dioxins/furans, primarily

2,3,7,8-TCDD in both surface and subsurface soil. The non-carcinogenic hazard indices for a child resident exceeded EPA threshold level of 1. For child resident exposed to contaminated surface soil via ingestion and dermal contact, the HI of 305 based on adverse effects on the immune system was due to TCE and PCBs and the HI of 150 based on adverse effects on the reproductive/endocrine systems was due to dioxins/furans, primarily 2,3,7,8-TCDD. For child resident exposed to contaminated subsurface soil via ingestion and dermal contact, the HI of 109 based on adverse effects on the immune system was due to TCE and PCBs and the HI of 50 based on adverse effects on the reproductive/endocrine systems was due to dioxins/furans, primarily 2,3,7,8-TCDD.

CONSTRUCTION WORKER

Tables G-1-9 and G-1-16 depict the carcinogenic and non-carcinogenic risk summary for the contaminants in soil 0-5 feet to reflect potential future exposures for construction worker working at the Source Area under the RME scenario. For the construction worker, carcinogenic risks were within the EPA acceptable risk range of 10^{-4} to 10^{-6} but exceeded RIDEM cancer risk level of 10^{-5}. The cumulative carcinogenic risks were 5×10^{-5} (5E-05) via ingestion and dermal contact. The exceedance was due to PCBs and dioxins/furans, primarily 2,3,7,8-TCDD in soil. The non-carcinogenic HI of 13 based on adverse effects on the immune system due to TCE and PCBs from contaminated soil exposure pathway for construction worker exceeded EPA threshold level of 1.

Allendale Area

RESIDENT LIVING ALONG THE RIVER

Tables G-1-10 and G-1-17 depict the carcinogenic and non-carcinogenic risk summary for the contaminants in biota and sediment to reflect potential current and future exposures for resident living along the River under the RME scenario. For the child and adult resident, carcinogenic risks exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6}. The cumulative carcinogenic risks were 5×10^{-3} (5E-03) from biota consumption and 2×10^{-4} (2E-04) from sediment exposures via ingestion and dermal contact. The exceedance was due to PCBs, pesticides, and dioxins/furans, primarily 2,3,7,8- TCDD in fish and PAHs, arsenic, and dioxins/furans, primarily 2,3,7,8-TCDD in sediment. The non-carcinogenic HI of 28 based on adverse effects on the immune system due to PCBs and of 129 based on adverse effects on the reproductive/endocrine systems due to dioxins/furans, primarily 2,3,7,8-TCDD from contaminated fish via biota consumption exposure pathway for child resident exceeded EPA threshold level of 1. The non-carcinogenic HI of 16 for child resident living along the River based on adverse effects on the reproductive/endocrine systems due to dioxins/furans, primarily 2,3,7,8-TCDD from ingestion of contaminated sediment in Allendale Pond exceeded EPA threshold level of 1.

VISITING RECREATIONAL ANGLER

Tables G-1-11 and G-1-18 depict the carcinogenic and non-carcinogenic risk summary for the contaminants in biota to reflect potential current and future exposures for visiting recreational angler under the RME scenario. The cumulative carcinogenic risks of 5×10^{-3} (5E-03) for biota consumption exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6} and were due to PCBs, pesticides, and dioxins/furans, primarily 2,3,7,8-TCDD. The non-carcinogenic HI of 28 based on adverse effects on the immune system due to PCBs and of 129 based on adverse effects on the reproductive/endocrine systems due to dioxins/furans, primarily 2,3,7,8-TCDD from contaminated fish via biota consumption exposure pathway for the child visiting recreational angler who shared the catch exceeded EPA threshold level of 1.

RESIDENTS ALONG THE EASTERN SHORE OF ALLENDALE POND

Tables G-1-12 and G-1-19 depict the maximum carcinogenic and non-carcinogenic risk summary for the contaminants in residential floodplain soil along the eastern shore of Allendale Pond to reflect potential current and future exposures for resident exposed to residential-use floodplain soil under the RME scenario. Under this maximum scenario, for the child and adult resident, carcinogenic risks exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6} and RIDEM cancer risk level of 10^{-5}. The highest exceeding cumulative carcinogenic risk was $2x10^{-4}$ (2E-04) from floodplain soil exposures mainly via ingestion of contaminated floodplain soil. The exceedance was due to dioxins/furans, primarily 2,3,7,8-TCDD in floodplain soils. The highest non-carcinogenic HI of 17 for child resident along the eastern shore of Allendale Pond based on adverse effects on the reproductive/endocrine systems due to dioxins/furans, primarily 2,3,7,8-TCDD mainly from ingestion of contaminated floodplain soil exceeded EPA threshold level of 1.

RECREATIONAL VISITOR

Table G-1-13 depicts the carcinogenic risk summary for the contaminants in recreational-use floodplain soil along the western shore of Allendale Pond to reflect potential current and future exposures for recreational visitor exposed to floodplain soil under the RME scenario. For the recreational visitor, the cumulative carcinogenic risks of $2x10^{-5}$ (2E-05) via mainly ingestion and dermal contact with floodplain soil exceeded the RIDEM cancer risk level of 10^{-5} and were due to dioxins/furans, primarily 2,3,7,8-TCDD. The non-carcinogenic HI of 1 equals to EPA threshold level of 1 so there is no unacceptable non-cancer hazard for recreational visitor exposed to floodplain soil at the western shore of Allendale Pond, thus there is no non-carcinogenic risk summary table.

Lyman Mill Area

RESIDENT LIVING ALONG THE RIVER

Tables G-1-10 and G-1-17 depict the carcinogenic and non-carcinogenic risk summary for the contaminants in biota and sediment to reflect potential current and future exposures for resident living along the River under the RME scenario. For the child and adult resident, carcinogenic risks exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6}. The cumulative carcinogenic risks were $6x10^{-3}$ (6E-03) from biota consumption and $3x10^{-4}$ (3E-04) from sediment exposures via ingestion and dermal contact. The exceedance was due to PCBs, pesticides, PAHs, arsenic, and dioxins/furans, primarily 2,3,7,8-TCDD in fish and PAHs, arsenic, and 2,3,7,8-TCDD in sediment. The non-carcinogenic HI of 32 based on adverse effects on the immune system due to PCBs and of 159 based on adverse effects on the reproductive/endocrine systems due to dioxins/furans, primarily 2,3,7,8-TCDD from contaminated fish via biota consumption exposure pathway for child resident exceeded EPA threshold level of 1. The non-carcinogenic HI of 24 for child resident living along the River based on adverse effects on the reproductive/endocrine systems due to dioxins/furans, primarily 2,3,7,8-TCDD via ingestion of and dermal contact with contaminated sediment in Lyman Mill Pond exceeded EPA threshold level of 1.

VISITING RECREATIONAL ANGLER

Tables G-1-11 and G-1-18 depict the carcinogenic and non-carcinogenic risk summary for the contaminants in biota to reflect potential current and future exposures for visiting recreational angler under the RME scenario. The cumulative carcinogenic risks of $6x10^{-3}$ (6E-03) for biota consumption exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6} and were due to PCBs, pesticides, PAHs, and dioxins/furans, primarily 2,3,7,8-TCDD. The non-carcinogenic HI of 32 based on adverse effects on the immune system due to PCBs and of 159 based on adverse effects on the reproductive/endocrine systems due to dioxins/furans, primarily 2,3,7,8-TCDD from contaminated fish via biota consumption exposure pathway for the child visiting recreational angler who shared the catch exceeded EPA threshold level of 1.

RESIDENTS ALONG THE EASTERN SHORE OF LYMAN MILL POND

Tables G-1-12 and G-1-19 depict the maximum carcinogenic and non-carcinogenic risk summary for the contaminants in residential floodplain soil along the eastern shore of Lyman Mill Pond to reflect potential current and future exposures for resident exposed to residential-use floodplain soil under the RME scenario. Under this maximum scenario, for the child and adult resident, carcinogenic risks exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6} and RIDEM cancer risk level of 10^{-5}. The highest exceeding cumulative carcinogenic risk was $9x10^{-3}$ (9E-03) from floodplain soil exposures mainly via ingestion of and dermal contact with contaminated floodplain soil. The exceedance was due mainly to benzo(a)pyrene, dibenz(a,h)anthracene, and dioxins/furans, primarily 2,3,7,8-TCDD in floodplain soil. The highest non-carcinogenic HI of 20 for child resident along the eastern shore of Lyman Mill Pond based on adverse effects on the reproductive/endocrine systems due to dioxins/furans, primarily 2,3,7,8-TCDD mainly from ingestion of contaminated floodplain soil exceeded EPA threshold level of 1.

PASSIVE RECREATIONAL VISITOR IN LYMAN MILL OXBOW AREA (GENERAL AREA)

Tables G-1-14 and G-1-20 depict the carcinogenic and non-carcinogenic risk summary for the contaminants in floodplain soil to reflect potential current and future exposures for passive recreational visitor for the Lyman Mill Oxbow Area - General Area under the RME scenario. The cumulative carcinogenic risks of $6x10^{-5}$ (6E-05) was within the EPA acceptable risk range of 10^{-4} to 10^{-6} but exceeded RIDEM cancer risk level of 10^{-5}. The exceeding cumulative cancer risks were due to benzo(a)pyrene, arsenic, and dioxins/furans, primarily 2,3,7,8-TCDD. The non-carcinogenic HI of 4 for child passive recreational visitor exposed to floodplain soil at the Lyman Mill Oxbow Area based on adverse effects on reproductive/endocrine systems due to dioxins/furans, primarily 2,3,7,8-TCDD, mainly from ingestion of contaminated floodplain soil exceeded EPA threshold level of 1.

Uncertainties

A thorough discussion of the major uncertainties associated with the risk assessment for the Site can be found in Section 6.0 and Table 14 of the BHHRA and Section 6.0 of the Supplemental Oxbow Risk Assessment. Those uncertainties may have resulted in an over- or under-estimation of risk. Below is a highlight of some major uncertainties.

The Allendale Dam had been breached in 2001 and the water levels in Allendale had receded.[6] Therefore, no largemouth bass was found and no largemouth bass samples were collected from Allendale Pond in summer 2001. There are some fish sample results that have not been incorporated into the biota consumption risk assessment. These samples were collected in April 2001 prior to the summer 2001 biota data collection program. Although the white sucker samples were limited in number and no other fallfish were collected for comparison, these samples might provide a snapshot of conditions at a time prior to the 2001 complete breaching of the Allendale Dam.

There is some uncertainty with the presence of subsistence anglers/consumers at the studied area of the Woonasquatucket River. The current fish consumption advisories and posted signs might reduce the likelihood that subsistence anglers/consumers would choose to fish this portion of the River for the main source of their diet. This exposure scenario was evaluated and presented as supplemental information in Appendix F of the BHHRA.

The approach of assuming a combined fish diet for residents living along the River and visiting recreational anglers has some uncertainties. Without site-specific data on the receptors' preferred fish species and fish consuming habits, it was assumed that they consume equal portions of the fish species collected at each exposure point. This assumption may have resulted in an over- or under-estimation of how much each specific fish species was consumed.

Dioxin and furan congeners were evaluated using the toxicity value from EPA's 1997 Health Effects Assessment Summary Table (HEAST). Other sources for dioxin's toxicity values that are publicly available and peer reviewed could also be considered for use in the risk assessment. The 1985 toxicity value from EPA's Office of Health and Environmental Assessment was quite similar to the one from HEAST and therefore would not result in significantly different risk results. However, using the 1986 and 2002 toxicity values from California EPA might result in slightly lower risks. Non-cancer hazard was not quantitatively evaluated in the BHHRA and the Supplemental Oxbow Risk Assessment for potential exposures to dioxin and furan congeners due to a lack of published and peer reviewed non-cancer toxicity values at the time. In February 2012, EPA released the final non-cancer dioxin reassessment (2012 Dioxin Reanalysis Volume

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6 The potential impacts of the May 2001 breach of the Allendale Dam on the development of sediment PRGs were evaluated. Based upon the evaluation of the pre-breach and post-breach sediment and fish tissue data and a comparison of fish tissue concentrations with literature values for BSAFs for dioxin TEQ and Aroclor-1254, it was determined that the site-specific BSAF data from Lyman Mill Pond should not be used. The BSAFs for the evaluated exposure areas other than Lyman Mill Pond were determined to be consistent and appropriate to use for PRG development. For the Lyman Mill Pond, arithmetic mean BSAF for each fish species from five other exposure areas (for Assapumpset, Greystone Mill, Allendale, Manton, and Dyerville) for each contaminant was used in the derivation of species-specific fish-consumption-based sediment PRGs for Lyman Mill Pond.

I) with a final oral RfD value for 2,3,7,8-TCDD for use in risk assessment. This value was then used to reassess the impact of the change on the Site human health risk assessments, human health PRGs, identification of target cleanup levels, and calculation of residual risks (2012 Technical Memorandum). Due to the uncertainty associated with the toxicity values for HCX, the risks associated with potential exposure to HCX may have been underestimated. There are no toxicity values available for HCX so non-cancer hazard and cancer risk from potential exposure to HCX were not quantified in the risk assessment. This may have resulted in an underestimation of the total risks and hazards for the receptors from being potentially exposed to HCX at the Site.

2. Ecological Risk Assessment

The complete baseline ecological risk assessment can be found in the September 2004 Interim Final Ecological Risk Assessment (BERA) and the June 2011 Interim Final Supplemental Baseline Human Health and Ecological Risk Assessment: Oxbow Area Floodplain Soil and Sediment (Part 2) (Supplemental BERA).

Receptor Groups, Endpoints, Lines of Evidence, and Exposure Areas

The BERA and Supplemental BERA evaluated the ecological risk in aquatic and floodplain habitats in the Allendale and Lyman Mill Ponds areas, including the Oxbow Area wetland. Two off-site areas including both aquatic and terrestrial habitat were also evaluated to assess upgradient background and reference conditions. The reference habitat was Assapumpset Brook and Pond; Assapumpset Brook is a tributary of the Woonasquatucket River and discharges along the western edge of Lyman Mill Pond. The upgradient background habitat was Greystone Mill Pond, an impoundment on the Woonasquatucket River, located about 3,000 feet upstream of the Site.

Tables G-2-1 and G-2-2 summarize the receptor groups, lines of evidence, endpoints, and exposure areas associated with unacceptable risks.

Contaminants evaluated were selected by comparing the analytical data for abiotic samples (i.e., surface water, sediment, and/or floodplain soil) and biotic samples (different tissues) obtained from the reference locations and the on-Site exposure areas against conservative screening benchmarks. Dioxin and furan congeners and homologue groups were evaluated in the assessment using a TEQ approach based on 2,3,7,8-TCDD.

A contaminant was evaluated in the BERA and Supplemental BERA if (a) its maximum concentration (or the maximum detection limit for non-detects) exceeded its screening benchmark, (b) a benchmark was not available, or (c) a contaminant had the potential to bioaccumulate in birds and mammals via food chain uptake. Numerous organic and inorganic compounds were selected in one or more of the abiotic and biotic matrices, principally inorganics (e.g., chromium, copper, lead, and zinc), organochlorine pesticides (e.g., technical chlordane, dieldrin, DDT and breakdown products), PAHs, PCBs (e.g., Aroclors and Coplanar PCB congeners), and dioxins/furan congeners.

Information on the contaminants considered in the BERA and Supplemental BERA to be associated with unacceptable risks, including statistical summary of the analytical results, screening benchmark values and screening HQs are presented in Tables G-2-3 through G-2-6. Tables G-2-3 and G-2-4 present summaries of evaluated contaminants for Allendale and Lyman Mill Pond sediment, respectively, and Tables G-2-5 and G-2-6 present similar information for floodplain soil.

Exposure Assessment

Table G-2-7 summarizes the ecological exposure pathways of concern evaluated in the BERA and Supplemental BERA, and which are associated with unacceptable risks. Information on the exposure routes, assessment (i.e., study objectives) and measurement (i.e., specific lines of evidence used to evaluate objectives) endpoints are presented by abiotic exposure medium (including sediment, surface water, and floodplain soil).

Complete Exposure Pathways for the Aquatic Habitats

For the aquatic portion of the impoundments, the BERA measured the exposure of various receptor groups to contaminants present in sediment, surface water, and aquatic food items at one or more of the ponds. The receptor groups associated with unacceptable risks consisted of fish, piscivorous birds (great blue heron and belted kingfisher), piscivorous mammals (river otter), insectivorous birds (tree swallow) and insectivorous mammals (little brown bat).

Sediment samples were collected from all four impoundments and at the Oxbow Area, whereas surface water samples were collected from the Allendale and Lyman Mill ponds. Crayfish, emergent insects, four fish species (i.e., largemouth bass, white sucker, brown bullhead[7], and American eel), tree swallow eggs, tree swallow nestlings, and tree swallow nestling stomach content (consisting mostly of emergent aquatic insects) were collected for chemical analyses from one or more of the impoundments and at the upstream reference and/or background locations.

The concentrations of bioaccumulative organic contaminants (specifically, dioxins, PCBs, and organochlorine pesticides) in the eggs of piscivorous birds feeding at the ponds were estimated based on measured concentrations of these compounds in fish tissues and literature-derived avian Biomagnification Factors (BMFs). Also, published mammal BMFs were used to estimate the concentrations of bioaccumulative organic contaminants (specifically, dioxins and PCBs) in piscivorous mammals feeding on fish from the ponds, and to estimate the TCDD TEQs in insectivorous mammal tissue (i.e., little brown bat) feeding on emergent insects.

The levels of organic and inorganic contaminants measured in crayfish and co-located sediment samples collected from Allendale and Lyman Mills Ponds were used to derive site-specific crayfish Biota-Sediment Accumulation Factors (BSAFs). Site-specific BSAFs were also developed to estimate the uptake of TCDD TEQs based on dioxin, furan, and PCB congeners

7 Brown bullhead was the bottom feeding fish surrogate for white sucker in the reference habitat, Assapumpset Brook.

into emerging insect tissue. These BSAFs were used together with the BMFs to estimate TCDD TEQ levels of insectivorous mammals in exposure areas lacking measured emerging insect data.

EPCs for contaminants in surface water, sediment, soil, and the various tissues were calculated in terms of RMEs and CTEs. RMEs were either the maximum detected value or the 95% UCL of the mean, depending on the structure of the datasets. Arithmetic means were used as CTEs, unless the mean exceeded the maximum due to high detection limits, in which case the maximum value was retained.

Complete Exposure Pathways for the Floodplain Habitats

The BERA and Supplemental BERA determined that terrestrial exposures pose unacceptable risks to vermivorous birds (American woodcock) and vermivorous mammals (short-tailed shrew, with 85 percent of the diet consisting of earthworms and 15 percent consisting of plants). Soil samples were collected from the floodplain habitats at Allendale Pond and Lyman Mill Pond, and at the Oxbow Area. Earthworms were collected for residue analysis from the floodplains at Allendale Pond and Lyman Mill Pond. The contaminant levels in earthworms at the Oxbow Area were estimated by multiplying Oxbow Area soil EPCs with the Site-specific BSAFs developed for the BERA. Contaminant levels in terrestrial plants at the Oxbow Area were estimated by multiplying Oxbow Area soil EPCs by literature-derived plant Bioaccumulation Factors (BAFs). The TCDD TEQs in vermivorous mammals (i.e., short-tailed shrew) and in the eggs of vermivorous bird (i.e., American woodcock) feeding on earthworms in the floodplain habitats at the impoundments and the Oxbow Area were estimated using published BMFs.

The terrestrial exposure media of concern that were shown in the BERA and Supplemental BERA to pose unacceptable ecological risks consisted of the following: (a) surface soil for ingestion by wildlife receptors, (b) terrestrial food items (earthworms and plants) consumed by birds and mammals, (c) eggs of vermivorous birds, and (d) tissues of vermivorous mammals.

Estimated Daily Intakes for Birds and Mammals

Food web modeling was used to calculate contaminant-specific Estimated Daily Intakes (EDIs) by wildlife receptors foraging in the aquatic and terrestrial habitats at the four impoundments and the Oxbow Area. The food web models quantified the EDIs by calculating the intake of contaminants via food ingestion, incidental soil or sediment ingestion, and surface water ingestion.

Depending on the exposure location, the amount of contaminants in food items eaten by birds and mammals were either estimated based on multiplying soil EPCs by published generic BAFs (e.g., plants), were measured directly in field-collected biota (e.g., fish, earthworms, emergent insects), or were derived based on Site-specific BSAFs and EPC concentrations (e.g., earthworms, crayfish and fish).

Ecological Effects Assessment

The potential for effects to community receptors (i.e., fish, benthic invertebrates, and soil invertebrates) exposed to contaminants of interest in surface water, sediment, and soil was assessed using published toxicity benchmarks and various site-specific field studies that are summarized in Table G-2-8.

The congeners of dioxins, furans, and PCBs detected in Site media were expressed in terms of TEQs. Congener-specific concentrations detected in all media were multiplied by TEFs for wildlife. Congener-specific concentrations detected in tissues were also multiplied by fish, bird, or mammal TEFs and compared to tissue-specific Critical Body Residues (CBRs). TEQs were expressed in terms of a total 2,3,7,8- TCDD TEQ (i.e., "2,3,7,8-TCDD Toxic Equivalency"), as well as the TEQs calculated separately for dioxin, furan, and PCB congeners in order to identify the relative contribution of these three groups of compounds to the overall TEQ. The TEQ concentrations for congeners of dioxins, furans, and PCBs were specified as "TEQ dioxin/furans" and "TEQ PCBs", respectively, with the receptor type specified (i.e., bird, mammal, fish).

An ELS laboratory bioassay using fertilized channel catfish eggs was performed to evaluate the lethal and sublethal effects of TCDD, PCB-77 and PCB-126, with and without HCX, on fish embryos and larvae. The goal was to provide supporting data for the ichthyoplankton survey. Both this study and the survey focused on the most sensitive fish life stages and key contaminants. The dose-response data from this study were related to sediment contaminant levels by developing maternal fish/egg transfer factors and site-specific BSAFs for use in the BERA. The waterborne exposures negatively correlated with hatching success and survival after hatching.

Various types of tissue samples were collected from aquatic and terrestrial habitats at the Site for chemical analyses. Those tissues consisted of fish (largemouth bass, white sucker, brown bullhead, and American eel), tree swallow nestling stomach content, tree swallow nestling livers and tree swallow eggs. The tissue residue data were used to evaluate the potential for direct effects based on comparing the residue data to tissue-specific CBRs.

Literature studies which reported on the chemical concentrations in the tissues and diet of herring gulls and otters were used to estimate tissue concentrations of bioaccumulative contaminants in piscivorous wildlife tissues. The literature was reviewed and summarized to derive lipid-normalized BMFs for dioxin/furan congeners (including TCDD), PCB congeners, organochlorine pesticides, and total Aroclors. These BMFs were multiplied by the appropriate CTE EPCs for key contaminants measured in Site-collected fish to estimate avian piscivore egg tissue concentrations and mammalian piscivore whole body concentrations. These estimated tissue levels were then compared to wildlife CBRs. Tissue estimates were derived for piscivorous birds and mammals that only eat fish. BMFs were also used to estimate the TCDD TEQs in insectivorous and vermivorous mammals (i.e., little brown bat and short-tailed shrew, respectively) and in the eggs of avian vermivores (i.e., woodcock).

Finally, nest boxes were placed along the shoreline of three of the four ponds in the study area as part of a multi-year tree swallow reproductive study. The goal was to evaluate if bioaccumulating contaminants caused reproductive impairment in the tree swallows that nested and fed in the study area. The data showed that reproduction was significantly affected in the tree swallows that nested along Allendale Pond and Lyman Mill Pond.

Swallow egg samples were collected and analyzed for contaminants. The livers from twelve-day old tree swallow nestlings were collected and tested for the activity of the Ethoxyresorufin-*O*-Deethylase (EROD) enzyme. High EROD activity is a biomarker of exposure to certain chemical classes, including dioxin/furan, PCBs, and PAHs. EROD activity during one field season was significantly higher in nestling livers collected from Allendale Pond compared to two regional reference areas in eastern Minnesota and western Massachusetts, but not so in the nestling livers from Greystone Mill Pond, located upstream of the Site. In the next field season, nestling livers from both Allendale Pond and Lyman Mill Pond had significantly higher EROD activity compared to those from both the reference areas and Greystone Mill Pond. EROD activity in nestling livers was similar between Greystone Mill Pond and the reference areas. TCDD levels measured in tree swallow eggs exhibited an increasing gradient of embryo exposure from the upstream background to Allendale Pond and Lyman Mill Pond.
Tree swallow nestlings in Allendale Pond and Lyman Mill Pond accumulated TCDD at a rate which was 119 times greater than that measured in nestlings from Greystone Mill Pond. These uptake rates correlated well with differences in TCDD levels measured in the stomach contents of the tree swallow nestlings collected from these study sites.

Risk Characterization

HQs were calculated to determine risk to (a) aquatic and terrestrial community receptors directly exposed to surface water, sediment, and soil, and (b) aquatic and terrestrial wildlife receptors exposed to contaminated surface water, sediment, or soil plus terrestrial food items. An HQ shows how much the concentration of a contaminant exceeded its benchmark, CBR, or toxicity reference value (TRV). Risk was assumed possible if an HQ exceeded 1.0. HQs were calculated as follows:

HQ = estimated contaminant-specific exposure level / benchmark, CBR, or TRV

The BERA and Supplemental BERA also distinguished between risks from Site-related versus background-related contaminant levels. Incremental Risk (IR) was calculated for each exposure area, receptor group, and contaminant by subtracting the background HQs from the Site HQs, as follows:

IR = site HQ - background HQ

The risk tables in the BERA and Supplemental BERA present the HQs and IRs. An IR above 1.0 measures how much a background-adjusted site exposure to a contaminant exceeded the benchmark, CBR or TRV for that contaminant.

Several measurement endpoints did not lend themselves to an HQ or IR analysis. For example, the responses observed in the benthic invertebrate toxicity test, fish ELS test, and the tree swallow reproduction test were analyzed statistically for significance. The results from other measurement endpoints (e.g., ichthyoplankton survey, frog mating call survey, or terrestrial invertebrate survey) could only be assessed qualitatively.

A weight-of-evidence analysis was used to evaluate how well the measurement endpoints represented their assessment endpoints. This analysis integrated all the BERA and Supplemental BERA findings to help determine the potential for risk by: 1) assigning a weight (between "low" and "high") to all measurement endpoints; 2) evaluating the magnitude of risk with respect to each measurement endpoint; and 3) determining the concurrence among the measurement endpoints used to answer the questions posed by the assessment endpoint.

The results of the risk characterizations for the BERA and the Supplemental BERA (Oxbow) are summarized below. Results are summarized by abiotic media, including for surface water, sediment and floodplain soil with findings for wildlife receptors, which integrate environmental exposures across environmental media more completely than other receptors evaluated (i.e., invertebrates and fish), summarized separately.

Sediment

The results summarized for wildlife receptors are indirectly attributable to contaminants in sediment because the concentrations of most contaminants in the aquatic prey (i.e., fish and insects) of wildlife receptors correlated well with sediment levels.

Floodplain Soil

The results described below for vermivorous wildlife receptors are indirectly attributable to contaminants in floodplain soil because the levels of most contaminants in their prey (e.g., earthworms) correlated well with those measured in co-located soil samples.

Wildlife Receptors

Risk results for wildlife receptors are discussed by trophic categories. Piscivorous (fish-feeding) and insectivorous (insect-feeding) categories apply to wildlife that are primarily exposed to contamination that have been bioaccumulated through aquatic food webs whereas the vermivorous (earthworm-feeding) receptors are primarily exposed to prey that have bioaccumulated contaminants from floodplain soils. The omnivorous trophic categories include wildlife that could be exposed to both aquatic and terrestrial habitats as part of their typical foraging activities.

PISCIVORES

Herons and kingfishers feeding on Allendale Pond fish have IRs above 1.0 for total Aroclors, dioxin TEQ, and Aroclor 1254. The same two receptors feeding on Lyman Mill Pond fish also show IR above 1.0 for total Aroclors, dioxin TEQ, 4,4'-DDE, Coplanar PCB TEQ, Aroclor 1254, 4,4'-DDD and technical chlordane (kingfisher only). These IRs for the two ponds are comparable. For instance, the NOAEL IRs for heron range from 1.4 (Aroclor 1254) to 7.6 (dioxin TEQ) in Allendale Pond, but from 1.3 (4,4'-DDD) to 7.8 (dioxin TEQ) in Lyman Mill Pond.

For the otter, only exposure to dioxin TEQ in fish from Allendale Pond poses an IR above 1.0. The IRs from dietary exposures to dioxin TEQ, Aroclor 1254, and Coplanar PCB TEQ in Lyman

Mill Pond all exceeded 1.0, with NOAEL-based IR slightly higher in Lyman Mill Pond (7.0) compared to Allendale Pond (5.6).

INSECTIVORES

Only dioxin TEQ contributes to the IR above 1.0 in adult tree swallows and little brown bats feeding on emergent insects. IRs to both receptors are higher in Allendale Pond compared to Lyman Mill Pond: the NOAEL IRs for swallows equaled 29 and 7.6, respectively, but equal 220 and 58 for the bat.

VERMIVORES

The American woodcock and short-tailed shrew feeding in the Oxbow Area and other floodplain habitat at Allendale Pond and Lyman Mill Ponds are at high risk from feeding on earthworms that bioaccumulated contaminants (in particular dioxin TEQ). The incidental ingestion of floodplain soil is also an exposure pathway of high concern. The NOAEL IR above 1.0 for Allendale Pond equals 6.6 and 130 for the woodcock and shrew, respectively. Aroclor 1254 also contributes to the IR for the shrew, with a NOAEL-based value of 1.3.

In the Oxbow Area, woodcock and shrew feeding on earthworms and ingesting floodplain soil containing dioxin TEQ, total Aroclors, Aroclor 1254 (shrew only), antimony (shrew only), cadmium (shrew only), lead (woodcock only) and zinc (woodcock only) all present an IR above 1.0. IRs are somewhat higher than those at Allendale Pond. For instance, the NOAEL IRs for dioxin TEQ for the shrew are 190 in the Oxbow Area and 130 in Allendale Pond.

Tables G-2-9 and G-2-10 summarize the baseline ecological risks for the sediment and floodplain soil media, respectively. The risk estimates provided in the two tables represent the total exposure risks in contrast to the IRs discussed above in which the risks attributable to background conditions has been subtracted out. Baseline risks to wildlife foraging in Allendale Pond primarily on fish and insects are 40 and 20, respectively, with 2,3,7,8-TCDD accounting for approximately 50 percent of the risks to fish-feeding wildlife and nearly all the risks to insect-feeding wildlife (Table G-2-9); exposure to PCBs (Total Aroclors and Aroclor 1254) in the diet of fish-feeding wildlife contribute the majority of the remaining ecological risks in Allendale Pond. Baseline risks to demersal fish (i.e., associated with sediment) are 70, with technical chlordane (34) and 2,3,7,8-TCDD (15) accounting for approximately 75 percent of the baseline risks; exposure to PCBs and inorganics represent approximately 10 percent and 15 percent of the total baseline risk. Pelagic fish (e.g., largemouth bass) were not present in Allendale Pond during the development of the BERA.

Ecological risk results for the Lyman Mill Reach are qualitatively similar to the Allendale Reach with fish predicted to be at greater risk than wildlife. Wildlife risks in Lyman Mill are 25 percent of the Allendale risk estimates but risk contributors and their relative importance in the overall risk estimates are similar. As observed for the Allendale Reach, 2,3,7,8-TCDD accounts for approximately 50 percent of the risks to fish-feeding wildlife and nearly all the risks to insect-feeding wildlife; however, pesticides (including chlordane and 4,4’-DDE and 4,4’-DDD), along with PCBs, contribute the remaining risks to fish-feeding wildlife in the Lyman Mill

Reach (Table G-2-9). Baseline risks to demersal and pelagic fish are 100 and 80, respectively, with technical chlordane accounting for over 75 percent of the baseline risks to demersal fish and over 50 percent of the risks to pelagic fish; several inorganics (particularly aluminum, barium and zinc) also contribute substantially to the baseline risk estimates.

Table G-2-10 summarizes the baseline ecological risks posed by floodplain soils (and stream sediments below Allendale Pond). 2,3,7,8-TCDD is the only substantial contributor to ecological risks for Allendale Reach floodplain soils, where the baseline ecological risk estimate is 20. For bird and mammals exposed to floodplain soil in the Lyman Mill Reach, baseline risks are elevated (70 and 100, respectively), with 2,3,7,8-TCDD accounting for approximately 15 percent of the total risks to birds and over 50 percent of the total risks to mammals. 4,4'-DDE and 4,4'-DDT account for the majority of risks (i.e., 85 percent) to bird receptors and inorganics (antimony and copper) contribute nearly 50 percent of the total estimated baseline risks to mammals.

Ecological Risk Assessment Summary

The findings of the risk characterization that were determined to pose an unacceptable ecological risk to fish and wildlife that are exposed through direct contact to site contaminants in sediment or floodplain soil and from feeding on contaminated prey are summarized below by major exposure areas, matrices, receptors, and contaminants:

Allendale Area

- Piscivorous birds: feeding on fish containing total Aroclors, dioxin TEQ (primarily 2,3,7,8-TCDD), and Aroclor 1254;
- Piscivorous mammals: feeding on fish containing dioxin TEQ (primarily 2,3,7,8-TCDD);
- Insectivorous birds and mammals: feeding on aquatic insects containing dioxin TEQ (primarily 2,3,7,8-TCDD);
- Vermivorous birds and mammals: feeding on earthworms containing dioxin TEQ (primarily 2,3,7,8-TCDD) and Aroclor 1254; and
- Fish: exposed through multiple exposure pathways that result in high body burdens of Aroclor 1254, technical chlordane, dioxin TEQ (primarily 2,3,7,8-TCDD), selenium, and zinc.

Lyman Mill Area

- Piscivorous birds: feeding on fish containing total Aroclors, dioxin TEQ (primarily 2,3,7,8-TCDD), 4,4'-DDE, Coplanar PCB TEQ, Aroclor 1254, 4,4'-DDD and technical chlordane;
- Piscivorous mammals: feeding on fish containing dioxin TEQ (primarily 2,3,7,8-TCDD), Aroclor 1254 and Coplanar PCB TEQ;

- Insectivorous birds and mammals: feeding on aquatic insects containing dioxin TEQ (primarily 2,3,7,8-TCDD) and Coplanar PCB TEQ;
- Vermivorous birds and mammals: feeding on earthworms containing 2,3,7,8-TCDD (dioxin TEQ), selenium and zinc; and
- Fish: exposed through multiple exposure pathways that result in high body burdens of Aroclor 1254, technical chlordane, 4,4'-DDD, 4,4'-DDE, dioxin TEQ (primarily 2,3,7,8-TCDD), Coplanar PCB TEQ, aluminum, barium, selenium, vanadium and zinc.

Uncertainty Analysis

The BERA and Supplemental BERA included an evaluation of the potential impact of various sources of uncertainties on the conclusions reached in the overall risk assessment. Uncertainties specific to the exposure and effects portions of the analysis, as well as the quantification of risks were considered. In the exposure assessment specific sources of uncertainty related to the following components: development of the EPCs, selection of evaluated receptors, selection of exposure parameter values to estimate exposures to wildlife receptors and the development of bioaccumulation factors. For the effects assessment, uncertainties related to the development of the TRVs and in the conduct (and interpretation) of the field studies used in the risk analysis were considered and finally, the approach used to quantify ecological risks was considered as a potential contributor to uncertainties in the risk characterization.

Table G-2-11 summarizes the principal uncertainties identified, the specific chemicals affected, and both qualitative (i.e., did the uncertainty likely result in risk being under- or over-estimated) and quantitative (i.e., magnitude of the potential effect) aspects of each uncertainty source. The specific uncertainties that likely resulted in the risk estimates being substantially under-estimated include (i) not deriving TCDD plant tissue concentrations to evaluate wildlife exposures, (ii) the lack of critical body residue data for some pesticides and inorganics constituents, (iii) the limited ichthyological survey study results. The following categories probably resulted in risk estimates being over-estimated: (i) the use of relatively large fish in the tissue sampling program to estimate ecological EPCs and (ii) use of standard toxicological benchmarks in deriving wildlife risk estimates.

Due to the magnitude of the risk estimates and the concurrence of multiple lines of evidence, which included extensive site-specific biological effects studies, it was concluded that the identified uncertainties are unlikely to affect the overall conclusions derived in the BERA and Supplemental BERA.

3. Basis for Response Action

The risk assessments revealed that residents living along the river, visiting recreational anglers, passive recreational visitors, and construction workers as well as fish and wildlife populations and macroinvertebrate communities are potentially exposed to Site contamination via combined fish (human) or general aquatic prey (ecological) diets, incidental ingestion and/or dermal contact, and that these exposures may present an unacceptable human health or ecological risk. Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment. In addition, sampling results indicate the presence of contamination at the Site above federal and state regulatory criteria and/or guidelines including exceedances of MCLs in groundwater at the Source Area. This remedial action focuses on Source Area soil, groundwater, Allendale and Lyman Mill sediment, Allendale floodplain soil, Lyman Mill stream sediment and floodplain soil (including Oxbow), and surface water.

Table G–1–1. Summary of Contaminants and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Future
Medium: Soil in the Source Area
Exposure Medium: Surface and Subsurface Soil (0- 5 ft)

Exposure Point	Contaminant	Concentration Detected		Unit	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Unit	Statistical Measure
		Minimum	Maximum					
Source Area Surface Soil (0-1 ft)	1,2,3-Trichlorobenzene	180	180	mg/kg	1/13	180	mg/kg	Maximum
	1,2,4-Trichlorobenzene	0.0018	340	mg/kg	2/13	340	mg/kg	Maximum
	Benzene	0.0064	0.098	mg/kg	4/14	0.069	mg/kg	95% UCL – NP
	Cis-1,2-dichloroethene	0.0073	180	mg/kg	2/13	180	mg/kg	Maximum
	Tetrachloroethene	0.0075	820	mg/kg	6/13	724	mg/kg	95% UCL – NP
	Trichloroethene	0.0027	630	mg/kg	5/13	566	mg/kg	95% UCL – NP
	4-Chloroaniline	280	280	mg/kg	1/30	280	mg/kg	Maximum
	Benzo(a)anthracene	0.082	8.5	mg/kg	32/33	3.5	mg/kg	95% UCL – NP
	Benzo(a)pyrene	0.085	8.9	mg/kg	31/33	2.9	mg/kg	95% UCL – NP
	Benzo(b)fluoranthene	0.19	7.8	mg/kg	30/33	3.4	mg/kg	95% UCL – NP
	Bis(2-ethylhexyl)phthalate	0.074	460	mg/kg	19/33	163	mg/kg	95% UCL – NP
	Dibenz(a,h)anthracene	0.062	2.2	mg/kg	21/33	0.57	mg/kg	95% UCL – NP
	Indeno(1,2,3-cd)pyrene	0.16	5.3	mg/kg	26/33	1.4	mg/kg	95% UCL – NP
	Dieldrin	0.006	1.9	mg/kg	15/30	0.22	mg/kg	95% UCL – NP
	Heptachlor	0.00031	1.7	mg/kg	2/31	0.81	mg/kg	95% UCL – NP
	Aroclor-1232	250	250	mg/kg	1/86	250	mg/kg	Maximum
	Aroclor-1242	0.19	230	mg/kg	4/87	8.0	mg/kg	95% UCL – NP
	Aroclor-1248	0.026	2.3	mg/kg	9/86	0.59	mg/kg	95% UCL – NP
	Aroclor-1254	0.041	560	mg/kg	80/87	64	mg/kg	95% UCL – NP
	Aroclor-1268	2.0	4.3	mg/kg	2/2	4.3	mg/kg	Maximum
	Arsenic	1.2	17.3	mg/kg	25/28	6.0	mg/kg	95% UCL – NP
	Thallium	0.2	6.8	mg/kg	3/28	6.2	mg/kg	95% UCL – NP
	Dioxins/Furans TEQ	0.00000071	0.14	mg/kg	280/280	0.008	mg/kg	95% UCL – NP

Key
mg/kg: milligrams per kilogram
Maximum: Maximum Detected Concentration, applied if fewer than 10 samples were available
95% UCL-NP: 95% Upper Confidence Limit on the arithmetic mean, non-parametric data distribution

This table represents the future contaminants and exposure point concentrations (EPCs) for each of the contaminants detected in surface soil for residential exposure. These concentrations were used to estimate the exposure and risk from each contaminant in surface soil. The table includes the range of concentrations detected for each contaminant in surface soil as well as the frequency of detection or the number of times the contaminant was detected in the samples collected at the Site, the EPC, and how the EPC was derived.

Table G–1–1. (Continued)

Exposure Point	Contaminant	Concentration Detected		Unit	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Unit	Statistical Measure
		Minimum	Maximum					
Source Area Subsurface Soil (1-5 ft)	Benzene	0.0017	480	mg/kg	16/59	109	mg/kg	95% UCL – NP
	Trichloroethene	0.0021	2,400	mg/kg	18/57	470	mg/kg	95% UCL – NP
	Benzo(a)anthracene	0.046	5.5	mg/kg	42/57	1.3	mg/kg	95% UCL – NP
	Benzo(a)pyrene	0.039	7.1	mg/kg	42/56	1.4	mg/kg	95% UCL – NP
	Benzo(b)fluoranthene	0.053	10	mg/kg	42/57	2.1	mg/kg	95% UCL – NP
	Bis(2-ethylhexyl)phthalate	0.061	390	mg/kg	44/57	91	mg/kg	95% UCL – NP
	Dibenz(a,h)anthracene	0.045	1	mg/kg	16/57	0.25	mg/kg	95% UCL – NP
	Indeno(1,2,3-cd)pyrene	0.053	3.3	mg/kg	34/57	0.52	mg/kg	95% UCL – NP
	Aldrin	0.00054	1.2	mg/kg	10/56	0.38	mg/kg	95% UCL – NP
	Dieldrin	0.00029	9.9	mg/kg	35/56	2.4	mg/kg	95% UCL – NP
	Heptaclor	0.0019	5.1	mg/kg	9/56	0.43	mg/kg	95% UCL – NP
	Aroclor-1232	1.2	35	mg/kg	4/189	1.8	mg/kg	95% UCL – NP
	Aroclor-1242	0.19	160	mg/kg	9/189	2.9	mg/kg	95% UCL – NP
	Aroclor-1248	0.057	420	mg/kg	18/189	17.2	mg/kg	95% UCL – NP
	Aroclor-1254	0.0074	1,300	mg/kg	141/189	88	mg/kg	95% UCL – NP
	Arsenic	1	49.3	mg/kg	55/156	9.9	mg/kg	95% UCL – NP
	Thallium	0.58	13.4	mg/kg	9/55	4.7	mg/kg	95% UCL – NP
	Dioxins/Furans TEQ	0.0000005	0.057	mg/kg	234/234	0.0025	mg/kg	95% UCL – NP

Key
mg/kg: milligrams per kilogram
95% UCL-NP: 95% Upper Confidence Limit on the arithmetic mean, non-parametric data distribution

This table represents the future contaminants and exposure point concentrations (EPCs) for each of the contaminants detected in subsurface soil for residential exposure. These concentrations were used to estimate the exposure and risk from each contaminant in subsurface soil. The table includes the range of concentrations detected for each contaminant in subsurface soil as well as the frequency of detection or the number of times the contaminant was detected in the samples collected at the Site, the EPC, and how the EPC was derived.

Table G–1–1. (Continued)

Exposure Point	Contaminant	Concentration Detected		Unit	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Unit	Statistical Measure
		Minimum	Maximum					
Source Area Surface and Subsurface Soil (0-5 ft)	Trichloroethene	0.0021	2,400	mg/kg	23/70	268	mg/kg	95% UCL – NP
	Aroclor-1248	0.026	420	mg/kg	27/275	11.8	mg/kg	95% UCL – NP
	Aroclor-1254	0.0074	1,300	mg/kg	221/276	68	mg/kg	95% UCL – NP
	Dioxins/Furans TEQ	0.0000005	0.14	mg/kg	514/514	0.0047	mg/kg	95% UCL – NP

Key
mg/kg: milligrams per kilogram
95% UCL-NP: 95% Upper Confidence Limit on the arithmetic mean, non-parametric data distribution

This table represents the future contaminants and exposure point concentrations (EPCs) for each of the contaminants detected in surface and subsurface soil for construction worker exposure. These concentrations were used to estimate the exposure and risk from each contaminant in soil up to 5 feet. The table includes the range of concentrations detected for each contaminant in soil 0-5 feet as well as the frequency of detection or the number of times the contaminant was detected in the samples collected at the Site, the EPC, and how the EPC was derived.

Table G–1–2. Summary of Contaminants and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Current/Future
Medium: Biota
Exposure Medium: Combined Fish Diet

Exposure Point	Contaminant	Concentration Detected		Unit	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Unit	Statistical Measure (1)
		Minimum	Maximum					
Allendale	Aroclor 1254	0.43	3.2	mg/kg	18/20	1.9	mg/kg	Average
	Aroclor 1268	0.018	0.077	mg/kg	11/20	0.027	mg/kg	Average
	Dieldrin	0.0017	0.014	mg/kg	19/20	0.0089	mg/kg	Average
	Technical chlordane	0.10	1.2	mg/kg	20/20	0.47	mg/kg	Average
	PCB congeners TEQ	0.000018	0.000042	mg/kg	6/6	0.000032	mg/kg	Average
	Dioxins/Furans TEQ	0.0000096	0.00080	mg/kg	20/20	0.00030	mg/kg	Average
Lyman Mill	Benzo(a)pyrene	0.00014	0.01469	mg/kg	18/30	0.0055	mg/kg	Average
	4,4’-DDE	0.02045	0.28651	mg/kg	30/30	0.089	mg/kg	Average
	Aroclor 1254	0.089	7.1	mg/kg	30/30	2.1	mg/kg	Average
	Aroclor 1268	0.007	0.06	mg/kg	20/30	0.021	mg/kg	Average
	Dieldrin	0.00064	0.011	mg/kg	30/30	0.0057	mg/kg	Average
	Technical chlordane	0.073	2.6	mg/kg	30/30	1.0	mg/kg	Average
	PCB congeners TEQ	0.0000014	0.000060	mg/kg	11/30	0.000041	mg/kg	Average
	Dioxins/Furans TEQ	0.0000099	0.0014	mg/kg	30/30	0.00037	mg/kg	Average

Key
mg/kg: milligrams per kilogram
(1) The combined fish diet exposure point concentration (EPC) is the arithmetic average of the EPCs for the individual species that comprise the combined fish diet. The individual species EPCs are either the 95% UCL on the mean or the maximum reported concentration. The EPCs in fish for Allendale are the averages of the EPCs for American eel and white sucker sampled at this reach. The EPCs in fish for Lyman Mill are the averages of the EPCs for American eel, largemouth bass (fillet), and white sucker sampled at this reach. All data is for whole fish, except largemouth bass, and is wet weight.

This table represents the current and future contaminants and EPCs for each of the contaminants detected in biota. These concentrations were used to estimate the exposure and risk from each contaminant in fish. The table includes the range of concentrations detected for each contaminant in fish as well as the frequency of detection or the number of times the contaminant was detected in the samples collected at the Site, the EPC, and how the EPC was derived. The minimum concentration is the detected minimum concentration among all species collected within that reach and the maximum concentration is the detected maximum concentration among all species collected within that reach. The EPC was developed for each species per reach, using different statistical rationale from maximum concentrations to statistical tests, depending on the data distribution. These species-specific EPCs were then aggregated and the average concentration per reach is the EPC used to quantify risks and is presented in this table.

Table G–1–3. Summary of Contaminants and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Contaminant	Concentration Detected		Unit	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Unit	Statistical Measure
		Minimum	Maximum					
Allendale	Benzo(a)pyrene	0.064	9.2	mg/kg	45/48	4.0	mg/kg	95% UCL-T
	Dibenzo(a,h)anthracene	0.077	2.6	mg/kg	26/47	2.0	mg/kg	95% UCL-T
	Arsenic	1	18	mg/kg	48/51	5.8	mg/kg	95% UCL-NP
	Dioxins/Furans TEQ	0.0000012	0.073	mg/kg	149/149	0.0057	mg/kg	95% UCL-NP
Lyman Mill	Benzo(a)pyrene	0.045	6.2	mg/kg	34/40	2.9	mg/kg	95% UCL-T
	Dibenzo(a,h)anthracene	0.078	1.1	mg/kg	17/40	1.1	mg/kg	Maximum
	n-Nitrosodi-n-propylamine	1.4	1.4	mg/kg	1/33	1.3	mg/kg	95% UCL-N
	Arsenic	1.2	13.2	mg/kg	37/39	6.4	mg/kg	95% UCL-T
	Dioxins/Furans TEQ	0.00000089	0.0080	mg/kg	46/46	0.0080	mg/kg	Maximum

Key
mg/kg: milligrams per kilogram
Maximum: Maximum Detected Concentration, applied if fewer than 10 samples were available
95% UCL-N: 95% Upper Confidence Limit on the mean, normal data distribution
95% UCL-T: 95% Upper Confidence Limit on the mean, lognormal data distribution
95% UCL-NP: 95% Upper Confidence Limit on the mean, non-parametric data distribution.

This table represents the current and future contaminants and exposure point concentrations (EPCs) for each of the contaminants detected in sediment. These concentrations were used to estimate the exposure and risk from each contaminant in sediment. The table includes the range of concentrations detected for each contaminant in sediment as well as the frequency of detection or the number of times the contaminant was detected in the samples collected at the Site, the EPC, and how the EPC was derived. The minimum concentration for each reach is the detected minimum concentration collected within that reach and the maximum concentration is the detected maximum concentration collected within that reach.

Table G–1–4. Summary of Contaminants and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Current/Future
Medium: Floodplain Soil
Exposure Medium: Residential Floodplain Soil

Exposure Point	Contaminant	Concentration Detected		Unit	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Unit	Statistical Measure
		Minimum	Maximum					
Eastern Shore of Allendale Pond	Benzo(a)pyrene	1.5	1.5	mg/kg	NA	NA	NA	NA
	Arsenic	1.5	1.5	mg/kg	NA	NA	NA	NA
	Dioxins/Furans TEQ	0.000000478	0.000870	mg/kg	NA	NA	NA	NA
Eastern Shore of Lyman Mill Pond	Benzo(a)pyrene	0.062	110	mg/kg	NA	NA	NA	NA
	Dibenz(a,h)anthracene	0.05503	26	mg/kg	NA	NA	NA	NA
	Arsenic	1.7	55.6	mg/kg	NA	NA	NA	NA
	Dioxins/Furans TEQ	0.000000726	0.00102	mg/kg	NA	NA	NA	NA
	PCB Congener TEQ	0.00000598	0.00000598	mg/kg	NA	NA	NA	NA

Key
mg/kg: milligrams per kilogram
NA: Not Applicable

This table represents the current and future contaminants and exposure point concentrations (EPCs) for each of the contaminants detected in residential-use floodplain soil of the maximum detected plots along the eastern shore of Allendale and Lyman Mill Ponds. These concentrations were used to estimate the exposure and risk from each contaminant in floodplain soil. The table includes the minimum and maximum concentrations of the maximum detected plots for the eastern shore of Allendale and Lyman Mill Pond. Since each plot was evaluated separately, there are no EPCs for the entire dataset. EPCs for individual plots can be found in the May 2012 Technical Memorandum.

Table G–1–5. Summary of Contaminants and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Recreational Floodplain Soil

Exposure Point	Contaminant	Concentration Detected		Unit	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Unit	Statistical Measure
		Minimum	Maximum					
Western Shore of Allendale Pond	2,3,7,8-TCDD	0.00000781	0.00151	mg/kg	19/21	0.00027	mg/kg	95% UCL-NP
Lyman Mill Oxbow Area – General Area	Benzo(a)pyrene	0.023	2.8	mg/kg	18/18	1.1	mg/kg	95% UCL-G
	Arsenic	1.7	13.3	mg/kg	19/19	7.0	mg/kg	95% UCL-G
	Dioxins/Furans TEQ	0.0000054	0.0064	mg/kg	22/22	0.0028	mg/kg	95% UCL-G

Key
mg/kg: milligrams per kilogram
95% UCL-G: 95% Upper Confidence Limit on the arithmetic mean, approximate gamma data distribution
95% UCL-NP: 95% Upper Confidence Limit on the mean, non-parametric data distribution

This table represents the current and future contaminants and exposure point concentrations (EPCs) for each of the contaminants detected in floodplain soil at the Western Shore of Allendale Pond and at Lyman Mill Oxbow Area – General Area. These concentrations were used to estimate the exposure and risk from each contaminant in floodplain soil. The table includes the range of concentrations detected for each contaminant in soil as well as the frequency of detection or the number of times the contaminant was detected in the samples collected at the Site, the EPC, and how the EPC was derived. The minimum concentration is the detected minimum concentration collected within each area and the maximum concentration is the detected maximum concentration collected within each area.

Table G–1–6. Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal							
Contaminant	**Oral Cancer Slope Factor**	**Dermal Cancer Slope Factor**	**Slope Factor Unit**	**Weight of Evidence/Cancer Guideline Description**	**Source**	**Date (1)**	**Date of Last IRIS Revision (2)**
Volatile Organic Compounds							
1,2,4-Trichlorobenzene	2.9E-02	2.9E-02	(mg/kg-day)$^{-1}$	NA	PPRTV	4/12	NA
Benzene	5.5E-02	5.5E-02	(mg/kg-day)$^{-1}$	A	IRIS	4/12	
Tetrachloroethene	2.1E-03	2.1E-03	(mg/kg-day)$^{-1}$	likely carcinogenic	IRIS	4/12	
Trichloroethene	4.6E-02	4.6E-02	(mg/kg-day)$^{-1}$	A	IRIS	4/12	
Semi-Volatile Organic Compounds							
4-Chloroaniline	2.0E-01	2.0E-01	(mg/kg-day)$^{-1}$	likely carcinogenic	PPRTV	4/12	NA
Benzo(a)anthracene	7.3E-01	7.3E-01	(mg/kg-day)$^{-1}$	B2	NCEA	4/12	NA
Benzo(a)pyrene	7.3E+00	7.3E+00	(mg/kg-day)$^{-1}$	B2	IRIS	4/12	
Benzo(b)fluoranthene	7.3E-01	7.3E-01	(mg/kg-day)$^{-1}$	B2	NCEA	4/12	NA
Bis(2-ethylhexyl)phthalate	1.4E-02	1.4E-02	(mg/kg-day)$^{-1}$	B2	IRIS	4/12	
Dibenzo(a,h)anthracene	7.3E+00	7.3E+00	(mg/kg-day)$^{-1}$	B2	NCEA	4/12	NA
Indeno(1,2,3-cd)pyrene	7.3E-01	7.3E-01	(mg/kg-day)$^{-1}$	B2	NCEA	4/12	NA
Pesticides/PCBs (3)							
Aldrin	1.7E+01	1.7E+01	(mg/kg-day)$^{-1}$	B2	IRIS	4/12	
Dieldrin	1.6E+01	1.6E+01	(mg/kg-day)$^{-1}$	B2	IRIS	4/12	
Heptachlor	4.5E+00	4.5E+00	(mg/kg-day)$^{-1}$	B2	IRIS	4/12	
Aroclor-1232	2.0E+00	2.0E+00	(mg/kg-day)$^{-1}$	B2		4/12	NA
Aroclor-1242	2.0E+00	2.0E+00	(mg/kg-day)$^{-1}$	B2		4/12	NA
Aroclor-1248	2.0E+00	2.0E+00	(mg/kg-day)$^{-1}$	B2		4/12	NA
Aroclor-1254	2.0E+00	2.0E+00	(mg/kg-day)$^{-1}$	B2		4/12	NA
Aroclor-1268	2.0E+00	2.0E+00	(mg/kg-day)$^{-1}$	B2		4/12	NA
Metals							
Arsenic	1.5E+00	1.5E+00	(mg/kg-day)$^{-1}$	A	IRIS	4/12	
Dioxins/Furans							
Dioxins/Furans TEQ	1.5E+05	1.5E+05	(mg/kg-day)$^{-1}$	B2	HEAST	4/12	NA

Table G–1–6. (Continued)

Pathway: Ingestion, Dermal

Contaminant	Oral Cancer Slope Factor	Dermal Cancer Slope Factor	Slope Factor Unit	Weight of Evidence/Cancer Guideline Description	Source	Date (1)	Date of Last IRIS Revision (2)

Key

IRIS: Integrated Risk Information System
HEAST: Health Effects Assessment Summary Tables
PPRTV: Provisional Peer Reviewed Toxicity Value

EPA Group:

A -Human carcinogen
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

Notes:
NA: Not Applicable
$(mg/kg/day)^{-1}$: per milligrams per kilogram per day
(1) Date when values were obtained from IRIS.
(2) Date of the most recent revisions to the IRIS carcinogenicity assessments.
(3) The oral cancer slope factors presented in this table are for a mixture of PCBs. EPA IRIS files currently do not identify oral cancer slope factors for individual Aroclors. The values shown are “high risk and persistence; upper-bound slope factors”.

This table provides carcinogenic risk information which is relevant to the contaminants in fish, sediment, and soil. At this time, slope factors are not available for the dermal route of exposure. Thus, the dermal slope factors used in the assessment have been extrapolated from oral values. An adjustment factor is sometimes applied, and is dependent upon how well the chemical is absorbed via the oral route. Adjustments are particularly important for chemicals with less than 50% absorption via the ingestion route. However, adjustment is not necessary for the chemicals evaluated at this Site. Therefore, the same values presented above were used as the dermal carcinogenic slope factors for these contaminants.

Table G–1–7. Non-Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal									
Contaminant	**Chronic/ Subchronic**	**Oral RfD Value**	**Oral RfD Unit**	**Dermal RfD**	**Dermal RfD Unit**	**Primary Target Organ**	**Combined Uncertainty/ Modifying Factors**	**Sources of RfD: Target Organ**	**Dates of RfD: Target Organ**
Volatile Organic Compounds									
1,2,3-Trichlorobenzene	Chronic	8.0E-04	mg/kg/day	8.0E-04	mg/kg/day	NOAEL	10000	PPRTV SL	4/12
1,2,4-Trichlorobenzene	Chronic	1.0E-02	mg/kg/day	1.0E-02	mg/kg/day	Endocrine	1000/1	PPRTV	4/12
Benzene	Chronic	4.0E-03	mg/kg/day	4.0E-03	mg/kg/day	Immune System/ Hematological	300	IRIS	4/12
Cis-1,2-dichloroethene	Chronic	2.0E-03	mg/kg/day	2.0E-03	mg/kg/day	Hematological	3000	IRIS	4/12
Tetrachloroethene	Chronic	6.0E-03	mg/kg/day	6.0E-03	mg/kg/day	Liver	1000/1	IRIS	4/12
Trichloroethene	Chronic	5.0E-04	mg/kg/day	5.0E-04	mg/kg/day	Immune System	1000	IRIS	4/12
Semi-Volatile Organic Compounds									
4-Chloroaniline	Chronic	4.0E-03	mg/kg/day	4.0E-03	mg/kg/day	Hematological	3000/1	IRIS	4/12
Benzo(a)anthracene	Chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Kidney	3000/1	Surrogate	4/12
Benzo(a)pyrene	Chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Kidney	3000/1	Surrogate	4/12
Benzo(b)fluoranthene	Chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Kidney	3000/1	Surrogate	4/12
Bis(2-ethylhexyl)phthalate	Chronic	2.0E-02	mg/kg/day	2.0E-02	mg/kg/day	Liver	1000/1	IRIS	4/12
Dibenzo(a,h)anthracene	Chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Kidney	3000/1	Surrogate	4/12
Indeno(1,2,3-cd)pyrene	Chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Kidney	3000/1	Surrogate	4/12
Pesticides/PCBs									
Aldrin	Chronic	3.0E-05	mg/kg/day	3.0E-05	mg/kg/day	Liver	1000/1	IRIS	4/12
Dieldrin	Chronic	5.0E-05	mg/kg/day	5.0E-05	mg/kg/day	Liver	100/1	IRIS	4/12
Heptachlor	Chronic	5.0E-04	mg/kg/day	5.0E-04	mg/kg/day	Liver	300/1	IRIS	4/12
Aroclor-1232	Chronic	2.0E-05	mg/kg/day	2.0E-05	mg/kg/day	Immune System/ Eye	300/1	Surrogate	4/12
Aroclor-1242	Chronic	2.0E-05	mg/kg/day	2.0E-05	mg/kg/day	Immune System/ Eye	300/1	Surrogate	4/12
Aroclor-1248	Chronic	2.0E-05	mg/kg/day	2.0E-05	mg/kg/day	Immune System/ Eye	300/1	Surrogate	4/12
Aroclor-1254	Chronic	2.0E-05	mg/kg/day	2.0E-05	mg/kg/day	Immune System/ Eye	300/1	Surrogate	4/12
Aroclor-1268	Chronic	2.0E-05	mg/kg/day	2.0E-05	mg/kg/day	Immune System/ Eye	300/1	Surrogate	4/12

Table G–1–7. (Continued)

Pathway: Ingestion, Dermal

Contaminant	Chronic/ Subchronic	Oral RfD Value	Oral RfD Unit	Dermal RfD	Dermal RfD Unit	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ
Metals									
Arsenic	Chronic	3.0E-04	mg/kg/day	3.0E-04	mg/kg/day	Skin/ Hematological	3/1	IRIS	4/12
Thallium	Chronic	1.0E-05	mg/kg/day	1.0E-05	mg/kg/day	NOAEL	3000	PPRTV SL	4/12
Dioxins/Furans									
Dioxins/Furans TEQ	Chronic	7.0E-10	mg/kg/day	7.0E-10	mg/kg/day	Reproductive/ Endocrine	NA	IRIS	4/12

Key
IRIS: Integrated Risk Information System
RfD: Reference Dose
PPRTV: Provisional Peer Reviewed Toxicity Value
mg/kg/day: milligrams per kilogram per day

This table provides non-carcinogenic risk information which is relevant to the contaminants in fish, sediment, and soil. Dermal RfDs are not available for any of the contaminants. As was the case for the carcinogenic data, dermal RfDs can be extrapolated from oral RfDs by applying an adjustment factor as appropriate for chemicals that have an oral absorption efficiency of less than 50%. However, adjustment is not necessary for the chemicals evaluated at this Site. Therefore, the same values presented above were used as the dermal RfDs for these contaminants.

Table G–1–8. Risk Characterization Summary – Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident Living at the Source Area
Receptor Age: Young Child/Older Child/Adult (Ages 0-30)

Medium	Exposure Medium	Exposure Point	Contaminant	Carcinogenic Risk				
				Ingestion	Dermal	Inhalation	External (Radiation)	Exposure Routes Total
Surface Soil	Soil	Source Area assuming no caps	1,2,4-Trichlorobenzene	1.7E-05	NA	NA	NA	1.7E-05
			Tetrachloroethene	2.6E-06	NA	NA	NA	2.6E-06
			Trichloroethene	4.4E-05	NA	NA	NA	4.4E-05
			4-Chloroaniline	9.5E-05	4.2E-05	NA	NA	1.4E-04
			Benzo(a)anthracene	1.5E-05	7.6E-06	NA	NA	2.2E-05
			Benzo(a)pyrene	1.2E-04	6.2E-05	NA	NA	1.8E-04
			Benzo(b)fluoranthene	1.4E-05	7.3E-06	NA	NA	2.1E-05
			Bis(2-ethylhexyl)phthalate	3.9E-06	1.7E-06	NA	NA	5.6E-06
			Dibenzo(a,h)anthracene	2.4E-05	1.2E-05	NA	NA	3.6E-05
			Indeno(1,2,3-cd)pyrene	5.7E-06	2.9E-06	NA	NA	8.7E-06
			Dieldrin	6.0E-06	NA	NA	NA	6.0E-06
			Heptachlor	6.2E-06	NA	NA	NA	6.2E-06
			Aroclor-1232	8.5E-04	5.3E-04	NA	NA	1.4E-03
			Aroclor-1242	2.7E-05	1.7E-05	NA	NA	4.4E-05
			Aroclor-1248	2.0E-06	1.2E-06	NA	NA	3.3E-06
			Aroclor-1254	2.2E-04	1.3E-04	NA	NA	3.5E-04
			Aroclor-1268	1.5E-05	9.1E-06	NA	NA	2.4E-05
			Arsenic	1.5E-05	2.0E-06	NA	NA	1.7E-05
			Dioxins/Furans TEQ	1.9E-03	2.6E-04	NA	NA	2.2E-03
								Total Risk = 4E-03

Table G–1–8. (Continued)

Scenario Timeframe: Future
Receptor Population: Resident Living at the Source Area
Receptor Age: Young Child/Older Child/Adult (Ages 0-30)

Medium	Exposure Medium	Exposure Point	Contaminant	Carcinogenic Risk				
				Ingestion	Dermal	Inhalation	External (Radiation)	Exposure Routes Total
Subsurface Soil	Soil	Source Area assuming no caps	Benzene	1.0E-05	NA	NA	NA	1.0E-05
			Trichloroethene	3.7E-05	NA	NA	NA	3.7E-05
			Benzo(a)anthracene	5.4E-06	2.8E-06	NA	NA	8.2E-06
			Benzo(a)pyrene	5.8E-05	3.0E-05	NA	NA	8.8E-05
			Benzo(b)fluoranthene	8.9E-06	4.6E-06	NA	NA	1.3E-05
			Bis(2-ethylhexyl)phthalate	2.2E-06	9.6E-07	NA	NA	3.1E-06
			Dibenzo(a,h)anthracene	1.0E-05	5.3E-06	NA	NA	1.6E-05
			Indeno(1,2,3-cd)pyrene	2.2E-06	1.1E-06	NA	NA	3.3E-06
			Aldrin	1.1E-05	NA	NA	NA	1.1E-05
			Dieldrin	6.6E-05	NA	NA	NA	6.6E-05
			Heptachlor	3.3E-06	NA	NA	NA	3.3E-06
			Aroclor-1232	6.0E-06	3.7E-06	NA	NA	9.7E-06
			Aroclor-1242	9.9E-06	6.1E-06	NA	NA	1.6E-05
			Aroclor-1248	5.8E-05	3.6E-05	NA	NA	9.5E-05
			Aroclor-1254	3.0E-04	1.8E-04	NA	NA	4.8E-04
			Arsenic	2.5E-05	3.3E-06	NA	NA	2.8E-05
			Dioxins/Furans TEQ	6.4E-04	8.6E-05	NA	NA	7.3E-04
								Total Risk = 2E-03

Key
NA: Route of exposure is not applicable to this medium.

This table provides risk estimates for the significant routes of exposure for the future resident living at the Source Area, assuming that the current caps not existing or not effective in preventing direct contact exposure to soil. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a child's and an adult's exposure to contaminated soil at the Source Area as well as the toxicity of the contaminants. The total risks from direct contact with contaminated soil at the Source Area assuming the existing caps are not available or protective to a future child and adult resident living in the area are estimated to be 4×10^{-3} for surface soil and 2×10^{-3} for subsurface soil. The contaminants contributing most to these risk levels are dioxins/furans TEQ, primarily 2,3,7,8-TCDD, Aroclors 1248 and 1254, benzo(a)pyrene, and arsenic. These risk levels indicate that if the current caps do not exist or are not functioning properly, an individual would have an increased probability of 4 in 1,000 and 2 in 1,000 of developing cancer as a result of site-related exposure to the contaminants in surface soil and subsurface soil, respectively, at the Source Area of the Centredale Manor Site. The contaminants contributing most to these risk levels are dioxins/furans TEQ.

Table G–1–9. Risk Characterization Summary – Carcinogens

Scenario Timeframe: Future
Receptor Population: Construction Worker Working at the Source Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant	Carcinogenic Risk				
				Ingestion	Dermal	Inhalation	External (Radiation)	Exposure Routes Total
Soil	Soil	Source Area	Aroclor-1248	1.1E-06	4.6E-07	NA	NA	1.5E-06
			Aroclor-1254	6.3E-06	2.6E-06	NA	NA	8.9E-06
			Dioxins/Furans TEQ	3.3E-05	2.9E-06	NA	NA	3.6E-05
								Total Risk = 5E-05

Key
NA: Route of exposure is not applicable to this medium.

This table provides risk estimates for the significant routes of exposure for the future construction worker working at the Source Area. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a construction worker's exposure to contaminated soil at the Source Area as well as the toxicity of the contaminants. The total risk from direct exposures to contaminated soil at the Source Area, to a future construction worker at the Source Area is estimated to be 5 x 10^{-5}. The contaminants contributing most to this risk level are dioxins/furans TEQ and Aroclors 1248 and 1254. This risk level indicates that a construction worker would have an increased probability of 5 in 100,000 of developing cancer as a result of site-related exposure to the contaminants in soil at the Source Area of the Centredale Manor Site.

Table G–1–10. Risk Characterization Summary – Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident Living Along the River
Receptor Age: Young Child/Older Child/Adult (Ages 0-30)

Medium	Exposure Medium	Exposure Point	Contaminant	Carcinogenic Risk				
				Ingestion	Dermal	Inhalation	External (Radiation)	Exposure Routes Total
Biota	Combined fish diet	Allendale	Aroclor 1254	3.5E-04	NA	NA	NA	3.5E-04
			Aroclor 1268	5.0E-06	NA	NA	NA	5.0E-06
			Dieldrin	1.3E-05	NA	NA	NA	1.3E-05
			Technical chlordane	1.5E-05	NA	NA	NA	1.5E-05
			PCB congeners TEQ	4.4E-04	NA	NA	NA	4.4E-04
			Dioxins/Furans TEQ	4.2E-03	NA	NA	NA	4.2E-03
Combined Fish Diet Risk = 5E-03								
Sediment	Sediment	Allendale	Benzo(a)pyrene	6.7E-06	3.2E-06	NA	NA	9.9E-06
			Dibenzo(a,h)anthracene	3.4E-06	1.6E-06	NA	NA	4.9E-06
			Arsenic	2.0E-06	2.2E-07	NA	NA	2.2E-06
			Dioxins/Furans TEQ	2.0E-04	2.1E-05	NA	NA	2.2E-04
Sediment Risk = 2E-04								
Allendale Total Risk Across All Media = 5E-03								
Biota	Combined fish diet	Lyman Mill	Benzo(a)pyrene	3.7E-06	NA	NA	NA	3.7E-06
			4,4'-DDE	2.8E-06	NA	NA	NA	2.8E-06
			Aroclor 1254	3.9E-04	NA	NA	NA	3.9E-04
			Aroclor 1268	4.0E-06	NA	NA	NA	4.0E-06
			Dieldrin	8.4E-06	NA	NA	NA	8.4E-06
			Technical chlordane	3.3E-05	NA	NA	NA	3.3E-05
			Arsenic	3.3E-06	NA	NA	NA	3.3E-06
			PCB congeners TEQ	5.6E-04	NA	NA	NA	5.6E-04
			Dioxins/Furans TEQ	5.1E-03	NA	NA	NA	5.1E-03
Combined Fish Diet Risk = 6E-03								

Table G–1–10. (Continued)

Scenario Timeframe: Current/Future **Receptor Population: Resident Living Along the River** **Receptor Age: Young Child/Older Child/Adult (Ages 0-30)**								
Medium	**Exposure Medium**	**Exposure Point**	**Contaminant**	**Carcinogenic Risk**				
				Ingestion	**Dermal**	**Inhalation**	**External (Radiation)**	**Exposure Routes Total**
Sediment	Sediment	Lyman Mill	Benzo(a)pyrene	4.9E-06	2.3E-06	NA	NA	7.2E-06
			Dibenzo(a,h) anthracene	1.8E-06	8.5E-07	NA	NA	2.6E-06
			n-Nitrosodi-n-propylamine	2.1E-06	7.6E-07	NA	NA	2.9E-06
			Arsenic	2.2E-06	2.4E-07	NA	NA	2.4E-06
			Dioxins/Furans TEQ	2.8E-04	3.0E-05	NA	NA	3.1E-04
Sediment Risk = 3E-04								
Lyman Mill Total Risk Across All Media = 6E-03								
Key NA: Route of exposure is not applicable to this medium.								
This table provides risk estimates for the significant routes of exposure for the current/future resident living along the River at Allendale and Lyman Mill reaches. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a child's and an adult's exposure to contaminated biota and sediment at the Site, as well as the toxicity of the contaminants. The total risks from consuming contaminated fish at this Site to a current/future child and adult resident living along the River are estimated to be 5 x 10^{-3} and 6 x 10^{-3} at Allendale and Lyman Mill, respectively. The contaminants contributing most to these risk levels are dioxins/furans TEQ, PCB congeners TEQ, and Aroclor 1254. These risk levels indicate that if no clean-up action is taken, an individual would have an increased probability of 5 in 1,000 and 6 in 1,000 at Allendale and Lyman Mill, respectively, of developing cancer as a result of site-related exposure to the contaminants via consumption of contaminated fish at the Centredale Manor Site. The total risks from direct exposure to contaminated sediment at this Site to a current/future child and adult resident living along the River are estimated to be 2 x 10^{-4} and 3 x 10^{-4} at Allendale and Lyman Mill, respectively. The contaminants contributing most to these risk levels are dioxins/furans TEQ. These risk levels indicate that if no clean-up action is taken, an individual would have an increased probability of 2 in 10,000 and 3 in 10,000 at Allendale and Lyman Mill, respectively, of developing cancer as a result of site-related exposure to the contaminants at the Centredale Manor Site via direct contact, mainly ingestion and dermal contact with contaminated sediment.								

Table G–1–11. Risk Characterization Summary – Carcinogens

Scenario Timeframe: Current/Future
Receptor: Visiting Recreational Angler
Receptor Age: Young Child/Older Child/Adult (Ages 0-30)

Medium	Exposure Medium	Exposure Point	Contaminant	Carcinogenic Risk				
				Ingestion	Dermal	Inhalation	External (Radiation)	Exposure Routes Total
Biota	Combined fish diet	Allendale	Aroclor 1254	3.5E-04	NA	NA	NA	3.5E-04
			Aroclor 1268	5.0E-06	NA	NA	NA	5.0E-06
			Dieldrin	1.3E-05	NA	NA	NA	1.3E-05
			Technical chlordane	1.5E-05	NA	NA	NA	1.5E-05
			PCB congeners TEQ	4.4E-04	NA	NA	NA	4.4E-04
			Dioxins/Furans TEQ	4.2E-03	NA	NA	NA	4.2E-03
Combined Fish Diet Risk = 5E-03								
Allendale Total Risk = 5E-03								
Biota	Combined fish diet	Lyman Mill	Benzo(a)pyrene	3.7E-06	NA	NA	NA	3.7E-06
			4,4’-DDE	2.8E-06	NA	NA	NA	2.8E-06
			Aroclor 1254	3.9E-04	NA	NA	NA	3.9E-04
			Aroclor 1268	4.0E-06	NA	NA	NA	4.0E-06
			Dieldrin	8.4E-06	NA	NA	NA	8.4E-06
			Technical chlordane	3.3E-05	NA	NA	NA	3.3E-05
			PCB congeners TEQ	5.6E-04	NA	NA	NA	5.6E-04
			Dioxins/Furans TEQ	5.1E-03	NA	NA	NA	5.1E-03
Combined Fish Diet Risk = 6E-03								
Lyman Mill Total Risk = 6E-03								

Key
NA: Route of exposure is not applicable to this medium.

This table provides risk estimates for the significant routes of exposure for the current/future visiting recreational angler at Allendale and Lyman Mill reaches. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a child’s and an adult’s exposure to contaminated biota at the Site, as well as the toxicity of the contaminants. The total risks from consuming contaminated fish at this Site to a current/future child and adult visiting recreational angler are estimated to be 5×10^{-3} and 6×10^{-3} at Allendale and Lyman Mill, respectively. The contaminants contributing most to these risk levels are dioxins/furans TEQ, PCB congeners TEQ, and Aroclor 1254. These risk levels indicate that if no clean-up action is taken, an individual would have an increased probability of 5 in 1,000 and 6 in 1,000 at Allendale and Lyman Mill, respectively, of developing cancer as a result of site-related exposure to the contaminants via consumption of contaminated fish at the Centredale Manor Site.

Table G–1–12. Risk Characterization Summary – Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident Living in the Floodplain Soil Area
Receptor Age: Young Child/Older Child/Adult (Ages 0-30)

Medium	Exposure Medium	Exposure Point	Contaminant	Carcinogenic Risk				
				Ingestion	Dermal	Inhalation	External (Radiation)	Exposure Routes Total
Residential-Use Floodplain Soil	Soil	Eastern Shore of Allendale Pond	Dioxins/Furans TEQ	2.2E-04	2.9E-05	NA	NA	2.5E-04
Eastern Shore Allendale Floodplain Soil Highest Cancer Risk = 2E-04								
Residential-Use Floodplain Soil	Soil	Eastern Shore of Lyman Mill Pond	Benzo(a)pyrene	4.6E-03	2.4E-03	NA	NA	7.0E-03
			Dibenz(a,h)anthracene	1.1E-03	5.6E-04	NA	NA	1.6E-03
			Arsenic	7.4E-06	9.8E-07	NA	NA	8.4E-06
			Dioxins/Furans TEQ	1.0E-05	1.4E-06	NA	NA	1.2E-05
Eastern Shore Lyman Mill Floodplain Soil Highest Cancer Risk = 9E-03								

Key
NA: Route of exposure is not applicable to this medium.

This table provides the maximum risk estimates for the significant routes of exposure for the current/future resident living in the residential-use floodplain soil at the eastern shore of Allendale and Lyman Mill Ponds. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a child's and an adult's exposure to contaminated residential-use floodplain soil at the Site, as well as the toxicity of the contaminants. The total risk from direct contact with contaminated floodplain soil at the eastern shore of Allendale Pond or Lyman Mill Pond to a current/future child and adult recreational visitor is estimated to be up to 2 x 10^{-4} and up to 9 x10^{-3}, respectively. The contaminants contributing most to these risk levels are dioxins/furans TEQ, benzo(a)pyrene, and arsenic. These risk levels indicate that if no clean-up action is taken, a resident would have an increased probability of up to 2 in 10,000 and up to 9 in 1,000 of developing cancer as a result of site-related exposure to the contaminants in the residential-use floodplain soil at the eastern shore of Allendale and Lyman Mill Ponds of the Centredale Manor Site.

Table G–1–13. Risk Characterization Summary – Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Recreational Visitor in the Floodplain Soil Area
Receptor Age: Young Child/Older Child/Adult (Ages 0-30)

Medium	Exposure Medium	Exposure Point	Contaminant	Carcinogenic Risk				
				Ingestion	Dermal	Inhalation	External (Radiation)	Exposure Routes Total
Recreational Use Floodplain Soil	Soil	Western Shore of Allendale Pond	2,3,7,8-TCDD	1.5E-05	2.0E-06	NA	NA	1.5E-05
							Western Shore Allendale Floodplain Soil Total Risk =	2E-05

Key
NA: Route of exposure is not applicable to this medium.

This table provides risk estimates for the significant routes of exposure for the current/future recreational visitor in the recreational-use floodplain soil at the western shore of Allendale Pond. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a child's and an adult's exposure to contaminated recreational-use floodplain soil at the Site, as well as the toxicity of the contaminants. The total risk from direct contact with contaminated floodplain soil at the western shore of Allendale Pond to a current/future child and adult recreational visitor is estimated to be 2×10^{-5}. The contaminants contributing most to these risk levels are 2,3,7,8-TCDD (no dioxin TEQ data is available in this area). These risk levels indicate that if no clean-up action is taken, a recreational visitor would have an increased probability of 2 in 100,000 of developing cancer as a result of site-related exposure to the contaminants in the recreational-use floodplain soil at the western shore of Allendale Pond of the Centredale Manor Site.

Table G–1–14. Risk Characterization Summary – Carcinogens

Scenario Timeframe: Current/Future
Receptor: Passive Recreational Visitor
Receptor Age: Young Child/Older Child/Adult (Ages 0-30)

Medium	Exposure Medium	Exposure Point	Contaminant	Carcinogenic Risk				
				Ingestion	Dermal	Inhalation	External (Radiation)	Exposure Routes Total
Floodplain Soil	Soil	Lyman Mill Oxbow Area (General Area)	Benzo(a)pyrene	3.4E-06	1.8E-06	NA	NA	5.1E-06
			Arsenic	1.3E-06	1.8E-07	NA	NA	1.5E-06
			Dioxins/Furans TEQ	5.3E-05	NA	NA	NA	5.3E-05
								Lyman Mill Oxbow Area Floodplain Soil Total Risk = 6E-05

Key
NA: Route of exposure is not applicable to this medium.

This table provides risk estimates for the significant routes of exposure for the current/future passive recreational visitor at Lyman Mill Oxbow Area – General Area. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a child's and an adult's exposure to contaminated floodplain soil at the Site, as well as the toxicity of the contaminants. The total risk from direct contact with contaminated floodplain soil at the Lyman Mill Oxbow Area – General Area to a current/future child and adult passive recreational visitor is estimated to be 6 x 10^{-5}. The contaminants contributing most to these risk levels are benzo(a)pyrene, arsenic, and dioxins/furans TEQ. These risk levels indicate that if no clean-up action is taken, an individual would have an increased probability of 6 in 100,000 of developing cancer as a result of site-related exposure to the contaminants in the floodplain soil at the Lyman Mill Oxbow Area – General Area of the Centredale Manor Site.

Table G–1–15. Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident Living at the Source Area
Receptor Age: Young Child age 0-6 (the most conservative receptor)

Medium	Exposure Medium	Exposure Point	Contaminant	Primary Target Organ	Non-Carcinogenic Hazard Quotient: Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Soil	Soil	Source Area assuming no caps	1,2,3-Trichlorobenzene	NOAEL	2.9	NA	NA	2.9
			Cis-1,2-dichloroethene	Undetermined	1.2	NA	NA	1.2
			Tetrachloroethene	Liver	1.5	NA	NA	1.5
			Trichloroethene	Immune System	14.5	NA	NA	14.5
			4-Chloroaniline	Hematological	0.89	0.25	NA	1.1
			Aroclor-1232	Immune System/ Eye	160	63	NA	222
			Aroclor-1242	Immune System/ Eye	5.1	2.0	NA	7.1
			Aroclor-1254	Immune System/ Eye	41	15.9	NA	57
			Aroclor-1268	Immune System/ Eye	2.8	1.1	NA	3.9
			Thallium	NOAEL	7.9	NA	NA	7.9
			Dioxins/Furans TEQ	Reproductive/ Endocrine	138	11.6	NA	150
Source Area (assuming no caps) Reproductive/Endocrine Systems Hazard Index = 150								
Source Area (assuming no caps) Immune System Hazard Index = 305								
Subsurface Soil	Soil	Source Area assuming no caps	Trichloroethene	Immune System	12.0	NA	NA	12.0
			Aroclor-1232	Immune System/ Eye	1.1	0.44	NA	1.6
			Aroclor-1242	Immune System/ Eye	1.9	0.73	NA	2.6
			Aroclor-1248	Immune System/ Eye	11.0	4.3	NA	15.3
			Aroclor-1254	Immune System/ Eye	56	22	NA	78
			Thallium	NOAEL	6.1	NA	NA	6.1
			Dioxins/Furans TEQ	Reproductive/ Endocrine	46	3.9	NA	50
Source Area (assuming no caps) Reproductive/Endocrine Systems Hazard Index = 50								
Source Area(assuming no caps) Immune System Hazard Index = 109								

Key
NA: Route of exposure is not applicable to this medium.

This table provides the hazard indices for the direct contact route of exposure to surface and subsurface soil at the Source Area, assuming that the current caps not existing or not effective in preventing direct contact exposure to soil, for future resident living near the Source Area. These hazard indices are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a child's exposure to contaminated soil at the Source Area as well as the toxicity of the contaminants. The hazard indices of 150 and 305 based on adverse effects on the reproductive/endocrine systems and the immune system, respectively, from exposure to surface soil at the Source Area assuming no caps exceeded the acceptable EPA threshold of 1. The contaminants contributing most to these hazards are trichloroethene, PCB Aroclors, thallium, and dioxins/furans TEQ. The hazard indices of 50 and 109 based on adverse effects on the reproductive/endocrine systems and the immune system, respectively, from exposure to subsurface soil at the Source Area assuming no caps exceeded the acceptable EPA threshold of 1. The contaminants contributing most to these hazards are trichloroethene, Aroclors 1248 and 1254, thallium, and dioxins/furans TEQ. These exceeding hazard indices indicate that if no clean-up action is taken, an individual would have adverse health effects on the immune system and reproductive/endocrine systems as a result of site-related exposure to the contaminants in contaminated soil at the Source Area assuming no caps.

Table G–1–16. Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Construction Worker Working at the Source Area
Receptor Age: Construction Worker

Medium	Exposure Medium	Exposure Point	Contaminant	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Soil	Source Area	Trichloroethene	Immune System	1.7	NA	NA	1.7
			Aroclor-1248	Immune System/ Eye	0.76	0.32	NA	1.1
			Aroclor-1254	Immune System/ Eye	7.4	3.1	NA	10.4
Source Area Immune System Hazard Index = 13								

Key
NA: Route of exposure is not applicable to this medium.

This table provides the hazard indices for the direct contact route of exposure to surface and subsurface soil at the Source Area for future construction worker working at the Source Area. These hazard indices are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a worker's exposure to contaminated soil at the Source Area as well as the toxicity of the contaminants. The total hazard index of 13 based on adverse effects on the immune system from exposure to surface and subsurface soil at the Source Area exceeded the acceptable EPA threshold of 1. The contaminants contributing most to these hazards are trichloroethene and Aroclor 1254. These exceeding hazard indices indicate that if no clean-up action is taken, an individual would have adverse health effects on the immune system as a result of site-related exposure to the contaminants in contaminated soil at the Source Area.

Table G–1–17. Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident Living Along the River
Receptor Age: Young Child age 0-6 (the most conservative receptor)

Medium	Exposure Medium	Exposure Point	Contaminant	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Dermal	Inhalation	Exposure Routes Total
Biota	Combined fish diet	Allendale Pond	Aroclor 1254	Immune System	28	NA	NA	28
			Dioxins/Furans TEQ	Reproductive/Endocrine Systems	129	NA	NA	129
Immune System Hazard Index = 28								
Reproductive/Endocrine Systems Hazard Index = 129								
Sediment	Sediment	Allendale Pond	Dioxins/Furans TEQ	Reproductive/Endocrine Systems	15	1	NA	16
Reproductive/Endocrine Systems Hazard Index = 16								
Allendale Pond Immune System Hazard Index Across All Media = 28 **Allendale Pond Reproductive/Endocrine Systems Hazard Index Across All Media = 145**								
Biota	Combined fish diet	Lyman Mill Pond	Aroclor 1254	Immune System	32	NA	NA	32
			Dioxins/Furans TEQ	Reproductive/Endocrine Systems	159	NA	NA	159
Immune System Hazard Index = 32								
Reproductive/Endocrine Systems Hazard Index = 159								
Sediment	Sediment	Lyman Mill Pond	Dioxins/Furans TEQ	Reproductive/Endocrine Systems	22	2	NA	24
Reproductive/Endocrine Systems Hazard Index = 24								
Lyman Mill Pond Immune System Hazard Index Across All Media = 32 **Lyman Mill Pond Reproductive/Endocrine Systems Hazard Index Across All Media = 183**								

Key
NA: Route of exposure is not applicable to this medium.

This table provides the hazard indices for the significant routes of exposure for the current/future resident living along the River at Allendale and Lyman Mill reaches. These hazard indices are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a child’s exposure to contaminated biota and sediment at the Site, as well as the toxicity of the contaminants. For both Allendale and Lyman Mill reaches, the hazard indices based on adverse effects on the immune system and the reproductive/endocrine systems via both fish consumption and direct contact with sediment, mainly via ingestion, exceeded EPA threshold of 1. The contaminants contributing most to these hazard indices are Aroclor 1254 and dioxins/furans TEQ. These exceeding hazard indices indicate that if no clean-up action is taken, an individual would have adverse health effects on the immune system and reproductive/endocrine systems as a result of site-related exposure to the contaminants in contaminated sediment and fish at Allendale and Lyman Mill reaches.

Table G–1–18. Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Visiting Recreational Angler
Receptor Age: Young Child age 0-6 (the most conservative receptor)

Medium	Exposure Medium	Exposure Point	Contaminant	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Dermal	Inhalation	Exposure Routes Total
Biota	Combined fish diet	Allendale	Aroclor 1254	Immune System	28	NA	NA	28
			Dioxins/Furans TEQ	Reproductive/Endocrine Systems	129	NA	NA	129
Immune System Hazard Index = 28								
Reproductive/Endocrine Systems Hazard Index = 129								
Allendale Highest Hazard Index = 129 (Reproductive/Endocrine Systems)								
Biota	Combined fish diet	Lyman Mill	Aroclor 1254	Immune System	32	NA	NA	32
			Dioxins/Furans TEQ	Reproductive/Endocrine Systems	159	NA	NA	159
Immune System Hazard Index = 32								
Reproductive/Endocrine Systems Hazard Index = 159								
Lyman Mill Highest Hazard Index = 159 (Reproductive/Endocrine Systems)								

Key
NA: Route of exposure is not applicable to this medium.

This table provides the hazard indices for the significant routes of exposure for the current/future visiting recreational angler fishing at Allendale and Lyman Mill reaches. These hazard indices are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a child's exposure to contaminated biota at the Site, as well as the toxicity of the contaminants. For both Allendale and Lyman Mill reaches, the hazard indices based on adverse effects on the immune system and the reproductive/endocrine systems via ingestion of contaminated fish exceeded EPA threshold of 1. The contaminants contributing most to these hazard indices are Aroclor 1254 and dioxins/furans TEQ. These exceeding hazard indices indicate that if no clean-up action is taken, an individual would have adverse health effects on the immune system and reproductive/endocrine systems as a result of site-related exposure to the contaminants in contaminated fish at Allendale and Lyman Mill reaches.

Table G–1–19. Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident Living in the Floodplain Soil Area
Receptor Age: Young Child (the most conservative receptor)

Medium	Exposure Medium	Exposure Point	Contaminant	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Dermal	Inhalation	Exposure Routes Total
Floodplain Soil	Soil	Eastern Shore of Allendale Pond	Dioxins/Furans TEQ	Reproductive/Endocrine Systems	15.9	1.3	NA	17
Eastern Shore Allendale Floodplain Soil Highest Hazard Index = 17 (Reproductive/Endocrine Systems)								
Floodplain Soil	Soil	Eastern Shore of Lyman Mill Pond	Dioxins/Furans TEQ	Reproductive/Endocrine Systems	18.2	1.5	NA	20
Eastern Shore Lyman Mill Floodplain Soil Highest Hazard Index = 20 (Reproductive/Endocrine Systems)								

Key
NA: Route of exposure is not applicable to this medium.

This table provides the hazard indices for the significant routes of exposure for the current/future resident living in the floodplain soil area at the eastern shore of Allendale and Lyman Mill Ponds. These hazard indices are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a child's exposure to contaminated floodplain soil at the Site, as well as the toxicity of the contaminants. For floodplain soil at the eastern shore of both Allendale and Lyman Mill Ponds, the hazard indices based on adverse effects on the reproductive/endocrine systems via direct contact with floodplain soil, mainly through ingestion, exceeded EPA threshold of 1. The contaminants contributing most to these hazard indices are dioxins/furans TEQ. These exceeding hazard indices indicate that if no clean-up action is taken, an individual would have adverse health effects on the reproductive/endocrine systems as a result of site-related exposure to the contaminants in contaminated floodplain soil at the eastern shore of Allendale and Lyman Mill Ponds.

Table G–1–20. Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Passive Recreational Visitor
Receptor Age: Young Child (the most conservative receptor)

Medium	Exposure Medium	Exposure Point	Contaminant	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Dermal	Inhalation	Exposure Routes Total
Floodplain Soil	Soil	Lyman Mill Oxbow Area (General Area)	Dioxins/Furans TEQ	Reproductive/Endocrine Systems	3.8	0.3	NA	4
Lyman Mill Oxbow Area (General Area) Floodplain Soil Hazard Index = 4 (Reproductive/Endocrine Systems)								

Key
NA: Route of exposure is not applicable to this medium.

This table provides the hazard indices for the significant routes of exposure for the current/future passive recreational visitor at Lyman Mill Oxbow Area – General Area. These hazard indices are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a child's and an adult's exposure to contaminated floodplain soil at the Site, as well as the toxicity of the contaminants. The total hazard index of 4 based on adverse effects on the reproductive/endocrine systems via direct contact with floodplain soil, mainly through ingestion of floodplain soil at the Lyman Mill Oxbow Area – General Area, exceeded the acceptable EPA threshold of 1. The contaminants contributing most to these risk levels are dioxins/furans TEQ. These exceeding hazard indices indicate that if no clean-up action is taken, an individual would have adverse health effects on the reproductive/endocrine systems as a result of site-related exposure to the contaminants in the floodplain soil at the Lyman Mill Oxbow Area – General Area of the Centredale Manor Site.

Table G–2–1. Receptor Groups, Endpoints, Lines of Evidence, and Exposure Areas Associated with Unacceptable Risks in the Aquatic Portion of the Ecological Risk Assessment

Aquatic Receptor Group	Assessment Endpoints	Representative Species	Lines of Evidence	Measurement Endpoints	Exposure Areas		
					Allendale Pond	Lyman Mill Pond	Oxbow
Demersal omnivorous fish populations	Protect and maintain demersal fish populations as a forage base and sports fishery	Generic demersal fish species; American eel, white sucker, brown bullhead	Fish community survey (Index of Biotic Integrity	Compare survey results to reference conditions	√	√	
			Fish ichthyoplankton survey	Compare survey results to reference conditions	√	√	
			Measured and modeled fish tissue residues	Compare tissue residues to CBRs	√	√	
Pelagic piscivorous and semi-piscivorous fish	Protect and maintain pelagic fish populations as a forage base and sports fishery	Generic pelagic fish species; largemouth bass	Fish community survey (Index of Biotic Integrity	Compare survey results to reference conditions	√	√	
			Fish ichthyoplankton survey	Compare survey results to reference conditions	√	√	
			Measured and modeled fish tissue residues	Compare tissue residues to CBRs	√	√	
Insectivorous mammals	Protect and maintain insectivorous mammal populations	Little brown bat	FCM using measured or modeled emerging insect tissue residues	Compare calculated EDDs to mammal TRVs or TEQs	√	√	
			Estimated mammal tissue residues based on modeling	Compare mammal residues to mammal CBRs	√	√	
Insectivorous birds	Protect and maintain insectivorous bird populations	Tree swallow	FCM using measured or modeled emerging insect tissue residues	Compare calculated EDDs to bird TRVs or TEQs	√	√	
			Reproductive success	Compare reductive success at Site vs. reference locations	√	√	
			Egg residue analysis	Compare egg residues to egg CBRs	√	√	
			Nestling stomach content analysis	Compare stomach residues to CBRs.	√	√	
			Measured nestling liver MFO activity	Compare liver MFO activity to reference condition	√	√	

Key:
CBR – critical body residues; EDD – estimated daily dose; FCM – food chain modeling; MFO – mixed function oxidase; TEQ – toxic equivalency; TRV – toxicity reference value

Table G–2–2. Receptor Groups, Endpoints, Lines of Evidence, and Exposure Areas Associated with Unacceptable Risks in the Floodplain Portion of the Ecological Risk Assessment

Floodplain Receptor Group	Assessment Endpoints	Representative Species	Lines of Evidence	Measurement Endpoints	Exposure Areas		
					Allendale Pond	**Lyman Mill Pond**	**Oxbow**
Vermivorous mammals	Protect and maintain vermivorous (i.e., worm-eating) mammal populations	Short-tailed shrew	FCM using measured and modeled earthworm tissue residues	Compare calculated EDDs to mammal TRVs or TEQs	√	√	√
			Modeled tissue residues	Compare mammal tissue residues to mammal CBRs	√	√	√
Vermivorous birds	Protect and maintain vermivorous (i.e., worm-eating) bird populations	American woodcock	FCM using measured and modeled earthworm tissue residues	Compare calculated EDDs to bird TRVs or TEQs	√	√	√
			Modeled egg tissue residues	Compare tissue residues to egg CBRs	√	√	√

Key:
CBR – critical body residues; EDD – estimated daily dose; FCM – food chain modeling; TEQ – toxic equivalency; TRV – toxicity reference value

Table G–2–3. Occurrence, Distribution, and Selection of Evaluated Contaminants

Exposure Medium: Allendale Sediment									
Contaminant[1]	**Min Conc. (mg/Kg)**	**Max Conc. (mg/Kg)**	**Mean Conc. (mg/Kg)**	**RME Conc. (mg/Kg)**	**Statistical Measure[2]**	**Background conc. (mg/Kg)**	**Screening Toxicity Value (mg/Kg)**	**Screening Toxicity Value Source**	**HQ[3]**
Dioxins and furans (TEQ- Bird)	8.96E-08	0.073	0.0058	0.027	95% UCL-T	0.000034	2.6E-06	Wildlife PCL	2.8E+04
Aroclor 1254	0.011	27	1.5	2.4	95% UCL-T	0.15	0.055	Wildlife PCL	4.9E+02
Total Aroclors	0.011	27	1.53	2.3	95% UCL-T	0.21	0.023	NOAA ER-L	1.2E+03
Technical chlordane	0.064	0.85181	0.515	0.651	95% UCL-N	0.4	0.0005	NOAA ER-L	1.7E+03
Selenium	0.58	3.8	1.1	1.4	95% UCL-T	1.1	0.52	Wildlife PCL	7.3E+00
Zinc	23	2088	354	482.4	95% UCL-T	221	0.37	Wildlife PCL	5.6E+03

Notes:

1 The contaminants listed in this table are a subset of those that were identified as resulting in unacceptable risks to one or more ecological receptor in the impoundments Ecological Risk Assessment. Specifically, cleanup levels were not developed for macroinvertebrates due to the lack of appropriate site-specific effects information and those contaminants posing an actionable risk to this receptor group only are not listed. Consideration of the spatial distribution and magnitude of the risk estimates for vertebrate receptors supports the use of fish- and wildlife-based values as protective surrogates for invertebrate receptors.

2 Statistical measures for the RME EPC are:

95% UCL – T: 95% upper confidence on the mean, lognormal distribution
95% UCL – N: 95% upper confidence on the mean, normal distribution
95% UCL – NP: 95% upper confidence on the mean, nonparametric distribution; arithmetic mean used to approximate the 95% UCL.
Max: Maximum detection concentration, applied if fewer than 10 samples or if the 95% UCL is greater than the maximum concentration.

3 HQ is defined as the Maximum Concentration/Screening Toxicity Value.

Key:
EPC - Exposure Point Concentration; RME - Reasonable Maximum Exposure; NOAA ER-L - National Oceanic and Atmospheric Administration Effects Range-Low; PCL - Protective Concentration Level; protective of semi-aquatic wildlife exposure to sediment via incidental sediment ingestion and consumption of contaminated prey; value is minimum of selected receptor species; mg/Kg - milligrams per kilogram

Table G–2–4. Occurrence, Distribution, and Selection of Evaluated Contaminants

Exposure Medium: Lyman Mill Sediment

Contaminant[1]	Min Conc. (mg/Kg)	Max Conc. (mg/Kg)	Mean Conc. (mg/Kg)	RME Conc. (mg/Kg)	Statistical Measure[2]	Back-ground Conc. (mg/Kg)	Screening Toxicity Value (mg/Kg)	Screening Toxicity Value Source	HQ[3]
Dioxins and furans (TEQ-Bird)[4]	8.96E-08	0.00808	0.0018	0.00808	Max	0.000034	2.6E-06	Wildlife PCL	3.1E+03
Coplanar PCBs (TEQ-Bird)[4]	1.27E-05	0.00021	0.00015	0.00021	Max	0.000045	2.6E-06	Wildlife PCL	8.1E+01
Aroclor 1254	0.011	2.2	0.27	0.49	95% UCL-T	0.15	0.055	Wildlife PCL	4.0E+01
Total Aroclors	0.011	2.2	0.2629	0.39	95% UCL-T	0.21	0.023	NOAA ER-L	9.6E+01
4,4'-DDD	0.00002	0.052	0.0093	0.0093	95% UCL-NP	0.0049	0.002	NOAA ER-L	2.6E+01
4,4'-DDE	0.00031	0.048	0.0083	0.011	95% UCL-T	0.006	0.0021	Wildlife PCL	2.3E+01
Technical chlordane	0.06385	2.2	1.3	2.21273	Max	0.4	0.0005	NOAA ER-L	4.4E+03
Aluminum	1,640	27773	10181	13069	95% UCL-T	8210	44	Wildlife PCL	6.3E+02
Barium	7.6	380	130	207	95% UCL-T	134	54	Wildlife PCL	7.0E+00
Selenium	0.58	2.9	0.96	1.2	95% UCL-T	1.1	0.52	Wildlife PCL	5.6E+00
Vanadium[5]	4	91.7	27.2	91.7	Max	37.6	9.6	Wildlife PCL	9.6E+00
Zinc	23	1662	391	758	95% UCL-T	221	0.37	Wildlife PCL	4.5E+03

Notes:

1 The contaminants listed in this table are a subset of those that were identified as resulting in unacceptable risks to one or more ecological receptor in the impoundments Ecological Risk Assessment. Specifically, cleanup levels were not developed for macroinvertebrates due to the lack of appropriate site-specific effects information and those contaminants posing an actionable risk to this receptor group only are not listed. Consideration of the spatial distribution and magnitude of the risk estimates for vertebrate receptors supports the use of fish- and wildlife-based values as protective surrogates for invertebrate receptors.

2 Statistical measures for the RME EPC are:

95% UCL – T: 95% upper confidence on the mean, lognormal distribution.
95% UCL – NP: 95% upper confidence on the mean, nonparametric distribution; arithmetic mean used to approximate the 95% UCL.
Max: Maximum detection concentration, applied if fewer than 10 samples or if the 95% UCL is greater than the maximum concentration.

3 HQ is defined as the Maximum Concentration/Screening Toxicity Value.

4 The impoundments Ecological Risk Assessment determined that exposure to dioxin and furans and coplanar PCBs would result in actionable risks to mammalian wildlife as well as bird and fish receptors; however, of these groups, mammals were determined to be the least sensitive and they thus would be protected by actions taken to eliminate risks to these other receptor categories.

5 Vanadium was screened out as an evaluated contaminant in sediment in the impoundments Ecological Risk Assessment but retained for fish tissue.

Key:
EPC - Exposure Point Concentration; RME - Reasonable Maximum Exposure; NOAA ER-L - National Oceanic and Atmospheric Administration Effects Range-Low;
PCL – Protective Concentration Level (protective of semi-aquatic wildlife exposure to sediment via incidental sediment ingestion and consumption of contaminated prey; value is minimum of selected receptor species); mg/Kg – milligrams per kilogram

Table G–2–5. Occurrence, Distribution, and Selection of Evaluated Contaminants

Exposure Medium: Allendale Soil

Contaminant[1]	Min Conc. (mg/Kg)	Max Conc. (mg/Kg)	Mean Conc. (mg/Kg)	RME Conc. (mg/Kg)	Statistical Measure[2]	Background Conc. (mg/Kg)	Screening Toxicity Value (mg/Kg)	Screening Toxicity Value Source	HQ[3]
Dioxins and furans (TEQ-mammal)[4]	8.5E-07	0.0281	0.00083	0.0024	95% UCL-T	0.000050	8.9E-07	Wildlife PCL	3.2E+04

Notes:

[1] The contaminants listed in this table are a subset of those that were identified as resulting in unacceptable risks to one or more ecological receptor in the impoundments Ecological Risk Assessment. Specifically, cleanup levels were not developed for macroinvertebrates due to the lack of appropriate site-specific effects information and those contaminants posing an actionable risk to this receptor group only are not listed. Consideration of the spatial distribution and magnitude of the risk estimates for vertebrate receptors supports the use of wildlife-based values as protective surrogates for invertebrate receptors.

[2] Statistical measures for the RME EPC are:

95% UCL – T: 95% upper confidence on the mean, lognormal distribution.
Max: Maximum detection concentration, applied if fewer than 10 samples or if the 95% UCL is greater than the maximum concentration.

[3] HQ is defined as the Maximum Concentration/Screening Toxicity Value.

[4] The impoundments Ecological Risk Assessment determined that exposure to dioxin and furans would result in actionable risks to avian wildlife as well as mammals; however, birds were determined to be less sensitive and they thus would be protected by actions taken to eliminate risks to mammals that forage in floodplain soils at the site.

Key:
EPC - Exposure Point Concentration; RME - Reasonable Maximum Exposure; PCL - Protective Concentration Level; protective of semi-aquatic wildlife exposure to sediment via incidental sediment ingestion and consumption of contaminated prey; value is minimum of selected receptor species; mg/Kg - milligrams per kilogram

Table G–2–6. Occurrence, Distribution, and Selection of Evaluated Contaminants

Exposure Medium: Lyman Mill Floodplain Soil (Including Oxbow)

Contaminant[1]	Min Conc. (mg/Kg)	Max Conc. (mg/Kg)	Mean Conc. (mg/Kg)	RME Conc. (mg/Kg)	Statistical Measure[2]	Background Conc. (mg/Kg)	Screening Toxicity Value (mg/kg)	Screening Toxicity Value Source	HQ[3]
2,3,7,8-TCDD	5.0E-07	0.015	0.0013	0.0018	95% UCL	0.000017	8.9E-07	Wildlife PCL	1.6E+04
Dioxins and furans (TEQ-mammal)[4]	1.0E-06	0.015	0.0014	0.0017	95% UCL	0.000050	8.9E-07	Wildlife PCL	1.6E+04
4,4'-DDT	0.0012	1.3	0.051	0.33	95% UCL	0.0085	0.0025	EPA Region IV	5.2E+02
4,4'-DDE	0.001	1.0	0.036	0.25	95% UCL	0.013	0.0025	EPA Region IV	4.0E+02
Antimony	0.13	38	1.9	10	95% UCL	0.62	0.27	ECO SSL	1.4E+02
Copper	6.2	2400	110	460	95% UCL	205	28	ECO SSL	8.4E+01

Notes:

1 The contaminants listed in this table are a subset of those that were identified as resulting in unacceptable risks to one or more ecological receptor in the Oxbow Area Ecological Risk Assessment, the Oxbow is where the most significant ecological exposures occur. Specifically, cleanup levels were not developed for macroinvertebrates due to the lack of appropriate site-specific effects information and those contaminants posing an actionable risk to this receptor group only are not listed. Consideration of the spatial distribution and magnitude of the risk estimates for vertebrate receptors supports the use of wildlife-based values as protective surrogates for invertebrate receptors.

2 Statistical measures for the Reasonable Maximum Exposure Point Concentration (RME EPC) are:

Max: Maximum detection concentration, applied if fewer than 10 samples or if the 95% UCL is greater than the maximum concentration.

3 HQ is defined as the Maximum Concentration/Screening Toxicity Value. These values were developed for the purpose of identifying contaminants that required risk analysis and are generally much larger than the actual site risks as characterized in the Oxbow Area Ecological Risk Assessment.

4 The Oxbow Area Ecological Risk Assessment determined that exposure to dioxin and furans would result in actionable risks to avian wildlife as well as mammals; however, birds were determined to be less sensitive and they thus would be protected by actions taken to eliminate risks to mammals that forage in floodplain soils at the site.

Key:
HQ – hazard quotient; PCL – Protective Concentration Level; protective of semi-aquatic wildlife exposure to sediment via incidental sediment ingestion and consumption of contaminated prey; value is minimum of selected receptor species; mg/kg - milligrams per kilogram; RME – reasonable maximum exposure; TEQ – toxic equivalency; 95% UCL – 95 percent upper confidence limit on the arithmetic mean

Table G–2–7. Ecological Exposure Pathways Associated with Unacceptable Risks

Exposure Medium	Sensitive Environment Flag Y or N	Receptor	Endangered/ Threatened Species Flag Y or N	Exposure Routes	Assessment Endpoints	Measurement Endpoints
Biological Tissue	N	Wildlife	N	Ingestion and direct contact with contaminants in wetland soils, sediment, and surface water	Protection and maintenance of piscivorous mammal and bird populations	Comparison of estimated ingestion doses in piscivorous wildlife with TRVs and toxic equivalencies
						Comparison of estimated piscivorous wildlife residues with CBRs
					Protection and maintenance of insectivorous mammal and bird populations	Comparison of estimated ingestion doses in insectivorous wildlife with TRVs and toxic equivalencies
						Comparison of measured insectivorous wildlife tissue and/or egg residues with CBR data
						Comparison of estimated insectivorous wildlife tissue and/or egg residues with site-specific CBR data
						Site-specific measurement of reproductive effects in local tree swallow populations

Key:
CBR – critical body residue; TRV – toxicity reference value

Table G–2–8. Summary of Toxicity and Field Studies That Demonstrated Unacceptable Risks

Environmental Media	Study Name	Endpoints	Results
Tissue	Partial life-cycle (ELS) bioassay	Evaluation of the lethal and sublethal effects of TCDD, PCB congeners, and HCX on fish embryos and larvae, including: • Days to hatch • Hatching success • Fry survival • Fry growth • Developmental malformations	Waterborne exposure of channel catfish eggs to increasing concentrations of TCDD, PCB-77, and PCB-126, with and without HCX added at approximately 5-times the concentration of TCDD, were negatively correlated with hatching success and fry survival 32 days post-hatch. Channel catfish egg exposures to TCDD and PCBs (with and without HCX) resulting in 10% and 25% increased mortality in the resulting fry were determined to be 319 and 510 pg TCDD Toxicity Equivalence Concentration (TEC)/g egg wet weight, respectively.

Key:
ELS - early life stage; HCX - hexachloroxanthene; PCB - polychlorinated biphenyl; TCDD - Tetrachlorodibenzo-p-dioxin

Table G–2–9. Summary of Ecological Risks - Sediment

Contaminant	Hazard Quotient[1]				
	Concentration[2]	Demersal Fish	Pelagic Fish	Piscivorous Wildlife	Insectivorous Wildlife
Sediment – Allendale Reach					
2,3,7,8-TCDD	0.0058	15	N/A	19	15
Aroclor 1254	1.5	6.8	N/A	4.7	-
Total Aroclors	1.53	-	N/A	14	-
Technical Chlordane	0.515	34	N/A	-	-
Selenium	1.1	2.6	N/A	-	-
Zinc	354	7.3	N/A	-	-
Total HI[3]		**70**	**-**	**40**	**20**
Sediment – Lyman Mill Reach					
2,3,7,8-TCDD	0.0018	3.5	1.5	5.1	8.2
Coplanar PCBs (TEQ)	0.00015	0.29	-	1.3	2.8
Aroclor 1254	0.27	0.96	-	0.66	-
Total Aroclors	0.2629	-	-	1.9	-
Technical Chlordane	1.3	91	43	0.37	-
4,4’-DDE	0.0083	0.59	-	2.4	-
4,4’-DDD	0.0093	0.44	-	1.1	-
Aluminum	10181	9.4	11	-	-
Barium	130	9.0	16	-	-
Selenium	0.96	2.0	-	-	-
Vanadium	27.2	0.90	1.2	-	-
Zinc	391	11	11	-	-
Total HI[3]		**100**	**80**	**10**	**10**

Notes:
1 HQ – Hazard Quotient is the ratio of the exposure concentration or dose to the receptor-specific toxicological benchmark value; values greater than 1.0 indicate that a given exposure could be harmful to the particular receptor.
2 Units in milligram per kilogram or part per million.
3 Values reported to one significant figure.

Key
N/A – not available/applicable

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Table G–2–10. Summary of Ecological Risks – Floodplain Soil and Stream Sediment

Contaminant	Concentration[2]	Hazard Quotient[1]	
		Wildlife - Birds	Wildlife - Mammals
Floodplain Soil – Allendale Reach			
2,3,7,8-TCDD	0.00083	-	22
	Total HI[3]		**20**
Floodplain Soil and Stream Sediment – Lyman Mill Reach			
2,3,7,8-TCDD	0.0018	11	52
4,4'-DDT	0.33	3.0	-
4,4'-DDE	0.25	54	-
Antimony	10	-	23
Copper	460	-	24
	Total HI[3]	**70**	**100**

Notes:
1 HQ – Hazard Quotient is the ratio of the exposure concentration or dose to the receptor-specific toxicological benchmark value; values greater than 1.0 indicate that a given exposure could be harmful to the particular receptor.
2 Units in milligram per kilogram or part per million.
3 Values reported to one significant figure.

Table G–2–11. Summary of Principal Ecological Risk Uncertainties

Uncertainty Category	Compound Category(ies)	Potential Impact on BERA Conclusions	
		Qualitative[1]	Quantitative[2]
Exposure Assessment			
Development of EPCs			
Allendale Dam breach in 2001	PBTs	?	+
Fish EPCs based on large fish	PBTs	+++	+++
No tissue data available for several wildlife receptors	PBTs	?	+++
Surface water data lacking for Oxbow	all	-	++
Spatial heterogeneity in chemical distribution and habitat foraging attractiveness	all	?	++
Insectivorous diets assumed to be entirely aquatic in origin within study area	dioxin/furans/PCBs	+++	+
Selection of Endpoint Receptors			
Habitat suitability for wide-ranging wildlife	all	+	++
Availability of soil invertebrates in Oxbow	all	+	++
Plant receptors not evaluated	all	-	+
Wildlife Exposure Parameters			
Use of standard literature values	all	?	+
Bioaccumulation Factors			
No TCDD plant uptake factor available	dioxin/furans/PCBs	--	+
Use of literature uptake factors for plants	all	?	+
Use of base-wide BAFs to estimate earthworm tissue concentrations in the Oxbow	all	?	+
Lack of BMFs for specific compounds	PBTs	--	+
Effects Assessment			
Toxicity Reference Values			
Lack of ingestion dose response data	pesticides, inorganics	--	+
Lack of critical body residue effects data	pesticides, inorganics	---	++
Extrapolation between laboratory and field studies	all	?	++
Inter-specific extrapolation for TRVs	dioxin/furans/PCBs	?	++
TEQ approach fails to account for antagonistic or synergistic interactions between congeners	dioxin/furans/PCBs	-	+
Field Studies			
Limited ichthyological data	dioxin/furans	--	+++
Limited emerging insect data	all	?	+

Table G–2–11. (Continued)

Uncertainty Category	Compound Category(ies)	Potential Impact on BERA Conclusions	
		Qualitative[1]	Quantitative[2]
Risk Characterization			
Hazard quotient approach	all	?	+

Notes:
[1] Direction of likely effect indicated by the sign: Under-estimated risk indicated by a "-" sign as follows: "-" – somewhat likely; "--" – likely; "---" very likely; "?" – direction of likely effect is indeterminate. Over-estimated risks indicated by a "+" sign as follows: "+" – somewhat likely; "++" likely; and "+++" very likely
[2] Estimated magnitude of effect on risk estimates where magnitude ranges from "+" – least to "+++" greatest.

Key:
PBTs – Persistent bioaccumulative toxicants, BMFs – Biomagnification factors, BAFs - Bioaccumulation factors, PCBs – polychlorinated biphenyls.

H. REMEDIAL ACTION OBJECTIVES

Based on preliminary information relating to types of contaminants, environmental media of concern, and potential exposure pathways, remedial action objectives (RAOs) were developed to aid in the development and screening of alternatives. These RAOs were developed to mitigate, restore and/or prevent existing and future potential threats to human health and the environment. The RAOs for the Site are:

Source Area Soil

- Prevent direct human exposure by incidental ingestion of and dermal contact with Source Area soil that contain contaminants in concentrations in excess of ARARs (e.g., RIDEM residential direct exposure criteria and TSCA requirements for PCBs) and EPA's recommended residential level for PCBs.
- Prevent direct human exposure by incidental ingestion of and dermal contact with Source Area soil that contain contaminants in concentrations that would result in a total excess lifetime cancer risk greater than the target risk range of 10^{-5} to 10^{-6} and/or a HI greater than 1.
- In addition, prevent leaching or migration of contaminants from vadose zone soil that would result in groundwater contamination in excess of ARARs (e.g., MCLs and non-zero maximum contaminant level goals [MCLGs]).

Groundwater

- Prevent migration of contaminants from groundwater within the Source Area that would result in surface water contamination in excess of ARARs (e.g., State of Rhode Island standards and federal WQC).
- Prevent migration of contaminants from groundwater that could indirectly lead to unacceptable human health risks, and/or that could result in exceedance of sediment cleanup levels.
- Prevent direct human exposure by dermal contact with or ingestion of groundwater by receptors within the Source Area that contain contamination in excess of ARARs.
- Comply with the federal drinking water standards at the Source Area.

Allendale Pond and Lyman Mill Pond Sediment

- Prevent direct human exposure by incidental ingestion of and dermal contact with sediments containing contaminants at concentrations that would result in a total excess lifetime cancer risk greater than the target risk range of 10^{-4} to 10^{-6} or an HI greater than 1.

- Prevent human ingestion of fish and other aquatic organisms containing contaminants at concentrations that would result in a total excess lifetime cancer risk greater than the target risk range of 10^{-4} to 10^{-6} or an HI greater than 1.
- Prevent dermal contact and ingestion by ecological receptors to sediment containing contaminants at levels that would result in unacceptable impacts.
- Prevent migration of contaminants from sediment that would result in River surface water concentrations in excess of ARARs or migration of contaminants downstream that could result in exceedance of sediment cleanup levels.
- Reduce contaminant concentrations in fish and other aquatic organisms so that they no longer present an unacceptable human health risk (a total excess lifetime cancer risk greater than the target risk range of 10^{-4} to 10^{-6} or an HI greater than 1).[8]

Allendale Floodplain Soil

- Prevent direct human exposure by incidental ingestion of and dermal contact with floodplain soil containing contaminants at concentrations in excess of ARARs (e.g., RIDEM residential direct exposure criteria).
- Prevent direct human exposure by incidental ingestion of and dermal contact with floodplain soil containing contaminants that would result in a total excess lifetime cancer risk greater than the target risk range of 10^{-5} to 10^{-6}, and/or an HI greater than 1.
- For ecological receptors, prevent dermal contact and ingestion of floodplain soil containing contaminants at levels that would result in unacceptable impacts.
- Prevent migration of contaminants from floodplain soil that would result in River surface water concentrations in excess of ARARs or migration of contaminants downstream that could result in exceedance of sediment cleanup levels.

Lyman Mill Stream Sediment and Floodplain Soil (Including Oxbow)

- Prevent direct human exposure by incidental ingestion of and dermal contact with floodplain soil containing contaminants at concentrations in excess of ARARs (e.g., RIDEM residential direct exposure criteria).
- Prevent direct human exposure by incidental ingestion of and dermal contact with floodplain soil containing contaminants that would result in a total excess lifetime cancer risk greater than the target risk range of 10^{-5} to 10^{-6}, and/or an HI greater than 1.
- Prevent direct human exposure by incidental ingestion of and dermal contact with sediments containing contaminants at concentrations that would result in a total

8 This RAO was not explicitly identified prior to the ROD but is implicit as a significant outcome is supporting documents (i.e. FS and HHRA) for the selected remedy. It does not change any aspect of the selected remedy.

excess lifetime cancer risk greater than the target risk range of 10^{-4} to 10^{-6} or an HI greater than 1.

- Prevent human ingestion of fish and other aquatic organisms containing contaminants at concentrations that would result in a total excess lifetime cancer risk greater than the target risk range of 10^{-4} to 10^{-6} or an HI greater than 1.
- For ecological receptors, prevent dermal contact and ingestion of floodplain soil/sediment containing contaminants at levels that would result in unacceptable impacts.
- For ecological receptors, maximize hazard reduction and minimize remediation-related habitat loss (floodplain soil).
- Prevent migration of contaminants from floodplain soil and sediment that would result in River surface water concentrations in excess of ARARs or migration of contaminants that could result in exceedance of sediment cleanup levels.

Allendale and Lyman Mill Surface Water

- Prevent migration of contaminants from floodplain soil and sediment that would result in surface water concentrations in excess of ARARs (e.g., ambient water quality criteria [AWQCs]).

See cleanup levels tables in Section L of the ROD for media-specific cleanup levels developed for each Action Area.

I. DEVELOPMENT AND SCREENING OF ALTERNATIVES

1. Statutory Requirements/Response Objectives

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences, including: a requirement that EPA's remedial action, when complete, must comply with all federal and more stringent state environmental and facility siting standards, requirements, criteria or limitations, unless a waiver is invoked; a requirement that EPA select a remedial action that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and a preference for remedies in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances is a principal element over remedies not involving such treatment. Response alternatives were developed to be consistent with these Congressional mandates.

2. Technology and Alternative Development and Screening

CERCLA and the NCP set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives for soil, sediment, and groundwater were developed for the site.

For purposes of the Feasibility Study, the Site was divided into five areas: Source Area Soil, Groundwater, Allendale Pond and Lyman Mill Pond Sediment, Allendale Floodplain Soil, and Lyman Mill Stream Sediment and Floodplain Soil (including the Oxbow wetland).

With respect to Source Area Soil, Allendale Pond and Lyman Mill Pond Sediment, Allendale Floodplain Soil, and Lyman Mill Stream Sediment and Floodplain Soil (including the Oxbow wetland), the RI/FS developed a range of alternatives for each area. This range included alternatives that remove or destroy hazardous substances to the maximum extent feasible, eliminating or minimizing to the degree possible the need for long term management. This range also included alternatives that treat the principal threats posed by the Site but vary in the degree of treatment employed and the quantities and characteristics of the treatment residuals and untreated waste that must be managed; alternative(s) that involve little or no treatment but provide protection through engineering or ICs, and a no action alternative.

With respect to the groundwater response action, the RI/FS developed a number of remedial alternatives using different technologies and a no action alternative.

As discussed in Section 4 of the FS, soil, sediment and groundwater treatment technology options were identified, assessed and screened based on implementability, effectiveness, and cost. Section 5 of the FS presented the remedial alternatives developed by combining the technologies identified in the previous screening process in the categories identified in Section 300.430(e)(3) of the NCP. The purpose of the initial screening was to narrow the number of potential remedial alternatives for further detailed analysis while preserving a range of options. Each alternative was then evaluated in detail in Section 6 of the FS.

In summary, three of the five Source Area soil alternatives, three out of the five Groundwater alternatives (two Groundwater alternatives remained after the 2009-2010 groundwater removal action), five out of the eleven Allendale Pond and Lyman Mill Pond Sediment alternatives, two out of the five Allendale Floodplain Soil alternatives and three out of the five Lyman Mill Stream Sediment and Floodplain Soil alternatives screened in Section 5, were retained for detailed analysis as possible alternatives for the cleanup of the Site.

In addition, a number of disposal options were evaluated for various alternatives in each of the five areas of the Site addressed in this ROD. The soil and sediment at the Site has been characterized as listed hazardous waste (F020) which is waste from the production or manufacturing use of trichlorophenol. (As discussed above, Metro-Atlantic used trichlorophenol in its manufacturing of hexachlorophene on-site and those operations resulted in discharges of dioxin-containing waste into the soil and sediment.) These disposal options are described below.

Disposal Option a: Containment in an Upland Confined Disposal Facility CDF)	A CDF would be constructed above the 100-year floodplain in accordance with RCRA subtitle C requirements, including a bottom liner, perimeter dikes, a leachate collection system, a multi-layer cap including geotextile, and a monitoring system. Soil and dewatered sediment placed into the upland CDF will have to meet the alternative treatment standards for contaminated soil set forth in the LDRs[9]. Those materials that do not meet the alternative treatment standards will be shipped off-site for treatment/disposal to a hazardous waste facility licensed under applicable law.
Disposal Option b: On-site Containment in a Near Shore Confined Disposal Facility	Near Shore CDFs 5 to 7 acres would be constructed within the footprint of the Allendale and Lyman Mill Ponds. Various types of containment structures, including cast-in-place reinforced concrete with steel pilings, would be evaluated during the design. Waste contained on-site, within the area of contamination, does not need to meet the LDRs.
Disposal Option d: On-site Incineration	The excavated soil and dewatered sediment would be treated on-site using thermal treatment. The dewatering process is expected to generate several types of solids, including debris, sand/gravel, and silt/clay. Each type of material would be stockpiled and treated. Liquid generated from dewatering operations would also be treated prior to discharge. The ash produced from incineration would be tested to characterize for disposal and then be taken off-site to an appropriate landfill.
Disposal Option e: Off-site Disposal and/or Treatment	The excavated soil and dewatered sediment would be disposed of and/or treated at an off-site permitted hazardous waste/solid waste facility. Stockpiled excavated material would be sampled to determine the proper final designation of the material (type of the landfill and/or treatment) in accordance with applicable law.
All of the cleanup alternatives for Source Area Soil and Groundwater evaluated only off-site disposal and/or treatment based upon screening in the FS (Option e). All of the cleanup alternatives for Allendale Pond and Lyman Mill Pond Sediment, Allendale Floodplain Soil, and Lyman Mill Stream Sediment and Floodplain Soil (including the Oxbow wetland) included all of the disposal options (Options a, b, d, and e). In addition, Alternative 11 for the Allendale Pond and Lyman Mill Pond Sediment included a fifth disposal option, **Option f (on-site consolidation within new floodplain areas and capping in place)**, under which the material removed from the new river channel and pond areas would be consolidated on top of contaminated sediment in what would become the new floodplain under a cover system comparable to that for an upland CDF. Option c, on-site containment in an Island Confined Disposal Facility, was screened out because it did not provide enough disposal space.	

9 LDRs (40 CFR Part 268) are technology based treatment standards that must be met before hazardous waste can be placed in a landfill. Numeric treatment standards, known as universal treatment standards ("UTS"), have been assigned to each possible hazardous constituent. Before a hazardous waste can be land disposed, each hazardous constituent in the waste must meet its UTS. Alternative treatment standards have been established for contaminated soil (40 CFR § 268.49). Before contaminated soil can be land disposed, it must be treated to reduce the concentrations of its hazardous constituents by 90 percent. However, the required level of treatment is capped at 10 times the UTS of each hazardous constituent. Therefore, if the concentration of each hazardous constituent in contaminated soil or dewatered sediment does not exceed 10 times its UTS, then the waste does not need to be treated prior to disposal in the upland CDF.

J. DESCRIPTION OF ALTERNATIVES

This Section provides a summary of each soil, groundwater, and sediment alternative evaluated. A more complete, detailed presentation of each alternative, along with disposal options, is found in Section 6 of the FS Reports. All volume estimates are approximate.

1. Source Area Soil Alternatives Analyzed

The Source Area Soil alternatives analyzed for the Site included:

- No Action (Alternative 1)
- Targeted Excavation, Upgrade and Maintain Existing Surfaces, and Off-Site Disposal and/or Treatment (Alternative 3e)
- Targeted Excavation, Convert to RCRA Caps and Maintain, and Off-Site Disposal and/or Treatment (Alternative 4e)

Each of the three Source Area Soil alternatives is summarized below.

No Action (Alternative 1)

No Action (Alternative 1) is intended to provide a baseline against which other alternatives can be compared, as required by the NCP. The No Action Alternative consists of Five-Year reviews and periodic monitoring triggered by severe storm events, but does not include any active remediation, maintenance or improvement to existing site conditions, such as interim soil caps or Site fencing, or ICs. This alternative would not meet RCRA/TSCA requirements, Rhode Island residential direct exposure criteria or risk based cleanup levels based upon TBC requirements. ARARs are presented in the FS Addendum, Table 6-32.

Treatment Components	None	
Containment Components	None	
Institutional Control Components	None	
Mitigation/Restoration	None	
Monitoring Requirements	Periodic monitoring triggered by severe storm events	
Operation and Maintenance Requirements	Review of the Source Area conditions and risks at five year intervals	
Estimated Time to Design and Construct	n/a	
Estimated Time to Reach Remedial Action Objectives	Not for the foreseeable future	
Cost	Capital Cost Present Worth of Long-term Monitoring and Maintenance Total Present Worth Cost	$0 $170,000 $170,000

Targeted Excavation, Upgrade and Maintain Existing Surfaces, and Off-Site Disposal and/or Treatment (Alternative 3e)

Targeted Excavation, Upgrade and Maintain Existing Surfaces, and Off-Site Disposal and/or Treatment (Alternative 3e) consists of measures including excavation and off-site disposal and/or treatment of buried waste material and soil that exceeds TSCA criteria for PCBs (40 CFR 761.61 cleanup and disposal of PCB remediation waste), risk-based cleanup levels for dioxin and other contaminants and state's GA (drinking water quality) leachability criteria for PCBs, pesticides, VOCs and/or SVOCs; repairing and extending existing caps over the remaining contaminated soil; upgrading paved surfaces by using asphalt sealant; long-term monitoring, O&M and ICs for the caps and upgraded surfaces; wetland mitigation; and replacement of flood storage capacity. This alternative would not meet ARARs related to hazardous waste closure and would have wetlands/floodplain impacts. Alternative-specific ARARs are presented in the FS Addendum, Table 6-34.

Treatment Components[1]	Off-site disposal and/or treatment of excavated material (14,300 cy from a depth of 1 to 5 ft bgs): • All 5,500 cy of excavated buried waste material requires treatment • Estimated 10 percent of 8,800 cy of contaminated soil exceeding TSCA and GA leachability criteria would require treatment
Containment Components	• Repair 4.3 acres of existing caps to meet original design requirements over soil areas exceeding RIDEM direct exposure criteria, and dioxin and other contaminants risk-based cleanup levels, raising existing surface elevation by approximately 0.5 feet • Extend caps to cover approximately 1.7 acre landscape area; raising existing surface elevation by approximately 1.5 feet • Upgrade 2.1 acres of paved surfaces by placing asphalt sealant over paved parking lots and driveways
Institutional Control Components	ICs to prevent future excavation, restrict access for buried utilities, and prevent construction of buildings with pilings or basements
Mitigation[10]	• Filling, grading and planting wetland shrub/tree/herbaceous seed mix and stream/river bank stabilization in excavated areas • Mitigation of wetlands/floodplain and floodplain storage loss compensation
Monitoring Requirements	Long-term monitoring of groundwater
Operation and Maintenance Requirements	• Inspection and maintenance of the caps, parking lots, paved surfaces and rip rap areas • Review of the Source Area conditions and risks at five year intervals
Estimated Time to Design and Construct	• Design 1 year • Construction 5 months
Estimated Time to Reach Remedial Action Objectives[2]	• 5 months to prevent direct contact • Significantly longer to prevent migration and leaching of contaminants

10 Legal compliance with wetlands and floodplain requirements for all alternatives is discussed in EPA's Wetland and Floodplain Assessment. To the extent that the tables in this Section include a mitigation component to address wetlands/floodplain damage/impacts, these sections relate only to addressing the actual impacts to these resources and are not indications of legal compliance with these requirements.

Cost[3]	Capital Cost Present Worth of Long-term Monitoring and Maintenance Total Present Worth Cost	$24,300,000 $500,000 $24,800,000

Notes:
1. All excavated waste material and estimated 10 percent of excavated soil (the amount that exceeds the LDR alternative treatment standards) to be shipped off-site for treatment
2. Time to reach RAOs is estimated from the start of construction
3. Additional cost to comply with the National Historic Preservation Act (NHPA) $120,000 to $135,000

Targeted Excavation, Convert to RCRA Caps and Maintain, and Off-Site Disposal and/or Treatment (Alternative 4e)

Targeted Excavation, Convert to RCRA Caps and Maintain, and Off-Site Disposal and/or Treatment (Alternative 4e) consists of measures including excavation and off-site treatment of buried waste material; converting all existing caps, landscaped areas, and paved surfaces to a RCRA C hazardous waste cap to cover remaining contamination exceeding cleanup levels; long-term monitoring, O&M and ICs for the RCRA caps; wetland mitigation; and replacement of flood storage capacity. This alternative meets all ARARs. ARARs are presented in the FS Addendum, Table 6-36.

Treatment Components[1]	Off-site disposal and treatment of excavated 5,500 cy of buried waste material from a depth of 4 ft bgs	
Containment Components	• Install RCRA C cap in the 4.3 acres area of existing caps, raising existing surface elevation by approximately 2.5 feet • Extend RCRA C cap to cover approximately 1.7 acre landscape area; raising existing surface elevation by approximately 3.0 feet • Install RCRA C cap in the 2.1 acres of paved parking lots and driveways, raising existing surface elevation by approximately 2.0 feet • Place underground utilities into clean corridors (trenches with clean soil)	
Institutional Control Components	ICs to prevent future excavation, restrict access for buried utilities, and prevent construction of buildings with pilings or basements	
Mitigation	• Filling, grading and planting wetland shrub/tree/herbaceous seed mix and stream/river bank stabilization in excavated areas • Mitigation of wetlands/floodplain and floodplain storage loss compensation	
Monitoring Requirements	Long-term monitoring of groundwater	
Operation and Maintenance Requirements	• Inspection and maintenance of RCRA C caps • Review of the Source Area conditions and risks at five year intervals	
Estimated Time to Design and Construct	• Design 1 year • Construction 8 months	
Estimated Time to Reach Remedial Action Objectives[2]	8 months to prevent direct contact, migration and leaching of contaminants	
Cost[3]	Capital Cost Present Worth of Long-term Monitoring and Maintenance Total Present Worth Cost	$21,200,000 $500,000 $21,700,000

Notes:
1. All excavated waste material to be shipped off-site for treatment
2. Time to reach RAOs is estimated from the start of construction
3. Additional cost to comply with the National Historic Preservation Act (NHPA) $120,000 to $135,000

2. Groundwater Alternatives Analyzed

Construction of the Excavation/Dewatering groundwater alternative (Alternative 2e) analyzed in the FS was conducted by the Potentially Responsible Parties in 2009/2010 (with the exception of additional groundwater monitoring wells installation) as a removal action.

The constructed groundwater alternative and the No Action Alternative are summarized below.

No Action (Alternative 1)

No Action (Alternative 1) is intended to provide a baseline against which other alternatives can be compared, as required by the NCP. The No Action Alternative consists of Five-Year reviews and periodic monitoring (conducted in conjunction with Source Area Soils alternatives), but does not include any active remediation, monitored natural attenuation, maintenance or improvement to existing site conditions, or implementation of ICs. This alternative would not meet federal drinking water standards at the Source Area. ARARs are presented in the FS Addendum, Appendix O, Table 6-39.

Treatment Components	None	
Containment Components	None	
Institutional Control Components	None	
Monitoring Requirements	Periodic monitoring triggered by severe storm events	
Operation and Maintenance Requirements	Review conditions and risks at five year intervals	
Estimated Time to Design and Construct	n/a	
Estimated Time to Reach Remedial Action Objectives	Not for the foreseeable future	
Cost	Capital Cost Present Worth of Long-term Monitoring and Maintenance Total Present Worth Cost	$0 $270,000 $270,000

Excavation/Dewatering (Alternative 2e)

Excavation/Dewatering (Alternative 2e) consists of measures including the installation of a sheet pile wall in the Woonasquatucket River along the excavation area; dewatering and excavation of contaminated soil from a 0.13 acre area underneath the Brook Village parking lot and shipment of the soil off-site for treatment; installation of a 2.5 ft RCRA Subtitle C cap over the backfilled area; installation of additional monitoring wells; long-term monitoring, O&M and ICs for the RCRA cap. This alternative assumes that Source Area soil will require a RCRA Subtitle C cap. This alternative meets ARARs including federal drinking water standards at the point of compliance. ARARs are presented in the FS Addendum, Appendix O, Table 6-4. Construction of this alternative has been completed. No dioxin was detected in the two new shallow monitoring wells installed and sampled at the groundwater discharge points to the Woonasquatucket River near the edge of the excavated/capped area.

