REGION 1

# HATHEWAY & PATTERSON SUPERFUND SITE
# RECORD OF DECISION SUMMARY
Mansfield-Foxborough, MA.

September 30, 2005

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# DECLARATION FOR THE RECORD OF DECISION

## A. SITE NAME AND LOCATION

**Hatheway & Patterson Superfund Site**
**Mansfield/Foxborough, Massachusetts**
**EPA Site ID Code: MAD001060805**
**Lead Agency: US Environmental Protection Agency**
**Support Agency: Massachusetts Department of Environmental Protection**
**Source of Funding: Fund Lead**

## B. STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Hatheway & Patterson Site, in Mansfield/Foxborough, MA, 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 Deputy Director of the Office of Site Remediation and Restoration (OSRR) has been delegated the authority to approve this Record of Decision (ROD).

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 Mansfield Public Library and at the United States Environmental Protection Agency (EPA) Region 1 OSRR Records Center in Boston, Massachusetts. The Administrative Record Index (Appendix E) identifies each of the items comprising the Administrative Record upon which the selection of the remedial action is based.

The Massachusetts Department of Environmental Protection has concurred with the Selected Remedy (Appendix A).

## 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 Hatheway & Patterson Superfund Site, addresses current and future risks due to direct contact and incidental ingestion of soil and risks to future users of groundwater. Soils contaminated with arsenic and pentachlorophenol will be excavated and stabilized/solidified if found to be leachable, while soils contaminated with dioxin and free product (Light Non-Aqueous Phase Liquid" or "LNAPL") will be disposed of at a licensed off-site facility. Groundwater risks are addressed through the use of institutional controls that restrict the installation of potable supplies at the Site, as well as monitoring.

This remedy addresses principal threats due to soils exposure and potential releases of contaminants from soils to other media such as groundwater and surface water. Soils containing arsenic and pentachlorophenol (PCP) will be addressed through treatment by stabilization/solidification and on-site consolidation under a low-permeability cap; soils above cleanup levels for Light Non-Aqueous Phase Liquids (LNAPL) and dioxin will be disposed of off-site. Institutional controls are being used to control exposures to groundwater and soils through land use controls.

The selected remedy is a comprehensive approach for this Site that addresses all current and potential future risks caused by soil and groundwater contamination. Specifically, this remedial action addresses soil and groundwater contamination above cleanup levels within the Site boundary.

The plan is based on a future use scenario of commercial/open space for the Mansfield portion of the Site and a smaller area for residential use in Foxborough. The plan also assumes that groundwater at the Site is not available for drinking water by future users of the Site, and therefore, no active cleanup measures are planned for groundwater under the Site**.**

The remedial measures will prevent exposure to receptors from soils and groundwater at the Site in accordance with the Remedial Action Objectives (RAOs) as described in Section H and will allow for restoration of the Site to its beneficial uses as described in Section F.

The major components of this remedy are:

- Approximately 31,000 cubic yards of soil exceeding cleanup levels will be excavated.
- The buildings in and near Hatheway & Patterson's former manufacturing area will be demolished to allow excavation of underlying contaminated soils. Excavated soil will be replaced with clean backfill.
- Soils containing pentachlorophenol (PCP), semi-volatile organic compounds (SVOCs), and arsenic will be excavated, tested for leachability and, if they fail, stabilization/solidification agent(s) will be utilized. The stabilized/solidified soils will then be consolidated on-site under a low-permeability cover.
- Soils containing dioxin and oily material (LNAPL) will be disposed of off-site at a licensed facility.
- Institutional controls will prohibit the use of Site groundwater and restrict land uses in a manner that ensures the protectiveness of the remedy as described in this ROD, and ensures the integrity of the on-site low-permeability cover and other remedial

components. Risks from soil exposures within the area of the existing railroad right of way will be evaluated during design and appropriate action such as deed restrictions or other legal and administrative measures will be implemented if necessary.

- Long term monitoring of groundwater, surface water, fish tissue and sediment.
- Five-year reviews, and operation and maintenance of remedial components, including the low permeability cover

This is the final Record of Decision (ROD) at this Site. In conjunction with the previously completed removal actions at the Site, the ROD is intended to provide a comprehensive remedy for the Site.

## E. ROD DATA CERTIFICATION CHECKLIST

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

Chemicals of concern (COCs) and their respective concentrations

Baseline risk represented by the COCs

Cleanup levels established for COCs and the bases for the levels

Current and future land and ground-water use assumptions used in the baseline risk assessment and ROD

Land and groundwater use that will be available at the Site as a result of the selected remedy

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

Decisive factor(s) that led to selecting the remedy

## F. 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 (ARARs); is cost-effective; and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

This remedy also partially 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 (groundwater and/or land use restrictions are necessary), a review will be conducted within five years after initiation of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

G. AUTHORIZING SIGNATURES

This ROD documents the selected remedy for soil and groundwater at the Hatheway & Patterson Site. This remedy was selected by EPA's Region I-New England office; with concurrence of the Massachusetts Department of Environmental Protection.

Concur and recommended for immediate implementation:

U.S. Environmental Protection Agency

By: ______________________ Date: 9-30-05

**Richard Cavagnero,**
**Deputy Director**
**Office of Site Remediation and Restoration**
**Region 1**

## A. SITE NAME, LOCATION AND BRIEF DESCRIPTION

- **Name and location: Hatheway & Patterson Superfund Site, Mansfield/Foxborough, MA.**
- **National Superfund electronic database identification number: MAD001060805**
- **Lead entity: United States Environmental Protection Agency**
- **Site type: former wood treatment facility**

The Hatheway & Patterson Superfund Site, a former wood treatment facility, is located on 35 County Street in Mansfield, Bristol County, Massachusetts. Approximately 36 of the 38.17-acre Site are located in the Town of Mansfield. The remaining 1.77 acres are located in the Town of Foxborough. The Site is bisected by the Rumford River, which runs north to south, and by a railroad right-of-way, which runs east to west, dividing the Site into four quadrants. The northeast and northwest quadrants are referred to as the "Process Area", the southeast and southwest quadrant (""SE/SW Quadrant") is the area south of the Rumford River, and the "County Street area" lies north of the Site fence in the northeast and northwest quadrants (see Figure B-1). Much of the southwestern portion of the Site is covered by wetlands, and several potential vernal pool like habitats exist in this area. The southerly section of the Site is bounded by the Rumford River backwash channel. The Site contains four buildings, a concrete pit/sump, several pilings from demolished wood storage structures, and some decommissioned above-ground tanks.

A more complete description of the Site can be found in Section 3 of the Remedial Investigation Report (TRC, Inc, 2005).

## B. SITE HISTORY AND ENFORCEMENT ACTIVITIES

### 1. History of Site Activities

Initially, the Hatheway & Patterson property consisted only of the land between County Street and the railroad tracks, and the land from the present eastern property boundary to approximately the Rumford River (See Figure B-1). The land west of the Rumford River was owned by the Penn Central Railroad, who used it for bulk chemical transfer and storage of electric/utility poles and railroad ties. This piece of land was purchased by Hatheway & Patterson in 1978. The land south of the railroad tracks was purchased by Hatheway & Patterson in 1981. This portion of land was apparently not used between 1955 and 1971, but prior to 1955 the area was reportedly used for coal storage.

Operations at the Site included the preservation of wood sheeting, planking, timber, piling, poles and other wood products. Reports indicate that Hatheway & Patterson began operations at the Site in 1927, but that wood treating did not begin until 1953. It is unknown what operations might have been conducted on Site between 1927 and 1953.

Wood treatment was accomplished by a variety of methods that changed over time. From 1953 through 1958, a solution of pentachlorophenol (PCP) in fuel oil, or creosote, was used for dipping lumber. After dipping, excess chemicals were allowed to drip off of the treated wood onto the ground surface. From 1958 through 1974, solutions of PCP in fuel oil and fluoro-chrome-arsenate-phenol (FCAP) salts in water were used in a pressure treatment process. From 1960 through 1984, PCP in mineral spirits was also used to pressure-treat lumber. From 1974 to 1984, operations incorporated PCP in fuel oil and chromated copper-arsenate (CCA) salts in water. From 1984 until operations ceased in 1993, solutions of CCA salts in water and PCP in water were utilized at the property. Wood was also infused with fire retardants including Dricon™ (boric acid and anhydrous sodium tetraborate). The various wood-treating chemicals were stored in aboveground storage tanks (ASTs), underground storage tanks (USTs), and sumps located inside and outside of the former process buildings (MADEP, 1994).

A more detailed description of the Site history can be found in Section 1.2.4 of the Remedial Investigation Report.

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

***State Actions***

In 1972, a tar seep (approximately 62 feet long and 6 inches thick) was discovered on the banks of the Rumford River on the southern portion of the property (exact location unknown) by representatives of the Town of Mansfield and the Massachusetts Department of Environmental Quality Engineering (MADEQE), predecessor to the Massachusetts Department of Environmental Protection (MADEP). Additionally, "oily water" and dead fowl were reported in Fulton Pond (the Rumford River discharges into and exits Fulton Pond downstream of the property). Subsequently, MADEQE and the Town of Mansfield requested that Hatheway & Patterson contain the "oily seepage", which appeared to originate from the eastern bank of the Rumford River adjacent to the Hatheway & Patterson Company (HPC) property (DynCorp, 2001).

Hatheway & Patterson took steps to control the "oily seepage" with deep water booms and sorbents. In 1973, test wells, as well as a collection pit and a collection trench, were installed to pump oil-contaminated groundwater. By the summer of 1973, oil seepage reportedly ceased; however, later in the year, seepage appeared farther downstream. As a result, Hatheway & Patterson installed a treated plywood bulkhead to trap the seepage and continued removing oil with sorbents. In 1974, an "L-shaped non-permeable" barrier was installed with four recovery pits along the River. Groundwater pumping operations were conducted from approximately 1973 through 1982 (DynCorp, 2001).

In 1981, an "oily seepage" was again observed in the Rumford River. A prospective buyer of the property conducted soil and groundwater sampling on the property. Analyses of the samples revealed "oily soils and/or oily groundwater." As of 1982, approximately 2,500 gallons of oil had been recovered through the groundwater pumping operations (DynCorp, 2001).

In May 1987, following an on-site reconnaissance, MADEQE issued a Notice of Noncompliance (NON) letter to Hatheway & Patterson. The NON required Hatheway & Patterson to complete a Phase I Initial Site Investigation (Phase I) pursuant to Massachusetts General Law (MGL), Chapter 21 E, Sections 4 and 5 (DynCorp, 2001).

In November 1987, Keystone Environmental Resources, Inc. (Keystone) of Monroeville, Pennsylvania conducted a Soils and Hydrogeologic Investigation (i.e., a Phase I) of the property. The investigation consisted of 11 soil borings on the property and nine monitoring wells (DynCorp, 2001).

Keystone collected 18 soil samples from various depth intervals. All of the soil samples were analyzed using EPA laboratory methods. Three volatile organic compounds (VOCs), 16 polycyclic aromatic hydrocarbons (PAHs), 12 phenolic compounds, and three metals were detected in the soil samples (DynCorp, 2001).

Two rounds of groundwater sampling (January and March 1988) were also completed as part of the Phase I. Three surface water samples were also collected from the Rumford River. (DynCorp, 2001).

Laboratory analysis of the groundwater samples revealed the presence of 17 PAHs and 12 phenolic compounds. VOCs including xylenes, 1,4-dichlorobenzene, and ethyl benzene, and metals including arsenic, chromium, and copper were also detected in the groundwater samples. Benzene and phenol were detected in surface water samples collected above-plant and below-plant, respectively (DynCorp, 2001).

As a result of groundwater pumping by Hatheway & Patterson in the mid-1970s, several drums of recovered oil were stored on the property along the east bank of the Rumford River, approximately 175 ft south of the railroad tracks. According to Keystone, at an unknown date, vandals reportedly shot holes in the drums, tipped the drums over, and allowed the oils to seep into the ground and the River (DynCorp, 2001).

After review of the Phase I report, MADEQE issued a Notice of Responsibility (NOR) letter to Hatheway & Patterson in August 1988. The NOR required Hatheway & Patterson to complete a Phase II Site Investigation (Phase II), a Risk Assessment, and an alternative evaluation (DynCorp, 2001).

In late 1988 and early 1989, on behalf of Hatheway & Patterson, Keystone performed a Phase II investigation of the property. The investigation consisted of six more soil borings, seven more monitoring wells, as well as installing two piezometers (P-1 and P-2, not found during RI investigations) and one pump test well (PW-001) (DynCorp, 2001).

A total of 14 soil samples were collected from various depth intervals during soil boring advancement, and monitoring well, piezometer, and pump test well installation. Three groundwater sampling rounds were conducted in February, March, and April 1989 as part of the Phase II. In addition, Keystone collected three surface water samples, and nine sediment samples from areas north and south of the Rumford River backwash channel (DynCorp, 2001).

Laboratory analysis of the soil and groundwater samples revealed the presence of VOCs, phenolic compounds, PAHs, chromium, copper, and arsenic. Phenolic compounds and PAHs were also detected in surface water and sediment samples. The only VOC detected in the sediment samples was toluene, which was present in all the sediment samples. No VOCs were detected in the surface water samples (DynCorp, 2001).

In June 1990, after a period of heavy rainfall, "oily seepage" was again reported on the Rumford River in the vicinity of the HPC property. As a result, the Massachusetts Department of Environmental Protection (MADEP), formerly MADEQE, issued a Request for Short Term Measure letter to Hatheway & Patterson to address the imminent hazard to the Rumford River area caused by on-site operations (DynCorp, 2001).

In the fall of 1990, Keystone conducted a short-term measure investigation. The investigation included the "sampling of the worst-case visibly stained soil along the river bank". Keystone reported that the results of the analyses indicated that the major constituent of the seepage to the River were semivolatile organic compounds (SVOCs). Oil and odors were also reported in some of the soil samples (DynCorp, 2001).

In September 1991, Hatheway & Patterson constructed a collection trench along the eastern bank of the Rumford River. Contaminated groundwater recovered from this trench was used by HPC as process make-up water. The collection trench was designed to intercept groundwater and oils migrating to the River from the oil-contaminated portion of the River bank. Some soil was excavated and stockpiled on Site (DynCorp, 2001).

In February 1992, Penney Engineering, Inc. (Penney) of Mansfield, Massachusetts began monthly monitoring of the collection trench. Penney retrofitted the trench to include a groundwater treatment system consisting of activated carbon canisters prior to discharging the groundwater to the Rumford River (DynCorp, 2001).

In January 1993, MADEP conducted an inspection of the property, and reported observing petroleum product flowing from the River bed into the River, a release of oil into nearby wetlands, and free-floating product in the wetlands. As a result, MADEP requested HPC to conduct an additional assessment and develop plans for corrective action at the property (DynCorp, 2001).

In February 1993, Hatheway & Patterson filed for bankruptcy protection. In April 1993,

manufacturing operations ceased at the property. The HPC facility closed on May 21, 1993, leaving wood-treatment chemicals and sludge in ASTs, UST sumps and drums at the abandoned property (DynCorp, 2001).

***Federal Actions***

In March 1992, two RCRA inspections were conducted at the property to determine compliance with RCRA drip pad standards. The inspections revealed that drip pads were riddled with cracks, seams, gaps, and corroded areas in the concrete, and that portions of the drip pads were not curbed or bermed. The inspection concluded that these drip pads were not in compliance with RCRA regulations (DynCorp, 2001).

On June 22, 1993, EPA Region I Emergency Planning and Response Branch (EPRB), MADEP, and Weston personnel initiated a Preliminary Assessment/Site Investigation (PA/SI) at the HPC property. (DynCorp, 2001).

On July 15, 1993, the groundwater treatment system operations were terminated. At that time it was concluded by MADEP that the groundwater, surface water, and River sediments were contaminated with PCP. MADEP also determined that a PCP- and CCA-contaminated groundwater plume was moving south into the adjacent wetlands and the Rumford River backwash channel. In addition, non-aqueous phase liquid (NAPL) was observed in monitoring wells that had previously been free of NAPL (DynCorp, 2001).

On December 7, 1993, based on the results of the PA/SI, EPA initiated an Emergency Removal Action, due to the presence of ASTs and USTs containing hazardous wastes located inside and outside the buildings, and the possibility of a release if the tanks and/or pipelines froze and ruptured during cold weather (DynCorp, 2001).

Activities conducted during the emergency removal included the characterization of chemical wastes (Dricon™, CCA, and PCP) stored in the ASTs, USTs, vessels, and drums on the property. A total of 32 ASTs and USTs were identified on the property. Sludge samples collected from the ASTs and USTs revealed the presence of six VOCs, five SVOCs, 11 metals, dioxin/furan congeners, pesticides and polychlorinated biphenyls (PCBs). All virgin wood-treating solutions were shipped to other wood-treating facilities. Approximately 100,000 gallons of liquid and solid wood-treating wastes were drummed and/or pumped into tank trucks and shipped to appropriate hazardous waste disposal facilities (DynCorp, 2001).

On December 12, 1993, the HPC property was added to the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database (DynCorp, 2001).

A comprehensive surface soil investigation was also conducted as part of the emergency removal in 1995. Soil samples were collected from a variety of areas on the property and screened on site

for arsenic. Based on the elevated concentrations of arsenic detected, several areas of the property received temporary geotextile/gravel and/or asphalt cover (DynCorp, 2001).

Additional operations conducted as part of the emergency removal included repair and installation of fencing around the perimeter of the property, installation of locks to manways of tanks, and installation of locks to on-site buildings. Operations continued until September 1995. Following the emergency removal, MADEP assumed oversight of the property (DynCorp, 2001).

An April 1998 on-site reconnaissance of the property noted the presence of stained drip pads, oily sheens in the River, and oily outbreaks in the soil in the southern portion of the property, and a deteriorating plastic cover on a soil pile. MADEP personnel collected six samples from the property in June, from groundwater, surface water, sediment from the Rumford River adjacent to the concrete retaining wall, soil/sediment from an oily seep outbreak area along the southern fill line, and surficial soil. Analytical data from these samples indicated elevated levels of dioxins and furans in sediment (DynCorp, 2001).

On October 16, 1998, EPA collected 12 sediment samples and five surface water samples from the Rumford River at locations upstream, adjacent, and downstream of the property, including Fulton Pond and Kingman Pond. The samples were collected to determine if there had been any migration of hazardous substances from the property to surface water. In addition, EPA collected six surficial soil samples from the property (DynCorp, 2001).

One SVOC, 16 dioxin/furan congeners, and two metals were detected in sediment samples; five dioxin/furan congeners were detected in surface water samples; and five SVOCs, 16 dioxin/furan congeners, and five metals were detected in soil samples (DynCorp, 2001).

On November 23 1998, EPA collected seven fish tissue samples from the Rumford River (downstream of the HPC property) to determine the potential for bioaccumulation of PCP, dioxin/furan congeners, and arsenic in fish tissue. PCP and a total of seven dioxin/furan congeners were detected in the fish tissue samples. Arsenic was not detected in any of the fish tissue samples (DynCorp, 2001).

In 2000, the Town of Mansfield conducted an environmental investigation at the Site (performed by Resource Controls) under a grant from EPA's Brownfields Pilot Program. The study included installation of nine overburden groundwater monitoring wells, two bedrock groundwater monitoring wells, sampling of surface water, sediment, soil and groundwater. Findings confirmed earlier studies indicating dioxin, arsenic and PCP contamination in surface soil, LNAPL (Light, Non-Aqueous Phase Liquid)[1] south of the railroad tracks, groundwater

contamination including arsenic and PCP, and sediment contamination. (DynCorp, 2001).

In fall 2001, EPA's contractors sampled 15 existing groundwater wells, and surface water/sediment from 19 locations in the Rumford River and two potential vernal pools. The results indicated the presence of a groundwater plume containing arsenic and PCP extending from the Process Area to the Rumford River, and a possible second groundwater plume emanating from the southern portion of the Site. Elevated concentrations of arsenic, lead, PCP and dioxin were detected in sediment adjacent to the Site and elevated concentrations of PCP were detected in surface water at the Site (DynCorp, 2001).[2]

In April 2003, the EPA laboratory analyzed several surface soil samples taken outside of the perimeter fence to determine whether there was any off-site arsenic contamination. Samples were obtained on both sides of County Street. Some samples contained arsenic in excess of 30 parts per million (ppm)(DynCorp, 2001).

In August 2003, the EPA initiated an Emergency Removal Action to address the off-site arsenic-contaminated soil identified in the April 2003 investigation. A total of 376 tons of soil was removed from both sides of Country Street. The excavations were lined with geotextile and backfilled with clean soil (Weston, 2004). The soil was disposed of at an off-site licensed facility**.**

3. History of CERCLA Enforcement Activities

Hatheway & Patterson Company, Inc. participated in some of the early cleanup activities at the Site; however, it declared bankruptcy and left the Site during 1993. Hatheway & Patterson Company, Inc. has not been active in the investigation or remedial selection since undertaking those early activities described above.

On December 1, 1993, EPA notified William Haynes (President of Hatheway & Patterson Company, Inc. and Trustee of HPC Realty Trust) of his potential liability with respect to the Site.

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1 Non-aqueous phase liquids are hydrocarbons, such as oil, which have a low solubility and therefore exist as a separate, immiscible phase when in contact with water or air. Often, NAPLs are mixtures of organic contaminants with varying degrees of solubility. See *Groundwater Issue Paper: Light Nonaqueous Phase Liquids* EPA, (July 1995) for more information.

2 The substrate in the vernal pools at the Site can be considered "sediment" for only several weeks in early spring when the pools are filled with water. For the remainder of the year, the vernal pools are dry and their substrate should more accurately be considered as "soil". However, in the discussions that follow, the vernal pool substrate is only referred to and discussed as "sediment." See the discussion in Section G of the ROD for more information on vernal pool identification at the Site.

## C. COMMUNITY PARTICIPATION

Throughout the Site's history, community concern and involvement has been moderate**.** EPA has 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 since the Site was added to the NPL.

- $ On October 18, 2001 and July 25, 2002 EPA held informational meetings in Mansfield to describe the plans for the Remedial Investigation and Feasibility Study.

- $ In August 2003, EPA released a fact sheet describing the upcoming removal action along the boundary of County Road.

- $ In 2003 EPA issued a Site Reuse Grant to the Town of Mansfield to assist it in determining the future use of the Site in its capacity as owner of most of the Site.

- $ In June 2004, EPA held an informational meeting at Mansfield Town Hall to discuss the results of the Remedial Investigation.

- $ On June 9, 2005, EPA published a notice and brief analysis of the Proposed Plan in the Attleboro Sun Chronicle and made the plan available to the public at the Mansfield Public Library.

- $ On June 16, 2005, EPA held a public informational meeting at Mansfield Town Hall to discuss the proposed cleanup plan for the Site. On June 17, 2005**,** EPA made the administrative record available for public review at EPA's offices in Boston and at the Mansfield Public Library**.** At the same time, the availability of the Proposed Plan was advertised by the posting of signs on bulletin boards at the Foxborough Public Library. The Mansfield Public Library is the primary information repository for local residents and will be kept up to date by EPA.

- $ From June 17, 2005 to July 18, 2005 the Agency held a 32 day public comment period to accept public comment on the alternatives presented in the Feasibility Study and the Proposed Plan and on any other documents previously released to the public.

- $ On July 7, 2005, the Agency held a public hearing to discuss the Proposed Plan and to accept any oral comments. A transcript of this meeting and the comments and the Agency's response to comments are included in the Responsiveness Summary, which is Part 3 of this Record of Decision.

## D. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

The selected remedy was developed by combining components of different source control and management of migration alternatives to obtain a comprehensive approach for Site remediation. In the past, removal actions have been utilized to stabilize and secure the Site as detailed in Section B of this ROD. These actions included but were not limited to the removal of soils along Country Street, the removal of process chemicals left at the Site by the former owner, and the placement of asphalt cover over significantly contaminated soils.

In summary, the remedy in this Record of Decision addresses contaminated surface and subsurface soil and monitors contaminated groundwater to ensure it does not migrate to off-site receptors. Dermal contact with and incidental ingestion of soils pose a current and future risk at the Site because EPA's acceptable risk range is exceeded. Contaminated groundwater also poses a risk to: 1) future users on-site and; 2) to off-site receptors if contaminated groundwater migrated off-site and was ingested or used for non-potable purposes. This response action addresses a principal threat at the Site through a combination of excavation followed either by, 1) off-site disposal or 2) consolidation, stabilization/solidification as necessary followed by covering soils on-site under a low-permeability cover. Groundwater will be managed through monitoring and institutional controls. LNAPL located in the subsurface soil and floating on groundwater poses a threat at the Site and is believed to be a source to the groundwater contamination. This response action includes removal of LNAPL coincident with the excavation of soils, thereby reducing, to some extent, the groundwater contamination.

The principal threats that this ROD addresses are summarized in the Table D-1. There are no low-level threats at this Site.

## E. SITE CHARACTERISTICS

This 38-acre Site is generally flat except for two small hills (approximately 15 and 50 feet high) located on the southeastern portion of the property and a shallow (< 20 feet) ravine occupied by the Rumford River. An abrupt topographic drop of approximately 10 to 20 feet extends in an east-west orientation along the southern edge of the fill line. The area south of the fill line is topographically lower, densely wooded, contains wetlands, and is bounded by the Rumford River backwash channel (TRC, 2005).

The Site lies within the Taunton River Basin which drains approximately 528 square miles and empties into the Narragansett Bay at Fall River, Massachusetts. The Rumford River flows north to south and is primarily fed by the Glue Factory Pond which is located approximately 1 mile north of the Site. The area to the north of the Site is developed with residences and light industry.

The Rumford River divides the Site into eastern and western portions. Much of the southwestern portion of the Site is covered by wetlands, and several potential vernal pool areas exist in this area. Portions of the Site are located within areas of the 100-year flood zone (Zone A3) and between limits of the 100-year flood and 500-year flood zone (Zone B) for the Rumford River. The River flows generally from north to south within the main facility area. The Rumford River's downstream water pathway flows through Fulton, Kingman, and Cabot Pond and then into the Norton Reservoir approximately 3.5 miles from the Site. The river exits the reservoir on the southeast side and joins with the Wading River approximately 8.7 miles from the Site. The River then joins with the Three Mile River approximately 1 mile southeast, eventually flowing into the Taunton River.

The Rumford River is a Class B surface water. Class B waters are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. They are also designated as suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. The Rumford River backwash channel (the southern boundary of the Site) was the former course of the main channel of the River until it was redirected further to the south during the 1960's. The Channel presently runs in a southeasterly direction for about 450 meters until it joins with the Rumford River.

The Site contains four buildings (former office building and two process buildings), a concrete pit/sump, and several relic pilings from demolished wood storage structures. Several above ground tanks exist at the Site, but all have been decommissioned and all contents were removed. Two former wood storage buildings were located in the southeastern portion of the property.

The Remedial Investigation (TRC, 2005) of the Site included ecological surveys (M&E, 2002), geophysical surveys, cone penetrometer surveying, surface and subsurface soil sampling, groundwater well installation, groundwater sampling, LNAPL sampling, and sampling of sediment and surface water.

In general soils (both surface and subsurface) contaminated with the highest concentrations of PCP, arsenic, dioxin and PAHs are located north of the railroad tracks in Process Area. There is a sizable LNAPL hot spot area just south of the railroad tracks near the Process Area. Groundwater plumes in both overburden and bedrock flow southwesterly from the Process Area and the LNAPL hot spot to the Rumford River on the east and the Rumford River backwash channel to the south. The plumes do not appear to be moving beyond these bounds (TRC, 2005).

The contaminant sources, media affected, release mechanisms, and contaminant volumes for each medium are summarized in Table E-1. Table E-2 describes concentrations of various Contaminants of Concern (COCs) found at the Site. Table E-3 shows the principal threats at the Site, concentration levels found in various media, and receptors for each.

The following sections describe the nature and extent of COCs in the areas investigated during the Remedial Investigation. Figures E-1 through E-17 show the location, nature, and magnitude of contamination in soil, groundwater, and sediment.

### Surface Soil

Pentachlorophenol (PCP), PAHs, arsenic, and dioxin were detected in surface soil at various locations on the Site. The highest concentrations of PCP were detected in the Process area in vicinity of the Cylinder No. 01 and 02 Building, at 4,900 mg/kg. The highest concentrations of PAHs were detected in samples SS-030 and SS-031, located on County Street. The highest concentrations of PAHs found within the Process Area were detected at SS-022 located in the northwest portion of the Site in the vicinity of the drying area.

The highest concentration of arsenic (1,860 mg/kg) was detected at location SS-058 in the vicinity of the Cylinder No. 03 Building and CCA drip pad. Elevated concentrations of arsenic (1,200 mg/kg) were also detected in surface soil sample HP4-G, located adjacent to the Cylinder No. 01 and 02 Building. An elevated concentration of arsenic was also detected at location HP1-M5, located in the northwest portion of the Site in the vicinity of the drying area, at a concentration of 630 mg/kg.

The highest concentrations of dioxin in surface soil were detected in the Process area in the vicinity of the PCP drip pad in surface soil sample SS-005 at a concentration of 15,000J ng/kg (or 0.015 mg/kg). The "J" designation means the value is estimated.

### Subsurface Soil

Pentachlorophenol, arsenic, and dioxin were detected in subsurface soil at various locations on the Site. The highest concentration of PCP was detected in the vicinity of the PCP drip pad in sample GP-013 (2-4 feet) at a concentration of 1,100 mg/kg. Elevated concentrations of PCP were also detected at deeper depths (6-8 feet) in the Process area and on the south side of the railroad tracks; 490 mg/kg near the kiln building and 710 mg/kg west of the former wood storage building paved area.

The highest on-site concentrations of arsenic in subsurface soil (540 mg/kg) were detected in the Process area at location GP-012 (2-4 feet) located northeast of the CCA drip pad. Elevated arsenic concentrations were also detected in sample MW-003 (6-8 feet) at 140 mg/kg, located at the edge of the PCP drip pad and in sample RCA-6 (4-6 feet) at 60 mg/kg, located next to the CCA sump. The highest concentration of arsenic on the south side of the railroad tracks was detected in sample SB-010 (1-4 feet) at 55.1 mg/kg, located at the edge of the paved area.

Elevated concentrations of dioxin in subsurface soil were detected in both the Process area and south of the railroad tracks next to a former wood storage building. The highest subsurface soil detection of dioxin was next to former wood storage building area in sample SB-010 (4-10 feet) at a concentration of 3,700J ng/kg. A lesser concentration of 250J mg/kg was detected in a deeper sample at the same location, SB-010 (4-10 feet). Elevated concentrations of dioxin were also detected in shallow and deeper subsurface soil samples from Process area samples SB-001 and SB-003, located near the CCA and PCP drip pads, ranging from 550J to 660J mg/kg.

**Groundwater**

Groundwater at the Site is impacted primarily by arsenic and PCP. The arsenic plume is contained within the PCP plume in the overburden.

Figure E-13 depicts the distribution of PCP in overburden groundwater at the Site. The highest concentration of PCP detected in overburden groundwater was in piezometer PZ-007 at a concentration of 17,000 ug/L. PZ-007 is located at the edge of the former wood treatment building paved area. Figures E-16 and E-17 depict the distribution of arsenic in groundwater samples taken from overburden and bedrock wells respectively. The highest concentration of arsenic was in piezometer MW-003 at a concentration of 940 ug/L, exceeding the groundwater screening criteria of 10 ug/L. MW-003 is located at the edge of the PCP drip pad in the Process area. Based on the southwesterly direction of groundwater flow and the absence of detectable PCP in piezometer PZ-004, it appears that the extent of contamination in overburden groundwater is bounded by the Rumford River and the backwash channel.

Table E-13a shows the rough extent of LNAPL contaminated “oily soil” as well as the approximate extent of the contaminated groundwater plume.

Figure E-14 shows the extent of PCP in bedrock groundwater. The highest concentration of PCP was detected in well MW-101R coincident with the location of the highest concentration of PCP detected in the overburden. Similar to PCP, the highest concentration of arsenic was detected in MW-101R at 37 ug/L. Elevated arsenic concentrations were also detected in downgradient monitoring wells MW-105R, MW-008B, and MW-009B at 8.8, 10.6, and 9.2 ug/L, respectively. Based on the absence of detectable PCP and low concentrations of arsenic in wells MW-107R and MW-109R, which are located across the Rumford River, it appears that the plume is confined to the Site, bounded by the River channel and that there are no off-site impacts to bedrock groundwater.

### LNAPL

Light Non-Aqueous Phase Liquid (LNAPL), ranging from a sheen to several inches, was observed in overburden wells, primarily in the SE/SW Quadrant. The greatest accumulation of LNAPL, 0.91 foot (approximately 11 inches), was observed in well MW-012. LNAPL was not observed in bedrock monitoring wells. No. 6 fuel oil, SVOCs, metals, and dioxin were detected within the LNAPL.

While LNAPL free product is largely confined to the monitoring wells in the SE/SW Quadrant of the Site (south of the railroad tracks), it was also detected in one monitoring well north of the railroad tracks. Isolated pockets of free product and LNAPL-saturated subsurface soils were detected throughout the Site ("oily soil" spots); additional soil sampling and excavation during Remedial Design will reveal the exact locations.

### Surface Water

PCP and two PAHs [benzo(a)anthracene and benzo(a)pyrene] were detected above surface water screening criteria in on-site Rumford River surface water samples. The highest concentration of PCP in surface water was detected in on-site vernal pool sample VP-002 at 680 ug/L, which exceeds the screening criterion of 15 ug/L. Elevated concentrations of PCP were detected along the Rumford River from the abandoned groundwater treatment system to just beyond the backwash channel.

### Sediment

PAHs including naphthalene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene were detected in upstream sediment samples at concentrations exceeding sediment screening criteria. In general, the highest concentrations of PAHs in upstream samples were detected at location SD-018, located downstream of Glue Factory Pond.

The same PAHs detected in upstream sediment were detected in on-site sediment samples at concentrations exceeding sediment screening criteria. In general, the highest concentrations of PAHs were detected at location SD-013, located in an upgradient area of the Site. Other SVOCs detected above sediment screening levels are 2-methylphenol, dibenzofuran, diethyl phthalate, and PCP.

The highest concentration of PCP in sediment was detected in on-site vernal pool sample VP-002 at 690 mg/kg, which exceeds the screening criterion of 0.36 mg/kg. PCP detected in on-site sediment samples from the Rumford River ranges from non-detect (ND) to 51 mg/kg. The highest concentration, 51 mg/kg, was detected at SD-009 located near the groundwater treatment system. PCP in downstream sediment samples range from ND to 0.55 mg/kg at SD-024. The locations of the potential vernal pools at the Site are shown in Figure E-14a.

The highest concentrations of dioxin were detected in on-site Rumford River sediment located downstream of the Process Area between the railroad tracks and the groundwater treatment system. Detected concentrations of dioxin exceed the sediment screening criterion of 410 ng/kg at three locations in this reach: RRHP02 (2,273J ng/kg), RRHP03-S (1,017J ng/kg), and SD-009 (1,200J ng/kg). Dioxin in downstream sediment samples range from ND to 200J ng/kg at SD-024.

### Fish Tissue

Fish tissue collected from the Rumford River was subjected to chemical analysis. Contaminant concentrations in on-site samples were generally higher than samples taken upstream of the Site. Concentrations of pentachlorophenol and dioxin were higher in on-site samples than upstream samples, while concentrations of metals (arsenic, cadmium, chromium, copper, and lead) were similar in on-site samples to upstream samples. See Section 4.6 of the R.I. Report (TRC, 2005) for more information.

### Conceptual Site Model

Figure E-15 shows a Conceptual Site Model (CSM) of soil and groundwater contamination for the Site. 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 for the contaminated soil and groundwater is based on this CSM.

The Conceptual Site Model allowed EPA to consider the relative risks and potential actions to be taken for contaminants of varying toxicity or mobility. 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.

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 groundwater, low leachability contaminants or low toxicity source material. There are no low-level threats at this Site. For additional information, see Table D-1 and Table E-3.

## F. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

### 1. Land Use

The majority of the Site is located in Mansfield and currently zoned as I-3. This is a flexible mixed-use industrial zone that allows an array of uses from heavy manufacturing to multi-family dwellings to day care. Currently, the Town of Mansfield utilizes a portion of the Site north of the railroad tracks for storage of emergency vehicles and uses one remaining building for office space; the remainder of the property is unoccupied. The Site has been used for commercial/industrial purposes intermittently since 1927 (Reuse Assessment, TRC, September 2003). The area of the Site south of the railroad tracks has historically been used for storage but has not been developed.

On March 31, 2005, the Town of Mansfield notified EPA that the reasonably anticipated future land use (RAFU) of the portion of the Site located in Mansfield will be commercial use for the front parcel located on County Street (north of the railroad tracks) and Open Space or Commercial, whichever is considered the higher standard of cleanup, for the back parcel (south of the railroad tracks). Site soil cleanup levels were based on this RAFU. In their letter (see Appendix F), the Town of Mansfield noted their understanding that necessary and appropriate deed restrictions will be placed on the property in accordance with the RAFU.

The 1.77 acre portion of the Site located in Foxborough is in a Residential and Agricultural District (R-40). (See Reuse Assessment, TRC, 2003). The district is established to promote agricultural uses and low-density residential uses and to allow other selected uses that are compatible with the open and rural character of the district. The Town of Foxborough has not indicated what the reasonably anticipated future land use of this approximately 2 acres will be or when this will be determined. Currently, the parcel is unused. During Hatheway & Patterson operations it may have been used for wood storage. The FS assumes the future use to remain residential for the Foxboro lot and cleanup levels were set based on residential use.

### 2. Groundwater Use

The Site and surrounding area are currently served by municipal drinking water. Groundwater underlying the Site is designated as Class III (non-potable) by the Commonwealth of Massachusetts (314 C.M.R. 6.00). The Massachusetts Department of Environmental Protection has issued a ‘Groundwater Use and Value Determination’ for the Site (Appendix G, which specifies the designated uses for the aquifer under the Site.) In part the document stated:

> *“The groundwater beneath and in the vicinity of the Site is not classified as a current or potential drinking water supply. The closest municipal water supply wells are located approximately one mile to the east. An approved Zone II*

*extends to approximately one-quarter mile to the east of the Site. There is an EPA designated Sole Source Aquifer also located approximately one-quarter mile to the east. Wetland areas are located to the east, northeast and southwest of the Site. The aquifer underlying the Site is classified as low yield by the United States Geological Survey (USGS). The Site Area aquifer is classified as both GW-2 and GW-3 (see description below).*

***GW-2*** *This designation addresses areas where there is a potential for migration of vapors from groundwater to occupied structures. The classification applies to locations where groundwater has an average annual depth of 15 feet or less and where there is an occupied building or structure within a 30-foot surface radius of that groundwater.*

***GW-3*** *This designation considers the impacts and risks associated with the discharge of groundwater to surface water, and therefore applies to all groundwater.*

*Considering this determination and the Site conditions, the groundwater risk evaluation and cleanup decisions should consider, but not be limited to the following:*

| | |
|---|---|
| *Human Health:* | *a) vapor seepage into buildings,*<br>*b) Site excavation activities that may expose workers to contaminated groundwater and vapors,*<br>*c) discharge to surface water and potential exposure routes (e.g. wading, other recreational activities) potential for migration of contaminated groundwater to areas of higher groundwater use and value.* |
| *Ecological* | *a) effects to wetlands and river biota.* |

*In light of the use and value factors and similar criteria established in the MCP that were examined in this determination, the Department recommends a <u>low use and value</u> for the Site groundwater. "*

The Massachusetts DEP's Use and Value Determination stated that "on-site businesses use public water" and that they are "not expected to use Site water for non-potable uses." Based on this information, any future use of the Site, whether for recreational, commercial, or even residential purposes, would be supported by municipal water and would not require use of the aquifer for potable uses. Therefore, the Remedial Action Objectives (RAOs) have been designed to protect GW-2 and GW-3 uses as well as protecting ecological resources. RAOs for groundwater have also been designed to be consistent with the Town of Mansfield's Reasonably Anticipated Future Use of the Site and the Town of Foxborough's zoned use of the Site.

## 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 action was taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The public 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 those aspects of the human health risk assessment which support the need for remedial action are discussed below followed by a summary of the environmental risk assessment.

### 1. Human Health Risk Assessment

**Hazard Identification**

Forty-two of the more than 75 chemicals detected at the Site were selected for evaluation in the human health risk assessment as chemicals of potential concern. The chemicals of potential concern 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 2.11 of the risk assessment (M&E, 2005). From this, a subset of the chemicals were identified in the Feasibility Study as presenting a significant current or future risk and are referred to as the Contaminants of Concern (COCs) in this ROD and summarized in Tables G-1 through G-5 for surface soil, subsurface soil, and groundwater (shallow and bedrock aquifers). These tables contain the exposure point concentrations used to evaluate the reasonable maximum exposure (RME) scenario in the baseline risk assessment for the chemicals of concern. Estimates of average or central tendency exposure concentrations for the chemicals of concern and all chemicals of potential concern can be found in Tables 3.1 through 3.11 of the risk assessment (M&E, 2005).

**Exposure Assessment**

Potential human health effects associated with exposure to the chemicals of potential concern were estimated quantitatively or qualitatively through the development of several hypothetical exposure pathways. These pathways were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses, and location of the Site. 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.[3]

The Site is bordered to the north by County Street and residential properties, to the south and west by residential areas, and to the east by commercial and industrial properties. The property is bisected by the Rumford River, which runs north to south, and by a railroad right-of-way, which runs east to west, dividing the Site into four quadrants. The northeast and northwest quadrants contain the Process Area, the SE/SW Quadrant is the area south of the Rumford River, and the County Street area lies north of the Site fence in the northeast and northwest quadrants (see Figure B-1). The majority of the Site, located in Mansfield, is zoned for industrial mixed use; however, based on the Town of Mansfield's RAFU, there is a high likelihood that a commercial reuse of the section of the Site north of the railroad tracks will be pursued. Similarly, the reuse of the Site to the south of the railroad tracks will most likely be either commercial or Aopen space@. The parcel located in Foxborough is in a Residential and Agricultural District, which allows for low density residential uses. The Site and the surrounding area are served by municipal drinking water. The Site aquifer is classified by the State as Class III with designated uses of GW-2 (areas where there is a potential for migration of vapors to occupied structures) and GW-3 (considers impacts associated with the discharge of groundwater to surface water).