Treatment Components	• Excavation and off-site treatment (incineration) of 1,725 cy of soil (completed) • Dewatering of the excavated area and treatment of water prior to discharge of extracted water to Woonasquatucket River (estimated 80,000 gal) (completed)	
Containment Components	• Construction of RCRA C cap over excavated 0.13 acre area (completed)	
Institutional Control Components	• ICs to prevent use and exposure to groundwater underneath the Source Area Soil cap	
Monitoring Requirements	• Periodic monitoring of existing and new groundwater monitoring wells and surface water	
Operation and Maintenance Requirements	• Installation of additional monitoring wells • Maintenance of existing and new monitoring wells • Review of the Source Area conditions and risks at five year intervals	
Estimated Time to Design and Construct	• Design 1 year • Construction completed (except for construction of monitoring wells)	
Estimated Time to Reach Remedial Action Objectives	8 months (concurrently with the Source Area Soil alternative)	
Cost	Capital Cost Present Worth of Long-term Monitoring and Maintenance Total Present Worth Cost	$2,700,000 $900,000 $3,600,000

3. Allendale Pond and Lyman Mill Pond Sediment Alternatives Analyzed

The Allendale and Lyman Mill Ponds sediment alternatives analyzed for the Site included:

- No Action (Alternative 1)
- Excavation and Disposal and/or Treatment (Alternative 7)
- Partial Excavation, Isolation Capping and Disposal and/or Treatment (Alternative 8)
- Dam Replacement, Excavation and Disposal and/or Treatment (Alternative 10)
- Dam Replacement, Partial Excavation, Isolation Capping and Disposal and/or Treatment (Alternative 11)

Each of the five Allendale Pond and Lyman Mill Pond sediment alternatives is summarized below.

No Action (Alternative 1)

No Action (Alternative 1) is intended to provide a baseline against which other alternatives can be compared, as required by the NCP. The No Action Alternative consists of periodic monitoring triggered by severe weather events and five year reviews of site conditions, but does not include any active remediation, maintenance or improvement to existing site conditions, such as Site fencing, or ICs. Alternative-specific ARARs are presented in the FS Addendum, Appendix O, Table 6-2.

Treatment Components	None	
Removal Components	None	
Institutional Control Components	No ICs	
Mitigation	None	
Monitoring Requirements	Periodic monitoring triggered by severe storm events	
Operation and Maintenance Requirements	Review of the Allendale and Lyman Mill Reaches conditions and risks at five year intervals	
Estimated Time to Design and Construct	n/a	
Estimated Time to Reach Remedial Action Objectives	Not for the foreseeable future	
Cost	Capital Cost Present Worth of Long-term Monitoring and Maintenance Total Present Worth Cost	$0 $450,000 $450,000

Excavation and Disposal and/or Treatment (Alternative 7)

Excavation and Disposal and/or Treatment (Alternative 7) consists of measures including excavation of all contaminated sediment above cleanup levels from the Allendale and Lyman Mill Ponds (155,800 cy for Options a, d and e and 123,500 cy for Option b (volumes are prior to dewatering)) after lowering water in the Ponds; disposal and/or treatment of the excavated sediment in accordance with four disposal Options (7a, b, d, e) evaluated; placing a thin-layer cover (6-inch sand) over areas of residual or deeper contamination if required by confirmatory sediment sampling; long–term monitoring, O&M and ICs for any CDFs (Options a, b) or operation of on-site incinerator (Option d); and wetland/floodplain mitigation and replacement of flood storage capacity depending on disposal option used. This alternative meets all ARARs with the exception of Option b which does not meet wetlands/floodplain requirements. ARARs are presented in the FS Addendum, Table 6-5.

Treatment Components (after dewatering)[1]	• Options 7a and 7e – 9,800 cy treated • Option 7b – none treated (because not subject to alternative treatment standards as contained within the Area Of Contamination) • Option 7d – all (98,000 cy) treated These estimated volumes are dewatered sediment and include 0.25 ft over-excavation allowance
Removal Components	Contaminated sediment removed from River: • Option 7a – 155,800 cy – 90% contained in upland CDF – remainder treated • Option 7b – none – 100% contained in near shore CDF within River • Option 7d – 155,800 cy – 100% treated therefore no containment required • Option 7e – 155,800 cy – 100% shipped offsite for treatment/disposal
Institutional Control Components	• ICs for containment disposal facilities (Options 7a and 7b) to prevent activities that could impact integrity of the CDFs and Allendale and Lyman Mill Dams (Option b) (likely Rhode Island land use restriction)

Mitigation	• Minimize soil compaction and vegetation destruction during construction • Benthic habitat layer (thin-layer cover if needed), submerged woody material and fish restocking • In-lieu-fee arrangements or out-of-kind mitigation/uplands preservation/wetland restoration, along western shore of Lyman Mill Pond (Option 7b and potentially Option 7a) • Mitigation of wetlands/floodplain and/or replacement of flood storage capacity as required		
Monitoring Requirements	• Periodic sediment, surface water and benthic and fish monitoring, including monitoring downstream from the Lyman Mill Dam • Periodic monitoring of any containment facilities (Options 7a and 7b), including groundwater monitoring		
Operation and Maintenance Requirements	• Maintenance of any containment disposal facilities (Options 7a and 7b) • Review of the Allendale and Lyman Mill Reaches conditions and risks every five years		
Estimated Time to Design and Construct	• Design 1 year • Construction 2 years		
Cost[3]	Capital Cost	Option 7a, Upland CDF	$58,000,000
		Option 7b, On-site Near Shore CDF	$44,000,000
		Option 7d, On-site Incineration	$115,000,000
		Option 7e, Off-site Disposal and/or Treatment	$90,000,000
	Present Worth of Long-term Monitoring and Maintenance	Option 7a, Upland CDF	$2,800,000
		Option 7b, On-site Near Shore CDF	$2,900,000
		Option 7d, On-site Incineration	$2,700,000
		Option 7e, Off-site Disposal and/or Treatment	$2,900,000
	Total Present Worth Cost	Option 7a, Upland CDF	$61,000,000
		Option 7b, On-site Near Shore CDF	$47,000,000
		Option 7d, On-site Incineration	$118,000,000
		Option 7e, Off-site Disposal and/or Treatment	$93,000,000

Notes:
1. An estimated 10 percent of excavated, dewatered sediment (Options 7a) (the amount that exceeds the LDR alternative treatment standards) would require treatment
2. Time to reach RAOs is estimated from the start of construction
3. Additional cost to comply with the National Historic Preservation Act (NHPA) $210,000 to $240,000

Partial Excavation, Isolation Capping and Disposal and/or Treatment (Alternative 8)

Partial Excavation, Isolation Capping and Disposal and/or Treatment (Alternative 8) consists of measures including partial excavation of contaminated sediment from the Allendale and Lyman Mill Pond areas most susceptible to erosion or with the highest contamination after lowering water in the Ponds (64,400 cy for options a, d and e and 56,500 cy for Option b [out of a total of 155,800 cy of contaminated sediment]); disposal and/or treatment of the excavated sediment in accordance with four disposal options (8a, b, e, d) evaluated; capping the entire bottom of Allendale and Lyman Mill Ponds; long-term monitoring, O&M and ICs for the isolation cap in the Ponds and any CDFs (Options a, b), or operation of on-site incinerator (Option d); and wetland/floodplain mitigation and replacement of flood storage capacity as required. This alternative will not meet wetlands and floodplain requirements. ARARs are presented in the FS Addendum, Table 6-8.

<table>
<tr><td>Treatment Components (after dewatering)[1]</td><td colspan="3">• Options 8a and 8e – 4,100 cy treated
• Option 8b – none treated
• Option 8d – all (41,000 cy) treated
These estimated volumes are dewatered sediment and include 0.25 ft over-excavation allowance</td></tr>
<tr><td>Removal Components</td><td colspan="3">Contaminated sediment removed from River:
• Option 8a – 64,400 cy – 90% contained in upland CDF – remainder treated
• Option 8b – none – 100% contained in River
• Option 8d – 64,400 cy – 100% treated therefore no containment required
• Option 8e – 64,400 cy – 100% shipped offsite for treatment/disposal</td></tr>
<tr><td>Institutional Control Components</td><td colspan="3">• ICs for the isolation cap, containment disposal facilities (Options 8a and 8b) to restrict future excavation or dredging, and limit boating use in the ponds, prevent activities that could impact integrity of the CDFs and Allendale and Lyman Mill Dams</td></tr>
<tr><td>Mitigation</td><td colspan="3">• Minimize soil compaction and vegetation destruction during construction
• Benthic habitat layer (isolation cap), submerged woody material and fish restocking
• In-lieu-fee arrangements or out-of-kind mitigation/uplands preservation/wetland restoration, along western shore of Lyman Mill Pond (Option 8b and potentially Option 8a)
• Mitigation of wetlands/floodplain and/or replacement of flood storage capacity as required</td></tr>
<tr><td>Monitoring Requirements</td><td colspan="3">• Periodic isolation cap, sediment, surface water and benthic and fish monitoring, including monitoring downstream from the Lyman Mill Dam
• Periodic monitoring of any containment facilities (Options 8a and 8b), including groundwater monitoring</td></tr>
<tr><td>Operation and Maintenance Requirements</td><td colspan="3">• Maintenance of any containment disposal facilities (Options 8a and 8b)
• Maintenance of the isolation cap
• Review of the Allendale and Lyman Mill Reaches conditions and risks every five years</td></tr>
<tr><td>Estimated Time to Design and Construct</td><td colspan="3">• Design 1 year
• Construction 2 years</td></tr>
<tr><td>Estimated Time to Reach Remedial Action Objectives[2]</td><td colspan="3">• 2 years for contact recreation
• 2-5 years for ecological receptors to recover and have no unacceptable impacts and for fish consumption advisory to be lifted</td></tr>
<tr><td rowspan="3">Cost[3]</td><td>Capital Cost</td><td>Option 8a, Upland CDF
Option 8b, On-site Near Shore CDF
Option 8d, On-site Incineration
Option 8e, Off-site Disposal and/or Treatment</td><td>$41,000,000
$32,000,000
$63,000,000
$52,000,000</td></tr>
<tr><td>Present Worth of Long-term Monitoring and Maintenance</td><td>Option 8a, Upland CDF
Option 8b, On-site Near Shore CDF
Option 8d, On-site Incineration
Option 8e, Off-site Disposal and/or Treatment</td><td>$4,500,000
$4,600,000
$4,100,000
$4,700,000</td></tr>
<tr><td>Total Present Worth Cost</td><td>Option 8a, Upland CDF
Option 8b, On-site Near Shore CDF
Option 8d, On-site Incineration
Option 8e, Off-site Disposal and/or Treatment</td><td>$45,000,000
$36,000,000
$67,000,000
$57,000,000</td></tr>
</table>

Notes:
1. An estimated 10 percent of excavated, dewatered sediment (Options 8a) (the amount that exceeds the LDR alternative treatment standards) would require treatment
2. Time to reach RAOs is estimated from the start of construction
3. Additional cost to comply with the National Historic Preservation Act (NHPA) $210,000 to $240,000

Dam Replacement, Excavation and Disposal and/or Treatment (Alternative 10)

Dam Replacement, Excavation and Disposal and/or Treatment (Alternative 10) consists of measures including the replacement of the existing Allendale and Lyman Mill dams with smaller weir structures; excavation of all contaminated sediment above cleanup levels from the Allendale and Lyman Mill Ponds (155,800 cy for options a, d and e and 111,800 cy for Option b); disposal and/or treatment of the excavated sediment in accordance with four disposal options (10a, b, d, e) evaluated; placing a thin-layer cover (6-inch sand) over areas of residual or deeper contamination if required in the newly created footprint of smaller water bodies; long–term monitoring, O&M and ICs for any CDFs (Options a, b), or operation of on-site incinerator (Option d); and wetland/floodplain mitigation and replacement of flood storage capacity depending on the disposal option used. This alternative will not meet wetlands requirements. In addition, Option b would not meet wetlands and floodplain requirements. ARARs are presented in the FS Addendum, Table 6-10.

Treatment Components (after dewatering)[1]	• Options 10a and 10e – 9,800 cy treated • Option 10b – none treated • Option 10d – all (98,000 cy) treated These estimated volumes are dewatered sediment and include 0.25 ft over-excavation allowance
Removal Components	Contaminated sediment removed from River: • Option 10a – 155,800 cy – 90% contained in upland CDF – remainder treated • Option 10b – none – 100% contained in River • Option 10d – 155,800 cy – 100% treated therefore no containment required • Option 10e – 155,800 cy – 100% shipped offsite for treatment/disposal
Institutional Control Components	• ICs for containment disposal facilities (Options 10a and 10b) to prevent activities that could impact integrity of the CDFs and the weir structures replacing Allendale and Lyman Mill Dams (Option b)
Mitigation/	• Minimize soil compaction and vegetation destruction during construction • Benthic habitat layer (thin-layer cover if needed), submerged wood material and fish restocking • New wetland/floodplain riparian zone within former pond footprint • In-lieu-fee arrangements or out-of-kind mitigation/uplands preservation/wetland restoration and/or preservation, along western shore of Lyman Mill pond (Option 10b and potentially Option 10a) • In-place mitigation by increased fish passage for anadromous populations • Mitigation of wetlands/floodplain and/or replacement of flood storage capacity as required
Monitoring Requirements	• Periodic sediment, surface water and benthic and fish monitoring, including monitoring downstream from the Lyman Mill Dam • Periodic monitoring of any containment facilities (Options 10a and 10b), including groundwater monitoring
Operation and Maintenance Requirements	• Maintenance of any containment disposal facilities (Options 10a and 10b) • Review of the Allendale and Lyman Mill Reaches conditions and risks every five years
Estimated Time to Design and Construct	• Design 1 year • Construction 2 years
Estimated Time to Reach Remedial Action Objectives[2]	• 2 years for contact recreation • 2-5 years for ecological receptors to recover and have no unacceptable impacts and for fish consumption advisory to be lifted

Cost[3]	Capital Cost	Option 10a, Upland CDF Option 10b, On-site Near Shore CDF Option 10d, On-site Incineration Option 10e, Off-site Disposal and/or Treatment	\$59,000,000 \$47,000,000 \$116,000,000 \$91,000,000
	Present Worth of Long-term Monitoring and Maintenance	Option 10a, Upland CDF Option 10b, On-site Near Shore CDF Option 10d, On-site Incineration Option 10e, Off-site Disposal and/or Treatment	\$2,800,000 \$3,000,000 \$2,700,000 \$2,900,000
	Total Present Worth Cost	Option 10a, Upland CDF Option 10b, On-site Near Shore CDF Option 10d, On-site Incineration Option 10e, Off-site Disposal and/or Treatment	\$62,000,000 \$50,000,000 \$119,000,000 \$94,000,000

Notes:
1. An estimated 10 percent of excavated, dewatered sediment (Options 10a) (the amount that exceeds the LDR alternative treatment standards) would require treatment
2. Time to reach RAOs is estimated from the start of construction
3. Additional cost to comply with the National Historic Preservation Act (NHPA) \$210,000 to \$240,000

Dam Replacement, Partial Excavation, Isolation Capping and Disposal and/or Treatment (Alternative 11)

Dam Replacement, Partial Excavation, Isolation Capping and Disposal and/or Treatment (Alternative 11) consists of measures including the replacement of the existing Allendale and Lyman Mill Dams with smaller weir structures; partial excavation of contaminated sediment from the footprints of the smaller water bodies created in Allendale and Lyman Mill Ponds (59,800 cy for all disposal options a, b, d, e and f); disposal and/or treatment of the excavated sediment, in accordance with five disposal options (11a, b, d, e, f); placing a thin-layer cover (6-inch sand) over areas of residual or deeper contamination if required in the excavated areas; relocation of deeper clean sediment over the contaminated sediment in the newly created floodplain to shape and maximize new areas of the Ponds; installation of a cap in areas outside the new water body; long-term monitoring, O&M and/or ICs for the isolation cap (including cap over sediment consolidation area under Option f), any CDFs (Options a, b), or operation of on-site incinerator (Option d); and wetland mitigation and replacement of flood storage capacity depending on the disposal option used. This alternative will not meet wetlands and floodplain requirements. In addition, Options b and f would not meet ARARs. ARARs are presented in the FS Addendum, Table 6-12.

Treatment Components (after dewatering)[1]	• Options 11a and 11e – 3,800 cy treated • Option 11b – none treated • Option 11d – all (38,000 cy) treated • Option 11f – none treated These estimated volumes are dewatered sediment and include 0.25 ft over-excavation allowance
Removal Components	Contaminated sediment removed from River: • Option 11a – 59,800 cy – 90% contained in upland CDF – remainder treated • Option 11b – none – 100% contained in River • Option 11d – 59,800 cy – 100% treated therefore no containment required • Option 11e – 59,800 cy – 100% shipped offsite for treatment/disposal • Option 11f – none – 100% contained in River

Institutional Control Components	• ICs for containment disposal facilities (Options 11a and 11b) to prevent activities that could impact integrity of the isolation cap, CDFs and the weir structures replacing Allendale and Lyman Mill Dams, to restrict future excavation or dredging, and limit boating use in the ponds		
Mitigation	• Minimize soil compaction and vegetation destruction during construction • Establishment and maintenance of vegetation suitable for the cap within former pond footprint • Fish restocking • In-lieu-fee arrangements or out-of-kind mitigation/uplands preservation/wetland restoration and/or preservation, along western shore of Lyman Mill pond (Option 11b and potentially Option 11a) • In-place mitigation by increased fish passage for anadromous populations • Mitigation of wetlands/floodplain and or replacement of flood storage capacity as required		
Monitoring Requirements	• Periodic cap, sediment, surface water and benthic and fish monitoring, including monitoring downstream from the Lyman Mill Dam • Periodic monitoring of any containment facilities (Options a, b, f), including groundwater monitoring		
Operation and Maintenance Requirements	• Maintenance of any containment disposal facilities (Options 11a and 11b) • Maintenance of an isolation cap • Review of the Allendale and Lyman Mill Reaches conditions and risks every five years		
Estimated Time to Design and Construct	• Design 1 year • Construction 2 years (1 year for option 11f (Consolidation))		
Estimated Time to Reach Remedial Action Objectives[2]	• 2 years for contact recreation • 2-5 years for ecological receptors to recover and have no unacceptable impacts and for fish consumption advisory to be lifted		
Cost[3]	Capital Cost	Option 11a, Upland CDF Option 11b, On-site Near Shore CDF Option 11d, On-site Incineration Option 11e, Off-site Disposal and/or Treatment Option 11f, On-site Consolidation	$38,000,000 $32,000,000 $60,000,000 $49,000,000 $30,000,000
	Present Worth of Long-term Monitoring and Maintenance	Option 11a, Upland CDF Option 11b, On-site Near Shore CDF Option 11d, On-site Incineration Option 11e, Off-site Disposal and/or Treatment Option 11f, On-site Consolidation	$4,500,000 $4,600,000 $4,100,000 $4,700,000 $4,500,000
	Total Present Worth Cost	Option 11a, Upland CDF Option 11b, On-site Near Shore CDF Option 11d, On-site Incineration Option 11e, Off-site Disposal and/or Treatment Option 11f, On-site Consolidation	$42,000,000 $37,000,000 $64,000,000 $54,000,000 $35,000,000

Notes:
1. An estimated 10 percent of excavated, dewatered sediment (Option 11a) (the amount that exceeds the LDR alternative treatment standards) would require treatment
2. Time to reach RAOs is estimated from the start of construction
3. Additional cost to comply with the National Historic Preservation Act (NHPA) $290,000 to $350,000

4. Allendale Floodplain Soil Alternatives Analyzed

The Allendale Floodplain Soil alternatives analyzed for the Site included:

- No Action (Alternative 1)
- Excavation and Disposal and/or Treatment (Alternative 5)

Each of the two Allendale Floodplain Soil alternatives is summarized below.

No Action (Alternative 1)

No Action (Alternative 1) is intended to provide a baseline against which other alternatives can be compared, as required by the NCP. The No Action Alternative consists of Five-Year reviews and periodic monitoring triggered by severe storm events, but does not include any active remediation, maintenance or improvements to existing Site conditions, such as Site fencing, or ICs. This alternative would not meet RIDEM residential direct exposure criteria or risk based cleanup levels based upon TBC requirements. ARARs are presented in the FS Addendum, Appendix O, Table 6-17.

Treatment Components	None	
Removal Components	None	
Institutional Control Components	None	
Mitigation	None	
Monitoring Requirements	Periodic monitoring triggered by severe storm events	
Operation and Maintenance Requirements	Review conditions and risks at five year intervals	
Estimated Time to Design and Construct	n/a	
Estimated Time to Reach Remedial Action Objectives	Not for the foreseeable future	
Costs	Capital Cost Present Worth of Long-term Monitoring and Maintenance Total Present Worth Cost *(Costs for periodic monitoring and Five-Year reviews are covered under the sediment No Action alternative)*	$0 $0 $0

Excavation and Disposal and/or Treatment (Alternative 5)

Excavation and Disposal and/or Treatment (Alternative 5) consists of measures including excavation of all contaminated floodplain soil to a depth of 1 ft or deeper, if required, that exceeds RIDEM residential direct exposure criteria or risk-based cleanup level for dioxin and other contaminants, or could migrate further downstream; disposal and/or treatment of the excavated soil in accordance with four disposal options (5a, b, d, e) evaluated; long-term monitoring, O&M and ICs for any CDFs (Options a, b), or operation of on-site incinerator (Option d); wetland mitigation; and replacement of flood storage capacity (Option b). Option b would not meet floodplain requirements. This alternative also includes excavation and disposal of floodplain soil from residential-use properties that exceed RIDEM residential direct exposure criteria and/or residential human health risk based cleanup levels for dioxin and other contaminants in soil. Precautionary measures to prevent exposures such as fencing or spreading a cover (e.g., mulch or clean soil) would be taken on residential-use soil in the interim. ARARs are presented in the FS Addendum, Appendix O, Table 6-19.

Treatment Components[1]	• Options 5a, 5b and 5e – none treated • Option 5d – all (6,600 cy) treated		
Removal Components	Contaminated soil removed: • Option 5a – 6,600 cy – 100% contained in upland CDF • Option 5b – none – 100% contained in River • Option 5d – 6,600 cy – 100% treated therefore no containment required • Option 5e – 6,600 cy – 100% shipped offsite for treatment/disposal *Volumes include potential 4,200 cy residential-use soil from eastern shore of Allendale Pond*		
Institutional Control Components	ICs for containment disposal facilities (Options 5a and 5b) to prevent activities that could impact integrity of the CDFs		
Mitigation	• Minimize soil compaction and vegetation destruction during construction • Filling, grading and planting wetland shrub/tree/herbaceous seed mix and stream/river bank stabilization in excavated areas • Uplands preservation/wetland restoration/wetland enhancement (Option 5b and potentially Option 5a) • Mitigation of wetlands and/or replacement of flood storage capacity as required		
Monitoring Requirements	• Periodic monitoring to assess biota recovery, including monitoring of downstream areas • Periodic monitoring of any containment facilities (Options 5a, b), including groundwater monitoring		
Operation and Maintenance Requirements	• Maintenance of any on-site containment disposal facilities (Options 5a, b) • Review of the Allendale Reach conditions and risks every five years		
Estimated Time to Design and Construct	• Design 1 year • Construction 1 month		
Estimated Time to Reach Remedial Action Objectives[2]	• 1 month for recreational use; several days per residential use property (to be done concurrently with Allendale Pond sediment cleanup) • Several years for ecological recovery (floodplain soil infauna, riparian vegetation, and wildlife)		
Cost[3]	Capital Cost	Option 5a, Upland CDF Option 5b, On-site Near Shore CDF Option 5d, On-site Incineration Option 5e, Off-site Disposal and/or Treatment	\$2,000,000 \$2,000,000 \$7,900,000 \$5,600,000
	Present Worth of Long-term Monitoring and Maintenance	Option 5a, Upland CDF Option 5b, On-site Near Shore CDF Option 5d, On-site Incineration Option 5e, Off-site Disposal and/or Treatment	\$100,000 \$100,000 \$100,000 \$100,000
	Total Present Worth Cost	Option 5a, Upland CDF Option 5b, On-site Near Shore CDF Option 5d, On-site Incineration Option 5e, Off-site Disposal and/or Treatment	\$2,100,000 \$2,100,000 \$8,000,000 \$5,700,000

Notes:
1. Assumes concentrations are below the LDR alternative treatment standards for soil
2. Time to reach RAOs is estimated from the start of construction
3. Additional cost to comply with the National Historic Preservation Act (NHPA) \$240,000 to \$275,000

5. Lyman Mill Stream Sediment and Floodplain Soil (including Oxbow) Alternatives Analyzed

The Lyman Mill Stream Sediment and Floodplain Soil (including Oxbow) alternatives analyzed for the Site included:

- No Action (Alternative 1)
- Targeted Excavation, Enhanced Natural Recovery, and Disposal and/or Treatment (Alternative 3)
- Partial Excavation, Enhanced Natural Recovery, and Disposal and/or Treatment (Alternative 5)

Each of the three Lyman Mill Stream and Floodplain Soil (including Oxbow) alternatives is summarized below.

No Action (Alternative 1)

No Action (Alternative 1) is intended to provide a baseline against which other alternatives can be compared, as required by the NCP. The No Action Alternative consists of Five-Year reviews and periodic monitoring triggered by severe storm events, but does not include any active remediation, maintenance or improvements to existing site conditions, or ICs. This alternative would not meet RIDEM residential direct exposure criteria or risk based cleanup levels based upon TBC requirements. ARARs are presented in the FS Addendum, Table 6-23.

Treatment Components	None	
Removal Components	None	
Institutional Control Components	None	
Mitigation	None	
Monitoring Requirements	Periodic monitoring triggered by severe storm events	
Operation and Maintenance Requirements	Review of Lyman Mill Reach conditions and risks at five year intervals	
Estimated Time to Design and Construct	n/a	
Estimated Time to Reach Remedial Action Objectives	Not for the foreseeable future (estimated over 200 years)	
Cost	Capital Cost Present Worth of Long-term Monitoring and Maintenance Total Present Worth Cost	$0 $250,000 $250,000

Targeted Excavation, Enhanced Natural Recovery, and Disposal and/or Treatment (Alternative 3)

Targeted Excavation, Enhanced Natural Recovery, and Disposal and/or Treatment (Alternative 3) consists of measures including excavation of floodplain soil that exceeds RIDEM residential direct exposure criteria or exceeds non-cancer health effects threshold level for dioxin in recreational-use soil, and excavation of sediment that exceeds human health risk-based cleanup levels and sediment from erosional areas such as the stream channel (soil to be excavated to a depth of 1 ft and sediment to be excavated from the top 1-3 ft, or deeper if required); placement of a thin–layer cover over the remaining areas with contaminant concentrations above cancer risk-based criteria for recreational visitors and wildlife to enhance natural recovery; disposal and/or treatment of the excavated soil and sediment in accordance with four disposal options (3a, b, d, e) evaluated; installation of flow-control structures in the stream channel to enhance deposition in the Oxbow; long-term monitoring, O&M and ICs for any CDFs and the thin-layer cover, or operation of on-site incinerator (Option d); wetland mitigation; and replacement of flood storage capacity (Option b). Application of soil slurry as a thin-layer cover in a heavily vegetated wetland area is an innovative approach. This alternative also includes excavation and disposal of floodplain soil from residential-use properties that exceed RIDEM residential direct exposure criteria and/or residential human health risk-based cleanup levels for dioxin and other contaminants in soil. Precautionary measures to prevent exposures such as fencing or spreading a cover (e.g., mulch or clean soil) would be taken on residential-use soil in the interim. This alternative would not meet RCRA closure/location standards outside of the residential areas. In addition, Option b would not meet wetlands/floodplain requirements. ARARs are presented in the FS Addendum, Table 6-25.

Treatment Components[1]	• Options 3a and 3e – 2,100 cy treated • Option 3b – none treated • Option 3d – 26,100 cy treated
Removal Components	Contaminated soil removed: • Option 3a – 26,100 cy – 90% contained in upland CDF – remainder treated • Option 3b – none – 100% contained in River • Option 3d – 26,100 cy – 100% treated therefore no containment required • Option 3e – 26,100 cy – 100% shipped offsite for treatment/disposal *Volumes include potential 5,600 cy residential-use soil from eastern shore of Lyman Mill Pond*
Institutional Control Components	ICs to prevent disturbance of the thin-layer cover and for containment disposal facilities (Options 3a and 3b) to prevent activities that could impact integrity of the CDFs and the dams
Mitigation	• Additional habitat functional assessments • Minimize soil compaction and vegetation destruction during construction • Filling, grading and planting wetland shrub/tree/herbaceous seed mix and stream/river bank stabilization to restore bank vegetation in excavated areas • Use of BMPs (best management practices) to minimize impacts to potential vernal pools • Uplands preservation/wetland restoration/wetland enhancement (Option 3b and potentially Option 3a) • Mitigation of wetlands/floodplain and replacement of flood storage capacity as required

Monitoring Requirements	• Periodic monitoring of the thin-layer cover, soil, sediment, biota, and surface water, including monitoring of downstream areas • Periodic monitoring of any containment facilities (Options 3a, b), including groundwater monitoring		
Operation and Maintenance Requirements	• Maintenance of Allendale Dam and flow-control structures in the Oxbow • Maintenance of any containment facilities (Options 3a, b) • Review of Lyman Mill Reach conditions and risks every five years		
Estimated Time to Design and Construct	• Design 1 year • Construction 1 year		
Estimated Time to Reach Remedial Action Objectives[2]	• 4 years for recreational use (boardwalks and fencing can be used before RAOs are achieved), several days per residential use property (to be done concurrently with Lyman Mill Pond sediment cleanup) • 30 years for ecological recovery with extensive habitat mitigation		
Cost[3]	Capital Cost	Option 3a, Upland CDF Option 3b, On-site Near Shore CDF Option 3d, On-site Incineration Option 3e, Off-site Disposal and/or Treatment	\$16,500,000 \$13,200,000 \$38,600,000 \$29,400,000
	Present Worth of Long-term Monitoring and Maintenance	Option 3a, Upland CDF Option 3b, On-site Near Shore CDF Option 3d, On-site Incineration Option 3e, Off-site Disposal and/or Treatment	\$2,900,000 \$2,900,000 \$2,600,000 \$2,600,000
	Total Present Worth Cost	Option 3a, Upland CDF Option 3b, On-site Near Shore CDF Option 3d, On-site Incineration Option 3e, Off-site Disposal and/or Treatment	\$19,400,000 \$16,100,000 \$41,200,000 \$32,000,000

Notes:
1. An estimated 10 percent of excavated sediment (Options 3a and 3e) (the amount that exceeds the LDR alternative treatment standards) would require treatment
2. Time to reach RAOs is estimated from the start of construction
3. Additional cost to comply with the National Historic Preservation Act (NHPA) \$290,000 to \$350,000

Partial Excavation, Enhanced Natural Recovery, and Disposal and/or Treatment (Alternative 5)

Partial Excavation, Enhanced Natural Recovery, and Disposal and/or Treatment (Alternative 5) consists of measures including excavation of floodplain soil that exceeds RIDEM residential direct exposure criteria or non-cancer health effects threshold level for dioxin in recreational-use soil, excavation of sediment that exceeds human health risk-based cleanup levels and from erosional areas such as the stream channel, and sediment/soil from areas with the most frequent human exposure (soil to be excavated to a depth of 1 ft and sediment to be excavated from the top 1-3 ft, or deeper if required); placement of a thin–layer cover over the remaining areas with contaminant concentrations above cancer risk-based criteria for recreational visitors and wildlife to enhance natural recovery; disposal and/or treatment of the excavated soil and sediment in accordance with four disposal options (5a, b, d, e) evaluated; installation of flow-control structures in the stream channel to enhance deposition in the Oxbow; long-term monitoring, O&M and ICs for any CDFs and thin-layer cover, or operation of on-site incinerator (Option d); wetland mitigation; and replacement of flood storage capacity (Option b). Application of soil slurry as a thin-layer cover in a heavily vegetated wetland area is an innovative approach. This alternative also includes excavation and disposal of floodplain soil from residential-use properties that exceed RIDEM residential direct exposure criteria and/or residential human health risk-based cleanup levels for dioxin and other contaminants in soil. Precautionary measures to prevent exposures such as fencing or spreading a cover (e.g., mulch or clean soil) are to be taken on residential-use soil in the interim. This alternative would not meet RCRA closure/location standards outside of the residential areas or wetlands requirements. In addition, Option b would not meet floodplain requirements. ARARs are presented in the FS Addendum, Table 6-27.

Treatment Components[1]	• Options 5a and 5e – 5,100 cy treated • Option 5b – none treated • Option 5d – 56,500 cy treated
Removal Components	Contaminated soil removed: • Option 5a – 56,500 cy – 90% contained in upland CDF – remainder treated • Option 5b – none – 100% contained in River • Option 5d – 56,500 cy – 100% treated therefore no containment required • Option 5e – 56,500 cy – 100% shipped offsite for treatment/disposal *Volumes include potential 5,600 cy residential-use soil from eastern shore of Lyman Mill Pond*
Institutional Control Components	ICs to prevent disturbance of the thin-layer cover and for containment disposal facilities (Options 5a and 5b) to prevent activities that could impact integrity of the CDFs and the dams
Mitigation	• Additional habitat functional assessments • Minimize soil compaction and vegetation destruction during construction • Filling, grading and planting wetland shrub/tree/herbaceous seed mix and stream/river bank stabilization to restore bank and riparian vegetation in excavated areas • Use of BMPs to minimize impacts to potential vernal pools • Uplands preservation/wetland restoration/wetland enhancement (Option 5b and potentially Option 5a) • Mitigation of wetlands/floodplain and/or replacement of flood storage capacity as required
Monitoring Requirements	• Periodic monitoring of the thin-layer cover, soil, sediment, biota, and surface water, including monitoring of downstream areas • Periodic monitoring of any containment facilities (Options 5a, b), including groundwater monitoring
Operation and Maintenance Requirements	• Maintenance of Allendale Dam and flow-control structures in the Oxbow • Maintenance of any containment facilities (Options 5a, b) • Review of Lyman Mill Reach conditions and risks every five years
Estimated Time to Design and Construct	• Design 1 year • Construction 1 year
Estimated Time to Reach Remedial Action Objectives[2]	• 6 months for recreational use (boardwalks and fencing can be used before RAOs are achieved), several days per residential use property (to be done concurrently with Lyman Mill Pond sediment cleanup) • 25 years for ecological recovery with extensive habitat mitigation

Cost[3]	Capital Cost	Option 5a, Upland CDF Option 5b, On-site Near Shore CDF Option 5d, On-site Incineration Option 5e, Off-site Disposal and/or Treatment	$31,500,000 $23,700,000 $78,600,000 $58,600,000
	Present Worth of Long-term Monitoring and Maintenance	Option 5a, Upland CDF Option 5b, On-site Near Shore CDF Option 5d, On-site Incineration Option 5e, Off-site Disposal and/or Treatment	$2,900,000 $2,900,000 $2,600,000 $2,600,000
	Total Present Worth Cost	Option 5a, Upland CDF Option 5b, On-site Near Shore CDF Option 5d, On-site Incineration Option 5e, Off-site Disposal and/or Treatment	$34,400,000 $26,600,000 $81,200,000 $61,200,000

Notes:
1. An estimated 10 percent of excavated sediment (Options 5a and 5e) (the amount that exceeds the LDR alternative treatment standards) would require treatment
2. Time to reach RAOs is estimated from the start of construction
3. Additional cost to comply with the National Historic Preservation Act (NHPA) $290,000 to $350,000

K. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Section l2l (b)(1) of CERCLA presents several factors that at a minimum EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives.

A detailed analysis was performed on the alternatives using the nine evaluation criteria in order to select a site remedy. The following is a summary of the comparison of each alternative's strengths and weaknesses with respect to the nine evaluation criteria. These criteria are summarized as follows:

1. Threshold Criteria

The two threshold criteria described below must be met in order for the alternatives to be eligible for selection in accordance with the NCP:

1. **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or ICs.
2. **Compliance with applicable or relevant and appropriate requirements (ARARs)** addresses whether or not a remedy will meet all Federal environmental and more stringent State environmental and facility siting standards, requirements, criteria or limitations, unless a waiver is invoked.

2. Primary Balancing Criteria

The following five criteria are utilized to compare and evaluate the elements of one alternative to another that meet the threshold criteria:

1. **Long-term effectiveness and permanence** addresses the criteria that are utilized to assess alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that they will prove successful.

2. **Reduction of toxicity, mobility, or volume through treatment** addresses the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site.
3. **Short term effectiveness** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup levels are achieved.
4. **Implementability** addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.
5. **Cost** includes estimated capital and O&M costs, as well as present-worth costs.

3. Modifying Criteria

The modifying criteria are used as the final evaluation of remedial alternatives, generally after EPA has received public comment on the RI/FS and Proposed Plan:

1. **State acceptance** addresses the State's position and key concerns related to the preferred alternative and other alternatives, and the State's comments on ARARs or the proposed use of waivers.

2. **Community acceptance** addresses the public's general response to the alternatives described in the Proposed Plan and RI/FS report.

Following the detailed analysis of each individual alternative, a comparative analysis, focusing on the relative performance of each alternative against the nine criteria, was conducted for each of the five areas addressed in this ROD. This comparative analysis can be found in more detail in Section 6 of the FS.

The section below presents the criteria and a brief narrative summary of the alternatives and the strengths and weaknesses according to the detailed and comparative analysis.

Source Area Soil
Alternatives:

1 – No Action
3e – Targeted Excavation, Upgrade and Maintain Existing Surfaces, and Off-Site Disposal and/or Treatment
4e—Targeted Excavation, Convert to RCRA Caps and Maintain, and Off-Site Disposal and/or Treatment

Overall Protection of Human Health and the Environment

The RAOs for Source Area soil are to 1) prevent direct human contact with Source Area soil that contain contamination above ARARs and EPA's recommended residential level for PCBs, 2) prevent direct human contact with Source Area soil that contain contamination that would result in a total excess lifetime cancer risk greater than the target risk range of 10^{-6} to 10^{-5}, and/or an HI greater than 1, and 3) prevent leaching or migration of contaminants from vadose zone soil that would result in groundwater contamination in excess of ARARs. The previously described removal actions (interim caps) at the Source Area are temporary measures constructed mainly to prevent direct human contact to the soil and no measures are included to maintain these interim measures in the long term. The No Action alternative would not provide overall protection of human health and the environment in the long term. Because this alternative does not include any long-term monitoring, it would not be possible to determine or evaluate the risks of future exposure.

Alternative 3e (Targeted Excavation, Upgrade and Maintain Existing Surfaces and Disposal and/or Treatment) would provide a higher level of protection compared to the No Action alternative, and Alternative 4e (Targeted Excavation, Convert to RCRA Caps and Maintain and Disposal and/or Treatment) would provide a higher level of protection when compared to Alternative 3e. Both types of caps would be very effective at preventing human contact with the contaminated Source Area soil.

Alternative 4e would provide the highest level of overall protection to human health and the environment. This is the only alternative that would comply with RCRA closure requirements and eliminate precipitation infiltration to the caps and in areas where soil or groundwater contains contamination above the ARARs for GA leachability and federal drinking water standards.

Compliance with ARARs

The No Action alternative will not comply with ARARs. Among the alternatives evaluated, only Alternative 4e will comply with all ARARs, including RCRA Subtitle C requirements for closure. The RCRA cap would also comply with TSCA regulations and would prevent exposure to PCB-contaminated waste as long as the caps are maintained. Alternative 3e would not meet RCRA Subtitle C requirements.

Alternatives 3e and 4e would require the filling of wetlands. Both active alternatives are the least damaging practicable alternatives for wetlands purposes. Both alternatives would result in a permanent occupancy and modification of the floodplain. There is no practicable alternative to doing this work in the floodplain. All other ARARs are met by these alternatives. (Alternative-specific ARARs are presented in the FS Addendum: Table 6-32 [No Action], Table 6-34 [Alternative 3e] and Table 6-36 [Alternative 4e])

Long-Term Effectiveness and Permanence

For Alternative 1, No Action, the residual risk remains high, and there are no ICs to prevent exposure or actions required to maintain the controls currently in place. Although much of the contamination remains under Alternatives 3e and 4e, there are ICs to prevent exposure, and actions required to maintain the controls would be included as part of these alternatives. These controls are only effective if adequately monitored and enforced. Among the alternatives, Alternative 4e would provide the highest long-term effectiveness and permanence because the RCRA/TSCA caps would provide very reliable chemical isolation, require less maintenance and would be designed, constructed, and maintained in compliance with RCRA and TSCA closure requirements.

Reduction of Toxicity, Mobility or Volume through Treatment

Alternative 3e would provide the greatest reduction of toxicity, mobility and volume through treatment, followed by Alternative 4e as Alternative 3 requires a greater volume of material be excavated and treated. The caps under Alternatives 3e and 4e would reduce the mobility of the contaminants through the soil with Alternative 4 providing the greatest reduction in mobility, although not through treatment. The No Action (Alternative 1) would not provide any treatment or reduction in mobility, toxicity or volume.

Short-Term Effectiveness

Alternative 1 would have fewer short-term impacts on the community, the environment and workers compared to Alternatives 3e and 4e because no construction activities would be performed for Alternative 1 and there would be little disruption to the residents of Centredale Manor, Brook Village, or the nearby community.

Alternatives 3e and 4e could be accomplished using routine construction methods, and asphalt paving could be performed using the materials and equipment typically used for routine road construction. However, both alternatives would have similar impacts on the community/workers and involve some disruption to the local residents, as well as the potential for exposure of workers to contamination during excavation activities. Phased construction, engineering controls, dust suppression techniques, and perimeter air monitoring would be undertaken to address potential risks from construction to workers and the community. Appropriate health and safety measures would be used to protect workers from exposure. The total time for on-site construction of Alternative 3e would be about 5 months, and the construction time for Alternative 4e would be about 8 months. Although construction activities would be conducted during regular business hours, there would be an increase in the volume of traffic and noise in the immediate vicinity of the Site.

Implementability

The No Action alternative would not require any action to be taken at the Site, and therefore does not present any implementability issues.

Although the construction work for Alternatives 3e and 4e would be routine, implementation at this Site would be more difficult because the remediation area is in close proximity to apartment buildings with a sensitive population and there is limited space available for material stockpiles, equipment storage, and efficient work operations. In addition, both of these alternatives would result in the filling of wetlands and the permanent occupancy and modification of the floodplain. Impacts to wetlands and floodplains would need to be minimized to the extent possible and mitigation for unavoidable floodplain/wetland impacts would be required, as well as replacement of flood storage capacity.

Alternative 4e is somewhat more difficult to implement compared to Alternative 3e because construction activities would be more extensive, especially in the parking areas with respect to placing the RCRA cap and installing a clean utility corridor.

Coordination with Department of Interior (DOI) would be required under Alternatives 3e and 4e if (during remedial design or remedial action) it is determined that the remedial action may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archaeological data.

Cost

Present worth costs for No Action (Alternative 1) is $170,000. Present worth costs for the action-based alternatives range from $21,700,000 for targeted excavation with the RCRA cap upgrade (Alternative 4e) to $24,800,000 for targeted excavation with the cap upgrade (Alternative 3e). Additional costs for compliance with the NHPA are the same for both action-based alternatives (potentially $120,000 to $135,000 or more in additional costs for Stage 1B cultural resource survey and mitigation).

State Acceptance

The State concurred with the selected Alternative.

Community Acceptance

Some comments received expressing a preference for a RCRA Subtitle C cap and a clear mechanism for long-term maintenance and ICs enforcement. PRPs commented that the extent of proposed capping and excavation was not necessary and preferred to maintain existing surfaces. More detail regarding community acceptance is in the Responsiveness Summary.

Source Area Groundwater

Alternatives:

1 – No Action
2e – Excavation/Dewatering

Alternative 2e: Construction of this Alternative (with the exception of additional monitoring wells) was performed by a Potentially Responsible Party in 2009/2010 as a time-critical removal action. Installation of additional monitoring wells, long-term monitoring, O&M, and Five-Year reviews are part of this ROD remedy.

Overall Protection of Human Health and the Environment

Alternative 1 provides no protection of human health and the environment. Alternative 2e would provide a high level of protection to human health and the environment because targeted contaminant source material from saturated soil would be dewatered and excavated and a RCRA cap installed over the excavation area.

Compliance with ARARs

Alternative 1 would not meet MCLs or non-zero MCLGs. Alternative 2e, in combination with additional source control measures for the Source Area soil, would meet all ARARs, including Safe Drinking Water Act (SDWA) MCLs and non-zero MCLGs and will prevent discharge of contaminants into the Woonasquatucket River above AWQCs. (Alternative-specific ARARs are presented in the FS Addendum, Appendix O: Table 6-39 [No Action], Table 6-41 [Alternative 2e] and Table 6-43 [Alternative 5])

Long-Term Effectiveness and Permanence

Alternative 1 would not provide long-term effectiveness or permanence. Alternative 2e would be highly effective in the long-term (assuming additional source control measures for the Source Area soil) because the residual risk is very low as saturated soil would be permanently removed and a RCRA cap installed over the targeted impacted area. Off-site disposal and/or treatment would provide a high level of long-term effectiveness and permanence as contaminants would be removed from the Site and permanently destroyed.

Reduction of Toxicity, Mobility or Volume through Treatment

Alternative 1 does not include any measures to reduce the toxicity, mobility, or volume of contaminants through treatment. Alternative 2e would reduce contaminant toxicity, mobility, and volume through off-site treatment of contaminated soil and on-site treatment of water during dewatering operation.

Short-Term Effectiveness

For Alternative 1, there would be no short-term impacts. Alternative 2e could have potential impacts to residents from dust and/or VOCs generated during excavation activities. Phased construction, engineering controls, dust suppression techniques, and perimeter air monitoring would be undertaken to address potential risks from construction to workers and the community.

Implementability

Alternative 1 would be the easiest to implement because no active cleanup actions are required. Alternative 2e would be easy to implement technically as the equipment and expertise required would be readily available from commercial vendors. The main difficulty would be presented by proximity of residents to the construction zone and a necessity to provide continuous access to residents. Close coordination with the management of the two apartment complexes should minimize disruption/impacts.

Cost

Total estimated present value is $270,000 for Alternative 1 and $3,600,000 for Alternative 2e (construction at $2,700,000 of capital costs has been implemented).

State Acceptance

The State concurred with the selected Alternative.

Community Acceptance

EPA received no comments on groundwater alternatives other than from the PRPs who questioned EPA's groundwater classification and its effects on the remedial alternatives. More detail regarding community acceptance is in the Responsiveness Summary.

Allendale Pond and Lyman Mill Pond Sediment
Alternatives:

1 – No Action

7 –Excavation and Disposal and/or Treatment
- 7a: containment in an Upland CDF;
- 7b: on-site containment in a Near Shore CDF;
- 7d: on-site incineration; and
- 7e: off-site disposal and/or treatment.

8 –Partial Excavation, Isolation Capping, and Disposal and/or Treatment
- 8a: containment in an Upland CDF;
- 8b: on-site containment in a Near Shore CDF;
- 8d: on-site incineration; and
- 8e: off-site disposal and/or treatment.

10- Dam Replacement, Excavation and Disposal and/or Treatment
- 10a: containment in an Upland CDF;
- 10b: on-site containment in a Near Shore CDF;
- 10d: on-site incineration; and
- 10e: off-site disposal and/or treatment.

11 – Dam Replacement, Partial Excavation, Isolation Capping, and Disposal and/or Treatment
- 11a: containment in an Upland CDF;
- 11b: on-site containment in a Near Shore CDF;
- 11d: on-site incineration;
- 11e: off-site disposal and/or treatment; and
- 11f: on-site consolidation.

Overall Protection of Human Health and the Environment

Human health and ecological risks are directly tied to the contaminated sediments and the consumption of contaminated prey or fish. Cleanup objectives for these alternatives focus on remediating the surface sediments or the biologically active zone. The No Action alternative would not provide any protection of human health or the environment because no active remediation would be conducted.

Among the active alternatives evaluated, Alternatives 7 (Excavation and Disposal and/or Treatment), and 10 (Dam Replacement, Excavation and Disposal and/or Treatment) provide the greatest overall protection of human health and the environment by removing the source of contamination from the River/Ponds which would lower the concentration of contaminants in the surface sediment where exposure is likely, and quickly reduce human health and ecological risk to acceptable levels. Under Alternatives 7 a, d and e and 10 a, d and e, excavation would be highly effective in the long term at this Site because all or nearly all of the sediment with contamination above the cleanup levels would be removed from the River/Ponds and either contained in a secure disposal facility or treated by incineration. This would reduce the human health risk to background levels and would eliminate the risk of sediment with contamination above cleanup levels migrating downstream due to erosion during flood flows as would be the case for Alternatives 8 and 11. Contamination would remain in the floodplain under Options 7b and10b and therefore these options would be less protective overall relative to the other options under Alternatives 7 and 10.

Alternative 8 (Partial Excavation, Isolation Capping and Disposal and/or Treatment) and Alternative 11 (Dam Replacement/ Partial Excavation, Isolation Capping and Disposal and/or Treatment) provide overall protection by partially removing and containing the source of contamination, which would lower the concentration of contaminants in the surface sediment where exposure is most likely. Placement of clean cap material over the entire pond bottom would reduce the surface concentrations so that the cleanup levels would be achieved at the end of construction. Although all of these alternatives would be designed to be secure, some risk remains that sediment above safe levels could be released in the future should catastrophic events occur or if monitoring, maintenance and/or ICs are not effective in the long term. It is important to note in terms of overall protection that a significant volume of contamination remains in the River/Ponds under these alternatives in perpetuity. For these alternatives to be protective in the future it is especially critical that they be adequately monitored and maintained. As a result, the overall protection of human health and the environment of these alternatives while greater than the No Action alternative, is less than those alternatives that remove contamination from the River.

Compliance with ARARs

All alternatives other than the No Action alternative have floodplain/wetlands and Section 404 impacts. Among all the active alternatives, Alternative 7 is the least environmentally damaging practicable alternative for wetlands purposes. The Upland CDF (option a), Incineration (option d) and Off-Site Treatment/Disposal (option e) have similar environmental impacts and therefore would be the least environmentally damaging practicable disposal options. Between the Upland CDF (option a), Near Shore CDF (option b), and On-site Consolidation (option f), clearly the Upland CDF would have the smallest environmental impact because of its location outside wetlands/floodplain. Alternatives 8 and 11 and all alternatives with the Option b disposal have unacceptable floodplain impacts. All other ARARs are met by these alternatives. (Alternative-specific ARARs are presented in the FS Addendum, Appendix O: Table 6-2 [No Action], Table 6-5 [Alternative 7], Table 6-8 [Alternative 8], Table 6-10 [Alternative 10] and Table 6-12 [Alternative 11])

Long-Term Effectiveness and Permanence

The No Action alternative is not considered effective with respect to long-term effectiveness and permanence as residual risk remains high and there are no controls to prevent exposure. Those alternatives that require full excavation and on-site Incineration or off-site disposal and/or treatment (Alternatives 7d, 7e, 10d, and 10e) provide the greatest long-term effectiveness and permanence. Under these alternatives, the excavated material would be completely removed from the River and/ or treated by incineration, which would destroy the organic contaminants.

The remaining hazard is reduced for excavation alternatives where Upland and Nearshore CDFs are used (Alternatives 7a, 7b, 10a, and 10b). Under these alternatives some or all sediment above cleanup levels remains untreated. However, under these alternatives contaminated sediment is either removed from the River and placed in secure upland locations or consolidated along the shore in near shore CDFs. The Upland CDF (Alternatives 7a and 10a) would have a liner, would be outside of the floodplain, and some waste would be treated while the Near shore CDF (Alternatives 7b and 10b) would not be lined, would be located within the floodplain, and no waste would be treated. ICs are necessary to prevent the disturbance of the caps for both CDF options. These controls are only effective if adequately monitored and enforced. There are additional reliability issues for Alternatives 7b and 10b because the CDF is located in the river/floodplain that would affect overall long term effectiveness. Those alternatives that require treatment or off-site disposal (Alternatives 7d, 7e, 10d and 10e) have the least remaining hazard.

The remaining hazard (risk) is highest for those alternatives where contaminated sediment is capped in place (Alternatives 8 and 11). Those alternatives that require some treatment (8d, 8e, 11d and 11e) would leave a smaller volume of waste that would have to be controlled when compared to those where contaminated sediment is either removed from the River and placed in secure upland locations or consolidated along the shore in near shore CDFs (8a, 8b, 11a, 11b). Even though the cap would provide reliable chemical isolation, the inherent hazard remains high as some contaminated sediment remains in the River at high levels. Although the top layer of the cap would be designed to withstand erosion and the Site is a stable depositional area, long-term maintenance and monitoring are critical for these alternatives to adequately and reliably prevent exposure to contamination in the long term as waste would remain in the River in perpetuity. Because contaminated sediment would remain in place, there would still be potential for migration of contaminated sediment downstream. In addition, Alternatives 8 and 11 rely significantly more on long-term ICs including possibly restricting some boating and recreational activities in the River to prevent disturbance of the cap. This is particularly important given that the Ponds will be very shallow once caps are put in place. These controls are only effective if adequately enforced.

Reduction of Toxicity, Mobility or Volume through Treatment

Alternatives 7d and 10d provide the greatest reduction of toxicity, mobility and volume through treatment followed by Alternatives 11d and 8d. Some material would also be treated under Alternatives 7a, 10a, 7e, and 10e, with lesser amounts treated under Alternatives 8a, 11a, 8e, and 11e. The No Action and excavation alternatives utilizing on-site containment in a near shore CDF (7b, 8b, 10b, and 11b) or consolidation (Option 11f) do not require treatment of contaminated material, although all of these alternatives with the exception of No Action reduce mobility.

Short-Term Effectiveness

The No Action alternative has no short-term impacts to the community, the environment or workers beyond what currently exist. The short-term impacts to the community are fairly similar for all alternatives although there are some minor differences for the alternatives that require on-site treatment (Alternatives 7d, 8d, 10d and 11d) and those alternatives that require containment (Alternatives 7a, 7b, 8a, 8b, 10a, 10b, 11a, 11b, and 11f). Those options that require operation of a treatment facility would have air emissions albeit at very low levels. The incinerator exhaust would be treated; however, it is typically not possible to remove all contaminants or odors from the emissions. An on-site incinerator would also utilize fuels such as natural gas or fuel oil, the combustion of which would result in additional exhaust emissions. Alternatives including on-site containment options (Alternatives 7a, 7b, 8a, 8b, 10a, 10b, 11a, 11b, and 11f) would also have some short-term impacts to the areas and community surrounding the CDF sites. Construction activities will temporarily increase during the time work is done in these areas. The short-term impacts to workers are all relatively the same under all alternatives.

There are however, some differences in impacts to the environment under the different alternatives. For those alternatives that require a cap (Alternatives 8 and 11) there could be some short-term water quality impacts due to increased suspended materials during cap placement. Additionally, the placement of the cap material would result in the burial and complete loss of the benthic macroinvertebrate community. Similarly, the excavation or partial excavation alternatives (Alternatives 7, 8, 10 and 11) would result in the complete elimination of the benthic macroinvertebrate and fish communities. One potential difference in short-term impacts between the capping and excavation alternatives would be if the capping alternatives required a more erosion-resistant cover substrate than the excavation alternative. If the capping substrate was less favorable for recolonization by macroinvertebrates, the delay in the reestablishment of the base of the aquatic food web in the Ponds could in turn delay the recovery of the fishery and wildlife populations.

The time for the pond ecosystems to recover to a point where expected services are again routinely provided is dependent on the degree to which habitat restoration features are included in the final design. It is assumed that any mitigation (e.g., biological habitat cap layer,restoration of submerged aquatic vegetation (SAV) or riparian vegetation) could be components of any of the active remedial alternatives so that the short-term effectiveness criterion would not be a discriminator among them. However, as noted above, design criteria associated with the construction of near shore CDFs (i.e., Alternatives 7b, 8b, 10b, and 11b) would limit or prevent the establishment of a functional riparian zone in perpetuity.

With regard to the community, the River edge under the dam replacement alternatives (Alternatives 10 and 11) would now be up to 150 to 200 feet farther west of its present boundary and many residents located along the eastern edge of Allendale and Lyman Mill Ponds would lose waterfront. On the other hand, that area would provide the natural beauty of the developing riparian habitat. In addition, all active alternatives have similar short term construction related impacts to the community (e.g. truck traffic, dust). Generators, heavy equipment, and large trucks would be used during remedy implementation. This would result in a temporary increase in noise and air emissions. These emissions would be within acceptable safe levels. Disposal of sediment/soil would involve transport of excavated materials to an on-site or off-site facility. Phased construction, engineering controls, dust suppression techniques, and perimeter air monitoring would be undertaken to address potential risks from construction to the community. Construction time for all alternatives is estimated at about 2 years. It is expected to take 2-5 years for ecological habitat and fish population to recover.

Implementability

All of the alternatives, except the No Action alternative, present different technical and administrative feasibility issues that make implementability more difficult. Those alternatives that require excavation and containment in Upland and Near shore CDFs (Alternatives 7a, 7b, 8a, 8b, 10a, 10b, 11a, and 11b) will require adequate space for the sediment processing area and potentially permitting for the disposal facility which makes implementability of these options more difficult. Such space must be acquired for the CDFs. In addition, those alternatives that require on-site incineration (Alternatives 7d, 8d, 10d, and 11d) would require the acquisition of adequate land for dewatering, stockpiling, and treatment areas. Additionally, vendors specializing in on site, high-temperature incineration of hazardous waste are needed and the incinerator would be required to meet the air-quality ARAR criteria. Gaining public acceptance is an important component of this option. These issues make implementability of treatment options (Alternatives 7d, 8d, 10d, and 11d) more difficult. Those alternatives that require dam replacement (Alternatives 10 and 11) would also present public acceptance issues that may make implementation more difficult. Under all alternatives other than No Action, impacts to wetlands would need to be minimized to the extent possible and mitigation for unavoidable wetland impacts would be required. Requirements for out-of-kind compensatory mitigation for unavoidable losses of aquatic habitat would be higher for Alternative 10b, followed by Alternatives 11b, 11f, 7b and 8b. Alternatives 7b and 8b would require greater flood storage replacement than Alternatives 10 and 11, which would gain capacity behind the new weir structures.

Coordination with DOI would be required under all Alternatives if (during remedial design or remedial action) it is determined that the remedial action may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archaeological data.

Cost

Present worth costs for No Action (Alternative 1) is $450,000. Present worth costs for the action-based alternatives range from $35,000,000 for dam replacement, partial excavation, isolation capping and on-site consolidation (Alternative 11f) to $119,000,000 for dam replacement, excavation and on-site treatment (Alternative 10d).

State Acceptance

The State concurred with the selected Alternative.

Community Acceptance

There was generally support from the public for EPA’s selected alternative but some expressed concern regarding where excavated sediment/soil would be placed. In addition, some residents abutting the Ponds were concerned about impacts from construction on their properties and quality of life, including short-term health impacts. Some commenters also felt that the River is already cleaner than it was in the past and will not be suitable for unrestricted use due to other sources of contamination. Other stakeholders wanted additional cleanup further downstream into additional reaches of the River. One of the PRPs expressed a preference for alternatives that would remove the dams, reduce the water bodies' extent and cap/consolidate sediment in place or store contaminated material in a near shore CDF. More detail regarding community acceptance is in the Responsiveness Summary.

Allendale Floodplain Soil
Alternatives:

1 – No Action
5 –Excavation and Disposal and/or Treatment
- 5a: containment in an Upland CDF;
- 5b: on-site containment in a Near Shore CDF;
- 5d: on-site incineration; and
- 5e: off-site disposal and/or treatment.

Overall Protection of Human Health and the Environment

Contaminant concentrations in residential- and recreational-use floodplain soil exceed state standards for direct exposure and total excess lifetime cancer risk is greater than the cancer target risk range of 10^{-6} to 10^{-5} and/or HI of 1. Other exposure pathways for floodplain soils are exposure by ecological receptors to contaminants, either directly or through biological uptake. Ecological hazards posed under current conditions are above EPA criteria. The No Action alternative would not provide any protection to human health or the environment because no active remediation would be performed. The excavation and disposal and/or treatment alternative (Alternative 5) provides the greatest overall protection of human health and the environment by removing the source of contamination from the floodplain which would quickly reduce risk to acceptable levels. Excavation would lower the concentrations of contaminants in the surface soil, effectively reducing human health and ecological hazards to background levels. All soil contamination above the cleanup levels would be removed from the floodplain and contained in a disposal facility or treated. This would prevent human and ecological exposure to contamination and eliminate the risk of contaminant migration downstream due to erosion during flood flows, as would be the case for Alternative 1. Under Alternative 5b, the contamination is contained in a CDF constructed in the floodplain, and would be less protective overall relative to the other options under Alternative 5.

Compliance with ARARs

The No Action alternative does not comply with ARARs for state residential direct exposure or risk cleanup levels based upon TBC requirements. Alternative 5 would have wetlands/Section 404 impacts. Alternative 5 is the least damaging practicable alternative for wetlands purposes. Among the disposal and/or treatment options, the Upland CDF (option a), Incineration (option d) and Off-Site Treatment/Disposal (option e) have similar environmental impacts and would be the least damaging practicable alternative. Between the Upland CDF (option a) and Near Shore CDF (option b), clearly the Upland CDF would have the smallest environmental impact because of location outside wetlands/floodplain. Option b disposal has unacceptable floodplain impacts. All other ARARs are met by this alternative. (Alternative-specific ARARs are presented in the FS Addendum, Appendix O: Table 6-17 [No Action] and Table 6-19 [Alternative 5])

Long-Term Effectiveness and Permanence

The No Action alternative is not effective or permanent in the long term and the residual risk remains high. In addition, there are no controls to prevent exposure. Alternative 5 would provide a very high level of risk reduction and low residual risk because the contamination would be removed and either contained in a disposal facility or treated. Among the disposal and/or treatment options, on-site Incineration or off-site disposal and/or treatment (Alternatives 5d and 5e) would provide the greatest long-term effectiveness and permanence as no contamination remains and these options would not rely on ICs and long-term monitoring to be effective in the long term.

The remaining hazard is somewhat higher for the containment options where upland and near shore CDFs are used (Alternatives 5a and 5b) because floodplain soil above cleanup levels remains untreated on Site, and these options would rely on other controls to be effective in the long term. There are additional reliability issues for Alternative 5b because the CDF is located in the river/floodplain. Long-term monitoring, maintenance and ICs are necessary to protect the integrity of both CDF options. These controls are only effective if adequately monitored and enforced.

Reduction of Toxicity, Mobility or Volume through Treatment

Alternative 5d provides the greatest reduction of toxicity, mobility and volume through treatment. No Action and all the excavation alternatives utilizing containment (Alternatives 5a and 5b) or off-site disposal (Alternative 5e) would not require treatment of contaminated material, although the containment and off-site disposal options do reduce mobility.

Short-Term Effectiveness

The No Action alternative has no short-term impacts to the community, the environment or workers. The short-term impacts to the community are fairly similar for all options under Alternative 5 although there are some minor differences for Alternative 5d (on-site treatment) and those alternatives that require on-site containment (Alternatives 5a and 5b). Generators, heavy equipment, and large trucks would be used during remedy implementation. This would result in a temporary increase in noise and air emissions. These emissions would be within acceptable safe levels. Residential properties would have construction impacts as work would be conducted on these properties. Each of these properties would be directly impacted over a few days or weeks concurrent with the Allendale Pond sediment cleanup over approximately 7 months. Precautionary measures to prevent exposure, such as fencing or spreading a cover (e.g., mulch or clean soil) will be taken in the interim. General construction good practices and frequent communications would be required. The alternative that requires operation of a treatment facility (Alternative 5d) would have air emissions albeit at very low levels. The incinerator exhaust would be treated; however, it is typically not possible to remove all contaminants or odors from the emissions. An on-site incinerator would also utilize fuels such as natural gas or fuel oil, the combustion of which would result in additional exhaust emissions. Alternatives including containment (Alternatives 5a and 5b) would also have some short-term impacts to the areas and community surrounding the CDF sites. Construction activities will temporarily increase during the time work is done in these areas. The short-term impacts to workers are all relatively the same under all alternatives and can be addressed through the use of standard health and safety measures.

All options under Alternative 5 would have short-term impacts on the environment due to the elimination of floodplain soil infauna and riparian vegetation and collateral impacts to wildlife that rely on this habitat for shelter and food. The short-term environmental impacts would be minimized by including habitat mitigation as a component of the excavation alternative. The use of an organic loam to backfill excavated areas followed by planting appropriate riparian vegetation (both trees and shrubs) would facilitate the ecological recovery process which is expected to take several years.

Implementability

There are no implementability issues for the No Action alternative because no construction activities would be required. Implementation of Alternative 5 on the residential properties would be in close proximity to residences requiring close coordination with property owners. The disposal and/or treatment options under Alternative 5 present different technical and administrative feasibility issues. The options that require on-site containment (Alternatives 5a and 5b) in conjunction with the sediment on-site disposal options will require adequate space for the soil processing area and disposal facility which makes implementability of these options more difficult. In addition, the option that requires on-site incineration (Alternative 5d) would require acquisition of adequate land for dewatering, stockpiling, and treatment areas for both, sediment and soil. Additionally, vendors specializing in on-site, high-temperature incineration of hazardous waste are needed and the incinerator would be required to meet the air-quality ARAR criteria. Gaining public acceptance is an important component of this option. These issues make implementability of Alternative 5d more difficult.

Coordination with DOI would be required under Alternative 5 if (during remedial design or remedial action) it is determined that the remedial action may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archaeological data.

Cost

Total present worth cost for Alternative 1, No Action, is $0 because costs for periodic monitoring and five-year reviews are covered under the sediment No Action alternative. Total present worth costs for Alternative 5, Excavation and Disposal and/or Treatment range from $2,100,000 for containment (Alternatives 5a and 5b) to $8,000,000 for on-site Incineration (Alternative 5d).

State Acceptance

The State concurred with the selected Alternative.

Community Acceptance

Comments EPA received on the general approach for Allendale and Lyman Mill Ponds sediment and Lyman Mill floodplain alternatives generally also apply to the Allendale Floodplain soil. For the interim measures to prevent exposures while waiting for the long-term cleanup on the residential-use soil in both Allendale and Lyman Mill reaches, the residents expressed an expectation that work will be done to in close coordination with individual property owners to minimize disruptions. More detail regarding community acceptance is in the Responsiveness Summary.

Lyman Mill Stream Sediment and Floodplain Soil (including the Oxbow)
Alternatives:

1-No Action
3-Targeted Excavation, Enhanced Natural Recovery and Disposal and/or Treatment
- 3a: containment in an Upland CDF;
- 3b: on-site containment in a Near Shore CDF;
- 3d: on-site incineration; and
- 3e: off-site disposal and/or treatment.

5-Partial Excavation, Enhanced Natural Recovery and Disposal and/or Treatment
- 5a: containment in an Upland CDF;
- 5b: on-site containment in a Near Shore CDF;
- 5d: on-site incineration; and
- 5e: off-site disposal and/or treatment.

Overall Protection of Human Health and the Environment

Residents living along the River and recreational visitors can be exposed to floodplain soil containing contaminants above RIDEM direct exposure criteria or in excess of target cancer risk range of 10^{-6} - 10^{-5} and/or HI of 1. Consumption of fish and direct contact with sediments can also pose a risk that exceeds target cancer risk range of 10^{-6} -10^{-4} and/or HI of 1. The ecological risks are associated with direct contact exposure with soil and contaminated sediment and consumption of prey items that have bioaccumulated contaminants from these media. Due to the high value of much of the ecological habitat in the Oxbow wetland, the RAOs for that area have been developed in an effort to obtain an optimal balance between the ecological benefits of the removal of contaminated sediment and soil versus the loss and destruction of sensitive habitat. Because of the mature nature of this floodplain forest along with its relative scarcity in this urbanized watershed, the impacts associated with large-scale excavation in the Oxbow would extend out for many decades. As a result, overall protection balances the benefits of reducing human risk with the benefits of protecting valuable existing wetland tree and shrub habitat in the long term. The No Action alternative would provide little protection to either human health or the environment because nothing would be done to address the risks associated with the current exposure pathways. Alternatives 3 and 5 would provide more protection to human health and the environment, with Alternative 5 (Partial Excavation and Enhanced Natural Recovery) providing greater protection.

For residential-use properties, both Alternatives 3 and 5 provide the greatest overall protection of human health and the environment by removing contaminated soil which would quickly reduce risk to acceptable levels. Excavation would lower the concentrations of contaminants in the surface soil, effectively reducing human health to background levels. All soil contamination above the cleanup levels would be removed from the residential-use floodplain and contained in a disposal facility or treated. This would prevent human and ecological exposure to contamination and eliminate the risk of contaminant migration downstream due to erosion during flood flows, as would be the case for Alternative 1. Under Alternatives 3b and 5b, the contamination is contained in a CDF constructed in the floodplain, and would be less protective overall relative to the other options under Alternatives 3 and 5.

For recreational-use areas (including Oxbow), both Alternatives 3 and 5 would protect human health through the targeted excavation of sediment and floodplain soil in areas where there is a greater likelihood of human exposure with Alternative 5 requiring more of the material that presents a risk to be removed. Alternative 5 would provide some protection of ecological receptors even though a larger portion of the area would be excavated and backfilled. The application of the thin-layer cover in the remaining area would also accelerate the natural recovery. This alternative would reduce the potential for downstream transport of contaminants into Lyman Mill Pond when compared to Alternative 3. Alternative 3 also includes placement of the thin-layer cover and, thus, would be similar to Alternative 5 in terms of short-term impacts to ecological receptors.

Compliance with ARARs

Alternative 1 (No Action) would not comply with state ARARs for residential direct exposure or meet the risk based cleanup levels based upon TBC requirements. The action-based alternatives (Alternatives 3 and 5) would both involve the placement of fill in waters of the state/US and the destruction of wetlands. Alternative 3 is the least environmentally damaging practicable alternative for wetlands purposes.

Among the disposal and/or treatment options, the Upland CDF (option a), Incineration (option d) and Off-Site Treatment/Disposal (option e) have similar environmental impacts and therefore would be the least damaging practicable alternatives. Between the Upland CDF (option a) and Near Shore CDF (option b), clearly the Upland CDF would have the smallest environmental impact because it would be located outside wetlands/floodplain. Option b disposal has unacceptable floodplain impacts.

None of the alternatives would satisfy the Subtitle C regulations under RCRA. For Alternatives 3 and 5, a waiver would be required on the basis that placement of a RCRA-compliant cap or constructing one that would prevent washout would create a greater risk to human health and the environment than the proposed cover. All other ARARs are met by these alternatives. (Alternative-specific ARARs are presented in the FS Addendum: Table 6-23 [No Action], Table 6-25 [Alternative 3] and Table 6-27 [Alternative 5])

Long-Term Effectiveness and Permanence

The three alternatives evaluated exhibit a range with respect to the long-term effectiveness and permanence of the remedy. Alternative 1 (No Action) would not be effective in the long term because the risk remains high and there are no controls to prevent exposure.

Alternatives 3 (Targeted Excavation, Enhanced Natural Recovery and Disposal and/or Treatment) and 5 (Partial Excavation, Enhanced Natural Recovery and Disposal and/or Treatment) would be more effective in the long term than the No Action alternative. Excavation of contaminated sediment/soil and placement of clean backfill in areas of potential human exposure and potential downstream migration would provide an increased level of long-term protection of human health and the environment. For residential-use properties, both Alternatives 3 and 5 would provide a very high level of risk reduction and low residual risk because all contamination above cleanup levels would be removed and either contained in a disposal facility or treated.

In the recreational-use areas (including Oxbow), Alternative 5 would provide a greater level of risk reduction than Alternative 3 throughout the post-construction period because more of the contamination would be removed and either contained in a disposal facility or treated. Ultimately (estimated duration of between 25 and 30 years), both action-based alternatives would achieve a low residual risk in these areas. ICs are included as a component of both Alternatives 3 and 5 in order to provide enhanced protectiveness by reducing human exposure to contamination. ICs would also be necessary to prevent the disturbance of the CDFs (Alternatives 3a, 3b, 5a and 5b) and thin-layer cover under Alternatives 3 and 5. These controls are only effective if adequately monitored and enforced. Engineering Controls such as walkways could be used under Alternatives 3 and 5 to provide further protection to human health. There are additional long term reliability issues for Alternatives 3b and 5b because the CDF is located in the river/floodplain. Residual risks to ecological receptors are significantly lower under the active remedial alternatives compared to the No Action alternative.

Other than residential-use areas where all contamination above cleanup levels would be removed, some post-construction risk remains under all action alternatives because contamination above the cleanup levels remains in place in the floodplain under the thin-layer cover for an extended period of time. There are additional long term reliability issues for Options 3b and 5b because the CDF is located in the river/floodplain. Long-term monitoring, maintenance, and ICs are necessary to protect the integrity of both CDF options. These controls are only effective if adequately monitored and enforced.

Reduction of Toxicity, Mobility or Volume through Treatment

Alternatives 5d and 3d would provide the greatest reduction of toxicity, mobility, and volume through treatment, followed by Alternatives 5a and 5e, and Alternatives 3a and 3e. The thin-layer cover (Alternatives 3 and 5) and upland and near shore CDFs containment options (Alternatives 3a, 3b, 5a, and 5b) would reduce the mobility of the contaminants through sediment/soil, although not through treatment (Alternatives 3b and 5b). The No Action alternative (Alternative 1) would not provide any treatment or reduction in mobility, toxicity or volume.

Short-Term Effectiveness

The No Action alternative has no short-term impacts to the community, the environment, or workers. The short-term impacts to the community and on-site workers are fairly similar for the remaining alternatives. Both Alternatives 3 and 5 would result in increased traffic around the site. Generators, heavy equipment, and large trucks would be used during remedy implementation. This would result in a temporary increase in noise and air emissions. These emissions would be within acceptable safe levels. Residential properties would have construction impacts as work would be conducted on these properties. Each of these properties would be directly impacted over a few days or weeks concurrent with the Lyman Mill Pond sediment cleanup estimated at approximately 12.5 months. Precautionary measures to prevent exposure, such as fencing or spreading a cover (e.g., mulch or clean soil) will be taken in the interim. General construction good practices and frequent communications would be required.

Disposal of sediment/soil would involve transport of excavated materials to an on-site or off-site facility. Engineering controls would be implemented to eliminate releases of contaminants during such transport. Additionally, if on-site treatment is utilized (Alternatives 3d and 5d), there would be air emissions associated with the incinerator operations. These emissions would be within acceptable safe levels.

Alternative 5, which includes excavating and backfilling, as well as construction activities related to the various disposal options, would present the most short-term impacts to the environment. In addition to the approximately 3.4 acre residential-use area, the excavation footprint for this alternative is approximately 19.5 acres of ecological habitat and includes areas of emergent marsh, scrub/shrub vegetation, as well as some areas with mature trees. The remaining 9.2 acres of ecological habitat would be covered with 3 inches of enhanced natural cover, which is less invasive, but not without some adverse effects. It is unlikely that 3 inches of material placed within this area would have a substantial deleterious effect on resident biota; however, there would be some disruption to the soil and benthic invertebrate communities as well as to non-woody vegetation. Any soil/sediment removal and backfilling activities will result in destruction of the habitat in the removal and staging areas. Although the remedy would include placing topsoil and planting vegetation at the conclusion of implementation, the emergent marsh and scrub/shrub area habitats are expected to take approximately a decade to fully develop. Mature trees would take even longer (on the order of decades) to become fully restored with respect to vegetative biomass and canopy cover criteria.

Alternative 3 would have somewhat fewer short-term impacts to the environment than Alternative 5 due to the reduced excavation footprint (6.5 acres excavated under Alternative 3 compared to 19.5 acres excavated under Alternative 5). The targeted excavation area in this alternative is limited to those areas that exceed state ARARs for residential direct exposure and above dioxin human health non-cancer threshold level, as well as potentially erosional areas with contamination above the cleanup levels (stream channel and channel areas in southern part of the Oxbow) which would not be suitable for the thin cover. Areas not remediated by excavation would be covered with 3 inches of enhanced natural cover, which is less invasive, but not without some adverse effects (e.g., some disruption to the soil community and the herbaceous stratum, same as Alternative 5). However, for ecological receptors, the time to achieve the target hazard for dioxin is anticipated to take approximately 30 years under Alternative 3 compared to 25 years under Alternative 5. This time differential is the tradeoff associated with the reduced footprint (i.e., approximately 13 fewer acres of impact to wetland vegetation). The delay in achieving the remedial goals (for ecological receptors) is balanced by the need to preserve the habitat necessary to maintain the receptors to be protected. As has been noted previously, this area provides a unique environmental function in the lower Woonasquatucket River watershed as one of the largest remaining tracts of undisturbed forested wetland.

Based on the current understanding of the hydrodynamics of this reach of the Woonasquatucket River and professional judgment concerning likely soil degradation rates, the best estimates of the amount of time to reach the desired ecological target hazard for the action-based alternatives is 25 years for Alternative 5 and 30 years for Alternative 3. The RAOs for human health will be achieved in approximately 0.5 and 4 years for Alternatives 5 and 3, respectively. The time to achieve the human health and ecological RAOs for the No Action alternative is unknown, but could be upwards of 200 years or more depending on the rate of natural recovery processes that are not monitored under this alternative.

Implementability

All of the alternatives except the No Action alternative present technical and administrative feasibility issues. Alternative 3, however, may have fewer implementability issues compared to Alternative 5 because the magnitude of wetlands destruction is reduced (i.e., 6.5 acres of wetlands destroyed under Alternative 3 compared to 19.5 acres destroyed under Alternative 5). Implementation of both Alternatives 3 and 5 on the residential properties would require close coordination with property owners.

Alternatives 3 and 5 would require space for construction activities such as material stockpiling and equipment staging. Space is very limited on site and the surrounding land is privately owned and, in most cases, already developed. In addition, both alternatives will require construction in areas having soft sediment/soil. Alternatives 3 and 5 will both face additional implementation issues if the presence of vernal pool habitat is confirmed within the current cleanup area. The animals that occur in vernal pools are typically very sensitive to environmental disturbances and special care would have to be taken during the design and construction aspects of these alternatives to mitigate these concerns. Even the application of a 3-inch layer of natural soil cover could have some deleterious effects on these areas. The application of slurry for cap placement has been widely used in aquatic settings; however, using this method for cover placement in wetland or more terrestrial regimes is an innovative application and may pose some unforeseen challenges.

Coordination with DOI would be required under Alternatives 3 and 5 if (during remedial design or remedial action) it is determined that the remedial action may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archaeological data.

The implementability of Alternatives 3 and 5 is largely determined by the various disposal options associated with this alternative. Those options that include treatment and/or disposal facilities (near shore or upland CDF) (Alternatives 3a, 3b, 3d, 5a, 5b, and 5d) will require adequate space and potentially permitting for such facilities. The option that requires on-site incineration (Alternatives 3d and 5d) would have additional implementability issues because of the need for vendors specializing in on-site, high-temperature incineration of hazardous waste. Gaining public acceptance is an important component as well.

Cost

The present worth cost for No Action is $250,000. Present worth costs for the action-based alternatives range from $16,100,000 for targeted excavation, enhanced natural recovery and on-site containment in a near shore CDF (Alternative 3b) to $81,200,000 for partial excavation, enhanced natural recovery and on-site Incineration (Alternative 5d). Additional costs for compliance with the NHPA are the same for both action-based alternatives (potentially $290,000 to $350,000 or more in additional costs for Stage 1B cultural resource survey and mitigation).

State Acceptance

The State concurred with the selected Alternative.

Community Acceptance

Some stakeholders were concerned about damage to the functional wildlife habitat from the excavation or application of the thin-layer cover, while others questioned the effectiveness of the thin-layer cover and suggested that full excavation is warranted to remove contamination in the long term. Others suggested no action in this area. There was also some concern with the effectiveness of the alternative to prevent future releases of contaminants from the area. Some commenters wanted additional data and information on the Oxbow before remediation proceeds and also emphasized the need for wildlife habitat restoration and mitigation at the Site. For the interim measures to prevent exposures while waiting for the long-term cleanup on the residential-use soil in both Allendale and Lyman Mill reaches, the residents expressed an expectation that work will be done in close coordination with individual property owners to minimize disruptions. More detail regarding community acceptance is in the Responsiveness Summary.

L. THE SELECTED REMEDY

1. Summary of the Rationale for the Selected Remedy

The selected remedy is a comprehensive remedy which utilizes source control and management of migration components to address the Site risks at the five areas addressed in this ROD.[11]

Source control measures are required to address soil, floodplain soil and sediment at the Source Area and Allendale and Lyman Mill Reaches of the Woonasquatucket River that present unacceptable risks to human health or to environmental receptors and/or exceed ARARs. The management of migration component addresses contaminants in groundwater in the Source Area that exceed ARARs. Of all the alternatives, the selected remedy best satisfies the statutory criteria for remedy selection.

The selected remedy calls for a combination of excavation, treatment and containment to address contaminants in soil, floodplain soil and sediment at the Site to protect human health and ecological receptors from exposure to contamination. The selected remedy at the Source Area will prevent leaching of and contact with contaminants. The selected remedy for Allendale and Lyman Mill reaches will also prevent contact with contaminated soil and sediment, ingestion of contaminated biota, and migration of contaminants. The remediated areas will be restored to provide pre-remediation use and functions to the extent possible. The most significantly contaminated principal threat waste (see Section E.7) will be sent off site for treatment prior to disposal. The selected remedy for contaminated groundwater at the Source Area will prevent migration of contaminants into the Woonasquatucket River and prevent contact with or ingestion of contaminated groundwater. This component of the selected remedy will be monitored to confirm that federal drinking water standards are being met at the point of compliance (edge of the waste management unit).

This remedy includes ICs to prevent exposure to contamination and to prohibit activities that might harm the selected remedy. The selected remedy will require long-term monitoring of soil,

11 This discussion of the selected remedy includes numerical estimates regarding sampling, monitoring and other components of the selected remedy. These estimates are approximate only and may be revised by EPA.

sediment, groundwater, surface water, and biota. Reviews of the effectiveness of the remedy will be conducted at least every five years to ensure that it remains protective over time.

The remedy set forth in this ROD addresses the following unacceptable risks:

- Exposure to soil, floodplain soil, surface water, biota and/or sediment contamination that presents an unacceptable risk to human health and/or ecological receptors and/or exceeds ARARs/TBC requirements; and
- Potential future exposure to contaminated groundwater that could be used as a drinking water source and present an unacceptable risk to human health.

2. Source Area Soil (Alternative 4E)

Description of Remedial Components for Source Area Soil

Buried waste material would be removed by excavation and existing interim caps and paved surfaces (Figure L-1) would be upgraded to meet RCRA hazardous waste requirements and associated guidance for caps over unlined hazardous waste landfills. The cap would also be extended to cover landscaped areas within the required cleanup area. Excavated material would be shipped off site for disposal and/or treatment.

Pre-design and design activities would include physical survey and soil and buried waste characterization, including test pits. It is estimated that 24 soil samples would be collected and analyzed for dioxins and other contaminants. Design will also include an evaluation of changes to the design and construction of the existing drainage pipes and manhole/control structure that directs stormwater flow onto the tailrace (Cap #3) in order to improve flow thru the tailrace and minimize sedimentation. The design will also include an evaluation of the rip rap along the edges of the RCRA cap/bank of the river to determine if additional measures are needed to prevent movement of contamination under the cap during flood events.

Steps shall be taken so that the work is performed in a manner that would protect the health and safety of the residents, would protect the existing facilities from contamination, and would provide continuous access to the facilities. All work would be coordinated with management of Brook Village and Centredale Manor to provide continuous access (as best as possible) to the residents and building service providers. The remedial action work plans, which would be developed during the design phase, will include a traffic control plan, a contamination migration control plan, and a resident health and safety plan. These plans will describe measures that would be implemented to provide continuous access, protect existing property and infrastructure, and protect residents' health and safety during construction. The management of Brook Village and Centredale Manor will be contacted during the preparation of these plans to facilitate coordination and obtain their input into the procedures. After approval by EPA, these plans will be provided to the residential facilities management and will be made available to the residents.

A proposed sequence for excavation activities, excavation/backfill volumes and rates, soil processing, construction to convert the existing surfaces to RCRA caps, relocation of utilities, construction monitoring, long-term monitoring and ICs, and disposal and/or treatment are generally described below. Construction activities would occur at the Source Area, where there is limited area for the stockpiling of material and equipment storage. Rules will be developed in accordance with TSCA for the decontamination of all construction equipment used when handling TSCA-contaminated material to avoid mixing with non-TSCA material. Stockpiled material shall be covered and bermed while awaiting transport and any runoff shall be collected and disposed of, so that the requirements of TSCA are met.

Construction Sequence

The work will be done in phases to minimize disruption to the residents. An example construction sequence is described below. (The cap constructed at Brook Village parking lot under the 2009–2010 removal action does not require an upgrade because it is a RCRA cap.)

1. Construct stockpiling, truck loading and decontamination facilities prior to excavation.
2. Excavate buried waste material and transport off site for disposal/treatment.
3. Relocate underground utilities.
4. Clear vegetation and install RCRA cap in Cap Area #1.
5. Install RCRA cap in Cap Area #3.
6. Install RCRA cap in Cap Area #2.
7. Install RCRA cap in landscape areas around Centredale Manor
8. Install RCRA cap in asphalt parking lot and access roadway southwest of Centredale Manor.
9. Install RCRA cap in asphalt parking lot and access roadways north of Centredale Manor.
10. Install RCRA cap in parking lot and access roadways south and north of Brook Village.
11. Remove the temporary roadways and restore the vegetation in the temporary work areas.

Excavation/Backfill Volumes and Rates

Conventional earth moving equipment would be used to excavate the buried waste material and associated soil from the Source Area. The spatial extent of the buried waste excavation area will be based upon the results of a pre-design study that focuses on the areas having the highest potential for containing buried bulk metallic materials. The vertical extent of buried waste material and of this excavation area is likely 4 ft bgs, which is based on the average fill thickness at the Source Area and confirmed by soil borings collected at this area. The total volume of Source Area soil/waste material that will be excavated has been estimated at 5,500 cy but the final volume will be determined from the pre-design study and actual field work.

The excavation and backfill rates are assumed to be approximately 400 cy/d and 500 tons/day, respectively. Based on these rates, it will take approximately 3 weeks to excavate the buried waste material and contaminated soil, but could take longer should more material need to be excavated. After excavation, imported backfill would be placed over approximately 4 weeks period to restore the site grade to existing elevation and to provide subgrade for the soil cap or asphalt.

Source Area Soil/Buried Waste Processing

The excavated soil/buried waste will generally be above the elevation of the groundwater table, so continual groundwater pumping and treatment will not be required. However, some of the deeper excavations may be below shallow groundwater during some seasons in the year. Therefore, the work will require provisions for pumping groundwater and rainwater from the excavations and treatment in a temporary treatment system. Any discharge from the water treatment system will be monitored in accordance with Rhode Island Pollutant Discharge Elimination System (RIPDES) requirements. The excavated soil/buried waste will be managed according to TSCA/RCRA requirements.

Cap Design and Construction

The RCRA caps will be designed to meet the requirements of the EPA Region 1 guidance for RCRA covers over unlined hazardous waste landfills; this RCRA cap will meet TSCA requirements. A cross-section showing the approximate placement of a RCRA/TSCA compliance cap at the Source Area, bounded to the west by the Woonasquatucket River and to the east by the steps to the Centredale Manor apartment building, is shown in Figure L-2. A cross-section of a representative RCRA cap showing the cover system is presented in Figure L-3. The total area of the existing interim soil caps is approximately186,000 sq ft (4.3 acres) and the total area of existing pavement is 93,000 sq ft (2.1 acres).

In the three existing soil cap areas, the interim soil material previously placed would serve as the Base Layer, Gas Vent Layer and Bottom Low-Permeability Layer. The following work elements would be required to upgrade the existing soil covers:

1. Regrade the Source Area to provide a minimum slope of 3%. This could be performed with contaminated floodplain soil excavated from the Allendale and Lyman Mill floodplain soil portion of the remedy. Approximately 14,900 tons of soil would be required.
2. Install a Geomembrane Layer using a minimum 60 mil thick low density polyethylene (LLDPE) or high-density polyethylene (HDPE). This would cover the cap area of 186,000 sq ft.
3. Install a Drain Layer using imported sand and gravel, with a layer thickness of 12 inches, or equivalent. Install a geotextile on top of the Drain Layer to prevent fine-grained soil from the top layers from migrating into the pore spaces and reducing the permeability. Approximately 12,000 tons would be required.
4. Install a Protective Soil Layer of a minimum 12 inches thick. Approximately 12,000 tons would be required.

5. Install a Topsoil Layer of a minimum 6 inches thick. Approximately 6,000 tons would be required.

Where necessary for drainage at Cap Area #3, 3.5 ft of soil would be removed and a 12-inch thick layer of silt installed. The silt layer would be covered with a geomembrane, drain layer, protective soil layer and topsoil as described above for the three cap areas. The total thickness of the new cap would be 3.5 ft, so that the future ground surface would be the same elevation as the existing ground.

For the Source Area cap, a total thickness of 18 inches for the Topsoil and Protective Layers will be used to protect the Drain Layer and Low-Permeability Layers. The use of a sand and gravel drain layer instead of a thinner geocomposite drain provides a total of 30 inches of soil over the geomembrane layer.

In the paved areas, the existing asphalt will be removed and transported to an off-site disposal or recycling facility. The existing soil under the pavement will serve as the Base Layer and Gas Vent Layer. The following work elements are required to upgrade the existing pavement areas:

1. Remove existing asphalt and take to an off-site disposal or recycling facility.
2. Install a Bottom Low-Permeability Layer and regrade to provide a minimum slope of 3%. This layer can use contaminated floodplain soil excavated as part of the Allendale and Lyman Mill floodplain soil portion of the remedy. Approximately 6,000 tons of imported soil would be required.
3. Install a Geomembrane Layer using a minimum 60 mil thick LLDPE or HDPE over an area of about 93,000 sq ft.
4. Install a sand and gravel Drain Layer using imported sand and gravel, with a layer thickness of 12 inches, or equivalent. Install a geotextile on top of the Drain Layer to prevent fine-grained soil from the top layers from migrating into the pore spaces and reducing the permeability. Approximately 6,000 tons would be required.
5. Install a total of 12 inches of gravel base and asphalt pavement to replace the pavement and serve as the Protective Layer. Approximately 6,000 tons would be required.

This would provide a total of 24 inches of gravel, sand or asphalt over the Geomembrane Layer, which will protect it from frost damage or from damage due to traffic loads.

The total weight of imported fill materials required will be about 72,000 tons (45,000 tons for the interim cap areas, 18,000 tons for pavement areas, and 8,900 tons for the excavation areas). This will require approximately 25 trucks per day for about 125 working days, or 25 weeks. The estimated construction to upgrade the three interim cap areas is approximately 25 weeks and the estimated time for the pavement areas is approximately 10 weeks, for a total construction time of 35 weeks, or 8 months.

In the landscaped areas (1.7 acres) that are not currently capped, 0.5 ft of soil will be removed and a 12-inch thick layer of silt installed. The silt layer will be covered with a geomembrane, drain layer, protective soil layer and topsoil as described above for the three cap areas. The total thickness of the new cap would be 3.5 ft, so that the future ground surface would be higher by 3.0 ft.

The ground surface elevation after upgrading the caps would be an average of 2.5 ft higher and this has the potential to impact flood storage, especially because a significant percentage of the cap areas are below the 100-year flood elevation. A pre-design study shall be conducted to identify additional measures that must be taken to meet location standards under RCRA and TSCA regulations. State and federal wetlands are associated with the Source Area and mitigation for any losses to these resource areas would need to be provided for. Any potential impacts would be evaluated and provided for as part of the overall mitigation planning for the project. Mitigative measures to replace lost flood storage capacity will be evaluated during design.

Relocation of Utilities

As part of the remedy implementation, underground utilities will be placed into trenches with only clean soil to allow for future maintenance requirements. Because the two buildings on the property are occupied, continuous service must be provided to the buildings. Because the residents are expected to remain on site during the construction, the most practical method to accomplish this construction would be to install new underground utilities parallel to the existing utilities, then remove the existing lines. Other approaches to utilities relocation can also be considered during the design. The new utilities include the following estimated size of trenches consistent with local building codes:

- Sanitary sewer lines - the trenches will be an average of 4 ft wide and 10 ft deep.
- Water, natural gas and storm drains - the trenches will be an average of 2 ft wide and 4 ft deep.
- Electric power, telephone, communication cable and parking lot lighting - all lines will be inside rigid conduits and the trenches will be an average of 2 ft wide and 4 ft deep.

After the new utilities are installed, connected, and buried in trenches with clean soil, the existing utilities will be excavated and removed. It is assumed that the soil removed from both new trenches and existing trenches would be contaminated and would be placed in the existing soil cap areas, then covered with the new RCRA caps.

Construction Monitoring

During all construction, work will be limited to normal work hours. During earthwork construction, dust and noise will be controlled to protect the health of the residents of the two on-site buildings and surrounding neighborhoods. Air monitoring and dust suppression measures will be maintained until excavation and transport of contaminated soil/buried waste and capping of contaminated soil is complete. Air and noise monitoring and abatement will be performed to ensure that the residents are not exposed to unsafe levels of particulates or volatiles in the air or unsafe noise levels. Dust and erosion controls will include actions such as applying water to keep the soil moist, covering exposed soil with straw or natural fiber mats, covering soil stockpiles with fabric, and/or installing silt fences around the perimeter of the site. During soil removal and processing, continuous work zone perimeter air monitoring for particulates (dust) will be performed to ensure that action levels are met. Action levels protective of workers and residents will be established and documented in a Health & Safety plan for dust monitoring and the action levels will consider expected concentrations of contaminants in the soil and duration of exposure associated with the construction. Continuous dust monitoring will be done at the excavation and stockpile areas. The system will include real-time monitoring equipment. EPA will have access to the real-time monitoring data to ensure public health and safety. If dust levels exceed action levels at the perimeter of the work zone, construction work will be stopped and additional dust control actions will be taken along with subsequent monitoring to confirm the effectiveness of the additional actions. In addition, other actions will include collecting samples of air and dust for chemical analysis at the beginning of each phase of the construction program. These samples will be used to confirm that there is not an identified VOC issue, that the continuous particulates monitoring is appropriate, and that the dust action level is protective of workers and nearby residents. Objectionable odors from air contaminants releases will also be controlled in accordance with RIDEM Air Pollution Control Regulations. Noise controls may include features such as mufflers of all equipment, or enclosing generators and air compressors in sound-reduction enclosures.

Long-Term Monitoring and Institutional Controls

Long-term monitoring for the Source Area will include assessment of the integrity of the cover system, including rip-rap along the bank of the river, and repairs each year, as required, on at least an annual basis and after severe storm events. Compensatory mitigation and invasive species monitoring and management will also be required. Because the contamination would remain on site, ICs will be required to prevent contact with contaminated Source Area soil. The ICs will include prohibiting future excavation, restricting access for buried utilities, preventing the construction of buildings with pilings or basements, and maintenance of the caps and parking lots. The existing groundwater monitoring wells would be protected and raised to the new ground surface elevations and used for long-term groundwater monitoring, along with newly installed wells as part of the Groundwater portion of the remedy.

Disposal and Treatment

Buried waste material, hazardous debris and excavated soil would be treated/disposed off site at a permitted facility.

Excavated material will be placed into a temporary stockpile for a short time while awaiting transport off site. All material will be stored within a temporary contained area which will have a bottom liner, perimeter berms, and stormwater collection sumps. Any precipitation that contacts the excavated material will be collected in the sumps and treated prior to discharge to the stormwater system. In addition, the temporary stockpile will be covered with impermeable materials to prevent erosion from precipitation or dust. The stockpile areas will be designed, constructed and operated in accordance with TSCA/RCRA regulations. The excavated soil/waste would be sampled on a daily basis. Representative, composite samples would be taken and analyzed for total dioxin and furans and other contaminants to determine off-site treatment requirements; it is estimated that about 14 samples would be required. Representative, composite samples would also be taken and analyzed for toxicity characteristic leaching procedure (TCLP) concentrations to determine the classification of the materials for disposal purposes. Once the appropriate disposal facility is identified, material would be loaded onto trucks and transported to the appropriate location.

As discussed above, excavated waste material would be subject to LDRs. It is assumed that all of the excavated potential buried waste material would be taken to an off-site incinerator for treatment.

Summary of the Estimated Remedy Costs for Source Area Soil

The Table L-1 presents major capital and annual O&M cost elements for Source Area Soil.

Expected Outcomes of the Selected Remedy for Source Area Soil Action Area

The primary expected outcome of the selected remedy for Source Area Soil is that this area will be remediated so that unacceptable risks from contamination will be addressed, RIDEM direct residential exposure criteria and TSCA requirements for PCBs/RCRA requirements for hazardous waste would be met, and RIDEM GA leachability criteria will also be addressed. Approximately 8 months are estimated as the amount of time necessary to achieve the goals consistent with residential use**.**

The Source Area is currently occupied by two multi-story buildings to house the elderly with associated paved and landscaped areas; this residential use is not expected to change significantly in the future.

For direct contact via incidental ingestion and dermal contact with contaminated soil at the Source Area, unacceptable cancer risks and non-cancer hazards were identified for a future resident and construction worker living and working at the Source Area. Cleanup levels for contaminants in surface and subsurface soil down to 5 feet depth exhibiting unacceptable cancer risk and non-cancer HI have been established such that they are protective of human health. Risk management was part of the process of selecting cleanup levels at the Site. Soil cleanup levels for known and suspect carcinogenic contaminants (specifically Class A and B2 compounds) have been set based on the consideration of protective human health risk levels for exposures via incidental ingestion and dermal contact, for resident and construction worker living and working at the Source Area, RIDEM residential direct exposure criteria, and RIDEM GA leachability criteria. Preliminary remediation goal at target risk level of 10^{-6} for each carcinogenic contaminant was considered as the point of departure for selecting cleanup goals so that cumulatively, cancer risk from all soil contaminants meets RIDEM risk requirement of 10^{-5}. If the background concentration for a given contaminant is greater than the risk-based concentration representing the 10^{-6} point of departure, the background concentration was selected as the cleanup level. This approach is consistent with risk assessment guidance and EPA policy indicating that cleaning up contaminants to levels below background levels is not warranted.

Soil cleanup levels for carcinogenic contaminants at the Site were selected to meet acceptable risk range with consideration of Site background levels and also to meet RIDEM risk requirement.

Cleanup levels for contaminants in soils having non-carcinogenic effects were derived for the same exposure pathways and correspond to an acceptable exposure level to which the human population, including sensitive subgroups, may be exposed without adverse effects during a lifetime or part of a lifetime, incorporating an adequate margin of safety or HQ of 1. Soil cleanup levels for non-carcinogenic contaminants at the Source Area are based on protective human health risk levels, RIDEM residential direct exposure criteria, and RIDEM GA leachability criteria. If a cleanup value described above is not capable of being detected with good precision and accuracy or is below background values, then the Site-specific background value was used as appropriate for the soil cleanup level. Soil cleanup levels for non-carcinogenic contaminants at the Site were selected to meet acceptable hazard index of 1 with consideration of Site background levels and also to meet RIDEM risk requirement.

Table L-2 summarizes the cleanup levels for contaminants identified in Source Area Soil.

The selected 2,3,7,8-TCDD soil cleanup level was a conservative Site-specific number, taking background into consideration. This cleanup level also takes into account the newly released EPA RfD value for 2,3,7,8-TCDD to meet EPA protective risk range, non-cancer risk level, and meet ARARs.

As part of pre-design, additional background characterization will be conducted to extend the current limited background dataset, verify background data and statistical analysis. Background soil samples would be analyzed for dioxin/furans, including 2,3,7,8-TCDD, Coplanar PCBs, pesticides, PCBs, VOCs, SVOCs, and metals. If necessary, soil cleanup levels which are based on human health risk with consideration of background levels will be adjusted using these data and documented in subsequent decision documents. Soil cleanup levels based on background may result in elevated risk to receptors, since cleanup levels cannot be established below background to avoid potential recontamination.

These soil cleanup levels must be met at the completion of the remedial action at the points of compliance determined by the extent of the RCRA cap. These soil cleanup levels are consistent with ARARs and risk-based levels and have been determined by EPA to be protective.

3. Groundwater (Alternative 2E)

Description of Remedial Components for Groundwater

Construction of the Groundwater remedy was completed in 2009-2010 as a removal action (Figure L-1). Remaining components to be implemented include:

Long-Term Monitoring and Institutional Controls

This component of the remedy (Figure L-1) includes the installation of an estimated three additional deep monitoring wells, each drilled to about 80 ft bgs and completed with multiple screened intervals for monitoring distinct depth intervals at about 40 and 80 ft bgs. Exact locations for the new wells in the vicinity of cap edges would be determined during design. Following construction of the new wells, it is estimated that 10 groundwater samples would be collected and analyzed for dioxins and other contaminants. Annual monitoring would include samples collected from 14 existing wells and 6 new well intervals, for dioxin and other contaminants, to evaluate the continued effectiveness of the 2009/2010 groundwater removal action and to determine whether contaminated groundwater is still leaving the Source Area. Should contaminated groundwater still be leaving the Source Area, additional measures will be taken to address this and identified in a subsequent decision document. ICs to prevent the exposure and use of groundwater will also be required. These ICs will likely be in the form of a land use restriction.

Summary of the Estimated Remedy Costs for Groundwater

Table L-3 presents major capital and annual O&M cost elements for the Groundwater.

Expected Outcomes of the Selected Remedy for Groundwater

The primary expected outcome of the selected remedy for Groundwater is that contamination will no longer migrate from the Source Area and ICs will prevent dermal contact and ingestion of contaminated groundwater. Groundwater will meet federal MCLs and non-zero MCLGs at the edge of the cap installed in the Source Area which is the point of compliance. Approximately 8 months are estimated as the amount of time necessary to achieve the goals consistent with this groundwater use.

Interim Groundwater Cleanup Levels

Because the aquifer under the Source Area is a federal Class IIB aquifer, which is a potential source of drinking water, interim cleanup levels have been set based on the most stringent of the following ARARs: MCLs and non-zero MCLGs established by EPA.

Periodic assessment of the protection afforded by remedial actions will be made as the remedy is being implemented and at the completion of the remedial action. At the time that interim groundwater cleanup levels identified in this ROD, ARARs, and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy have been achieved and have not been exceeded for a period of three consecutive years, a risk assessment shall be performed on all residual groundwater contamination to determine whether the remedial action is protective. This risk assessment of the residual groundwater contamination shall follow EPA procedures and will assess the cumulative carcinogenic and non-carcinogenic risks posed by all contaminants (including but not limited to the contaminants in Table L-4) via relevant exposure pathways. If, after review of the risk assessment, the remedial action is not determined to be protective by EPA, the remedial action shall continue until either protective levels are achieved, and are not exceeded for a period of three consecutive years, or until the remedy is otherwise deemed protective or is modified. Any modification of the cleanup levels will be included in a subsequent decision document. These protective residual levels shall constitute the final cleanup levels for this ROD and shall be considered performance standards for this remedial action.

All interim groundwater cleanup levels identified in this ROD, ARARs, and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy and the protective levels determined as a consequence of the risk assessment of residual contamination, must be met at the completion of this remedial action at the points of compliance. Because waste has been left in place, the point of compliance for groundwater cleanup levels is at the edge of the waste management unit.

Interim groundwater cleanup levels for known and suspect carcinogenic contaminants (specifically Classes A and B2 compounds) and for non-carcinogenic contaminants have been set at MCLs and non-zero MCLGs established by EPA for incidental ingestion and dermal contact exposure pathways, for residents living at the Source Area.

Table L-4 summarizes the interim cleanup levels for contaminants identified in Groundwater.

Sampling of monitoring wells will be used to verify that cleanup levels have been met. EPA estimates that groundwater Interim Cleanup Levels will be met at the completion of the Source Area Soil remediation.

4. Allendale Pond and Lyman Mill Pond Sediment (Alternative 7A)

Description of Remedial Components for Allendale Pond and Lyman Mill Pond Sediment

Contaminated sediment above cleanup levels would be removed using excavation. Prior to excavation, the pond water elevations will be lowered so that the exposed sediment can be excavated using conventional earthwork equipment. The water level in Allendale Pond will be lowered by opening the gates at the Allendale Dam and letting the water drain. In order to minimize the amount of suspended sediment transported downstream, the gates will be lowered incrementally and the water will be discharged at a controlled rate. In addition, a turbidity barrier will be installed upstream from the dam gate structure to reduce the potential for migration of suspended sediment downstream from the gate structure. The water level for Lyman Mill Pond could be incrementally lowered by pumping around the dam or by repairing the gates at the dam, which are currently inoperative. The actual method used will be determined during design. Excavated sediment would be placed into an upland CDF, with an estimated 10 percent (concentrations above the LDR alternative treatment standards) shipped off site for disposal and/or treatment. The actual volume will be determined based upon sampling to insure compliance with the LDRs. The production rate for excavation, dewatering and transport of pond sediment will be optimized during design. The optimized timeframe will consider factors such as the sequence of construction, limitation of space for dewatering equipment and sediment stockpiles, and limits on truck traffic.

As part of pre-design, additional background characterization will be conducted. Background sediment samples would be analyzed for dioxin/furans, including 2,3,7,8-TCDD, Coplanar PCBs, pesticides, PCBs, VOCs, SVOCs, metals, percent solids, grain size and organic content. If necessary, sediment cleanup levels which are based on background levels will be adjusted using these data for sediment in both Allendale and Lyman Mill Ponds Sediment and Lyman Mill Stream Sediment and Floodplain Soil and documented in subsequent decision documents.

Additional pre-design and design activities include physical and ecological surveys and sediment, surface water and biota sampling to establish pre-construction baseline conditions. It is estimated that 160 sediment characterization samples (to determine whether sediment can be placed into an upland CDF or shipped off site for disposal and/or treatment to meet LDRs) would be collected and analyzed for dioxins, percent solids, grain size, organic content and TCLP analysis for metals, pesticides, VOCs and SVOCs. Alternatively, sediment characterization for disposal purposes can be done during construction. An additional estimated 20 sediment samples will be analyzed for engineering properties, such as shear strength and consolidation tests. An estimated 15 surface water samples and 22 benthic samples will also be collected and analyzed for dioxins and other contaminants. To establish baseline conditions prior to excavation in support of risk-reduction evaluations and long-term monitoring, about 20 fish tissue and sediment samples (2 rounds of approximately 20 samples per round concurrently with sediment samples collection) (fillet and whole body) will be collected and analyzed for dioxin/furans, pesticides, PCBs, PAHs, and metals. This data will be also used to re-evaluate sediment/fish tissue BSAFs and to assess impacts, if any, on the sediment cleanup levels.

The river channel within the Ponds and north of Allendale Pond will also be addressed. The mean average flow in the Woonasquatucket River at Centredale ranges from 50 to 100 cfs in most years and increases significantly during flood events. Because of this, the areas of active sediment removal will be separated from the active river channel by a hydraulic barrier. Steel sheet pile driven along the length of the ponds, or an equivalent method, would be used to separate removal areas from river flow. An example of a work sequence would be for the removal work to be done on the west side of the barrier while the river flowed on the east side, and then for the flow to be switched for removal on the east side.

During design and work plan preparation, contingency plans will be developed to handle severe flood flows that may occur during the time of sediment excavation. Since the removal of sediment will take several months, it is likely that some flooding will occur during the time this work is conducted. The regular flood flows could be handled by one half of the pond area outside the work zone, thereby not impacting the construction activities.

In order to attain the RAOs related to biota consumption as quickly as possible, measures will be taken to collect all fish stranded during the construction phase. All stranded fish would be euthanized and taken off site for disposal. Disposal of stranded fish will prevent secondary contamination of sensitive species via scavenging of contaminated fish and prevent disease generation from decaying biomass. Aquatic animals such as turtles and amphibians will not be collected.

The surface sediment in both ponds is very soft and will not be able to support wheeled vehicles, even after drying for several days. In this case, low-ground pressure equipment would be used (e.g., crawler mounted equipment with extra-wide tracks). In areas too soft to even support low-ground pressure equipment, hydraulic excavators with extra-long booms would be used to remove sediment. The excavators would work from a network of temporary roadways that could be constructed using gravel or mats placed over the sediment after the water level is lowered.

Construction monitoring shall include physical surveys and surface water monitoring for dioxins and other contaminants once a week during excavation. Following removal, confirmation sampling will be conducted to verify that the cleanup levels were achieved. Post-excavation sediment confirmation samples from the ponds footprints will include an estimated 160 samples (4 samples per acre) and will be analyzed for dioxins/furans, pesticides, PCBs, PAHs, and metals. To establish post-construction baseline conditions, an estimated 20 fish samples (fillet and whole body) will be collected from both re-established ponds and analyzed for dioxins/furans, pesticides, PCBs, PAHs, and metals. The excavated sediment would be disposed of in an upland CDF with an estimated 10 percent shipped off-site for disposal and/or treatment to meet LDRs. During construction, work zone perimeter air monitoring for particulates (dust) will be performed similar to procedures described for Source Area Soil to ensure protection of workers and nearby residents. Objectionable odors from air contaminants releases will also be controlled in accordance with RIDEM Air Pollution Control Regulations. The sequence of excavation activities, excavation volumes and rates, sediment processing, mitigation/restoration activities, long-term monitoring and ICs, and disposal or treatment options are described below.

Construction Sequence

A typical construction sequence is described below:

1. Clear temporary work areas and build access ramps to the ponds.
2. Construct CDF disposal facility and water treatment system prior to sediment removal.
3. Construct sediment dewatering area, install dewatering equipment and water treatment equipment and truck loading and decontamination facilities prior to excavation.
4. Drain the ponds one at a time beginning with Allendale Pond, excavate sediment from the ponds in an upstream to downstream direction, dewater using mechanical means and move excavated material into the upland CDF or transport off site for disposal based on results of designation sampling.
5. Operate the upland CDF water treatment system during excavation.
6. Place a cap over the upland CDF.
7. Evaluate sediment confirmation samples and determine need for a thin-layer of soil cover; install the soil cover if necessary.
8. Remove the temporary vessel launch ramps and restore the vegetation in the temporary work areas.

Excavation Volumes and Rates

Estimated excavation areas for Allendale and Lyman Mill Ponds are shown on Figures L-4 and L-5, respectively. These areas above sediment cleanup levels were developed using the available chemistry and geotechnical data for surface and subsurface sediment samples in each pond. Total volume of sediment requiring excavation is calculated to be approximately 155,800 cy (2,400 cy in the river channel north of Allendale Pond, 52,900 cy in Allendale Pond and 100,500 cy in Lyman Mill Pond). The back-calculated, average excavation depth in Allendale Pond is 2.2 ft and 2.7 ft in Lyman Mill, assuming an over-excavation thickness of 0.25 ft.

The rate of excavation will be controlled by the rate of material transport from the ponds to the sediment processing area and the rate of mechanical dewatering. One long-reach excavator working to remove a thin layer of soft sediment should remove about 400 in-situ cy per day. This volume will be dewatered with modular equipment delivered by trucks and stockpiled on the Site. Sediment excavation will take approximately 28 weeks for Allendale Pond and 50 weeks for Lyman Mill Pond.

Sediment Processing

All of the excavated sediment will be dewatered, and after dewatering, will be placed and compacted in an upland CDF using conventional earthwork equipment. Sediment with concentrations that exceed the LDR alternative treatment standards (an estimated 10 percent) will be stockpiled in accordance with sampling and analysis (hazardous waste) done during the remedial design or construction phase, to await off-site disposal and/or treatment. Because space is limited at the Site, mechanical dewatering will be employed and the dewatered sediment (filter cake) will then be handled with conventional earthmoving equipment to place into stockpiles or into an upland CDF. If the material is being disposed of off - site, the material will be properly characterized and classified and then loaded onto trucks for transport to an appropriately licensed disposal facility. Mechanical dewatering would reduce the overall volume of contaminated sediment for disposal or treatment by approximately 37 percent and would reduce the disposal/treatment volume from 155,800 cy to 97,700 cy. No volume reduction is expected in the 2,400 cy dredged from the river channel.

Water separated from the excavated material will be pumped to a treatment system. The treatment system will consist of a settling basin sized to provide time for suspended sediment to settle, followed by additional treatment as necessary to meet discharge criteria. The water will be tested on a regular basis to confirm that chemical concentrations are at levels acceptable for return to the surface water in accordance with ARAR requirements. As part of the design, treatment by sand filtration and activated carbon adsorption will be evaluated to see if this provides sufficient treatment.

Removal of 2,000 in-situ cubic yards per week would produce approximately 1,100 cy of dewatered sediment for disposal. The material will be stored between concrete blocks stacked 6-ft high on temporary asphalt pavement pads in an upland area of the Site. The sediment stockpiles will be covered to prevent infiltration of rainwater. An area of 2 to 3 acres would be required for the treatment of equipment and sediment stockpiles, which includes space for the mechanical dewatering and water treatment facilities as well as space to stockpile dewatered sediment prior to placement in the upland CDF. One possible location would be on Cap Area #1 in the Source Area.

Cover Placement

Should sediment confirmatory samples indicate that there are areas of the River/Ponds where dioxin and other contaminant concentrations remain above the cleanup levels, where no further excavation is feasible, a thin-layer soil cover would be installed in these areas if needed. This cover shall be sufficient to result in risk reductions to meet RAOs upon its installation, to be determined using an area-weighted average contaminant concentrations approach in each Pond. The cover thickness and composition will be determined during the design phase but the minimum will be six inches.

Mitigation

Remedy implementation will involve the destruction of an existing aquatic habitat structure (both benthic and pelagic) and the temporary extirpation of the fish and invertebrate communities. Secondary impacts include the markedly reduced aquatic productivity anticipated in the years following implementation of the remedy that will impact aquatic-dependent wildlife and anglers that fish in these ponds. Collateral impacts to floodplain soils, including destruction of vegetation and soil compaction, are also anticipated due to the movement of heavy machinery across the floodplains to access existing aquatic areas during remediation.

If a thin-layer cover is necessary, it will be designed as a benthic habitat layer consisting of optimal grain size and organic carbon content for growth of benthic and epibenthic macroinvertebrates and submerged woody material would be included to provide some interim structural diversity. EPA will work with RIDEM to facilitate the restocking of game fish in the ponds to further expedite recovery. If necessary, opportunities for additional mitigation in areas proximate to the Ponds have been identified. Along affected riverbanks, backfill will be placed in all excavated areas, stabilized and then planted with trees and shrubs. Restoration of the river bank would include installation of “Biolog” or equivalent erosion control tubes and biodegradable erosion control blankets along with shrub planting.

The movement of heavy equipment across the floodplain will be limited to as few access points as possible and weight-dissipating structures will be laid down to distribute the weight so that soil compaction concerns are minimized to the extent possible. Following implementation of the sediment remedy, the impacted floodplain soil will be manually aerated and then revegetated with appropriate floodplain/riparian shrubs and tree species. If the floodplain soil within the particular access point is also within the sediment footprint (co-located), then it would be remediated concurrently with the sediment and the aeration step would not be necessary.

Long-Term Monitoring and Institutional Controls

Long-term monitoring is necessary to confirm that this component of the remedy remains protective in the long term and to support five-year reviews. Long-term monitoring is also required because some contamination might remain in the ponds after excavation, even after RAOs have been achieved. Long-term monitoring and ICs will also be required for upland CDFs. Details of the monitoring plan would be developed during final design.

Long-term monitoring will include physical surveys and several monitoring components. Sediment monitoring will be performed to confirm that the sediment is meeting cleanup objectives. The monitoring program will also include benthic community recovery analysis, surface water chemistry to assess water quality, and fish chemistry to determine progress in achieving the biota tissue targets. An estimated 20 sediment, benthic community, surface water and fish tissue samples will be analyzed annually or biannually for dioxin and other compounds. Monitoring downstream of the Lyman Mill Dam will also be performed to assess impacts of the remedial action on the downstream areas, including the collection and dioxin analysis of 10 sediment samples per year. Periodic reporting will be required to document remedy progress and efficacy, and the long-term monitoring results will be used to determine if additional evaluations or clean-ups are warranted.

The upland CDF will require long-term monitoring, maintenance and ICs to protect the integrity of the facility. Long-term monitoring will include CDF physical survey and groundwater monitoring for dioxins and other contaminants. Future use restrictions will be required to prevent excavation or other activities that could adversely impact the integrity of the CDFs (e.g., limit the size of woody vegetation on top of the CDFs, prevent the construction of buildings with basements or burial of utilities on or in the CDF cap, which would be incompatible with beneficial reuse of the facility).

Disposal and Treatment

The remedy includes construction of a CDF above the 100-year flood elevation and outside wetlands. The Proposed Plan and FS assumed that that the upland CDF would be constructed on-site as that term is defined in CERCLA (areas in very close proximity to the Site and necessary for implementation of the cleanup) and a number of potential locations in the Town of Johnston were identified. Since then, concerns were raised by some members of the public during the public comment period regarding the possible locations for the upland CDF identified by EPA. Because EPA continues to believe the upland CDF disposal option is the best approach to address contaminated sediment /soil, this component of the remedy remains in the selected remedy. However, EPA has expanded the area where an upland CDF could be located to locations outside the Town of Johnston and beyond what is in very close proximity to the Site. Any off-site CDF will need to comply with CERCLA's Off-Site Rule which means generally that the facility must operate in compliance with RCRA and all applicable state requirements and cannot be releasing any hazardous waste into the groundwater, surface water or soil. By expanding the area where the upland CDF can be located, EPA believes a location can be identified that addresses most or all of the concerns raised by the public. Therefore, as part of pre-design, an evaluation will be conducted to identify additional locations where an upland CDF could be located. Additional public outreach and input would be a component of this evaluation.

The CDF would be designed and built to meet state landfill regulations for hazardous waste and RCRA requirements. As discussed above, excavated sediment processed by mechanical dewatering and placed in an upland CDF would have to meet LDRs. It is estimated that 10% of the sediment would need to be taken off site for disposal by incineration. The volume estimate will be refined based on the pre-design and design sediment sampling and analysis. For sediment requiring treatment, the dewatered material would be loaded onto trucks for transportation to the designated disposal facility.

Alternative treatment standards in 40 CFR §268.49 will be used for excavated material to determine what dewatered sediment will require treatment. Based upon current sampling data, approximately 10 percent of the excavated material will require treatment (approximately 10 percent of the samples contain contamination above the LDR alternative treatment standards for contaminated soil in 40 CFR §268.49). These assumptions would be confirmed during design. Alternative treatment standards for debris (40 CFR §268.45) may be used if debris is encountered.

A typical sequence of construction for an upland CDF is listed below:

1. Clear site vegetation.
2. Remove soil to prepare the ground surface for installation of bottom liner and a leachate collection system. If needed, capacity can be increased by lowering the ground surface elevation by removing additional material from the current ground surface.
3. Construct perimeter dikes, install a base liner and leachate collection system.
4. Connect the leachate collection and storm water collection system to a water treatment plant. This could be a separate plant at the CDF site or a connection to the water treatment plant used to treat return water separated from the excavated sediment. The option of discharging leachate to a public sewer facility would be evaluated during design.
5. Place excavated, dewatered sediment into the upland CDF.
6. Install a cover over contaminated sediment and prepare surface for future beneficial use.

The perimeter dikes would be built with sand and gravel supplied by commercial vendors. In order to provide a stable foundation, very soft soils under the dike location will have to be removed and replaced with compacted sand and gravel. The dikes will have an outside slope of three horizontal to one vertical (3H:1V) and an inside slope of 2H:1V.

Because the CDF will be designed and built to contain only one type of material, a single geomembrane liner would be sufficient to protect the environment. The liner system would be designed to meet requirements in state hazardous waste regulations. A support layer of screened sand will be placed, then covered with a geomembrane, which in turn will be covered with a layer of fine sand about 12 inches thick. The sand layer will include perforated pipes to collect leachate that will be generated as the sediment is compressed.

When the sediment is placed to the final design height, a cover system would be installed. The cover system will meet the requirements for alternate RCRA covers, similar to the closure for Source Area soil and will meet RCRA Subtitle C capping requirements. The cap will consist of (a) a 12-inch-thick low-permeability layer of soil to support a geomembrane, (b) a geomembrane to reduce infiltration of precipitation, (c) a 12-inch-thick sand drain layer to protect the geomembrane and to drain precipitation, (d) a geotextile separation layer, (e) a 12-inch-thick protection layer of soil and (f) a 6-inch-thick layer of topsoil. The topsoil and vegetation could be replaced with gravel and asphalt, or another surface, for future use. Site use restrictions will limit the size of trees or woody vegetation and will prohibit the construction of buildings with basements or buried utilities.

Summary of the Estimated Remedy Costs for Allendale Pond and Lyman Mill Pond Sediment

Table L-5 presents major capital and annual O&M cost elements for Allendale and Lyman Mill Ponds Sediment.

Expected Outcomes of the Selected Remedy for Allendale Pond and Lyman Mill Pond Sediment

The primary expected outcome of the selected remedy for Allendale and Lyman Mill Sediment is that sediment will no longer present an unacceptable risk as a result of contaminated biota ingestion and direct contact with contaminated sediment, and, that for site-related contaminants, these reaches of the Woonasquatucket River will be suitable for contact recreational uses, such as fish consumption and swimming. Another expected outcome is that Allendale and Lyman Mill sediments will no longer result in river surface water concentrations in excess of federal and state AWQCs or migration of contaminants downstream. Approximately 2-5 years are estimated as the amount of time necessary for to achieve the objectives consistent with unrestricted recreational uses of the River, including fish consumption at frequencies consistent with the exposure scenarios used in the risk assessment done for the Site. Allendale and Lyman Mill dams could be removed without additional excavation/impacts in the future, once RAOs are achieved, including RAOs for the Oxbow Area.

The selected remedy will also provide socio-economic and community revitalization impacts such as enhanced recreational uses of ecological resources in the Allendale and Lyman Mill Reaches of the River.

For direct contact via incidental ingestion and dermal contact with contaminated sediment and ingestion of fish associated with contaminated sediment at Allendale and Lyman Mill reaches, unacceptable cancer risks and non-cancer hazards were identified for current and future resident living along the River and visiting recreational angler (fish ingestion only). Cleanup levels for contaminants in sediment exhibiting unacceptable cancer risk and non-cancer HI have been established such that they are protective of human health. Sediment cleanup levels for known and suspect carcinogenic contaminants (specifically Class A and B2 compounds) as well as for non-carcinogenic contaminants have been set at site-specific levels after an evaluation of risk-based levels developed for the most sensitive receptor and/or exposure pathway (there are no chemical-specific ARARs for sediment) and Site background data. The cleanup goal selection process for sediment was similar to that for soil, considering risk-based values and background concentrations. Sediment cleanup levels for Site contaminants were selected to meet acceptable risk range with consideration of Site background levels.

Sediment cleanup levels for contaminants in surficial sediments exhibiting an unacceptable hazard quotient have been established such that they are protective of the environment. Cleanup levels for contaminants in sediment having potential population-level effects to fish, wildlife and other ecological receptors were derived for the contaminated prey ingestion, incidental sediment ingestion and/or dermal contact exposure pathways and correspond to an acceptable exposure level to which sensitive environmental populations (including sensitive species/taxa) may be chronically exposed to without adverse population-level effects (such as reduction in number of individuals or elimination of a local population). Exposure parameters for the contaminated prey ingestion, incidental sediment ingestion and/or dermal contact exposure pathways have been described in the Baseline Ecological Risk Assessment. If a cleanup value described above is below background values, then a background value was used as appropriate for the sediment cleanup level.

As part of pre-design, additional background characterization will be conducted to extend the current limited background dataset, verify background data and statistical analysis. Background sediment samples would be analyzed for dioxin/furans, including 2,3,7,8-TCDD, Coplanar PCBs, pesticides, PCBs, VOCs, SVOCs, and metals. If necessary, sediment cleanup levels which are based on background levels will be adjusted using these data and documented in subsequent decision documents. Sediment cleanup levels based on background may result in elevated risk to receptors, since cleanup levels cannot be established below background to avoid potential recontamination.

Tables L-6 through L-9 summarize the cleanup levels for contaminants identified in Allendale and Lyman Mill Ponds Sediment.

These sediment cleanup levels attain EPA's risk management goal for remedial actions and have been determined by EPA to be protective. These sediment cleanup levels must be met at the completion of the remedial action at the points of compliance throughout the entire area of Lyman Mill Pond and Allendale Pond by confirmatory sampling using an area-weighted average contaminant concentrations approach in each Pond. This confirmatory sampling will determine the extent of a thin-layer cover, if such cover is required in these Ponds, to meet sediment RAOs. Specific criteria to be used to determine the need and extent of such thin-layer cover will be determined as part of the design and construction plans.

To monitor progress of remediation and to determine when fish are safe to eat following attainment of the sediment cleanup levels, fish target tissue concentrations for bioaccumalative contaminants were also developed using sediment cleanup levels and site-specific BSAFs. Table L-10 presents calculated fish target tissue concentrations for the Allendale and Lyman Mill Ponds.

Sampling and analysis of fish tissue will be included in the long-term monitoring program. Fish tissue will be collected and analyzed from each individual pond on an annual or biannual basis, with fish samples number for each species and pond to be determined based on the fish sampling conducted to-date and an appropriate statistical analysis. The long-term monitoring program is expected to target the same species that have been sampled previously: largemouth bass, American eel, and white sucker. In the event that the fish community changed substantially, (as could be the case where fish ladders are constructed or dams are removed at some point in the future), then the expected new species should be monitored. Fish tissue analytical parameters include all fish target contaminants. The monitoring program will be conducted over a long enough timeframe to ensure that variability in fish tissue concentrations is accounted for. Data quality objectives (DQOs) developed as part of the long-term monitoring plan will consider median, mean, upper confidence level on mean or upper percentile as statistical parameters to determine when target fish tissue concentrations have been met. Fish tissue target concentrations are expected to be reached within 2-5 years following sediment excavation. Fish are expected to be safe to consume (catch and release advisory lifted) once tissue concentrations are less than or equal to fish targets for all analytical parameters and have remained as such for two subsequent sampling events. The long-term fish monitoring program will be conducted concurrently with the long-term sediment monitoring program to monitor any changes for site-specific BSAFs and the progress of remediation.

5. Allendale Floodplain Soil (Alternative 5A)

Description of Remedial Components for Allendale Floodplain Soil

Contaminated floodplain soil would be removed using conventional excavation techniques (Figure L-6 shows areas for excavation). It is estimated that contaminated floodplain soil will be removed to an approximate depth of 1 foot in ecological habitat and recreational-use areas, replaced with clean fill, and the floodplain habitat restored. A depth of 1 foot was estimated because this is generally considered the depth to which the majority of relevant ecological exposures occur as a result of foraging or burrowing activities.

As part of pre-design, a background characterization will be performed using an estimated 20 floodplain soil samples to confirm floodplain soil contaminant concentrations upstream from the Site (Greystone area). Soil cleanup levels which are based on background levels will be adjusted based on this data. Background soil samples would be analyzed for dioxin/furans, Coplanar PCBs, pesticides, PCBs, VOCs, SVOCs, metals, percent solids, grain size and organic content. Background soil data will be used for both Allendale Floodplain Soil and Lyman Mill Stream Sediment and Floodplain Soil (including Oxbow).

The actual depth of excavation will extend deeper within the vadose zone to meet RAOs as necessary, and will be determined during design based on sampling and analysis of deeper soil samples. Design and pre-design activities will include physical and ecological surveys and collection of an estimated 20 soil samples that will be analyzed for dioxins and other contaminants. For residential-use properties where excavation depth throughout the vadose zone (depth less than 10 feet) is required, incremental composite soil sampling will be conducted on each property to determine properties requiring excavation, consistent with *User Guide - Uniform Federal Policy Quality Assurance Project Plan Template For Soils Assessment of Dioxin Sites (September 2011*). Precautionary interim measures to prevent exposure, such as fencing or spreading a cover (e.g., mulch or clean soil) will be taken in the interim. Such measures will be considered on an individual property basis, to be coordinated with residents and/or property owners.

Removal of floodplain soil will likely be carried out concurrently with the sediment excavation in the Allendale Pond, as pond water levels will be below the normal water level so that all work will be performed above the water level. During construction, work zone perimeter air monitoring will be performed similar to procedures described for Source Area Soil to ensure protection of workers and nearby residents.

The surface soils in the floodplain areas are expected to be soft and may not be able to support wheeled vehicles, even after drying for several days. In this case, low-ground pressure equipment will be used (i.e., crawler mounted equipment with extra-wide tracks). With the pond water level lowered, the excavated soils will be transported using off-road trucks on temporary haul roads along the pond shoreline to a temporary work area at the Source Area. This will reduce the need for any trucks hauling contaminated soil on the local residential streets.

Following removal, confirmation sampling will be conducted to verify that the cleanup levels are achieved. An estimated 10 confirmation soil samples will be collected and analyzed for dioxin and other contaminants for non-residential properties. For residential properties, confirmatory sampling will be done in accordance with *User Guide - Uniform Federal Policy QAPP Template For Soils Assessment of Dioxin Sites*. The likely sequence of excavation activities, excavation volumes and rates, soil processing, mitigation activities, long-term monitoring and ICs, and disposal and/or treatment options are described below. This component of the remedy assumes that soil dewatering will likely not be required. During construction, work zone perimeter air monitoring will be performed similar to procedures described for Source Area Soil to ensure protection of workers and nearby residents.

Construction Sequence

A typical construction sequence is described below:

1. Clear temporary work areas and build access ramps to the ponds. (Use same areas cleared for pond sediment removal).
2. Construct upland CDF disposal facility prior to soil removal.
3. Construct stockpiling, truck loading and decontamination facilities prior to excavation.
4. Lower the water level in Allendale Pond, excavate floodplain soils in an upstream to downstream direction, and place excavated material in the upland CDF or transport off site for disposal in accordance with LDRs.
5. Operate the upland CDF water treatment system during excavation.
6. Place a cap over the upland CDF.
7. Evaluate confirmation samples, place backfill, and restore site grade and habitat.
8. Remove the temporary roadways and restore the vegetation in the temporary work areas.

Excavation Volumes and Rates

The estimated volume of soil that will be excavated is approximately 2,400 cy (does not include over-excavation allowance), excluding residential-use soil. The rate of excavation will be controlled by the rate of material transport from the floodplain areas to the upland processing area. It is assumed that one long-reach excavator working to remove a 1-foot thick layer of soil would remove about 400 in-situ cy/d. Soil excavation will take approximately 1 week. For residential-use properties, the estimated volume of soil that will be excavated is 4,200 cy. Excavation will be done on a property by property basis with work on each property estimated to take several days to weeks. Excavation of soil on the impacted residential-use properties will be done using a combination of efforts, including hand labor and heavy equipment.

Floodplain Soil Processing

Excavated floodplain soil should be much drier than the pond sediments and will likely not require any kind of dewatering prior to disposal or treatment.

Floodplain soil will likely be stockpiled in the same processing area established for pond sediments; an area of 2 to 3 acres would be required. One possible location will be on Cap Area #1 in the Source Area, which has an area of approximately 2 acres.

Mitigation

After excavation and evaluation of the confirmation samples, imported clean backfill (free of contaminants above cleanup levels) will be placed to restore the site grade to existing elevation and to provide subgrade for re-vegetation of the area. The area could be planted with common floodplain trees (e.g., black willow, red maple) and fruit-bearing wetland shrubs such as elderberry and highbush blueberry. The specific species, planting specifications and monitoring requirements will be identified during the remedial design phase. Clean fill, topsoil and hyrdoseeding will be used to restore disturbed residential-use properties to their pre-construction condition and damaged or lost landscaping will be replaced as needed.

Long-Term Monitoring and Institutional Controls

Long-term monitoring will be required to assess the rate of recovery and degree of functioning riparian vegetation (including the tree, shrub, and herbaceous cover strata), to determine biota recovery, to assess the impact of this component of the remedy on the downstream areas, and to determine if additional evaluations or clean-ups are warranted. Compensatory mitigation will be required, including monitoring and management of invasive species.

The upland CDF will require long-term monitoring, maintenance and ICs to protect the integrity of the facility. Future use restrictions will be required to prevent excavation or other activities that could adversely impact the integrity of the CDF (e.g., limit the size of woody vegetation on top of the CDFs, prevent the construction of buildings with basements or burial of utilities on or in the CDF cap).

Disposal and Treatment

Some of the excavated floodplain soil can be used to assist in grading and building the bottom layer of the cap to be constructed at the Source Area. This material would not need to comply with the LDRs because it would be consolidated and moved on-site, within the area of contamination.

Long-term O&M requirements of the upland CDF are covered under the sediment excavation Action Area. The costs assume that treatment is not required because existing floodplain soil data for Allendale reach meet the LDR alternative treatment standards; this assumption would be confirmed during design. If soil does exceed these standards, it will be taken off site for treatment/disposal or be placed under the Source Area RCRA cap.

Summary of the Estimated Remedy Costs for Allendale Floodplain Soil

Table L-11 present major capital and annual O&M cost elements for Allendale Floodplain Soil.

Expected Outcomes of the Selected Remedy for Allendale Floodplain Soil

The primary expected outcome of the selected remedy is that Allendale Floodplain Soil will no longer present an unacceptable human health risk from direct contact with contaminated floodplain soil for residential and recreational users, and the area will be remediated in a manner that meets RIDEM direct residential exposure criteria. Another expected outcome of the selected remedy is that it will prevent migration of contaminants from Allendale floodplain soil that would result in river surface water concentrations in excess of federal and state WQCs or in sediment concentration above cleanup levels. Approximately 1 month is estimated as the amount of time necessary to achieve these goals for recreational-use areas and several days for each residential–use property.

The selected remedy will also provide environmental and ecological benefits by reduction of risks of ecological exposure related to bioaccumulation hazards in soil invertebrate tissue. It is anticipated that the selected remedy for the Allendale Floodplain Soil will also provide enhanced access to recreational uses in the Allendale Reach of the River.

For direct contact via incidental ingestion and dermal contact with contaminated residential-use floodplain soil at the eastern shore of Allendale Pond, unacceptable cancer risks and non-cancer hazards were identified for current and future residents living along the River. Cleanup levels for contaminants in residential-use floodplain soil exhibiting unacceptable cancer risk and non-cancer HI have been established such that they are protective of human health. Floodplain soil cleanup levels for known and suspect carcinogenic contaminants (specifically Class A and B2 compounds) as well as for non-carcinogenic contaminants have been set at site specific levels after an evaluation of risk-based levels developed for the most sensitive receptor and/or exposure pathway, ARARs, TBCs, and site background data.

For direct contact via incidental ingestion and dermal contact with contaminated recreational-use floodplain surface soil at the western shore of Allendale Pond, unacceptable cancer risks were identified for current and future passive recreational visitors. Cleanup levels for contaminants in recreational-use floodplain surface soil exhibiting unacceptable cancer risk have been established such that they are protective of human health. Floodplain surface soil cleanup levels for known and suspect carcinogenic contaminants (specifically Class B2 compounds) have been set at site specific levels after an evaluation of risk-based levels developed for the most sensitive receptor and/or exposure pathway, ARARs, TBCs, and site background data.

Soil cleanup levels for contaminants in floodplain surface soil exhibiting an unacceptable hazard quotient have been established such that they are protective of the environment. Cleanup levels for contaminants in soils having potential population-level effects to wildlife and other ecological receptors were derived for the contaminated prey ingestion, incidental soil ingestion and/or dermal contact exposure pathways and correspond to an acceptable exposure level to which sensitive environmental populations (including sensitive species/taxa) may be chronically exposed to without adverse population-level effects (such as reduction in number of individuals or elimination of a local population). Exposure parameters for the contaminated prey ingestion, incidental soil ingestion and dermal contact exposure pathways have been described in the BERA. If a cleanup value described above is below background values, then a background value was used as appropriate for the soil cleanup level.

Risk management was part of the process of selecting cleanup levels at the Site. Soil cleanup levels for known and suspect carcinogenic contaminants (specifically Class A and B2 compounds) have been set based on the consideration of protective human health risk levels for exposures via incidental ingestion and dermal contact, for resident and recreational visitor in the Allendale Floodplain Soil Area and RIDEM residential direct exposure criteria. Preliminary remediation goal at target risk level of 10^{-6} for each carcinogenic contaminant was considered as the point of departure for selecting cleanup goals so that cumulatively, cancer risk from all soil contaminants meets RIDEM risk requirement of 10^{-5}. If the background concentration for a given contaminant is greater than the risk-based concentration representing the 10^{-6} point of departure, the background concentration was selected as the cleanup level. This approach is consistent with risk assessment guidance and EPA policy indicating that cleaning up contaminants to levels below background levels is not warranted. Soil cleanup levels for carcinogenic contaminants at the Site were selected to meet acceptable risk range with consideration of Site background levels and also to meet RIDEM risk requirement.

Cleanup levels for contaminants in soils having non-carcinogenic effects were derived for the same exposure pathways and correspond to an acceptable exposure level to which the human population, including sensitive subgroups, may be exposed without adverse effects during a lifetime or part of a lifetime, incorporating an adequate margin of safety or HQ of 1. Soil cleanup levels for non-carcinogenic contaminants at the Allendale Floodplain Soil Area are based on protective human health risk levels and RIDEM residential direct exposure criteria. If a cleanup value described above is not capable of being detected with good precision and accuracy or is below background values, then the Site-specific background value was used as appropriate for the soil cleanup level. Soil cleanup levels for non-carcinogenic contaminants at the Site were selected to meet acceptable hazard index of 1 with consideration of Site background levels and also to meet RIDEM risk requirement.

Tables L-12 through L-14 summarize the cleanup levels for contaminants identified in Allendale Floodplain Soil.

These soil cleanup levels attain EPA's risk management goal for remedial actions and have been determined by EPA to be protective. These cleanup levels in soil are consistent with ARARs for soil, attain EPA's risk management goal for remedial actions, and have been determined by EPA to be protective. The selection process of these floodplain soil cleanup levels was similar to that for Source Area soil and sediment. These soil cleanup levels must be met at the completion of the remedial action throughout the Allendale Floodplain Soil as demonstrated by confirmatory soil samples**.** For residential-use properties, incremental composite sampling of floodplain soil on approximately 28 properties will be used during the design to evaluate which properties require excavation. Precautionary measures to prevent exposure, such as fencing or spreading a cover (e.g., mulch or clean soil) will be taken on residential-use properties in the interim.

The selected 2,3,7,8-TCDD soil cleanup level was a conservative Site-specific number, taking background into consideration. This cleanup level also takes into account the newly released EPA RfD value for 2,3,7,8-TCDD to meet EPA protective risk range, non-cancer risk level, and meet ARARs.

As part of pre-design, additional background characterization will be conducted to extend the current limited background dataset, verify background data and statistical analysis. Background soil samples would be analyzed for dioxin/furans, including 2,3,7,8-TCDD, Coplanar PCBs, pesticides, PCBs, VOCs, SVOCs, and metals. If necessary, floodplain soil cleanup levels which are based on human health risk with consideration of background levels will be adjusted using these data and documented in subsequent decision documents. Soil cleanup levels based on background may result in elevated risk to receptors, since cleanup levels cannot be established below background to avoid potential recontamination.

6. Lyman Mill Stream Sediment and Floodplain Soil (Including Oxbow) (Alternative 3A)

Description of Remedial Components for Lyman Mill Stream Sediment and Floodplain Soil (including Oxbow)

This portion of the remedy includes excavation and removal of contaminated sediment and floodplain soil from targeted areas within the ecological habitat and recreational-use cleanup areas and/or placement of a thin-layer cover over the other areas where soil/sediment remains above cleanup levels to accelerate the natural recovery processes by placing clean material over the underlying contaminated material. Areas targeted for excavation include 1) erosional areas with contaminant concentrations above the cleanup levels where a thin-layer cover is not suitable and contaminated sediment/soil could be transported downstream if remobilized during flooding events and 2) areas with contaminant concentrations in excess of RIDEM's residential direct exposure criteria (except where background is an issue, i.e., human health and ecological risk assessments and ARARs are the basis for developing cleanup levels. Background is subsequently taken into consideration to ensure that cleanup levels below background are not selected), and EPA's site-specific non-cancer health effects threshold level for dioxin in soil for recreational visitors. Floodplain soil above cleanup levels on residential use properties is also targeted for excavation, with specific areas to be based on additional sampling. Excavated material will be placed in an upland CDF with an estimated 10 percent to be shipped off-site for treatment.

Pre-design and design investigations will include physical and ecological surveys to further delineate wetlands functions and to identify any potential vernal pools and collection of benthic, soil, sediment and surface water samples. It is estimated that 10 animal tissue samples, 10 surface water samples and 80 soil/sediment samples would be analyzed for dioxin and other contaminants. Habitat features would need to be updated during design based on the finalized excavation and thin-layer cover areas.

The addition of baffles within preferred floodwaters flow paths in the Oxbow will be evaluated during the design phase of the project. The flow control structures and situated baffles will be designed to increase the amount of the sediment load that is deposited into the Oxbow while minimizing the likelihood that floodwater flows would retain sufficient energy to erode surface soils and transport residual contamination into Lyman Mill Pond. Hydrodynamic modeling over a range of peak flows will also be conducted in concert with the engineering design to ensure that the engineered structures will function as intended.

If the combined engineering and hydrodynamic modeling analysis are unable to reduce the uncertainties related to deposition (and length of time to achieve the desired level of risk reduction) and stability (and risks of downgradient migration), an increase in the excavation footprint beyond the area identified (resulting in a reduction in the proportion of the remedial footprint receiving the thin-layer cover) can be required by EPA if: (i) the size of area requiring cleanup is increased based upon design sampling and data evaluations, (ii) deposition rates are slower than estimated, (iii) engineered structures are less effective at preventing “short-circuiting” of the Oxbow Area than estimated, and (iv) in-place contamination is less stable than estimated in the FS. Increases in the excavation footprint will need to consider any additional information concerning the possible presence of sensitive species in the Oxbow (e.g. vernal pools).

For residential-use properties, incremental composite soil sampling will be conducted on each property to determine excavation areas, consistent with *User Guide - Uniform Federal Policy Quality Assurance Project Plan Template For Soils Assessment of Dioxin Sites* (September 2011). Precautionary interim measures to prevent exposure, such as fencing or spreading a cover (e.g., mulch or clean soil) will be taken in the interim. Such measures will be considered on an individual property basis, to be coordinated with residents and/or property owners. An interim measure will also include a fence along the Allendale Mill raceway southern end which is located in a wooded area next to the Allendale Mill condominium complex.

To implement this portion of the cleanup, access areas will be created so that all areas requiring cleanup can be reached. Additionally, staging areas to stockpile the cover material will be required. This component of the remedy will likely be implemented concurrently with the remedy for Lyman Mill Pond sediment and will use the staging areas and access roadways installed for the sediment remediation. Any excavation activities will be conducted after the pond water levels are temporarily lowered. During construction, work zone perimeter air monitoring will be performed similar to procedures described for Source Area Soil to ensure protection of workers and nearby residents.

Figure L-7 shows areas for excavation and thin-layer cover within the Lyman Mill stream sediment and floodplain soil cleanup area based on currently available data. Moving north to south, targeted excavation will:

- Remove the top 1 foot of sediment from the stream channel connecting Allendale and Lyman Mill Ponds.
- Remove the top 1 foot of floodplain soil from areas where contaminant concentrations are in excess of state ARARs for residential direct exposure (except where background is an issue) or site-specific risk-based dioxin level in soil for recreational visitors; and
- Remove the top 1 to 3 ft of sediment in abutting channel areas in the southern Oxbow Area.
- Remove floodplain soil from residential-use properties as required by the design delineation sampling.

A 1-foot excavation depth is estimated for the stream channel and floodplain soil areas because this is generally considered the depth to which the majority of relevant ecological exposures occur as a result of foraging or burrowing activities, as well as human exposure. For floodplain soil, the actual depth of excavation could extend deeper within the vadose zone as necessary to meet RAOs. The excavation depth of 1 ft bgs for sediment in the stream channel and 1 to 3 ft bgs for sediment in the southern Oxbow Area are based on the depth needed to reach clean substrate according to currently available data. The excavation depth for sediment and soil areas will be determined during design based on sampling and analysis of deeper sediment/soil samples. Excavation and backfill volumes will also be evaluated during design to ensure no net loss of flood storage capacity from placement of the thin-layer cover in wetland/floodplain areas. Additional data needs include the collection of floodplain soil and sediment samples as well as a survey to more precisely delineate the boundaries between the various vegetation types represented.

Following removal, an estimated 28 confirmation soil and sediment samples will be collected to verify that the cleanup levels were achieved, and to determine whether excavated sediment/soil will require treatment for non-residential properties. On residential-use properties, where depth of excavation is required throughout the vadose zone (depth less than 10 feet) , confirmatory sampling will be done in accordance with *User Guide - Uniform Federal Policy QAPP Template For Soils Assessment of Dioxin Sites*. The likely sequence of excavation activities, excavation/backfill volumes and rates, cover placement, sediment/soil processing, flow control structures, mitigation activities, long-term monitoring and ICs, and disposal or treatment options are described below.

Construction Sequence

A typical construction sequence is presented below:

1. Construct temporary access roads and staging areas.
2. Clear debris and vegetation as necessary.
3. Excavate contaminated sediment/soil in an upstream to downstream direction, stockpile and dispose.

4. If material must be disposed of off site, testing would be conducted to determine the appropriate disposal designation.
5. Evaluate confirmation samples and backfill excavated areas with clean material.
6. Place enhanced natural cover in areas that were not remediated with excavation, which could be performed concurrently with backfill placement.
7. Plant appropriate types of vegetation within the excavation footprint to enhance ecosystem recovery.

Excavation/Backfill Volumes and Rates

Sediment and floodplain soil will be removed after the pond water levels are temporarily lowered (for the sediment remedy at Lyman Mill). Approximately 6.5 acres, excluding residential-use soil, would be excavated and backfilled with clean material to provide subgrade for re-vegetation of the area.

- Approximately 20,500 cy of floodplain soil and stream sediment will be removed from the excavation footprint under this alternative, including a 0.25 foot over-excavation allowance.
- Approximately 15,600 tons (10,400 cy) of soil will be placed as backfill in the excavation area.
- Approximately 13,500 tons (or 9,000 cy) of soil will be placed for the thin-layer cover.

All excavation areas in recreational-use area/ecological habitat will be backfilled with 1 foot of clean material, which will provide a high quality substrate for restoring the terrestrial (floodplain soil) and aquatic (sediment) invertebrate communities and vegetation in the floodplain. A uniform 1-ft backfill volume will also result in a post-remediation elevation lower than existing conditions in areas where the excavation footprint extends deeper than 1 foot (i.e., sediment areas in southern Oxbow Area), and this will provide mitigation for lost flood storage capacity from the thin-layer cover as well as greater flow capacity in the river. The criteria used during the design to select backfill material and determine excavation depth for the stream channel connecting Allendale and Lyman Mill Ponds will include adequacy of erosion protection during flood flows and benthic habitat suitability.

The excavation rate for sediment and floodplain soil is assumed to be 200 cubic yards per day (cy/d); the placement rate of clean backfill is assumed to be 500 tons/day; placement of thin-layer cover is assumed to be 70 tons/day; and the rate of replanting vegetation is assumed to be 7,400 square feet per day (sq ft/d). Including the required wetland mitigation and streambank restoration activities, it is estimated that this alternative will take approximately one year to implement.

For residential-use properties, the estimated volume of soil that will be excavated is 5,600 cy. Excavation will be done on a property by property basis with work on each property estimated to take several days to weeks. Excavation of soil on the impacted residential-use properties will be done using a combination of efforts, including hand labor and heavy equipment. Backfill and topsoil will be placed and compacted in the excavated areas. The residential-use properties will be restored to pre-construction grade, disturbed areas will be hydroseeded, and damaged or lost landscaping will be replaced as needed.

Cover Design and Placement

The final composition and thickness of the cover will be determined during the design phase; however, a cover thickness of 3 inches with a composition similar to the existing soil is assumed will be needed for floodplain habitat within the Oxbow Area. In aquatic sections of the cleanup area, the cover material would have a particle size distribution and organic carbon content designed to optimize rapid recolonization of the substrate by benthos.

The cover material will be placed over 22.2 acres of contaminated sediment and floodplain soil within the entire 28.7 acres cleanup area (excluding residential-use areas) that are not remediated by excavation (Figure L-7). In order to reduce the need for tree and shrub removal and to minimize the impact on the existing roots, cover material will be placed using a hydraulic slurry method that involves adding water to the cover material to form a slurry and then spraying the slurry over the area until the appropriate thickness is achieved.

In order to create a soil slurry that can be pumped, water would be added to the soil in a hopper and the slurry fed into pumps connected to a network of pipes and hoses for distribution. A temporary network of slurry pipes will be installed to allow access to the cleanup area. These pipes will be placed on the existing ground surface and held in place with temporary earth anchors or weights (such as sand bags). In the alternative, pipes and hoses could be placed using small low-ground pressure equipment commonly used in landscape maintenance work. This would have much less impact on the existing vegetation than conventional heavy earthmoving equipment, which can harm or kill trees through soil compaction.

Placement of 3 inches of clean material will require approximately 13,500 tons of cover material. It is estimated that the slurry will likely be placed using a 4-inch diameter hose with a total slurry (sand plus carriage water) discharge rate of approximately 350 gpm.

Sediment/Floodplain Soil Processing

Wetland soil and sediment removed using excavation will likely not be processed with mechanical dewatering because this material contains more vegetation and has a higher in-situ solids content than the river/pond sediment. Additional sediment/soil characterization will be performed during the remedial design phase. The excavated sediment/soil will be stockpiled in the same processing area established for pond sediment.

Flow Control Structures

A study during the design phase will be done to evaluate flow control structures to divert some of the flow from the Woonasquatucket River into and through the Oxbow Area to increase natural sediment deposition rates. Some site regrading will also be conducted within the Oxbow, including filling and the creation of baffles in portions of the abandoned river channel to minimize the short-circuiting of floodwaters through the wetland system and increase sediment deposition rates.

Mitigation

This portion of the remedy will involve the destruction of some existing forested and/or scrub/shrub habitat structure and jurisdictional (federal and state) wetlands. Sediment/soil excavation and application of a cover will either eliminate (sediment/soil excavation) or potentially degrade (thin-layer cover) the invertebrate communities associated with floodplain soil and aquatic sediment. In addition, the remediation of the lotic portion of the river will destroy benthic habitat and disrupt a portion of the adjacent riverbank including some riparian vegetation and tree root systems.

The application of the cover material will be performed during the dormant season to minimize damage to the existing vegetation. This application process significantly reduces the amount of vegetation that would need to be removed or mowed prior to cover placement.

Concerns associated with placement of cover material within the Oxbow will be evaluated during design. For example, additional research will be performed to better understand the potential effects to the tree species within the Oxbow from placement of cover material, to understand tolerance limits related to the thickness of the cover, and to determine a preferred cover material (composition) suitable for application. Depending on the research outcomes, additional types of biota (i.e., in addition to potential vernal pool habitat and inhabitants) that could be particularly sensitive to the proposed remedy can be identified. A detailed field survey will be conducted to locate sensitive components, such as specific tree species along with vernal pool habitat, within the Oxbow using Global Positioning System (GPS) in order to identify the exact locations on the design drawings. Information from these additional design studies would be used to develop specifications designed to protect sensitive components within the Oxbow. Specifications will include cover material that allows air passage (e.g., sandy loam much preferable to clay), identification of protection zones surrounding sensitive trees or potential vernal pools that would be marked on the design drawings, prohibiting use of heavy construction equipment within designated areas to prevent soil compaction within the drip-line zone, identifying areas (e.g., areas with sensitive trees) where cover material would be spread manually, and designation of over placement allowances where thicker cover material could be placed without resulting in deleterious effects to the trees within the Oxbow. It is anticipated that the majority of the dominant canopy species (e.g., red maple) can be preserved by utilizing these remedy implementation practices.

After excavation and evaluation of the confirmation samples, imported backfill (with appropriate humic content to facilitate infaunal recolonization) will be placed to established design grades to provide subgrade for re-vegetation of the area. The area will be planted with common floodplain trees (e.g., black willow, red maple) and fruit-bearing wetland shrubs such as elderberry and highbush blueberry. An appropriate herbaceous seed mix will be applied to rapidly stabilize the soil. The specific species, planting specifications, and monitoring requirements will be identified during the remedial design phase. The vegetation will consist of canopy species saplings (e.g., red maple, cottonwood, and swamp white oak), balled shrubs (e.g., highbush blueberry, alder, and northern arrowwood), and a wetland grass mix (to stabilize exposed soil in the short term). Clean fill, topsoil and seeding will be used to restore residential-use properties to their pre-construction condition.

Mitigation for impacts associated with the sediment remediation will include backfilling with clean sediment of similar composition to emulate current benthic habitat structure (and provide similar sediment stability). Mitigation of the entire section of river bank will include use of techniques to ensure bank stability (e.g., installation of "Biolog" or an equivalent at toe of the slope and biodegradable erosion control blanket) along with shrub plantings to compensate for loss of riparian vegetation. If additional floodplain soil sampling determines that the remedial footprint needs to be increased resulting in greater impacts to canopy species than currently anticipated, additional mitigation would be provided. This additional mitigation would consist of the planting of saplings of riparian zone canopy species (e.g., red maple) adjacent to the restored bank. The extent of additional mitigation will be dependent upon the size of the final remedial footprint and scaled to the amount of additional impacts to the existing forested habitat.

Long-Term Monitoring, Dam Maintenance and Institutional Controls

Long-term monitoring, maintenance of Allendale Dam, and ICs will be required to maintain the integrity of the thin-layer cover, dams and stream restoration and prevent activities (e.g., excavation) that could expose the underlying contaminated sediment/soil before RAOs are met. Long-term monitoring will be designed to evaluate the integrity of the thin-layer cover and stream restoration, whether any downstream transport of contaminated sediment/soil is occurring, and the rate at which recovery is occurring after the placement of the natural cover material.

The general approach for monitoring includes an annual survey, collection of samples for analytical chemistry and assessment of the rate of recovery and degree of functioning of riparian vegetation (including the tree, shrub, and herbaceous cover strata). Sediment/soil monitoring will be performed on an annual basis as well as after significant storm events to evaluate the thickness of the sediment/soil deposited over time and to confirm that the contaminated sediment/soil has not migrated away from this area of the site. An estimated 20 soil samples will be collected annually and analyzed for dioxin, other contaminants, and physical properties. Long-term biota monitoring will be conducted to determine biota recovery by collecting about 10 annual tissue (earthworm) samples per year and analyzing these samples for dioxin and other contaminants. Water quality monitoring using 10 dioxin and other contaminant samples per year will be performed to assess the quality of the surface water and potential for downriver transport. Monitoring downstream of the Lyman Mill Dam will also be performed to assess potential impact of the remedial action on the downstream areas. Compensatory mitigation and annual invasive species monitoring and management will also be necessary.

Annual maintenance for the Allendale and Lyman Mill dams will include checking gate operation, cutting vegetation on the embankments, a visual inspection of dam structure and repairs. Periodic reporting will be required to document remedy progress and efficacy, and the long-term monitoring results will be used to determine if additional evaluations or cleanups were warranted. Details of the monitoring plan will be developed during final design.

Maintenance of the Allendale Dam will be required to prevent a sudden release of water that could erode the cover over contaminated sediment/soil. ICs restricting site access and use will be required to prevent the disturbance of the thin-layer cover and dams. In addition, engineering controls (such as boardwalks and fencing) could be used to enhance remedy effectiveness by further reducing human exposure.

Disposal and Treatment

It may be possible to use some of the excavated material to assist in grading and building the bottom layer of the cap to be constructed in the Source Area. This material would not need to comply with the LDRs because it would be consolidated and moved within the area of contamination. Use of some of the excavated material in this way would reduce the amount of material requiring disposal.

The alternative treatment standards for contaminated soil in 40 CFR §268.49 will be used for excavated material to determine what soil will require treatment. Based upon current sampling data, approximately 10 percent of the excavated material will require treatment (approximately 10 percent of the samples contain contamination above the LDR alternative treatment standards in 40 CFR §268.49). These assumptions would be confirmed during design. Alternative treatment standards for debris (40 CFR §268.45) may be used if debris is encountered.

Summary of the Estimated Remedy Costs for Lyman Mill Stream Sediment and Floodplain Soil (including Oxbow)

Table L-15 presents major capital and annual O&M cost elements for Lyman Mill Stream Sediment and Floodplain Soil (including Oxbow).

Expected Outcomes of the Selected Remedy for Lyman Mill Stream Sediment and Floodplain Soil (including Oxbow)

The primary expected outcome of the selected remedy is that this area of the Site will no longer present an unacceptable risk to human health for recreational and residential users from direct contact with contaminated floodplain soil and sediment (including Oxbow) and from contaminated biota ingestion. The area will also be remediated in a manner that meets RIDEM direct residential exposure criteria. Another expected outcome of the selected remedy is that it will prevent migration of contaminants from Lyman Mill stream sediment and floodplain soil that would result in river surface water concentrations in excess of federal and state WQCs or in sediment concentrations above cleanup levels.

The selected remedy will also provide environmental and ecological benefits by reducing risks to ecological receptors related to bioaccumulation hazards while balancing this risk reduction with preservation of a large wetland ecological habitat in the area. This component of the selected remedy will also provide enhanced access to recreational uses in the Lyman Mill Reach of the River. Approximately 4 years are estimated as the amount of time necessary to achieve the goals consistent with recreational human exposures and approximately 30 years are estimated as the amount of time necessary to achieve the goals for ecological receptors. For the residential-use areas, the time estimated to reach cleanup objectives is several days for each property.

For direct contact via incidental ingestion and dermal contact with contaminated residential-use floodplain soil at the eastern shore of Lyman Mill Pond, unacceptable cancer risks and non-cancer hazards were identified for current and future residents living along the River. Cleanup levels for contaminants in residential-use floodplain soil exhibiting unacceptable cancer risk and non-cancer HI have been established such that they are protective of human health. Floodplain soil cleanup levels for known and suspect carcinogenic contaminants (specifically Class A and B2 compounds) as well as for non-carcinogenic contaminants have been set at site specific levels after an evaluation of risk-based levels developed for the most sensitive receptor and/or exposure pathway, ARARs, TBCs, and site background data.

For direct contact via incidental ingestion and dermal contact with contaminated floodplain surface soil at Lyman Mill Oxbow Area – General Area, unacceptable cancer risks and non-cancer hazards were identified for current and future passive recreational visitors. Cleanup levels for contaminants in floodplain soil exhibiting unacceptable cancer risk and non-cancer HI have been established such that they are protective of human health. Floodplain soil cleanup levels for known and suspect carcinogenic contaminants (specifically Class A and B2 compounds) as well as for non-carcinogenic contaminants have been set based on protective human health risk levels considering exposures via incidental ingestion and dermal contact for recreational visitors to the Oxbow Area – General Area, and at site specific levels after an evaluation of risk-based levels developed for the most sensitive receptor and/or exposure pathway, ARARs, TBCs, and site background data. The cleanup goal selection process for sediment was similar to that for soil, considering risk-based values and background concentrations. . Sediment cleanup levels for Site contaminants were selected to meet acceptable risk range with consideration of Site background levels.

Risk management was part of the process of selecting cleanup levels at the Site. Soil cleanup levels for known and suspect carcinogenic contaminants (specifically Class A and B2 compounds) have been set based on the consideration of protective human health risk levels for exposures via incidental ingestion and dermal contact, for resident and recreational visitor at Lyman Mill Stream Sediment and Floodplain Soil (including Oxbow) Area and and RIDEM residential direct exposure criteria. Preliminary remediation goal at target risk level of 10^{-6} for each carcinogenic contaminant was considered as the point of departure for selecting cleanup goals so that cumulatively, cancer risk from all soil contaminants meets RIDEM risk requirement of 10^{-5}. If the background concentration for a given contaminant is greater than the risk-based concentration representing the 10^{-6} point of departure, the background concentration was selected as the cleanup level. This approach is consistent with risk assessment guidance and EPA policy indicating that cleaning up contaminants to levels below background levels is not warranted. Soil cleanup levels for carcinogenic contaminants at the Site were selected to meet acceptable risk range with consideration of Site background levels and also to meet RIDEM risk requirement.

Cleanup levels for contaminants in soils having non-carcinogenic effects were derived for the same exposure pathways and correspond to an acceptable exposure level to which the human population, including sensitive subgroups, may be exposed without adverse effects during a lifetime or part of a lifetime, incorporating an adequate margin of safety or HQ of 1. Soil cleanup levels for non-carcinogenic contaminants at the Lyman Mill Stream Sediment and Floodplain Soil (including Oxbow) Area are based on protective human health risk levels and RIDEM residential direct exposure criteria. If a cleanup value described above is not capable of being detected with good precision and accuracy or is below background values, then the Site-specific background value was used as appropriate for the soil cleanup level. Soil cleanup levels for non-carcinogenic contaminants at the Site were selected to meet acceptable hazard index of 1 with consideration of Site background levels and also to meet RIDEM risk requirement.

These soil cleanup levels attain EPA's risk management goal for remedial actions and have been determined by EPA to be protective. These cleanup levels in soil are consistent with ARARs for soil, attain EPA's risk management goal for remedial actions, and have been determined by EPA to be protective. The selection process of these floodplain soil cleanup levels was similar to that for Source Area soil and sediment. These soil cleanup levels must be met at the completion of the remedial action throughout the Lyman Mill Stream Sediment and Floodplain Soil (including Oxbow) Area as demonstrated by confirmatory soil samples**.** For residential-use properties, incremental composite sampling of floodplain soil on approximately 20 properties will be used during the design to evaluate which properties require excavation. Precautionary measures to prevent exposure, such as fencing or spreading a cover (e.g., mulch or clean soil) will be taken on residential-use properties in the interim.

The selected 2,3,7,8-TCDD soil cleanup level was a conservative Site-specific number, taking background into consideration. This cleanup level also takes into account the newly released EPA RfD value for 2,3,7,8-TCDD to meet EPA protective risk range, non-cancer risk level, and meet ARARs.

As part of pre-design, additional background characterization will be conducted to extend the current limited background dataset, verify background data and statistical analysis. Background soil and sediment samples would be analyzed for dioxin/furans, including 2,3,7,8-TCDD, Coplanar PCBs, pesticides, PCBs, VOCs, SVOCs, and metals. If necessary, floodplain soil and sediment cleanup levels which are based on human health risk with consideration of background levels will be adjusted using these data and documented in subsequent decision documents. Soil and sediment cleanup levels based on background may result in elevated risk to receptors, since cleanup levels cannot be established below background to avoid potential recontamination.

The cleanup goal selection process for sediment was similar to that for soil, considering risk-based values and background concentrations. Sediment cleanup levels for Site contaminants were selected to meet acceptable risk range with consideration of Site background levels.
Soil cleanup levels for contaminants in floodplain surface soil exhibiting an unacceptable hazard quotient have been established such that they are protective of the environment. Cleanup levels for contaminants in soils having potential population-level effects to wildlife and other ecological receptors were derived for the contaminated prey ingestion, incidental soil ingestion and/or dermal contact exposure pathways and correspond to an acceptable exposure level to which sensitive environmental populations (including sensitive species/taxa) may be chronically exposed to without adverse population-level effects (such as reduction in number of individuals

or elimination of a local population). Exposure parameters for the contaminated prey ingestion, incidental soil ingestion and dermal contact exposure pathways have been described in the Baseline Ecological Risk Assessment. If a cleanup value described above is below background values, then a background value was used as appropriate for the soil cleanup level.

Sediment cleanup levels for Lyman Mill Pond apply to Lyman Mill Stream Sediment and Floodplain Soil. Tables L-16 through L-18 summarize the soil cleanup levels for contaminants identified in Lyman Mill Stream Sediment and Floodplain Soil.

These cleanup levels in soils and sediment are consistent with ARARs for soil, attain EPA's risk management goals for remedial actions, and have been determined by EPA to be protective. These soil/sediment cleanup levels must be met at the completion of the remedial action at the point of compliance (throughout) in the Lyman Mill Stream Sediment and Floodplain Soil. Confirmatory sampling will be performed in the excavated areas at the end of the construction to confirm that the criteria for excavation, such as site-specific dioxin cleanup levels, and RIDEM residential direct exposure criteria, have been met, in addition to excavation of areas subject to erosion by confirming the delineated excavation footprint. For residential-use properties, incremental composite sampling of floodplain soil on approximately 20 properties will be used to evaluate areas requiring excavation. Precautionary measures to prevent exposure, such as fencing or spreading a cover (e.g., mulch or clean soil) may be taken on residential-use properties in the interim.

7. Site-wide Remedy Features

Site-wide Mitigation

Mitigation must be done to meet regulatory wetlands and floodplain requirements including but not limited to the following:

Out-of-kind mitigation for the lost habitat would be provided adjacent to the river, most likely along the western shore of Lyman Mill Pond and developing a permanent buffer zone. Several candidate locations along the western edge of Lyman Mill Pond include the mouth of Assapumpset Stream and former wetland situated southwest of the river channel remnant in the Oxbow Area, and a couple of other potential restoration opportunities along the eastern shoreline of Lyman Mill Pond

In addition, historical filling activities near the southwestern corner of the Oxbow Area and the confluence of Assapumpset Stream with the river provide opportunities for wetland restoration. The fill material would be removed, the original soil material tested for contamination (and further excavated as necessary), the land surface graded to re-establish proper wetland hydrology and then replanted to develop emergent marsh, scrub/shrub or palustrine forest habitat to be specified in the mitigation plan. Control of invasive species would also be required.

It is assumed that all work will be performed in an upstream to downstream direction to prevent re-contamination of areas previously remediated and that all remediation work will be carried concurrently in the Allendale Reach before proceeding to the Lyman Mill Reach.

Surface Water

The stretch of the Woonasquatucket River where the Site is located has been designated by the State of Rhode Island as Class B1 waters, which are designated for primary and secondary contact recreational activities and fish and wildlife habitat, but primary contact recreational activities may be impacted due to pathogens from approved wastewater discharges. However all Class B criteria established by the State must be met for these waters. Because dioxin detected in surface water exceeds federal and state WQC of 0.5 pg/L, as modified based on site specific bioaccumulation factors, a cleanup level for 2,3,7,8-TCDD of 0.5 pg/L in surface water has been established based on this ARAR. The components of the selected remedy that address soil, floodplain soil, groundwater and sediment should result in attainment of these standards. Any contaminants detected in surface water in excess of ARARs but found to be consistent with, or less than background conditions were not retained for cleanup level determination. However, additional sampling will be performed during the design phase to verify background conditions and the statistical comparisons, and verify undetected contaminants using analytical methods capable of measuring concentrations at levels below the ARARs. These data will be evaluated to assess impacts, if any, to the cleanup levels in surface water and could result in the identification of additional surface water criteria that must be met.

Changes in the Remedy

The selected remedy may change somewhat as a result of the remedial design and construction processes. Changes to the remedy described in this Record of Decision will be documented in a technical memorandum in the Administrative Record for the Site, an Explanation of Significant Differences (ESD) or a Record of Decision Amendment, as appropriate.

Five-Year Reviews

This Site will require Five-Year reviews. To the extent required by law, EPA will review the Site at least once every five years after the initiation of remedial action at the Site because hazardous substances, pollutants or contaminants remain at the Site to assure that the remedial action continues to protect human health and the environment. Table L-19 presents Remedy total cost summary.

Remedy Cost Information

The information in the cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost. These estimates are to be refined as the remedy is designed and implemented.

Table L-1. Source Area Soil Alternative 4e, Cost Detail Summary

Category	Description	Cost	Assumption
Direct Costs	Install RCRA/TSCA Caps	$6,000,000	Install RCRA/TSCA caps over 7.8 acres (existing caps, paved surfaces, and landscape areas); includes excavation of soil from landscape areas and off-site disposal in hazardous waste landfill (1,800 tons at $410/ton; $760,000)
	Additional Cleanup Area	$300,000	Landscaped areas north of Brook Village apartment building - clear 0.3 acre, excavate 430 cy soil, off-site disposal (alternatively install RCRA cap over 0.3 acres)
	Clean utility corridor	$700,000	Replace sewer, water, gas, power, telephone, cable and storm drains
	Disposal of Principal Threat Waste	$8,400,000	Off-site treatment by incineration, 8,900 tons ($880/ton)
	Health and safety	$140,000	~1% of direct costs; majority of work with clean materials
	Total Direct Costs	**$15,550,000**	
Indirect Costs	Design and pre-design sampling	$460,000	
	Construction oversight & QA	$920,000	
	Legal and Admin	$850,000	5% of total direct, design, & construction oversight/QA costs
	Contingency	$3,400,000	20% of total direct, design, &construction oversight/QA costs
	Total Indirect Costs	**$5,630,000**	
TOTAL CAPITAL COSTS		**$21,200,000**	
Operation and Maintenance	O&M	$300,000	Annual mowing, cap maintenance, & invasive species control; 30 years (Annual O&M $24,000/year)
	Five-year reviews	$25,000	30 years
	Monitoring	$150,000	Inspections of caps (GW monitoring covered under GW long-term O&M); 30 years (Annual monitoring $12,000/year)
	Total O&M Costs	**$470,000**	
TOTAL PRESENT WORTH COST		**$21,700,000**	7% discount rate over 30 years

Notes: Additional cost to comply with the National Historic Preservation Act (NHPA) $120,000 to $135,000

Table L-2. Cleanup Levels for Source Area Soil Contact for a Resident

Contaminant	Cleanup Level[1]	Basis	Explanation
Dioxin (ng/kg)			
2,3,7,8-TCDD[2]	17	HH Risk with Site background taken into consideration	This level equals to residual HI of less than 1 and cancer risk of 5E-06.
Pesticides/PCBs (mg/kg)			
Total Aroclors (total PCB)	1	TBC[a]	EPA's recommended residential level for PCB
Aldrin[3]	0.035	HH Risk	Resident, direct contact with soil
Dieldrin	0.04	ARAR	RIDEM residential direct exposure criteria
Heptachlor[3]	0.13	HH Risk	Resident, direct contact with soil
Technical Chlordane	0.5	ARAR	RIDEM residential direct exposure criteria
Semi-volatile Organic Compounds (mg/kg)			
4-chloroaniline[3]	2.0	HH Risk	Resident, direct contact with soil
Benzo(a)anthracene	0.9	ARAR	RIDEM residential direct exposure criteria
Benzo(a)pyrene	0.4	ARAR	RIDEM residential direct exposure criteria
Benzo(b)fluoranthene	0.9	ARAR	RIDEM residential direct exposure criteria
Benzo(g,h,i)perylene	0.8	ARAR	RIDEM residential direct exposure criteria
Benzo(k)fluoranthene	0.9	ARAR	RIDEM residential direct exposure criteria
Biphenyl, 1,1-	0.8	ARAR	RIDEM residential direct exposure criteria
Bis(2-ethylhexyl)phthalate	46	ARAR	RIDEM residential direct exposure criteria
Chrysene	0.4	ARAR	RIDEM residential direct exposure criteria
Dibenzo(a,h)anthracene	0.4	ARAR	RIDEM residential direct exposure criteria
Fluoranthene	20	ARAR	RIDEM residential direct exposure criteria
Indeno(1,2,3-cd)pyrene	0.9	ARAR	RIDEM residential direct exposure criteria
Naphthalene	0.8	ARAR	RIDEM GA leachability criteria
Pentachlorophenol	5.3	ARAR	RIDEM residential direct exposure criteria
Pyrene	13	ARAR	RIDEM residential direct exposure criteria
Metals (mg/kg)			
Antimony	10	ARAR	RIDEM residential direct exposure criteria
Arsenic	7	ARAR	RIDEM residential direct exposure criteria
Beryllium	0.4	ARAR	RIDEM residential direct exposure criteria
Cadmium	39	ARAR	RIDEM residential direct exposure criteria
Lead	150	ARAR	RIDEM residential direct exposure criteria
Manganese	390	ARAR	RIDEM residential direct exposure criteria
Thallium	5.5	ARAR	RIDEM residential direct exposure criteria

Table L-2. (Continued)

Contaminant	Cleanup Level[1]	Basis	Explanation
Volatile organic compounds (mg/kg)			
Benzene	0.2	ARAR	RIDEM GA leachability criteria
Chlorobenzene	3.2	ARAR	RIDEM GA leachability criteria
Dichloroethane (1,2-)	0.1	ARAR	RIDEM GA leachability criteria
Dichloroethene (cis-1,2-)	1.7	ARAR	RIDEM GA leachability criteria
Ethyl benzene	27	ARAR	RIDEM GA leachability criteria
Tetrachloroethene (PCE)	0.1	ARAR	RIDEM GA leachability criteria
Toluene	32	ARAR	RIDEM GA leachability criteria
Trichlorobenzene (1,2,3-)[3]	63	HH RISK	Resident, direct contact with soil
Trichlorobenzene (1,2,4-)[3]	20	HH RISK	Resident, direct contact with soil
Trichloroethene (TCE)	0.2	ARAR	RIDEM GA leachability criteria
Vinyl chloride	0.02	ARAR	RIDEM residential direct exposure criteria
Xylenes (Total)	110	ARAR	RIDEM residential direct exposure criteria
Trichloroethane (1,1,1-)	11	ARAR	RIDEM GA leachability criteria
Trichloroethane (1,1,2-)	0.1	ARAR	RIDEM GA leachability criteria
Dichlorobenzene (1,2-)	41	ARAR	RIDEM GA leachability criteria
Styrene	2.9	ARAR	RIDEM GA leachability criteria
Dichloroethene (trans-1,2)	3.3	ARAR	RIDEM GA leachability criteria

Notes:

1. Cleanup levels are based on these contaminants detected in vadose zone samples at concentrations in excess of ARARs (RIDEM residential direct exposure and GA leachability criteria), at concentrations in excess of EPA's recommended residential level for PCB, or risk-based PRGs (developed for the most sensitive receptor and/or exposure pathway) where ARARs are not available.
2. The cleanup goal selection process for soil, considering risk-based values, ARARs, TBCs, and background concentrations, was conducted for the Source Area. Using Site-specific values, the 2,3,7,8-TCDD PRG at 17 ng/kg is selected because it results in acceptable HI of less than 1, acceptable cancer risk of 5E-6, and meets RIDEM regulations. For Dioxin TEQ, human health risk-based non-cancer PRG of 50 ng/kg for HI of 1 would result in cancer risk of 1.4E-5 for resident, direct contact. When considering the cumulative cancer health effects from other contaminants at the Source Area, the cumulative cancer risk would exceed RIDEM's risk requirement of 10^{-5}. Therefore, the cleanup level for dioxin at the Source Area is 17 ng/kg, primarily 2,3,7,8-TCDD.
3. Contaminant is included because it was identified in the Source Area Risk Assessment. Levels for these contaminants either did not exceed ARAR or no ARAR exist.

a. Use of TBC (EPA's recommended residential PRG for PCB of 1 mg/kg) as a cleanup level for total Aroclors (total PCB) is a site-specific decision. All numeric criteria for all contaminants listed in regulations identified as ARARs are also considered cleanup levels and must be met regardless of whether or not they are identified above as cleanup levels except where background is an issue.

Key: ARAR - Applicable or Relevant and Appropriate Requirement; EPA – United States Environmental Protection Agency; PCB - polychlorinated biphenyl; PRG – Preliminary Remediation Goal, RIDEM – Rhode Island Department of Environmental Management; TBC - to be considered; TEQ - toxic equivalency; mg/kg - milligram per kilogram; and ng/kg - nanograms per kilogram

Table L-3. Groundwater Alternative 2e, Cost Detail Summary

Category	Description	Cost	Assumption
Direct and Indirect Costs	Excavate contaminated material and install RCRA Cap	$2,700,000	Excavate 2,300 tons of soil, install RCRA caps over 0.1 acres, off-site treatment by incineration
TOTAL CAPITAL COSTS		**$2,700,000**[1]	Completed
Operation and Maintenance	Install additional wells	$50,000	3 additional deep monitoring wells with multiple screened intervals
	O&M	$140,000	Redevelop 20 wells once every 5 years
	Five-year reviews	$0	30 years, costs are covered under Source Area Soil Alternative 4e
	Monitoring	$740,000	30 years (Annual monitoring $70,600/year), 20 well intervals (5 sampling days, 25 groundwater samples)
	Total O&M Costs	**$930,000**	
TOTAL PRESENT WORTH COST		**$3,600,000**	7% discount rate over 30 years

Notes:
1. Performed as time-critical removal action in 2009-2010

Table L-4. Interim Cleanup Levels for Groundwater

Contaminant	Interim Cleanup Level[1]	Basis	Explanation
Dioxin (pg/L)			
2,3,7,8-TCDD	30	ARAR	Federal MCL
Metals (mg/L)			
Arsenic	0.01	ARAR	Federal MCL
Chromium	0.1	ARAR	Federal MCL
Lead	0.015	ARAR	Federal MCL
Thallium	0.0005	ARAR	Federal non-zero MCLG
Volatile organic compounds (mg/L)			
Benzene	0.005	ARAR	Federal MCL
Chlorobenzene	0.1	ARAR	Federal MCL
Dibromochloropropane (DBCP)	0.0002	ARAR	Federal MCL
Dichloroethene (cis-1,2-)	0.07	ARAR	Federal MCL
Tetrachloroethene (PCE)	0.005	ARAR	Federal MCL
Trichloroethene (TCE)	0.005	ARAR	Federal MCL
Vinyl chloride	0.002	ARAR	Federal MCL
Ethylene dibromide	0.00005	ARAR	Federal MCL

Notes:

1. Interim cleanup levels are based on these contaminants detected in groundwater within the Source Area at concentrations in excess of ARARs (MCLs and non-zero MCLGs for drinking water). Cleanup levels were not developed for undetected contaminants where the laboratory detection limits were in excess of ARARs. Additional sampling will be performed during the design phase to verify background conditions and the statistical comparisons, and verify undetected contaminants using analytical methods capable of measuring concentrations at levels below the ARARs. These data will be evaluated to assess impacts, if any, to the cleanup levels. However, all numeric criteria for all contaminants listed in regulations identified as ARARs are also considered cleanup levels and must be met regardless of whether or not they are identified above as cleanup levels except where background is an issue.

Key: ARAR - Applicable or Relevant and Appropriate Requirement; DBCP – dibromochloropropane; MCL – maximum contaminant level; mg/L – milligrams per liter; PCE – tetrachloroethylene; pg/L – picograms per liter; and TCE – trichloroethylene.

Table L-5. Allendale and Lyman Mill Sediment Alternative 7a, Cost Detail Summary

Category	Description	Cost	Assumption
Direct Costs	Mobilization & temporary roads	$1,800,000	384,000 sf of roads and work areas
	Drain ponds	$3,500,000	Repair Lyman Mill Dam gate structures; gravity drain; sheet pile along centerline
	Excavate, haul, thin-layer cover	$5,800,000	Excavate 155,800 cy, thin-layer cover 47,000 tons
	Upland CDF/sediment processing	$17,100,000	Mechanical dewatering, treat water and build approx 5 acre CDF
	Contractor supervision/field office	$2,500,000	21 months for field staff
	Off-site Disposal (incineration)	$9,900,000	10% of dewatered sediment (11,300 tons @ $880/ton)
	Health and safety	$840,000	Safety officer and crew PPE
	Total Direct Costs	**$41,500,000**	
Indirect Costs	Design and pre-design sampling	$1,500,000	
	Construction oversight & QA	$2,600,000	
	Legal and Admin	$2,300,000	5% of total direct, design, & construction oversight/QA costs
	Property Purchase	$600,000	Land for upland CDF
	Contingency	$9,100,000	20% of total direct, design, & construction oversight/QA costs
	Total Indirect Costs	**$16,200,000**	
TOTAL CAPITAL COSTS		**$57,700,000**	
Operation and Maintenance	O&M	$270,000	CDF cover maintenance; 30 years (Annual O&M $22,000/year)
	Five-year reviews	$32,000	30 years
	Monitoring	$2,500,000	Annual benthic community analysis & fish/water/sediment/ CDF monitoring; 30 years (Annual monitoring $199,000/year)
	Total O&M Costs	**$2,800,000**	
TOTAL PRESENT WORTH COST		**$60,500,000**	7% discount rate over 30 years

Notes: Additional cost to comply with the National Historic Preservation Act (NHPA) $210,000 to $240,000

Table L-6. Allendale Pond Sediment and Sediment Associated Fish Consumption for a Resident Living Along the River

Carcinogenic Contaminant	Cancer Classification	Sediment Cleanup Level[1] (mg/Kg)	Basis	RME Residual Cancer Risk	
Benzo(a)pyrene	B2	1.4	Background[a]	4.E-06	A
Dibenz(a,h)anthracene	B2	0.97	Background[a]	2.E-06	A
Dieldrin	B2	0.0026	Background[a]	2.E-06	B
Technical Chlordane	B2	0.4	Background[b]	8.E-06	B
Aroclor 1254	B2	0.031	Background[ac]	8.E-06	B
Aroclor 1268	B2	0.023	Background[ac]	2.E-06	B
Arsenic	A	3.9	Background[a]	1.E-06	A
2,3,7,8-Tetrachlorodibenzo-p-dioxin[2]	B2	0.000015	Background[a]	3.E-05	C
Coplanar PCBs (TEQ)[3]	B2	0.000025	Background[a]	--	D
			Sum of Carcinogenic Risk	**5.E-05**	
Non-Carcinogenic Contaminant	**Target Endpoint**	**Sediment Cleanup Level (mg/Kg)**	**Basis**	**RME Residual Hazard Index**	
Benzo(a)pyrene	Kidney	1.4	Background[a]	0.0001	A
Dibenz(a,h)anthracene	Kidney	0.97	Background[a]	0.00008	A
Dieldrin	Liver	0.0026	Background[a]	0.007	B
Technical Chlordane	Liver	0.4	Background[b]	0.1	B
Aroclor 1254	Immune system	0.031	Background[ac]	0.7	B
Aroclor 1268	Immune system	0.023	Background[ac]	0.1	B
Arsenic	Skin	3.9	Background[a]	0.03	A
2,3,7,8-Tetrachlorodibenzo-p-dioxin[2]	Reproductive/ Endocrine	0.000015	Background[a]	1	C
Coplanar PCBs (TEQ)[3]	--	0.000025	Background[a]	--	D
			HI Kidney	**0.00008**	
			HI Liver	**0.2**	
			HI Immune System	**0.8**	
			HI Skin	**0.03**	
			HI Reproductive	**1**	

Notes:
1. Cleanup levels are based on an evaluation of risk-based PRGs, (developed for the most sensitive receptor and/or exposure pathway) TBCs and Site background data. Because there are no chemical-specific ARARs for sediment, ARARs are not included in this evaluation. Additional sampling will be performed during the design phase to verify background conditions and the statistical comparisons, and verify undetected contaminants using analytical methods capable of measuring concentrations at levels below the risk-based PRGs. These data will be evaluated to assess impacts, if any, to the cleanup levels.
2. Dioxin TEQ cleanup level for sediment is background level of 34 ng/kg. Background is used because human health risk-based PRG (combined fish diet and direct contact, 10^{-6}) is below upstream background value.
3. Coplanar PCBs (TEQ) will be included as part of the sediment dioxin TEQ cleanup level in the future data evaluations.
a. Background is used because human health risk based PRG (10^{-6}) is below upstream background value.
b. Background is used because ecological risk-based PRG (HI=1) is below upstream background value. Human health risk-based PRG (10^{-6}) is also below upstream background value.
c. Estimated regional background values derived by excluding elevated upriver background results collected between the Smithfield Wastewater Treatment Plant and Route 44.

Key:
A - Residual cancer risk and/or hazard index for direct contact; B - Residual cancer risk and/or hazard index for fish consumption; C - Residual cancer risk and/or hazard index for fish consumption and direct contact; D - Residual cancer risk and/or hazard index not calculated for Coplanar PCBs due to highly uncertain BSAFs. Use of this Cleanup Level with the existing BSAFs would be inconsistent with the previously calculated risk at Greystone Mill Pond (the background area);
HI - Hazard Index; RME - Reasonable Maximum Exposure; mg/kg - milligrams/kilogram; PCB - polychlorinated biphenyl; TEQ - toxic equivalent

Table L-7. Allendale Pond Sediment Contact and Sediment Associated Prey Consumption by Ecological Receptors

Contaminant	Sediment Cleanup Level[1] (mg/Kg)	Basis	Residual Hazard Quotients[a]			
			Demersal Fish[b]	Pelagic Fish[b]	Piscivorous Wildlife[c]	Insectivorous Wildlife[d]
2,3,7,8-TCDD[2]	0.000015	Background[e]	0.038 A	N/A	0.049 B	0.039 C
Aroclor 1254[3]	0.031	Background[eg]	0.14 A	N/A	0.10 B	-
Total Aroclors[3]	0.060	Background[fg]	-	N/A	0.55 B	-
Technical Chlordane	0.4	Background[f]	27 A	N/A	-	-
Selenium	1.1	Background[f]	2.6 A	N/A	-	-
Zinc	221	Background[f]	4.5 A	N/A	-	-
		HI[h]	**30**		**0.7**	**0.04**

Notes:

1. Cleanup levels are based on an evaluation of risk-based PRGs (developed for the most sensitive receptor and/or exposure pathway), TBCs and Site background data. Because there are no chemical-specific ARARs for sediment, ARARs are not included in this evaluation. Additional sampling will be performed during the design phase to verify background conditions and the statistical comparisons, and verify undetected contaminants using analytical methods capable of measuring concentrations at levels below the risk-based PRGs. These data will be evaluated to assess impacts, if any, to the cleanup levels.
2. Dioxin TEQ cleanup level for sediment is background level of 34 ng/kg. Background is used because human health risk-based PRG (combined fish diet and direct contact, 10^{-6}) is below upstream background value.
3. The BERA evaluated risks for individual and Total Aroclors if benchmarks were available for a specific endpoint species.

a. Calculated by dividing the cleanup level by the PRG for the most sensitive measurement endpoint for each receptor category.
b. Sediment concentrations protective of demersal and pelagic fish were derived using (A) literature-derived CBR; the basis (*i.e.*, most protective of available PRGs) for the residual hazard calculation indicated. The white sucker and large-mouth bass are representative receptor species for these two assessment endpoints, respectively.
c. Sediment concentrations protective of piscivorous wildlife were derived using: (B) dietary exposure modeling. The belted kingfisher is the representative receptor species for this assessment endpoint.
d. Sediment concentrations protective of insectivorous wildlife were derived using: (C) literature-derived CBR; the basis (*i.e.*, most protective of available PRGs) for the residual hazard calculation indicated. The tree swallow is the representative receptor species for this assessment endpoint.
e. Background is used because human health risk-based PRG (10^{-6}) is below upstream background value.
f. Background is used because ecological risk-based PRG (HI=1) is below upstream background value. For technical chlordane, human health risk-based PRG (10^{-6}) is also below upstream background value.
g. Estimated regional background values derived by excluding elevated upriver background results collected between the Smithfield Wastewater Treatment Plant and Route 44.
h. Values reported as one significant figure.

Key: PCB - polychlorinated biphenyl; TEQ - Toxic Equivalent; N/A - not applicable

Table L-8. Lyman Mill Pond Sediment and Sediment Associated Fish Consumption for a Resident Living Along the River

Carcinogenic Contaminant	Cancer Classification	Sediment Cleanup Level[1] (mg/Kg)	Basis	RME Residual Cancer Risk	
Benzo(a)pyrene	B2	1.4	Background[a]	4.E-06	C
Dibenz(a,h)anthracene	B2	0.97	Background[a]	2.E-06	A
N-Nitroso-di-n-propylamine	B2	0.46	HH Risk	1.E-06	A
Dieldrin	B2	0.0026	Background[a]	2.E-06	B
Technical Chlordane	B2	0.4	Background[b]	8.E-06	B
Aroclor 1254	B2	0.031	Background[ac]	8.E-06	B
Aroclor 1268	B2	0.023	Background[ac]	2.E-06	B
Arsenic	A	3.9	Background[a]	1.E-06	A
2,3,7,8-Tetrachlorodibenzo-p-dioxin[2]	B2	0.000015	Background[a]	3.E-05	C
Coplanar PCBs (TEQ)[3]	B2	0.000025	Background[a]	--	D
			Sum of Carcinogenic Risk	**6.E-05**	
Non-Carcinogenic Contaminant	**Target Endpoint**	**Sediment Cleanup Level (mg/Kg)**	**Basis**	**RME Residual Hazard Index**	
Benzo(a)pyrene	Kidney	1.4	Background[a]	0.0001	C
Dibenz(a,h)anthracene	Kidney	0.97	Background[a]	0.00008	A
N-Nitroso-di-n-propylamine	--	0.46	HH Risk	--	E
Dieldrin	Liver	0.0026	Background[a]	0.007	B
Technical Chlordane	Liver	0.4	Background[b]	0.1	B
Aroclor 1254	Immune system	0.031	Background[ac]	0.7	B
Aroclor 1268	Immune system	0.023	Background[ac]	0.1	B
Arsenic	Skin	3.9	Background[a]	0.03	A
2,3,7,8-Tetrachlorodibenzo-p-dioxin[2]	Reproductive/ Endocrine	0.000015	Background[a]	1	C
Coplanar PCBs (TEQ)[3]	--	0.000025	Background[a]	--	D
			HI Kidney	**0.0002**	
			HI Liver	**0.2**	
			HI Immune System	**0.8**	
			HI Skin	**0.03**	
			HI Reproductive	**1**	

Notes:
1. Cleanup levels are based on an evaluation of risk-based PRGs (developed for the most sensitive receptor and/or exposure pathway), TBCs and Site background data. Because there are no chemical-specific ARARs for sediment, ARARs are not included in this evaluation. Additional sampling will be performed during the design phase to verify background conditions and the statistical comparisons, and verify undetected contaminants using analytical methods capable of measuring concentrations at levels below the risk-based PRGs. These data will be evaluated to assess impacts, if any, to the cleanup levels.
2. Dioxin TEQ cleanup level for sediment is background level of 34 ng/kg. Background is used because human health risk-based PRG (combined fish diet and direct contact, 10^{-6}) is below upstream background value.
3. Coplanar PCBs (TEQ) will be included as part of the sediment dioxin TEQ cleanup level in the future data evaluations.
a. Background is used because human health risk-based PRG (10^{-6}) is below upstream background value.
b. Background is used because ecological risk-based PRG (HI=1) is below upstream background value. Human health risk-based PRG (10^{-6}) is also below upstream background value.
c. Estimated regional background values derived by excluding elevated upriver background results collected between the Smithfield Wastewater Treatment Plant and Route 44.

Key:
A - Residual cancer risk and/or hazard index for direct contact; B - Residual cancer risk and/or hazard index for fish consumption; C - Residual cancer risk and/or hazard index for fish consumption and direct contact; D - Residual cancer risk and/or hazard index not calculated for Coplanar PCBs due to highly uncertain BSAFs. Use of this cleanup level with the existing BSAFs would be inconsistent with the previously calculated risk at Greystone Mill Pond (the background area); E - RME Residual Hazard Index not calculated for this compound due to lack of noncarcinogenic toxicity data; HI - Hazard Index; RME - Reasonable Maximum Exposure; mg/kg - milligrams/kilogram; PCB - polychlorinated biphenyl; TEQ - toxic equivalent

Table L-9. Lyman Mill Pond Sediment Contact and Sediment Associated Prey Consumption by Ecological Receptors

Contaminant	Sediment Cleanup Level[1] (mg/Kg)	Basis	Residual Hazard Quotients[a]							
			Demersal Fish[b]		Pelagic Fish[b]		Piscivorous Wildlife[c]		Insectivorous Wildlife[d]	
2,3,7,8-TCDD[2]	0.000015	Background[e]	0.028	A	0.012	A	0.042	C	0.067	D
Coplanar PCBs (TEQ)[3]	0.000025	Background[e]	0.049	B	-		0.21	C	0.46	D
Aroclor 1254[4]	0.031	Background[eg]	0.11	A	-		0.076	C	-	
Total Aroclors[4]	0.060	Background[fg]	-		-		0.43	C	-	
Technical Chlordane	0.4	Background[f]	29	A	13	A	0.11	C	-	
4.4'-DDE	0.006	Background[f]	0.43	A	-		1.8	C	-	
4,4'-DDD	0.0084	Kingfisher diet	0.40	A	-		1.0	C	-	
Aluminum	8210	Background[f]	7.6	A	8.4	A	-		-	
Barium	134	Background[f]	9.3	A	16	A	-		-	
Selenium	1.1	Background[f]	2.3	A	-		-		-	
Vanadium	37.6	Background[f]	1.3	A	1.7	A	-		-	
Zinc	221	Background[f]	6.1	A	6.1	A	-		-	
		HI[h]	**60**		**50**		**4**		**0.5**	

Notes:
1. Cleanup levels are based on an evaluation of risk-based PRGs (developed for the most sensitive receptor and/or exposure pathway) and Site background data. Because there are no chemical-specific ARARs for sediment, ARARs are not included in this evaluation. Additional sampling will be performed during the design phase to verify background conditions and the statistical comparisons, and verify undetected contaminants using analytical methods capable of measuring concentrations at levels below the risk-based PRGs. These data will be evaluated to assess impacts, if any, to the cleanup levels.
2. Dioxin TEQ cleanup level for sediment is background level of 34 ng/kg. Background is used because human health risk-based PRG (combined fish diet and direct contact, 10^{-6}) is below upstream background value.
3. Coplanar PCBs (TEQ) will be included as part of the sediment dioxin TEQ cleanup level in the future data evaluations.
4. The BERA evaluated risks for individual and Total Aroclors if benchmarks were available for a specific endpoint species.

a. Calculated by dividing the cleanup level by the PRG for the most sensitive measurement endpoint for each receptor category.
b. Sediment concentrations protective of demersal and pelagic fish were derived using: (A) literature-derived CBR and (B) site-specific ELS thresholds; the basis (*i.e.*, most protective of available PRGs) for the residual hazard calculation indicated. The white sucker and large-mouth bass are representative receptor species for these two assessment endpoints, respectively.
c. Sediment concentrations protective of piscivorous wildlife were derived using: (C) dietary exposure modeling. The belted kingfisher is the representative receptor species for this assessment endpoint.
d. Sediment concentrations protective of insectivorous wildlife were derived using: (D) literature-derived CBR; the basis (*i.e.*, most protective of available PRGs) for the residual hazard calculation indicated. The tree swallow is the representative receptor species for this assessment endpoint.
e. Background is used because human health risk-based PRG (10^{-6}) is below upstream background value.
f. Background is used because ecological risk-based PRG (HI=1) is below upstream background value. For technical chlordane and 4,4'-DDE, human health risk-based PRG (10^{-6}) are also below upstream background value.
g. Estimated regional background values derived by excluding elevated upriver background results collected between the Smithfield Wastewater Treatment Plant and Route 44.
h. Values reported to one significant figure.

Key: HI - Hazard Index; mg/Kg - milligrams/kilogram; PCB - polychlorinated biphenyl; TEQ - Toxic Equivalent; N/A - not applicable

Table L-10. Calculated Fish Target Tissue Concentrations

Contaminant	Current Background (Greystone)[a] Fish Tissue Concentration	Current Allendale and Lyman Mill Fish Tissue Concentration[b]	Fish Target Tissue Concentration[c]	Basis[d]	Anticipated % Reduction in Concentration from Current Conditions[e]
Benzo(a) pyrene	0.00099	0.0035	0.0015	HH	58
4,4'-DDE	0.033	0.057	0.018	HH	69
4,4'-DDD	0.013	0.020	0.0062	Eco	100
Aroclor-1254	0.18	2.0	0.037	HH	98
Aroclor-1268	0.085	0.024	0.011	HH	55
Aroclor Total	0.33[e]	3.1[e]	0.076	Eco	92
Dieldrin	0.0027	0.0073	0.0011	HH	85
Technical Chlordane	0.21	0.74	0.13	Eco	71
2,3,7,8-TCDD	0.0000014	0.00034	0.0000022	HH	99
Dioxin/Furans TEQ	0.000054[f]	0.00060[e]	0.000044	Eco	99

Notes:
Units are in mg/kg (wet weight – tissue)

a. Current background fish tissue concentration in a Woonasquatucket River reach upstream of the Site (Greystone); values are based on the Combined Fish Diet Exposure Point Concentrations (EPCs; i.e., arithmetic average of American eel, white sucker/brown bullhead, and largemouth bass concentrations where available) unless noted otherwise.
b. Current (existing) fish tissue concentrations – calculated as the arithmetic mean of the Allendale and Lyman Mill Pond Combined Fish Diet Exposure Point Concentrations (EPCs) unless noted otherwise.
c. Presented in the Interim Final FS
d. With the exception of 4,4'-DDD and dioxin/furan TEQs, the sediment cleanup levels for these contaminants were established at the sediment background concentrations for Greystone Mill Pond. The basis for the 4,4'-DDD cleanup level was protection of dietary exposures in piscivorous birds (e.g., belted kingfisher) and for dioxin/furan TEQ, the basis was protection of residue-based effects (embryonic survival) in insectivorous birds (e.g., tree swallow).
e. Calculated as a difference between the current (existing conditions) Combined Fish Diet concentrations averaged for Allendale and Lyman Mill Ponds and the tissue concentrations anticipated following remediation, divided by existing conditions.
f. Aroclor Total and Dioxin/Furan TEQ values are arithmetic means of white sucker and largemouth bass EPCs

Key: HH - Human Health-based fish target tissue concentration, Eco - Ecological Risk-based fish target tissue concentration

Table L-11. Allendale Floodplain Soil Alternative 5a, Cost Detail Summary

Category	Description	Cost	Assumption
Direct Costs	Mobilization & temporary roads	$320,000	Clear 1.5 acres
	Excavate, haul, backfill	$240,000	Excavate 2,400 cy, backfill 3,900 tons
	Plantings	$62,000	Plant 1.5 acres
	CDF disposal	$65,000	
	Contractor supervision/field office	$110,000	1 month for field staff
	Health and safety	$15,000	Safety officer and crew PPE
	Additional Cleanup Area	$520,000	Clear 1.7 acres, excavate 4,220 cy and backfill 4,340 tons, restore to pre-existing conditions 1.7 acres, CDF containment and Health and Safety
	Total Direct Costs	**$1,330,000**	
Indirect Costs	Design and pre-design sampling	$160,000	
	Construction oversight & QA	$86,000	
	Legal and Admin	$79,000	5% of total direct, design, & construction oversight/QA costs
	Contingency	$315,000	20% of total direct, design, & construction oversight/QA costs
	Total Indirect Costs	**$640,000**	
TOTAL CAPITAL COSTS		**$2,000,000**	
Operation and Maintenance	O&M	$38,960	Invasive species control 3.1 acres; 30 years (Annual O&M $3,100/year)
	Five-year reviews	$0	Covered under remedy for the Allendale Pond sediment
	Monitoring	$74,100	Annual vegetation monitoring; 30 years (Annual monitoring $6,000/year)
	Total O&M Costs	**$113,000**	
TOTAL PRESENT WORTH COST		**$2,100,000**	7% discount rate over 30 years

Notes: Additional cost to comply with the National Historic Preservation Act (NHPA) $240,000 to $275,000

Table L-12. Allendale Floodplain Soil Contact for a Resident Living along the River

Carcinogenic Contaminant	Cancer Classification	Cleanup Level[1] (mg/Kg)	Basis	RME Residual Cancer Risk[a]	
Residential-use Soil/Eastern Shore of Allendale Pond					
Arsenic	A	7.7	Background[b]	(1)TBD	A
Benzo(a)pyrene	B2	2.0	Background[bc]	(1)TBD	A
Dibenz(a,h)-anthracene	B2	0.61	Background[b]	(1)TBD	A
2,3,7,8-TCDD[2]	B2	0.000017	HH Risk with Site background taken into consideration	5E-6	A
		Sum of Carcinogenic Risk		**5E-6**	
Non-Carcinogenic Contaminant	**Target Endpoint**	**Cleanup Level[1] (mg/Kg)**	**Basis**	**RME Residual Hazard Index[a]**	
Residential-use Soil/Eastern Shore of Allendale Pond					
Arsenic	Skin	7.7	Background[b]	(1)TBD	A
Benzo(a)pyrene	Kidney	2.0	Background[bc]	(1)TBD	A
Dibenz(a,h)-anthracene	Kidney	0.61	Background[b]	(1)TBD	A
2,3,7,8-TCDD[2]	Reproductive / Endocrine	0.000017	HH Risk with Site background taken into consideration	< 1	A

Notes:

1. Cleanup levels are based on an evaluation of risk-based PRGs (developed for the most sensitive receptor and/or exposure pathway), ARARs, TBCs, and Site background data. Cleanup levels were not developed for undetected contaminants where the laboratory detection limits were in excess of ARARs. Additional sampling will be performed during the design phase to verify background conditions and the statistical comparisons, and verify undetected contaminants using analytical methods capable of measuring concentrations at levels below the ARARs or risk-based PRGs. These data will be evaluated to assess impacts, if any, to the cleanup levels. However, all numeric criteria for all contaminants listed in regulations identified as ARARs are also considered cleanup levels and must be met regardless of whether or not they are identified above as cleanup levels except where background is an issue.
2. The cleanup goal selection process for soil, considering risk-based values, ARARs, and background concentrations, was conducted for the Allendale floodplain soil area. Using Site-specific values, the 2,3,7,8-TCDD PRG at 17 ng/kg is selected because it results in acceptable HI of less than 1, acceptable cancer risk of 5E-6, and meets RIDEM regulation. For Dioxin TEQ, human health risk-based non-cancer PRG of 50 ng/kg for HI of 1 would result in cancer risk of 1.4E-5 for resident, direct contact. When considering the cumulative cancer health effects from other contaminants at the Allendale floodplain soil area, the cumulative cancer risk would exceed RIDEM's risk requirement of 10^{-5}. Therefore, the cleanup level for dioxin in Allendale floodplain soil is 17 ng/kg, primarily 2,3,7,8-TCDD.

(1)TBD: Contaminant RME residual cancer risk and residual HI to be determined during design as part of the additional background study. There are a substantial number of soil samples analyzed for Dioxin TEQ along Allendale Pond (69 surface soil samples and 24 subsurface soil samples). However, there are fewer soil samples analyzed for arsenic, benzo(a)pyrene, and dibenz(a,h)anthracene along Allendale Pond (1 surface soil sample and 5 subsurface soil samples).

a. A - Residual cancer risk and/or hazard index for direct contact.
b. Background is used because human health risk-based PRG (10^{-6}) is below upstream background value.
c. Estimated regional background values based on upstream background samples from Esmond Dam south to Route 44.

Key: RME - Reasonable Maximum Exposure; mg/kg - milligrams/kilogram; TEQ - toxicity equivalence

Table L-13. Allendale Floodplain Surface Soil Contact for a Passive Recreational Visitor

Carcinogenic Contaminant	Cancer Classification	Cleanup Level[1] (mg/Kg)	Basis	RME Residual Cancer Risk[a]	
Recreational-use Soil/Western Bank of Allendale Pond					
2,3,7,8-TCDD[2]	B2	0.000017	HH Risk with Site background taken into consideration	1.E-06	A
		Sum of Carcinogenic Risk		**1.E-06**	
Non-Carcinogenic Contaminant	**Target Endpoint**	**Cleanup Level[1] (mg/Kg)**	**Basis**	**RME Residual Hazard Index[a]**	
Recreational-use Soil/Western Bank of Allendale Pond					
2,3,7,8-TCDD[2]	Reproductive / Endocrine	0.000017	HH Risk with Site background taken into consideration	0.07	A

Notes:

1. Cleanup levels are based on an evaluation of risk-based PRGs (developed for the most sensitive receptor and/or exposure pathway), ARARs, TBCs, and Site background data. Cleanup levels were not developed for undetected contaminants where the laboratory detection limits were in excess of ARARs. Additional sampling will be performed during the design phase to verify background conditions and the statistical comparisons, and verify undetected contaminants using analytical methods capable of measuring concentrations at levels below the ARARs or risk-based PRGs. These data will be evaluated to assess impacts, if any, to the cleanup levels. However, all numeric criteria for all contaminants listed in regulations identified as ARARs are also considered cleanup levels and must be met regardless of whether or not they are identified above as cleanup levels except where background is an issue.
2. Only 2,3,7,8-TCDD (no Dioxin TEQ) data are available for western shore of Allendale Floodplain soil. Ecological risk-based PRG for Short-tailed Shrew Diet (HI of 1) of 35 ng/kg developed for the Oxbow Area is used in the evaluations to determine cleanup levels for both, Allendale and Lyman Mill ecological habitat areas. Using Site-specific values, the cleanup level of 17 ng/kg for 2,3,7,8-TCDD is selected to meet acceptable cancer risk range, acceptable non-cancer HI, and RIDEM regulation.

a. A - Residual cancer risk and/or hazard index for direct contact.

Key: RME - Reasonable Maximum Exposure; mg/kg - milligrams/kilogram

Table L-14. Allendale Floodplain Soil Contact and Prey Consumption by Ecological Receptors

Contaminant	Floodplain Soil Cleanup Level[1] (mg/Kg)	Basis	Residual Hazard Quotients[a]	
			Insectivorous Wildlife[b]	
2,3,7,8-TCDD[2]	0.000017	HH Risk with Site background taken into consideration	0.46	A
		HI[c]	**0.5**	

Notes:

1. Cleanup levels are based on an evaluation of risk-based PRGs (developed for the most sensitive receptor and/or exposure pathway), ARARs, TBCs, and Site background data. Cleanup levels were not developed for undetected contaminants where the laboratory detection limits were in excess of ARARs. Additional sampling will be performed during the design phase to verify background conditions and the statistical comparisons, and verify undetected contaminants using analytical methods capable of measuring concentrations at levels below the ARARs or risk-based PRGs. These data will be evaluated to assess impacts, if any, to the cleanup levels. However, all numeric criteria for all contaminants listed in regulations identified as ARARs are also considered cleanup levels and must be met regardless of whether or not they are identified above as cleanup levels except where background is an issue.
2. Only 2,3,7,8-TCDD (no Dioxin TEQ) data are available for western shore Allendale Floodplain soil. Using Site-specific values, the cleanup level for 2,3,7,8-TCDD is selected to meet acceptable risk range, acceptable non-cancer HI, and RIDEM regulation. Ecological risk-based PRG for Short-tailed Shrew Diet (HQ of 1) of 35 ng/kg developed for the Oxbow Area is used in the evaluations to determine cleanup levels for both Allendale and Lyman Mill ecological habitat areas.

a. Calculated by dividing the cleanup level by the PRG for the most sensitive measurement endpoint for each receptor category.
b. Floodplain soil concentrations protective of insectivorous wildlife were derived using: (A) dietary exposure modeling. The short-tailed shrew is the representative receptor species for this assessment endpoint.
c. Value reported to one significant figure.

Key: HI - Hazard Index; mg/Kg - milligrams/kilogram; TEQ - Toxic Equivalent

Table L-15. Lyman Mill Stream Sediment and Floodplain Soil (including Oxbow) Alternative 3a, Cost Detail Summary

Category	Description	Cost	Assumption
Direct Costs	Mobilization & temporary roads	$360,000	Clear 6.5 acres
	Excavate, haul, backfill	$2,000,000	Excavate 20,500 cy, backfill 15,600 tons
	Apply thin-layer cover	$1,650,000	22.2 acres, 13,500 tons
	Upland CDF construction	$2,030,000	Includes sediment/soil placement
	Off-site incineration	$2,625,000	3,075 tons
	Plantings, streambank restoration	$330,000	Plant 6.5 acres
	Contractor supervision/field office	$575,000	6 months for field staff
	Health and safety	$300,000	
	Additional Cleanup Area	$2,330,000	Clear 3.4 acres, excavate 5,600 cy and backfill 8,300 tons, CDF disposal, 3.4 acres plantings/restoration, and Health and Safety
	Total Direct Costs	**$12,200,000**	
Indirect Costs	Design and pre-design sampling	$500,000	
	Construction oversight & QA	$475,000	
	Legal and Admin	$660,000	5% of total direct, design, & construction oversight/QA costs
	Contingency	$2,640,000	20% of total direct, design, & construction oversight/QA costs
	Total Indirect Costs	**$4,275,000**	
TOTAL CAPITAL COSTS		**$16,500,000**	

Table L-15. (Continued)

Category	Description	Cost	Assumption
Operation and Maintenance	O&M	$1,170,000	Thin-layer cover/plantings/CDF cover maintenance & invasive species control 32.2 acres; 30 years (Annual O&M $94,100/year)
	Five-year reviews	$33,000	30 years
	Monitoring	$1,670,000	Annual biota, water, sed/soil & CDF monitoring; 30 years (Annual monitoring $134,800/year)
	Total O&M Costs	**$2,900,000**	
TOTAL PRESENT WORTH COST		**$19,400,000**	7% discount rate over 30 years

Notes: Additional cost to comply with the National Historic Preservation Act (NHPA) $290,000 to $350,000

Table L-16. Lyman Mill Floodplain Surface Soil Contact for a Passive Recreational Visitor[1]

Carcinogenic Contaminant	Cancer Classification	Floodplain Soil Cleanup Level (mg/Kg)[2]	Basis	RME Residual Cancer Risk[a]	
Dioxin TEQ[3]	B2	0.000053	HH Risk	1.E-06	A
Benzo(a)pyrene	B2	2.0	Background[bc]	9.E-06	A
Arsenic	A	7.7	Background[b]	2.E-06	A
			Sum of Carcinogenic Risk	**1.E-05**	
Non-Carcinogenic Contaminant	**Target Endpoint**	**Floodplain Soil Cleanup Level (mg/Kg)[2]**	**Basis**	**RME Residual Hazard Index[a]**	
Dioxin TEQ[3]	Reproductive/Endocrine	0.000053	HH Risk	0.08	A
Benzo(a)pyrene	Kidney	2.0	Background[bc]	0.00008	A
Arsenic	Skin	7.7	Background[b]	0.03	A
			HI Kidney	**0.00008**	
			HI Liver	--	
			HI Immune System	--	
			HI Skin	**0.03**	
			HI Reproductive	**0.08**	

Notes:
1. Human health risk-based Dioxin TEQ PRG of 680 ng/kg (passive recreational visitor, Oxbow General Area, HI of 1) is one of the factors to determine areas requiring excavation versus thin-layer cover in the Oxbow.
2. Cleanup levels are based on an evaluation of risk-based PRGs (developed for the most sensitive receptor and/or exposure pathway), ARARs, TBCs, and Site background data. Cleanup levels were not developed for undetected contaminants where the laboratory detection limits were in excess of ARARs. Additional sampling will be performed during the design phase to verify background conditions and the statistical comparisons, and verify undetected contaminants using analytical methods capable of measuring concentrations at levels below the ARARs or risk-based PRGs. These data will be evaluated to assess impacts, if any, to the cleanup levels. However, all numeric criteria for all contaminants listed in regulations identified as ARARs are also cleanup requirements and must be met regardless of whether or not they are identified above as cleanup levels except where background is an issue.
3. 2,3,7,8-TCDD cleanup level is of 35 ng/kg is ecological risk-based PRG for Short-tailed Shrew Diet (HI of 1).

a. A - Residual cancer risk and/or hazard index for direct contact.
b. Background is used because human health risk-based PRG (10^{-6}) is below upstream background value.
c. Estimated regional background values based on upstream background samples from Esmond Dam south to Route 44.

Key: HH PRG - Human Health Risk-based PRG; HI - Hazard Index; RME - Reasonable Maximum Exposure; mg/Kg - milligrams/kilogram; TEQ - toxic equivalent

Table L-17. Lyman Mill Floodplain Soil Contact for a Resident Living along the River

Carcinogenic Contaminants	Cancer Classification	Cleanup Level[1] (mg/Kg)	Basis	RME Residual Cancer Risk[a]	
Residential-use Soil/Eastern Shore of Lyman Mill Pond					
Arsenic	A	7.7	Background[b]	(1)TBD	A
Benzo(a)pyrene	B2	2.0	Background[bc]	(1)TBD	A
Dibenz(a,h)-anthracene	B2	0.61	Background[b]	(1)TBD	A
Coplanar PCB TEQ	B2	0.000038	Background[b]	(1)TBD	A
2,3,7,8-TCDD[2]	B2	0.000017	HH Risk with Site background taken into consideration	5E-6	A
		Sum of Carcinogenic Risk		**5E-6**	
Non-Carcinogenic Contaminants	**Target Endpoint**	**Cleanup Level[1] (mg/Kg)**	**Basis**	**RME Residual Hazard Index[a]**	
Residential-use Soil/Eastern Shore of Lyman Mill Pond					
Arsenic	Skin	7.7	Background[b]	(1)TBD	A
Benzo(a)pyrene	Kidney	2.0	Background[bc]	(1)TBD	A
Dibenz(a,h)-anthracene	Kidney	0.61	Background[b]	(1)TBD	A
Coplanar PCB TEQ	Reproductive / Endocrine	0.000038	Background[b]	(1)TBD	A
2,3,7,8-TCDD[2]	Reproductive / Endocrine	0.000017	HH Risk with Site background taken into consideration	< 1	A

Notes:
1. Cleanup levels are based on an evaluation of risk-based PRGs (developed for the most sensitive receptor and/or exposure pathway), ARARs, TBCs, and Site background data. Cleanup levels were not developed for undetected contaminants where the laboratory detection limits were in excess of ARARs. Additional sampling will be performed during the design phase to verify background conditions and the statistical comparisons, and verify undetected contaminants using analytical methods capable of measuring concentrations at levels below the ARARs or risk-based PRGs. These data will be evaluated to assess impacts, if any, to the cleanup levels. However, all numeric criteria for all contaminants listed in regulations identified as ARARs are also considered cleanup levels and must be met regardless of whether or not they are identified above as cleanup levels except where background is an issue.
2. The cleanup goal selection process for soil, considering risk-based values, ARARs, and background concentrations, was conducted for the Lyman Mill floodplain soil area. Using Site-specific values, the 2,3,7,8-TCDD PRG at 17 ng/kg is selected because it results in acceptable HI of less than 1, acceptable cancer risk of 5E-6 and meets RIDEM regulation. For Dioxin TEQ, human health risk-based non-cancer PRG of 50 ng/kg for HI of 1 would result in cancer risk of 1.4E-5 for resident, direct contact. When considering the cumulative cancer health effects from other contaminants at the Lyman Mill floodplain soil area, the cumulative cancer risk would exceed RIDEM's risk requirement of 10^{-5}. Therefore, the cleanup level for dioxin in Lyman Mill floodplain soil is 17 ng/kg, primarily 2,3,7,8-TCDD.

(1)TBD: Contaminant RME residual cancer risk and residual HI to be determined during design as part of the additional background study. There are substantial numbers of soil samples analyzed for of Dioxin TEQ Lyman Mill Pond (97 surface soil samples). However, there are fewer soil samples analyzed for arsenic, benzo(a)pyrene, dibenz(a,h)anthracene, PCB Congener TEQ along Lyman Mill Pond (31 surface soil samples analyzed for arsenic, benzo(a)pyrene, and dibenz(a,h)anthracene and 1 sample for PCB Congener TEQ).

a. A - Residual cancer risk and/or hazard index for direct contact.
b. Background is used because human health risk-based PRG (resident, direct contact, 10^{-6}) is below upstream background value.
c. Estimated regional background values based on upstream background samples from Esmond Dam south to Route 44.

Key:

RME- Reasonable Maximum Exposure; mg/kg – milligrams per kilogram; TEQ – toxicity equivalence

Table L-18. Lyman Mill Floodplain Soil Contact and Prey Consumption by Ecological Receptors

Contaminant	Floodplain Soil Cleanup Level (mg/Kg)[1]	Basis	Residual Hazard Quotients[a]			
			Wildlife – Birds[b]		Wildlife – Mammals[c]	
2,3,7,8-TCDD[2]	0.000035	Mammal Dose	0.21	A	1.0	B
4,4'-DDT	0.10	Bird Dose	1.0	B	-	
4,4'-DDE	0.013	Background[d]	2.8	A	-	
Antimony	0.62	Background[d]	-		1.4	B
Copper	205	Background[d]	-		11	B
		HI[e]	**4**		**10**	

Notes:
1. Cleanup levels are based on an evaluation of risk-based PRGs (developed for the most sensitive receptor and/or exposure pathway), ARARs, TBCs, and Site background data. Cleanup levels were not developed for undetected contaminants where the laboratory detection limits were in excess of ARARs. Additional sampling will be performed during the design phase to verify background conditions and the statistical comparisons, and verify undetected contaminants using analytical methods capable of measuring concentrations at levels below the ARARs or risk-based PRGs. These data will be evaluated to assess impacts, if any, to the cleanup levels. However, all numeric criteria for all contaminants listed in regulations identified as ARARs are also considered cleanup levels and must be met regardless of whether or not they are identified above as cleanup levels except where background is an issue.
2. Dioxin TEQ cleanup level of 53 ng/kg is based on Passive Recreational Visitor PRG (target cancer risk level of 10^{-6}).

Residual risk estimates are for the Oxbow Area (i.e., west of the Woonasquatucket River below Allendale Dam); risk estimates would be slightly lower for the eastern shore of Lyman Mill Pond where the lower cleanup level for 2,3,7,8-TCDD, based on background (i.e., 0.000017 mg/kg or 17 ng/kg), would apply. Separate cleanup levels for the Oxbow Area and eastern shoreline are necessary because of the applicable human health exposure scenarios (passive recreational and residential) that apply to these two areas. The overall HIs for wildlife would not change as 2,3,7,8-TCDD is not the largest contributor to the residual risk estimates.

a. Calculated by dividing the cleanup level concentration by the PRG for the most sensitive measurement endpoint for each receptor category. A dash indicates no unacceptable risk for that particular receptor.
b. Floodplain soil concentrations protective of vermivorous wildlife (birds) were derived using: (A) literature-derived CBRs and (B) dietary exposure modeling. The American woodcock is the representative receptor species for this assessment endpoint.
c. Floodplain soil concentrations protective of vermivorous wildlife (mammals) were derived using: (B) dietary exposure modeling. The short-tailed shrew is the representative receptor species for this assessment endpoint.
d. Background is used because ecological risk-based PRGs (HQ of 1) are below upstream background values.
e. Values reported to one significant figure.

Key:
ARAR – Applicable or Relevant and Appropriate Requirement; HI - Hazard Index; mg/Kg - milligrams/kilogram

Table L-19. Remedy Total Cost Summary

Action Area (Alternative)	Total Capital Cost	Total O&M Cost	Total Present Worth Cost
Source Area Soil (Alternative 4e)	$21,200,000	$500,000	$21,700,000
Groundwater (Alternative 2e)	---[1]	$900,000	$900,000
Allendale And Lyman Mill Sediment (Alternative 7a)	$57,700,000	$2,800,000	$60,500,000
Allendale Floodplain Soil (Alternative 5a)	$2,000,000	$100,000	$2,100,000
Lyman Mill Stream Sediment and Floodplain Soil (Including Oxbow) (Alternative 3a)	$16,500,000	$2,900,000	$19,400,000
Total Remedy	**$97,400,000**[1]	**$7,200,000**	**$104,600,000**[1]

Notes:
1. Construction for the Groundwater Alternative 2e completed in 2009-2010 as time critical removal action at approximate cost of $2,700,000.

Additional cost to comply with the National Historic Preservation Act (NHPA) $860,000 to $1,000,000

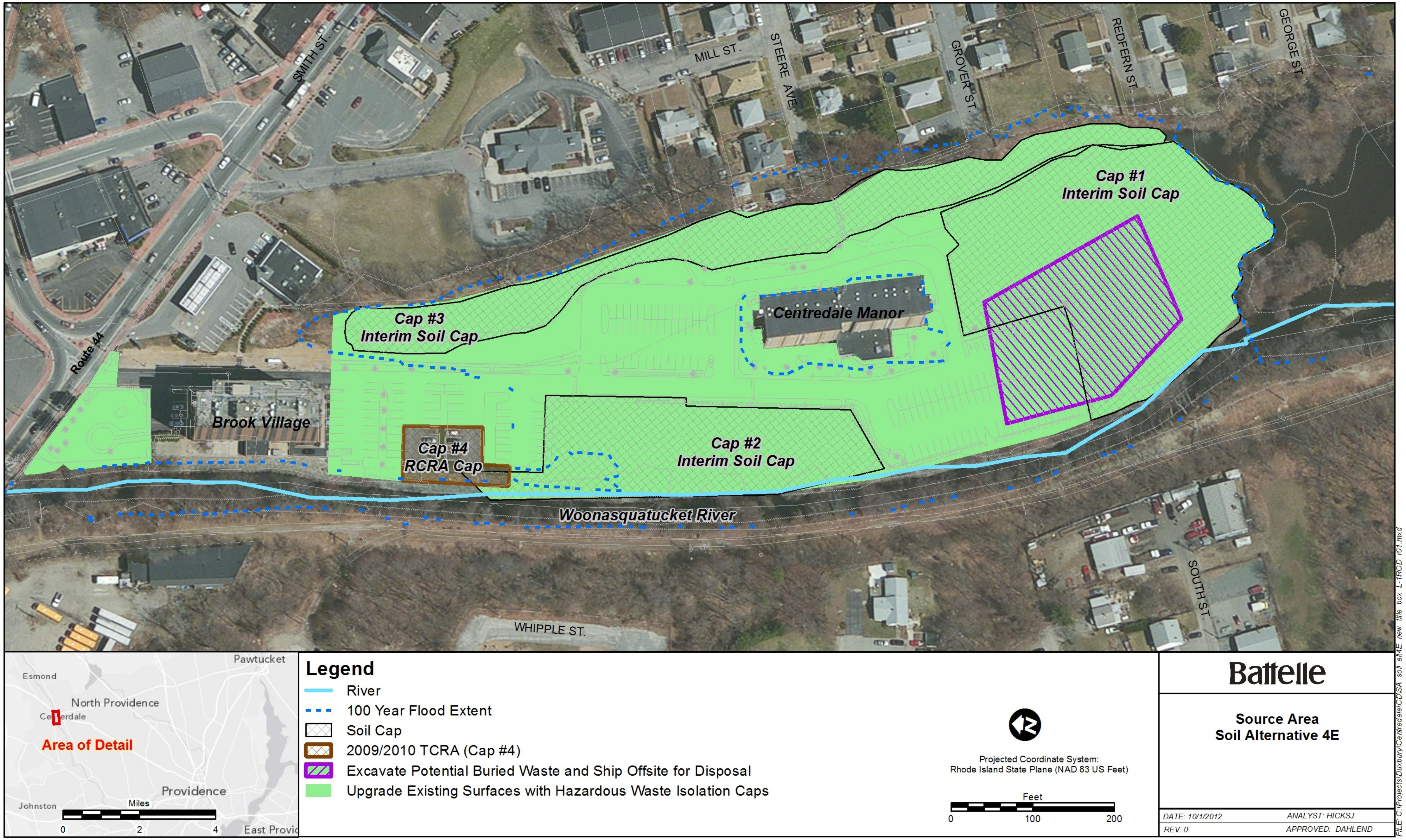

Figure L-1. Source Area Soil Alternative 4E

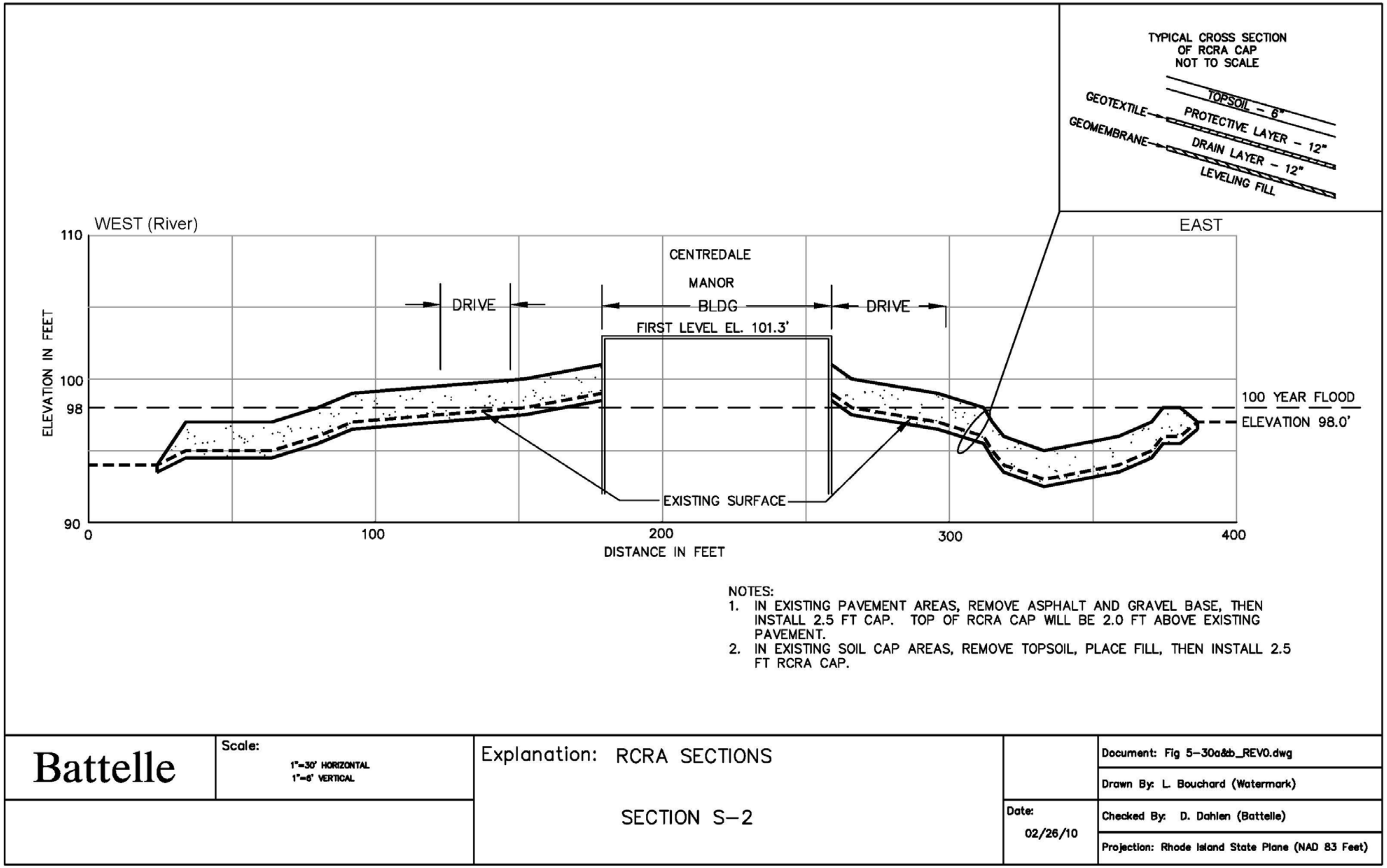

Figure L-2. Source Area Soil Alternative 4E: Cross Section Showing a Representative RCRA Cap Relative to the Woonasquatucket River and Centredale Manor Apartment Building

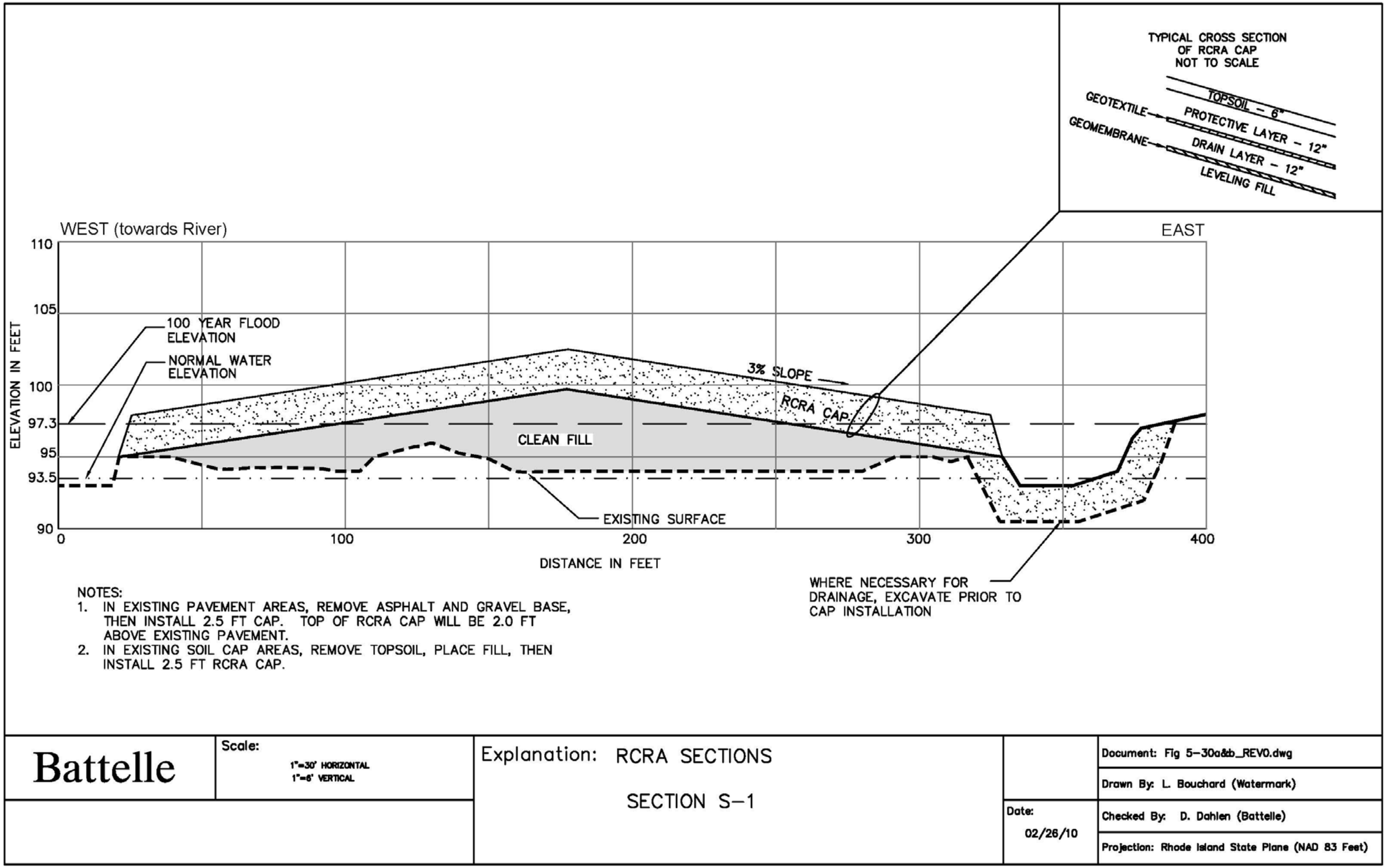

Figure L-3. Source Area Soil Alternative 4E: Cross Section of a Representative RCRA Cap Showing the Cover System.

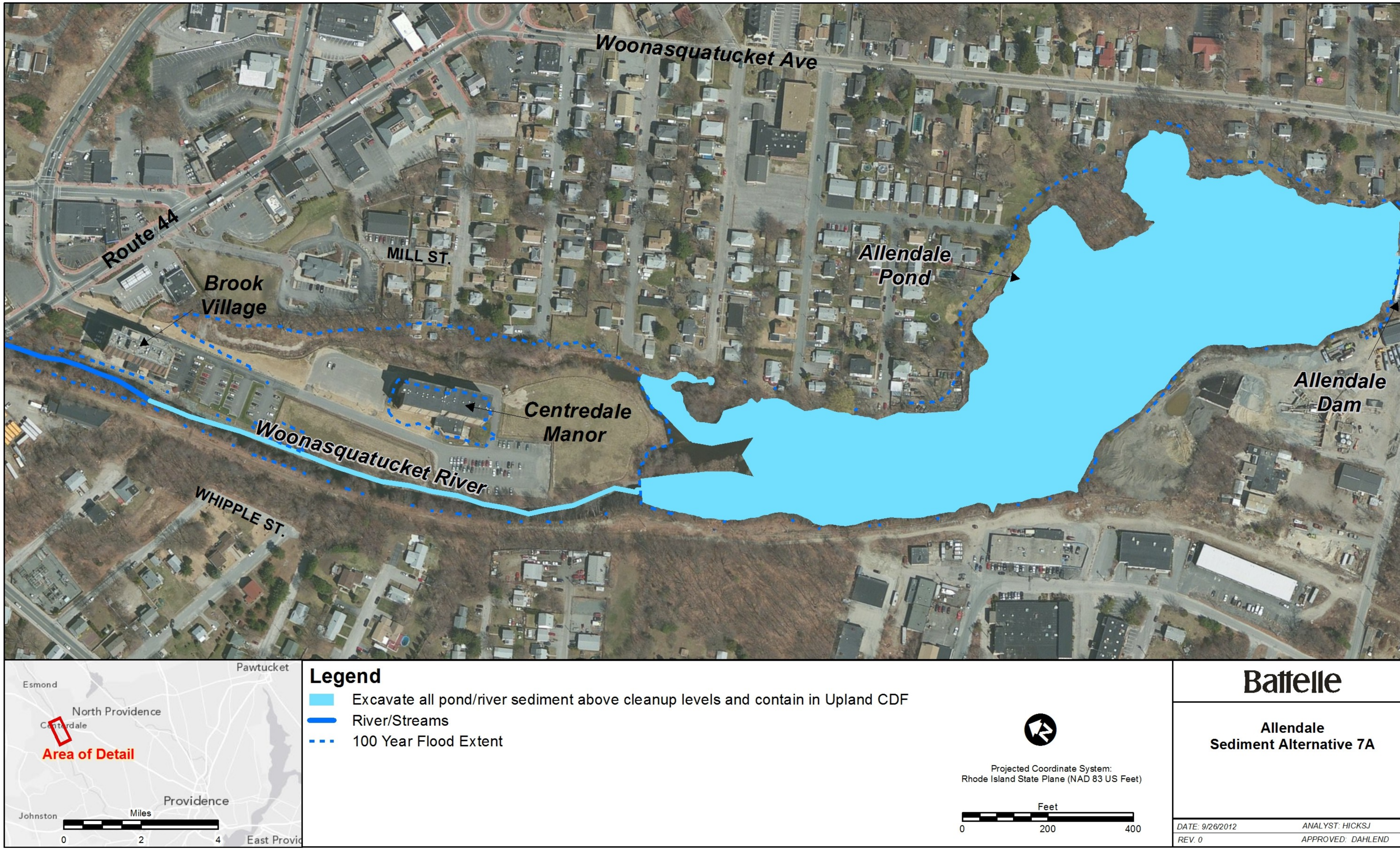

Figure L-4. Allendale Pond Sediment Alternative 7A

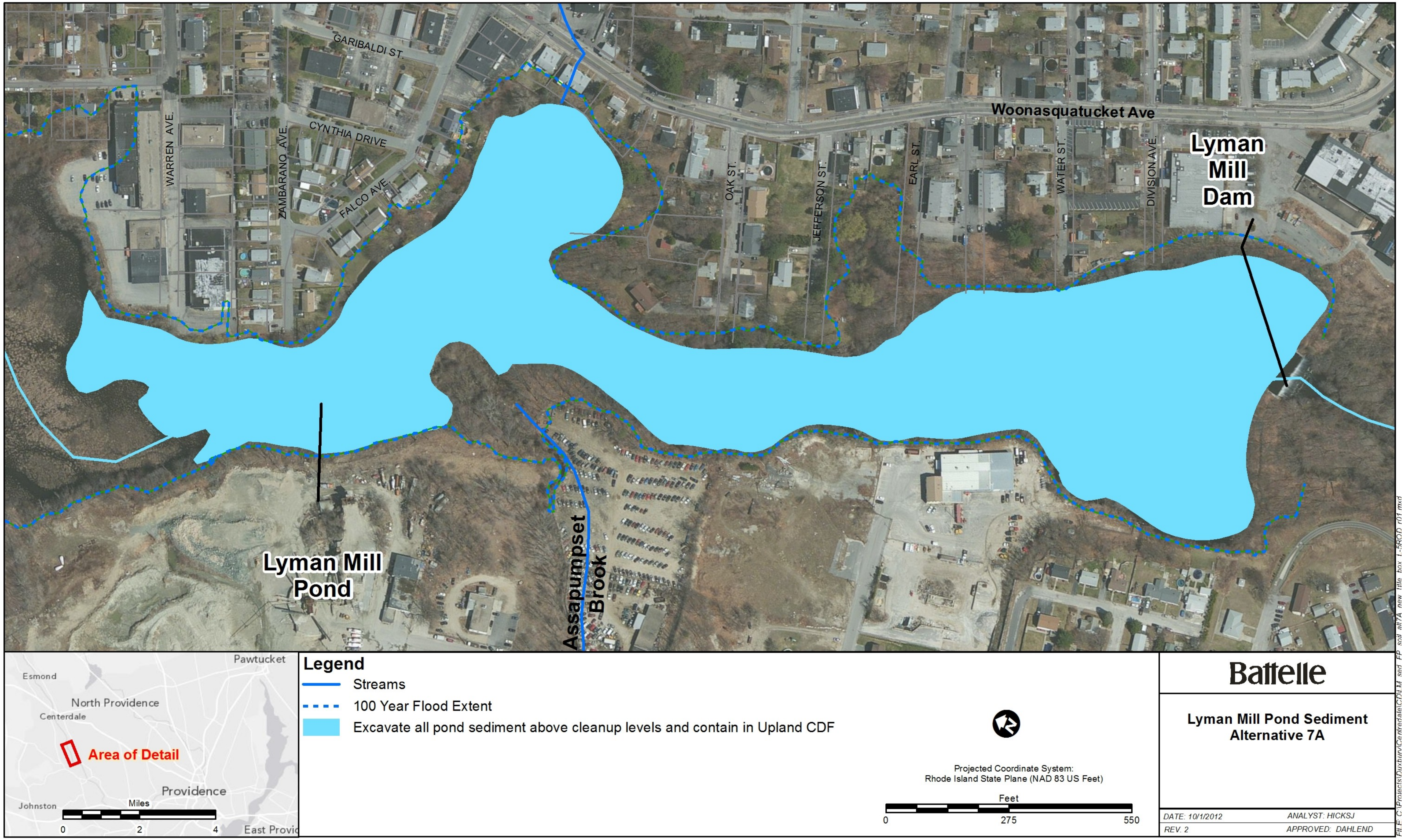

Figure L-5. Lyman Mill Pond Sediment Alternative 7A

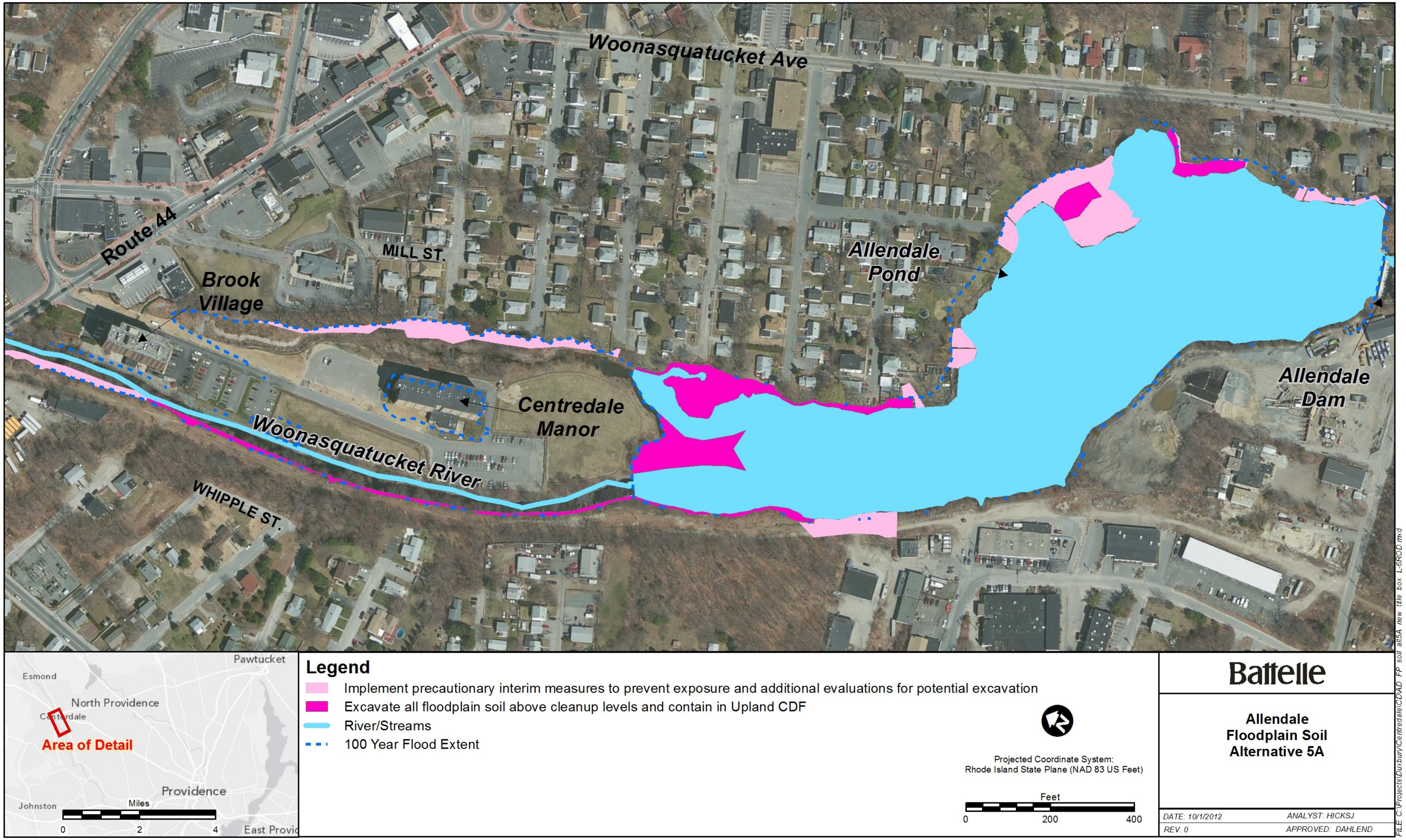

Figure L-6. Allendale Floodplain Soil Alternative 5A

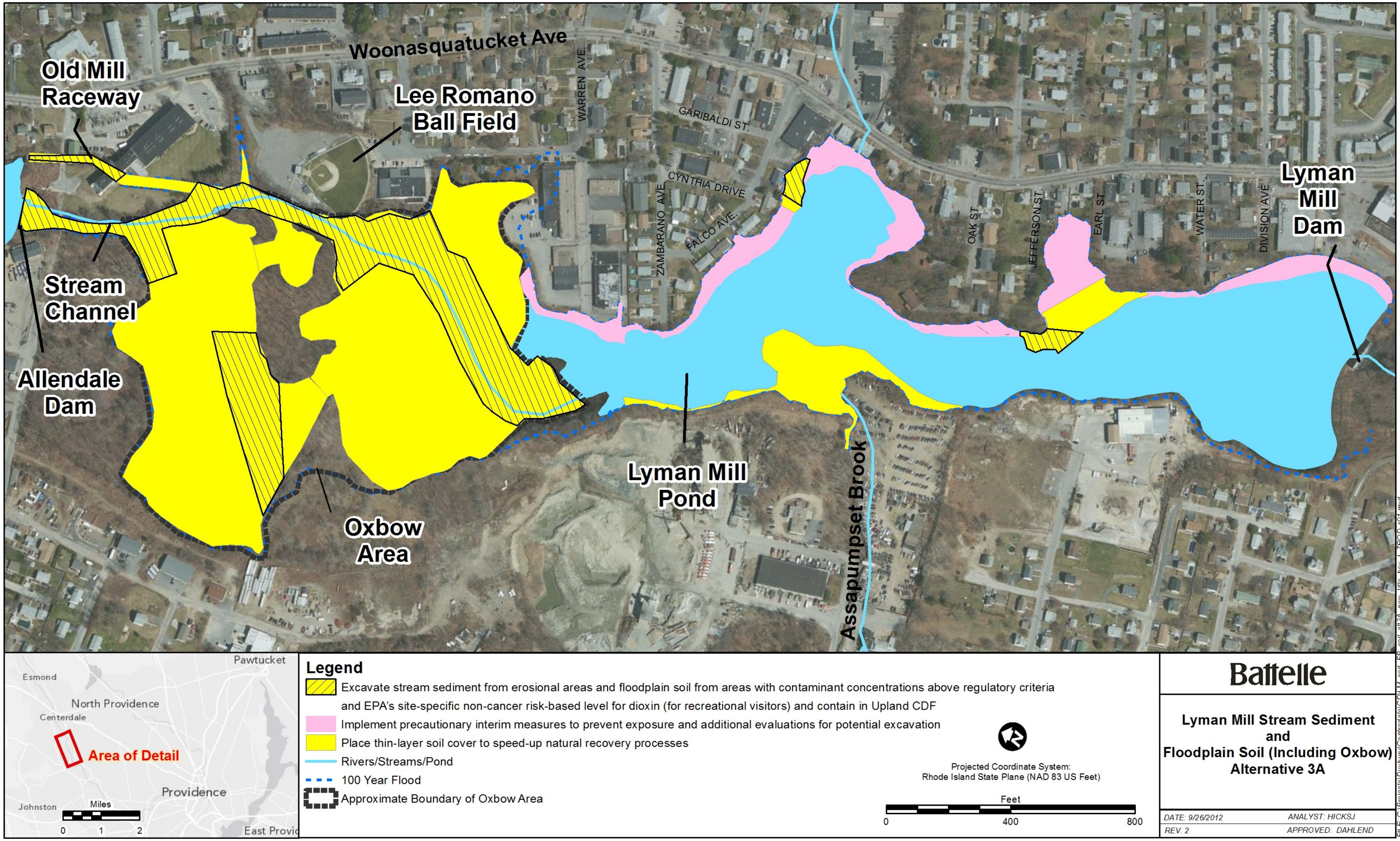

Figure L-7. Lyman Mill Stream Sediment and Floodplain Soil (Including Oxbow) Alternative 3A

M. STATUTORY DETERMINATIONS

The remedial action selected for implementation at the Site is consistent with CERCLA and, to the extent practicable, the NCP. The selected remedy is protective of human health and the environment, will comply with ARARs or invokes an appropriate waiver and is cost effective. In addition, the selected remedy utilizes permanent solutions and alternate treatment technologies or resource recovery technologies to the maximum extent practicable, and satisfies the statutory preference for treatment that permanently and significantly reduces the mobility, toxicity or volume of hazardous substances as a principal element. The following statutory determination is presented for each Action Area of the remedy.

1. The Selected Remedy is Protective of Human Health and the Environment

The selected remedy is protective of human health and the environment.

The Source Area Soil component of the remedy will adequately protect human health and the environment by eliminating, reducing or controlling exposures to human and environmental receptors through treatment, engineering controls, and ICs. More specifically, excavation and removal of some principal threat waste material and converting the existing surfaces (interim caps, parking lots, pavement, and landscape areas) to a RCRA hazardous waste cap would be highly protective of human health and the environment. Targeted removal of some principal threat waste would remove highly toxic and/or highly mobile waste that generally cannot be reliably contained and could present a significant risk to human health or the environment should exposure occur. The RCRA cap would also meet TSCA requirements for capping PCB remediation waste. This remedy would prevent direct contact with soil, prevent erosion and runoff of hazardous waste/contaminated soils, and prevent precipitation infiltration into the groundwater. The RCRA cap is designed to maintain its integrity over time while functioning with minimum maintenance. The remedy will prevent potential human health risks from direct contact with contaminated soil that contain contaminants at concentrations that would exceed ARARs and/or result in a total excess lifetime cancer risk greater than the target risk range of 10^{-5} to 10^{-6} and/or HI greater than 1 for Source Area soil.

The groundwater component of the selected remedy will adequately protect human health and the environment by eliminating, reducing and/or controlling exposures to human and environmental receptors through the removal of contaminated soil and groundwater to reduce concentrations in groundwater to levels that meet ARARs (federal MCLs and federal non-zero MCLGs) for groundwater quality at the edge of the waste management unit thereby also preventing future migration of contaminated groundwater to the Woonasquatucket River.

Permanent removal of all contaminated sediment from the River would reduce the threat of human exposure to contaminants via direct contact or fish ingestion from the Allendale and Lyman Mill Ponds. Risks to ecological receptors from sediment contact and sediment associated prey consumption would also be reduced to levels comparable with background. The excavation and removal of sediments would provide high overall protection to human health and the environment by quickly reducing human health and ecological risks to acceptable levels. In addition, the removal of contaminated resident fish from the ponds would effectively reduce the fish consumption risks to humans and piscivorous wildlife. Removal of the sediment and placement into an upland CDF/off-site disposal and treatment would reliably prevent contaminant migration downstream due to erosion in the long term and would not rely on institutional controls and maintenance in perpetuity in the River for protection.

The current cancer risks associated with fish consumption from the River in Allendale Reach is $5x10^{-3}$ and in the Lyman Mill Reach is $6x10^{-3}$. Eating contaminated fish also results in elevated non-cancer Hazard Indices, including an HI of 129 for dioxin exposure in Allendale Reach and an HI of 159 for dioxin exposure in Lyman Mill Reach. The current cancer risks for residents living along the River in Allendale Reach from contact with sediment is $2x10^{-4}$ and in Lyman Mill Reach is $3x10^{-4}$; HI is also elevated for current sediment exposures. The Allendale and Lyman Mill sediment component of the remedy will reduce the cancer risks from sediment contact and fish consumption to $5x10^{-5}$ in Allendale Reach and $6x10^{-5}$ in Lyman Mill Reach, respectively. The risks remaining after sediment has been addressed are within the EPA cancer risk range and two orders of magnitude less than current (existing) risks. Organ-specific non-carcinogenic hazards to exposed human receptors are reduced to less than 1.

The Allendale Reach floodplain soil component of the selected remedy will reduce human health risk levels to protective ARARs levels, i.e., the Allendale Reach Floodplain Soil remedy will comply with ARARs and TBC criteria, including RIDEM residential direct exposure criteria, by excavating and permanently removing from floodplain soil that which presents an unacceptable risk. The selected remedy will reduce human health risk from direct contact with floodplain soil for a passive recreational visitor from $2x10^{-5}$ to $1x10^{-6}$. For residential-use soil, cancer risks via soil contact would be reduced from up to $2x10^{-4}$ to $1x10^{-5}$ and non-cancer HI would be reduced from up to 17 to the acceptable level of 1. Soil will also be excavated and removed from the floodplain to reduce currently elevated risks to wildlife from contact with contaminated floodplain soil and prey consumption.

The combination of targeted excavation and removal of contaminated material and placement of a thin-layer cover would provide protection to human health and the environment from contaminated Lyman Mill Reach stream sediment and floodplain soil. Removal of the sediment from the stream channel and south Oxbow Area would reduce contaminant migration downstream due to erosion. In addition, removal of contaminated soil that exceeds ARARs or EPA's site-specific dioxin cleanup level requirements in combination with a thin cover would reduce exposure to contamination and accelerate the natural recovery processes. Flow control structures to divert stream flow into the Oxbow would also accelerate the natural recovery processes. Engineering Controls (such as boardwalks and fencing) would be used to enhance remedy effectiveness by further reducing human exposure in the short term.

The selected remedy for the Lyman Mill stream sediment and floodplain soil would reduce cancer risks for a passive recreational visitor via surface soil contact (including Oxbow) from $6x10^{-5}$ to $1x10^{-5}$ and non-cancer HI from 4 to the acceptable level of 1. For residential-use soil, cancer risks would be reduced from up to $9x10^{-3}$ to $1x10^{-5}$ and non-cancer HI would be reduced from up to 20 to the acceptable level of 1. The remedy will also reduce potential human health risk levels to protective ARARs levels. Reduction of risks in this area from exposure to sediment and sediment associated fish consumption would be similar to that for exposure to

Allendale and Lyman Mill sediment. Risks to ecological receptors and the bioaccumulation hazard to wildlife in this area of the Site would also be reduced. In the long-term, the selected remedy will reduce currently elevated risks to wildlife from contact with contaminated floodplain soil and prey consumption to levels similar to background.

Because some contamination would remain in place, ICs would be required to prevent the disturbance of the upland CDF, and thin-layer cover in the Oxbow, protect the integrity of the cap in the Source Area and to prevent use of groundwater at the Source Area. A fish advisory would remain in effect until fish are safe to eat. Long term monitoring and maintenance are also required for some components of the selected remedy to insure that the remedy remains protective in the long-term.

No unacceptable short-term risks to human health or cross media impacts are expected from construction of the Source Area cap, excavation of soil/waste material, floodplain soil, sediment, construction of the upland CDF or other components of the selected remedy.

2. The Selected Remedy Complies With ARARs

The selected remedy will comply with all federal and state ARARs except as discussed below. A detailed list of ARARs/To Be Considered requirements for the selected remedy is included in Appendix B of this ROD. A discussion of the more significant ARARs issues is included below.

Land Disposal Restrictions

RCRA LDRs (40 CFR 268) are technology based treatment standards that must be met before hazardous waste can be placed in a landfill. Alternative treatment standards have been established for contaminated soil (40 CFR § 268.49). As discussed above, the soil and sediment at the Site have been characterized as F020 listed hazardous waste and are subject to the LDRs. In order to meet these requirements, only material that meets the alternative treatment standards for soil would be placed in the upland CDF. The remaining material will be shipped off-site for treatment and disposal.

Wetlands Impacts

The cleanup plan selected by EPA includes activities that impact wetlands and results in the discharge of dredged or fill material into waters of the United States. Before EPA can select a cleanup plan that will impact wetlands/results in the discharge of dredged or fill material into waters of the United States, Section 404 of the Clean Water Act and Executive Order 11990 (Protection of Wetlands) require that EPA make a determination that there is no practicable alternative to conducting work this work. EPA has determined that because significant levels of contamination exist in wetlands within the site's cleanup areas, there is no practicable alternative to conducting work in these wetlands.

For those wetland areas that will be impacted by cleanup activities, EPA has made the determination that the cleanup alternatives selected are the least damaging practicable alternatives.

EPA will minimize potential harm and avoid adverse impacts on wetland resources, to the extent practical, by using best management practices to minimize harmful impacts on the wetlands, wildlife or habitat. Wetlands will be mitigated consistent with the requirements of federal and state wetlands protection laws.

Floodplain Impacts

The cleanup plan selected by EPA includes activities that result in the occupancy and modification of the floodplain. Before EPA can select such a cleanup plan, Executive Order 11988 (Floodplain Management) requires EPA to make a determination that there is no practicable alternative to doing so. EPA has determined there is no practicable alternative to occupancy and modification of the floodplain at the Source Area.

The selected cleanup plan for Source Area Soil calls for caps that will occupy and modify the area's floodplain. Although excavation could also be conducted that would not have the same impacts on the floodplain, it is not a practicable alternative because extensive excavation would result in unacceptable impacts to residents.

EPA will avoid or minimize potential harmful impacts on floodplain resources to the extent practicable. In addition, any lost flood storage capacity from cleanup activities within the 100-year floodplain will be addressed as appropriate.

Waiver of Hazardous Waste Facility Requirements

The location and closure of facilities containing hazardous waste is regulated by federal and state hazardous waste laws that specify how hazardous waste should be covered and how hazardous waste located in a floodplain should be addressed. The selected cleanup plan for the Lyman Mill stream sediment and floodplain soil includes the placement of a three-inch thin-layer of soil over contaminated floodplain soil that will remain in this area. This soil cover will not meet the requirements of federal and state environmental regulations (Subtitle C requirements of RCRA).

EPA is waiving these federal and state hazardous waste requirements by using a "protectiveness waiver" under Section 121(d)(4)(B) of CERCLA. EPA has determined that meeting these requirements in this area of the Site would result in greater risk to human health and the environment. The following requirements are waived: Sections 264.18, 264.301, 264.302 and 264.310 of the Subtitle C regulations of RCRA, 40 CFR §§ 264.18, 264.301, 264.302 and 264.310, and the State of Rhode Island equivalent regulations.

TSCA Requirements

TSCA regulates disposal of PCB contaminated soil and sediment. Consistent with Section 761.61(c) of TSCA, and based on the Administrative Record for this Site, which contains the information required under TSCA, EPA has made a finding that disposal of PCB contaminated material as set out in this ROD does not result in an unreasonable risk of injury to human health or the environment as long as the following conditions are met:

1. If sediment excavated from the river contains PCB levels greater than 1 mg/kg, it shall be disposed of in an Upland Confined Disposal Facility that complies with (meets) the requirements of Subtitle C of RCRA.
2. If contaminated soil from the Source Area contains PCB levels greater than 1 mg/kg, it shall be disposed of in place using a cap that complies with (meets) the requirements of Subtitle C of RCRA.
3. All excavated sediment is disposed of in accordance with TSCA based on *in situ* PCB levels and not subject to dilution.
4. Rules developed in accordance with TSCA will be followed for the decontamination of all equipment used when handling TSCA-contaminated material to avoid mixing with non-TSCA material.
5. Stockpiled material shall be covered and bermed while awaiting transport, and any runoff shall be collected and disposed of, in accordance with the requirements of TSCA.
6. Air monitoring and dust suppression measures for PCBs shall be maintained until excavation and transport of PCB contaminated sediment and capping of contaminated sediment and soil is complete.
7. Once capping is complete, the caps shall be monitored annually at a minimum to insure that their integrity is maintained. A long-term monitoring and maintenance plan shall be developed which details the monitoring and maintenance activities for the caps.
8. Land use restrictions shall be put in place to insure the long-term effectiveness of the caps. These may include, but not be limited to, restricting future excavation, restricting access for buried utilities, preventing the construction of buildings with pilings or basements and maintaining the caps.

Issuance of this ROD indicates approval of this risk-based method for disposing of PCB contaminated soil and sediment pursuant to Section 761.61(c) of TSCA.

3. The Selected Remedy is Cost-Effective

In EPA's judgment, the selected remedy for the Source Area Soil is cost-effective because the remedy’s costs are proportional to its overall effectiveness (see 40 CFR 300.430(f)(1)(ii)(D)). This determination was made by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (i.e., that are protective of human health and the environment and comply with all federal and any more stringent ARARs, or as appropriate, waive ARARs).[12] Overall effectiveness was evaluated by assessing three of the five balancing criteria -- long-term

12 It should be noted that many of the alternatives that were evaluated in the detailed analysis of alternatives and are discussed here do not meet ARARs/TBC requirements for wetlands/floodplains. The final ARARs determination for these requirements is made in this ROD and was not made at the time the FS was prepared as EPA sought additional comments on wetlands/floodplain impacts in its Proposed Plans before making a final determination on ARARs/TBC compliance. Regardless, EPA has taken into account all alternatives in the detailed analysis including the ones that do not meet ARARs in the evaluation of this criteria.

effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness, in combination. The overall effectiveness of each alternative then was compared to the alternative's costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence represents a reasonable value for the money to be spent. Summary of the cost effectiveness evaluation are in Tables M-1 to M-5.

4. The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable

Once the Agency identified those alternatives that attain or, as appropriate, waive ARARs[13] and that are protective of human health and the environment, EPA identified which alternative utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This determination was made by deciding which one of the identified alternatives provides the best balance of trade-offs among alternatives in terms of: 1) long-term effectiveness and permanence; 2) reduction of toxicity, mobility or volume through treatment; 3) short-term effectiveness; 4) implementability; and 5) cost. The balancing test emphasized long-term effectiveness and permanence and the reduction of toxicity, mobility and volume through treatment; and considered the preference for treatment as a principal element, the bias against off-site land disposal of untreated waste, and community and state acceptance. The selected remedy provides the best balance of trade-offs among the alternatives.

The selected remedy excavates and treats off-site significantly contaminated principal threat buried waste material at the Source Area, as well as sediment and floodplain soil that contain the highest levels of contamination in Allendale and Lyman Mill Pond. Treatment (likely high temperature incineration) will effectively and permanently reduce the toxicity, mobility and volume of the most highly contaminated material at the Site. After treatment, this material will be appropriately disposed of in the long term at a secure off-site location. Although this remedy does result in the off-site land disposal of untreated waste, the waste that is untreated is disposed of securely in accordance with applicable law.

The remaining contaminated soil at the Source Area is effectively and appropriately covered with a hazardous waste cap that will prevent infiltration to groundwater. With the exception of some floodplain soil in the Oxbow, all remaining floodplain soil and sediment that does not require treatment will be removed and stored safely outside the floodplain in a secure upland disposal facility. These measures will reliably and permanently prevent unacceptable exposure to human and ecological receptors from contaminated sediment and floodplain soil in the long term thereby satisfying the criteria for long term effectiveness.

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13 It should be noted that many of the alternatives that were evaluated in the detailed analysis of alternatives and are discussed here do not meet ARARs/TBC requirements for wetlands/floodplains. The final ARARs determination for these requirements is made in this ROD and was not made at the time the FS was prepared as EPA sought additional comments on wetlands/floodplain impacts in its Proposed Plans before making a final determination on ARARs/TBC compliance. Regardless, EPA has taken into account all alternatives in the detailed analysis including the ones that do not meet ARARs in the evaluation of this criteria.

Highly contaminated saturated soil has been permanently removed from the Source Area and remaining soil covered with an impermeable cap. These measures, in combination with the impermeable cap required in the Source Area, will allow federal drinking water requirements in groundwater to be met at the edge of the waste management unit and prevent further migration of contaminants from the Source Area into the River thereby satisfying the criteria for long term effectiveness. The Oxbow cleanup was balanced by the need to preserve the ecological receptors to be protected. This is especially important because this area provides unique environmental functions in the lower Woonasquatucket watershed. This balance is achieved by removing most contaminated soil/sediment above human health risk based criteria and where migration of contaminates was most likely. The selected remedy does not present short-term risks that are significantly different from the other active alternatives. With the exception of the disposal options, there are no significant implementability issues that set the selected remedy apart from any of the other active alternatives evaluated. Each disposal option raises different and, in some cases, unique implementability issues. This is not unusual when large quantities of contaminated soil/sediment must be addressed. For the selected remedy, additional work must be done to identify an appropriate location for the upland CDF. Like the upland CDF disposal option, the near shore CDF option and the incineration option also have implementability issues related to where the contamination will be located (Near Shore CDF) or treated (incineration). For the off-site treatment/disposal option, there are a limited number of facilities that can accept the waste material from this site. The selected remedy is supported by the State and generally the public. The most significant concerns have been addressed in changes to the selected remedy.

5. The Selected Remedy Satisfies the Preference for Treatment Which Permanently and Significantly Reduces the Toxicity, Mobility or Volume of the Hazardous Substances as a Principal Element

The selected remedy requires treatment of principal threat buried waste material from the Source Area as well as the most highly contaminated floodplain soil and sediment (also principal threat waste) found at the Site. Treatment will permanently and significantly reduce the toxicity, mobility or volume of hazardous substances. As a result, the selected remedy satisfies the preference for treatment which permanently and significantly reduces the toxicity, mobility or volume of the hazardous substances as a principal element.

Large-scale excavation and ex-situ treatment of all source material at the Source Area were also considered. However, this alternative was screened out primarily because implementation of a treatment-based remedy would result in greater overall risk to human health due to risks posed to the surrounding community during implementation, which could not be otherwise addressed through implementation measures. (*See* 55 FR 8703 - implementation of a treatment-based remedy would result in greater overall risk to human health and the environment due to risks posed to workers or the surrounding community during implementation.)

Treatment for all contaminated floodplain soil and pond sediment (principal threat waste) beyond the Source Area was also evaluated. Because of the large volume of contaminated floodplain soil and sediment (approximately 226,000 cy total estimated volume of contaminated material present, including over-excavation allowance, from an area covering approximately 74.2 acres, out of which about 194,000 cy are subject to excavation (volume is prior to dewatering) under this remedy) that needs to be addressed (and associated cost for treatment) coupled with the overall complexity of the Site make full scale implementation of treatment impracticable. (*See* 55 FR 8703 - the extraordinary size or complexity of a site makes implementation of treatment technologies impracticable.)

6. Five-Year Reviews of the Selected Remedy are Required

Because this remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure, a review will be conducted within five years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Table M-1. Cost and Effectiveness, Source Area Soil Alternatives

Relevant Considerations for Cost-effectiveness Determination: (site-characteristics relate to cost-effectiveness criteria)

- Contamination levels in soil exceed RIDEM direct exposure criteria and RIDEM GA leachability criteria and EPA's recommended residential levels for PCBs
- Baseline cancer risk to residents for the potential future risk scenario through direct contact with surface soil is $4x10^{-3}$, should caps no longer exist or not be effective in the long term. Baseline Hazard Index is elevated for several target organs, including Immune System HI (PCBs) of 305 and Reproductive /Endocrine Effects HI (dioxin) of 150. Baseline cancer risk to construction workers for the potential future risk scenario through direct contact with vadose zone soil is $5x10^{-5}$ and Hazard Index is 13 for Immune System largely due to PCBs.
- Site current and future potential land use is residential, with two high rise apartment building currently providing elderly housing
- Most of the source area is located within 100-year floodplain zone subject to flooding
- Alternative 3 does not meet RCRA closure requirements

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
1: NO ACTION	$170,000	--------	◘ Magnitude of Residual Risk: Inherent hazard and risk of existing contaminated soil will remain. ◘ Adequacy and Reliability of Controls: There would be no adequate or reliable controls.	◘ Treatment Process Used and Materials Treated: None proposed. ◘ Amount Destroyed or Treated: None anticipated. ◘Degree of Expected Reductions of Toxicity, Mobility, or Volume Through Treatment: None. ◘ Degree to Which Treatment is Irreversible: Not applicable. ◘Type and Quantity of Residuals Remaining After Treatment: Not Applicable.	◘ Protection of Community During Remedial Action: Not applicable. ◘Protection of Workers During Remedial Action: Not applicable. ◘ Environmental Impacts: Not applicable. ◘Time Until Remedial Action Objectives are Achieved: This alternative would not achieve the RAOs.

Table M-1. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
4e: TARGETED EXCAVATION, CONVERT TO RCRA CAPS AND MAINTAIN AND DISPOSAL AND/OR TREATMENT	$21,700,000	+$21,530,000	↑ Magnitude of Residual Risk: Excavation and off-site disposal or treatment of some principal threat waste will be effective in the long term. Capping contaminated soils with a RCRA hazardous waste cap would increase the long-term effectiveness of this alternative by providing highly reliable chemical isolation. Risk reduction will be high as the cap will be designed, constructed, and maintained in compliance with RCRA and TSCA closure requirements. ↑ Adequacy and Reliability of Controls: Long-term monitoring, maintenance in perpetuity, and ICs would be required to protect integrity of the caps. ICs would also be required to prevent human exposure, and could include restrictions on excavation, access for buried utilities, and construction with pilings or basements. However, these controls are only effective if adequately monitored and enforced.	↑ Treatment Process Used and Materials Treated: This alternative assumes principal threat waste will be shipped off site for treatment. ↑ Amount Destroyed or Treated: Approximately 5,500 cy of principal threat waste would be excavated and treated. ↑ Degree of Expected Reductions of Toxicity, Mobility, or Volume Through Treatment: There would be a reduction of toxicity, mobility, or volume of contamination through treatment. ↑ Degree to Which Treatment is Irreversible: Process is irreversible. ↑ Type and Quantity of Residuals Remaining After Treatment: After incineration, the volume of inorganic sediment/soil particles would be nearly the same as the pre-treatment volume,	↓Protection of Community During Remedial Action: There would be some short-term impacts to the community from construction. ↓Protection of Workers During Remedial Action: Health and safety plans, emergency response plans, engineering controls (dust suppression), and personal protective equipment will be used during construction activities. ↓Environmental Impacts: Excavation and placement of fill in wetland areas would result in the destruction of existing wetlands. ↑Time Until Remedial Action Objectives are Achieved: Approximately 8 months.

Table M-1. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
				but the concentrations of organic chemical contaminants would be below detection limits.	
3e: TARGETED EXCAVATION, UPGRADE AND MAINTAIN EXISTING SURFACES AND DISPOSAL AND/OR TREATMENT	$24,800,000	+$3,100,000	↓Magnitude of Residual Risk: Inherent hazard of contamination will remain on site under an upgraded cap but without a RCRA Subtitle C closure and some leaching of contaminants could still occur. Risk reduction (mainly dermal contact) will be high as long as the cap is designed, constructed, and maintained in perpetuity to provide long-term isolation of contaminants. ↓ Adequacy and Reliability of Controls: Long-term monitoring and maintenance of the upgraded surfaces in perpetuity particularly important given cap and would be required to prevent erosion and exposure of the underlying contaminated soils. Some leaching of contaminants could still occur. In addition, ICs would be required to prevent human exposure, and could include restrictions on excavation, access for buried utilities, and construction with pilings or	↔Treatment Process Used and Materials Treated: Buried waste/ contaminated soil will be treated off site to meet LDRs. ↑ Amount Destroyed or Treated: Approximately 14,300 cy of contaminated material would be excavated and approximately 6,400 cy would be treated. ↑Degree of Expected Reductions of Toxicity, Mobility, or Volume Through Treatment: There would be a reduction of toxicity, mobility, or volume of contamination through treatment. ↔ Degree to Which Treatment is Irreversible: Process is irreversible. ↔Type and Quantity of Residuals Remaining After Treatment: After incineration, the	↔Protection of Community During Remedial Action: There would be some short-term impacts to the community from construction. ↔Protection of Workers During Remedial Action: Health and safety plans, emergency response plans, engineering controls, and personal protective equipment will be used during construction activities. ↔Environmental Impacts: Excavation and placement of fill in wetland areas would result in the destruction of existing wetlands. ↓ Time Until Remedial Action Objectives are Achieved: The RAO to prevent direct human contact with the contaminated vadose zone soil approximately five

Table M-1. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
			basements. However, these controls are only effective if adequately monitored and enforced.	volume of inorganic sediment/soil particles would be nearly the same as the pre-treatment volume, but the concentrations of organic chemical contaminants would be below detection limits.	months. The time to achieve the RAO to prevent migration or leaching of contaminants to soil and groundwater that would result unknown.