## Current Land Use

The risk assessment looked at several different exposure pathways consistent with current and future potential uses at the Site. The following current uses were evaluated in the risk assessment:

-Trespasser (adolescent) with exposure to surface soil at the Site by ingestion and dermal contact; to surface water (by dermal contact); and to sediment (by ingestion and dermal contact) within the Rumford River.

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[3] For contaminated groundwater, ingestion of 2 l/day, 350 days/year for 24 years was presumed for an adult. For a young child (age 1 to 6), ingestion of 1.5 liters/day, 350 days/year for 6 years was presumed. Both the adult and child were assumed to shower/bathe 350 days/year, resulting in total body surface area exposure, for a combined exposure duration of 30 years. Adult and child swimming pool exposures were assumed to occur 60 days/year for a total of 30 years. Dermal contact and incidental ingestion of soil was evaluated for an adolescent trespasser (age 9-18 years) who may be exposed between 52 and 78 days each summer for 10 years. For the on-site resident, soil exposures were evaluated for an adult and child using soil ingestion rates of 100 mg/day and 200 mg/day, respectively. The adult soil ingestion rate was applied to the adolescent. Residential soil exposures were assumed to occur 150 days/year for 30 years. Town and commercial workers were assumed to be exposed to soils 52 days/year and 250 days/year, respectively, using a soil ingestion rate of 100 mg/day and an exposure duration of 25 years. Incidental ingestion of and dermal contact with soils were evaluated for a utility worker presumed to be exposed for 66 days/year. The soil ingestion rate was set at 200 mg/day.

-County Street resident (adult and child) with exposure to surface soil by ingestion and dermal contact;

-Recreational user (adult and child) with exposure to fish fillet tissue (by ingestion); to surface water (by dermal contact); and to sediment (by ingestion and dermal contact) within the Rumford River and Fulton/Kingman Ponds, downstream of the Site; and

-Off-site resident (adult and child) with exposure to groundwater (by ingestion and dermal contact) used to fill a swimming pool.

These current exposure pathways and receptors identified may continue in the future.

**Future Land Use**

The following future uses were also evaluated in the risk assessment:

$ Trespasser (adolescent) with exposure to surface and subsurface soil at the Site by ingestion and dermal contact; to surface water (by dermal contact); and to sediment (by ingestion and dermal contact) within the Rumford River.
$ County Street resident (adult and child) with exposure to surface and subsurface soil by ingestion and dermal contact;
$ Town worker with exposure to surface and subsurface soil by ingestion and dermal contact;
$ Commercial worker with exposure to surface and subsurface soil (by ingestion and dermal contact); and to indoor air (by inhalation) following the subsurface migration of volatile compounds in soil and groundwater;
$ Utility worker with exposure to surface and subsurface soil (by ingestion and dermal contact); to shallow groundwater (by dermal contact); and to outdoor air (by inhalation) following the migration of volatile compounds in soil and groundwater;
$ On-site resident (adult and child) with exposure to surface and subsurface soil (by ingestion and dermal contact); to surface water (by dermal contact); to sediment (by ingestion and dermal contact); and to indoor air (by inhalation) following the subsurface migration of volatile compounds in soil and groundwater; and
$ Off-site resident (adult and child) with exposure to groundwater by ingestion and dermal contact while showering and bathing and in swimming pool; and by ingestion of groundwater as drinking water should on-site groundwater migrate to off-site receptors.

Because the future commercial use scenario results in a higher degree of exposure and risk than that associated with a future recreational scenario, the commercial use scenario is considered protective of open space use that may occur in the future within the area south of the railroad tracks.

## Current and Future Groundwater Use

The off-site groundwater exposure scenarios evaluate the use of contaminated groundwater currently limited to the aquifer located beneath the Site. These unlikely scenarios are based on the conservative assumption that the contaminant plume will migrate in the future to a location outside the current Site boundary. Further it is assumed that groundwater will be used by off-site residents in the future via existing wells on their properties for both potable and non-potable use, despite the fact these wells are currently designated for non-potable use only. Groundwater use scenarios were selected and evaluated in the risk assessment before MADEP had issued its groundwater use and value determination and before EPA was advised of the Town of Mansfield=s RAFU for the Site.

## Toxicity Assessment

EPA assessed the potential for cancer risk and non-cancer health effects.

The potential for carcinogenic effects is evaluated with chemical specific cancer slope factors (CSFs) for oral and dermal exposure and unit risk values for exposure via inhalation. A weight of evidence classification is assigned for each chemical. CSFs have been developed by EPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk calculated using CSFs is unlikely to be greater than the risk predicted. A summary of the cancer toxicity data relevant to the chemicals of concern is presented in Table G-6.

The potential for non-cancer health effects is quantified by using Reference doses (RfDs) for oral and dermal exposures and Reference Concentrations (RfCs) for inhalation exposures. RfDs and RfCs, developed by EPA, represent estimates (spanning perhaps an order of magnitude) of a daily exposure that is likely to be without an appreciable risk of deleterious effects during a lifetime. RfDs and RfCs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. A summary of the non-carcinogenic toxicity data relevant to the chemicals of concern is presented in Table G-7.

## Risk Characterization

Risk Characterization combines estimates of exposure with toxicity to estimate potential health effects that might occur if no action were taken.

Excess lifetime cancer risks were determined for each exposure pathway by multiplying the daily intake level (see Exposure Assessment) by the CSF or by comparison to the unit risk value. These toxicity values are conservative upper bound estimates, approximating a 95% confidence limit, on the increased cancer risk from a lifetime exposure to an agent. Therefore, the true risks are unlikely to be greater than the risks predicted. Cancer risk estimates are expressed as a probability, e.g., one in a million. Scientific notation is used to express probability; one in a million risk (1 in 1,000,000) is indicated by $1 \times 10^{-6}$ or 1E-06. In this example, an individual is not likely to have greater that a one in a million chance of developing cancer over a lifetime as a result of exposure to the concentrations of chemicals at a site. All risks estimated represent an "excess lifetime cancer risk" in addition to the background cancer risk experienced by all individuals over a lifetime. 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's generally acceptable risk range for site related exposure is $10^{-4}$ to $10^{-6}$. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances.

In assessing the potential for adverse effects other than cancer, a hazard quotient (HQ) is calculated by dividing the daily intake level by the RfD or RfC. A HQ $< 1$ indicates that an exposed individual's dose of a single contaminant is less than the RfD or RfC and that a toxic effect is unlikely. The Hazard Index (HI) is generated by adding the HQs for all chemical(s) of concern that affect the same target organ (e.g. liver) within or across those media to which the same individual may reasonably be exposed. A HI $\leq 1$ indicates that toxic non-carcinogenic effects are unlikely.

The following is a brief summary of the exposure pathways that were found to present a significant risk exceeding EPA's cancer risk range and non-cancer threshold. A more thorough description of all exposure pathways evaluated in the risk assessment including estimates for an average exposure scenario, can be found in Section 5 and on Tables 9.1 through 9.36 of the risk assessment (M&E, 2005).

Adolescent Trespasser

For a trespasser, recreational exposure assumptions were used to calculate risk. Tables G-8 through G-11 depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in surface soil evaluated to reflect current and potential future recreational exposure corresponding to the RME scenario. For the current and future adolescent trespasser, carcinogenic and non-carcinogenic risks exceeded the EPA acceptable risk range of $10^{-4}$ to $10^{-6}$ and a target organ HI of 1. The exceedances were due primarily to the presence of arsenic in surface and subsurface soil for both the current and future scenario.

<u>Town Worker</u>

Table G-12 depicts the carcinogenic risk summary for the chemicals of concern in surface soil evaluated to reflect potential future town worker exposure corresponding to the RME scenario. For the future town worker, carcinogenic risks exceeded the EPA acceptable risk range of $10^{-4}$ to $10^{-6}$. The exceedance was due primarily to the presence of arsenic in surface soil.

<u>Commercial Worker</u>

Tables G-13 and G-14 depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in surface and subsurface soil evaluated to reflect potential future commercial worker exposure corresponding to the RME scenario. For the future commercial worker, carcinogenic and non-carcinogenic risks for surface soil exceeded the EPA acceptable risk range of $10^{-4}$ to $10^{-6}$and a target organ HI of 1. For subsurface soil, carcinogenic risks exceeded the EPA acceptable risk range. The exceedances were due primarily to the presence of dioxin and arsenic in surface soil, and pentachlorophenol and arsenic in subsurface soil.

<u>Utility Worker</u>

Table G-15 depicts the non-carcinogenic risk summary for the chemicals of concern in surface soil evaluated to reflect potential future utility worker exposure corresponding to the RME scenario. For the future utility worker, non-carcinogenic risks exceeded the EPA target organ HI of 1. The exceedance was due primarily to the presence of arsenic in surface soil.

<u>On-Site Resident (Foxborough only)</u>

Tables G-16 and G-17 depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in surface and subsurface soil evaluated to reflect potential future residential exposure corresponding to the RME scenario. For the future on-site resident, carcinogenic and non-carcinogenic risks exceeded the EPA acceptable risk range of $10^{-4}$ to $10^{-6}$ and a target organ HI of 1. The exceedances were due primarily to the presence of dioxin, arsenic, and chromium in surface soil, and pentachlorophenol and arsenic in subsurface soil.

<u>Off-site Resident</u>

Tables G-18 and G-19 depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in groundwater evaluated to reflect potential future RME residential drinking water and swimming pool water exposures. For the future off-site resident, carcinogenic and non-carcinogenic risks exceeded the EPA acceptable risk range of $10^{-4}$ to $10^{-6}$ and a target organ HI of 1. For drinking water, the exceedances were due primarily to the presence of 2,3,5,6-tetrachlorophenol, 2,4,6-trichlorophenol, pentachlorophenol, arsenic, manganese, and thallium in the bedrock aquifer, and 2,3,5,6-tetrachlorophenol, 2,4,6-trichlorophenol, 2-methylnaphthalene, dibenzofuran, pentachlorophenol, dioxin, arsenic, chromium, and manganese in the shallow overburden aquifer. For swimming pool water exposures, the exceedances were primarily due to the presence of 2-methylnaphthalene, pentachlorophenol, and arsenic in the shallow overburden aquifer. Although not specifically calculated, theoretical future on-site residents with complete exposure pathways to groundwater would also likely be at risk from drinking groundwater and from dermal contact with groundwater.

For the surface water and groundwater dermal contact pathways, risk associated with dermal absorption could not be quantified for all contaminants. Data needed to predict dermal absorption is insufficient for some compounds including pentachlorophenol, dioxin, and carcinogenic polycyclic aromatic hydrocarbons. This uncertainty may result in an underestimation of carcinogenic risk. This uncertainty will be periodically reviewed and the models updated to address changes in the dermal absorption values.

**Uncertainties**

The non-cancer hazard and cancer risk estimates are subject to numerous uncertainties. Uncertainty, except as noted above for dermal absorption values, has been addressed by making assumptions that would overestimate rather than underestimate the risk. Consequently, risk estimates likely overestimate actual risks associated with exposure to COCs at the Site. The following bullets summarize the major areas of uncertainty that have been addressed. Please refer to Section 5.3 of the Baseline Human Health Risk Assessment for more detailed description of uncertainties.

- Environmental Sampling and Analysis - Since it is not possible to obtain data for the entire area of interest at a site, samples are taken from each environmental medium of interest and are considered representative of chemical concentrations throughout the site. This approach may over- or underestimate risk. Analytical data were qualified as “estimated” by the laboratory; some samples were rejected because of analytical or sampling errors and, thus, decreased the amount of data available for the assessment. Concentrations of contaminants were assumed to remain constant over time which may overestimate risk.
- Selection of Chemicals of Concern – A conservative screening approach was used to focus the risk assessment on chemicals that account for the greatest risk. It is unlikely that this approach results in a significant underestimate of risk.
- Toxicity Assessment – Cancer slope are upper bound estimates that are not expected to underestimate risk. Reference doses and Reference Concentrations are levels below which no adverse health effects are expected. Thus, the toxicity values are more likely to overestimate risk. EPA’s draft toxicity value for dioxin is currently undergoing review by the National Academy of Sciences. If that value were finalized, the risks associated with exposure to dioxin would be 6 times greater.

- Exposure Assessment – Uncertainties in the exposure assessment include exposure pathway assumptions, exposure point concentrations, and exposure parameters used to calculate exposure doses. The statistics used to calculate the exposure point concentrations (95% upper confidence limit on the mean) are selected based on the concentration distribution for each chemical in each media. This approach, which is more accurate than previously used methods, is more likely to overestimate than underestimate the concentration term. The Reasonable Maximum Exposure frequencies and durations of exposure assumed in the Baseline Risk Assessment are more likely to overestimate than underestimate risks.
- Because information is not available to estimate dermal absorption from water of two highly toxic contaminants, dioxin and pentachlorophenol, risks cannot be quantified. Therefore, risks via dermal absorption while swimming or wading in surface water or while using residential groundwater for showering or bathing is underestimated.
- Risk Characterization – Cumulative residual cancer risk from soil is presented in Table L-1; however, cancer risks and HIs for each receptor were not summed across all media. For example, the risks to the recreational user from surface water, surface soil and sediment ingestion and/or dermal contact were not summed with those from fish ingestion. In addition, risks from a given medium were not summed across exposure points. That is, for the adolescent trespasser, risks from ingestion and/or dermal contact with surface soil, sediment, and surface water were assumed to occur with in a given exposure point, such as in the SE/SW quadrants. This assumption is uncertain since a given receptor may spend half his/her time in one exposure area and half in another. Risks to such an individual would be intermediate between the risks to individuals exposed solely within each exposure area.

## 2. Baseline Ecological Risk Assessment (BERA)

The Baseline Ecological Risk Assessment or "BERA" (Lockheed Martin Information Technologies, June 2005) **was developed as described below**:

### Identifying contaminants of concern (COCs)

<u>Data management</u>

Analytical data collected during the remedial investigations (RI) were compiled and sorted by environmental medium. The media of concern were surface water, sediments, and aquatic biota collected from the Rumford River, both at the Site and at the upstream background section.

- The surface water samples were analyzed for TAL (target analyte list) filtered and unfiltered metals, TCL (target compound list) semivolatile organic compounds (SVOCs), and TCL volatile organic compounds (VOCs). A subset was also analyzed for dioxins and furans (congeners and totals; only congeners were used in the BERA). Six more surface water samples used in aquatic toxicity testing were analyzed for metals, SVOCs and polycyclic aromatic hydrocarbons (PAHs), but not for dioxins and furans.

- The sediment samples were analyzed for metals, pesticides, polychlorinated biphenyls (PCBs, specifically Aroclors), SVOCs and VOCs. A subset was also analyzed for dioxins and furans.

- The aquatic biota samples were analyzed for metals, phenolic compounds, PAHs, and dioxins and furans.

The analytical data underwent a Tier I validation to assess completeness and performance evaluation (PE) sample results. All values with qualifiers indicating that an analyte was detected or presumptively present (e.g., data flagged as J or EB) were retained and used as reported. All results with qualifiers indicating that the analyte was not detected (i.e., data flagged as U or UJ) were retained as non-detected results. Finally, any data flagged as R were removed. Following EPA Region I practices, COCs were not selected by comparing Site data to data from the background locations. However, background data were used during risk characterization to separate COCs present in the Rumford River due to natural or upstream anthropogenic sources from those that may have been released from the Site at levels exceeding background.

The outcome of the data evaluation and summarization process was a comprehensive database for use in the BERA. Individual datasets compiled analytical results for each medium of interest (i.e., surface water, sediment, aquatic biota), analyte group (metals, various organics) and location (Site & background).

For the surface water and sediment analytical results, a geometric mean was calculated for each analyte retained in the database, recognizing that such data typically have skewed distributions (e.g., many low values, fewer higher values) instead of normal (bell-shaped) distributions needed to calculate arithmetic means. For each analyte, the maximum concentration instead of the 95% upper confidence limit (UCL) was retained. To be conservative, this value was either the highest detected concentration or one half the DL for that same analyte, whichever was largest.

Summary statistics were not calculated for redfin pickerel, white sucker, and crayfish tissue residue data because only a single (composite) sample was available for each species collected at the Site and background locations. The residue data could also not be combined because each species was considered an individual prey item in the wildlife exposure modeling.

Finally, the concentrations of individual dioxin and furan congeners in surface water, sediments, and aquatic biota were multiplied by published toxic equivalence factors (TEFs) for fish, birds and mammals. A TEF represents the toxicity of a particular congener relative to 2,3,7,8-TCDD; the latter represents the most potent dioxin compound. No TEFs were available for aquatic invertebrates. Instead, the fish TEFs were used to convert the individual dioxin and furan

congeners measured in the crayfish tissue samples. The TEFs were then summed to generate a medium- and receptor-specific toxic equivalent (TEQ) value for use in the exposure calculations.

Data Summaries

Table G-20 (surface water in the Rumford River) and Table G-21 (sediment in the Rumford River) provide, for each COC, the (a) detection frequency, (b) minimum Site concentration, (c) geometric mean site concentration, (d) maximum site concentration, (e) maximum background concentration, (f) benchmark, (g) ecological hazard quotient (HQ), (h) COC flag, and (i) reason codes. The 95% upper confidence limits (UCL) were not included because reasonable maximum exposures (RMEs) were calculated based on maximum concentrations instead of the UCLs.

Table G-22 provides tissue residue COCs. The aquatic organisms were grouped by species into one Site and one background sample and were composited whole body to obtain enough mass for whole body residue analysis. This approach generated six composite samples, three from the Site and three from the background locations, each consisting of crayfish, redfin pickerel, and white sucker. Hence, the tissue analyses generated single analyte concentrations for each species and sampling location. A contaminant became a COC if it was present above its detection limit (DL) in at least one of the six composite tissue samples.

Selecting COCs

Six inorganics and seventeen SVOCs were retained as surface water COCs, either because their maximum concentrations exceeded their benchmarks or because no benchmarks were available (see Table G-20). The dioxins and furans were not compared to benchmarks. Instead, their concentrations were converted to a TEQ.

Nineteen inorganics, five pesticides, 28 SVOCs, and nine VOCs were retained as sediment COCs either because their maximum concentrations exceeded their benchmarks or because no benchmarks were available (see Table G-21). The dioxins and furans were not compared to benchmarks. Instead, their concentrations were converted to a TEQ.

Seventeen SVOCs (plus total PAHs) and 16 inorganics were retained as aquatic biota COCs (see Table G-22). The dioxins and furans were not compared to benchmarks. Instead, their concentrations were converted to a TEQ.

**Exposure assessment**

Ecological setting

The section of the Rumford River of interest to the BERA runs from the outlet of Glue Factory

Pond to a large culvert downstream of the Site which carries the River underneath Mansfield.

Between these two landmarks, the River consists of three general sections:

$ The Rumford River flows for about 1,685 meters through wetlands and meadows from Glue Factory Pond to County Street. This stretch represents the local background conditions. The River splits in two branches before reaching the Site. Each branch flows through a separate culvert underneath County Street, which also serves as the northern Site boundary.

$ After passing through the culverts, the two branches immediately rejoin and the River flows for about 150 meters in an easterly direction parallel to County Street before turning south and flowing for another 60 meters before reaching a waterfall. Between the turn to the south and the waterfall, the River is partially enclosed by 2 to 3 meter high, man-made vertical walls which support railroad tracks that run through the Site.

$ The main stem of the River flows for about 1,100 meters between the waterfall and the large culvert underneath Mansfield. The waterfall is 2 meters high and is an impassable barrier for upstream fish movement. The upper half of the River was impacted by the Site. A dead-end branch of the River called the back channel links to the main stem River about 100 meters downstream of the waterfall. The back channel is located just south of the Site fence. It runs in a south-easterly direction for about 450 meters, draining a wetland area next to the Site.

Little terrestrial habitat of ecological significance is found in the northern half of the Site. No terrestrial habitat was identified in the northeast quadrant. A small area of palustrine forest and successional fields exists along the banks of the Rumford River in the northwest quadrant. The upper half of the southeast quadrant consists of successional fields which abut the former wood storage area, whereas the lower half of this quadrant supports palustrine forested wetland. The upper half of the southwest quadrant supports a mixed upland forest abutting the former wood storage area, whereas the lower half of this quadrant also consists of a palustrine forested wetland.

The Feasibility Study noted that further study would be conducted to determine whether or not several temporary pools at the Site could be classified as vernal pools pursuant to state law, particularly VP-D1 and VP-C2. See Figure G-1. A study (Lockheed Martin Information Technologies, June 23, 2005) was conducted and completed after the Proposed Plan issued in June 2005. As a result, it has been determined that VP-D1 has all the characteristics of a certifiable vernal pool but VP-C2 does not.

<u>Key species</u>

The Rumford River sediments support a diverse community of benthic invertebrates. This community was assessed in the BERA. The River also supports a substantial population of crayfish (exact species unknown), some of which were collected for tissue residue analysis.

No attempts were made to fully characterize the local fish community. Based on conditions noted during past field investigations and other sources of information, the River is expected to support a warm-water fishery which would include minnows, white sucker, sunfish, largemouth bass, yellow perch, and pickerel, among others. During electrofishing in October of 2003, juveniles of the redfin pickerel and white sucker were collected from the River below the waterfall and upstream of County Street for use in tissue residue analyses. No other fish species were present at that time.

The red back salamander, green frog and wood frog were observed during past field studies. A further evaluation suggested that at least ten more amphibian species could use the habitats at the Site.

Snapping turtles in the Rumford River were the only reptiles observed during field investigations. A further evaluation suggested that at least 15 more species of reptiles could use the habitats at the Site.

The following birds were observed directly or indirectly during field studies: red-tailed hawk, American kestrel, mourning dove, chimney swift, tree swallow, blue jay, great blue heron, common moorhen, American crow, American robin, mallard duck, gray catbird, European starling, red-winged blackbird, common grackle, brown-headed cowbird, and northern oriole. A further evaluation suggested that at least 60 more bird species could use the habitats at the Site.

The following mammals were observed directly or indirectly (e.g., tracks, droppings) during field studies: raccoon, white-tailed deer, bat (species unknown) and eastern cottontail. A further evaluation suggested that at least 29 more mammal species could use the habitats at the Site. Those species include squirrels, voles, shrews, mice, opossum, coyote, foxes, river otter, mink, and beaver.

No state or federal listed species are known to be present at the Site.

**Establishing exposures**

Table G-23 summarizes the ecological exposure pathways of concern and the various endpoints evaluated during the BERA. Tables G-24, G-25, and G-26 summarize the exposure point concentrations for surface water, sediment, and aquatic biota, respectively, at the Site EU (Exposure Unit) and background EU.

**Calculating ecological exposures**

<u>Benthic invertebrates</u>

Benthic invertebrates were assumed to have limited mobility. As such, they would be exposed to

contaminants within a small area of sediment. It would have been inappropriate to assess exposure based on mean or maximum concentration representing a large stretch of River. Instead, each sediment sample collected from the Rumford River was viewed as an independent EU to assess exposure.

Water column invertebrates, fish and crayfish

Water column invertebrates, fish and crayfish were assumed to be exposed via direct contact with the River water. In addition, fish and crayfish exposure was also assessed using tissue residue analyses.

The water column is a more dynamic medium compared to sediments. Exposure is also less static because the water is continuously changing as it flows by. The exposure point concentrations (EPCs) were represented as the geometric mean (i.e., central tendency exposure [CTE]) and maximum concentration (i.e., RME) at the site Exposure Unit (EU) and background EU.

Wildlife exposures

Food chain modeling was used to calculate COC-specific estimated daily intakes (EDIs) to piscivorous wildlife receptors assumed to forage for aquatic organisms along the Rumford River. The generic equation for calculating a total EDI was as follows:

$$EDI_{total} = EDI_{water} + EDI_{sediment} + EDI_{aquatic\ prey}$$

Where:
- $EDI_{total}$ = the total estimated daily intake of a COC from all applicable exposure routes
- $EDI_{water}$ = the estimated daily intake from ingesting surface water from the Rumford River
- $EDI_{sediment}$ = the estimated daily intake from the incidental ingestion of sediment from the Rumford River
- $EDI_{aquatic\ prey}$ = the estimated daily intake from ingesting fish and crayfish from the Rumford River

Food chain models were developed to calculate a mean and maximum EDI for adult great blue heron and mink, respectively. Species-specific exposure factors (i.e., ingestion rates, prey preferences, home ranges, etc.) were also developed for use with the food chain models

Field studies conducted to quantify exposure

One line of evidence used to quantify field exposures consisted of analyzing whole body composite samples of fish and crayfish collected from the Rumford River at the site EU and background EU.

**Ecological effects assessment**

Measures of effect for benthic invertebrates

- *Sediment benchmarks*: The screening-level sediment benchmarks used to select COCs were expanded to include published Aeffects@ benchmarks. Both sets of sediment benchmarks were used to better quantify the potential impacts associated with one or more COC exceedences.

- *Laboratory toxicity testing*: The amphipod *H. azteca* and the chironomid *C. tentans* were exposed for 10 days in the laboratory to an undiluted whole sediment sample from the Site EU, an undiluted whole sediment sample from the background EU and artificial laboratory reference sediment. The goal was to see if exposure to Site contaminants affected survival or growth in the two test species.

- *Critical body residues (CBRs)*: crayfish were collected from the Rumford River at the Site and background EUs for whole body analysis. Tissue residue levels were compared to published no effect and effect toxicity threshold values. The no effect CBRs represent residue levels below which adverse impacts on survival, growth or reproduction are unlikely to occur. The effect CBRs represent residue levels above which adverse impacts to survival, growth or reproduction are more likely to occur.

- *Macroinvertebrate community study*: Benthic macroinvertebrates were collected within the Rumford River at the Site and background EUs to determine if significant differences existed in community composition between Site and background locations.

Measures of effect for water column invertebrates and fish

- *Surface water benchmarks*: The same screening-level surface water benchmarks used to select COCs were retained as conservative measures of effects to aquatic receptors in the risk characterization.

- *Laboratory toxicity testing*: The water flea *C. dubia* and fathead minnow *P. promelas* were exposed for 7 days in the laboratory to undiluted river water from the site EU and background EU, and to laboratory control water to see if Site water would affect survival, growth, or reproduction.

- *Critical body residues (CBRs)*: Fish were collected from the Rumford River at the Site and background EUs for whole body residue analysis. Tissue residue levels were compared to published no effect and effect CBRs for fish.

Measures of effect for wildlife receptors

- *Toxicity reference values (TRVs)*: Wildlife receptor exposures were estimated using food chain modeling to calculate an EDI for each COC. The EDIs was compared to published no effect and effect TRVs. The no effect TRVs represent daily contaminant intakes not believed to result in harmful impacts under long-term exposures, whereas the effect TRVs represent daily contaminant intakes which are more likely to result in harmful impacts during long-term exposures.

**Ecological Risk Characterization**

When applicable, the hazard quotient (HQ = exposure concentration ÷ toxicity value) was used to characterize risk to receptor groups from exposure to the COCs in the media of concern at the Site and upstream background locations. This approach compared the exposure doses to benchmarks, CBRs, and TRVs.

If an HQ was below 1, then it was assumed unlikely that the COC would result in an adverse effect to a receptor group. Conversely, an HQ above 1.0 indicated the possibility of risk to the receptor group. The degree of risk was assumed to be a function of this exceedance. Based on the overall conservatism built into the BERA, HQs falling between 1.0 and 5.0 were considered to represent minimal risk to a receptor group. HQs above 5.0 but below 10.0 were considered to represent a small potential for risk to a receptor group. HQs exceeding 10.0 were assumed to represent a significant potential for risk to a receptor group.

The Rumford River above the Site does not represent a pristine environment. Non-Site related contamination has resulted in the release of pollutants in this stretch of River. It was important to separate risks derived from past Site activities from those associated with upstream activities. The residual risk (RR = site HQ ÷ background HQ) for each COC under average and maximum exposure was calculated to achieve this goal. The background risk exceeded the Site risk if the residual risk was less than 1.0. Under those circumstances, the Site risk for that COC was considered unrelated to past activities at the Site. If the residual risk was above 1.0, then the Site risk exceeded the background risk and the residual risk may have been indicative of past Site-related releases.

**Risk summaries**

Risk to the benthic invertebrate community

- Comparing COCs to sediment benchmarks suggested a strong hypothetical risk in one sediment sample at the Site. In addition, the presence of metals and PAHs above their effects levels in the most upgradient sediment sample collected from the back channel suggested the potential for risk in that location as well.

- The sediment toxicity testing indicated that no significant risk was associated with the direct exposure of two benthic invertebrate species to a sediment sample collected from the historically-contaminated stretch of the Rumford River.

- Comparing the crayfish tissue residues to CBRs indicated that aluminum exceeded the effects HQ at the Site and background EUs. This metal was not related to past Site activities and the residual risk was below 1.0, indicating that the HQ was even higher at the background EU. The RRs for selenium and vanadium equaled 1.5 and 1.4, but neither of these metals was associated with past Site activities, suggesting that much of this hypothetical risk represents background. None of the organics measured in whole body crayfish resulted in risk.

- The benthic community survey showed no significant differences between the Site and background EUs. The results indicated that the benthic communities at both EUs were somewhat degraded due to the less than pristine conditions prevailing throughout the Rumford River.

Integrating these results, the benthic invertebrate community in the Rumford River is not at a substantial risk of harm from exposure to Site-related sediment contaminants.

<u>Risk to the water column invertebrate community</u>

- Comparing COCs to surface water benchmarks suggested a strong potential for risk at the Site EU associated with metals and PAHs. However, this hypothetical risk was substantially reduced when considered against the background risks. The evidence indicated that much of the Site risk appeared to be the result of input from upstream sources.

- The surface water toxicity testing indicated that no significant risk to water column invertebrates was associated with direct exposure to Rumford River surface water.

Based on this evidence, it was concluded that the water column invertebrate community in the Rumford River was unlikely to be at a substantial risk from exposure to Site-related contaminants.

<u>Risk to the fish community</u>

- Comparing COCs to surface water benchmarks suggested a strong potential for risk at the Site EU associated with metals and PAHs. However, this hypothetical risk was substantially reduced when considered against the background risks. The evidence indicated that much of the Site risk appeared to be the result of input from upstream sources.

- The surface water toxicity testing indicated that no significant risk to developing fish larvae was associated with direct exposure to Rumford River surface water.

- Comparing whole body fish tissue residues to CBRs indicated that copper, selenium, and zinc exceeded the effects HQs at the Site and background EUs. The RRs exceedences were small, however, suggesting that much of this risk originated upstream from the Site. Also, the actual risks measured as effects HQs at the site EU were small, none exceeding 5.0.

Based on this evidence, it was concluded that the fish community in the Rumford River was unlikely to be at a substantial risk from exposure to site-related contaminants.

<u>Risk to piscivorous bird populations</u>

- Comparing average and maximum EDIs for the great blue heron feeding at the Site to avian no effect and effect TRVs indicated that none of the HQs exceeded 1.0.

Based on this evidence, it was concluded that piscivorous birds feeding along the Rumford River were unlikely to be at a substantial risk from exposure to Site-related contaminants.

<u>Risk to piscivorous mammal populations</u>

Comparing modeled EDIs for the mink to mammalian TRVs indicated that:

- Dioxins and furans, quantified as TEQ, showed risk at the Site EU when the average and maximum EDIs were compared to the no effect TRV (average HQ = 1.5 and maximum HQ = 15.5, respectively). These Site risks exceeded the background risk only under the maximum exposure scenario. The risk associated with TEQ was considered small to minimal because residual risk at the Site EU was present only for the (unrealistic) maximum exposure scenario using the no effects TRV. That risk became minimal (HQ < 5.0) when the maximum EDI was compared to the effect TRV, and disappeared (HQ < 1.0) when the average EDI was compared to the same effect TRV.

- Arsenic showed minimal risk at the Site EU (HQ = 1.7) when the maximum EDI was compared to the no effect TRV. This risk disappeared (HQ < 1.0) when this EDI was compared to the effect TRV.

Based on this evidence, it was concluded that piscivorous mammals feeding along the Rumford

River were unlikely to be at a substantial risk from exposure to Site-related contaminants.

Risk within potential Vernal Pool Habitat

Two seasonally-flooded pools in the area of the Rumford River and Back Channel on the Site

were considered potentially impacted vernal pools and were the subject of study by EPA and its contractors. (Lockheed Martin Information Technologies, March 2005)

Two of these temporary pools were evaluated by Metcalf and Eddy. Sediment and surface water from the pools were subjected to chemical analysis of Site contaminants. One of the pools, designated VP-C2, was found to have pentachlorophenol (PCP) in sediment and water. The other pool, designated VP-D1, was found to have minimal contamination with site-related chemicals.

In order to establish whether these pools are in fact vernal pools, Lockheed Martin (under contract to EPA) studied these pools through the spring of 2005 to determine whether they meet criteria set forth by the Commonwealth of Massachusetts to be considered vernal pools. In a memorandum to EPA, Lockheed Martin stated that VP-C2 did not meet criteria to be considered a vernal pool, while VP-D1 did meet the criteria. (Lockheed Martin, June 23, 2005)

On the basis of observations made during 2005, VP-C2 is not a vernal pool and does not provide significant habitat value for amphibians. The available evidence suggests that the contamination found in this pool is not widespread; for instance, a sediment sample taken a short distance from this pool in the Backwash Channel had no detectable PCP. Based on the small size and limited habitat value of VP-C2, it is not likely that contamination in this pool would pose a population-level risk to amphibians, invertebrates, or soil organisms within the area of the site. There is therefore no actionable risk posed by this pool. There is potential for some receptors to be exposed to PCP in sediments in this location, and as a precautionary step this exposure could be minimized by simply covering or removing surficial sediments in this pool as part of the overall remediation effort. No such action would be required under CERLCA ecological risk guidelines, however.

The vernal pool VP-D1 is performing the function of a breeding habitat for amphibians, and amphibians were found to be successfully breeding and developing within this vernal pool. Contamination within this vernal pool was minimal and no actions are recommended for VP-D1, because any benefit derived from actions to reduce contamination would likely be outweighed by disruption of the habitat. No actionable risks are indicated in this pond.

The fact that VP-D1 meets Massachusetts criteria to be considered a vernal pool does not dictate any specific action on the part of EPA. There are, however, specific protections for vernal pools under the Massachusetts Wetland Protection Act that would be relevant should it be necessary to fill or otherwise alter this vernal pool as part of remedial actions.

As there is no actionable ecological risk for VP-C2 and VP-D1, the Remedial Action Objectives (RAOs) included in the Feasibility Study should not be included for these seasonally flooded pools.

**Major Uncertainties associated with assessing risk to the Site receptor groups in the BERA**

- *Benthic invertebrates:* (a) selection of the sediment sampling locations for use in chemical analyses, toxicity testing and the community survey; (b) identifying conservative benchmarks or guidelines from the literature; (c) exposing the two benthic test species for a relatively short duration (10 days); and (d) using tissue residue data not specific to crayfish to derive the CBRs, which was compensated by systematically selecting the lowest available aquatic invertebrate CBR for a given analyte.

- *Water column invertebrates*: (a) identifying conservative surface water benchmarks or guidelines; (b) for metals, using analytical data from unfiltered samples and assuming that the measured concentrations were 100% bioavailable; (c) using water samples collected over a 7-day period in the fall to represent annual conditions.

- *Fish*: (a) identifying conservative surface water benchmarks or guidelines; (b) for metals, using analytical data from unfiltered samples and assuming that the measured concentrations were 100% bioavailable; (c) using water samples collected over a 7-day period in the fall to represent annual conditions; (d) exposing the single test species for a relatively-short exposure period (7 days) which was partly compensated by using a highly-sensitive life stage (<24 h-old neonates); (e) using generic fish CBRs, which was compensated by systematically selecting the lowest available CBR for a given analyte.

- *Piscivorous birds and mammals*: (a) using single composite aquatic biota tissue samples; (b) using generic bird and mammal TRVs, which was compensated by adjusting them downward, if necessary, to account for differences in species or life stage sensitivities, endpoints, and/or exposure durations; (c) assuming that both wildlife receptor species obtained their total daily doses exclusively from the Rumford River; and (d) assuming that the mink would feed only on aquatic biota instead of modeling a more terrestrial (but less contaminated) diet by including small rodents and other types of prey.

3. Basis for Response Action

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

The baseline human health risk assessment revealed that the receptors listed below are potentially exposed to compounds of concern in soil and groundwater via the exposure pathways listed. The human health risk assessment stated that the exposures and pathways listed present an unacceptable human health risk outside EPA's acceptable risk range of $10^{-4}$ to $10^{-6}$ from actual or threatened releases of hazardous substances from the Site. If not addressed by implementing the response action selected in this ROD, these risks may present an imminent and

substantial endangerment to public health, welfare, or the environment.

- Process Area
    - *Surface Soil* – for each of the following exposure scenarios, *ingestion and dermal contact* with *soil* were found to create a risk outside EPA's target risk range.
        - Adolescent Trespasser (current and future)
        - On-site resident (future)
        - Town worker (future)
        - Commercial worker (future)
        - Utility worker (future)
    - *Sub-Surface Soil*[4] –For each of the following scenarios, *ingestion* and *dermal contact* with *sub-surface soil* were found to create a risk outside EPA's target risk range:
        - On-site Resident (future)
        - Commercial worker (future)

- On-site Groundwater (contaminant plume)[5]
    - *Bedrock* – Off-site Resident – Drinking water and dermal contact (future)
    - *Overburden (shallow)* – Off-site Resident -- Drinking water and dermal contact (future)
    - *Overburden (shallow)* – Off-site Resident – Swimming Pool (future)

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4 The subsurface soil scenarios reflect future conditions in which the soil currently located under the surface would be exposed.

5 These scenarios evaluate the use of the groundwater currently located underneath the Site. The scenarios conservatively assume that the contaminant plume will migrate to a location outside the current Site boundary and will be used by off-Site residents and be accessed via existing wells on their properties which are currently designated as non-potable.

## H. REMEDIATION OBJECTIVES

### 1. Site-Specific Remedial Action Objectives

Remedial Action Objectives (RAOs) were developed for various media at the Site based on the results of the Remedial Investigation and Risk Assessments. The RAOs identify the media, COPCs, exposure routes, receptors and preliminary remediation goals for each exposure route.

These remedial action objectives are designed to meet ARARs and to address human health risks posed by exposure to Site contaminants. Based on the risk assessments and the reasonably anticipated future uses of the Site, remedial action was found to be appropriate for the following media:

<u>Residential Exposure Scenario (Foxborough Parcel Only)</u>

- Surface soil in the process area .
- Subsurface Soil in the process area
- Groundwater (shallow and bedrock aquifer)[6]

<u>Commercial/Open Space Exposure Scenario (Mansfield Parcel Only)</u>

- Surface soil in the process area.
- Subsurface Soil in the process area.
- Groundwater (shallow and bedrock aquifer)[7]

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

- Surface Soil (Process Area) – Prevent current and future trespassers and future on-site residents (Foxborough parcel), commercial workers, town workers, and utility workers from ingestion of or dermal contact with COPCs (including arsenic, dioxin, and pentachlorophenol) which would result in a cumulative excess cancer risk greater than $10^{-4}$ to $10^{-6}$ or HI =1.

- Subsurface Soil (Process Area) – Prevent future commercial workers and future on-site residents (Foxborough parcel) from ingestion of or dermal contact with COPCs (including arsenic, dioxin, and pentachlorophenol) which would result in a cumulative risk greater than $10^{-4}$ to $10^{-6}$ or HI=1.

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6 Groundwater is considered to be an incomplete pathway, see Footnote 5.
7 See above footnote.

- Groundwater – Prevent discharge of pentachlorophenol and other COPCs from soil to groundwater and from groundwater to surface water at concentrations that would result in an in stream exceedence of the Ambient Water Quality Criteria (AWQCs) through source control. Prevent exposure to groundwater by future residents, recreational users, or commercial workers by monitoring extent of plume (to ensure it is remaining on-site) and implementing institutional controls to restrict groundwater use within the Site boundary[8].

- Inter-Media Transfer - Eliminate or reduce potential for leaching through source control and inter-media transfer of COPCs from soil to groundwater and surface water.

- LNAPL – Minimize further contaminant transfer from LNAPL source material to groundwater by reducing LNAPL source material in soil excavation/treatment areas. Minimize further migration of LNAPL free product to groundwater and surface water by removing free product "hotspots" to the extent feasible.

The study completed after the Proposed Plan was issued (Lockheed Aerospace Information Systems, June 23, 2005) concluded that sediment in vernal pool VP-D-1 did not pose an ecological risk. Therefore, an RAO for sediment is no longer necessary. See Section G-2 of the ROD for more information.

A range of response alternatives were developed for each media that could achieve these RAOs.

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8 EPA guidance provides that remedial action objectives for Groundwater aquifers classified as "low" use and value should generally address migration of sources material, protection of ecological receptors, and protection of other beneficial uses, while taking into account site-specific conditions. See *Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites* at 5.2.2 (Groundwater That Is Not Current or Potential Drinking Water)(EPA, December 1998)(OSWER Directive 9283.1-2)(emphasis added). Region I guidance provides that RAO's for low use and value aquifers include "prevention of exposure to contaminated groundwater and prevention of further migration, but generally will not include a goal of restoration." *Groundwater Use and Value Determination Guidance: A Resource-Based Approach to Decision Making,* (US EPA, Region *I, April 1996) (emphasis added). Available at:* http://*www.epa.gov/region1/superfund/resource/gwater.pdf*.

## I. DEVELOPMENT AND SCREENING OF ALTERNATIVES

### 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 National Contingency Plan (NCP) set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives were developed for the Site.

With respect to source control, the RI/FS developed a range of alternatives in which treatment that reduces the toxicity, mobility, or volume of the hazardous substances is a principal element. This range included an alternative that removes or destroys 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 institutional controls; and a no action alternative.

With respect to groundwater response action, the RI/FS developed a limited action remedial alternative that attains Site specific remediation levels and a no action alternative. Active remediation of groundwater was not considered due to the ‘Groundwater Use’ factors referenced in Section F of this ROD.

As discussed in Section 4 of the FS, soil treatment technology options were identified, assessed and screened based on implementability, effectiveness, and cost. These technologies were combined into source control (RA-S1 through RA-S5) and management of migration (RA-G1 and RA-G2) alternatives. 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 actions for further detailed analysis while preserving a range of options. Each alternative was then evaluated in detail in Section 5 of the FS. From this initial screening, remedial options were combined into source control and management of migration alternatives that were selected for detailed analysis.