COST-EFFECTIVENESS SUMMARY:

- Alternative 1and 3e are not considered cost-effective
- Alternatives 4e is considered to be cost-effective. Alternative 4e provides a potentially greater return on investment.

Key:

◘ = Baseline characteristic
↑ = More 'effective" compared to previous alternative
↓ = Less "effective" compared to previous alternative
↔ = No change compared to previous alternative

Table M-2. Cost and Effectiveness, Groundwater Alternatives

Relevant Considerations for Cost-effectiveness Determination: (site-characteristics relate to cost-effectiveness criteria)

- Groundwater is potential drinking water source under federal classification system and contamination levels in groundwater exceed MCLs and non-zero MCLGs
- Source Area groundwater is discharging into the Woonasquatucket River, where surface water contamination can exceed State of Rhode Island standards and federal Water Quality Criteria (WQC) and chronic ambient freshwater and human health criteria for consumption of water and aquatic organisms. Dioxin WQC in surface water is exceeded.

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
1: NO ACTION	$270,000	--------	◘ <u>Magnitude of Residual Risk:</u> Existing risk will remain as no action is taken to address the contamination. ◘ <u>Adequacy and Reliability of Controls:</u> There are no actions to reliably and adequately control the contamination and no controls in place to prevent exposure.	◘ <u>Treatment Process Used and Materials Treated:</u> None proposed. ◘ <u>Amount Destroyed or Treated:</u> None anticipated. ◘ <u>Degree of Expected Reductions of Toxicity, Mobility, or Volume Through Treatment:</u> No reductions of toxicity, mobility, or volume of contamination. ◘ <u>Degree to Which Treatment is Irreversible:</u> Not applicable. ◘<u>Type and Quantity of Residuals Remaining After Treatment:</u> There would be no residuals because no treatment is planned.	◘ <u>Protection of Community During Remedial Action:</u> Not applicable. ◘ <u>Protection of Workers During Remedial Action:</u> Not applicable. ◘ <u>Environmental Impacts:</u> Not applicable. ◘ <u>Time Until Remedial Action Objectives are Achieved:</u> Unknown.

Table M-2. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
ALTERNATIVE 2e, EXCAVATION/DEWATERING	$3,600,000	+3,330,000 ($2,700,000 construction completed; $900,000 O&M)	↑Magnitude of Residual Risk: Removal of the contaminant source and installation of RCRA Subtitle C cap in the 0.13 acre, and off-site disposal and treatment of contaminated soil provides long-term highly reliable protection from leaching of contaminants from soil to groundwater and from migration of contaminated groundwater to the Woonasquatucket River when combined with selected remedy for Source Area soil. ↑Adequacy and Reliability of Controls: Installation of additional wells and periodic monitoring of groundwater will be conducted to assess the efficacy of the remedy. ICs would be required to prevent the use of groundwater. However, these controls are only effective if adequately monitored and enforced.	↑Treatment Process Used and Materials Treated: Extracted groundwater treated. Excavated soil treated to meet LDRs. ↑Amount Destroyed or Treated: Approximately 80,000 gallons of extracted groundwater. Approximately 1,725 cubic yards of excavated soil. ↑Degree of Expected Reductions of Toxicity, Mobility, or Volume Through Treatment: For excavated soils that were incinerated (up to 1,725 cy), the mobility, toxicity and volume would be reduced. ↑Degree to Which Treatment is Irreversible: Process is irreversible. ↓Type and Quantity of Residuals Remaining After Treatment: After incineration, the volume of inorganic sediment/soil particles	↓Protection of Community During Remedial Action: Short-term impacts to the community under this alternative. Protection of Workers During Remedial Action: Health and safety plans, emergency response plans, engineering controls (dust suppression), and personal protective equipment used during construction activities. ↓Environmental Impacts: Excavation impacted wetlands. ↑Time Until Remedial Action Objectives are Achieved: RAOs would be achieved upon completion of Source Area Soil remedy.

Table M-2. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
				would be nearly the same as the pre-treatment volume, but the concentrations of organic chemical contaminants would be below detection limits.	

COST-EFFECTIVENESS SUMMARY:

- Alternative 1 is not cost-effective
- Alternative 2e is cost-effective.

Key:

◘ = Baseline characteristic
↓ = Less "effective" compared to previous alternative
↑ = More 'effective" compared to previous alternative
↔ = No change compared to previous alternative

Table M-3. Cost and Effectiveness, Allendale And Lyman Mill Sediment Alternatives

Relevant Considerations for Cost-effectiveness Determination: (site-characteristics relate to cost-effectiveness criteria)

- Contaminated sediment volume above cleanup levels is 155,800 cy extending over 39 acres of Allendale and Lyman Mill Pond areas
- Contaminated sediment is located in open waters in wetland areas or navigable waters and floodplain
- Baseline cancer risk to residents and visiting recreational anglers is $5x10^{-3}$ from fish consumption and $2x10^{-4}$ from sediment contact in Allendale Pond and is $6x10^{-3}$ from fish consumption and $3x10^{-4}$ from sediment contact in Lyman Mill Pond. Baseline HI is also elevated, including Reproductive/Immune effects (dioxin) HI of 129 and 159 from fish consumption and HI of 16 and 24 from sediment contact in Allendale and Lyman Mill Ponds, respectively.
- Baseline risks to ecological receptors through sediment contact and sediment associated prey consumption are also elevated
- Contaminated sediment can migrate downstream during flood events and contamination can migrate from sediment into Woonasquatucket River surface water
- Alternatives 8, 10 and 11 are not the least environmentally damaging practicable alternative (LEDPA) for wetlands purposes and Disposal Option b does not meet wetland/floodplain requirements

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
1: NO ACTION	$450,000	--------	◘ Magnitude of Residual Risk: Existing risk will remain because no action would be taken. ◘ Adequacy and Reliability of Controls: This alternative does not include any measures or controls.	◘ Treatment Process Used and Materials Treated: None proposed. ◘ Amount Destroyed or Treated: None anticipated. ◘ Reductions of Toxicity, Mobility, or Volume Through Treatment: No reductions in toxicity, mobility, or volume of contamination. ◘ Degree to Which Treatment is Irreversible: Not applicable. ◘Type and Quantity of Residuals Remaining After Treatment: No residuals.	◘ Protection of Community During Remedial Action: Not applicable. ◘ Protection of Workers During Remedial Action: Not applicable. ◘ Environmental Impacts: Not applicable. ◘ Time Until Remedial Action Objectives are Achieved: Unknown.

Table M-3. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
11: DAM REPLACEMENT, PARTIAL EXCAVATION, ISOLATION CAPPING, AND DISPOSAL AND/OR TREATMENT	Option 11a, Upland CDF $42,000,000 Option 11b, On-site Near Shore CDF $37,000,000 Option 11d, On-site Incineration $64,000,000 Option 11e, Off-site Disposal and/or Treatment $54,000,000 Option 11f, On-site Consolidation $35,000,000	+$41,550,000 +$36,550,000 +$63,550,000 +$53,550,000 +$34,550,000	↑Magnitude of Residual Risk: Residual risk after the contaminated sediment is partially excavated and a cap is installed will be low, provided the cap is designed, constructed and maintained to provide long-term (in perpetuity) isolation of contaminants. Sediment would be removed from areas with the highest potential for erosion and the cap would provide chemical isolation. However, potential future risk remains because most/all of the sediment would remain in the river and newly formed floodplain areas under the cap. Partial excavation would provide some risk reduction ↑*For material that is excavated - Disposal Options* a. high long term effectiveness as material is removed to secure location outside 100 floodplain. b. somewhat effective in	↑Treatment Process Used and Materials Treated: Options 11a and 11e require treatment. Option 11d includes on-site incineration. ↑Amount Destroyed or Treated: Options 11a and 11e, approximately 3,800 cy treated. Option 11d, approximately 59,800 cy treated. ↑Degree of Expected Reductions of Toxicity, Mobility, or Volume Through Treatment: Incineration under Options 11a, 11d, and 11e. (very high expected reduction) ↑Degree to Which Treatment is Irreversible: Process is irreversible. ↑Type and Quantity of Residuals Remaining After Treatment: After incineration, the volume of inorganic sediment particles would be nearly the same as the pre-treatment volume, but	↓Protection of Community During Remedial Action: This alternative would permanently reduce the size of the waterbodies. All of the options would present limited impacts to the community from construction. ↓Protection of Workers During Remedial Action: Health and safety plans, emergency response plans, engineering controls (dust suppression), and personal protective equipment will be used during construction activities. ↓Environmental Impacts: Excavation would result in destruction of the existing benthic habitat in both ponds and the elimination of the fish communities. During pond lowering, there is the potential for downstream migration of contaminated sediment. Replacing the dams with a smaller weir structure would permanently reduce the size of the lacustrine (i.e., lake) habitat, increase

Table M-3. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
			long term as all material remains in River. d. highly effective permanent. e. highly effective permanent. ↑<u>Adequacy and Reliability of Controls:</u> Reliability of a cap over contaminated sediment would be highly dependent upon monitoring, maintenance and ICs in perpetuity. In addition, the cap is in a relatively stable depositional area and would provide reliable chemical isolation with the top layer of the cap designed to withstand erosion, although there are some reliability concerns because contamination is still located in the river/ floodplain. Long-term monitoring, maintenance and ICs in perpetuity would be required critical to control physical disturbances ensure long-term effectiveness of this alternative.	concentrations of chemical contaminants would be below detection limits.	the river riparian habitat and convert some aquatic habitat to floodplain habitat Difficult to predict the impact of replacement of the dams. ↑<u>Time Until Remedial Action Objectives are Achieved:</u> RAOs achieved approximately one year for Option 11f and two years for Options 11a, 11b, 11d, and 11e.

Table M-3. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
			↑*For material that is excavated - Disposal Options* a. highly reliable as material is removed to secure location outside 100 floodplain/RCRA cap and ICs. b. somewhat reliable as all material remains in River and greater reliance on ICs maintenance monitoring in perpetuity. d. highly reliable. e. highly reliable.		
8: PARTIAL EXCAVATION, ISOLATION CAPPING AND DISPOSAL AND/OR TREATMENT	Option 8a, Upland CDF $45,000,000 Option 8b, On-site Near Shore CDF $36,000,000 Option 8d, On-site Incineration $67,000,000 Option 8e, Off-site Disposal and/or Treatment $57,000,000	+$3,000,000 -$1,000,000 +$3,000,000 +$3,000,000	↔Magnitude of Residual Risk: Residual risk after the contaminated sediment is excavated and a cap is installed will be reduced, provided the cap is designed, constructed, monitored and maintained (in perpetuity) to provide long-term isolation of contaminants. Where contamination remains under the cap in the river and contained on site in a controlled disposal facility (8b), potential future risk remains because most/all of the sediment would remain in the river under	↑Treatment Process Used and Materials Treated: Options 8a and 8e some treatment to meet LDRs. Option 8d includes on-site incineration. **Amount Destroyed or Treated: Under Options 8a and 8e, approximately 4,100 cy. Under Option 8d, approximately 64,400 cy. ↔ Degree of Expected Reductions of Toxicity, Mobility, or Volume Through Treatment: There would be a reduction of toxicity, mobility, or	↔Protection of Community During Remedial Action: All of the options would present limited impacts to the community from construction. ↔Protection of Workers During Remedial Action: Health and safety plans, emergency response plans, engineering controls (dust suppression), and personal protective equipment will be used during construction activities, mitigating risks to workers. ↑Environmental Impacts: Excavation and capping

Table M-3. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
			caps/cover. Partial excavation would provide some risk reduction. ***For material that is excavated - Disposal Options* a. high long term effectiveness as material is removed to secure location outside 100 floodplain. b. somewhat effective in long term as all material remains in River. d. highly effective permanent. e. highly effective permanent. ↔<u>Adequacy and Reliability of Controls:</u> Reliability of a cap over contaminated sediment would be highly dependent upon monitoring, maintenance and ICs (in perpetuity). Cap is in a relatively stable depositional area and would provide reliable chemical isolation with the top layer of the cap designed to withstand erosion, although there are some reliability concerns	volume of contamination by incineration (very high expected reduction). ↔<u>Degree to Which Treatment is Irreversible:</u> Process is irreversible. ↔<u>Type and Quantity of Residuals Remaining After Treatment:</u> After incineration, the volume of inorganic sediment particles would be nearly the same as the pre-treatment volume, but concentrations of chemical contaminants would be below detection limits.	would result in destruction of the existing benthic habitat in both ponds and the elimination of the fish communities. In addition, aquatic-dependent wildlife populations would be adversely affected until ponds had become re-established which could take two to five years. During pond lowering, there is the potential for downstream migration of contaminated sediment. Cap placement could increase non-contaminated suspending solids. ↔<u>Time Until Remedial Action Objectives are Achieved:</u> RAOs are achieved approximately two years.

Table M-3. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
			because contamination is still located in the river/ponds. Long-term monitoring, maintenance, including maintenance of the dams, and ICs would be critical to control physical disturbances ensure long-term effectiveness of this alternative. ***For material that is excavated - Disposal Options* a. highly reliable as material is removed to secure location outside 100 floodplain/RCRA cap and ICs. b. somewhat reliable as all material remains in River and greater reliance on ICs maintenance and monitoring. d. highly reliable. e. highly reliable.		
7: EXCAVATION AND DISPOSAL AND/OR TREATMENT	Option 7a, Upland CDF $61,000,000 Option 7b, On-site Near Shore CDF $47,000,000	+$16,000,000 +$11,000,000	↑<u>Magnitude of Residual Risk:</u> Excavation would remove contaminated sediment from the river/ponds to provide a very high level of risk reduction and low residual risk. In order to meet the RAOs, a thin-	↑T<u>reatment Process Used and Materials Treated:</u> Options 7a and 7e some material requires treatment to meet LDRs. Option 7d incineration all material.	↔<u>Protection of Community During Remedial Action:</u> All of the options would result in limited impacts to the community from construction.

Table M-3. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
	Option 7d, On-site Incineration $118,000,000 Option 7e, Off-site Disposal and/or Treatment $93,000,000	+$51,000,000 +$36,000,000	layer cover would be placed on top of the sediment if post-excavation contaminant concentrations exceeded the cleanup levels in some locations. ***For material that is excavated - Disposal Options* a. high long term effectiveness as material is removed to secure location outside 100 floodplain. b. somewhat effective in long term as all material remain in River. d. highly effective permanent. e. highly effective permanent. ↑<u>Adequacy and Reliability of Controls:</u> Excavation would be effective in the long term because the contaminated sediment would be removed and either contained on site, destroyed, or shipped off site for disposal or treatment. This alternative can be reliable	**<u>Amount Destroyed or Treated:</u> Under Options 7a and 7e, approximately 9,800 cy. Under Option 7d, approximately 155,800 cy. ↔<u>Degree of Expected Reductions of Toxicity, Mobility, or Volume Through Treatment:</u> There would be a reduction of toxicity, mobility, or volume of contamination from incineration under Options 7a, 7d, and 7e. (very high expected reduction) ↔<u>Degree to Which Treatment is Irreversible:</u> Process is irreversible. ↔<u>Type and Quantity of Residuals Remaining After Treatment:</u> After incineration, the volume of inorganic sediment particles would be nearly the same as the pre-treatment volume, but concentrations of chemical contaminants would be below detection limits.	↔<u>Protection of Workers During Remedial Action:</u> Health and safety plans, emergency response plans, engineering controls (dust suppression), and personal protective equipment will be used during site activities. ↔<u>Environmental Impacts:</u> Excavation would result in destruction of the existing benthic habitat in both ponds and the elimination of the fish communities. In addition, aquatic-dependent wildlife populations would be adversely affected ponds becomes re-established During pond lowering, there is the potential for downstream migration of contaminated sediment. ↔<u>Time Until Remedial Action Objectives are Achieved:</u> RAOs are achieved approximately two years.

Table M-3. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
			as long as long-term monitoring, maintenance and ICs are implemented for any type of on-site disposal facility (Options 7a and 7b). Maintenance, monitoring, and ICs are particularly important for Option 7b (near shore CDF) because the inherent hazard remains in the floodplain adjacent to the river. ***For material that is excavated - Disposal Options* a. highly reliable as material is removed to secure location outside 100 floodplain/RCRA cap and ICs. b. somewhat reliable as all material remain in River and greater reliance on ICs maintenance and monitoring. d. highly reliable. e. highly reliable.		
10: DAM REPLACEMENT, EXCAVATION, AND DISPOSAL AND/OR TREATMENT	Option 10a, Upland CDF $62,000,000 Option 10b, On-site Near Shore CDF	+$1,000,000 +$3,000,000	↔Magnitude of Residual Risk: Excavation would remove contaminated sediment from the river to provide a very high level of risk reduction. A thin-layer	↔Treatment Process Used and Materials Treated: Options 10a and 10e some material requires treatment to meet LDRs. Option 10d requires incineration all material.	↔Protection of Community During Remedial Action: This alternative would permanently reduce the size of the waterbodies bordering adjacent property owners along the eastern

Table M-3. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
	$50,000,000 Option 10d, On-site Incineration $119,000,000 Option 10e, Off-site Disposal and/or Treatment $94,000,000	 +$1,000,000 +$1,000,000	cover may be placed on top of the sediment if post-excavation contaminant concentrations exceed the cleanup levels in some locations ** *For material that is excavated - Disposal Options* a. high long term effectiveness as material is removed to secure location outside 100 floodplain b. somewhat effective in long term as all material remain in River. d. highly effective permanent. e. highly effective permanent. ↔Adequacy and Reliability of Controls: Excavation would be effective in the long term because the contaminated sediment would be removed and either contained on site, destroyed, or shipped off site for disposal or treatment. Inspections and long-term	**Amount Destroyed or Treated: Under Options 10a and 10e, approximately 9,800 cy treated Under Option 10d, approximately 155,800 cy of sediment treated. ↔Degree of Expected Reductions of Toxicity, Mobility, or Volume Through Treatment: There would be a reduction in the toxicity, mobility, or volume of contamination from incineration under Options 10a, 10d, and 10e. (very high expected reduction) ↔Degree to Which Treatment is Irreversible: Process is irreversible. ↔Type and Quantity of Residuals Remaining After Treatment: After incineration, the volume of inorganic sediment particles would be nearly the same as the pre-treatment volume, but concentrations of chemical contaminants would be below detection limits.	shore of both ponds. Depending on the specific disposal option selected, open water habitat would be replaced with either floodplain or an engineered containment structure. All of the options would present limited impacts to the community from construction. ↔Protection of Workers During Remedial Action: Health and safety plans, emergency response plans, engineering controls (dust suppression), and personal protective equipment will be used during construction activities. ↓Environmental Impacts: Excavation would result in destruction of the existing benthic habitat in both ponds and the elimination of the fish communities. In addition, aquatic-dependent wildlife populations would be adversely affected until primary and secondary productivity in the ponds becomes re-established which could take two to five

Table M-3. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
			maintenance of the weir structure would also be required for Alternative 10 for any options where inherent hazard remains in the river or floodplain. ***For material that is excavated - Disposal Options* a. high long term effectiveness as material is removed to secure location outside 100 floodplain. b. somewhat effective in long term as all material remains in River. d. highly effective permanent. e. highly effective permanent.		years. During pond lowering and dam replacement, there is the potential for downstream migration of contaminated sediment. Replacing the dams with a smaller weir structure would permanently reduce the size of the lacustrine (i.e., lake) habitat, increase the river riparian habitat and convert some aquatic habitat to floodplain habitat. It Difficult to predict fully the impact of replacement of the dams. ↔<u>Time Until Remedial Action Objectives are Achieved:</u> RAOs are achieved two years.

COST-EFFECTIVENESS SUMMARY:

- Alternatives 1, 8 and 11 are not cost-effective
- Alternatives 7 and 10 are cost-effective
- Disposal Options a and e are cost effective; Options b and d are not cost effective with Option a providing a potentially greater return on investment.

Key:
◘ = Baseline characteristic
↑ = More 'effective" compared to previous alternative
↓ = Less "effective" compared to previous alternative
↔ = No change compared to previous alternative
** Effective/less effective/ reduction through treatment compared to previous alternative depends upon disposal option

Table M-4. Cost and Effectiveness, Allendale Floodplain Soil Alternatives

Relevant Considerations for Cost-effectiveness Determination: (site-characteristics relate to cost-effectiveness criteria)

- Contaminated floodplain soil above cleanup levels is 2,400 cy extending over 1.5 acres of Allendale Reach, and potentially 4,200 cy over 1.7 acres of residential-use soil areas along the eastern shore of Allendale Pond
- Contaminated floodplain soil is located in wetland areas and floodplain
- Human health risk assessment shows that direct contact with floodplain soil poses elevated cancer risks of $2x10^{-5}$ for recreational visitors and up $2x10^{-4}$ for residents living along the River. Baseline HI is also elevated for residents living along the River, including reproductive endocrine effects (dioxin) HI of up to 17.
- Baseline risks to ecological receptors through sediment contact and sediment associated prey consumption are also elevated
- Contaminant levels also exceed RIDEM residential direct exposure criteria.
- Contaminated soil can migrate downstream during flood events

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
1: NO ACTION	$0 (costs for periodic monitoring and five-year reviews are covered under the sediment No Action alternative, Table M-6)	--------	◘ <u>Magnitude of Residual Risk:</u> The residual risk is high because no actions are taken to address the contaminated floodplain soil or reduce the risk of erosion and migration downstream. ◘ <u>Adequacy and Reliability of Controls:</u> There would be no controls in place to adequately and/or reliably prevent exposure in the long term.	◘ <u>Treatment Process Used and Materials Treated:</u> None proposed. ◘ <u>Amount Destroyed or Treated:</u> None anticipated. ◘ <u>Degree of Expected Reductions of Toxicity, Mobility, or Volume Through Treatment:</u> No reductions in toxicity, mobility, or volume. ◘ <u>Degree to Which Treatment is Irreversible:</u> Not applicable. ◘<u>Type and Quantity of Residuals Remaining After Treatment:</u> There would be no residuals.	◘ <u>Protection of Community During Remedial Action:</u> Not applicable. ◘ <u>Protection of Workers During Remedial Action:</u> Not applicable. ◘ <u>Environmental Impacts:</u> Not applicable. ◘ <u>Time Until Remedial Action Objectives are Achieved:</u> Unknown.

Table M-4. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
5: EXCAVATION AND DISPOSAL AND/OR TREATMENT	Option 5a, Upland CDF $2,100,000 Option 5b, On-site Near Shore CDF $2,100,000 Option 5d, On-site Incineration $8,000,000 Option 5e, Off-site Disposal and/or Treatment $5,700,000	+$2,100,000 +$2,100,000 +$8,000,000 +$5,700,000	↑Magnitude of Residual Risk: Excavation would be effective in the long term because the contaminated soil would be removed and either contained on site, destroyed, or shipped off site for disposal and/or treatment thereby greatly reducing the residual risk. ↑*For material that is excavated - Disposal Options* a. high long term effectiveness as material is removed to secure location outside 100 floodplain. b. somewhat effective in long term as all material remain in River. d. highly effective permanent. e. highly effective permanent. ↑Adequacy and Reliability of Controls: Because this alternative relies on excavation to remove contaminated soil, there is little reliance on controls. However, long-term monitoring, maintenance and ICs would be required to maintain any type of on-site disposal facility (Options 5a and 5b).	↑Treatment Process Used and Materials Treated: Option 5d includes on-site incineration. ↑Amount Destroyed or Treated: Under Option 5d, approximately 6,600 cy of soil would be excavated and treated. ↑Degree of Expected Reductions of Toxicity, Mobility, or Volume Through Treatment: There would be a reduction of toxicity, mobility, or volume of contamination through incineration. ↑Degree to Which Treatment is Irreversible: Process is irreversible. ↑Type and Quantity of Residuals Remaining After Treatment: After incineration, the volume of inorganic soil particles would be nearly the same as the pre-treatment volume, but concentrations of organic chemical contaminants would be below detection limits.	↓Protection of Community During Remedial Action: All of the options would present limited impacts to the community from construction. Biggest impact is expected on residential properties directly affected by the action. ↓Protection of Workers During Remedial Action: Health and safety plans, emergency response plans, engineering controls (dust suppression), and personal protective equipment will be used during site activities. ↓Environmental Impacts: Excavation would result in the temporary destruction of the existing habitat, the elimination of floodplain soil infauna and riparian vegetation, and collateral impacts to wildlife that rely on this habitat for shelter and food. Habitat enhancement during construction will help facilitate ecological recovery. ↑Time Until Remedial Action Objectives are Achieved: RAOs are achieved in approximately one month except for residential use properties. Each residential-use property will take several days to excavate.

Table M-4. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
			↑*For material that is excavated - Disposal Options* a. high long term effectiveness as material is removed to secure location outside 100 floodplain. b. somewhat effective in long term as all material remain in River. d. highly effective permanent. e. highly effective permanent.		

COST-EFFECTIVENESS SUMMARY:

- Alternatives 1, and 5b and d are not cost-effective
- Alternatives 5a and 5e are cost-effective. Alternative 5a provides potentially greater return on investment.

Key:
◘ = Baseline characteristic
↑ = More ‘effective” compared to previous alternative
↓ = Less “effective” compared to previous alternative
↔ = No change compared to previous alternative

Table M-5. Cost and Effectiveness, Lyman Mill Stream Sediment and Floodplain Soil Alternatives

Relevant Considerations for Cost-effectiveness Determination: (site-characteristics relate to cost-effectiveness criteria)

- Contaminated floodplain soil and sediment above cleanup levels is estimated at 58,400 cy extending over 28.7 acres of Lyman Mill Reach, and potentially 5,600 cy over 3.4 acres of residential-use soil areas along the eastern shore of Lyman Mill Pond
- Oxbow Area is a net depositional environment
- Oxbow wetland is a large valuable ecological habitat
- Contaminated floodplain soil and sediment are located in open waters in wetland areas or navigable waters and floodplain
- Baseline cancer risks for a passive recreational visitor via surface soil contact is 6x10^{-5} and non-cancer HI is 4. For residential-use soil, cancer risks are up to 9x10^{-3} and baseline Hazard Index for reproductive/endocrine effects (dioxin) is up to 20.
- Contaminant levels also exceed RIDEM residential direct exposure criteria.
- Baseline risks to ecological receptors through floodplain soil contact and prey consumption are also elevated
- Contaminated floodplain soil and sediment can erode and migrate downstream during flood events and contamination can migrate from sediment into Woonasquatucket river surface water

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
1: NO ACTION	$250,000	--------	◘ Magnitude of Residual Risk: The residual risk is high. ◘ Adequacy and Reliability of Controls: There would be no controls.	◘ Treatment Process Used and Materials Treated: None proposed. ◘ Amount Destroyed or Treated: None anticipated. ◘ Degree of Expected Reductions of Toxicity, Mobility, or Volume Through Treatment: No reductions in toxicity, mobility, or volume. ◘ Degree to Which Treatment is Irreversible: Not applicable. ◘Type and Quantity of Residuals Remaining After Treatment: No residuals.	◘ Protection of Community During Remedial Action: Not applicable. ◘ Protection of Workers During Remedial Action: Not applicable. ◘ Environmental Impacts: Not applicable, as no remedial actions are proposed. ◘ Time Until Remedial Action Objectives are Achieved: Unknown.

Table M-5. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
3: TARGETED EXCAVATION, ENHANCED NATURAL RECOVERY AND DISPOSAL AND/OR TREATMENT	Option 3a, Upland CDF $19,400,000 Option 3b, On-site Near Shore CDF $16,100,000 Option 3d, On-site Incineration $41,200,000 Option 3e, Off-site Disposal and/or Treatment $32,000,000	+$19,150,000 +$15,850,000 +$40,950,000 +31,750,000	↑Magnitude of Residual Risk: Targeted excavation would be somewhat effective in the long term because some contaminated sediment/soil would be removed. In residential-use areas, all areas exceeding ARARs for residential direct exposure and risk-based levels will be removed and provide a higher level of risk reduction for human receptors. Post-construction ecological residual risk would remain elevated The risks to ecological receptors would be further reduced over time, as clean material was deposited within the area. ICs and ECs would be used to further minimize human exposure. ↑ *For material that is excavated - Disposal Options* a. high long term effectiveness as material is removed to secure location outside 100 floodplain. b. somewhat effective in long term as all material remain in River.	↑Treatment Process Used and Materials Treated: Options 3a and 3e l require treatment to meet LDRs. Option 3d includes on-site incineration. ↑Amount Destroyed or Treated: Under Options 3a and 3e, approximately 2,100 cy treated. Under Option 3d, 20,500 cy treated. ↑Degree of Expected Reductions of Toxicity, Mobility, or Volume Through Treatment: There would be a reduction of toxicity, mobility, or volume under Options 3a, 3d, and 3e. (Very high reduction expected) ↑Degree to Which Treatment is Irreversible: Process is irreversible. ↑Type and Quantity of Residuals Remaining After Treatment: After incineration, the volume of inorganic soil	↓Protection of Community During Remedial Action: All of the options would result in limited impacts to the community from construction. Residential-use requiring excavation properties will be most impacted. ↓Protection of Workers During Remedial Action: Health and safety plans, emergency response plans, engineering controls (dust suppression), and personal protective equipment will be used during site activities. ↓Environmental Impacts: Excavation would temporarily destroy existing habitat, which may take at least a decade to become reestablished in areas of emergent marsh. Application of cover material may have deleterious effects to the trees within the Oxbow. However, using a hydraulic slurry method and performing the work during the dormant season (e.g.,

Table M-5. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
			d. highly effective permanent. e. highly effective permanent. ↑<u>Adequacy and Reliability of Controls:</u> Long-term monitoring, maintenance, including maintenance of the dam, and ICs would be critical to assure the long-term protectiveness of this alternative, including the soil cover and CDFs particularly 3b. Implementation of ICs would provide further protection by lowering the potential for exposure; ICs are only effective if adequately monitored, enforced, and maintained. ↑*For material that is excavated - Disposal Options* a. high long term effectiveness as material is removed to secure location outside 100 floodplain. b. somewhat effective in long term as all material remain in River. d. highly effective	particles would be nearly the same as the pre-treatment volume, but concentrations of organic chemical contaminants would be below detection limits.	late fall or early winter) would minimize damage to vegetation. Non-mobile animals, such as soil invertebrates, would be buried by the cover; however, it is expected that they would quickly colonize the newly applied cap material. ↑<u>Time Until Remedial Action Objectives are Achieved:</u> Time to reach the cleanup levels for most sensitive ecological receptor best estimate approximately 30 years. The time to reach the cleanup levels for the passive recreational visitor 4 years. Each residential-use property will take several days to excavate.

Table M-5. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
			permanent. e. highly effective permanent.		
5: PARTIAL EXCAVATION, ENHANCED NATURAL RECOVERY, AND DISPOSAL AND/OR TREATMENT	Option 3a, Upland CDF $34,400,000 Option 3b, On-site Near Shore CDF $26,600,000 Option 3d, On-site Incineration $81,200,000 Option 3e, Off-site Disposal and/or Treatment $61,200,000	+$15,000,000 +$10,500,000 +$40,000,000 +$29,200,000	↑<u>Magnitude of Residual Risk:</u> Partial excavation would be more effective in the long term because additional contaminated sediment/soil would be removed. In addition, placement of a thin-layer cover would facilitate risk reduction through natural recovery. All sediment and floodplain soil will be excavated from areas where contaminant concentrations are in excess of ARARs for residential direct exposure or EPA's site specific levels for dioxin as well as from areas of highest potential for future erosion, from low-lying channels and areas with potential for frequent human exposure; the residual risk would be significantly reduced particularly for human receptors. The elevated post-construction ecological residual risk from contamination	↑<u>Treatment Process Used and Materials Treated:</u> Options 5a and 5e require some treatment to meet LDRs. Option 5d includes on-site incineration. **<u>Amount Destroyed or Treated:</u> Under Options 5a and 5e, 5,100 cy treated. Under Option 5d, 50,900 cy treated. ↔<u>Degree of Expected Reductions of Toxicity, Mobility, or Volume Through Treatment:</u> There would be a reduction of toxicity, mobility, or volume of contamination by incineration under Options 5a, 5d, and 5e.(Very high reduction expected) ↔<u>Degree to Which Treatment is Irreversible:</u> Process is irreversible.	↔<u>Protection of Community During Remedial Action:</u> All of the options would present limited impacts to the community from construction. Residential-use requiring excavation properties will be most impacted. ↔<u>Protection of Workers During Remedial Action:</u> Health and safety plans, emergency response plans, engineering controls (dust suppression), and personal protective equipment will be used during site activities, ↓<u>Environmental Impacts:</u> Excavation would temporarily destroy existing habitat, which may take at least a decade to become reestablished in areas of emergent marsh, and a considerably longer time (on the order of several decades) in areas with a well-developed tree canopy.

Table M-5. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
			remaining in place under the thin-layer cover would be further reduced over time as clean material was deposited within the area, although this process will be fairly slow even with the inclusion of river flow-diversion structures to increase sedimentation rates in the Oxbow. ***For material that is excavated - Disposal Options* a. high long term effectiveness as material is removed to secure location outside 100 floodplain. b. somewhat effective in long term as all material remain in River. d. highly effective permanent. e. highly effective permanent. ↑<u>Adequacy and Reliability of Controls:</u> Long-term monitoring, maintenance, including maintenance of the dam, and ICs would be critical to ensure the long-term protectiveness of the thin-layer cover and any CDF	↔<u>Type and Quantity of Residuals Remaining After Treatment:</u> After incineration, the volume of inorganic sediment/soil particles would be nearly the same as the pre-treatment volume, but the concentrations of organic chemical contaminants would be below detection limits.	↑<u>Time Until Remedial Action Objectives are Achieved:</u> The time to achieve RAOs for the most sensitive ecological receptor best estimate 25 years. For the passive recreational visitor 0.5 years. Each residential-use property will take several days to excavate.

Table M-5. (Continued)

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume Through Treatment	Short-Term Effectiveness
			particularly 5b. Implementation of ICs would provide further protection by lowering the potential for exposure; ICs are only effective if adequately monitored, enforced, and maintained. ***For material that is excavated - Disposal Options* a. high long term effectiveness as material is removed to secure location outside 100 floodplain. b. somewhat effective in long term as all material remain in River. d. highly effective permanent. e. highly effective permanent.		

COST-EFFECTIVENESS SUMMARY:

- Alternatives 1, 3b and 3d, and 5b and 5d are not cost-effective
- Alternatives 3a and 3e, and 5a and 5e are cost-effective. Alternative 3a provides potentially greater return on investment.

Key:

◘ = Baseline characteristic
↑ = More 'effective" compared to previous alternative
↓ = Less "effective" compared to previous alternative
↔ = No change compared to previous alternative
** Effective/less effective/reduction through treatment compared to previous alternative depends upon disposal option.

N. DOCUMENTATION OF SIGNIFICANT CHANGES

EPA presented a proposed plan (preferred alternative) for remediation of the Site on October 27, 2011[14]. The preferred alternative included:

- Removing buried waste material from the Source Area (where contamination originally occurred), and the majority of contaminated Woonasquatucket River sediment and floodplain soil near and downstream of the Source Area, using a combination of containment and treatment methods;
- Installing new hazardous waste isolation caps over the remaining Source Area contaminated soil and placing thin soil covers over contaminated wetlands and floodplain areas to speed up natural recovery processes and preserve valuable habitat;
- Placing restrictions to permanently prevent the use of groundwater and to temporarily prohibit eating fish, as well as restricting other activities that could potentially expose remaining contamination;
- Monitoring in the long term to assess the cleanup's effectiveness and recovery of the Woonasquatucket River and its floodplain, and to evaluate the potential need for other response actions in the downstream reaches beyond Lyman Mill Dam into the Providence area;
- Complying with federal drinking water standards at the Source Area; and
- Monitoring the contribution of Site contaminants to the Woonasquatucket River's surface water.

EPA presented a proposed plan amendment for remediation of the Site on July 19, 2012, following EPA's release of the final non-cancer dioxin reassessment on February 17, 2012. The amended preferred alternative included:

- Including the newly calculated Site-specific non-cancer human health hazards from dioxin exposure;
- Lowering the residential cleanup level of 1,000 ng/kg for dioxin in soil (used for earlier short term cleanups) to a Site-specific cleanup level of 50 ng/kg; and
- Potentially conducting additional cleanup beyond what was proposed in the October 2011 Proposed Plan in three of the Site's five Action Areas and thus potentially increasing the cleanup costs. The three impacted areas were the Source Area Soil, Allendale Floodplain Soil, and the Lyman Mill Stream Sediment and Floodplain Soil (including the Oxbow Area). The plan also included precautionary interim measures

14 In developing dioxin cleanup goals in the FS and the May 2012 Technical Memorandum, data for both 2,3,7,8-TCDD and Dioxin TEQ was used. As a result, cleanup levels were developed for both, 2,3,7,8-TCDD and total TEQ in the FS and the Technical Memorandum. To simplify cleanup levels presentation in the ROD, only one dioxin cleanup level is presented for each Action Area, based on most appropriate data analysis, including residential-use soil. These clarifications do not change the remedy and are fully consistent with the previous documents developed for the Site.

(e.g., fencing or spreading a cover) to prevent exposures to contaminated soil shortly after EPA issues the ROD.

EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy, as originally identified in the proposed plan and proposed plan amendment, were necessary. Two changes were made based upon comments received. The Proposed Plan assumed that the upland CDF component of the remedy would be constructed on-site and identified a number of potential locations in the Town of Johnston. Because of concerns raised by some of the public during the public comment period regarding the possible locations for the upland CDF identified by EPA, EPA has expanded in the ROD the area where an upland CDF could be located to beyond what is in close proximity to the Site. Selected remedy for the Oxbow Area is also modified and expanded to allow for additional removal of contaminated soil and sediment in response to concerns about the effectiveness of the proposed remedy.

O. STATE ROLE

The Rhode Island Department of Environmental Management has reviewed the various alternatives and has indicated its support for the selected remedy. The State has also reviewed the Remedial Investigation, Risk Assessment and Feasibility Study to determine if the selected remedy is in compliance with applicable or relevant and appropriate State environmental and facility siting laws and regulations. Rhode Island concurs with the selected remedy for the Centredale Manor Restoration Project Superfund Site. A copy of the declaration of concurrence is attached as Appendix A.

RESPONSIVENESS SUMMARY

PREFACE

The purpose of this Responsiveness Summary is to document EPA's responses to the questions and comments received during the public comment period on the October 2011 Proposed Plan and the July 2012 Proposed Plan Amendment for the Centredale Manor Restoration Project Superfund Site. EPA considered all of the comments summarized in this document before selecting the remedy to address contamination at the Site.[1]

The public hearings on the Proposed Plan were held on December 7, 2011 in Centredale Manor at 2074 Smith Street, North Providence, Rhode Island and in North Providence Town Hall, 2000 Smith Street, North Provide, Rhode Island. The public hearings on the Proposed Plan Amendment were held on July 30, 2012 in Pocasset Bay Retirement Living at 12 Pocasset Lane, Johnston, Rhode Island and on July 31, 2012 in Centredale Manor at 2074 Smith Street, North Providence, Rhode Island and in North Providence Town Hall, 2000 Smith Street, North Provide, Rhode Island. The transcripts contain original comments submitted orally by citizens and other stakeholders during these hearings.

Written comments on the Proposed Plan from citizens and other stakeholders were also received during the public comment period on the Proposed Plan held from November 14, 2011 to March 2, 2012, and on the Proposed Plan Amendment during the public comment period held from July 19, 2012 to September 17, 2012.

A copy of each hearing transcript and copies of all written comments are included in the Administrative Record available for review at the Site information repositories at the North Providence Union Free Library, 1810 Mineral Springs Avenue, North Providence, Rhode Island, the Mohr Memorial Library, 1 Memorial Avenue, Johnston, Rhode Island and the EPA New England Records Center, 5 Post Office Square, Boston, Massachusetts or online at www.epa.gov/region1/superfund/sites/centredale. The Administrative Record Index is included as Appendix C of the Record of Decision (ROD).

Comments received from environmental groups generally favored removal of contamination from the Woonasquatucket River, while the Potentially Responsible Parties (PRPs) objected to many legal and technical aspects and the high cost of the remedy. Residents abutting the River generally were concerned about construction impacts on their properties, quality of life, and wildlife, as well as the prospects for overall cleanup success. The Town of Johnston commented on proposed storage locations of the soil and sediment removed from the Site and impact on the

[1] This final Responsive Summary is a slightly updated version of the Responsiveness Summary attached to the Record of Decision as it was signed on September 28, 2012. This final Responsiveness Summary was updated to address formatting, confidential business information and minor corrections to the text. These changes have been reviewed by the official approving the ROD and this constitutes the official EPA Responsiveness Summary for the Record of Decsion.

town economy. A number of different stakeholders commented on the cleanup approach to the Oxbow wetland with opinions varying from doing nothing (No Action), to conducting additional investigations, to excavating the whole area.

A. SELECTED REMEDY SUMMARY

The selected remedy is a comprehensive approach that addresses all current and potential future risks caused by soil, sediment, groundwater and surface water contamination. For purposes of the ROD, the Site has been divided into five areas: Source Area Soil, Groundwater, Allendale Pond and Lyman Mill Pond Sediment, Allendale Floodplain Soil, and Lyman Mill Stream Sediment and Floodplain Soil (including the Oxbow wetland).

The remedial measures selected in this ROD will prevent direct contact with contaminated soil and sediment that presents an unacceptable risk; prevent movement of contaminants into the Woonasquatucket River that could result in exceedances of WQC (water quality criteria); comply with federal drinking water standards at the Source Area; allow fish consumption and sediment contact and additional non-contact recreational use of the Woonasquatucket River; and reduce risk to wildlife. All buried waste material at the Source Area, and all soil and sediment at the Site are principal threat wastes which will be treated to the maximum extent practicable.

The remedy selected in the ROD generally requires:

1. Removal and off-site treatment and/or disposal of buried waste material from the Source Area (where contamination release originally occurred) and installation of a Resource Conservation and Recovery Act (RCRA) C cap over remaining contamination in the Source Area;
2. Excavation of the majority of contaminated Woonasquatucket River sediment and floodplain soil in the Allendale and Lyman Mill reaches of the River and placement into an upland confined disposal facility (CDF) with off-site treatment and/or disposal of approximately 10 percent of excavated material;
3. Placement of a thin layer soil cover over the remaining contamination in the Oxbow to facilitate enhanced natural recovery and preserve valuable habitat;
4. Implementation of institutional controls (ICs) to prevent exposure and preserve the integrity of components of the selected remedy;
5. Long-term monitoring and maintenance to protect the integrity of the RCRA cap, upland CDF, Allendale and Lyman Mill Dams and thin-layer wetland cover; and
6. Mitigation/restoration of wetlands and floodplains.

B. SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES

Comments were received from private citizens, non-government organizations (NGOs), including the Audubon Society of Rhode Island, Brown University Superfund Research Program, Rhode Island Building and Construction Trades Council and the Woonasquatucket River Watershed Council and from City, State and Federal government agencies (Town of

Johnston Department of Planning and Economic Development, Town of Johnston, North Providence Environmental Commission, Rhode Island Department of Health [RIDOH], U.S. Fish and Wildlife Service [USFWS]), and PRPs (Emhart Industries, Inc.).

Comments received generally fit into one or more of the themes identified below:

- The Oxbow Area cleanup approach;
- Health impacts from exposure to contamination at the Site;
- Restoring remediated areas and mitigation and compensation for lost floodplain and wetland resources;
- Short-term impacts to residents and wildlife from construction;
- Upland CDF siting and beneficial reuse;
- Impact on local economy;
- Downstream areas impact and monitoring;
- Other sources of contamination in the River;
- Cleanup plan in general and opinions on alternatives not selected;
- Support for EPA’s preferred alternative; and
- Opposition to EPA’s preferred alternative.

In addition, Emhart Industries, Inc.’s comments dealt with disagreements on the following general topics:

- Conceptual Site Model (CSM) and sources of contamination;
- Dioxin RCRA-listed F020 designation;
- Information Quality Act (IQA);
- Selection of dioxin cleanup levels;
- Site characterization and uncertainty in remedy cost and implementation;
- Application of Floodplain Executive Order 11988;
- Screening out of certain alternatives and reliance on an upland CDF;
- Feasibility of off-site disposal;
- Feasibility of near shore CDF and sediment isolation caps;
- Oxbow Area remediation approach;
- Application of RCRA regulations;
- Principal threat waste designation;
- Residents relocation in the Brook Village and Centredale Manor apartment buildings;
- Groundwater remedy remedial action objectives (RAOs) and implementability;
- Extent of data and evaluation of cleanup alternatives for the Proposed Plan Amendment; and
- Risk assessment and cleanup levels determination for the Proposed Plan Amendment.

Specific comments regarding the remedy selected in this ROD are addressed below. Where possible, EPA has grouped and summarized similar comments, and prepared a single response.

1. Several commenters suggested that the Oxbow has not been well-characterized. Commenters felt that Oxbow topography and the 100-yr flood elevation was not well defined and could be underestimated, increasing chances of exposure or erosion if contaminated material was left in place. Another commenter indicated that some areas classified for human use are unlikely to be utilized for residential or recreational purposes and that further examination of proposed removal areas based on human health exposures is warranted to better define excavation areas. There were also comments that there has been insufficient floodplain soil and sediment sampling in the Oxbow.

   EPA Response: Investigations performed at the Oxbow provided sufficient information to support the feasibility study (FS) in terms of characterizing the nature and extent of contamination and potential risks to human health and the environment, and evaluating remedial alternatives. Additional data collection activities will be performed to support the design in order to confirm the spatial and vertical extent of the cleanup area and to better understand the microtopography and hydrodynamics (e.g., water flow and flood elevations) within the Oxbow.

   Regarding human use, the human health risk assessment evaluated the potential receptor scenarios in the context of ease of access and likely activities in the upland areas and the low-lying areas within the 100-year floodplain. The "human health concern area" is the upland area of the Oxbow, where there are clear walking trails and evidence of activities such as campfires and possibly teenager congregation. This area is considered more likely to attract passive recreational visitors and it has been assumed that visitors might be present as many as 78 days per year. This represents repeated visits and frequent potential for direct exposures to surface soil. Given the duration of winter, with cold weather and ice and snow, and the frequency of days with rain during non-winter months, this assumed frequency of visits is considered conservative and health protective for the passive recreational scenario. In the low-lying areas of the Oxbow (Oxbow general area), much of the soils are wetland soils and because of their soggy nature and the very dense vegetation in most of those areas, the environment is not as inviting to passive recreational visitors and those areas are more difficult to access and the physical environment makes activities such as hiking and observing the natural environment more difficult. Nonetheless, the risk assessment has assumed that passive recreational visitors might visit and potentially be exposed to surface soils in the low-lying areas as many as 26 days per year. Given the physical environment and its potential impact on accessibility, this assumed frequency is considered conservative and health protective. It has been suggested that users of all-terrain vehicles (ATVs) might be exposed to a greater frequency in the low-lying areas. However, soil exposures associated with ATV use are typically associated with dust inhalation that might be raised by the vehicles. In the low-lying areas, where the soils are typically wet or moist, the generation of dust and subsequent inhalation of that dust is not considered to be substantial.

2. Comments were also received that raised concerns regarding the impacts and effectiveness of the proposed cleanup plan (Alternative 3a) for the Oxbow Area within the Lyman Mill Stream Sediment and Floodplain action area. This cleanup plan relies, in part, on the application of a thin-layer cover (TLC) to facilitate natural depositional processes as well as engineered structures to enhance depositional rates during flood events.

   Specifically, commenters were concerned that the application of a TLC over substantial acreage within the Oxbow either is not warranted in some areas and would impact large areas of functional habitat where there is little risk, or would not be protective enough in other areas. Some commenters were concerned that the TLC may not be effective in keeping the remaining contamination in place, or eliminate the threat of downgradient contaminant migration during flooding events. Commenters suggested that EPA did not have sufficient information regarding the physical stability of remaining contamination beneath the TLC, to support the deposition rates expected by this alternative, or to demonstrate that flow diversion could be effective at enhancing deposition under the conditions at this Site. A commenter suggested that the detailed analysis of alternatives was biased because the FS did not include biodegradation processes in the modeling evaluation of the No Action alternative. Finally, commenters were concerned that the application of a TLC in forested wetlands could lead to short-term impacts to sensitive habitat greater than expected by EPA. Based on these concerns, some commenters have suggested that additional or full excavation be conducted in this area. Others indicated that the No Action alternative should be selected either because of concern that the proposed remedy will not work or that remediation is not warranted because they felt that wildlife populations in the Oxbow are healthy.

   EPA Response: The remedy is based upon a number of assumptions and the objective of maintaining as much of the natural habitat as possible while minimizing risk. The FS provides a detailed analysis that addresses costs and benefits of each of the alternatives evaluated. EPA acknowledges that there are uncertainties that need to be further investigated during the design to confirm that the remedy will provide the anticipated benefits. These uncertainties include the following, each of which is discussed in more detail below:

   - Spatial extent of ARAR (Applicable or Relevant and Appropriate Requirements) and risk-based cleanup levels exceedances;
   - Deposition and biodegradation rate assumptions;
   - Impact of a TLC on vegetation; and
   - Soil stability.

   Spatial Extent

   The remedial footprint was determined based on the extent of contamination requiring remediation. The excavation area is based, in part, on a necessity to meet

Rhode Island Department of Environmental Management (RIDEM) direct exposure criteria and site-specific non-cancer threshold for dioxin. Some uncertainty remains regarding the spatial distribution of soil that exceeds cleanup levels and, following further characterization during design, the excavation area/volume could increase. Because the remedy targets areas of greatest contamination and those areas where flood water flows are expected to be the highest, the remedy focuses on both mass removal and the prevention of downgradient contaminant migration.

Deposition and Biodegradation Rate Assumptions

The deposition rate is important because receptors could be exposed to contamination remaining in surficial floodplain soil well into the future if sufficient deposition does not take place. No site specific information was available to estimate the deposition rate within the Oxbow. EPA estimated in the FS that the typical average deposition rate in the Oxbow is 0.048 inches/year; this estimate was derived by assuming that deposition in the Oxbow would be 20 percent of the average rate for Allendale and Lyman Mill Pond (0.24 inches/year based on information collected during the Remedial Investigation [RI] at the Site). This assumption is a reasonable one because, although deposition processes are episodic rather than continual as in dormant regions of the ponds, when floodwaters do enter the Oxbow, they normally contain large quantities of suspended particulates that get deposited there.

EPA expects that this deposition rate will be further evaluated as part of the engineering analysis that will be conducted to evaluate soil stability during the design. The engineering analysis will include evaluation of various flow control structures (e.g., diversion wings to divert sediment-laden floodwaters into the Oxbow and baffles to slow the flows and prevent “short-circuiting” of floodwaters through the Oxbow and into Lyman Mill Pond) to increase the deposition rate. The engineering analysis will determine the specific configurations for a sufficient deposition rate in this area across a range of anticipated flow rates rate while also ensuring soil stability. However, if it is determined that the combined engineering and hydrodynamic modeling analyses have not adequately reduced the uncertainties related to deposition (and length of time to achieve the desired level of risk reduction) and stability (and risks of downgradient migration), EPA will evaluate the benefits of increasing the excavation footprint beyond the area currently identified.

With respect to No Action alternative, the FS (Appendix M) identified the rate of biodegradation processes in Oxbow floodplain soil as an important factor in the estimate of the time to achieve RAOs and noted that uncertainties related to actual rates were particularly important. Unlike the active remedies which include long-term monitoring and Five-Year Reviews, there is no mechanism in place to monitor the progress of the No Action alternative to ensure that biodegradation was occurring or at what rate. The analyses presented in the FS (Appendix M) estimated the time to achieve RAOs with and without biodegradation for all alternatives evaluated (i.e., No Action along with Alternatives 3 and 5). The range of 12 to over 200 years for the No Action alternative was included in Table 6-28 in the FS Addendum. While Table 6-

28 of the FS Addendum references Appendix M which includes the results for the no biodegradation case for the active remedies, it may have been more consistent to include these results in Table 6-28 as well, although the No Action alternative presents other issues such as no actions to address potential downgradient migration of contamination. Regardless, there would be no monitoring data to evaluate assumptions concerning the relative deposition rates under this alternative.

Impact of Thin Layer Cover on Vegetation

The remedy includes application of a TLC to those areas within the footprint that are not excavated. During the preparation of the FS, available information was reviewed concerning the impacts of cover on tree root systems and it was concluded that the selected 3 inch thickness would not likely harm the canopy tree species that reside in the wetter portions of the Oxbow (predominantly red maple). A thicker cover layer (e.g. 6 inches or greater) would increase the likelihood that the floodplain forest habitat would be lost. The remedy includes a number of actions that will be taken to minimize adverse effects from TLC application, including the use of cover material that allows air passage (e.g., sandy loam much preferable to clay) and avoiding compaction of existing soil.

Little information is available on the impacts of a TLC application on herbaceous vegetation or shrub species; however, remediation success, including potential impacts to vegetation, will be monitored. To fulfill the goal of long-term restoration, these strata could be restored fairly quickly if the impacts are different than expected. The TLC material will be placed using a hydraulic slurry method which involves adding water to the cover material to form a slurry (semi-solid material) and then spraying the slurry over the area until a thickness of three inches is achieved. Water would be added to the soil in a hopper and the slurry fed into pumps connected to a temporary network of pipes and hoses for distribution throughout the cleanup area, and these pipes would be placed on the existing ground surface using small low-ground pressure equipment commonly used in landscape maintenance work and held in place with temporary earth anchors or weights, such as sand bags. This would have much less impact on the existing vegetation than conventional heavy earthmoving equipment, which can harm or kill trees through soil compaction. The application of the cover material would also be performed during the dormant season to minimize damage to the existing vegetation. Any damaged vegetation could be replaced with native shrubs of similar wildlife value.

Excavated areas could be planted with common floodplain trees (e.g., black willow, red maple) and fruit-bearing wetland shrubs such as elderberry and highbush blueberry. An appropriate herbaceous seed mix could be applied to rapidly stabilize the soils. The specific species, planting specifications and monitoring requirements will be identified during design. In addition, the proposed monitoring program will include an annual assessment component to detect the presence of invasive plant species. Appropriate actions would be taken to ensure that non-native species do not become established to the detriment of long-term restoration goals.

Soil Stability

EPA recognizes that there is some uncertainty concerning soil stability in the Oxbow Area. However, the addition of baffles (flow regulating devices) within preferred floodwater flow paths in the Oxbow will be evaluated during design to promote soil stability and deposition and to ensure that the potential for the Oxbow to serve as a continuing downstream source of contaminated sediment is minimized. Soil stability will be increased with design and construction of flow control structures and situated baffles that will divert some of the flow from the Woonasquatucket River during flood events into and through the Oxbow to increase the amount of the sediment load to the Oxbow while minimizing the likelihood that floodwater flows would retain sufficient energy to erode surface soils and transport residual contamination into Lyman Mill Pond (i.e., serve as a continuing source of contaminated sediment to downstream areas). Hydrodynamic modeling will also be conducted in concert with the engineering analysis to ensure that the engineered structures will function as intended. Hydrodynamic studies conducted over a range of peak flows representative of likely future flood events would provide useful data to support the engineering analysis (i.e., baffle design configuration[s] and placement within the Oxbow) and reduce the uncertainties associated with the soil stability/contaminant migration issue. Additional excavation of soil and sediment may be required if: (i) the size of area requiring cleanup is increased, (ii) deposition rates are slower than assumed, (iii) engineered structures are less effective at preventing "short-circuiting" of the Oxbow Area than assumed, and (iv) in-place contamination is less stable than estimated in the FS. Additional removal, focusing on those areas that were determined to be least stable, if any, would directly reduce overall uncertainties regarding remedy effectiveness. Increases in the excavation footprint will need to consider any additional information developed during the design concerning the possible presence of sensitive species in the Oxbow (e.g. vernal pools). Sediment stability will be a particular focus of the long-term monitoring program and evaluated during each scheduled Five-Year Review.

3. Some commenters requested additional information regarding how people and wildlife are exposed to contamination at the Site, what measures could be taken to prevent exposure, and what the potential health effects are from short- and long-term exposure to toxic contaminants in the environment, including vapor exposures. One commenter suggested that restrictions would need to be permanent, to prevent exposure of receptors to contamination that will not degrade and exceed the soil and sediment RAOs, and that monitoring disturbance within the area will be difficult. Some commenters suggested that the Oxbow may become more attractive for human use during and after remediation, increasing the potential for exposure if the three-inch TLC were to be disturbed. Another commenter indicated that a health impact assessment should have been conducted to better understand the benefits associated with the different remediation options.

EPA Response: The cleanup of the Site will address unacceptable long-term health risks posed by the contamination as calculated in the baseline risk assessment. The FS used EPA's nine National Contingency Plan (NCP) criteria to select the cleanup plan among the alternatives evaluated, including overall protection of human health and the environment, long-term effectiveness and permanence, and short-term effectiveness.

As presented in the risk assessments, the contaminants in the River sediments (primarily dioxins, furans and polychlorinated biphenyls [PCBs]) may pose a risk to humans only if people come into contact with sediment, mostly through incidental ingestion or if they consume fish and other biota that have accumulated contaminants in their tissue. Area residents have been advised to avoid contact with river sediments and to avoid consuming fish and other biota from the River within the Site boundaries while cleanup is being planned. Aside from not consuming any fish from the River, people should use best management practices to avoid incidental ingestion or contaminated sediment or soil. For instance, people should wash their hands before eating, smoking, or drinking. People should take off shoes before entering a home, wash clothes that may have come into contact with contaminated sediment or soil, and wash before eating any garden produce from floodplain gardens. By following these advisories, people would limit their current exposures to the contaminants that are in the River sediments and hence reduce potential health impacts. The contaminants that pose health risks identified in sediments sorb strongly to sediments, and do not vaporize to any substantial degree to the atmosphere. The selected cleanup will address the potential exposures to contaminants in sediments such that people will not need to avoid direct sediment contact or avoid consumption of fish and other biota due to Site contaminants in the future.

Potential exposure to contaminants in the Oxbow Area could occur primarily via accidental ingestion and skin contact with soil, and potential inhalation of dust derived from dry soils during activities that may disturb the surface soil. The risk assessments conducted for the soils in the Oxbow Area have evaluated potential adult and older child exposures to soils in the human health concern area (above the 100-year flood plain, thought to be more accessible to visitors) assuming a frequency exposure of 78 days per year and for the Oxbow general area (low-lying areas) assuming a frequency exposure of 26 days per year. These assumptions are appropriate for a passive recreational visitor and would also be appropriate for some use of the area for recreational vehicle use and people accessing the area to engage in fishing activities and infrequent overnight camping. The remedy (targeted excavation and TLC) will effectively eliminate the potential exposures of concern and natural recovery, in the context of future deposition of un-impacted River sediment in the floodplain, will supplement that remedy.

Long-term exposures to dioxins and furans have been associated with risk of developing cancer and risks to the reproductive and endocrine systems. Exposures to PCBs have been associated with cancer risk and potential effects to the immune system. Currently, given public outreach and education, exposures to these contaminants in River sediments and via consumption of fish and other biota are being minimized. The cleanup plan includes implementation of early interim measures (such as fencing or spreading a cover) on residential properties prone to flooding from the River to further limit the potential exposure to contaminants. During the cleanup activities, there will be stringent contractor requirements to use engineering controls, such as covering the piles of material, applying foam or water to suppress dust, to prevent emissions of contaminants during excavation, dewatering, stockpiling, transport and disposal. Monitoring for dust and vapors will be an integral part of all cleanup activities, including these for the river sediments. There is no expectation that anyone would experience any unacceptable exposures to site-related contaminants during the cleanup action. The remedy also requires a use of post-construction institutional and engineering controls in recreational use areas (e.g., boardwalks in the Oxbow Area) to limit exposure to contamination until cleanup levels that allow for unrestricted exposure are achieved. The selected alternatives minimize the time such restrictions would be required.

Principal short-term impacts to the environment from implementing the cleanup are the temporary elimination of the biological communities. It is expected that this will be followed by their relatively quick (a functioning aquatic community is expected to have become reestablished within 5 years) re-establishment once the habitats have been restored and biota disperse back into the affected areas from the surrounding areas. Restoration efforts will include the planting of native species to replace existing invasive species. Native species are more beneficial to ecosystems and wildlife. For the Oxbow wetland, impacts include the disturbance during the construction phase to wildlife, while amphibians, reptiles and the small animals living in soil will be covered in areas with TLC or removed entirely in excavated areas. To help recovery, the TLC and backfill for excavated areas will include organic carbon amendments to facilitate rapid recolonization by soil invertebrates.

4. Some commenters were concerned about disruption to their lives and property and opposed any cleanup of the River as they feel that EPA has already ‘fixed most of the problem (contamination)’ at the Site and there may still be a health risk after the cleanup from recreational activities on the River, such as walking, boating, fishing or swimming, and that people rarely use the River anyway.

   EPA Response: EPA selected the cleanup plan for this Site because the contaminated biota, sediment, soil and water in and adjacent to the River pose unacceptable human health and environmental risks. While previous actions, such as interim capping in the Source Area, reduced contaminant exposure in the short term, contaminants are still present at very high levels at the Source Area and in Allendale and Lyman Mill ponds. In addition, EPA’s newly released lower dioxin toxicity value required EPA to revisit impacted low-lying residential properties (some of which were previously excavated) where soil may be contaminated above the new dioxin cleanup levels. These properties also risk recontamination from periodic flooding as long as high levels of contaminants, including dioxin, remain in the ponds. Furthermore, as long as high levels of contaminants remain in an uncontrolled fashion on the bottoms of the ponds, there is a risk of contaminant migration further downstream should a catastrophic breach of the Allendale or Lyman Mill dams occur as it did in 1991. Access restriction, such as fencing the Allendale Pond, and RIDOH catch-and-release fish advisory, while providing some interim measure of protection, are difficult to monitor and enforce and do not provide a permanent solution to people's exposure in the long term. Despite a resurgence of wildlife populations not supported during Site industrial operations, EPA also found significant impacts to wildlife populations along the River.

EPA's evaluations show that the cleanup plan can reduce levels of Site contaminants in the River to background levels and reduce the human health risks from river-caught fish consumption and direct contact with soil and sediment by several orders of magnitude to levels within the acceptable range. This result, although not removing all impediments to making the River fishable and swimmable, will remove a major contaminant source and thereby significantly advancing the river towards reaching the goal of fishable and swimmable. EPA understands that the Smithfield Wastewater Treatment Facility has planned improvements that should advance efforts to address high bacteria levels in the River, another contaminant source that prevents swimming.

5. In light of the new dioxin science, a commenter requested EPA to review the need for public outreach at the Mill at Allendale Condominium complex and the potential exposure to residents, especially kids living in the Mill at Allendale, from the Allendale Mill raceway. The commenter also requested EPA consider extending public outreach to Johnston in a residential area in proximity to the Lyman Mill Dam.

   EPA Response: EPA believes that the Allendale Mill raceway, with its vertical side walls, is quite inaccessible. As a precautionary interim measure to prevent access even further, EPA could add fencing along the Allendale Mill raceway southern end which is located in a wooded area next to the condominium's lawn. The Mill at Allendale Condominium itself is not considered within the River's floodplain. On the Johnston side near the Lyman Mill Dam, residential properties along the pond are not within the floodplain and potential exposures on the pond banks are considered to be consistent with recreational uses of the area. EPA believes that public outreach on the Do's and Don'ts of the Woonasquatucket River is more appropriate in both cases, rather than the type of outreach measures that have taken for private property residents within the floodplain along the River.

6. There were comments requesting that financial requirements to address the Site include funds for restoration of remediated lands to a safe, recreationally, and ecologically productive status.

   EPA Response: EPA's remedy requires restoration and mitigation components for each area of the Site where work will be conducted and these requirements will be incorporated into the design, construction and long-term monitoring plans for the Site. To ensure proper financial planning, the specific restoration areas, species, planting specifications and monitoring requirements would be identified during design and further developed during the cleanup. Additional detailed habitat characterization will occur during design to support adequate restoration.

7. Some commenters raised concerns that the sediment and floodplain cleanup proposed under EPA's preferred alternatives will result in substantial injury to natural resources. They suggested that damages should be avoided, remediated areas should be restored after construction to stabilize the shoreline and restore floodplain and pond habitat, and mitigation performed according to U.S. Army Corps of Engineer standards to satisfy the Natural Resource Trustees. Some commenters provided suggestions for how the cleanup could be designed to promote successful restoration. There also were comments concerned that it may take too long for wildlife to return and wanted to know what EPA's plan is to restore wildlife and enhance habitat recovery and what kind of monitoring would be performed to assess recovery.

   EPA Response: Superfund cleanup is required at this Site because the contaminated biota, sediment, soil, and water in and adjacent to the River pose unacceptable human health and environmental risks and/or are above requirements of federal and state environmental laws and regulations or criteria. EPA acknowledges that construction activities associated with the cleanup implementation will have some temporary impacts to existing riverine, floodplain and wetland habitat. These impacts will be avoided to the extent possible and minimized where they cannot be avoided. EPA has determined that the selected cleanup plan represents the best balance of the evaluation criteria (which include consideration of short-term impacts) that are required to be evaluated under the Superfund Program (specifically in the National Contingency Plan). EPA's approach includes a restoration/mitigation measure for each component of the remedy. The objective of the proposed restoration[2] work is that there will be no net loss of wetland habitat or flood storage capacity as a result of cleanup implementation. EPA will work closely with relevant federal, state and local government agencies and other stakeholders to apply the general principles of "avoid, minimize, compensate" in each situation evaluated consistent with applicable law. The restoration elements, as described below, would be incorporated into the design,

[2] In order to fully respond to these comments, it is important to clarify the distinction between habitat restoration- and mitigation-related activities. Whereas ecological restoration can be defined as any effort enacted with the intended goal to 'return of an ecosystem to a close approximation of its condition prior to disturbance,' mitigation is a category of restoration that is limited to activities conducted to compensate for permitted wetland losses. Specifically, mitigation applies to the unavoidable losses to wetland and floodplain habitats that occur as a result of implementing the cleanup.

construction and long-term monitoring plans. The design and construction documents will include a detailed restoration plan.

A more detailed analysis of the nature, magnitude, and location of mitigative measures will be conducted during design, and a mitigation plan will be prepared as required by the 2008 Army Corps of Engineers and EPA joint regulation on compensatory mitigation for losses of aquatic resources (Final Mitigation Rule). The mitigation plan will also describe the strategy to control invasive plants. An analysis will be conducted to ensure that the proposed activities meet wetland mitigation procedures of the RIDEM Fresh Water Wetland Act. The ROD and Appendix K of the FS provide additional information on wetland and floodplain compensatory mitigation.

Specific issues raised in the comments are discussed below including:

- Proposed restoration/mitigation related to habitat impacts within each Action Area [i.e., ponds and associated banks, floodplain areas, and Source Area];
- Mitigation requirements for flood storage capacity; and
- The time period for project restoration goals to be achieved.

Proposed Restoration/Mitigation – Ponds and Associated Banks

Remedy implementation will temporarily impact aquatic habitat, aquatic-dependant wildlife, and recreational uses of this portion of the Woonasquatucket River. The cleanup includes features to prevent erosion of exposed soil or backfill, to provide habitat substrate, and to accelerate wildlife recovery. Following excavation activities, backfill consisting of a natural earth material with grain size appropriate to resist erosion and provide habitat, will be placed over the entire surface. The backfill material specified in the sediment remedy will consist of material suitable for aquatic invertebrate re-colonization and provisions of submerged woody material after excavation of sediment from the ponds to promote benthic recolonization and provide habitat structure within the ponds. Following re-flooding of the ponds, various aquatic enhancement features (e.g., logs and other structural features) will be installed and finally, EPA will work with RIDEM to facilitate the restocking of game fish in the ponds to further expedite recovery.

Along affected riverbanks, backfill will be placed in all excavated areas, stabilized and then planted with trees and shrubs. Restoration of the river bank will include installation of “Biolog” or equivalent erosion control tubes and biodegradable erosion control blankets along with shrub planting.

Proposed Restoration/Mitigation – Floodplains

For floodplain soil along the River, construction access points will be limited to the minimum necessary, and engineering controls, such as weight-dissipating structures, will be used to limit the impact from soil compaction and vegetation destruction. A

TLC specified in the floodplain soil remedy would consist of material suitable for soil invertebrate re-colonization and a grass mix applied for rapid soil stabilization.

Following cleanup of floodplain soil along Allendale and Lyman Mill Ponds, the grade will be restored and the impacted floodplain habitat will be revegetated with appropriate wetland fruit bearing shrubs (e.g., elderberry, highbush blueberry) and tree species (e.g., black willow, red maple), while residential properties will be restored to the original grade and any lost or damaged landscaping will be replaced, as required. An appropriate herbaceous seed mix will be applied to rapidly stabilize disturbed soils.

Floodplain soil removal in Lyman Mill Reach will result in temporary loss of wetland vegetation, but this will be limited in spatial extent where the concentrations of contamination are highest and where removal is necessary. The cleanup plan includes placing backfill and replanting to restore the lost vegetation. For the Oxbow wetland, where a large area including forested wetland, will be impacted, plantings will include canopy species saplings (e.g., red maple, cottonwood, and swamp white oak), balled shrubs (e.g., highbush blueberry, alder, and northern arrowwood), and a wetland grass mix. The details of the backfill and planting plans will be made in consultation with U.S. Army Corps of Engineers, Natural Resource Trustees and other stakeholders to provide the highest value habitat in the wetland areas and to insure that unavoidable losses have been adequately compensated for.

Proposed Restoration/Mitigation – Source Area

In the Source Area, remediation work will be performed in areas of existing soil caps, paved parking lots and upland areas adjacent to Centredale Manor. The cleanup action for the Source Area includes placing topsoil and seeding in all the capped areas outside of parking lots. With the exception of several relatively small fringing areas located along the former tailrace channel in the eastern portion of the Site, to the south of Cap Area #1, and along the bank of the Woonasquatucket River, no wetland vegetation occurs at the Source Area. Affected wetland areas will be restored in a fashion similar to floodplain soil habitat with placement and stabilization of topsoil following by planting of appropriate shrub and tree species.

Mitigation Requirements for Flood Storage Capacity

As explained in the FS, installation of the RCRA cap in the Source Area will result in a net import of 23,000 cubic yards (cy) of fill material, which will result in a net increase in ground surface elevation in the existing interim cap, landscaped and paved areas. Most of the Source Area is below the elevation of the 100-year flood. The flood flows with return periods of 5 years and 100 years and are 890 and 2,300 cubic feet per second, respectively (which equals 575 million and 1,490 million gallons per day). At these flows, a volume of 23,000 cy (which equals 4 million gallons) would be filled in 12 minutes or 5 minutes for a 5-year or 100-year flow, respectively. Although this loss of estimated flood storage and its downstream impacts might be considered minimal, the required flood storage compensation will be evaluated further during the cleanup design.

There will be an increase in flood storage capacity in the Oxbow Area of Lyman Mill reach because the volume of excavation is estimated to be about 10,100 cy greater than the volume of backfill. Current estimates results in a gain of 2 million gallons of flood storage capacity. In addition, there will be an increase in the depth and volume of water in Allendale and Lyman Mill ponds because the volume of excavation is approximately 122,000 cy greater than the volume of backfill (which equals 25 million gallons); water levels in the pond(s) could be controlled using dam gates, if necessary.

Time Period Required for Wildlife Recovery

The aquatic habitat is expected to return to a fully functioning capacity in a relatively short period of time (on the order of 5 years or less) as instream habitat features will be replaced as part of the cleanup and water column and benthic invertebrates are anticipated to rapidly recolonize from recruitment from upstream (primarily) areas. With the base of the food chain restored, fish populations should also return with recruits dispersing from upstream areas and supplemented by the addition of stocked animals and finally aquatic-dependent wildlife (e.g., insect- and fish- feeding birds and mammals).

Although greater uncertainty exists related to the length of time necessary to achieve RAOs in the Oxbow Area (with decades expected before ecological risks are reduced to acceptable levels), it is important to note that the selected cleanup plan represents a balance between short-term impacts and ecological risk reduction. Although wildlife and other environmental receptors that utilize the Oxbow habitat are predicted to experience a degree of harm over time associated with exposure to residual remaining contamination (while natural fate processes operate to affect a gradual reduction) this is offset by the reduced (as compare to full excavation) short-term impacts on the habitat structure that is necessary to support the community. Maintenance of the canopy forests, and restoration of the shrubs and non-woody vegetation, will minimize the habitat disruption to wildlife. The FS included an overview of the general elements of the long-term monitoring plan that will be developed during design. The long-term monitoring plan will be available for review and comments from stakeholders.

8. Some commenters expressed an interest in the opportunity to comment on the project's engineering design phase as the commenters felt issues addressed during that phase could be significant. One commenter requested that the proposed plan comment period close after the engineering design work is complete.

   EPA Response: Statutorily the Agency is directed to hold a formal public comment period to receive comment on its identified range of proposed cleanup approaches and its preferred alternative published in the Proposed Plan. EPA considers and uses these comments to improve the cleanup approach ultimately selected. In the Superfund process, the formal comment period on cleanup alternatives is concluded and a cleanup plan is selected and documented in the Record of Decision before the engineering design phase can start.

   Although a formal public comment period is not held during any portion of the engineering design phase, EPA incorporates opportunities for public involvement as it proceeds with the implementation of the cleanup plan. EPA will seek the input of local safety officials in the development of items such as traffic management plans and health and safety plans, both components of the design phase. As design progresses, EPA will issue several design documents (such as 30% design, 60% design and 100% design), outlining construction and monitoring plans in detail. These design documents will be shared with the public, town officials and other interested parties. Likely mechanisms for sharing engineering design information include posting design documents on the Site web page, making them available at the information repositories, distributing a Site newsletter highlighting the design information, and holding public informational meetings. In addition, EPA will coordinate closely with residents who reside on potentially impacted properties.

9. There were comments expressing concern that prior to completion of engineering plans only incomplete information is available about potential health risks impacts during the cleanup and that the community may not know pertinent questions to ask or comments to make at this stage.

   EPA Response: EPA evaluated short-term health impacts of construction for all cleanup alternatives it considered, including engineering measures to alleviate any construction impacts. EPA has to meet stringent health and safety protocol and monitoring requirements for the Site cleanup. The specific engineering and monitoring plans will be shared with the public once they are developed as part of the design.

10. One commenter recommended that EPA pro-actively explain aspects of construction to local residents and involve the RIDOH and Agency for Toxic Substances and Disease Registry (ATSDR) to explain likely environmental monitoring procedures.

    EPA Response: EPA plans to continue public outreach throughout the design and construction phase and make monitoring data available to the public. EPA can involve RIDOH and ATSDR in discussions concerning health concerns with the residents.

11. Some residents expressed concerns that the proposed interim measures restricting access to contamination, such as moving of or installing a fence, would result in limiting the use of their property or impacting aesthetics. Some property owners were also concerned about potential damage to their property such as loss of mature trees. Some residents also expressed an interest in the fence staying after the cleanup while others wanted it removed or a gate installed to provide access to the pond and to clean out the brush on the pond side of the fence.

    EPA Response: EPA will work with individual property owners to select and implement interim protective measures most appropriate for the layout and use of each property to minimize potential disruption. Wherever possible, mature trees will be protected and other property features will be restored or replaced. Disposition of the fence after the cleanup, when it is no longer needed to protect human health, will be decided in consultation with property owners.

12. Some residents expressed concern about exposure to contaminants, especially about children playing in and next to the River.

    EPA Response: In addition to interim precautionary measures that EPA will implement, EPA recommends that residents keep their house clean of dirt and soil from outside by taking off shoes before entering the house and washing clothing used when doing yard work. It is also recommended that children avoid placing soiled hands or objects into their mouths, that residents wash their hands with soap and water before cooking, eating, drinking or smoking, and after playing or working outside, and washing fruits and vegetables from your garden. These hygienic measures and a fishing advisory have been discussed with residents abutting the River during individual and public meetings in July 2012.

13. Some residents wondered whether they could deny EPA access to their property.

    EPA Response: Although EPA could ask a court to grant access to implement cleanup actions, EPA tries to resolve specific issues that concern property owners so that voluntary access can be granted.

14. Some residents expressed concern that EPA will take their property by eminent domain.

    EPA Response: EPA has no intention of taking property by eminent domain; the objective of the cleanup is to clean up the River and the contaminated areas along the River to allow their use by residents.

15. One commenter noted that without a cleanup, people would still be breathing contamination over a long time and also expressed the opinion that the cleanup can be performed in a controlled matter such as moving contaminated material in sealed and covered trucks, using cartridges to monitor air quality and replacing removed contaminated soil with clean fill.

    EPA Response: EPA agrees that the selected cleanup plan can be implemented successfully without causing adverse human health impacts.

16. One commenter with construction experience noted that the parties that will do the cleanup work have experience in these types of cleanups. They have concern for the residents and will not spread contamination during clean up. The job will be done right, on time and on budget with controls and highly trained staff.

    EPA Response: EPA agrees that the people who will conduct the cleanup work will have appropriate training and supervision and will follow required health and safety practices to insure that all work will be conducted safely and in accordance with industry standards.

17. Several commenters raised concerns that residents will be exposed to toxins in the air, dust, noise and displaced rodents during construction, and that these short-term construction impacts would adversely impact the quality of life. Commenters requested information regarding EPA's plan to manage short-term construction impacts (air quality, noise) and protect residents, wildlife, and vegetation along the river. Specifically, commenters requested information regarding what types of monitoring would be performed and where, how residents will be notified, and what type of shelter and provisions would be provided in case of an emergency. Some commenters also raised concerns that short-term construction impacts could have an economic impact on local businesses or residents that rely on rental incomes.

    Additional comments raised concerns that draining and excavating the ponds and excavating floodplain areas will displace or kill wildlife along the River such as fish, birds and otters. Commenters are concerned about the loss of wildlife, which they feel have only just returned since Allendale Dam was reconstructed. Commenters requested information regarding how long will it take for the wildlife to recover and return to the River.

    EPA Response: The plans and specification prepared during design will include special provisions that the contractor will implement to protect surrounding areas during construction. The contractor requirements to protect human health and the environment will be specified in detail in a construction plan approved by EPA. For example, during excavation of sediment, the work will be done in smaller sections to avoid exposing large areas of River and pond bottoms to the atmosphere. In the ponds, sediment removal will start in the shallow areas so that it is removed as soon as it is exposed. This will prevent drying of contaminated sediment, which will eliminate the potential for contaminated dust generation. All sediment and soil stockpiles will be covered to prevent any release of dust. A haul road will be constructed from imported clean soil and other materials, so haul trucks will not generate any dust from existing soils adjacent to the ponds. Water spraying in work areas, particularly in materials transfer locations and the haul road will be used by the contractors to suppress dust on an on-going basis. All haul trucks will be cleaned and the material will be transported in self-enclosed covered containers to prevent tracking soil onto streets and to prevent release during transport. The primary contaminants at the Site are not highly volatile (they tend to sorb strongly to sediment material) and the presence of water in the sediment will also inhibit any losses by vaporization from the sediment to the atmosphere.

Short-term Impacts to Local Residents

During sediment/soil removal and processing, continuous work zone perimeter air monitoring for particulates (dust) will be performed to ensure that action levels are met. Action levels protective of workers and residents will be established and documented in a Health & Safety plan for dust monitoring and the action levels will consider expected concentrations of contaminants in the sediment and duration of exposure associated with the construction. Continuous dust monitoring will be done at the excavation areas, stockpile areas, and at the confined disposal facility. The system will include real-time monitoring equipment. EPA will have access to the real-time monitoring data to ensure public health and safety. If dust levels exceed action levels at the perimeter of the work zone, construction work will be stopped and further dust control actions will be taken along with subsequent monitoring to confirm the effectiveness of the additional actions.

In addition, other actions will include collecting samples of air and dust for chemical analysis at the beginning of each phase of the construction program. These samples will be used to confirm that there is not an identified Volatile Organic Compound issue, that the continuous particulates monitoring is appropriate, and that the dust action level is protective of workers and residents. Because contaminated sediment material (including de-watered sediment) being removed will have relatively high water content, the primary contaminants are not highly volatile. In addition, Best Management Practices will prevent unintentional releases of solid waste materials in residential areas, and based on previous experiences with excavation work at this Site at Brook Village property and Allendale Dam reconstruction, it is not expected that emissions or airborne particulates will reach levels of concern at any point during construction. Although EPA does not have toxicity values for estimating the risk posed by the inhalation of dioxin, inhalation risk estimated using dioxin soil screening levels for the inhalation pathway shows that the contribution of the inhalation pathway is well below one percent of soil exposure risk. Therefore, even in the unlikely event that emissions occur, the risks due to inhalation of dioxin particulates and vapors from soil are expected to be minimal.

The work hours will be limited to daylight only, Monday through Friday or Saturday, so that equipment will not be generating noise or light at night. The sediment excavation equipment and transport trucks will be conventional construction equipment, and they will be required to have effective mufflers on the engines to limit noise during work hours.

The remediation work is expected to have a positive impact on the local economy. Many of the materials and supplies needed for the work, such as diesel fuel, equipment repair and maintenance, and earth backfill, will be supplied by local suppliers. For projects such as this Site, it is common practice that the majority of the site workers live in the local community. There are usually some workers with special skills from other areas and they will require local living accommodations. The work will not have a negative impact on any business in the area because construction will not obstruct access to local businesses. The only impact to off-site areas will be truck traffic for material delivery and hauling sediment to the disposal facility. The number of trucks will be limited to a few per hour, which will not severely impact local roads.

Short-term Impacts to Wildlife

The impact to the wildlife will be minimized by performing the work in one pond at a time, and each pond will be divided into two sections lengthwise to provide continuous river flow. The work will start upstream in Allendale Pond, then proceed downstream to the Lyman Mill reach section between the ponds and then into Lyman Mill Pond. Therefore, habitat will be maintained in Lyman Mill reach during work in Allendale Pond. Habitat in Allendale Pond will be restored before starting work downstream of Allendale Dam. Within each pond, river flow will be maintained in one side of the pond, while work in done in the other side. This will provide continuous aquatic habitat during remediation.

Wildlife management plans will be developed during design. The plans will include any actions if needed to control nuisance situations. Since work will be performed in a phased, gradual fashion, no displacement of rodents into residential areas is expected.

18. One commenter suggested that the decision where to locate the CDFs be made in tandem with the decision as to how they are going to be used.

    EPA Response: The proposed cleanup plan and FS assumed that the upland CDF would be constructed in area(s) in very close proximity to the Site and a number of potential locations in the Town of Johnston were identified. In response to concerns raised by commenters regarding the possible locations for the upland CDF, EPA has expanded the area where an upland CDF could be located to beyond what is in close proximity to the Site, including locations outside the Town of Johnston. EPA agrees with the commenter that when a CDF location is selected, we will work with interested stakeholders regarding reuse.

19. Some commenters expressed concern that none of the pollution was generated in Johnston and yet all five potential upland CDF locations are located in Johnston, and that while the Town of Johnston is an abutter to the Site, none of the pollution was generated in Johnston yet they are being asked to bear the brunt of the on-site disposal. Furthermore, the Town of Johnston bears a disproportionate share of landfill disposal statewide. In a related comment, a commenter notes that he has seen what some of the contamination has already done to Johnston - boarded up houses, unused ball fields – and that he is not positive about having contamination from Centredale stored in town.

    EPA Response: In response to this and other comments, EPA has greatly expanded the area where the CDFs can be located to include locations outside of the Town of Johnston.

20. The Town of Johnston expressed support regarding using the Department of Public Works (DPW) site at 100 Irons Avenue and the former tire dump off Railroad Avenue as a location for an Upland CDF.

    EPA Response: This comment was later withdrawn by the Town.

21. The Town of Johnston does not support any upland disposal of contaminated material in Johnston associated with the Site.

    EPA Response: In response to this and other comments, EPA has greatly expanded the area where the CDFs can be located to include locations outside of the Town of Johnston. EPA does believe that most, if not all, of the concerns raised by Johnston can be addressed should an acceptable location be found.

22. A commenter who supported the selected sediment cleanup alternative, suggested that out of the three upland CDF locations in the Proposed Plan, a preferred CDF siting would be an option on the property currently operating as a concrete plant in Johnston so as to preserve existing green space.

    EPA Response: Based on the comments received on the Proposed Plan, EPA has widened a search for upland CDF potential locations beyond the immediate vicinity of the site. Additional locations to be considered are likely to include Brownfield properties.

23. Some commenters mentioned a preference to waste being shipped to appropriate facilities such as ones in Canada, rather than having contamination remaining on site.

    EPA Response: EPA generally agrees with this comment and the EPA cleanup plan calls for the most contaminated soil and sediment to be removed from the River and floodplain and either shipped to an off-site existing permitted facility or be stored securely and permanently in an upland CDF. Contamination in the Source Area where apartment complexes already have been built and where full soil excavation was ruled out, would be contained under a RCRA Subtitle C cap. Should an acceptable location for an Upland CDF not be found, off-site disposal of the remaining contamination would be the next best option for disposal.

24. One commenter expressed a strong preference for siting the upland CDF in a former industrial area rather than destroying existing wooded areas.

    EPA Response: EPA considered a number of locations for an upland CDF in the FS and has greatly expanded the universe of potential CDF locations as a result of comments received on the Proposed Plan. EPA will continue evaluating disposal sites throughout the cleanup design phase with an emphasis on beneficial reuse of the space following the construction. EPA's preference would be to construct an upland CDF on an industrial or Brownfield site, not in a wooded space.

25. Some commenters raised concerns that disposal of contaminated material in an upland CDF may not be safe in the long-term and that leachate generated from the upland CDF could be a secondary source of contamination at the Site. Commenters requested information regarding the leachate, including what volume of leachate is expected to be generated, how contaminated the leachate would be, and what measures would be taken to manage the leachate.

    EPA Response: The only material that will be placed in the CDF will be sediment from Allendale and Lyman Mill ponds, soil from the Allendale floodplain and soil and wetland sediment from the Lyman Mill reach. A portion of the porewater in wet sediment from the two ponds will be squeezed out by presses to lower the water content so that the sediment will be like moist soil. Therefore, all the material placed into the CDF will have the consistency of moist soil. Soil is composed of inorganic particles so that it will not decompose over time and will be as stable in the long-term as soil in the vicinity of the Site.

    The CDF will have synthetic liners on the bottom as well as the top and sides. The natural sand and soil materials and synthetic materials used in the landfill leachate collection system and cover system will be durable materials that will not degrade or deteriorate. These materials have been used in similar projects and long-term monitoring and testing have proven their reliability and durability.

    During construction of the CDF, leachate and stormwater that has contacted contaminated sediment/soil will be collected and treated with a temporary water treatment plant prior to discharge. The treatment plant will remove suspended sediment particles and dissolved contaminants to concentrations required to meet ARARs (state and federal environmental requirements) for stormwater discharges to surface water.

    Calculations performed as part of the FS evaluations for the CDF show that the concentrations of dioxin and PCBs in leachate are expected to be less than the allowable concentrations for drinking water (i.e. maximum contaminant levels

[MCLs]), which are $3x10^{-5}$ micrograms per liter (µg/L) for dioxin and 0.5 µg/L for PCBs. These calculations are based on the "worst-case" condition where the leachate moves slow enough to allow maximum transfer of contaminants from the sediment/soil into the water. This provides a reasonable estimate of the concentrations expected in the sediment/soil porewater and leachate generated after the final cover is placed. The actual concentrations during CDF construction and filling will be less as stormwater runoff will not be in contact long enough to leach as much as calculated.

The volume of leachate is expected to be negligible (essentially zero) within one year after the final cover is placed. The final cover system will have an impermeable membrane and be sloped to drain surface water, so that there will be negligible amount of precipitation infiltration. In addition, the sediment will be compacted when it is placed into the CDF so that no porewater will be squeezed out once the final cover is placed. The leachate collection pipes in the bottom of the CDF will be connected to the temporary water treatment plant after the final cover is completed and any leachate flow and contaminant concentrations will be monitored. Once monitoring data shows that the flow is negligible and contaminant concentrations are below the MCLs, the treatment plant will be removed and the small volume of leachate that may seep from the CDF will be allowed to infiltrate into the ground or collected, tested and disposed of as required. Long-term maintenance will include periodic groundwater monitoring.

26. The Town of Johnston commented that it supports restoring water quality in the Woonasquatucket but it must be a win/win and not at a cost to the Town of Johnston.

    EPA Response: EPA believes the selected remedy provides the water quality improvements supported by the Town and the broadening of potential CDF siting locations should address the Town's other concerns.

27. The Town of Johnston commented that any disposal within the Town must be mitigated by development of appropriate surface reuse so that not just the Town of North Providence and EPA are winners, but that the Town of Johnston is a winner as well. The Town of Johnston also commented that should the upland CDF be designed for beneficial reuse for the Town, EPA and/or the PRPs should provide financial support to the community to support town related costs including negotiations costs. Also EPA should provide public education regarding health risks for use of recreational facilities.

    EPA Response: Beneficial reuse will likely be an important factor when evaluating upland CDF locations. Although there are limitations as to what can be funded under the Superfund law, there are EPA resources that are available to help with evaluating the potential for beneficial reuse. For example, EPA provided funding to the Town of Johnston for a consultant who specializes in beneficial reuse of Superfund properties and who engaged with the town in a visioning process to determine potential reuse of the DPW site at 100 Irons Avenue. In addition, EPA can encourage the parties doing the cleanup to work with the affected community to provide voluntary appropriate support/enhancements. Should the CDF be developed for reuse, EPA will provide appropriate outreach to the public regarding safe use of the facility. Because reuse would only be allowed if there is no public health risk, in addition to educating the public to the fact that no unacceptable public health risk exists, a focus of outreach would likely be on educating users/owners/operators that significant construction activities cannot be conducted on the CDF beyond the approved beneficial reuse.

28. The Town of Johnston commented that it must be assured that the Town will not be liable for the maintenance or failure of any future confined disposal facilities located within Johnston. In a related comment, a commenter expressed concern about the long term financial impact of the cleanup to the community in Johnston and hopes something will be done to address it.

    EPA Response: The responsibility (including liability and long-term maintenance) for the CDF disposal facility will not belong to the Town of Johnston. It is EPA's intent that that responsibility will be undertaken by the PRPs at the Site. If the government conducts the cleanup, then it would be responsible for any long term issues, not the Town. Any settlement reached with PRPs would require significant long-term financial assurances are put in place to insure that funds are available to support the cleanup in the long term.

29. The Town of Johnston commented that the location of any upland disposal sites would adversely affect property and tangibles tax revenue to the Town as these sites would be removed from tax rolls or have lower value than if developed for industrial use, in accordance with zoning.

    EPA Response: As discussed previously, EPA has greatly expanded the area where the CDFs can be located. As a result, it is difficult to predict the affect a CDF would have on local tax revenue. It is possible that tax revenue could increase or decrease depending upon the particular circumstances and property involved. EPA will work with the community where the CDF will be located to address local concerns.

30. Some commenters requested a commitment that state and local workers would be hired for the remediation project and stated that a local trained work force is available. The commenters also expressed hope that the project would create substantial work opportunities and bring local income. Other commenters expressed the opinion that no local residents would be hired and there would be no benefit to the local work force.

    EPA Response: Should the cleanup be done by PRPs, EPA cannot require private parties to hire locally; however, EPA encourages PRPs to hire locally to the maximum extent practicable. EPA also will work closely with the PRPs and representatives of the local community to identify appropriate methods and possible resources to facilitate hiring locally. EPA has a job readiness program (Superfund Job Training Initiative [SuperJTI]) that provides training and employment opportunities in site cleanup for people living in communities affected by Superfund sites. To the extent possible, EPA intends to use this program at this project to work with community partners to conduct outreach and recruitment in the community near the Site where cleanup is occurring. SuperJTI assists local communities by providing job opportunities for qualified residents, increasing the skills of the local labor pool, and increasing the local tax base. During the design process, EPA will seek assistance from the community on identifying local resources, support services and local businesses that are potentially interested and available for the project. When implementing short-term cleanup in the last ten years at this Site, private parties consulted with the Rhode Island Workforce Investment Board for local work force contacts and hires.

31. Commenters expressed concern that the proposed location of the upland CDF not displace existing jobs in Johnston and not negatively impact the multiplier effect of these local jobs on the local economy. A commenter also expressed an interest in selling a property he owns in Johnston near the Site for an Upland CDF use.

    EPA Response: EPA has been looking at a number of locations for an upland CDF which is an integral part of the cleanup and has expanded its search to include the area where an upland CDF could be located to beyond the Town of Johnston based on the comments received on the Proposed Plan. EPA recognizes the concern about displacement of existing businesses and has been looking at the options to minimize such impacts if a property for an upland CDF has an active operating facility.

32. Commenters recommended EPA's Superfund Program take a more active role, including monitoring and cleanup further downstream of the Woonasquatucket River, into the Providence area.

    EPA Response: EPA's actions to date and the ROD cleanup plan for the Site are designed to address contamination at the source of this Site contamination (2072 and 2074 Smith Street) and downstream areas most impacted by the contamination originating at that Source. Consistent with its guidance on using a phased approach to making decisions, EPA will evaluate the impact of cleanup implementation on areas further downstream, as information becomes available from sampling these downstream areas. This information will guide EPA's involvement in downstream reaches of the River. This phased approach for monitoring and evaluation of the Woonasquatucket River downstream areas is described in the ROD and Section 3 of the FS.

    The comprehensive monitoring plans developed during the remedial design and remedial action will specify pre- and post-construction monitoring activities and data evaluations as well as the geographic extent of the monitoring area, to assess River conditions and the rate of recovery and to identify triggers for future potential actions downstream. The sampling program may include sediment sampling to measure contaminant concentrations and rate of sediment deposition, biota sampling to assess bioaccumulation potential, and toxicity testing to evaluate ecological effects.

Monitoring data will also support specific risk evaluations. Results from this adaptive management approach could be the basis of an Explanation of Significant Difference (ESD) or ROD amendment if downstream action is warranted.

It should be noted that results from more recent investigations suggest that dioxin levels in surface sediment in downstream areas of the Woonasquatucket River, while still elevated, have decreased in recent years and could be approaching background concentrations. Implementation of additional cleanup actions described in the ROD and proposed downstream monitoring are necessary to confirm the expected control of remaining secondary sources of contaminations and its impact on further natural recovery downstream. It is premature to specify remedial action in downstream areas prior to successful implementation of the cleanup plan for the Source Area and Allendale and Lyman Mill reaches of the River which may still act as secondary sources of contamination.

33. Several commenters expressed concern about ongoing dust and air emissions from other sources, including the Johnston Asphalt Company and Baccala Concrete Corporation and their impact on the community and whether it is worthwhile to conduct the Site cleanup if there are other sources of pollution to the River. A number of commenters also mentioned concerns about potential for recontamination of the River from other upstream industrial source discharges, including the Smithfield Wastewater Treatment Facility, and runoff from highways, parking lots, and roads, even after the Site after it is cleaned up.

    EPA Response: In evaluating its Site cleanup plan, EPA also took into consideration existing background contaminant levels upstream from the Site, because EPA cannot cleanup the Site below these background levels due to recontamination concerns. Contaminant levels at the Site are significantly elevated above background and EPA's evaluations show that the Site cleanup reduces the human health risks to acceptable levels even when considering other sources of pollution in the River.

    Other sources of pollution in the Woonasquatucket River watershed are being addressed by the State of Rhode Island and River water quality is being improved over time. A number of measures have been taken or are planned that will have a positive impact on water quality. According to RIDEM, the Smithfield Wastewater Treatment Facility will be upgraded to advanced waste treatment, to improve its effluent water quality. The contract to construct this upgrade has been awarded and construction should begin shortly. The State's Phase II of Narragansett Bay Commission's Combined Sewer Overflow (CSO) Abatement Program currently has four projects ongoing that will divert combined sewage from the westernmost CSOs in Providence, which discharge into the Woonasquatucket River, to the tunnel which is the major underground CSO built a few years ago that redirects flow to Fields Point facility on Narragansett Bay.

    Other projects that will improve the quality of the River include a recently completed Woonasquatucket Reservoir (aka Stump Pond) Stormwater Abatement at Mann

School Road in Smithfield, RI. The Town of Smithfield installed an infiltration system with two oil/water separators capturing overflow from the infiltration units as well as additional overland runoff prior to flow entering an infiltration basin. The Town of Smithfield has reported that between the completion of the project in September 2011 and April 30, 2012, the system has captured 100% of all observed rain events with no water exiting the system via the overflow at the end of the infiltration basin.

As far as air emissions from the concrete and asphalt plants, EPA encourages citizens to contact RIDEM regarding concerns associated with potential sources of contamination from operating facilities unrelated to the Site. EPA has no reason to believe that air emissions from the concrete and asphalt plants would impact the Site cleanup.

34. There were comments supporting the cleanup plan in general but were skeptical about spending millions on the Site cleanup while the Johnston Asphalt Plant continues its operation.

    EPA Response: EPA's evaluations show that the Site is the major source of contaminants found in the River and human health/ecological risks from using the River are largely due to these contaminants, including dioxin and PCBs. The Site cleanup is necessary as the removal of Site-related contamination would reduce risks to acceptable levels.

35. Some commenters expressed an interest in the fate of the Allendale Mill old raceway. One commenter suggested restoring the flow through the raceway, while another suggested filling it up to avoid it becoming a potential source of floodwaters into the Mill at Allendale Condominiums.

    EPA Response: The sediment accumulated in the Allendale Mill old raceway (part of which comes under the Mill at the Allendale Condominiums) has been sampled by EPA as part of its investigations and was found to have elevated levels of contaminants, including dioxin. As part of the EPA's non-time critical removal action (NTCRA) in 2001-2002, which also included restoration of the Allendale Dam, the raceway entrance was blocked off by a concrete barrier/coffer dam to restrict water flow and potential contaminant transport. The raceway is part of the Lyman Mill Stream Sediment and Floodplain Soil action area in this ROD which requires either excavation or TLC over the contamination. As part of the cleanup design, EPA will investigate an option of removing the concrete barrier/coffer dam after the mill raceway contamination is removed. The raceway can be opened up if it does not increase the flooding potential of the condominiums. Filling the raceway up with soil may be problematic as it is a historical feature and currently for the interim the concrete barrier already prevents River water flow and potential flooding.

36. A commenter requested removal of the restrictive fencing along the River.

EPA Response: EPA will discuss with property owners abutting the River whether they want to keep their fence once the Site is cleaned up and the fence is no longer needed to limit exposures to protect human health.

37. A commenter expressed concern that the company or companies may not be able to pay for the clean-up, and should they not, then the taxpayers would bear this burden because EPA is a tax-funded entity in the U.S. government.

    EPA Response: The commenter is correct that if there are no viable liable parties that can pay for the cleanup, responsibility for the cleanup costs would fall to the government. However, EPA has identified a large number of viable parties that it believes are responsible for the contamination at the Site and expects that these parties will pay/perform the cleanup.

38. A commenter said that the community must be patient for the legal action that will happen because sometimes the companies that created the contamination are no longer in business.

    EPA Response: The commenter is correct that if a settlement cannot be reached by which PRPs agree to do the cleanup, the cleanup could be delayed until responsibility for the cleanup is resolved in Court.

39. A commenter expressed an interest in coordinating with EPA the extension of the Woonasquatucket River Bikeway during the remediation project.

    EPA Response: EPA shares the interest to coordinate Site cleanup efforts with improvements to or extension of the Woonasquatucket River Bikeway that currently runs on the west side of the River's lower reaches until diverting to local streets at the Lyman Mill Dam in Johnston, Rhode Island. After issuance of the Record of Decision, EPA staff will make themselves available to meet with the Woonasquatucket River Watershed Council and others to discuss the bikeway.

40. Support was voiced for the cleanup plan as it would benefit both the Town of North Providence and Narragansett Bay by cleaning up and preserving critical state floodplain and wetland resources.

    EPA Response: EPA agrees that Site cleanup will assist in creating additional uncontaminated green spaces that will have environmental and recreational benefits.

41. Several comments were received in support of EPA's cleanup plan as summarized below. Because these comments support EPA's cleanup plan, no response id provided.

    - Extensive reclamation has happened in that area. What is the option to not cleaning up Centredale - to leave it there? It will be short-term pains for long-term gains. This project will improve the quality of life not only for the community along the river but for both communities as a whole (North Providence and Johnston). Supports project.

- Supports long-term planning by EPA. Does not support letting contamination sit there - risk of future flooding to spread contamination and future risk of exposure.
- Supports project - benefits include influx of jobs with multiplier effect on local economy, removing contaminants; no financial burden on the municipality.
- Understands that testing of wildlife and fish show that they are already contaminated and now there is buried material underground. It would be beneficial for everybody to clean it up.
- Preferred Remedial Option for the Oxbow Area: Alternative 3A: Excavated sediment should be contained in the same upland CDF as above.
- Pleased to see that EPA's proposal considers future monitoring and maintenance costs associated with these remedies.
- North Providence Environmental Commission supports EPA's general remediation approach. Glad to see remediation is proposed for the Source Area as well as the downstream sections of the river. Would like entire proposed remediation completed by EPA.
- Glad to see proposal relies largely upon upland containment sites due to strong likelihood of future flooding.
- EPA has performed proper due diligence and agree with EPA's results and recommendations.
- Encouraged that EPA cleanup plan includes many elements of the remedy that the Woonasquatucket River Watershed Coalition supports (on-site CDF, caps at Source Area).

42. Some commenters expressed opposition to cleanup options evaluated but not proposed by EPA that would 1) reduce the pond sizes by replacing existing dams with smaller weirs, 2) would leave all or part of contaminated sediment capped in the ponds and/or 3) construct near-shore CDFs within footprint of the ponds. These commenters were concerned about alterations to natural resources and aquatic communities; full consideration of long-term maintenance and integrity of the caps on river bottoms and the near shore CDF and ability to detect a cap or near shore CDF failure as well as consideration of mitigation measures costs should a cap or near-shore CDF fail. Some commenters also felt that a near shore CDF and capping of sediments on the river bottom would be in a conflict with RIDEM Freshwater Wetland Act.

    EPA Response: EPA has evaluated in detail a wide range of cleanup alternatives to address contaminated soil and sediment. These cleanup alternatives were then evaluated using the Superfund nine criteria for selecting the remedy at the Site: overall protection of human health and the environment, compliance with ARARs (state and federal environmental requirements), long-term effectiveness and permanence, reduction of toxicity, mobility or volume through treatment, short-term effectiveness, implementability and cost. The concerns raised by commenters such as reliability of a near shore CDF or a cap over the contaminated sediment, perpetual long-term maintenance/monitoring, and impact of the alternatives on ecological habitat were evaluated as part of one or more of these criteria.

The cleanup alternatives which included removal of the dams and reduction in pond sizes, construction of the caps over the sediment and/or near shore CDFs for permanent storage of excavated contaminated soil and sediment were not selected because EPA decided that the selected remedy is a better approach when evaluated against each of the criteria. The RIDEM Rules and Regulations for Governing the Administration and Enforcement of the Fresh Water Wetlands Act were considered when analyzing remedial alternatives and potential impact to wetlands and flood storage. To a large extent, comments submitted by these commenters regarding options not selected are consistent with EPA's evaluation of these options regarding the environmental impact of dam removals and reliability and long-term maintenance/monitoring of the near shore CDF as well as caps on the bottoms of the ponds.

Comments Submitted by Emhart Industries, Inc.

1. EPA's Conceptual Site Model is Not Supported by the Administrative Record

    A. Comment: New information regarding the sources of the contamination and types of contamination were omitted from the CSM. As a result, EPA has not correctly identified the "known and suspected sources of contamination," "the type of contamination," or attributes of contaminants at the Site.

       EPA Response: EPA has correctly identified the "known and suspected sources of contamination," "the type of contamination," or attributes of contaminants at the Site in its CSM. A CSM is developed so that an understanding of the site dynamics can be obtained and is primarily based upon data generated as part of the RI. Its purpose is to describe the site and to present hypotheses regarding suspected sources and types of contaminants present, contaminant release and transport mechanisms, rate of contaminant release and transport, affected media, known and potential routes of migration, and known and potential human and environmental receptors. The initial design of the CSM is based on existing site data compiled during previous studies. These data may include site sampling data, historical records, aerial photographs, maps, and State soil surveys, as well as information on local and regional conditions relevant to migration and potential receptors. Data sources include Superfund site assessment documents (i.e., the

PA/SI), documentation of removal actions, and records of other site characterizations or actions.

It is a tool that can assist the remedial project manager in determining the scope of the project, identifying data needs and establishing preliminary RAOs. The key element in the development of the CSM is to identify those aspects of the model that require more information to make a decision about remediation. Based upon the initial investigation conducted by EPA, EPA identified the Source Area as the known and suspected source of contamination for purposes of the CSM. As new information was developed, to the extent it was relevant to the CSM it was incorporated into the CSM.

As discussed below, the commenter confuses information that could be relevant to liability and enforcement determinations with information that is relevant to the CSM.

i. Comment: Soil samples collected in the "footprint" of the former HCP manufacturing building showing the presence of the herbicide methylchlorophenoxy-propionic acid (MCPP) indicates that chemicals were disposed of by others at the Site.

EPA Response: The CSM has identified the Source Area as the source of contaminants found on the ground, in groundwater and in the River. The contamination described by the commenter is within the Source Area. There were six samples with detected results of MCPP in the Source Area. Most of these samples were in the vicinity of the Brook Village parking lot. Based upon this sampling data, EPA reached the conclusion that the detection of MCPP in this area does not mean that there is significant MCPP contamination or that MCPP is a significant source of contamination within the Source Area.

It should be noted that the herbicide, MCPP, is widely used by lawn care professionals and municipalities to kill plants such as clover and dandelions. Although it is primarily applied to lawns and turf, it can also be used on drainage ditch banks and roadsides.

The commenter indicates that the detection of this contaminant is important to the CSM because it indicates that chemicals were disposed of by others at the Site. However, the commenter does not explain why this would have an impact on the CSM. EPA believes that who disposed of this contamination is not important for purposes of the CSM. It could, however, be relevant for liability purposes.

ii. Comment: 2,3,7,8-TCDD identified in the Site samples did not come from the sodium 2,4,5-tricholorophenolate ("Na-2,4,5-TCP") that Metro-Atlantic received from Diamond Alkali and used in its HCP manufacturing process, and therefore must have come from a source other than Metro-Atlantic.

EPA Response: EPA's CSM describes the Source Area as the source of the contamination, including dioxins, and defines the extent and nature of contamination based on extensive sampling data and evaluations of such data. Whether or not the 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD) identified at the Site came from a Diamond Alkali product or from another manufacturer would not alter EPA's remedial decisions at the site.

The commenter indicates that these sampling results are important to the CSM because it indicates that contamination must have been disposed of by someone other than the commenter. At this Site, EPA believes that who disposed of this contamination is not important for purposes of the CSM. It could, however, be relevant for liability purposes.

iii. Comment: Chemicals were not directly discharged to the River or disposed of on the ground based upon process used and waste disposal practices.

EPA Response: The CSM is a data driven process that focuses on sources and types of contaminants present, contaminant release and transport mechanisms, rate of contaminant release and transport, affected media, known and potential routes of migration. The CSM has identified the Source Area as the source of contaminants found on the ground, in groundwater, and in the River.

Less important for purposes of the CSM but more important for liability purposes is how releases occurred in the first place which is the focus of this comment[3]. EPA's CSM is consistent with evidence developed to support its liability case as discussed below.

Metro-Atlantic's chemical manufacturing processes resulted in the generation of considerable amounts of solid and liquid waste. Factual testimony from administrative and judicial depositions, past trial testimony, and other sources describe several methods by which Metro-Atlantic discharged its waste to the River and disposed of it on the ground. These methods include, without limitation, burying its solid waste in drums on the Site, sending its solid waste to NECC for incineration, disposing of its liquid waste via plant drainage systems that discharged directly or inadvertently onto Site property and/or into the Woonsquatucket River, and by dumping its liquid waste directly into the River. Sampling data shows wide-spread and high levels of contaminants present in the soil, sediment, and water at the Site, pointing to the Source Area as the source of site-related contamination in the River. Analysis of

[3] It could have some limited importance for fate and transport.

historic aerial photos also shows evidence of dumping, chemical releases, and improper waste disposal in the Source Area. The past use of the site as a chemical manufacturing company and an incinerator-based barrel reclamation facility on the shores of the Woonasquatucket River is consistent with the presence of dioxin and other contaminants at the Site. As a result of these releases at the Source Area, contaminants have also impacted downstream stretches of the river through transport and deposition of contaminated soil and sediment.

iv. Comment: No liquids containing dioxin were released during production, but even if there were releases, the amount would have been too small to result in the amount currently present at the Site.

EPA Response: The CSM has identified the Source Area as the source of contaminants found on the ground, in groundwater and in the River. This comment focuses on how releases originally occurred at the Source Area which is important for liability purposes but is significantly less important for purposes of this CSM[4]. EPA's CSM is consistent with evidence developed to support its liability case as discussed below.

Dioxin and other contaminants are present at high concentrations on the Source Area property. These concentrations and locations are consistent with evidence of releases to the Site from the barrel recycling operations and hexachlorophene manufacturing process via various waste streams, including but not limited to discharge pipes and building drains onto the Site and ultimately into the Woonsquatucket River. Additional sources of dioxin releases onto the Source Area may also include: (1) material losses during handling and transfer of TCP into the hexachlorophene plant; (2) material losses during TCP purification and other operation of the hexachlorophene plant; (3) removal of residual waste, including TCDDs, from plant equipment after batch processing; (4) discharge of TCP-byproducts and other residual waste through the facility's drainage system and onto the Site; (5) dumping of drums containing TCP-byproducts and other residual waste on the Site; (6) material losses during the handling of drums; and (7) the dumping of drum liners, drum residue, paint waste and incinerator ash onsite.
Significant levels and wide spread dioxin contamination were found at the Site, including levels as high as 140 ppb in the Source Area soil and up to 93 ppb in sediment near the Allendale dam, about half a mile downstream from the Source Area. Other contaminants were also found at high concentrations at the Site. Dioxin background levels upstream from the site were found at relatively low levels consistent with urban background; and dioxin levels decrease further downstream from the Source Area, all pointing to the Source Area as the source of contamination.

[4] It could have some limited importance for fate and transport.

v. Comment: High concentrations of HCX in the tail race, adjacent to and downstream of NECC's operations support the position that contamination is not from Metro-Atlantic's HCP process. HCX at the Site is not associated with the HCP manufacturing process.

EPA Response: The purpose of the CSM is to assist EPA in making decisions about remediation. When EPA initially discovered high concentrations of 2,3,7,8-TCDD in sediment, levels of hexachloroxanthene (HCX) were also detected in the sediment. Research indicates that HCX contamination is associated with the manufacturing of hexachlorophene. EPA considered this finding to be an indicator that the manufacture of hexachlorophene could have resulted in the releases at the source of the contamination (Source Area). EPA continues to believe that the HCX is site-related.

The commenter attempts to draw conclusions from the concentrations of HCX found at the tailrace compared to the concentration found in one sample within the footprint of the former manufacturing building. In particular, the commenter states that high concentrations found in the tailrace compared to a lower concentration found in the Source Area must mean that there is another source of the HCX. EPA disagrees. Evidence exists showing waste disposal activities in the tailrace. In addition, significant reworking of the soil at the Site in the past could have impacted contaminant distribution. Although EPA continues to believe that HCX is site-related, its presence and contaminant distribution was not relied on by EPA when developing and analyzing remedial alternatives for the Site. Rather, EPA focused on the data from dioxin and other contaminants.

vi. Comment: Surface and subsurface soil samples collected from erosional areas on the western shore of the River contain concentrations of 2,3,7,8-TCDD as high as 73,000 ng/kg (nanograms per kilogram) in surface and subsurface soils. This is inconsistent with EPA's CSM and EPA does not present any analysis or conclusions regarding this data and/or their impact on the conceptual site model.

EPA Response: Dioxin concentrations in soil along the western shore of the Woonasquatucket River from RT44 to Allendale Dam range from 7.8 ng/kg to 1,510 ng/kg. None of the soil samples analyzed along the western shore from RT44 to Allendale Dam have a dioxin concentration of 73,000 ng/kg referenced by the commenter. There are no sub-surface data available for soil along the western bank of the river from RT44 to Allendale Dam.

The highest concentrations of dioxin in surface and sub-surface soil along the western shore of the river were measured at the Oxbow area (maximum concentration 14,600 ng/kg), a forested wetland southwest of Allendale Dam. Dioxin concentrations in floodplain soil from the Oxbow wetland are within the range measured in sediment from Allendale and Lyman Mill Ponds, suggesting that low-lying areas in this forested wetland have been impacted by contamination from the Site – consistent with the Site CSM. This is also consistent with the geomorphology investigation which showed that this area is impacted during flooding and times of high water.

vii. CMS fails to consider the congener profile of the dioxins found in the Site samples and no chemical analysis of the 2,3,7,8-tetrachlorodibenzo-p-dioxin ("2,3,7,8-TCDD") was performed to better identify the source.

EPA Response: The CSM has identified the Source Area as the source of contaminants (including dioxins) found on the ground, in groundwater and in the River. The commenter argues that EPA did not incorporate into its CSM information presented in opinions generated by experts hired by the commenter in litigation related to the Site. This comment focuses on how releases may or may not have originally occurred at the Source Area which is important for liability purposes (who disposed of the contamination at the Source Area) but is significantly less important for purposes of this CSM because it does not change the fact that this contamination originated at the Source Area. As discussed elsewhere, the CSM is typically based on factual information such as sampling data, historical records, photographs and maps. Opinions generated by experts hired by private parties are not appropriate for inclusion in EPA's CSM.

2. The F020 Waste Code Is Applied Improperly

A. Comment: There is no evidence that spills, releases, dumping, or disposal of any dioxin or dioxin-containing chemicals occurred in connection with Metro-Atlantic's HCP production process.

EPA Response: Based on our review of administrative depositions taken by EPA staff, judicial depositions, and expert reports, dioxins and other byproducts were released to the Site from the hexachlorophene manufacturing process via various waste streams, including discharge pipes and building drains onto the Site and ultimately into the Woonasquatucket River. Additional sources of dioxin releases onto at the Site may include: (1) material losses during handling and transfer of TCP into the hexachlorophene plant; (2) material losses during TCP purification and other operation of the hexachlorophene plant; (3) removal of residual waste, including TCDDs, from plant equipment after batch processing; (4) discharge of TCP-byproducts and other residual waste through the facility's drainage system and onto the Site; and (5) the handling, recycling and dumping of drums and their contents containing TCP-byproducts and other residual waste on the Site.

B. Comment: Dioxin found in samples in the area of Metro-Atlantic's former HCP operation and throughout the Site, is inconsistent with the byproduct contaminants that would have been contained in raw material Metro-Atlantic procured from Diamond Alkali

EPA Response: EPA disagrees with this comment. EPA understands that experts have been hired to opine on this subject in litigation related to the Site. However, EPA continues to believe that the factual circumstances of the Site and findings from EPA's investigations support its hazardous waste determination.

C. Comment: Activated carbon filtration removed any dioxin or HCX and HCP process filters were disposed of off-Site. Because EPA did not find activated carbon on-site this supports the conclusion that hexachlorophene process filters containing 2,3,7,8 TCDD were not disposed of onsite.

EPA Response: The CSM has identified the Source Area as the source of contaminants found on the ground, in groundwater and in the River. The commenter argues that EPA did not incorporate into its waste determination information presented in opinions generated by experts hired by the commenter in litigation related to the Site. This comment focuses on how releases may or may not have originally occurred at the Source Area which is important for liability purposes but is significantly less important for purposes of the waste determination particularly in light of other information. Opinions generated by experts hired by private parties are not appropriate for incorporation into EPA's hazardous waste determination.

D. Comment: Dioxin found at the site was from NECC drum conditioning operations

EPA Response: EPA agrees that in addition to Metro-Atlantic's operations, NECC's drum reconditioning operation resulted in releases of dioxin found at the site.

E. Comment: Waste must be traced back to a single original source before it can be identified as a listed waste.

EPA Response: Available site information should be used to make a good faith effort to determine if a waste comes from a listed source. However, there is no requirement that there be only one source of a particular waste material. Rather, if any amount of a listed hazardous waste mixes with a nonhazardous solid waste, the entire mixed amount is considered a listed waste. 40 C.F.R. § 261.3(a)(2)(iv)

F. Comment: At other sites, EPA did not identify waste as "listed waste":

- Hathaway Patterson Site
- Tittabawassee River, Saginaw River & Bay Site (Dow Chemical Company)
- Diamond Alkali Site

EPA Response: The determination of whether a waste is a listed waste is very fact specific. Each site must be addressed in accordance with the particular circumstances of that site.

Hathaway and Patterson Superfund Site

The commenter suggests that EPA had more detailed information regarding site operations at the Hathaway and Patterson Superfund Site than at the Centredale Site, yet made the determination that waste was not listed waste. The factual situation at Hathaway and Patterson is different from Centredale. Operations at the Hathaway and Patterson Site included preserving wood sheeting, planking, timber, piling, poles, and other wood products. Wood treating operations began on the property in 1953, although the facility was in operation beginning in 1927. Operations between 1927 and 1953 are unknown. The Hathaway and Patterson Site was also utilized for various purposes including rail and truck shipment and storage of various materials, railroad maintenance operations, as well as bulk chemical transfer and processing facilities, some of which involved or may have involved contaminants identical to those in the wood treating listing. Because of this, the Record of Decision for this Site did not identify waste generated during final cleanup operations as listed waste. It should be noted that chemical wastes directly attributable to the wood treating operations were disposed of as listed waste in a previous removal action. In addition, after signature of the ROD and during implementation of the selected remedy, the material excavated during the cleanup was disposed of at a RCRA hazardous waste facility.

Tittabawassee River, Saginaw River & Bay Site (Dow Chemical Company)

The commenter refers to the Dow Chemical facility in Midland, Michigan and infers that EPA's waste determination at the Centredale Site is inconsistent with EPA's characterization of the waste generated at the Dow Chemical facility which has contaminated the Tittabawassee River, Saginaw River and Bay Site. There is no sound basis for comparing the waste determinations made at both of these sites. The Dow Chemical Company began operations at the plant in 1897. The facility covers almost 2,000 acres and has produced over 1,000 different organic and inorganic chemicals over the years making the factual determinations regarding listed waste significantly more complex. Significant contamination extends over 50 miles downstream from the facility. In contrast, Metro-Atlantic operated for a much shorter timeframe and conducted much more limited operations. In fact, the entire Source Area of the Centredale Site is only approximately 9 acres with a focus on contamination extending less than 2 miles downstream. It is inappropriate to compare EPA's activities at both of these sites.

The commenter also quotes from an interoffice communication prepared by the Michigan Department of Environmental Quality (MDEQ) in 2008. That communication discusses Dow's petition for a treatability variance so that it can dispose of F039 waste soil at Dow's Salzburg Landfill, a hazardous waste landfill located near the facility and licensed by EPA and MDEQ. First, this communication was prepared by a state agency, not EPA. In addition, it relates to a RCRA corrective action cleanup that is being conducted at the Dow facility under state oversight. The waste at issue and the treatability variance deal with contaminated soil generated from maintenance and upgrade activities of a groundwater intercept system and other corrective action projects and do not address sediment. It is unclear why the statement on sediment was included or what exactly it was meant to mean in the context of F039 soil. In addition, any opinions provided by MDEQ in the communication are those of MDEQ, not EPA.

Diamond Alkali Site

EPA Region 1 has consulted with EPA Region 2 personnel who work on the Diamond Alkali Superfund Site. To reach the determination with respect to the Passaic River sediments, EPA reviewed historical information about the former pesticide manufacturing facility located at 80 Lister Avenue in Newark, New Jersey and the waste streams generated at the facility that had contaminated the sediments of the Passaic River, as well as other potential sources of dioxin contamination (some of which would not be considered processes generating a listed waste). As a result of this evaluation, EPA determined that, on balance, it did not have enough information to conclude that the dioxin-contaminated sediments in the Passaic River contain a listed hazardous waste. EPA does not believe that the same set of facts exist for Metro-Atlantic's operations at the Centredale Site.

G. Comment: Soil sample results reveal significant concentrations of dioxin, furan and PCB congeners unrelated to either a Hexachlorophene ("HCP") manufacturing operation or the hazardous constituents for which a F020 waste code would apply.

EPA Response: As discussed above, whether or not there are contaminants unrelated to a hexachlorophene manufacturing operation does not mean that the waste should not be characterized as listed waste.

H. Comment: The results of the radiometric age dating study that suggests there may be an alternate source for the dioxin contamination prior to 1965.

EPA Response: EPA has not identified any other specific source for the dioxin other than the Source Area. Radiometric dating conducted is consistent with the identification of the Source Area as the source of site contaminants. Radiometric dating is a well documented, scientific method used to determine the age of a sample of material based on the concentration of a particular radioactive isotope contained within it by using established decay rates of radioactive nuclides to provide a clock. Radionuclides, lead-210 (^{210}Pb) and cesium-137 (^{137}Cs), were measured in vertical segments from sediment cores collected at Allendale and Lyman Mill Ponds.

The approximate date of deposition of the sediment from within each segment was determined from the amount of radionuclide isotope remaining in that segment (based on known decay rates). These data were used to estimate sedimentation rates (i.e., the rate at which sediment deposits) and the stratigraphic chronology (i.e., age of the sediment column) to reconstruct the history of sediment deposition in the ponds. This information, along with results of the dioxin analysis of sediment collected at discrete depth intervals below the ground surface of the ponds, was used to identify relationships between depth, age, and dioxin contamination in the ponds, if any. The radiometric sediment age dating methods, assumptions, and uncertainties are described in detail in technical reports for the Site (Battelle 2005 and 2006; Corcoran 2006), and which are part of the Administrative Record.

Radiometric age dating of sediment cores in the Woonasquatucket River did not identify an alternative source of dioxin beyond the Source Area, rather the study concluded, within its capabilities to predict sediment accumulation rates, that the dioxin maximum contamination generally corresponds to sediment depositions of an estimated age of 40 to 60 years (study done in early 2000s). The dioxin maximum contamination in the Allendale Pond generally corresponds to sediments deposited between about 1950 and 1970. This period corresponds with Site industrial operations, including haxachlorothene manufacturing and drum reconditioning at the Site. For Lyman Mill Pond, the maximum dioxin concentrations generally correspond to sediment deposited between 1960 and 2000 – which corresponds with the time that chemical and drum reconditioning activities occurred at the Site and likely also reflect downstream transport of contaminated sediments following the breach of the Allendale Dam in 1991 and again in 2001.

I. Comment: Remediation waste from the Site has been identified as both listed waste and solid (non-listed) waste.

EPA Response: The analysis of whether a waste originated from a listed source is fact-specific. Information available at the time remediation waste was generated was used to ascertain the specific sources of wastes or contaminants. As more information became available, this information was used when doing this analysis.

With respect to waste generated at the Site, EPA concluded initially that the waste fit the definition of F020 listed hazardous waste. However, after further discussions with the parties performing the work, EPA noted that there was a question about one of the materials used in the process that generated the waste. At that time, EPA informed the PRPs that the waste did not need to be treated as listed hazardous waste. However, shortly thereafter, EPA obtained information provided by Thomas Cleary, one of the individuals who assisted Metro-Atlantic with the process it used to manufacture hexachlorophene at the site. That information provided additional details about the materials and processes used to manufacture hexachlorophene at the Site. After learning of this information, EPA concluded that the waste at the Site fits the definition of listed hazardous waste.

J. Comment: Use of the F020 code required excavated soil and sediment to be subject to RCRA closure requirements thereby increasing the cost of disposal

EPA Response: While excavated soil and sediment were identified as listed waste subject to RCRA hazardous waste closure requirements, the use of the F020 code did not result in increased disposal costs in the FS in complying with closure requirements. As discussed above, soil and sediment have been properly identified as listed waste. A discussion of how decisions regarding closure requirements were made is included below.

RCRA hazardous waste requirements (including closure requirements) for the treatment, storage, and disposal of hazardous waste (including listed waste) are applicable to a Superfund remedial action if the following conditions are met:

> The waste was initially treated, stored, or disposed of after the effective date of the particular RCRA requirements, or
>
> The activity at the CERCLA site constitutes treatment, storage, or disposal, as defined by RCRA.

RCRA Subtitle C hazardous waste closure requirements were identified as legal requirements (ARARs) for two components of the selected remedy: capping of Source Area soil and disposal of soil/sediment in an Upland CDF. For Source Area soil, hazardous waste is being covered and closed in place. The activity being conducted under the selected remedy does not constitute treatment, storage, or disposal of a hazardous waste and, therefore, RCRA hazardous waste closure requirements are not applicable.

RCRA requirements that are not applicable may, nonetheless, be relevant and appropriate, based on site-specific circumstances. The determination of relevance and appropriateness of RCRA requirements is based on an evaluation of a variety of factors: the circumstances of the release, the hazardous properties of the waste, its composition and matrix, the characteristics of the site, the nature of the release or threatened release from the site, and the nature and purpose of the requirement itself.

EPA has determined, based upon site specific circumstances, that RCRA closure requirements are relevant and appropriate for Source Area soil that will be capped and remain in place at the Site. This determination was made based upon sampling data that indicate dioxin/furans, PCBs, selected pesticides, semi-volatile organic compounds (SVOCs), metals, and volatile organic compounds (VOCs) are present in Source Area soil - in some cases at extremely high levels. The nature of this contamination is very similar/identical to contamination that is typically addressed by RCRA's hazardous waste requirements.

In addition, significant levels of PCBs (1,300 milligrams per kilogram [mg/kg] total PCB (based on Aroclor 1254) at CMS-147 (2-3 feet below ground surface [ft bgs]) are present in Source Area soil. Where Superfund remedial actions leave PCBs in place at these levels, capping consistent with hazardous waste closure requirements is appropriate. (Long-term management controls for PCB-contaminated material generally will also parallel RCRA closures.)

Other factors supporting this determination include the fact that EPA's CSM has identified this area as the source of significant contamination in groundwater, the adjacent River and downstream areas and that the waste would remain in perpetuity. The Source Area is also located in the 100 year floodplain supporting the more robust hazardous cover than would be required for solid (non-hazardous) waste.

For the Upland CDF evaluated in the FS, RCRA closure requirements are legally required to be met (i.e. closure requirements are applicable) because the activity (placement in a CDF) constitutes disposal of a hazardous waste as defined by RCRA.

In both cases, EPA does not believe the identification of soil and sediment as listed hazardous waste has increased the cost of disposal in terms of closure. For the Source Area, the hazardous waste closure was not based specifically and solely on the listed waste determination but rather on an analysis of site-specific factors discussed above.

For the Upland CDF evaluated in the FS, even if EPA had determined that the waste was not a listed waste because the source or prior use of the waste was not identifiable, the waste is similar in composition to a known, listed RCRA waste. As a result, EPA would have determined that RCRA hazardous waste closure requirements were relevant and appropriate and the cost of disposal would have remained the same.[5]

K. Comment: There are no facilities in the United States that are permitted/have the capacity to accept F020 waste

EPA Response: Clean Harbors owns and operates permitted facilities both in the United States and Canada. The Sarnia facility in Ontario (Canada) and the Lone Mountain facility in Oklahoma (United States) are permitted to manage F020 waste by incineration (Sarnia) or hazardous landfill (Lone Mountain). The Aragonite and Grassy Mountain facilities in Utah (United States) can manage F020 waste but would have to apply for a variance from EPA to accept F020 waste. Clean Harbors has successfully obtained a variance in the past for the Aragonite facility and the time frame of obtaining such a variance (9 months to a year) would not delay the current Centredale project schedule, as construction is not expected to start for approximately 5 to 6 years. Additional information regarding Clean Harbor's facilities and incineration and landfill capacities is discussed below.

L. Comment: Disposal costs/environmental impact of shipping waste to Canada are very high. These increased costs are not factored into EPA's evaluation of alternatives.

EPA Response: The disposal costs estimated in the FS are reasonable and there are not significant cost differences between the US and Canada in terms of costs. The off-site disposal costs used for remedial cost estimating in the FS were based on an estimate from Clean Harbors. Clean Harbors recently revised the incineration unit price down, but also indicated that the original price would be sufficient to manage F020 waste from the Centredale site, even if it had to be shipped to Canada.

M. Comment: State of Rhode Island Hazardous Waste Generation Fee costs should have been included into EPA's evaluation of alternatives.

EPA Response: EPA did not include the State of Rhode Island's hazardous waste generation fee in costs developed as part of EPA's evaluation of alternatives because EPA is exempt from paying these fees under the State's *Rules and Regulations for Hazardous Waste Management,* Section 3.

[5] Since the FS was written and the Proposed Plan issued, EPA has decided to expand the area where the Upland CDF can be located to include areas that are no longer on-site for purposes of ARARs. As a result, it is possible that only applicable requirements must be met depending upon the CDF location.

3. EPA Does Not Fulfill the Requirements of the IQA and Implementing Guidelines Because Current Site Data are not Incorporated

   EPA Response: As discussed below, EPA has fulfilled the requirements of IQA and the information relied upon is accurate, reliable and unbiased.

   A. Comment: Conceptual site model does not reflect NECC's drum reconditioning operation as the likely source of the dioxin and HCX on the Site.

      EPA Response: The information that forms the basis of the CSM is accurate, reliable and unbiased. The CSM identifies the Source Area as the source of contamination (including dioxin and HCX) at the Site. The Source Area includes the area where NECC's drum reconditioning operations took place.

   B. Comment: The FS Report contains no discussion of the March 30, 2010 flood event and its impacts on existing soil caps in the Source Area Soil action area

      EPA Response: The Administrative Record for the Site includes information regarding the March 30, 2010 flood event and its impacts on temporary soil caps in the Source Area and EPA has taken this information into account in its evaluation of alternatives for the Source Area.

      The post-flood inspection memo dated April 27, 2010, is part of the Administrative Record. Although the FS did not specifically discuss this flood event because the FS was finalized and in printing/production while EPA was investigating the impacts from the flood, the potential for flood impacts on these temporary caps was considered by EPA in its evaluation of alternatives for the Source Area and was taken into account when preparing the Proposed Plan.

      The post–flood inspection report indicates that erosion of the top layer of temporary soil caps did occur in some places. The flooding history of the Woonasquatucket River prior to the March 30, 2010 event is also documented in the *October 2005 Storm Evaluation* letter report (Battelle, 2006), which is part of the Administrative Record, and in the FS report. The FS report also describes the physical setting of the Source Area in relation to the floodplain (i.e., approximately 85% of the Source Area is below the 100-year flood elevation) and indicates that these areas may be subject to erosion during flooding. Notably, the FS report summarizes findings from a 2002 site inspection which revealed that some areas of the existing interim caps have been impacted by limited amounts of erosion as evidenced by the apparent lack of vegetative cover in these locations. The stages of erosion impacting the existing interim caps include "raindrop" erosion and the initial stages of "sheet" erosion (as defined by the State of Rhode Island's "Soil Erosion and Sediment Control Handbook", dated 1989). Should these erosion processes be allowed to continue unabated, the potential for some degree of cap failure due to a flood zone event (i.e. flood) increases.

Evidence of erosion was also observed during a site inspection performed in April 2006 (Battelle, 2006) after the October 15, 2005 flood, which was one of the largest high-flow events ever recorded at the USGS gauging station since 1942. The peak discharge recorded at the Woonasquatucket River gauging station (located immediately upstream of the Site) during this event was 1,530 cubic feet per second (cfs) as compared to the peak discharge of 1,750 cfs recorded during the March 30, 2010 flood event (U.S. Department of Interior and U.S. Geological Survey joint report, 2011). Photo documentation from the October 15, 2005 flood shows that flood waters approached the 98 ft elevation near the Centredale Manor building. With respect to erosion, the April 2006 inspection revealed many areas where the black mesh textile, which had been installed under the topsoil as part of the cap, was exposed at Cap Area 1. Given that the April 2006 inspection occurred nearly six months after the October 2005 flood, it is not clear whether the mesh textile was exposed as a result of the October 2005 flood, or exposed over time from cumulative flooding and high flow events that are prone to occur at the Site. Overall, information from the site inspections (e.g., evidence of cap erosion) and flooding history was considered in the evaluation of alternatives for the Source Area.

4. EPA Improperly References EPA's Draft Recommended Interim PRGs

   A. Comment: EPA's Draft Recommended Interim PRGs should not be used to set Site cleanup goals

      EPA Response: Cleanup goals based upon EPA's *Draft Recommended Interim Preliminary Remediation Goals for Dioxin in Soil at CERCLA and RCRA Sites* were used in Appendix N of the FS because at the time the FS was finalized it was possible that when the remedy was selected, the preliminary remediation goals (PRGs) for dioxin could have been revised consistent with this draft guidance. If that was the case, it was appropriate to determine the impact this change might have on the clean up alternatives evaluated in the FS.

      EPA has the discretion to identify guidance such as EPA's *Draft Recommended Interim Preliminary Remediation Goals for Dioxin in Soil at CERCLA and RCRA Sites* as a "to be considered" (TBC) requirement. TBCs are non-promulgated criteria, advisories, guidance, and proposed standards issued by federal or state governments and can be used to determine preliminary remediation goals when ARARs do not exist for particular contaminants.

      On February 17, 2012, EPA finalized its non-cancer reassessment for dioxins that included the release of the Tier 1 IRIS reference dose (RfD) for 2,3,7,8- TCDD. EPA now requires evaluation of the dioxin non-cancer health effects using the new RfD for TCDD for a range of agency activities, including establishing cleanup levels at Superfund sites consistent with this reference dose. Based upon this reassessment, EPA has re-calculated non–cancer risks for soil and sediment at the site based upon these new requirements.

As a result, EPA will now be relying on calculations using this reference dose to develop site-specific PRGs. With the release of the Tier 1 IRIS RfD for TCDD, EPA will no longer use the PRGs for dioxin in soil recommended in EPA's 1998 *Approach for Addressing Dioxin in Soil at CERCLA and RCRA Sites* (EPA 1998) or the proposed interim PRGs provided in the December 30, 2009 *Draft Recommended Interim Preliminary Remediation Goals for Dioxin in Soil at CERCLA and RCRA Sites.* In addition, the Tier 1 IRIS RfD for 2,3,7,8-TCDD has now been identified as a TBC requirement.

B. Comment: Before cleanup goals for dioxin can be revised, EPA must re-examine the potential human health risk associated with exposure to dioxin within each exposure area.

EPA Response: Since the new dioxin RfD was issued by EPA on February 17, 2012, EPA has performed an evaluation of its impact on the Site, reexamined the potential health risks associated with exposure to dioxin within each exposure area, and updated its human health risk assessment and cleanup goals to reflect changes to the dioxin RfD as suggested by the commenter. (*See* Technical Memorandum dated May 2012).

C. Comment: EPA cannot identify additional areas/additional soil volumes to be remediated or the cost implications of remediating any such additional areas if the cleanup goal for dioxin is revised. As a result, the analysis conducted by EPA in Appendix N to assess the costs and feasibility of the various disposal options in the FS Report based upon hypothetical cleanup goals is not sufficient.

EPA Response: Appendix N evaluations presented impacts of the then proposed draft new dioxin PRG. Since the new dioxin RfD was adopted by EPA on February 17, 2012, EPA has identified additional areas/additional soil volumes to be remediated and revised cost estimates to reflect remediation of additional areas that now require cleanup. (*See* Technical Memorandum dated May 2012). EPA also issued an amended Proposed Plan and solicited public comments on new dioxin cleanup goals and associated changes to the cleanup alternatives.

5. EPA's Analysis of Remedial Alternatives Did Not Give Proper Weight to Remedies That Reduce Uncertainties in Cost and Implementability[6]

   A. Comment: EPA does not define the Site cleanup goals clearly and consistently in the FS Report and Addendum resulting in uncertainty concerning the extent of the cleanup and the volume of contamination that should be addressed.

      EPA Response: As was previously noted by the commenter, substantial time has passed between the performance of the RI and the issuance of the FS Addendum and later EPA's Dioxin Technical Memo. Because of this, development of the FS, Addendum and Technical Memo was an iterative process that evolved over time as additional information was identified and previously collected information was further evaluated in light of new information. As a result, EPA built upon and refined the cleanup goals to conform to the information in the Administrative Record.

      That being said, the cleanup goals are clearly defined to support the FS Report, Addendum and Technical Memo. Extensive work was conducted to support both the human and ecological risk assessments that form the basis for defining Site cleanup goals. In addition, as new information was developed, risk assessments were revised to reflect this new information. Clear detailed RAOs were identified to further guide EPA in determining the extent of cleanup and volume of contamination that should be addressed. Finally, ARARs and TBC requirements were evaluated in detail and revised as appropriate to further define cleanup goals. To the extent that changes were required based upon revisions to risk assessments, RAOs, or legal requirements, the FS Report Addendum, and/or the Technical Memo were updated to reflect these changes.

      The commenter also suggests that an *in situ* remedy would fulfill the recommendation made by the National Remedy Review Board (NRRB) that EPA reconsider the merits of alternatives that include both capping and excavation In response to the NRRB, EPA fully and fairly reevaluated capping and excavation for sediment based upon site-specific factors and provided its response to the NRRB.

   B. Comment: Cleanup goals for dioxin are based on upstream background data for sediments but not enough data exists to support this as the basis for EPA's proposed cleanup goals. In addition, EPA has limited data regarding the depth of soil contamination. As a result, EPA's volume estimates in the FS Report

[6] The comments provided on EPA's analysis of alternatives focus to a large degree on cost, implementability and to some degree protectiveness. It is important to note that one of the threshold criteria in the NCP is compliance with all ARARs and that, in most if not all cases, the alternatives proposed by the commenter do not meet all ARARs and therefore do not meet threshold criteria. While in some cases ARARs can be waived, no basis for waivers was identified.

are inaccurate resulting in an imprecise analysis by EPA of remedial alternatives in the FS.

EPA Response: Sufficient dioxin background data exist to use in setting cleanup goals, as demonstrated by statistical calculation of the mean value for these background values data sets. Background conditions are based on chemical and physical data associated with up to 13 surface sediment and four floodplain soil samples collected immediately upstream of the Site. Background samples were analyzed for dioxin and furans, PCBs, pesticides, SVOCs, metals, grain size and total organic carbon (TOC) content. Background values used in the FS to develop cleanup goals for the Site are based on the arithmetic mean of the background data for all risk-based contaminants. The use of the arithmetic mean to represent background conditions is a reasonable approach that will be refined during design once additional background data are available.

Additional background data will be collected closer to the time of remediation to confirm pre-construction background conditions and the statistical assumptions and comparisons performed in the FS (e.g., the distribution of the data will be examined to identify the most appropriate use of the central tendency: arithmetic mean for normally distributed data or geometric mean for log normally distributed data).

It should also be noted that elevated dioxin levels in sediment are so wide-spread (requiring cleanup of the entire ponds), that even if cleanup goals were significantly raised, there would be minimal impact on the volumes that would need cleanup. For example, if the 2,3,7,8-TCDD cleanup goal was raised by more than three times from 15 ng/kg to 50 ng/kg (a level corresponding to the upper Superfund acceptable risk range boundary of 10E-4) for human health cancer risk, approximately 80% to 85% of the Allendale and Lyman Mill ponds would still be above this higher cleanup level. This percentage difference will not have an impact on the cleanup plan, as it cannot be practically delineated during excavation in order to be excluded from the cleanup area. Thus, use of background levels as a basis for cleanup goals is appropriate at the site.

The vertical extent of the sediment cleanup area was determined by comparing sub-surface sediment data to the cleanup goals such that the depth for cleanup corresponds to the depth at which concentrations of the contaminants do not exceed the cleanup goals. EPA has a substantial sub-surface sediment dataset used in these evaluations, comprised of approximately 250 data records at Allendale Pond (ranging from 0.5 ft bgs to 12 ft bgs) and approximately 160 data records at Lyman Mill Pond (ranging from 0.5 ft bgs to 4 ft bgs). Based on the comparison of sub-surface sediment data to the cleanup goals, the average cleanup depth is approximately 1.9 ft at Allendale Pond and 2.4 ft at Lyman Mill Pond. The depth of contamination is well defined within the practical ability of the mechanical equipment that would be used to perform the cleanup (i.e., excavation). In addition, the removal volumes estimated in the FS include an over-excavation allowance of 0.25 ft as well as a 6-inch soil cover on the sediment bottom in the event that post-construction sampling reveals areas of residual contamination above the cleanup goals in some locations and additional excavation is not feasible. The evaluations performed in the FS are sufficient at this stage of the Superfund process. EPA will perform additional sampling and analysis closer to the time of remediation to confirm the sediment cleanup depth and volume.

Similar evaluations were performed in the FS to determine the vertical extent of contamination in soil at the Site. EPA has a substantial sub-surface soil dataset for the Source Area (more than 10,000 data records within vadose zone), which showed widespread contamination throughout the vadose zone. There are limited sub-surface soil data along the shore of Allendale and Lyman Mill Pond; however, EPA will perform additional sampling and analysis closer to the time of remediation to confirm the cleanup areas, depths and volumes. Site CSM and available data suggests that soil contamination is most widely spread in surface areas.

C. Comment: Uncertainties regarding cleanup goals and volumes would be eliminated if much of the contaminated sediment was managed in place.

EPA Response: As discussed above and below, EPA does not believe there is any significant uncertainty regarding cleanup goals or volume of sediment that must be addressed.

The commenter is correct that uncertainty regarding volume of sediment that would need to be addressed would be eliminated if most of the contaminated sediment was left in the River. “Certainty” is not explicitly identified as a criteria EPA must evaluate under the Superfund law. However, CERCLA and the National Contingency Plan both recognize that there are inherent *uncertainties* when identifying the volume of waste that must be remediated and include flexibility to address uncertainty in components of a remedy including changes in volume or cleanup goals.

The NCP, for example, requires cost estimates for purposes of the detailed analysis in the FS be accurate within a range of +50% to -30% thereby implicitly acknowledging that there is uncertainty in the estimations that are done at the FS/ROD stage. In addition, the cost estimates for excavation and disposal in an Upland CDF include a large contingency of 25% of the estimated cost. Should changes in volume or cleanup levels occur that would impact cost, the cost estimate for the selected remedy has flexibility to accommodate uncertainty within this range but still be consistent with NCP cost requirements.

In addition, if new information regarding volumes or cleanup goals is developed after the ROD is issued (typically in the pre-design stage and before construction begins) indicating that there are significant or fundamental differences to the selected remedy, then EPA is required to revise the remedy through an ESD or a ROD Amendment.

D. Comment: Background should not be used as the cleanup goal for pond sediments and floodplain soils at this Site as higher cleanup goals are consistent with the NCP

EPA Response: Overall, cleanup goals at a Superfund Site are used to delineate the proposed cleanup areas and are based on an evaluation of potential ARARs, TBC criteria, and risk-based PRGs. In cases when risk-based or ARAR-based cleanup goals for individual contaminants for the most sensitive receptor within the respective exposure pathway are below background levels, as is the case in some instances at the Centredale Site, EPA must take background into consideration to ensure that cleanup levels below background are not selected..

Soil and sediment dioxin levels upstream from the Centredale Site were used to define background levels for this Site. Consideration of background is appropriate to avoid the potential for re-contamination following the cleanup. Per EPA Guidance, a cumulative residual risk calculation for the selected cleanup goals is performed for the media to be addressed for the most sensitive receptor. The purpose is to ensure that the selected cleanup goals would result in a cumulative risk level protective of that receptor.

E. Comment: Costs, volumes, and implementability do not vary significantly for in situ sediment alternatives. As a result, they are better cleanup options.

EPA Response: EPA evaluated all alternatives based upon the 9 criteria in CERCLA and based upon the evaluation of these criteria has determined that the selected alternative best meets the criteria. While the commenter is correct that, without taking into account disposal options, those alternatives that leave contamination in the River have lower costs than those that remove all the contamination from the River, cost is only one factor evaluated by EPA. Implementability in terms of actual construction was relatively similar between those alternatives that leave contamination in the River and those alternatives that require all contamination removed from the River but there were significant and important differences between how these alternatives met criteria making the selected remedy the best option.

6. Allendale and Lyman Mill Reach Sediment, General Comments

A. Comment: The Nearshore CDF Disposal Option is Implementable, Protective, and Cost-Effective

EPA Response: As discussed in more detail below, while the Nearshore CDF could be constructed from a technical perspective and thus would be "implementable", it does not best meet CERCLA criteria (e.g. does not meet ARARs, less reliable in the long term, no treatment etc.). In addition, many of the "implementability" issues identified by the commenter for the Upland CDF also apply to the Nearshore CDF supported by the commenter.

i. Comment: EPA Incorrectly Applies the Floodplain Executive Orders to the Nearshore CDF Disposal Options

EPA Response: EPA does not agree that it has incorrectly applied the Floodplain Executive Order. EPA's determination regarding the Floodplain Executive Order and the Nearshore CDF is as follows:

> Under the Floodplain Executive Order 11988, floodplain requirements focus on avoiding to the extent practical the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. Before an alternative that is located in or affects a floodplain can be selected, EPA must look at all of the other options for cleanup and make a determination that there is no practical alternative to taking this action except for the alternative that impacts the floodplain. For the purpose of this floodplain assessment, floodplain areas are defined as the area of water and land inundated during the highest point of the base, or 100-year, flood using maps prepared by the Federal Insurance Administration of the Federal Emergency Management Agency (Flood Insurance Rate Maps or Flood Hazard Boundary Maps).
>
> Near Shore CDFs would be constructed in open water, wetland or floodplain areas and are filled so that the top cover is above the normal water level. A permanent perimeter dike would be installed along the shoreline.
>
> Because this disposal option would include placement of contamination and a structure (dike) on the existing floodplain as well as location of a structure (cap) in or affecting the floodplain, it would result in an occupancy and modification of the floodplain. Thus, a determination would first need to be made concluding that there is no other practicable alternative to the Near Shore disposal option before it could be considered. EPA has determined that there is a practicable alternative to the Near Shore disposal option. The Upland CDF disposal option provides greater overall effectiveness and protection at a reasonable cost without resulting in the modification and occupancy of the floodplain and associated adverse impacts.

The commenter's analysis of the Floodplain Executive Order as it relates to the Nearshore CDF is incorrect. The Floodplain Executive Order requires Federal agencies to conduct a phased analysis. While the focus of the Wetlands Executive Order is on avoiding destruction of wetlands, the Floodplain Executive Order focuses on avoiding development in a floodplain where there is a practicable alternative. As a result, EPA believes the

Floodplain Executive Order first requires EPA to determine if there is a practicable alternative to floodplain development (modification and occupancy in a floodplain) as a first step in the analysis. If there are practicable alternatives that would avoid activities in the floodplain altogether, as is the case here, then this is the end of the analysis as far as the federal government is concerned.

The commenter does not address this threshold determination but instead moves on to discuss adverse impacts once it has been determined that there is no practicable alternative to locating a structure in a floodplain. Because EPA has not made that determination here, this analysis of adverse impacts is misplaced.

EPA does, however, agree with the commenter that Executive Order 11988 is not an absolute prohibition against selecting a remedy in a floodplain. Under appropriate circumstances, remedies can be located in floodplains. The commenter is correct that EPA selected an alternative that resulted in the occupancy and modification of the floodplain at the Nyanza Superfund Site.[7] That decision was based upon a threshold determination that there was no practicable alternative to locating a portion of the remedy in a floodplain. Therefore, the commenter is incorrect, that EPA based its floodplain determination in Nyanza on different factors than those used at Centredale Manor. Finally, the "least environmentally damaging practicable alternative" analysis quoted from the Nyanza ROD by the commenter relates to wetlands and not floodplains. Section 404 of the Clean Water Act requires an analysis of the least environmentally damaging practicable alternative (LEDPA) once a determination is made that wetlands impacts are unavoidable. LEDPA is unrelated to the analysis of floodplain impacts under the Federal Executive Order.

The commenter also pointed to the floodplain findings in the ROD issued for the Pownal Tannery Superfund site in Vermont for support that EPA considers cost-effectiveness in determining what is practicable.[8] EPA agrees that cost is

[7] It is difficult if not impossible to compare actions taken at one Superfund site to actions taken at another because each Site is unique and presents its own set of Site specific factors that lead to individual remedy decisions. There are significant differences, for example, between the Centredale Site/Woonasquatucket River and the Nyanza Site/Sudbury River. The Centredale Site is significantly contaminated with a number of contaminants that present cancer and non-cancer risks to human receptors as well as ecological risks. The Nyanza Site (Sudbury River) has only one contaminant of concern (mercury) and when found at its highest levels presents only a very slightly elevated non-cancer risk. Elevated levels of mercury in the Sudbury River are also the result of atmospheric deposition unrelated to the problem addressed under Superfund. The selected remedy at Nyanza required a 6" cover of sand over one area of the River. EPA determined there was no practicable alternative to the placement of this material in the River because costs for alternatives that removed contamination from the River were extraordinarily high when compared to risk reduction ($59.7 million to $213.5 million when compared to the cost of the selected remedy ($8.5 million)).

[8] It is difficult if not impossible to compare actions taken at one Superfund site to actions taken at another because each Site is unique and presents its own set of Site specific factors that lead to individual remedy decisions.

one factor that is appropriate to consider in deciding what is practicable. The selected remedy at the Pownal site allowed solid waste to be consolidated within the upper boundary of the 100-year floodplain. One explicit consideration for cost-effectiveness in the Pownal ROD was that the selected alternative could be designed and implemented to be resistant to flood damage, and would minimize the effects on the existing floodplain. After completion of construction, flooding in the Hoosic River resulted in damage to the selected remedy.

Although not mentioned by the commenter, wetlands impacts were also a very important factor in EPA's evaluation of the Nearshore CDF disposal option:

> Placement of the Near Shore CDF would also result in the discharge of dredged or fill material to waters of the US and destruction of wetlands. As a result, EPA must look at all of the other disposal options to see if a determination can be made that there is no practical alternative to taking this action. EPA has determined that there is a practicable alternative to the Near Shore disposal option. The Upland CDF disposal option provides greater overall effectiveness and protection at a reasonable cost without impacting wetlands. …. The Upland CDF, Incineration and Off-Site Treatment/Disposal Options have similar environmental impacts and therefore, are the least damaging practicable alternative for wetlands purposes.

ii. Comment: EPA should not have Screened Out Alternative 11 Channel Only based upon community acceptance in the FS

EPA Response: EPA acknowledges that only one of the two Alternatives involving dam removal, reduction in ponds volume, partial excavation and sediment consolidation within the ponds footprint (Alternative 11f) was carried through the detailed analysis in the FS. Both alternatives (channel-only and channel with small ponds) were developed by the PRPs and provided to EPA for further analysis and inclusion in the FS.

EPA guidance allows screening out of similar alternatives to reduce the number of alternatives analyzed in detail to ensure that only the most promising alternatives are considered (*Guidance for Conducting RI/FSs under CERCLA*, October 1988). Both alternatives provided by the PRPs required partial excavation with dam removal and varied basically in the area where surface water would remain after removal of the dam. In determining which alternatives moved forward into the detailed analysis, the intent was, consistent with guidance, to choose alternatives that represent a full range of options within a general approach.

Thus, EPA carried forward through the detailed analysis only one representative alternative for dam removal/partial excavation and sediment consolidation, as it would have done if the dam removal/partial excavation and sediment consolidation option had been developed by EPA from the start. Since the PRPs provided two alternatives that were essentially a variation of the same option, EPA had either to combine these two variations or choose one to carry forward as a representative option.

EPA chose the latter so as to retain most of the specific analysis done by the PRPs for that alternative. EPA did not speculate on community acceptance in this case… it relied upon discussions from dialogue group meetings with the stakeholders held at that time that the dam removal option was being developed and based upon these discussions; maximizing remaining open water would be more acceptable to the public and therefore was the most promising between the two alternatives. Thus, although the FS mentions community concerns as the reason for screening out this alternative, this decision was part of a broader analysis conducted by EPA to evaluate in detail alternatives that represented a broad range of options.

B. Comment: EPA Fails to Address Uncertainties Concerning the Implementability and Cost Effectiveness of an Upland CDF

EPA Response: As discussed below, EPA has taken into account implementability and cost effectiveness in its decision to retain the Upland CDF as the disposal option for the selected remedy. As discussed below, many of the “implementability” issues identified by the commenter for the Upland CDF also apply to the Nearshore CDF supported by the commenter.

i. Comment: All potential locations contemplated by EPA are not implementable because EPA cannot get approval from the Town of Johnston

EPA Response: EPA agrees that comments submitted by the Town of Johnston during the public comment period indicate that Town officials do not support alternatives that would result in contamination being placed on any property within Johnston. EPA believes that opposition from the Town applies also to the Nearshore CDF disposal option supported by the commenter given the Town’s concern that Johnston bears a disproportionate share of responsibility for waste disposal within the State of Rhode Island and has indicated it would prevent Johnston property owners from accepting the material. In addition, the Near Shore disposal option cannot be used for beneficial reuse supported by some commenters.

All disposal options evaluated by EPA have implementability issues. This is not unusual at a Superfund site where large volumes of highly contaminated material are involved. That being said, EPA continues to believe that the Upland CDF disposal option remains the best choice among disposal options assuming a suitable property can be located. For that reason, EPA has expanded the area where it believes an Upland CDF can be located to also include areas outside of Johnston.

We also believe there may be significant benefits to the host community from an Upland CDF facility that should not be overlooked and explored further particularly if a brownfields property can be used. A brownfield is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties increases local tax bases, facilitates job growth, utilizes existing infrastructure, takes development pressures off of undeveloped, open land, and both improves and protects the environment. EPA will work closely with potentially impacted communities to address concerns should locations be identified in their communities that are suitable for an Upland CDF.

ii. Comment: Upland CDF should have been screened out by EPA based upon public acceptance.

EPA Response: The commenter cites to comments submitted by the Town of Johnston to EPA during the public comment period as well as newspaper articles published during the public comment period indicating that Town officials do not support alternatives that would result in contamination being placed on any property in Johnston. Based upon this, the commenter believes the Upland CDF disposal option should have been screened out by EPA because it is not implementable.[9]

All disposal options evaluated by EPA have implementability issues. This is not unusual at a Superfund site where large volumes of highly contaminated material are involved. Waste disposal within Johnston is currently opposed by officials from the Town of Johnston. While no comments were received regarding on-site incineration, EPA's experience at other sites indicates that there is typically local opposition to this option. Off-site disposal has the

[9] The commenter also states that EPA must have local "approval" before a remedial action can be implemented. This is not usually the case. Under CERCLA, EPA is specifically exempt from the requirement to obtain permits or approvals with respect to planned cleanup actions conducted on-site. Section 121(e)(1) of CERCLA, 42 U.S.C. §9621(e)(1). The purpose of this provision is to make sure that permits or other local requirements do not delay or hamper performance of selected remedial or removal actions under CERCLA; it is intended to allow EPA (or a PRP under EPA oversight) to perform cleanup actions in an expeditious manner.

The definition of 'on site' is construed broadly; it has been interpreted to include abutting properties as well as other properties in close proximity. *See*, e.g., Town of Fort Edward v. US EPA (Second Circuit Court of Appeals, 1/3/08) ("While EPA has indicated that "very close proximity" will generally mean adjacent to the contamination site, (see 55 Fed. Reg. 8666, 8690 (March 8, 1990)), it is plain from examples cited at the time of the regulation's promulgation that the "very close proximity" limitation within the definition of "on-site" was intended to afford EPA some flexibility in identifying proximate sites necessary to achieve CERCLA objectives. See, e.g. 53 Fed. Reg. 51394, 51406-407 (Dec. 21, 1988)".

fewest implementability issues, but is more costly. Because all disposal options have implementability issues, it was appropriate to retain and not "screen out" any options.[10]

Although EPA is now looking beyond the Town of Johnston for the location of the Upland CDF, EPA believes that most or all of the concerns raised by the Town of Johnston can be addressed to the Town's satisfaction should an appropriate location be found in Johnston.[11]

iii. Comment: Properties Targeted By EPA for Placement of Upland CDFs Are of Limited Size

EPA Response: The volume of contaminated material may be a less critical issue given that the area where an Upland CDF may be located has expanded. Nonetheless, EPA provides the following responses to comments on this issue.

a. Comment: The reduction in volume of sediment estimated by EPA from dewatering (37%) is not supportable.

EPA Response: Calculations of the reduction in volume of sediments from Allendale Pond, Lyman Mill Pond and the Woonasquatucket River after dewatering are shown in Appendix J of the FS. In summary, the in-situ excavation volume is estimated to be 155,800 cy. In the dewatering process, water will be squeezed out by high-pressure filter presses. After dewatering, the sediments will have an estimated volume of 97,700 cy, which represents a 37% reduction in volume. The calculations are based on experience with sediment dredging and dewatering projects.

One example of published data is in the 2006 Dredge Season Data Submittal for work in the New Bedford Harbor Superfund Site (Jacobs 2007)[12]. In this example, 20,096 in-situ cy of sediment were dredged and after dewatering the weight of dewatered sediment was 13,454

[10] Communications with the Town of Johnston were taken into account in proposing the Upland CDF disposal option. Although Johnston periodically expressed opposition to any kind of permanent storage of contaminated soil/sediment within the Town of Johnston, in a letter from the Town to EPA in July 2010, there was some indication that the Town remained open about the possibility of an Upland CDF: "…if there is a way to mitigate upland disposal…with construction of a public access/park between the disposal site and the river, we may be open to discussion." The Town's letter to EPA on December 7, 2011 also indicated the Town was open to the idea of an Upland CDF.

[11] In addition, if, after additional evaluation, a suitable property for the Upland CDF cannot be found, then EPA can revise the remedy through an ESD or a ROD Amendment to select a different disposal option (likely off-site disposal).

[12] Jacobs 2007. "2006 Dredge Season Data Submittal, New Bedford Harbor Remedial Action, New Bedford Harbor Superfund Site, New Bedford, MA", Jacobs Engineering Group, Bourne, MA.

tons or 10,000 cy, which represents a 50% reduction in volume (compared to the 37% reduction estimated for the Centredale Manor Site).

b. Comment: EPA's excavation approach is not based on the known areal extent and depth of sediment and soil to be excavated and therefore the volume of contaminated sediment is uncertain.

EPA Response: EPA has extensive sampling data in the sediment and floodplain soil at the Site. For example, over 400 samples were collected in the Allendale and Lyman Mill Pond sediments alone. The commenter conducted additional data collection in the Oxbow area in 2010 with its stated objective of better characterizing the distribution of contaminants in that area as well. EPA believes that the existing data set is sufficient for the purposes of selecting the remedy at the Site. As with all cleanups, it expected that additional design and pre-excavation sampling will be done in specific areas of the Site to better refine/confirm estimates.

c. Comment: Uncertainties regarding volumes/suitability for the three Upland CDF locations were not discussed by EPA in the FS

EPA Response: As noted in responses above, while EPA believes that the Upland CDF disposal option remains the best choice among disposal options assuming a suitable site can be located, EPA has expanded the area where it believes an Upland CDF can be located to also include areas outside of Johnston.

That being said, the evaluation of the feasibility and costs of constructing one or more upland CDFs was based on the physical characteristics of representative properties adjacent to Allendale or Lyman Mill ponds. The most significant components of the CDFs are the base liner and leachate collection system, perimeter containment berms, the haul route to transport sediment into the CDF, placement of sediment into the CDF and construction of the cover system. The components of the liner and leachate collection system and cover system are identical for any location because they are based on Rhode Island regulations for storage of hazardous waste materials. The feasibility of placing sediment into the CDF would be identical for any location. The shape of the CDF and the configuration of the perimeter berms would change depending on the geometry of a specific site, but this is a relatively low cost item and would not have a significant impact on the cost of a CDF. In summary, the differences in the shape of upland CDFs at different locations would have very minor impacts on the cost and little to no impact on the feasibility or evaluation of the alternative with respect to the NCP evaluation criteria. It should be noted that to the extent there are uncertainties regarding volume and suitability, Nearshore CDFs have similar uncertainties.

iv. Comment: Property for CDFs Has Not Been Purchased and Cost of Purchase is Not Included in EPA's Cost Estimate

EPA Response: The property for the Upland CDF has not yet been purchased – neither has the property for the Nearshore CDF. EPA did include the cost of acquiring property for an Upland CDF in its cost estimates. Representative costs for property acquisition are included in the capital cost estimate. The costs are based on assessed values of properties adjacent to the ponds as shown in public assessment records. The cost estimate for Allendale and Lyman Mill Sediment alternative 7a (Excavation and Upland CDF) includes $600,000 for acquiring property. This is included in the contingency line item for Excavation on the Present Worth cost sheet. EPA did not include the cost of acquiring property for the Nearshore CDF in its estimates but should have included these costs.

a. Comment: Representatives of a Potentially Responsible Party had difficulty obtaining access to the properties near the Site. This is an indication that EPA will have difficulty obtaining access in the future

EPA Response: Access issues occasionally occur in the course of conducting work under Superfund. If this occurs, EPA has the option to go into court to obtain access. Future access could also be a problem for the Nearshore CDF.

b. Comment: PRPs who EPA may ask to perform the selected upland CDF remedy have no independent authority to compel the property owners to sell their land.

EPA Response: CERCLA provides that EPA may obtain access to perform response activities. However, EPA is hopeful that the property for the Upland CDF can be purchased at fair market value from a willing seller. It should be noted that owners of property where the Nearshore CDF would be located could also be unwilling to sell their properties.

c. Comment: EPA's access authority is not sufficient for EPA to obtain use of uncontaminated property for CDF locations.

EPA Response: EPA, the PRPs, and property owners can work cooperatively to obtain the access necessary to address the remedial action for the Site. Section 104(e) of CERCLA (40 CFR 300.400(d)) provides EPA with the authority to enter property for the purpose of determining, choosing or taking a response action or otherwise enforcing CERLCA (CERCLA 104(e)(1)). EPA may obtain access to perform response activities for itself or its representatives. CERCLA further provides that EPA may secure access "in any other lawful manner." (CERCLA 104(e)(6).

v. Comment: Availability of an LDR Treatability Variance is Uncertain

EPA Response: EPA is no longer relying on obtaining a Treatability Variance to meet Land Disposal Restrictions (LDRs) requirements.[13] Instead , EPA has concluded that the alternative treatment standards for contaminated soil can be used because the dewatered sediment fits within the LDR definition of soil – "unconsolidated earth material composing the superficial geologic strata, consisting of clay, silt, sand or gravel size particles…or a mixture of such materials with liquids, sludges or solids which is inseparable by simple mechanical removal processes and is made up of primarily soil by volume based on visual inspection." This conclusion was reached after further discussions with other EPA regions, the Office of Solid Waste and Emergency Response, and the Office of General Counsel's national remedy selection group.

vi. Comment: It is uncertain whether the Upland CDFs would be "On Site" as defined by CERCLA as the Upland CDF locations may not be "necessary" or "suitable" for purposes of meeting the "on-Site" criteria.

EPA Response: EPA believes the suggested locations in the FS for the Upland CDF are on-site for purposes of the permit exemption under Section 121(e)(1) of CERCLA, 42 U.S.C. §9621(e)(1). Under CERCLA, EPA is specifically exempt from the requirement to obtain permits or approvals with respect to planned cleanup actions conducted on-site.

The definition of 'on site' is construed broadly; it has been interpreted to include abutting properties as well as other properties in close proximity. *See*, e.g., <u>Town of Fort Edward v. US EPA</u> (Second Circuit Court of Appeals, 1/3/08) ("While EPA has indicated that "very close proximity" will generally mean adjacent to the contamination site, *See* 55 Fed. Reg. 8666, 8690 (March 8, 1990), it is plain from examples cited at the time of the regulation's promulgation that the "very close proximity" limitation within the definition of "on-site" was intended to afford EPA some flexibility in identifying

[13] Although EPA is no longer seeking a treatability variance, it should be noted that EPA believes a variance could also have been obtained. The treatment variance discussed in the FS required sediment to be treated consistent with the alternative treatment standards for soil and the FS contained sufficient information to support a treatability variance.

proximate sites necessary to achieve CERCLA objectives. *See* e.g., 53 Fed. Reg. 51394, 51406-407 (Dec. 21, 1988)"

While the location of the Upland CDF in an area that could be construed as "on-site" would obviate the need to obtain permits, there is nothing in CERCLA that requires the Upland CDF to be located "on-site".

As a result, EPA has expanded the area where an Upland CDF could be sited to be beyond the area that EPA would consider on-site. This is because there may be areas outside the locations originally investigated that may be well suited for the Upland CDF. While this would require going through the permitting process, EPA believes this additional step should not be an impediment to selecting the Upland CDF as the disposal option. Should a suitable Upland CDF location not be identified, then EPA would revise the selected remedy via an ESD or ROD Amendment and select another disposal option (likely off-site disposal).

Finally, EPA disagrees with the commenter that if there are options other than the Upland CDF that meet the NCP criteria, then the Upland CDF may not be "necessary" for purposes of defining on-site. EPA also disagrees with the commenter's characterization of what is "suitable" for purposes of meeting the "on-Site" criteria.

vii. Comment: Suitability of the Targeted Properties for Placement of Upland CDFs Is Not Determined

a. Comment: Soil samples were not collected and analyzed for geotechnical and chemical testing.

EPA Response: Sampling and geotechnical testing is not necessary to evaluate the feasibility of constructing an Upland CDF in the site vicinity. Furthermore, the CDF can also be located elsewhere. The earth berms and fill placement that would be performed to construct the CDF would result in a facility that would tolerate settlement and be stable even if it is built on soft soils. Based on observation of soil and rock stockpiles and commercial building on properties in the vicinity of the Site, the soils will provide adequate support for a CDF at locations evaluated in the FS as well as other locations that may be available in the vicinity of the Site. Additional characterization will be conducted as part of the site identification process to insure that the property is suitable for the Upland CDF.

b. Comment: Costs of the Upland CDF disposal option are inaccurate because the costs to excavate and dispose of any contaminated soil on properties used is not known and no location has been identified where this additional contaminated soil would be located.

EPA Response: The evaluations of the CDF construction on the properties evaluated in the FS included excavation and off-site disposal of existing excess soils. However, if the CDFs were to be constructed on contaminated property (i.e. a "brownfield"), there would be an opportunity for reduction in risks to human health and the environment and cost savings because constructing a CDF over contaminated soil could become part of the brownfield remedial action.

viii. Comment: EPA's Confirmation Sampling Approach is Not Implementable

a. Comment: Does not allow for an accurate estimate of the volume of sediment to be excavated and infeasible to implement due to time constraints in the approach

EPA Response: Additional sampling is planned as part of the design to more accurately determine the depth of required excavation. In addition, this alternative includes placement of a 6 inch thick layer of sand over the pond area to cover residual contamination locations that may remain after excavation, if additional excavation is not feasible. Compliance with sediment cleanup levels will be determined by confirmatory sampling using an area-weighted average contaminant concentrations approach in Allendale and Lyman Mill Ponds. This confirmatory sampling will determine the extent of a TLC, if such cover is required in these Ponds, to meet sediment RAOs. Specific criteria to be used to determine the need and extent of such TLC will be determined as part of the design and construction plans.

Confirmation analyses can be done within one to two weeks to provide the field managers information needed to make decisions. The data does not have to be fully validated in order to provide information for decision making.

b. Comment: Excavated areas would be subject to impacts from precipitation events and the release of pond water from upstream reservoirs, presenting issues regarding management of water within the remediation cells

EPA Response: More detailed plans for managing storm water will be generated during design and pre-construction planning. But generally for the pond remediation, the pond areas will be divided into two sections parallel to the river flow, which will allow river water to flow on one side while remediation work is done on the other side. One half of the pond area will provide sufficient hydraulic capacity for normal flow and typical storm events. During the rare extreme flood flows, work will be stopped and equipment evacuated to allow flood flows. The work will be done from upstream to downstream to avoid re-contamination in the unlikely event of rare flooding during the time of remediation actions. The PRPs successfully used similar water diversion methods in the Allendale Pond to reconstruct the Allendale Dam in 2001 as part of the non-time-critical removal action.

c. Comment: Better approach is not to "excavate and test" but instead place a soil cover over areas excavated to a pre-determined depth

EPA Response: The selected remedy (Alternative 7a) is a restoration remedy which allows for unrestricted use of the Ponds (i.e., no Institutional Controls and long-term maintenance required) after the sediment cleanup levels and RAOs are achieved. The approach suggested by the commenter (no confirmatory sampling and a cap over the excavated areas) would not allow EPA to know what contaminant levels remain in the Ponds and would require a minimum of 1 foot cap of clean material to prevent exposure to contamination (in reality the cap would have to be at least twice as thick to provide erosion protection layer as well). This cap would make the remedy a containment remedy (similar to Alternative 8a) requiring long-term maintenance of the caps and both dams and implementation of Institutional Controls to prevent disturbance and damage of the caps. EPA's selected remedy, on the other hand, requires the use of an area-wide averaging approach to confirmatory sediment sampling (rather than point by point comparison) to confirm that cleanup levels are met and a limited use of TLC, if any, is required to meet the cleanup levels area-wide in the Ponds.

ix. Application of the Alternative Treatment Standards for Soil to Sediment is Not Practicable

a. Comment: It is not possible to segregate sediment/soil to apply the alternative treatment standards given time and space considerations.

EPA Response: The pond sediment will be excavated at a rate of approximately 400 cubic yards per day (cy/d). Samples will be taken each day and the results will be available to the management team within one to two week. Therefore, there will need to be a minimum of seven stockpile areas on site. With one week turn-around time, seven 400 cy stockpiles will fit within an area of 14,000 square feet and there is space on site for that amount of stockpile areas. If results were not available for two weeks, there would be room for additional stockpiles.

b. Comment: EPA's estimate that only 10% of the soil and sediment will exceed the alternative treatment standards for soil is based on limited data and under estimates volume. For example, more recent data from Oxbow identified additional materials containing dioxin at concentrations above those in the alternative treatment standards.

EPA Response: EPA's estimate that 10% of the soil and sediment data will exceed the alternative treatment standards for soil is based on an evaluation of site data available for approximately 250 floodplain soil (not including Source Area soil) samples and 400 sediment samples collected from Allendale and Lyman Mill reaches. Cost estimates for disposal of excavated soil from the Oxbow area were updated in the 2011 FS to consider results from the PRP 2010 Oxbow investigation, which indicated that approximately 10% of the soil had dioxin concentrations above the alternative treatment standards for soil. Previously in the 2010 FS, the Upland CDF disposal option assumed that none of the soil from the Oxbow would require treatment, whereas the 2011 FS cost estimates for this disposal option are higher because it is assumed that approximately 10% of the Oxbow soil would be shipped off site for treatment.

C. Comment: Off-site Disposal is Not Feasible

i. Comment: EPA cannot determine whether there would be any off-site facilities able to accept the excavated material at the time that the remedy is implemented. Facilities in operation today may not be in operation later or may not have the capacity to accept the waste or accept the waste on a schedule that is commensurate with the remediation schedule.

EPA Response: There are facilities that can accept waste from the site. Excavated material has also been shipped from the Site before as part of the previous response actions. The commenter provides no information to substantiate the concern that no facility will be availability in the future.

The comment seems to underestimate Clean Harbors' facilities capacities. Clean Harbors owns and operates permitted incinerators both in the United States and Canada. The Sarnia facility in Ontario (Canada) is permitted to manage F020 waste and the Aragonite facility in Utah (United States) can manage F020 waste but would have to apply for a variance from EPA to accept F020 waste. Clean Harbors has successfully obtained a variance in the past for the Aragonite facility and the time frame of obtaining such a variance (9 months to a year) would not delay Centredale current project schedule, as construction is not expected to start until several years from now. Both the Sarnia and Aragonite facilities have sufficient capacity (Grassy Mountain and Lone Mountain are options for landfill and can each take approximately 200,000 tons) to manage waste from the Centredale Manor Site within the construction time frame of 2-3 years estimated by the FS and are hazardous waste facilities.)

For the selected Disposal Option a (Upland CDF), waste to be shipped off-site for treatment is estimated at 17,900 cy (24,100 tons), (i.e., based on site data approximately 10% of Allendale and Lyman Mill sediment and Oxbow floodplain soil are above 10 times the Universal Treatment Standards (UTS) for dioxin, 10 micrograms per kilogram [µg/kg] and need to be incinerated and 100% of Source Area soil). Clean Harbors facilities also have sufficient capacity for Disposal Option e (off-site disposal and treatment) to which the commenter appears to refer: if all waste is shipped off-site to the Clean Harbors' facilities for hazardous landfilling and incineration then it would be estimated that 136,400 cy (169,900 tons) would be shipped off-site out of which 17,900 cy would require incineration.

ii. Comment: There are few facilities in Canada that can accept the waste resulting in a less than competitive market. Thus, the disposal costs that would be incurred in shipping the waste to Canada are very high and were not factored into EPA's evaluation.

EPA Response: The disposal costs estimated in the FS are reasonable and there are not significant cost differences between the US and Canada in terms of costs. The off-site disposal costs used for remedial cost estimating in the FS were based on an estimate from Clean Harbors. Clean Harbors recently revised the incineration unit price down, but also indicated that the original price would be sufficient to manage F020 waste from the Centredale Manor site, even if it had to be shipped to Canada.

iii. Comment: There is no known regional rail loading facility for transportation nor as one been identified

EPA Response: The Massachusetts Transload Facility is located in Worcester, MA and could be used to transfer soil from trucks to rail.

iv. Comment: The Upland CDF alternative is inconsistent with EPA's green remediation policy[14].

[14] A similar comment was made regarding the selected alternative for Source Area soil. This response addresses this comment as well.

EPA Response: EPA's emphasis on green remediation in the Superfund program is mainly directed at evaluating alternative approaches to reduce or mitigate the environmental effects *within the scope of the proposed or selected remedy*. The language quoted from EPA Guidance by the commenter regarding air emissions relates to minimizing emissions *during construction of the selected remedy*. As such, it does not support the commenter's contention that further evaluation is required of EPA for the off-site disposal option.

EPA considers green remediation principles in the Superfund program as a means to enhance remedy protectiveness, not as a disincentive to active remediation processes or an approach that reduces remedy protectiveness. EPA's focus on green remediation is not an overriding criterion in the remedy selection process nor is it used as *a tenth evaluation criterion* as doing so would be inconsistent with CERCLA and the NCP.

Both EPA's Office of Solid Waste and Emergency Response (OSWER) and the Office of Superfund Remediation and Technology Innovation (OSRTI) have issued policy statements with respect to greener remediation. As stated in the OSWER *Principles for Greener Cleanup*[15] (*Principles*):

> These *Principles for Greener Cleanups* are not intended to allow cleanups that do not satisfy threshold requirements for protectiveness, or do not meet other site specific cleanup objectives, to be considered greener cleanup. The Principles are not intended to trade cleanup program objectives for other environmental objectives. Successful green cleanup practices can help achieve cleanup objectives by ensuring protectiveness while decreasing the environmental footprint of the cleanup activity itself.

Greener remediation is not intended in any way to serve as a basis to select less protective, less complete, or less time-effective remedies. Greener remediation does not represent a new criterion beyond the nine NCP remedy evaluation criteria for remedy selection.

[15] Assistant Administrator Mathy Stanislaus of the Office of Solid Waste and Emergency Response (OSWER) issued the "Principles for Greener Cleanups"[15] (*Principles*) on August 27, 2009. The *Principles* encourage all OSWER cleanup programs to consider greener approaches, consistent with existing statutes and regulations, when cleaning up sites. http://www.epa.gov/oswer/greencleanups/principles.html

D. Comment: Emhart's Recommended Approach for the Allendale and Lyman Mill Reach Sediment is Protective, Implementable, and Cost-Effective

i. Comment: Alternatives 10b (Dam Replacement, Excavation, and Disposal in a Nearshore CDF) and 11f (Dam Replacement, Partial Excavation, Isolation Capping and Consolidation) are better approaches than EPA's proposed remedy given the implementation issues identified above.

EPA Response: In evaluating Alternative 10b, EPA has taken into account implementability, protectiveness and cost effectiveness in its decision to retain the Upland CDF as the disposal option for the selected remedy rather than the Nearshore CDF which is a component of Alternative 10b[16]. As discussed above, many of the "implementability" issues identified by the commenter for the Upland CDF also apply to the Nearshore CDF supported by the commenter. Under the Nearshore CDF disposal option, contaminated sediment would remain in the River in perpetuity and may be less reliable in the long term thereby affecting the long-term effectiveness which is a factor in evaluating overall protection. There are also wetlands and floodplain issues with this alternative (meeting ARARs is a threshold requirement). In terms of the dam replacement components of Alternatives 10b and 11f, there was opposition to changing the configuration of the Ponds. Under Alternative 11f, all contaminated sediment would remain in the River in perpetuity and may be less reliable in the long term and rely to a greater extent on Institutional Controls and operation and maintenance in perpetuity thereby affecting long-term effectiveness which is a factor in evaluating overall protection. There are also wetlands and/or floodplain issues with these alternatives (meeting ARARs is a threshold requirement).

7. Allendale Reach Floodplain Soil, General Comments

A. Comment: Alternatives for Allendale Reach Floodplain Soil present the same issues as Allendale and Lyman Mill Reach Sediment.

EPA Response: *See* responses above for Allendale and Lyman Mill Reach Sediment.

[16] Excavation required by this alternative is the same as the excavation component in the selected remedy so EPA agrees with the commenter regarding excavation.

8. Lyman Mill Reach Stream Sediment and Floodplain Soil (Oxbow Area), General Comments

   A. Comment: Alternatives for Lyman Mill Reach Stream Sediment and Floodplain Soil present the same issues as Allendale and Lyman Mill Reach Sediment.

      EPA Response: *See* responses above for Allendale and Lyman Mill Reach Sediment.

   B. Comment: The Falco Street and Assapumpset Brook Floodplain Areas should not be included in the Proposed Lyman Mill Pond Floodplain Cleanup Area.

      EPA Response: Floodplain areas abutting Falco Street are now included in the cleanup area because contaminant concentrations in floodplain soil at this location are above RIDEM's residential direct exposure criteria (DEC) (Antimony is 17 mg/kg compared to 10 mg/kg DEC) and EPA's recommended residential level for soil (Dioxin toxic equivalency [TEQ] is 1,019 ng/kg). EPA's recommended residential level for soil has been replaced by the site-specific cleanup level (see Tech Memo dated May May 2012); dioxin concentrations still exceed this revised cleanup level.

      Floodplain areas abutting Assapumpset Brook provide floodplain habitat to ecological receptors. This area was included in the proposed cleanup area because dioxin and antimony concentrations in floodplain soil at this location are above the cleanup goals developed to protect wildlife.

   C. Comment: EPA's conceptual site model is not sufficient to determine the fate and transport of chemicals into or out of the Oxbow Area because no technical basis is provided for the quantification of deposition rates within the Oxbow Area. This affects evaluation of short term effectiveness and reduction of toxicity, mobility and volume through treatment. *(Fate and transport of chemicals into or out of the Oxbow Area and quantification of deposition rates within the Oxbow Area are discussed in the next response).*

      EPA Response: EPA has fully and accurately evaluated reduction of contaminant toxicity, mobility, or volume through treatment and short-term effectiveness for the Oxbow Area for all alternatives. The commenter states that EPA does not have sufficient information to estimate deposition rates with the Oxbow Area and this resulted in faulty evaluation of these two statutory criteria. As discussed above, the commenter is incorrect that EPA does not have sufficient data to estimate deposition rates.

      Moreover, deposition rates have nothing to do with the reduction of toxicity, mobility or volume through treatment. This evaluation criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances as their principal element. This preference is satisfied when treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, reduction of the total mass of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media. How quickly sediment will be deposited in the Oxbow is unrelated to this criteria.

It is also difficult to see how depositional rates have significant affects on the short term effectiveness criteria. This evaluation criterion addresses the impacts of the alternative during the construction and implementation phase until cleanup goals are reached. Under this criterion, alternatives should be evaluated with respect to impacts on human health and the environment during implementation of the remedial action (e.g. dust during construction activities).

D. Comment: *(Emhart's comments are included within this summary of comments which is repeated from comments provided by the general public from above and the response to the general public is provided again below because it is this response that includes responses to Emhart's comments.)* Several commenters raised concerns regarding the impacts and effectiveness of Alternative 3A for the Oxbow Area floodplain soils and sediment. This alternative relies, in part, on the application a TLC to facilitate natural depositional processes and engineered structures to enhance depositional rates during flood events.

Some commenters were concerned with the approach proposed by EPA that resulted in leaving contamination in-place beneath the TLC. Commenters were concerned that the cover may be less effective than expected by EPA in keeping remaining contamination in-place. In addition, because some contamination will remain in place, this alternative may not be effective in eliminating the threat of downgradient migration during flooding events. This could lead to additional exposure/redistribution of contamination. Other commenters suggested that EPA did not have sufficient information regarding stability of remaining contamination beneath the TLC to support the deposition rates expected by this alternative or to demonstrate that flow diversion could be effective under the conditions at this Site.

Finally, commenters were concerned that application of a TLC in forested wetlands could lead to short term impacts to sensitive habitat greater than expected by EPA. If this were the case, large areas of functional habitat could be impacted. If the proposed alternative did not operate as expected, the commenters were concerned that there could be with minimal risk reduction with significant habitat impacts.

Based on these concerns, some commenters suggested that additional or full excavation be conducted in this area. Others indicated that the No Action alternative should be selected either because of concern that the proposed remedy would not work or that remediation wasn't warranted because they felt that wildlife populations in the Oxbow appear healthy.

EPA Response: As reflected in the comments received and summarized above, the selection of Alternative 3A as the preferred alternative was based upon a number of assumptions and EPA acknowledges that there are uncertainties that need to be further investigated to confirm that this alternative will provide the anticipated benefits. These uncertainties include the following, each of which is discussed in more detail below:

- Spatial extent of ARAR exceedances
- Deposition rate
- Impact of a TLC on vegetation
- Soil stability

Spatial extent of ARAR exceedances. EPA's preferred alternative would involve the use of targeted excavation to remove the top 1 foot of sediment from the stream channel connecting Allendale and Lyman Mill Ponds and the top 1 foot of floodplain soil from areas where contaminant concentrations are in excess of ARARs for residential direct exposure or EPA's proposed dioxin cleanup level of 680 parts per trillion for recreational-use soil. The approximate excavation area and volume are 6.5 acres and 20,500 cy, respectively in the Oxbow Area and other recreational-use areas (based on excavation depth of 1 foot and over-excavation allowance of 0.25 ft; the excavation depth could extend deeper within the vadose zone as necessary to meet ARARs or EPA's dioxin requirements, respectively. Some uncertainty remains regarding the spatial distribution of soil that exceeds cleanup levels and, following further characterization during design, the excavation area/volume could increase if soil sampling identifies additional areas of soil exceedances. Because the remedy targets areas of greatest contamination and those areas where flood waters flows are expected to be the highest, the preferred remedy focuses on both mass removal and the prevention of downgradient contaminant migration.

Deposition rate. The deposition rate is important because receptors could be exposed in the future to contamination remaining in surficial floodplain soil if sufficient deposition does not take place. No site specific information was available to estimate the deposition rate within the Oxbow. However, EPA assumed in the FS that the typical average deposition rate in the Oxbow is 0.048 inches/year; this estimate was derived by assuming that deposition in the Oxbow would be 20 percent of the average rate for Allendale and Lyman Mill Pond (0.24 inches/year based on information collected during the RI at the Site). This assumption is a reasonable one because although deposition processes are episodic rather than continual as in quiescent regions of the ponds, when floodwaters do enter the Oxbow, they normally contain large quantities of suspended particulates that deposit out as the floodwaters migrate laterally and lose energy.

This assumed deposition rate will be further evaluated as part of the engineering analysis that will be conducted to evaluate soil stability. As discussed in the FS, the selected alternative would include the installation of various flow control structures (e.g., diversion wings to divert sediment-laden floodwaters into the Oxbow and baffles to slow the flows and prevent "short-circuiting" of floodwaters through the Oxbow and into Lyman Mill Pond) to increase the annualized deposition rate. An engineering analysis will be conducted during the Final Design phase to determine the specific configurations to maximize project objectives across a range of anticipated flow rates and to confirm that sufficient deposition will occur in this area to reduce exposures as expected.

Impact of TLC on vegetation. The preferred alternative includes application of a TLC to those areas within the footprint that are not excavated. During the preparation of the FS, available information was reviewed concerning the impacts of cover on tree root systems and it was concluded that the selected 3 inch thickness would not likely harm the canopy trees species that reside in the wetter portions of the Oxbow (primarily red maple). The FS discussed a number of actions that could be taken to minimize adverse effects from TLC application including the use of cover material that allows air passage (e.g., sandy loam much preferable to clay) and avoiding compaction of existing soil.

Little information is available on the impacts of a TLC application on herbaceous vegetation or shrub species; however these strata could be restored fairly quickly if the impacts are different than expected. Concerns raised regarding the stability of the TLC are addressed in the next section.

Soil stability. The FS assumes that deposited material within the Oxbow is stable and not subject to substantial erosional forces that could lead to contaminant migration into Lyman Mill Pond during flooding events. EPA recognizes that there is some uncertainty concerning soil stability. However, the addition of baffles within preferred floodwaters flow paths in the Oxbow will be evaluated during the Final Design phase of the project in order to reduce this source of uncertainty. Sediment stability will be increased with design and construction of flow control structures and situated baffles that will increase the amount of the sediment load that is deposited into the Oxbow while minimizing the likelihood that floodwater flows would retain sufficient energy to erode surface soils and transport residual contamination into Lyman Mill Pond. EPA anticipates that hydrodynamic modeling will also be conducted in concert with the engineering analysis to ensure that the engineered structures will function as intended. Hydrodynamic studies conducted over a range of peak flows representative of likely future flood events would provide useful data to support the engineering analysis (i.e., baffle design configuration(s) and placement within the Oxbow) and reduce the uncertainties associated with the soil stability/contaminant migration issue.

EPA believes that there is sufficient flexibility in how these structures are engineered so that both objectives can be achieved with acceptable levels of confidence. However, if the combined engineering and hydrodynamic modeling analysis were unable to reduce the uncertainties related to deposition (and length of time to achieve the desired level of risk reduction) and stability (and risks of downgradient migration), EPA has revised this component of the selected remedy to allow increasing the excavation footprint beyond the area identified. Additional removal[17] may be required by EPA if: (i) the size of area requiring cleanup is increased based upon additional evaluation, (ii) deposition rates are slower than assumed, (iii) engineered structures are less effective at preventing "short-circuiting" of the Oxbow Area than assumed, and (iv) in-place contamination is less stable than assumed in the FS. Additional removal, focusing on those areas that were determined to be least stable (assuming these are identified), would directly reduce overall uncertainties regarding remedy effectiveness. Increases in the excavation footprint will need to consider any additional information that is forthcoming concerning the possible presence of sensitive species in the Oxbow (e.g. vernal pools). Sediment stability will be a particular focus of the long-term monitoring program and evaluated during each scheduled 5-year review.

EPA does not believe taking "no action" in this area is the appropriate response.

E. Comment: EPA acknowledges that the proposed remedy may not operate in the way that EPA models it and that potential recontamination of Lyman Mill Ponds may occur from transport of Oxbow surface soil. This was not taken into account in the evaluation of short-term or long-term effectiveness of the Oxbow remedies or the Lyman Mill Reach sediment remedy.

   EPA Response: This comment is responded to above.

F. Comment: A commenter suggested that the detailed analysis of alternatives was biased because the FS did not include biodegradation processes in the modeling evaluation of the No Action alternative.

   EPA Response: Some clarification is necessary with respect to the comment that EPA's comparative analysis of the Oxbow surface soil alternative was biased because of assumptions regarding contaminant biodegradation were not applied to the No Action alternative. The FS (Appendix M) identified the rate of biodegradation processes in Oxbow floodplain soil as an important factor in the estimate of the time to achieve RAOs and noted that uncertainties related to actual rates were particularly important. In order to bound the effects of these uncertainties, the analyses presented in Appendix M estimated the time to achieve RAOs with and without biodegradation for all alternatives evaluated (i.e., No Action along with Alternatives 3 and 5).

[17] Additional removal would result in a reduction in the proportion of the remedial footprint receiving the TLC and an increase in the excavated area.

As noted in Appendix M, the impact of assuming no biodegradation was much greater on the No Action alternative compared to the two active remedies. The estimated times to achieve the RAOs with and without biodegradation for the No Action Alternative ranged from approximately 12 to over 200 years; whereas, the differences for Alternative 3 (4 and 27 years, respectively) and Alternative 5 (0.5 and 12 years, respectively) were much less. The range of 12 to over 200 years for the No Action alternative was included in Table 6-28 in the Addendum to the Interim Final FS (Battelle, 2011) while the timeframe for Alternatives 3 and 5 was based on the assumption that biodegradation was occurring. Unlike the active remedies which include long-term monitoring and 5 year reviews, there is no mechanism in place to monitor this progress of the No Action alternative to ensure that biodegradation was occurring.

EPA acknowledges that it would have been more appropriate to include the results for the no biodegradation case for the active remedies in Table 6-28 as well. EPA points out that the complete range of timeframes for all alternatives was included in Appendix M and that Appendix M was referenced in Table 6-28. EPA did consider the complete range of timeframes for all alternatives in its analysis of alternatives and in its decision to select Alternative 3. Even though the estimated time to achieve RAOs for the No Action alternative (12 years) would be closer to the timeframes for Alternatives 3 and 5 (4 and 0.5 years, respectively) assuming biodegradation takes place, the No Action Alternative presents other issues that resulted in it not being selected. For example, this alternative includes no actions to address potential downgradient migration of contamination (an important component of the RAO). In addition, there would be no monitoring data to evaluate assumptions regarding the relative deposition rates under this alternative, which is another source of uncertainty.

9. Source Area Soil, General Comments

   A. Comment: EPA Improperly Applies RCRA Closure Requirements.

      i. Comment: In-Place Environmental Media Are Not Waste Subject to RCRA Closure

EPA Response: EPA has applied the RCRA hazardous waste closure requirements correctly at the Source Area. RCRA hazardous waste requirements (including closure requirements) for the treatment, storage, and disposal of hazardous waste (including listed waste) are applicable to a Superfund remedial action if the following conditions are met:

> The waste was initially treated, stored, or disposed of after the effective date of the particular RCRA requirements, or

The activity at the CERCLA site constitutes treatment, storage, or disposal, as defined by RCRA.

RCRA Subtitle C hazardous waste closure requirements were identified by EPA as legal requirements (ARARs) for capping Source Area soil. For Source Area soil, hazardous waste is being covered and closed in place. The activity being conducted under the selected remedy does not constitute treatment, storage, or disposal of a hazardous waste and, therefore, RCRA hazardous waste closure requirements are not applicable.

RCRA requirements that are not applicable may, nonetheless, be relevant and appropriate, based on site-specific circumstances. The determination of relevance and appropriateness of RCRA requirements is based on an evaluation of a variety of factors: the circumstances of the release, the hazardous properties of the waste, its composition and matrix, the characteristics of the site, the nature of the release or threatened release from the site, and the nature and purpose of the requirement itself.

EPA has determined, based upon site specific circumstances, that RCRA closure requirements are relevant and appropriate for Source Area soil that will be capped and remain in place at the Site. This determination was made based upon sampling data that indicate dioxin/furans, PCBs, selected pesticides, SVOCs, metals, and VOCs are present in Source Area soil in some cases at extremely high levels. The nature of this contamination is very similar/identical to contamination that is typically addressed by RCRA's hazardous waste requirements.

In addition, significant levels of PCBs are present in Source Area soil (maximum total PCB concentration is 1,300,000 µg/kg (ppb) or 1,300 mg/kg (ppm). Where Superfund remedial actions leave PCBs in place at these levels, capping consistent with hazardous waste closure requirements is appropriate. (Long-term management controls for PCB-contaminated material generally will also parallel RCRA closures.) Other factors supporting this determination include the fact that EPA's CSM has identified this area as the source of significant contamination in groundwater, the adjacent River and downstream areas. The Source Area is also located in the 100 year floodplain supporting the more robust hazardous cover than would be required for solid (non-hazardous) waste.

a. Comment: EPA is incorrect in concluding contaminated media contain a RCRA F-listed waste. EPA's response on this issue to the NRRB was inadequate.

EPA Response: For the reasons discussed above, EPA believes it has appropriately characterized the soil in the Source Area as RCRA F-listed waste.

b. Comment: EPA is incorrect in concluding that only the RCRA cap alternative for Source Area Soil action area would comply with all ARARs. RCRA does not apply to Site environmental media unless they are removed from the land or the area of contamination. EPA's approval of activities related to replacement of a water line support this position.

EPA Response: As discussed above, EPA has made the determination that RCRA hazardous waste requirements are relevant and appropriate for Source Area soil. That being the case, only Alternative 4 includes a cover designed in accordance with hazardous waste requirements.

EPA's approval of activities related to replacement of the water line is fully consistent with this determination. Waterline activities included excavation of soil surrounding the waterline which was then used as backfill within the areas of excavation once the waterline was replaced. All of these activities took place with an "area of contamination" or AOC. Movement of hazardous waste within an AOC is not considered land disposal and would not trigger LDR requirements or RCRA closure requirements. When determining the applicability of RCRA, the concept of placement is important to consider because placement (and therefore disposal) of hazardous waste is what triggers LDR and closure requirements. Placement does not occur when hazardous waste is consolidated in the AOC, when it is treated in situ, or when it is left in place as is the case with the waterline construction. An AOC is equated to a RCRA land-based unit, therefore, placement occurs and the requirements of LDR and closure are triggered, when waste is moved from one AOC to another AOC or if the waste is managed in another unit within or outside the AOC and then returned to the land

ii. There is an Insufficient Basis to Conclude that Principal Threat Waste is Present at the Site and that RCRA Closure is Required

a. Comment: EPA's identification of all Source Area soil, floodplain soil and pond sediment at the reaches of Allendale and Lyman Mill as PTW resulted in EPA concluding erroneously that RCRA closure requirements apply.

EPA Response: The concepts of principal threat waste (PTW) and RCRA closure are essentially unrelated[18]. As discussed above, the decision to follow hazardous waste closure requirements under RCRA was based upon EPA's review of ARARs for the Site. The decision to require hazardous waste closures is a regulatory decision based upon a review of legal requirements in RCRA's regulations. Closure requirements at the Centredale site are required to be met for material that *does not* require treatment.

PTW, on the other hand, establishes an expectation that significantly contaminated, toxic, and/or mobile source material will be treated and this expectation helps to streamline and focus the RI/FS on appropriate waste management options (treatment). The identification of PTW is site-specific determination that is made when characterizing source material. This determination focuses on specific characteristics of waste at a site and is not directly based upon the regulatory status of the material.

b. Comment: EPA's prior investigations that identified buried abnormalities are not sufficient to identify this material as PTW or to indicate the presence of buried, intact drums of hazardous material that might constitute PTW.

EPA Response: EPA believes there is sufficient information to conclude that PTW is likely present beneath the Source Area. The identification of magnetic anomalies[19] along with evidence of prior disposal activities on the southern end of the Source Area, the nature of prior industrial activity at the Site (chemical manufacturing and drum refurbishing), and the fact that buried drums have been discovered previously within the Source Area[20], support EPA's determination that PTW is likely present in this area of the Site.

EPA agrees with the commenter that additional investigation is appropriate to confirm the presence of PTW.[21] The selected remedy includes a pre-design study to more fully determine the nature and extent of buried material beneath the Source Area. The only way to conclusively determine if this buried material is PTW is by excavation

[18] Of course factors that are looked at in making a PTW determination (e.g. toxicity, mobility, risk to human health or the environment) are also factors that are considered in RCRA's hazardous waste requirements.
[19] Magnetic anomalies are an indication that metal drums may be buried beneath the surface.
[20] During excavation work conducted as part of the construction of Centredale Manor in 1982, approximate 400 buried drums were discovered within the area excavated. Labels on drums indicated that hazardous substances including caustics, halogenated solvents, PCBs, and inks were or had been in these drums. Testing of the contents of the drums indicated elevated levels of BTEX compounds and metals.
[21] EPA also agrees that the PTW determination "should be based on inherent toxicity and consideration of the physical state of the material".

and sampling to determine the inherent toxicity and the physical state of the material. If this investigation determines that buried waste material does not meet the definition of PTW, then this material will remain on-site and not be shipped off-site for treatment and disposal.[22]

The commenter also implies that only intact drums of hazardous material can constitute PTW. There is no support for this in EPA's regulations or Guidance on PTW. Because waste disposal activities at most Superfund sites took place many years ago, deteriorating, partially filled drums and associated contaminated soil are not uncommon. The material remaining in deteriorating drums and associated contaminated soil, depending upon characterization, can well meet the definition of PTW.

c. Comment: If no magnetic anomalies are found after implementing the proposed remedy, CERCLA's preference for treatment would not be satisfied because a magnetic anomaly is not a measure of toxicity, volume, or mobility, and is not an indication of a hazardous substance, pollutant or contaminant.

EPA Response: Magnetic anomalies are not PTW but rather are indications that PTW may be present. As discussed above, if pre-design investigations determine that buried waste material does not meet the definition of PTW, then this material will not be shipped off-site for treatment and disposal. Even if this material does not require treatment, EPA's selected remedy still requires that other PTW (soil/sediment outside the Source Area) be treated to the maximum extent practicable and, therefore, CERCLA's preference for treatment would be satisfied.

d. Comment: In the Addendum, EPA changes its definition of PTW at the Site to include all Source Area soil, floodplain soil and pond sediment at the reaches of Allendale and Lyman Mill. However, EPA provides no basis for characterizing these environmental media as PTW. There is no support for characterizing as PTW all Source Area soil, floodplain soil and pond sediment at the reaches of Allendale and Lyman Mill as other sites have allowed dioxin to remain in place.

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[22] The commenter relies upon EPA guidance *Presumptive Remedy for CERCLA Municipal Landfill Sites* to suggest that because the physical/chemical characteristics of the wastes are unknown, the waste cannot be identified as principal threat waste. The conditions at municipal landfills are different than what are found at this Site. In addition, if subsequent investigations determine that buried waste material does not meet the definition of PTW, then it will not be addressed as PTW.

EPA Response: EPA Guidance defines PTW as follows:

> Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. They included liquids and other highly mobile materials … or materials having high concentrations of toxic compounds. No "threshold level" of toxicity/risk has been established to equate to "principal threat." However, where toxicity and mobility of source material combine to pose a potential risk of 10E-3 or greater, generally treatment alternatives should be evaluated.

Wastes that EPA generally considered principal threats include:

1) Waste contained in drums, lagoons or tanks, containing contaminants of concern.
2) Mobile source material including surface soil or subsurface soil containing high concentrations of that are (or potentially are) mobile due to surface runoff, or sub-surface transport.
3) Highly-toxic source material such as buried drummed non-liquid waste, buried tanks containing non-liquid wastes, or soil containing significant concentrations of highly toxic materials.

The media identified by EPA as PTW fall within these categories. It should be noted that although EPA has identified all Source Area soil (including buried material), floodplain soil and pond sediment as PTW, EPA is only requiring that a small portion of this material be treated (buried waste material at the Source Area (assuming it meets the definition of PTW) and contaminated soil and sediment that exceeds alternative treatment standards for soil/LDR requirements (approximately 10% of this material).

In addition, although the commenter is correct that EPA changed its definition of PTW at the Site to include all Source Area soil, floodplain soil and pond sediment at the reaches of Allendale and Lyman Mill, this did not change EPA's prior determination regarding which waste requires treatment so that in fact this change had no practical effect on the selected remedy.

The commenter also confuses the concept of PTW with whether material can be left in place. Identifying material as PTW merely means that there is a presumption (expectation) under the NCP that treatment of this material is appropriate unless it is not practicable, or otherwise not appropriate to treat (e.g. treatment cannot be safely conducted or no treatment technology is feasible) . PTW can left in place while treated (in situ treatment)[23] or a determination can be made that treatment is not practicable as EPA has done in the case of the vast majority of the waste at the Source Area and at the other areas of the Site.

Finally, the determination of what is PTW is a site-specific one. The commenter points to other sites where contamination remained in place as an indication that the determination made by EPA for this Site is incorrect. Numerous site specific factors go into these determinations as each site presents its own unique characteristics. Here, it is clear based upon site-specific factors that EPA's determination regarding PTW is fully consistent with the NCP and associated guidance.

B. Comment: EPA Errs in Screening Out Remedial Alternative 2

EPA Response: EPA did not err in screening out Alternative 2 as discussed below.

i. Comment: Existing caps are protective of human health and the environment, and RCRA caps would be no more protective than the existing caps

EPA Response: The RCRA caps would be more protective because they would prevent infiltration, would be thicker, more resistant to damage and erosion, and would be more reliable in the long-term. The existing soil caps and upgraded soil caps proposed under Source Area Soil Alternative 3E would allow infiltration of precipitation and floodwater through cap materials. As a result, contaminants could be leached from the soil and transported into groundwater, which would transport contaminants to surface water. RCRA caps include an impermeable membrane, which will prevent infiltration and leaching of contaminants and require minimal maintenance. The existing soil caps have been eroded, but the thicker and stronger RCRA caps would be more robust and resistant to erosion and other damage.

ii. Comment: The long-term protectiveness of the caps was demonstrated following the flood event in March 2010 as no damage to the existing caps occurred.

[23] The Cabot Carbon/Koppers Superfund Site ROD cited by the commenter does require PTW be treated; PTW is just treated in place.

EPA Response: Long-term protectiveness evaluation of the caps is based on various factors, including more than one flood event, during the life of the caps.(*See* previous response re: flooding impacts).

iii. Comment: EPA incorrectly concludes that Alternative 2 would not comply with the ARARs for GB leachability, RCRA or Toxic Substances Control Act (TSCA) closure, residential direct exposure, or EPA's recommended residential level for dioxin in soil.

EP A Response: RIDEM GB leachability standards[24] are not ARARs for the Source Area because they apply to non-drinking water and are, therefore, not appropriate for what is a potential drinking water source under the federal groundwater classification system. (*See* response below). [25] Instead, EPA is relying on the State's GA leachability criteria for Source Area soil.

Regardless of which standards apply, the commenter suggests that EPA could reach a different conclusion regarding leachability by developing site-specific leachability criterion as provided in RIDEM regulations. RIDEM has confirmed that it has not identified this portion of its regulations to EPA as an ARAR. Even if it had been identified, EPA does not believe that this portion of the RIDEM regulations meets the definition of an ARAR as it could be inconsistently applied and is not of "generally applicability."

In addition, the commenter suggested that EPA must perform leachability tests in order to complete the evaluation of whether contaminants have the potential to leach from the soil. This could present additional uncertainty given the variability in the site lithology and depth to groundwater, and the presence of chemical mixtures in the saturated zone. Iit would be difficult to apply point-specific values across the Source Area or even a selected area. A site-specific leachability evaluation was not performed in the FS because it was not a regulatory requirement. Additionally, data collected from multiple investigations at the Source Area revealed widespread groundwater contamination above the ARARs (i.e., Federal MCLs) primarily related to VOCs.

EPA agrees that Alternative 2 may meet Rhode Island's direct exposure criteria if this alternative was revised to address additional areas and some additional upgrade to the caps is conducted

[24] The commenter only discusses leachability criteria for PCBs in its comment and it should be noted that there are several other contaminants at the Source Area that exceed leachability criteria under either the GA or GB standards.

[25] Even if the GB standards were ARARs, Alternative 2 would not meet these requirements because soil contaminant concentrations exceed contaminant concentrations in the Method 1 Soil Objectives specified in Table 2of Rhode Island's *Remediation Regulations.*

RCRA hazardous waste closure standards are ARARs for the Source Area based upon the site-specific conditions found in the Source Area. (*See* responses above for a discussion of how this determination was reached.) As a result, Alternative 2 would not meet these requirements.

The commenter also suggests that the EPA Region 1 PCB Coordinator could make a risk-based determination to allow Source Area soil impacted with PCBs to remain in-place under existing interim caps under TSCA. PCB remediation waste under TSCA is addressed in 40 CFR 761.61. These regulations include provisions for self- implementing measures in 40 CFR 761.61(a) as well provisions for a site specific risk-based disposal approval (40 CFR 761.61(c)) when a variation from the self-implementing requirements for sampling, storage, and/or disposal is sought. Under 761.61(a), PCB remediation waste, as defined at §761.3, must be disposed of based on its existing PCB concentrations. Bulk PCB remediation waste (e.g., soil) may remain in-place on a site at the prescriptive concentrations specified under § 761.61(a)(4)(i). For off-site disposal, PCB remediation waste at concentrations of 50 ppm or greater must be disposed of in a TSCA PCB approved disposal facility; a RCRA hazardous waste landfill.

At this Site, because PCB contaminated soil is left in place at concentrations greater than the prescriptive PCB concentrations specified under §761.61(a)(4)(i), and not being excavated and disposed of off-site , the remediation of PCBs is being conducted under 40 CFR 761.61(c). 40 CFR 761.61(c) allows for a site-specific risk-based determination by the EPA Regional Administrator or his delegate.

This risk-based evaluation was conducted after review of the PCB contamination within the Source Area and the draft approval included in the Proposed Plan (*See* Proposed TSCA Determination in the October 2011 Proposed Plan). An important component of the risk-based determination under § 761.61(c) is that, in keeping with the fact that waste will remain in perpetuity, the proposed remedial action must be undertaken to ensure protection of both human health and the environment for the long-term. As such, a landfill cover should be constructed to minimize infiltration of water and should function with minimum maintenance, and should promote drainage and minimize erosion or abrasion of the cover.[26] Based upon this

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[26] See 761.61(a)(7). (7) *Cap requirements*. Any person designing and constructing a cap must do so in accordance with §264.310(a) of this chapter, and ensure that it complies with the permeability, sieve, liquid limit, and plasticity index parameters in §761.75(b)(1)(ii) through (b)(1)(v). 40 CFR § 264.310 regulates closure and post-closure of hazardous waste landfills and includes the following requirements regarding landfill/cell covers:

> (a) At final closure of the landfill or upon closure of any cell, the owner or operator must cover the landfill or cell with a final cover designed and constructed to:
>
> (1) Provide long-term minimization of migration of liquids through the closed landfill;

review, EPA recommended closure based upon RCRA hazardous waste requirements as hazardous waste closures best provide long term minimization of migration of contaminants, function with minimum maintenance, and promote drainage and minimize erosion or abrasion of the cover.

EPA agrees with commenter that if soils excavated in areas exceeding TSCA requirements for PCBs were consolidated and covered with a RCRA (hazardous waste)/TSCA compliant cap then TSCA requirements would be met. RCRA hazardous waste requirements would not be met for other parts of the Source Area where contamination other than PCBs remains under a non-hazardous waste closure.

C. Comment: EPA retains infeasible alternatives while screening out viable ones because EPA does not adequately or fully consider the short- and long- term human health impacts on the residents of the Brook Village and Centredale Manor apartments of the remedy selected in the PRAP. It would be necessary to relocate the residents of the two apartment buildings during implementation of EPA's selected remedy.

EPA Response: EPA does not agree that relocation of the residents is required or needed to implement the selected Source Control remedy or that the selected remedy would result in greater overall risk to human health due to risks posed to the surrounding community during implementation. The construction work is proposed to be done in phases, each phase similar in scope to the Removal Action implemented by the PRPs at the Brook Village parking lot in the fall of 2009, which included substantial excavation/dewatering and construction a RCRA cap over a portion of the Brook Village parking lot. That work started with pre-construction site preparation activities in mid-August 2009 and was completed with new paving over the parking lot by beginning of November 2009. The soil excavation was done in less than a month during September with the RCRA cap largely installed by mid-October.

Based on the experience during that Removal Action, with successful parking, traffic and building access arrangements for the Brook Village residents (handled without a single complaint as far as EPA knows from the residents), there is no reason to believe that similar site management and controls, including air monitoring, soil management and traffic control, cannot be made for the selected

(2) Function with minimum maintenance;

(3) Promote drainage and minimize erosion or abrasion of the cover;

(4) Accommodate settling and subsidence so that the cover's integrity is maintained; and

(5) Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

Source Area soil alternative implementation. There were also no concerns about temporary disruptions raised by residents of either the Centredale or Brook Village apartment buildings during the public meetings at their facilities held in 2011 and 2012 to explain the proposed cleanup action.

The commenter also cites to EPA's response to the NRRB where EPA stated that full excavation and treatment of all contaminated soil was not supportable given the risks and disruption presented to residents. There is a significant difference in impacts between full excavation (approximately 62,900 cy) and the excavation required under Alternatives 3 (14,300 cy) and 4 (5,500 cy). In addition, while there will be more general construction activity under Alternative 4 related to the hazardous waste cover, these activities involve non-hazardous materials. Finally, detailed monitoring, mitigation and other measures have been included in the ROD to prevent unacceptable impacts.

The commenter also indicates that meeting the requirements for a hazardous waste closure could also pose greater risks to workers or residents and therefore can be waived by EPA. The basis for a waiver does not exist here as protective measures are practicable and for the most part, routinely used as standard practice on these types of construction projects.

i. Comment: FS includes no diagram, such as by means of a cross section, of a RCRA cap relative to the existing buildings, sidewalks and other paved areas. Installation of a RCRA cap likely would result in the final ground surface being raised one to two feet above some of these features, which would be particularly unwieldy.

EPA Response: The 2010 FS includes two cross sections developed in support of Alternative 4E that illustrate placement of a RCRA cap at the Source Area. Figure 5-30b shows the RCRA cap bounded to the west by the Woonasquatucket River and to the east by the steps to the Centredale Manor apartment building. The cross section shows that the top of the RCRA cap is even with the Centredale Manor steps, which could be considered an improvement in that it provides a level entrance to the building.

ii. Comment: West of the Centredale Manor apartment building, the proposed excavation and soil removal remedy is not consistent with the data: there are no data that warrant the removal of soil from this area or the capping of the parking lot area. EPA fails to justify why source area soils that have not been addressed yet need to be covered with an additional clean soil.

EPA Response: We are not clear as to exactly what area commenter is referring to. Assuming we have identified the correct area, this is the explanation as to why additional cover is required:

Boring CMS-433 located in landscape area south of Centredale Manor front steps has PCB concentrations in vadose zone soil at levels above the RIDEM DEC and GA leachability criteria and EPA's recommended residential level (maximum total PCB concentration at CMS-433 is 16 mg/kg in 2-3 ft depth interval; next highest is 6.6 mg/kg in surface 0-1 ft interval). Boring CMS-418 located west of Centredale Manor building, in the south parking lot, has PCB concentrations above these criteria, and above TSCA criteria. See Figure 2-13 from 2011 FS Addendum.

VOC concentrations also exceed the GA leachability criteria at three locations in the Centredale Manor south parking lot (see Figure 2-14, 2011 FS Addendum).Dioxin concentrations throughout this area west of the Centredale Manor building also exceed the site-specific cleanup levels proposed in the Proposed Plan Amendment.

Overall, detected concentrations of a wide suite of contaminants (including VOCs, PCB, SVOCs and metals) in vadose zone soil from this area (area in front of Centredale Manor building and the south parking lot) exceed the soil cleanup levels (which are based on RIDEM DEC and GA leachability criteria) developed in the FS.

10. Source Area Groundwater, General Comments

A. Comment: EPA did not revise its evaluation of remedial alternatives for groundwater to address the change in groundwater classification, the expansion of the area addressed, or the new RAOs. This should have been done because the most recent groundwater data (2002 data) indicate that contaminant concentrations at the point of compliance exceed the newly imposed federal drinking water standards.

EPA Response: The comment is correct that EPA did not revise the Groundwater Alternatives evaluation in its entirety in the September 2011 FS Addendum as that report was completed after the PRPs implemented the 2009 groundwater removal action in an area of Brook Village parking lot which essentially required the construction contemplated by Alternative 2e of the FS report.

The commenter is correct that there is no recent groundwater data at what will be the point of compliance for contaminants other than dioxin and for dioxin, data is only available in the location where the removal action was conducted. Groundwater data collected at the completion of that removal action at the two newly installed monitoring points where the removal action was conducted showed no elevated dioxin levels in groundwater. The commenter is correct that given previous groundwater data, other measures to address groundwater beyond the removal action were necessary. For that reason, rather than exploring additional groundwater alternatives that directly address groundwater, EPA instead elected to indirectly address the remaining groundwater contamination by requiring an impermeable cover in the Source Area which is part of the selected Alternative 4e for the Source Area soil. Sampling to determine compliance with drinking water standards would need to conducted after the impermeable cap is completed to confirm compliance with federal drinking water standards.

B. Comment: Sampling results from the area surrounding the former HCP building do not support the assumption of facilitated transport of dioxin in groundwater.

EPA Response: In prior correspondence, the commenter has raised similar comments that potential mechanisms including cosolvency with other organic solvents present and/or colloidal transport do not support facilitated transport of dioxin in groundwater. While the exact mechanism(s) influencing the facilitated transport is (are) not well defined, the observed elevated levels of dioxin in groundwater and sediment in this area support the facilitated transport of dioxin in groundwater and into the river, which the 2009-2010 time critical removal action performed by the PRPs was designed to address.

Prior to the 2009/2010 time critical removal action, high concentrations of dioxin and chlorinated solvents were detected in groundwater samples from Well MW-05S, located near the former HCP building. Concentrations of tetrachloroethylene in groundwater at Well MW-05S are suggestive of the presence of nonaqueous-phase liquid (NAPL), and a visual inspection of sub-surface soil at one boring near MW-05S revealed a small quantity of greenish NAPL. The presence of NAPL is indicative of a past release at the Site. NAPL can also facilitate transport of contamination in groundwater. A passive vapor diffusion survey identified a plume of VOC-contaminated groundwater discharging to the Woonasquatucket River near and immediately downstream of Well MW-05S.

Supplemental groundwater investigations were performed in 2005 using semi-permeable membrane devices (SPMDs) to determine if there was a potential for VOC contamination to increase dissolved concentrations of dioxin in groundwater, and subsequently mobilize dioxin in the subsurface discharge to the River by the groundwater migration pathway. Results from the investigation showed that the sediment and pore water/groundwater at locations within the plume of VOC-contaminated groundwater discharge have substantially higher dioxin concentrations than other nearby river sediment locations. Furthermore, results from the investigation suggest that the sediments themselves are likely *not* the primary source of the dioxin (legacy contamination) sampled by the buried SPMDs; rather groundwater flowing through the sediments may be a source of dioxin to the SPMDs. Overall, the 2005 investigation suggests that the groundwater plume is likely an ongoing source or migration pathway of dioxin from the Source Area to the Woonasquatucket River.

Another groundwater investigation performed by the PRPs in 2008 confirmed the presence of dioxin in groundwater (in dissolved phase and whole water) sampled along an 85-ft stretch of the eastern bank of the River in the area of the groundwater plume; the highest dioxin concentrations (2,740 pg/L and 6,150 pg/L) were measured in groundwater immediately west and downgradient of Well MW-05S.

In February 2010, the PRPs collected post-construction groundwater samples for dioxin/furan analysis. Dioxin and furans were detected at low levels in the groundwater samples (unfiltered); however, based on a third party review most of the results (including all 2,3,7,8-TCDD results) were qualified as estimates by the validators (LEA, 2010). Estimate results for 2,3,7,8-TCDD ranged from 1.8 pg/L to 6.7 pg/L, which represents a two to three order of magnitude decrease compared to maximum dioxin concentrations measured in groundwater at Well MW-05S (4,144.76 pg/L in 2005) prior to the removal action. Long-term monitoring will be performed to evaluate the continued effectiveness of this removal action.

i. Comment: EPA's statement that "[t]he elevated concentrations of 2,3,7,8-TCDD in adjacent river sediment may reflect legacy contamination from historic site activities, *continuing contributions from contaminated groundwater*, or a combination of the two." FS Report, at 2-19 (emphasis added) is inconsistent with post-removal action groundwater monitoring data.

EPA Response: The April 2010 FS statement reflects groundwater conditions in the area where the removal action was implemented prior to the 2009-2010 PRPs' performance of the groundwater time-critical removal action. The ROD acknowledges the groundwater removal action performed by the PRPs and post-removal groundwater data collected at the area of the removal action**.**

C. Comment: Even if dioxins were previously migrating in groundwater, EPA's removal action is fully protective

EPA Response: EPA recognizes that a source of contamination under the Brook Village parking lot was addressed as part of prior action. No other areas of the Source Area groundwater were addressed by that removal action. The selected long term remedy for groundwater builds on this removal action by requiring additional long term monitoring. This, coupled with the selected remedy for the Source Area soil, which will prevent additional contamination from moving into groundwater, should be sufficient in the long term to address groundwater assuming monitoring confirms contamination is no longer leaving the Source Area. Because of this, EPA elected to incorporate the work done initially as a short term removal action into the selected long term remedy for the groundwater.

D. Comment: EPA identifies federal drinking water standards as ARARs. This is inconsistent with decisions made at other Superfund sites.

- Pownal
- Pine Street
- Atlas Tack

EPA Response: Records of Decision for the three New England sites (Pine Street Canal, Vermont (Sept 1998), Pownal Tannery, Vermont (Sept. 2002), and Atlas Tack Corp., Massachusetts (March 2000), which the commenter suggests are inconsistent with Centredale approach, were issued in states with existing approved Core Comprehensive State Groundwater Protection Program (CSGWPP). Vermont completed its Core CSGWPP in 1998 and EPA approved the Plan on June 6 1998. Similarly, Massachusetts had its Core CSGWPP approved by EPA on September 25, 1995. As a result, groundwater classification decisions at these Sites were consistent with the NCP and guidance. As National Remedy Review Board Recommendations and Region 1 Responses for the Centredale Site noted, the State of Rhode Island has not obtained a CSGWPP approval, so the groundwater classification would default to the federal classification. Only where States have an approved CSGWPP does EPA defer to a State's determination of groundwater uses. Thus, identification of federal drinking water standards as ARARs at Centredale Site is appropriate and consistent with EPA's approach at other sites.

E. Comment: Effect of EPA's Decision to Re-classify Groundwater.

i. Comment: Removal action was designed to address only the shallow groundwater in a limited area and not all the groundwater beneath the Source Area.

EPA Response: The commenter is correct. The time critical removal action was designed to address discharge of elevated levels of dioxin from groundwater into the Woonasquatucket River in one portion of the Source Area) (Brook Village parking lot, near the former HCP building). The Source Area remedy, which includes RCRA cap, is designed to prevent additional movement of remaining contamination to groundwater for the entire Source Area.

With a selected remedy for the Source Area soil including a RCRA Subtitle C cap, it is expected that leaching of contamination would be minimized. The selected remedy for groundwater includes installation of additional monitoring wells and long term monitoring of impacts of the cap on groundwater quality. This long-term monitoring program will establish if there are any exceedances of federal drinking water standards at the edge of the new cap (compliance points at the edge of the waste management unit). In addition, this monitoring will evaluate impacts of the RCRA cap installation on deeper groundwater to determine if additional measures are required.

ii. Comment: Contaminant concentrations exceed drinking water standards at the point of compliance.

EPA Response: The commenter is correct that drinking water standards may still be exceeded at the point of compliance established in the ROD. This was one of the reasons why EPA selected the RCRA cap for the Source Area as it is designed to prevent additional movement of remaining contamination to groundwater for the entire Source Area.

iii. Comment: There is no technical basis for groundwater monitoring requirement at the point of compliance and EPA doesn't explain how it will use this data.

EPA Response: Since the remedy calls for RCRA hazardous waste closure of the Source Area soils[27], groundwater will be monitored in accordance with 40 C.F.R. Part 264 for RCRA closures and the groundwater data will be used to compare with MCLs to evaluate and monitor the integrity and performance of the Source Area closure (RCRA cap).

iv. Comment: EPA should identify the RIDEM GB standards as ARARs or grant an ARAR waiver for the federal drinking water standards and establish alternate concentration.

EPA Response: Groundwater classified as GB in Rhode Island is groundwater which may not be suitable for drinking water use without treatment due to known or presumed degradation. Rhode Island has designated the groundwater at the Source Area as GB. Requirements for GB groundwater are less stringent than the federal requirements for groundwater at the Source Area and are not appropriate for the federal classification of groundwater. As a result, EPA is correct in not identifying the RIDEM GB standards as ARARs for the Source Area.

The NCP states that "EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site." This expectation hinges on the determination of the current or potential use of the groundwater aquifer. The NCP preamble states:

[27] Although the selected remedy calls for a hazardous waste closure, the other closure alternative, essentially a solid waste closure, would also require groundwater monitoring.

> …to the degree that the state or local governments have classified their ground water, EPA will consider these classifications and their applicability to the selection of an appropriate remedy… If a state classification would lead to a less stringent solution than the EPA classification scheme, then the remediation goals will generally be based on EPA classification.

The NCP preamble guides almost all EPA groundwater classification and beneficial use decisions for CERCLA response actions. However, in states that have an EPA-endorsed Comprehensive State Ground Water Protection Program (CSGWPP), greater deference is accorded to States in making groundwater classification determinations as the principles relied upon in having an endorsed CSGWPP are based upon the NCP preamble with respect to the State role. (See *The Role of CSGWPP in EPA Remediation Programs* (April 4, 1997, OSWER Directive 9283.1-09).

Rhode Island does not, however, have an approved CSGWPP. For States that do not have an EPA-endorsed CSGWPP, the Superfund program follows the guidance provided in the NCP Preamble. As a result, EPA made the determination that the groundwater at the Source Area is a potential drinking water source based upon EPA's classification scheme described in *EPA Guidelines for Ground-Water Classification* (December 1986). This long-standing guidance is based upon the language in the NCP preamble and is used to make groundwater classification determinations consistent with the NCP.

EPA Region 1 initially relied upon the RIDEM GB groundwater classification when proposing that groundwater at the Site be classified as Class III: Not a Potential Source of Drinking Water and/or of Limited Beneficial Use. EPA Headquarters review and comments submitted to the Region by the NRRB indicated that the Region's groundwater classification approach was not consistent with the 2009 Office of Solid Waste and Emergency Response (OSWER) Directive 9283.1-33, *Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration* and the *Guidelines for Groundwater Classification under the EPA Ground-Water Protection Strategy* (December 1986) (Groundwater Protection Strategy).

The Region agrees with these comments that our initial determination was incorrect because Rhode Island does not have an approved CSGWPP and therefore the Region should not have looked to the State's classification in making its preliminary determination. Instead, the Region should have evaluated groundwater based upon the classification system in EPA's 1986 Groundwater Protection Strategy.

EPA's Groundwater Protection Strategy classifies groundwater into three classes: Class I: Special Ground-Waters, Class II: Current and Potential Sources of Drinking Water, and Class III: Ground-Waters Not Considered Potential Sources of Drinking Water and of Limited Beneficial Use.

Class III groundwater includes sources that are saline (TDS greater than 10,000 milligrams per liter [mg/L]), or that are so contaminated by naturally occurring conditions or the effects of broad-scale human activity (unrelated to a specific activity) that they cannot be cleaned up using treatment methods reasonably employed in public water supply systems.

None of these conditions applies to groundwater at the Source Area as the groundwater is neither saline nor significantly contaminated by naturally occurring conditions. Groundwater at the Source Area is also not the result of broad-scale human activity (unrelated to a specific activity). Nor is it such that it cannot be cleaned up using treatment methods reasonable employed in public water supply systems. As a result, the groundwater at the Source Area is clearly not Class III groundwater and, therefore is correctly classified as Class IIB groundwater. EPA's decision regarding classification of groundwater as IIB relates only to Source Area groundwater and not to groundwater beyond the Source Area.

The commenter also suggests that EPA waive the federal drinking water standards at the Source Area. CERCLA does have provisions for waiving applicable or relevant and appropriate standards such as federal drinking water standards. However, there is no basis for waiving these requirements based upon the waiver provisions in CERCLA given the situation at the Source Area.

v. Comment: EPA does not explain how its proposed alternative will meet RAOs.

EPA Response: The groundwater remedy in the Source Area will be implemented in conjunction with the RCRA subtitle C closure of the Source Area soils which is designed to address migration of contaminated groundwater with points of compliance set at the edge of the RCRA cap. Institutional controls will be put in place to prevent use of the groundwater beneath the cap. As a result of these actions, drinking water standards will be met at the point of compliance and unacceptable risks addressed by preventing use of the groundwater beneath the cap thereby meeting the RAOs.

vi. Comment: EPA should work with RIDEM to approve a Comprehensive Groundwater Protection Program that would enable EPA's use of RIDEM groundwater protection standards as ARARs.

EPA Response: EPA is happy to work with Rhode Island should the State express interest in having an approved CSGWPP.

11. EPA's Proposed Plan Amendment Is Not Supported by Its Own Data

A. Comment: The extent to which additional cleanup would be required, and the costs thereof, are uncertain and cannot be determined based on the current record. The lateral and vertical extent of contamination present at levels exceeding EPA's proposed cleanup values is simply unknown. Samples collected by EPA during the RI were analyzed using laboratory detection limits well above the numerical values to which EPA now proposes for cleanup. In many instances the newly-proposed cleanup values are below the analytical detection limit utilized by EPA during the Site investigation.

EPA Response: The statement regarding samples and detections limits is not supported by the data used in the 2012 Technical Memorandum. The analytical reporting limits achieved during EPA's Site investigations were sufficiently sensitive to meet the lower cleanup level proposed for dioxin (2,3,7,8-TCDD) in residential-use soil. The Site database has approximately 226 records with concentration results for dioxin (2,3,7,8-TCDD) measured in floodplain residential-use soil samples collected from the eastern shore floodplain at the Allendale and Lyman Mill reaches. Approximately 94% of the records (212 out of 226) have detected concentrations, with approximately half having concentrations below the new lower cleanup level and half having concentrations above the new lower cleanup level (17 ng/kg). Among the 226 records evaluated, approximately 6% (14 out of 226 records) were reported as non-detects, with only 1 of the non-detect records having a sample quantitation limit above the proposed lower cleanup level for dioxin in residential-use soil. The dioxin data associated with these samples were collected prior to and during the conduct of the NTCRA initiated and completed by the PRPs.

The analytical methods and the reporting limits (sample quantitation limits) for the eastern shore residential use soil samples were sufficiently sensitive to allow the risk evaluation that was reported in the Technical Memorandum associated with the Dioxin reassessment. Given the large number of samples, the high frequency of detection of 2,3,7,8-TCDD in those samples (94%), and the high frequency of detected 2,3,7,8-TCDD concentrations greater than the cleanup levels, there are approximately 100 sampling locations where floodplain residential-use soil samples have 2,3,7,8-TCDD concentrations greater than cleanup levels. This information supports the evaluation of human health risks to determine where precautionary actions should be taken to address potential on-going soil exposures prior to additional sampling, analysis, and assessment activities to refine the soil remedial footprint (horizontal and vertical) identified for the eastern shore floodplain soil. The additional data collection and assessment will be conducted as a pre-design activity as specified in the ROD.

Given the CSM, which describes the contamination of floodplain soils through suspension of impacted river sediments, migration of floodwaters to the floodplain, and deposition of impacted sediment particles on the floodplain, there are expected boundaries on the horizontal (floodplain) and vertical (surficial soil – since dioxins do not migrate easily through the soil column) extent of dioxin impacts. The existing data confirm that the expected boundaries are realistic, and further refinement of the boundaries and spatial distribution would likely result in small incremental changes (likely decreases) in volume of soil to be remediated on the eastern shore floodplain compared to the volumes identified in the Amendment to the Proposed Plan.

In summary, the dioxin results used to delineate the potential additional residential areas for cleanup identified in the Proposed Plan Amendment are based on sensitive analytical methods capable of measuring dioxin in soil at levels below the new lower cleanup level. The high frequency of detection and sensitive detection limits indicate that the lower cleanup levels do not introduce additional uncertainty with respect to delineation of the cleanup areas, excavation volumes or cost estimates for residential-use soil.

B. Comment: Short of completely re-performing the RI for the Site, EPA has no choice but to evaluate remedial options that would not entail excavation of dioxin-impacted media to the levels currently proposed by EPA. While the proposed Amendment undoubtedly will alter both the volume of materials requiring cleanup, and the cost thereof, EPA never took those changed circumstances into consideration when it issued the latest iteration of its proposed cleanup plan.

EPA Response: Potential impacts from applying a lower cleanup level for dioxin in residential-use soil and elsewhere at the Site were evaluated in the FS; see Appendix N of the 2010 FS. Specifically, the evaluation considered potential impacts to the RI/FS from utilizing EPA's draft recommended interim PRG for dioxin in soil (72 ng/kg dioxin TEQ), which represented more than an order of magnitude decrease from EPA's 1998 guidance value (1,000 ng/kg dioxin TEQ), and is comparable to the changed circumstances presented in the Proposed Plan Amendment.

The evaluation presented in Appendix N of the 2010 FS assessed potential impacts to the nature and extent of contamination at the Site presented in the RI, as well as quantified potential impacts to the RAOs, cleanup levels, cleanup areas and volumes, remedial alternatives and costs estimates presented in the FS. Overall, the evaluation showed that utilizing EPA's draft recommended interim PRG for dioxin in soil (72 ng/kg compared to 50 ng/kg proposed in the Proposed Plan Amendment) resulted in a lower cleanup level, expanded areas for cleanup and higher remedial costs. The evaluation indicated that the remediation approach (e.g., monitored natural recovery, excavation, capping) would not change from that evaluated in the FS, except that the areas for remediation would be generally larger to encompass areas with dioxin concentrations above the lower cleanup level for residential-use soil. The resultant increase in remediation soil volume was estimated at approximately 8 %. Impacts to the remedial alternative screening and detailed analysis are summarized in Appendix N to the FS (Appendix N). In addition, the decision to excavate soil at individual residential homes is consistent with the NTCRA previously conducted. Finally, based upon professional judgment and practical considerations, excavation is the most typical response away from the source when contamination is on residential parcels.

Following the release of the Dioxin Reanalysis Volume 1 and the publication of the oral RfD for 2,3,7,8-TCDD in the USEPA IRIS (EPA, 2012), additional required evaluations on the risk assessment, PRGs, cleanup levels, cleanup areas and associated costs and residual risk were evaluated. Impacts resulting from these changed conditions are presented in the EPA's May 2012 Technical Memorandum and are generally consistent with evaluations presented in Appendix N to the FS.

12. EPA's Proposed Delineation of Additional Cleanup Areas Does Not Satisfy NCP Requirements

    A. Comment: EPA has included within its delineation of additional cleanup areas at the Site a wide swath of residential use floodplain soils that were never characterized during EPA's RI and never evaluated for potential remediation under EPA's FS.

       EPA Response: Although not mentioned in the comments, these floodplain residential-use areas were subject to the NTCRA performed by the PRPs in 2001-2003. An Engineering Evaluation/Cost Analysis (EE/CA) was performed in 2000 as the basis for a NTCRA. The EE/CA included a streamlined human health risk assessment and screening ecological risk assessment. The streamlined human health risk assessment identified potential risks to residents and recreational users of the pond banks along the Allendale and Lyman Mill Ponds from exposure to Site-related chemicals. Dioxin (2,3,7,8-TCDD) was identified as the primary risk driver, and a policy-based action level of 1,000 ng/kg dioxin TEQ was selected as the recommended starting point for soil cleanups based on a residential exposure scenario. The NTCRA performed by the PRPs included delineation and excavation of contaminated floodplain soils in eleven action areas defined by additional pre-construction sampling on residential properties and recreational access points along Allendale and Lyman Mill Ponds to minimize exposure to Site-related contaminants. Approximately 100 cy of soil were excavated and transported offsite for disposal. Details regarding the NTCRA are contained in an Action Memorandum dated January 18, 2001 (EPA, 2001) and the Completion of

Work Report (LEA, 2005). The Action Memorandum stated that these areas would be re-evaluated as soon as EPA's Dioxin Reassessment is available. EPA's 2012 Technical Memorandum did just this (as discussed above). The memorandum re-evaluated the nature and extent of contamination in soil at Allendale and Lyman Mill reaches with respect to the proposed lower cleanup level, and also evaluated the impacts to the risk assessments, RAOs, PRGs and cleanup levels, cleanup areas, remedial alternatives and remedial alternative cost estimates.

B. Comment: EPA has proposed to expand the areas of the Site requiring remediation to include virtually all soils within the 100-year floodplain. In a number of these proposed expansion areas there is no indication whatsoever that cleanup would actually be required.

EPA Response: As discussed above, the potential additional areas for cleanup were evaluated in EPA's 2010 FS and the 2012 Technical Memorandum. That is, potential impacts to the risk assessment, RAOs, PRGs and cleanup levels, cleanup areas, remedial alternatives and associated costs, and residual risk were evaluated and presented. Given the changing conditions, EPA's Proposed Plan Amendment included precautionary interim measures (e.g., fencing or spreading clean cover) to prevent current exposure to contaminated soil in residential-use areas, additional sampling at residential properties within the 100-year floodplain to augment the existing soil contaminant data in order to refine the identification of representative exposure point concentrations for each of the residential exposure points identified in the May 2012 Technical Memorandum, additional risk assessment activities using more robust exposure assessment to refine the areas requiring remediation (level of contamination is above the dioxin cleanup level and/or above the respective cleanup levels of other Site contaminants). That additional sampling and evaluations (and the residential properties cleanup) are proposed to be done concurrently with the Ponds sediment cleanup to account for potential recontamination of the residential-use properties due to flooding while waiting the final cleanup of the Site which is expected to take a number of years to implement. Results from the additional evaluations may identify areas, currently included within the proposed remedial footprint, where no further action will be required.

C. Comment: It does not appear that EPA has concluded with any reasonable degree of certainty that dioxin-impacted media at concentrations in excess of the EPA proposed cleanup values are even present in this area. EPA itself concedes in the Technical Memorandum that the limited number of adequate Site samples is not sufficient to allow use of the EPA-developed and widely-recognized statistical software ProUCL to calculate a reasonable estimation of the volume of materials that would have to be excavated at the Site under the proposal.

EPA Response: As discussed above, delineation of the potential additional areas for cleanup are based on an evaluation of approximately 226 data records for dioxin (not including additional data records for other Site contaminants). This evaluation clearly showed that dioxin (2,3,7,8-TCDD) concentrations are above the cleanup level for floodplain residential-use soil in approximately 45% of the locations sampled along the eastern shore of Allendale and Lyman Mill Ponds. The observed floodplain contamination is consistent with the Site's CSM, which indicates that contaminated sediment particles from the Ponds are resuspended, transported downstream, and deposited in floodplain areas during times of high water and flooding.

The human health risks were evaluated for individual residential exposure points, typically comprised of one or two residential lots (there are approximately 62 impacted property lots). The individual exposure points are decision units, since they represent locations where individuals/families may reside for prolonged periods of time. While there are large numbers of samples in the eastern shore floodplain area, typically, there are only one to three soil samples per exposure unit. Typically, a minimum of five samples is necessary (and 10 samples are preferred) to allow the ProUCL software to calculate a conservative estimate of the mean concentration within an exposure point. In the absence of five or more samples for an exposure point, the maximum detected concentration is identified as the conservative estimate of exposure potential. When additional sampling and statistical analysis on the new data are conducted as recommended in the Proposed Plan Amendment, the ProUCL software may be utilized to calculate exposure point concentrations for individual exposure points and risks will be calculated based on those exposure point concentrations. The use of maximum detected concentrations given the small number of samples per exposure point is appropriate for recommending precautionary interim actions to prevent current exposures, identifying risk-based PRGs, and identifying a preliminary remedial footprint pending refinement of exposure point concentrations and additional risk assessment activities.

As with any other cleanup area, additional characterization is anticipated during the design, prior to construction, to define the limits of excavation (similar to the NTCRA delineation sampling done by the PRPs in this area prior to excavation in 2002). Because this floodplain area is subject to flooding and change in dioxin levels due to contamination in the Ponds, such characterization and excavation need to be performed concurrently with River sediment remediation to avoid re-contamination and a need for re-sampling and re-excavation. Also it should be noted that data needs to characterize nature and extent of contamination may be different than that used in the risk assessment.

D. Comment: The arbitrariness of EPA's volume estimates is further illustrated when one considers that EPA proposes to reduce the applicable cleanup value by a factor of 20 (from 1,000 ng/kg to 50 ng/kg), but assumes that the volume of material that would have to excavated under the new value would increase by less than 1 percent in most areas (430 cy out of 63,000 cy).

EPA Response: The comment pertains to the volume estimates proposed for Source Area soil. The Source Area is approximately 9 acres and is bounded by the Woonasquatucket River, old mill tailrace, Allendale Pond, and Route 44 on all sides. The majority of this area (7.8 acres out of 9 acres) was proposed for cleanup in the FS based on widespread soil contamination above the cleanup levels for dioxin and other Site contaminants (e.g., PCBs). Areas not proposed for cleanup (approximately 1.2 acres) include the Brook Village and Centredale Manor apartment buildings footprints, as well as some small areas near the entrance to the Source Area (in the vicinity of the Brook Village apartment building) where contaminant levels were below the cleanup levels developed in the FS. Concentrations of dioxin were previously measured in soil at small landscaped uncovered area near the entrance to the Source Area at levels below the previous cleanup level; however, these levels are now above the new lower cleanup level proposed for dioxin in residential-use soil. While the dioxin cleanup level was reduced by a factor of 20, a corresponding 20-fold increase in the cleanup area was not evident simply because the majority of the Source Area soil action area had already been identified for cleanup (7.8 acres) based on geographic conditions (Source Area is basically an island) and the depth to the water table, leaving a much smaller area affected by the new lower cleanup level.

E. Comment: EPA's latest proposal fails to consider whether acquisition of residential properties might be required under the proposal.

EPA Response: As discussed above, the NTCRA performed by the PRPs on some of these residential-use properties excavated the most highly impacted dioxin-contaminated soil above the action level of 1,000 ng/kg. The NTCRA did not evaluate property acquisition, nor did the EE/CA which was the basis of the NTCRA. (The EE/CA evaluated four removal actions, including excavation with or without restoration of Allendale Dam and capping with or without restoration of Allendale Dam.) The NCP expects further remedial actions to be consistent with the removals and for the removal actions to contribute, to the extent practicable, to the efficient performance of any anticipated long-term remedial action (NCP Section 300.415 "Removal actions shall, to the extent practicable, contribute to the efficient performance of any anticipated long-term remedial action with respect to the release concerned"), and as such there is no basis for the assertion in this comment that acquisition of residential properties is required. In addition, no comments were received from affected landowners requesting relocation.

13. EPA May Not Utilize A Postulated Chemical Fingerprint As A Surrogate For Site Delineation

A. Comment: EPA's Technical Memorandum presents the concept of a Site-related dioxin/furan "signature" for floodplain soils at the Site. All of the upstream floodplain soil samples that EPA contends constitute "background" actually were collected by EPA below Greystone Mill Dam, along the Woonasquatucket River.

EPA Response: The term "upstream background" used in the 2012 Technical Memorandum refers to the reach of the Woonasquatucket River located upstream of the Source Area, which includes Greystone Mill Pond, the River and areas along the River (the Greystone Mill Pond reach). Samples collected from this reach of the River are not impacted by Site activities and are expected to reflect regional background conditions.

Floodplain soil samples used to characterize upstream background conditions (in the RI/FS and 2012 Technical Memorandum) were collected upstream from the Source Area, in the reach of the River below Greystone Mill Pond and upgradient of Route 44. These floodplain soil samples were co-located with four earthworm samples collected to characterize background or reference conditions upstream of the site. These floodplain soil samples were designated RWR-FP-5001 through RWR-FP-5004. It is appropriate and scientifically sound to use contaminant data from these samples to represent upstream floodplain soil background conditions and the background signature. Site dioxin sig
nature as described in the RI is determined by the site data and is clearly different than dioxin signature of the upstream background.

14. EPA Failed To Conduct A Site-Specific Risk Assessment In Support Of Its Proposal Contrary To The Requirements Of The NCP and EPA's Own Guidance

    A. Comment: Rather than include in its proposal Site-specific, baseline risk assessments for residential floodplain soils, EPA relies on non-Site-specific and unrealistically high exposure parameters in these areas leading to cleanup values that are not Site-specific and consequently unduly stringent.

    EPA Response: EPA used Risk Assessment Guidance for Superfund and other current EPA risk guidance for risk assessment methodology and standard default exposure values as well as Region 1 procedures in accordance with the NCP to conduct risk assessments for the Site. EPA used both Site-specific information and standard default values in conducting the risk assessments. The receptors, exposure scenarios, contaminants and their concentrations are specific to the Site. Some exposure parameters are based on conservative standard default values and best professional judgment due to lack of Site information. There are no conditions at this Site that would support a deviation from EPA's risk methodology and standard default exposure values. It is required that the risk assessment analyze the current and future potential adverse health effects caused by hazardous substance releases from the Site under conservative conditions and with the assumption of no remedial action. The eastern shore floodplain soils are in areas that are currently in residential use with a need for precautionary measures to prevent exposure to current residents under potentially changing conditions due to flooding from the Ponds where high dioxin concentrations were found in sediment.

B. Comment: EPA's update to its human health risk assessments screens the exposure point concentrations for certain areas of the Site at a 10^{-5} incremental cancer risk level but uses a 10^{-6} target cancer risk level to develop cleanup levels.

EPA Response: The comment appears to mix two concepts: a trigger for taking a Superfund cleanup action and a point of departure for individual compounds in setting cleanup levels. One factor in triggering cleanup is the human health risk assessment. To trigger cleanup based upon cancer risks, the baseline risk assessment generally identifies a risk outside the risk range of 10E-4 to 10E-6. If the risk is within the range, such as 10E-5 for example, it is possible that action may not be triggered (although other factors such as ARARs, ecological risk assessment, and hazard index would also have to be taken into account in deciding whether action is triggered). Once action is triggered, then the point of departure for cleanup level for each identified Site-related carcinogenic contaminant is usually determined in such a way that the residual cumulative risk after the cleanup would remain acceptable and would meet RAOs. For sites with a number of contaminants present, the cleanup level point of departure for each contaminant is usually set at 10E-6 risk. Furthermore, for purposes of this remedial action for floodplain soil, the soil cleanup levels and residual risk have to meet more stringent RAOs of 10E-5 to 10E-6 risk range based on RIDEM regulations.

The decision made for Merino Park at target cancer risk level of 10E-5 and target non-cancer hazard quotient of 2 was based on a removal site criteria (short term removal action), not remedial (final remedy). At sites where contamination is present at 10E-5 and/or hazard quotient of less than 3, EPA Superfund removal program has the discretion to determine that action is not triggered for removal purposes. Merino Park is not part of the long-term remedial action.

15. EPA's Development of Revised Cleanup Values For 2,3,7,8-TCDD and Dioxin At The Site Is Contrary To Its Own Guidance And Without Foundation in Law

A. Comment: In calculating cancer risks and target cleanup levels, EPA errs in its use of a Tier 3 cancer slope factor instead of a Tier 1 reference dose.

EPA Response: USEPA did not "err in the use of a Tier 3 cancer slope factor (CSF) instead of a Tier 1 reference dose" as suggested by the comment. A contaminant must be evaluated for both its cancer and non-cancer health effects, if applicable, in the risk assessment. Dioxin is considered to cause both cancer and non-cancer health effects to those exposed to it. The new dioxin non-cancer RfD is a Tier 1 toxicity value. Hence, applying the RfD as Tier 1 in risk assessment is consistent with EPA's 2003 OSWER Directive 9285.7-53 on the hierarchy of human health toxicity values. For dioxin cancer toxicity values, only Tier 3 values are currently available. Hence, using Tier 3 CSF value for dioxin in the assessment of cancer risk is appropriate at this time. The selection of the non-cancer Tier 1 RfD value and the cancer Tier 3 CSF value for evaluation of non-cancer and cancer risks, respectively, for dioxins/furans in the HHRAs was consistent with EPA's 2003 OSWER Directive 9285.7-53.

The comment seems to suggest that only the RfD (but not the CSF) should be used in deriving PRGs and in developing cleanup goals, seemingly arguing that the Tier 1 RfD negates the need to use a Tier 3 CSF. That suggestion is not accurate. EPA risk assessment guidance and RI/FS guidance require that risk assessments, risk-based PRGs, and cleanup goals consider both non-cancer and cancer risks. It is appropriate for EPA to use the newly published RfD and existing cancer toxicity values for site decisions as laid out in the Agency risk assessment guidance and the toxicity hierarchy approach. Consistent with EPA guidance, both the Tier 1 Reference Dose and the Tier 3 Cancer Slope Factor toxicity values were used to assess risks and to develop health risk-based Preliminary Remediation Goals which then were used, in conjunction with other information, to derive cleanup goals that are protective of both non-cancer and cancer risks.

B. Comment: Although EPA has identified the Integrated Risk Information System ("IRIS") value as the recommended TBC value, there is no legal reason for EPA to change the cleanup values proposed in the October 2011 PRAP.

EPA Response: In order for the remedy to be legally sufficient, it must be protective as well as meet ARARs and TBC requirements. The IRIS value was used to determine the protectiveness of the remedy. The basis for the change in dioxin cleanup level was described in the May 2012 Technical Memorandum (text reproduced below).

> Residential-use soils impacted by dioxins and furans have been addressed at the site by the application of the 1998 USEPA *Approach for Addressing Dioxin in Soil at CERCLA and RCRA Sites*, OSWER Directive 9200.4-26 (USEPA, 1998). That directive indicates that USEPA should generally use 1,000 ng/kg (dioxin TEQ) as a starting point for residential-use soil cleanup levels for CERCLA non-time critical removal sites (and time permitting, for emergency and time critical sites) and as a PRG for remedial sites. The 1998 Directive indicates the cancer risk associated with 1,000 ng/kg dioxin TEQ in residential-use soil is approximately 2.5 x 10^{-4}. Using the recently published oral RfD, the HQ associated with 1,000 ng/kg dioxin TEQ in residential-use soil is approximately 20. Human health risk calculations have not previously been conducted for residential properties associated with the Site as a component of the RI or FS, but residential-use soil risks were evaluated in the risk assessment included in the Engineering Evaluation/Cost Analysis (EE/CA). The 1998 Directive indicates that when the Dioxin Reassessment is completed, the dioxin soil cleanup levels will be revisited. In addition, the *Action Memorandum: Non-Time-Critical Removal Action* (USEPA, 2001a) states the following:

> It is anticipated that following issuance of the final dioxin reassessment report, OSWER will issue guidance, informed by the reassessment effort that will provide a basis for the selection of dioxin cleanup levels. In accordance with the 1998 Guidance, USEPA intends to review the Action Memorandum promptly following the release and analysis of the reassessment report and OSWER guidance, and if necessary, to make changes to the Action memorandum and cleanup actions, based on the information contained in the reassessment report and the OSWER guidance.

The 1998 Directive has been withdrawn by the EPA following the issuance of the new dioxin RfD. The re-evaluation of dioxin risks and cleanup levels at the Site is consistent with its OSWER Directive 9285.7-53 on the hierarchy of human health toxicity values and information provided on the current EPA dioxin website http://epa.gov/superfund/health/contaminants/dioxin/dioxinsoil.html.

16. EPA Failed To Perform Site-Specific Risk Assessment, Resulting In A Legally-Unsupportable Proposed Cleanup Plan

    A. Comment: In its "streamlined approach," EPA erroneously equates the maximum detected concentration of a contaminant of concern on each property with the exposure point concentration for that parcel.

    EPA Response: The streamlined approach did not "erroneously equate the maximum detected concentration of a contaminant of concern on each property with the exposure point concentration for that parcel". As described previously, the human health risks were evaluated for individual residential exposure points, typically comprised of one or two residential lots. The individual exposure points are decision units, since they represent locations where individuals/families may reside for prolonged periods of time. While there are large numbers of samples in the eastern shore floodplain area, typically, there are only one to three soil samples per exposure unit. Typically, a minimum of five samples is necessary (and 10 samples are preferred) to allow the ProUCL software to calculate a conservative estimate of the mean concentration within an exposure point. In the absence of five or more samples for an exposure point, the maximum detected concentration is identified as the conservative estimate of exposure potential. When additional sampling and statistical analysis on the new data are conducted as recommended in the Proposed Plan Amendment, the ProUCL software may be utilized to calculate exposure point concentrations for individual exposure points and risks will be calculated based on those exposure point concentrations. The use of maximum detected concentrations given the small number of samples per exposure point is appropriate for recommending precautionary interim actions, for identifying risk-based PRGs, and for identifying a conceptual remedial footprint pending refinement of exposure point concentrations and additional risk assessment activities.

The risk evaluation for the eastern shore floodplain residential use soils clearly described the use of the maximum reported concentration as the exposure point concentration for each property and explained the rationale for this approach – as well as recommending additional sampling and statistical analysis to augment the existing data. The text from the risk evaluation is reproduced below.

This risk assessment utilizes the available information, and the number of soil samples available for each exposure area is limited. Therefore, the ProUCL software was not used to calculate 95% upper confidence limit (UCLs). In addition, the analytical data associated with the small number of samples for each exposure area may not be fully representative of potential exposures; more sampling may be appropriate to characterize potential exposure/risk. In most cases there are fewer than 4 samples with dioxin data and only one sample with metals, SVOCs, and pesticides data.

B. Comment: In the Technical Memorandum, EPA relied on exposure parameters that EPA termed "site-specific." But the exposure parameters are in some cases not plausible for this region of the country. At other sites within the region, EPA typically has used seasonal adjustments of exposure frequency.

EPA Response: EPA used Risk Assessment Guidance for Superfund and other current EPA risk guidance for risk assessment methodology and standard default exposure values as well as Region 1 procedures in accordance with the NCP to conduct risk assessments for the site. It is required that the risk assessment analyze the current and future potential adverse health effects caused by hazardous substance releases from the site under conservative conditions and with the assumption of no remedial action. Please also note that the eastern shore floodplain soils are in areas that are currently in residential use with a need for precautionary measures to prevent exposure to current residents.

The citation referring to "Cleanup Levels for Removal Actions" for two different sites is not relevant to the exposure assessment and risk assessment related to the proposed Remedial Actions for the Centredale site. In the CERCLA context, Removal Actions and Remedial Actions have distinct objectives and definitions. According to the NCP, the purpose of removal actions generally is to respond to a release or threat of release of hazardous substances, pollutants, or contaminants so as to prevent, minimize, or mitigate harm to human health and the environment. Removals are distinct from remedial actions in that they may mitigate or stabilize the threat rather than comprehensively address all threats at a site, and removal authority is mainly used to respond to emergency, immediate threats, and time-critical situations where long deliberation prior to response is not feasible. The 1999 EPA memorandum cited for the GE Housatonic River Site is for removal, not remedial, actions for potential future residential exposure to soil. The 2010 EPA memorandum cited for Merino Park is for recreational exposure to soil also for potential removal action. At Centredale Site, the exposure parameters used are for the remedial action for current and future residential-use soil. Since the 2002.release of EPA Supplemental Soil Screening Guidance, EPA Region 1 has been typically using the recommended exposure frequency value from the national EPA Guidance in conducting residential risk assessment at Superfund remedial sites. Since there is no recommended standard national value for recreational exposure frequency, Site-specific values are typically developed for recreational scenario.

C. Comment: The Technical Memorandum failed to account for Site-specific bioavailability of dioxins in soil, which is inconsistent with EPA guidance.

EPA Response: EPA did consider site-specific bioavailability of dioxins in soil. Currently available information does not support the assignment of a relative bioavailability value in the absence of actual "site-specific" bioavailability test results.

Relative Bioavailability (RBA) refers to the relative bioavailability of dioxins/furans from ingested soil compared to the bioavailability of dioxins/furans assumed for the media that are the basis of toxicity values. The available information indicates that the relative bioavailability of dioxins/furans is likely less than 1.

The comment suggests an RBA of 0.3 (30%) should be used in the HHRA. However, the May 2011 USEPA *Peer Review Report, Bioavailability of Dioxins and Dioxin-Like Compounds in Soil,* evaluated this issue and reached the following conclusions:

- Each of the reviewers agreed the RBA of dioxin in soils is less than 100%,
- Two of the three reviewers agreed there were insufficient data to support a nationally-applicable value for RBA for use in risk assessments. The reviewer who did not agree recommended assigning a national RBA value less than 100% as a compromise due to the lack of data from a statistically balanced study on dioxins RBA in soil, but did not provide a scientifically defensible basis for doing so.
- Two of the three reviewers agreed that the current literature does not support a preferred animal model for use as an animal bioassay.
- The reviewers identified critical points of clarification that would be required to calculate a nationally applicable RBA.

- The reviewers agreed that the animal models presented in the 2010 report (swine and rat) are appropriate and are commonly used in bioavailability studies, the two models do not produce equivalent results.
- The reviewers agreed that additional studies are required to establish a standard animal protocol to be used to determine a site-specific RBA for dioxin.

The available information indicates that there is not sufficient information to identify, from the literature, an RBA for dioxin in soil to be applied to this Site. The available information also suggests there is not, at this time, a consensus protocol for determining a site-specific RBA for dioxin in soil, nor are such assessments a common practice. In this case when there is no national default value for RBA, a conservative value of 100% is used. Therefore, no revision of the HHRA to address the RBA issue is required at this time.

17. EPA Applied Target Risk Criteria Inconsistently And Arbitrarily In Determining The Need For Cleanup And Selecting Cleanup Levels

A. Comment: EPA applies different target risk levels for different areas of the Site in determining whether remediation is required (Lee Romano Field and vicinity and Merino Park).

EPA Response: EPA consistently applies risk criteria as the basis for cleanup levels in all areas of the site. The comment appears to mix two concepts: the trigger for taking a Superfund cleanup action and the point of departure for individual compounds in setting cleanup levels. One factor in triggering cleanup is the baseline human health risk assessment. To trigger cleanup based upon cancer risk, the baseline risk assessment generally identifies a risk outside the risk range of 10E-4 to 10E-6. If the risk is within the range, such as 10E-5 for example, it is possible that action may not be triggered (although other factors such as ARARs, ecological risk assessment, and hazard index would also have to be taken into account in deciding whether action is triggered). Once action is triggered, then the point of departure for cleanup level for each identified Site-related carcinogenic contaminant is usually determined in such a way that the residual cumulative risk after the cleanup would remain acceptable and would meet RAOs. For sites with a number of contaminants present, the cleanup level point of departure for each contaminant is usually set at 10E-6 risk. Furthermore, for purposes of this remedial action for floodplain soil, the soil cleanup levels and residual risk have to meet more stringent RAOs of 10E-5 to 10E-6 risk range based on RIDEM regulations.

An evaluation of floodplain soil at the Lee Romano Field was conducted and documented in the May 2012 Technical Memorandum. Available soil data were evaluated, mainly for dioxin to address the release of the new dioxin RfD in

February 2012. Dioxin soil data were screened against Site-specific screening levels developed for recreational exposure scenario. The screening indicated that detected dioxin concentrations at the Field were well below acceptable risk-based human health screening levels, within the acceptable risk range, and there was no need to do a further in-depth risk evaluation, thus action was not triggered. The evaluation concluded that soils at and in the vicinity of the Lee Romano Field are not impacted by the Site and need not be considered further.

For Merino Park, EPA developed Site-specific dioxin action level for recreational use in this evaluation, using standard risk methodology, Site-specific information, and standard default exposure values when needed. This was conducted and documented in EPA 2010 memorandum. An evaluation of available soil data at Merino Park against this action level and RIDEM's ARAR indicated that there is no imminent threat to human health or the environment, which would require a removal action. After the release of the new dioxin RfD value in February 2012, available dioxin soil data at Merino Park were re-evaluated against the revised dioxin action level, using the new RfD value. This re-evaluation was documented in EPA 2012 memorandum and concluded that soil dioxin TEQ concentrations collected along the river bank and at Merino Park are below the revised action level and within the acceptable risk range. Future long-term monitoring would be needed, but no short-term action is required.

APPENDIX A

RIDEM LETTER OF CONCURRENCE

RECORD OF DECISION

CENTREDALE MANOR RESTORATION PROJECT
SUPERFUND SITE
NORTH PROVIDENCE, RHODE ISLAND

RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
235 Promenade Street, Providence, RI 02908-5767 TDD 401-222-4462

28 September 2012

Mr. James T. Owens, Director
USEPA – New England, Region 1
Office of Site Remediation and Restoration
5 Post Office Square
Mail Code: OSR
Boston, MA 02109-3912

RE: Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

Dear Mr. Owens.

The Office of Waste Management has conducted a review of the *Record of Decision* (ROD), dated September 2012, for the Centredale Manor Restoration Project Superfund Site (Site) located in North Providence, Rhode Island. The selected remedy the Environmental Protection Agency (EPA) has put forth includes upgrading the current interim caps, removal of contaminated soil and sediment, soil and sediment containment in confined disposal facilities (CDFs), and thin-layer capping in environmentally sensitive areas.

The Department of Environmental Management (the Department) has worked with your Agency and a host of other municipal and federal agencies and other stakeholders, from the early investigatory phases through this important decision milestone. Based on the Department's review of the ROD, we would like to offer our concurrence on this decision. This concurrence is based upon all aspects of the aforementioned ROD being implemented during the design, construction and operation of the remedy in a timely manner.

The Department would like to specifically emphasize the following aspects of the ROD:

- The Department appreciates the EPA's commitment to addressing potential short-term impacts to residents adjacent to the Site that were brought to light following the dioxin reassessment released in February 2012. The Department looks forward to working with EPA in implementing interim measures to ensure every reasonable precautionary action is taken on the impacted residential properties while we await final remedy implementation.

- Source area caps are to be upgraded to RCRA Subtitle C, or equivalent, requirements. The permanency of these caps, and therefore the public health and safety, depend largely on adequate long-term regular maintenance. The operation and maintenance requirements should be well defined, and a consistent, reliable entity should be responsible for performing such requirements. Of particular concern is the Tailrace Area cap, which protects an area of soil and sediment which could become highly mobile if the integrity of that engineered cap were to be compromised.

- Specifically, the Department continues to advocate for a centralized mechanism for Long-Term Stewardship which will lessen the regulatory burden on EPA and RIDEM and ensure permanency of the remedy

- As a great deal of the remediation and disturbance of materials will be within or adjacent to areas of potential flooding, the Department would like to stress that all activities remain sensitive to the potential loss of flood storage. Loss of flood storage capacity, could directly and negatively impact local residents and businesses along the Woonasquatucket River, not only adjacent to the Site, but downstream as well.

- The Department also appreciates EPA's commitment to monitoring downstream areas of potential impact from the Site, using an adaptive management approach. The Department looks forward to coordinating with EPA in these efforts, and seeing the results thereof.

- Community participation is an extremely important to the Department and we believe it to be critical at this Site. We believe public outreach will be a critical part of remedy implementation due to the fact that remediation may be occurring in residents' back yards and in a river used for recreation.

- Finally, the Department urges EPA to take every measure necessary to ensure that the Responsible Parties perform and fund the remedial actions necessary at the Site. The financial burden should be kept off the taxpayers of Rhode Island and be consistent with the long standing notion that the polluter pays to the maximum extent feasible.

The Department looks forward to continued cooperation and working toward our mutual goals of remediating this Site and thanks you for the opportunity to review this important ROD.

If you have any questions please feel free to contact me or Matthew DeStefano of my staff at (401) 222-4700, extensions 2409 and 7141, respectively.

Sincerely,

Janet Coit, Director
Dept. of Environmental Management

cc: T. Gray, Associate Director, RIDEM
L. Hellested, RIDEM OWM
M. DeStefano, RIDEM OWM
L. Maccarone, RIDEM OWM
L. Brill, USEPA OSRR
M. Jasinski, USEPA OSRR
A. Krasko, USEPA OSRR
Mayor Joseph Polisena, Johnston
Mayor Charles Lombardi, North Providence

APPENDIX B

ARARS TABLES

RECORD OF DECISION

CENTREDALE MANOR RESTORATION PROJECT SUPERFUND SITE NORTH PROVIDENCE, RHODE ISLAND

Table B-1. Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) Criteria for the Selected Source Area Soil Remedy (Alternative 4e), Targeted Excavation, Convert to RCRA Caps and Maintain and Disposal and/or Treatment

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Chemical-Specific ARARs			
Federal Requirements			
TSCA PCB Regulations (40 CFR 761)	Applicable	Establishes requirements for PCB-remediation waste	PCBs present in source area soil would be addressed under this alternative
EPA Guidance on Remedial Actions for Superfund Sites with PCB Contamination	TBC	Describes the recommended approach to evaluating and remediating Superfund Sites with PCB contamination	This guidance used when establishing remediation goals for PCB contaminated media and goals established would be met by this alternative.
Guidelines for Carcinogenic Risk Assessment, EPA/630/P-03/001F	TBC	These guidelines provide guidance on conducting risk assessments involving carcinogens	Guidelines used to evaluate all risk assessments on carcinogenicity.
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, EPA/630/R-03/003F	TBC	These guidelines provide guidance on conducting risk assessments involving carcinogens	Guidelines used to evaluate all risk assessments on carcinogenicity in children.
EPA Risk Reference Doses (RfDs)	TBC	RfDs are estimates of a daily exposure concentration that is likely to be without appreciable risk of deleterious effects during a lifetime exposure	RfDs used to characterize human health risks due to non-carcinogens in site media
Human Health Assessment Cancer Slope Factors (CSFs)	TBC	CSFs are estimates of the upper-bound probability of an individual developing cancer as a result of a lifetime exposure to a particular concentration of a potential carcinogen.	CSFs used to compute the individual incremental cancer risk resulting from exposure to carcinogens in site media.
EPA Carcinogenic Assessment Group Potency Factors	TBC	These factors are used to evaluate an acceptable risk from a carcinogen.	Used to evaluate carcinogenicity of dioxin
EPA Health Advisories	TBC	EPA publishes contaminant-specific health advisories that indicate the non-carcinogenic risks associated with consuming contaminated drinking water	Used to establish criteria in the absence of other standards
Chemical-Specific ARARs			
State Requirements			
RIDEM Water Quality Regulations	R & A	Provides water classification for surface waters in Rhode Island and sets ambient water quality criteria for toxic substances and governs water quality impacts associated with site activities	Contributions of contaminants from sediment that could result in exceedances of water quality standards in the Woonasquatucket River will be minimized to the maximum extent practical

Table B-1. (continued)

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Chemical-Specific ARARs (cont)			
State Requirements (cont)			
RIDEM Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (i e., Remediation Regulations)	Applicable R & A	Unless otherwise specified, soil contaminated as a result of a release of hazardous materials shall be remediated in a manner which meets the direct exposure and leachability criteria for each hazardous substance established in Rule 8 02.B (Method 1 Soil Objectives)	Soils at the source area contain contaminants subject to the Rule 8 02B soil objectives and would be addressed under this alternative consistent with state requirements (residential direct exposure criteria applicable) (GA leachability criteria R & A when corresponding federal MCL).
Location-Specific ARARs			
Federal Requirements			
Clean Water Act, Section 404 Guidelines for discharge of dredged or fill material into waters of US (40 CFR Parts 230 and 231, 33 CFR Parts 320-323, and 33 CFR Part 332)	Applicable	Outlines requirements for the discharge of dredged or fill materials into surface waters, including wetlands. Such discharges are not allowed if there are practicable alternatives with less adverse impact.	Excavation/backfill and capping subject to these requirements. Activities must be conducted in accordance with these requirements, including but not limited to mitigation and/or restoration Alternative was evaluated and EPA determined that it is the least damaging practicable alternative
National Historic Preservation Act 16 USC 470 36 CFR Part 800	Applicable	A federal agency must take into account the project's effect on properties included or eligible for inclusion in the National Register of Historic Places.	Work conducted will take into account the project's effect on properties included or eligible for inclusion in the National Register of Historic Places as required under this law.
Archaeological and Historical Preservation Act of 1974 Public Law 93-291	Potentially applicable	When a Federal agency finds, or is notified, that its activities in connection with a Federal construction project may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archeological data, such agency shall notify DOI. Such agency may request DOI to undertake the preservation of such data or it may undertake such activities	If during remedial design or remedial action, it is determined that this alternative may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archaeological data, EPA will notify DOI and comply with these requirements.
Protection of Wetlands (Executive Order 11990)	TBC	Federal agencies are required to avoid adversely impacting wetlands unless there is no practicable alternative and the proposed action includes all practicable measures to minimize harm to wetlands that may result from such use.	Excavation/backfill and capping are subject to these requirements Activities must be conducted in accordance with these requirements.

Table B-1. (continued)

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Location-Specific ARARs (cont)			
Federal Requirements (cont)			
Floodplain Management (Executive Order 11988)	TBC	Federal agencies are required to avoid impacts associated with the occupancy and modification of a floodplain and avoid support of floodplain development wherever there is a practicable alternative	EPA determined that there is no practicable alternative to occupancy and modification of floodplain. Source area soil is located within the 100 year floodplain.
State Requirements			
RIDEM Rules and Regulations for Hazardous Waste Management – Section 8 Location Standards for Hazardous Waste Facilities	R & A	Rhode Island is delegated to administer the federal RCRA statute through its state regulations The standards of 40 CFR 264.18(b) are incorporated by reference Facility located in 100-yr floodplain must be designed, constructed, operated and maintained to prevent washout of any hazardous waste by 100-yr flood, unless demonstrate no adverse effects on human health or environment will result from washout.	Hazardous waste remains in place within the 100-yr floodplain under this alternative. As a result, these requirements must be met for waste that remains. Some principal threat waste is excavated and disposed off site and therefore would not be subject to washout.
Rhode Island Historic Preservation Act – Rhode Island General Laws 42-45 et seq.	Applicable	Regulations that address the project's effect on properties included or eligible for inclusion in the State/National Registers of Historic Places	Will take into account the project's effect on properties included or eligible for inclusion in the National/State Registers of Historic Places in accordance with these requirements.
RIDEM Rules and Regulations Governing the Enforcement of the Freshwater Wetlands Act	Applicable	Sets requirements to prevent the undesirable drainage, excavation, filling, alteration, encroachment, or any other form of disturbance or destruction to a wetland.	Activities required by RIDEM for remediation will be conducted in accordance with these requirements
Action-Specific ARAR			
Federal Requirements			
TSCA PCB Regulations (40 CFR 761)	Applicable	Establishes requirements for PCB-remediation waste.	PCBs present in source area soil will be addressed in accordance with these requirements.

Table B-1. (continued)

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Action-Specific ARAR (cont)			
Federal Requirements (cont)			
Safe Drinking Water Act Maximum Contaminant Levels (MCLs), 40 CFR 141.11-141 13	R & A	The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to Maximum Contaminant Levels Goals (MCLGs) as feasible using the best available treatment technology and taking cost into consideration MCLs are enforceable standards.	MCLs are relevant and appropriate as the groundwater at the Source Area is a potential federal drinking water source. These standards would be used to evaluate the effectiveness of Source Are soil alternatives in reducing/preventing migration of contaminants from soil to groundwater
Safe Drinking Water Act Maximum Contaminant Levels Goals (non-zero MCLGs), 40 CFR 141 50-141.51	R & A	The level of a contaminant in drinking water below which there is no known or expected risk to health MCLGs allow for a margin of safety and are non-enforceable public health goals	Non-zero MCLGs are relevant and appropriate as the groundwater at the Source Area is a potential federal drinking water source These standards would be used to evaluate the effectiveness of Source Area soil alternatives in reducing/preventing migration of contaminants from soil to groundwater
Clean Water Act Federal Water Quality Criteria, Section 304(a) 40 CFR 131 11	Applicable	Ambient Water Quality Criteria (AWQC) are provided by EPA for chemicals for both the protection of human health and the protection of aquatic life.	Excavation/backfill and capping must be conducted so that there are no exceedances of AWQC.
Invasive Species (Executive Order 13112)	TBC	Federal agencies are directed to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause when requiring actions that impact the environment.	Actions will be taken to address invasive species consistent with the Executive Order
State Requirements			
RIDEM Rules and Regulations for Hazardous Waste Management Identification and Listing of Hazardous Wastes	Applicable	Rhode Island is delegated to administer the federal RCRA statute through its regulations The standards of 40 Part 261 of RCRA are incorporated by reference Sets forth requirements for hazardous waste determination according to federal (40 CFR 262 11) and RI State (Rule 5 8) definitions	Will be used to determine appropriate treatment and disposal.