## J. DESCRIPTION OF ALTERNATIVES

This Section provides a narrative summary of each source control and management of migration alternative evaluated in the Feasibility Study (TRC, 2005).

### 1. Source Control Alternatives Analyzed

The source control alternatives analyzed for the Site include:

| | |
|---|---|
| RA-S1 | No Action |
| RA-S2 | Limited Action |
| RA-S3 | Thermal desorption of PCP and LNAPL soils, stabilize and consolidate arsenic soils under low permeability cover, dispose dioxin soils off-site. |
| RA-S4 | Stabilize/solidify and consolidate arsenic and PCP and LNAPL containing soils under low permeability cover, dispose dioxin and LNAPL soils off-site. |
| RA-S5 | Excavation/off-site disposal |

Each of the five source control alternatives is summarized below. A more complete, detailed presentation of each alternative is found in Section 4 of the FS. The applicable or relevant and appropriate requirements (ARARs) associated with each alternative are presented in Tables 5.5-1 through Table 5.5-3 of the FS. The ARARs for the selected alternatives are presented in Appendix D to this ROD.

### RA-S1 – No Action

This alternative requires that no further action be taken at the Site, including monitoring or the implementation of institutional controls. Any reduction in risk at the Site would be accomplished through natural attenuation and would take many decades to reach cleanup levels. The current asphalt cover on contaminated soils could break down, allowing exposure to trespassers and workers. Costs are insignificant since this response involves no action. Although this alternative does not accomplish any of the RAOs, it is retained as a baseline alternative for comparison in accordance with the NCP and the RI/FS Guidance.

### RA-S2 – Limited Action

This alternative requires only the implementation of institutional controls (commonly enacted through deed restrictions or proprietary controls) at the Site to mitigate risks due to dermal contact and incidental ingestion of soil and to prohibit use of groundwater for potable uses. Land use restrictions may include health and safety requirements for any future subsurface work and restrictions on future use and redevelopment of the Site. This alternative also includes long-term monitoring of groundwater and surface water as well as Five Year Reviews. The monitoring program will include sampling to ensure that groundwater contamination is not migrating to receptors off-site and that designated GW-2 and GW-3 uses are maintained.

Similar to No Action, by leaving contaminated soil in place without providing maintenance of the asphalt cover currently in place, receptors remain at risk of dermal contact. Institutional controls will prevent exposure to contaminated groundwater as long as the restrictions remain in place and are enforced. Costs of this alternative are related to groundwater monitoring and implementing institutional controls.

**RA-S3 – Thermal Desorption of Organics including PCP and LNAPL Soils, Off-Site Disposal of Dioxin, Stabilization/Solidification of Metals Contaminated Soils and Consolidation of Contaminated Soils under Low Permeability Cover**

Figure J-1 shows a diagram of areas which require remediation for this alternative.[9] The total estimated soil volume to be excavated is 31,000 cubic yards. Figure J-2 shows a conceptual layout of how this alternative would be implemented. Figure L-2 shows a diagram of the cover system that is anticipated.

The buildings in the Process Area would be demolished to allow the waste in place under them to be addressed. This alternative includes excavation and off-site disposal of dioxin-contaminated soils as well as consolidation with on-site treatment of soil with certain other contaminants through thermal desorption and/or stabilization/solidification. Treated soils and any other remaining contaminated soils, except as explained below, would be consolidated on-site under a low permeability cover.

During consolidation, soils containing PCPs and SVOCs in excess of cleanup levels would be tested for leachability. These soils also contain arsenic since these contaminants are co-located at much of the Site. If they fail, the soils would be subjected to a thermal treatment process which will minimize the presence of PCPs and SVOCs, leaving mostly arsenic. The condensate from the thermal process would be sent off-site to a licensed disposal facility. Should the remaining arsenic contaminated soil as well as any other arsenic contaminated soil fail a leachability test, it would be mixed with stabilization/solidification agent(s), for example Portland cement. Treatability design studies would be completed to arrive at a suitable mixture of stabilization/solidification agent(s) to ensure the protectiveness of the remedy. The stabilized/solidified soils would then be consolidated on-site under a low-permeability cover.

9 Figure J-1 is used to illustrate RA-S3, RA-S4 and RA-S5

Soils containing dioxin at concentrations in excess of cleanup levels would be segregated and disposed of at an off-site licensed facility. Soils contaminated with LNAPL located south of the railroad tracks in an area considered to be an LNAPL hot spot would be excavated down to the water table. Any floating free product would be removed at the same time to the extent practicable through some type of vacuum process and/or through the use of sorbent material. LNAPL soil may be dewatered and subjected to thermal desorption before disposal under the low permeability cover. Free product may be blended with the soil and subjected to thermal desorption. LNAPL contaminated soil outside the hot spot would be excavated to the extent it coexists with other Site contaminants targeted for excavation, treated similarly as that soil, and consolidated for disposal under the low permeability cover.

Excavated areas would be backfilled with clean soil. Affected wetlands would be restored.

Site water resulting from dewatering activities of soil collected from contaminated areas would be discharged to the Rumford River after treatment in an on-site mobile treatment facility.

Current information indicated that soil cleanup levels are exceeded on the boundary of existing railroad right of way passing through the site. Soil exposures within the area of the existing railroad right of way would be evaluated during design and appropriate action such as deed restrictions and fencing would be implemented, if necessary.

Soil contaminant concentrations should be reduced to cleanup levels within 18-24 months, with the Site available for reuse, with restrictions at that time. The cost of this alternative is $13.4 million, with significant potential for cost-increase for the thermal desorption component.

This alternative also includes long term monitoring of groundwater and surface water, Five Year Reviews, and operation and maintenance of remedial components, including the low permeability cover. The monitoring program would include sampling to ensure that groundwater contamination is not migrating to receptors off-site and that GW-2 and GW-3 uses are maintained.

Institutional controls would be included to prohibit use of Site groundwater and to restrict residential land use except on the Foxborough parcel. Activities that would interfere with the integrity of the cap would also be prohibited.

**RA-S4 –Off-Site Dioxin and LNAPL Soil Disposal, Stabilization/Solidification of remaining contaminated soils and Consolidation under Low Permeability Cover**

This is the selected remedy. See Section L.

Figure J-1 shows a diagram of which areas will require remediation for this alternative. The total estimated soil volume to be excavated is 31,000 cubic yards. Figure J-3 shows a conceptual layout of how this alternative will be implemented.

As with RA-S3, the buildings in the Process Area will be demolished to allow the waste in place under them to be addressed. Excavated soil would be replaced with clean backfill.

RA-S4 is very much like RA-S3 except there is no thermal treatment component in RA-S4. Instead, soils containing PCPs, SVOCs, and arsenic would be consolidated and tested for leachability. If they fail a leachability test, they will be stabilized/solidified using a stabilization/solidification agent, for example Portland cement. As with RA-S3, treatability design studies will be completed to arrive at a suitable mixture of stabilization/solidification agent(s) to ensure the protectiveness of the remedy. The stabilized/solidified soils will then be consolidated on-site under a low-permeability cover.

Soils containing dioxin and LNAPLs above cleanup levels will be excavated, segregated, and disposed of off-site at a licensed facility. LNAPL contaminated soils will be handled as in RA-S3 except for disposal. Any recovered free product LNAPL would most likely be containerized before off-site disposal.

Current information indicates soil cleanup levels are exceeded on the boundary of the existing railroad right of way passing through the Site. Soil exposures within the area of the existing railroad right of way will be evaluated during design and appropriate action such as deed restrictions and fencing will be implemented if necessary.

Water from dewatering and wetland restoration activities will be handled as in RA-S3.

This alternative also includes long-term monitoring of groundwater and surface water, Five Year Reviews, and operation and maintenance of remedial components, including the low permeability cover. The monitoring program will include sampling to ensure that groundwater contamination is not migrating to receptors off-site and that GW-2 and GW-3 uses are maintained.

Institutional controls would be included to prohibit use of Site groundwater for potable uses and to restrict residential land use except on the Foxborough parcel. Controls such as deed restrictions would also prohibit activities that would compromise the cover.

Soil cleanup levels would be achieved within 18-24 months of the start of the response action, with the Site available for reuse with restrictions in place. This alternative is $2.7 million less than alternative RA-S3, since it does not include on-site thermal treatment.

**RA-S5 – Excavation and Off-Site Disposal**

Figure J-1 shows a diagram of which areas would require remediation for this alternative. A

conceptual layout of the remedy is shown in Figure J-4. The total estimated soil volume to be excavated is 31,000 cubic yards.

This remedial alternative involves the extraction and off-site disposal of soil exceeding cleanup levels. As is true for RA-S3 and RA-S4, based on the relatively shallow depth of contamination, soil would be excavated using conventional excavation equipment (i.e., backhoe, excavator) and transported off site by dump trucks or rail cars. Contaminated soil may be stored on a geotechnical barrier on-site for a short-period of time during excavation before being shipped off-site. Material would not be stockpiled at the Site.

Similar to RA-S3 and RA-S4, the buildings in the Process Area would be demolished to allow the waste in place under them to be addressed. Excavated soil and sediment would be replaced with clean backfill.

Soils containing LNAPL would be removed under this alternative via excavation and disposed off-site. Dewatering activities may occur before off-site disposal, with water treatment prior to discharge to the Rumford River. Free product (LNAPL liquids) would most likely be containerized before off-site disposal. Soils contaminated with dioxin above Site cleanup levels would also be disposed of off-site.

Current information indicates soil cleanup levels are exceeded on the boundary of the existing railroad right of way passing through the Site. Soil exposures within the area of the existing railroad right of way would be evaluated during design and appropriate action such as deed restrictions and fencing would be implemented if necessary.

Wetland restoration activities as well as long-term monitoring and institutional controls would be the same as RA-S3 and RA-S4.

This response alternative would be implemented within 15-20 months and the Site would be ready for reuse with restrictions. Costs for this alternative are approximately $20.9 million.

2. Management of Migration Alternatives Analyzed

Management of migration (MM) alternatives address contaminants that have migrated into and with the groundwater from the original source of contamination. At the Site, contaminants have migrated from the process area towards the Rumford River. The MM alternatives analyzed for the Site include:

**RA-G1 No Action**

**RA-G2 Limited Action**

Each of the two MM alternatives is summarized below. A more complete detailed presentation of each alternative is found in Section 4 of the FS.

**RA-G1 –No Action**

This alternative requires that no further action be taken at the Site, including monitoring or the implementation of institutional controls. Any reduction in risk at the Site would be accomplished through natural attenuation. Although this alternative does not accomplish any of the RAOs, it is retained as a baseline alternative for comparison in accordance with the NCP and the RI/FS Guidance. Without action, contaminated groundwater could migrate to off-site receptors undetected. There are no costs for this alternative.

**RA-G2 – Limited Action**

This is the Selected Remedy. See Section L.

This alternative requires only the implementation of institutional controls at the Site to mitigate risks due to:

- dermal contact with groundwater, and;
- ingestion of Site groundwater as drinking water.

Institutional controls will prohibit the use of Site groundwater. Residential uses of the Mansfield portion of the Site and other uses incompatible with the remedy will be prohibited. Institutional controls will also be designed to prevent the use of groundwater for drinking water at the Site as well as to ensure that the designated GW-2 and GW-3 uses are maintained. Examples of institutional control mechanisms that could be utilized are administrative, or legal measures such as easements, covenants, notices, well drilling prohibitions, zoning restrictions, and special building permit requirements. These controls must remain in place and be enforced to ensure the protectiveness of this alternative.

This alternative also includes long-term monitoring of groundwater and Five Year Reviews. Monitoring of the plume to date has not shown that it is migrating beyond the Site boundary. The groundwater monitoring program will include sampling to ensure that contamination is not migrating to receptors off-site and that designated GW-2 and GS-3 uses are maintained.

Institutional controls could be implemented in 6-12 months. Monitoring would be ongoing. Costs to implement this alternative are approximately $1.4 million.

## 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 strength and weakness with respect to the nine evaluation criteria. These criteria are summarized as follows:

### 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 institutional controls.

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.

### 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:

3. **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.

4. **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.

5. **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 goals are achieved.

6. **Implementability** addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. **Cost** includes estimated capital and Operation Maintenance (O&M) costs, as well as present-worth costs.

**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:

8. **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.

9. **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. This comparative analysis can be found in Tables 5.4-1 (relating to source control remedies) and Table 5.4-2 (relating to groundwater remedies) of the FS, and attached to this ROD as Tables K-1 and K-2.

The section below presents the nine criteria and a brief narrative summary of the alternatives and the strengths and weaknesses according to the detailed and comparative analysis. Only those alternatives which satisfied the first two threshold criteria were balanced and modified using the remaining seven criteria.

### Overall Protection of Human Health and the Environment

#### *Soil Alternatives*

Alternative RA-S1, No Action, would be the least protective of human health and the environment. Because no remedial action would be performed, soil and groundwater exceeding Site-specific cleanup levels would remain at the Site. Therefore, current and future unacceptable risk to human health would remain at the Site. In addition, LNAPL would remain unaddressed and continue to leach into groundwater, ultimately reaching surface water via groundwater seeps. Deed restrictions would not be in place to ensure appropriate land use nor would fencing be assured to prevent trespassers from contacting Site soils.  As a result, this alternative would not meet the threshold criteria in the NCP.

All other soil remedial alternatives include deed restrictions as well as fencing and other necessary institutional controls to prevent inappropriate land use and to maintain GW 2 and 3 uses.  These alternatives also include long-term monitoring of groundwater to ensure that GW-2 and GW-3 conditions are maintained.

Alternative RA-S2 relies entirely on institutional controls and long-term monitoring to protect human health from exposure to contaminated Site media.  Without addressing contaminated soils, protection is dependent on continued maintenance and enforcement of these controls.

The alternatives RA-S3, RA-S4, and RA-S5 offer the greatest level of protection to human health and the environment.  Each of these alternatives would either eliminate or substantially reduce exposure to impacted source materials exceeding Site-specific cleanup levels to varying degrees. In addition to institutional controls and long-term monitoring, these alternatives utilize off-site disposal (for all excavated contaminated media in RA-S5), together with either immobilization and/or treatment or consolidation and containment under a low permeability cover (for RA-S3 and RA-S4).  Because RA-S5 removes the greatest amount of materials that pose an unacceptable risk through excavation and off-site disposal, it provides the highest degree of overall protection.

***Groundwater Alternatives***

Alternative RA-G1, No Action, would be the least protective of human health and the environment.  Groundwater contamination in the aquifer, although not a drinking water source, could migrate to off-site receptors undetected without monitoring.  In addition, inter-media transfer of contaminants from unaddressed soils to groundwater that discharges to surface water could endanger the quality of surface water in the Rumford River.  The absence of institutional controls may allow unrestricted access to shallow groundwater by utility workers as well as inappropriate use of groundwater.

Institutional controls and long-term monitoring of groundwater in RA-G2 will protect human health through deed restrictions preventing inappropriate use of groundwater.  Designated uses for GW-2 and GW-3 conditions are maintained, and groundwater is monitored to ensure it does not migrate to off-site receptors.

## Compliance with ARARs

### *Soil Alternatives*

Alternatives RA-S1 and RA-S2 would not meet soil cleanup levels or groundwater performance standards to protect surface water AWQCs.

Alternatives RA-S3, RA-S4, RA-S5, would meet all chemical, location and action-specific ARARs. See section 5.3 for of the FS for discussion of significant ARARS and Tables 5.5-1 through 5.5-3 in the FS for additional identification and discussion of ARARs for each soil alternative.

### *Groundwater Alternatives*

Because groundwater is not a drinking water source there are no chemical-specific ARARs in RA-G1. Similarly, without action, there are no location- or action-specific ARARs.

RA-G2 also has no chemical-specific ARARs since the aquifer is not a drinking water source; however, it will comply with location-specific and action-specific ARARs .

See section 5.3 of the FS for discussion of significant ARARS and Tables 5.5-1 through 5.5-3 of the FS for additional identification and discussion of ARARs for each groundwater alternative.

## Long-Term Effectiveness and Permanence

### *Soil Alternatives*

Alternative RA-S1 does not provide long-term effectiveness in that there is a high magnitude of risk left behind from Site soils that remain unaddressed. RA-S2 affords very little long-term effectiveness and permanence for protecting human health from exposure to soil at the Site. Institutional controls, unless maintained and enforced, are not a permanent solution.

Alternatives RA-S3, RA-S4, and RA-S5 all provide a higher degree of long-term effectiveness and permanence. Since the greatest volume of soil contamination is taken off-site for disposal in RA-S5, this alternative is slightly more effective and provides the highest level of permanence. Consolidation and use of a low-permeability cover is a proven technology to eliminate exposure to waste material and is effective in the long-term as long as it is regularly maintained. Adding a treatment component to RA-S3 and RA-S4 soils prior to capping enhances the permanence of immobilizing contaminants and prevents further leaching to groundwater. Thermal treatment of organics in RA-S3, though proven, is a more complex technology than the stabilization/solidification processes that would be used in RA-S4.

All three alternatives would include long-term monitoring and institutional controls which would ensure appropriate land use and that GW-2 and GW-3 uses are protected.

***Groundwater Alternatives***

The magnitude of residual risk under RA-G1 is higher than RA-G2 in that the former does not include institutional controls that would ensure that groundwater is not inappropriately used for drinking water, that shallow groundwater is not exposed during utility work, nor does it include long-term monitoring to ensure that contaminated groundwater is not migrating to off-site receptors and to ensure that intermedia transfer of contaminants is not degrading surface water via groundwater seeps into the Rumford River.

Monitoring and institutional controls in RA-G2 will be effective in the long-term as long as they are maintained and enforced.

**Reduction of Toxicity, Mobility, or Volume Through Treatment**

***Soil Alternatives***

Alternatives RA-Sl and RA-S2 do not employ active removal or treatment processes to address soil contamination and therefore would not satisfy CERCLA's statutory preference for treatment as a principal component for soil remedial action.

Alternatives RA-S3 and RA-S4 employ active treatment for some soils. RA-S3 provides the most reduction of toxicity through both a thermal treatment process for organics and a stabilization/solidification process for inorganics. RA-S4 may provide similar reductions in toxicity by applying a stabilization/solidification process to both organics and inorganics. A treatability study will be required to determine the correct stabilization/solidification agents. In addition, both of these alternatives reduce mobility of Site contaminants placed beneath the low permeability cover by preventing precipitation from coming in contact with the waste causing further leaching to groundwater.

Alternative RA-S5 does the least to reduce toxicity of Site contamination in that it does not involve treatment; however, it does remove the highest volume of contamination for off-site disposal and as a result, eliminates contaminant mobility. Alternative RA-S3 leaves the most on-site in that only dioxin contaminated soil is sent off-site for disposal. LNAPL soil is ultimately disposed of under the low permeability cover after treatment. RA-S4 sends soil containing both dioxin and LNAPL off-site for disposal.

With all alternatives, soil near the railroad tracks will be evaluated during design and may be left on-site with institutional controls to prevent inappropriate land use or contact.

Depending on the facilities are available at the time of the remedial action, it is possible that some material shipped off-site may require treatment prior to final disposal.

***Groundwater Alternatives***

Neither alternative includes treatment processes and no media would be treated; similarly no hazardous material is removed or treated. Reductions to toxicity and volume of groundwater contaminants would occur through natural processes; however, the Rumford River backwash channel appears to act as a hydraulic barrier to off-site mobility of groundwater contamination.

Groundwater contamination will remain on-site until reduced/eliminated through natural processes over a time period estimated to take many years or decades. This time period would be shortened if these alternatives are combined with alternatives RA-S3, RA-S4, or RA-S5.

**Short-Term Effectiveness**

***Soil Alternatives***

Because Alternative RA-S1 would not require any action to be conducted, there would not be any short-term impacts on the community or on-site workers. Installing additional monitoring wells in RA-S2 results in negligible short-term impacts to the community and minimal impacts to Site workers. Any harm to wetlands from well drilling and installation would be mitigated. Neither of these alternatives would achieve remedial action objectives for many years, or even decades.

Alternatives RA-S3, RA-S4, and RA-S5 all include excavation/consolidation of Site soils and RA-S3 and RA-S4 also include treatment and capping components. These activities would have some short-term impacts on the community and the workers through potential increased truck traffic, air emissions and, for the workers, material handling risks. Personal protective equipment and engineering controls (including air monitoring) would be required. A traffic plan would be implemented to minimize traffic impacts, including the potential use of railroad transport for materials shipped from the Site. Appropriate health and safety requirements would be followed to reduce risk to on-site workers.

Alternatives RA-S3 and RA-S5 would result in the greatest level of short-term risk to the community and workers due to addition of thermal treatment in RA-S3 and the high volume of off-site transportation needed in RA-S5. Thermal treatment is a complex technology and may require extra material handling. It also generates air emissions which would be controlled through engineering means and monitored. In RA-S5, although transportation could be completed by rail, this alternative will result in the greatest potential level of increased truck traffic, noise and dust generation. This scenario would represent the most risk to nearby residents and people located along the transportation route.

The time to achieve RAOs for RA-S3 and RA-S4 is approximately 18 to 24 months; for RA-S5, approximately 15 to 20 months.

***Groundwater Alternatives***

Installation of monitoring wells and periodic sampling in RA-G2 will have negligible impacts on the surrounding community and minimal impacts to Site workers. A Site-specific Health and Safety Plan will be required for this work. Alternative RA-G1 has no impacts since no construction activities are planned.

Similarly, without construction RA-G1 has no short-term impacts to the environment. Fencing, signs and monitoring well installation required in RA-G2 would have slight impacts on wetlands—any damage would be mitigated.

Groundwater contamination will remain on-site for many years or decades; however, installing additional monitoring wells, and developing a long-term monitoring plan and implementing deed restrictions as required by RA-G2 could be accomplished within approximately 6 to 12 months.

**Implementability**

***Soil Alternatives***

Alternative RA-S1 requires no remedial action and so is easily implementable. While RA-S2 requires only implementation of institutional controls and monitoring, coordination with the Towns and the railroad will be necessary to effectuate this remedy.

Alternatives RA-S3, RA-S4, and RA-S5 utilize reliable waste disposal technologies with proven histories of success. Treatment technologies for RA-S3 (thermal treatment for organics) and RA-S4 (stabilization/solidification for inorganics and possibly organics) are more complex but have been used effectively at other sites. These alternatives are highly implementable; however, logistical implementation issues exist with RA-S3 and RA-S4 due to the limited area of the Site to provide workspace as well as the need to locate on-site the consolidated and covered material after treatment. Excavation activities near the railroad track may require specialized design and construction methods and coordination with the railroad to ensure track integrity. All active source control remedial alternatives ( RA-S3, RA-S4, RA-S5) may encounter some implementability issues with regard to movement of material and equipment from one side of the railroad tracks to the other.

Engineering and construction services, equipment, and materials are readily available to implement any of the alternatives.

***Groundwater Alternatives***

Alternative RA-G1 does not involve the use of technology or construction. There is nothing to operate or monitor. No approvals, coordination or off-site services are required nor any type of administrative process.

Alternative RA-G2 is easily implementable. Monitoring/sampling methods are well developed and routinely performed. Fencing is a standard field task. Implementing and enforcing land use restrictions would require coordination and cooperation with local officials. Anticipated restrictions, when this alternative is teamed with RA-S3, RA-S4 or RA-S5, do not appear to conflict with local reuse plans.

Well drilling investigation derived waste would produce minimal material for off-site disposal for which licensed facilities are available. No special equipment is necessary.

**Cost**

***Soil Alternatives***

Capital, operations and maintenance, and present worth costs were estimated for all alternatives and separate costs are presented for residential (for the Foxborough portion of the Site) versus commercial exposure scenarios (for the remainder of the Site located in Mansfield). This approach was utilized due to the land use factors discussed in Section F of the ROD. Cost estimates for these alternatives all included similar expenses for long-term environmental monitoring.

There are no costs associated with Alternative RA-Sl, so it is the least costly remedial alternative.

The detailed cost breakdowns for Remedial Alternatives RA-S2, RA-S3, RA-S4, RA-S5 are presented in Tables 5.4-4, through 5.4-7 of the FS. A summary of the total cost of each alternative is presented in Table K-3 of this ROD. Overall, RA-S5 is the most expensive at $20.9 million, with RA-S3 and RA-S$ within $2.7 million of each other.

***Groundwater Alternatives***

Like the soil no action alternative, there are no costs associated with the groundwater no action alternative, RA-G1.

Costs for RA-G2 are presented in Table 5-4.8 of the FS. A summary of the cost estimate is presented in Table K-3, at approximately $1.4 million.

**State/Support Agency Acceptance**

The lead agency for the Commonwealth of Massachusetts, the Department of Environmental Protection (MA DEP), has expressed its support for Alternative RA-S4 and RA-G2. See Appendix A for the State concurrence letter.

### Community Acceptance

During the 30-day public comment period, the community expressed its support for the proposed alternative. Several commenter asked that the remedy be designed and built in such a manner as to allow the maximum flexibility with respect to the construction of structures on the consolidated and covered area. See Part 3, the Responsiveness Summary for responses to specific comments received during the comment period.

## L. THE SELECTED REMEDY

### 1. Summary of the Selected Remedy

The selected remedy is a comprehensive remedy which utilizes source control and management of migration components to address the principal Site risks. The selected remedy corresponds to Alternatives RA-S4 and RA-G2 which are described in the FS.

The major components of the remedy include excavation and consolidation of soils to address direct contact and incidental ingestion risks, the treatment and covering of the soils and/or disposal off-site, and the use of institutional controls and monitoring to address groundwater ingestion and contact risks, protect the integrity of the low-permeability cover and other remedial components, and restrict future land uses to ensure the protectiveness of the remedy. Removal of LNAPL soil will also reduce a primary source of groundwater contamination.

The plan is based on a future use scenario of commercial/open space for the Mansfield portion of the Site and a smaller area for residential use in Foxborough. The plan also assumes that groundwater at the Site is not available for drinking water by future Site users, therefore no active cleanup measures are planned for Site groundwater.

The institutional controls described below will ensure that the future uses of the Site will conform to the assumptions in the risk assessment which are in turn based upon the "reasonable future use assumptions" outlined in Section F of this ROD.

### 2. Description of Remedial Components

<u>The major components of this remedy are:</u>

•Approximately 31,000 cubic yards of soil exceeding cleanup levels will be addressed through a combination of excavation and off-site disposal and on-site consolidation with a low-permeability cover.

•The buildings in and near Hatheway & Patterson Company's former manufacturing area will be demolished to allow excavation and/or consolidation of underlying contaminated soils. Excavated soil will be replaced with clean backfill.

•Soils containing pentachlorophenol (PCP), semi-volatile organic compounds (SVOCs), and arsenic will be excavated, tested for leachability and, if they fail, stabilization/solidification agent(s) will be used. The stabilized/solidified soils will then be consolidated on-site under a low-permeability cover.

•Soils containing dioxin and oily material will be disposed of off-site at a licensed facility.

•Institutional controls will prohibit the use of Site groundwater, restrict land uses and will protect the integrity of the cover. Risks from soil exposure within the existing railroad right of way will be evaluated during design and appropriate action such as deed restrictions and fencing will be implemented if necessary.

•Long-term monitoring of groundwater and surface water, five-year reviews, and operation and maintenance of remedial components, including the low-permeability cover will be performed.

Approximately 31,000 cubic yards of soil exceeding cleanup levels will be excavated and disposed of off-site or consolidated on-site under a low permeability cover. The soils will be excavated to the cleanup levels shown in Table L-1. Excavated soil will be replaced with clean backfill. Based on the relatively shallow depth of contamination, soil will be excavated using conventional excavation equipment (i.e., backhoe, excavator) and transported by truck or rail cars. Some contaminated soil may be stored on a geotechnical barrier on-site for a short time during excavation before being transported off-site.

The buildings in and near Hatheway & Patterson Company's old manufacturing "Process Area" will be demolished in order to address the wastes beneath them.

The FS estimated the quantity of soil based upon the sampling performed to date. The design effort will include further characterization work (including the characterization of soils beneath the existing buildings on-site) to minimize the chance of underestimation of soil quantities. The vertical extent of excavation will be limited by the elevation of the water table. Any floating free product will be removed at the same time to the extent practicable through some type of vacuum process and/or sorbent material. Areas excavated will be backfilled with clean soil. Any wetlands resources impacted will be restored.

Some soil excavation activities may require dewatering before consolidation or off-site disposal. Water resulting from dewatering activities of saturated soil will be discharged to the Rumford River after treatment in a mobile treatment facility. The areas to be excavated are shown in Figure L-1.

Soils exceeding the cleanup levels in Table L-1 for dioxin or containing LNAPL will be shipped to an off-site disposal facility. These soils will be segregated and shipped off-site by rail or by truck in order to minimize short-term impacts to the community. LNAPL containing material outside the hot spot will be excavated to the extent it coexists with other Site contaminants targeted for excavation, and segregated for off-site disposal.

Soils containing pentachlorophenol (PCP), semi-volatile organic compounds (SVOCs), and arsenic above the cleanup levels in Table L-1 will be excavated, tested for leachability using appropriate test methods and, if they fail leachability criteria, a stabilization/solidification agent(s) will be utilized. If treatment is needed, a pug mill will likely be used to mix and treat the soils.

The stabilized/solidified soils, along with demolition debris will then be consolidated on-site under a low-permeability cover. A representative cross-section diagram of a low permeability cover is show in Figure L-2. A schematic of the selected cleanup plan is shown in Figure L-3. The location of the consolidated and covered material will be determined during design, but will be located in an area that is consistent with future use assumptions and is not within a wetland area.

Risks from soil exposures within the area of the existing railroad right of way will be evaluated during design and appropriate action such as deed restrictions or other legal and administrative measures will be implemented if necessary.

In order to ensure that contaminated groundwater is not impacting off-site receptors, additional monitoring wells will be installed in a downgradient direction. A long-term groundwater monitoring plan will be developed and implemented to ensure that the groundwater plumes are not migrating beyond the compliance boundary. If exceedances are found, further actions may be necessary.

Institutional controls will prohibit the use of Site groundwater and restrict land uses in a manner that ensures the protectiveness of the remedy as described in this ROD, and ensures the integrity of the on-site low-permeability cover and other remedial components. There will be a provision that prevents land use activities which would interfere with the integrity of the low-permeability cover or are inconsistent with the land use assumptions used as the basis for the soil cleanup levels. Residential uses of the Mansfield portion of the Site and other uses incompatible with the remedy will be prohibited. Institutional controls will also be designed to prevent the use of groundwater for drinking water at the Site as well as to ensure that the designated GW-2 and GW-3 uses are maintained. Examples of institutional control mechanisms that could be utilized are administrative, or legal measures such as easements, covenants, notices, well drilling prohibitions, zoning restrictions, and special building permit requirements.

ARARs for the selected remedy are shown in Appendix D.

3. Cleanup Levels and Performance Standards

a. Soil Cleanup Levels

The reasonably anticipated future use of the Site is commercial/industrial and or open/space per Appendix F (letter from Mansfield, MA.) for the portion of the Site in Mansfield, and residential in the small portion that is located in Foxborough. The soil cleanup levels are based upon the assumptions made in the Human Health Risk Assessment (M&E, 2005).

Soil cleanup levels for contaminants of concern in surface and subsurface soil exhibiting an unacceptable cancer risk and/or hazard index have been established such that they are protective of human health. Exposure parameters for dermal contact and incidental ingestion have been described in the Human Health Risk Assessment (M&E, 2005) and in Section G of this ROD.

Prior to excavation or during consolidation activities, soils will be tested for leachability, if leaching is found to be unacceptable, a stabilization/solidification agent will be added to soils before being consolidated and covered.

The cleanup levels in Table L-1 must be met at the completion of the remedial action. The soil cleanup levels apply to the entire Hatheway & Patterson Site and they will be met in soils to a depth of the groundwater table. Compliance will be demonstrated through a conformational sampling and analysis plan which will be developed as part of the Remedial Design. These soil cleanup levels attain EPA's risk management goal for remedial actions and have been determined by EPA to be protective.

b. Groundwater Performance Standards

Because Site groundwater has been classified by the Commonwealth of Massachusetts as Class III, non-potable use, performance standards for on-site groundwater have been set to protect the designated uses for Class III groundwater; that is, to prevent concentrations that would cause vapor intrusion and to prevent degradation of surface water (the Rumford River) below AWQC via groundwater discharge. The Rumford River is a Class B surface water with a designated use of primary- and secondary- contact recreation and recreational fishing. Massachusetts AWQCs for protection of aquatic life were used in conjunction with estimated low flows in the Rumford River and a dilution factor to calculate the Performance Standards in Table L-2 for groundwater. See Table L-3 for calculation details. These Performance Standards were designed to protect aquatic life habitat in the Rumford River from contaminated Site groundwater that discharges through seeps into the River which may degrade the water. Because consumption of fish from the River did not pose an unacceptable risk to human health, only the aquatic protection calculations appear in Table L-2. [10]

The Massachusetts Department of Environmental Protection completed a Groundwater Use and Value Determination on the aquifer in which the Hatheway & Patterson Superfund Site is

[10] At the time this ROD was issued, risk associated with dermal absorption could not be quantified for some contaminants, including pentachlorophenol, dioxin, and carcinogenic polycyclic aromatic hydrocarbons, because dermal absorption coefficients were insufficient according to EPA. This uncertainty may result in an underestimation of carcinogenic risk. Because some of these contaminants may be present in the groundwater as it discharges to the River, this uncertainty will be reviewed during the five-year review at this Site to see if models have been updated to address changes in the dermal absorption values.

located. This determination is attached as Appendix G**.** This finding indicates that the groundwater beneath the Site has medium/low value as a future drinking water supply because:

> *"The groundwater beneath and in the vicinity of the Site is not classified as a current or potential drinking water supply. The closest municipal water supply wells are located approximately one mile to the east. An approved Zone II extends to approximately one-quarter mile to the east of the Site. There is an EPA designated Sole Source Aquifer also located approximately one-quarter mile to the east. Wetland areas are located to the east, northeast and southwest of the Site. The aquifer underlying the Site is classified as low yield by the United States Geological Survey (USGS)"*

In addition the Massachusetts DEP's Use and Value Determination stated that

> "on-site businesses use public water" and are "not expected to use Site water for non-potable uses." Based on this information, any future use of the Site, whether for recreational, commercial, or even residential purposes, would be supported by municipal water and would not require use of the aquifer for potable uses."

Therefore drinking water standards, consistent with the use and value determination, shall not be required to be attained in the groundwater at the Site.

Although cleanup levels are not set for site groundwater for use as drinking water, MCLs and state groundwater standards have been identified as groundwater performance standards at the Site compliance boundary (the southern property boundary/Rumford River backwash channel and the Rumford River on the southwestern portion of the property). These Performance Standards will ensure that contaminated groundwater is not migrating to off-site receptors. Performance Standards at the compliance boundary are shown in Table L-5. If the Performance Standards are exceeded beyond the compliance boundary, EPA will re-evaluate whether or not off-site receptors are at risk. If action is necessary, a subsequent decision document will be issued.

EPA expects that as the remedy is implemented, groundwater quality will improve and any impacts on surface water quality will decrease. Monitoring will confirm that groundwater is not migrating off-site or adversely impacting the Rumford River above acceptable levels.

4. Design and Pre-Design Efforts

The design effort for soils will include sampling beneath the remaining Hatheway & Patterson production buildings that will be demolished, as well as further soil sampling at the Site in order to further characterize the extent of contaminants at the Site

During design, stabilization/solidification bench scale (and potentially pilot scale) testing will be performed in order to refine estimates of the volume of soil to be treated and the reagent mix found to ensure the protectiveness of the remedy. Among the reagents that may be used are Portland cement, powdered activated carbon (PAC), and ferrous sulfate. Soils will be tested for leachability to determine if a reagent mix is necessary before covering. Pilot scale efforts may also be performed on other aspects of the design/remedial action as necessary. The potential volumes that may be generated by excavation in the area of VP-C2 as described in Section G will be estimated.

Among the goals of the pre-design bench scale testing will be the generation of the data needed to compare to Toxicity Characteristic Leaching Procedure (TCLP) and/or calculate acceptable Synthetic Precipitation Leaching Procedure (SPLP) criteria for the contaminants of concern, the unconfined compressive strength in the solidified material, as well as to determine the permeability of the solidified material. The design effort will use the data to calculate criteria for each of those parameters for use in design and construction.

For the low-permeability cover, a cross-sectional diagram is presented in Figure L-2. The actual cross sectional details of the low permeability cover will be determined in the design process. The cover will be designed to allow the maximum flexibility in future re-use of the Site, including potentially supporting foundations for slab-on-grade buildings**.** Part of the design effort will be focused on ensuring that reuse of the property is supported to the maximum extent by the engineering performed in putting together the design specifications for the project. This will entail working closely with the owner(s) of the various parcels and the municipalities.

Soil exposures within the area of the existing railroad right of way will be evaluated during design and appropriate action such as deed restrictions and fencing will be implemented as necessary.

During the design development, as well as during the remedial construction phase, EPA will work with local authorities to minimize traffic impacts on the surrounding community to the extent practicable by working with local authorities on appropriate routes, hours of operation, and traffic control. EPA will also explore the potential to use the existing rail line to bring material to and from the Site.

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 fact sheet, an Explanation of Significant Differences or a Record of Decision Amendment, depending on the magnitude of the changed component.

5. Operations and Maintenance and Long-Term Monitoring Components

Long term monitoring of groundwater surface water, sediment and fish tissue; five-year reviews; and operation and maintenance of remedial components, including the low-permeability cover will be performed.

An O&M plan will be developed and will include a regular list of inspection items to be carried out, including: 1) regular review and maintenance of the Site fence; 2) the cover installed over the materials consolidated on-site as well as other on-site remedial components; and 3) inspection, monitoring, and enforcement of institutional controls.

During the Remedial Design phase, EPA will coordinate with key stakeholders, including the Town of Mansfield on cover design and location issues. To the extent that reuse plans exist at the time of the design, EPA will work with the Town, to the extent practicable, to coordinate redevelopment designs and cover designs. If reuse plans involving the cover area arise at a later date, the Institutional Controls will outline a process for review and approval of redevelopment plans. Long-term operation and maintenance activities will be coincident with site reuse and will be outlined in greater detail in the Operation and Maintenance (O&M) Plan.

Monitoring of sediment and surface water will be continued annually until completion of the first 5 year review after construction of the remedy is completed in order to document conditions at and near the Site. A round of fish tissue sampling will be performed in conjunction with the 5 year review as well. Sampling of Site groundwater and off-site groundwater (including the new wells installed during the remedial action) will be performed twice a year, every other year until the first 5 year review. The sampling will continue after the first 5 year review in accordance with the O&M Plan to ensure that contaminated groundwater is not impacting off-site receptors and to ensure the protectiveness of the remedy.

Monitoring will be particularly aimed at ensuring that any off-site contaminant migration via groundwater to potential receptors will be detected through the installation of additional wells and the monitoring of pre-existing wells. Institutional controls will be implemented and enforced by the appropriate entities. During remedial design and construction (before completion of the remedy) regular inspections of fencing and physical hazards will be performed to limit exposure to contaminants and other hazards at the Site. Risk communication measures such as signage and other outreach activities will be implemented in concert with municipalities and other public health related agencies as necessary in order to ensure that any future risks, if they arise, are communicated effectively.

EPA will review the Site at least once every five years after the initiation of remedial action at the Site to assure that the remedial action continues to protect human health and the environment.

6. Summary of the Estimated Remedy Costs

Table L-4 represents a summary of the expected costs of the selected alternatives. The Table represents a breakdown of the major construction and O&M activities required to implement each remedial component in logical sequence. A discount rate of 7% was used for calculating total present worth costs as required by current OSWER policy over a 30 year time period. The information in this 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.

7. Expected Outcomes of the Selected Remedy

The expected outcome of the selected remedy is that the Mansfield portion of the Site will no longer present an unacceptable risk to trespassers, recreational users, or commercial/industrial users via soil exposure and will be suitable for the reasonably anticipated future use as described in Section F of the ROD. The Foxborough portion of the Site will be protective of these uses as well as cleaned up for residential use. Another expected outcome is that groundwater contamination does not migrate to off-site receptors, and that the Site will not present a potential future unacceptable risk to the environment via aquatic receptors through seepage to the Rumford River. The designated uses of the Rumford River and Site groundwater will be protected through this action.

It is anticipated that the selected remedy will also provide socio-economic and community revitalization impacts such as increased tax revenues due to redevelopment of the Site which has been predominantly vacant since the mid-1990s.

Approximately 18 months to 2 years are estimated as the amount of time necessary to implement the response action.

## M. STATUTORY DETERMINATIONS

The remedial action selected for implementation at the Hatheway & Patterson 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, 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 partially satisfies the statutory preference for treatment that permanently and significantly reduces the mobility, toxicity or volume of hazardous substances as a principal element.

### 1. The Selected Remedy is Protective of Human Health and the Environment

The remedy at this Site will adequately protect human health and the environment by eliminating, reducing or controlling exposures to human and environmental receptors through treatment, engineering controls and institutional controls. More specifically institutional controls and soil excavation combined with 1) stabilization/solidification and consolidation on-site; or 2) off-site disposal at a licensed facility, will eliminate the threat posed by soils at the Site. Groundwater risks to potential receptors will be eliminated through the use of institutional controls on-site and monitoring of potential migration off-Site. Removal of LNAPL soils will reduce a source of contamination to groundwater.

The selected remedy will reduce potential human health risk levels such that they do not exceed EPA=s acceptable risk range of $10^{-4}$ to $10^{-6}$ for incremental carcinogenic risk. Likewise the remedy will ensure that the non-carcinogenic hazard is below a level of concern because the calculated HI will not exceed 1. The remedy will reduce potential human health risk levels to protective ARARs levels; the remedy will comply with ARARs and To Be Considered criteria.

The remedy provides for protection of the environment through the removal of soils containing high levels of LNAPL and PCP (in the southeast/southwest quadrant) which may act as a source of groundwater contamination discharging to the Rumford River. Groundwater performance standards were set to protect aquatic life in the River.

Implementation of the selected remedy will not pose any unacceptable short-term risks or cause any cross-media impacts.