Table B-1. (continued)

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Action-Specific ARARs (cont)			
State Requirements (cont)			
RIDEM Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (i.e., Remediation Regulations), Section 8 0 (Risk Management)	Applicable	This section regulates impacted media at contaminated sites	This section was used to develop cleanup goals for the site This alternative meets this requirement.
RIDEM Rules and Regulations for Hazardous Waste Management, Section 8 – Operation Requirements for Treatment, Storage, and Disposal Facilities	R & A	Outlines operational requirements for all hazardous waste treatment, storage, and disposal facilities, including general waste analyses, security procedures, inspections, safety, groundwater monitoring etc. Sets design, construction, and operational requirements for hazardous waste containers and tanks, and closure requirements for hazardous waste facilities	Substantive requirements related to land disposal/closure, etc. must be met.
RIDEM Rules and Regulations for Hazardous Waste Management, Section 8 – Land Disposal Facilities	R & A	Outlines design, operational, and closure requirements for land disposal facilities	This alternative will meet the substantive requirements related to land disposal/closure, etc
RIDEM Water Quality Regulations	Applicable	Provides water classification for surface waters in Rhode Island and sets ambient water quality criteria for toxic substances and governs water quality impacts associated with site activities	Excavation and capping must be conducted so that there are no exceedances of water quality standards.
RI Air Pollution Control Regulation #1. Visible Emissions	Applicable	Establishes opacity limitations for contaminant emissions	Remediation will be conducted to meet the standards for visible emissions.
RI Air Pollution Control Regulation #5: Fugitive Dust	Applicable	Requires that reasonable precaution be taken to prevent particulate matter from becoming airborne.	Actions will be taken to prevent particulate matter from becoming airborne in accordance with these regulations.
RI Air Pollution Control Regulation #7 Emissions Detrimental to Persons or Property	Applicable	Prohibits emissions of contaminants which may be injurious to human, plant, or animal life or cause damage to property or which unreasonably interfere with the enjoyment of life and property.	Any potential emissions subject to these requirements will meet these standards

Key.
R & A – Relevant and Appropriate, TBC – To Be Considered

Table B-2. Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) Criteria for the Selected Source Area Groundwater Remedy (Alternative 2e), Excavation/Dewatering

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Chemical-Specific ARARs			
Federal Requirements			
Safe Drinking Water Act Maximum Contaminant Levels (MCLs), 40 CFR 141 11-141 13	R & A	The highest level of a contaminant that is allowed in drinking water MCLs are set as close to Maximum Contaminant Levels Goals (MCLGs) as feasible using the best available treatment technology and taking cost into consideration MCLs are enforceable standards.	MCLs are relevant and appropriate as the groundwater at the Source Area is a potential federal drinking water source. These standards met by this alternative if combined with additional source controls measures to address the Source Area
Safe Drinking Water Act Maximum Contaminant Levels Goals (non-zero MCLGs), 40 CFR 141 50-141.51	R & A	The level of a contaminant in drinking water below which there is no known or expected risk to health MCLGs allow for a margin of safety and are non-enforceable public health goals	Non-zero MCLGs are relevant and appropriate as the groundwater at the Source Area is a potential federal drinking water source These standards met by this alternative if combined with additional source controls measures to address the Source Area.
Clean Water Act Federal Water Quality Criteria, Section 304(a) 40 CFR 131 11	R & A	Ambient Water Quality Criteria (AWOC) are provided by EPA for chemicals for both the protection of human health and the protection of aquatic life.	Contaminants that could result in exceedances of AWQC in Woonasquatucket River will be minimized to the maximum extent practical.
State Requirements			
RIDEM Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (i e , Remediation Regulations)	Applicable	Groundwater objectives established in Rule 8.03 provide groundwater cleanup criteria.	Groundwater beyond the Source Area contains contaminants subject to the Rule 8 03 GB groundwater objectives and would be addressed under this alternative consistent with state requirements. Contaminated soil that exceed GA leachability criteria in Rule 8.02 included under the Source Area Soil remedy

Table B-2. (continued)

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Chemical-Specific ARARs (cont)			
State Requirements (cont)			
RIDEM Water Quality Regulations	R & A	Provides water classification for surface waters in Rhode Island and sets water quality standards	Contaminants that could result in exceedances of water quality standards in Woonasquatucket River will be minimized to the maximum extent practical.
Location-Specific ARARs			
Federal Requirements			
Clean Water Act, Section 404 Guidelines for discharge of dredged or fill material into waters of US (40 CFR Parts 230 and 231, 33 CFR Parts 320-323, and 33 CFR Part 332)	Applicable	Outlines requirements for the discharge of dredged or fill materials into surface waters, including wetlands. Such discharges are not allowed if there are practicable alternatives with less adverse impact. Sets standards for restoration and mitigation required as a result of unavoidable impacts to aquatic resources	Excavation/backfill, dewatering, capping, and sheet pile wall are subject to these requirements. Activities must be conducted in accordance with these requirements, including but not limited to mitigation and/or restoration. Alternative was evaluated and determined by EPA to be the least damaging practicable alternative.
Rivers and Harbors Act Section 10 (33 U.S C Section 403)	Applicable	Sets forth criteria for placing dams/structures in navigable waters of the U S	Coffer dam and sheet pile wall subject to these requirements Activities must be conducted in accordance with these requirements
Protection of Wetlands (Executive Order 11990)	TBC	Federal agencies are required to avoid adversely impacting wetlands unless there is no practicable alternative and the proposed action includes all practicable measures to minimize harm to wetlands that may result from such use.	Excavation/backfill, sheet pile wall, dewatering, and capping are subject to these requirements. Activities must be conducted in accordance with these requirements
State Requirement			
RIDEM Rules and Regulations Governing the Enforcement of the Freshwater Wetlands Act	Applicable	Sets requirements to prevent the undesirable drainage, excavation, filling, alteration, encroachment, or any other form of disturbance or destruction to a wetland	Some riverbank wetland resource areas are located within the site boundaries. Activities must be conducted in accordance with Rule 6.08

Table B-2. (continued)

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Action-Specific ARARs			
Federal Requirements			
Clean Water Act Federal Water Quality Criteria, Section 304(a) 40 CFR 131 11	Applicable	Ambient Water Quality Criteria (AWQC) are provided by EPA for chemicals for both the protection of human health and the protection of aquatic life.	Excavation/backfill, dewatering, sheet pile wall, and capping must be conducted so that there are no exceedances of AWQC
State Requirements			
RIDEM Regulations for the Rhode Island Pollutant Discharge Elimination System (RIPDES)	Applicable	Contains discharge limitations, monitoring requirements, and best management practices applicable to discharges to navigable waters.	Remediation activities require discharge of water to the Woonasquatucket River as a result of extracting groundwater or dewatering an excavation. Discharge of treated groundwater to river must meet substantive requirements.
RIDEM Water Quality Regulations	R & A	Provides water classification for surface waters in Rhode Island and sets ambient water quality criteria for toxic substances and governs water quality impacts associated with site activities	Excavation/backfill, dewatering, sheet pile wall, and capping must be conducted so that there are no exceedances of water quality standards.
RIDEM Rules and Regulations for Groundwater Quality, 5/06	Applicable	Establishes construction standards for permanent monitoring wells and abandonment procedures (Appendix 1)	Monitoring wells must comply with these standards
RIDEM Rules and Regulations for Hazardous Waste Management Identification and Listing of Hazardous Wastes	Applicable	Rhode Island is delegated to administer the federal RCRA statute through its regulations The standards of 40 Part 261 of RCRA are incorporated by reference Sets forth requirements for hazardous waste determination according to federal (40 CFR 262 11) and RI State (Rule 5 08) definitions	Material generated by excavation must undergo hazardous waste determination to determine appropriate treatment and disposal. .
RIDEM Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (i e., Remediation Regulations), Section 8.0 (Risk Management)	Applicable	This section regulates impacted media at contaminated sites	This section was used to develop cleanup goals for the site This alternative meets these requirements

Table B-2. (continued)

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Action-Specific ARARs(cont)			
State Requirements (cont)			
RIDEM Rules and Regulations for Hazardous Waste Management, Section 8 – Operation Requirements for Treatment, Storage, and Disposal Facilities	Applicable	Outlines operational requirements for all hazardous waste treatment, storage, and disposal facilities, including general waste analyses, security procedures, inspections, safety, groundwater monitoring etc. Sets design, construction, and operational requirements for hazardous waste containers and tanks, and closure requirements for hazardous waste facilities.	Substantive requirements related to excavated material and closure must be met. Groundwater monitoring to be conducted in accordance with these requirements.
RI Air Pollution Control Regulation #1· Visible Emissions	Applicable	Establishes opacity limitations for contaminant emissions	Remediation to be conducted to meet the standards for visible emissions
RI Air Pollution Control Regulation #5 Fugitive Dust	Applicable	Requires that reasonable precaution be taken to prevent particulate matter from becoming airborne	Actions taken to prevent particulate matter from becoming airborne in accordance with these regulations.
RI Air Pollution Control Regulation #7 Emissions Detrimental to Persons or Property	Applicable	Prohibits emissions of contaminants which may be injurious to human, plant, or animal life or cause damage to property or which unreasonably interfere with the enjoyment of life and property	Any potential emissions subject to these requirements to meet these standards

Key:
R & A – Relevant and Appropriate, TBC – To Be Considered

Table B-3. Potential Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) Criteria for the Selected Allendale and Lyman Mill Sediment Remedy (Alternative 7a), Excavation and Disposal and/or Treatment

Requirement	Status	Synopsis	Action to be Taken to Attain Requirement
Chemical-Specific ARARs			
Federal Requirements			
Clean Water Act Federal Water Quality Criteria, Section 304(a) 40 CFR 131 11	R & A	Ambient Water Quality Criteria (AWQC) are provided by EPA for chemicals for both the protection of human health and the protection of aquatic life.	Contaminants that could result in exceedances of AWQC in the Woonasquatucket River will be minimized to the maximum extent practical.
Guidelines for Carcinogenic Risk Assessment, EPA/630/P-03/001F	TBC	These guidelines provide guidance on conducting risk assessments involving carcinogens	Guidelines used to evaluate all risk assessments on carcinogenicity.
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, EPA/630/R-03/003F	TBC	These guidelines provide guidance on conducting risk assessments involving carcinogens	Guidelines used to evaluate all risk assessments on carcinogenicity in children
EPA Risk Reference Doses (RfDs)	TBC	RfDs are estimates of a daily exposure concentration that is likely to be without appreciable risk of deleterious effects during a lifetime exposure.	RfDs used to characterize human health risks due to non-carcinogens in site media
Human Health Assessment Cancer Slope Factors (CSFs)	TBC	CSFs are estimates of the upper-bound probability of an individual developing cancer as a result of a lifetime exposure to a particular concentration of a potential carcinogen.	CSFs used to compute the individual incremental cancer risk resulting from exposure to carcinogens in site media.
EPA Carcinogenic Assessment Group Potency Factors	TBC	These factors are used to evaluate an acceptable risk from a carcinogen	Used to evaluate carcinogenicity of dioxin
EPA Health Advisories	TBC	EPA publishes contaminant-specific health advisories that indicate the non-carcinogenic risks associated with consuming contaminated drinking water	Health Advisories used to establish criteria in the absence of other standards.
State Requirements			
RIDEM Water Quality Regulations	R & A	Provides water classification for surface waters in Rhode Island and sets ambient water quality criteria for toxic substances and governs water quality impacts associated with site activities	Contributions of contaminants from sediment that could result in exceedances of water quality standards in the Woonasquatucket River will be minimized to the maximum extent practical.

Table B-3. (continued)

Requirement	Status	Synopsis	Action to be Taken to Attain Requirement
Location-Specific ARARs			
Federal Requirements			
Fish and Wildlife Coordination Act 16 U.S.C. 661, Fish and Wildlife Protection (40 CFR Section 6 302(g))	Applicable	Requires that a federal agency take action to prevent, mitigate, or compensate for project-related losses of fish and wildlife resources Encourages that any federal agency proposing to modify a body of water to consult with the U S Fish and Wildlife Service, National Marine Fisheries Service, and other related state agencies.	Construction activities under this alternative in the Woonasquatucket River are subject to these requirements. Actions will be taken in accordance with these requirements
Clean Water Act, Section 404 Guidelines for discharge of dredged or fill material into waters of US (40 CFR Parts 230 and 231, 33 CFR Parts 320-323, and 33 CFR Part 332)	Applicable	Outlines requirements for the discharge of dredged or fill materials into surface waters, including wetlands. Such discharges are not allowed if there are practicable alternatives with less adverse impact. Sets standards for restoration and mitigation required as a result of unavoidable impacts to aquatic resources.	Excavation, thin cover, and dewatering, (and potentially upland CDF) subject to these requirements Activities must be conducted in accordance with these requirements including but not limited to mitigation and/or restoration. This alternative was evaluated and EPA determined that it is the least damaging practicable alternative
Rivers and Harbors Act Section 10 (33 U S C. Section 403)	Applicable	Sets forth criteria for placing dams/structures in navigable waters of the U.S.	Thin cover subject to these requirements Activities must be conducted in accordance with these requirements.
Archaeological and Historical Preservation Act of 1974 Public Law 93-291	Potentially applicable	When a Federal agency finds, or is notified, that its activities in connection with a Federal construction project may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archeological data, such agency shall notify DOI Such agency may request DOI to undertake the preservation of such data or it may undertake such activities	If during remedial design or remedial action, it is determined that this alternative may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archaeological data, EPA will notify DOI and comply with these requirements.
Protection of Wetlands (Executive Order 11990)	TBC	Federal agencies are required to avoid adversely impacting wetlands unless there is no practicable alternative and the proposed action includes all practicable measures to minimize harm to wetlands that may result from such use.	An upland CDF containing wetlands can only be selected if there is no practicable alternative to destruction of wetlands.

Table B-3. (continued)

Requirement	Status	Synopsis	Action to be Taken to Attain Requirement
***Location-Specific ARARs* (cont)**			
Federal Requirements (cont)			
National Historic Preservation Act 16 USC 470 36 CFR Part 800	Applicable	A federal agency must take into account the project's effect on properties included or eligible for inclusion in the National Register of Historic Places	Work conducted will take into account the project's effect on properties included or eligible for inclusion in the National Register of Historic Places as required under this law
State Requirements			
Rhode Island Historic Preservation Act – Rhode Island General Laws 42-45 et seq.	Applicable	Regulations that address the project's effect on properties included or eligible for inclusion in the State/National Registers of Historic Places	Will take into account the project's effect on properties included or eligible for inclusion in the National/State Registers of Historic Places in accordance with these requirements.
RIDEM Rules and Regulations Governing the Enforcement of the Freshwater Wetlands Act	Applicable	Sets requirements to prevent the undesirable drainage, excavation, filling, alteration, encroachment, or any other form of disturbance or destruction to a wetland.	Activities required by RIDEM for remediation will be conducted in accordance with these requirements.
Action-Specific ARARs			
Federal Requirements			
Clean Water Act Federal Water Quality Criteria, Section 304(a) 40 CFR 131.11	Applicable	Ambient Water Quality Criteria (AWQC) are provided by EPA for chemicals for both the protection of human health and the protection of aquatic life	Excavation, dewatering, and thin cover must be conducted so that there are no exceedances of AWQC
RCRA (40 CFR 264, Subpart CC)	Applicable	Air emission standards for tanks, surface impoundments, and containers used to manage hazardous waste. Emission controls required if tanks, surface impoundments, and containers used to manage hazardous waste have greater than 500 ppmw of volatile organics	If tanks, surface impoundments, and containers used to manage hazardous waste have greater than 500 ppmw of volatile organics then these requirements will be met
RCRA Land Disposal Restrictions (40 CFR 268)	Applicable	These regulations identify treatment standards for hazardous wastes and specify requirements that generators, transporters, and owners or operators of treatment, storage, and disposal facilities that manage restricted wastes destined for land disposal must meet	Material subject to these regulations placed in upland CDF must be treated to meet these requirements

Table B-3. (continued)

Requirement	Status	Synopsis	Action to be Taken to Attain Requirement
Action-Specific ARARs (cont)			
Federal Requirements (cont)			
Invasive Species (Executive Order 13112)	TBC	Federal agencies are directed to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause when requiring actions that impact the environment.	Actions will be taken to address invasive species consistent with the Executive Order.
State Requirements			
RIDEM Rules and Regulations for Hazardous Waste Management Identification and Listing of Hazardous Wastes	Applicable	Rhode Island is delegated to administer the federal RCRA statute through its regulations The standards of 40 Part 261 of RCRA are incorporated by reference Sets forth requirements for hazardous waste determination according to federal (40 CFR 262 11) and RI State (Rule 5 8) definitions.	Used to determine appropriate disposal for contaminated sediment
RIDEM Rules and Regulations for Hazardous Waste Management, Section 8 – Operation Requirements for Treatment, Storage, and Disposal Facilities	Applicable	Outlines operational requirements for all hazardous waste treatment, storage, and disposal facilities, including general waste analyses, security procedures, inspections, safety, groundwater monitoring etc Sets design, construction, and operational requirements for hazardous waste containers and tanks, and closure requirements for hazardous waste facilities	Substantive requirements related to land disposal, closure, etc must be met
RIDEM Rules and Regulations for Hazardous Waste Management, Section 8 – Land Disposal Facilities	Applicable	Outlines design, operational, and closure requirements for land disposal facilities	Substantive requirements related to land disposal, closure, etc must be met for upland CDF.
RIDEM Water Quality Regulations	Applicable	Provides water classification for surface waters in Rhode Island and sets ambient water quality criteria for toxic substances and governs water quality impacts associated with site activities.	Excavation, thin cover, and dewatering (discharge of dredged return water) must be conducted so that there are no exceedances of water quality standards
RIDEM Regulations for the Rhode Island Pollutant Discharge Elimination System (RIPDES)	Applicable	Contains discharge limitations, monitoring requirements, and best management practices applicable to discharges to navigable waters.	Remediation activities require discharge of water to the Woonasquatucket River as a result of extracting groundwater or dewatering an excavation. Discharge of treated groundwater to river must meet substantive requirements.
RI Air Pollution Control Regulation #1 Visible Emissions	Applicable	Establishes opacity limitations for contaminant emissions	Remediation will be conducted to meet the standards for visible emissions.

Table B-3. (continued)

Requirement	Status	Synopsis	Action to be Taken to Attain Requirement
***Action-Specific ARARs* (cont)**			
State Requirements (cont)			
RI Air Pollution Control Regulation #5 Fugitive Dust	Applicable	Requires that reasonable precaution be taken to prevent particulate matter from becoming airborne	Actions will be taken to prevent particulate matter from becoming airborne in accordance with these regulations
RI Air Pollution Control Regulation #7 Emissions Detrimental to Persons or Property	Applicable	Prohibits emissions of contaminants which may be injurious to human, plant, or animal life or cause damage to property or which unreasonably interfere with the enjoyment of life and property	Any potential emissions subject to these requirements will meet these standards

Key
R & A – Relevant and Appropriate; TBC – To Be Considered

Table B-4. Potential Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) Criteria for the Selected Allendale Floodplain Soil Remedy (Alternative 5a), Excavation and Disposal and/or Treatment

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Chemical-Specific ARARs			
Federal Requirements			
Clean Water Act Federal Water Quality Criteria, Section 304(a) 40 CFR 131.11	R & A	Ambient Water Quality Criteria (AWOC) are provided by EPA for chemicals for both the protection of human health and the protection of aquatic life.	Contaminants from floodplain soil that could result in exceedances of AWQC in Woonasquatucket River will be minimized to the maximum extent practical
Guidelines for Carcinogenic Risk Assessment, EPA/630/P-03/001F	TBC	These guidelines provide guidance on conducting risk assessments involving carcinogens	Guidelines used to evaluate all risk assessments on carcinogenicity
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, EPA/630/R-03/003F	TBC	These guidelines provide guidance on conducting risk assessments involving carcinogens	Guidelines used to evaluate all risk assessments on carcinogenicity in children
EPA Risk Reference Doses (RfDs)	TBC	RfDs are estimates of a daily exposure concentration that is likely to be without appreciable risk of deleterious effects during a lifetime exposure	RfDs used to characterize human health risks due to non-carcinogens in site media.
Human Health Assessment Cancer Slope Factors (CSFs)	TBC	CSFs are estimates of the upper-bound probability of an individual developing cancer as a result of a lifetime exposure to a particular concentration of a potential carcinogen	CSFs used to compute the individual incremental cancer risk resulting from exposure to carcinogens in site media
EPA Carcinogenic Assessment Group Potency Factors	TBC	These factors are used to evaluate an acceptable risk from a carcinogen	Used to evaluate carcinogenicity of dioxin.
EPA Health Advisories	TBC	EPA publishes contaminant-specific health advisories that indicate the non-carcinogenic risks associated with consuming contaminated drinking water	Used to establish criteria in the absence of other standards
State Requirements			
RIDEM Water Quality Regulations	R & A	Provides water classification for surface waters in Rhode Island and sets ambient water quality criteria for toxic substances and governs water quality impacts associated with site activities	Contributions of contaminants from sediment that could result in exceedances of water quality standards in the Woonasquatucket River will be minimized to the maximum extent practical

Table B-4. (continued)

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Chemical-Specific ARARs (cont)			
State Requirements (cont)			
RIDEM Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (i e., Remediation Regulations)	Applicable	Unless otherwise specified, soil contaminated as a result of a release of hazardous materials shall be remediated in a manner which meets the direct exposure and leachability criteria for each hazardous substance established in Rule 8 02 B (Method 1 Soil Objectives)	Some residential use soils at the site contain contaminants subject to the Rule 8.02B soil objectives and would be addressed under this alternative consistent with state requirements.
Location-Specific ARARs			
Federal Requirements			
Fish and Wildlife Coordination Act 16 U S.C. 661, Fish and Wildlife Protection (40 CFR Section 6 302(g))	Applicable	Requires that a federal agency take action to prevent, mitigate, or compensate for project-related losses of fish and wildlife resources. Encourages that any federal agency proposing to modify a body of water to consult with the U S Fish and Wildlife Service, National Marine Fisheries Service, and other related state agencies	Construction activities under this alternative in the Woonasquatucket River are subject to these requirements. Actions will be taken in accordance with these requirements.
Clean Water Act, Section 404 Guidelines for discharge of dredged or fill material into waters of US (40 CFR Parts 230 and 231, 33 CFR Parts 320-323, and 33 CFR Part 332)	Applicable	Outlines requirements for the discharge of dredged or fill materials into surface waters, including wetlands Such discharges are not allowed if there are practicable alternatives with less adverse impact Sets standards for restoration and mitigation required as a result of unavoidable impacts to aquatic resources	Excavation and placement of backfill, (and potentially upland CDF) subject to these requirements Activities must be conducted in accordance with these requirements, including but not limited to mitigation and/or restoration Alternative was evaluated and EPA determined it to be the least damaging practicable alternative
Rivers and Harbors Act Section 10 (33 U S C Section 403)	Applicable	Sets forth criteria for placing dams/structures in navigable waters of the U S.	Lyman Mill dam modifications during construction subject to these requirements Activities must be conducted in accordance with these requirements
Protection of Wetlands (Executive Order 11990)	TBC	Federal agencies are required to avoid adversely impacting wetlands unless there is no practicable alternative and the proposed action includes all practicable measures to minimize harm to wetlands that may result from such use.	Excavation and placement of backfill, (and potentially the upland CDF) are subject to these requirements. Activities must be conducted in accordance with these requirements

Table B-4. (continued)

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Location-Specific ARARs (cont)			
Federal Requirements (cont)			
Archaeological and Historical Preservation Act of 1974 Public Law 93-291	Potentially applicable	When a Federal agency finds, or is notified, that its activities in connection with a Federal construction project may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archeological data, such agency shall notify DOI Such agency may request DOI to undertake the preservation of such data or it may undertake such activities	If during remedial design or remedial action, it is determined that this alternative may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archaeological data, EPA will notify DOI and comply with these requirements
National Historic Preservation Act 16 USC 470 36 CFR Part 800	Applicable	A federal agency must take into account the project's effect on properties included or eligible for inclusion in the National Register of Historic Places	Work conducted will take into account the project's effect on properties included or eligible for inclusion in the National Register of Historic Places as required under this law
State Requirements			
Rhode Island Historic Preservation Act - Rhode Island General Laws 42-45 et seq	Applicable	Regulations that address the project's effect on properties included or eligible for inclusion in the State/National Registers of Historic Places	Will take into account the project's effect on properties included or eligible for inclusion in the National/State Registers of Historic Places in accordance with these requirements
RIDEM Rules and Regulations Governing the Enforcement of the Freshwater Wetlands Act	Applicable	Sets requirements to prevent the undesirable drainage, excavation, filling, alteration, encroachment, or any other form of disturbance or destruction to a wetland	Activities required by RIDEM for remediation will be conducted in accordance with these requirements.
Action-Specific ARARs			
Federal Requirements			
Clean Water Act Federal Water Quality Criteria, Section 304(a) 40 CFR 131.11	Applicable	Ambient Water Quality Criteria (AWQC) are provided by EPA for chemicals for both the protection of human health and the protection of aquatic life	Excavation and placement of backfill, must be conducted so that there are no exceedances of AWQC.

Table B-4. (continued)

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
***Action-Specific ARARs* (cont)**			
Federal Requirements (cont)			
RCRA (40 CFR 264, Subpart CC)	Applicable	Air emission standards for tanks, surface impoundments, and containers used to manage hazardous waste. Emission controls required if tanks, surface impoundments, and containers used to manage hazardous waste have greater than 500 ppmw of volatile organics	If tanks, surface impoundments, and containers used to manage hazardous waste have greater than 500 ppmw of volatile organics then these requirements will be met.
RCRA Land Disposal Restrictions (40 CFR 268)	Applicable	These regulations identify treatment standards for hazardous wastes and specify requirements that generators, transporters, and owners or operators of treatment, storage, and disposal facilities that manage restricted wastes destined for land disposal must meet.	Material subject to these regulations placed in upland CDF must be treated to meet these requirements
Invasive Species (Executive Order 13112)	TBC	Federal agencies are directed to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause when requiring actions that impact the environment	Actions will be taken to address invasive species consistent with the Executive Order
State Requirements			
RIDEM Rules and Regulations for Hazardous Waste Management Identification and Listing of Hazardous Wastes	Applicable	Rhode Island is delegated to administer the federal RCRA statute through its regulations The standards of 40 Part 261 of RCRA are incorporated by reference Sets forth requirements for hazardous waste determination according to federal (40 CFR 262.11) and RI State (Rule 5 8) definitions	Will be used to determine appropriate treatment and disposal.
RIDEM Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (i e , Remediation Regulations), Section 8.0 (Risk Management)	Applicable	This section regulates impacted media at contaminated sites	This section was used to develop cleanup goals for the site. This alternative meets this requirement
RIDEM Rules and Regulations for Hazardous Waste Management, Section 8 – Operation Requirements for Treatment, Storage, and Disposal Facilities	Applicable and R & A	Outlines operational requirements for all hazardous waste treatment, storage, and disposal facilities, including general waste analyses, security procedures, inspections, safety, groundwater monitoring etc Sets design, construction, and operational requirements for hazardous waste containers and tanks, and closure requirements for hazardous waste facilities	Substantive requirements related to land disposal, closure, etc must be met
RIDEM Rules and Regulations for Hazardous Waste Management, Section 8 – Land Disposal Facilities	Applicable	Outlines design, operational, and closure requirements for land disposal facilities.	Substantive requirements for land disposal/closure, etc. must be met

Table B-4. (continued)

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
***Action-Specific ARARs* (cont)**			
State Requirements (cont)			
RIDEM Water Quality Regulations	Applicable	Provides water classification for surface waters in Rhode Island and sets ambient water quality criteria for toxic substances and governs water quality impacts associated with site activities.	Excavation and placement of backfill must be conducted so that there are no exceedances of water quality standards.
RI Air Pollution Control Regulation #1. Visible Emissions	Applicable	Establishes opacity limitations for contaminant emissions.	Remediation will be conducted to meet the standards for visible emissions
RI Air Pollution Control Regulation #5 Fugitive Dust	Applicable	Requires that reasonable precaution be taken to prevent particulate matter from becoming airborne	Actions will be taken to prevent particulate matter from becoming airborne in accordance with these regulations.
RI Air Pollution Control Regulation #7 Emissions Detrimental to Persons or Property	Applicable	Prohibits emissions of contaminants which may be injurious to human, plant, or animal life or cause damage to property or which unreasonably interfere with the enjoyment of life and property	Any potential emissions subject to these requirements will meet these standards.
RI Air Pollution Control Regulation #15: Control of Organic Solvent Emissions	Applicable: On-site incineration	Limits the amount of organic solvents emitted to the atmosphere.	Any emissions of organic solvents will be controlled to ensure that the standards are met
RI Air Pollution Control Regulation #22 Air Toxics, Air Toxics Guideline, and Air Modeling Guidelines	Applicable: On-site incineration	Prohibits the emissions of specified contaminants that result in ground level concentrations greater than ambient level concentrations	Remediation will be conducted so that these requirements are met

Key:
R & A – Relevant and Appropriate, TBC – To Be Considered

Table B-5. Potential Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) Criteria for the Selected Lyman Mill Stream Sediment and Floodplain Soil Remedy (Alternative 3a), Targeted Excavation, Enhanced Natural Recovery and Disposal and/or Treatment

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Chemical-Specific ARARs			
Federal Requirements			
Clean Water Act Federal Water Quality Criteria, Section 304(a) 40 CFR 131 11	R & A	Ambient Water Quality Criteria (AWOC) are provided by EPA for chemicals for both the protection of human health and the protection of aquatic life.	Contaminants from sediment/floodplain soil that could result in exceedances of AWQC in Woonasquatucket River will be minimized to the maximum extent practical.
Guidelines for Carcinogenic Risk Assessment, EPA/630/P-03/001F	TBC	These guidelines provide guidance on conducting risk assessments involving carcinogens	Guidelines used to evaluate all risk assessments on carcinogenicity.
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, EPA/630/R-03/003F	TBC	These guidelines provide guidance on conducting risk assessments involving carcinogens	Guidelines used to evaluate all risk assessments on carcinogenicity in children.
EPA Risk Reference Doses (RfDs)	TBC	RfDs are estimates of a daily exposure concentration that is likely to be without appreciable risk of deleterious effects during a lifetime exposure.	RfDs used to characterize human health risks due to non-carcinogens in site media
Human Health Assessment Cancer Slope Factors (CSFs)	TBC	CSFs are estimates of the upper-bound probability of an individual developing cancer as a result of a lifetime exposure to a particular concentration of a potential carcinogen.	CSFs used to compute the individual incremental cancer risk resulting from exposure to carcinogens in site media.
EPA Carcinogenic Assessment Group Potency Factors	TBC	These factors are used to evaluate an acceptable risk from a carcinogen.	Used to evaluate carcinogenicity of dioxin.
EPA Health Advisories	TBC	EPA publishes contaminant-specific health advisories that indicate the non-carcinogenic risks associated with consuming contaminated drinking water	Used to establish criteria in the absence of other standards
State Requirements			
RIDEM Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (i e , Remediation Regulations)	Applicable	Unless otherwise specified, soil contaminated as a result of a release of hazardous materials shall be remediated in a manner which meets the direct exposure and leachability criteria for each hazardous substance established in Rule 8.02.B (Method 1 Soil Objectives)	Some residential use soils at the site contain contaminants subject to the Rule 8 02B soil objectives and would be addressed under this alternative consistent with state requirements

Table B-5. (continued)

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Chemical-Specific ARARs (cont)			
State Requirements (cont)			
RIDEM Water Quality Regulations	R & A	Provides water classification for surface waters in Rhode Island and sets ambient water quality criteria for toxic substances and governs water quality impacts associated with site activities.	Contributions of contaminants from sediment that could result in exceedances of water quality standards in the Woonasquatucket River will be minimized to the maximum extent practical.
Location-Specific ARARs			
Federal Requirements			
Fish and Wildlife Coordination Act 16 U.S C. 661, Fish and Wildlife Protection (40 CFR Section 6.302(g))	Applicable	Requires that a federal agency take action to prevent, mitigate, or compensate for project-related losses of fish and wildlife resources. Encourages that any federal agency proposing to modify a body of water to consult with the U S Fish and Wildlife Service, National Marine Fisheries Service, and other related state agencies	Construction activities under this alternative in the Woonasquatucket River are subject to these requirements. Actions will be taken in accordance with these requirements.
Clean Water Act, Section 404 Guidelines for discharge of dredged or fill material into waters of US (40 CFR Parts 230 and 231, 33 CFR Parts 320-323, and 33 CFR Part 332)	Applicable	Outlines requirements for the discharge of dredged or fill materials into surface waters, including wetlands. Such discharges are not allowed if there are practicable alternatives with less adverse impact. Sets standards for restoration and mitigation required as a result of unavoidable impacts to aquatic resources.	Excavation/backfill and placement of thin cover (and potentially upland CDF) subject to these requirements Activities must be conducted in accordance with these requirements, including but not limited to mitigation and/or restoration. Alternative was evaluated and EPA determined it to be the least damaging practicable alternative
Rivers and Harbors Act Section 10 (33 U.S.C. Section 403)	Applicable	Sets forth criteria for placing dams/structures in navigable waters of the U.S.	Backfill/thin cover and flow control structures subject to these requirements Activities must be conducted in accordance with these requirements.

Table B-5. (continued)

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Location-Specific ARARs (cont)			
Federal Requirements (cont)			
Protection of Wetlands (Executive Order 11990)	TBC	Federal agencies are required to avoid adversely impacting wetlands unless there is no practicable alternative and the proposed action includes all practicable measures to minimize harm to wetlands that may result from such use	Excavation/backfill and placement of thin cover (and potentially upland CDF) are subject to these requirements Activities must be conducted in accordance with these requirements
Archaeological and Historical Preservation Act of 1974 Public Law 93-291	Potentially applicable	When a Federal agency finds, or is notified, that its activities in connection with a Federal construction project may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archeological data, such agency shall notify DOI Such agency may request DOI to undertake the preservation of such data or it may undertake such activities	If during remedial design or remedial action, it is determined that this alternative may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archaeological data, EPA will notify DOI and comply with these requirements
National Historic Preservation Act 16 USC 470 36 CFR Part 800	Applicable	A federal agency must take into account the project's effect on properties included or eligible for inclusion in the National Register of Historic Places	Work conducted will take into account the project's effect on properties included or eligible for inclusion in the National Register of Historic Places as required under this law
State Requirements			
RIDEM Rules and Regulations for Hazardous Waste Management – Section 8 Location Standards for Hazardous Waste Facilities	R & A	Rhode Island is delegated to administer the federal RCRA statute through its state regulations The standards of 40 CFR 264 18(b), with some exceptions, are incorporated by reference Certain facilities located in 100-yr floodplain must be designed, constructed, operated and maintained to prevent washout of any hazardous waste by 100-yr flood, unless demonstrate no adverse effects on human health or environment will result from washout	Waste material that remains in the Oxbow will not meet these requirements and it has been waived
Rhode Island Historic Preservation Act – Rhode Island General Laws 42-45 et seq	Applicable	Regulations that address the project's effect on properties included or eligible for inclusion in the State/National Registers of Historic Places	Will take into account the project's effect on properties included or eligible for inclusion in the National/State Registers of Historic Places in accordance with these requirements

Table B-5. (continued)

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Location-Specific ARARs (cont)			
State Requirements (cont)			
RIDEM Rules and Regulations Governing the Enforcement of the Freshwater Wetlands Act	Applicable	Sets requirements to prevent the undesirable drainage, excavation, filling, alteration, encroachment, or any other form of disturbance or destruction to a wetland.	Activities required by RIDEM for remediation will be conducted in accordance with these requirements.
Action-Specific ARARs			
Federal Requirements			
Clean Water Act Federal Water Quality Criteria, Section 304(a) 40 CFR 131 11	Applicable	Ambient Water Quality Criteria (AWQC) are provided by EPA for chemicals for both the protection of human health and the protection of aquatic life.	Excavation/backfill and placement of thin cover must be conducted so that there are no exceedances of AWQC
RCRA (40 CFR 264, Subpart CC)	Applicable	Air emission standards for tanks, surface impoundments, and containers used to manage hazardous waste. Emission controls required if tanks, surface impoundments, and containers used to manage hazardous waste have greater than 500 ppmw of volatile organics	If tanks, surface impoundments, and containers used to manage hazardous waste have greater than 500 ppmw of volatile organics then these requirements will be met.
RCRA Land Disposal Restrictions (40 CFR 268)	Applicable	These regulations identify treatment standards for hazardous wastes and specify requirements that generators, transporters, and owners or operators of treatment, storage, and disposal facilities that manage restricted wastes destined for land disposal must meet	Material subject to these regulations placed in upland CDF must be treated to meet these requirements
Invasive Species (Executive Order 13112)	TBC	Federal agencies are directed to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause when requiring actions that impact the environment	Actions will be taken to address invasive species consistent with the Executive Order.
State Requirements			
RIDEM Rules and Regulations for Hazardous Waste Management Identification and Listing of Hazardous Wastes	Applicable	Rhode Island is delegated to administer the federal RCRA statute through its regulations. The standards of 40 Part 261 of RCRA are incorporated by reference. Sets forth requirements for hazardous waste determination according to federal (40 CFR 262.11) and RI State (Rule 5.8) definitions	Will be used to determine appropriate treatment and disposal
RIDEM Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (i e., Remediation Regulations), Section 8.0 (Risk Management)	Applicable	This section regulates impacted media at contaminated sites.	This section was used to develop cleanup goals for the site. This alternative meets this requirement.

Table B-5. (continued)

Requirement	Status	Synopsis	Action to Be Taken to Attain Requirement
Action-Specific ARARs (cont)			
State Requirements (cont)			
RIDEM Rules and Regulations for Hazardous Waste Management, Section 8 – Operation Requirements for Treatment, Storage, and Disposal Facilities	Applicable and R & A	Outlines operational requirements for all hazardous waste treatment, storage, and disposal facilities, including general waste analyses, security procedures, inspections, safety, groundwater monitoring etc Sets design, construction, and operational requirements for hazardous waste containers and tanks, and closure requirements for hazardous waste facilities	Substantive requirements related to land disposal, closure, etc. must be met Waste material that remains in the Oxbow will not meet these requirements and it was waived
RIDEM Rules and Regulations for Hazardous Waste Management, Section 8 – Land Disposal Facilities	Applicable and R & A	Outlines design, operational, and closure requirements for land disposal facilities	Substantive requirements for land disposal/closure, etc must be met Waste material that remains in the Oxbow will not meet these requirements and it was waived.
RIDEM Water Quality Regulations	Applicable	Provides water classification for surface waters in Rhode Island and sets ambient water quality criteria for toxic substances and governs water quality impacts associated with site activities	Excavation/backfill and placement of thin cover must be conducted so that there are no exceedances of water quality standards
RI Air Pollution Control Regulation #1 Visible Emissions	Applicable	Establishes opacity limitations for contaminant emissions	Remediation will be conducted to meet the standards for visible emissions
RI Air Pollution Control Regulation #5 Fugitive Dust	Applicable	Requires that reasonable precaution be taken to prevent particulate matter from becoming airborne	Actions will be taken to prevent particulate matter from becoming airborne in accordance with these regulations
RI Air Pollution Control Regulation #7 Emissions Detrimental to Persons or Property	Applicable	Prohibits emissions of contaminants which may be injurious to human, plant, or animal life or cause damage to property or which unreasonably interfere with the enjoyment of life and property.	Any potential emissions subject to these requirements will meet these standards

Key:
R & A – Relevant and Appropriate; TBC – To Be Considered

APPENDIX C

ADMINISTRATIVE RECORD INDEX AND GUIDANCE DOCUMENTS

RECORD OF DECISION

CENTREDALE MANOR RESTORATION PROJECT SUPERFUND SITE NORTH PROVIDENCE, RHODE ISLAND

CENTREDALE MANOR RESTORATION PROJECT

Superfund Site

Administrative Record Index
for the
Record of Decision (ROD)

ROD Signed: September 28, 2012
Released on DVD-ROM: October 04, 2012

Prepared by

EPA New England
Office of Site Remediation and Restoration

With Assistance from
ASRC Management Services
6301 Ivy Lane, Suite 300
Greenbelt, MD 20770

Introduction to the Collection

This is the Administrative Record Index for the Centredale Manor Restoration Project Superfund Site, North Providence, Rhode Island, Record of Decision (ROD), released September 2012. The file contains site-specific documents and a list of guidance documents used by EPA staff in selecting a response action at the site.

This record includes, by reference, the Administrative Record for the Centredale Manor Restoration Project, the Removal Action Administrative Record, dated August 1999, the Removal Action Addendum Administrative Record, dated January 2000, the Removal Action Addendum 2 Administrative Record, dated October 2000, the Removal Action Addendum 3 Administrative Record, dated October 2006, the Removal Action Addendum 4 Administrative Record, dated October 2009, the Removal Action Addendum Administrative Record, dated December 2005, the Interim Engineering Evaluation/Cost Analysis (EE/CA) Approval Memorandum Administrative Record, dated January 2000, Non-Time Critical Removal Action Administrative Record File, dated January 2001, the Record of Decision (ROD) Proposed Plan Administrative Record, released October 2011, and the Record of Decision (ROD) Proposed Plan Amendment Administrative Record, released July 2012.

Documents listed as bibliographic sources in reports might not be listed separately in the index.

The administrative record file is available for review at:

EPA New England Office of
Site Remediation & Restoration
5 Post Office Square - Suite 100 (OSRR02-3)
Boston, MA 02109-3912

(by appointment)
617-918-1440 (phone)
617-918-0440 (fax)
www.epa.gov/region01/superfund/resource/records.htm

North Providence Union Free Library
1810 Mineral Springs Ave
North Providence, RI 02911
(401) 353-5600 (phone)
(401) 353 – 1794 (fax)
http://www.nplib.com/

MarionJ.Mohr Memorial Library
1 Memorial Avenue
Johnston, RI 02919
(401) 231-4980 (phone)
((401) 231 – 4984 (fax)
info@mohrlibrary.org

An administrative record file is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

Please note that the compact disc(s) (CD) containing this Administrative Record may include index data and other metadata (hereinafter collectively referred to as metadata) to allow the user to conduct index searches and key word searches across all the files contained on the CD. All the information that appears in the metadata, including any dates associated with creation of the indexing data, is not part of the Administrative Record for the Site under CERCLA and shall not be construed as relevant to the documents that comprise the Administrative Record. This metadata is provided as a convenience for the user and is not part of the Administrative Record.

Questions about this administrative record file should be directed to the EPA New England site manager.

Phase 02: REMOVAL RESPONSE

18427 **FINAL QUALITY ASSURANCE PROJECT PLAN (QAPP), PART 1 OF 5: REPORT & APPENDIX A**
# of Pages: 107
Doc Date: 07/14/1999

Author: , IT CORP
Addressee: , US EPA REGION 1
Doc Type: REPORT; WORK PLAN
File Break: 02.06
Access Type(s): REL

18429 **FINAL QUALITY ASSURANCE PROJECT PLAN (QAPP), PART 2 OF 5: APPENDICES B1 - B7**
# of Pages: 345
Doc Date: 07/14/1999

Author: , IT CORP
Addressee: , US EPA REGION 1
Doc Type: REPORT; SAMPLING & ANALYSIS PLAN; WORK PLAN
File Break: 02.06
Access Type(s): REL

18430 **FINAL QUALITY ASSURANCE PROJECT PLAN (QAPP), PART 3 OF 5: APPENDICES B8 - B9**
# of Pages: 128
Doc Date: 07/14/1999

Author: , IT CORP
Addressee: , US EPA REGION 1
Doc Type: REPORT; WORK PLAN
File Break: 02.06
Access Type(s): REL

Phase 02: REMOVAL RESPONSE

18546 **FINAL QUALITY ASSURANCE PROJECT PLAN (QAPP), PART 4 OF 5: APPENDIX C**
# of Pages: 302
Doc Date: 07/14/1999

Author: , IT CORP
Addressee: , US EPA REGION 1
Doc Type: REPORT; WORK PLAN
File Break: 02.06
Access Type(s): REL

18547 **FINAL QUALITY ASSURANCE PROJECT PLAN (QAPP), PART 5 OF 5: APPENDICES C, D & E**
# of Pages: 215
Doc Date: 07/14/1999

Author: , IT CORP
Addressee: , US EPA REGION 1
Doc Type: REPORT; WORK PLAN
File Break: 02.06
Access Type(s): REL

25908 **POLLUTION REPORT (POLREP) 1, FIRST - NTCRA**
# of Pages: 4
Doc Date: 08/07/2001

Author: , US EPA REGION 1
Addressee:
Doc Type: POLREP; REPORT
File Break: 02.04
Access Type(s): REL

Phase 02: REMOVAL RESPONSE

27017 **IMPLEMENTATION WORK PLAN**
# of Pages: 664
Doc Date: 08/06/2001

Author:	Addressee:	Doc Type:	File Break:	Access Type(s):
, LOUREIRO ENGINEERING ASSOCIATES INC	, US EPA REGION 1	WORK PLAN	02.02	REL

27018 **ALLENDALE DAM REPLACEMENT DESIGN DRAWINGS [AVAILABLE ON CD FORMAT AT US EPA SUPERFUND RECORDS CENTER, BOSTON, MA]**
# of Pages: 1
Doc Date: 09/13/2001

Author:	Addressee:	Doc Type:	File Break:	Access Type(s):
, LOUREIRO ENGINEERING ASSOCIATES INC	, US EPA REGION 1	DRAWING	02.02	REL

29554 **AMENDMENT NO. 3 TO DRAFT IMPLEMENTATION WORK PLAN**
# of Pages: 14
Doc Date: 03/08/2002

Author:	Addressee:	Doc Type:	File Break:	Access Type(s):
, LOUREIRO ENGINEERING ASSOCIATES INC	, CENTREDALE MANOR ASSOCIATES LIMITED PARTNERSHIP	WORK PLAN	02.02	REL

Phase 02: REMOVAL RESPONSE

35137 **REVIEW OF HISTORIC TOPOGRAPHIC MAPS AND AERIAL PHOTOGRAPHS SUMMARY REPORT**
# of Pages: 31
Doc Date: 01/23/2002

Author	Addressee	Doc Type	File Break	Access Type(s)
, LOUREIRO ENGINEERING ASSOCIATES INC	JEROME C MUYS JR, SWIDLER BERLIN SHEREFF FRIEDMAN LLP	REPORT	02.17	REL

35716 **PHOTODOCUMENTATION**
# of Pages: 18
Doc Date: 02/08/2002

Author	Addressee	Doc Type	File Break	Access Type(s)
, LOUREIRO ENGINEERING ASSOCIATES INC		PHOTOGRAPH	02.02	REL

35724 **DESIGN WORK PLAN**
# of Pages: 16
Doc Date: 05/09/2001

Author	Addressee	Doc Type	File Break	Access Type(s)
, LOUREIRO ENGINEERING ASSOCIATES INC	, CENTREDALE MANOR PERFORMING PARTIES GROUP	WORK PLAN	02.02	REL

Phase 02: REMOVAL RESPONSE

35730 **DIOXIN SAMPLING RESULTS, APRIL 2002**
# of Pages: 12
Doc Date: 06/20/2002

Author	Addressee	Doc Type	File Break / Access Type(s)
, LOUREIRO ENGINEERING ASSOCIATES INC	ANNA KRASKO, US EPA REGION 1	DATA SUMMARY REPORT REPORT SAMPLING DATA	File Break: 02.03 Access Type(s): REL

35731 **DIOXIN SAMPLING RESULTS FOR ALLENDALE POND, APRIL 2002**
# of Pages: 10
Doc Date: 06/27/2002

Author	Addressee	Doc Type	File Break / Access Type(s)
ANNA KRASKO, US EPA REGION 1	, NORTH PROVIDENCE (RI) RESIDENT	CORRESPONDENCE DATA SUMMARY REPORT LETTER REPORT SAMPLING DATA	File Break: 02.03 Access Type(s): REL

35732 **SUMMARY OF APRIL 2002 SAMPLING RESULTS WITH NEARBY PROPERTY OWNER INFORMATION**
# of Pages: 4
Doc Date: 01/01/2002

Author	Addressee	Doc Type	File Break / Access Type(s)
		CORRESPONDENCE DATA SUMMARY REPORT LETTER REPORT SAMPLING DATA	File Break: 02.03 Access Type(s): REL

Phase 02: REMOVAL RESPONSE

35735 **FINAL REPORT, CENTREDALE MANOR INDOOR AIR SURVEY (TRANSMITTAL MEMORANDUM IS ATTACHED)**

# of Pages: 29
Doc Date: 08/23/1999

Author: , US EPA REGION 1
Addressee:
Doc Type: REPORT
File Break: 02.02
Access Type(s): REL

35736 **DRAFT ADDITIONAL SAMPLING PLAN - ACTION AREA DELINEATION**

# of Pages: 17
Doc Date: 07/11/2002

Author: , LOUREIRO ENGINEERING ASSOCIATES INC
Addressee: , CENTREDALE MANOR PERFORMING PARTIES GROUP
Doc Type: REPORT
SAMPLING & ANALYSIS PLAN
WORK PLAN
File Break: 02.06
Access Type(s): REL

35792 **VALIDATED DATA AND EXCAVATION AREAS**

# of Pages: 24
Doc Date: 07/01/2002

Author:
Addressee:
Doc Type: DATA VALIDATION REPORT
REPORT
SAMPLING DATA
File Break: 02.03
Access Type(s): REL

Phase 02: REMOVAL RESPONSE

35793 **TRANSMITTAL OF APRIL AND JULY 2002 VALIDATED DATA PACKAGES**
# of Pages: 1
Doc Date: 10/04/2002

Author: DAVID N SCOTTI, LOUREIRO ENGINEERING ASSOCIATES INC
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 02.03
Access Type(s): REL

35794 **TRANSMITTAL OF APRIL 2002 VALIDATED DATA PACKAGES**
# of Pages: 1
Doc Date: 05/30/2002

Author: NANCY WEAVER, ENVIRONMENTAL DATA SERVICES INC
Addressee: DAVID N SCOTTI, LOUREIRO ENGINEERING ASSOCIATES INC
Doc Type: CORRESPONDENCE LETTER
File Break: 02.03
Access Type(s): REL

35795 **TRANSMITTAL OF JULY 2002 VALIDATED DATA PACKAGES**
# of Pages: 1
Doc Date: 09/17/2002

Author: NANCY WEAVER, ENVIRONMENTAL DATA SERVICES INC
Addressee: DAVID N SCOTTI, LOUREIRO ENGINEERING ASSOCIATES INC
Doc Type: CORRESPONDENCE LETTER
File Break: 02.03
Access Type(s): REL

Phase 02: REMOVAL RESPONSE

35796 **VALIDATED DATA FOR DATA SET G2D130156**
# of Pages: 72
Doc Date: 05/22/2002

Author:	Addressee:	Doc Type:	File Break:
NANCY WEAVER, ENVIRONMENTAL DATA SERVICES INC		DATA VALIDATION REPORT REPORT SAMPLING DATA	02.03 **Access Type(s):** REL

35797 **VALIDATED DATA FOR DATA SET G2D130158**
# of Pages: 61
Doc Date: 05/21/2002

Author:	Addressee:	Doc Type:	File Break:
NANCY WEAVER, ENVIRONMENTAL DATA SERVICES INC		DATA VALIDATION REPORT REPORT SAMPLING DATA	02.03 **Access Type(s):** REL

35798 **VALIDATED DATA FOR DATA SET G2G240279**
# of Pages: 58
Doc Date: 09/13/2002

Author:	Addressee:	Doc Type:	File Break:
NANCY WEAVER, ENVIRONMENTAL DATA SERVICES INC		DATA VALIDATION REPORT REPORT SAMPLING DATA	02.03 **Access Type(s):** REL

Phase 02: REMOVAL RESPONSE

35799 **VALIDATED DATA FOR DATA SET G2G190281**
# of Pages: 42
Doc Date: 09/12/2002

Author: NANCY WEAVER, ENVIRONMENTAL DATA SERVICES INC
Addressee:
Doc Type: DATA VALIDATION REPORT
REPORT
SAMPLING DATA
File Break: 02.03
Access Type(s): REL

35800 **VALIDATED DATA FOR DATA SET G2G220146**
# of Pages: 37
Doc Date: 09/10/2002

Author: NANCY WEAVER, ENVIRONMENTAL DATA SERVICES INC
Addressee:
Doc Type: DATA VALIDATION REPORT
REPORT
SAMPLING DATA
File Break: 02.03
Access Type(s): REL

35801 **VALIDATED DATA FOR DATA SET G2G230229**
# of Pages: 56
Doc Date: 09/10/2002

Author: NANCY WEAVER, ENVIRONMENTAL DATA SERVICES INC
Addressee:
Doc Type: DATA VALIDATION REPORT
REPORT
SAMPLING DATA
File Break: 02.03
Access Type(s): REL

Phase 02: REMOVAL RESPONSE

35802 **DIOXIN SAMPLING RESULTS FOR ALLENDALE AND LYMANSVILLE PONDS, JULY 2002 (TRANSMITTAL LETTER IS ATTACHED)**
# of Pages: 13
Doc Date: 10/08/2002

Author: ANNA KRASKO, US EPA REGION 1
Addressee: , NORTH PROVIDENCE (RI) RESIDENT
Doc Type: CORRESPONDENCE
DATA SUMMARY REPORT
LETTER
REPORT
SAMPLING DATA
File Break: 02.03
Access Type(s): REL

35803 **SUMMARY OF JULY 2002 SAMPLING RESULTS WITH NEARBY PROPERTY OWNER INFORMATION**
# of Pages: 4
Doc Date: 01/01/2002

Author:
Addressee:
Doc Type: CORRESPONDENCE
DATA SUMMARY REPORT
LETTER
REPORT
SAMPLING DATA
File Break: 02.03
Access Type(s): REL

35804 **DRAFT AMENDMENT NO. 4 TO IMPLEMENTATION WORK PLAN**
# of Pages: 16
Doc Date: 10/16/2002

Author: , LOUREIRO ENGINEERING ASSOCIATES INC
Addressee: , CENTREDALE MANOR PERFORMING PARTIES GROUP
Doc Type: WORK PLAN
File Break: 02.06
Access Type(s): REL

Phase 02: REMOVAL RESPONSE

36071 **AMENDMENT NO. 2 TO IMPLEMENTATION WORK PLAN**
# of Pages: 12
Doc Date: 08/31/2001

Author:	Addressee:	Doc Type:	File Break:
DAVID N SCOTTI, LOUREIRO ENGINEERING ASSOCIATES INC	, US ARMY CORPS OF ENGINEERS	WORK PLAN	02.06 Access Type(s): REL

48762 **DATA VALIDATION SUMMARY REPORT FOR SEPTEMBER 2002 SAMPLING EVENT (11/08/02 TRANSMITTAL LETTER IS ATTACHED)**
# of Pages: 34
Doc Date: 01/01/1111

Author:	Addressee:	Doc Type:	File Break:
, LOUREIRO ENGINEERING ASSOCIATES INC		DATA VALIDATION REPORT REPORT SAMPLING DATA	02.03 Access Type(s): REL

48775 **POST REMOVAL SITE CONTROL PLAN**
# of Pages: 16
Doc Date: 01/06/2003

Author:	Addressee:	Doc Type:	File Break:
, LOUREIRO ENGINEERING ASSOCIATES INC	, CENTREDALE MANOR PERFORMING PARTIES GROUP	WORK PLAN	02.02 Access Type(s): REL

Phase 02: REMOVAL RESPONSE

48782 **TRANSMITTAL OF DRAFT BASELINE HUMAN HEALTH RISK ASSESSMENT FOR REVIEW**
# of Pages: 1
Doc Date: 08/13/2003

Author: MICHAEL JASINSKI, US EPA REGION 1
Addressee: MATTHEW LORBER, US EPA
Doc Type: CORRESPONDENCE, LETTER
File Break: 03.01
Access Type(s): REL

48813 **ALLENDALE DAM RESTORATION DRAWINGS (05/29/03 TRANSMITTAL LETTER IS ATTACHED)**
# of Pages: 12
Doc Date: 07/01/2001

Author: , GEI CONSULTANTS INC; , LOUREIRO ENGINEERING ASSOCIATES INC
Addressee:
Doc Type: DRAWING
File Break: 02.02
Access Type(s): REL

204618 **ACTION MEMORANDUM - THIRD ADDENDUM: REQUEST FOR CHANGE OF SCOPE AND 12-MONTH EXEMPTION FOR CONTINUED REMOVAL ACTION**
# of Pages: 18
Doc Date: 09/29/2003

Author: TED BAZENAS, US EPA REGION 1
Addressee: SUSAN STUDLIEN, US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION
Doc Type: ACTION MEMORANDUM, CORRESPONDENCE, DECISION DOCUMENT, MEMO
File Break: 02.09
Access Type(s): REL

Phase 02: REMOVAL RESPONSE

204625 **DRAFT WORK PLAN, TIME-CRITICAL REMOVAL ACTION**
# of Pages: 80
Doc Date: 09/01/2003

Author	Addressee	Doc Type	File Break	Access Type(s)
, LOUREIRO ENGINEERING ASSOCIATES INC	, CENTREDALE MANOR PERFORMING PARTIES GROUP	REPORT	02.06	REL

237558 **DRAFT, COMPLETION OF WORK REPORT - SECOND UNILATERAL ADMINISTRATIVE ORDER FOR REMOVAL ACTION**
# of Pages: 679
Doc Date: 04/01/2005

Author	Addressee	Doc Type	File Break	Access Type(s)
, LOUREIRO ENGINEERING ASSOCIATES INC	, CENTREDALE MANOR PERFORMING PARTIES GROUP	REPORT	02.02	REL

253318 **POLLUTION REPORT (POLREP) #2, FINAL - NON-TIME CRITICAL REMOVAL ACTION (NTCRA) (DISTRIBUTION LIST ATTACHED)**
# of Pages: 9
Doc Date: 05/17/2005

Author	Addressee	Doc Type	File Break	Access Type(s)
, US EPA REGION 1		POLREP REPORT	02.04	REL

Phase 02: REMOVAL RESPONSE

273400 **LETTER TO RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT (RIDEM) ON COMPLETION OF TIME CRITICAL REMOVAL ACTIONS**

# of Pages: 1
Doc Date: 06/27/2006

Author: TED BAZENAS, US EPA REGION 1
Addressee: LOUIS R MACCARONE, RI DEPT OF ENVIRONMENTAL MANAGEMENT
Doc Type: CORRESPONDENCE LETTER
File Break: 02.01
Access Type(s): REL

273401 **NOTICE OF COMPLETION THIRD ADMINISTRATIVE ORDER ON CONSENT FOR REMOVAL ACTION**

# of Pages: 2
Doc Date: 06/27/2006

Author: EDWARD BAZENAS, US EPA REGION 1
Addressee: JEFFERY J LOUREIRO, LOUREIRO ENGINEERING ASSOCIATES INC
Doc Type: CORRESPONDENCE LETTER
File Break: 02.01
Access Type(s): REL

461982 **COMPLETION OF WORK REPORT - TIME-CRITICAL REMOVAL ACTION (TCRA) SHALLOW GROUNDWATER REMEDY**

# of Pages: 640
Doc Date: 02/01/2010

Author: , LOUREIRO ENGINEERING ASSOCIATES INC
Addressee: , EMHART INDUSTRIES INC
Doc Type: REPORT
File Break: 02.02
Access Type(s): REL

Phase 02: REMOVAL RESPONSE

462808 **FIELD SAMPLING PLAN, SHALLOW GROUNDWATER REMEDY - GROUNDWATER ACTION AREA**
# of Pages: 88
Doc Date: 11/19/2009

Author: , LOUREIRO ENGINEERING ASSOCIATES INC
Addressee: , EMHART INDUSTRIES INC
Doc Type: SAMPLING DATA; SAMPLING & ANALYSIS PLAN; WORK PLAN
File Break: 02.03
Access Type(s): REL

462809 **PROJECT SPECIFIC QUALITY ASSURANCE PROJECT PLAN (QAPP) TIME CRITICAL REMOVAL ACTION (TCRA) SHALLOW GROUNDWATER REMEDY**
# of Pages: 260
Doc Date: 11/18/2009

Author: , LOUREIRO ENGINEERING ASSOCIATES INC
Addressee: , EMHART INDUSTRIES INC
Doc Type: REPORT; SAMPLING & ANALYSIS PLAN; WORK PLAN
File Break: 02.02
Access Type(s): REL

462877 **PROPOSED REMEDIAL ALTERNATIVE FOR SHALLOW GROUNDWATER UNDER TIME-CRITICAL REMOVAL ACTION (TCRA)**
# of Pages: 10
Doc Date: 05/08/2009

Author: DAVID N SCOTTI, LOUREIRO ENGINEERING ASSOCIATES INC
Addressee: TED BAZENAS, US EPA REGION 1
Doc Type: PROPOSED PLAN; PUBLIC INFORMATION; REPORT
File Break: 02.02
Access Type(s): REL

Phase 02: REMOVAL RESPONSE

462880 **PHOTODOCUMENTATION TIME-CRITICAL REMOVAL ACTION (TCRA) SHALLOW GROUNDWATER REMEDY**
# of Pages: 1
Doc Date: 01/01/1111

Author:	Addressee:	Doc Type:	File Break / Access Type(s):
, LOUREIRO ENGINEERING ASSOCIATES INC		PHOTOGRAPH	File Break: 02.02 Access Type(s): REL

462881 **NOTIFICATION EMAIL LETTER AND CD-ROM WITH BROOK VILLAGE PHOTOGRAPHS MARCH/APRIL 2010**
# of Pages: 88
Doc Date: 04/01/2010

Author:	Addressee:	Doc Type:	File Break / Access Type(s):
JEROME C MUYS JR, EMHART INDUSTRIES INC	TED BAZENAS, US EPA REGION 1 ANNA KRASKO, US EPA REGION 1 EVE VAUDO, US EPA REGION 1	CORRESPONDENCE LETTER	File Break: 02.01 Access Type(s): REL

474509 **SITE MAP: CAP # 2 INTERIM CONTOURS**
# of Pages: 1
Doc Date: 10/07/1999

Author:	Addressee:	Doc Type:	File Break / Access Type(s):
, IT CORP		MAP	File Break: 02.02 Access Type(s): REL

Phase 02: REMOVAL RESPONSE

474510 **SITE MAP: CAP # 1 SUBGRADE/GEOTEXTILE CONTOUR**
# of Pages: 1
Doc Date: 10/07/1999

Author:	Addressee:	Doc Type:	File Break:
, IT CORP		MAP	02.02 Access Type(s): REL

474511 **SITE MAP: CAP # 1 FINAL COVER CONTOUR**
# of Pages: 1
Doc Date: 10/07/1999

Author:	Addressee:	Doc Type:	File Break:
, IT CORP		MAP	02.02 Access Type(s): REL

475809 **ADDENDUM NO.1 COMPLETION OF WORK REPORT TIME-CRITICAL REMOVAL ACTION (TCRA)**
# of Pages: 1032
Doc Date: 04/01/2010

Author:	Addressee:	Doc Type:	File Break:
, LOUREIRO ENGINEERING ASSOCIATES INC	, EMHART INDUSTRIES INC	REPORT	02.02 Access Type(s): REL

Phase 02: REMOVAL RESPONSE

492986 **POST FLOOD INSPECTION OF APRIL 15, 2010**
# of Pages: 7
Doc Date: 04/27/2010

Author:	Addressee:	Doc Type:	File Break:
TED BAZENAS, US EPA REGION 1		CORRESPONDENCE MEMO	02.01 Access Type(s): REL

506585 **EMHART INDUSTRIES INC'S RESPONSE TO 07/16/2009 ACTION MEMORANDUM REGARDING REQUEST FOR REMOVAL ACTION AT THE CENTREDALE MANOR (TRANSMITTAL LETTER ATTACHED)**
# of Pages: 112
Doc Date: 08/06/2009

Author:	Addressee:	Doc Type:	File Break:
, SULLIVAN & WORCESTER LLP		REPORT	02.09 Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

25635 **FINAL DATA MANAGEMENT PLAN**
# of Pages: 129
Doc Date: 09/04/2001

Author: , HARDING ESE INC
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: REPORT
File Break: 03.04
Access Type(s): REL

25638 **DRAFT FINAL WORK PLAN AMENDMENT N0. 3**
# of Pages: 28
Doc Date: 05/01/2001

Author: , TETRA TECH NUS INC
Addressee: , US EPA REGION 1
Doc Type: WORK PLAN
File Break: 03.07
Access Type(s): REL

25640 **FINAL FIELD SAMPLING PLAN, HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT**
# of Pages: 203
Doc Date: 06/01/2001

Author: , HARDING ESE INC
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: REPORT
File Break: 03.04
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

25646 **QUALITY ASSURANCE PROJECT PLAN, BASELINE RISK ASSESSMENT, INITIAL PROJECT PLANNING, AND SUPPORT, VOLUME 2 OF 2 (SOPS) [PART 1 OF 4: ATTACHMENT G]**
# of Pages: 356
Doc Date: 06/01/2001

Author:	Addressee:	Doc Type:	File Break / Access
, BATTELLE	, US ARMY CORPS OF ENGINEERS	REPORT SAMPLING & ANALYSIS PLAN WORK PLAN	File Break: 03.04 Access Type(s): REL

25648 **QUALITY ASSURANCE PROJECT PLAN, BASELINE RISK ASSESSMENT, INITIAL PROJECT PLANNING, AND SUPPORT, VOLUME 2 OF 2 [PART 2 OF 4: ATTACHMENT G]**
# of Pages: 351
Doc Date: 06/01/2001

Author:	Addressee:	Doc Type:	File Break / Access
, BATTELLE	, US ARMY CORPS OF ENGINEERS	REPORT SAMPLING & ANALYSIS PLAN WORK PLAN	File Break: 03.04 Access Type(s): REL

25649 **QUALITY ASSURANCE PROJECT PLAN, BASELINE RISK ASSESSMENT, INITIAL PROJECT PLANNING, AND SUPPORT, VOLUME 2 OF 2 [PART 3 OF 4: ATTACHMENT G]**
# of Pages: 321
Doc Date: 06/01/2001

Author:	Addressee:	Doc Type:	File Break / Access
, BATTELLE	, US ARMY CORPS OF ENGINEERS	REPORT SAMPLING & ANALYSIS PLAN WORK PLAN	File Break: 03.04 Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

25650 **QUALITY ASSURANCE PROJECT PLAN, BASELINE RISK ASSESSMENT, INITIAL PROJECT PLANNING, AND SUPPORT, VOLUME 2 OF 2 [PART 4 OF 4: ATTACHMENT G]**

# of Pages: 131
Doc Date: 06/01/2001

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: REPORT; SAMPLING & ANALYSIS PLAN; WORK PLAN
File Break: 03.04
Access Type(s): REL

25903 **DRAFT TECHNICAL MEMORANDUM, MANTON AND DYERVILLE REACHES SEDIMENT SAMPLING**

# of Pages: 161
Doc Date: 01/01/2001

Author: , TETRA TECH NUS INC
Addressee: , US EPA REGION 1
Doc Type: REPORT
File Break: 03.04
Access Type(s): REL

25904 **DRAFT WORK PLAN AMENDMENT N0. 2 TECHNICAL ASSISTANCE**

# of Pages: 30
Doc Date: 08/01/2000

Author: , TETRA TECH NUS INC
Addressee: , US EPA REGION 1
Doc Type: WORK PLAN
File Break: 03.04
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

25905 **SAMPLING AND ANALYSIS PLAN, ADDENDUM 1**
# of Pages: 6
Doc Date: 08/01/2000

Author: , TETRA TECH EC INC
Addressee: , US EPA REGION 1
Doc Type: REPORT
File Break: 03.04
Access Type(s): REL

25911 **QUALITY ASSURANCE PROJECT PLAN, BASELINE RISK ASSESSMENT, INITIAL PROJECT PLANNING, AND SUPPORT, VOLUME 1 OF 2, FIELD SAMPLING, CHEMICAL, AND TOXICITY TESTING [PART 1 OF 2: TEXT & ATTACHMENT A]**
# of Pages: 314
Doc Date: 05/23/2001

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: REPORT
SAMPLING & ANALYSIS PLAN
WORK PLAN
File Break: 03.04
Access Type(s): REL

25912 **QUALITY ASSURANCE PROJECT PLAN, BASELINE RISK ASSESSMENT, INITIAL PROJECT PLANNING, AND SUPPORT, VOLUME 1 OF 2, FIELD SAMPLING, CHEMICAL, AND TOXICITY TESTING [PART 2 OF 2: ATTACHMENTS B - F]**
# of Pages: 206
Doc Date: 05/23/2001

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: REPORT
File Break: 03.04
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

25914 **TISSUE CHEMISTRY QUALITY ASSURANCE PROJECT PLAN, BASELINE RISK ASSESSMENT, INITIAL PROJECT PLANNING, AND SUPPORT [PART 1 OF 2: TEXT & ATTACHMENTS A - E]**
# of Pages: 242
Doc Date: 11/08/2000

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: REPORT
SAMPLING & ANALYSIS PLAN
WORK PLAN
File Break: 03.04
Access Type(s): REL

25915 **TISSUE CHEMISTRY QUALITY ASSURANCE PROJECT PLAN, BASELINE RISK ASSESSMENT, INITIAL PROJECT PLANNING, AND SUPPORT [PART 2 OF 2: TEXT & ATTACHMENT E]**
# of Pages: 222
Doc Date: 11/08/2000

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: REPORT
SAMPLING & ANALYSIS PLAN
WORK PLAN
File Break: 03.04
Access Type(s): REL

25916 **TECHNICAL ASSISTANCE QUALITY ASSURANCE PROJECT PLAN [PART 1 OF 2: TEXT & APPENDICES A - B]**
# of Pages: 317
Doc Date: 11/01/2000

Author: , TETRA TECH NUS INC
Addressee: , US EPA REGION 1
Doc Type: REPORT
File Break: 03.07
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

25917 **TECHNICAL ASSISTANCE QUALITY ASSURANCE PROJECT PLAN [PART 2 OF 2: APPENDICES C - E]**
# of Pages: 425
Doc Date: 11/01/2000

Author: , TETRA TECH NUS INC
Addressee: , US EPA REGION 1
Doc Type: REPORT; SAMPLING & ANALYSIS PLAN; WORK PLAN
File Break: 03.07
Access Type(s): REL

27807 **IDENTIFICATION OF PREFERRED TARGET SPECIES AND THE CONTINGENCY PLAN TO SUPPORT THE HUMAN HEALTH BIOTA CONSUMPTION AND ECOLOGICAL RISK EVALUATIONS**
# of Pages: 10
Doc Date: 06/08/2001

Author: , BATTELLE OCEAN SCIENCES; , HARDING ESE INC
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: DATA SUMMARY REPORT; REPORT; SAMPLING DATA
File Break: 03.07
Access Type(s): REL

27810 **WORK PLAN, HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT**
# of Pages: 111
Doc Date: 03/16/2001

Author: , HARDING ESE INC
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: WORK PLAN
File Break: 03.07
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

29555 **TASK 22F POST-THIRD PARTY VALIDATED ELS FISH TISSUE CHEMISTRY DATA REPORT, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS**
# of Pages: 89
Doc Date: 02/01/2002

Author: , BATTELLE
Addressee:
Doc Type: DATA VALIDATION REPORT
REPORT
SAMPLING DATA
File Break: 03.02
Access Type(s): REL

29556 **TASK 22C POST-THIRD PARTY VALIDATED WATER CHEMISTRY DATA REPORT, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS**
# of Pages: 226
Doc Date: 02/01/2002

Author: , BATTELLE
Addressee:
Doc Type: DATA VALIDATION REPORT
REPORT
SAMPLING DATA
File Break: 03.02
Access Type(s): REL

29557 **ANURAN CALL SURVEY OF THE WOONASQATUCKET RIVER**
# of Pages: 22
Doc Date: 10/01/2001

Author: LAURA EATON-POOLE, US FISH & WILDLIFE SERVICE
KENNETH MUNNEY, US DOI/US FISH & WILDLIFE SERVICE
Addressee:
Doc Type: REPORT
File Break: 03.04
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

29564 **TASK 22D POST-THIRD PARTY VALIDATED SOIL CHEMISTRY DATA REPORT - NTCRA SOILS, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS**
# of Pages: 27
Doc Date: 03/01/2002

Author: , BATTELLE
Addressee:
Doc Type: DATA VALIDATION REPORT; REPORT; SAMPLING DATA
File Break: 03.02
Access Type(s): REL

29566 **DRAFT, TECHNICAL MEMORANDUM, SOURCE AREA INVESTIGATION, TECHNICAL ASSISTANCE (PART 1 OF 2).**
# of Pages: 196
Doc Date: 01/01/2002

Author: , TETRA TECH NUS INC
Addressee: , US EPA REGION 1
Doc Type: REPORT
File Break: 03.04
Access Type(s): REL

29567 **DRAFT, TECHNICAL MEMORANDUM, SOURCE AREA INVESTIGATION, TECHNICAL ASSISTANCE (PART 2 OF 2).**
# of Pages: 324
Doc Date: 01/01/2002

Author: , TETRA TECH NUS INC
Addressee: , US EPA REGION 1
Doc Type: REPORT
File Break: 03.04
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

35129 **ALLENDALE DAM SEDIMENT RE-SAMPLING DATA (TRANSMITTAL LETTER IS ATTACHED)**
# of Pages: 11
Doc Date: 04/30/2002

Author: STEPHEN S PARKER, TETRA TECH NUS INC
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: DATA SUMMARY REPORT
REPORT
SAMPLING DATA
File Break: 03.04
Access Type(s): REL

35197 **TASK 22B POST-THIRD PARTY VALIDATED SEDIMENT CHEMISTRY DATA REPORT, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS**
# of Pages: 352
Doc Date: 04/01/2002

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: DATA VALIDATION REPORT
REPORT
SAMPLING DATA
File Break: 03.02
Access Type(s): REL

35721 **FROG CALL SURVEY OF THE WOONASQUATUCKET RIVER**
# of Pages: 5
Doc Date: 04/30/2001

Author: , US FISH & WILDLIFE SERVICE
Addressee:
Doc Type: REPORT
SAMPLING DATA
File Break: 03.04
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

35737 **TASK 22F POST-THIRD PARTY VALIDATED ELS EGG AND CATFISH FRY TISSUE CHEMISTRY DATA REPORT, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS**

# of Pages: 170
Doc Date: 09/01/2002

Author:	Addressee:	Doc Type:	File Break:
, BATTELLE		DATA VALIDATION REPORT REPORT SAMPLING DATA	03.02 **Access Type(s):** REL

35738 **TASK 22A POST-THIRD PARTY VALIDATED DIET TISSUE CHEMISTRY DATA REPORT, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS [PART 1 OF 2]**

# of Pages: 247
Doc Date: 09/01/2002

Author:	Addressee:	Doc Type:	File Break:
, BATTELLE		DATA VALIDATION REPORT REPORT SAMPLING DATA	03.02 **Access Type(s):** REL

35739 **TASK 22A POST-THIRD PARTY VALIDATED DIET TISSUE CHEMISTRY DATA REPORT, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS [PART 2 OF 2]**

# of Pages: 225
Doc Date: 09/01/2002

Author:	Addressee:	Doc Type:	File Break:
, BATTELLE		DATA VALIDATION REPORT REPORT SAMPLING DATA	03.02 **Access Type(s):** REL

Phase 03: REMEDIAL INVESTIGATION (RI)

35807 **PROPOSAL FOR GEOMORPHIC EVALUATION OF THE WOONASQUATUCKET RIVER**

# of Pages: 4
Doc Date: 07/29/2002

Author:	Addressee:	Doc Type:	File Break:	Access Type(s):
, ERDC-WATERWAYS EXPERIMENT STATION	, US EPA REGION 1	WORK PLAN	03.03	REL

35810 **WORK PLAN FOR GEOPHYSICAL SURVEYS AND SEDIMENT SAMPLING**

# of Pages: 12
Doc Date: 09/17/2002

Author:	Addressee:	Doc Type:	File Break:	Access Type(s):
, LOCKHEED MARTIN REAC	, US EPA REGION 1	WORK PLAN	03.07	REL

35812 **DRAFT FINAL SCOPE OF WORK (SOW) - ESTIMATION OF SEDIMENT STABILITIES, CONTAMINANT VOLUMES, AND COMPARATIVE RISKS**

# of Pages: 1
Doc Date: 07/15/2002

Author:	Addressee:	Doc Type:	File Break:	Access Type(s):
, US EPA REGION 1		WORK PLAN	03.03	REL

Phase 03: REMEDIAL INVESTIGATION (RI)

35814 **TASK 22A POST-THIRD PARTY VALIDATED FISH TISSUE CHEMISTRY DATA REPORT, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS, VOLUME 2 OF 2 [PART 1 OF 2]**

# of Pages: 400
Doc Date: 07/01/2002

Author: , BATTELLE
Addressee:
Doc Type: DATA VALIDATION REPORT; REPORT; SAMPLING DATA
File Break: 03.02
Access Type(s): REL

35816 **TASK 22A POST-THIRD PARTY VALIDATED FISH TISSUE CHEMISTRY DATA REPORT, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS, VOLUME 2 OF 2 [PART 2 OF 2]**

# of Pages: 435
Doc Date: 07/01/2002

Author: , BATTELLE
Addressee:
Doc Type: DATA VALIDATION REPORT; REPORT; SAMPLING DATA
File Break: 03.02
Access Type(s): REL

35817 **TASK 22D POST-THIRD PARTY VALIDATED SOIL CHEMISTRY DATA REPORT, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS**

# of Pages: 110
Doc Date: 07/01/2002

Author: , BATTELLE
Addressee:
Doc Type: DATA VALIDATION REPORT; REPORT; SAMPLING DATA
File Break: 03.02
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

35818 **TASK 22A POST-THIRD PARTY VALIDATED FISH TISSUE CHEMISTRY DATA REPORT, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS, VOLUME 1 OF 2 [PART 1 OF 4]**
# of Pages: 353
Doc Date: 07/01/2002

Author: , BATTELLE
Addressee:
Doc Type: DATA VALIDATION REPORT
REPORT
SAMPLING DATA
File Break: 03.02
Access Type(s): REL

35820 **TASK 22A POST-THIRD PARTY VALIDATED FISH TISSUE CHEMISTRY DATA REPORT, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS, VOLUME 1 OF 2 [PART 2 OF 4]**
# of Pages: 208
Doc Date: 07/01/2002

Author: , BATTELLE
Addressee:
Doc Type: DATA VALIDATION REPORT
REPORT
SAMPLING DATA
File Break: 03.02
Access Type(s): REL

35821 **TASK 22A POST-THIRD PARTY VALIDATED FISH TISSUE CHEMISTRY DATA REPORT, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS, VOLUME 1 OF 2 [PART 3 OF 4]**
# of Pages: 204
Doc Date: 07/01/2002

Author: , BATTELLE
Addressee:
Doc Type: DATA VALIDATION REPORT
REPORT
SAMPLING DATA
File Break: 03.02
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

35822 **TASK 22A POST-THIRD PARTY VALIDATED FISH TISSUE CHEMISTRY DATA REPORT, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS, VOLUME 1 OF 2 [PART 4 OF 4]**
# of Pages: 285
Doc Date: 07/01/2002

Author: , BATTELLE
Addressee:
Doc Type: DATA VALIDATION REPORT
REPORT
SAMPLING DATA
File Break: 03.02
Access Type(s): REL

35823 **FINAL WORK PLAN, INTERIM DATA COLLECTION, REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS)**
# of Pages: 46
Doc Date: 09/01/2002

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: WORK PLAN
File Break: 03.07
Access Type(s): REL

35824 **FINAL SITE MANAGEMENT PLAN UPDATE, INTERIM DATA COLLECTION, REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS)**
# of Pages: 15
Doc Date: 09/01/2002

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: REPORT
WORK PLAN
File Break: 03.07
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

35825 **FINAL DATA MANAGEMENT PLAN UPDATE, INTERIM DATA COLLECTION, REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS)**
# of Pages: 31
Doc Date: 09/01/2002

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: REPORT; WORK PLAN
File Break: 03.07
Access Type(s): REL

35827 **FINAL FIELD SAMPLING PLAN, INTERIM DATA COLLECTION, REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS)**
# of Pages: 96
Doc Date: 09/01/2002

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: REPORT; WORK PLAN
File Break: 03.07
Access Type(s): REL

35828 **ADDENDUM TO FINAL QUALITY ASSURANCE PROJECT PLAN, INTERIM DATA COLLECTION, REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS)**
# of Pages: 219
Doc Date: 09/01/2002

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: REPORT; SAMPLING & ANALYSIS PLAN; WORK PLAN
File Break: 03.07
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

35829 **DRAFT ADDENDUM, QUALITY ASSURANCE PROJECT PLAN - ATTACHMENT K, STANDARD OPERATING PROCEDURES (SOPS)**
# of Pages: 337
Doc Date: 07/01/2002

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: REPORT
SAMPLING & ANALYSIS PLAN
WORK PLAN
File Break: 03.07
Access Type(s): REL

35830 **FINAL HEALTH AND SAFETY PLAN, INTERIM DATA COLLECTION, REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS)**
# of Pages: 294
Doc Date: 09/01/2002

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: REPORT
WORK PLAN
File Break: 03.07
Access Type(s): REL

36072 **ANURAN CALL SURVEY OF THE WOONASQATUCKET RIVER**
# of Pages: 22
Doc Date: 09/01/2002

Author: LAURA EATON-POOLE, US FISH & WILDLIFE SERVICE
Addressee:
Doc Type: REPORT
File Break: 03.04
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

48743 **FINAL DATA EVALUATION REPORT [PART 1 OF 2]**
# of Pages: 276
Doc Date: 01/15/2003

Author: , BATTELLE
, MACTEC ENGINEERING AND CONSULTING INC

Addressee: , US ARMY CORPS OF ENGINEERS

Doc Type: DATA SUMMARY REPORT
REPORT
SAMPLING DATA

File Break: 03.04
Access Type(s): REL

48748 **FINAL DATA EVALUATION REPORT [PART 2 OF 2]**
# of Pages: 242
Doc Date: 01/15/2003

Author: , BATTELLE
, MACTEC ENGINEERING AND CONSULTING INC

Addressee: , US ARMY CORPS OF ENGINEERS

Doc Type: DATA SUMMARY REPORT
REPORT
SAMPLING DATA

File Break: 03.04
Access Type(s): REL

48755 **FINAL QUALITY ASSURANCE PROJECT PLAN (QAPP) ADDENDUM ERRATA SHEET (11/06/02 TRANSMITTAL LETTER IS ATTACHED)**
# of Pages: 7
Doc Date: 11/06/2002

Author: , BATTELLE

Addressee:

Doc Type: REPORT
SAMPLING & ANALYSIS PLAN
WORK PLAN

File Break: 03.04
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

48758 **AMENDED ATTACHMENT E, FINAL HEALTH AND SAFETY PLAN (11/13/02 TRANSMITTAL LETTER IS ATTACHED)**
# of Pages: 9
Doc Date: 11/13/2002

Author: , BATTELLE
Addressee:
Doc Type: REPORT
File Break: 03.04
Access Type(s): REL

48763 **REVISED TASK 22B POST-THIRD PARTY VALIDATED ARCHIVED SEDIMENTS CHEMISTRY DATA REPORT, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS**
# of Pages: 40
Doc Date: 12/01/2002

Author: , BATTELLE
Addressee:
Doc Type: DATA VALIDATION REPORT
REPORT
SAMPLING DATA
File Break: 03.02
Access Type(s): REL

48767 **TASK 22A POST-THIRD PARTY VALIDATED TREE SWALLOW TISSUE CHEMISTRY DATA REPORT, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS [PART 1 OF 2]**
# of Pages: 272
Doc Date: 12/01/2002

Author: , BATTELLE
Addressee:
Doc Type: DATA VALIDATION REPORT
REPORT
SAMPLING DATA
File Break: 03.02
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

48769 **TASK 22A POST-THIRD PARTY VALIDATED TREE SWALLOW TISSUE CHEMISTRY DATA REPORT, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS [PART 2 OF 2]**
# of Pages: 213
Doc Date: 12/01/2002

Author: , BATTELLE
Addressee:
Doc Type: DATA VALIDATION REPORT; REPORT; SAMPLING DATA
File Break: 03.02
Access Type(s): REL

48770 **DIOXIN SAMPLING RESULTS FOR ALLENDALE AND LYMANSVILLE PONDS, SEPTEMBER 2002**
# of Pages: 4
Doc Date: 12/17/2002

Author: ANNA KRASKO, US EPA REGION 1
Addressee: , NORTH PROVIDENCE (RI) RESIDENT
Doc Type: CORRESPONDENCE; DATA SUMMARY REPORT; LETTER; REPORT; SAMPLING DATA
File Break: 03.02
Access Type(s): REL

48779 **TRANSMITTAL OF DRAFT BASELINE HUMAN HEALTH RISK ASSESSMENT FOR REVIEW**
# of Pages: 1
Doc Date: 08/13/2003

Author: MICHAEL JASINSKI, US EPA REGION 1
Addressee: DAVID E COOPER, US EPA
Doc Type: CORRESPONDENCE; LETTER
File Break: 03.01
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

48781 **REVIEW REQUEST FOR DRAFT BASELINE HUMAN HEALTH RISK ASSESSMENT (HHRA)**
# of Pages: 1
Doc Date: 08/13/2003

Author: MICHAEL JASINSKI, US EPA REGION 1
Addressee: MARIAN OLSEN, US EPA REGION 2
Doc Type: CORRESPONDENCE
LETTER
File Break: 03.01
Access Type(s): REL

48783 **QUALITY ASSURANCE PROJECT PLAN (QAPP) - ADDENDUM 2**
# of Pages: 192
Doc Date: 04/14/2003

Author: , LOCKHEED MARTIN CORP
Addressee: , US EPA REGION 1
Doc Type: REPORT
SAMPLING & ANALYSIS PLAN
WORK PLAN
File Break: 03.04
Access Type(s): REL

48786 **TASK RI-3 CHEMISTRY DATA REPORT, INTERIM DATA COLLECTION, REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS) [PART 1 OF 2]**
# of Pages: 189
Doc Date: 05/01/2003

Author: , BATTELLE
Addressee:
Doc Type: DATA SUMMARY REPORT
REPORT
SAMPLING DATA
File Break: 03.02
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

48796 **DRAFT DATA SUMMARY REPORT, INTERIM DATA COLLECTION, REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS)**
# of Pages: 119
Doc Date: 06/01/2003

Author	Addressee	Doc Type	File Break	Access Type(s)
, BATTELLE	, US ARMY CORPS OF ENGINEERS	DATA SUMMARY REPORT REPORT SAMPLING DATA	03.04	REL

48799 **DRAFT FINAL WORK PLAN, EXPANDED HUMAN HEALTH RISK ASSESSMENT**
# of Pages: 58
Doc Date: 07/01/2003

Author	Addressee	Doc Type	File Break	Access Type(s)
, BATTELLE , MACTEC ENGINEERING AND CONSULTING INC	, US ARMY CORPS OF ENGINEERS	WORK PLAN	03.07	REL

48801 **TASK 22H CHEMISTRY DATA REPORT, YR2002 TREE SWALLOW STUDY POST-THIRD PARTY VALIDATION, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS**
# of Pages: 78
Doc Date: 05/01/2003

Author	Addressee	Doc Type	File Break	Access Type(s)
, BATTELLE		DATA VALIDATION REPORT REPORT SAMPLING DATA	03.02	REL

Phase 03: REMEDIAL INVESTIGATION (RI)

48804 **PRELIMINARY DRAFT TRIP REPORT, WATERBORNE GEOPHYSICAL SURVEYS**
# of Pages: 17
Doc Date: 03/13/2003

Author:	Addressee:	Doc Type:	File Break:
GORDON SHIELDS, LOCKHEED MARTIN REAC	ALAN M HUMPHREY, US EPA	REPORT	03.04 **Access Type(s):** REL

48809 **FINAL WORK PLAN, REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS)**
# of Pages: 60
Doc Date: 04/16/2003

Author:	Addressee:	Doc Type:	File Break:
, BATTELLE	, US ARMY CORPS OF ENGINEERS	WORK PLAN	03.07 **Access Type(s):** REL

48843 **TASK RI-3 CHEMISTRY DATA REPORT, INTERIM DATA COLLECTION, REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS) [PART 2 OF 2]**
# of Pages: 204
Doc Date: 05/01/2003

Author:	Addressee:	Doc Type:	File Break:
, BATTELLE		DATA SUMMARY REPORT REPORT SAMPLING DATA	03.02 **Access Type(s):** REL

Phase 03: REMEDIAL INVESTIGATION (RI)

65197 **INSTRUCTIONS TO REPLACE PAGES IN DRAFT FINAL WORK PLAN FOR EXPANDED HUMAN HEALTH RISK ASSESSMENT (REPLACED PAGES ATTACHED)**
# of Pages: 47
Doc Date: 04/05/2004

Author:	Addressee:	Doc Type:	File Break:
DEIRDRE DAHLEN, BATTELLE ANNA KRASKO, US EPA REGION 1		CORRESPONDENCE MEMO	03.01 **Access Type(s):** REL

204614 **REVIEW REQUEST FOR DRAFT BASELINE ECOLOGICAL RISK ASSESSMENT (BERA)**
# of Pages: 3
Doc Date: 09/11/2003

Author:	Addressee:	Doc Type:	File Break:
MICHAEL JASINSKI, US EPA REGION 1	DAVID W CHARTERS, US EPA PHILIP M COOK, US EPA MARK D SPRENGER, US EPA	CORRESPONDENCE LETTER	03.01 **Access Type(s):** REL

204623 **TRIP REPORT - WATERBORNE GEOPHYSICAL SURVEYS AND SEDIMENT CORING (VOLUME 1)**
# of Pages: 68
Doc Date: 10/31/2003

Author:	Addressee:	Doc Type:	File Break:
GORDON SHIELDS, LOCKHEED MARTIN REAC	ALAN M HUMPHREY, US EPA	REPORT	03.04 **Access Type(s):** REL

Phase 03: REMEDIAL INVESTIGATION (RI)

204624 **TRIP REPORT - WATERBORNE GEOPHYSICAL SURVEYS AND SEDIMENT CORING (VOLUME 2 FIGURES ON E-SIZE SHEETS)**
# of Pages: 8
Doc Date: 10/31/2003

Author	Addressee	Doc Type	File Break / Access Type(s)
GORDON SHIELDS, LOCKHEED MARTIN REAC	ALAN M HUMPHREY, US EPA	REPORT	File Break: 03.04 Access Type(s): REL

204626 **PETROLEUM HYDROCARBON ASSESSMENT OF CENTREDALE SEDIMENT CORES (TRANSMITTAL LETTER ATTACHED)**
# of Pages: 67
Doc Date: 09/01/2003

Author	Addressee	Doc Type	File Break / Access Type(s)
KAREN FOSTER, BATTELLE WILLIAM G STEINHAUER, BATTELLE , BATTELLE	LAUREEN A BOROCHANER, US ARMY CORPS OF ENGINEERS	REPORT	File Break: 03.04 Access Type(s): REL

204628 **FINAL DATA SUMMARY REPORT, INTERIM DATA COLLECTION, REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS) (TRANSMITTAL LETTERS ATTACHED)**
# of Pages: 130
Doc Date: 09/01/2003

Author	Addressee	Doc Type	File Break / Access Type(s)
, BATTELLE	, US ARMY CORPS OF ENGINEERS	DATA SUMMARY REPORT REPORT SAMPLING DATA	File Break: 03.04 Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

ID	Title	# of Pages	Doc Date	Author	Addressee	Doc Type	File Break	Access Type(s)
204629	TASK 22I CHEMISTRY DATA REPORT, YR2003 TREE SWALLOW STUDY POST-THIRD PARTY VALIDATION, HUMAN HEALTH AND BASELINE RISK ASSESSMENTS	65	01/01/2004	, BATTELLE , US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION		DATA VALIDATION REPORT REPORT SAMPLING DATA	03.02	REL
206663	INTERIM-FINAL BASELINE HUMAN HEALTH RISK ASSESSMENT VOLUME 1 OF 3	201	08/06/2004	, BATTELLE , MACTEC ENGINEERING AND CONSULTING INC	, US ARMY CORPS OF ENGINEERS	REMEDIAL INVESTIGATION (I REPORT	03.04	REL
206664	INTERIM-FINAL BASELINE HUMAN HEALTH RISK ASSESSMENT VOLUME 2 OF 3	740	08/06/2004	, BATTELLE , MACTEC ENGINEERING AND CONSULTING INC	, US ARMY CORPS OF ENGINEERS	REMEDIAL INVESTIGATION (I REPORT	03.04	REL

Phase 03: REMEDIAL INVESTIGATION (RI)

206665 **INTERIM-FINAL BASELINE HUMAN HEALTH RISK ASSESSMENT VOLUME 3 OF 3**
# of Pages: 1012
Doc Date: 08/06/2004

Author: , BATTELLE
, MACTEC ENGINEERING AND CONSULTING INC
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: REMEDIAL INVESTIGATION (F REPORT
File Break: 03.04
Access Type(s): REL

206666 **INTERIM-FINAL BASELINE ECOLOGICAL RISK ASSESSMENT VOLUME I OF II [PART 1 OF 2: EXECUTIVE SUMMARY AND FIGURES]**
# of Pages: 325
Doc Date: 09/24/2004

Author: , MACTEC ENGINEERING AND CONSULTING INC
Addressee: , US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION
Doc Type: REMEDIAL INVESTIGATION (F REPORT
File Break: 03.04
Access Type(s): REL

206667 **INTERIM-FINAL BASELINE ECOLOGICAL RISK ASSESSMENT VOLUME II OF II [PART 1 OF 4: APPENDICES A THROUGH F]**
# of Pages: 497
Doc Date: 09/24/2004

Author: , MACTEC ENGINEERING AND CONSULTING INC
Addressee: , US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION
Doc Type: REMEDIAL INVESTIGATION (F REPORT
File Break: 03.04
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

206668 **INTERIM-FINAL BASELINE ECOLOGICAL RISK ASSESSMENT VOLUME II OF II [PART 2 OF 4: APPENDICES G THROUGH I]**
# of Pages: 366
Doc Date: 09/24/2004

Author: , MACTEC ENGINEERING AND CONSULTING INC
Addressee: , US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION
Doc Type: REMEDIAL INVESTIGATION (F REPORT
File Break: 03.04
Access Type(s): REL

206669 **INTERIM-FINAL BASELINE ECOLOGICAL RISK ASSESSMENT VOLUME II OF II [PART 3 OF 4: APPENDICES J THROUGH K]**
# of Pages: 380
Doc Date: 09/24/2004

Author: , MACTEC ENGINEERING AND CONSULTING INC
Addressee: , US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION
Doc Type: REMEDIAL INVESTIGATION (F REPORT
File Break: 03.04
Access Type(s): REL

206720 **INTERIM-FINAL BASELINE ECOLOGICAL RISK ASSESSMENT VOLUME II OF II [PART 4 OF 4: APPENDICES L THROUGH N]**
# of Pages: 370
Doc Date: 09/24/2004

Author: , MACTEC ENGINEERING AND CONSULTING INC
Addressee: , US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION
Doc Type: REMEDIAL INVESTIGATION (F REPORT
File Break: 03.04
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

206721 **CHEMISTRY DATA REPORT, TASK RI-8 SEDIMENT INVESTIGATION (09/02/2004 TRANSMITTAL LETTER IS ATTACHED)**
# of Pages: 368
Doc Date: 09/01/2004

Author:	Addressee:	Doc Type:	File Break / Access
		DATA VALIDATION REPORT REPORT SAMPLING DATA	**File Break:** 03.02 **Access Type(s):** REL

206722 **CHEMISTRY DATA REPORT, TASK RI-12 OXBOW AREA SEDIMENT INVESTIGATION (12/30/2004 TRANSMITTAL LETTER IS ATTACHED)**
# of Pages: 111
Doc Date: 12/01/2004

Author:	Addressee:	Doc Type:	File Break / Access
, BATTELLE	, US ARMY CORPS OF ENGINEERS	DATA VALIDATION REPORT REPORT SAMPLING DATA	**File Break:** 03.02 **Access Type(s):** REL

206723 **FINAL TECHNICAL MEMORANDUM, SEDIMENT STABILITY STUDY**
# of Pages: 74
Doc Date: 11/01/2004

Author:	Addressee:	Doc Type:	File Break / Access
, BATTELLE	, US ARMY CORPS OF ENGINEERS	CORRESPONDENCE MEMO WORK PLAN	**File Break:** 03.07 **Access Type(s):** REL

Phase 03: REMEDIAL INVESTIGATION (RI)

206724 **FINAL TECHNICAL MEMORANDUM, APPROACH FOR DEVELOPING A LONG-TERM REMEDY FOR SOURCE AREA SOILS (07/26/2004 TRASMITTAL LETTER IS ATTACHED)**
# of Pages: 26
Doc Date: 07/01/2004

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: CORRESPONDENCE
MEMO
WORK PLAN
File Break: 03.07
Access Type(s): REL

206725 **GEOMORPHIC ASSESSMENT OF THE WOONASQUATUCKET RIVER**
# of Pages: 80
Doc Date: 09/01/2004

Author: , US ARMY CORPS OF ENGINEERS - WATERWAYS EXPERIMENT STATION
Addressee:
Doc Type: REMEDIAL INVESTIGATION (I
REPORT
File Break: 03.06
Access Type(s): REL

206726 **FINAL WORK PLAN, SEDIMENT STABILITY STUDY**
# of Pages: 12
Doc Date: 06/15/2004

Author: , BATTELLE

, QUANTITATIVE ENVIRONMENTAL ANALYSIS LLC
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: WORK PLAN
File Break: 03.07
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

206727 **FINAL WORK PLAN, SEDIMENT SAMPLE COLLECTION AND ANALYSIS AT THE OXBOW AREA**
# of Pages: 5
Doc Date: 06/17/2004

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION
Doc Type: WORK PLAN
File Break: 03.07
Access Type(s): REL

206728 **FINAL WORK PLAN, SHAKER STUDY FOR ALLENDALE AND LYMAN MILL PONDS**
# of Pages: 11
Doc Date: 12/15/2004

Author: , BATTELLE
, QUANTITATIVE ENVIRONMENTAL ANALYSIS LLC
Addressee: , US ARMY CORPS OF ENGINEERS - ENGINEERING DIVISION
Doc Type: WORK PLAN
File Break: 03.07
Access Type(s): REL

212291 **INTERIM-FINAL BASELINE ECOLOGICAL RISK ASSESSMENT VOLUME I OF II [PART 2 OF 2: TABLES]**
# of Pages: 365
Doc Date: 09/24/2004

Author: , MACTEC ENGINEERING AND CONSULTING INC
Addressee: , US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION
Doc Type: REMEDIAL INVESTIGATION (I REPORT
File Break: 03.04
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

233928 **FINAL WORK PLAN - SURFACE WATER SAMPLE COLLECTION AT UPSTREAM AND DOWNSTREAM LOCATIONS**
# of Pages: 6
Doc Date: 12/06/2004

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION
Doc Type: WORK PLAN
File Break: 03.07
Access Type(s): REL

233947 **RESPONSE TO 08/18/04 CONTAMINATED SEDIMENTS TECHNICAL ADVISORY GROUP (CSTAG) RECOMMENDATIONS**
# of Pages: 12
Doc Date: 10/07/2004

Author: ANNA KRASKO, US EPA REGION 1
Addressee: STEPHEN J ELLS, CONTAMINATED SEDIMENTS TECHNICAL ADVISORY GROUP (CSTAG)
JOHN C MEYERS, CONTAMINATED SEDIMENTS TECHNICAL ADVISORY GROUP (CSTAG)
Doc Type: CORRESPONDENCE
MEMO
PUBLIC (AND OTHER) COMME
File Break: 03.01
Access Type(s): REL

233948 **CONTAMINATED SEDIMENTS TECHNICAL ADVISORY GROUP (CSTAG) RECOMMENDATIONS**
# of Pages: 6
Doc Date: 08/18/2004

Author: STEPHEN J ELLS, CONTAMINATED SEDIMENTS TECHNICAL ADVISORY GROUP
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE
MEMO
File Break: 03.01
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

233949 **COMMENTS ON SEDIMENT RELATED DOCUMENTS (PHOTO AND USGS ATTACHED)**
# of Pages: 10
Doc Date: 07/14/2004

Author: EUGENIA MARKS, AUDUBON SOCIETY OF RHODE ISLAND	**Addressee:** , CONTAMINATED SEDIMENTS TECHNICAL ADVISORY GROUP (CSTAG)	**Doc Type:** CORRESPONDENCE LETTER	**File Break:** 03.01 **Access Type(s):** REL

233950 **QUESTIONS REGARDING SEDIMENT INVESTIGATION AND CLEANUP**
# of Pages: 4
Doc Date: 07/15/2004

Author: , WOONASQUATUCKET RIVER WATERSHED COUNCIL	**Addressee:** , CONTAMINATED SEDIMENTS TECHNICAL ADVISORY GROUP (CSTAG)	**Doc Type:** CORRESPONDENCE LETTER	**File Break:** 03.01 **Access Type(s):** REL

233954 **SUMMARY PAPER FOR CONTAMINATED SEDIMENTS TECHNICAL ADVISORY GROUP (CSTAG) MEETING**
# of Pages: 19
Doc Date: 07/15/2004

Author: , AMEC EARTH AND ENVIRONMENTAL , LOUREIRO ENGINEERING ASSOCIATES INC	**Addressee:** , CONTAMINATED SEDIMENTS TECHNICAL ADVISORY GROUP (CSTAG)	**Doc Type:** REPORT	**File Break:** 03.01 **Access Type(s):** REL

Phase 03: REMEDIAL INVESTIGATION (RI)

233955 **LETTER REGARDING SCHEDULED APPEARANCE AT 07/05/04 SEDIMENT INVESTIGATION MEETING (LIST ATTACHED)**
# of Pages: 3
Doc Date: 07/13/2004

Author: ELIZABETH L ANDERSON, SCIENCES INTERNATIONAL INC	**Addressee:** KYMBERLEE KECKLER, US EPA REGION 1	**Doc Type:** CORRESPONDENCE LETTER	**File Break:** 03.01 **Access Type(s):** REL

233956 **INVITATIONS TO CONTAMINATED SEDIMENTS TECHNICAL ADVISORY GROUP (CSTAG) STAKEHOLDERS (GUIDANCE MEMO ATTACHED)**
# of Pages: 87
Doc Date: 05/27/2004

Author: KYMBERLEE KECKLER, US EPA REGION 1	**Addressee:** , CONTAMINATED SEDIMENTS TECHNICAL ADVISORY GROUP (CSTAG)	**Doc Type:** CORRESPONDENCE LETTER	**File Break:** 03.01 **Access Type(s):** REL

237179 **FINAL WORK PLAN, SEDIMENT PROBING DATA COLLECTION AT ALLENDALE AND LYMAN MILL PONDS**
# of Pages: 10
Doc Date: 01/07/2005

Author: , BATTELLE	**Addressee:** , US ARMY CORPS OF ENGINEERS	**Doc Type:** WORK PLAN	**File Break:** 03.07 **Access Type(s):** REL

Phase 03: REMEDIAL INVESTIGATION (RI)

237189 **INTERIM FINAL REMEDIAL INVESTIGATION (RI) REPORT**
# of Pages: 435
Doc Date: 06/30/2005

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS; , US EPA REGION 1
Doc Type: REPORT
File Break: 03.06
Access Type(s): REL

237559 **COMPARISON OF PRE-BREACH AND POST-BREACH DATA**
# of Pages: 252
Doc Date: 04/29/2005

Author: MICHAEL J MURPHY, MACTEC ENGINEERING AND CONSULTING INC
Addressee: DEIRDRE DAHLEN, BATTELLE
Doc Type: REPORT
File Break: 03.04
Access Type(s): REL

242136 **INTERIM FINAL, BASELINE HUMAN HEALTH RISK ASSESSMENT, VOL 1 OF 3**
# of Pages: 215
Doc Date: 11/18/2005

Author: , MACTEC ENGINEERING AND CONSULTING INC
Addressee: , BATTELLE; , US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION
Doc Type: REPORT; RISK/HEALTH ASSESSMENT
File Break: 03.04
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

242207 **INTERIM FINAL, BASELINE HUMAN HEALTH RISK ASSESSMENT, VOL 2 OF 3**
# of Pages: 690
Doc Date: 11/18/2005

Author: , MACTEC ENGINEERING AND CONSULTING INC

Addressee: , BATTELLE
, US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION

Doc Type: REPORT
RISK/HEALTH ASSESSMENT

File Break: 03.04
Access Type(s): REL

242208 **INTERIM FINAL, BASELINE HUMAN HEALTH RISK ASSESSMENT, VOL 3 OF 3**
# of Pages: 1074
Doc Date: 11/18/2005

Author: , MACTEC ENGINEERING AND CONSULTING INC

Addressee: , BATTELLE
, US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION

Doc Type: REPORT
RISK/HEALTH ASSESSMENT

File Break: 03.04
Access Type(s): REL

242219 **INTERIM FINAL - PRELIMINARY REMEDIATION GOALS REPORT**
# of Pages: 349
Doc Date: 11/01/2005

Author:

Addressee:

Doc Type: REPORT

File Break: 03.04
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

253310 **FINAL WORK PLAN - CURRENT VELOCITY/STAGE HEIGHT DATA COLLECTION ACTIVITIES**
# of Pages: 8
Doc Date: 03/01/2005

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: WORK PLAN
File Break: 03.07
Access Type(s): REL

253311 **FINAL WORK PLAN - SEDIMENT COLLECTION AT MANTON POND**
# of Pages: 6
Doc Date: 04/01/2005

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: WORK PLAN
File Break: 03.07
Access Type(s): REL

253335 **INVESTIGATION OF LYMANSVILLE AND MANTON DAMS, WOONASQUATUCKET RIVER, RHODE ISLAND**
# of Pages: 144
Doc Date: 05/01/2005

Author: , US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION
Addressee:
Doc Type: REPORT
File Break: 03.04
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

253336 **CHEMISTRY DATA REPORT - SEMI-PERMEABLE MEMBRANE DEVICE (SPMD) INVESTIGATION (11/10/05 DATA VALIDATION ATTACHED)**
# of Pages: 126
Doc Date: 11/01/2005

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: DATA VALIDATION REPORT; REPORT; SAMPLING DATA
File Break: 03.04
Access Type(s): REL

253337 **INTERIM FINAL, SEDIMENT STABILITY STUDY - PHASE 2 REPORT**
# of Pages: 104
Doc Date: 03/01/2006

Author: , BATTELLE; , QUANTITATIVE ENVIRONMENTAL ANALYSIS LLC
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: WORK PLAN
File Break: 03.04
Access Type(s): REL

253338 **FINAL WORK PLAN DOCUMENTS - FIELD SAMPLING PLAN (FSP), QUALITY ASSURANCE PROJECT PLAN (QAPP), ADDENDUM 3 AND HEALTH AND SAFETY PLAN (HASP)**
# of Pages: 422
Doc Date: 03/01/2006

Author: , BATTELLE
Addressee: , US ARMY CORPS OF ENGINEERS
Doc Type: WORK PLAN
File Break: 03.07
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

253339	**COMBINED CHEMISTRY DATA REPORT - TASK RI-13, SURFACE WATER AND LYMAN MILL SEDIMENT INVESTIGATION AND TASK RI-15 MANTON POND SEDIMENT INVESTIGATION (10/25/05 DATA VALIDATION SUMMARY ATTACHED)**		**# of Pages:** 367 **Doc Date:** 10/01/2005
Author: , BATTELLE	**Addressee:** , US ARMY CORPS OF ENGINEERS	**Doc Type:** REPORT	**File Break:** 03.04 **Access Type(s):** REL
273402	**ADDENDUM TO THE INTERIM FINAL BASELINE HUMAN HEALTH RISK ASSESSMENT (BHHRA): OXBOW AREA**		**# of Pages:** 326 **Doc Date:** 08/01/2006
Author: , MACTEC ENGINEERING AND CONSULTING INC	**Addressee:** , US ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT	**Doc Type:** REPORT RISK/HEALTH ASSESSMENT	**File Break:** 03.04 **Access Type(s):** REL
273403	**INTERIM FINAL WORK PLAN, GROUNDWATER ELEVATION DATA AND SAMPLE COLLECTION**		**# of Pages:** 12 **Doc Date:** 12/22/2006
Author: , BATTELLE	**Addressee:** , US ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT	**Doc Type:** WORK PLAN	**File Break:** 03.07 **Access Type(s):** REL

Phase 03: REMEDIAL INVESTIGATION (RI)

273408 **LETTER ON RISK ASSESSMENT AND REMEDIAL INVESTIGATION**
# of Pages: 2
Doc Date: 12/21/2006

Author: EVE VAUDO, US EPA REGION 1	**Addressee:** JEROME C MUYS JR, BINGHAM MCCUTCHEN	**Doc Type:** CORRESPONDENCE LETTER	**File Break:** 03.01 **Access Type(s):** REL

273409 **LETTER ON BASELINE RISK ASSESSMENT: OXBOW AREA**
# of Pages: 1
Doc Date: 02/16/2007

Author: EVE VAUDO, US EPA REGION 1	**Addressee:** JEROME C MUYS JR, SULLIVAN & WORCESTER LLP	**Doc Type:** CORRESPONDENCE LETTER	**File Break:** 03.01 **Access Type(s):** REL

273410 **LETTER FROM AMEC TO EPA ON OXBOW AREA RISK ASSESSMENT**
# of Pages: 5
Doc Date: 05/04/2007

Author: RUSSELL E KEENAN, AMEC EARTH AND ENVIRONMENTAL INC , AMEC EARTH AND ENVIRONMENTAL INC	**Addressee:** ANNA KRASKO, US EPA REGION 1	**Doc Type:** CORRESPONDENCE LETTER	**File Break:** 03.01 **Access Type(s):** REL

Phase 03: REMEDIAL INVESTIGATION (RI)

273411 **EMHART'S COMMENTS ON THE ADDENDUM TO THE INTERIM-FINAL BASELINE HUMAN HEALTH AND RISK ASSESSMENT (BHHRA) AND THE INTERIM-FINAL BASELINE ECOLOGICAL RISK ASSESSMENT (BERA): OXBOW AREA**
# of Pages: 37
Doc Date: 01/25/2007

Author: JEROME C MUYS JR, BINGHAM MCCUTCHEN
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 03.10
Access Type(s): REL

273412 **EMHART'S COMMENTS ON THE INTERIM-FINAL BASELINE RISK ASSESSMENTS AND REMEDIAL INVESTIGATION (RI) AND THE INTERIM-FINAL PRELIMINARY REMEDIATION GOALS REPORT (PRG)**
# of Pages: 124
Doc Date: 10/19/2006

Author: JEROME C MUYS JR, BINGHAM MCCUTCHEN
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 03.10
Access Type(s): REL

273415 **COMMENTS ON BEHALF OF CUSTOMER'S OF NEW ENGLAND CONTAINER COMPANY (NECC)**
# of Pages: 32
Doc Date: 01/31/2004

Author: , SCIENCES INTERNATIONAL INC
Addressee:
Doc Type: REPORT
File Break: 03.10
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

273436 **SUBMITTAL OF DELIVERABLE - INTERIM FINAL LETTER REPORT, OCTOBER 2005 STORM EVALUATION**

# of Pages: 11
Doc Date: 07/11/2006

Author: DEIRDRE DAHLEN, BATTELLE
LISA LEFKOVITZ, BATTELLE

Addressee: BEVERLY LAWRENCE, US ARMY CORP OF ENGINEERS

Doc Type: REPORT

File Break: 03.04
Access Type(s): REL

285149 **RESPONSE TO EXPONENT MEMORANDUM SUBMITTED BY NEW ENGLAND CONTAINER COMPANY (NECC) CUSTOMER GROUP REGARDING EPA'S CONCEPTUAL SITE MODEL**

# of Pages: 22
Doc Date: 07/20/2007

Author: JEROME C MUYS JR, SULLIVAN & WORCESTER LLP

Addressee: EVE VAUDO, US EPA REGION 1

Doc Type: CORRESPONDENCE
LETTER

File Break: 03.01
Access Type(s): REL

285150 **EXPONENT'S RESPONSE TO DR J RONALD HASS AND AMEC EARTH AND ENVIRONMENTAL INC RESPONSES DATED ON APRIL 04, 2007 AND JULY 19, 2007 REGARDING EPA'S CONCEPTUAL SITE MODEL**

# of Pages: 19
Doc Date: 09/20/2007

Author: , EXPONENT

Addressee: , NEW ENGLAND CONTAINER CO INC

Doc Type: CORRESPONDENCE
MEMO

File Break: 03.01
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

285151 **SPMD INVESTIGATION REVIEW**
# of Pages: 3
Doc Date: 04/13/2007

Author: ROBERT FORD, US EPA
Addressee: CORNELL ROSIU, US EPA REGION 1
Doc Type: CORRESPONDENCE MEMO
File Break: 03.01
Access Type(s): REL

285152 **COMMENTS ON EPA'S CONCEPTUAL MODEL FOR GROUNDWATER TO SURFACE WATER TRANSPORT PATHWAY**
# of Pages: 9
Doc Date: 06/08/2007

Author: PATRICK O GWINN, AMEC EARTH AND ENVIRONMENTAL
RUSSELL E KEENAN, AMEC EARTH AND ENVIRONMENTAL INC
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 03.01
Access Type(s): REL

285153 **COMMENTS ON FACILITATED TRANSPORT OF DIOXIN FROM MW-05S TO THE WOONASQUATUCKET RIVER**
# of Pages: 4
Doc Date: 10/15/2007

Author: PATRICK O GWINN, AMEC EARTH AND ENVIRONMENTAL
RUSSELL E KEENAN, AMEC EARTH AND ENVIRONMENTAL INC
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 03.01
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

285155 **ADDENDUM 1- RESPONSE TO ADDITIONAL COMMENTS NOVEMBER 13, 2007 MONITORING WELL INSTALATION WORK PLAN**
# of Pages: 65
Doc Date: 01/29/2008

Author: DAVID N SCOTTI, LOUREIRO ENGINEERING ASSOCIATES INC
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE; LETTER
File Break: 03.07
Access Type(s): REL

285156 **RESPONSE TO COMMENTS NOVEMBER 13, 2007 MONITORING WELL INSTALATION WORK PLAN (EPA'S COMMENTS AND WORK PLAN ATTACHED)**
# of Pages: 239
Doc Date: 01/07/2008

Author: DAVID N SCOTTI, LOUREIRO ENGINEERING ASSOCIATES INC
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE; LETTER; PUBLIC (AND OTHER) COMME
File Break: 03.07
Access Type(s): REL

506556 **COMMENTS ON SUPPLEMENTAL BASELINE HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT: OXBOW AREA FLOOD PLAIN SOIL AND SEDIMENT**
# of Pages: 3
Doc Date: 10/05/2011

Author: ALICIA J LEHRER , WOONASQUATUCKET RIVER WATERSHED COUNCIL
Addressee: STACY GREENDLINGER, US EPA REGION 1
Doc Type: CORRESPONDENCE; LETTER
File Break: 03.10
Access Type(s): REL

Phase 03: REMEDIAL INVESTIGATION (RI)

521762 **TECHNICAL MEMORANDUM: REVIEW OF COMMENTS ON US EPA'S INTERIM-FINAL SUPPLEMENTAL BASELINE HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENTS (TRANSMITTAL LETTER ATTACHED)**

# of Pages: 22
Doc Date: 09/25/2012

Author: , AMEC ENVIRONMENT AND INFRASTRUCTURE INC
Addressee: , DEPT OF ARMY - NEW ENGLAND DISTRICT
Doc Type: CORRESPONDENCE MEMO
File Break: 03.07
Access Type(s): REL

522356 **MEMO REGARDING REVIEW OF COMMENTS INCLUDED IN 10/19/2006 LETTER FROM BINGHAM MCCUTCHEN LLC**

# of Pages: 13
Doc Date: 09/28/2012

Author: MICHAEL MURPHY, AMEC ENVIRONMENT AND INFRASTRUCTURE INC
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE MEMO
File Break: 03.01
Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

273404 **PROPOSAL FOR HYDRODYNAMIC MODELING ANALYSIS**
# of Pages: 5
Doc Date: 01/18/2007

Author: C KIRK ZIEGLER, QUANTITATIVE ENVIRONMENTAL ANALYSIS LLC
Addressee: RUSSELL KEENAN, NONE
Doc Type: CORRESPONDENCE LETTER
File Break: 04.04
Access Type(s): REL

273407 **NEW ENGLAND CONTAINER COMPANY (NECC) CUSTOMER GROUP'S RESPONSE TO HASS REPORT**
# of Pages: 19
Doc Date: 04/06/2007

Author: DAVID B GRAHAM, KAUFMAN & CANOLES
Addressee: EVE VAUDO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 04.01
Access Type(s): REL

273413 **LETTER FROM AMEC REGARDING PRELIMINARY REMEDIATION GOALS (PRG) DEVELOPMENT PROJECT**
# of Pages: 3
Doc Date: 09/28/2005

Author: RUSSELL E KEENAN, AMEC EARTH AND ENVIRONMENTAL INC
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 04.01
Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

273414 **EPA'S LETTER RESPONSE TO AMEC'S SEPTEMBER 28, 2005 LETTER ON PRG DEVELOPMENT**
# of Pages: 1
Doc Date: 10/06/2005

Author: ANNA KRASKO, US EPA REGION 1
Addressee: RUSSELL E KEENAN, AMEC EARTH AND ENVIRONMENTAL INC
Doc Type: CORRESPONDENCE LETTER
File Break: 04.01
Access Type(s): REL

273418 **AUDUBON LETTER - PROPOSED DAM REMOVAL OPTION**
# of Pages: 2
Doc Date: 10/12/2006

Author: EUGENIA MARKS, AUDUBON SOCIETY OF RHODE ISLAND
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 04.01
Access Type(s): REL

285154 **SUMMARY OF FINDINGS REGARDING COSOLVENCY AT WM-05S**
# of Pages: 8
Doc Date: 08/15/2007

Author: PATRICK O GWINN, AMEC EARTH AND ENVIRONMENTAL
RUSSELL E KEENAN, AMEC EARTH AND ENVIRONMENTAL INC
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 04.01
Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

285157 **LETTER REGARDING REMEDIAL ALTERNATIVE FOR SOURCE AREA SOILS**
# of Pages: 3
Doc Date: 07/18/2007

Author: JEFFREY M KARP , SULLIVAN & WORCESTER LLP
Addressee: EVE VAUDO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 04.01
Access Type(s): REL

285158 **SOURCE AREA SOIL ALTERNATIVES**
# of Pages: 5
Doc Date: 06/08/2007

Author: JEFFERY J LOUREIRO, LOUREIRO ENGINEERING ASSOCIATES INC
JEROME C MUYS JR, SULLIVAN & WORCESTER LLP
Addressee: EVE VAUDO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 04.01
Access Type(s): REL

285159 **EPA'S RESPONSE LETTER TO AMEC AUGUST 15, 2007 AND LEA SEPTERMBER 11, 2007 LETTERS**
# of Pages: 2
Doc Date: 09/14/2007

Author: ANNA KRASKO, US EPA REGION 1
Addressee: DAVID N SCOTTI, LOUREIRO ENGINEERING ASSOCIATES INC
Doc Type: CORRESPONDENCE LETTER
File Break: 04.01
Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

285160 **REMEDIAL ALTERNATIVE FOR SOURCE-AREA SOIL**
# of Pages: 7
Doc Date: 09/11/2007

Author: DAVID N SCOTTI, LOUREIRO ENGINEERING ASSOCIATES INC
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 04.01
Access Type(s): REL

285161 **EPA'S RESPONSE LETTER TO EMHART'S JULY 18, 2007 LETTER**
# of Pages: 2
Doc Date: 08/14/2007

Author: EVE VAUDO, US EPA REGION 1
Addressee: JEFFREY M KARP , SULLIVAN & WORCESTER LLP
Doc Type: CORRESPONDENCE LETTER
File Break: 04.01
Access Type(s): REL

285162 **SIMULATED HYDROLOGICAL RESPONSES TO THE REMOVAL OF TWO DAMS ON THE WOONASQUATUCKET RIVER (07/19/2007 COVER LETTER ATTACHED)**
# of Pages: 5
Doc Date: 07/19/2007

Author: , DEPARTMENT OF ARMY
Addressee:
Doc Type: REPORT
File Break: 04.04
Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

285164 **HYDRODYNAMIC ANALYSIS OF REMEDIAL ALTERNATIVES (SUPPLEMENTAL FIGURES ATTACHED)**
# of Pages: 115
Doc Date: 11/16/2007

Author: , QUANTITATIVE ENVIRONMENTAL ANALYSIS LLC
Addressee: , EMHART INDUSTRIES INC
Doc Type: REPORT
File Break: 04.04
Access Type(s): REL

449064 **SUPPLEMENTAL RESPONSE TO EMHART'S ASSERTION THAT SAMPLE ID CMS-451-F MAY HAVE BEEN TAKEN IN AN AREA USED BY NECC FOR INCOMING DRUM STORAGE (04/16/2008 TRANSMITTAL IS ATTACHED)**
# of Pages: 4
Doc Date: 04/14/2008

Author: PAUL TURNHAM, EXPONENT
Addressee: DAVID B GRAHAM, KAUFMAN & CANOLES
Doc Type: CORRESPONDENCE MEMO
File Break: 04.01
Access Type(s): REL

449065 **LETTER CONTINUED DISCUSSION REGARDING SEDIMENT-RELATED REMEDIAL ALTERNATIVES IN FEASIBILITY STUDY**
# of Pages: 5
Doc Date: 05/16/2008

Author: DAVID N SCOTTI, LOUREIRO ENGINEERING ASSOCIATES INC
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 04.01
Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

449066 **LETTER REGARDING RESPONSE TO SEPTEMBER 20, 2007 EXPONENT MEMORANDUM SUBMITTED BY NECC CUSTOMER GROUP**

# of Pages: 33
Doc Date: 04/17/2008

Author: JEROME C MUYS JR, SULLIVAN & WORCESTER LLP

Addressee: EVE STOLOV VAUDO, US EPA REGION 1

Doc Type: CORRESPONDENCE
LETTER

File Break: 04.01

Access Type(s): REL

449067 **LETTER FROM WRWC REGARDING REITERATION AND CONCERNS RELATED TO THE PRP REPORT ON THE HYDRODYNAMIC ANALYSIS OF REMEDIAL ALTERNATIVES**

# of Pages: 2
Doc Date: 05/09/2008

Author: EUGENIA D MARKS, WOONASQUATUCKET RIVER WATERSHED COUNCIL
JANE SHERMAN, WOONASQUATUCKET RIVER WATERSHED COUNCIL

Addressee: ANNA KRASKO, US EPA REGION 1

Doc Type: CORRESPONDENCE
LETTER

File Break: 04.01

Access Type(s): REL

449068 **LETTER REGARDING INVESTIGATION-DERIVED WASTE (IDW)**

# of Pages: 4
Doc Date: 05/09/2008

Author: JEROME C MUYS JR, SULLIVAN & WORCESTER LLP

Addressee: EVE VAUDO, US EPA REGION 1

Doc Type: CORRESPONDENCE
LETTER

File Break: 04.01

Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

449069 **RESPONSE LETTER FROM EPA REGARDING LETTER DATED ON MAY 9, 2008 TO WRWC**
# of Pages: 3
Doc Date: 06/19/2008

Author: ANNA KRASKO, US EPA REGION 1

Addressee: JANE SHERMAN, WOONASQUATUCKET RIVER WATERSHED COUNCIL

Doc Type: CORRESPONDENCE
LETTER
PUBLIC (AND OTHER) COMME

File Break: 04.01

Access Type(s): REL

449070 **LETTER REGARDING NECC AS A LIKELY SOURCE OF DIOXIN BASED ON GEOCHRONOLOGY DATA**
# of Pages: 2
Doc Date: 07/03/2008

Author: JEROME C MUYS JR, SULLIVAN & WORCESTER LLP

Addressee: EVE STOLOV VAUDO, US EPA REGION 1

Doc Type: CORRESPONDENCE
LETTER

File Break: 04.01

Access Type(s): REL

449071 **LETTER FROM EPA TO BACCALA REGARDING DISCUSSION OF DIOXIN-CONTAMINATIONED WOONASQUATUCKET RIVER**
# of Pages: 1
Doc Date: 09/28/2008

Author: STACY GREENDLINGER, US EPA REGION 1

Addressee: JAMES BACCALA, BACCALA CONCRETE CORPORATION

Doc Type: CORRESPONDENCE
LETTER
PUBLIC (AND OTHER) COMME

File Break: 04.01

Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

449072 **EPA'S RESPONSE LETTER TO MUYS LETTER DATED DECEMBER 30, 2008 CONCERNING DISPOSAL OF INVESTIGATION-DERIVED WASTE (IDW)**
# of Pages: 2
Doc Date: 01/20/2009

Author: EVE VAUDO, US EPA REGION 1
Addressee: JEROME C MUYS JR, SULLIVAN & WORCESTER LLP
Doc Type: CORRESPONDENCE
LETTER
PUBLIC (AND OTHER) COMME
File Break: 04.01
Access Type(s): REL

449073 **OXBOW AREA WETLAND DELINEATION REPORT AND FUNCTIONS AND VALUES ASSESSMENT**
# of Pages: 86
Doc Date: 04/01/2008

Author: , US ARMY CORP ENGINEERS
Addressee: , US EPA REGION 1
Doc Type: REPORT
File Break: 04.04
Access Type(s): REL

449074 **DRAFT COMPARATIVE ECOLOGICAL ASSESSMENT REPORT**
# of Pages: 85
Doc Date: 01/25/2008

Author: , AMEC EARTH AND ENVIRONMENTAL
Addressee: , EMHART INDUSTRIES INC
Doc Type: REPORT
File Break: 04.04
Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

449075 **FINAL COMPARATIVE ECOLOGICAL ASSESSMENT REPORT (6/15/2009 LETTER ATTACHED)**
# of Pages: 114
Doc Date: 10/01/2008

Author: , AMEC EARTH AND ENVIRONMENTAL INC
Addressee: , EMHART INDUSTRIES INC
Doc Type: REPORT
File Break: 04.04
Access Type(s): REL

449076 **SHALLOW GROUNDWATER DATA REPORT (11/06/2008 EPA'S COMMENTS ATTACHED) [MARGINALIA]**
# of Pages: 1193
Doc Date: 09/12/2008

Author: , LOUREIRO ENGINEERING ASSOCIATES INC
Addressee: , EMHART INDUSTRIES INC
Doc Type: REPORT
SAMPLING DATA
File Break: 04.04
Access Type(s): REL

449077 **ASSESSORS MAPS EVALUATION FOR UPLAND STORAGE AREAS [MARGINALIA]**
# of Pages: 59
Doc Date: 03/20/2008

Author: JOSEPH M REDLINGER, US DEPT OF ARMY
Addressee:
Doc Type: MAP
File Break: 04.04
Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

455647 **NATURAL RESOURCE TRUSTEE COMMENTS ON THE COMPARATIVE ECOLOGICAL ASSESSMENT REPORT (TRANSMITTAL ATTACHED)**
# of Pages: 10
Doc Date: 01/27/2009

Author	Addressee	Doc Type	File Break / Access Type(s)
ANNA KRASKO, US EPA REGION 1	RUSSELL E KEENAN, AMEC EARTH AND ENVIRONMENTAL INC	CORRESPONDENCE LETTER	File Break: 04.04 Access Type(s): REL

455648 **EPA'S COMMENTS ON THE COMPARATIVE ECOLOGICAL ASSESSMENT REPORT**
# of Pages: 2
Doc Date: 07/21/2008

Author	Addressee	Doc Type	File Break / Access Type(s)
ANNA KRASKO, US EPA REGION 1	JEFFERY J LOUREIRO, LOUREIRO ENGINEERING ASSOCIATES INC	CORRESPONDENCE LETTER	File Break: 04.04 Access Type(s): REL

455649 **RESPONSE TO 10/02/2006 CORRESPONDENCE CONCERNING DAM REMOVAL OPTIONS PROPOSED BY LOUREIKO ENGINEERING ASSOCIATES INC (LETTER FROM EUGENIA MARKS ATTACHED)**
# of Pages: 8
Doc Date: 04/09/2007

Author	Addressee	Doc Type	File Break / Access Type(s)
PATRICK O GWINN, AMEC EARTH AND ENVIRONMENTAL DAVID N SCOTTI, LOUREIRO ENGINEERING ASSOCIATES INC	ANNA KRASKO, US EPA REGION 1	CORRESPONDENCE LETTER	File Break: 04.04 Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

462873 **MEETING NOTES BETWEEN BACCALA CONCRETE CORPORATION AND BATTELLE TO DISUSS POTENTIAL OF LOCATING A CONFINED DISPOSAL FACILITY (CDF)**
# of Pages: 3
Doc Date: 04/08/2009

Author	Addressee	Doc Type	File Break / Access
, BATTELLE	, US EPA REGION 1	MEETING RECORD	File Break: 04.01 Access Type(s): REL

464417 **INTERIM FINAL FEASIBILITY STUDY (FS) VOLUMES 1 & 2**
# of Pages: 1864
Doc Date: 04/30/2010

Author	Addressee	Doc Type	File Break / Access
, BATTELLE	, US ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT , US EPA REGION 1	FEASIBILITY STUDY (FS) REPORT	File Break: 04.06 Access Type(s): REL

467906 **SAMPLING AND ANALYSIS PLAN (SAP): SUPPLEMENTAL INVESTIGATION OF THE LYMAN MILL REACH SEDIMENT AND FLOOD PLAIN SOILS (TRANSMITTAL LETTER AND 08/04/2010 ERRATA SHEET ATTACHED)**
# of Pages: 799
Doc Date: 06/21/2010

Author	Addressee	Doc Type	File Break / Access
, INTEGRAL CONSULTING INC	, EMHART INDUSTRIES INC	SAMPLING DATA SAMPLING & ANALYSIS PLAN WORK PLAN	File Break: 04.02 Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

472034 **INTERIM FINAL FOR SUPPLEMENTAL HUMAN HEALTH RISK ASSESSMENT (HHRA) SOURCE AREA UTILITY WORKER**

# of Pages: 94
Doc Date: 10/01/2010

Author: , MACTEC ENGINEERING AND CONSULTING INC
Addressee: , DEPT OF THE ARMY
Doc Type: REPORT
File Break: 04.04
Access Type(s): REL

474574 **LETTER REGARDING EMHART'S REVISIONS TO PROPOSED AMENDEMENT TO STATEMENT OF WORK (SOW) AND SAMPLING AND ANALYSIS PLAN (SAP) (11/18/2010 FIRST AMENDMENT TO AOC ATTACHED)**

# of Pages: 8
Doc Date: 11/17/2010

Author: PATRICK O GWINN, INTEGRAL CONSULTING INC
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 04.01
Access Type(s): REL

485660 **EMAIL REGARDING 2010 OXBOW SAMPLING (EMAIL HISTORY ATTACHED)**

# of Pages: 19
Doc Date: 03/29/2011

Author: PATRICK O GWINN, INTEGRAL CONSULTING INC
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE EMAIL
File Break: 04.01
Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

486500 **COMMENTS OF EMHART INDUSTRIES ON INTERIM FINAL FEASIBILITY STUDY REPORT DATED 04/30/2010 (TRANSMITTAL & CITED DOCUMENTS ATTACHED), VOLUME 1**

# of Pages: 132
Doc Date: 05/25/2011

Author: , SULLIVAN & WORCESTER LLP
Addressee:
Doc Type: REPORT
File Break: 04.06
Access Type(s): REL

486501 **COMMENTS OF EMHART INDUSTRIES ON INTERIM FINAL FEASIBILITY STUDY REPORT DATED 04/30/2010 (CITED DOCUMENTS), VOLUME 2**

# of Pages: 6
Doc Date: 05/25/2011

Author: , SULLIVAN & WORCESTER LLP
Addressee:
Doc Type: REPORT
File Break: 04.06
Access Type(s): REL

486542 **CORRESPONDENCE LETTER REGARDING STAGE 1A CULTURAL RESOURCES SURVEY**

# of Pages: 4
Doc Date: 06/21/2011

Author: ELISE L DIETERICH, SULLIVAN & WORCESTER LLP
JEFFREY M KARP , SULLIVAN & WORCESTER LLP
Addressee: ANNA KRASKO, US EPA REGION 1
EVE VAUDO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 04.01
Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

486543 **INTERIM FINAL, SUPPLEMENTAL BASELINE HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT: OXBOW AREA FLOODPLAIN SOIL AND SEDIMENT**

# of Pages: 425
Doc Date: 06/01/2011

Author: , BATTELLE
, MACTEC ENGINEERING AND CONSULTING INC

Addressee: , US ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT

Doc Type: REPORT
RISK/HEALTH ASSESSMENT

File Break: 04.04
Access Type(s): REL

492977 **FIELD SAMPLING AND DATA REPORT: 2010 SUPPLEMENTAL INVESTIGATION OF THE LYMAN MILL REACH SEDIMENT AND FLOOD PLAIN SOILS (07/21/2011 TRANSMITTAL LETTER & 08/05/2011 CERTIFICATION LETTER ATTACHED)**

# of Pages: 1011
Doc Date: 07/01/2011

Author: , INTEGRAL CONSULTING INC

Addressee: , EMHART INDUSTRIES INC

Doc Type: REPORT
SAMPLING DATA

File Break: 04.02
Access Type(s): REL

492983 **NATIONAL REMEDY REVIEW BOARD (NRRB) RECOMMENDATIONS FOR CENTREDALE**

# of Pages: 5
Doc Date: 10/28/2010

Author: AMY LEGARE, US EPA - HEADQUARTERS
US EPA - HEADQUARTERS

Addressee: JAMES T OWENS III, US EPA REGION 1

Doc Type: CORRESPONDENCE
MEMO

File Break: 04.01
Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

492984 **REQUEST FOR EPA CONSIDERATION IN FEASIBILITY STUDY OF ADDITIONAL POND SEDIMENT REMEDIAL ALTERNATIVE**

# of Pages: 7
Doc Date: 09/22/2009

Author: JEFFREY M KARP , SULLIVAN & WORCESTER LLP

Addressee: EVE VAUDO, US EPA REGION 1

Doc Type: CORRESPONDENCE
LETTER

File Break: 04.01

Access Type(s): REL

492987 **NATIONAL REMEDY REVIEW BOARD (NRRB) STAKEHOLDER LETTERS (JULY TO AUGUST 2010)**

# of Pages: 43
Doc Date: 08/02/2010

Author: DONALD BURNS, SMITHFIELD (RI) TOWN OF
SMITHFIELD (RI) TOWN OF

THOMAS R CHAPMAN, US DEPT OF INTERIOR - FISH & WILDLIFE SERVICE
DAVID N CICILLINE, MAYOR CITY OF PROVIDENCE (RI)
GINA DEMARCO, NORTHERN RHODE ISLAND CONSERVATION DISTRICT
YVONNE MARIE FEDEROWICZ, TOWN OF NORTH PROVIDENCE
DENNIS G FINLAY, SMITHFIELD (RI) TOWN OF
LEO HELLESTED, RI DEPT OF ENVIRONMENTAL MANAGEMENT
ALICIA LEHRER, WOONASQUATUCKET RIVER WATERSHED COUNCIL
RONALD F MANNI, SMITHFIELD (RI) TOWN OF
BARRY SCHILLER, TOWN OF NORTH PROVIDENCE
PAMELA M SHERRILL, JOHNSTON (RI), TOWN OF
, SULLIVAN WORCESTER

Addressee: ANNA KRASKO, US EPA REGION 1

Doc Type: CORRESPONDENCE
LETTER

File Break: 04.01

Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

492988 **LIST OF STATE WASTE SITES IN A VICINITY OF CENTREDALE MANOR WITH GROUNDWATER MONITORING DATA**
# of Pages: 15
Doc Date: 08/01/2010

Author:

Addressee:

Doc Type: LIST
SAMPLING DATA

File Break: 04.02
Access Type(s): REL

492990 **ADDENDUM TO INTERIM FINAL PRELIMINARY REMEDIATION GOALS REPORT: OXBOW AREA**
# of Pages: 60
Doc Date: 09/01/2011

Author: MICHAEL MURPHY, MACTEC ENGINEERING AND CONSULTING INC
BRIAN J RODEN, MACTEC ENGINEERING AND CONSULTING INC
, BATTELLE

Addressee: , US ARMY CORPS OF ENGINEERS

Doc Type: REPORT

File Break: 04.04
Access Type(s): REL

494702 **ADDENDUM TO THE INTERIM FINAL FEASIBILITY STUDY (FS), CENTREDALE MANOR RESTORATION PROJECT**
# of Pages: 1116
Doc Date: 09/01/2011

Author: , BATTELLE

Addressee: , US ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT
, US EPA REGION 1

Doc Type: FEASIBILITY STUDY (FS)
REPORT

File Break: 04.06
Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

494711 **MEMO REGARDING RESPONSE TO NATIONAL REMEDY REVIEW BOARD (NRRB) RECOMMENDATIONS FOR CENTREDALE MANOR**

# of Pages: 15
Doc Date: 09/28/2011

Author: JAMES T OWENS III, US EPA REGION 1
Addressee: AMY LEGARE, US EPA - HEADQUARTERS
US EPA - HEADQUARTERS
Doc Type: CORRESPONDENCE
MEMO
File Break: 04.01
Access Type(s): REL

494725 **CENTREDALE MANOR RESTORATION SUPERFUND SITE - SECTION 404 (CLEAN WATER ACT) WETLANDS AND FLOODPLAIN ANALYSIS**

# of Pages: 12
Doc Date: 10/01/2011

Author: , US EPA REGION 1
Addressee:
Doc Type: CORRESPONDENCE
MEMO
File Break: 04.01
Access Type(s): REL

494732 **PROPOSED PLAN FOR FOR RECORD OF DECISION (ROD) FOR CENTREDALE MANOR RESTORATION PROJECT**

# of Pages: 34
Doc Date: 10/01/2011

Author: , US EPA REGION 1
Addressee:
Doc Type: PROPOSED PLAN
PUBLIC INFORMATION
REPORT
File Break: 04.09
Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

506581 **COMMENTS ON US EPA'S INTERIM FINAL, SUPPLEMENTAL BASELINE HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT: OXBOW AREA FLOODPLAIN SOIL AND SEDIMENT(10/21/2011 TRANSMITTAL LETTER ATTACHED)**

# of Pages: 185
Doc Date: 10/20/2011

Author: , INTEGRAL CONSULTING INC
Addressee: , EMHART INDUSTRIES INC
Doc Type: REPORT
File Break: 04.04
Access Type(s): REL

509364 **TECHNICAL MEMORANDUM: IMPACT OF DIOXIN REASSESSMENT (05/31/2012 COVER LETTER ATTACHED)**

# of Pages: 852
Doc Date: 05/01/2012

Author: , AMEC ENVIRONMENT AND INFRASTRUCTURE INC
Addressee: , DEPARTMENT OF ARMY
, US EPA REGION 1
Doc Type: REPORT
File Break: 04.06
Access Type(s): REL

509365 **PROPOSED PLAN AMENDMENT**

# of Pages: 11
Doc Date: 07/01/2012

Author: , US EPA REGION 1
Addressee:
Doc Type: PROPOSED PLAN
PUBLIC INFORMATION
REPORT
File Break: 04.09
Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

517997 **REQUEST FOR AN EXTENSION OF PUBLIC COMMENT PERIOD FOR PROPOSED CLEANUP PLAN AMENDMENT**
# of Pages: 2
Doc Date: 07/24/2012

Author: JEFFREY M KARP , SULLIVAN & WORCESTER LLP
Addressee: ANNA KRASKO, US EPA REGION 1; EVE VAUDO, US EPA REGION 1
Doc Type: CORRESPONDENCE; LETTER
File Break: 04.09
Access Type(s): REL

517998 **REQUEST FOR AN EXTENSION OF PUBLIC COMMENT PERIOD FOR PROPOSED CLEANUP PLAN AMENDMENT**
# of Pages: 1
Doc Date: 08/14/2012

Author: EVE VAUDO, US EPA REGION 1
Addressee: JEFFREY M KARP , SULLIVAN & WORCESTER LLP
Doc Type: CORRESPONDENCE; LETTER
File Break: 04.09
Access Type(s): REL

521700 **UPDATED CALCULATION OF SITE-SPECIFIC CANCER AND NON-CANCER DIOXIN SOIL PRELIMINARY REMEDIATION GOALS (PRGS) FOR RECREATIONAL SCENARIO AT THE OXBOW GENERAL AREA**
# of Pages: 3
Doc Date: 08/08/2012

Author: CHAU VU, US EPA REGION 1
Addressee:
Doc Type: CORRESPONDENCE; MEMO; SAMPLING DATA
File Break: 04.02
Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

521740 **RECORDS OF CONVERSATIONS WITH INDIVIDUAL PROPERTY OWNERS/RESIDENTS IN NORTH PROVIDENCE (PROPOSED PLAN ATTACHED)**
# of Pages: 16
Doc Date: 07/01/2012

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		REPORT	04.09 **Access Type(s):** REL

521741 **WOONASQUATUCKET RIVER WATERSHED COUNCIL (WRWC) COMMENTS TO USEPA ON PROPOSED PLAN AMENDMENT (08/17/2012 EMAIL ATTACHED)**
# of Pages: 4
Doc Date: 08/17/2012

Author:	Addressee:	Doc Type:	File Break:
, WOONASQUATUCKET RIVER WATERSHED COUNCIL	, US EPA REGION 1	REPORT	04.09 **Access Type(s):** REL

521743 **EMHART INDUSTRIES INC COMMENTS ON EPA PROPOSED PLAN AMENDMENT (JULY 2012) AND EPA TECHNICAL MEMORANDUM - IMPACT OF DIOXIN REASSESSMENT (05/31/2012) (TRANSMITTAL LETTER AND CITED SOURCES ATTACHED)**
# of Pages: 22
Doc Date: 09/17/2012

Author:	Addressee:	Doc Type:	File Break:
, EMHART INDUSTRIES INC	ANNA KRASKO, US EPA REGION 1	REPORT	04.09 **Access Type(s):** REL

Phase 04: FEASIBILITY STUDY (FS)

521759 **EMAIL REGARDING RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT (RIDEM) APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)**
# of Pages: 1
Doc Date: 09/20/2012

Author: LOUIS R MACCARONE, RI DEPT OF ENVIRONMENTAL MANAGEMENT
Addressee: GRETCHEN MUENCH, US EPA REGION 1
Doc Type: CORRESPONDENCE EMAIL
File Break: 04.09
Access Type(s): REL

521763 **SUMMARY OF MEETINGS WITH NORTH PROVIDENCE AND JOHNSTON MAYORS**
# of Pages: 4
Doc Date: 07/03/2012

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD
File Break: 04.01
Access Type(s): REL

521765 **MEMO WITH RESPONSE TO 07/18/2007 EMHART INDUSTRIES LETTER**
# of Pages: 1
Doc Date: 09/27/2012

Author: EVE VAUDO, US EPA REGION 1
Addressee:
Doc Type: CORRESPONDENCE MEMO
File Break: 04.09
Access Type(s): REL

Phase 04: FEASIBILITY STUDY (FS)

521790 **[REDACTED] LETTER REGARDING COMMENTS ON PROPOSED PLAN AMENDMENT**

# of Pages: 3
Doc Date: 08/17/2012

Author:	Addressee:	Doc Type:	File Break:
RICHARD A POIRIER, SMITHFIELD (RI) TOWN OF	ANNA KRASKO, US EPA REGION 1	CORRESPONDENCE LETTER	04.09 **Access Type(s):** REL

Phase 05: RECORD OF DECISION (ROD)

506526 **EMAIL REGARDING PUBLIC COMMENT ON PROPOSED PLAN**
# of Pages: 1
Doc Date: 03/02/2012

Author: ROBERT VANDERSLICE, RI DEPT OF HEALTH
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE
EMAIL
PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

506527 **LETTER SUMMARIZING HEARING COMMENT BY JOHNSTON TOWN PLANNER (TRANSMITTAL EMAIL ATTACHED)**
# of Pages: 3
Doc Date: 12/07/2011

Author: PAMELA M SHERRILL, JOHNSTON (RI), TOWN OF
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE
LETTER
PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

506528 **FISH AND WILD LIFE SERVICES (FWS) COMMENTS ON PROPOSED PLAN (TRANSMITTAL EMAIL ATTACHED)**
# of Pages: 7
Doc Date: 03/02/2012

Author: THOMAS R CHAPMAN, US DEPT OF INTERIOR - FISH & WILDLIFE SERVICE
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE
LETTER
PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

Phase 05: RECORD OF DECISION (ROD)

506529 **LETTER REGARDING TOWN OF JOHNSTON'S POSITION ON UPLAND DISPOSAL OF CONTAMINATED MATERIAL**

# of Pages: 2
Doc Date: 12/29/2011

Author:	Addressee:	Doc Type:	File Break:
JOSEPH M POLISENA, JOHNSTON (RI), TOWN OF	ANNA KRASKO, US EPA REGION 1	CORRESPONDENCE LETTER PUBLIC (AND OTHER) COMME	05.03 **Access Type(s):** REL

506530 **LETTER FROM TOWN OF NORTH PROVIDENCE REGARDING PROPOSED PLAN**

# of Pages: 2
Doc Date: 02/06/2012

Author:	Addressee:	Doc Type:	File Break:
YVONNE MARIE FEDEROWICZ, TOWN OF NORTH PROVIDENCE BARRY SCHILLER, TOWN OF NORTH PROVIDENCE	ANNA KRASKO, US EPA REGION 1	CORRESPONDENCE LETTER PUBLIC (AND OTHER) COMME	05.03 **Access Type(s):** REL

506531 **COMMENTS FROM AUDUBON SOCIETY OF RHODE ISLAND REGARDING PROPOSED PLAN (TRANSMITTAL EMAIL ATTACHED)**

# of Pages: 4
Doc Date: 02/21/2012

Author:	Addressee:	Doc Type:	File Break:
EUGENIA MARKS, AUDUBON SOCIETY OF RHODE ISLAND	ANNA KRASKO, US EPA REGION 1	CORRESPONDENCE LETTER PUBLIC (AND OTHER) COMME	05.03 **Access Type(s):** REL

Phase 05: RECORD OF DECISION (ROD)

506532 **EMAIL REGARDING PROPOSED PLAN COMMENTS**
# of Pages: 1
Doc Date: 02/06/2012

Author: ALICIA LEHRER, WOONASQUATUCKET RIVER WATERSHED COUNCIL
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE; LETTER; PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

506533 **COMMENTS FROM RHODE ISLAND BUILDING TRADES ON PROPOSED PLAN**
# of Pages: 2
Doc Date: 12/07/2011

Author: MICHAEL F SABITONI, RHODE ISLAND BUILDING TRADES
Addressee:
Doc Type: CORRESPONDENCE; LETTER; PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

506534 **WOONASQUATUCKET RIVER WATERSHED COUNCIL COMMENTS ON EPA'S PROPOSED CLEANUP PLAN (TRANSMITTAL EMAIL ATTACHED)**
# of Pages: 19
Doc Date: 02/21/2012

Author: ALICIA J LEHRER , WOONASQUATUCKET RIVER WATERSHED COUNCIL
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE; LETTER; PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

Phase 05: RECORD OF DECISION (ROD)

506537 **EMAIL FROM PUBLIC REGARDING PROPOSED PLAN DISRUPTIONS**
# of Pages: 1
Doc Date: 11/28/2011

Author	Addressee	Doc Type	File Break / Access
DONALD ASSELIN, NONE	ANNA KRASKO, US EPA REGION 1	CORRESPONDENCE EMAIL PUBLIC (AND OTHER) COMME	File Break: 05.03 Access Type(s): REL

506550 **LETTER FROM EPA IN RESPONSE TO EMHART INDUSTRIES, INC REQUEST FOR 120-DAY EXTENSION OF THE PUBLIC COMMENT PERIOD FOR THE PROPOSED PLAN**
# of Pages: 2
Doc Date: 12/05/2011

Author	Addressee	Doc Type	File Break / Access
EVE VAUDO, US EPA REGION 1	JEROME C MUYS JR, SULLIVAN & WORCESTER LLP	CORRESPONDENCE LETTER PUBLIC (AND OTHER) COMME	File Break: 05.03 Access Type(s): REL

506551 **REQUEST FOR 120-DAY EXTENSION OF THE PUBLIC COMMENT PERIOD FOR THE PROPOSED REMEDIAL ACTION (RA) PLAN**
# of Pages: 2
Doc Date: 11/14/2011

Author	Addressee	Doc Type	File Break / Access
JEROME C MUYS JR, SULLIVAN & WORCESTER LLP	ANNA KRASKO, US EPA REGION 1 EVE VAUDO, US EPA REGION 1	CORRESPONDENCE LETTER PUBLIC (AND OTHER) COMME	File Break: 05.03 Access Type(s): REL

Phase 05: RECORD OF DECISION (ROD)

506552 **REQUEST FOR SUPPLEMENTAL EXTENSION OF PUBLIC COMMENT PERIOD REGARDING PROPOSED REMEDIAL ACTION (RA) PLAN AND SUPPORTING DOCUMENTS**

# of Pages: 2
Doc Date: 02/01/2012

Author: JEROME C MUYS JR, SULLIVAN & WORCESTER LLP

Addressee: ANNA KRASKO, US EPA REGION 1
EVE VAUDO, US EPA REGION 1

Doc Type: CORRESPONDENCE
LETTER
PUBLIC (AND OTHER) COMME

File Break: 05.03
Access Type(s): REL

506582 **COMMENT LETTER FROM BROWN UNIVERSITY TO USEPA REGARDING PROPOSED PLAN REMEDIATION**

# of Pages: 2
Doc Date: 02/20/2012

Author: PHILIP BROWN, BROWN UNIVERSITY
DAVID CIPLET, BROWN UNIVERSITY
JAMES RICE, BROWN UNIVERSITY
ERIC SUUBERG, BROWN UNIVERSITY

Addressee: ANNA KRASKO, US EPA REGION 1

Doc Type: CORRESPONDENCE
LETTER

File Break: 05.03
Access Type(s): REL

506583 **COMMENTS OF EMHART INDUSTRIES INC, ON US EPA'S PROPOSED REMEDIAL ACTION PLAN (PRAP) (OCTOBER 2011) ADDENDUM TO THE INTERIM FINAL FEASIBILITY STUDY REPORT (SEPTEMBER 2011) AND INTERIM FINAL FEASIBILITY STUDY REPORT (APRIL 30, 2011)**

# of Pages: 161
Doc Date: 03/02/2012

Author: , SULLIVAN & WORCESTER LLP

Addressee:

Doc Type: REPORT

File Break: 05.03
Access Type(s): REL

Phase 05: RECORD OF DECISION (ROD)

506584 **LETTER TRANSMITTING COMMENTS OF EMHART INDUSTRIES INC, ON US EPA'S PROPOSED REMEDIAL ACTION PLAN (PRAP)**

# of Pages: 2
Doc Date: 03/02/2012

Author: JEROME C MUYS JR, SULLIVAN & WORCESTER LLP

Addressee: ANNA KRASKO, US EPA REGION 1
EVE STOLOV VAUDO, US EPA REGION 1

Doc Type: CORRESPONDENCE
LETTER

File Break: 05.03
Access Type(s): REL

506587 **LETTER RESPONSE TO 02/01/2012 REQUEST FOR ADDITIONAL SIXTY-DAY EXTENSION OF PUBLIC COMMENT PERIOD FOR PROPOSED PLAN**

# of Pages: 3
Doc Date: 02/09/2012

Author: EVE VAUDO, US EPA REGION 1

Addressee: JEROME C MUYS JR, SULLIVAN & WORCESTER LLP

Doc Type: CORRESPONDENCE
LETTER
PUBLIC (AND OTHER) COMME

File Break: 05.03
Access Type(s): REL

506591 **COMBINED PUBLIC COMMENTS ON PROPOSED PLAN FOR REMEDIAL ACTION (RA)**

# of Pages: 352
Doc Date: 01/01/1111

Author:

Addressee:

Doc Type: CORRESPONDENCE
LETTER
PUBLIC (AND OTHER) COMME

File Break: 05.03
Access Type(s): REL

Phase 05: RECORD OF DECISION (ROD)

521774 **[REDACTED] LETTER FROM CITIZENS CONCERNING CENTREDALE RESTORATION PROJECT (01/25/2012 TRANSMITTAL EMAIL ATTACHED)**
# of Pages: 4
Doc Date: 12/05/2011

Author: ANTHONY JANELLO, NORTH PROVIDENCE (RI) RESIDENT OF
Addressee: STACY GREENDLINGER, US EPA REGION 1
Doc Type: CORRESPONDENCE; LETTER; PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

521775 **[REDACTED] EMAIL REGARDING PROPOSED PLAN**
# of Pages: 1
Doc Date: 03/02/2012

Author: POLLY REYNOLDS, NONE
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE; EMAIL; PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

521776 **[REDACTED] EMAIL FROM PUBLIC REGARDING PROPOSED PLAN DISRUPTIONS**
# of Pages: 1
Doc Date: 02/08/2012

Author: DONALD ASSELIN, NONE
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE; EMAIL; PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

Phase 05: RECORD OF DECISION (ROD)

521777 **[REDACTED] EMAIL FROM PUBLIC OPPOSING PROPOSED CLEANUP**
# of Pages: 1
Doc Date: 02/09/2012

Author: SUSAN ASSELIN, TOWN OF NORTH PROVIDENCE
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE
EMAIL
PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

521778 **[REDACTED] LETTER FROM PUBLIC REGARDING PROPOSED PLAN (TRANSMITTAL EMAIL ATTACHED)**
# of Pages: 3
Doc Date: 01/06/2012

Author: BRIAN FEENEY, NORTH PROVIDENCE (RI) RESIDENT OF
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE
LETTER
PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

521779 **[REDACTED] COMMENT LETTER FROM PUBLIC REGARDING PROPOSED PLAN**
# of Pages: 1
Doc Date: 01/10/2012

Author: JEAN LYNCH, JOHNSTON (RI) RESIDENT
JOHNSTON (RI) RESIDENT
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE
LETTER
PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

Phase 05: RECORD OF DECISION (ROD)

521780 **[REDACTED] EMAIL FROM PUBLIC REGARDING PROPOSED PLAN**
# of Pages: 1
Doc Date: 01/26/2012

Author: NANCY MENDES, NONE
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE
EMAIL
PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

521781 **[REDACTED] EMAIL FROM PUBLIC REGARDING PROPOSED PLAN**
# of Pages: 1
Doc Date: 02/05/2012

Author: MARIE BUTERA, NONE
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE
EMAIL
PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

521782 **[REDACTED] EMAIL FROM PUBLIC REGARDING PROPOSED PLAN**
# of Pages: 1
Doc Date: 02/05/2012

Author: DAVID BUTERA, NONE
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE
EMAIL
PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

Phase 05: RECORD OF DECISION (ROD)

521783 **[REDACTED] EMAIL FROM PUBLIC COMMENTS ON MONITORING AND CLEANUP OF TOXIC DUST**
# of Pages: 2
Doc Date: 02/09/2012

Author: ANTHONY JANELLO, NORTH PROVIDENCE (RI) RESIDENT OF
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE
EMAIL
PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

521784 **[REDACTED] EMAIL FROM PUBLIC REGARDING PROPOSED PLAN**
# of Pages: 1
Doc Date: 02/12/2012

Author: MARY JANE DAVIDOW, NONE
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE
EMAIL
PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

521785 **[REDACTED] EMAIL FROM PUBLIC REGARDING PROPOSED PLAN**
# of Pages: 3
Doc Date: 02/12/2012

Author: NANCY BOLDUC, NONE
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE
EMAIL
PUBLIC (AND OTHER) COMME
File Break: 05.03
Access Type(s): REL

Phase 05: RECORD OF DECISION (ROD)

521786 **[REDACTED] EMAIL FROM PUBLIC REGARDING PROPOSED PLAN**
# of Pages: 1
Doc Date: 02/26/2012

Author	Addressee	Doc Type	File Break / Access
KATHLEEN THIBODEAU, NORTH PROVIDENCE (RI) RESIDENT OF	ANNA KRASKO, US EPA REGION 1	CORRESPONDENCE EMAIL PUBLIC (AND OTHER) COMME	File Break: 05.03 Access Type(s): REL

521787 **[REDACTED] LETTER FROM PUBLIC REGARDING PROPOSED PLAN**
# of Pages: 1
Doc Date: 12/15/2011

Author	Addressee	Doc Type	File Break / Access
LEONARD PEZZA, L P C CORP	ANNA KRASKO, US EPA REGION 1	CORRESPONDENCE LETTER PUBLIC (AND OTHER) COMME	File Break: 05.03 Access Type(s): REL

521788 **RECORD OF DECISION (ROD)**
# of Pages: 656
Doc Date: 09/28/2012

Author	Addressee	Doc Type	File Break / Access
, US EPA REGION 1		DECISION DOCUMENT RECORD OF DECISION (ROD) REPORT	File Break: 05.04 Access Type(s): REL

Phase 05: RECORD OF DECISION (ROD)

521789 **STATE CONCURRENCE LETTER FOR RECORD OF DECISION (ROD)**

# of Pages: 2
Doc Date: 09/28/2012

Author:	Addressee:	Doc Type:	File Break:
JANET COIT, RI DEPT OF ENVIRONMENTAL MGMT	JAMES T OWENS III, US EPA REGION 1	CORRESPONDENCE LETTER	05.01 **Access Type(s):** REL

Phase 06: REMEDIAL DESIGN (RD)

505085 **REUSE ASSESSMENT SUMMARY**

# of Pages: 4
Doc Date: 01/01/2012

Author:	Addressee:	Doc Type:	File Break:
, SKEO SOLUTIONS	, JOHNSTON (RI) TOWN OF , US EPA REGION 1	REPORT	06.04 **Access Type(s):** REL

Phase 09: STATE COORDINATION

233929 **REQUEST FOR IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) FOR FEASIBILITY STUDY**
# of Pages: 1
Doc Date: 09/28/2004

Author: ANNA KRASKO, US EPA REGION 1

Addressee: MATTHEW D DESTEFANO, RI DEPT OF ENVIRONMENTAL MANAGEMENT

Doc Type: CORRESPONDENCE
LETTER

File Break: 09.01
Access Type(s): REL

233930 **LETTER REGARDING COORDINATION OF DAM RELEASE IN WOONASQUATUCKET RIVER (WOONASQUATUCKET COORDINATION CONTACT LIST ATTACHED)**
# of Pages: 4
Doc Date: 10/04/2004

Author: LEO HELLESTED, RI DEPT OF ENVIRONMENTAL MANAGEMENT

Addressee: MARK BARNES, SLACKS POND MANAGEMENT ASSOCIATION
EUGENE BIELICKI, GEORGIAVILLE POND MANAGEMENT ASSOCIATION
RONALD DEPAULT, WATERMAN LAKE MANAGEMENT ASSOCIATION
JAY FORTE, SLACKS POND MANAGEMENT ASSOCIATION
RICHARD KONDIAN, NONE
JEFFREY LOUREIRO, LOUREIRO ENGINEERING ASSOCIATION
RICK RUDIS, GEORGIAVILLE POND MANAGEMENT ASSOCIATION
DENNIS RYAN, ROUND TOP MANAGEMENT AREA

Doc Type: CORRESPONDENCE
LETTER

File Break: 09.01
Access Type(s): REL

233931 **SUMMARY TABLE OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) IDENTIFICATION (RESPONSE LETTER ATTACHED)**
# of Pages: 4
Doc Date: 10/28/2004

Author: MATTHEW D DESTEFANO, RI DEPT OF ENVIRONMENTAL MANAGEMENT

Addressee: ANNA KRASKO, US EPA REGION 1

Doc Type: LIST

File Break: 09.01
Access Type(s): REL

Phase 09: STATE COORDINATION

233932 **DECLARATION OF COVENANTS AND ENVIRONMENTAL PROTECTION/CONSERVATION EASEMENT (EXHIBITS A AND B, 03/11/04 TRANSMITTAL LETTER ATTACHED)**
# of Pages: 23
Doc Date: 10/24/2002

Author: STEPHEN EMBER, MILL AT ALLENDALE CONDOMINIUM ASSOCIATION
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: LIST
File Break: 09.01
Access Type(s): REL

273405 **RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT (RIDEM) LETTER ON TAILRACE CAPING PROJECT FOR THE TIME CRITICAL REMOVAL ACTION**
# of Pages: 2
Doc Date: 07/21/2006

Author: LOUIS R MACCARONE, RI DEPT OF ENVIRONMENTAL MANAGEMENT
Addressee: TED BAZENAS, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 09.01
Access Type(s): REL

273406 **LETTER TO RHODE ISLAND DEPARTMENT OF TRANSPORTATION (RIDOT) WITH PERMANENT DRAINAGE EASEMENT DOCUMENT**
# of Pages: 5
Doc Date: 09/26/2006

Author: EVE VAUDO, US EPA REGION 1
Addressee: JOHN B AFFLECK, RI DEPT OF TRANSPORTATION
Doc Type: CORRESPONDENCE LETTER
File Break: 09.01
Access Type(s): REL

Phase 09: STATE COORDINATION

273449 **NOTICE OF RIPDES PERMIT FOR WORCETER MILLS**
# of Pages: 3
Doc Date: 11/06/2006

Author:	Addressee:	Doc Type:	File Break:
ERIC A BECK, RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT		PUBLIC INFORMATION	09.01 **Access Type(s):** REL

485692 **LETTER REGARDING RESPONSE TO JULY 19, 2010 TELEPHONE CONVERSATION AND EMAIL CORRESPONDENCE**
# of Pages: 4
Doc Date: 08/04/2010

Author:	Addressee:	Doc Type:	File Break:
EDWARD F SANDERSON, RI HISTORIC PRESERVATION COMMISSION	ANNA KRASKO, US EPA REGION 1	CORRESPONDENCE LETTER	09.01 **Access Type(s):** REL

Phase 10: ENFORCEMENT/NEGOTIATION

25906 **FIRST AMENDMENT TO SECOND UNILATERAL ADMINSTRATIVE ORDER (UAO) FOR REMOVAL ACTION**
# of Pages: 5
Doc Date: 09/06/2001

Author: , US EPA REGION 1
Addressee:
Doc Type: ENFORCEMENT & SETTLEMEI
UNILATERAL ORDER
File Break: 10.07
Access Type(s): REL

25907 **SECOND UNILATERAL ADMINISTRATIVE ORDER (UAO) FOR REMOVAL ACTION**
# of Pages: 31
Doc Date: 03/26/2001

Author: , US EPA REGION 1
Addressee:
Doc Type: ENFORCEMENT & SETTLEMEI
UNILATERAL ORDER
File Break: 10.07
Access Type(s): REL

25920 **AFFIDAVIT OF JOSEPH NADEAU**
# of Pages: 3
Doc Date: 01/20/2001

Author: JOSEPH NADEAU, NONE
Addressee:
Doc Type: ENFORCEMENT & SETTLEMEI
File Break: 10.04
Access Type(s): REL

Phase 10: ENFORCEMENT/NEGOTIATION

35167 **SECOND AMENDMENT TO SECOND UNILATERAL ADMINISTRATIVE ORDER (UAO) FOR REMOVAL ACTIONS**
# of Pages: 6
Doc Date: 03/25/2002

Author: , US EPA REGION 1
Addressee:
Doc Type: ENFORCEMENT & SETTLEMEI UNILATERAL ORDER
File Break: 10.07
Access Type(s): REL

35609 **[REDACTED] ADMINISTRATIVE DEPOSITION OF DON ASSELIN**
# of Pages: 71
Doc Date: 11/30/1999

Author:
Addressee:
Doc Type: ENFORCEMENT & SETTLEMEI INTERVIEW
File Break: 10.04
Access Type(s): REL

35623 **[REDACTED] ADMINISTRATIVE DEPOSITION OF JOHN TURCONE**
# of Pages: 49
Doc Date: 11/30/1999

Author:
Addressee:
Doc Type: ENFORCEMENT & SETTLEMEI INTERVIEW
File Break: 10.04
Access Type(s): REL

Phase 10: ENFORCEMENT/NEGOTIATION

44194 **STATEMENT OF RAYMOND NADEAU**
# of Pages: 4
Doc Date: 08/14/2002

Author:	Addressee:	Doc Type:	File Break:
RAYMOND NADEAU, NONE		ENFORCEMENT & SETTLEMEI	10.04 Access Type(s): REL

44195 **STATEMENT OF CHARLOTTE KNOTT**
# of Pages: 2
Doc Date: 08/22/2002

Author:	Addressee:	Doc Type:	File Break:
CHARLOTTE E KNOTT, NONE		ENFORCEMENT & SETTLEMEI	10.04 Access Type(s): REL

44196 **[REDACTED] INTERVIEW OF RAYMOND NADEAU (03/10/03 COVER LETTER IS ATTACHED)**
# of Pages: 9
Doc Date: 12/11/2001

Author:	Addressee:	Doc Type:	File Break:
		ENFORCEMENT & SETTLEMEI INTERVIEW	10.04 Access Type(s): REL

Phase 10: ENFORCEMENT/NEGOTIATION

44198 **[REDACTED] DEPOSITION OF JOHN TURCONE**
# of Pages: 24
Doc Date: 12/16/2002

Author:
Addressee:
Doc Type: ENFORCEMENT & SETTLEMEI
File Break: 10.10
Access Type(s): REL

44201 **[REDACTED] DEPOSITION OF KENNETH NERI**
# of Pages: 28
Doc Date: 12/18/2002

Author:
Addressee:
Doc Type: ENFORCEMENT & SETTLEMEI
File Break: 10.10
Access Type(s): REL

204619 **THIRD ADMINISTRATIVE ORDER ON CONSENT (AOC) FOR REMOVAL ACTION**
# of Pages: 52
Doc Date: 09/11/2003

Author: SUSAN STUDLIEN, US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION
Addressee:
Doc Type: ACTION MEMORANDUM
ADMIN ORDER ON CONSENT
CORRESPONDENCE
DECISION DOCUMENT
ENFORCEMENT & SETTLEMEI
MEMO
File Break: 10.07
Access Type(s): REL

Phase 10: ENFORCEMENT/NEGOTIATION

204620 **THIRD UNILATERAL ADMINISTRATIVE ORDER (UAO) FOR REMOVAL ACTION**
# of Pages: 31
Doc Date: 10/08/2003

Author: SUSAN STUDLIEN, US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION
Addressee:
Doc Type: ENFORCEMENT & SETTLEMEI; UNILATERAL ORDER
File Break: 10.07
Access Type(s): REL

204621 **DEPOSITION OF THOMAS F CLEARY**
# of Pages: 192
Doc Date: 02/10/2003

Author:
Addressee:
Doc Type: ACTION MEMORANDUM; CORRESPONDENCE; DECISION DOCUMENT; ENFORCEMENT & SETTLEMEI; MEMO
File Break: 10.04
Access Type(s): REL

253316 **LETTER REGARDING COMPLETION OF WORK FOR SECOND ADMINISTRATIVE ORDER FOR REMOVAL ACTION (CERTIFIED MAIL RECEIPT ATTACHED)**
# of Pages: 6
Doc Date: 05/13/2005

Author: ANNA KRASKO, US EPA REGION 1
Addressee: JEFFREY LOUREIRO, LOUREIRO ENGINEERING ASSOCIATES INC
Doc Type: CORRESPONDENCE; LETTER
File Break: 10.07
Access Type(s): REL

Phase 10: ENFORCEMENT/NEGOTIATION

271386 **CONSENT DECREE (CD) UNITED STATES OF AMERICA AND THE STATE OF RHODE ISLAND V. CENTREDALE MANOR ASSOCIATES C.A. N0.05-195S**
# of Pages: 28
Doc Date: 11/06/2006

Author: MARY M LISI, UNITED STATES DISTRICT JUDGE , US EPA REGION 1	**Addressee:**	**Doc Type:** CONSENT DECREE ENFORCEMENT & SETTLEMEI	**File Break:** 10.08 **Access Type(s):** REL

271388 **CONSENT DECREE (CD) UNITED STATES OF AMERICA AND THE STATE OF RHODE ISLAND V. BROOK VILLAGE ASSOCIATES C.A. N0.05-195S**
# of Pages: 28
Doc Date: 11/06/2006

Author: MARY M LISI, UNITED STATES DISTRICT JUDGE , US EPA REGION 1	**Addressee:**	**Doc Type:** CONSENT DECREE ENFORCEMENT & SETTLEMEI	**File Break:** 10.08 **Access Type(s):** REL

275694 **ADMINISTRATIVE ORDER ON CONSENT (AOC) SETTLEMENT AGREEMENT**
# of Pages: 25
Doc Date: 09/25/2007

Author: , US EPA REGION 1	**Addressee:** , EMHART INDUSTRIES INC	**Doc Type:** ADMIN ORDER ON CONSENT ENFORCEMENT & SETTLEMEI	**File Break:** 10.07 **Access Type(s):** REL

Phase 10: ENFORCEMENT/NEGOTIATION

285165 **NOTICE OF PAYMENTS MADE PURSUANT TO CONSENT DECREE CIVIL ACTION N0. 05-195S - BROOK VILLAGE ASSOCIATES**
# of Pages: 3
Doc Date: 08/03/2007

Author: US DISTRICT COURT/DISTRICT OF RI
US DISTRICT COURT/DISTRICT OF RI
Addressee:
Doc Type: ENFORCEMENT & SETTLEMEI
File Break: 10.08
Access Type(s): REL

285166 **NOTICE OF PAYMENTS MADE PURSUANT TO CONSENT DECREE CIVIL ACTION N0. 05-195S - CENTREDALE MANOR ASSOCIATES**
# of Pages: 4
Doc Date: 08/03/2007

Author: LAURIE BURT, FOLEY HOAG & ELIOT LLP
RICHARD J WELCH, MOSES & ALFONSO
Addressee:
Doc Type: ENFORCEMENT & SETTLEMEI
File Break: 10.08
Access Type(s): REL

285175 **EXHIBITS AND DIPOSITION OF THOMAS F CLEARY (SUPPORTING DOCUMENTS ATTACHED)**
# of Pages: 92
Doc Date: 02/10/2003

Author: US DISTRICT COURT/DISTRICT OF RI
US DISTRICT COURT/DISTRICT OF RI
Addressee:
Doc Type: ENFORCEMENT & SETTLEMEI
File Break: 10.04
Access Type(s): REL

Phase 10: ENFORCEMENT/NEGOTIATION

466677 **ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT (AOC) - DOCKET #01-2010-0045**
# of Pages: 27
Doc Date: 06/29/2010

Author: , US EPA REGION 1
Addressee: , EMHART INDUSTRIES INC
Doc Type: ADMIN ORDER ON CONSENT
ENFORCEMENT & SETTLEMEI
File Break: 10.07
Access Type(s): REL

471122 **NOTICE OF COMPLETION OF WORK UNDER ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT FOR REMOVAL ACTION - CERCLA DOCKET # 01-2009-0086**
# of Pages: 2
Doc Date: 07/27/2010

Author: TED BAZENAS, US EPA REGION 1
Addressee: JEFFERY J LOUREIRO, LOUREIRO ENGINEERING ASSOCIATES INC
Doc Type: CORRESPONDENCE
LETTER
File Break: 10.07
Access Type(s): REL

471123 **NOTICE OF COMPLETION OF WORK UNDER ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT FOR REMOVAL ACTION - CERCLA DOCKET # 01-2007-0163**
# of Pages: 2
Doc Date: 09/02/2010

Author: JEFFERY J LOUREIRO, LOUREIRO ENGINEERING ASSOCIATES INC
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE
LETTER
File Break: 10.07
Access Type(s): REL

Phase 10: ENFORCEMENT/NEGOTIATION

471124 **NOTICE OF COMPLETION OF WORK UNDER ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT FOR REMOVAL ACTION - CERCLA DOCKET # 01-2007-0163**
# of Pages: 2
Doc Date: 09/07/2010

Author: ANNA KRASKO, US EPA REGION 1
Addressee: JEFFERY J LOUREIRO, LOUREIRO ENGINEERING ASSOCIATES INC
Doc Type: CORRESPONDENCE
LETTER
File Break: 10.07
Access Type(s): REL

479434 **FIRST AMENDMENT TO ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT, DOCKET # 01-2010-0045**
# of Pages: 2
Doc Date: 11/18/2010

Author: , US EPA REGION 1
Addressee: , EMHART INDUSTRIES INC
Doc Type: ADMIN ORDER ON CONSENT
ENFORCEMENT & SETTLEMEI
File Break: 10.07
Access Type(s): REL

492985 **ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT (AOC) - DOCKET #01-2010-0045, EFFECTIVE JUNE 30, 2010**
# of Pages: 8
Doc Date: 11/04/2010

Author: PATRICK O GWINN, INTEGRAL CONSULTING INC
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: ADMIN ORDER ON CONSENT
ENFORCEMENT & SETTLEMEI
File Break: 10.07
Access Type(s): REL

Phase 10: ENFORCEMENT/NEGOTIATION

521766 **[REDACTED] DEPOSITION OF CHARLOTTE E KNOTT**
# of Pages: 109
Doc Date: 02/11/2004

Author: US DISTRICT COURT/DISTRICT OF RI
US DISTRICT COURT/DISTRICT OF RI
Addressee:
Doc Type: ENFORCEMENT & SETTLEMEI
File Break: 10.10
Access Type(s): REL

521768 **[REDACTED] DEPOSITION UNDER OATH OF RAYMOND NADEAU**
# of Pages: 37
Doc Date: 10/01/2002

Author: , UNITED STATES DISTRICT COURT SOUTHERN DISTRIC OF NEW YORK
Addressee:
Doc Type: ENFORCEMENT & SETTLEMEI REPORT
File Break: 10.10
Access Type(s): REL

521769 **[REDACTED] DEPOSITION OF VINCENT J BUONANNO, CA.NO. 01-CV--8218 (WK)**
# of Pages: 100
Doc Date: 03/28/2003

Author: , US DISTRICT COURT SOUTHERN DISTRICT OF NEW YORK
Addressee:
Doc Type: ENFORCEMENT & SETTLEMEI INTERVIEW
File Break: 10.10
Access Type(s): REL

Phase 10: ENFORCEMENT/NEGOTIATION

521796	**[REDACTED] DEPOSITION OF LAWRENCE R BELLO**		**# of Pages:** 40 **Doc Date:** 08/31/2000
Author:	**Addressee:**	**Doc Type:** ENFORCEMENT & SETTLEMEI	**File Break:** **Access Type(s):** REL

Phase 11: POTENTIALLY RESPONSIBLE PARTY

42368 **GENERAL NOTICE/SPECIAL NOTICE LETTER [COMPOSITE LETTER]**

# of Pages: 47
Doc Date: 03/03/2003

Author: RICHARD A CAVAGNERO, US EPA REGION 1

Addressee: ANNE CHRISTIEN, CIBA-GEIGY CORP
STEPHEN B FORMAN, ORIGINAL BRADFORD SOAP WORKS INC THE
GREGORY M GORMLEY, ORGANIC DYESTUFFS CORP
THEODORE C HADLEY, UNOCAL CORP
GARY M ROWEN, AMERICAN HOECHST
BARRY S SHEPARD, EASTERN COLOR & CHEMICAL CO
RICHARD A SHERMAN, EDWARDS & ANGELL LLP
GEORGE W SHUSTER, CRANSTON PRINT WORKS CO
, AMERICAN MINERAL SPIRITS CO
, CIBA-GEIGY CORP
, CRANSTON PRINT WORKS CO
, EASTERN COLOR & CHEMICAL CO
, EASTERN SMELTING
, ORGANIC DYESTUFFS CORP
, ORIGINAL BRADFORD SOAP WORKS INC THE
, T H BAYLIS CO
, WARWICK CHEMICAL COMPANY

Doc Type: CORRESPONDENCE LETTER

File Break: 11.09

Access Type(s): REL

Phase 11: POTENTIALLY RESPONSIBLE PARTY

42646 **GENERAL NOTICE/SPECIAL NOTICE LETTER - CIBA-GEIGY CORP**
# of Pages: 24
Doc Date: 03/03/2003

Author: RICHARD A CAVAGNERO, US EPA REGION 1
Addressee: ANNE CHRISTIEN, CIBA-GEIGY CORP
Doc Type: CORRESPONDENCE LETTER
File Break: 11.09
Access Type(s): REL

42647 **GENERAL NOTICE/SPECIAL NOTICE LETTER - AMERICAN MINERAL SPIRITS CO**
# of Pages: 19
Doc Date: 03/03/2003

Author: RICHARD A CAVAGNERO, US EPA REGION 1
Addressee: THEODORE C HADLEY, UNOCAL CORP
Doc Type: CORRESPONDENCE LETTER
File Break: 11.09
Access Type(s): REL

42648 **GENERAL NOTICE/SPECIAL NOTICE LETTER - EASTERN COLOR AND CHEMICAL CO**
# of Pages: 16
Doc Date: 03/03/2003

Author: RICHARD A CAVAGNERO, US EPA REGION 1
Addressee: BARRY S SHEPARD, EASTERN COLOR & CHEMICAL CO
Doc Type: CORRESPONDENCE LETTER
File Break: 11.09
Access Type(s): REL

Phase 11: POTENTIALLY RESPONSIBLE PARTY

42649 GENERAL NOTICE/SPECIAL NOTICE LETTER - WARWICK CHEMICAL CO
# of Pages: 18
Doc Date: 03/03/2003

Author: RICHARD A CAVAGNERO, US EPA REGION 1
Addressee: LEONARD P PASCULLI, SEQUA CORP
SEQUA CORP
Doc Type: CORRESPONDENCE LETTER
File Break: 11.09
Access Type(s): REL

42650 GENERAL NOTICE/SPECIAL NOTICE LETTER - THE ORIGINAL BRADFORD SOAP WORKS INC
# of Pages: 19
Doc Date: 03/03/2003

Author: RICHARD A CAVAGNERO, US EPA REGION 1
Addressee: STEPHEN B FORMAN, ORIGINAL BRADFORD SOAP WORKS INC THE
Doc Type: CORRESPONDENCE LETTER
File Break: 11.09
Access Type(s): REL

42651 GENERAL NOTICE/SPECIAL NOTICE LETTER - ORGANIC DYESTUFFS CORP
# of Pages: 19
Doc Date: 03/03/2003

Author: RICHARD A CAVAGNERO, US EPA REGION 1
Addressee: GREGORY M GORMLEY, ORGANIC DYESTUFFS CORP
Doc Type: CORRESPONDENCE LETTER
File Break: 11.09
Access Type(s): REL

Phase 11: POTENTIALLY RESPONSIBLE PARTY

42653 **GENERAL NOTICE/SPECIAL NOTICE LETTER - CRANSTON PRINT WORKS CO**
# of Pages: 19
Doc Date: 03/03/2003

Author: RICHARD A CAVAGNERO, US EPA REGION 1
Addressee: GEORGE W SHUSTER, CRANSTON PRINT WORKS CO
Doc Type: CORRESPONDENCE LETTER
File Break: 11.09
Access Type(s): REL

42654 **GENERAL NOTICE/SPECIAL NOTICE LETTER - T H BAYLIS CO**
# of Pages: 19
Doc Date: 03/03/2003

Author: RICHARD A CAVAGNERO, US EPA REGION 1
Addressee: CHARLES E BRADLEY, STANWICH PARTNERS INC
Doc Type: CORRESPONDENCE LETTER
File Break: 11.09
Access Type(s): REL

42655 **GENERAL NOTICE/SPECIAL NOTICE LETTER - TEKNOR APEX CO**
# of Pages: 21
Doc Date: 03/03/2003

Author: RICHARD A CAVAGNERO, US EPA REGION 1
Addressee: JONATHAN D FAIN, TEKNOR APEX COMPANY
Doc Type: CORRESPONDENCE LETTER
File Break: 11.09
Access Type(s): REL

Phase 11: POTENTIALLY RESPONSIBLE PARTY

208883 **NOTICE OF POTENTIAL LIABILITY - CONOCOPHILLIPS CO**
# of Pages: 9
Doc Date: 05/11/2004

Author: SUSAN STUDLIEN, US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION
Addressee: WILLETTE A DUBOSE, CONOCOPHILLIPS CO
Doc Type: CORRESPONDENCE
GENERAL NOTICE LETTER
LETTER
File Break: 11.09
Access Type(s): REL

208884 **NOTICE OF POTENTIAL LIABILITY - ELI LILLY & CO**
# of Pages: 8
Doc Date: 05/11/2004

Author: SUSAN STUDLIEN, US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION
Addressee: JOAN HEINZ, ELI LILLY & CO
Doc Type: CORRESPONDENCE
GENERAL NOTICE LETTER
LETTER
File Break: 11.09
Access Type(s): REL

253317 **METRO-ATLANTIC TECHNICAL BULLETIN (04/07/69 TRANSMITTAL LETTER ATTACHED) [MARGINALIA]**
# of Pages: 17
Doc Date: 01/01/1111

Author: , METRO ATLANTIC INC
Addressee:
Doc Type: REPORT
File Break: 11.10
Access Type(s): REL

Phase 11: POTENTIALLY RESPONSIBLE PARTY

274330 **NOTIFICATION OF GENERAL NOTICE LETTER - REFINITY CORPORATION (04/03/2003 CERTIFIED MAIL RECEIPT ATTACHED)**

# of Pages: 50
Doc Date: 03/31/2003

Author: EVE VAUDO, US EPA REGION 1
Addressee: JEFFREY O PLANK, REFINITY CORP
Doc Type: CORRESPONDENCE; GENERAL NOTICE LETTER; LETTER
File Break: 11.09
Access Type(s): REL

285163 **STATEMENT OF QUALIFICATIONS INVESTIGATION AND REMEDIATION - LOUREIRO ENGINEERING ASSOCIATES [(LEA) (10/05/2007 COVER LETTER AND 10/02/2007 TRANSMITTAL ATTACHED)**

# of Pages: 214
Doc Date: 09/01/2007

Author: , LOUREIRO ENGINEERING ASSOCIATES INC
Addressee:
Doc Type: REPORT
File Break: 11.09
Access Type(s): REL

285167 **LETTER REGARDING THE LIABILITY OF A NUMBER OF NON PARTICIPATING POTENTIALLY RESPONSIBLE PARTIES**

# of Pages: 16
Doc Date: 07/16/2007

Author: JEROME C MUYS JR, SULLIVAN & WORCESTER LLP
Addressee: EVE VAUDO, US EPA REGION 1
Doc Type: CORRESPONDENCE; LETTER
File Break: 11.05
Access Type(s): REL

Phase 11: POTENTIALLY RESPONSIBLE PARTY

285168 **NOTICE LETTER - NORTHEAST PRODUCTS COMPANY**
# of Pages: 16
Doc Date: 08/07/2007

Author: JAMES T OWENS, US EPA REGION 1
Addressee: ALEXANDRA K CALLAM, HINCKLEY ALLEN & SNYDER LLP
Doc Type: CORRESPONDENCE
LETTER
File Break: 11.09
Access Type(s): REL

285169 **NOTICE LETTER - UNITED STATES NAVY**
# of Pages: 14
Doc Date: 08/07/2007

Author: JAMES T OWENS, US EPA REGION 1
Addressee: SUZANNE KROLIKOWSKI, US NAVY
Doc Type: CORRESPONDENCE
LETTER
File Break: 11.09
Access Type(s): REL

285170 **NOTICE LETTER - UNITED STATES DEPARTMENT OF THE AIR FORCE**
# of Pages: 15
Doc Date: 09/20/2007

Author: JAMES T OWENS, US EPA REGION 1
Addressee: BRIAN TURCOTT, US AIR FORCE
Doc Type: CORRESPONDENCE
GENERAL NOTICE LETTER
LETTER
File Break: 11.09
Access Type(s): REL

Phase 11: POTENTIALLY RESPONSIBLE PARTY

449079 **104 INFORMATION REQUEST SUPPLEMENTAL RESPONSE - NECC**
# of Pages: 17
Doc Date: 10/01/2008

Author: SARAH M MARTIN, ROBINSON AND COLE LLP
Addressee: EVE VAUDO, US EPA REGION 1
Doc Type: 104E INFO REQ RESPONSE; CORRESPONDENCE; LETTER
File Break: 11.09
Access Type(s): REL

449080 **104 INFORMATION REQUEST SUPPLEMENTAL RESPONSE - NECC**
# of Pages: 3
Doc Date: 04/21/2009

Author: SARAH M MARTIN, ROBINSON AND COLE LLP
Addressee: EVE VAUDO, US EPA REGION 1
Doc Type: CORRESPONDENCE; LETTER
File Break: 11.09
Access Type(s): REL

494712 **GENERAL NOTICE LETTER (GNL) - LONZA INC [LIST OF PRPS ATTACHED]**
# of Pages: 21
Doc Date: 09/23/2011

Author: JAMES T OWENS III, US EPA REGION 1
Addressee: JEANNE THOMA, LONZA INC
Doc Type: CORRESPONDENCE; GENERAL NOTICE LETTER; LETTER
File Break: 11.09
Access Type(s): REL

Phase 11: POTENTIALLY RESPONSIBLE PARTY

494713 **GENERAL NOTICE LETTER (GNL) - WOBURN STEEL DRUM INC [LIST OF PRPS ATTACHED]**
# of Pages: 21
Doc Date: 09/23/2011

Author: JAMES T OWENS III, US EPA REGION 1
Addressee: STEPHEN DAGATA, WOBURN STEEL DRUM INC
Doc Type: CORRESPONDENCE; GENERAL NOTICE LETTER; LETTER
File Break: 11.09
Access Type(s): REL

494714 **GENERAL NOTICE LETTER (GNL) - EXXONMOBIL ENVIRONMENTAL SERVICES CO [LIST OF PRPS ATTACHED]**
# of Pages: 21
Doc Date: 09/23/2011

Author: JAMES T OWENS III, US EPA REGION 1
Addressee: JOANNE W EAGLET, EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
Doc Type: CORRESPONDENCE; GENERAL NOTICE LETTER; LETTER
File Break: 11.09
Access Type(s): REL

494715 **GENERAL NOTICE LETTER (GNL) - INDUSOL INC [LIST OF PRPS ATTACHED]**
# of Pages: 19
Doc Date: 08/06/2008

Author: JAMES T OWENS III, US EPA REGION 1
Addressee: JOHN J CONNOR JR, INDUSOL INC
Doc Type: CORRESPONDENCE; GENERAL NOTICE LETTER; LETTER
File Break: 11.09
Access Type(s): REL

Phase 11: POTENTIALLY RESPONSIBLE PARTY

494716 **GENERAL NOTICE LETTER (GNL) - EASTERN RESIN CORP [LIST OF PRPS AND CERTIFIED MAIL RECEIPT ATTACHED]**
# of Pages: 22
Doc Date: 08/06/2008

Author: JAMES T OWENS III, US EPA REGION 1
Addressee: DAVID A VIOLA, EASTERN RESINS CORP
Doc Type: CORRESPONDENCE, GENERAL NOTICE LETTER, LETTER
File Break: 11.09
Access Type(s): REL

494717 **GENERAL NOTICE LETTER (GNL) - BNS CO., INC [LIST OF PRPS ATTACHED]**
# of Pages: 20
Doc Date: 08/06/2008

Author: JAMES T OWENS III, US EPA REGION 1
Addressee: MICHAEL WARREN, BNS CO
Doc Type: CORRESPONDENCE, GENERAL NOTICE LETTER, LETTER
File Break: 11.09
Access Type(s): REL

494718 **GENERAL NOTICE LETTER (GNL) - A HARRISON & CO INC [LIST OF PRPS ATTACHED]**
# of Pages: 20
Doc Date: 08/06/2008

Author: JAMES T OWENS III, US EPA REGION 1
Addressee: RICHARD R HARRISON, A HARRISON & CO
Doc Type: CORRESPONDENCE, GENERAL NOTICE LETTER, LETTER
File Break: 11.09
Access Type(s): REL

Phase 11: POTENTIALLY RESPONSIBLE PARTY

494719 **GENERAL NOTICE LETTER (GNL) - CAL CHEMICAL CORP[LIST OF PRPS ATTACHED]**
# of Pages: 20
Doc Date: 08/06/2008

Author: JAMES T OWENS III, US EPA REGION 1
Addressee: CHARLES A LAMENDOLA, CAL CHEMICAL CORP
Doc Type: CORRESPONDENCE
GENERAL NOTICE LETTER
LETTER
File Break: 11.09
Access Type(s): REL

494720 **GENERAL NOTICE LETTER (GNL) - CAL CHEMICAL CORP[LIST OF PRPS ATTACHED]**
# of Pages: 20
Doc Date: 08/06/2008

Author: JAMES T OWENS III, US EPA REGION 1
Addressee: DAVID D ETHIER, DURO TEXTILES LLC
Doc Type: CORRESPONDENCE
GENERAL NOTICE LETTER
LETTER
File Break: 11.09
Access Type(s): REL

506558 **LETTER REGARDING PRELIMINARY QUESTIONS IN EVALUATING UPLAND CONFINED DISPOSAL FACILITY (CDF) DISPOSAL ALTERNATIVE (TRANSMITTAL EMAIL ATTACHED)**
# of Pages: 4
Doc Date: 01/18/2008

Author: JEROME C MUYS JR, SULLIVAN & WORCESTER LLP
Addressee: EVE VAUDO, US EPA REGION 1
Doc Type: CORRESPONDENCE
LETTER
File Break: 11.09
Access Type(s): REL

Phase 11: POTENTIALLY RESPONSIBLE PARTY

506559 **LETTER FROM WORCESTER & SULLIVAN ON BEHALF OF EMHART INDUSTRIES REGARDING CENTREDALE PROJECT**
# of Pages: 2
Doc Date: 09/06/2011

Author: JEROME C MUYS JR, SULLIVAN & WORCESTER LLP
Addressee: EVE VAUDO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 11.09
Access Type(s): REL

506560 **RESPONSE LETTER TO 09/06/2011 CORRESPONDENCE FROM SULLIVAN & WORCESTER ON BEHALF OF EMHART INDUSTRIES**
# of Pages: 2
Doc Date: 10/04/2011

Author: EVE VAUDO, US EPA REGION 1
Addressee: JEROME C MUYS JR, SULLIVAN & WORCESTER LLP
Doc Type: CORRESPONDENCE LETTER
File Break: 11.09
Access Type(s): REL

521736 **FORENSIC ANALYSIS OF DIOXIN CONTAMINATION AND DIOXIN SOURCES AT SITE (09/18/2012 TRANSMITTAL LETTER ATTACHED)**
# of Pages: 466
Doc Date: 07/01/2012

Author: , EXPONENT
, LIMNOTECH
Addressee:
Doc Type: REPORT
File Break: 11.09
Access Type(s): REL

Phase 11: POTENTIALLY RESPONSIBLE PARTY

521772 **EMAIL REGARDING CLEAN HARBORS DISCUSSION**
# of Pages: 1
Doc Date: 09/27/2012

Author: DEIRDRE DAHLEN, BATTELLE
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE
EMAIL
File Break: 11.09
Access Type(s): REL

521794 **CLEAN HARBORS WASTE TRANSPORTATION AND DISPOSAL SERVICES**
# of Pages: 9
Doc Date: 01/01/1111

Author: , CLEANHARBORS
Addressee:
Doc Type: REPORT
File Break: 11.09
Access Type(s): REL

521795 **[REDACTED] CLEAN HARBOR'S ANNUAL REPORT FOR 2011 (07/11/2012 TRANSMITTAL EMAIL AND EMAIL HISTORY ATTACHED)**
# of Pages: 127
Doc Date: 01/01/2011

Author: , CLEAN HARBORS
Addressee:
Doc Type: REPORT
File Break: 11.09
Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

35133 **AUDUBON SOCIETY ARTICLE ON WOONASQUATUCKET RIVER**
# of Pages: 2
Doc Date: 01/01/1111

Author: , AUDUBON SOCIETY OF RHODE ISLAND
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

35140 **SUPERFUND SITE CLEANUP MOVES AHEAD AT MANOR**
# of Pages: 1
Doc Date: 02/27/2002

Author: PROVIDENCE (RI) JOURNAL
PROVIDENCE (RI) JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

35143 **EPA REMINDS PUBLIC TO USE WOONASQUATUCKET RIVER AND ALLENDALE POND RESPONSIBLY**
# of Pages: 2
Doc Date: 04/08/2002

Author: , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

35144 **SITE ACTIVITY UPDATE - ALLENDALE DAM RECONSTRUCTION**
# of Pages: 4
Doc Date: 11/01/2001

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		FACT SHEET PUBLIC INFORMATION	13.03 Access Type(s): REL

35147 **WOONASQUATUCKET RIVER TREE SWALLOW STUDY ENVIRONMENTAL UPDATE**
# of Pages: 3
Doc Date: 01/01/2002

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		FACT SHEET PUBLIC INFORMATION	13.03 Access Type(s): REL

35148 **IN NORTH PROVIDENCE, CONSTRUCTION EVERYWHERE**
# of Pages: 2
Doc Date: 12/28/2001

Author:	Addressee:	Doc Type:	File Break:
PROVIDENCE (RI) JOURNAL PROVIDENCE (RI) JOURNAL		ARTICLE - NEWS/ PERIODICAI NEWS ARTICLE PUBLIC INFORMATION	13.03 Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

35150 **THEIR MISSION: PROTECT THE WOONASQUATUCKET**
# of Pages: 1
Doc Date: 11/28/2001

Author: PROVIDENCE (RI) JOURNAL
PROVIDENCE (RI) JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

35151 **AT LONG LAST, ALLENDALE DAM WILL ONCE AGAIN HOLD BACK RIVER**
# of Pages: 2
Doc Date: 09/27/2001

Author: PROVIDENCE (RI) JOURNAL
PROVIDENCE (RI) JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

35153 **EPA HOLDS FORUM TONIGHT ON WOONASQUATUCKET CLEANUP**
# of Pages: 1
Doc Date: 08/01/2001

Author: PROVIDENCE (RI) JOURNAL
PROVIDENCE (RI) JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

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35154 **CELONA SEEKS SUPERFUND RELIEF**
# of Pages: 1
Doc Date: 07/18/2001

Author: PROVIDENCE (RI) JOURNAL
PROVIDENCE (RI) JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

35155 **4 COMPANIES COMPLY WITH SUPERFUND SITE CLEANUP ORDER**
# of Pages: 2
Doc Date: 06/19/2001

Author: PROVIDENCE (RI) JOURNAL
PROVIDENCE (RI) JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

35156 **EPA ORDERS 5 BUSINESSES TO CLEAN UP SUPERFUND SITE**
# of Pages: 1
Doc Date: 03/28/2001

Author: PROVIDENCE (RI) JOURNAL
PROVIDENCE (RI) JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

35157 **EPA TO GO AHEAD WITH DIOXIN CLEANUP**
# of Pages: 1
Doc Date: 01/26/2001

Author: PROVIDENCE (RI) JOURNAL
PROVIDENCE (RI) JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

35158 **EPA TO FURTHER TEST RIVER FOR EXTENT OF POLLUTION**
# of Pages: 1
Doc Date: 12/15/2000

Author: PROVIDENCE (RI) JOURNAL
PROVIDENCE (RI) JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

35159 **EPA ORDERS FIVE PARTIES AT SUPERFUND SITE TO RESTORE ALLENDALE DAM AND EXCAVATE CONTAMINATED SOILS AND SEDIMENTS NEAR WOONASQUATUCKET RIVER**
# of Pages: 2
Doc Date: 03/27/2001

Author: , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

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35160 **EPA TO HOST CENTREDALE MANOR RESTORATION OPEN HOUSE**
# of Pages: 1
Doc Date: 07/25/2001

Author: , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

35161 **EPA ISSUES CLEANUP DECISION FOR FLOODPLAIN AREA DOWNSTREAM FROM CENTREDALE MANOR**
# of Pages: 3
Doc Date: 01/25/2001

Author: , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

35162 **SAMPLING WORK RESUMES THIS WEEK AT CENTREDALE MANOR SITE IN RHODE ISLAND**
# of Pages: 1
Doc Date: 12/13/2000

Author: , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

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35163 **AT SUPERFUND SITE: CLEANUP CONTINUES**
# of Pages: 1
Doc Date: 07/12/2001

Author: , NORTH PROVIDENCE NORTH STAR
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

35164 **EPA PLAN TARGETS RIVER SITE**
# of Pages: 1
Doc Date: 01/26/2001

Author: , BOSTON GLOBE (BOSTON MA)
BOSTON GLOBE (BOSTON MA)
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

35165 **CENTREDALE MANOR RESTORATION PROJECT UPDATE**
# of Pages: 2
Doc Date: 05/01/2001

Author: , US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

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35166 **CENTREDALE MANOR RESTORATION PROJECT UPDATE**
# of Pages: 2
Doc Date: 12/01/2000

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		FACT SHEET PUBLIC INFORMATION	13.03 Access Type(s): REL

35172 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 04/03/2002

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 Access Type(s): REL

35173 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 03/06/2002

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 Access Type(s): REL

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35174 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 02/06/2002

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD
PUBLIC INFORMATION
File Break: 13.11
Access Type(s): REL

35175 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 01/09/2002

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD
PUBLIC INFORMATION
File Break: 13.11
Access Type(s): REL

35176 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 12/05/2001

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD
PUBLIC INFORMATION
File Break: 13.11
Access Type(s): REL

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35177 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 10/10/2001

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 Access Type(s): REL

35178 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 09/19/2001

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 Access Type(s): REL

35180 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 07/11/2001

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 Access Type(s): REL

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35182 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 05/02/2001

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 **Access Type(s):** REL

35183 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 04/04/2001

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 **Access Type(s):** REL

35184 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 02/21/2001

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 **Access Type(s):** REL

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35185 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 1
Doc Date: 02/07/2001

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 Access Type(s): REL

35186 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 01/24/2001

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 Access Type(s): REL

35187 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 01/03/2001

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 Access Type(s): REL

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35188 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 12/06/2000

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 Access Type(s): REL

35189 **ALLENDALE RIBBON CUTTING CEREMONY**
# of Pages: 2
Doc Date: 02/20/2002

Author:	Addressee:	Doc Type:	File Break:
, NORTH PROVIDENCE (RI) TOWN OF		PRESS RELEASE PUBLIC INFORMATION	13.03 Access Type(s): REL

35717 **SITE UPDATE, SEPTEMBER 2002**
# of Pages: 2
Doc Date: 09/01/2002

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		FACT SHEET PUBLIC INFORMATION	13.05 Access Type(s): REL

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35718 **RESIDENTS UPDATED ON WOONASQUATUCKET CLEANUP**
# of Pages: 2
Doc Date: 09/04/2002

Author: PROVIDENCE (RI) JOURNAL
PROVIDENCE (RI) JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

35719 **EPA RELEASES NEW DATA FOR WOONASQUATUCKET RIVER: MOST FINDINGS ARE BELOW DIOXIN STANDARD**
# of Pages: 1
Doc Date: 07/12/2002

Author: , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

35720 **STATE SENATOR MAKES PLEA TO PRESIDENT**
# of Pages: 1
Doc Date: 07/19/2002

Author:
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

35727 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 08/07/2002

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD
PUBLIC INFORMATION
File Break: 13.11
Access Type(s): REL

35729 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 05/08/2002

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD
PUBLIC INFORMATION
File Break: 13.11
Access Type(s): REL

35734 **DO'S AND DON'T'S TO HELP YOU BETTER ENJOY THE WOONASQUATUCKET RIVER**
# of Pages: 2
Doc Date: 07/01/1999

Author: , US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
PUBLIC INFORMATION
File Break: 13.05
Access Type(s): REL

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204579 **CENTREDALE MANOR RESTORATION PROJECT UPDATE**
# of Pages: 1
Doc Date: 12/01/2003

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		FACT SHEET PUBLIC INFORMATION	13.05 **Access Type(s):** REL

204580 **WOONASQUATUCKET RIVER SITE UPDATE ON FISHING ADVISORY**
# of Pages: 3
Doc Date: 08/01/2003

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		FACT SHEET PUBLIC INFORMATION	13.05 **Access Type(s):** REL

204581 **URBAN RIVERS RESTORATION PILOT/BLACKSTONE-WOONASQUATUCKET RIVERS AND COMMUNITIES**
# of Pages: 1
Doc Date: 02/26/2003

Author:	Addressee:	Doc Type:	File Break:
, US ARMY CORPS OF ENGINEERS , US EPA REGION 1		FACT SHEET PUBLIC INFORMATION	13.05 **Access Type(s):** REL

Phase 13: COMMUNITY RELATIONS

204582 **CENTREDALE MANOR RESTORATION PROJECT UPDATE**
# of Pages: 2
Doc Date: 12/01/2002

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		FACT SHEET PUBLIC INFORMATION	13.05 Access Type(s): REL

204583 **EPA STOPS WORK FOR THE WINTER ON CANAL AREA**
# of Pages: 1
Doc Date: 02/04/2004

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		PRESS RELEASE PUBLIC INFORMATION	13.03 Access Type(s): REL

204584 **EPA ORDERS TWO ADDITIONAL PARTIES TO PARTICIPATE IN CLEANUP WORK**
# of Pages: 1
Doc Date: 10/23/2003

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		PRESS RELEASE PUBLIC INFORMATION	13.03 Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

204585 **PRESS RELEASE: EPA TO BEGIN WORK IN CANAL AREA**
# of Pages: 2
Doc Date: 09/26/2003

Author: , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE, PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

204586 **EPA BEGINS SPRING WORK**
# of Pages: 2
Doc Date: 05/01/2003

Author: , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE, PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

204587 **PRESS CONFERENCE REGARDING WOONASQUATUCKET/BLACKSTONE RIVERS TO BE HELD ON FRIDAY MAY 2**
# of Pages: 2
Doc Date: 05/01/2003

Author: , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE, PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

204588 **EPA REMINDS PUBLIC TO USE WOONASQUATUCKET RIVER RESPONSIBLY**
# of Pages: 1
Doc Date: 04/10/2003

Author: , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE; PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

204589 **ACTIVE AUTUMN AT CENTREDALE MANOR RESTORATION PROJECT IN RHODE ISLAND**
# of Pages: 2
Doc Date: 09/30/2002

Author: , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE; PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

204590 **WOONASQUATUCKET PROJECT TO BEGIN**
# of Pages: 1
Doc Date: 10/14/2003

Author: S J ROSENBAUM, PROVIDENCE (RI) JOURNAL
PROVIDENCE (RI) JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI; NEWS ARTICLE; PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

204591 **EPA PLAN FOR SUPERFUND SITE INVOLVES LOSS OF TREES**
# of Pages: 2
Doc Date: 09/29/2003

Author: S J ROSENBAUM, PROVIDENCE (RI) JOURNAL
PROVIDENCE (RI) JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

204592 **EPA CHIEF LAUDS RIVER CLEANUP**
# of Pages: 2
Doc Date: 02/01/2003

Author: S J ROSENBAUM, PROVIDENCE (RI) JOURNAL
PROVIDENCE (RI) JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

204593 **STATE WINS EPA TO GRANT TO RESTORE WATERSHED**
# of Pages: 2
Doc Date: 05/03/2003

Author: PETER LORD, PROVIDENCE JOURNAL/EVENING BULLETIN
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

204594 **EPA CHIEF ON CAMPAIGN SWING DOLES OUT GRANTS**

# of Pages: 2
Doc Date: 11/02/2002

Author: FELICE J FREYER, PROVIDENCE (RI) JOURNAL

Addressee:

Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION

File Break: 13.03

Access Type(s): REL

204595 **EPA SURVEYS PONDS BOTTOMS IN TOXIN STUDY**

# of Pages: 2
Doc Date: 10/10/2002

Author: S J ROSENBAUM, PROVIDENCE (RI) JOURNAL
PROVIDENCE (RI) JOURNAL

Addressee:

Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION

File Break: 13.03

Access Type(s): REL

204596 **COASTAL CLEANUP NETS BEER/RUG/LOTS OF CIGARETTE BUTTS**

# of Pages: 2
Doc Date: 10/04/2002

Author: PETER LORD, PROVIDENCE JOURNAL/EVENING BULLETIN

Addressee:

Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION

File Break: 13.03

Access Type(s): REL

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204600 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 02/03/2004

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD
PUBLIC INFORMATION
File Break: 13.11
Access Type(s): REL

204601 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 01/06/2004

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD
PUBLIC INFORMATION
File Break: 13.11
Access Type(s): REL

204602 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 12/02/2003

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD
PUBLIC INFORMATION
File Break: 13.11
Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

204603 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 10/07/2003

Author: , LOUREIRO ENGINEERING ASSOCIATES INC
Addressee:
Doc Type: MEETING RECORD; PUBLIC INFORMATION
File Break: 13.11
Access Type(s): REL

204604 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 09/09/2003

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD; PUBLIC INFORMATION
File Break: 13.11
Access Type(s): REL

204605 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 08/19/2003

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD; PUBLIC INFORMATION
File Break: 13.11
Access Type(s): REL

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204606 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 04/01/2003

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 **Access Type(s):** REL

204607 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 03/04/2003

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 **Access Type(s):** REL

204608 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 01/07/2003

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 **Access Type(s):** REL

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204609 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 12/03/2002

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 Access Type(s): REL

204610 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 11/06/2002

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 Access Type(s): REL

204611 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 10/02/2002

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

204612 **MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES**
# of Pages: 2
Doc Date: 09/04/2002

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.11 **Access Type(s):** REL

204615 **QUESTIONNAIRES ON FISHING ACTIVITIES IN WOONASQUATUCKET RIVER**
# of Pages: 45
Doc Date: 03/01/2001

Author:	Addressee:	Doc Type:	File Break:
		FORM	13.01 **Access Type(s):** REL

212557 **START OF CONVENING PROCESS FOR REMEDY SELECTION DIALOGUE WITH STAKEHOLDERS**
# of Pages: 1
Doc Date: 09/28/2004

Author:	Addressee:	Doc Type:	File Break:
ANNA KRASKO, US EPA REGION 1		CORRESPONDENCE MEMO	13.01 **Access Type(s):** REL

Phase 13: COMMUNITY RELATIONS

213083 **FACTSHEET: RESTORATION OF ALLENDALE IS COMPLETE**
# of Pages: 4
Doc Date: 04/01/2002

Author: , US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
PUBLIC INFORMATION
File Break: 13.05
Access Type(s): REL

213084 **FACTSHEET: DRAFT BASELINE HUMAN HEALTH RISK ASSESSMENT**
# of Pages: 3
Doc Date: 10/01/2004

Author: , US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
PUBLIC INFORMATION
File Break: 13.05
Access Type(s): REL

213085 **FACTSHEET: DRAFT BASELINE ECOLOGICAL RISK ASSESSMENT UPDATE**
# of Pages: 3
Doc Date: 12/01/2004

Author: , US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
PUBLIC INFORMATION
File Break: 13.05
Access Type(s): REL

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233933 **SUMMARY OF MANAGEMENT ACTION COMMITTEE (MAC) MEETING**
# of Pages: 3
Doc Date: 02/01/2005

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD	13.01 Access Type(s): REL

233934 **SUMMARY OF MANAGEMENT ACTION COMMITTEE (MAC) MEETING**
# of Pages: 2
Doc Date: 12/07/2004

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD	13.01 Access Type(s): REL

233935 **SUMMARY OF MANAGEMENT ACTION COMMITTEE (MAC) MEETING**
# of Pages: 2
Doc Date: 11/09/2004

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD	13.01 Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

233936 **SUMMARY OF MANAGEMENT ACTION COMMITTEE (MAC) MEETING**
# of Pages: 2
Doc Date: 08/03/2004

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD	13.01 **Access Type(s):** REL

233937 **SUMMARY OF MANAGEMENT ACTION COMMITTEE (MAC) MEETING**
# of Pages: 3
Doc Date: 04/06/2004

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD	13.01 **Access Type(s):** REL

233938 **NEWS CLIPPING: DAM REINFORCEMENT WORK TO BEGIN**
# of Pages: 1
Doc Date: 08/06/2004

Author:	Addressee:	Doc Type:	File Break:
S J ROSENBAUM, PROVIDENCE (RI) JOURNAL PROVIDENCE (RI) JOURNAL		ARTICLE - NEWS/ PERIODICAI NEWS ARTICLE PUBLIC INFORMATION	13.03 **Access Type(s):** REL

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233939 **NEWS CLIPPING: STILLWATER: HARD-HAT COUNTRY NOW**
# of Pages: 3
Doc Date: 07/19/2004

Author:	Addressee:	Doc Type:	File Break:
THOMAS J MORGAN, PROVIDENCE JOURNAL.COM		ARTICLE - NEWS/ PERIODICAI NEWS ARTICLE PUBLIC INFORMATION	13.03 **Access Type(s):** REL

233940 **NEWS CLIPPING: STILLWATER DAM WORK SET TO START TODAY**
# of Pages: 3
Doc Date: 07/19/2004

Author:	Addressee:	Doc Type:	File Break:
THOMAS J MORGAN, PROVIDENCE JOURNAL.COM		ARTICLE - NEWS/ PERIODICAI NEWS ARTICLE PUBLIC INFORMATION	13.03 **Access Type(s):** REL

233941 **PRESS RELEASE: MAINTENANCE WORK TO BE CONDUCTED AT ALLENDALE DAM**
# of Pages: 1
Doc Date: 08/04/2004

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		PRESS RELEASE PUBLIC INFORMATION	13.03 **Access Type(s):** REL

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233942 **PRESS RELEASE: EPA RESUMES WORK FOR CANAL AREA**
# of Pages: 1
Doc Date: 04/07/2003

Author: , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

233943 **FACT SHEET: WOONASQUATUCKET RIVER**
# of Pages: 2
Doc Date: 06/01/2002

Author: , US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

233944 **FACT SHEET: DRAFT BASELINE ECOLOGICAL RISK ASSESSMENT UPDATE**
# of Pages: 4
Doc Date: 12/01/2004

Author: , US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

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233945 **FACT SHEET: DRAFT BASELINE HUMAN HEALTH RISK ASSESSMENT**
# of Pages: 4
Doc Date: 10/01/2004

Author: , US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

233946 **FACT SHEET: WOONASQUATUCKET RIVER SITE UPDATE ON FISHING ADVISORY**
# of Pages: 4
Doc Date: 08/01/2003

Author: , US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

253313 **LETTER REGARDING INVITATION TO INITIATE DIALOGUE (LIST OF PRPS ATTACHED)**
# of Pages: 8
Doc Date: 02/02/2005

Author: ANGELA BONARRIGO, US EPA REGION 1
ANNA KRASKO, US EPA REGION 1
Addressee:
Doc Type: CORRESPONDENCE
LETTER
File Break: 13.01
Access Type(s): REL

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253314 **TRANSMITTAL LETTERS OF 03/23/05 PHONE INTERVIEW SUMMARY REPORT (INTERVIEW REPORT, LIST OF PRPS ATTACHED)**

# of Pages: 29
Doc Date: 04/06/2005

Author: ANGELA BONARRIGO, US EPA REGION 1
ANNA KRASKO, US EPA REGION 1

Addressee: KENNETH FINKELSTEIN, US NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
JOHANNA HUNTER, WOONASQUATUCKET RIVER WATERSHED COUNCIL
LOUIS R MACCARONE, RI DEPT OF ENVIRONMENTAL MANAGEMENT
EUGENIA MARKS, AUDUBON SOCIETY OF RHODE ISLAND
ROLAND MERGENER, NORTH PROVIDENCE CONSERVATION COMMISSION
MICHAEL MERRILL, NATURAL RESOURCES CONSERVATION SERVICE (NRCS)
MICHAEL MILITO, RI HOUSING & MORTGAGE FINANCE CORP
A RALPH MOLLIS, NORTH PROVIDENCE (RI) TOWN OF
NORTH PROVIDENCE (RI) TOWN OF
JENNIFER PEREIRA, WOONASQUATUCKET RIVER WATERSHED COUNCIL
JANE SHERMAN, PROVIDENCE PLAN
WILLIAM SWEET, US AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR)
ROBERT R VANDERSLICE, RI DEPT OF PUBLIC HEALTH

Doc Type: CORRESPONDENCE
LETTER

File Break: 13.01
Access Type(s): REL

253319 **PRESS RELEASE ON SETTLEMENT WITH BROOK VILLAGE, CENTERDALE MANOR**

# of Pages: 3
Doc Date: 05/20/2005

Author: , US EPA REGION 1

Addressee:

Doc Type: PRESS RELEASE
PUBLIC INFORMATION

File Break: 13.03
Access Type(s): REL

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253321 **LETTERS REGARDING DIALOGUE CORRESPONDENCE WITH STAKEHOLDERS**

# of Pages: 12
Doc Date: 06/17/2005

Author: ANGELA BONARRIGO, US EPA REGION 1
ANNA KRASKO, US EPA REGION 1

Addressee: KENNETH FINKELSTEIN, US NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
JOHANNA HUNTER, WOONASQUATUCKET RIVER WATERSHED COUNCIL
LOUIS R MACCARONE, RI DEPT OF ENVIRONMENTAL MANAGEMENT
EUGENIA MARKS, AUDUBON SOCIETY OF RHODE ISLAND
ROLAND MERGENER, NORTH PROVIDENCE CONSERVATION COMMISSION
MICHAEL MERRILL, NATURAL RESOURCES CONSERVATION SERVICE (NRCS)
MICHAEL MILITO, RI HOUSING & MORTGAGE FINANCE CORP
A RALPH MOLLIS, NORTH PROVIDENCE (RI) TOWN OF
ORTH PROVIDENCE (RI) TOWN OF
JENNIFER PEREIRA, WOONASQUATUCKET RIVER WATERSHED COUNCIL
JANE SHERMAN, PROVIDENCE PLAN
WILLIAM SWEET, US AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR)
ROBERT R VANDERSLICE, RI DEPT OF PUBLIC HEALTH

Doc Type: CORRESPONDENCE
LETTER

File Break: 13.01
Access Type(s): REL

253322 **LETTER REGARDING DIALOGUE CORRESPONDENCE WITH POTENTIALLY RESPONSIBLE PARTIES (PRPS) (DISTRIBUTION LIST ATTACHED)**

# of Pages: 5
Doc Date: 06/21/2005

Author: EVE VAUDO, US EPA REGION 1

Addressee:

Doc Type: CORRESPONDENCE
LETTER

File Break: 13.01
Access Type(s): REL

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253325 **PRESS RELEASE - ENVIRONMENTAL SAMPLING IN WOONASQUATUCKET RIVER TO OCCUR**

# of Pages: 2
Doc Date: 03/28/2005

Author: , US EPA REGION 1

Addressee:

Doc Type: PRESS RELEASE
PUBLIC INFORMATION

File Break: 13.03

Access Type(s): REL

253326 **SUMMARY OF MANAGEMENT ACTION COMMITTEE (MAC) MEETING NOTES - 08/09/05-01/10/06**

# of Pages: 63
Doc Date: 01/10/2006

Author: , US EPA REGION 1

Addressee:

Doc Type: CORRESPONDENCE
MEMO

File Break: 13.01

Access Type(s): REL

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253331 **LETTERS REGARDING INVITATION TO PARTICIPATE IN DIALOGUE**

# of Pages: 28
Doc Date: 02/14/2006

Author:
ANGELA BONARRIGO, US EPA REGION 1
ANNA KRASKO, US EPA REGION 1

Addressee:
KENNETH FINKELSTEIN, US NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
JOANNE M HUNTER, US EPA REGION 1
LOUIS R MACCARONE, RI DEPT OF ENVIRONMENTAL MANAGEMENT
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JOHNSTON (RI) TOWN OF
EUGENIA MARKS, AUDUBON SOCIETY OF RHODE ISLAND
ROLAND MERGENER, NORTH PROVIDENCE CONSERVATION COMMISSION
MICHAEL MERRILL, NATURAL RESOURCES CONSERVATION SERVICE (NRCS)
MICHAEL MILITO, RI HOUSING & MORTGAGE FINANCE CORP
A RALPH MOLLIS, NORTH PROVIDENCE (RI) TOWN OF
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TIM MOONEY, PROVIDENCE (RI) CITY OF
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JANE SHERMAN, WOONASQUATUCKET RIVER WATERSHED COUNCIL
WILLIAM SWEET, US AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR)
ROBERT R VANDERSLICE, RI DEPT OF PUBLIC HEALTH

Doc Type: CORRESPONDENCE
LETTER

File Break: 13.01

Access Type(s): REL

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253332 **LETTERS REGARDING INVITATION TO PARTICIPATE IN DIALOGUE**

# of Pages: 30
Doc Date: 02/21/2006

Author: EVE VAUDO, US EPA REGION 1

Addressee:
GREGORY L BENIK ESQ, HOLLAND & KNIGHT LLP
LAURIE BURT, FOLEY HOAG
COLBURN T CHERNEY, ROPES & GRAY
STEPHEN P CHUNG, CONOCOPHILLIPS CO
MICHAEL DONEGAN, DONEGAN & ASSOCIATES
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DAVID B GRAHAM, KAUFMAN & CANOLES
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MARK C KALPIN, HALE AND DORR LLP
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STEVEN M MCINNIS, NONE
JEROME C MUYS JR, SWIDLER BERLIN SHEREFF FRIEDMAN LLP
JAMES P RAY, ROBINSON & COLE LLP
RICHARD A SHERMAN, EDWARDS & ANGELL LLP
JILL A TRACY, UNOCAL CORP
JEAN WARSHAW, NONE

Doc Type: CORRESPONDENCE
LETTER

File Break: 13.01

Access Type(s): REL

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253333 **CENTREDALE DIALOG MEETING #1 FINAL AGENDA, MEETING SUMMARY, AND LIST OF ATTENDEES**
# of Pages: 10
Doc Date: 04/24/2006

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD	13.04 **Access Type(s):** REL

273416 **EPA AND RIDEM LETTER TO RESIDENTS ABOUT CENTREDALE MANOR RESTORATION PROJECT**
# of Pages: 1
Doc Date: 04/18/2007

Author:	Addressee:	Doc Type:	File Break:
ANNA KRASKO, US EPA REGION 1 LOUIS R MACCARONE, RI DEPT OF ENVIRONMENTAL MANAGEMENT	KENNETH DI ORIO, NONE ANTHONY R HEIRS, NONE	CORRESPONDENCE LETTER	13.01 **Access Type(s):** REL

273417 **EPA AND RIDEM LETTER TO A RESIDENT ABOUT CENTREDALE MANOR RESTORATION PROJECT**
# of Pages: 1
Doc Date: 04/18/2007

Author:	Addressee:	Doc Type:	File Break:
ANNA KRASKO, US EPA REGION 1 LOUIS R MACCARONE, RI DEPT OF ENVIRONMENTAL MANAGEMENT	LITTRIA LIBUTTI, NONE	CORRESPONDENCE LETTER	13.01 **Access Type(s):** REL

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273420 **NEWS RELEASE: WITH SUMMER APPROACHING, RHODE ISLANDERS REMINDED ABOUT WOONASQUATUCKET RIVER "DO'S AND DON'TS**

# of Pages: 1
Doc Date: 05/10/2007

Author: , US EPA REGION 1
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

273422 **NEWS RELEASE: RHODE ISLAND RESIDENTS REMINDED ABOUT WOONASQUATUCKET RIVER "DO'S AND DON'TS**

# of Pages: 2
Doc Date: 06/16/2006

Author: , US EPA REGION 1
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

273423 **NEWS RELEASE: TAG AWARD - RHODE ISLAND WATERSHED GROUP AWARDED $ 50,000 GRANT FOR WOONASQUATUCKET RIVER RESTORATION PROJECT**

# of Pages: 1
Doc Date: 02/02/2005

Author: , US EPA REGION 1
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

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273424 **EPA'S CENTREDALE DAILOG MEETING**
# of Pages: 33
Doc Date: 04/24/2006

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD
File Break: 13.04
Access Type(s): REL

273425 **CENTREDALE DIALOG MEETING # 2**
# of Pages: 31
Doc Date: 06/07/2006

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD
File Break: 13.04
Access Type(s): REL

273426 **CENTREDALE DIALOG MEETING # 4**
# of Pages: 28
Doc Date: 04/23/2007

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD
File Break: 13.04
Access Type(s): REL

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273427 **SUMMARY - WORKSHOP ON HYDRODYNAMIC MODELING FOR 'NO-DAMS' ALTERNATIVES**
# of Pages: 16
Doc Date: 05/08/2007

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD
File Break: 13.04
Access Type(s): REL

285172 **MAC MEETING SUMMARY AND HANDOUTS**
# of Pages: 30
Doc Date: 11/28/2007

Author: , QUANTITATIVE ENVIRONMENTAL ANALYSIS LLC
Addressee:
Doc Type: MEETING RECORD
PUBLIC INFORMATION
File Break: 13.04
Access Type(s): REL

285173 **MEETING SUMMARY - DAILOG MEETING # 4**
# of Pages: 4
Doc Date: 04/23/2007

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD
PUBLIC INFORMATION
File Break: 13.04
Access Type(s): REL

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449081 **NEWS RELEASE: WITH SUMMER APPROACHING, RHODE ISLANDERS REMINDED ABOUT WOONASQUATUCKET RIVER "DO'S AND DON'TS"**
# of Pages: 2
Doc Date: 06/06/2008

Author: DAVE DEEGAN , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

462874 **NEWS RELEASE: WITH SUMMER APPROACHING, RHODE ISLANDERS REMINDED ABOUT WOONASQUATUCKET RIVER "DO'S AND DON'TS"**
# of Pages: 2
Doc Date: 06/23/2009

Author: DAVE DEEGAN , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

462875 **FACT SHEET: STARTING IN AUGUST CONTAMINATED SOIL ALONGSIDE AND UNDER PORTIONS OF THE BROOK VILLAGE PARKING LOT WILL BE REMOVED**
# of Pages: 3
Doc Date: 08/01/2009

Author: , US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
PUBLIC INFORMATION
File Break: 13.05
Access Type(s): REL

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462876 **LETTER TO THE DIALOGUE GROUP**
# of Pages: 3
Doc Date: 08/06/2009

Author: STACY GREENDLINGER, US EPA REGION 1 ANNA KRASKO, US EPA REGION 1 EVE VAUDO, US EPA REGION 1	**Addressee:**	**Doc Type:** CORRESPONDENCE LETTER	**File Break:** 13.01 **Access Type(s):** REL

466097 **EMAIL TO DIALOGUE GROUP REGARDING FINAL FEASIBILITY STUDY (FS) (05/07/2010) WITH RECIPIENTS LIST)**
# of Pages: 5
Doc Date: 05/11/2010

Author: STACY GREENDLINGER, US EPA REGION 1	**Addressee:** , DIALOGUE GROUP	**Doc Type:** CORRESPONDENCE LETTER	**File Break:** 13.01 **Access Type(s):** REL

469013 **PRESS RELEASE: SHORT-TERM CLEANUP COMPLETED AT CENTREDALE MANOR RESTORATION PROJECT IN N. PROVIDENCE**
# of Pages: 3
Doc Date: 09/07/2010

Author: , US EPA REGION 1	**Addressee:**	**Doc Type:** PRESS RELEASE PUBLIC INFORMATION	**File Break:** 13.03 **Access Type(s):** REL

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479423 **PUBLIC MEETING AND PRESENTATION SLIDES: PUBLIC HEALTH AND WOONASQUATUCKET RIVER**
# of Pages: 23
Doc Date: 01/13/1998

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD; PUBLIC INFORMATION
File Break: 13.04
Access Type(s): REL

479494 **LETTER INFORMING DIALOGUE GROUP ABOUT ADDITIONAL OXBOW AREA SAMPLING: PRELIMINARY DATA (MAP ATTACHED)**
# of Pages: 2
Doc Date: 04/07/2011

Author: STACY GREENDLINGER, US EPA REGION 1
Addressee: , DIALOGUE GROUP
Doc Type: CORRESPONDENCE; LETTER; PUBLIC INFORMATION
File Break: 13.01
Access Type(s): REL

486558 **FACT SHEET: INFORMATION UPDATE REGARDING CENTREDALE MANOR RESTORATION PROJECT**
# of Pages: 6
Doc Date: 07/01/2011

Author: , US EPA REGION 1
Addressee:
Doc Type: FACT SHEET; PUBLIC INFORMATION
File Break: 13.05
Access Type(s): REL

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487301 **NEWS RELEASE: WITH SUMMER'S ARRIVAL, RHODE ISLANDERS REMINDED ABOUT WOONASQUATUCKET RIVER "DO'S AND DON'TS"**

# of Pages: 1
Doc Date: 06/15/2011

Author: , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE; PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

490415 **UPDATE ON THE EFFORTS TO ADDRESS DIOXIN CONTAMINATION IN THE WOONASQUATUCKET RIVER - EPA TO HOLD PUBLIC INFORMATION MEETING JULY 21, 2011**

# of Pages: 1
Doc Date: 07/21/2011

Author: , US EPA REGION 1
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI; NEWS ARTICLE; PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

490416 **EPA PROVIDES UPDATE ON EFFORTS TO ADDRESS DIOXIN CONTAMINATION IN THE WOONASQUATUCKET RIVER**

# of Pages: 2
Doc Date: 07/22/2011

Author: , US EPA REGION 1
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI; NEWS ARTICLE; PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

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490418 **PUBLIC MEETING JULY 21, 2011**
# of Pages: 46
Doc Date: 07/21/2011

Author: , US EPA REGION 1
Addressee:
Doc Type: MEETING RECORD; PUBLIC (AND OTHER) COMME
File Break: 13.04
Access Type(s): REL

490434 **NEWS CLIPPING: EPA REPORT FINDS WORST CONTAMINATION NEAR NORTH PROVIDENCE APARTMENT COMPLEX**
# of Pages: 2
Doc Date: 07/23/2011

Author: MARK REYNOLDS, PROVIDENCE JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI; NEWS ARTICLE; PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

490435 **NEWS CLIPPING: EPA GIVES UPDATE ON WOONASQUATUCKET CONTAMINATION**
# of Pages: 1
Doc Date: 07/22/2011

Author: NICOLE FRIEDMAN, PROVIDENCE JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI; NEWS ARTICLE; PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

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492994 **EMAIL FROM PROPERTY OWNER GEGARDING CENTREDALE MANOR (EMAIL HISTORY ATTACHED)**
# of Pages: 1
Doc Date: 08/15/2011

Author:	Addressee:	Doc Type:	
STACY GREENDLINGER, US EPA REGION 1	SUSAN ASSELIN, TOWN OF NORTH PROVIDENCE		**File Break:** 13.01 **Access Type(s):** REL

494727 **LETTER FROM EPA AND RIDEM TO UPDATE RESIDENT ABOUT DIOXIN CLEANUP OPTIONS**
# of Pages: 1
Doc Date: 04/18/2007

Author:	Addressee:	Doc Type:	
ANNA KRASKO, US EPA REGION 1 LOUIS R MACCARONE, RI DEPT OF ENVIRONMENTAL MANAGEMENT	LITTRIA LIBUTTI, JOHNSTON (RI) TOWN OF JOHNSTON (RI) TOWN OF		**File Break:** 13.01 **Access Type(s):** REL

494728 **FOLLOWS UP LETTER FROM EPA AND RIDEM TO UPDATE RESIDENT ABOUT EPA'S CLEANUP STATUS OF CENTREDALE**
# of Pages: 2
Doc Date: 01/27/2009

Author:	Addressee:	Doc Type:	
ANNA KRASKO, US EPA REGION 1 LOUIS R MACCARONE, RI DEPT OF ENVIRONMENTAL MANAGEMENT	JAMES BACCALA, BACCALA CONCRETE CORPORATION		**File Break:** 13.01 **Access Type(s):** REL

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494729	**LETTER FROM EPA AND RIDEM TO UPDATE RESIDENT ABOUT DIOXIN CLEANUP OPTIONS**		**# of Pages:** 1 **Doc Date:** 04/18/2007
Author: ANNA KRASKO, US EPA REGION 1 LOUIS R MACCARONE, RI DEPT OF ENVIRONMENTAL MANAGEMENT	**Addressee:** KENNETH DI ORIO, NORTH PROVIDENCE (RI) RESIDENT ORTH PROVIDENCE (RI) RESIDENT ANTHONY ROSSI HEIRS, NORTH PROVIDENCE (RI) RESIDENT	**Doc Type:**	**File Break:** 13.01 **Access Type(s):** REL
496992	**NEWS RELEASE: EPA ISSUES PROPOSED CLEANUP PLAN FOR WOONASQUATUCKET RIVER**		**# of Pages:** 2 **Doc Date:** 10/27/2011
Author: , US EPA REGION 1	**Addressee:**	**Doc Type:** PRESS RELEASE PUBLIC INFORMATION	**File Break:** 13.03 **Access Type(s):** REL
497900	**MEDIA ADVISORY: EPA TO HOLD PUBLIC INFORMATIONAL MEETINGS ON WOONASQUATUCKET RIVER CLEANUP PLAN**		**# of Pages:** 1 **Doc Date:** 11/07/2011
Author: , US EPA REGION 1	**Addressee:**	**Doc Type:** PRESS RELEASE PUBLIC INFORMATION	**File Break:** 13.03 **Access Type(s):** REL

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498806 **PUBLIC NOTICE**
# of Pages: 2
Doc Date: 01/01/1111

Author: , US EPA REGION 1
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

501039 **PUBLIC HEARING TRANSCRIPT - BUNDLE 1**
# of Pages: 43
Doc Date: 12/07/2011

Author: , ALLIED COURT REPORTERS INC
Addressee:
Doc Type: MEETING RECORD
PUBLIC (AND OTHER) COMME
File Break: 13.04
Access Type(s): REL

501040 **PUBLIC HEARING TRANSCRIPT - BUNDLE 2**
# of Pages: 71
Doc Date: 12/07/2011

Author: , ALLIED COURT REPORTERS INC
Addressee:
Doc Type: MEETING RECORD
PUBLIC (AND OTHER) COMME
File Break: 13.04
Access Type(s): REL

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504315 **MEMO TO FILE REGARDING VIDEO RECORDINGS OF PUBLIC MEETINGS**
# of Pages: 1
Doc Date: 01/23/2012

Author:	Addressee:	Doc Type:	File Break:
CHRISTOPHER FERRY, ASRC PRIMUS		CORRESPONDENCE MEMO	13.04 Access Type(s): REL

505087 **PRESS RELEASE: EPA UPDATES SCIENCE ASSESSMENT FOR DIOXIN / AIR EMISSIONS OF DIOXINS HAVE DECREASED BY 90 PERCENT SINCE THE 1980S**
# of Pages: 1
Doc Date: 02/17/2012

Author:	Addressee:	Doc Type:	File Break:
, US ENVIRONMENTAL PROTECTION AGENCY		PRESS RELEASE PUBLIC INFORMATION	13.03 Access Type(s): REL

506554 **RADIO INTERVIEW RECORD WITH MAYOR OF TOWN OF JOHNSTON**
# of Pages: 2
Doc Date: 11/07/2011

Author:	Addressee:	Doc Type:	File Break:
, WRNI		NEWS ARTICLE PUBLIC INFORMATION	13.03 Access Type(s): REL

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506555 **CORRESPONDENCE WITH DIALOGUE GROUP**
# of Pages: 2
Doc Date: 10/11/2011

Author: STACY GREENDLINGER, US EPA REGION 1

Addressee: MICHAEL JASINSKI, US EPA REGION 1
ANNA KRASKO, US EPA REGION 1
LOUIS R MACCARONE, RI DEPT OF ENVIRONMENTAL MANAGEMENT
ELISSA TONKIN, US EPA REGION 1
EVE VAUDO, US EPA REGION 1

Doc Type: CORRESPONDENCE
EMAIL
MEETING RECORD
PUBLIC INFORMATION

File Break: 13.03
Access Type(s): REL

506562 **EMAIL REGARDING INCLUSION OF EXPLANATION OF POTENTIAL RISKS TO FETUSES OR CHILDREN LESS THAN 5 YEARS OF AGE IN THE PROPOSED PLAN**
# of Pages: 1
Doc Date: 10/27/2011

Author: PETER SIMON, NONE

Addressee: ANNA KRASKO, US EPA REGION 1

Doc Type: CORRESPONDENCE
EMAIL

File Break: 13.01
Access Type(s): REL

506571 **EMAIL REGARDING SITE HISTORY**
# of Pages: 1
Doc Date: 11/13/2011

Author: NANCY BOLDUC, NONE

Addressee: ANNA KRASKO, US EPA REGION 1

Doc Type: CORRESPONDENCE
EMAIL

File Break: 13.01
Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

506572 **EMAIL REGARDING LOCATION OF POSSIBLE TUNNEL ON SITE**
# of Pages: 1
Doc Date: 11/09/2011

Author: NANCY BOLDUC, NONE
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE
EMAIL
File Break: 13.01
Access Type(s): REL

506573 **EPA RELEASES FINAL HEALTH ASSESSMENT FOR TETRACHLOROETHYLENE (PERC) / PUBLIC HEALTH PROTECTIONS REMAIN IN PLACE**
# of Pages: 2
Doc Date: 02/10/2012

Author: , US ENVIRONMENTAL PROTECTION AGENCY
Addressee:
Doc Type: NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.01
Access Type(s): REL

506574 **ARTICLE: SUPERFUND SITE CLEANUP COULD REACH 101 MILLION**
# of Pages: 2
Doc Date: 11/01/2011

Author: MARK REYNOLDS, PROVIDENCE JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

506575 **ARTICLE: EPA COST FOR WOONASQUATUCKET SITE CLEANUP:101M**
# of Pages: 1
Doc Date: 11/01/2011

Author: , THE PROVIDENCE JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI; NEWS ARTICLE; PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

506576 **ARTICLE: TONIGHT: EPA PLANS FOR WOONASQUATUCKET RIVER CLEANUP**
# of Pages: 1
Doc Date: 11/09/2011

Author: BETH HURD, JOHNSTON INSIDER
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI; NEWS ARTICLE; PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

506577 **ARTICLE: BIG CLEANUP PROPOSED FOR TOXIC NORTH PROVIDENCE SITE**
# of Pages: 2
Doc Date: 11/13/2011

Author: TIM FAULKNER, ECORI NEWS
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI; NEWS ARTICLE; PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

506578 **ARTICLE: TOWN MAY LET EPA BURY CENTREDALE WASTE HERE**
# of Pages: 2
Doc Date: 12/14/2011

Author: BETH HURD, JOHNSTON INSIDER
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI; NEWS ARTICLE; PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

506579 **ARTICLE: MAYOR KILLS PLAN TO BURY TOXIC SOIL AT DPW SITE**
# of Pages: 4
Doc Date: 01/05/2012

Author: JOSEPH HUTNAK, JOHNSTON PATCH
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI; NEWS ARTICLE; PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

506580 **ARTICLE: MAYOR'S DENIAL OF EPA PLAN AWESOME SAYS RESIDENT**
# of Pages: 4
Doc Date: 01/06/2012

Author: JOSEPH HUTNAK, JOHNSTON PATCH
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI; NEWS ARTICLE; PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

509360 **NEWS ARTICLE: EPA SAID TO FLOAT STRICT DIOXIN SITE CLEANUP GOAL BASED ON NEW RISK STUDY**
# of Pages: 3
Doc Date: 04/30/2012

Author: , INSIDEEPA.COM
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

509361 **NEWS ARTICLE: WITHDRAWAL OF DIOXIN REMEDIATION GOALS CREATES CLEANUP UNCERTAINTY**
# of Pages: 3
Doc Date: 04/13/2012

Author: , INSIDEEPA.COM
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

517743 **PRESS RELEASE: WITH SUMMER'S ARRIVAL, RHODE ISLANDERS REMINDED ABOUT WOONASQUATUCKET RIVER 'DO'S AND DON'TS'**
# of Pages: 2
Doc Date: 06/29/2012

Author: , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

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517974 **FACT SHEET: SITE UPDATE**

# of Pages: 2
Doc Date: 07/01/2012

Author:	Addressee:	Doc Type:	File Break: / Access Type(s):
, US EPA REGION 1		FACT SHEET PUBLIC INFORMATION	File Break: 13.05 Access Type(s): REL

517985 **PROPOSED PLAN AMENDMENT INFORMATION MEETING**

# of Pages: 27
Doc Date: 07/01/2012

Author:	Addressee:	Doc Type:	File Break: / Access Type(s):
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	File Break: 13.04 Access Type(s): REL

517989 **SLIDES FOR PROPOSED PLAN BRIEF INFORMATION SESSION**

# of Pages: 21
Doc Date: 12/07/2011

Author:	Addressee:	Doc Type:	File Break: / Access Type(s):
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	File Break: 13.04 Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

517990 **SLIDES FOR PROPOSED PLAN INFORMATION MEETING**
# of Pages: 28
Doc Date: 11/09/2011

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		MEETING RECORD PUBLIC INFORMATION	13.04 **Access Type(s):** REL

517996 **ARTICLE: EPA AMENDS WOONASQUATUCKET RIVER SITE CLEANUP**
# of Pages: 1
Doc Date: 07/17/2012

Author:	Addressee:	Doc Type:	File Break:
MICHAEL SOUZA, PBN		ARTICLE - NEWS/ PERIODICAI NEWS ARTICLE PUBLIC INFORMATION	13.03 **Access Type(s):** REL

517999 **ARTICLE: EPA REVISES CLEANUP PLAN FOR WOONASQUATUCKET**
# of Pages: 1
Doc Date: 07/30/2012

Author:	Addressee:	Doc Type:	File Break:
MARK REYNOLDS, PROVIDENCE JOURNAL		ARTICLE - NEWS/ PERIODICAI NEWS ARTICLE PUBLIC INFORMATION	13.03 **Access Type(s):** REL

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518862 **PRESS RELEASE: EPA PROPOSES AMENDMENTS TO CLEANUP PLAN FOR WOONASQUATUCKET RIVER IN N. PROVIDENCE, RI**
# of Pages: 2
Doc Date: 07/16/2012

Author:	Addressee:	Doc Type:	File Break:
, US EPA REGION 1		PRESS RELEASE	13.03 Access Type(s): REL

521702 **ARTICLE: OFFICIALS EXPAND CLEANUP PLAN FOR WOONASQUATUCKET**
# of Pages: 1
Doc Date: 07/30/2012

Author:	Addressee:	Doc Type:	File Break:
PROVIDENCE (RI) JOURNAL PROVIDENCE (RI) JOURNAL		ARTICLE - NEWS/ PERIODICAI NEWS ARTICLE PUBLIC INFORMATION	13.03 Access Type(s): REL

521703 **ARTICLE: OFFICIALS EXPAND CLEANUP PLAN FOR WOONASQUATUCKET**
# of Pages: 1
Doc Date: 07/30/2012

Author:	Addressee:	Doc Type:	File Break:
, ABC 6 NEWS		ARTICLE - NEWS/ PERIODICAI NEWS ARTICLE PUBLIC INFORMATION	13.03 Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

521704 **PUBLIC NOTICES OF NOVEMBER 2011 INFORMATION MEETINGS**
# of Pages: 2
Doc Date: 11/28/2011

Author:
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

521705 **PUBLIC NOTICES OF DECEMBER 2011 PROPOSED PLAN FORMAL PUBLIC HEARINGS**
# of Pages: 4
Doc Date: 12/02/2011

Author: , US EPA REGION 1
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

521706 **PUBLIC NOTICES OF FIRST COMMENT PERIOD EXTENSION**
# of Pages: 1
Doc Date: 02/02/2012

Author:
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

521707 **PUBLIC NOTICES OF SECOND COMMENT PERIOD EXTENSION**
# of Pages: 2
Doc Date: 02/16/2012

Author:
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 13.03
Access Type(s): REL

521709 **PUBLIC HEARING TRANSCRIPT: PROPOSED PLAN AMENDMENT INFORMATIONAL MEETING**
# of Pages: 84
Doc Date: 07/30/2012

Author: , ALLIED COURT REPORTERS INC
Addressee:
Doc Type: MEETING RECORD
PUBLIC (AND OTHER) COMME
File Break: 13.04
Access Type(s): REL

521710 **PUBLIC HEARING TRANSCRIPT: PROPOSED PLAN AMENDMENT INFORMATIONAL MEETING**
# of Pages: 111
Doc Date: 07/31/2012

Author: , ALLIED COURT REPORTERS INC
Addressee:
Doc Type: MEETING RECORD
PUBLIC (AND OTHER) COMME
File Break: 13.04
Access Type(s): REL

Phase 13: COMMUNITY RELATIONS

521744	**ARTICLES: PROPOSED PLAN COMMENT PERIOD EXTENDED TO 09/17/2012**			**# of Pages:** 1 **Doc Date:** 08/28/2012
Author: , JOHNSTON SUNRISE , VALLEY BREEZE	**Addressee:**	**Doc Type:** ARTICLE - NEWS/ PERIODICAI NEWS ARTICLE PUBLIC INFORMATION		**File Break:** 13.03 **Access Type(s):** REL
521745	**ARTICLES: PROPOSED PLAN AMENDMENT MEETINGS/HEARINGS**			**# of Pages:** 2 **Doc Date:** 07/26/2012
Author: , JOHNSTON SUNRISE , VALLEY BREEZE	**Addressee:**	**Doc Type:** ARTICLE - NEWS/ PERIODICAI NEWS ARTICLE PUBLIC INFORMATION		**File Break:** 13.03 **Access Type(s):** REL
521764	**CENTREDALE DIALOG MEETING NO. 3 SUMMARY (07/05/2006 MEMO WITH AGENDA ATTACHED) [MARGINALIA]**			**# of Pages:** 6 **Doc Date:** 07/12/2006
Author: , US EPA REGION 1	**Addressee:**	**Doc Type:** MEETING RECORD PUBLIC INFORMATION		**File Break:** 13.04 **Access Type(s):** REL

Phase 16: NATURAL RESOURCE TRUSTEE

475804 **EPA LETTER TO ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING NOTICE OF ADVERSE EFFECTS AS A RESULT OF PLANNED REMEDIAL ACTIVITIES**
# of Pages: 2
Doc Date: 08/16/2010

Author: ANNA KRASKO, US EPA REGION 1
Addressee: , ADVISORY COUNCIL ON HISTORIC PRESERVATION
Doc Type: CORRESPONDENCE LETTER
File Break: 16.01
Access Type(s): REL

475805 **EPA LETTER TO RHODE ISLAND (RI) HISTORICAL PRESERVATION REGARDING STAGE IA LEVEL CULTURAL RESOURCES SURVERY TO IDENTIFY HISTORIC PROPERTIES**
# of Pages: 2
Doc Date: 10/19/2010

Author: ANNA KRASKO, US EPA REGION 1
Addressee: EDWARD F SANDERSON, RI HISTORIC PRESERVATION COMMISSION
Doc Type: CORRESPONDENCE LETTER
File Break: 16.01
Access Type(s): REL

475806 **EPA LETTER TO NARRAGANSETT INDIAN TRIBE REGARDING STAGE IA LEVEL CULTURAL RESOURCES SURVERY TO IDENTIFY HISTORIC PROPERTIES**
# of Pages: 2
Doc Date: 10/19/2010

Author: ANNA KRASKO, US EPA REGION 1
Addressee: JOHN BROWN, NARRAGANSETT INDIAN TRIBE
Doc Type: CORRESPONDENCE LETTER
File Break: 16.01
Access Type(s): REL

Phase 16: NATURAL RESOURCE TRUSTEE

485691 **LETTER REGARDING PHASE 1A CULTURAL RESOURCE SURVEY REPORT**
# of Pages: 1
Doc Date: 04/19/2011

Author: EDWARD F SANDERSON, RI HISTORIC PRESERVATION COMMISSION
Addressee: ANNA KRASKO, US EPA REGION 1
Doc Type: CORRESPONDENCE LETTER
File Break: 16.01
Access Type(s): REL

485693 **EPA LETTER PROVIDING ADVISORY COUNCIL ON HISTORICAL PRESERVATION (NHPA) NOTICE OF ADVERSE EFFECTS AS RESULT OF PLANNED REMEDIAL ACTIVITIES**
# of Pages: 2
Doc Date: 08/16/2010

Author: ANNA KRASKO, US EPA REGION 1
Addressee: , ADVISORY COUNCIL ON HISTORIC PRESERVATION
Doc Type: CORRESPONDENCE LETTER
File Break: 16.01
Access Type(s): REL

490402 **TECHNICAL MEMORANDUM: REVIEW AND EVALUATION OF CLEANUP ALTERNATIVES FOR IMPACTS UPON HISTORIC PROPERTIES**
# of Pages: 17
Doc Date: 06/30/2011

Author: MARCOS A PAIVA, US ARMY CORPS OF ENGINEERS
Addressee:
Doc Type: CORRESPONDENCE MEMO
File Break: 16.01
Access Type(s): REL

Phase 16: NATURAL RESOURCE TRUSTEE

494723 **TECHNICAL MEMO REGARDING REVIEW AND EVALUATION OF EPA'S CLEANUP PLAN FOR IMPACTS UPON HISTORIC PROPERTIES**

# of Pages: 12
Doc Date: 10/01/2011

Author:	Addressee:	Doc Type:	File Break:
MARCOS A PAIVA, US ARMY CORPS OF ENGINEERS	, US EPA REGION 1	CORRESPONDENCE MEMO	16.01 **Access Type(s):** REL

Phase 17: SITE MANAGEMENT RECORDS

27005 **SOIL DIOXIN RESULTS**
# of Pages: 2
Doc Date: 07/12/1999

Author: HEATHER A BOYD, GOLDMAN ENVIRONMENTAL CONSULTANTS
Addressee: EDWARD BAZENAS, US EPA REGION 1
Doc Type: SAMPLING DATA
File Break: 17.01
Access Type(s): REL

27006 **SITE PLAN AND SOIL AND GROUNDWATER DATA**
# of Pages: 17
Doc Date: 04/12/1999

Author: HEATHER A BOYD, GOLDMAN ENVIRONMENTAL CONSULTANTS
Addressee: EDWARD BAZENAS, US EPA REGION 1
Doc Type: SAMPLING DATA
File Break: 17.01
Access Type(s): REL

27007 **PROPOSED SOIL BORINGS AND MONITORING WELL LOCATIONS**
# of Pages: 3
Doc Date: 02/23/1999

Author: HEATHER A BOYD, GOLDMAN ENVIRONMENTAL CONSULTANTS
Addressee: GARY WALDECK, RI DEPT OF ENVIRONMENTAL MANAGEMENT
Doc Type: CORRESPONDENCE
LETTER
File Break: 17.01
Access Type(s): REL

Phase 17: SITE MANAGEMENT RECORDS

27010 **BORING LOGS FOR BROOK VILLAGE**
# of Pages: 8
Doc Date: 04/14/1999

Author: HEATHER A BOYD, GOLDMAN ENVIRONMENTAL CONSULTANTS
Addressee: EDWARD BAZENAS, US EPA REGION 1
Doc Type: SAMPLING DATA
File Break: 17.01
Access Type(s): REL

27792 **AERIAL PHOTOGRAPHIC ANALYSIS OF CENTREDALE MANOR SITE SUBAREA, ADDENDUM REPORT, EPIC BOOK**
# of Pages: 20
Doc Date: 12/01/2001

Author: , US EPA - ENVIRONMENTAL PHOTOGRAPHIC INTERPRETATION CTR (EPIC)
Addressee: , US EPA REGION 1
Doc Type: REPORT
File Break: 17.04
Access Type(s): REL

35715 **URBAN RIVER USE SURVEY FOR 1998 - WOONASQUATUCKET RIVER (26 COMPLETED SURVEYS ATTACHED)**
# of Pages: 55
Doc Date: 08/07/1998

Author: KRISTI N REA, URBAN ENVIRONMENTAL INITIATIVE
Addressee: , URBAN RIVERS TEAM
Doc Type: FORM
File Break: 17.08
Access Type(s): REL

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35722 **SCIENCE ADVISORY BOARD (SAB) REVIEW OF THE OFFICE OF RESEARCH AND DEVELOPMENT'S REASSESSMENT OF DIOXIN**
# of Pages: 80
Doc Date: 05/01/2001

Author: , US EPA SCIENCE ADVISORY BOARD
Addressee:
Doc Type: REPORT
File Break: 17.07
Access Type(s): REL

35725 **PRINCIPLES FOR MANAGING CONTAMINATED SEDIMENT RISKS AT HAZARDOUS WASTE SITES**
# of Pages: 11
Doc Date: 02/12/2002

Author: MARIANNE LAMONT HORINKO, US EPA
Addressee: , US EPA RCRA SENIOR POLICY ADVISORS
, US EPA SUPERFUND NATIONAL POLICY MANAGERS
Doc Type: CORRESPONDENCE
MEMO
File Break: 17.07
Access Type(s): REL

204597 **DIOXIN 2003 CONFERENCE - DISCOVERY OF DIOXIN CONTAMINATION IN THE WOONASQUATUCKET RIVER**
# of Pages: 4
Doc Date: 08/26/2003

Author: ANDREW F BELIVEAU, US EPA REGION 1
RICHARD PRUELL, US EPA
BRIAN TAPLIN, US EPA
Addressee:
Doc Type: REPORT
File Break: 17.07
Access Type(s): REL

Phase 17: SITE MANAGEMENT RECORDS

204598 **DIOXIN 2003 CONFERENCE - CONTAMINATION DISTRIBUTION IN WHOLE BODY, FILLET AND OFFAL OF FISH AND HUMAN HEALTH EXPOSURE ASSESSMENT OF FISH CONSUMPTION**
# of Pages: 4
Doc Date: 08/26/2003

Author: DEIRDRE DAHLEN, BATTELLE
KAREN TRACY, BATTELLE
CHAU VU, US EPA REGION 1
Addressee:
Doc Type: REPORT
File Break: 17.07
Access Type(s): REL

204599 **DIOXIN 2003 CONFERENCE - ACCUMULATION OF DIOXINS AND FURANS IN TREE SWALLOW NESTS**
# of Pages: 4
Doc Date: 08/26/2003

Author: CHRISTINE M CUSTER, US GEOLOGICAL SURVEY
THOMAS CUSTER, US GEOLOGICAL SURVEY
CORNELL ROSIU, US EPA REGION 1
Addressee:
Doc Type: REPORT
File Break: 17.07
Access Type(s): REL

204622 **TOOL KIT FOR URBAN RIVERS - PUBLIC OUTREACH AND EDUCATION (APPENDICES ON CD ROM)**
# of Pages: 65
Doc Date: 02/10/2003

Author: , NORTHERN RHODE ISLAND CONSERVATION DISTRICT
Addressee:
Doc Type: REPORT
File Break: 17.08
Access Type(s): REL

Phase 17: SITE MANAGEMENT RECORDS

204627 **EPA DESK STATEMENT - DRAFT DIOXIN REASSESSMENT (2003 VERSION) SENT TO THE NATIONAL ACADEMY OF SCIENCES (NAS) FOR REVIEW (TRANSMITTAL LETTER ATTACHED)**
# of Pages: 7
Doc Date: 10/29/2003

Author: PAUL GILMAN, NONE	**Addressee:** BRUCE ALBERTS, NATIONAL RESEARCH COUNCIL	**Doc Type:** CORRESPONDENCE LETTER	**File Break:** 17.07 **Access Type(s):** REL

233951 **COMMENTS ON ECOLOGICAL RISK ASSESSMENT AND OTHER EPA-AUTHORED DOCUMENTS**
# of Pages: 2
Doc Date: 06/16/2004

Author: KENNETH FINKELSTEIN, US NATIONAL OCEANIC AND ATMOSPHERIC	**Addressee:** KYMBERLEE KECKLER, US EPA REGION 1	**Doc Type:** CORRESPONDENCE LETTER PUBLIC (AND OTHER) COMME	**File Break:** 17.01 **Access Type(s):** REL

233952 **LETTER REGARDING STATE INVOLVEMENT WITH SITE**
# of Pages: 2
Doc Date: 07/13/2004

Author: LOUIS R MACCARONE, RI DEPT OF ENVIRONMENTAL MANAGEMENT	**Addressee:** KYMBERLEE KECKLER, US EPA REGION 1	**Doc Type:** CORRESPONDENCE LETTER	**File Break:** 17.01 **Access Type(s):** REL

Phase 17: SITE MANAGEMENT RECORDS

233953 **RESPONSE TO PRESENTATION REQUEST AT MEETING ON SEDIMENT INVESTIGATION**
# of Pages: 1
Doc Date: 06/18/2004

Author: DAVID B GRAHAM, KAUFMAN & CANOLES
Addressee: KYMBERLEE KECKLER, US EPA REGION 1
Doc Type: CORRESPONDENCE
LETTER
File Break: 17.01
Access Type(s): REL

233957 **REFERENCE INFORMATION ABOUT CONTAMINATED SEDIMENTS TECHNICAL ADVISORY GROUP (CSTAG) AND 03/15/04 OPERATING PROCEDURES**
# of Pages: 20
Doc Date: 03/25/2004

Author: , US EPA
Addressee:
Doc Type: REPORT
File Break: 17.01
Access Type(s): REL

233958 **COLLECTION OF NEWS ARTICLES REGARDING ALLENDALE DAM - 1991-2003**
# of Pages: 44
Doc Date: 03/25/2004

Author: PROVIDENCE JOURNAL/EVENING BULLETIN
PROVIDENCE JOURNAL/EVENING BULLETIN
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 17.08
Access Type(s): REL

Phase 17: SITE MANAGEMENT RECORDS

233959 **WEBSITE PAGE REGARDING WOONASQUATUCKET WETLAND RESTORATION**
# of Pages: 2
Doc Date: 07/20/2004

Author: , RI DEPT OF ENVIRONMENTAL MANAGEMENT
Addressee:
Doc Type: MISC
File Break: 17.08
Access Type(s): REL

233960 **REPORT ON RESULTS OF AN EXAMINATION OF CONDITIONS CAUSING POLLUTION OF MOSHASSUCK, WOONASQUATUCKET, AND PROVIDENCE RIVERS**
# of Pages: 19
Doc Date: 01/01/1908

Author: , RI STATE BOARD OF HEALTH
, US GEOLOGICAL SURVEY
Addressee:
Doc Type: REPORT
File Break: 17.08
Access Type(s): REL

233961 **PHASE 1 ENVIRONMENTAL SITE ASSESSMENT - LIBUTTI SITE**
# of Pages: 68
Doc Date: 01/01/2004

Author: , LAKE SHORE ENVIRONMENTAL INC
Addressee: WILLIAM R MACERA, JOHNSTON (RI) TOWN OF
JOHNSTON (RI) TOWN OF
Doc Type: REPORT
File Break: 17.08
Access Type(s): REL

Phase 17: SITE MANAGEMENT RECORDS

233962 **EXPOSURE AND EFFECTS OF 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN IN TREE SWALLOWS NESTING ALONG THE WOONASQUATUCKET RIVER, RHODE ISLAND**

# of Pages: 17
Doc Date: 01/01/2005

Author: JOHN W BICKHAM, TEXAS A & M UNIVERSITY
CHRISTINE M CUSTER, US GEOLOGICAL SURVEY
THOMAS CUSTER, US GEOLOGICAL SURVEY
COLE W MATSON, NONE
MARK J MELANCON, US GEOLOGICAL SURVEY
CORNELL ROSIU, US EPA REGION 1
, ENVIRONMENTAL TOXICOLOGY AND CHEMISTRY

Addressee:

Doc Type: REPORT

File Break: 17.08
Access Type(s): REL

233963 **PROGRESS REPORT 2: WATER QUALITY CHARACTERIZATION FOR THE WOONASQUATUCKET RIVER BASIN**

# of Pages: 146
Doc Date: 05/22/2000

Author: , LOUIS BERGER GROUP INC THE

Addressee: , RI DEPT OF ENVIRONMENTAL MANAGEMENT

Doc Type: REPORT

File Break: 17.08
Access Type(s): REL

233964 **ENVIROFACTS DATA AND 12/2000 RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT (RIPDEM) INFORMATION ON FACILITIES ALONG WOONASQUATUCKET RIVER**

# of Pages: 89
Doc Date: 08/05/2004

Author: , LOUIS BERGER GROUP INC THE

Addressee: , RI DEPT OF ENVIRONMENTAL MANAGEMENT

Doc Type: REPORT

File Break: 17.08
Access Type(s): REL

Phase 17: SITE MANAGEMENT RECORDS

252323 **PHASE 1 ENVIRONMENTAL SITE ASSESSMENT - MAP 14, LOT 516**
# of Pages: 201
Doc Date: 04/18/2002

Author	Addressee	Doc Type	File Break / Access Type(s)
, LINCOLN ENVIRONMENTAL INC	, CUMBERLAND FARMS INC	REPORT	File Break: 17.07; Access Type(s): REL

252324 **PHASE 2 LIMITED SUBSURFACE INVESTIGATION - PLAT 14, LOT 515 [HARD COPY PAGE 9 ILLEGIBLE]**
# of Pages: 130
Doc Date: 06/03/2002

Author	Addressee	Doc Type	File Break / Access Type(s)
, LINCOLN ENVIRONMENTAL INC	, CUMBERLAND FARMS INC	REPORT	File Break: 17.07; Access Type(s): REL

253312 **INTERNET ARTICLE REGARDING FISH ADVISORIES FOR WOONASQUATUCKET RIVER**
# of Pages: 2
Doc Date: 06/30/2004

Author	Addressee	Doc Type	File Break / Access Type(s)
, US EPA REGION 1		REPORT	File Break: 17.07; Access Type(s): REL

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253315 **APPENDIX TO PRELIMINARY SUMMARY OF FISH SURVEYS CONDUCTED IN RI STREAMS AND PONDS BETWEEN 1993-2002, WOONASQUATUCKET AND MOSHASSUCK RIVER WATERSHEDS**
# of Pages: 17
Doc Date: 05/01/2004

Author: , RI DEPT OF ENVIRONMENTAL MANAGEMENT
Addressee:
Doc Type: REPORT
File Break: 17.08
Access Type(s): REL

253320 **PRESS RELEASE REGARDING SENATOR CHAFEE AND SETTLEMENT**
# of Pages: 2
Doc Date: 05/20/2005

Author: LINCOLN D CHAFEE, US SENATE
Addressee:
Doc Type: PRESS RELEASE
PUBLIC INFORMATION
File Break: 17.07
Access Type(s): REL

253323 **RHODE ISLAND RIVERS POLICY AND CLASSIFICATION PLAN [HIGHLIGHTS]**
# of Pages: 81
Doc Date: 09/20/2004

Author: , RHODE ISLAND STATEWIDE PLANNING PROGRAM
Addressee:
Doc Type: REPORT
File Break: 17.08
Access Type(s): REL

Phase 17: SITE MANAGEMENT RECORDS

253324 **PRESS RELEASE - SENATORS ASKED FOR SUPPORT FOR SUPERFUND**
# of Pages: 4
Doc Date: 09/30/2005

Author:	Addressee:	Doc Type:	File Break:
, WOONASQUATUCKET RIVER WATERSHED COUNCIL		PRESS RELEASE PUBLIC INFORMATION	17.07 Access Type(s): REL

253327 **ENVIORNMENTAL DATA RESOURCES (EDR) RADIUS MAP REPORT**
# of Pages: 33
Doc Date: 03/16/2005

Author:	Addressee:	Doc Type:	File Break:
, ENVIRONMENTAL DATA SERVICES INC		REPORT	17.07 Access Type(s): REL

253328 **STATE OF RHODE ISLAND EXECUTIVE ORDER - ESTABLISING THE GOVERNOR'S NARRAGANSETT BAY AND WATERSHED PLANNING COMMISSION**
# of Pages: 5
Doc Date: 10/22/2003

Author:	Addressee:	Doc Type:	File Break:
DONALD L CARCIERI, RI STATE OF		ENFORCEMENT & SETTLEMEI	17.07 Access Type(s): REL

Phase 17: SITE MANAGEMENT RECORDS

253329 **PRESS RELEASE - AMERICAN HERITAGE RIVERS EXECUTIVE ORDER 13061**
# of Pages: 7
Doc Date: 09/11/1997

Author:	Addressee:	Doc Type:	File Break / Access Type(s):
WILLIAM J CLINTON, PRESIDENT THE WHITE HOUSE		PRESS RELEASE PUBLIC INFORMATION	File Break: 17.07 Access Type(s): REL

253330 **WEBSITE INFORMATION ON WOONASQUATUCKET RIVER WATERSHED COUNCIL**
# of Pages: 7
Doc Date: 09/26/2005

Author:	Addressee:	Doc Type:	File Break / Access Type(s):
, WOONASQUATUCKET RIVER WATERSHED COUNCIL		CORRESPONDENCE MEMO	File Break: 17.07 Access Type(s): REL

253334 **NOTIFICATION TO ABUTTERS OF CUMBERLAND FARMS SITE INVESTIGATION ACTIVITIES (TRANSMITTAL LETTER ATTACHED)**
# of Pages: 2
Doc Date: 02/22/2005

Author:	Addressee:	Doc Type:	File Break / Access Type(s):
KENNETH R MASON, LINCOLN ENVIRONMENTAL INC	, BROOK VILLAGE ASSOCIATES	CORRESPONDENCE LETTER	File Break: 17.07 Access Type(s): REL

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273419 **INSIDE EPA ARTICLE - AS EPA SCALES BACK DIOXIN RISKS, INDUSTRY EYES LIMITING CLEANUP LEVELS**
# of Pages: 2
Doc Date: 05/11/2007

Author: , INSIDE EPA
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI; NEWS ARTICLE; PUBLIC INFORMATION
File Break: 17.07
Access Type(s): REL

273421 **ARTICLE - PROPERTY OWNERS FIND THEMSELVES RESPONSIBLE FOR COSTLY DAMS**
# of Pages: 2
Doc Date: 12/29/2005

Author: SUSAN HAIGH, ASSOCIATED PRESS
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI; NEWS ARTICLE; PUBLIC INFORMATION
File Break: 17.07
Access Type(s): REL

273430 **GEOMORPHIC IDENTIFICATION AND VERIFICATION OF RECENT SEDIMENTATION PATTERNS IN THE WOONASQUATUCKET RIVER, NORTH PROVIDENCE, RI**
# of Pages: 138
Doc Date: 03/01/2007

Author: MAUREEN K CORCORAN , US ARMY ENGINEER RESEARCH AND DEVELOPMENT
Addressee: , US ARMY CORP OF ENGINEERS
Doc Type: REPORT
File Break: 17.07
Access Type(s): REL

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273431 **SEDIMENT DREDGING AT SUPERFUND MEGASITES: ASSESSING THE EFFECTIVENESS**
# of Pages: 185
Doc Date: 06/05/2007

Author:	Addressee:	Doc Type:	File Break:
, NATIONAL ACADEMY OF SCIENCES		REPORT	17.07 Access Type(s): REL

273433 **DIOXIN REGISTRY REPORT - REPORT PREPARED BY REVIEW DOCUMENTS FROM DIAMOND SHAMROCK CORPORATION AND DIAMOND ALKALI COMPANY, REPORT N0. IWS-117-16**
# of Pages: 58
Doc Date: 06/01/1986

Author:	Addressee:	Doc Type:	File Break:
DAVID MARLOW, US DEPT OF HEALTH AND HUMAN SERVICES		REPORT	17.07 Access Type(s): REL

273439 **DAM REMOVAL - SCIENCE AND DECISION MAKING**
# of Pages: 235
Doc Date: 01/01/2002

Author:	Addressee:	Doc Type:	File Break:
, THE H JOHN HEINZ III CENTER FOR SCIENCE, ECONOMICS AND THE		REPORT	17.07 Access Type(s): REL

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273440 **RELICS AND RIVERS - DISMANTLING DAMS IN NEW ENGLAND**
# of Pages: 3
Doc Date: 01/01/1111

Author: , NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Addressee:
Doc Type: REPORT
File Break: 17.07
Access Type(s): REL

273443 **WOONASQUATUCKET RIVER WATERSHED RESTORATION SITES: SITES MAP - HIGHLIGHTS OF THE FARM BILL PROJECTS**
# of Pages: 1
Doc Date: 01/01/1111

Author: , RI DEPT OF ENVIRONMENTAL MANAGEMENT
, UNIVERSITY OF RHODE ISLAND
Addressee:
Doc Type: MAP
File Break: 17.08
Access Type(s): REL

273444 **WOONASQUATUCKET RIVER DAM LOCATION MAP**
# of Pages: 1
Doc Date: 01/01/1111

Author: , RHODE ISLAND STATE OF
Addressee:
Doc Type: MAP
File Break: 17.08
Access Type(s): REL

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273445 **SEDIMENT SAMPLING SUMMARY - WOONASQUATUCKET RIVER FISH PASSAGE PROJECTS**
# of Pages: 11
Doc Date: 02/12/2007

Author: JONATHAN PETRILO, EA ENGINEERING SCIENCE & TECHNOLOGY INC
Addressee: JOSEPH BACHAND, NATURAL RESOURCES CONSERVATION SERVICE (NRCS)
Doc Type: SAMPLING DATA
File Break: 17.08
Access Type(s): REL

273446 **FINAL RULE ADOPTED BY THE RHODE ISLAND RIVERS COUNCIL FOR WATERSHED COUNCIL GRANTS AND NOTIFICATION OF PROPOSED ACTIONS TO WATERSHED COUNCILS**
# of Pages: 9
Doc Date: 07/13/2005

Author: , STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
Addressee:
Doc Type: REPORT
File Break: 17.08
Access Type(s): REL

273447 **NRCS RHODE ISLAND (RI) ANADROMOUS FISH HABITAT RESTORATION SPECIAL PROJECT PROPOSAL**
# of Pages: 10
Doc Date: 01/01/2005

Author: , NATURAL RESOURCES CONSERVATION SERVICE (NRCS)
Addressee:
Doc Type: REPORT
File Break: 17.08
Access Type(s): REL

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273448 **ANALYTICAL RESULTS REPORT - WOONASQUATUCKET RIVER (12/28/06 COVER LETTER ATTACHED)**

# of Pages: 206
Doc Date: 12/28/2006

Author:	Addressee:	Doc Type:	File Break:
SEVERN TRENT LABORATORIES (STL) SEVERN TRENT LABORATORIES (STL)		REPORT	17.08 Access Type(s): REL

273451 **WOONASQUATUCKET RIVER DAM REMOVAL FLOOD STUDY PROVIDENCE, RI**

# of Pages: 26
Doc Date: 09/01/2000

Author:	Addressee:	Doc Type:	File Break:
, US ARMY CORPS OF ENGINEERS		REPORT	17.08 Access Type(s): REL

273452 **COMPARATIVE TOXICITY OF 2, 3, 7, 8 - TETRACHLORODIBENZO-P-DIOXIN (TCDD) TO SEVEN FRESHWATER FISH SPECIES DURING EARLY LIFE-STAGE DEVELOPMENT**

# of Pages: 12
Doc Date: 01/01/1998

Author:	Addressee:	Doc Type:	File Break:
, US ENVIRONMENTAL PROTECTION AGENCY		REPORT	17.07 Access Type(s): REL

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273455 **HEC-RAS MODEL DEVELOPED FOR THE LOWER WOONASQUATUCKET RIVER DAM REMOVAL FLOOD STUDY {5/29/07 TRANSMITTAL IS ATTACHED)**
# of Pages: 2
Doc Date: 01/01/1111

Author: , US DEPT OF AGRICULTURE
Addressee:
Doc Type: REPORT
File Break: 17.08
Access Type(s): REL

285178 **ENVIRONMENTAL PROTECTION AGENCY (EPA), ARMY CORPS ISSUE JOINT GUIDANCE TO SUSTAIN WETLANDS PROTECTION UNDER SUPREME COURT DECISION**
# of Pages: 2
Doc Date: 06/05/2007

Author: JESSICA EMOND, US ENVIRONMENTAL PROTECTION AGENCY
DAVID W HEWITT, US ARMY CORPS OF ENGINEERS
Addressee:
Doc Type: PRESS RELEASE
PUBLIC INFORMATION
File Break: 17.07
Access Type(s): REL

285179 **CLEAN WATER ACT JURISDICTION FOLLOWING THE US SUPREME COURT'S DECISION IN RAPANOS V. UNITED STATES & CARBELL V. UNITED STATES**
# of Pages: 12
Doc Date: 06/05/2007

Author: BENJAMIN H GRUMBLES, US ENVIRONMENTAL PROTECTION AGENCY
JOHN P WOODLEY JR, US DEPT OF ARMY
Addressee:
Doc Type: CORRESPONDENCE
MEMO
File Break: 17.07
Access Type(s): REL

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285180 **MEMORANDUM FOR DIRECTOR OF CIVIL WORKS AND US EPA REGIONAL ADMINISTRATORS REGARDING COORDINATION ON JURISDICTIONAL DETERMINATIONS UNDER CLEAN WATER ACT**

# of Pages: 7
Doc Date: 06/05/2007

Author: BENJAMIN H GRUMBLES, US ENVIRONMENTAL PROTECTION AGENCY
JOHN P WOODLEY JR, US DEPT OF ARMY

Addressee:

Doc Type: CORRESPONDENCE
MEMO

File Break: 17.07
Access Type(s): REL

285181 **SEDIMENT DREDGING HAS FALLEN SHORT OF ACHIEVING CLEANUP GOALS AT MANY CONTAMINATED SITES: BETTER MONITORING NEEDED TO ASSESS SUITABILITY AND RESULTS**

# of Pages: 4
Doc Date: 06/05/2007

Author: , NATIONAL ACADEMIES

Addressee:

Doc Type: PRESS RELEASE
PUBLIC INFORMATION

File Break: 13.03
Access Type(s): REL

285182 **SEDIMENT DREDGING AT SUPERFUND MEGASITES: ASSESSING THE EFFECTIVENESS**

# of Pages: 130
Doc Date: 06/05/2007

Author: , NATIONAL ACADEMIES

Addressee:

Doc Type: REPORT

File Break: 17.07
Access Type(s): REL

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285183 **REPORT IN BRIEF - SEDIMENT DREDGING AT SUPERFUND MEGASITES: ASSESSING THE EFFECTIVENESS**

# of Pages: 4
Doc Date: 06/01/2007

Author:	Addressee:	Doc Type:	File Break:	Access Type(s):
, NATIONAL ACADEMIES		REPORT	17.07	REL

285186 **NEWS RELEASE: DEPARTMENT OF ENVIRONMENTAL MANAGEMENT (DEM) ISSUES DRAFT DOCUMENT ASSESSING QUALITY OF STATE'S WATERS AND LISTING OF IMPAIRED WATERS 303 (D) LIST**

# of Pages: 2
Doc Date: 02/19/2008

Author:	Addressee:	Doc Type:	File Break:	Access Type(s):
, RHODE ISLAND DEPT OF ENVIRONMENTAL MANAGEMENT		PRESS RELEASE PUBLIC INFORMATION	17.07	REL

285187 **DRAFT LIST OF IMPAIRED WATERS - STATE OF RHODE ISLAND 2008 303 (D) LIST**

# of Pages: 16
Doc Date: 02/18/2008

Author:	Addressee:	Doc Type:	File Break:	Access Type(s):
, RHODE ISLAND DEPT OF ENVIRONMENTAL MANAGEMENT		REPORT	17.07	REL

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449078 **COURT OPINION: THETA PROPERTIES ET AL V. RONCI REALTY CO INC**
# of Pages: 16
Doc Date: 01/30/2003

Author:	Addressee:	Doc Type:	File Break:
, SUPERIOR COURT OF RI		ENFORCEMENT & SETTLEMEI	17.07 Access Type(s): REL

455641 **WOONASQUATUCKET RIVER WATERSHED COUNCIL ANNOUNCEMENT OF THE RISING SUN MILLS FISH LADDER**
# of Pages: 2
Doc Date: 06/02/2008

Author:	Addressee:	Doc Type:	File Break:
ALICIA LEHRER, WOONASQUATUCKET RIVER WATERSHED COUNCIL	ANNA KRASKO, US EPA REGION 1	PUBLIC INFORMATION	17.07 Access Type(s): REL

455642 **LETTER CLARIFYING WHAT CONSTITUTES DIOXIN RELATED MATERIALS**
# of Pages: 3
Doc Date: 12/24/1992

Author:	Addressee:	Doc Type:	File Break:
SYLVIA LOWRANCE, US EPA - HEADQUARTERS	JACKIE NOLES, LAIDLAW ENVIRONMENTAL SERVICES INC	PUBLIC INFORMATION	17.07 Access Type(s): REL

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455646 **WOONASQUATUCKET RIVER FECAL COLIFORM BACTERIA AND DISSOLVED METALS TOTAL MAXIMUM DAILY LOADS**
# of Pages: 121
Doc Date: 04/01/2007

Author: , RI DEPT OF ENVIRONMENTAL MANAGEMENT
Addressee:
Doc Type: REPORT
File Break: 17.08
Access Type(s): REL