The selected remedy provides for long-term monitoring to ensure that off-site receptors will not be exposed to contaminated groundwater and that waste left in place will not leach contaminants to groundwater. The source control component of the selected remedy eliminates contact with soil through consolidation, treatment and a low permeability cover. Institutional controls will prevent groundwater use as drinking water, protect the integrity of the cover and the rest of the remedial components, and restrict land uses incompatible with the remedy.

2. The Selected Remedy Complies With ARARs

Section 5.3 of the Feasibility Study describes the most significant chemical, location and action specific ARARs for the remedy. Appendix D to the ROD summarizes the various environmental ARARs for the remedy and their impact on remedial activities.

Section 404 of the Clean Water Act and Executive Order 11990 (Protection of Wetlands) require a determination be made that federal actions involving dredging and filling activities or activities in wetlands minimize the destruction, loss, or degradation of wetlands and preserve and enhance the natural and beneficial values of wetlands. EPA, after soliciting and receiving public comment, hereby makes the determination that (1) because significantly high levels of contamination exist in the wetlands areas of the Site, there is no practicable alternative to conducting work in these areas; and (2) the selected remedy will be conducted with best management practices to minimize adverse impacts on wetlands, wildlife, and its habitat. To the extent practicable, EPA will locate the consolidated and covered waste on an upland area away from the wetlands to minimize adverse impacts. Damage to the wetlands will be mitigated through erosion controls measures and proper regarding and re-vegetation of the impacted area with indigenous species. Following excavation activities, wetlands will be restored or replicated consistent with the requirements of the federal and state wetlands protection laws.

3. The Selected Remedy is Cost-Effective

The selected remedy 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 state ARARs, or as appropriate, waive ARARs). Overall effectiveness was evaluated by assessing three of the five balancing criteria -- long-term 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 it represents a reasonable value for the money to be spent.

From this evaluation, EPA has determined that Alternatives RA-S4 and RA-G2 are cost effective as they meet both threshold criteria and are reasonable given the relationship between the overall effectiveness afforded by the other alternatives and costs compared to other available options. The detailed cost estimates for the components of the selected alternatives are shown in Table L-4.

In evaluating the differences between Alternatives RA-S2, RA-S3, RA-S4, and RA-S5, Alternative RA-S5 provides the greatest long-term effectiveness and permanence when compared to the other source control alternatives, and also provides greater reduction in toxicity, mobility, and volume, although not through treatment. However, the cost effectiveness of RA-S5 is not a great as RA-S2, RA-S3, and RA-S4 because of the large disposal and transportation costs for off-site disposal.

Alternative RA-S2 has marginally fewer short term impacts on the community than Alternatives RA-S3 and RA-S4. RA-S2 contains costs for only monitoring and institutional controls, however RA-S2 is not protective. The difference between RA-S3 and RA-S4 is basically the cost of the thermal treatment applied to the soil. The $2.7 million cost increase attributable to the application of thermal treatment to soils and LNAPL in RA-S3 is not proportional to the increase in protectiveness over RA-S4; both will prevent leaching of contamination to groundwater.

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 ARARs 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 provides the best balance among the other soil alternatives in that it provides for off-site disposal of some material (dioxin and LNAPL soil), as well as on-site stabilization/solidification and consolidation of other contaminated soils, all without sacrificing protectiveness. Weighing removal of more material off-site or adding more treatment against the degree of added protection such measures would provide, lead to the conclusion that Alternative RA-S4 is the most cost-effective alternative.

5. The Selected Remedy Partially Satisfies the Preference for Treatment Which Permanently and Significantly Reduces the Toxicity, Mobility or Volume of the Hazardous Substances as a Principal Element

The principal element of the selected remedy is source control through excavation followed by

1) stabilization/solidification and consolidation of PCP and metals contaminated soils; and
2) off-site disposal of dioxin and LNAPL contaminated soils. This element addresses the primary threat at the Site: dermal contact and incidental ingestion of contaminated soil, as defined by the Cleanup Levels in Table L-1**.** The selected remedy also partially satisfies the statutory preference for treatment as a principal element by reducing the ability of contaminants to leach into groundwater and to otherwise reach receptors by the use of stabilization/solidification agents.

The selected remedy permanently reduces toxicity and mobility of contaminants through stabilization/solidification of the soil found above Cleanup Levels. It includes a low permeability cover that further minimizes mobility of contaminants by preventing water from coming into contact with waste material. It also eliminates toxicity, mobility and volume, although not through treatment, by off-site disposal of some or all of the contaminated soils exceeding Cleanup Levels.

None of the alternatives actively treat contaminated groundwater; however groundwater will be monitored to prevent contamination from reaching off-site receptors; institutional controls will restrict the future uses of groundwater at the Site to ensure that they are consistent with the findings of the human health risk assessment, restrict land uses incompatible with the remedy, and prevent interference with the low permeability cover and other remedial components.

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.

The five year reviews at the Site will also evaluate risks posed by groundwater and surface water in light of monitoring and any updated dermal absorption values for certain contaminants of concern. At the time this ROD was issued, risk associated with dermal absorption could not be quantified for some contaminants, including pentachlorophenol, dioxin, and carcinogenic PAHs, because dermal absorption coefficients were insufficient according to EPA. This uncertainty may result in an underestimation of carcinogenic risk. This uncertainty will be reviewed and the models updated to address any changes in the dermal absorption values.

## N. DOCUMENTATION OF NO SIGNIFICANT CHANGES

EPA presented a proposed plan for remediation of the Site on June 16th, 2005**.** 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 were necessary as a result of these comments.

After the Proposed Plan was issued, additional data was gathered concerning two small, seasonally flooded depressions on the Site which had been identified for further evaluation as a potential vernal pool habitat and whether sediment in these areas posed a risk to ecological receptors. One depression (VP-C2) did not display characteristics of a vernal pool based on criteria developed by the Commonwealth. The second depression (VP-D1) did display physical and biological characteristics of a vernal pool based on those criteria. Although depression VP-D1 is not officially classified as a certified vernal pool by the Commonwealth, this remedy will treat the location as a vernal pool as reflected in the ARARs identified in Appendix D.

Finally, the Feasibility Study included state groundwater standards as chemical specific ARARs; however, because the state has classified the aquifer at the Site as non-potable, cleanup of groundwater is outside the scope of this ROD. Instead, as explained in Section L.3 of the ROD, state groundwater standards and MCLs are cited as ARARs that will act as performance standards for the remedy to ensure that contaminated groundwater is not migrating to off-site receptors or degrading surface water beyond the compliance boundary. The performance standards are listed in Table L-5.

## O. STATE ROLE

The Massachusetts Department of Environmental Protection has reviewed the various alternatives and has indicated its support for the selected remedy. The State has also reviewed the Remedial Investigation, the Risk Assessments and Feasibility Study to determine if the selected remedy is in compliance with applicable or relevant and appropriate State requirements. The MA DEP concurs with the selected remedy for the Hatheway & Patterson Site. A copy of the declaration of concurrence is attached as Appendix A**.**

# PART 3

# RESPONSIVENESS SUMMARY

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## HATHEWAY & PATTERSON SUPERFUND SITE RESPONSIVENESS SUMMARY

## A. PREFACE

The U.S. Environmental Protection Agency (EPA) held a 30-day public comment period from June 17th to July 18, 2005, to provide an opportunity for public input on the June 2005 Proposed Plan to address contamination at the Hatheway & Patterson Superfund Site (the "Site") in Mansfield/Foxborough, MA. EPA prepared the Proposed Plan based on the results of the human-health risk assessment, ecological risk assessment, remedial investigation data evaluation reports, the Feasibility Study and the Commonwealth of Massachusetts groundwater use and value determination. All documents that were used in EPA's selection of the preferred alternative were placed in the Administrative Record which is available for public review in the Mansfield Public Library, and at the EPA Records Center in Boston, Massachusetts.

The purpose of this Responsiveness Summary is to document EPA's responses to the questions and comments raised during the public comment period. EPA considered all the comments summarized in this document before selecting a final remedy for the Hatheway & Patterson Superfund Site

This Responsiveness Summary is organized into the following sections:

Overview of Proposed Plan. This section briefly outlines the June 2005 Proposed Plan for addressing the contamination at the Site.

Site history and background on community involvement and concerns. This section provides a brief history of the Site and an overview of community interests and concerns regarding the Site.

Summary of comments received during the public comment period. This section summarizes comments received and provides EPA's responses to comments from the public during the public comment period.

A copy of the transcript from the public hearing held on Thursday, July 7th, 2005, in Mansfield, Massachusetts, is included as Attachment A to this Responsiveness Summary. The written comments received during the comment period are included in Attachment B.

## B. OVERVIEW OF PROPOSED PLAN

On June 17th, 2005, the Proposed Plan for the Hatheway & Patterson Superfund Site was released. Its main points included:

- The plan is based on a future use scenario of commercial/open space for the Mansfield portion of the Site and a smaller area for residential use in Foxborough. The Plan also assumes that groundwater at the Site is not available for drinking water by future users of the Site; therefore, no active cleanup measures are planned for groundwater under the Site**.**
- Approximately 31,000 cubic yards of soil exceeding cleanup levels will be excavated.
- The buildings in and near Hatheway & Patterson's old manufacturing space will be demolished to allow the waste in place under them to be addressed. Excavated soil will be replaced with clean backfill.
- Soils containing pentachlorophenol (PCP), semi-volatile organic compounds (SVOCs), and arsenic will be excavated, tested for leachability and, if they fail, stabilization/solidification agent(s) will be utilized. The stabilized/solidified soils will then be consolidated on-site under a low-permeability cover.
- Soils containing dioxin and oily material (LNAPL) will be disposed of off-site at a licensed facility.
- Institutional controls will prohibit the use of Site groundwater and restrict land uses. Soil exposures within the area of the existing railroad right of way will be evaluated during design and appropriate action such as deed restrictions and will be implemented if necessary.
- Long term monitoring of groundwater and surface water, Five-year reviews, and operation and maintenance of remedial components, including the low permeability cover will be performed.

## C. SITE HISTORY AND BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

**Please see Sections B and C of the Record of Decision.**

## D. SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES

This Responsiveness Summary addresses comments pertaining to the Proposed Plan that were received by EPA during the public comment period (June 17th to July 18, 2005). Several individuals submitted written comments. Three individuals submitted oral comments at the public hearing on July 7th, 2005. What follows are EPA's responses to these comments. Where possible, EPA has grouped similar comments, and prepared a single response. A copy of the public hearing transcript is included as Attachment A. Copies of the written comments are included as Attachment B.

Comment #1: Several comments were received regarding the design of the cover over the consolidated material. The comments pertained to the capabilities of the cover to support buildings or other facilities which might be built on top of them.

Response #1: During the Remedial Design phase, EPA will coordinate with key stakeholders, including the Town of Mansfield on cover design and location issues. To the extent that reuse plans exist at the time of the design, EPA will work with the Town, to the extent practicable, to coordinate redevelopment designs and cover designs. If reuse plans involving the cover area arise at a later date, the Institutional Controls will outline a process for review and approval of redevelopment plans. Long-term operation and maintenance activities should be able to be coordinated with Site reuse and will be outlined in greater detail in an Operation and Maintenance Plan.

Comment #2: The Town of Mansfield commented that it was concerned that the proposed plan to consolidate material on-site would limit the Town's ability to reuse the site fully for commercial use. The Town indicated a desire to work with EPA to ensure that its concerns are addressed with regard to the exact location of the consolidated material.

Response #2: The re-use of the Site should not be limited by the placement of the cap, if EPA and the Town of Mansfield (and other stakeholders) work together as outlined in the response to #1 above.

Comment # 3: One comment suggested some type of barrier to isolate Site groundwater from the Rumford River.

Response #3: The Human Health Risk Assessment and the Baseline Ecological Risk Assessment have evaluated all viable complete pathways of exposure to the Rumford River surface water and sediment and have found no unacceptable risks from Site related contaminants. Risks have been found to off-site residents from Site groundwater should groundwater migrate off-site and be used as drinking water or for showering/bathing or for non-potable uses such as filling swimming pools. Likewise, any future on-site user of groundwater for these purposes would be at risk. Institutional controls have been incorporated into the remedy to protect against these uses.

Because there are no actionable risks stemming from groundwater discharge to the Rumford River, there is no requirement for the placement of a barrier, hydraulic or otherwise. However, Section E of the ROD discusses the direction of the groundwater plume and recognizes that the Rumford River Backwash channel appears to be acting as a natural hydraulic barrier to off-site migration of groundwater. In addition, the remedy includes groundwater performance standards that will be used to ensure that the Rumford River is not degraded by Site groundwater, and that the ecology of the River is protected. The remedy also includes source control measures designed to eliminate a hot spot of LNAPL located in the SE/SW area of the Site which appears to be a source of contamination to groundwater.

Removing LNAPL, combined with the natural hydraulic barrier of the Backwash channel as well as the ongoing groundwater and surface water monitoring program will allow EPA to continue to evaluate risk from groundwater as well as to ensure the protection of the Rumford River from Site contaminants. EPA will continue to reexamine this data and evaluate the ongoing protectiveness of the remedy during periodic Five-Year Reviews of the Site.

Comment #4: One comment received expressed concern regarding adverse impacts from the planned building demolition work on the environment and the community, including air emissions. This comment also asked about the planned oversight of the demolition and cleanup activities.

Response #4: The demolition of the buildings will take place in accordance with applicable, relevant or appropriate requirements and will include careful monitoring and use of dust and odor suppression techniques in order to ensure that there will be no adverse impact on the neighborhood. EPA will, in its role as lead agency for this cleanup, be responsible for oversight of all design and construction activities.

Comment #5: One comment was received indicating concern over truck traffic that is to be associated with the cleanup of the Site.

Response #5: EPA will work with local authorities to attempt to minimize traffic impacts on the surrounding community through the planning of appropriate routes, hours of operation, and traffic control. EPA will also explore the potential to utilize the existing rail line on the Site for transporting material to and from the Site.

Comment #6: Several comments received indicated preference for specific reuses of the Site, for example: a community center or performance center.

Response #7: The reuse of the Site will be addressed by the owner/s of the Site and the municipalities in which the lots are located. EPA will coordinate with these entities during the design phase of the remedy to maximize Site reuse to the extent practicable should reuse plans be in place at that time.

Comment #7: The Mansfield Planning Board commented in support of EPA's proposal but asked for a further evaluation of alternative RA-S5:

Response #7: The Selected Remedy is similar to the RA-S5 alternative in some respects. For instance, both alternatives meet the threshold criteria of protection of human health and the environment, as well as the requirement to meet ARARs. Short-term impacts would be much greater, however from the RA-S5 alternative due to the much larger amount of traffic to and from the Site due to its shipment of all waste to an off-site disposal facility. The RA-S4 alternative is much more cost effective, yet still protective of human health but at approximately half the cost of RA-S5. Therefore, the RA-S4 remedy has been selected using EPA's 9 criteria comparative analysis.

Comment #8: CSX Corporation indicated that using certain tools would help to limit the volume of physical remediation necessary, specifically the use of an iterative approach to identifying soil samples requiring remediation; as well as geostatistical methods for estimating exposure point concentrations.

Response #8: The use of statistical methods will be considered during remedial design.

Comment # 9: The Massachusetts Department of Public Health indicated its concern about the potential for contaminated groundwater to periodically reach the Rumford River and contaminate sediment and fish, posing health concerns with regard to human fish consumption. MDPH noted their intent to keep the public health fish consumption advisory in place for the Rumford River until these concerns are more fully addressed. MDPH recommended continued monitoring of sediment and fish from the Rumford River until it is confirmed that contamination from the Site no longer reaches the River from groundwater.

Response #9: With regard to fish consumption, EPA's human health risk assessment has concluded that there is no risk to humans from consumption of fish from the Rumford River. However, monitoring of sediment and fish, as well as surface water and groundwater at the Site will be continued as part of the remedy and the Five-year review process in order to meet the concerns of the Massachusetts DPH and to ensure the protectiveness of the remedy. Monitoring will be particularly aimed at ensuring that any off-site migration of groundwater to potential receptors will be detected through the installation of additional off-site groundwater wells and the monitoring of pre-existing wells. Risk communication measures such as signage and other outreach activities will be implemented in concert with municipalities and other public health related agencies as necessary in order to ensure that any future risks are communicated effectively.

As noted in the response to Comment #3, the selected remedy includes source control measures to remove continuing sources of groundwater contamination from soil and LNAPL. Groundwater Performance Standards have been established based on potential risks to aquatic life in the Rumford River from Site groundwater. EPA believes that through these source control measures and continued monitoring, these cleanup goals can be achieved in the long-term.

Comment #10: MA DPH also indicated its concerns regarding the planned depth of soil excavation, particularly in areas of dioxin contamination.

Response #10: Based on the HHRA, the cleanup levels have been set in order to protect the Reasonably Anticipated Future Uses (RAFU) of the Site. The selected remedy includes source control measures to minimize future leaching of contaminants to the Rumford River. The extent of soil excavation will be refined during sampling conducted in conjunction with the Remedial Design. In addition, confirmation sampling will be conducted after excavation to ensure that soils contaminated above Cleanup Levels are addressed.

<u>Comment #11</u>

MA DPH indicated that its concerns regarding the potential migration of contaminated groundwater could be better addressed after further characterization of the groundwater flow and discharge to surface water through monitoring.

<u>Response #11</u>

The selected remedy will include monitoring of groundwater to ensure that it is not impacting off-site receptors. Additional monitoring well locations could be added depending on sampling results. Although EPA believes that once the source of groundwater contamination is addressed, the presence of these contaminants in surface water will diminish, the selected remedy also includes surface water, sediment, and biota monitoring in the Rumford River. The results of the sampling events will be evaluated as part of the Five Year Review process at the Site.

TABLES

Table D-1: Threats and Actions to Be Taken

| **Principal Threats** | **Medium** | **Contaminant(s)** | **Action To Be Taken** |
|---|---|---|---|
| Dermal & Incidental Ingestion | Surface and subsurface soil | Pentachlorophenol (PCP) Arsenic, | Stabilization, disposal on-site |
| Dermal & Incidental Injestion | Surface and subsurface soil | Dioxin, LNAPL, | Off-site disposal |
| Groundwater Contact and Ingestion | Ground-water | PCP | Monitoring, institutional controls |

Table E-1: Nature and Extent of Contaminants

| **Known Contaminant Source** | **Contaminant** | **Medium Affected** | **Release Mechanisms** | **Contamination Volume or Areal Extent** | **Sampling Activities** |
|---|---|---|---|---|---|
| Process Buildings, drip pads, wood drying areas | Pentachlorophenol, dioxin, arsenic, benzo(a)pyrene | Soil | Tank leaks, dripping of treated wood, wood drying, infiltration | 30,888 cy | Surface soil sampling, soil borings |
| | Pentachlorophenol, arsenic, chromium | Ground Water | Tank leaks, dripping of treated wood, wood drying, infiltration | 30,888 cy | Monitoring well installation, four rounds of ground water sampling |
| **Suspected Contaminant Source** | **Contaminant** | **Medium Affected** | **Release Mechanisms** | **Contamination Volume or Areal Extent** | **Sampling Activities** |
| LNAPL | Pentachlorophenol | Ground Water | Leaching of LNAPL to ground water | Approx. 1.5 acres | LNAPL sampling, ground water sampling |

Table E-2: Contaminant of Concern Concentration Ranges and Averages

| Affected Medium | Contaminant | Concentration Range | Concentration Average | Mobility | Toxicity |
|---|---|---|---|---|---|
| Soil | Pentachlor-ophenol | 0-4,900 ppm | 118 ppm | Low | Cancer, non-cancer |
| | Arsenic | 0-1,860 ppm | 51 ppm | Low | Cancer, non-cancer |
| | Dioxin | 0.018-15,000 ppt | 589 ppt | Low | Cancer |
| | Benzo(a) pyrene | 0-5.9 ppm | 0.36 ppm | Low | Cancer |
| Ground water | Pentachlor-ophenol | 0-17,000 ppb | 1,545 ppb | Moderate | Cancer, non-cancer |
| | Arsenic | 0-940 ppb | 72 ppb | Low | Cancer, non-cancer |
| | Chromium | 0-241 ppb | 7.9 ppb | Low | Non-cancer |

| Aquifer/Aquitard Formation/ Confined | Flow Direction, Quantity | Source Contaminants | Discharges To | NAPLs | Dissolved VOCs |
|---|---|---|---|---|---|
| Overburden | southwest | Pentachloro-phenol, arsenic, chromium | Rumford River | Yes | No |
| Bedrock | southwest | Pentachloro-phenol, arsenic, chromium | Rumford River | No | No |

Table E-3: Principal Threats, Concentrations, and Receptors

| **Principal Threats** | | | | | |
|---|---|---|---|---|---|
| **Source Media** | **Affected Media** | **Contaminant(s)** | **Reason(s)** | **Concentration(s)** | **Receptors** |
| Soil | Soil | Pentachloro-phenol, dioxin, arsenic, benzo(a)pyrene | Toxicity | Pentachlorophenol 0-4,900 ppm<br>Arsenic 0-1,860 ppm<br>Dioxin 0.018-15,000 ppt<br>Benzo(a) pyrene 0-5.9 ppm | Future residents, current and future site workers, current and future trespassers. |
| | Ground water | Pentachloro-phenol, arsenic, chromium | Toxicity | Pentachlorophenol 0-17,000 ppb<br>Arsenic 0-940 ppb<br>Chromium 0-241 ppb | Future residents, current and future site workers, off-site ground water users |

## ROD RISK WORKSHEET

### Table G-1

### Summary of Chemical of Concern and Medium-Specific Exposure Point Concentration

**Scenario Timeframe: Current**
**Medium: Soil**
**Exposure Medium: Surface Soil**

| Exposure Point | Chemical of Concern | Concentration Detected | | Units | Frequency of Detection | Exposure Point Concentration | Exposure Point Concentration Units | Statistical Measure |
|---|---|---|---|---|---|---|---|---|
| | | Minimum | Maximum | | | | | (1) |
| Process Area | | | | | | | | |
| | Arsenic | 3.9 | 1860 | mg/kg | 3 / 3 | 1860 | mg/kg | Max |

**Key**

(1) Statistics: Maximum Detected Value (Max); 95% UCL of Transformed Data (95% UCL - T); 95% UCL of Normal Data (95% UCL - N); 95% UCL of Non-parametric Data (95% UCL - NP); 95% UCL of Gamma Distributed Data (95% UCL - G); Arithmetic Mean (Mean)

The table represents the current chemical of concern (COC) and exposure point concentration (EPC) for the COC detected in surface soil (i.e., the concentration that will be used to estimate the exposure and risk for the COC in surface soil). The table includes the range of concentrations detected for the COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and how the EPC was derived. This table indicates that arsenic is the only COC in surface soil at the site. Due to the limited amount of sample data available for arsenic, the maximum detected concentration was used as the default EPC.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

## ROD RISK WORKSHEET

### Table G-2

### Summary of Chemical of Concern and Medium-Specific Exposure Point Concentration

**Scenario Timeframe: Future**
**Medium: Soil**
**Exposure Medium: Surface Soil**

| Exposure Point | Chemical of Concern | Concentration Detected | | Units | Frequency of Detection | Exposure Point Concentration | Exposure Point Concentration Units | Statistical Measure (1) |
|---|---|---|---|---|---|---|---|---|
| | | Minimum | Maximum | | | | | |
| Process Area | | | | | | | | |
| | Benzo(a)pyrene | 0.089 | 2 | mg/kg | 10 / 11 | 1.1 | mg/kg | 95% UCL - G |
| | Dioxin TEQ | 0.0000028 | 0.011 | mg/kg | 12 / 12 | 0.005 | mg/kg | 95% UCL - G |
| | Arsenic | 3.9 | 1860 | mg/kg | 12 / 12 | 1700 | mg/kg | 95% UCL - NP |
| | Chromium | 8.5 | 2230 | mg/kg | 12 / 12 | 2038 | mg/kg | 95% UCL - NP |

**Key**

(1) Statistics: Maximum Detected Value (Max); 95% UCL of Transformed Data (95% UCL - T); 95% UCL of Normal Data (95% UCL - N); 95% UCL of Non-parametric Data (95% UCL - NP); 95% UCL of Gamma Distributed Data (95% UCL - G); Arithmetic Mean (Mean)

The table represents the future chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in surface soil (i.e., the concentrations that will be used to estimate the exposure and risk for each COC in surface soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and how the EPC was derived. This table indicates that inorganic chemicals and dioxin are the most frequently detected COCs in surface soil at the site. The 95% UCL on the arithmetic mean was used as the EPC for the inorganic compounds arsenic and chromium, and for the organic chemicals benzo(a)pyrene and dioxin.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

## ROD RISK WORKSHEET

### Table G-3

### Summary of Chemical of Concern and Medium-Specific Exposure Point Concentration

**Scenario Timeframe: Future**
**Medium: Soil**
**Exposure Medium: Subsurface Soil**

| Exposure Point | Chemical of Concern | Concentration Detected | | Units | Frequency of Detection | Exposure Point Concentration | Exposure Point Concentration Units | Statistical Measure |
|---|---|---|---|---|---|---|---|---|
| | | Minimum | Maximum | | | | | (1) |
| Process Area | | | | | | | | |
| | Benzo(a)pyrene | 0.15 | 0.56 | mg/kg | 5 / 18 | 0.32 | mg/kg | 95% UCL - NP |
| | Pentachlorophenol | 0.33 | 1100 | mg/kg | 20 / 28 | 950 | mg/kg | 95% UCL - T |
| | Dioxin TEQ | 0.000000018 | 0.00048 | mg/kg | 10 / 10 | 0.00048 | mg/kg | Max |
| | Arsenic | 1.1 | 540 | mg/kg | 19 / 28 | 242 | mg/kg | 95% UCL - NP |

**Key**

(1) Statistics: Maximum Detected Value (Max); 95% UCL of Transformed Data (95% UCL - T); 95% UCL of Normal Data (95% UCL - N); 95% UCL of Non-parametric Data (95% UCL - NP);
95% UCL of Gamma Distributed Data (95% UCL - G); Arithmetic Mean (Mean)

The table represents the future chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in subsurface soil (i.e., the concentrations that will be used to estimate the exposure and risk for each COC in subsurface soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and how the EPC was derived. This table indicates that arsenic, dioxin, and pentachlorophenol are the most frequently detected COCs in subsurface soil at the site. The 95% UCL on the arithmetic mean was used as the EPC for the inorganic compound arsenic, and for the organic chemicals benzo(a)pyrene and pentachlorophenol. However, due to the limited amount of sample data available for dioxin, the maximum detected concentration was used as the default EPC.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

## ROD RISK WORKSHEET

### Table G-4

### Summary of Chemical of Concern and Medium-Specific Exposure Point Concentration

*Scenario Timeframe:* **Future**
**Medium: Groundwater**
**Exposure Medium: Shallow (Overburden) Groundwater**

| Exposure Point | Chemical of Concern | Concentration Detected Minimum | Concentration Detected Maximum | Units | Frequency of Detection | Exposure Point Concentration | Exposure Point Concentration Units | Statistical Measure (1) |
|---|---|---|---|---|---|---|---|---|
| Drinking Water Well | | | | | | | | |
| | Trichloroethene | 0.14 | 2.6 | ug/L | 4 / 12 | 2.6 | ug/L | Max |
| | Vinyl chloride | 0.09 | 1.4 | ug/L | 4 / 12 | 1.4 | ug/L | Max |
| | 2,3,5,6-Tetrachlorophenol | 0.045 | 580 | ug/L | 28 / 42 | 580 | ug/L | Max |
| | 2,4,6-Trichlorophenol | 0.026 | 5.9 | ug/L | 14 / 42 | 5.9 | ug/L | Max |
| | 2-Methylnaphthalene | 2 | 440 | ug/L | 17 / 42 | 440 | ug/L | Max |
| | Benzo(a)anthracene | 0.0088 | 0.15 | ug/L | 7 / 41 | 0.15 | ug/L | Max |
| | Benzo(a)pyrene | 0.0074 | 0.0765 | ug/L | 9 / 41 | 0.0765 | ug/L | Max |
| | Dibenzofuran | 0.9 | 40.5 | ug/L | 18 / 42 | 40.5 | ug/L | Max |
| | Pentachlorophenol | 0.28 | 17000 | ug/L | 36 / 42 | 17000 | ug/L | Max |
| | Dioxin TEQ | 0.000011 | 0.00185 | ug/L | 7 / 7 | 0.00185 | ug/L | Max |
| | Arsenic | 0.12 | 940 | ug/L | 42 / 42 | 940 | ug/L | Max |
| | Chromium | 2.5 | 241 | ug/L | 15 / 42 | 241 | ug/L | Max |
| | Manganese | 9.1 | 14600 | ug/L | 42 / 42 | 14600 | ug/L | Max |
| Swimming Pool | | | | | | | | |
| | 2-Methylnaphthalene | 2 | 440 | ug/L | 17 / 42 | 440 | ug/L | Max |
| | Pentachlorophenol | 0.28 | 17000 | ug/L | 36 / 42 | 17000 | ug/L | Max |
| | Dioxin TEQ | 0.000011 | 0.00185 | ug/L | 7 / 7 | 0.00185 | ug/L | Max |
| | Arsenic | 0.12 | 940 | ug/L | 42 / 42 | 940 | ug/L | Max |

**Key**

(1) *Statistics: Maximum Detected Value (Max); 95% UCL of Transformed Data (95% UCL - T); 95% UCL of Normal Data (95% UCL - N); 95% UCL of Non-parametric Data (95% UCL - NP);*
95% UCL of Gamma Distributed Data (95% UCL - G); Arithmetic Mean (Mean)

The table represents the chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in shallow groundwater (i.e., the concentrations that will be used to estimate the exposure and risk for each COC in groundwater). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and how the EPC was derived. This table indicates that inorganic chemicals are the most frequently detected COCs in groundwater at the site. As prescribed by EPA guidance, the maximum detected concentration was used as the EPC for all COCs detected in groundwater.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

## ROD RISK WORKSHEET

### Table G-5

### Summary of Chemical of Concern and Medium-Specific Exposure Point Concentration

**Scenario Timeframe: Future**
**Medium: Groundwater**
**Exposure Medium: Deep (Bedrock) Groundwater**

| Exposure Point | Chemical of Concern | Concentration Detected Minimum | Concentration Detected Maximum | Units | Frequency of Detection | Exposure Point Concentration | Exposure Point Concentration Units | Statistical Measure (1) |
|---|---|---|---|---|---|---|---|---|
| Drinking Water Well | | | | | | | | |
| | 2,3,5,6-Tetrachlorophenol | 0.25 | 455 | ug/L | 12 / 15 | 455 | ug/L | Max |
| | 2,4,6-Trichlorophenol | 0.032 | 5.2 | ug/L | 5 / 14 | 5.2 | ug/L | Max |
| | Benzo(a)anthracene | 0.0061 | 0.48 | ug/L | 8 / 15 | 0.48 | ug/L | Max |
| | Benzo(a)pyrene | 0.007 | 0.31 | ug/L | 4 / 15 | 0.31 | ug/L | Max |
| | Benzo(b)fluoranthene | 0.0066 | 0.8 | ug/L | 7 / 15 | 0.8 | ug/L | Max |
| | Dibenz(a,h)anthracene | 0.01 | 0.01 | ug/L | 1 / 15 | 0.01 | ug/L | Max |
| | Pentachlorophenol | 6 | 3100 | ug/L | 14 / 17 | 3100 | ug/L | Max |
| | | | | | | | | |
| | Arsenic | 0.57 | 37 | ug/L | 17 / 17 | 37 | ug/L | Max |
| | Manganese | 16.6 | 2865 | ug/L | 17 / 17 | 2865 | ug/L | Max |
| | Thallium | 2.3 | 2.3 | ug/L | 1 / 17 | 2.3 | ug/L | Max |

**Key**

(1) Statistics: Maximum Detected Value (Max); 95% UCL of Transformed Data (95% UCL - T); 95% UCL of Normal Data (95% UCL - N); 95% UCL of Non-parametric Data (95% UCL - NP);
95% UCL of Gamma Distributed Data (95% UCL - G); Arithmetic Mean (Mean)

The table represents the chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in bedrock groundwater (i.e., the concentrations that will be used to estimate the exposure and risk for each COC in groundwater). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and how the EPC was derived. This table indicates that inorganic chemicals are the most frequently detected COCs in groundwater at the site. As prescribed by EPA guidance, the maximum detected concentration was used as the EPC for all COCs detected in groundwater.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

# ROD RISK WORKSHEET

## Table G-6

### Cancer Toxicity Data Summary

**Pathway: Ingestion, Dermal**

| Chemical of Concern | Oral Cancer Slope Factor | Dermal Cancer Slope Factor | Slope Factor Units | Weight of Evidence/Cancer Guideline Description | Source | Date (MM/DD/YYYY) |
|---|---|---|---|---|---|---|
| Trichloroethene | 4.0E-01 | 4.0E-01 | $(mg/kg\text{-}day)^{-1}$ | C-B2 | NCEA | 01/05/05 |
| Vinyl chloride | 7.5E-01 | 7.5E-01 | $(mg/kg\text{-}day)^{-1}$ | A | IRIS | 01/05/05 |
| | | | | | | |
| 2,3,5,6-Tetrachlorophenol | N/A | N/A | $(mg/kg\text{-}day)^{-1}$ | D | IRIS | 01/05/05 |
| 2,4,6-Trichlorophenol | 1.1E-02 | 1.1E-02 | $(mg/kg\text{-}day)^{-1}$ | B2 | IRIS | 01/05/05 |
| 2-Methylnaphthalene | N/A | N/A | $(mg/kg\text{-}day)^{-1}$ | C | IRIS | 01/05/05 |
| Benzo(a)anthracene | 7.3E-01 | 7.3E-01 | $(mg/kg\text{-}day)^{-1}$ | B2 | IRIS | 01/05/05 |
| Benzo(a)pyrene | 7.3E+00 | 7.3E+00 | $(mg/kg\text{-}day)^{-1}$ | B2 | IRIS | 01/05/05 |
| Benzo(b)fluoranthene | 7.3E-01 | 7.3E-01 | $(mg/kg\text{-}day)^{-1}$ | B2 | IRIS | 01/05/05 |
| Dibenz(a,h)anthracene | 7.3E+00 | 7.3E+00 | $(mg/kg\text{-}day)^{-1}$ | B2 | IRIS | 01/05/05 |
| Dibenzofuran | N/A | N/A | $(mg/kg\text{-}day)^{-1}$ | D | IRIS | 01/05/05 |
| Pentachlorophenol | 1.2E-01 | 1.2E-01 | $(mg/kg\text{-}day)^{-1}$ | B2 | IRIS | 01/05/05 |
| | | | | | | |
| Dioxin TEQ | 1.5E+05 | 1.5E+05 | $(mg/kg\text{-}day)^{-1}$ | B2 | HEAST | 07/01/97 |
| | | | | | | |
| Arsenic | 1.5E+00 | 1.5E+00 | $(mg/kg\text{-}day)^{-1}$ | A | IRIS | 01/05/05 |
| Chromium | N/A | N/A | $(mg/kg\text{-}day)^{-1}$ | D | IRIS | 01/05/05 |
| Manganese | N/A | N/A | $(mg/kg\text{-}day)^{-1}$ | D | IRIS | 01/05/05 |
| Thallium | N/A | N/A | $(mg/kg\text{-}day)^{-1}$ | D | IRIS | 01/05/05 |
| | | | | | | |

**Key**

N/A: Not applicable

IRIS: Integrated Risk Information System, U.S. EPA

NCEA: National Center for Environmental Assessment, U.S. EPA

HEAST: Health Effects Assessment Summary Tables, U.S. EPA

**EPA Group**

A - Human carcinogen

B1 - Probable human carcinogen - Indicates that limited human data are available

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

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

This table provides the carcinogenic risk information which is relevant to the contaminants of concern in soil and groundwater. At this time, slope factors are not available for the dermal route of exposure. Thus, the dermal slope factors used in this 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.

***Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)***

## ROD RISK WORKSHEET

### Table G-7

### Non-Cancer Toxicity Data Summary

**Pathway: Ingestion, Dermal**

| Chemical of Concern | Chronic/ Subchronic | Oral RfD Value | Oral RfD Units | Dermal RfD | Dermal RfD Units | Primary Target Organ | Combined Uncertainty/ Modifying Factors | Sources of RfD: Target Organ | Dates of Rfd: Target Organ (MM/DD/YYYY) |
|---|---|---|---|---|---|---|---|---|---|
| Trichloroethene | Chronic | 3.0E-04 | mg/kg-day | 3.0E-04 | mg/kg-day | Liver | 3000 | NCEA | 01/05/05 |
| Vinyl chloride | Chronic | 3.0E-03 | mg/kg-day | 3.0E-03 | mg/kg-day | Liver | 30 | IRIS | 01/05/05 |
| 2,3,5,6-Tetrachlorophenol | Chronic | 3.0E-02 | mg/kg-day | 3.0E-02 | mg/kg-day | Liver | 1000 | IRIS | 01/05/05 |
| 2,4,6-Trichlorophenol | Chronic | 1.0E-04 | mg/kg-day | 1.0E-04 | mg/kg-day | Reproductive | 3000 | NCEA | 01/05/05 |
| 2-Methylnaphthalene | Chronic | 4.0E-03 | mg/kg-day | 4.0E-03 | mg/kg-day | Respiratory | 1000 | IRIS | 01/05/05 |
| Benzo(a)anthracene | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Benzo(a)pyrene | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Benzo(b)fluoranthene | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Dibenz(a,h)anthracene | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Dibenzofuran | Chronic | 2.0E-03 | mg/kg-day | 2.0E-03 | mg/kg-day | Kidney | 10000 | NCEA | 01/05/05 |
| Pentachlorophenol | Chronic | 3.0E-02 | mg/kg-day | 3.0E-02 | mg/kg-day | Liver/Kidney | 100 | IRIS | 01/05/05 |
| Dioxin TEQ | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Arsenic | Chronic | 3.0E-04 | mg/kg-day | 3.0E-04 | mg/kg-day | Skin | 3 | IRIS | 01/05/05 |
| Arsenic | Subchronic | 3.0E-04 | mg/kg-day | 3.0E-04 | mg/kg-day | Skin | 3 | IRIS | 01/05/05 |
| Chromium | Chronic | 3.0E-03 | mg/kg-day | 7.5E-05 | mg/kg-day | GI System | 300 | IRIS | 01/05/05 |
| Manganese (water) | Chronic | 2.4E-02 | mg/kg-day | 9.6E-04 | mg/kg-day | Nervous System | 9 | IRIS | 01/05/05 |
| Thallium | Chronic | 8.0E-05 | mg/kg-day | 8.0E-05 | mg/kg-day | Blood | 3000 | IRIS | 01/05/05 |

**Key**

N/A - No information available

IRIS - Integrated Risk Information System, U.S. EPA

NCEA - *National Center for Environmental Assessment*, U.S. EPA

*This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in soil and groundwater. Eleven of the COCs have toxicity data indicating their potential for adverse non-carcinogenic health effects in* humans. Chronic and subchronic toxicity data available for the eleven COCs for oral exposures have been used to develop chronic and subchronic oral reference doses (RfDs), provided in this table. The available chronic and subchronic toxicity data indicate that trichloroethene, vinyl chloride, 2,3,5,6-tetrachlorophenol, and pentachlorophenol affect the liver, thallium affects the blood, arsenic affects the skin, dibenzofuran and pentachlorophenol affect the kidneys, chromium affects the gastrointestinal system, manganese affects the nervous system, 2,4,6-trichlorophenol affects the reproductive system, and 2-methylnaphthalene affects the respiratory system. Reference doses are not available for the carcinogenic polycyclic aromatic hydrocarbons (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene) or dioxin. Dermal RfDs are not available for any of the COCs. As was the case for the carcinogenic data, dermal RfDs can be extrapolated from oral RfDs by applying an adjustment factor as appropriate. Dermal RfDs have been extrapolated for the inorganic compounds chromium and manganese that have less than 50% absorption via the ingestion route.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

## ROD RISK WORKSHEET

| Table G-8 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Risk Characterization Summary - Carcinogens** | | | | | | | | |
| **Scenario Timeframe: Current**<br>**Receptor Population: Trespasser**<br>**Receptor Age: Adolescent** | | | | | | | | |
| **Medium** | **Exposure Medium** | **Exposure Point** | **Chemical of Concern** | **Carcinogenic Risk** | | | | |
| | | | | **Ingestion** | **Inhalation** | **Dermal** | **External (Radiation)** | **Exposure Routes Total** |
| Soil | Surface Soil | Process Area | Arsenic | 1E-04 | - - | 3E-05 | - - | 1E-04 |
| | | | | | | | **Surface Soil Risk Total =** | 1E-04 |
| | | | | | | | **Total Risk =** | 1E-04 |

**Key**

-- Route of exposure is not applicable to this medium.

*This table provides risk estimates for the significant routes of exposure for the current adolescent trespasser. 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 an adolescent's exposure to surface soil, as well as the toxicity of the COC (arsenic). The total risk from direct exposure to *contaminated surface soil at this site to a future adolescent trespasser is estimated to be $1 \times 10^{-4}$.* The COC contributing most to this risk level is *arsenic in surface soil*. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 1 in 10,000 of developing cancer as a result of site-related exposure to the COC.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

## ROD RISK WORKSHEET

| Table G-9 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Risk Characterization Summary - Non-Carcinogens** | | | | | | | | |
| **Scenario Timeframe: Current**<br>**Receptor Population: Trespasser**<br>**Receptor Age: Adolescent** | | | | | | | | |
| **Medium** | **Exposure Medium** | **Exposure Point** | **Chemical of Concern** | **Primary Target Organ** | **Non-Carcinogenic Hazard Quotient** | | | |
| | | | | | **Ingestion** | **Inhalation** | **Dermal** | **Exposure Routes Total** |
| Soil | Surface Soil | Process Area | Arsenic | Skin | 2E+00 | - - | 5E-01 | 2E+00 |
| | | | | | | | **Soil Hazard Index Total =** | 2E+00 |
| | | | | | | | **Receptor Hazard Index =** | 2E+00 |
| | | | | | | | **Skin Hazard Index =** | 2E+00 |

**Key**

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for the current adolescent trespasser. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indictes the potential for adverse noncancer effects. The estimated HI of 2 indicates that the potential for adverse noncancer effects could occur from exposure to contaminated surface soil containing arsenic.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

## ROD RISK WORKSHEET

| Table G-10 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Risk Characterization Summary - Carcinogens** | | | | | | | | |
| **Scenario Timeframe: Future**<br>**Receptor Population: Trespasser**<br>**Receptor Age: Adolescent** | | | | | | | | |
| **Medium** | **Exposure Medium** | **Exposure Point** | **Chemical of Concern** | **Carcinogenic Risk** | | | | |
| | | | | **Ingestion** | **Inhalation** | **Dermal** | **External (Radiation)** | **Exposure Routes Total** |
| Soil | Surface Soil | Process Area | Dioxin TEQ | 4E-05 | -- | 1E-05 | -- | 6E-05 |
| | | | Arsenic | 1E-04 | -- | 4E-05 | -- | 2E-04 |
| | | | | | | | ***Surface Soil Risk Total =*** | 2E-04 |
| | | | | | | | **Total Risk =** | 2E-04 |

**Key**

-- Route of exposure is not applicable to this medium.