456900 **WETLAND RESTORATION PLAN FOR THE WOONASQUATUCKET RIVER WATERSHED, RHODE ISLAND**
# of Pages: 177
Doc Date: 03/01/2003

Author: FRANCIS C GOLET, UNIVERSITY OF RHODE ISLAND/DEPT OF NATURAL RESOURCES
NICHOLAS A MILLER, UNIVERSITY OF RHODE ISLAND/DEPT OF NATURAL
Addressee:
Doc Type: REPORT
File Break: 17.08
Access Type(s): REL

462878 **ENVIRONMENTAL PROTECTION AGENCY (EPA) SEEKS PUBLIC INPUT ON INTERIM GUIDANCE FOR DIOXINS IN SOIL CLEANUP GOALS (WITH DRAFT GUIDANCE DOCUMENT)**
# of Pages: 47
Doc Date: 12/31/2009

Author: , US EPA REGION 1
Addressee:
Doc Type: PRESS RELEASE
PUBLIC INFORMATION
File Break: 17.07
Access Type(s): REL

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462879 **AERIAL HISTORICAL PHOTOGRAPHIC ANALYSIS LAND USE/LAND COVER ANALYSIS AND WETLANDS/DRAINAGE ANALYSIS OF CENTREDALE MANOR**
# of Pages: 52
Doc Date: 05/01/2009

Author: , US EPA REGION 1
Addressee:
Doc Type: PHOTOGRAPH
File Break: 17.04
Access Type(s): REL

475808 **NEWS RELEASE: NORTH PROVIDENCE NEIGHBOURHOOD COMPLAINS OF AIR QUALITY ISSUES FROM JOHNSTON ASPHALT PLANT**
# of Pages: 3
Doc Date: 12/16/2010

Author: MARK REYNOLDS, PROVIDENCE JOURNAL
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI
NEWS ARTICLE
PUBLIC INFORMATION
File Break: 17.07
Access Type(s): REL

479470 **COMPLETION OF WORK REPORT (CWR) ENERGY REPLACEMENT OF WATER LINE**
# of Pages: 159
Doc Date: 03/01/2011

Author: , GZA GEO ENVIRONMENTAL INC
Addressee: , CENTREDALE ASSOCIATES
Doc Type: REPORT
File Break: 17.07
Access Type(s): REL

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485694 **PRELIMINARY ASSESSMENT/SITE INVESTIGATION REPORT (PA/SI) FOR MERINO PARK, HARTFORD AVENUE AND HEATH STREET**
# of Pages: 39
Doc Date: 01/01/2011

Author: , WESTON SOLUTIONS INC
Addressee: , US EPA REGION 1
Doc Type: PA/SI REPORT; REPORT
File Break: 17.07
Access Type(s): REL

485697 **DATA SUMMARY TABLE: DIOXIN/FURAN ANALYSIS - SOIL SAMPLING, SDG NO. D24240**
# of Pages: 4
Doc Date: 01/01/1111

Author: , AGAT LABORATORIES
Addressee:
Doc Type: REPORT; SAMPLING DATA
File Break: 17.07
Access Type(s): REL

485699 **DATA VALIDATION REPORT, SDG NO. 24240 (02/08/2011 COVER LETTER ATTACHED)**
# of Pages: 75
Doc Date: 11/09/2010

Author:
Addressee: CHRISTINE CLARK, US EPA REGION 1
Doc Type: DATA VALIDATION REPORT; REPORT; SAMPLING DATA
File Break: 17.07
Access Type(s): REL

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486528 **HABITAT VALUES OF NEW ENGLAND WETLANDS (02/01/1995 HAND WRITTEN NOTES AND A LIST OF VERNAL POOL ANIMALS ATTACHED) [MARGINALIA]**
# of Pages: 41
Doc Date: 05/01/1995

Author: , US FISH & WILDLIFE SERVICE
Addressee:
Doc Type: REPORT
File Break: 17.07
Access Type(s): REL

490403 **WOONASQUATUCKET: AMERICAN HERITAGE RIVER**
# of Pages: 1
Doc Date: 07/19/2011

Author: , WOONASQUATUCKET RIVER WATERSHED COUNCIL
Addressee:
Doc Type: REPORT
File Break: 17.07
Access Type(s): REL

490404 **BLACKSTONE - WOONASQUATUCKET AMERICAN HERITAGE RIVER APPLICATION (12/10/1997 COVER SHEET ATTACHED)**
# of Pages: 16
Doc Date: 01/01/1111

Author: , WOONASQUATUCKET RIVER WATERSHED COUNCIL
Addressee:
Doc Type: REPORT
File Break: 17.07
Access Type(s): REL

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492978 **ENVIRONMENTAL ASSESSMENT: DIOXIN**
# of Pages: 2
Doc Date: 09/06/2011

Author:	Addressee:	Doc Type:	File Break:
, EPA		REPORT	17.07 Access Type(s): REL

492979 **NEWS CLIPPING: EPA ANNOUNCES SCHEDULE FOR DIOXIN ASSESSMENT**
# of Pages: 1
Doc Date: 08/29/2011

Author:	Addressee:	Doc Type:	File Break:
, EPA		ARTICLE - NEWS/ PERIODICAI NEWS ARTICLE PUBLIC INFORMATION	17.07 Access Type(s): REL

492980 **SCIENCE ADVISORY BOARD (SAB) REVIEW OF EPA'S REANALYSIS OF KEY ISSUES RELATED TO DIOXIN TOXICITY AND RESPONSE TO NATIONAL ACADEMY OF SCIENCE (NAS) COMMENTS (MAY 2010)**
# of Pages: 84
Doc Date: 08/26/2010

Author:	Addressee:	Doc Type:	File Break:
, U.S. EPA		REPORT	17.07 Access Type(s): REL

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494700 **NEWS CLIPPING: ELWHA DAM REMOVAL ILLUSTRATES GROWING MOVEMENT**
# of Pages: 4
Doc Date: 09/16/2011

Author: JULIET EILPERIN, WASHINGTON POST
Addressee:
Doc Type: ARTICLE - NEWS/ PERIODICAI; NEWS ARTICLE; PUBLIC INFORMATION
File Break: 17.07
Access Type(s): REL

494726 **COMBINED ALLENDALE AND LYMAN MILL SURFACE/SUBSURFACE FIGURES 1 TO 12**
# of Pages: 15
Doc Date: 04/26/2004

Author: , BATTELLE
Addressee:
Doc Type: MAP
File Break: 17.04
Access Type(s): REL

497914 **MAP OF FLOOD ZONES IN JOHNSTON, RI**
# of Pages: 1
Doc Date: 11/08/2011

Author: , US EPA REGION 1
Addressee:
Doc Type: MAP
File Break: 17.04
Access Type(s): REL

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505088 **EPA'S REANALYSIS OF KEY ISSUES RELATED TO DIOXIN TOXICITY AND RESPONSE TO NAS COMMENTS, VOLUME 1**
# of Pages: 344
Doc Date: 02/01/2012

Author:	Addressee:	Doc Type:	File Break:
, US ENVIRONMENTAL PROTECTION AGENCY		REPORT	17.07 **Access Type(s):** REL

505089 **APPENDICES A THROUGH I: EPA'S REANALYSIS OF KEY ISSUES RELATED TO DIOXIN TOXICITY AND RESPONSE TO NAS COMMENTS, VOLUME 1**
# of Pages: 1521
Doc Date: 01/01/2012

Author:	Addressee:	Doc Type:	File Break:
, US ENVIRONMENTAL PROTECTION AGENCY		REPORT	17.07 **Access Type(s):** REL

505090 **ENVIRONMENTAL ASSESSMENT: DIOXIN**
# of Pages: 2
Doc Date: 01/01/2012

Author:	Addressee:	Doc Type:	File Break:
, US ENVIRONMENTAL PROTECTION AGENCY		REPORT	17.07 **Access Type(s):** REL

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506557 **WOONASQUATUCKET WATERSHED COUNCIL PHOTOS, OXBOW AREA**
# of Pages: 3
Doc Date: 01/01/2011

Author:	Addressee:	Doc Type:	File Break: / Access Type(s):
		PHOTOGRAPH	File Break: 17.07 Access Type(s): REL

506561 **GREEN HILL ROAD NATIONAL PRIORITIES LIST PUBLIC ACCESS DATABASE (NPL PAD) ENTRY**
# of Pages: 6
Doc Date: 03/21/2003

Author:	Addressee:	Doc Type:	File Break: / Access Type(s):
, US ENVIRONMENTAL PROTECTION AGENCY		REPORT	File Break: 17.07 Access Type(s): REL

506563 **EMAIL CORRESPONDENCE WITH SKEO REGARDING TOWN OF JOHNSTON DEPT OF PUBLIC WORKS (DPW) PROPERTY REUSE ASSESSMENT UPDATE**
# of Pages: 1
Doc Date: 12/30/2011

Author:	Addressee:	Doc Type:	File Break: / Access Type(s):
MATT ROBBIE, SKEO SOLUTIONS	JOHN R PODGURSKI, US EPA REGION 1	CORRESPONDENCE EMAIL	File Break: 17.07 Access Type(s): REL

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506564 **TWO EXAMPLES OF RESIDENTIAL RE-USE OF SUPERFUND SITE; MIDVALE, UTAH AND ANNACONDA CO SMELTER**
# of Pages: 7
Doc Date: 01/01/1111

Author:	Addressee:	Doc Type:	File Break / Access Type(s)
		REPORT	File Break: 17.07 Access Type(s): REL

506565 **EMAIL REGARDING USE OF UNION WORKERS (PROVIDENCE WORKFORCE INVESTMENT BOARD DIRECTORY ATTACHED)**
# of Pages: 4
Doc Date: 11/15/2011

Author:	Addressee:	Doc Type:	File Break / Access Type(s)
DAVID N SCOTTI, LOUREIRO ENGINEERING ASSOCIATES INC	ANNA KRASKO, US EPA REGION 1	CORRESPONDENCE EMAIL	File Break: 17.07 Access Type(s): REL

506566 **SUPERFUND JOB TRAINING INITIATIVE (JTI)**
# of Pages: 3
Doc Date: 01/01/1111

Author:	Addressee:	Doc Type:	File Break / Access Type(s)
, US ENVIRONMENTAL PROTECTION AGENCY		REPORT	File Break: 17.07 Access Type(s): REL

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506567 **SUPERFUND JOB TRAINING INITIATIVE (JTI) POWERPOINT PRESENTATION**
# of Pages: 29
Doc Date: 01/01/1111

Author: , US ENVIRONMENTAL PROTECTION AGENCY
Addressee:
Doc Type: REPORT
File Break: 17.07
Access Type(s): REL

506568 **MAP: UPLAND CONFINED DISPOSAL FACILITY (CDF) SURVEY**
# of Pages: 2
Doc Date: 10/01/2011

Author: , US ENVIRONMENTAL PROTECTION AGENCY
Addressee:
Doc Type: REPORT
File Break: 17.07
Access Type(s): REL

506569 **LETTER FROM FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) TO TOWN OF JOHNSTON REGARDING RISK MAP DISCOVERY MEETINGS (11/21/2011 TRANSMITTAL EMAIL ATTACHED)**
# of Pages: 6
Doc Date: 11/17/2011

Author: , FEDERAL EMERGENCY MANAGEMENT AGENCY
Addressee: VINCENT BARRARI JR, JOHNSTON (RI) TOWN OF
JOHNSTON (RI) TOWN OF
Doc Type: CORRESPONDENCE
LETTER
File Break: 17.07
Access Type(s): REL

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506570 **TOWN OF JOHNSTON SURVEY REPORT FOR DEPT OF PUBLIC WORKS (DPW) PROPERTY**
# of Pages: 3
Doc Date: 12/12/2011

Author: , FEDERAL EMERGENCY MANAGEMENT AGENCY
Addressee:
Doc Type: REPORT
File Break: 17.07
Access Type(s): REL

509362 **EPA NON-CANCER TOXICITY VALUE FOR DIOXIN AND CERCLA/RCRA CLEANUPS**
# of Pages: 2
Doc Date: 02/17/2012

Author: , EPA
Addressee:
Doc Type: REPORT
File Break: 17.07
Access Type(s): REL

509363 **UPDATED CALCULATION OF SITE-SPECIFIC NON-CANCER DIOXIN SOIL PRELIMINARY REMEDIATION GOALS (PRGS) FOR RECREATIONAL SCENARIO AND RE-EVALUATION OF DIOXIN SOIL DATA FOR MERINO PARK (11/23/2010 MEMO WITH PRIOR CALCULATION ATTACHED)**
# of Pages: 10
Doc Date: 03/29/2012

Author: CHAU VU, US EPA REGION 1
Addressee:
Doc Type: CORRESPONDENCE
MEMO
File Break: 17.07
Access Type(s): REL

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509387 **ELEVATION OF MARCH - APRIL 2010 FLOOD HIGH WATER IN SELECTED RIVER REACHES IN RHODE ISLAND**
# of Pages: 41
Doc Date: 01/01/2011

Author:	Addressee:	Doc Type:	File Break:
GARDNER C BENT, US GEOLOGICAL SURVEY PHILLIP J ZARRIELLO, US GEOLOGICAL SURVEY		REPORT	17.07 **Access Type(s):** REL

521701 **EMAIL REGARDING SUPERFUND JOB TRAINING INITIATIVE (SJTI) PROJECT AT THE SITE**
# of Pages: 1
Doc Date: 08/20/2012

Author:	Addressee:	Doc Type:	File Break:
MELISSA FRIEDLAND, US EPA	ANNA KRASKO, US EPA REGION 1	CORRESPONDENCE MEMO	17.07 **Access Type(s):** REL

521767 **[REDACTED] TESTIMONY OF JOSEPH NADEAU AND RAYMOND NADEAU**
# of Pages: 98
Doc Date: 09/14/2006

Author:	Addressee:	Doc Type:	File Break:
US DISTRICT COURT/DISTRICT OF RI US DISTRICT COURT/DISTRICT OF RI		REPORT	17.07 **Access Type(s):** REL

Number of Documents in Administrative Record: 640

AR Collection 62707
Confidential Documents
AR Collection Index Report
*****For External Use*****

Phase 11: POTENTIALLY RESPONSIBLE PARTY

File Break: 11.09

70004723 CLEAN HARBOR'S ANNUAL REPORT FOR 2011 (07/11/2012 TRANSMITTAL EMAIL AND EMAIL HISTORY ATTACHED)

# of Pages: 127
Doc Date: 01/01/2011

Author:	Addressee:	Doc Type:	Access Type(s):
, CLEAN HARBORS		REPORT	LCB Bates #: Weston #:

Number of Documents in Administrative Record: 1

EPA Guidance Documents may be reviewed at the OSRR Records and Information Center in Boston, MA

Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
	01-Jan-94	METHODS FOR MEASURING THE TOXICITY AND BIOACCUMULATION OF SEDIMENT-ASSOICATED CONTAMINANTS WITH FRESHWATER INVERTEBRATES	
0001	01-Oct-87	EXPANDED SITE INSPECTION (ESI) TRANSITIONAL GUIDANCE FOR FY-88	OSWER #9345.1-02
0002	01-Jan-88	PRELIMINARY ASSESSMENT (PA) GUIDANCE FISCAL YEAR 1988	OSWER #9345.0-01
1001	01-Jan-81	COSTS OF REMEDIAL RESPONSE ACTIONS AT UNCONTROLLED HAZARDOUS WASTE SITES	
1002	01-Jan-83	EMERGENCY RESPONSE PROCEDURES FOR CONTROL OF HAZARDOUS SUBSTANCE RELEASES	EPA-600/D-84-023
1003	13-Apr-87	ENVIRONMENTAL REVIEW REQUIREMENTS FOR REMOVAL ACTIONS	OSWER #9318.0-05
1004	06-Apr-87	GUIDANCE ON IMPLEMENTATION OF THE "CONTRIBUTE TO EFFICIENT REMEDIAL PERFORMANCE" PROVISION	OSWER #9360.0-13
1005	19-Apr-88	INFORMATION ON DRINKING WATER ACTION LEVELS	
1006	01-Feb-88	SUPERFUND REMOVAL PROCEDURES, REVISION #3	OSWER #9360.0-03B
1007	21-Apr-87	ROLE OF EXPEDITED RESPONSE ACTIONS (EPA) UNDER SARA	OSWER #9360.0-15
1008	03-Apr-89	GUIDANCE ON NON-NPL REMOVAL ACTIONS INVOLVING NATIONALLY SIGNIFICANT OR PRECEDENT SETTING ISSUES	OSWER #9360.0-19
2001	01-Jun-85	EPA GUIDE FOR MINIMIZING ADVERSE ENVIRONMENTAL EFFECTS OF CLEANUP OF UNCONTROLLED HAZARDOUS-WASTE SITES	EPA/600/8-85/008
2002	01-Oct-88	INTERIM FINAL GUIDANCE FOR CONDUCTING REMEDIAL INVESTIGATIONS AND FEASIBILITY STUDIES UNDER CERCLA.	OSWER #9355.3-01
2004	01-Apr-85	MODELING REMEDIAL ACTIONS AT UNCONTROLLED HAZARDOUS WASTE SITES (VOL. I-IV)	OSWER #9355.0-08
2005	01-Aug-85	POLICY ON FLOOD PLAINS AND WETLAND ASSESSMENTS FOR CERCLA ACTIONS	OSWER #9280.0-02
2006	01-Mar-84	REMEDIAL RESPONSE AT HAZARDOUS WASTE SITES: SUMMARY REPORT	EPA 540/2-84/002A
2007	13-Nov-87	REVISED PROCEDURES FOR IMPLEMENTING OFF-SITE RESPONSE ACTIONS	OSWER #9834.11
2008	23-Jul-87	RI/FS IMPROVEMENTS	OSWER #9355.0-20

EPA Guidance Documents may be reviewed at the OSRR Records and Information Center in Boston, MA

Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
2009	25-Apr-88	RI/FS IMPROVEMENTS FOLLOW-UP	OSWER #9355.3-05
2010	01-Dec-86	SUPERFUND FEDERAL-LEAD REMEDIAL PROJECT MANAGEMENT HANDBOOK (DRAFT)	OSWER #9355.1-1
2011	01-Jun-86	SUPERFUND REMEDIAL DESIGN AND REMEDIAL ACTION GUIDANCE	OSWER #9355.0-4A
2013	01-Nov-89	GETTING READY - SCOPING THE RI/FS [QUICK REFERENCE FACT SHEET]	
2014	01-Aug-90	GUIDANCE ON REMEDIAL ACTIONS FOR SUPERFUND SITES WITH PCB CONTAMINATION	OSWER #9355.4-01
2015	01-Dec-89	GUIDE FOR CONDUCTING TREATABILITY STUDIES UNDER CERCLA; INTERIM FINAL;	EPA/540/2-89/058
2017	01-Jan-89	RI/FS IMPROVEMENTS PHASE II, STREAMLINING RECOMMENDATIONS	OSWER #9355.3-06
2018	01-Nov-89	FEASIBILITY STUDY - DEVELOPMENT AND SCREENING OF REMEDIAL ACTION ALTERNATIVES [QUICK REFERENCE FACT SHEET]	OSWER #9355.3-01FS3
2019	01-Mar-90	FEASIBILITY STUDY: DETAILED ANALYSIS OF REMEDIAL ACTION ALTERNATIVES [QUICK REFERENCE FACT SHEET]	OSWER #9355.3-01FS4
2020	01-Dec-89	TREATABILITY STUDIES UNDER CERCLA: AN OVERVIEW [QUICK REFERENCE FACT SHEET]	OSWER #9380.3-02FS
2100	01-Dec-87	COMPENDIUM OF SUPERFUND FIELD OPERATIONS METHODS	OSWER #9355.0-14
2101	01-Mar-87	DATA QUALITY OBJECTIVES FOR REMEDIAL RESPONSE ACTIVITIES: DEVELOPMENT PROCESS	EPA/540/G-87/003
2102	01-Mar-87	DATA QUALITY OBJECTIVES FOR REMEDIAL RESPONSE ACTIVITIES: EXAMPLE SCENARIO: RI/FS ACTIVITIES AT A SITE W/ CONTAMINATED SOILS AND GROUNDWATER	EPA/540/G-87/004
2103	01-Feb-84	DESIGN AND DEVELOPMENT OF A HAZARDOUS WASTE REACTIVITY TESTING PROTOCOL	EPA-600/2-84-057
2104	02-Apr-86	FIELD SCREENING FOR ORGANIC CONTAMINANTS IN SAMPLES FROM HAZARDOUS WASTE SITES	
2105	01-Sep-88	FIELD SCREENING METHODS CATALOG: USER'S GUIDE	EPA/540/2-88/005
2111	01-Jun-84	GEOPHYSICAL TECHNIQUES FOR SENSING BURIED WASTES AND WASTE MIGRATION	EPA-600/7-84/064
2112	01-Jun-87	GUIDELINES AND SPECIFICATIONS FOR PREPARING QUALITY ASSURANCE PROGRAM DOCUMENTATION	

EPA Guidance Documents may be reviewed at the OSRR Records and Information Center in Boston, MA

DOCNUMBER	DOCDATE	Selected Key Guidance Documents TITLE	OSWEREPAID
2113	01-Jul-88	LABORATORY DATA VALIDATION FUNCTIONAL GUIDELINES FOR EVALUATING INORGANICS ANALYSES (DRAFT)	
2114	01-Feb-88	LABORATORY DATA VALIDATION FUNCTIONAL GUIDELINES FOR EVALUATING ORGANICS ANALYSES (DRAFT)	
2115	01-Sep-85	PRACTICAL GUIDE FOR GROUND-WATER SAMPLING	EPA/600/2-85/104
2116	01-Jul-85	SEDIMENT SAMPLING QUALITY ASSURANCE USER'S GUIDE	EPA/600/4-85/048
2118	01-Nov-86	TEST METHODS FOR EVALUATING SOLID WASTE, LABORATORY MANUAL PHYSICAL/CHEMICAL METHODS, THIRD EDITION (VOLUMES IA, IB, IC, AND II)	
2119	01-Dec-88	USER'S GUIDE TO THE CONTRACT LABORATORY PROGRAM	OSWER #9240.0-1
2200	01-Sep-85	COVERS FOR UNCONTROLLED HAZARDOUS WASTE SITES	EPA/540/2-85/002
2201	01-Nov-88	DESIGN, CONSTRUCTION, AND EVALUATION OF CLAY LINERS FOR WASTE MANAGEMENT FACILITIES.	EPA/530/SW-86/007F
2204	11-Aug-87	LAND DISPOSAL RESTRICTIONS	
2205	01-Sep-88	LINING OF WASTE CONTAINMENT AND OTHER IMPOUNDMENT FACILITIES	EPA/600/2-88/052
2208	01-Jul-82	RCRA GUIDANCE DOCUMENT: LANDFILL DESIGN LINER SYSTEMS AND FINAL COVER (DRAFT)	
2209	01-May-85	SETTLEMENT AND COVER SUBSIDENCE OF HAZARDOUS WASTE LANDFILLS: PROJECT SUMMARY	EPA-600/S2-85-035
2210	07-Aug-86	SUPPLEMENTARY GUIDANCE ON DETERMINING LINER/LEACHATE COLLECTION SYSTEM COMPATIBILITY	OSWER #9480.00-13
2211	01-Oct-86	TECHNICAL GUIDANCE DOCUMENT: CONSTRUCTION QUALITY ASSURANCE FOR HAZARDOUS WASTE LAND DISPOSAL FACILITIES	OSWER #9472.003
2212	01-Jan-84	TREATMENT OF REACTIVE WASTES AT HAZARDOUS WASTE LANDFILLS: PROJECT SUMMARY	EPA/600/S2-83/118

EPA Guidance Documents may be reviewed at the OSRR Records and Information Center in Boston, MA

Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
2213	27-Dec-89	APPLICABILITY OF LAND DISPOSAL RESTRICTIONS TO RCRA AND CERCLA GROUND WATER TREATMENT REINJECTION SUPERFUND MANAGEMENT REVIEW: RECOMMENDATION NO.26	OSWER #9234.1-06
2214	01-Jul-89	SUPERFUND LDR GUIDE #1 OVERVIEW OF RCRA LAND DISPOSAL RESTRICTIONS (LDRs)	OSWER #9347.3-O1FS
2215	01-Jul-89	SUPERFUND LDR GUIDE #2 COMPLYING WITH THE CALIFORNIA LIST RESTRICTIONS UNDER LAND DISPOSAL RESTRICTIONS (LDRs)	OSWER #9347.3-O2FS
2216	01-Jul-89	SUPERFUND LDR GUIDE #3 TREATMENT STANDARDS AND MINIMUM TECHNOLOGY REQUIREMENTS UNDER LAND DISPOSAL RESTRICTIONS (LDRs)	OSWER #9347.3-O3FS
2217	01-Jul-89	SUPERFUND LDR GUIDE #4 COMPLYING WITH THE HAMMER RESTRICTIONS UNDER LAND DISPOSAL RESTRICTIONS (LDRs)	OSWER #9347.3-O4FS
2218	01-Jul-89	SUPERFUND LDR GUIDE #5 DETERMINING WHEN LAND DISPOSAL RESTRICTIONS (LDRs) ARE APPLICABLE TO CERCLA RESPONSE ACTIONS	OSWER #9347.3-O5FS
2219	01-Jul-89	SUPERFUND LDR GUIDE #6A OBTAINING A SOIL AND DEBRIS TREATABILITY VARIANCE FOR REMEDIAL ACTIONS	OSWER #9347.3-O6FS
2220	01-Dec-89	SUPERFUND LDR GUIDE #7 DETERMINING WHEN LAND DISPOSAL RESTRICTIONS (LDRs) ARE RELEVANT AND APPROPRIATE TO CERCLA RESPONSE ACTIONS	OSWER #9347.3-O8FS
2300	01-Sep-87	COMPENDIUM OF TECHNOLOGIES USED IN THE TREATMENT OF HAZARDOUS WASTES	EPA/625/8-87/014
2302	01-Sep-81	ENGINEERING HANDBOOK FOR HAZARDOUS WASTE INCINERATION	OSWER #9488.00-5
2303		EPA GUIDE FOR IDENTIFYING CLEANUP ALTERNATIVES AT HAZARDOUS-WASTE SITES AND SPILLS: BIOLOGICAL TREATMENT	EPA-600/3-83-063
2307	01-Aug-83	HANDBOOK FOR EVALUATING REMEDIAL ACTION TECHNOLOGY PLANS	EPA-600/2-83-076
2308	01-Jun-86	HANDBOOK FOR STABILIZATION/SOLIDIFICATION OF HAZARDOUS WASTE	EPA/540/2-86-001
2309	01-Oct-85	HANDBOOK REMEDIAL ACTION AT WASTE DISPOSAL SITES (REVISED)	EPA/625/6-85/006
2310	01-Nov-85	LEACHATE PLUME MANAGEMENT	EPA/540/2-85/004
2311	01-Sep-86	MOBILE TREATMENT TECHNOLOGIES FOR SUPERFUND WASTES	EPA/540/2-86-003F

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Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
2312	01-Apr-86	PRACTICAL GUIDE-TRIAL BURNS FOR HAZARDOUS WASTE INCINERATORS	EPA/600/2-86/050
2313	01-Jul-86	PRACTICAL GUIDE-TRIAL BURNS FOR HAZARDOUS WASTE INCINERATORS, PROJECT SUMMARY	EPA/600/S2-86/050
2315	01-Nov-84	REVIEW OF IN-PLACE TREATMENT TECHNIQUES FOR CONTAMINATED SURFACE SOILS-VOL. 2: BACKGROUND INFORMAITON FOR IN-SITU TREATMENT	EPA-540/2-84-003b
2316	19-Sep-84	REVIEW OF IN-PLACE TREATMENT TECHNIQUES FOR CONTAMINATED SURFACE SOILS-VOL. 1: TECHNICAL EVALUATION	EPA/540/2-84-003a
2317	01-Feb-84	SLURRY TRENCH CONSTRUCTION FOR POLLUTION MIGRATION CONTROL	EPA/540/2-84-001
2318	01-Sep-86	SYSTEMS TO ACCELERATE IN SITU STABILIZATION OF WASTE DEPOSITS	EPA 540/2-86/002
2319	01-Sep-88	TECHNOLOGY SCREENING GUIDE FOR TREATMENT OF CERCLA SOILS AND SLUDGES	EPA 540/2-88/004
2320	01-Jul-86	TREATMENT TECHNOLOGY BRIEFS: ALTERNATIVES TO HAZARDOUS WASTE LANDFILLS	EPA/600/8-86/017
2321	21-Feb-89	ADVANCING THE USE OF TREATMENT TECHNOLOGIES FOR SUPERFUND REMEDIES	OSWER #9355.0-26
2322	01-Mar-89	GUIDE TO TREATMENT TECHNOLOGIES FOR HAZARDOUS WASTES AT SUPERFUND SITES	EPA/540/2-89/052
2323	01-Nov-89	INNOVATIVE TECHNOLOGY - BEST SOLVENT EXTRACTION PROCESS [QUICK REFERENCE FACT SHEET]	OSWER #9200.5-253FS
2400	01-Jul-86	CRITERIA FOR IDENTIFYING AREAS OF VULNERABLE HYDROGEOLOGY UNDER RCRA: STATUTORY INTERPRETIVE GUIDANCE	OSWER #9472.00-2A
2401	19-Dec-86	FINAL RCRA COMPREHENSIVE GROUND-WATER MONITORING EVALUATION (CME) GUIDANCE DOCUMENT	OSWER #9950.2
2403	01-Aug-84	GROUND-WATER PROTECTION STRATEGY	EPA/440/6-84-002
2404	01-Dec-86	GUIDELINES FOR GROUND-WATER CLASSIFICATION UNDER THE EPA GROUND-WATER PROTECTION STRATEGY (DRAFT)	
2406	01-Sep-86	PROTOCOL FOR GROUND-WATER EVALUATIONS	OSWER #9080.0-1
2407	01-Sep-86	RCRA GROUND-WATER MONITORING TECHNICAL ENFORCEMENT GUIDANCE DOCUMENT(TEGD)	OSWER #9950.1

EPA Guidance Documents may be reviewed at the OSRR Records and Information Center in Boston, MA

DOCNUMBER	DOCDATE	Selected Key Guidance Documents TITLE	OSWEREPAID
2409	01-Apr-89	GUIDE ON REMEDIAL ACTIONS FOR CONTAMINATED GROUND WATER [QUICK REFERENCE FACT SHEET]	OSWER #9283.1-2FS
2410	18-Oct-89	CONSIDERATIONS IN GROUND WATER REMEDIATION AT SUPERFUND SITES	OSWER #9355.4-03
2411	01-Oct-89	DETERMINING SOIL RESPONSE ACTION LEVELS BASED ON POTENTIAL CONTAMINANT MIGRATION TO GROUNDWATER: A COMPENDIUM OF EXAMPLES	EPA/540/2-89/057
2412	01-Sep-89	EVALUATION OF GROUND-WATER EXTRACTION REMEDIES-VOLUME 1 SUMMARY REPORT	EPA/540/2-89/054
2413	01-Dec-88	GUIDANCE ON REMEDIAL ACTIONS FOR CONTAMINATED GROUND WATER AT SUPERFUND SITES	OSWER #9283.1-2
3000	01-Apr-85	APPLICABILITY OF THE HSWA MINIMUM TECHNICAL REQUIREMENTS RESPECTING LINERS AND LEACHATE COLLECTION SYSTEMS	OSWER #9480.01(85)
3001	02-Oct-85	CERCLA COMPLIANCE WITH OTHER ENVIRONMENTAL STATUTES	OSWER #9234.0-2
3002	08-Aug-88	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL (DRAFT)	OSWER #9234.1-01
3003	21-May-87	EPA'S IMPLEMENTATION OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986	
3004	01-Mar-86	GUIDANCE MANUAL ON THE RCRA REGULATION OF RECYCLED HAZARDOUS WASTES	OSWER #9441.00-2
3005	27-Mar-86	INTERIM RCRA/CERCLA GUIDANCE ON NON-CONTIGUOUS SITES AND ON-SITE MANAGEMENT OF WASTE AND TREATMENT RESIDUE	OSWER #9347.0-1
3006	01-May-89	ARARs Q'S & A'S [QUICK REFERENCE FACT SHEET]	OSWER #9234.2-01FS
3007	01-Dec-89	ARARs SHORT GUIDANCE QUARTERLY REPORT [QUICK REFERENCE FACT SHEET]	OSWER #9234.3-00I
3008	01-Mar-90	ARARs SHORT GUIDANCE QUARTERLY REPORT [QUICK REFERENCE FACT SHEET]	OSWER #9234.3-00I
3009	01-Dec-89	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL - CERCLA COMPLIANCE WITH STATE REQUIREMENTS [QUICK REFERENCE FACT SHEET]	OSWER #9234.2-05FS
3010	01-Feb-90	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL - CERCLA COMPLIANCE WITH THE CWA AND SDWA [QUICK REFERENCE FACT SHEET]	OSWER #9234.2-06FS

EPA Guidance Documents may be reviewed at the OSRR Records and Information Center in Boston, MA

DOCNUMBER	DOCDATE	Selected Key Guidance Documents TITLE	OSWEREPAID
3011	01-Dec-89	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL - OVERVIEW OF ARARs - FOCUS ON ARAR WAIVERS [QUICK REFERENCE FACT SHEET]	OSWER #9234.2-03FS
3012	01-Apr-90	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL - SUMMARY OF PART II - CAA, TSCA, AND OTHER STATUTES [QUICK REFERENCE FACT SHEET]	OSWER #9234.2-07FS
3013	01-Aug-89	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL PART II: CLEAN AIR ACT AND OTHER ENVIRONMENTAL STATUTES AND STATE REQUIREMENTS	OSWER #9234.1-02
3014	15-Jun-89	CONTROL OF AIR EMISSIONS FROM SUPERFUND AIR STRIPPERS AT SUPERFUND GROUNDWATER SITES	OSWER #9533.0-28
3015	01-Sep-89	INTERIM GUIDANCE ON ESTABLISHING SOIL LEAD CLEANUP LEVELS AT SUPERFUND SITES	OSWER #9355.4-02
3016	05-Jun-89	LAND DISPOSAL RESTRICTIONS AS RELEVANT AND APPROPRIATE REQUIREMENTS FOR CERCLA CONTAMINATED SOIL AND DEBRIS	OSWER #9347.2-01
3017	01-Oct-89	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL. RCRA ARARS: FOCUS ON CLOSURE REQUIREMENTS.	OSWER #9234.2-04FS
3018	01-Jul-89	TREATMENT STANDARDS AND MINIMUM TECHNOLOGY REQUIREMENTS UNDER LAND DISPOSAL RESTRICTIONS (LDR)	OSWER #9347.3-03FS
4000	01-Jul-87	ALTERNATE CONCENTRATION LIMIT GUIDANCE PART 1, ACL POLICY AND INFORMATION REQUIREMENTS	OSWER #9481.00-6C
4001	01-Feb-88	GUIDANCE DOCUMENT FOR PROVIDING ALTERNATE WATER SUPPLIES	OSWER #9355.3-03
4002	06-Oct-87	INTERIM FINAL GUIDANCE ON REMOVAL ACTION LEVELS AT CONTAMINATED DRINKING WATER SITES	OSWER #9360.1-01
4003	01-May-87	QUALITY CRITERIA FOR WATER 1986	EPA/440/5-86-001
5001	27-Sep-85	CHEMICAL, PHYSICAL & BIOLOGICAL PROPERTIES OF COMPOUNDS PRESENT AT HAZARDOUS WASTE SITES	OSWER #9850.3
5002	14-May-87	FINAL GUIDANCE FOR THE COORDINATION OF ATSDR HEALTH ASSESSMENT ACTIVITIES WITH THE SUPERFUND REMEDIAL PROCESS	OSWER #9285.4-02

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Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
5003	24-Sep-86	GUIDELINES FOR CARCINOGEN RISK ASSESSMENT (FEDERAL REGISTER, SEPTEMBER 24, 1986, p. 33992)	
5004	24-Sep-86	GUIDELINES FOR EXPOSURE ASSESSMENT (FEDERAL REGISTER, SEPTEMBER 24, 1986, p. 34042)	
5005	24-Sep-86	GUIDELINES FOR HEALTH ASSESSMENT OF SUSPECT DEVELOPMENTAL TOXICANTS (FEDERAL REGISTER, SEPTEMBER 24, 1986, p. 34028)	
5006	24-Sep-86	GUIDELINES FOR MUTAGENICITY RISK ASSESSMENT (FEDERAL REGISTER, SEPTEMBER, 24, p. 34006)	
5007	24-Sep-86	GUIDELINES FOR THE HEALTH RISK ASSESSMENT OF CHEMICAL MIXTURES (FEDERAL REGISTER, SEPTEMBER 24, 1986, p. 34014)	
5008	01-Sep-84	HEALTH EFFECTS ASSESSMENT DOCUMENTS (58 CHEMICAL PROFILES)	EPA/540/1-86/001-058
5009		INTEGRATED RISK INFORMATION SYSTEM (IRIS) [A COMPUTER-BASED HEALTH RISK INFORMATION SYSTEM AVAILABLE THROUGH E-MAIL--BROCHURE ON ACCESS IS INCLUDED]	
5010	07-Jan-87	INTERIM POLICY FOR ASSESSING RISKS OF "DIOXINS" OTHER THAN 2,3,7,8-TCDD	
5013	01-Apr-88	SUPERFUND EXPOSURE ASSESSMENT MANUAL	OSWER #9285.5-1
5015	01-Aug-85	TOXICOLOGY HANDBOOK	OSWER #9850.2
5020	01-Jul-89	EXPOSURE FACTORS HANDBOOK	EPA/600/8-89/043
5023	29-Sep-89	RISK ASSESSMENT GUIDANCE FOR SUPERFUND, VOLUME I, HUMAN HEALTH EVALUATION MANUAL	OSWER #9285.7-01a
5024	01-Mar-89	RISK ASSESSMENT GUIDANCE FOR SUPERFUND, VOLUME II, ENVIRONMENTAL EVALUATION MANUAL	EPA/540/1-89/001
5025	01-Nov-89	REMEDIAL INVESTIGATION - SITE CHARACTERIZATION AND TREATABILITY STUDIES [QUICK REFERENCE FACT SHEET]	OSWER #9355.3-01FS2
5027	01-Jun-89	TOXICOLOGICAL PROFILE FOR 2, 3, 7, 8 - TETRACHLORO-DIBENZO-P-DIOXIN	

EPA Guidance Documents may be reviewed at the OSRR Records and Information Center in Boston, MA

Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
5039	01-Jun-89	TOXICOLOGICAL PROFILE FOR SELECTED PCBs (AROCLOR-1260, -1254, -1248, -1242, -1232, -1221, AND -1016)	
6000	01-Oct-87	REMEDIAL ACTION COSTING PROCEDURES MANUAL	
6001	01-Apr-88	REMOVAL COST MANAGEMENT MANUAL	OSWER #9360.0-02B
7000	01-Jun-88	COMMUNITY RELATIONS IN SUPERFUND: A HANDBOOK (INTERIM VERSION). INCLUDES CHAPTER 6, DATED 11/03/88.	OSWER #9230.0-03B
8000	22-Nov-85	ENDANGERMENT ASSESSMENT GUIDANCE	OSWER #9850.0-1
8001	16-May-88	INTERIM GUIDANCE ON POTENTIALLY RESPONSIBLE PARTY PARTICIPATION IN REMEDIAL INVESTIGATIONS AND FEASIBILITY STUDIES	OSWER #9835.1a
9000	24-Dec-86	INTERIM GUIDANCE ON SUPERFUND SELECTION OF REMEDY	OSWER #9355.0-19
9001	24-Jun-85	RCRA/CERCLA DECISIONS MADE ON REMEDY SELECTION	
9002	01-Apr-90	GUIDE TO SELECTING SUPERFUND REMEDIAL ACTIONS	OSWER #9355.0-27FS
C002		ANALYSIS OF RCRA CLOSURE OPTIONS FOR SUPERFUND SITES IN SUPERFUND 1987: PROCEEDINGS OF THE 8TH NATIONAL CONFERENCE.	
C009	06-May-88	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL DRAFT GUIDANCE. SUPERSEDED BY 3002.	OSWER 9234.1-01
C011	01-Oct-89	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL. RCRA ARARS: FOCUS ON CLOSURE REQUIREMENTS. DUPLICATE OF 3017.	OSWER 9234.2-04FS
C012	01-Jul-88	CATALOG OF SUPERFUND PROGRAM DIRECTIVES. INTERIM EDITION.	OSWER 9200.7-01
C013		CHEMICAL DESTRUCTION OF CHLORINATED DIOXINS AND FURANS.	
C014	23-Jun-87	CHEMICAL DESTRUCTION OF HALOGENATED ALIPHATIC HYDROCARBONS.	
C016	01-Sep-79	CLASSIFICATION OF SURFACE WATERS.	
C018	17-Oct-86	COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980. AMENDED BY PL 99-499, 10/17/86.	

EPA Guidance Documents may be reviewed at the OSRR Records and Information Center in Boston, MA

		Selected Key Guidance Documents	
DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C019	01-May-86	DEVELOPMENT OF ADVISORY LEVELS FOR POLYCHLORINATED BIPHENYLS (PCBS) CLEANUP.	EPA 600/6-86/002
C020	01-Mar-85	DEVELOPMENT OF STATISTICAL DISTRIBUTION OR RANGES STANDARD FACTORS USED IN EXPOSURE ASSESSMENTS.	EPA 600/8-85-010
C021	01-Mar-88	DRAFT GUIDANCE FOR CONDUCTING REMEDIAL INVESTIGATIONS AND FEASIBILITY STUDIES UNDER CERCLA. SUPERSEDED BY 2002.	OSWER 9335.3-01
C022	01-Oct-86	DRAFT GUIDANCE ON REMEDIAL ACTIONS FOR CONTAMINATED GROUND WATER AT SUPERFUND SITES.	OSWER 9283.1-2
C025	01-Aug-85	ENDANGERMENT ASSESSMENT HANDBOOK.	OSWER 9850.1
C026	08-Jan-87	ESTIMATED SOIL INGESTION RATES FOR USE IN RISK ASSESSMENT. TAKEN FROM RISK ANALYSIS, VOL. 7, NO. 3, 1987.	
C031	01-May-86	GROUNDWATER CLASSIFICATION SYSTEM.	
C032	01-Jul-83	GUIDANCE MANUAL FOR HAZARDOUS WASTE INCINERATOR PERMITS.	OSWER 9488.00-4
C034	01-Jun-85	GUIDANCE ON FEASIBILITY STUDIES UNDER CERCLA.	EPA 540/G-85-003
C035	01-Jun-85	GUIDANCE ON REMEDIAL INVESTIGATIONS UNDER CERCLA.	EPA 540/G-85/002
C036	26-Oct-84	GUIDELINES ESTABLISHING TEST PROCEDURES FOR THE ANALYSIS OF POLLUTANTS UNDER THE CLEAN WATER ACT; FINAL, INTERIM FINAL & PROPOSED RULE.	
C038	01-Dec-88	HIGH TEMPERATURE THERMAL TREATMENT FOR CERCLA WASTE. EVALUATION AND SELECTION OF ONSITE AND OFFSITE SYSTEMS.	EPA 540/X-88/006
C039		IMPACT OF THE RCRA LAND DISPOSAL RESTRICTIONS ON SUPERFUND RESPONSE ACTIONS IN SUPERFUND.	
C044	21-May-87	EPA IMPLEMENTATION OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (SARA). DUPLICATE OF 3003.	
C047		DISTRIBUTION OF DRAFT CLEAN WATER ACT/SAFE DRINKING WATER ACT (CWA/SWDA) VOLUME OF THE SUPERFUND COMPLIANCE MANUAL.	
C052	31-Jul-87	SCOPE OF CERCLA PETROLEUM EXCLUSION UNDER SECTIONS 101(14) AND 104(a)(2).	OSWER 9838.1

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Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C053	28-Aug-85	COMMUNITY RELATIONS ACTIVITIES AT SUPERFUND ENFORCEMENT SITES.	OSWER 9836.1
C054	05-Jun-89	LAND DISPOSAL RESTRICTIONS AS RELEVANT AND APPROPRIATE REQUIREMENTS FOR CERCLA CONTAMINATED SOIL AND DEBRIS. DUPLICATE OF 3016.	OSWER 9347.2-01
C055	09-Jul-87	INTERIM GUIDANCE ON COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS.	OSWER 9234.0-05
C057	03-Aug-79	APPLICABILITY OF PCB REGULATIONS TO SPILLS WHICH OCCURRED PRIOR TO THE EFFECTIVE DATE OF THE 1978 REGULATION.	
C058	17-Apr-89	POLICY FOR SUPERFUND COMPLIANCE WITH THE RCRA LAND DISPOSAL RESTRICTIONS.	OSWER 9347.1-02
C059		PROCEDURES FOR IMPLEMENTING CERCLA DELEGATIONS FOR OFF-SITE RESPONSE ACTIONS.	
C062	09-Jun-89	NCP WORKGROUP MEETINGS.	
C063	01-Jan-92	NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN.	OSWER 9200.2-14
C065	01-Oct-85	OCCUPATIONAL SAFETY AND HEALTH GUIDANCE MANUAL FOR HAZARDOUS WASTE SITE ACTIVITIES.	01A0006857
C070	01-Sep-86	PERMIT WRITER'S GUIDE TO TEST BURN DATA. HAZARDOUS WASTE INCINERATION. HANDBOOK.	EPA 625/6-86/012
C071		PERSONNEL PROTECTION AND SAFETY.	
C080	01-Oct-85	REMEDIAL ACTION AT WASTE DISPOSAL SITES (REVISED). HANDBOOK. DUPLICATE OF 2309.	EPA 625/6-85/006
C081		RISK ANALYSIS OF TCDD CONTAMINATED SOIL.	EPA 600/8-84-031
C084		SUMMARY OF THE REQUIREMENTS: LAND DISPOSAL RESTRICTIONS RULE.	
C087	01-Jun-86	SUPERFUND REMEDIAL DESIGN AND REMEDIAL ACTION GUIDANCE. DUPLICATE OF 2011.	OSWER 9355.0-4A
C088	01-Jan-87	TECHNOLOGY BRIEFS: DATA REQUIREMENTS FOR SELECTING REMEDIAL ACTION TECHNOLOGY.	EPA 600/2-87/001

EPA Guidance Documents may be reviewed at the OSRR Records and Information Center in Boston, MA

Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C090	01-Sep-88	TECHNOLOGY SCREENING GUIDE FOR TREATMENT OF CERCLA SOILS AND SLUDGES. DUPLICATE OF 2319.	EPA 540/2-88/004
C090	01-Sep-88	TECHNOLOGY SCREENING GUIDE FOR TREATMENT OF CERCLA SOILS AND SLUDGES. DUPLICATE OF 2319.	EPA 600/8-89/046
C091	01-Mar-89	SOIL SAMPLING QUALITY ASSURANCE USER'S GUIDE. SECOND EDITION.	OSWER 9330.2-4
C094	15-Apr-86	DISCHARGE OF WASTEWATER FROM CERCLA SITES INTO POTWS.	OSWER 9850.4
C099	09-Feb-89	INTERIM FINAL GUIDANCE ON SOIL INGESTION RATES.	
C101	24-Feb-89	B.E.S.T. PROCESS-EFFECTIVE TREATMENT OF SLUDGES, SOILS, AND SEDIMENTS CONTAMINATED WITH PCBS, SEMI-VOLATILE ORGANICS (PAHS), VOCS, PCP, CREOSOTES...	
C102	14-Aug-89	B.E.S.T. PROCESS-EFFECTIVE TREATMENT OF SLUDGES, SEDIMENTS AND SOILS CONTAMINATED WITH PCBS, POLYNUCLEAR AROMATICS (PNAS), VOCS, PCP, CREOSOTE...	
C103	07-Nov-86	HAZARDOUS WASTE MANAGEMENT SYSTEM, LAND DISPOSAL RESTRICTIONS, FINAL RULE.	EPA 901/5-89-001
C104	01-Jun-89	SUPPLEMENTAL RISK ASSESSMENT GUIDANCE FOR THE SUPERFUND PROGRAM. DRAFT FINAL.	
C105	08-Jul-87	LAND DISPOSAL RESTRICTIONS FOR CERTAIN "CALIFORNIA LIST" HAZARDOUS WASTES AND MODIFICATIONS TO THE FRAMEWORK. FINAL RULE.	OSWER 9283.1-2
C106	01-Dec-88	GUIDANCE ON REMEDIAL ACTIONS FOR CONTAMINATED GROUND WATER AT SUPERFUND SITES. INTERIM FINAL. DUPLICATE OF 2413.	ECAO-CIN-414
C107	01-Apr-88	DRINKING WATER CRITERIA FOR POLYCHLORINATED BIPHENYLS (PCBS). FINAL. RESEARCH AND DEVELOPMENT.	OSWER 9234.1-01
C108	08-Aug-88	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL: DRAFT GUIDANCE. DUPLICATE OF 3002.	OSWER 9234.1-02

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Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C109	01-Aug-89	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL: PART II. CLEAN AIR ACT AND OTHER ENVIRONMENTAL STATUTES AND STATE REQUIREMENTS. INTERIM FINAL. DUP. OF 3013.	OSWER 9355.0-28
C110	12-Jul-89	AIR STRIPPER CONTROL GUIDANCE.	EPA 540/2-90/002
C111	01-Jan-90	IN SITU TREATMENT OF HAZARDOUS WASTE-CONTAMINATED SOILS. HANDBOOK.	SCD# 17
C116	01-May-88	INTERIM SEDIMENT CRITERIA VALUES FOR NONPOLAR HYDROPHOBIC ORGANIC CONTAMINANTS.	OSWER 9234.1-06
C117	27-Dec-89	APPLICABILITY OF LDRS TO RCRA AND CERCLA GROUND WATER TREATMENT REINJECTION SUPERFUND MANAGEMENT REVIEW: RECOMMENDATION NO. 26. DUPLICATE OF C119.	OSWER 9234.1-06
C119	27-Dec-89	APPLICABILITY OF LDRS TO RCRA AND CERCLA GROUND WATER TREATMENT REINJECTION SUPERFUND MANAGEMENT REVIEW: RECOMMENDATION NO. 26. DUPLICATE OF 2213.	OSWER 9283.1-2FS
C120	01-Apr-89	GUIDE ON REMEDIAL ACTIONS FOR CONTAMINATED GROUND WATER. DUPLICATE OF 2409.	EPA 540/5-89/003a
C122	01-May-89	ARARS Q'S & A'S. GENERAL POLICY: RCRA, CWA & SDWA. SUPERFUND FACT SHEET. DUPLICATE OF 3006.	OSWER 9234.2-01/FS-A
C123	01-Jun-89	LAND DISPOSAL RESTRICTIONS. SUMMARY OF REQUIREMENTS.	OS-520
C124	01-Jul-89	SUPERFUND LDR GUIDE #1. OVERVIEW OF RCRA LAND DISPOSAL RESTRICTIONS (LDRS). DUPLICATE OF 2214.	OSWER 9347.3-01FS
C125	01-Jul-89	SUPERFUND LDR GUIDE #2. COMPLYING WITH THE CALIFORNIA LIST RESTRICTIONS UNDER LAND DISPOSAL RESTRICTIONS (LDRS). DUPLICATE OF 2215.	OSWER 9347.3-02FS
C126	01-Jul-89	SUPERFUND LDR GUIDE #3. TREATMENT STANDARDS AND MINIMUM TECHNOLOGY REQUIREMENTS UNDER LAND DISPOSAL RESTRICTIONS (LDRS). DUPLICATE OF 3018.	OSWER 9347.3-03FS
C127	01-Jul-89	SUPERFUND LDR GUIDE #5. DETERMINING WHEN LAND DISPOSAL RESTRICTIONS (LDRS) ARE APPLICABLE TO CERCLA RESPONSE ACTIONS. DUPLICATE OF 2218.	OSWER 9347.3-05FS

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Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C128	01-Jul-89	SUPERFUND LDR GUIDE #6A. OBTAINING A SOIL AND DEBRIS TREATABILITY VARIANCE FOR REMEDIAL ACTIONS. DUPLICATE OF 2219.	OSWER 9347.3-06FS
C129	01-Jul-89	CODE OF FEDERAL REGULATIONS. TITLE 40. PARTS 190 TO 299. PROTECTION OF ENVIRONMENT. REVISED AS OF JULY 1, 1989.	OLD 40 CFRs
C130		STATE AND LOCAL INVOLVEMENT IN THE SUPERFUND PROGRAM. FALL 1989.	OSWER 9375.5-01/FS
C131	01-Sep-89	EVALUATION OF GROUND-WATER EXTRACTION REMEDIES. VOLUME 1. SUMMARY REPORT. DUPLICATE OF 2412.	EPA 540/2-89/054
C132	01-Oct-80	AMBIENT WATER QUALITY CRITERIA FOR POLYCHLORINATED BIPHENYLS.	EPA 440/5-80-068
C133	01-Oct-89	DETERMINING SOIL RESPONSE ACTION LEVELS BASED ON POTENTIAL CONTAMINANT MIGRATION TO GROUND WATER: A COMPENDIUM OF EXAMPLES. DUPLICATE OF #2411.	EPA 540/2-89/057
C134	01-Oct-89	GROUND WATER ISSUE. PERFORMANCE EVALUATIONS OF PUMP-AND-TREAT REMEDIATIONS.	EPA 540/4-89/005
C135	01-Jul-89	SUPERFUND LDR GUIDE #4. COMPLYING WITH THE HAMMER RESTRICTIONS UNDER LAND DISPOSAL RESTRICTIONS (LDRS). DUPLICATE OF 2217.	OSWER 9347.3-04FS
C136	18-Oct-89	CONSIDERATIONS IN GROUND WATER REMEDIATION AT SUPERFUND SITES. DUPLICATE OF 2410.	OSWER 9355.4-03
C137	01-Nov-89	SUPERFUND INNOVATIVE TECHNOLOGY EVALUATION PROGRAM: TECHNOLOGY PROFILES.	EPA 540/5-89/013
C138	30-Nov-89	ANALYSIS OF TREATABILITY DATA FOR SOIL & DEBRIS: EVALUATION OF LAND BAN IMPACT ON USE OF SUPERFUND TREATMENT TECHNOLOGIES: SF MGMT. REVIEW: REC. 34A.	OSWER 9380.3-04
C139	01-Dec-89	SUPERFUND LDR GUIDE #7. DETERMINING WHEN LAND DISPOSAL RESTRICTIONS (LDRS) ARE RELEVANT AND APPROPRIATE TO CERCLA RESPONSE ACTIONS. DUPLICATE OF 2220.	OSWER 9347.3-08FS

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Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C140	01-Dec-89	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL. CERCLA COMPLIANCE WITH STATE REQUIREMENTS. DUPLICATE OF 3009.	OSWER 9234.2-05/FS
C141	01-Dec-89	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL. OVERVIEW OF ARARS. FOCUS ON ARAR WAIVERS. DUPLICATE OF 3011.	OSWER 9234.2-03/FS
C143	01-Sep-93	PRESUMPTIVE REMEDIES: POLICY AND PROCEDURES.	OSWER 9355.0-47FS
C144	01-Jan-90	STATE OF TECHNOLOGY REVIEW: SOIL VAPOR EXTRACTION SYSTEMS. PROJECT SUMMARY.	EPA 600/S2-89/024
C145	01-Feb-90	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL. CERCLA COMPLIANCE WITH THE CWA AND SDWA. DUPLICATE OF 3010.	OSWER 9234.2-06/FS
C147	01-Apr-90	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL. SUMMARY OF PART II. CAA, TSCA, AND OTHER STATUTES. DUPLICATE OF 3012.	OSWER 9234.2-07/FS
C155	20-Dec-89	FINAL METHODOLOGIES FOR IMPLEMENTATION OF CERCLA SECTION 122(g)(1)(A) DE MINIMIS WASTE CONTRIBUTOR SETTLEMENT PROPOSALS AND AGREEMENTS.	OSWER 9834.7-1B
C158	04-Oct-93	GUIDANCE FOR EVALUATING THE TECHNICAL IMPRACTICABILITY OF GROUND WATER RESTORATION.	OSWER 9355.0-49FS
C159	22-Feb-91	FINAL GUIDANCE ON PREPARING AND RELEASING WASTE-IN LISTS AND VOLUMETRIC RANKINGS TO PRPS UNDER CERCLA.	OSWER 9234.2-25
C162	27-Sep-93	OFF-SITE RULE IMPLEMENTATION.	OSWER 9835.0
C165	01-Dec-84	RCRA REGULATORY STATUS OF CONTAMINATED GROUNDWATER.	OSWER 9834.11FSa
C166	13-Nov-86	RCRA REGULATORY STATUS OF CONTAMINATED GROUND WATER.	OSWER 9481.16(84)
C167	01-Aug-90	CERCLA SITE DISCHARGES TO POTWS GUIDANCE MANUAL.	OSWER 9441.1986(83)
C168	01-Sep-93	QUALITY ASSURANCE AND QUALITY CONTROL FOR WASTE CONTAINMENT FACILITIES. TECHNICAL GUIDANCE DOCUMENT.	EPA 540/G-90/005
C169	08-Aug-88	DRAFT GUIDANCE ON CERCLA COMPLIANCE WITH OTHER LAWS MANUAL. DUPLICATE OF C108.	PB94-159100

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Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C171	01-Apr-89	REQUIREMENTS FOR HAZARDOUS WASTE LANDFILL DESIGN, CONSTRUCTION, AND CLOSURE.	OSWER 9234.1-01
C172	01-Jul-89	FINAL COVERS ON HAZARDOUS WASTE LANDFILLS AND SURFACE IMPOUNDMENTS. TECHNICAL GUIDANCE DOCUMENT.	EPA 625/4-89/022
C173	01-Oct-89	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL. RCRA ARARS: FOCUS ON CLOSURE REQUIREMENTS. DUPLICATE OF 3017.	EPA 530-SW-89-047
C174	01-Dec-89	RISK ASSESSMENT GUIDANCE FOR SUPERFUND. VOLUME I. HUMAN HEALTH EVALUATION MANUAL (PART A). INTERIM FINAL.	OSWER 9234.2-04FS
C175	01-Jan-88	HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE MODEL - VERSION 2.05.	EPA 540/1-89/002
C178	25-Nov-87	DRAFT GUIDANCE ON CERCLA COMPLIANCE WITH OTHER LAWS MANUAL.	
C179	01-Jul-89	GUIDANCE ON PREPARING SUPERFUND DECISION DOCUMENTS: THE PROPOSED PLAN, THE RECORD OF DECISION, E.S.D.'S, R.O.D. AMENDMENT. INTERIM FINAL.	OSWER 9234.1-01
C181	01-Jul-89	FINAL COVERS ON HAZARDOUS WASTE LANDFILLS AND SURFACE IMPOUNDMENTS. TECHNICAL GUIDANCE DOCUMENT. DUPLICATE OF C172.	OSWER 9355.3-02
C182	01-Mar-88	DRAFT ENGINEERING EVALUATION/COST ANALYSIS GUIDANCE FOR NON-TIME-CRITICAL REMOVAL ACTIONS.	EPA 530-SW-89-047
C183	01-Sep-91	SUPERFUND REMOVAL PROCEDURES: GUIDANCE ON THE CONSIDERATION OF ARARS DURING REMOVAL ACTIONS	
C184	01-Jul-91	FINAL GUIDANCE ON OVERSITE OF POTENTIALLY RESPONSIBLE PARTY REMEDIAL INVESTIGATIONS AND FEASIBILITY STUDIES. VOLUMES 1 & 2.	EPA 540/P-91/011
C185	01-Dec-92	EARLY ACTION AND LONG-TERM ACTION UNDER SACM (SUPERFUND ACCELERATED CLEANUP MODEL). INTERIM GUIDANCE.	OSWER 9835.1 (d)
C186	01-Aug-93	GUIDANCE ON CONDUCTING NON-TIME-CRITICAL REMOVAL ACTIONS UNDER CERCLA.	OSWER 9203.1-051
C187	14-Sep-93	SUPERFUND ACCELERATED CLEANUP MODEL (SACM) COORDINATION STRATEGY.	EPA 540-R-93-057
C188	01-Dec-93	CONDUCTING NON-TIME-CRITICAL REMOVAL ACTIONS UNDER CERCLA.	OSWER 9203.1-11
C189	01-May-91	MANAGEMENT OF INVESTIGATION-DERIVED WASTES DURING SITE INSPECTIONS.	OSWER 9360.0-32FS

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Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C190	01-Oct-90	CERCLA COMPLIANCE WITH THE RCRA TOXICITY CHARACTERISTICS (TC) RULE: PART II.	EPA 540/G-91/009
C191	01-Jul-90	ARARs Q's & A's: STATE GROUND-WATER ANTIDEGRADATION ISSUES.	OSWER 9347.3-11FS
C192	01-Jun-90	ARARs Q's & A's: COMPLIANCE WITH FEDERAL WATER QUALITY CRITERIA.	OSWER 9234.2-11FS
C193	01-May-90	ARARs Q's & A's. COMPLIANCE WITH THE TOXICITY CHARACTERISTICS RULE: PART I.	OSWER 9234.2-09/FS
C194	24-Jul-87	ADDITIONAL INTERIM GUIDANCE FOR FISCAL YEAR 1987 RECORDS OF DECISION. FINAL.	OSWER 9234.2-08/FS
C195	11-Mar-87	FINAL GUIDANCE FOR COORDINATING ATSDR HEALTH ASSESSMENT ACTIVITIES WITH THE SUPERFUND REMEDIAL PROCESS.	EPA 600/8-90/003
C196	01-Jun-85	ALTERNATE CONCENTRATION LIMIT GUIDANCE BASED ON S264.94(b) CRITERIA. PART I. INFORMATION REQUIRED IN ACL DEMONSTRATIONS. DRAFT.	OSWER 9355.0-21
C197	01-Sep-91	FATE OF POLYCHLORINATED BIPHENYLS (PCBs) IN SOIL FOLLOWING STABILIZATION WITH QUICKLIME.	OSWER 9285.4-02
C198	01-May-89	STABILIZATION/SOLIDIFICATION OF CERCLA AND RCRA WASTES. PHYSICAL TESTS, CHEMICAL TESTING PROCEDURES, TECHNOLOGY SCREENING, AND FIELD ACTIVITIES.	
C201	01-Feb-91	INNOVATIVE TREATMENT TECHNOLOGIES. DRAFT.	EPA 600/2-91/052
C202	01-Feb-91	IMMOBILIZATION AS TREATMENT. DRAFT.	EPA 625/6-89/022
C205	07-Jun-90	SUPERFUND RESPONSIVENESS SUMMARIES. (SUPERFUND MANAGEMENT REVIEW: RECOMMENDATION #43E).	OSWER 9380.3-05FS
C207	08-Jul-87	NATIONAL PRIMARY DRINKING WATER REGULATIONS, SYNTHETIC ORGANIC CHEMICALS; MONITORING FOR UNREGULATED CONTAMINANTS; FINAL RULE. 40 CFR PARTS 141 & 142.	OSWER 9380.3-07FS
C208	13-Nov-85	NATIONAL PRIMARY DRINKING WATER REGULATIONS; VOLATILE SYNTHETIC ORGANIC CHEMICALS; FINAL RULE AND PROPOSED RULE. 40 CFR PARTS 141 & 142.	OSWER 9203.0-06

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Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C209	18-Aug-88	DRINKING WATER REGULATIONS; MAXIMUM CONTAMINANT LEVEL GOALS AND NATIONAL PRIMARY DRINKING WATER REGULATIONS FOR LEAD AND COPPER; PROPOSED RULE.	
C210	25-Jul-90	NATIONAL PRIMARY AND SECONDARY DRINKING WATER REGULATIONS; SYNTHETIC ORGANIC CHEMICALS AND INORGANIC CHEMICALS; PROPOSED RULE. 40 CFR PART 141 et al.	
C211	22-May-89	NATIONAL PRIMARY AND SECONDARY DRINKING WATER REGULATIONS; PROPOSED RULE. 40 CFR PARTS 141, 142 & 143.	
C212	01-Jun-82	REMEDIAL ACTION AT WASTE DISPOSAL SITES. HANDBOOK.	
C213	19-Jan-95	CONSISTENT IMPLEMENTATION OF THE FY 1993 GUIDANCE ON TECHNICAL IMPRACTICABILITY OF GROUND-WATER RESTORATION AT SUPERFUND SITES.	
C214	25-Jun-93	FINAL REVISIONS TO OMB CIRCULAR A-94 ON GUIDELINES AND DISCOUNT RATES FOR BENEFIT-COST ANALYSIS.	EPA 625/6-82-006
C216	27-May-92	CONSIDERATIONS IN GROUND-WATER REMEDIATION AT SUPERFUND SITES AND RCRA FACILITIES. UPDATE.	OSWER 9200.4-14
C217	01-Sep-92	AIR/SUPERFUND NATIONAL TECHNICAL GUIDANCE STUDY SERIES. ASSESSING POTENTIAL INDOOR AIR IMPACTS FOR SUPERFUND SITES.	OSWER 9355.3-20
C218	01-Jan-92	ESTIMATING POTENTIAL FOR OCCURRENCE OF DNAPL AT SUPERFUND SITES.	OSWER 9283.1-06
C219	25-Mar-91	RISK ASSESSMENT GUIDANCE FOR SUPERFUND. VOL 1. HUMAN HEALTH EVALUATION MANUAL SUPPLEMENTAL GUIDANCE: STANDARD DEFAULT EXPOSURE FACTORS. INTERIM FINAL.	EPA 451/R-92-002
C220	29-May-92	FINAL GUIDELINES FOR EXPOSURE ASSESSMENT. PGS. 22888 - 22938.	OSWER 9355.4-07FS
C221	01-Sep-90	REDUCING RISK: SETTING PRIORITIES AND STRATEGIES FOR ENVIRONMENTAL PROTECTION.	OSWER 9285.6-03

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Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C222	01-Aug-90	SUPERFUND INNOVATIVE TECHNOLOGY EVALUATION. CF SYSTEMS ORGANICS EXTRACTION PROCESS. NEW BEDFORD HARBOR, MA. APPLICATIONS ANALYSIS REPORT.	57 FR 22888
C223	01-Sep-92	PROCEEDINGS OF THE SYMPOSIUM ON SOIL VENTING. APRIL 29 - MAY 1, 1991. HOUSTON, TX.	SAB-EC-90-021
C224	01-Nov-91	SITE CHARACTERIZATION FOR SUBSURFACE REMEDIATION. SEMINAR PUBLICATION.	EPA 540/A5-90/002
C225	01-Apr-84	COMPENDIUM OF METHODS FOR THE DETERMINATION OF TOXIC ORGANIC COMPOUNDS IN AMBIENT AIR. INCLUDES SEPT. 1986 SUPPLEMENT EPA/600/4-87/006.	EPA 600/R-92/174
C227	01-Jan-92	DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS. INTERIM REPORT.	EPA 625/4-91/026
C228	01-Mar-94	HEALTH EFFECTS ASSESSMENT SUMMARY TABLES (HEAST). FY-1994 ANNUAL.	EPA 600/4-84-041
C232	07-Jan-92	INTERIM CASHOUT SETTLEMENT PROCEDURES.	PB94-921100
C233	01-Dec-79	CLASSIFICATION OF WETLANDS AND DEEPWATER HABITATS OF THE UNITED STATES.	OSWER 9834.7-1D
C234	29-Dec-80	INTERIM GUIDELINES AND SPECIFICATIONS FOR PREPARING QUALITY ASSURANCE PROJECT PLANS.	
C235	01-Apr-91	RISK ASSESSMENT IN SUPERFUND: A PRIMER. FIRST EDITION. SEPTEMBER 1990.	FWS/OBS-79/31
C236	01-Oct-91	INNOVATIVE TREATMENT TECHNOLOGIES: OVERVIEW AND GUIDE TO INFORMATION SOURCES.	QAMS-005/80
C237	01-Jul-89	SUPERFUND INNOVATIVE TECHNOLOGY EVALUATION. TERRA VAC IN SITU VACUUM EXTRACTION SYSTEM. APPLICATIONS ANALYSIS REPORT.	EPA 540/X-91/002
C247	01-May-91	DESIGN AND CONSTRUCTION OF RCRA/CERCLA FINAL COVERS.	OSWER 9835.9
C248	01-Sep-91	GUIDE FOR CONDUCTING TREATABILITY STUDIES UNDER CERCLA: SOIL VAPOR EXTRACTION. INTERIM GUIDANCE.	OSWER 9835.9FS
C249	01-Jun-89	INTERIM FINAL GUIDANCE ON PREPARING SUPERFUND DECISION DOCUMENTS: PROPOSED PLAN, RECORD OF DECISION, ESD'S, RECORD OF DECISION AMENDMENT.	EPA 625/4-91/025
C250	10-Jun-91	FURTHERING THE USE OF INNOVATIVE TREATMENT TECHNOLOGIES IN OSWER PROGRAMS. MISSING PGS. 15 & i.	EPA 540/2-91/019A

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Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C251	01-Mar-89	ECOLOGICAL ASSESSMENT OF HAZARDOUS WASTE SITES: A FIELD AND LABORATORY REFERENCE.	OSWER 9355.3-02
C253	01-May-89	RAPID BIOASSESSMENT PROTOCOLS FOR USE IN STREAMS AND RIVERS. BENTHIC MACROINVERTEBRATES AND FISH.	OSWER 9380.0-17
C254	01-Aug-90	GUIDE ON REMEDIAL ACTIONS AT SUPERFUND SITES WITH PCB CONTAMINATION. QUICK REFERENCE FACT SHEET.	EPA 600/3-89/013
C255	23-May-91	STRUCTURE AND COMPONENTS OF FIVE YEAR REVIEWS.	EPA 444/4-89-001
C256	01-Sep-92	COMPLIANCE WITH THE CLEAN AIR ACT AND ASSOCIATED AIR QUALITY REQUIREMENTS. ARARS FACT SHEET.	OSWER 9355.4-01FS
C258	01-Sep-94	GROUND-WATER TREATMENT TECHNOLOGY RESOURCE GUIDE.	OSWER 9355.7-02
C259	01-Apr-91	GUIDE TO ADDRESSING PRE-ROD AND POST-ROD CHANGES.	OSWER 9234.2-22FS
C260	01-Mar-86	COMMUNITY RELATIONS IN SUPERFUND: A HANDBOOK.	EPA 542-B-94-009
C261	27-Sep-96	SUPERFUND REFORMS: UPDATING REMEDY DECISIONS MEMORANDUM	OSWER 9355.02FS-4
C263	01-Sep-90	SUPERFUND REMOVAL PROCEDURES ACTION MEMORANDUM GUIDANCE	OSWER 9230.0-3A
C268	01-Jan-96	ECO UPDATE. ECOLOGICAL SIGNIFICANCE AND SELECTION OF CANDIDATE ASSESSMENT ENDPOINTS. INTERMITTENT BULLETIN VOLUME 3, NUMBER 1	OSWER 9360.3-01
C269	01-Jan-96	ECO UPDATE. ECOTOX THRESHOLDS. INTERMITTENT BULLETIN VOLUME 3, NUMBER 2	PB96-185434
C270	29-Apr-96	INITIATIVES TO PROMOTE INNOVATIVE TECHNOLOGY IN WASTE MANAGEMENT PROGRAMS	OSWER 9345.0-11FSI
C273	03-Apr-96	GROUNDWATER USE AND VALUE DETERMINATION GUIDANCE. A RESOURCE-BASED APPROACH TO DECISION MAKING. FINAL DRAFT.	PB96-109145
C274	01-Sep-93	INNOVATIVE TREATMENT TECHNOLOGIES: ANNUAL STATUS REPORT (FIFTH EDITION)	PB96-105044
C275	01-Apr-91	GUIDE TO DEVELOPING SUPERFUND NO ACTION, INTERIM ACTION, AND CONTINGENCY REMEDY RODS	
C276	22-Apr-91	ROLE OF THE BASELINE RISK ASSESSMENT IN SUPERFUND REMEDY SELECTION DECISIONS	EPA 542-R-93-003

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DOCNUMBER	DOCDATE	Selected Key Guidance Documents TITLE	OSWEREPAID
C277	11-Jul-94	RISK-BASED CONCENTRATION TABLE, THIRD QUARTER 1994	OSWER 9355.3-02FS-3
C278	04-Apr-96	FINAL GROUND WATER USE AND VALUE DETERMINATION GUIDANCE	OSWER 9355.0-30
C280	22-Jan-98	SUPERFUND REMOVAL PROCEDURES SPECIAL CIRCUMSTANCES AND FACT SHEET	
C281	01-Sep-92	ARAR'S FACT SHEET: COMPLIANCE WITH CLEAN THE CLEAN AIR ACT AND ASSOCIATED AIR QUALITY REQUIREMENTS	
C282		SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986	OSWER 9360.3-09FS
C283	19-Aug-93	DETERMINATION OF IMMINENT AND SUBSTANIAL ENDANGERMENT FOR REMOVAL ACTIONS	
C284	06-Aug-92	TRANSMITTAL OF SUPERFUND REMOVAL PROCEDURES--REMOVAL ENFORCEMENT GUIDANCE FOR ON-SCENE COORDINATORS	PL 99-499
C285	23-Jun-92	TRANSMITTAL OF SUPERFUND REMOVAL PROCEDURES--PUBLIC PARTICIPATION GUIDANCE FOR ON-SCENE COORDINATORS: COMMUNITY RELATIONS AND THE ADMINISTRATIVE RECOR	OSWER 9360.0-34
C287	19-Nov-93	REGULATION FILING AND PUBLICATION-REGULATION CHAPTER NUMBER AND HEADING: 310 CMR 40.000	OSWER 9360.3-06
C288	01-Aug-94	RISK UPDATE ISSUE NO. 2	OSWER 9360.3-05
C294	01-Jan-87	STATISTICAL METHODS FOR ENVIRONMENTAL POLLUTION MONITORING	
C295	01-Dec-90	SUPERFUND REMOVAL PROCEDURES: ACTION MEMORANDUM GUIDANCE (EPA/540/P-90/004)	
C297	23-Aug-91	GUIDANCE ON THE CONSIDERATION OF ARARS DURING REMOVAL ACTIONS	TD193 G55
C308	01-Jan-93	ESTIMATING CONSUMPTION OF FRESHWATER FISH AMONG MAINE ANGLERS	OSWER 9360.3-01
C317	01-Jan-95	LAND USE IN THE CERCLA REMEDY SELECTION PROCESS	OSWER 9360.3-02
C356	01-Aug-97	EXPOSURE FACTORS HANDBOOK; GENERAL FACTORS, VOLUME I	
C361	02-Jun-97	ECOLOGICAL RISK ASSESSMENT GUIDANCE FOR SUPERFUND PROCESS FOR DESIGNING AND CONDUCTING ECOLOGICAL RISK ASSESSMENTS (EPA 540-R-97-006)	OSWER 9355.7-04

EPA Guidance Documents may be reviewed at the OSRR Records and Information Center in Boston, MA

DOCNUMBER	DOCDATE	Selected Key Guidance Documents TITLE	OSWEREPAID
C362	29-Jun-97	SPECIAL REPORT ON ENVIRONMENTAL ENDOCRINE DISRUPTION: AN EFFECTS ASSESSMENT AND ANALYSIS	EPA 600/P-95/002FA
C363	01-May-93	REVIEW OF ECOLOGICAL ASSESSMENT CASE STUDIES FROM A RISK ASSESSMENT PERSPECTIVE	
C364	01-Feb-92	FRAMEWORK FOR ECOLOGICAL RISK ASSESSMENT (EPA/630/R-92/001)	PB97-137772
C365	31-Mar-98	REPORT FROM THE WORKSHOP ON THE APPLICATION OF 2,3,7,8 -TCDD TOXCITY EQUIVALENCY FACTORS TO FISH AND WILDLIFE	EPA 630/R-92-005
C366	18-Jul-97	DRAFT FINAL GUIDELINES FOR ECOLOGICAL RISK ASSESSMENT	EPA 630/R-92-001
C367	01-Jan-94	REVIEW OF ECOLOGICAL ASSESSMENT CASE STUDIES FROM A RISK ASSESSMENT PERSPECTIVE - VOLUME II (EPA/630/R-94/003)	
C368	01-Jun-96	TOXICOLOGICAL BENCHMARKS FOR WILDLIFE: 1996 REVISION	
C369	01-Nov-94	ECOLOGICAL RISK ASSESSMENT ISSUE PAPERS (EPA/630/R-94/009)	EPA 630/R-94-003
C370	20-Jan-92	ENFORCEMENT UNDER SACM - INTERIM GUIDANCE (VOL. 1, NO. 3)	
C371	01-Dec-92	SACM REGIONAL DECISION TEAMS - INTERIM GUIDANCE (VOLUME I, NO. 5)	EPA 630/R-94-009
C372	01-Nov-92	SAB REPORT: REVIEW OF SEDIMENT CRITERIA DEVELOPMENT METHODOLOGY FOR NON-IONIC ORGANIC CONTAMINANTS (EPA-SAB-EPEC-92-002)	OSWER 9203.1-05I
C373	01-May-92	SUPPLEMENTAL GUIDANCE TO RAGS: CALCULATING THE CONCENTRATION TERM (PUBLICATION 9285 7-081 VOL. I, NUMBER 1)	OSWER 9203.1-05I
C374	01-Sep-94	ECO UPDATE: FIELD STUDIES FOR ECOLOGICAL RISK ASSESMENT (VOL. 2, NUMBER 2)	
C376	01-Jul-94	TOXICOLOGICAL BENCHMARKS FOR SCREENING POTENTIAL CONTAMINANTS OF CONCERN FOR EFFECTS ON AQUATIC BIOTA: 1994 REVISION	
C382	01-Nov-97	EPA'S CONTAMINATED SEDIMENT MANAGEMENT STRATEGY	
C384	01-Sep-94	ESTIMATING EXPOSURE OF TERRESTRIAL WILDLIFE TO CONTAMINANTS	
C390	01-Jan-96	GUIDELINES FOR THE PROTECTION AND MANAGEMENT OF AQUATIC SEDIMENT QUALITY IN ONTARIO	

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Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C393	01-Dec-79	WATER-RELATED ENVIRONMENTAL FATE OF 129 PRIORITY POLLUTANTS (VOLUME I) (EPA-440/4-79-029A)	01A0008399
C395	01-Jan-91	TECHNICAL BASIS FOR ESTABLISHING SEDIMENT QUALITY CRITERIA FOR NONIONIC ORGANIC CHEMICALS USING EQUILIBRIUM PARTITIONING	
C396	01-Jan-92	FRAMEWORK FOR ECOLOGICAL RISK ASSESSMENT AT THE EPA	
C398	01-Sep-93	GUIDELINES FOR DERIVING SITE-SPECIFIC SEDIMENT QUALITY CRITERIA FOR THE PROTECTION OF BENTHIC ORGANISMS (EPA-822-R-93-017)	
C399	01-Sep-93	TECHNICAL BASIS FOR DERIVING SEDIMENT QUALITY CRITERIA FOR NONIONIC ORGANIC CONTAMINANTS FOR THE PROTECTION OF BENTHIC ORGANISMS BY	
C406	01-Jan-87	ENDPOINTS FOR RESPONSES OF FISH TO CHRONIC TOXIC EXPOSURES - (HAZARD ASSESSMENT)	
C418	01-Jan-95	INCIDENCE OF ADVERSE BIOLOGICAL EFFECTS WITHIN RANGES OF CHEMICAL CONCENTRATIONS IN MARINE AND ESTUARINE SEDIMENTS	EPA 822-R-93-011
C441	01-Jan-82	2,3,7,8 TETRACHLORODIBENZO-P-DIOXIN AND RELATED HALOGENATED AROMATIC HYDROCARBONS: EXAMINATION OF THE MECHANISM OF TOXCITY	
C447	01-Jan-85	GUIDELINES FOR DERIVING NUMERICAL NATIONAL WATER QUALITY FOR THE PROTECTION OF AQUATIC ORGANISMS AND THEIR USES	
C448	01-Jan-65	ENVIRONMENT AND DISEASE: ASSOCIATION OR CAUSATION	
C449	09-Nov-97	SUMMARY OF EPA SEDIMENT POLICY GOALS	TD370 G946
C450	26-Nov-97	INITIATION OF FINAL AGENCY REVIEW FOR CONTAMINATED SEDIMENT MANAGEMENT STRATEGY	
C462	01-Apr-98	EPA'S CONTAMINATED SEDIMENT MANAGEMENT STRATEGY	
C468	01-Jul-97	HEALTH EFFECTS ASSESSMENT SUMMARY TABLES - FY 1997 UPDATE	
C469	01-Jan-92	DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS	
C470	01-Oct-92	DOCUMENTATION FOR THE RISK ASSESSMENT SHORTFORM RESIDENTIAL SCENARIO(POLICY #WCS/ORS-142-92)	EPA 540/R-97-036

EPA Guidance Documents may be reviewed at the OSRR Records and Information Center in Boston, MA

Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C471	24-May-77	EXECUTIVE ORDER 11988 - FLOODPLAIN MANAGEMENT	EPA 600/8-91-011B
C472	24-May-77	EXECUTIVE ORDER 11990 - PROTECTION OF WETLANDS	
C473	01-Aug-97	RULES OF THUMB FOR SUPERFUND REMEDY SELECTION (EPA 540-R-97-013)	
C474	01-Dec-97	DRAFT INTERIM FINAL OSWER MONITORED NATURAL ATTENUATION POLICY	
C475	01-Nov-97	USE OF MONITORED NATURAL ATTENUATION AT SUPERFUND, RCRA CORRECTIVE ACTION, AND UNDERGROUND STORAGE TANK SITES	OSWER 9355.0-69
C476	14-Apr-97	TRANSMITTAL OF OSWER DIRECTIVE ON COMPREHENSIVE STATE GROUND WATER PPROTECTION PROGRAMS (CSGWPPS)	OSWER 9200.4-17
C478	01-Sep-94	INNOVATIVE SITE REMEDIATION TECHNOLOGY: CHEMICAL TREATMENT, VOL. 2	OSWER 9200.4-17
C479	01-Nov-93	INNOVATIVE SITE REMEDIATION TECHNOLOGY, SOIL WASHING/SOIL FLUSHING, VOL. 3	OSWER 9283.1-09
C480	01-Jun-94	INNOVATIVE REMEDIATION TECHNOLOGY: SOLIDIFICATION/STABILIZATION VOLUME 4	EPA 542-B-94-004
C481	01-Jun-95	INNOVATIVE SITE REMEDIATION TECHNOLOGY- SOLVENT CHEMICAL EXTRACTION VOLUME 5	EPA 542-B-93-012
C482	01-Nov-93	INNOVATIVE SITE REMEDIATION TECHNOLOGY: THERMAL DESORPTION, VOL. 6	EPA 542-B-94-001
C483	01-Oct-94	INNOVATIVE SITE REMEDIATION TECHNOLOGY: THERMAL DESTRUCTION, VOL. 7	EPA 542-B-94-005
C484	01-May-93	ENGINNERING BULLETIN: SOLDIFICATION/STABILIZATION OF ORGANICS AND INORGANICS	EPA 542-B-93-011
C485	01-Aug-98	CITIZEN'S GUIDE TO PHYTOREMEDIATION	EPA 542-B-94-003
C486	14-Oct-98	MANAGEMENT OF REMEDIATION WASTE UNDER RCRA	EPA 540/S-92/015
C487	13-Mar-96	USE OF THE AREA OF CONTAMINATION (AOC) CONCEPT DURING RCRA CLEANUPS	EPA 542-F-98-011
C488	01-Jan-92	COMMUNITY RELATIONS IN SUPERFUND: A HANDBOOK	EPA 530-F-98-026
C491	01-Sep-93	PRESUMPTIVE REMEDIES: SITE CHARACTERIZATION AND TECHNOLOGY SELECTION FOR CERCLA SITES WITH VOLATILE ORGANIC COMPOUNDS IN SOILS	
C495	30-Sep-97	ALTERNATIVE CAP DESIGN GUIDANCE PROPOSED FOR UNLINED, HAZARDOUS WASTE LANDFILLS IN EPA REGION I	EPA 540/R-92/009

EPA Guidance Documents may be reviewed at the OSRR Records and Information Center in Boston, MA

Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C496	08-Mar-90	FEDERAL REGISTER, PART II, 40 CFR PART 300 NATIONAL OIL AND HAZARDOUS SUBSTANCES CONTINGENCY PLAN, FINAL RULE, VOL. 55, NO. 46	OSWER 9355.0-48FS
C496	08-Mar-90	FEDERAL REGISTER, PART II, 40 CFR PART 300 NATIONAL OIL AND HAZARDOUS SUBSTANCES CONTINGENCY PLAN, FINAL RULE, VOL. 55, NO. 46	
C497	29-Jun-98	DISPOSAL OF POLYCHLORINATED BIPHENYLS (PCBS); FINAL RULE, FEDERAL REGISTER, VOL. 63, NO. 124	NCP PDF or FR
C501	01-Aug-97	EXPOSURE FACTORS HANDBOOK; FOOD INGESTION FACTORS, VOLUME II	63 FR 35384-354764
C502	01-Aug-97	EXPOSURE FACTORS HANDBOOK; ACTIVITY FACTORS, VOLUME III	EPA/600/P-95/002FB
C503	01-Jul-98	NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTIGENCY PLAN; CODE OF FEDERAL REGULATIONS (TITLE 40, PART 300)	EPA/600/P-95/002FC
C504	13-Apr-98	APPROACH FOR ADDRESSING DIOXIN IN SOIL AT CERCLA AND RCRA SITES	
C505		INTERIM POLICY ON THE USE OF PERMANENT RELOCATIONS AS PART OF SUPERFUND REMEDIAL ACTIONS	OSWER 9200.4-26
C511	01-Dec-96	RECOMMENDATIONS OF THE TECHNICAL REVIEW WORK GROUP FOR LEAD FOR AN INTERIM APPROACH	OSWER 9355.0-71P
C512	21-Apr-99	FINAL OSWER DIRECTIVE "USE OF MONITORED NATURAL ATTENUATION AT SUPERFUND, RCRA CORRECTIVE ACTION, AND UNDERGROUND STORAGE TANK SITES"	01A0007451
C513	01-Jun-96	TOXICOLOGICAL BENCHMARKS FOR SCREENING POTENTIAL CONTAMINANTS OF CONCERN FOR EFFECTS ON AQUATIC BIOTA: 1996 REVISION	OSWER 9200.4-17P
C514	06-Aug-93	CONDUCTING NON-TIME-CRITICAL REMOVAL ACTIONS UNDER CERCLA. (EPA/540-R-93-057)	
C515	21-Apr-99	USE OF MONITORED NATURAL ATTENTUATION AT SUPERFUND, RCRA CORRECTIVE ACTION, AND UNDERGROUND STORAGE TANK SITES	OSWER 9360.0-32
C516	01-Sep-99	GROUND WATER ISSUE: MICROBIAL PROCESSES AFFECTING MONITORED NATURAL ATTENUATION OF CONTAMINANTS IN THE SUBSURFACE	OSWER 9200.4-17P

EPA Guidance Documents may be reviewed at the OSRR Records and Information Center in Boston, MA

DOCNUMBER	DOCDATE	Selected Key Guidance Documents TITLE	OSWEREPAID
C517	01-Nov-91	ANALYSIS OF GROUND-WATER REMEDIAL ALTERNATIVES AT A SUPERFUND SITE, GROUNDWATER, VOL. 29, NO. 6	EPA 540/S-99/001
C518	14-Feb-00	USE OF NON-TIME-CRITICAL REMOVAL AUTHORITY IN SUPERFUND RESPONSE ACTIONS, (REGIONS I-X)	
C519	22-Jun-00	NATIONAL PRIMARY DRINKING WATER REGULATIONS: ARSENIC AND CLARIFICATIONS TO COMPLIANCE AND NEW SOURCE CONTAMINANTS MONITORING. (CFR, VOL. 65, NO. 121)	
C520	01-May-00	PROPOSED REVISION TO ARSENIC DRINKING WATER STANDARD (815-F-00-012)	
C521	19-Jan-00	IMPLEMENTING FY2000 APPROPRIATIONS REPORT LANGUAGE ON SEDIMENT DREDGING	
C522	26-May-00	GUIDANCE ON EXERCISING CERCLA ENFORCEMENT DISCRETION IN ANTICIPATION OF FULL COST ACCOUNTING CONSISTENT WITH THE STATEMENT OF FEDERAL FINANCIAL ACCOUNTING STANDARDS NO. 4	
C523		SUPERFUND INDIRECT COST RATES FOR FISCAL YEARS (FY) 1990 - 2001	
C524	05-Feb-01	REVISED ALTERNATIVE CAP DESIGN GUIDANCE PROPOSED FOR UNLINED HAZARDOUS WASTE LANDFILLS IN THE EPA REGION I	
C525	01-Jul-99	GUIDE TO PREPARING SUPERFUND PROPOSED PLANS RECORDS OF DECISION AND OTHER REMEDY SELECTION DECISION DOCUMENTS	
C529	22-Mar-01	FISCAL YEAR 2001 APPROPRIATIONS CONFERENCE REPORT LANGUAGE ON CONTAMINATED SEDIMENTS	
C531	01-Sep-00	INSTITUTIONAL CONTROLS: A SITE MANAGER'S GUIDE TO IDENTIFYING, EVALUATING AND SELECTING INSTITUTIONAL CONTROLS AT SUPERFUND AND RCRA CORRECTIVE ACTION CLEANUPS.	OSWER 9200.0-36
C532	01-Sep-93	GUIDANCE FOR EVALUATING THE TECHNICAL IMPRACTICABILITY OF GROUND-WATER RESTORATION.	OSWER 9355.0-74 FS-P
C533	01-Sep-98	FIELD APPLICATIONS OF IN SITU REMEDIATION TECHNOLOGIES: CHEMICAL OXIDATION.	EPA 540-R-93-080

EPA Guidance Documents may be reviewed at the OSRR Records and Information Center in Boston, MA

DOCNUMBER	DOCDATE	Selected Key Guidance Documents TITLE	OSWEREPAID
C534	01-Jan-97	Dioxin and Dioxin-Like Compounds in Soil, Part 1: ATSDR Interim Policy Guideline.	EPA 542-R-98-008
C535	01-Dec-98	TOXIC EQUIVALENCY FACTORS (TEFs) FOR PCBs, PCDDs, PSDFs FOR HUMANS AND WILDLIFE.	
C537		ELEMENTS FOR EFFECTIVE MANAGEMENT OF OPERATING PUMP AND TREAT SYSTEMS	
C538	02-Jul-03	TRANSFER OF LONG-TERM RESPONSE ACTION (LTRA) PROJECTS TO STATES	OSWER 9355.4-27FS-A
C539	01-Jun-03	COMPREHENSIVE FIVE-YEAR REVIEW GUIDANCE	OSWER 9355.0-81FS-A
C540	01-Feb-84	CHEMICAL ATTENUATION RATES, COEFFICIENTS, AND CONSTANTS IN LEACHATE MIGRATION, VOLUME 2: AN ANNOTATED BIBLIOGRAPHY	OSWER 9355.7-03B-P
C541	27-Apr-00	WORKSHOP ON MONITORING OXIDATION-REDUCTION PROCESSES FOR GROUND-WATER RESTORATION, WORKSHOP SUMMARY, DALLAS, TEXAS, APRIL 25-27, 2000	
C542	01-Aug-93	GUIDE FOR CONDUCTING TREATABILITY STUDIES UNDER CERCLA, BIODEGRADATION REMEDY SELECTION, INTERIM GUIDANCE	EPA 600/R-02-002
C543	01-Jul-02	GUIDANCE FOR MONITORING AT HAZARDOUS WASTE SITES: FRAMEWORK FOR MONITORING PLAN DEVELOPMENT AND IMPLEMENTATION	EPA 540/R-93/519A
C544	01-May-02	GROUND-WATER SAMPLING GUIDELINES FOR SUPERFUND AND RCRA PROJECT MANAGERS, GROUND WATER FORUM ISSUE PAPER	OSWER 9355.4-28
C545	01-Jun-91	EPA'S STRATEGY FOR PROTECTING THE NATION'S GROUND WATER IN THE 1990S: QUICK REFERENCE FACT SHEET	EPA 542-S-02-001
C546	01-Jul-91	GUIDE FOR CONDUCTING TREATABILITY STUDIES UNDER CERCLA: AEROBIC BIODEGRADATION REMEDY SCREENING, QUICK REFERENCE FACT SHEET	01A0006399
C547	01-Jul-91	GUIDE FOR CONDUCTING TREATABILITY STUDIES UNDER CERCLA: AEROBIC BIODEGRADATION REMEDY SCREENING, INTERIM GUIDANCE	EPA 540/2-91/013B
C548	01-Feb-93	QUALITY ASSURANCE FOR SUPERFUND ENVIRONMENTAL DATA COLLECTION ACTIVITIES, QUICK REFERENCE FACT SHEET	EPA 540/2-91/013A

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DOCNUMBER	DOCDATE	Selected Key Guidance Documents TITLE	OSWEREPAID
C549	01-Apr-90	QUALITY ASSURANCE/QUALITY CONTROL GUIDANCE FOR REMOVAL ACTIVITIES, SAMPLING QA/QC PLAN AND DATA VALIDATION PROCEDURES, INTERIM FINAL	OSWER 9200.2-16FS
C550	01-May-93	SEMINAR ON REGIONAL CONSIDERATIONS FOR DENSE NONAQUEOUS PHASE LIQUIDS AT HAZARDOUS WASTE SITES: IMPLEMENTATION AND ENFORCEMENT ISSUES, PRESENTATION SLIDE HARDCOPY	OSWER 9360.4-01
C552	01-Mar-91	GROUND WATER ISSUE, DENSE NONAQUEOUS PHASE LIQUIDS	EPA 600/K-93/004
C553	01-Sep-93	EVALUATION OF THE LIKELIHOOD OF DNAPL PRESENCE AT NPL SITES, NATIONAL RESULTS	EPA 540/4-91-002
C554	01-Jul-89	IN-SITU AQUIFER RESTORATION OF CHLORINATED ALIPHATICS BY METHANOTROPHIC BACTERIA	OSWER 9355.4-13
C555	01-Nov-94	CONTAMINANTS AND REMEDIAL OPTIONS AT SOLVENT-CONTAMINATED SITES	EPA 600/2-89/033
C556	01-Apr-90	LABORATORY INVESTIGATION OF RESIDUAL LIQUID ORGANICS FROM SPILLS, LEAKS, AND THE DISPOSAL OF HAZARDOUS WASTES IN GROUNDWATER	EPA 600/R-94/203
C558	01-Aug-94	SYMPOSIUM ON INTRINSIC BIOREMEDIATION OF GROUNDWATER	PB90-235797
C559	01-Sep-90	HANDBOOK, GROUND WATER, VOLUME 1: GROUND WATER AND CONTAMINATION	EPA 540/R-94/515
C560	01-Jul-91	HANDBOOK, GROUND WATER, VOLUME 2: METHODOLOGY	EPA 625/6-90/016A
C561	01-Jan-04	GUIDANCE FOR MONITORING AT HAZARDOUS WASTE SITES: FRAMEWORK FOR MONITORING PLAN DEVELOPMENT AND IMPLEMENTATION	EPA 625/6-90/016B
C562	01-Nov-02	GROUND WATER ISSUE, CALCULATION AND USE OF FIRST-ORDER RATE CONSTANTS FOR MONITORED NATURAL ATTENUATION STUDIES	OSWER 9355.4-28
C563	07-Oct-99	ECOLOGICAL RISK ASSESSMENT AND RISK MANAGEMENT PRINCIPLES FOR SUPERFUND SITES	EPA 540/S-02/500
C564	12-Aug-94	ROLE OF THE ECOLOGICAL RISK ASSESSMENT IN THE BASELINE RISK ASSESSMENT	OSWER 9285.7-28 P
C565	12-Feb-02	PRINCIPLES FOR MANAGING CONTAMINATED SEDIMENT RISKS AT HAZARDOUS WASTE SITES	OSWER 9285.7-17
C566	01-Dec-93	WILDLIFE EXPOSURE FACTORS HANDBOOK, VOLUME 1 OF 2	OSWER 9285.6-08

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Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C567	01-Dec-93	WILDLIFE EXPOSURE FACTORS HANDBOOK, VOLUME 2 OF 2	EPA 600/R-93/187
C568	01-Nov-03	ECOLOGICAL SOIL SCREENING LEVEL FOR ALUMINUM, INTERIM FINAL	EPA 600/R-93/187
C569	01-Nov-03	ECOLOGICAL SOIL SCREENING LEVEL FOR LEAD, INTERIM FINAL	OSWER 9285.7-60
C570	01-Nov-03	ECOLOGICAL SOIL SCREENING LEVEL FOR DIELDRIN, INTERIM FINAL	OSWER 9285.7-70
C571	24-Sep-96	COORDINATION BETWEEN RCRA CORRECTIVE ACTION AND CLOSURE AND CERCLA SITE ACTIVITIES	OSWER 9285.7-56
C572	01-Oct-98	ENVIRONMENTAL FACT SHEET, POST-CLOSURE PERMIT AMENDMENT ADDRESSES CORRECTIVE ACTION	
C573	16-Mar-98	RISK-BASED CLEAN CLOSURE	EPA530-F-98-031
C574	20-Oct-02	DRAFT GUIDANCE FOR EVALUATING THE VAPOR INTRUSION TO INDOOR AIR PATHWAY FROM GROUNDWATER AND SOILS (SUBSURFACE VAPOR INTRUSION GUIDANCE)	
C575	01-Sep-04	STRATEGY TO ENSURE INSTITUTIONAL CONTROL IMPLEMENTATION AT SUPERFUND SITES	
C576	01-Mar-89	FINAL GUIDANCE ON ADMINISTRATIVE RECORDS FOR SELECTING CERCLA RESPONSE ACTIONS	OSWER NO. 9355.0-106
C577	01-Jul-96	SOIL SCREENING GUIDANCE: USER'S GUIDE	OSWER NO. 9833.3A-1
C579	01-Sep-90	A GUIDE TO DELISTING OF RCRA WASTES FOR SUPERFUND REMEDIAL RESPONSES	OSWER NO. 9355.4-23
C580	01-Oct-92	A SUPERFUND GUIDE TO RCRA HAZARDOUS WASTES	OSWER 9347.3-09FS
C581	01-Dec-03	THE DNAPL REMEDIATION CHALLENGE: IS THERE A CASE FOR SOURCE DEPLETION?	OSWER9345.3-03FS
C582	01-Jul-00	A GUIDE TO DEVELOPING AND DOCUMENTING COST ESTIMATES DURING THE FEASIBILITY STUDY	EPA/600/R-03/143
C583	01-Jan-94	METHODS FOR MEASURING THE MEASURING THE TOXICITY AND BIOACCUMULATION OF SEDIMENT-ASSOCIATED CONTAMINANTS WITH FRESHWATER INVERTEBRATES	OSWER 9355.0-75

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Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C584	01-Dec-96	REGION I, EPA-NE DATA VALIDATION FUNCTIONAL GUIDELINES FOR EVALUATING ENVIRONMENTAL ANALYSES	
C585	01-Jan-00	METHODS FOR MEASURING THE TOXICITY AND BIOACCUMULATION OF SEDIMENT-ASSOCIATED CONTAMINANTS WITH FRESHWATER INVERTEBRATES	
C587	01-May-92	SUPPLEMENTAL GUIDANCE TO RAGS: CALCULATIING THE CONCENTRATION TERM	
C588	01-Jul-93	PROVISIONAL GUIDANCE FOR QUANTITATIVE RISK ASSESSMENT OF POLYCYCLIC AROMATIC HYDROCARBONS	
C589	01-Jul-94	REVISED INTERIM SOIL LEAD GUIDANCE FOR CERCLA SITES AND RCRA CORRECTIVE ACTION FACILITIES	
C590	01-Feb-94	GUIDANCE MANUAL FOR THE INTEGRATED EXPOSURE UPTAKE BIOKINETIC MODEL FOR LEAD IN CHILDREN	OSWER 9355.4-12
C591	01-Aug-95	RISK UPDATES NO 3	
C592	01-Nov-96	RISK UPDATES NO 4	
C593	01-Dec-01	RISK ASSESSMENT GUIDANCE FOR SUPERFUND VOLUME I: HUMAN HEALTH EVALUATION MANUAL. PART D. STANDARDIZED PLANNING, REPORTING, AND REVIEW OF SUPERFUND RISK ASSESSMENTS. FINAL	
C594	01-Oct-02	PRELIMINARY REMEDIATION GOALS TABLE REGION 9 TECHNICAL SUPPORT TEAM	
C595	01-May-02	USERS GUIDE FOR THE INTEGRATED EXPOSURE UPTAKE BIOKINETIC MODEL FOR LEAD IN CHILDREN	
C596	01-Dec-02	CALCULATING UPPER CONFIDENCE LIMITS FOR EXPOSURE POINT CONCENTRATIONS AT HAZARDOUS WASTE SITES	
C597	27-Dec-02	NATIONAL RECOMMENDED WATER QUALITY CRITERIA	
C598	01-Jan-03	RECOMMENDATIONS OF THE TECHNICAL REVIEW WORKGROUP FOR LEAD FOR AN APPROACH TO ASSESSING RISK ASSOCIATED WITH ADULT EXPOSURES TO LEAD IN SOIL	
C600	14-Apr-04	RISK-BASED CONCENTRATION TABLE REGION III TECHNICAL GUIDANCE MANUAL RISK ASSESSMENT	

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DOCNUMBER	DOCDATE	Selected Key Guidance Documents TITLE	OSWEREPAID
C601	01-Apr-04	PRO-UCL VERSION 3.0 STATISTICAL SOFTWARE TO COMPUTE UPPER CONFIDENCE LIMITS ON THE UNKNOWN POPULATION MEAN	
C602	01-Jul-04	RISK ASSESSMENT GUIDANCE FOR SUPERFUND VOLUME I: HUMAN HEALTH EVALUATION MANUAL (PART E SUPPLEMENTAL GUIDANCE FOR DERMAL RISK ASSESSMENT) FINAL	
C603	01-Jan-80	AMBIENT WATER QUALITY CRITERIA FOR DDT	
C605	01-Jan-86	UPDATE NUMBER 1 TO QUALITY CRITERIA FOR WATER	
C606	01-Jan-87	UPDATE NUMBER 2 TO QUALITY CRITERIA FOR WATER	
C607	01-Jan-92	WATER QUALITY STANDARDS: ESTABLISHMENT OF NUMERIC CRITERIA FOR PRIORITY TOXIC POLLUTANTS STATES COMPLIANCE	
C608	01-May-92	SUPPLEMENTAL GUIDANCE TO RAGS CALCULATING THE CONCENTRATION TERM	
C610	01-Jan-93	SEDIMENT QUALITY CRITERIA FOR THE PROTECTION OF BENTHIC ORGANISMS: DIELDRIN	
C611	01-Jan-93	SEDIMENT QUALITY CRITERIA FOR THE PROTECTION OF BENTHIC ORGANISMS: ENDRIN	
C612	01-Feb-94	GUIDANCE MANUAL FOR THE INTEGRATED EXPOSURE UPTAKE BIOKINETIC MODEL FOR LEAD IN CHILDREN	
C614	01-Apr-98	GUIDELINES FOR ECOLOGICAL RISK ASSESSMENT	
C615	10-Dec-98	NATIONAL RECOMMENDED WATER QUALITY CRITERIA	
C616	29-Apr-98	AQUIRE - AQUATIC TOXICITY INFORMATION RETRIEVAL DATABASE	
C617	01-Jan-99	DRAFT EQUILIBRIUM-PARTITIONING SEDIMENT GUIDELINES (ESGS) FOR THE PROTECTION OF BENTHIC ORGANISMS: METAL MIXTURES (CADMIUM, COPPER, LEAD, NICKEL, SILVER AND ZINC)	
C620	01-Oct-04	EPA REGION 9 PRELIMINARY REMEDIATION GOALS TABLE	
C621	01-Jan-00	CLOSE OUT PROCEDURES FOR NATIONAL PRIORITIES LIST SITES	
C622	01-Nov-91	A GUIDE TO PRINCIPLE THREAT AND LOW LEVEL THREAT WASTES	OSWER 9320.2-09A-P

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Selected Key Guidance Documents

DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C623	01-May-01	OPERATION AND MAINTENANCE IN THE SUPERFUND PROGRAM	9380.3-06FS
C624	01-Apr-03	TRANSFER OF LONG-TERM RESPONSE ACTION (LTRA) PROJECTS TO STATES	OSWER 9200.1-37FS
C625	01-Dec-95	DETERMINATION OF BACKGROUND CONCENTRATIONS OF INORGANICS IN SOILS AND SEDIMENTS AT HAZARDOUS WASTE SITES	OSWER 9355.0-81FS
C626	30-Apr-96	PROCEDURES FOR PARTIAL DELETIONS AT NPL SITES	EPA/540/S-96/500
C627	01-Jun-01	ECO UPDATE: THE ROLE OF SCREENING-LEVEL RISK ASSESSMENTS AND REFINING CONTAMINANTS OF CONCERN IN BASELINE RISK ASSESSMENTS	EPA 540/R-96/014
C629	01-Dec-05	CONTAMINATED SEDIMENT REMEDIATION GUIDANCE FOR HAZARDOUS WASTE SITES	EPA 540/F-01/014
C630	01-Feb-05	GUIDANCE FOR DEVELOPING ECOLOGICAL SOIL SCREENING LEVELS	EPA-540-R-05-012
C631	01-Jan-05	ECOLOGICAL SOIL SCREENING LEVELS (ECO-SSL) (VARIOUS METALS) GUIDANCE AND DOCUMENTS FOUND AT http://www.epa.gov/ecotox/ecossl/index.html	OSWER 9285.7.5-55
C632	01-Nov-02	OSWER DRAFT GUIDANCE FOR EVALUATING THE VAPOR INTRUSION TO INDOOR AIR PATHWAY FROM GROUNDWATER AND SOILS (SUBSURFACE VAPOR INTRUSION GUIDANCE	
C633	01-Sep-94	DNAPL SITE CHARACTERIZATION	EPA530-D-02-004
C634	12-Apr-06	VAPOR INTRUSION SITE CHARACTERIZATION AND SCREENING - NEWMOA WORKSHOP ON VAPOR INTRUSION	EPA/540/F-94/049
C635	01-Aug-06	DESIGN & INSTALLATION SPECIFICATIONS FOR SUB-SLUB DEPRESSURIZATION SYSTEMS (SSD)	
C636	01-Jan-04	DRINKING WATER HEALTH ADVISORY FOR MANGANESE	
C637	01-Dec-04	2004 EDITION OF THE DRINKING WATER STANDARDS AND HEALTH ADVISORIES	EPA-822-R-04-003
C638	05-Mar-05	SUPPLEMENTAL GUIDANCE FOR ASSESSING SUSCEPTIBILITY FROM EARLY-LIFE EXPOSURE TO CARCINOGENS	EPA-822-R-04-005
C640	07-Jul-95	STANDARDIZING THE DE MIMINIS PREMIUM	

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DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C644	01-Dec-91	RISK ASSESSMENT GUIDANCE FOR SUPERFUND. VOL 1. HUMAN HEALTH EVALUATION MANUAL (PART B, DEVELOPMENT OF RISK-BASED PRELIMINARY REMEDIATION GOALS) INTERIM	
C645	01-Jun-01	GUIDANCE FOR CHARACTERIZING BACKGROUND CHEMICALS IN SOIL AT SUPERFUND SITES EXTERNAL REVIEW DRAFT	OSWER 9285.6-03
C646	07-Oct-99	ISSUANCE OF FINAL GUIDANCE: ECOLOGICAL RISK ASSESSMENT AND RISK MANAGEMENT PRINCIPLES FOR SUPERFUND SITES	OSWER 9285.7-41
C648	01-Mar-73	ECOLOGICAL RESEARCH SERIES: WATER QUALITY CRITERIA, 1972	OSWER 9285.7-28 P
C650	01-Jun-03	EPA NATIONAL PRIMARY DRINKING WATER STANDARDS	
C651	01-Feb-03	HEALTH EFFECTS SUPPORT DOCUMENT FOR MANGANESE	
C652	23-Aug-07	NATIONAL PRIMARY DRINKING WATER REGULATIONS; ARSENIC AND CLARIFICATIONS TO COMPLIANCE AND NEW SOURCE CONTAMINANTS MONITORING	
C654	01-Feb-89	METHODS FOR EVALUATING THE ATTAINMENT OF CLEANUP STANDARDS, VOLUME 1: SOILS AND SOLID MEDIA	
C655	01-Dec-02	SUPPLEMENTAL GUIDANCE FOR DEVELOPING SOIL SCREENING LEVELS FOR SUPERFUND SITES	EPA 230/02-89-042
C658		NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN, CODE OF FEDERAL REGULATIONS (TITLE 40, PART 300), 1985	OSWER 9355.4-24
C659	01-Sep-05	GUIDANCE FOR EVALUATING LANDFILL GAS EMISSION FROM CLOSED OR ABANDONED FACILITIES	
C660	01-Oct-05	A CASE STUDY DEMONSTRATING US EPA GUIDANCE FOR EVALUATING LANDFILL GAS EMISSION FROM CLOSED OR ABANDONED FACILITIES	EPA-600/R-05/123a
C661	01-Sep-02	GUIDANCE FOR COMPARING BACKGROUND AND CHEMICAL CONCENTRATIONS IN SOIL FOR CERCLA SITES	EPA-600/R-05/141
C662	01-Jun-93	TECHNICAL RESOURCE DOCUMENT - SOLIDIFICATION/STABILIZATION AND ITS APPLICATION TO WASTE MATERIALS	EPA-540-R-01-003

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DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C663	01-Sep-96	ROLE OF COST IN THE SUPERFUND REMEDY SELECTION PROCESS	EPA/530/R-93/012
C664	01-Jan-91	COMPLYING WITH LAND DISPOSAL RESTRICTIONS (LDR) FOR CERCLA REMEDIAL ACTIONS INVOLVING CONTAMINATED SOIL AND DEBRIS	EPA-540/F-96/018
C665	01-Jul-89	SUPERFUND LDR GUIDE #2 - COMPLYING WITH THE CALIFORNIA LIST RESTRICTIONS UNDER LAND DISPOSAL RESTRICTIONS (LDRS)	EH-231002/0191A
C668	01-Oct-92	A SUPERFUND GUIDE TO RCRA HAZARDOUS WASTES	OSWER 9347.3-02FS
C669	01-May-90	ARARs Q's & A's - COMPLIANCE WITH THE TOXICITY CHARACTERISTICS RULE: PART 1	OSWER/P9345.3-04FS
C670	14-Oct-98	MANAGEMENT OF REMEDIATION WASTE UNDER RCRA	OSWER/P9234.2-08/FS
C671	01-Jan-05	PROCEDURES FOR THE DERIVATION OF EQUILIBRIUM PARTITIONING SEDIMENT BENCHMARKS FOR THE PROTECTION OF BENTHIC ORGANISMS	EPA530-F-98-026
C688	01-Jan-06	NATIONAL RECOMMENDED WATER QUALITY CRITERIA	EPA-600-R-02-011
C691	01-Aug-97	CLARIFICATION OF THE ROLE OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS IN ESTABLISHING PRELIMINARY REMEDIATION GOALS UNDER CERCLA	
C692	19-Feb-92	PERMITS AND PERMIT EQUIVALENCY PROCESSES FOR CERCLA ON-SITE RESPONSE ACTIONS	OSWER 9200.4-23
C693	01-Jul-91	ARARS Q'S & A'S: GENERAL POLICY, RCRA, CWA, SDWA, POST-ROD INFORMATION AND CONTINGENT WAIVERS	OSWER 9355.7-03
C695	10-May-04	ENGINEERED PASSIVE BIOREACTIVE BARRIERS: RISK MANAGING THE LEGACY OF INDUSTRIAL SOIL AND GROUNDWATER POLLUTION	9234.2-01/FS-A
C698	12-Jun-89	FINAL GUIDANCE ON IMPLEMENTATION OF THE 'CONSISTENCY" EXEMPTION TO THE STATUTORY LIMITS ON REMOVAL ACTIONS	
C699	27-Jan-00	PLACEMENT OF PROCEEDS FROM CERCLA SETTLEMENTS IN SPECIAL ACCOUNTS	9360.0-12A
C700	04-Oct-02	CONSOLIDATED GUIDANCE ON THE ESTABLISHMENT AND USE OF CERCLA SPECIAL ACCOUNTS	

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DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C701	01-Nov-09	UNDERSTANDING THE USE OF MODELS IN PREDICTING THE EFFECTIVENESS OF PROPOSED REMEDIAL ACTIONS AT SUPERFUND SITES	
C702	09-Sep-09	CHANGES TO THE ROLES AND RESPONSIBILITIES OF THE CONTAMINATED SEDIMENTS TECHNICAL ADVISORY GROUP (CSTAG)	
C703	01-Jul-08	USING FISH TISSUE DATA TO MONITOR REMEDY EFFECTIVENESS - SEDIMENT ASSESSMENT AND MONITORING SHEET (SAMS) #1	
C705	01-Mar-04	GUIDELINES FOR THE OSRTI REVIEW OF CONSIDERATION MEMOS ON TIER 1 SEDIMENT SITES	
C706	05-Mar-04	OSRTI SEDIMENT TEAM AND NRRB COORDINATION AT LARGE SEDIMENT SITES	
C707	01-Aug-07	INTEGRATING WATER AND WASTE PROGRAMS TO RESTORE WATERSHEDS: A GUIDE FOR FEDERAL AND STATE PROJECT MANAGERS	
C708	01-May-09	TECHNICAL GUIDE: MONITORED NATURAL RECOVERY AT CONTAMINATED SEDIMENT SITES, ESTCP PROJECT ER-0622, MAY 2009	
C709	01-Sep-08	TECHNICAL GUIDELINES FOR ENVIRONMENTAL DREDGING OF CONTAMINATED SEDIMENTS	
C710	01-Jan-08	THE FOUR RS OF ENVIRONMENTAL DREDGING: RESUSPENSION, RELEASE, RESIDUAL, AND RISK	
C711	01-Jan-07	SEDIMENT DREDGING AT SUPERFUND MEGASITES - ASSESSING THE EFFECTIVENESS	
C713	01-Nov-00	GUIDANCE FOR ASSESSING CHEMICAL CONTAMINANT DATA FOR USE IN FISH ADVISORIES	
C716	01-Jan-02	U.S. EPA OFFICE OF WATER: METHODS FOR COLLECTION, STORAGE AND MANIPULATION OF SEDIMENTS	
C717	01-Jan-00	U.S. EPA OFFICE OF WATER: METHODS FOR SAMPLING AND ANALYZING CONTAMINANTS IN FISH AND SHELLFISH TISSUE	
C718	01-Jan-97	ECOLOGICAL RISK ASSESSMENT GUIDANCE FOR SUPERFUND	
C719	24-Feb-10	ADDITIONAL TOOLS FOR ECOLOGICAL RISK ASSESSMENT	

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DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C720	08-May-98	CONTAMINATED SEDIMENT MANAGEMENT STRATEGY	
C722	27-Oct-90	ISSUANCE OF FINAL GUIDANCE:ECOLOGICAL RISK ASSESMENT AND RISK MANAGEMENT	
C723	01-May-09	TECHNICAL GUIDE: MONITORED NATURAL RECOVERY AT CONTAMINATED SEDIMENT SITES	9285.7-28 P
C724	01-Jun-09	UNDERSTANDING THE USE OF MODELS IN PREDICTING RISK RECUTION OF PROPOSED REMEDIAL ACTIONS AT SUPERFUND SEDIMENT SITES (SEDIMENT ASSESSMENT & MONITORING SHEET #2)	
C730	06-Feb-90	MEMORANDUM OF AGREEMENT BETWEEN THE DEPARTMENT OF THE ARMY AND THE ENVIRONMENTAL PROTECTION AGENCY, THE DETERMINATION OF MITIGATION UNDER THE CLEAN WATER ACT, SECTION 404(B)(1) GUIDELINES	9200.1-96FS
C733	01-Jan-10	SUGGESTED WATER QUALITY TESTING FOR PRIVATE WELLS, ENVIRONMENTAL FACT SHEET	
C735	11/1/1983	DIOXIN WHAT WE KNOW, WHAT WE DON'T KNOW	WD-DWGB-2-1
C736	01-Aug-98	MEMORANDUM: OSWER DIRECTIVE - CLARIFICATION TO THE 1994 REVISED INTERIM SOIL LEAD (Pb) GUIDANCE FOR CERCLA SITES AND RCRA CORRECTIVE ACTION FACILITIES	
C737	9/24/2010	UPDATE ON PROVIDING ALTERNATIVE WATER SUPPLY AS PART OF SUPERFUND RESPONSE ACTIONS	EPA/540/F-98/030
C738	5/1/2008	PARAMETERS AND TESTING FREQUENCY FOR PRIVATE WELLS	OSWER 9355.3-22
C739	10/25/1993	FINAL GUIDANCE ON NUMERIC REMOVAL ACTION LEVELS FOR CONTAMINATED DRINKING WATER SITES	
C740	11/10/1998	RETRANSMITTAL OF THE LATEST SUPERFUND REMOVAL ACTION LEVELS	OSWER 9360.1-02
C741	6/26/2009	SUMMARY OF KEY EXISTING EPA CERCLA POLICIES FOR GROUNDWATER RESTORATION	
C743	12/31/2009	PUBLIC REVIEW DRAFT: DRAFT RECOMMENDED INTERIM PRELIMINARY REMEDIATION GOALS FOR DIOXIN IN SOIL AT CERCLA AND RCRA SITES	OSWER 9283.1-33

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DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C744	4/29/1996	REQUIREMENTS FOR MANAGEMENT OF HAZARDOUS CONTAMINATED MEDIA (40 CFR PARTS 260, 261, 262, 264, 268, 269, 271)	OSWER 9200.3-56
C745	1/8/1985	LISTING BACKGROUND DOCUMENT	
C746	4/10/1984	MEMO: RUN-OFF FROM ACTIVE PORTIONS OF HAZARDOUS WASTE MANAGEMENT UNITS	
C747	1/23/1986	MEMO: REGULATORY INTERPRETATION WITH RESPECT TO LEAKS, SPILLS, AND ILLEGAL DISCHARGES OF LISTED WASTES TO SURFACE WATERS	9411.1986(07)
C748	11/14/1984	LEACHATE AND PRECIPITATION RUN-OFF AT LFs, WASTE PILES, AND LT UNITS	9411.1984(37)
C749	12/5/1997	CLARIFICATION OF STANDARDS FOR HAZARDOUS WASTE LAND DISPOSAL RESTRICATION TREATMENT VARIANCES (FEDERAL REGISTER: VOL 62, NO. 234)	
C750	12/21/1988	NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN (53 FED. REG. 51394 1988)	
C751	7/1/2011	GROUNDWATER ROAD MAP: RECOMMENDED PROCESS FOR RESTORING CONTAMINATED GROUNDWATER AT SUPERFUND SITES	OSWER 9288.1-34
C752	12/1/2004	A SUMMARY OF RHODE ISLAND GROUNDWATER CLASSIFICATION	
C753	9/15/1995	MEMO: CONTAINED-IN POLICY, AREAS OF CONTAMINATION (AOCs) AND REMEDIATION WASTE (FB 11948, RPPC 9441.1995(32), SOC 1995-23.5)	9441.1995(32)
C754	3/25/1996	LETTER: USE OF THE AREA OF CONTAMINATION (AOC) CONCEPT (FB 11970, RPPC 9502.1996(02), SOC 1996-2b)	9502.1996(02)
C755	1/8/1997	MEMO: USE OF SITE-SPECIFIC LAND DISPOSAL RESTRICTION TREATABILITY VARIANCES UNDER 40 CFR 268.44(H) DURING CLEANUPS	
C756	01/01/1111	VARIANCE ASSISTANCE DOCUMENT: LAND DISPOSAL RESTRICTIONS TREATABILITY VARIANCES & DETERMINATIONS OF EQUIVALENT TREATMENT	
C757	9/1/2005	INTRODUCTION TO LAND DISPOSAL RESTRICTIONS (40 CFR PART 268)	EPA530-K-05-013
C758	12/1/1999	LAND DISPOSAL RESTRICTIONS FOR HAZARDOUD WASTES	EPA530-99-043

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DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C759	7/1/2002	GUIDANCE ON DEMONSTRATING XOMPLIANCE WITH THE LAND DISPOSAL RESTRICTIONS (LDR) ALTERNATIVE SOIL TREATMENT STANDARDS	EPA530-R-02-003
C760	5/9/2011	FACT SHEET ON THE MANAGEMENT OF DIOXIN CONTAMINATED SOILS	
C761	10/15/1996	NATIONAL HISTORIC PRESERVATION ACT OF 1996, AS AMENDED THROUGH 2000 WITH ANNOTATIONS	
C762	9/1/1999	RISK UPDATES	
C763	Sep-00	EXPOSURE AND HUMAN HEALTH REASSESSMENT OF 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD) AND RELATED COMPOUNDS, DRAFT	EPA/600/P-00/001Bb
C764	12/5/2003	HUMAN HEALTH TOXICITY VALUES IN SUPERFUND RISK ASSESSMENTS	OSWER No. 9285.7-53
C765	Mar-05	GUIDELINES FOR CARCINOGEN RISK ASSESSMENT, RISK ASSESSMENT FORUM	EPA/630/P-03/001F
C766	Dec-10	RECOMMENDED TOXICITY EQUIVALENCE FACTORS (TEFS) FOR HUMAN HEALTH RISK ASSESSMENTS OF 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN AND DIOXIN-LIKE COMPOUNDS	EPA/100/R/ 10/005
C767	5/31/2001	DIOXIN REASSESSMENT - AN SAB REVIEW OF THE OFFICE OF RESEARCH AND DEVELOPMENT'S REASSESSMENT OF DIOXIN, REVIEW OF THE REVISED SECTIONS (DOSE RESPONSE MODELING, INTEGRATED SUMMARY, RISK CHARACTERIZATION, AND TOXICITY EQUIVALENCY FACTORS) OF THE EPA'S REASSESSMENT OF DIOXIN BY THE DIOXIN REASSESSMENT REVIEW SUBCOMMITTEE OF THE EPA SCIENCE ADVISORY BOARD (SAB	EPA-SAB-EC-01-006
C768	1/28/2009	PART F, SUPPLEMENTAL GUIDANCE FOR INHALATION RISK ASSESSMENT	EPA-540-R-070-002, OSWER 9285.7-82
C769	7/7/2006	REVIEW, THE 2005 WORLD HEALTH ORGANIZATION REEVALUATION OF HUMAN AND MAMMALIAN TOXIC EQUIVALENCY FACTORS FOR DIOXIN AND DIOXIN-LIKE COMPOUNDS, TOXICOLOGICAL SCIENCES	
C770	Dec-98	TOXICOLOGICAL PROFILE FOR CHLORINATED DIBENZO-P-DIOXINS	
C771	Nov-00	TOXICOLOGICAL PROFILE FOR POLYCHLORINATED BIPHENYLS (PCBS	

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DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C772	Sep-02	TOXICOLOGICAL PROFILE FOR ALDRIN AND DIELDRIN	
C773	4/10/2009	TECHNICAL LETTER, GUIDELINES FOR LANDSCAPE PLANTING AND VEGETATION MANAGEMENT AT LEVEES, FLOODWALLS, EMBANKMENT DAMS, AND APPURTENANT STRUCTURES	ETL 1110-2-571
C774	Mar-06	LEVEE OWNER'S MANUAL FOR NON-FEDERAL FLOOD CONTROL WORK	
C775	Jan-03	EVALUATION OF DREDGED MATERIAL PROPOSED FOR DISPOSAL AT ISLAND, NEARSHORE, OR UPLAND CONFINED DISPOSAL FACILITIES - TESTING MANUAL	
C776	Aug-01	SUBAQUEOUS CAP DESIGN: SELECTION OF BIOTURBATION PROFILES, DEPTHS, AND PROCESS RATES	
C777	May-99	NEW BEDFORD HARBOR SUPERFUND PILOT STUDY, EVALUATION OF DREDGING AND DREDGED MATERIAL DISPOSAL	
C778	3/25/2003	DREDGING AND DREDGED MATERIAL DISPOSAL	EM 1110-2-5025
C779	2/19/2003	TRANSMITTAL OF DRAFT GUIDANCE "INSTITUTIONAL CONTROLS: A GUIDE TO IMPLEMENTING, MONITORING, AND ENFORCING INSTITUTIONAL CONTROLS AT SUPERFUND, BROWNFIELDS, FEDERAL FACILITY, UST AND RCRA CORRECTIVE ACTION CLEANUP" FOR REVIEW	
C780	Jul-99	PROPOSED PLAN FOR THE MARINE OPERABLE UNIT "WARD COVE SEDIMENT REMEDIATION PROJECT	
C781	Jan-98	ON-SITE INCINERATION AT THE BAIRD AND MCGUIRE SUPERFUND SITE, HOLBROOK, MASSACHUSETTS	
C782	Mar-98	ON-SITE INCINERATION: OVERVIEW OF SUPERFUND OPERATING EXPERIENCE	EPA/542/R-97/012
C783	Jun-93	SELECTING REMEDIATION TECHNIQUES FOR CONTAMINATED SEDIMENT	EPA/823/B-93/001
C784	May-04	EVALUATING ENVIRONMENTAL EFFECTS OF DREDGED MATERIAL MANAGEMENT ALTERNATIVES - A TECHNICAL FRAMEWORK,	EPA842-B-92-008
C785	Jun-02	2002 EDITION OF THE DRINKING WATER STANDARDS AND HEALTH ADVISORIES	EPA 822-R-02-038
C786	Dec-98	COLUMBIA RIVER BASIN FISH CONTAMINANT SURVEY 1996-1998	EPA 910-R-02-006

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DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C787	Oct-00	MERCURY IN THE ENVIRONMENT	
C788	12/31/2009	EPA SEEKS PUBLIC INPUT ON INTERIM GUIDANCE FOR DIOXINS IN SOIL CLEANUP GOALS	
C789	7/29/1992	ARARS EXPLAINED IN TWELEVE PAGES	
C790	Jun-98	RCRA, SUPERFUND & EPCRA HOTLINE TRAINING MODULE	EPA540-R-98-020, OSER9205.5-10A
C792	5/1/2010	SOFTWARE FOR CALCULATING UPPER CONFIDENCE LIMITS. PROUCL VERSION 4.1.00. TECHNICAL SUPPORT CENTER FOR MONITORING AND SITE CHARACTERIZATION	
C793	1/1/1992	A STAGE 1A CULTURAL RESOURCES SURVEY OF PINE STREET CANAL SUPERFUND SITE	
C794	1/1/2004	HISTORY OF THE STATE OF RHODE ISLAND WITH ILLUSTRATIONS	
C795	4/1/1978	HISTORIC AND ARCHITECTURAL RESOURCES OF NORTH PROVIDENCE, RHODE ISLAND: A PRELIMINARY REPORT	
C796	1/1/1909	ANNALS OF CENTERDALE IN THE TOWN OF NORTH PROVIDENCE, RHODE ISLAND: ITS PAST AND PRESENT 1636-1909	
C797	1/1/1996	NORTH PROVIDENCE	
C798	1/1/1991	A HANDBOOK OF INDIAN ARTIFACTS FROM SOUTHERN NEW ENGLAND	
C799	1/1/1978	AN INVENTORY OF HISTORIC ENGINEERING AND INDUSTRIAL SITES	
C800	1/1/1989	RHODE ISLAND HISTORICAL PRESERVATION COMMISSION (RIHPC) 1989 RHODE ISLAND HISTORIC PRESERVATION PLAN.	
C801	1/1/1971	NATIONAL REGISTER OF HISTORIC PLACES INVENTORY - NOMINATION FORM, ALLENDALE MILL, CENTREDALE, RHODE ISLAND	
C802	11/1/2010	REGIONAL SCREENING LEVELS FOR CHEMICAL CONTAMINANTS AT SUPERFUND SITES	
C803	2/7/2003	STABLE LEAD ISOTOPES, CONTAMINANT METALS AND RADIONUCLIDES IN UPPER HUDSON RIVER SEDIMENT CORES: IMPLICATIONS FOR IMPROVED TIME STRATIGRAPHY AND TRANSPORT PROCESSES	
C804	1/1/2003	BIOGEOCHEMISTRY OF NONYLPHENOL ETHOXYLATES IN URBAN ESTUARINE SEDIMENTS	

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DOCNUMBER	DOCDATE	TITLE	OSWEREPAID
C805	6/1/1999	ARTICLE FROM CHEMOSPHERE - UPTAKE RATES OF SEMIPERMEABLE MEMBRANE DEVICES (SPMDS) FOR PCDDS, PCDFS, AND PCBS IN WATER AND SEDIMENT	
C806	1/1/2001	SUMMARY OF ARTICLE ABSTRACTS FROM 1972-2003 RELATING TO ECOLOGICAL ASSESSMENT OF BATS	
C807	3/23/2007	DRAFT INTERIM REGIONAL SUPERFUND REMEDIAL VAPOR INTRUSION APPROACH	
C808	2/4/2004	MODIFIED POLYTOPIC VECTOR ANALYSIS TO IDENTIFY AND QUANTIFY A DIOXIN DECHLORINATION SIGNATURE IN SEDIMENTS. 1. THEORY	
C809	7/7/2006	REVIEW 2005 WORLD HEALTH ORGANIZATION (WHO) REEVALUATION OF HUMAN AND MAMMALIAN TOXIC EQUIVALENCY FACTORS FOR DIOXINS AND DIOXIN-LIKE COMPOUNDS	
C810	3/5/2004	GUIDANCE THAT PROVIDES ADDITIONAL INFORMATION ON THE OFFICE OF SUPERFUND REMEDIATION AND TECHNOLOGY INNOVATION (OSRTI) SEDIMENT TEAM AND NATIONAL REMEDY REVIEW BOARD (NRRB) COORDINATION AT LARGE SEDIMENTS SITES	
C811	1/1/1993	SOURCE OF GEOLOGICAL AND HYDROLOGIC INFORMATION PERTINENT TO GROUNDWATER RESOURCES IN RHODE ISLAND	
C812	12/1/2006	RIDEM FECAL COLIFORM BACTERIA AND DISOLVED METALS, TOTAL MAXIMUM DAILY LOADS (TMDL)	
C813	7/1/2006	ITRC TECHNICAL AND REGULATORY GUIDANCE - PLANNING AND PROMOTING ECOLOGICAL LAND REUSE OF REMEDIATED SITES	
C814	1/1/2004	ITRC WHITE PAPER AND CASE STUDY - MAKING THE CASE FOR ECOLOGICAL ENHANCEMENTS	
C815	7/26/2005	EPA NCEA - DATABASE OF SOURCES OF ENVIRONMENTAL RELEASES OF DIOXIN-LIKE COMPOUNDS IN THE UNITED STATES	

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DOCNUMBER	DOCDATE	Selected Key Guidance Documents TITLE	OSWEREPAID
C816	10/9/2006	DESORPTION AND RELEASE OF DISSOLVED AND BIOAVAILABLE SEDIMENT CONTAMINANTS DURING RESUSPENSION EVENTS: AN OVERVIEW OF PRINCIPLES, OBSERVATIONS AND MODELS	
C817	7/1/2007	NATIONAL MANAGEMENT MEASURES TO CONTROL NONPOINT SOURCE POLLUTION FROM HYDROMODIFICATION - EPA 841-B-07-002	
C818	1/1/2008	FOUR RS OF ENVIRONMENTAL DREDGING: SESUSPENSION, RELEASE, RESIDUAL, AND RISK	
C819	7/3/2008	RESPONSE TO REGIONAL REQUEST REGARDING SEDIMENT CLEANUP AT 05/2008 SUPERFUND DIVISION DIRECTORS MEETING, OSWER DIRECTIVE 9200.1-90 (SUPPORTING DOCUMENTATION ATTACHED)	
C820	3/18/2008	JOURNAL ARTICLE: RAPID DECHLORINATION OF POLYCHLORINATED DIBENZO-P-DIOXINS BY BIMETALLIC AND NANOSIZED ZEROVALENT IRON (ENVIRONMENTAL SCIENCE & TECHNOLOGY, VOL. 42, NO. 11, 2008)	
C821	2/1/2008	JOURNAL ARTICLE: AN ENZYME-LINKED IMMUNOSORBENT ESSAY FOR THE DETERMINATION OF DIOXINS IN CONTAMINATED SEDIMENT AND SOIL SAMPLE	
C822	3/1/2008	JOURNAL ARTICLE: DOWN WITH THE DAMS: UNCHAINING U.S. RIVERS	
C823	1/1/2009	FRAMEWORK FOR LONG-TERM MONITORING OF HAZARDOUS SUBSTANCES AT SEDIMENT SITES	
C824	3/2/2011	RESEARCH BRIEF 195: MECHANISM OF RESISTANCE TO PCB TOXICITY IN FISH	
C825	11/30/2010	FINAL REPORT, BIOAVAILABILITY OF DIOXINS AND DIOXIN-LIKE COMPOUNDS IN SOIL	
C826	11/1/2010	REGIONAL SCREENING LEVELS FOR CHEMICAL CONTAMINANTS AT SUPERFUND SITES, EPA OFFICE OF SUPERFUND. NOVEMBER	
C827	1/1/1994	ASSESSMENT AND REMEDIATION OF CONTAMINATED SEDIMENTS (ARCS) PROGRAM - REMEDIATION GUIDANCE DOCUMENT	EPA 905-B94-003
C828	10/1/2002	RISK BASED CONCENTRATION TABLE	

EPA Guidance Documents may be reviewed at the OSRR Records and Information Center in Boston, MA

DOCNUMBER	DOCDATE	Selected Key Guidance Documents TITLE	OSWEREPAID
C829	1/1/1994	ASSESSMENT AND REMEDIATION OF CONTAMINATED SEDIMENTS (ARCS) PROGRAM - REMEDIATION GUIDANCE DOCUMENT	EPA 905-B94-003
C867	9/1/1994	SEMINAR PUBLICATION: DESIGN, OPERATION, AND CLOSURE OF MUNICIPAL SOLID WASTE LANDFILLS	EPA/625/R-94/008
C898	9/2/1987	WASTEWATERS EXCLUSION FROM THE DEFINITION OF F021 FOR PCP MANUFACTURE, 9444.1987 (39)	
C899	1/1/1986	WASTES COVERED UNDER THE DIOXIN LISTING, 9444.1986 (23)	
C900	3/26/1991	CONTAINED IN POLICY, 9441.1991 (04)	
C901	5/26/1998	PREAMBLE TO AMENDED RCRA REGULATIONS - LDR TREATMENT STANDARDS FOR SOIL	
C902	1/14/1985	HAZARDOUS WASTE MANAGEMENT SYSTEM, DIOXIN-CONTAINING WASTES	
C903	12/24/1992	CLARIFICATION ON WHAT CONSTITUTES DIOXIN RELATED MATERIALS, PPC 9444.1992 (09)	
C904	4/4/1983	HAZARDOUS WASTE MANAGEMENT SYSTEM: IDENTIFICATION AND LISTING OF HAZARDOUS WASTE;STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES; INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS FOR HAZARDOUS WASTE TREATMENT, STORAGE AND DISPOSAL FACILITIES; AND STORAGE AND DISPOSAL OF WASTE MATERIAL; PROHIBITION OF DISPOSAL OF TETRACHLORODIBENZO-P-DIOXIN	