This table provides risk estimates for the significant routes of exposure for the future adolescent trespasser. 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 an adolescent's exposure to surface soil, as well as the toxicity of the COCs (dioxin and arsenic). The total risk from direct exposure to contaminated surface soil at this site to a future adolescent trespasser is estimated to be $2 \times 10^{-4}$. The COC contributing most to this risk level is arsenic in surface soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 2 in 10,000 of developing cancer as a result of site-related exposure to the COCs.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

## ROD RISK WORKSHEET

| Table G-11 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Risk Characterization Summary - Non-Carcinogens** | | | | | | | | |
| **Scenario Timeframe: Future**<br>**Receptor Population: Trespasser**<br>**Receptor Age: Adolescent** | | | | | | | | |
| **Medium** | **Exposure Medium** | **Exposure Point** | **Chemical of Concern** | **Primary Target Organ** | **Non-Carcinogenic Hazard Quotient** | | | |
| | | | | | **Ingestion** | **Inhalation** | **Dermal** | **Exposure Routes Total** |
| Soil | Surface Soil | Process Area | Arsenic | Skin | 2E+00 | - - | 6E-01 | 3E+00 |
| | | | | | | | ***Surface Soil Hazard Index Total =*** | 3E+00 |
| | | | | | | | **Receptor Hazard Index =** | 3E+00 |
| | | | | | | | **Skin Hazard Index =** | 3E+00 |

**Key**

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for the future adolescent trespasser. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indictes the potential for adverse noncancer effects. The estimated HI of 3 indicates that the potential for adverse noncancer effects could occur from exposure to contaminated surface soil containing arsenic.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

## ROD RISK WORKSHEET

### Table G-12

### Risk Characterization Summary - Carcinogens

**Scenario Timeframe: Future**
**Receptor Population: Town Worker**
**Receptor Age: Adult**

| Medium | Exposure Medium | Exposure Point | Chemical of Concern | Carcinogenic Risk | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total |
| Soil | Surface Soil | Process Area | Dioxin TEQ | 5E-05 | -- | 1E-05 | -- | 6E-05 |
| | | | Arsenic | 2E-04 | -- | 4E-05 | -- | 2E-04 |
| | | | | | | | Surface Soil Risk Total = | 3E-04 |
| | | | | | | | Total Risk = | 3E-04 |

**Key**

-- Route of exposure is not applicable to this medium.

This table provides risk estimates for the significant routes of exposure for the future town worker. 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 an adult's exposure to surface soil, as well as the toxicity of the COCs (dioxin and arsenic). The total risk from direct exposure to contaminated surface soil at this site to a future town worker is estimated to be $3 \times 10^{-4}$. The COC contributing most to this risk level is arsenic in surface soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 3 in 10,000 of developing cancer as a result of site-related exposure to the COCs.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

## ROD RISK WORKSHEET

### Table G-13

### Risk Characterization Summary - Carcinogens

**Scenario Timeframe: Future**
**Receptor Population: Commercial Worker**
**Receptor Age: Adult**

| Medium | Exposure Medium | Exposure Point | Chemical of Concern | Carcinogenic Risk | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total |
| Soil | Surface Soil | Process Area | Benzo(a)pyrene | 3E-06 | - - | 2E-06 | - - | 5E-06 |
| | | | Dioxin TEQ | 3E-04 | - - | 5E-05 | - - | 3E-04 |
| | | | Arsenic | 9E-04 | - - | 2E-04 | - - | 1E-03 |
| | | | | | | | Surface Soil Risk Total = | 1E-03 |
| | Subsurface Soil | Process Area | Benzo(a)pyrene | 8E-07 | - - | 7E-07 | - - | 2E-06 |
| | | | Pentachlorophenol | 4E-05 | - - | 7E-05 | - - | 1E-04 |
| | | | Dioxin TEQ | 3E-05 | - - | 5E-06 | - - | 3E-05 |
| | | | Arsenic | 1E-04 | - - | 3E-05 | - - | 2E-04 |
| | | | | | | | Subsurface Soil Risk Total = | 3E-04 |
| | | | | | | | Total Risk = | N/A |

**Key**

-- Route of exposure is not applicable to this medium.

N/A - Not applicable. Summing of surface and subsurface soil risks is not applicable since remedial decisions are based on risk estimates for each interval.

This table provides risk estimates for the significant routes of exposure for the future commercial worker. 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 an adult's exposure to surface and subsurface soil, as well as the toxicity of the COCs (benzo(a)pyrene, pentachlorophenol, dioxin, and arsenic). The risk from direct exposure to contaminated soil at this site to a future commercial worker is estimated to be $1 \times 10^{-3}$ for surface soil and $3 \times 10^{-4}$ for subsurface soil. The COCs contributing most to these *risk levels are dioxin and arsenic in surface soil, and pentachlorophenol and arsenic in subsurface soil. These risk levels indicate that if no clean-up action is taken, an individual would have an increased probability* of 1 in 1,000 of developing cancer as a result of site-related exposure to the COCs in surface soil and 3 in 10,000 for site-related exposure to the COCs in subsurface soil.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

## ROD RISK WORKSHEET

| Table G-14 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Risk Characterization Summary - Non-Carcinogens** | | | | | | | | |
| **Scenario Timeframe: Future**<br>**Receptor Population: Commercial Worker**<br>**Receptor Age: Adult** | | | | | | | | |
| **Medium** | **Exposure Medium** | **Exposure Point** | **Chemical of Concern** | **Primary Target Organ** | **Non-Carcinogenic Hazard Quotient** | | | |
| | | | | | **Ingestion** | **Inhalation** | **Dermal** | **Exposure Routes Total** |
| Soil | Surface Soil | Process Area | Arsenic | Skin | 6E+00 | - - | 1E+00 | 7E+00 |
| | | | | | | | **Surface Soil Hazard Index Total =** | 7E+00 |
| | | | | | | | **Receptor Hazard Index =** | 7E+00 |
| | | | | | | | **Skin Hazard Index =** | 7E+00 |

**Key**

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

– Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for the future commercial worker. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indictes the potential for adverse noncancer effects. The estimated HI of 7 indicates that the potential for adverse noncancer effects could occur from exposure to contaminated surface soil containing arsenic.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

## ROD RISK WORKSHEET

| Table G-15 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Risk Characterization Summary - Non-Carcinogens** | | | | | | | | |
| **Scenario Timeframe: Future**<br>**Receptor Population: Utility Worker**<br>**Receptor Age: Adult** | | | | | | | | |
| **Medium** | **Exposure Medium** | **Exposure Point** | **Chemical of Concern** | **Primary Target Organ** | **Non-Carcinogenic Hazard Quotient** | | | |
| | | | | | **Ingestion** | **Inhalation** | **Dermal** | **Exposure Routes Total** |
| Soil | Surface Soil | Process Area | Arsenic | Skin | 3E+00 | - - | 3E-01 | 3E+00 |
| | | | | | | | **Surface Soil Hazard Index Total =** | 3E+00 |
| | | | | | | | **Receptor Hazard Index =** | 3E+00 |
| | | | | | | | **Skin Hazard Index =** | 3E+00 |

**Key**

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for the future utility worker. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indictes the potential for adverse noncancer effects. The estimated HI of 3 indicates that the potential for adverse noncancer effects could occur from exposure to contaminated surface soil containing arsenic.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

# ROD RISK WORKSHEET

| Table G-16 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Risk Characterization Summary - Carcinogens** | | | | | | | | |
| **Scenario Timeframe: Future**<br>**Receptor Population: On-Site Resident**<br>**Receptor Age: Young Child/Adult** | | | | | | | | |
| **Medium** | **Exposure Medium** | **Exposure Point** | **Chemical of Concern** | **Carcinogenic Risk** | | | | |
| | | | | **Ingestion** | **Inhalation** | **Dermal** | **External (Radiation)** | **Exposure Routes Total** |
| Soil | Surface Soil | Process Area | Benzo(a)pyrene | 5E-06 | -- | 2E-06 | -- | 8E-06 |
| | | | Dioxin TEQ | 5E-04 | -- | 5E-05 | -- | 5E-04 |
| | | | Arsenic | 2E-03 | -- | 2E-04 | -- | 2E-03 |
| | | | | | | | **Surface Soil Risk Total =** | 2E-03 |
| | Subsurface Soil | Process Area | Benzo(a)pyrene | 2E-06 | -- | 6E-07 | -- | 2E-06 |
| | | | Pentachlorophenol | 8E-05 | -- | 6E-05 | -- | 1E-04 |
| | | | Dioxin TEQ | 5E-05 | -- | 5E-06 | -- | 5E-05 |
| | | | Arsenic | 2E-04 | -- | 2E-05 | -- | 3E-04 |
| | | | | | | | **Subsurface Soil Risk Total =** | 5E-04 |
| | | | | | | | **Total Risk =** | N/A |

**Key**

-- Route of exposure is not applicable to this medium.

N/A - Not applicable. Summing of surface and subsurface soil risks is not applicable since remedial decisions are based on risk estimates for each interval.

This table provides risk estimates for the significant routes of exposure for the future on-site resident. 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 young child's and adult's exposure to surface and subsurface soil, as well as the toxicity of the COCs (benzo(a)pyrene, pentachlorophenol, dioxin, and arsenic). The risk from direct exposure to contaminated soil at this site to a future young child/adult on-site resident is estimated to be $2 \times 10^{-3}$ for surface soil and $5 \times 10^{-4}$ for subsurface soil. The COCs contributing most to these risk levels are dioxin and arsenic in surface soil and pentachlorophenol and arsenic in subsurface soil. These risk levels indicate that if no clean-up action is taken, an individual would have an increased probability of 2 in 1,000 of developing cancer as a result of site-related exposure to the COCs in surface soil and 5 in 10,000 for site-related exposure to the COCs in subsurface soil.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

# ROD RISK WORKSHEET

| Table G-17 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Risk Characterization Summary - Non-Carcinogens** | | | | | | | | |
| **Scenario Timeframe: Future**<br>**Receptor Population: On-Site Resident**<br>**Receptor Age: Young Child/Adult** | | | | | | | | |
| **Medium** | **Exposure Medium** | **Exposure Point** | **Chemical of Concern** | **Primary Target Organ** | **Non-Carcinogenic Hazard Quotient** | | | |
| | | | | | **Ingestion** | **Inhalation** | **Dermal** | **Exposure Routes Total** |
| Soil | Surface Soil | Process Area | Arsenic | Skin | 3E+01 | - - | 3E+00 | 3E+01 |
| | | | *Chromium* | *GI System* | 4E+00 | - - | N/A | 4E+00 |
| | | | | | | | **Surface Soil Hazard Index Total =** | 4E+01 |
| | | | | | | | **GI System Hazard Index =** | 4E+00 |
| | | | | | | | **Skin Hazard Index =** | 3E+01 |
| | Subsurface Soil | Process Area | Arsenic | Skin | 4E+00 | - - | 4E-01 | 5E+00 |
| | | | | | | | ***Subsurface Soil Hazard Index Total =*** | 5E+00 |
| | | | | | | | **Skin Hazard Index =** | 5E+00 |

**Key**

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for the future on-site resident. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indictes the potential for adverse noncancer effects. The estimated skin HI of 30 and GI system HI of 4 for surface soil indicates that the potential for adverse noncancer effects could occur from exposure to contaminated surface soil containing arsenic and chromium, respectively. The estimated skin HI of 5 for subsurface soil indicates that the potential for adverse noncancer effects could occur from exposure to contaminated subsurface soil containing arsenic.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

# ROD RISK WORKSHEET

| Table G-18 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Risk Characterization Summary - Carcinogens** | | | | | | | | |
| **Scenario Timeframe: Future**<br>**Receptor Population: Off-Site Resident**<br>***Receptor Age: Young Child/Adult*** | | | | | | | | |
| **Medium** | **Exposure Medium** | **Exposure Point** | **Chemical of Concern** | **Carcinogenic Risk** | | | | |
| | | | | ***Ingestion*** | ***Inhalation*** | ***Dermal*** | **External (Radiation)** | **Exposure Routes Total** |
| Groundwater | Bedrock Groundwater | Drinking Water Well | | | | | | |
| | | | 2,4,6-Trichlorophenol | 1E-06 | -- | 6E-07 | -- | 2E-06 |
| | | | Benzo(a)anthracene | 6E-06 | -- | N/A | -- | 6E-06 |
| | | | Benzo(a)pyrene | 4E-05 | -- | N/A | -- | 4E-05 |
| | | | Benzo(b)fluoranthene | 1E-05 | -- | N/A | -- | 1E-05 |
| | | | Dibenz(a,h)anthracene | 1E-06 | -- | N/A | -- | 1E-06 |
| | | | Pentachlorophenol | 7E-03 | -- | N/A | -- | 7E-03 |
| | | | Arsenic | 1E-03 | -- | 5E-06 | -- | 1E-03 |
| | | | | | | | ***Groundwater Risk Total =*** | 8E-03 |
| | Shallow Groundwater | Drinking Water Well | | | | | | |
| | | | Trichloroethene | 2E-05 | -- | 3E-06 | -- | 2E-05 |
| | | | Vinyl chloride | 3E-05 | -- | 1E-06 | -- | 3E-05 |
| | | | 2,4,6-Trichlorophenol | 1E-06 | -- | 7E-07 | -- | 2E-06 |
| | | | Benzo(a)anthracene | 2E-06 | -- | N/A | -- | 2E-06 |
| | | | Benzo(a)pyrene | 1E-05 | -- | N/A | -- | 1E-05 |
| | | | Pentachlorophenol | 4E-02 | -- | N/A | -- | 4E-02 |
| | | | Dioxin TEQ | 5E-03 | -- | N/A | -- | 5E-03 |
| | | | Arsenic | 2E-02 | -- | 1E-04 | -- | 2E-02 |
| | | | | | | | **Groundwater Risk Total =** | 7E-02 |
| | Shallow Groundwater | Swimming Pool | | | | | | |
| | | | Pentachlorophenol | 2E-04 | -- | N/A | -- | 2E-04 |
| | | | Dioxin TEQ | 2E-05 | -- | N/A | -- | 2E-05 |
| | | | Arsenic | 1E-04 | -- | 3E-05 | -- | 2E-04 |
| | | | | | | | **Groundwater Risk Total =** | 4E-04 |
| | | | | | | | **Total Risk =** | N/A |

**Key**

-- Route of exposure is not applicable to this medium.

N/A - Not applicable. Summing of bedrock and shallow groundwater risks is not applicable since remedial decisions are based on risk estimates for each aquifer.

This table provides risk estimates for the significant routes of exposure for the future off-site resident. 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 young child's and adult's exposure to groundwater, as well as the toxicity of the COCs (trichloroethene, vinyl chloride, 2,4,6-trichlorophenol, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, pentachlorophenol, dioxin, and arsenic). The risk from direct exposure to contaminated groundwater at this site to a future young *child/adult off-site resident is estimated to be $8 \times 10^{-3}$ for bedrock groundwater used as drinking water, $7 \times 10^{-2}$ for shallow groundwater used as drinking water, and $4 \times 10^{-4}$ for shallow groundwater used to fill a* swimming pool. The COCs contributing most to these risk levels are pentachlorophenol and arsenic in bedrock groundwater and pentachlorophenol, dioxin, and arsenic in overburden groundwater. These risk levels indicate that if no clean-up action is taken, an individual would have an increased probability of 8 in 1,000 of developing cancer as a result of site-related exposure to the COCs in bedrock groundwater used as drinking

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

## ROD RISK WORKSHEET

| Table G-19 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Risk Characterization Summary - Non-Carcinogens** | | | | | | | | |
| ***Scenario Timeframe:* *Future*** | | | | | | | | |
| **Receptor Population: Off-Site Resident** | | | | | | | | |
| **Receptor Age: Young Child/Adult** | | | | | | | | |
| **Medium** | **Exposure Medium** | **Exposure Point** | **Chemical of Concern** | **Primary Target Organ** | **Non-Carcinogenic Hazard Quotient** | | | |
| | | | | | **Ingestion** | **Inhalation** | **Dermal** | ***Exposure Routes Total*** |
| Groundwater | Bedrock Groundwater | Drinking water Well | | | | | | |
| | | | 2,3,5,6-Tetrachlorophenol | Liver | 1E+00 | - - | 3E+00 | 4E+00 |
| | | | 2,4,6-Trichlorophenol | Reproductive | 5E+00 | - - | 2E+00 | 7E+00 |
| | | | Pentachlorophenol | Liver/Kidney | 1E+01 | - - | N/A | 1E+01 |
| | | | Arsenic | Skin | 1E+01 | - - | 5E-02 | 1E+01 |
| | | | Manganese | CNS | 1E+01 | - - | 5E-02 | 1E+01 |
| | | | Thallium | Blood | 3E+00 | - - | 1E-02 | 3E+00 |
| | | | | | | | **Groundwater Hazard Index Total =** | 5E+01 |
| | | | | | | | **Blood Hazard Index =** | 3E+00 |
| | | | | | | | **Reproductive Hazard Index =** | 7E+00 |
| | | | | | | | **Kidney Hazard Index =** | 1E+01 |
| | | | | | | | **Liver Hazard Index =** | 1E+01 |
| | | | | | | | **CNS Hazard Index =** | 1E+01 |
| | | | | | | | **Skin Hazard Index =** | 1E+01 |
| | Shallow Groundwater | Drinking Water Well | | | | | | |
| | | | 2,3,5,6-Tetrachlorophenol | Liver | 2E+00 | - - | 4E+00 | 6E+00 |
| | | | 2,4,6-Trichlorophenol | Reproductive | 6E+00 | - - | 3E+00 | 8E+00 |
| | | | 2-Methylnaphthalene | Respiratory | 1E+01 | - - | 1E+01 | 2E+01 |
| | | | Dibenzofuran | Kidney | 2E+00 | - - | 2E+00 | 4E+00 |
| | | | Pentachlorophenol | Liver/Kidney | 5E+01 | - - | N/A | 5E+01 |
| | | | Arsenic | Skin | 3E+02 | - - | 1E+00 | 3E+02 |
| | | | Chromium | GI System | 8E+00 | - - | 7E-02 | 8E+00 |
| | | | Manganese | CNS | 6E+01 | - - | 3E-01 | 6E+01 |
| | | | | | | | **Groundwater Hazard Index Total =** | 5E+02 |
| | | | | | | | **Reproductive Hazard Index =** | 8E+00 |
| | | | | | | | **Respiratory Hazard Index =** | 2E+01 |
| | | | | | | | **Kidney Hazard Index =** | 6E+01 |
| | | | | | | | **Liver Hazard Index =** | 6E+01 |
| | | | | | | | **CNS Hazard Index =** | 6E+01 |
| | | | | | | | **Skin Hazard Index =** | 3E+02 |
| | Shallow Groundwater | Swimming Pool | | | | | | |
| | | | 2-Methylnaphthalene | Respiratory | 6E-02 | - - | 2E+00 | 2E+00 |
| | | | Arsenic | Skin | 2E+00 | - - | 2E-01 | 2E+00 |
| | | | | | | | **Groundwater Hazard Index Total =** | 4E+00 |
| | | | | | | | **Respiratory Hazard Index =** | 2E+00 |
| | | | | | | | **Skin Hazard Index =** | 2E+00 |

**Key**

*N/A - Toxicity criteria are not available to quantitatively address this route of exposure*

-- Route of exposure is not applicable to this medium.

*This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for the future off-site resident. The Risk Assessment Guidance* (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indictes the potential for adverse noncancer effects. For bedrock groundwater used as drinking water, the estimated target organ HIs between 10 and 3 indicate that the potential for adverse effects could occur from exposure to contaminated groundwater containing 2,3,5,6-tetrachlorophenol, 2,4,6-trichlorophenol, pentachlorophenol, arsenic, manganese, and thallium. For shallow groundwater used as drinking water, the estimated target organ HIs between 300 and 6 indicate that the potential for adverse effects could occur from exposure to contaminated groundwater containing 2,3,5,6-tetrachlorophenol, 2,4,6-trichlorophenol, 2-methylnaphthalene, dibenzofuran, pentachlorophenol, arsenic, chromium, and manganese. For shallow groundwater used to fill a swimming pool, the estimated target organ HIs of 2 indicate that the potential for adverse effects could occur from exposure to contaminated groundwater containing 2-methylnaphthalene and arsenic.

**Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

| Table G-20: COCs in Surface Water Collected from the Rumford River<br>Baseline Ecological Risk Assessment<br>Hatheway & Patterson Superfund Site<br>Mansfield, Massachusetts | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Frequency of detection** | **Minimum detected conc. on site** | **Geometric mean conc. on site** | **Maximum conc. on site** | **Maximum background conc.** | **Surface water benchmark** | **Benchmark source** | **Hazard Quotient** | **COC?** | **Reason code** |
| ***Dioxins & Furans (mg/l)*** | | | | | | | | | | |
| 2,3,7,8-TCDD | 1/2 | 2.45E-09 | 1.21E-09 | 2.45E-09 | ND | - | - | - | - | - |
| 1,2,3,4,6,7,8-HpCDD | 1/2 | 4.35E-07 | 3.83E-08 | 4.35E-07 | ND | - | - | - | - | - |
| OCDD | 1/2 | 3.64E-06 | 2.28E-07 | 3.64E-06 | ND | - | - | - | - | - |
| 2,3,7,8-TCDF | 1/2 | 1.45E-09 | 8.08E-10 | 1.45E-09 | ND | - | - | - | - | - |
| 1,2,3,4,6,7,8-HpCDF | 1/2 | 6.89E-08 | 1.25E-08 | 6.89E-08 | ND | - | - | - | - | - |
| OCDF | 1/2 | 3.03E-07 | 3.54E-08 | 3.03E-07 | ND | - | - | - | - | - |
| | | | | | | | | | | |
| ***Inorganics (mg/l)*** | | | | | | | | | | |
| **Aluminum** | 7/10 | 1.25E-02 | 3.82E-02 | 6.31E-01 | 1.55E-01 | 8.70E-02 | (1) | 7.25E+00 | **YES** | **(b)** |
| Antimony | 6/10 | 2.80E-04 | 6.55E-04 | 3.10E-03 | 3.10E-03 | 3.00E-02 | (2) | 1.03E-01 | NO | (c) |
| Arsenic | 7/10 | 3.75E-04 | 1.51E-03 | 2.05E-03 | 2.05E-03 | 1.50E-01 | (1) | 1.37E-02 | NO | (c) |
| **Barium** | 10/10 | 1.55E-02 | 2.72E-02 | 7.01E-02 | 2.83E-02 | 4.00E-03 | (2) | 1.75E+01 | **YES** | **(b)** |
| Beryllium | 1/10 | 1.50E-04 | 5.68E-05 | 1.50E-04 | ND | 6.60E-04 | (2) | 2.27E-01 | NO | (c) |
| **Cadmium** | 2/10 | 7.00E-05 | 7.11E-05 | 3.00E-04 | 3.00E-04 | 2.50E-04 | (1) | 1.20E+00 | **YES** | **(b)** |
| Calcium | 10/10 | 1.00E+01 | 1.41E+01 | 3.36E+01 | 1.22E+01 | 1.16E+02 | (2) | 2.90E-01 | NO | (c,d) |
| Chromium | 1/10 | 4.20E-03 | 1.00E-03 | 4.20E-03 | ND | 1.10E-02 | (1) | 3.82E-01 | NO | (c) |
| Cobalt | 1/10 | 2.50E-03 | 5.69E-04 | 2.50E-03 | ND | 2.30E-02 | (2) | 1.09E-01 | NO | (c) |
| Copper | 7/10 | 1.00E-03 | 1.24E-03 | 6.90E-03 | 2.60E-03 | 9.00E-03 | (1) | 7.67E-01 | NO | (c) |
| **Iron** | 9/10 | 8.35E-02 | 3.02E-01 | 7.51E+00 | 1.07E+00 | 1.00E+00 | (1) | 7.51E+00 | **YES** | **(b)** |
| **Lead** | 7/10 | 1.20E-04 | 4.72E-04 | 5.90E-03 | 3.40E-03 | 2.50E-03 | (1) | 2.36E+00 | **YES** | **(b)** |
| Magnesium | 10/10 | 2.25E+00 | 2.80E+00 | 5.76E+00 | 2.48E+00 | 8.20E+01 | (2) | 7.02E-02 | NO | (c,d) |
| **Manganese** | 10/10 | 4.70E-03 | 1.01E-01 | 4.53E-01 | 3.27E-01 | 1.20E-01 | (2) | 3.78E+00 | **YES** | **(b)** |
| Mercury | 1/10 | 1.85E-05 | 4.58E-06 | 5.00E-05 | 5.00E-05 | 7.70E-04 | (1) | 6.49E-02 | NO | (c) |
| Nickel | 1/10 | 2.70E-03 | 1.18E-03 | 2.70E-03 | ND | 5.20E-02 | (1) | 5.19E-02 | NO | (c) |
| Potassium | 10/10 | 1.78E+00 | 2.58E+00 | 5.35E+00 | 2.59E+00 | 5.30E+01 | (2) | 1.01E-01 | NO | (c,d) |
| Selenium | 3/10 | 5.80E-04 | 6.26E-04 | 2.10E-03 | ND | 5.00E-03 | (1) | 4.20E-01 | NO | (c) |
| Sodium | 10/10 | 2.50E+01 | 4.49E+01 | 1.45E+02 | 4.30E+01 | 6.80E+02 | (2) | 2.13E-01 | NO | (c,d) |
| Vanadium | 1/10 | 5.30E-03 | 1.10E-03 | 5.30E-03 | ND | 2.00E-02 | (2) | 2.65E-01 | NO | (c) |
| Zinc | 3/10 | 4.10E-03 | 4.07E-03 | 1.33E-02 | 9.90E-03 | 1.20E-01 | (1) | 1.10E-01 | NO | (c) |
| | | | | | | | | | | |

| Table G-20: COCs in Surface Water Collected from the Rumford River<br>Baseline Ecological Risk Assessment<br>Hatheway & Patterson Superfund Site<br>Mansfield, Massachusetts | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Frequency of detection** | **Minimum detected conc. on site** | **Geometric mean conc. on site** | **Maximum conc. on site** | **Maximum background conc.** | **Surface water benchmark** | **Benchmark source** | **Hazard Quotient** | **COC?** | **Reason code** |
| ***SVOCs (mg/l)*** | | | | | | | | | | |
| **Isophorone** | 1/10 | 2.70E-04 | 1.42E-03 | 5.00E-03 | ND | NA | - | - | **YES** | **(a)** |
| **2,6-Dinitrotoluene** | 1/10 | 7.00E-03 | 5.17E-03 | 7.00E-03 | ND | NA | - | - | **YES** | **(a)** |
| **4,6-Dinitro-2-methylphenol** | 1/10 | 6.90E-04 | 5.42E-03 | 1.30E-02 | ND | NA | - | - | **YES** | **(a)** |
| **Atrazine** | 1/10 | 3.30E-04 | 3.81E-03 | 5.00E-03 | ND | NA | - | - | **YES** | **(a)** |
| **Pentachlorophenol** | 8/10 | 5.30E-06 | 1.95E-03 | 2.80E-02 | 5.00E-03 | 1.50E-02 | (1) | 1.87E+00 | **YES** | **(b)** |
| **Carbazole** | 1/10 | 4.50E-04 | 3.93E-03 | 5.00E-03 | 5.00E-03 | NA | - | - | **YES** | **(a)** |
| Di-n-butyl phthalate | 3/10 | 2.60E-04 | 2.29E-03 | 5.00E-03 | 5.00E-03 | 3.50E-02 | (2) | 1.43E-01 | NO | (c) |
| Fluoranthene | 1/10 | 3.80E-04 | 3.86E-03 | 5.00E-03 | 5.00E-03 | 1.50E-02 | (2) | 3.33E-01 | NO | (c) |
| **Pyrene** | 1/10 | 6.10E-04 | 4.05E-03 | 5.00E-03 | 5.00E-03 | NA | - | - | **YES** | **(a)** |
| Butyl benzyl phthalate | 3/10 | 2.80E-04 | 2.67E-03 | 5.00E-03 | 5.00E-03 | 1.90E-02 | (2) | 2.63E-01 | NO | (c) |
| **Benzo(a)anthracene** | 3/10 | 9.40E-06 | 3.32E-04 | 5.00E-03 | 5.00E-03 | 2.70E-05 | (2) | 1.85E+02 | **YES** | **(b)** |
| **Chrysene** | 3/10 | 1.50E-05 | 3.67E-04 | 5.00E-03 | 5.00E-03 | NA | - | - | **YES** | **(a)** |
| **Bis(2-ethylhexyl) phthalate** | 1/10 | 3.00E-03 | 4.75E-03 | 5.00E-03 | ND | 3.00E-03 | (2) | 1.67E+00 | **YES** | **(b)** |
| Di-n-octyl phthalate | 2/10 | 7.40E-04 | 3.80E-03 | 5.00E-03 | 5.00E-03 | 7.08E-01 | (2) | 7.06E-03 | NO | (c) |
| **Benzo(b)fluoranthene** | 2/10 | 1.70E-05 | 5.35E-04 | 5.00E-03 | 5.00E-03 | NA | - | - | **YES** | **(a)** |
| **Benzo(k)fluoranthene** | 2/10 | 1.40E-05 | 5.11E-04 | 5.00E-03 | 5.00E-03 | NA | - | - | **YES** | **(a)** |
| **Benzo(a)pyrene** | 2/10 | 1.10E-05 | 4.59E-04 | 5.00E-03 | 5.00E-03 | 1.40E-05 | (2) | 3.57E+02 | **YES** | **(b)** |
| **Indeno(1,2,3-cd)pyrene** | 2/10 | 1.30E-05 | 4.66E-04 | 5.00E-03 | 5.00E-03 | NA | - | - | **YES** | **(a)** |
| **Dibenz(a,h) anthracene** | 3/10 | 5.00E-06 | 2.15E-04 | 5.00E-03 | 5.00E-03 | NA | - | - | **YES** | **(a)** |
| **Benzo(g,h,i)perylene** | 1/10 | 5.40E-04 | 4.00E-03 | 5.00E-03 | 5.00E-03 | NA | - | - | **YES** | **(a)** |
| **2,3,5,6-Tetrachlorophenol** | 1/10 | 3.30E-04 | 8.73E-03 | 1.25E-02 | ND | NA | - | - | **YES** | **(a)** |
| | | | | | | | | | | |
| ***VOCs (mg/l)*** | | | | | | | | | | |
| 1,1,2-Trichloroethane | 1/7 | 6.20E-04 | 7.16E-05 | 6.20E-04 | ND | 1.20E+00 | (2) | 5.17E-04 | NO | (c) |
| | | | | | | | | | | |
| ***PAHs (mg/l)*** | | | | | | | | | | |
| Anthracene | 2/3 | 3.50E-05 | 2.60E-05 | 1.00E-04 | ND | 7.30E-04 | (2) | 1.37E-01 | NO | (c) |
| Benzo(a)anthracene | 1/3 | 1.95E-05 | 7.87E-06 | 1.95E-05 | ND | 2.70E-05 | (2) | 7.22E-01 | NO | (c) |
| **Benzo(a)pyrene** | 2/3 | 7.10E-06 | 1.62E-05 | 1.20E-04 | ND | 1.40E-05 | (2) | 8.57E+00 | **YES** | **(b)** |
| Fluoranthene | 2/3 | 7.00E-06 | 1.68E-05 | 1.35E-04 | 7.40E-06 | 1.50E-02 | (2) | 9.00E-03 | NO | (c) |

**Table G-20: COCs in Surface Water Collected from the Rumford River**
**Baseline Ecological Risk Assessment**
**Hatheway & Patterson Superfund Site**
**Mansfield, Massachusetts**

| | Frequency of detection | Minimum detected conc. on site | Geometric mean conc. on site | Maximum conc. on site | Maximum background conc. | Surface water benchmark | Benchmark source | Hazard Quotient | COC? | Reason code |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluorene | 3/3 | 8.40E-06 | 1.75E-05 | 6.50E-05 | ND | 3.90E-03 | (2) | 1.67E-02 | NO | (c) |
| Phenanthrene | 3/3 | 9.60E-06 | 7.93E-05 | 2.60E-04 | 6.20E-06 | 2.00E-01 | (2) | 1.30E-03 | NO | (c) |
| | | | | | | | | | | |
| NA = not available | | | | | | | | | | |
| ND = not detected | | | | | | | | | | |
| | | | | | | | | | | |
| Only those contaminants present above their analytical detection limit (DL) in at least one sample from the site were retained; contaminants present below their analytical DL in all the site samples were omitted. | | | | | | | | | | |
| | | | | | | | | | | |
| Note 1: | | | | | | | | | | |
| The surface water benchmarks used in selecting contaminants of concern were as follows: | | | | | | | | | | |
| | | | | | | | | | | |
| (1) U.S. EPA. 2002. National Recommended Water Quality Criteria: 2002, EPA 822-R-02-047. The values shown in this table are the freshwater criterion continuous concentrations (CCCs). | | | | | | | | | | |
| (2) Suter, G.W. and C.L. Tsao. 1996. Toxicological benchmarks for screening potential contaminants of concern for effects of aquatic biota: 1996 revision. Oak Ridge National laboratory. ES/ER/TM-96/R2. | | | | | | | | | | |
| Note 2: | | | | | | | | | | |
| The order of preference (from high to low) for selecting a freshwater benchmark was as follows: | | | | | | | | | | |
| a. the chronic National Ambient Water Quality Criteria presented in U.S. EPA (2002). | | | | | | | | | | |
| b. Secondary Chronic values from Table 1 in Suter and Tsao (1996). | | | | | | | | | | |
| c. Lowest Chronic Value for fishes, aquatic invertebrates, or aquatic plants from Table 1 in Suter and Tsao (1996). | | | | | | | | | | |
| Note 3: | | | | | | | | | | |
| The analytical data for inorganics represent total unfiltered metals; the benchmarks for metals were not corrected for surface water hardness. | | | | | | | | | | |
| note 4: | | | | | | | | | | |
| reason codes are as follows: (a) no benchmark was available; (b) the maximum concentration exceeded its benchmark; (c) the maximum concentration did not exceed its benchmark; (d) the compound was a physiological electrolyte. | | | | | | | | | | |

| Table G-21: COCs in Sediments Collected from the Rumford River<br>Baseline Ecological Risk Assessment<br>Hatheway & Patterson Superfund Site, Mansfield, MA<br>Mansfield, Massachusetts | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Frequency of detection | Minimum detected conc. on site | Geometric Mean Conc. on site | Maximum Conc. on site | Maximum background conc. | Sediment benchmark | Benchmark Source | Hazard Quotient | COC? | Reason Code |
| ***Dioxins & Furans (mg/kg, DW)*** | | | | | | | | | | |
| 2,3,7,8-TCDD | 5/13 | 8.51E-07 | 6.76E-07 | 3.29E-06 | ND | NA | - | - | - | - |
| 1,2,3,7,8-PeCDD | 8/13 | 2.43E-06 | 3.03E-06 | 4.91E-05 | 2.14E-06 | NA | - | - | - | - |
| 1,2,3,4,7,8-HxCDD | 9/13 | 1.21E-05 | 8.45E-06 | 2.15E-04 | 1.73E-06 | NA | - | - | - | - |
| 1,2,3,6,7,8-HxCDD | 10/13 | 2.51E-05 | 3.50E-05 | 1.82E-03 | 1.17E-05 | NA | - | - | - | - |
| 1,2,3,7,8,9-HxCDD | 10/13 | 1.67E-05 | 2.25E-05 | 6.15E-04 | 4.65E-06 | NA | - | - | - | - |
| 1,2,3,4,6,7,8-HpCDD | 13/13 | 1.75E-05 | 1.05E-03 | 5.90E-02 | 1.86E-04 | NA | - | - | - | - |
| OCDD | 13/13 | 1.22E-04 | 7.09E-03 | 5.24E-01 | 1.41E-03 | NA | - | - | - | - |
| 2,3,7,8-TCDF | 7/13 | 1.20E-06 | 1.38E-06 | 2.81E-05 | 5.76E-06 | NA | - | - | - | - |
| 1,2,3,7,8-PeCDF | 7/13 | 2.08E-06 | 1.29E-06 | 3.60E-05 | 9.56E-07 | NA | - | - | - | - |
| 2,3,4,7,8-PeCDF | 7/13 | 2.13E-06 | 1.43E-06 | 2.89E-05 | 1.13E-06 | NA | - | - | - | - |
| 1,2,3,4,7,8-HxCDF | 10/13 | 7.32E-06 | 1.15E-05 | 2.79E-04 | 3.86E-06 | NA | - | - | - | - |
| 1,2,3,6,7,8-HxCDF | 9/13 | 5.12E-06 | 9.87E-06 | 1.37E-04 | 2.57E-06 | NA | - | - | - | - |
| 2,3,4,6,7,8-HxCDF | 4/13 | 2.49E-05 | 3.08E-06 | 1.38E-04 | 1.58E-06 | NA | - | - | - | - |
| 1,2,3,7,8,9-HxCDF | 3/13 | 1.44E-06 | 5.81E-07 | 3.31E-05 | ND | NA | - | - | - | - |
| 1,2,3,4,6,7,8-HpCDF | 11/13 | 3.61E-05 | 2.06E-04 | 9.12E-03 | 1.29E-04 | NA | - | - | - | - |
| 1,2,3,4,7,8,9-HpCDF | 9/13 | 1.10E-05 | 1.77E-05 | 8.15E-04 | 1.71E-04 | NA | - | - | - | - |
| OCDF | 11/13 | 1.22E-04 | 6.28E-04 | 5.38E-02 | 9.77E-05 | NA | - | - | - | - |
| | | | | | | | | | | |
| ***Inorganics (mg/kg, DW)*** | | | | | | | | | | |
| **Aluminum** | 13/13 | 2.02E+03 | 3.81E+03 | 1.20E+04 | 5.68E+03 | NA | - | - | **YES** | (a) |
| **Antimony** | 9/13 | 1.50E-01 | 1.13E+00 | 1.80E+01 | 2.40E+00 | 1.20E+01 | (5) | 1.50E+00 | **YES** | (b) |
| **Arsenic** | 13/13 | 2.10E-01 | 2.77E+00 | 6.50E+01 | 3.40E+00 | 9.79E+00 | (1) | 6.64E+00 | **YES** | (b) |
| **Barium** | 13/13 | 1.12E+01 | 3.18E+01 | 1.00E+02 | 6.34E+01 | NA | - | - | **YES** | (a) |
| **Beryllium** | 13/13 | 1.70E-01 | 3.89E-01 | 1.80E+00 | 4.60E-01 | NA | - | - | **YES** | (a) |
| **Cadmium** | 13/13 | 1.00E-01 | 3.44E-01 | 6.80E+00 | 6.90E-01 | 9.90E-01 | (1) | 6.87E+00 | **YES** | (b) |
| Calcium | 13/13 | 8.03E+02 | 1.56E+03 | 6.00E+03 | 5.17E+03 | NA | - | - | NO | (d) |
| **Chromium** | 13/13 | 3.10E+00 | 1.56E+01 | 3.30E+02 | 1.55E+01 | 4.34E+01 | (1) | 7.60E+00 | **YES** | (b) |
| **Cobalt** | 13/13 | 1.75E+00 | 3.35E+00 | 1.20E+01 | 5.40E+00 | NA | - | - | **YES** | (a) |

**Table G-21: COCs in Sediments Collected from the Rumford River**
**Baseline Ecological Risk Assessment**
**Hatheway & Patterson Superfund Site, Mansfield, MA**
**Mansfield, Massachusetts**

| | Frequency of detection | Minimum detected conc. on site | Geometric Mean Conc. on site | Maximum Conc. on site | Maximum background conc. | Sediment benchmark | Benchmark Source | Hazard Quotient | COC? | Reason Code |
|---|---|---|---|---|---|---|---|---|---|---|
| **Copper** | 13/13 | 2.10E+00 | 1.94E+01 | 2.70E+02 | 2.68E+01 | 3.16E+01 | (1) | 8.54E+00 | **YES** | (b) |
| **Iron** | 13/13 | 2.74E+03 | 6.54E+03 | 2.10E+04 | 1.08E+04 | 2.00E+04 | (4) | 1.05E+00 | **YES** | (b) |
| **Lead** | 13/13 | 5.90E+00 | 3.38E+01 | 2.10E+02 | 4.65E+01 | 3.58E+01 | (1) | 5.87E+00 | **YES** | (b) |
| Magnesium | 13/13 | 7.67E+02 | 1.12E+03 | 2.60E+03 | 1.43E+03 | NA | - | - | NO | (d) |
| **Manganese** | 13/13 | 5.26E+01 | 1.34E+02 | 1.30E+03 | 1.10E+03 | 4.60E+02 | (4) | 2.83E+00 | **YES** | (b) |
| **Mercury** | 10/13 | 1.00E-02 | 3.79E-02 | 1.50E+00 | 1.30E-01 | 1.80E-01 | (1) | 8.33E+00 | **YES** | (b) |
| **Nickel** | 13/13 | 3.10E+00 | 7.43E+00 | 2.60E+01 | 1.04E+01 | 2.27E+01 | (1) | 1.15E+00 | **YES** | (b) |
| Potassium | 11/13 | 1.16E+01 | 1.74E+02 | 4.22E+02 | 2.89E+02 | NA | - | - | NO | (d) |
| **Selenium** | 6/13 | 1.60E-01 | 4.31E-01 | 3.90E+00 | 7.70E-01 | NA | - | - | **YES** | (a) |
| **Silver** | 10/13 | 4.00E-02 | 2.52E-01 | 2.20E+00 | 2.30E+00 | 1.00E+00 | (2) | 2.20E+00 | **YES** | (b) |
| Sodium | 12/13 | 3.89E+01 | 9.28E+01 | 6.30E+02 | 2.46E+02 | NA | - | - | NO | (d) |
| **Thallium** | 10/13 | 2.00E-02 | 4.74E-02 | 3.20E-01 | 5.00E-02 | NA | - | - | **YES** | (a) |
| **Vanadium** | 13/13 | 6.10E+00 | 1.33E+01 | 3.70E+01 | 1.63E+01 | NA | - | - | **YES** | (a) |
| **Zinc** | 13/13 | 1.56E+01 | 5.01E+01 | 9.90E+02 | 7.64E+01 | 1.21E+02 | (1) | 8.18E+00 | **YES** | (b) |
| | | | | | | | | | | |
| ***Pesticides (mg/kg, DW)*** | | | | | | | | | | |
| **4,4'-DDD** | 5/9 | 1.47E-03 | 1.28E-03 | 8.03E-03 | 1.12E-01 | 1.88E-03 | (1) | 4.27E+00 | **YES** | (b) |
| **4,4'-DDE** | 6/9 | 7.29E-04 | 1.48E-03 | 9.27E-03 | 1.79E-02 | 3.16E-03 | (1) | 2.93E+00 | **YES** | (b) |
| 4,4'-DDT | 5/9 | 6.92E-04 | 1.02E-03 | 3.67E-03 | 1.98E-02 | 4.16E-03 | (1) | 8.82E-01 | NO | (c) |
| **Aldrin** | 2/9 | 1.82E-03 | 2.93E-04 | 3.25E-03 | ND | 2.00E-03 | (4) | 1.63E+00 | **YES** | (b) |
| alpha-Chlordane | 3/9 | 3.61E-04 | 3.25E-04 | 2.21E-03 | 4.04E-04 | 7.00E-03 | (4) | 3.16E-01 | NO | (c) |
| Dieldrin | 2/9 | 1.16E-03 | 4.45E-04 | 1.63E-03 | 6.76E-04 | 1.90E-03 | (1) | 8.58E-01 | NO | (c) |
| **Endrin** | 1/9 | 4.03E-02 | 5.49E-04 | 4.03E-02 | ND | 2.22E-03 | (1) | 1.82E+01 | **YES** | (b) |
| **gamma-Chlordane** | 1/9 | 5.69E-03 | 2.90E-04 | 5.69E-03 | ND | NA | - | - | **YES** | (a) |
| Methoxychlor | 2/9 | 4.84E-03 | 2.06E-03 | 4.85E-03 | ND | 1.90E-02 | (3) | 2.55E-01 | NO | (c) |
| | | | | | | | | | | |
| ***PCBs (mg/kg, DW)*** | | | | | | | | | | |
| Aroclor 1254 | 3/9 | 1.21E-02 | 7.27E-03 | 3.45E-02 | | 5.98E-02 | (1) | 5.77E-01 | NO | (c) |
| Aroclor 1260 | 3/9 | 1.30E-02 | 6.62E-03 | 1.82E-02 | | 5.98E-02 | (1) | 3.04E-01 | NO | (c) |
| | | | | | | | | | | |

**Table G-21: COCs in Sediments Collected from the Rumford River**
**Baseline Ecological Risk Assessment**
**Hatheway & Patterson Superfund Site, Mansfield, MA**
**Mansfield, Massachusetts**

| | Frequency of detection | Minimum detected conc. on site | Geometric Mean Conc. on site | Maximum Conc. on site | Maximum background conc. | Sediment benchmark | Benchmark Source | Hazard Quotient | COC? | Reason Code |
|---|---|---|---|---|---|---|---|---|---|---|
| *SVOCs (mg/kg, DW)* | | | | | | | | | | |
| **Benzaldehyde** | 7/13 | 1.70E-02 | 1.65E-01 | 2.70E+00 | 9.00E-01 | NA | - | - | **YES** | (a) |
| **2-Methylphenol** | 4/13 | 5.95E-03 | 3.62E-02 | 9.50E-01 | 9.00E-01 | 1.20E-02 | (5) | 7.92E+01 | **YES** | (b) |
| **Acetophenone** | 1/13 | 9.00E-03 | 7.27E-02 | 9.50E-01 | ND | NA | - | - | **YES** | (a) |
| **4-Methylphenol** | 2/13 | 8.30E-02 | 2.14E-01 | 9.50E-01 | ND | NA | - | - | **YES** | (a) |
| **N-Nitrosodi-n-propylamine** | 1/13 | 2.20E-01 | 1.19E-01 | 9.50E-01 | 9.00E-01 | NA | - | - | **YES** | (a) |
| **Naphthalene** | 10/13 | 9.00E-03 | 9.84E-02 | 1.10E+00 | 8.50E-01 | 1.76E-01 | (1) | 6.25E+00 | **YES** | (b) |
| **2-Methylnaphthalene** | 7/13 | 2.50E-01 | 1.83E-01 | 7.00E+00 | 8.50E-01 | 7.00E-02 | (2) | 1.00E+02 | **YES** | (b) |
| **2,4,5-Trichlorophenol** | 1/13 | 4.50E-01 | 1.10E-01 | 9.50E-01 | ND | NA | - | - | **YES** | (a) |
| 1,1'-Biphenyl | 6/13 | 9.00E-03 | 7.87E-02 | 3.60E-01 | 8.50E-01 | 1.10E+00 | (3) | 3.27E-01 | NO | (c) |
| **Dimethyl phthalate** | 1/13 | 7.00E-02 | 1.09E-01 | 9.50E-01 | ND | NA | - | - | **YES** | (a) |
| **Acenaphthylene** | 4/13 | 3.80E-02 | 7.36E-02 | 4.80E-01 | 6.00E-01 | 4.40E-02 | (2) | 1.09E+01 | **YES** | (b) |
| **Acenaphthene** | 1/13 | 9.00E-03 | 4.80E-02 | 4.80E-01 | 4.40E-01 | 1.60E-02 | (2) | 3.00E+01 | **YES** | (b) |
| Dibenzofuran | 3/13 | 9.00E-03 | 8.77E-02 | 9.50E-01 | 1.00E+00 | 2.00E+00 | (3) | 4.75E-01 | NO | (c) |
| **Diethyl phthalate** | 1/13 | 4.90E-02 | 1.06E-01 | 9.50E-01 | 9.00E-01 | 6.30E-01 | (3) | 1.51E+00 | **YES** | (b) |
| **Fluorene** | 3/13 | 2.30E-02 | 6.88E-02 | 4.95E-01 | 1.30E+00 | 7.74E-02 | (1) | 6.40E+00 | **YES** | (b) |
| **Pentachlorophenol** | 7/13 | 1.40E-02 | 4.38E-01 | 2.40E+01 | ND | NA | - | - | **YES** | (a) |
| **Phenanthrene** | 13/13 | 4.10E-03 | 1.95E-01 | 2.50E+00 | 1.20E+01 | 2.04E-01 | (1) | 1.23E+01 | **YES** | (b) |
| **Anthracene** | 7/13 | 1.00E-02 | 6.03E-02 | 5.10E-01 | 9.10E-01 | 5.72E-02 | (1) | 8.92E+00 | **YES** | (b) |
| **Carbazole** | 3/13 | 2.10E-02 | 9.68E-02 | 9.50E-01 | 8.50E-01 | NA | - | - | **YES** | (a) |
| Di-n-butyl phthalate | 2/13 | 2.60E-01 | 9.00E-02 | 9.50E-01 | 9.00E-01 | 1.10E+01 | (3) | 8.64E-02 | NO | (c) |
| **Fluoranthene** | 13/13 | 4.00E-02 | 2.69E-01 | 5.70E+00 | 1.10E+01 | 4.23E-01 | (1) | 1.35E+01 | **YES** | (b) |
| **Pyrene** | 13/13 | 6.90E-03 | 2.68E-01 | 6.70E+00 | 1.90E+01 | 1.95E-01 | (1) | 3.44E+01 | **YES** | (b) |
| **Benzo(a)anthracene** | 13/13 | 2.60E-03 | 1.83E-01 | 2.90E+00 | 5.10E+00 | 1.08E-01 | (1) | 2.69E+01 | **YES** | (b) |
| **Chrysene** | 13/13 | 3.80E-03 | 1.86E-01 | 2.80E+00 | 6.00E+00 | 1.66E-01 | (1) | 1.69E+01 | **YES** | (b) |
| Bis(2-ethylhexyl) phthalate | 5/13 | 9.70E-02 | 3.81E-01 | 4.75E+00 | 4.35E+00 | 8.90E+02 | (5) | 5.34E-03 | NO | (c) |
| Di-n-octyl phthalate | 3/13 | 3.00E-01 | 1.21E-01 | 9.50E-01 | 9.00E-01 | 1.00E+05 | (5) | 9.50E-06 | NO | (c) |
| **Benzo(b)fluoranthene** | 13/13 | 3.10E-03 | 1.94E-01 | 3.40E+00 | 5.20E+00 | NA | - | - | **YES** | (a) |
| **Benzo(k)fluoranthene** | 13/13 | 2.70E-03 | 1.43E-01 | 1.50E+00 | 4.90E+00 | 2.40E-01 | (4) | 6.25E+00 | **YES** | (b) |
| **Benzo(a)pyrene** | 13/13 | 1.90E-03 | 1.31E-01 | 2.00E+00 | 4.60E+00 | 1.50E-01 | (1) | 1.33E+01 | **YES** | (b) |

| Table G-21: COCs in Sediments Collected from the Rumford River<br>Baseline Ecological Risk Assessment<br>Hatheway & Patterson Superfund Site, Mansfield, MA<br>Mansfield, Massachusetts | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Frequency of detection** | **Minimum detected conc. on site** | **Geometric Mean Conc. on site** | **Maximum Conc. on site** | **Maximum background conc.** | **Sediment benchmark** | **Benchmark Source** | **Hazard Quotient** | **COC?** | **Reason Code** |
| **Indeno(1,2,3-cd)pyrene** | 10/13 | 9.00E-03 | 8.60E-02 | 1.10E+00 | 2.70E+00 | 2.00E-03 | (4) | 5.50E+02 | **YES** | (b) |
| **Dibenz(a,h) anthracene** | 10/13 | 4.10E-04 | 2.59E-02 | 4.70E-01 | 7.70E-01 | 3.30E-02 | (1) | 1.42E+01 | **YES** | (b) |
| **Benzo(g,h,i)perylene** | 9/13 | 9.00E-03 | 7.64E-02 | 8.30E-01 | 2.40E+00 | 1.70E-01 | (4) | 4.88E+00 | **YES** | (b) |
| **2,3,5,6-Tetrachlorophenol** | 2/13 | 3.00E-01 | 1.26E-01 | 9.50E-01 | ND | NA | - | - | **YES** | (a) |
| | | | | | | | | | | |
| *VOCs (mg/kg, DW)* | | | | | | | | | | |
| **Acetone** | 3/9 | 1.70E-01 | 9.11E-02 | 3.15E-01 | ND | 8.70E-03 | (5) | 3.62E+01 | **YES** | (b) |
| **Carbon disulfide** | 3/9 | 1.60E-02 | 1.93E-02 | 2.95E-02 | ND | 8.50E-04 | (5) | 3.47E+01 | **YES** | (b) |
| **Methyl acetate** | 8/9 | 4.50E-02 | 2.98E-01 | 1.90E+00 | 2.50E+00 | NA | - | - | **YES** | (a) |
| **1,1-Dichloroethane** | 1/9 | 3.40E-03 | 6.39E-03 | 2.95E-02 | ND | 2.70E-02 | (5) | 1.09E+00 | **YES** | (b) |
| cis-1,2-Dichloroethene | 1/9 | 5.30E-03 | 6.76E-03 | 2.95E-02 | ND | 4.00E-01 | (5) | 7.38E-02 | NO | (c) |
| 2-Butanone (MEK) | 3/9 | 2.00E-02 | 5.40E-02 | 2.60E-01 | ND | 2.70E-01 | (5) | 9.63E-01 | NO | (c) |
| **Cyclohexane** | 1/9 | 8.00E-03 | 7.89E-03 | 2.95E-02 | ND | NA | - | - | **YES** | (a) |
| Trichloroethene | 2/9 | 1.80E-02 | 9.99E-03 | 3.00E-02 | ND | 2.20E+01 | (5) | 1.36E-03 | NO | (c) |
| **Methyl cyclohexane** | 3/9 | 5.20E-03 | 7.98E-03 | 2.95E-02 | ND | NA | - | - | **YES** | (a) |
| Chlorobenzene | 1/9 | 3.20E-03 | 6.34E-03 | 2.95E-02 | ND | 8.20E-01 | (3) | 3.60E-02 | NO | (c) |
| Ethylbenzene | 1/9 | 8.60E-02 | 9.96E-03 | 8.60E-02 | ND | 3.60E+00 | (3) | 2.39E-02 | NO | (c) |
| **Xylenes (total)** | 4/9 | 6.20E-03 | 1.85E-02 | 2.16E-01 | 2.20E-02 | 1.60E-01 | (3) | 1.35E+00 | **YES** | (b) |
| **Styrene** | 1/9 | 3.40E-03 | 6.39E-03 | 2.95E-02 | ND | NA | - | - | **YES** | (a) |
| **Isopropylbenzene** | 2/9 | 6.30E-03 | 8.24E-03 | 3.30E-02 | ND | NA | - | - | **YES** | (a) |
| | | | | | | | | | | |
| NA = *not available* | | | | | | | | | | |
| ND = not detected | | | | | | | | | | |
| | | | | | | | | | | |
| Only those contaminants present above their analytical detection limit (DL) in at least one sample from the site were retained; contaminants present below their analytical *DL in all the site samples were omitted.* | | | | | | | | | | |
| | | | | | | | | | | |
| Note 1: The sediment benchmarks used in selecting contaminants of concern were as follows: | | | | | | | | | | |
| (1) MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Arch. Environ. Contam. Toxicol. 39:20-31. | | | | | | | | | | |

**Table G-21: COCs in Sediments Collected from the Rumford River**
**Baseline Ecological Risk Assessment**
**Hatheway & Patterson Superfund Site, Mansfield, MA**
**Mansfield, Massachusetts**

| | Frequency of detection | Minimum detected conc. on site | Geometric Mean Conc. on site | Maximum Conc. on site | Maximum background conc. | Sediment benchmark | Benchmark Source | Hazard Quotient | COC? | Reason Code |
|---|---|---|---|---|---|---|---|---|---|---|
| (2) Long, E.R., D.D. MacDonald, S.L. Smith and F.D. Calder. 1995. Incidence of adverse biological effects with ranges of chemical concentrations in marine and estuarine sediments. Environ. Manag. 19:81-97. | | | | | | | | | | |
| (3) U.S. EPA. 1996. ECO Update: Ecotox Thresholds. EPA 540/F-95/038. January, 1996. | | | | | | | | | | |
| (4) Persaud, D., R. Jaagumagi and A. Hayton. 1993. Guidelines for the protection and management of aquatic sediment quality in Ontario. Ontario Ministry of Environment and Energy. | | | | | | | | | | |
| (5) Jones, D.S., G.W. Suter and R.N. Hull. 1997. Toxicological benchmarks for screening contaminants of potential concern for effects on sediment-associated biota: 1997 revision. Oak Ridge National Laboratory. ES/ER/TM-95/R4. | | | | | | | | | | |
| | | | | | | | | | | |
| Note 2: The order of preference (from highest to lowest) for selecting the freshwater sediment benchmarks was as follows: | | | | | | | | | | |
| | | | | | | | | | | |
| 1. the consensus-based threshold effects concentrations (TECs) shown in Table 2 of MacDonald et al. (2000). | | | | | | | | | | |
| 2. the effects range low for PAHs and pesticides presented in Long et al., 1995. | | | | | | | | | | |
| 3. the ecotox thresholds for sediments shown in Table 2 of U.S. EPA (1996); within this table, the order of preference was freshwater Sediment Quality Criteria, Sediment Quality benchmarks, and Effects Range - Low. | | | | | | | | | | |
| 4. the lowest effect level (LEL) Ontario Provincial Sediment Quality Guidelines summarized by Persaud et al. (1993) standardized to 1% organic carbon | | | | | | | | | | |
| 5.1. for organic compounds, the EqP-derived secondary chronic value or lowest chronic value sediment quality benchmarks shown in Table 3 of Jones et al. (1997). | | | | | | | | | | |
| 5.2. for organic compounds, the EPA Region IV sediment screening values shown in table 5 of Jones et al. (1997). | | | | | | | | | | |
| | | | | | | | | | | |
| note 3: reason codes are as follows: (a) no benchmark was available; (b) the maximum concentration exceeded its benchmark; (c) the maximum concentration did not exceed its benchmark; (d) the compound was a physiological electrolyte. | | | | | | | | | | |

**Table G-22: COCs in Biota Collected from the Rumford River**
**Baseline Ecological Risk Assessment**
**Hatheway & Patterson Superfund Site**
**Mansfield, Massachusetts**

| Analytes | Crayfish | | | | Redfin pickerel | | | | White sucker | | | | COC? | Reason Code |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site | | Background | | Site | | Background | | Site | | Background | | | |
| ***Dioxins and Furans (ng/kg, wet weight)*** | | | | | | | | | | | | | | |
| 2,3,7,8-TCDD | 0.315 | U* | 0.246 | U* | 0.234 | UJ | 1.67 | | 0.285 | U* | 0.564 | U* | NA | - |
| 1,2,3,7,8-PeCDD | 2.78 | UJ | 0.185 | U* | 3.87 | UJ | 1.92 | UJ | 0.155 | U | 0.483 | U* | NA | - |
| 1,2,3,4,7,8-HxCDD | 1.77 | U* | 0.156 | U* | 1.29 | UJ | 0.178 | U | 0.0583 | U | 0.218 | U* | NA | - |
| 1,2,3,6,7,8-HxCDD | 14.3 | | 0.296 | U* | 17.9 | J | 1.38 | U | 1.63 | U* | 0.388 | U* | NA | - |
| 1,2,3,7,8,9-HxCDD | 4.23 | U | 0.0585 | U | 3.76 | UJ | 0.541 | U | 0.0388 | U | 0.176 | U | NA | - |
| 1,2,3,4,6,7,8-HpCDD | 130 | J | 4.95 | J | 42 | J | 1.8 | UJ | 10 | J | 1.4 | UJ | NA | - |
| OCDD | 2010 | J | 44.9 | J | 842 | J | 4.67 | UJ | 310 | J | 18 | UJ | NA | - |
| 2,3,7,8-TCDF | 0.0984 | U | 0.657 | U | 1.91 | J | 3.25 | | 0.117 | U | 0.135 | U | NA | - |
| 1,2,3,7,8-PeCDF | 0.941 | * | 0.156 | U | 0.656 | * | 0.529 | U | 0.0971 | U | 0.193 | U | NA | - |
| 2,3,4,7,8-PeCDF | 1.07U | U* | 0.175 | U | 1.37 | UJ | 0.889 | U* | 0.0971 | U | 0.334 | U* | NA | - |
| 1,2,3,4,7,8-HxCDF | 6.5 | | 0.359 | U* | 2.9 | UJ | 0.285 | U* | 0.0583 | U | 0.153 | U* | NA | - |
| 1,2,3,6,7,8-HxCDF | 3.93 | U | 0.187 | U* | 1.95 | UJ | 0.271 | U* | 0.361 | U* | 0.116 | U | NA | - |
| 2,3,4,6,7,8-HxCDF | 1.4 | U | 0.0585 | U | 0.738U | U* | 0.113 | U* | 0.124 | U | 0.102 | U* | NA | - |
| 1,2,3,7,8,9-HxCDF | 0.37 | U* | 0.0897 | U* | 0.111 | UJ | 0.0178 | U* | 0.0777 | U* | 0.154 | U | NA | - |
| 1,2,3,4,6,7,8-HpCDF | 27.8 | | 1.42 | U | 6.38 | J | 0.6U | U* | 1.98 | U | 0.305 | U* | NA | - |
| 1,2,3,4,7,8,9-HpCDF | 2.81 | U | 0.15U | U* | 1.02 | U* | 0.317 | U | 0.243 | U* | 0.0579 | U* | NA | - |
| OCDF | 41.9 | | 1.19U | U* | 10.1 | UJ | 0.192 | U* | 3.69 | U* | 0.425 | U* | NA | - |
| | | | | | | | | | | | | | | |
| ***Metals (mg/kg, wet weight)*** | | | | | | | | | | | | | | |
| **Aluminum** | 12 | J | 16.9 | J | 2.68 | J | 5.12 | J | 4.18 | J | 3.26 | J | **YES** | (b) |
| **Antimony** | 0.05 | U | 0.0906 | | 0.0417 | U | 0.0476 | U | 0.0476 | U | 0.0467 | U | **YES** | (b) |
| **Arsenic** | 0.458 | J | 0.26 | J | 0.13 | J | 0.0673 | J | 0.0351 | J | 0.037 | J | **YES** | (b) |
| **Barium** | 63 | J | 56.2 | J | 8.37 | J | 3.03 | J | 1.8 | J | 2.02 | J | **YES** | (b) |
| Beryllium | 0.966 | U | 0.917 | U | 1 | U | 0.98 | U | 0.957 | U | 0.971 | U | NO | (a) |
| **Cadmium** | 0.123 | J | 0.0609 | J | 0.0847 | J | 0.0246 | J | 0.0658 | | 0.034 | J | **YES** | (b) |
| **Chromium (total)** | 0.131 | J | 0.282 | J | 0.211 | J | 0.215 | J | 0.177 | J | 0.216 | J | **YES** | (b) |

| Table G-22: COCs in Biota Collected from the Rumford River<br>Baseline Ecological Risk Assessment<br>Hatheway & Patterson Superfund Site<br>Mansfield, Massachusetts | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Analytes** | **Crayfish** | | | | **Redfin pickerel** | | | | **White sucker** | | | | **COC?** | **Reason Code** |
| | **Site** | | **Background** | | **Site** | | **Background** | | **Site** | | **Background** | | | |
| **Cobalt** | 0.195 | | 0.273 | | 0.0614 | | 0.0635 | | 0.0491 | | 0.0663 | | **YES** | (b) |
| **Copper** | 22.5 | | 19.9 | | 1.01 | | 0.815 | | 0.728 | | 1.08 | | **YES** | (b) |
| **Iron** | 287 | | 517 | | 42.3 | | 49.7 | | 30.3 | | 56.3 | | **YES** | (b) |
| **Lead** | 0.309 | J | 0.375 | J | 0.316 | J | 0.238 | J | 0.0936 | | 0.0661 | J | **YES** | (b) |
| **Manganese** | 168 | J | 246 | J | 43.2 | J | 35.7 | J | 27.7 | J | 32.6 | J | **YES** | (b) |
| **Nickel** | 2.01 | J | 1.96 | J | 1.02 | J | 0.594 | J | 0.676 | J | 0.555 | J | **YES** | (b) |
| **Selenium** | 0.172 | J | 0.112 | J | 0.355 | J | 0.344 | J | 0.392 | | 0.338 | J | **YES** | (b) |
| **Silver** | 0.482 | | 0.711 | | 0.0286 | | 0.0459 | | 0.0161 | | 0.0648 | | **YES** | (b) |
| Thallium | 0.0183 | U | 0.0183 | U | 0.01 | U | 0.0098 | U | 0.009 | U | 0.0097 | U | NO | (a) |
| **Vanadium** | 0.317 | J | 0.235 | J | 0.129 | J | 0.0868 | J | 0.0574 | | 0.0467 | J | **YES** | (b) |
| **Zinc** | 15.6 | | 15.9 | | 51 | | 52.8 | | 20.3 | | 16.5 | | **YES** | (b) |
| | | | | | | | | | | | | | | |
| ***SVOCs (mg/kg, wet weight)*** | | | | | | | | | | | | | | |
| 2-Chlorophenol | 0.078 | U | 0.079 | U | 0.079 | U | 0.078 | U | 0.077 | U | 0.077 | U | NO | (a) |
| 2,4-Dichlorophenol | 0.078 | U | 0.079 | U | 0.079 | U | 0.078 | U | 0.077 | U | 0.077 | U | NO | (a) |
| Naphthalene | 0.004 | UJ | 0.004 | UJ | 0.004 | UJ | 0.004 | UJ | 0.004 | UJ | 0.004 | UJ | NO | (a) |
| **2-Methylnaphthalene** | 0.0019 | J | 0.004 | UJ | 0.0013 | J | 0.004 | UJ | 0.004 | UJ | 0.004 | UJ | **YES** | (b) |
| 2,4,6-Trichlorophenol | 0.078 | U | 0.079 | U | 0.079 | U | 0.078 | U | 0.077 | U | 0.077 | U | NO | (a) |
| 2,4,5-Trichlorophenol | 0.078 | U | 0.079 | U | 0.079 | U | 0.078 | U | 0.077 | U | 0.077 | U | NO | (a) |
| Biphenyl | 0.004 | UJ | 0.004 | UJ | 0.004 | UJ | 0.004 | UJ | 0.004 | UJ | 0.004 | UJ | NO | (a) |
| **Acenaphthylene** | 0.00052 | J | 0.00043 | J | 0.00063 | J | 0.004 | UJ | 0.004 | UJ | 0.00039 | J | **YES** | (b) |
| **Acenaphthene** | 0.00076 | J | 0.00031 | J | 0.0011 | J | 0.001 | J | 0.00043 | J | 0.00087 | J | **YES** | (b) |
| **2,3,5,6-Tetrachlorophenol** | 0.078 | U | 0.079 | U | 0.079 | U | 0.078 | U | 0.18 | J | 0.077 | U | **YES** | (b) |
| **Fluorene** | 0.00088 | J | 0.004 | UJ | 0.0014 | J | 0.0011 | J | 0.00065 | J | 0.0012 | J | **YES** | (b) |
| **Pentachlorophenol** | 0.39 | U | 0.39 | U | 3.1 | | 0.39 | U | 7.4 | | 0.38 | U | **YES** | (b) |
| **Phenanthrene** | 0.0033 | J | 0.003 | J | 0.0031 | J | 0.004 | UJ | 0.004 | UJ | 0.004 | UJ | **YES** | (b) |
| **Anthracene** | 0.004 | UJ | 0.004 | UJ | 0.00064 | J | 0.004 | UJ | 0.004 | UJ | 0.004 | UJ | **YES** | (b) |
| **Fluoranthene** | 0.0048 | J | 0.0059 | J | 0.0036 | J | 0.0017 | J | 0.003 | J | 0.0013 | J | **YES** | (b) |

| Table G-22: COCs in Biota Collected from the Rumford River<br>Baseline Ecological Risk Assessment<br>Hatheway & Patterson Superfund Site<br>Mansfield, Massachusetts | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Crayfish | | | | Redfin pickerel | | | | White sucker | | | | | |
| Analytes | Site | | Background | | Site | | Background | | Site | | Background | | COC? | Reason Code |
| **Pyrene** | 0.0036 | J | 0.0051 | J | 0.0027 | J | 0.0011 | J | 0.0025 | J | 0.004 | UJ | **YES** | (b) |
| **Benzo(a)anthracene** | 0.0011 | J | 0.0013 | J | 0.0011 | J | 0.004 | UJ | 0.001 | J | 0.004 | UJ | **YES** | (b) |
| **Chrysene** | 0.002 | J | 0.003 | J | 0.0021 | J | 0.004 | UJ | 0.0016 | J | 0.004 | UJ | **YES** | (b) |
| **Benzo(b)fluoranthene** | 0.0011 | J | 0.0016 | J | 0.0017 | J | 0.004 | UJ | 0.0015 | J | 0.004 | UJ | **YES** | (b) |
| **Benzo(k)fluoranthene** | 0.0012 | J | 0.0017 | J | 0.0014 | J | 0.004 | UJ | 0.0012 | J | 0.004 | UJ | **YES** | (b) |
| **Benzo(a)pyrene** | 0.00082 | J | 0.0014 | J | 0.00084 | J | 0.002 | UJ | 0.001 | J | 0.002 | UJ | **YES** | (b) |
| **Indeno(1,2,3-cd)pyrene** | 0.002 | UJ | 0.0012 | J | 0.002 | UJ | 0.002 | UJ | 0.0012 | J | 0.002 | UJ | **YES** | (b) |
| Dibenz(a,h)anthracene | 0.002 | UJ | 0.002 | UJ | 0.002 | UJ | 0.002 | UJ | 0.002 | UJ | 0.002 | UJ | NO | (a) |
| **Benzo(g,h,i)perylene** | 0.004 | UJ | 0.0015 | J | 0.004 | UJ | 0.004 | UJ | 0.0011 | J | 0.004 | UJ | **YES** | (b) |
| **Total PAHs** | 0.022 | J | 0.026 | J | 0.022 | J | 0.0049 | J | 0.015 | J | 0.0038 | J | **YES** | (b) |
| | | | | | | | | | | | | | | |
| NA = not applicable; risk associated with dioxins and furans was assessed in terms of toxicity equivalence (TEQ) | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Note 1: hazard quotients are not provided because screening-level tissue benchmarks were unavailable | | | | | | | | | | | | | | |
| Note 2: reason codes are as follows: (a) the target analyte was not present above its detection limit in any of the six tissue samples; (b) the target analyte was present above its detection limit in at least one of the six samples | | | | | | | | | | | | | | |
| * = estimated maximum possible concentration (EMPC) | | | | | | | | | | | | | | |
| U and UJ = the contaminant is not present above its detection limit | | | | | | | | | | | | | | |
| J = the contaminant is present above its detection limit but the reported concentration is an estimate | | | | | | | | | | | | | | |

| Table G-23: Summary of ecological exposure pathways and endpoints | | | | | |
|---|---|---|---|---|---|
| Receptor Group | Listed species | Main exposure media | Exposure routes | Assessment Endpoints | Measurement Endpoints |

| Table G-23: Summary of ecological exposure pathways and endpoints | | | | | |
|---|---|---|---|---|---|
| **Receptor Group** | **Listed species** | **Main exposure media** | **Exposure routes** | **Assessment Endpoints** | **Measurement Endpoints** |
| benthic invertebrates | NO | Sediment | Ingestion, respiration, direct contact with chemicals in sediment | maintain a stable and healthy benthic invertebrate community in Rumford River sediments at the site | • compare contaminant levels measured in Rumford River sediment samples to published benchmarks<br>• perform a 10-day laboratory toxicity test to measure survival and growth using chironomid larvae *(C. tentans)* and amphipod juveniles *(H. azteca)* exposed to sediments collected from the site EU and the background EU<br>• compare tissue residue levels measured in crayfish collected from the site and background EUs to published critical body residues (CBRs)<br>• compare the diversity and community structure of benthic invertebrates collected from sediments at the site EU from sediments collected at the background EU |
| water column invertebrates | NO | Surface water | Ingestion, respiration, direct contact with chemicals in surface water | maintain a stable and healthy water column invertebrate community in the Rumford River at the site | • compare the contaminant concentrations measured in Rumford River surface water samples to published benchmarks<br>• perform a 7-day laboratory toxicity test to measure survival and reproduction in neonates of the water flea (*C. dubia)* exposed to surface water samples collected from the site and background EUs |
| fish | NO | Surface water | Ingestion, respiration, direct contact with chemicals in surface water | maintain a stable and healthy warm water fish community in the Rumford River at the site | • compare contaminant levels measured in Rumford River surface water samples to published benchmarks<br>• perform a 7-day laboratory toxicity test to measure survival and biomass using neonates of the fathead minnow (*P. promelas*) exposed to surface water samples collected from the site and background EUs<br>• compare tissue residues measured in whole fish collected from the site and background EUs to published CBRs |
| piscivorous birds | NO | Surface water and aquatic biota | Ingestion | maintain stable and healthy piscivorous bird populations along the Rumford River at the site | • calculate a mean and maximum estimated daily dose in great blue heron from the ingestion of surface water and biota (fish and crayfish) collected from the site and background EU for comparison to published toxicity reference values (TRVs) |
| piscivorous mammals | NO | Surface water, sediment, and aquatic biota | Ingestion | maintain stable and healthy piscivorous mammal populations along the Rumford River at the site | • calculate a mean and maximum estimated daily dose in mink from the ingestion of sediments, surface water and biota (fish and crayfish) collected from the site and background EU for comparison to published TRVs |

| Table G-24: Exposure Point Concentrations for Surface Water COCs from the Rumford River<br>Baseline Ecological Risk Assessment<br>Hatheway & Patterson Superfund Site<br>Mansfield, Massachusetts | | | | | |
|---|---|---|---|---|---|
| | SITE EU | | | BACKGROUND EU | |
| Analyte | Mean Exposure | Maximum Exposure | | Mean Exposure | Maximum Exposure |
| *Inorganics (mg/l, DW)* | | | | | |
| Aluminum | 3.82E-02 | 6.31E-01 | | 7.82E-02 | 1.55E-01 |
| Barium | 2.72E-02 | 7.01E-02 | | 2.44E-02 | 2.83E-02 |
| Cadmium | 7.11E-05 | 3.00E-04 | | 1.32E-04 | 3.00E-04 |
| Iron | 3.02E-01 | 7.51E+00 | | 4.95E-01 | 1.07E+00 |
| Lead | 4.72E-04 | 5.90E-03 | | 1.58E-03 | 3.40E-03 |
| Manganese | 1.01E-01 | 4.53E-01 | | 2.59E-01 | 3.27E-01 |
| Silver | ND | ND | | 2.66E-04 | 5.50E-04 |
| Cyanide | ND | ND | | 4.80E-03 | 9.22E-03 |
| | | | | | |
| *SVOCs (mg/l, DW)* | | | | | |
| Isophorone | 1.42E-03 | 5.00E-03 | | ND | ND |
| 2,6-Dinitrotoluene | 5.17E-03 | 7.00E-03 | | ND | ND |
| 4,6-Dinitro-2-methylphenol | 5.42E-03 | 1.30E-02 | | ND | ND |
| Atrazine | 3.81E-03 | 5.00E-03 | | ND | ND |
| Pentachlorophenol | 1.95E-03 | 2.80E-02 | | ND | ND |
| Carbazole | 3.93E-03 | 5.00E-03 | | 2.90E-03 | 5.00E-03 |
| Pyrene | 4.05E-03 | 5.00E-03 | | 3.39E-03 | 5.00E-03 |
| Benzo(a)anthracene | 3.32E-04 | 5.00E-03 | | 7.79E-04 | 5.00E-03 |
| Chrysene | 3.67E-04 | 5.00E-03 | | 4.86E-04 | 5.00E-03 |
| Bis(2-ethylhexyl) phthalate | 4.75E-03 | 5.00E-03 | | ND | ND |
| Benzo(b)fluoranthene | 5.35E-04 | 5.00E-03 | | 8.16E-04 | 5.00E-03 |
| Benzo(k)fluoranthene | 5.11E-04 | 5.00E-03 | | 8.27E-04 | 5.00E-03 |
| Benzo(a)pyrene | 4.59E-04 | 5.00E-03 | | 7.50E-04 | 5.00E-03 |
| Indeno(1,2,3-cd)pyrene | 4.66E-04 | 5.00E-03 | | 4.45E-04 | 5.00E-03 |
| Dibenz(a,h) anthracene | 2.15E-04 | 5.00E-03 | | 6.09E-04 | 5.00E-03 |
| Benzo(g,h,i)perylene | 4.00E-03 | 5.00E-03 | | 2.79E-03 | 5.00E-03 |
| 2,3,5,6-Tetrachlorophenol | 8.73E-03 | 1.25E-02 | | ND | ND |
| | | | | | |
| ND = not detected | | | | | |

| Table G-25: Exposure Point Concentrations for Sediment COCs from the Rumford River<br>Baseline Ecological Risk Assessment<br>Hatheway & Patterson Superfund Site, Mansfield, MA<br>Mansfield, Massachusetts | | | | |
|---|---|---|---|---|
| | **SITE EU** | | **BACKGROUND EU** | |
| **Analyte** | **Mean Exposure** | **Maximum Exposure** | **Mean Exposure** | **Maximum Exposure** |
| ***Inorganics (mg/kg, DW)*** | | | | |
| Aluminum | 3.81E+03 | 1.20E+04 | 3.27E+03 | 5.68E+03 |
| Antimony | 1.13E+00 | 1.80E+01 | - | - |
| Arsenic | 2.77E+00 | 6.50E+01 | - | - |
| Barium | 3.18E+01 | 1.00E+02 | 4.02E+01 | 6.34E+01 |
| Beryllium | 3.89E-01 | 1.80E+00 | 2.30E-01 | 4.60E-01 |
| Cadmium | 3.44E-01 | 6.80E+00 | - | - |
| Chromium | 1.56E+01 | 3.30E+02 | - | - |
| Cobalt | 3.35E+00 | 1.20E+01 | 3.04E+00 | 5.40E+00 |
| Copper | 1.94E+01 | 2.70E+02 | - | - |
| Iron | 6.54E+03 | 2.10E+04 | - | - |
| Lead | 3.38E+01 | 2.10E+02 | 2.55E+01 | 4.65E+01 |
| Manganese | 1.34E+02 | 1.30E+03 | 4.53E+02 | 1.10E+03 |
| Mercury | 3.79E-02 | 1.50E+00 | - | - |
| Nickel | 7.43E+00 | 2.60E+01 | - | - |
| Selenium | 4.31E-01 | 3.90E+00 | 3.39E-01 | 7.70E-01 |
| Silver | 2.52E-01 | 2.20E+00 | 3.79E-01 | 2.30E+00 |
| Thallium | 4.74E-02 | 3.20E-01 | 4.24E-02 | 5.00E-02 |
| Vanadium | 1.33E+01 | 3.70E+01 | 1.05E+01 | 1.63E+01 |
| Zinc | 5.01E+01 | 9.90E+02 | - | - |
| | | | | |
| ***Pesticides (mg/kg, DW)*** | | | | |
| 4,4'-DDD | 1.28E-03 | 8.03E-03 | 9.85E-03 | 1.12E-01 |
| 4,4'-DDE | 1.48E-03 | 9.27E-03 | 4.52E-03 | 1.79E-02 |
| 4,4'-DDT | - | - | 9.25E-03 | 1.98E-02 |
| Aldrin | 2.93E-04 | 3.25E-03 | ND | ND |
| alpha-Chlordane | - | - | 4.04E-04 | 4.04E-04 |
| Endrin | 5.49E-04 | 4.03E-02 | ND | ND |
| gamma-Chlordane | 2.90E-04 | 5.69E-03 | ND | ND |
| | | | | |
| ***Semivolatile organic compounds (mg/kg, DW)*** | | | | |
| Benzaldehyde | 1.65E-01 | 2.70E+00 | 1.70E-01 | 9.00E-01 |
| 2-Methylphenol | 3.62E-02 | 9.50E-01 | 9.03E-02 | 9.00E-01 |
| Acetophenone | 7.27E-02 | 9.50E-01 | ND | ND |
| 4-Methylphenol | 2.14E-01 | 9.50E-01 | ND | ND |
| N-Nitrosodi-n-propylamine | 1.19E-01 | 9.50E-01 | 9.62E-02 | 9.00E-01 |
| Naphthalene | 9.84E-02 | 1.10E+00 | 1.13E-01 | 8.50E-01 |
| 2-Methylnaphthalene | 1.83E-01 | 7.00E+00 | 1.04E-01 | 8.50E-01 |

**Table G-25: Exposure Point Concentrations for Sediment COCs from the Rumford River**
**Baseline Ecological Risk Assessment**
**Hatheway & Patterson Superfund Site, Mansfield, MA**
**Mansfield, Massachusetts**

| Analyte | SITE EU | | BACKGROUND EU | |
|---|---|---|---|---|
| | Mean Exposure | Maximum Exposure | Mean Exposure | Maximum Exposure |
| 2,4,5-Trichlorophenol | 1.10E-01 | 9.50E-01 | ND | ND |
| Dimethyl phthalate | 1.09E-01 | 9.50E-01 | ND | ND |
| Acenaphthylene | 7.36E-02 | 4.80E-01 | 1.22E-01 | 6.00E-01 |
| Acenaphthene | 4.80E-02 | 4.80E-01 | 8.93E-02 | 4.40E-01 |
| Diethyl phthalate | 1.06E-01 | 9.50E-01 | 7.98E-02 | 9.00E-01 |
| Fluorene | 6.88E-02 | 4.95E-01 | 1.39E-01 | 1.30E+00 |
| Pentachlorophenol | 4.38E-01 | 2.40E+01 | ND | ND |
| Phenanthrene | 1.95E-01 | 2.50E+00 | - | - |
| Anthracene | 6.03E-02 | 5.10E-01 | 1.01E-01 | 9.10E-01 |
| Carbazole | 9.68E-02 | 9.50E-01 | 1.60E-01 | 8.50E-01 |
| Fluoranthene | 2.69E-01 | 5.70E+00 | 6.15E-01 | 1.10E+01 |
| Pyrene | 2.68E-01 | 6.70E+00 | 7.89E-01 | 1.90E+01 |
| Benzo(a)anthracene | 1.83E-01 | 2.90E+00 | 2.94E-01 | 5.10E+00 |
| Chrysene | 1.86E-01 | 2.80E+00 | 3.64E-01 | 6.00E+00 |
| Di-n-octyl phthalate | - | - | 2.00E-01 | 9.00E-01 |
| Benzo(b)fluoranthene | 1.94E-01 | 3.40E+00 | 3.37E-01 | 5.20E+00 |
| Benzo(k)fluoranthene | 1.43E-01 | 1.50E+00 | 2.02E-01 | 4.90E+00 |
| Benzo(a)pyrene | 1.31E-01 | 2.00E+00 | 2.75E-01 | 4.60E+00 |
| Indeno(1,2,3-cd)pyrene | 8.60E-02 | 1.10E+00 | 1.74E-01 | 2.70E+00 |
| Dibenz(a,h) anthracene | 2.59E-02 | 4.70E-01 | 5.52E-02 | 7.70E-01 |
| Benzo(g,h,i)perylene | 7.64E-02 | 8.30E-01 | 1.18E-01 | 2.40E+00 |
| 2,3,5,6-Tetrachlorophenol | 1.26E-01 | 9.50E-01 | ND | ND |
| | | | | |
| ***Volatile Organic Compounds (mg/kg, DW)*** | | | | |
| Acetone | 9.11E-02 | 3.15E-01 | ND | ND |
| Carbon disulfide | 1.93E-02 | 2.95E-02 | ND | ND |
| Methyl acetate | 2.98E-01 | 1.90E+00 | 4.05E-01 | 2.50E+00 |
| 1,1-Dichloroethane | 6.39E-03 | 2.95E-02 | ND | ND |
| Cyclohexane | 7.89E-03 | 2.95E-02 | ND | ND |
| Methyl cyclohexane | 7.98E-03 | 2.95E-02 | ND | ND |
| Xylenes (total) | 1.85E-02 | 2.16E-01 | - | - |
| Styrene | 6.39E-03 | 2.95E-02 | ND | ND |
| Isopropylbenzene | 8.24E-03 | 3.30E-02 | ND | ND |
| | | | | |
| ND = not detected | | | | |
| - = detected but not selected as a COC | | | | |

| Table G-26: Exposure Point Concentrations for aquatic biota COCs from the Rumford River<br>Baseline Ecological Risk Assessment<br>Hatheway & Patterson Superfund Site, Mansfield, MA<br>Mansfield, Massachusetts | | | | | | |
|---|---|---|---|---|---|---|
| | Crayfish | | Redfin pickerel | | White sucker | |
| Analytes | Site | Background | Site | Background | Site | Background |
| ***Metals (mg/kg, WW)*** | | | | | | |
| Aluminum | 12 | 16.9 | 2.68 | 5.12 | 4.18 | 3.26 |
| Antimony | 0.025 | 0.0906 | 0.029 | 0.0238 | 0.0238 | 0.0234 |
| Arsenic | 0.458 | 0.26 | 0.13 | 0.0673 | 0.0351 | 0.037 |
| Barium | 63 | 56.2 | 8.37 | 3.03 | 1.8 | 2.02 |
| Cadmium | 0.123 | 0.0609 | 0.0847 | 0.0246 | 0.0658 | 0.034 |
| Chromium (total) | 0.131 | 0.282 | 0.211 | 0.215 | 0.177 | 0.216 |
| Cobalt | 0.195 | 0.273 | 0.0614 | 0.0635 | 0.0491 | 0.0663 |
| Copper | 22.5 | 19.9 | 1.01 | 0.815 | 0.728 | 1.08 |
| Iron | 287 | 517 | 42.3 | 49.7 | 30.3 | 56.3 |
| Lead | 0.309 | 0.375 | 0.316 | 0.238 | 0.0936 | 0.0661 |
| Manganese | 168 | 246 | 43.2 | 35.7 | 27.7 | 32.6 |
| Nickel | 2.01 | 1.96 | 1.02 | 0.594 | 0.676 | 0.555 |
| Selenium | 0.172 | 0.112 | 0.355 | 0.344 | 0.392 | 0.338 |
| Silver | 0.482 | 0.711 | 0.0286 | 0.0459 | 0.0161 | 0.0648 |
| Vanadium | 0.317 | 0.235 | 0.129 | 0.0868 | 0.0574 | 0.0467 |
| Zinc | 15.6 | 15.9 | 51 | 52.8 | 20.3 | 16.5 |
| | | | | | | |
| ***SVOCs (mg/kg, WW)*** | | | | | | |
| 2-Methylnaphthalene | 0.0019 | 0.002 | 0.0013 | 0.002 | 0.002 | 0.002 |
| Acenaphthylene | 0.00052 | 0.00043 | 0.00063 | 0.002 | 0.002 | 0.00039 |
| Acenaphthene | 0.00076 | 0.00031 | 0.0011 | 0.001 | 0.00043 | 0.00087 |
| 2,3,5,6-Tetrachlorophenol | 0.039 | 0.040 | 0.040 | 0.039 | 0.18 | 0.039 |
| Fluorene | 0.00088 | 0.002 | 0.0014 | 0.0011 | 0.00065 | 0.0012 |
| Pentachlorophenol | 0.195 | 0.195 | 3.1 | 0.195 | 7.4 | 0.19 |
| Phenanthrene | 0.0033 | 0.003 | 0.0031 | 0.002 | 0.002 | 0.002 |
| Anthracene | 0.002 | 0.002 | 0.00064 | 0.002 | 0.002 | 0.002 |
| Fluoranthene | 0.0048 | 0.0059 | 0.0036 | 0.0017 | 0.003 | 0.0013 |
| Pyrene | 0.0036 | 0.0051 | 0.0027 | 0.0011 | 0.0025 | 0.002 |
| Benzo(a)anthracene | 0.0011 | 0.0013 | 0.0011 | 0.002 | 0.001 | 0.002 |
| Chrysene | 0.002 | 0.003 | 0.0021 | 0.002 | 0.0016 | 0.002 |
| Benzo(b)fluoranthene | 0.0011 | 0.0016 | 0.0017 | 0.002 | 0.0015 | 0.002 |
| Benzo(k)fluoranthene | 0.0012 | 0.0017 | 0.0014 | 0.002 | 0.0012 | 0.002 |
| Benzo(a)pyrene | 0.00082 | 0.0014 | 0.00084 | 0.001 | 0.001 | 0.001 |
| Indeno(1,2,3-cd)pyrene | 0.001 | 0.0012 | 0.001 | 0.001 | 0.0012 | 0.001 |
| Benzo(g,h,i)perylene | 0.002 | 0.0015 | 0.002 | 0.002 | 0.0011 | 0.002 |
| Total PAHs | 0.022 | 0.026 | 0.022 | 0.0049 | 0.015 | 0.0038 |
| | | | | | | |
| NA = not applicable; risk associated with dioxins and furans was assessed in terms of toxicity equivalence (TEQ) | | | | | | |
| Note 1: hazard quotients are not provided because screening-level tissue benchmarks were unavailable | | | | | | |
| * = estimated maximum possible concentration (EMPC) | | | | | | |
| U and UJ = the contaminant is not present above its detection limit | | | | | | |

| Table G-26: Exposure Point Concentrations for aquatic biota COCs from the Rumford River<br>Baseline Ecological Risk Assessment<br>Hatheway & Patterson Superfund Site, Mansfield, MA<br>Mansfield, Massachusetts | | | | | | |
|---|---|---|---|---|---|---|
| Analytes | Crayfish | | Redfin pickerel | | White sucker | |
| | Site | Background | Site | Background | Site | Background |
| J = the contaminant is present above its detection limit but the reported concentration is an estimate | | | | | | |

| Table K-1 Soil Remedial Alternatives Evaluation Summary | | | | | |
|---|---|---|---|---|---|
| *Detailed Analysis Criteria* | *RA-S1*<br>*No Action* | *RA-S2*<br>*Limited Action* | *RA-S3*<br>*Thermal Desorption of PCP and LNAPL, Off-site Disposal of Dioxin, Stabilization of Arsenic and Consolidation Under Low Permeability Cover* | *RA-S4*<br>*Off-site Disposal of Dioxin and LNAPL, Stabilization of Arsenic and Consolidation Under Low Permeability Cover* | *RA-S5*<br>*Excavation/Off-site Disposal* |
| **Overall Protection of Human Health and the Environment**<br><br>Human Health Protection<br><br>Ecological Protection | No reduction in risk.<br><br>Contaminants would continue to pose a risk from dermal contact and ingestion of soils. Source areas continue to leach into ground water uncontrolled and undetected.<br><br>Further study of vernal pool habitat would not occur to determine whether or not risk is present. | Some reduction in risk to human health accomplished by land use restrictions, including residential development.<br><br>Source area contamination would continue to leach into ground water resulting in intermedia transfer of contaminants and jeopardizing GW-2 and GW-3 uses.<br><br>Fencing may minimize trespassing and access to Site soils and the Rumford River.<br><br>Railroad track area soil and vernal pool habitat would not be evaluated. | Excavation, treatment and capping of soils and, if necessary, sediments provides needed overall protection of human health and the environment.<br><br>Removal of hot spot LNAPLs will minimize contaminated groundwater seeps to the Rumford River.<br><br>Soil exposures within rail right of way will be evaluated and appropriate action taken if necessary.<br><br>Further studies, risk evaluation and action, if necessary of potential vernal pool sediments will ensure ecological protection. | Excavation, treatment and capping of soils and, if necessary, sediment provides needed overall protection of human health and the environment.<br><br>Removal of hot spot LNAPLs from the groundwater table will minimize contaminated groundwater seeps to the Rumford River.<br><br>Soil exposures within rail right of way will be evaluated and appropriate action taken if necessary.<br><br>Further studies, risk evaluation and action, if necessary of potential vernal pool sediments will ensure ecological protection. | Excavation and off-site disposal of contaminated soils, LNAPL and, if necessary, sediment provides needed overall protection of human health and the environment.<br><br>Removal of hot spot LNAPLs from the groundwater table will minimize contaminated groundwater seeps to the Rumford River.<br><br>Soil exposures within rail right of way will be evaluated and appropriate action taken if necessary.<br><br>Further studies, risk evaluation and action, if necessary of potential vernal pool sediments will ensure ecological protection. |

| Table K-1 Soil Remedial Alternatives Evaluation Summary | | | | | |
|---|---|---|---|---|---|
| *Detailed Analysis Criteria* | *RA-S1*<br>*No Action* | *RA-S2*<br>*Limited Action* | *RA-S3*<br>*Thermal Desorption of PCP and LNAPL, Off-site Disposal of Dioxin, Stabilization of Arsenic and Consolidation Under Low Permeability Cover* | *RA-S4*<br>*Off-site Disposal of Dioxin and LNAPL, Stabilization of Arsenic and Consolidation Under Low Permeability Cover* | *RA-S5*<br>*Excavation/Off-site Disposal* |
| **Overall Protection of Human Health and the Environment (continued)** | | | Monitoring would determine whether waste left on-site is leaching into ground water resulting in intermedia transfer of contaminants and jeopardizing GW-2 and GW-3 conditions. | Monitoring would determine whether waste left on-site is leaching into groundwater resulting in intermedia transfer of contaminants and jeopardizing GW-2 and GW-3 conditions. | Monitoring would determine whether any waste left on-site is leaching into groundwater resulting in intermedia transfer of contaminants and jeopardizing GW-2 and GW-3 conditions. |
| **Compliance with ARARs**<br><br>Chemical specific | See Appendix D for action specific ARARs.<br><br>This alternative would not comply with soil cleanup levels | See Appendix D for action specific ARARs.<br><br>This alternative would not comply with soil cleanup levels. | See Appendix D for action specific ARARs..<br><br>This alternative will comply with all chemical-specific ARARs. | See Appendix Dfor action specific ARARs.<br><br>This alternative will comply with all chemical-specific ARARs. | See Table 5.5-3 for action specific ARARs.<br><br>This alternative will comply with all chemical specific ARARs. |
| Location specific | There are no location-specific ARARs for this Alternative. | This alternative will comply with all location-specific ARARs. | This alternative will comply with all location-specific ARARs. | This alternative will comply with all location-specific ARARs. | This alternative will comply with all location-specific ARARs. |
| Action specific | There are no Action-specific ARARs for this Alternative. | This alternative will not comply with all action–specific ARARs. | This alternative will comply with all action-specific ARARs. | This alternative will comply with all action-specific ARARs. | This alternative will comply with all action-specific ARARs. . |

| Table K-1 Soil Remedial Alternatives Evaluation Summary | | | | | |
|---|---|---|---|---|---|
| ***Detailed Analysis Criteria*** | ***RA-S1*** <br> ***No Action*** | ***RA-S2*** <br> ***Limited Action*** | ***RA-S3*** <br> ***Thermal Desorption of PCP and LNAPL, Off-site Disposal of Dioxin, Stabilization of Arsenic and Consolidation Under Low Permeability Cover*** | ***RA-S4*** <br> ***Off-site Disposal of Dioxin and LNAPL, Stabilization of Arsenic and Consolidation Under Low Permeability Cover*** | ***RA-S5*** <br> ***Excavation/Off-site Disposal*** |
| **Long-Term Effectiveness & Permanence** <br><br> Magnitude of residual risk <br><br> Adequacy and reliability of controls | This alternative would not remove or contain contaminated soil, LNAPL or, if necessary, sediment. Contaminants would continue to leach to groundwater, further threatening Rumford River surface water. <br><br> The residual risk would remain high at this Site because waste remains unaddressed. <br><br> There would be no controls in place. | This alternative would address soil and potential sediment contact risks because it would not remove or contain contaminated soil, or, if necessary, sediment. It relies solely on the success of institutional controls, monitoring, and natural attenuation. <br><br> The magnitude of the residual risk is high. <br><br> Adequacy of institutional controls and monitoring is moderate in that their effectiveness lies in the continued enforcement of land use restrictions and maintenance of fencing and monitoring wells. | Off-site disposal of dioxin contaminated soil, thermal treatment of PCPs (and potentially LNAPL soil) along with stabilization of arsenic contaminated soils and sediment, if necessary, will significantly reduce the residual risks left on-site. <br><br> Consolidation of treated soils under a low permeability cover will prevent dermal contact with any remaining contaminants in the consolidated soils. <br><br> Removal of hot spot LNAPL soil and associated free product (and potential thermal treatment) before consolidation will substantially | Offsite disposal of dioxin and LNAPL contaminated soil, stabilization of arsenic and PCP contaminated soils (and sediment, if necessary), will significantly reduce the residual risks left on-site . <br><br> Soils contaminated with PCPs and SVOCs (and any other organics) will be stabilized before consolidation if they fail leaching tests to further reduce residual Site risks. <br><br> Consolidation of treated soils under a low permeability cover will prevent dermal contact with any remaining contaminants in the consolidated soils. <br><br> Removal of hot spot | Excavation and off-site disposal of contaminated soil, LNAPL and, if necessary, sediment will significantly reduce the residual risks left on-site. <br><br> Removing hot spot contaminated LNAPL soil and associated free product will eliminate leaching to groundwater substantially reducing intermedia transfer of contaminants to the Rumford River. <br><br> Institutional controls will be necessary to ensure appropriate land and groundwater use. Some risk may remain if soil around rail area is evaluated and institutional controls are implemented. <br><br> Regular inspection and maintenance of the |

| Table K-1 Soil Remedial Alternatives Evaluation Summary | | | | | |
|---|---|---|---|---|---|
| *Detailed Analysis Criteria* | *RA-S1*<br>*No Action* | *RA-S2*<br>*Limited Action* | *RA-S3*<br>*Thermal Desorption of PCP and LNAPL, Off-site Disposal of Dioxin, Stabilization of Arsenic and Consolidation Under Low Permeability Cover* | *RA-S4*<br>*Off-site Disposal of Dioxin and LNAPL, Stabilization of Arsenic and Consolidation Under Low Permeability Cover* | *RA-S5*<br>*Excavation/Off-site Disposal* |
| **Long-Term Effectiveness & Permanence (continued)** | | | reduce intermedia transfer of contaminants to the Rumford River.<br><br>Institutional controls will be necessary to ensure appropriate land and groundwater use. Some risk may remain if soil around rail area is evaluated and institutional controls are implemented.<br><br>Regular inspection and maintenance of the low permeability cover, fencing, signs and monitoring wells will be required as well as continued enforcement of institutional controls. | LNAPL soil and associated free product for off-site disposal will substantially reduce intermedia transfer of contaminants to the Rumford River.<br><br>Institutional controls will be necessary to ensure appropriate land and groundwater use. Some risk may remain if soil around rail area is evaluated and institutional controls are implemented.<br><br>Regular inspection and maintenance of the low permeability cover, fencing, signs and monitoring wells will be required as well as continued enforcement of institutional controls. | monitoring wells (and any necessary fencing and signage) will be required as well as continued enforcement of institutional controls. |

| Table K-1 Soil Remedial Alternatives Evaluation Summary | | | | | |
|---|---|---|---|---|---|
| ***Detailed Analysis Criteria*** | ***RA-S1*** ***No Action*** | ***RA-S2*** ***Limited Action*** | ***RA-S3*** ***Thermal Desorption of PCP and LNAPL, Off-site Disposal of Dioxin, Stabilization of Arsenic and Consolidation Under Low Permeability Cover*** | ***RA-S4*** ***Off-site Disposal of Dioxin and LNAPL, Stabilization of Arsenic and Consolidation Under Low Permeability Cover*** | ***RA-S5*** ***Excavation/Off-site Disposal*** |
| **Reduction of Toxicity, Mobility & Volume Through Treatment**<br><br>Treatment process used and materials treated<br><br>Amount of hazardous materials removed or treated<br><br>Degree of expected reductions in toxicity, mobility and volume<br><br>Degree to which treatment is reversible<br><br>Type/quantity of residuals remaining after treatment | This alternative does not meet this criteria since it does not include treatment.<br><br>No treatment processes are proposed nor media treated.<br><br>No hazardous material is removed or treated.<br><br>Minimal reduction of toxicity, mobility and volume would occur through natural processes. Site conditions would remain unchanged. | This alternative does not meet this criteria since it does not include treatment.<br><br>Reductions depend solely on natural processes.<br><br>COCs in soil and groundwater would remain toxic and mobile for many years or possibly decades. | The toxicity and mobility of PCPs, arsenic, SVOCs and LNAPLs would be permanently minimized as a result of the thermal treatment of the organic contaminants and stabilization of inorganics.<br><br>Thermal treatment and stabilization followed by consolidation and capping also eliminates infiltration of remaining contaminants to groundwater.<br><br>Volume and toxicity of dioxin contaminated soil would be permanently eliminated via off-site disposal.<br><br>Removal of LNAPL | The toxicity and mobility of PCPs, arsenic, and SVOCs would be permanently minimized as a result of stabilization processes.<br><br>Stabilization, followed by consolidation and capping also eliminated infiltration of remaining contaminants to groundwater.<br><br>Volume and toxicity of dioxin and LNAPL contaminated soils would be permanently eliminated via offsite disposal.<br><br>Removal of LNAPL soil and associated free product eliminates mobility of contaminants and inter-media transfer to groundwater and, through seeps, to | Toxicity, mobility and volume of waste on site above target cleanup levels will be substantially reduced by excavation and off-site disposal.<br><br>Removal of LNAPL free product eliminates mobility of contaminants and inter-media transfer to groundwater and, through seeps, to surface water.<br><br>Some risk may remain if soil around rail area is evaluated but will be controlled through institutional controls if necessary.<br><br>Contaminated groundwater remains on-site but does not pose a drinking water risk given its low use and value determination. Some risk |

| Table K-1 Soil Remedial Alternatives Evaluation Summary | | | | | |
|---|---|---|---|---|---|
| *Detailed Analysis Criteria* | *RA-S1 No Action* | *RA-S2 Limited Action* | *RA-S3 Thermal Desorption of PCP and LNAPL, Off-site Disposal of Dioxin, Stabilization of Arsenic and Consolidation Under Low Permeability Cover* | *RA-S4 Off-site Disposal of Dioxin and LNAPL, Stabilization of Arsenic and Consolidation Under Low Permeability Cover* | *RA-S5 Excavation/Off-site Disposal* |
| **Reduction of Toxicity, Mobility and Volume through Treatment (continued)** | | | soil and associated free product eliminates mobility of contaminants and inter-media transfer to groundwater and, through seeps, to surfacewater.<br><br>Treated waste will remain capped on-site and will require inspection and maintenance. Some risk may remain if soil around rail area is evaluated but institutional controls will be implemented, if necessary.<br><br>Contaminated groundwater remains on-site but does not pose a drinking water risk given its low use and value determination. Some | surface water.<br><br>Treated waste will remain on-site under the cap and will require inspection and maintenance. Some risk may remain if soil around rail area is evaluated but institutional controls will be implemented, if necessary.<br><br>Contaminated groundwater remains on-site but does not pose a drinking water risk given its low use and value determination. Some risk remains from dermal contact; deed restrictions on land and groundwater use would minimize this risk.<br><br>Treatment processes are irreversible. The cap | remains from dermal contact; deed restrictions on land and groundwater use would minimize this risk.<br><br>Aside from treating groundwater resulting from any necessary dewatering processes, there are no treatment technologies proposed in this alternative. |

| Table K-1 Soil Remedial Alternatives Evaluation Summary | | | | | |
|---|---|---|---|---|---|
| ***Detailed Analysis Criteria*** | ***RA-S1*** <br> ***No Action*** | ***RA-S2*** <br> ***Limited Action*** | ***RA-S3*** <br> ***Thermal Desorption of PCP and LNAPL, Off-site Disposal of Dioxin, Stabilization of Arsenic and Consolidation Under Low Permeability Cover*** | ***RA-S4*** <br> ***Off-site Disposal of Dioxin and LNAPL, Stabilization of Arsenic and Consolidation Under Low Permeability Cover*** | ***RA-S5*** <br> ***Excavation/Off-site Disposal*** |
| | | | risk remains from dermal contact; deed restrictions on land and groundwater use would minimize this risk. <br><br> Treatment processes are irreversible. The cap may be removed if necessary. | may be removed if necessary. | |
| **Implementability** <br><br> Ability to construct and operate the technology <br><br> Reliability of the technology <br><br> Ease of undertaking additional remedial actions if necessary <br><br> Ability to monitor effectiveness of remedy <br><br> Availability of prospective technologies | Since there is no use of technology proposed, there will be no construction, nothing to operate and no reliability to evaluate. <br><br> Additional remedial action could be taken. <br><br> Without monitoring natural degradation processes could not be evaluated. <br><br> No approvals, | This alternative has high technical feasibility since it relies only on sampling (sampling methods are well developed), installation of fencing (which is a standard field task) and additional monitoring wells. <br><br> Well drillings would produce minimal material for off-site disposal. | Construction and operation on the Site will be complicated due to the large square footage of targeted excavation areas leaving less area for operations associated with locating the thermal desorption equipment, dewatering, screening, blending, curing consolidating, covering and regrading. Work | Construction and operation on the Site will be complicated due to the large square footage of targeted excavation areas leaving less area for operations associated with dewatering, screening, blending, curing consolidating, covering and regarding. Work could be conducted in phases to provide enough working area. | Construction and operation on the Site will be complicated due to the large square footage of targeted excavation areas leaving less area for operations associated with dewatering, screening, regarding, and loading of contaminated material on trucks or rail for off-site transportation. Work could be conducted in phases to provide enough working area. |

| Table K-1 Soil Remedial Alternatives Evaluation Summary | | | | | |
|---|---|---|---|---|---|
| ***Detailed Analysis Criteria*** | ***RA-S1 No Action*** | ***RA-S2 Limited Action*** | ***RA-S3 Thermal Desorption of PCP and LNAPL, Off-site Disposal of Dioxin, Stabilization of Arsenic and Consolidation Under Low Permeability Cover*** | ***RA-S4 Off-site Disposal of Dioxin and LNAPL, Stabilization of Arsenic and Consolidation Under Low Permeability Cover*** | ***RA-S5 Excavation/Off-site Disposal*** |
| **Implementability (continued)**<br><br>Ability to obtain approvals from other agencies<br><br>Coordination with other agencies<br><br>Availability of off-site treatment, storage and disposal services and capacity are required | coordination or offsite services<br><br>There are no Administrative feasibility issues with this alternative.<br><br>There are no issues related to service and materials for this alternative since no services and materials are required | Undertaking additional remedial action would be easy. Monitoring groundwater and surface water is routinely performed.<br><br>Enforcement of land use restrictions would require coordination and cooperation with local officials. Restrictions may conflict with local reuse plans.<br><br>Coordination and implementation would be required for the long term monitoring and Site inspections that are part of this alternative.<br><br>Preparation and recording of the institutional controls will be required.<br><br>All of the needed services and materials | could be conducted in phases to provide enough working area.<br><br>Work south of the rail tracks will be difficult to access. Excavation in close proximity to the tracks may require special design and construction methods as well as coordination with railroad to prevent any impact to the tracks.<br><br>Excavation, stabilization of inorganics, and capping are standard, reliable technologies. Thermal desorption for the inorganics is moderately complex but is a proven technology. Stabilization will require treatability tests to arrive at a | Work south of the rail tracks will be difficult to access. Excavation in close proximity to the tracks may require special design and construction methods as well as coordination with railroad to prevent any impact to the tracks.<br><br>Immobilization of soils with organics and inorganics is an intricate technology but has been successfully implemented at sites around the country.<br><br>Excavation, stabilization of inorganics, and capping are standard, reliable technologies. Stabilization will require treatability tests to arrive at a suitable | Work south of the rail tracks will be difficult to access. Excavation in close proximity to the tracks may require special design and construction methods as well as coordination with railroad to prevent any impact to the tracks.<br><br>Excavation is widely accepted and would be accomplished with conventional equipment such as backhoe and excavator. Waste would be transported offsite by dump trucks or rail cars.<br><br>Additional excavation can always be completed at a later date.<br><br>Long-term monitoring of surface water and groundwater will determine whether the soil remedy is successful |

| Table K-1 Soil Remedial Alternatives Evaluation Summary | | | | | |
|---|---|---|---|---|---|
| ***Detailed Analysis Criteria*** | ***RA-S1*** <br> ***No Action*** | ***RA-S2*** <br> ***Limited Action*** | ***RA-S3*** <br> ***Thermal Desorption of PCP and LNAPL, Off-site Disposal of Dioxin, Stabilization of Arsenic and Consolidation Under Low Permeability Cover*** | ***RA-S4*** <br> ***Off-site Disposal of Dioxin and LNAPL, Stabilization of Arsenic and Consolidation Under Low Permeability Cover*** | ***RA-S5*** <br> ***Excavation/Off-site Disposal*** |
| **Implement-ability (continued)** | | are readily available for this alternative. | suitable mixture of stabilization agent(s). <br><br> Additional excavation can always be completed at a later date. However, once the cap is constructed, areas within the cap footprint would not be easily accessible for future remediation. <br><br> Long-term monitoring of surface water and groundwater will determine whether the remedy is successful in preventing contaminated groundwater from degrading the Rumford River. <br><br> Inspections and continuing maintenance of the cap would assess cap integrity, vegetative | mixture of stabilization agent(s). <br><br> Additional excavation can always be completed at a later date. However, once the cap is constructed, areas within the cap footprint would not be easily accessible for future remediation. <br><br> Long-term monitoring of surface water and groundwater will determine whether the remedy is successful in preventing contaminated groundwater from degrading the Rumford River. <br><br> Inspections and continuing maintenance of the cap would assess cap integrity, vegetative cover and drainage | in preventing contaminated groundwater from degrading the Rumford River. <br><br> Coordination with the railroad will be necessary to ensure excavation does not affect the structural integrity of the track bed. <br><br> Coordination will also occur with the local conservation commission for work in the wetlands and with affected state and federal agencies that oversee endangered, threatened or species of special concern or their habitat. <br><br> Other minor issues are related to coordination with the State to ensure long term monitoring is performed and preparation and recording |

| Table K-1 Soil Remedial Alternatives Evaluation Summary | | | | | |
|---|---|---|---|---|---|
| *Detailed Analysis Criteria* | *RA-S1 No Action* | *RA-S2 Limited Action* | *RA-S3 Thermal Desorption of PCP and LNAPL, Off-site Disposal of Dioxin, Stabilization of Arsenic and Consolidation Under Low Permeability Cover* | *RA-S4 Off-site Disposal of Dioxin and LNAPL, Stabilization of Arsenic and Consolidation Under Low Permeability Cover* | *RA-S5 Excavation/Off-site Disposal* |
| **Implementability (continued)** | | | cover and drainage systems.<br><br>Coordination with the railroad will be necessary to ensure excavation does not affect the structural integrity of the track bed.<br><br>Coordination will also occur with the local conservation commission for work in the wetlands and with affected state and federal agencies that oversee endangered, threatened or species of special concern or their habitat.<br><br>Other minor issues are related to coordination with the State to ensure long term monitoring is performed and | systems.<br><br>Coordination with the railroad will be necessary to ensure excavation does not affect the structural integrity of the track bed.<br><br>Coordination will also occur with the local conservation commission for work in the wetlands and with affected state and federal agencies that oversee endangered, threatened or species of special concern or their habitat.<br><br>Other minor issues are related to coordination with the State to ensure long term monitoring is performed and preparation and recording of the | of the institutional controls.<br><br>Equipment and materials are generally available for all the processes being proposed as part of this alternative. |

| Table K-1 Soil Remedial Alternatives Evaluation Summary | | | | | |
|---|---|---|---|---|---|
| *Detailed Analysis Criteria* | *RA-S1*<br>*No Action* | *RA-S2*<br>*Limited Action* | *RA-S3*<br>*Thermal Desorption of PCP and LNAPL, Off-site Disposal of Dioxin, Stabilization of Arsenic and Consolidation Under Low Permeability Cover* | *RA-S4*<br>*Off-site Disposal of Dioxin and LNAPL, Stabilization of Arsenic and Consolidation Under Low Permeability Cover* | *RA-S5*<br>*Excavation/Off-site Disposal* |
| | | | preparation and recording of the institutional controls.<br><br>Equipment and materials are generally available for al the processes being proposed as part of this alternative. | institutional controls.<br><br>Equipment and materials are generally available for all the processes being proposed as part of this alternative. | |
| **Short-Term Effectiveness**<br><br>Protection of community during remedial actions<br><br>Protection of workers during remedial actions<br><br>Environmental impacts<br><br>Time until remedial action objectives are achieved | There are no short term risks to the community or workers with this alternative because there is no construction involved.<br><br>Without construction, there are no environmental impacts associated with this alternative.<br><br>The estimated time to achieve cleanup goals is many years or decades. | Installation of monitoring wells and periodic sampling have minimal impacts on surrounding community or workers; a site-specific Health and Safety Plan would be required.<br><br>Fencing, signs and monitoring well installation would have slight impacts on wetlands -- any damage would be restored. | There are short-term risks to the community and Site workers from inhalation of fugitive dust and increased truck traffic in the neighborhood as equipment and supplies are brought to the Site. Workers are exposed to slightly more risk from materials handling during excavation and treatment. | There are short-term risks to the community and site workers from inhalation of fugitive dust and increased truck traffic in the neighborhood as equipment and supplies are brought to the Site. Workers are exposed to slightly more risk from materials handling during excavation and treatment.<br><br>Excavation, construction and | There are enhanced short-term risks to the community and Site workers from inhalation of fugitive dust and increased truck traffic in the neighborhood as equipment and supplies are brought to the Site and excavated material is taken off the Site. Workers are exposed to slightly more risk from materials handling during excavation.<br><br>Excavation, construction |

| Table K-1 Soil Remedial Alternatives Evaluation Summary | | | | | |
|---|---|---|---|---|---|
| *Detailed Analysis Criteria* | *RA-S1*<br>*No Action* | *RA-S2*<br>*Limited Action* | ***RA-S3***<br>***Thermal Desorption of PCP and LNAPL, Off-site Disposal of Dioxin, Stabilization of Arsenic and Consolidation Under Low Permeability Cover*** | ***RA-S4***<br>***Off-site Disposal of Dioxin and LNAPL, Stabilization of Arsenic and Consolidation Under Low Permeability Cover*** | ***RA-S5***<br>***Excavation/Off-site Disposal*** |
| **Short-Term Effectivness (continued)** | | The estimated time to achieve cleanup goals is many years or decades. | Excavation, construction and treatment activities will be completed in accordance with all required health and safety regulations and procedures.<br><br>A traffic control plan would be implemented; the use of train transport will be investigated<br><br>Site workers would wear appropriate PPE during site work.<br><br>Air monitoring and engineering controls would be instituted to verify that the work is conducted in a manner that is safe for both community and workers.<br><br>Appropriate measures | treatment activities will be completed in accordance with all required health and safety regulations and procedures.<br><br>A traffic control plan would be implemented.<br><br>Site workers would wear appropriate PPE during Site work; the use of train transport will be investigated<br>.<br><br>Air monitoring and engineering controls would be instituted to verify that the work is conducted in a manner that is safe for both community and workers.<br><br>Site runoff and soil erosion controls would be needed during all | and treatment activities will be completed in accordance with all required health and safety regulations and procedures.<br><br>A traffic control plan would be implemented; the use of train transport will be investigated<br>.<br><br>Site workers would wear appropriate PPE during Site work.<br><br>Air monitoring and engineering controls would be instituted to verify that the work is conducted in a manner that is safe for both community and workers. Site runoff and soil erosion controls would be needed during all major soil disturbance to minimize short term |

| Table K-1 Soil Remedial Alternatives Evaluation Summary | | | | | |
|---|---|---|---|---|---|
| ***Detailed Analysis Criteria*** | ***RA-S1***<br>***No Action*** | ***RA-S2***<br>***Limited Action*** | ***RA-S3***<br>***Thermal Desorption of PCP and LNAPL, Off-site Disposal of Dioxin, Stabilization of Arsenic and Consolidation Under Low Permeability Cover*** | ***RA-S4***<br>***Off-site Disposal of Dioxin and LNAPL, Stabilization of Arsenic and Consolidation Under Low Permeability Cover*** | ***RA-S5***<br>***Excavation/Off-site Disposal*** |
| | | | will be taken to address legal requirements related to endangered, threatened or species of special concern or their habitat.<br><br>Site runoff and soil erosion controls would be needed during all major soil disturbance to minimize short term effects on adjacent wetland and surface water areas to the extent practicable. Disturbed wetlands would be restored.<br><br>This alternative can be completed in approximately 18-24 months. | major soil disturbance to minimize short term effects on adjacent wetland and surface water areas to the extent practicable. Disturbed wetlands would be restored.<br><br>This alternative can be completed in approximately 18-24 months. | effects on adjacent wetland and surface water areas to the extent practicable. Disturbed wetlands would be restored.<br><br>This alternative can be completed in approximately 15-20 months. |

| Table K-2: Ground Water Remedial Alternatives Evaluation Summary | | |
|---|---|---|
| *Detailed Analysis Criteria* | ***RA-G1*** <br> ***No Action*** | ***RA-G2*** <br> ***Limited Action*** |
| **Overall Protection of Human Health and the Environment**<br><br>Human Health Protection<br><br>Ecological Protection | On-site groundwater is contaminated but does not pose a risk to drinking water because the low use and value determination prohibits the use of groundwater as a drinking water source. Shallow groundwater poses a risk if dermal contact occurs.<br><br>This alternative does not monitor groundwater to ensure that contaminated groundwater is not migrating to off-site receptors.<br><br>This alternative does not monitor groundwater to ensure that intermedia transfer of contaminants is not occurring between groundwater and surface water.<br><br>This alternative does not provide for any activities or controls to prevent inappropriate use of groundwater as drinking water or to prevent dermal contact with shallow groundwater. | On-site groundwater is contaminated but does not pose a risk because the low use and value determination prohibits the use of groundwater as a drinking water source. Shallow groundwater poses a risk if dermal contact occurs.<br><br>Groundwater monitoring would ensure that contaminated groundwater is not migrating to off-site receptors and that intermedia transfer of contaminants is not occurring between groundwater and surface water.<br><br>This alternative includes institutional controls to prevent inappropriate use of groundwater as drinking water and to prevent dermal contact with shallow groundwater. |
| **Compliance with ARARs**<br><br>Chemical-specific ARARs<br><br>Location-specific ARARs<br><br>Action-specific ARARs | See Table 5.5-3 for action specific ARARs.<br><br>Because this is not a drinking water aquifer, there are no chemical-specific ARARs.<br><br>Because there are no actions required by this alternative, there are no location specific or action specific ARARs. | See Table 5.5-3 for action specific ARARs.<br><br>Because this is not a drinking water aquifer, there are no chemical-specific ARARs.<br><br>This alternative will comply with all location-specific ARARs.<br><br>This alternative will comply with all action-specific ARARs. |

| Table K-2: Ground Water Remedial Alternatives Evaluation Summary | | |
|---|---|---|
| ***Detailed Analysis Criteria*** | ***RA-G1*** <br> ***No Action*** | ***RA-G2*** <br> ***Limited Action*** |
| | | |
| **Long-Term Effectiveness & Permanence** <br><br> Magnitude of residual risk <br><br> Adequacy and reliability of controls | The magnitude of residual risk under this alternative is moderate to high because contamination groundwater remains on-site unmonitored to ensure it is not migrating to off-site receptors or transferring contaminants to surface water via groundwater seeps to the Rumford River. <br><br> This alternative does not provide for any activities or controls to prevent inappropriate use of or exposure to groundwater. | The magnitude of residual risk under this alternative is low to moderate. Although contaminated groundwater remains on-site, groundwater is not a source of drinking water and migration of contaminated groundwater is monitored to ensure it is not migrating to off-site receptors or transferring contaminants to surface water via groundwater seeps to the Rumford River. <br><br> Monitoring and institutional controls will be effective in the long-term as long as they are maintained and enforced. |
| **Reduction of Toxicity, Mobility and Volume Through Treatment** <br><br> Treatment process used and materials treated <br><br> Amount of hazardous materials removed or treated <br><br> Degree of expected reductions in toxicity, mobility and volume <br><br> Degree to which treatment is reversible <br><br> Type and quantity of residuals remaining after treatment | There are no treatment processes proposed and no media would be treated. <br><br> No hazardous material is removed or treated. <br><br> Minimum reduction of toxicity, mobility and volume would occur through natural processes. Site conditions would remain unchanged. | This alternative does not include treatment. Reductions of volume and toxicity depend solely on natural processes. <br><br> Contaminated groundwater would remain on-site. The Rumford River appears to act as a hydraulic barrier to off-site mobility of groundwater contamination. <br><br> Groundwater contamination will remain on-site until reduced/eliminated through natural processes. |
| **Short-Term Effectiveness** <br><br> Protection of community during remedial actions | This alternative does not present any short-term risk or impacts to the community or workers because no construction activities take place. | Installation of monitoring wells and periodic sampling have minimal impacts on surrounding community and workers; a Site-specific Health and Safety Plan would be required. <br><br> Fencing, signs and monitoring well installation would have slight |

| Table K-2: Ground Water Remedial Alternatives Evaluation Summary | | |
|---|---|---|
| ***Detailed Analysis Criteria*** | ***RA-G1*** <br> ***No Action*** | ***RA-G2*** <br> ***Limited Action*** |
| Protection of workers during remedial actions <br><br> Environmental impacts <br><br> Time until remedial action objectives are achieved | Without construction there are no short-term impacts to the environment. <br><br> It will take many years or decades for natural attenuation to address groundwater contamination. | impacts on wetlands—any damage would be restored. <br><br> Groundwater contamination will remain on-site for many years or decades; however, installing additional monitoring wells, and developing a long-term monitoring plan and implementing deed restrictions could be accomplished within approximately 6 to 12 months. |
| **Implementability** <br><br> Ability to construct and operate the technology <br><br> Reliability of the technology <br><br> Ease of undertaking additional remedial actions, if necessary <br><br> Ability to monitor effectiveness of remedy <br><br> Ability to obtain approvals from other agencies <br><br> Coordination with other agencies <br><br> Availability of off-site treatment, storage and disposal services and capacity <br><br> Availability of prospective technologies | Since there is no use of technology proposed, there will be no construction, nothing to operate and no reliability to evaluate. <br><br> Additional remedial action could be taken. <br><br> Without monitoring natural degradation processes could not be evaluated. <br><br> No approvals, coordination or off-site services are required. <br><br> There are no administrative feasibility issues with this alternative. <br><br> There are no issues related to service and materials for this alternative since no services and materials are required | This alternative has high technical feasibility since it relies only on sampling (sampling methods are well developed), installation of fencing (which is a standard field task) and additional monitoring wells. <br><br> Well drillings would produce minimal material for off-site disposal. <br><br> Undertaking additional remedial action would be easy. Monitoring groundwater and surface water is routinely performed. <br><br> Enforcement of land use restrictions would require coordination and cooperation with local officials. Restrictions do not appear to conflict with local reuse plans. <br><br> Coordination with the Towns and the State would be required for the institutional controls, long term monitoring and Site inspections that are part of this alternative. <br><br> Preparation and recording of the institutional controls will be required. <br><br> All of the needed services and materials are readily available for this alternative. |

| Table K-3 Remedial Alternative Cost Estimates | |
|---|---|
| ***Remedial Alternative*** | ***Total Cost ($)*** |
| **Soil Alternatives** | |
| RA-S1 | $0 |
| RA-S2 | $118,000 |
| RA-S3 | $13,400,000 |
| RA-S4 | $10,700,000 |
| RA-S5 | $20,900,000 |
| **Ground Water Alternatives** | |
| RA-G1 | $0 |
| RA-G2 | $1,400,000 |

| Table L-1: Soil Cleanup Levels | | | | | |
|---|---|---|---|---|---|
| ***Compound*** | ***Cancer Classification*** | ***Residential*** | | ***Commercial/Open Space*** | |
| | | ***Cleanup Level (ppm)*** | ***RME Risk*** | ***Cleanup Level (ppm)*** | ***RME Risk*** |
| Benzo(a)pyrene | B2 | --** | | 2.1 | $1 \times 10^{-5}$ |
| Dioxin TEQ* | B2 | --** | | 0.001 | $6 \times 10^{-5}$* |
| Arsenic | A | 9.1 | $1 \times 10^{-5}$ | 16 | $1 \times 10^{-5}$ |
| Pentachlorophenol | B2 | --** | | 90 | $1 \times 10^{-5}$ |
| **Cumulative Residual Risk** | | **$1 \times 10^{-5}$** | | **$9 \times 10^{-5}$** | |

* Dioxin TEQ PRG set based on OSWER Directive 9200.4-26, April 13, 1998, Approaches for Addressing Dioxin in Soil at CERCLA and RCRA Sites. The cleanup level for commercial reuse is 5-20 ppb, while that for residential reuse is 1 ppb. The 1 ppb level is being set as the cleanup level for the commercial future use as a conservative measure.

** The Residential RAFU portion of the site did not contain these contaminants at levels that exceeded the calculated PRGs.

| Table L-2: On-Site Ground Water Performance Standards | | |
|---|---|---|
| ***Compound*** | ***Cleanup Levels (ppb)*** | ***Basis*** |
| Pentachlorophenol | 1,792 | AWQC (15 ppb) |
| Arsenic | 17,924 | AWQC (150 ppb) |
| Chromium | 1,314 | AWQC (11 ppb) |

Note:
Performance Standards represent maximum concentrations in groundwater that are protective of ambient water quality criteria (AWQC) in the Rumford River under low flow conditions (See Appendix F of the FS for details on calculation).

**Table L-3: Basis of Onsite Groundwater Performance Standards**

| | | |
|---|---|---|
| Plume Width | 150 ft/d | Measured from RI info |
| Plume Thickness | 15 ft/d | Measured from RI info |
| K (hydraukic conductivity) | 14 ft/d | RI Avg of three tests |
| I (horiziontal hydraulic gradient | 0.025 ft/ft | Measured from RI info |
| Qgw | 787.5 cf/d | =(plume width)*(plume thickness)*i*K |
| | | |
| 7Q10 flow | 1.08 cf/s | avg, from USGS Water Resources Investigations Report 99-4006, pp |
| Qriv=7Q10 flow converted | 93312 cf/d | |

| **AWQC=** | |
|---|---|
| PCP | 15 ppb |
| As | 150 ppb |
| Cr | 11 ppb |
| Cadmium | 0.25 ppb |
| Copper | 9 ppb |
| Lead | 2.5 ppb |
| Nickel | 52 ppb |
| Selenium | 5 ppb |
| Zinc | 120 ppb |

| **GW PRG=** | =AWQC*(Qgw+Qriv)/Qgw |
|---|---|
| PCP | **1792 ppb** |
| As | **17924 ppb** |
| Cr | **1314 ppb** |
| Cadmium | **30 ppb** |
| Copper | **1075 ppb** |
| Lead | **299 ppb** |
| Nickel | **6214 ppb** |
| Selenium | **597 ppb** |
| Zinc | **14339 ppb** |

**Table L-4: Cost Estimate**

**Source Control Cost Estimate (RA-S4)**
**Off-Site Disposal of Dioxin and LNAPL Soils, Stabilization of Arsenic, and Consolidation of Contaminated Soils Under Low Permeability Cover**

| Description | QTY | UNIT | UNIT COST | COST | TOTAL |
|---|---|---|---|---|---|
| **CAPITAL COSTS** | | | | | |
| Pre-Mobilization Activities | | | | | $200,000 |
| Predesign investigation | 1 | ls | $200,000.00 | $200,000.00 | |
| | | | | | |
| Site Preparation and General Equipment | | | | | $929,000 |
| Mobilization/Demobilization (Assume 10%) | 1 | ls | $84,377.70 | $84,377.70 | |
| Temporary office trailer (2) | 24 | mo | $954.85 | $22,916.28 | |
| Temporary storage trailer | 24 | mo | $125.98 | $3,023.58 | |
| Temporary personnel decontamination trailer | 24 | mo | $477.42 | $11,458.14 | |
| Temporary fencing and gates | 500 | lf | $8.31 | $4,155.99 | |
| Construct staging area for mixing/stabilization | 1 | ls | $10,000.00 | $10,000.00 | |
| Portable toilets (3) | 24 | mo | $285.14 | $6,843.42 | |
| Install utility poles | 1 | ls | $1,000.00 | $1,000.00 | |
| Utility connection/disconnection | 1 | ls | $1,000.00 | $1,000.00 | |
| Utilities (phone and electric) | 24 | mo | $400.00 | $9,600.00 | |
| Install erosion control measures | 2,000 | lf | $3.51 | $7,019.49 | |
| Pre-construction survey of railroad tracks | 1 | ls | $2,500.00 | $2,500.00 | |
| Construct vehicle decontamination area | 1 | ls | $5,000.00 | $5,000.00 | |
| Dust monitoring | 24 | mo | $10,260.65 | $246,255.61 | |
| Sheet pile wall excavation support | 1,000 | sy | $429.12 | $429,120.00 | |
| Stabilization equipment mobilization/purchase of components | 1 | ls | $26,484.50 | $26,484.50 | |
| Flagman at railroad crossing | 82 | days | $700.00 | $57,400.00 | |
| | | | | | |
| Demolition | | | | | $551,000 |
| Utility shutoffs | 1 | ls | $500.00 | $500.00 | |
| Asbestos survey | 1 | ls | $24,600.00 | $24,600.00 | |
| Lead paint survey | 1 | ls | $1,000.00 | $1,000.00 | |
| Asbestos abatement and disposal | 1 | ls | $142,000.00 | $142,000.00 | |
| Building demolition - sort/stockpile/controls | 300,000 | cf | $0.14 | $42,000.00 | |
| Concrete slab and foundation removal (steel reinforced) | 8,000 | sy | $7.85 | $62,800.00 | |
| Concrete slab and foundation removal (non-reinforced) | 18,000 | sy | $0.81 | $14,580.00 | |
| Aboveground tank removal & disposal | 19 | ea | $2,000.00 | $38,000.00 | |
| Concrete sump and channel removal | 1,000 | cy | $2.13 | $2,130.00 | |
| Backfill sumps and channels | 1,000 | cy | $10.29 | $10,291.94 | |
| Asphalt removal for excavation in process area | 90,000 | sf | $0.62 | $55,800.00 | |
| Load and transport demolition debris | 500 | hr | $69.42 | $34,710.00 | |
| Disposal of demolition debris | 6,000 | cy | $20.34 | $122,040.00 | |
| | | | | | |
| Excavation Dewatering | | | | | $127,000 |
| *Equipment* | | | | | |
| Mobilization of base water treatment system | 1 | ls | $5,000.00 | $5,000.00 | |
| Dewatering Pump & Equipment | 19 | days | $73.94 | $1,414.99 | |
| Rental of Base Unit minus carbon | 1 | mo | $10,302.00 | $10,302.00 | |
| Rental of Carbon Equipment & Operation (2 Units) | 3 | wk | $3,000.00 | $9,000.00 | |
| Allowance for optional components | 1 | mo | $2,500.00 | $2,500.00 | |
| *Maintenance* | | | | | |
| Full time treatment system operator | 3 | wk | $1,000.00 | $3,000.00 | |
| Remove and dispose spent carbon (4,000 lb/mo) | 4,000 | lb | $1.00 | $4,000.00 | |
| Bag filter changeout | 3 | ea | $288.00 | $864.00 | |
| Sand & gravel changeout | 3 | ea | $1,200.00 | $3,600.00 | |
| Monitoring | | | | | |
| Effluent Testing (2 per day, 24-hr TAT) | 38 | ea | $2,281.50 | $87,317.82 | |
| | | | | | |
| Dioxin/LNAPL-Saturated Soil - Hot Spot Removal | | | | | $4,013,000 |
| Excavate & load dioxin-impacted soil | 1,243 | cy | $2.55 | $3,173.19 | |
| Confirmatory analysis (1 sample every 50 feet) | 12 | ea | $1,755.00 | $21,060.00 | |
| Off-site disposal of dioxin-impacted soil | 1,864 | ton | $471.00 | $878,127.17 | |
| Backfill soil excavation with clean fill | 1,243 | cy | $10.29 | $12,792.12 | |
| | | | | | |
| Excavate clean soil above LNAPL-saturated soil | 9,956 | cy | $2.55 | $25,416.53 | |
| Excavate & load LNAPL-saturated soil | 2,478 | cy | $2.55 | $6,326.33 | |

**Table L-4: Cost Estimate**

**Source Control Cost Estimate (RA-S4)**
***Off-Site Disposal of Dioxin and LNAPL Soils, Stabilization of Arsenic, and***
**Consolidation of Contaminated Soils Under Low Permeability Cover**

| Description | QTY | UNIT | UNIT COST | COST | TOTAL |
|---|---|---|---|---|---|
| Confirmatory analysis (1 sample every 50 feet) | 16 | ea | $1,125.00 | $18,000.00 | |
| Off-site disposal of oil-saturated soil | 3,717 | ton | $800.00 | $2,973,600.00 | |
| Backfill excavated soil removed from above LNAPL-saturated soil | 9,956 | cy | $4.72 | $46,979.54 | |
| Backfill soil excavation with clean fill | 2,478 | cy | $10.29 | $25,503.42 | |
| Disposal characterization analysis (every 1,000 cy) | 4 | ea | $395.00 | $1,580.00 | |
| Excavate and Consolidate Arsenic-Impacted Soil | | | | | $1,188,000 |
| Excavate consolidation area/spoils to side | 27,167 | cy | $2.55 | $69,356.78 | |
| Excavate & load arsenic-contaminated soil | 27,167 | cy | $2.55 | $69,356.78 | |
| Confirmatory analysis (1 sample every 50 feet) | 56 | ea | $1,755.00 | $98,280.00 | |
| Haul and place soil in consolidation area | 27,167 | cy | $7.60 | $206,470.16 | |
| Backfill excavation area with clean fill | 27,167 | cy | $10.29 | $279,598.82 | |
| Rental of soil mixer including labor and maintenance | 6 | mo | $8,238.62 | $49,431.74 | |
| Portland Cement (assume 12%) | 1,087 | cy | $92.00 | $99,973.74 | |
| Load soil into mixer (assume one-third fails TCLP testing) | 9,056 | cy | $1.24 | $11,219.11 | |
| Post-stabilization matrix testing (every 500 cubic yards) | 21 | ea | $708.50 | $14,878.50 | |
| Furnish & install 6 inches gas vent sand | 4,616 | sy | $3.80 | $17,539.96 | |
| Furnish & install 40-mil LLDPE geomembrane | 4,616 | sy | $11.17 | $51,558.24 | |
| Furnish & install geocomposite drainage layer | 4,616 | sy | $8.49 | $39,187.95 | |
| Cover with soil removed from consolidation area | 27,167 | cy | $4.72 | $128,198.04 | |
| 6" Loam | 1,585 | cy | $32.02 | $50,741.65 | |
| Seed | 2.0 | acres | $635.92 | $1,249.35 | |
| | | | | **Subtotal Capital Costs:** | **$7,008,000** |
| Contingencies | | | | | $3,416,400 |
| 10% Scope + 15% Bid | | | 25% | $1,752,000.00 | |
| Project Management | | | 5% | $438,000.00 | |
| Remedial Design | | | 8% | $700,800.00 | |
| Construction Management | | | 6% | $525,600.00 | |
| | | | | Estimated Capital Costs: | $10,425,000 |

**OPERATION, MAINTENANCE, AND MONITORING COSTS**

| Description | QTY | UNIT | UNIT COST | COST | TOTAL |
|---|---|---|---|---|---|
| Maintain Low Permeability (Annual Cost) | | | | | $13,000 |
| Semi-annual inspection of cover | 16 | hr | $38.43 | $614.83 | |
| Mowing | 4 | ea | $3,000.00 | $12,000.00 | |
| Five Year Review (Annual Cost) | | | | | $3,000 |
| Evaluation of Remedial Action | 1 | ea | $15,000.00 | $15,000.00 | |
| | | | | **Subtotal O&M Costs:** | **$16,000** |
| Contingencies | | | | | $7,200 |
| 10% Scope + 15% Bid | | | 25% | $4,000.00 | |
| Project Management | | | 6% | $1,200.00 | |
| O&M Technical Support | | | 10% | $2,000.00 | |
| | | | | Estimated Annual O&M Costs: | $24,000 |

| Cost Type | Years | Annual Cost | Dicount Factor | Present Value |
|---|---|---|---|---|
| Capital | 0 | $10,425,000 | 1.000 | $10,425,000 |
| O&M | 30 | $24,000 | 12.409 | $297,817 |

**Table L-4: Cost Estimate**

**Source Control Cost Estimate (RA-S4)**
**Off-Site Disposal of Dioxin and LNAPL Soils, Stabilization of Arsenic, and Consolidation of Contaminated Soils Under Low Permeability Cover**

| Description | QTY | UNIT | UNIT COST | COST | TOTAL |
|---|---|---|---|---|---|
| | | | | TOTAL PRESENT VALUE OF SOURCE CONTROL ALTERNATIVE: | $10,723,000 |

**Management of Migration (RA-G2) Cost Estmate**
**Limited Action (Monitoring and Institutional Controls)**

| Description | QTY | UNIT | UNIT COST | COST | TOTAL |
|---|---|---|---|---|---|
| **CAPITAL COSTS** | | | | | |
| Installation of New Monitoring Wells | | | | | $28,000 |
| Install overburden monitoring wells | 12 | ea | $1,950.00 | $23,400.00 | |
| Supervision | 12 | days | $307.41 | $3,688.98 | |
| | | | | **Subtotal Capital Costs:** | **$28,000** |
| Contingencies | | | | | $22,750 |
| 10% Scope + 15% Bid | | | 25% | $7,000.00 | |
| Project Management | | | 10% | $3,500.00 | |
| Remedial Design | | | 20% | $7,000.00 | |
| Construction Management | | | 15% | $5,250.00 | |
| | | | | Estimated Capital Costs: | $51,000 |
| **OPERATION, MAINTENANCE, AND MONITORING COSTS** | | | | | |
| *Semi-Annual Sampling (Annual Cost)* | | | | | $72,000 |
| Semi-annual inspection of site, river and monitoring wells | 16 | hr | $38.43 | $614.83 | |
| Collection of Ground water and surface water samples | 16 | days | $307.41 | $4,918.63 | |
| Ground Water Sample Analysis (15 wells x 2 rounds per yr) | 30 | ea | $1,124.50 | $33,735.00 | |
| Surface Water Sample Analysis | 12 | ea | $1,014.00 | $12,168.00 | |
| Semi-annual sampling report | 2 | ea | $10,000.00 | $20,000.00 | |
| Additional Cost to Site Five Year Review (Annual Cost) | | | | | $3,000 |
| Evaluation of Remedial Action | 1 | ea | $15,000.00 | $15,000.00 | |
| | | | | **Subtotal O&M Costs:** | **$75,000** |
| Contingencies | | | | | $33,750 |
| 10% Scope + 15% Bid | | | 25% | $18,750.00 | |
| Project Management | | | 6% | $5,625.00 | |
| O&M Technical Support | | | 10% | $9,375.00 | |
| | | | | Estimated Annual O&M Costs: | $109,000 |

| Cost Type | Years | Annual Cost | Dicount Factor | Present Value |
|---|---|---|---|---|
| Capital | 0 | $51,000 | 1.000 | $51,000 |
| O&M | 30 | $109,000 | 12.409 | $1,352,585 |

| | |
|---|---|
| TOTAL PRESENT VALUE OF MANAGEMENT OF MIGRATION ALTERNATIVE: | $1,404,000 |
| TOTAL | $12,127,000 |

| Table L-5: Compliance Boundary Ground Water Performance Standards | | |
|---|---|---|
| ***Compound*** | ***(ppb)*** | ***Basis*** |
| Pentachlorophenol | 1 | MCL |
| Arsenic | 10 | MCL |
| Chromium | 100 | MCL |

FIGURES


BASE MAP IS A PORTION OF THE FOLLOWING 7.5' x 15' USGS TOPOGRAPHIC QUADRANGLE:
BROCKTON, MA. 1987

0 1000 2000
Scale in Feet

**FIGURE A-1**
**SITE LOCATION MAP**

HATHEWAY AND PATTERSON SITE
15 COUNTY STREET
MANSFIELD, MASSACHUSETTS

M&E Metcalf & Eddy

TRC
Boott Mills South
Foot of John Street
Lowell, MA 01852
978-970-5600

QUADRANGLE LOCATION
MASS

TRC PROJ. NO.: 02136-0490-01X39
EPA CONTRACT NO.: 68-W6-0042
RAC SUBCONTRACT NO.: 107061

02136/HATHAWAY/ROD/TOPO

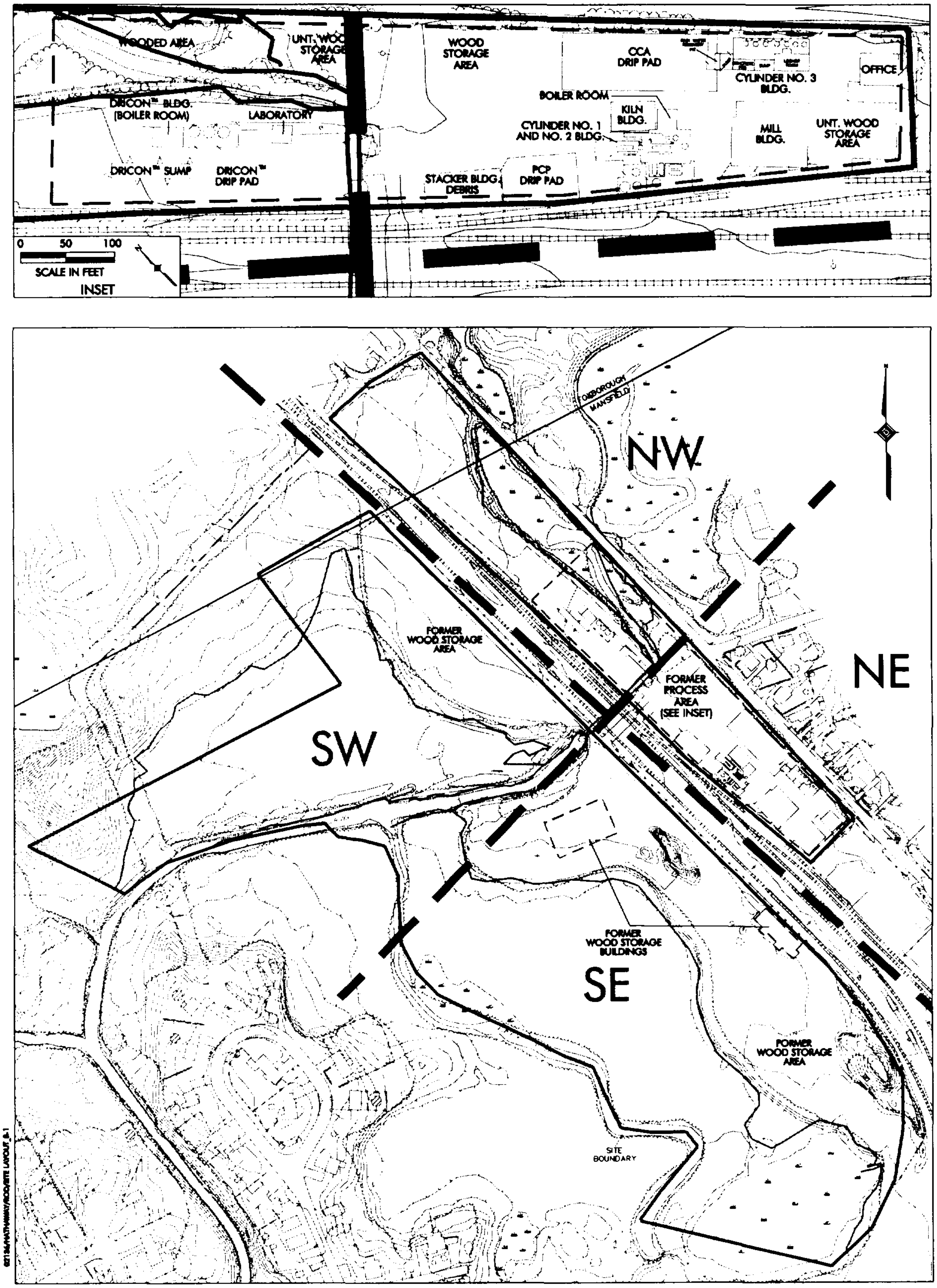



FIGURE B-1

SITE LAYOUT

HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

Metcalf & Eddy

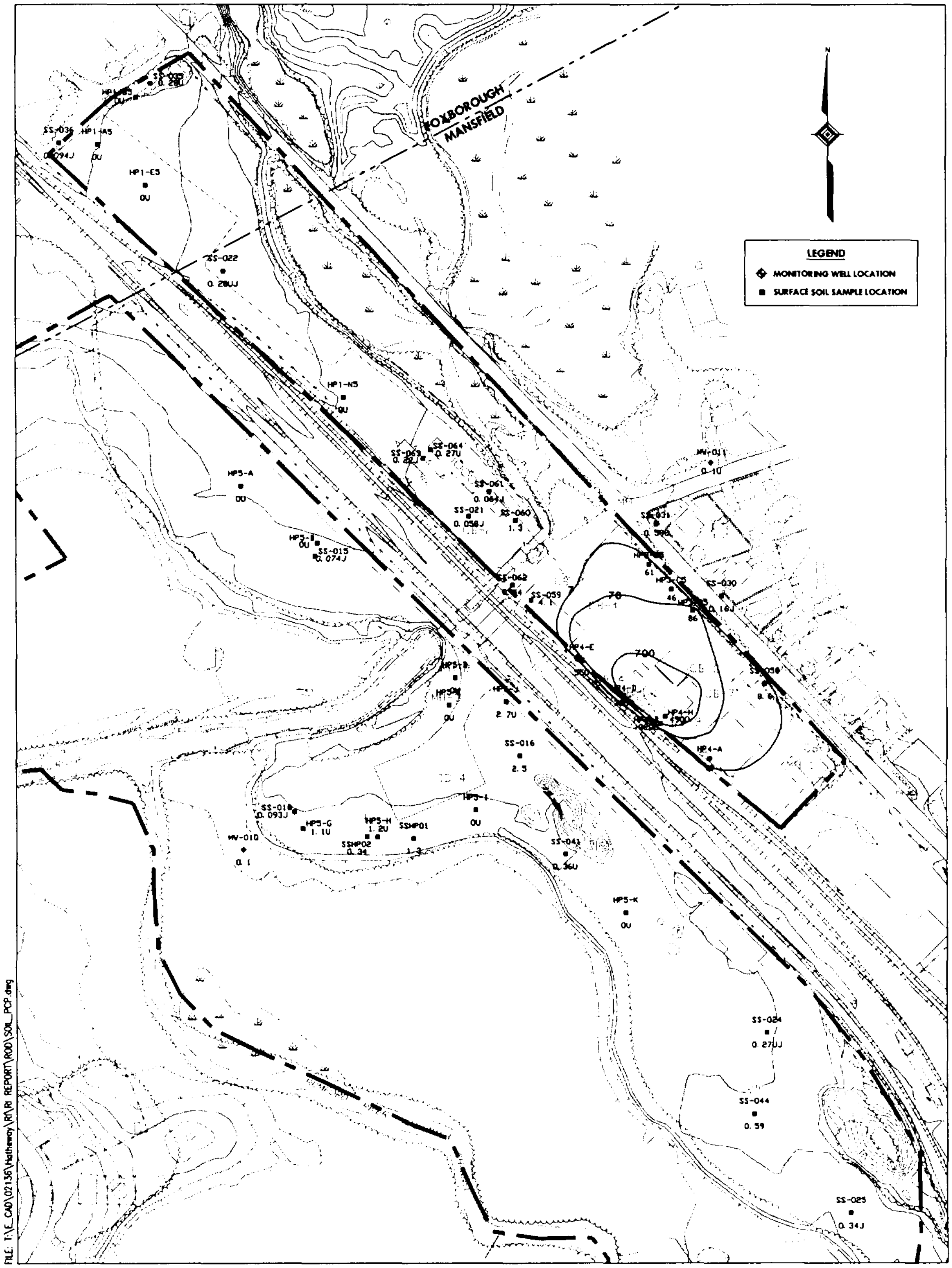
TRC

Boott Mills South
Foot of John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02138-0490-01X39

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACTOR: 107061




FILE: T:\E_CAD\02136\Hatheway\RI\RI REPORT\ROD\SOIL_PCP.dwg

DATA QUALIFIERS:

U = UNDETECTED AT THE SPECIFIED DETECTION LIMIT
UJ = ESTIMATED NONDETECT
J = ESTIMATED VALUE
0U = NOT DETECTED; DETECTION LIMIT NOT AVAILABLE

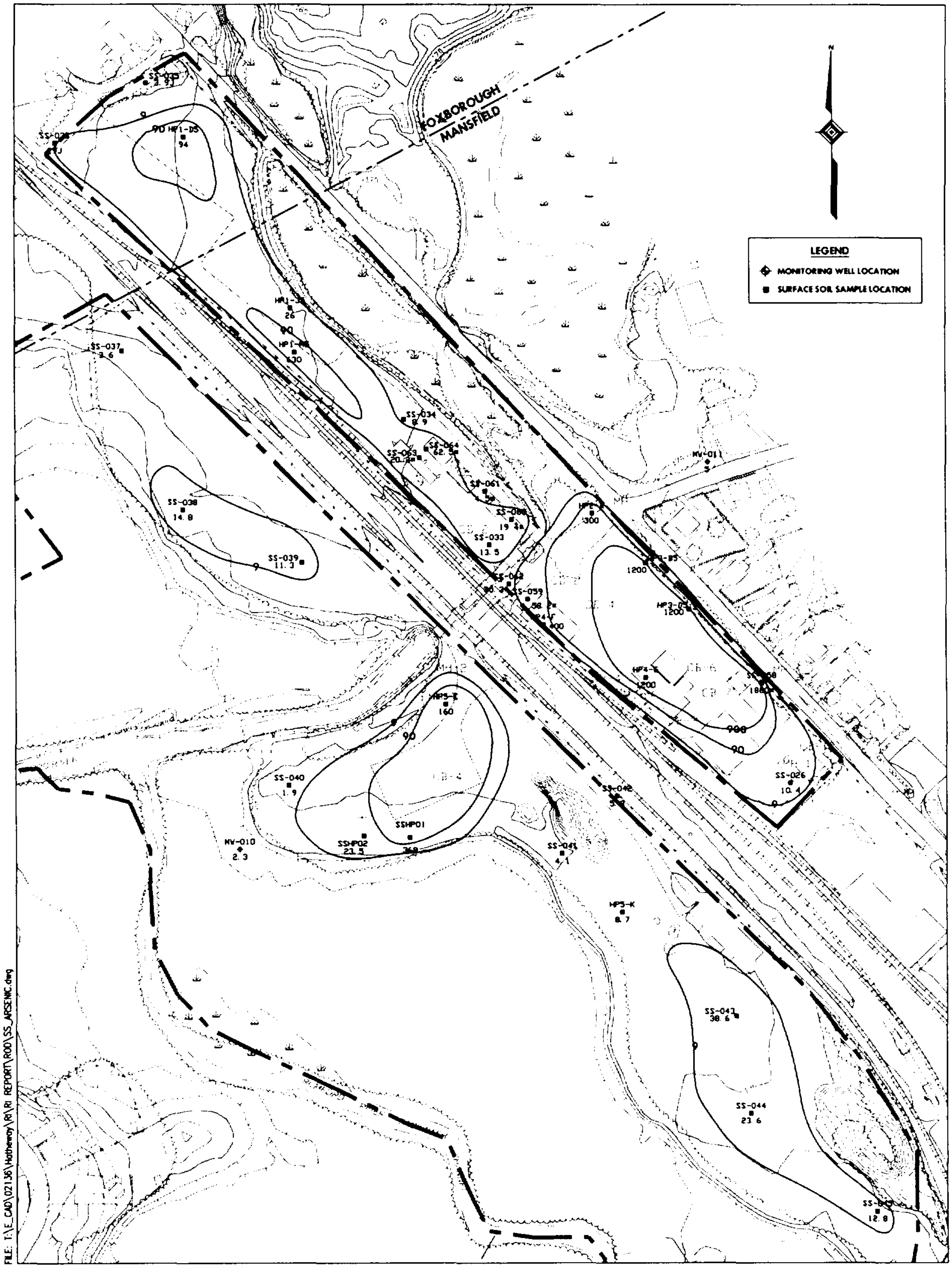
0 75 150 225 300
SCALE IN FEET

FIGURE E-1
PCP IN SURFACE SOIL (mg/kg)
HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

Metcalf & Eddy

TRC
Boott Mills South
116 John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0490-01X39
EPA CONTRACT NO.: 68-W6-0042
RAC SUBCONTRACT NO.: 107061




FILE: T:\E_CAD\02136\Hatheway\RI\RI REPORT\R00\SS_ARSENIC.dwg

DATA QUALIFIERS:

- U = UNDETECTED AT THE SPECIFIED DETECTION LIMIT
- UJ = ESTIMATED NONDETECT
- J = ESTIMATED VALUE
- * = DUPLICATE ANALYSIS NOT WITHIN CONTROL LIMITS
- + = FIELD SCREENING RESULT
- 0U = NOT DETECTED; DETECTION LIMIT NOT AVAILABLE

0 75 150 225 300

SCALE IN FEET

FIGURE E-2

ARSENIC IN SURFACE SOIL (mg/kg)

HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

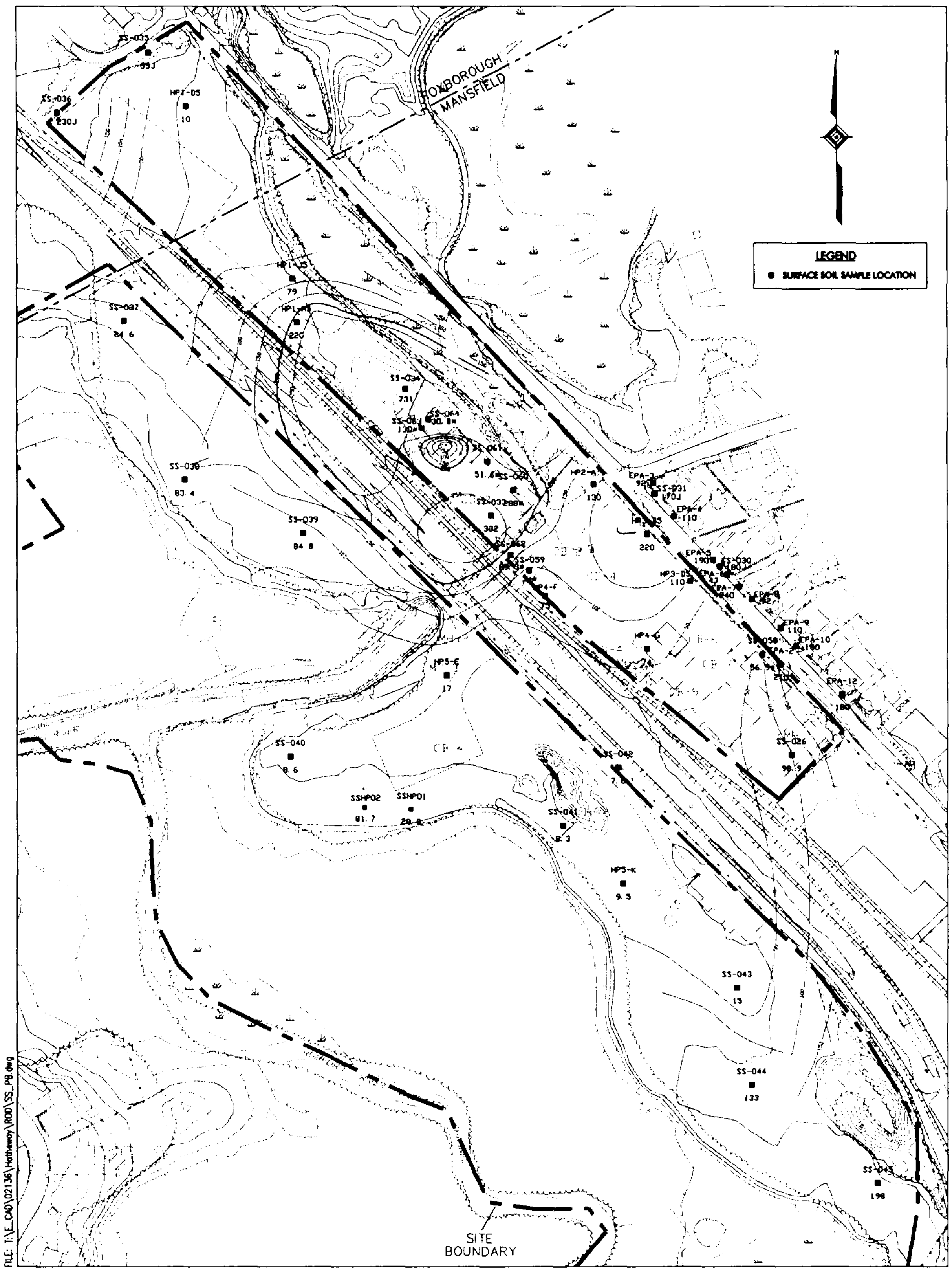
M&E Metcalf & Eddy

TRC Boott Mills South 116 John Street Lowell, MA 01852 978-970-5600

TRC PROJ. NO.: 02136-0490-01X39

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061

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**DATA QUALIFIERS:**

- U = UNDETECTED AT THE SPECIFIED DETECTION LIMIT
- UJ = ESTIMATED NONDETECT
- J = ESTIMATED VALUE
- * = DUPLICATE ANALYSIS NOT WITHIN CONTROL LIMITS
- + = FIELD SCREENING RESULT
- 0U = NOT DETECTED; DETECTION LIMIT NOT AVAILABLE

0 75 150 225 300

SCALE IN FEET

FIGURE E-3

LEAD IN SURFACE SOIL (mg/kg)

HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

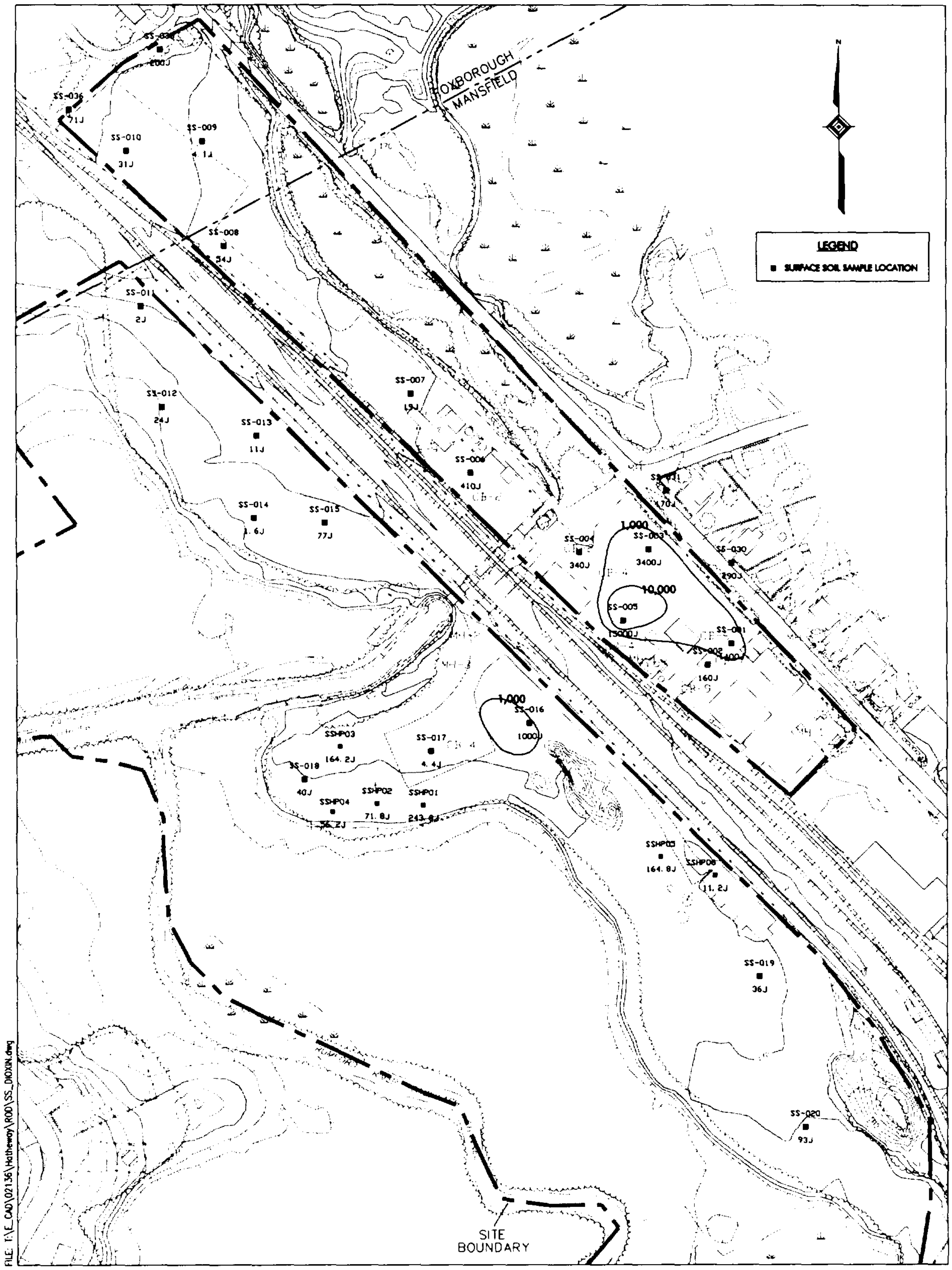
M&E Metcalf & Eddy

TRC Boott Mills South, 116 John Street, Lowell, MA 01852, 978-970-5600

TRC PROJ. NO.: 02136-0490-01X39

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061




DATA QUALIFIERS:
J = ESTIMATED VALUE

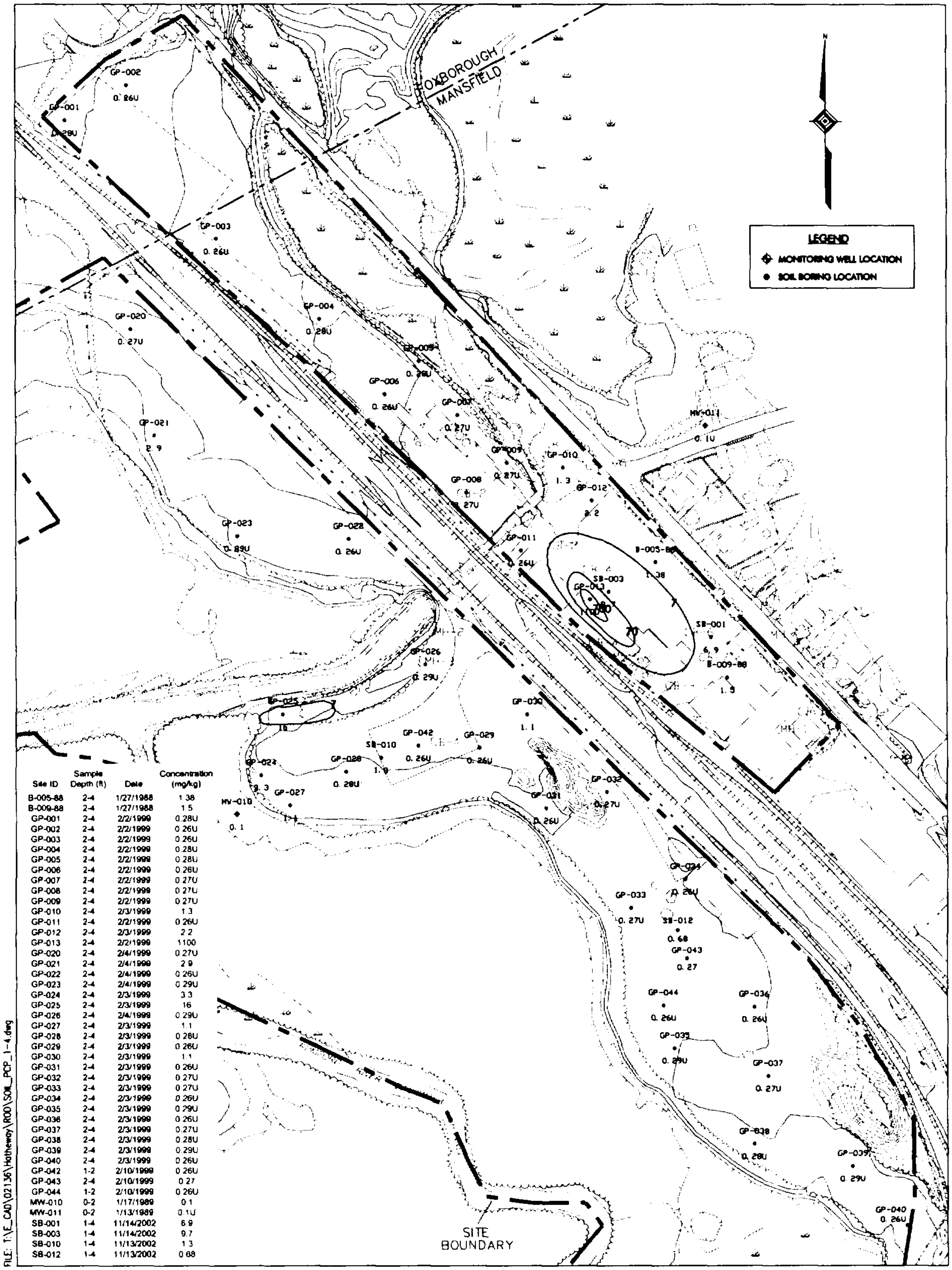
0 75 150 225 300
SCALE IN FEET

FIGURE E-4
DIOXIN IN SURFACE SOIL (ng/kg)
HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

M&E Metcalf & Eddy

TRC
Boott Mills South
116 John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0490-01X39
EPA CONTRACT NO.: 68-W6-0042
RAC SUBCONTRACT NO.: 107061




| Site ID | Sample Depth (ft) | Date | Concentration (mg/kg) |
|---|---|---|---|
| B-005-88 | 2-4 | 1/27/1988 | 1.38 |
| B-009-88 | 2-4 | 1/27/1988 | 1.5 |
| GP-001 | 2-4 | 2/2/1999 | 0.28U |
| GP-002 | 2-4 | 2/2/1999 | 0.26U |
| GP-003 | 2-4 | 2/2/1999 | 0.26U |
| GP-004 | 2-4 | 2/2/1999 | 0.28U |
| GP-005 | 2-4 | 2/2/1999 | 0.28U |
| GP-006 | 2-4 | 2/2/1999 | 0.26U |
| GP-007 | 2-4 | 2/2/1999 | 0.27U |
| GP-008 | 2-4 | 2/2/1999 | 0.27U |
| GP-009 | 2-4 | 2/2/1999 | 0.27U |
| GP-010 | 2-4 | 2/3/1999 | 1.3 |
| GP-011 | 2-4 | 2/2/1999 | 0.26U |
| GP-012 | 2-4 | 2/3/1999 | 2.2 |
| GP-013 | 2-4 | 2/2/1999 | 1100 |
| GP-020 | 2-4 | 2/4/1999 | 0.27U |
| GP-021 | 2-4 | 2/4/1999 | 2.9 |
| GP-022 | 2-4 | 2/4/1999 | 0.26U |
| GP-023 | 2-4 | 2/4/1999 | 0.29U |
| GP-024 | 2-4 | 2/3/1999 | 3.3 |
| GP-025 | 2-4 | 2/3/1999 | 16 |
| GP-026 | 2-4 | 2/4/1999 | 0.29U |
| GP-027 | 2-4 | 2/3/1999 | 1.1 |
| GP-028 | 2-4 | 2/3/1999 | 0.28U |
| GP-029 | 2-4 | 2/3/1999 | 0.26U |
| GP-030 | 2-4 | 2/3/1999 | 1.1 |
| GP-031 | 2-4 | 2/3/1999 | 0.26U |
| GP-032 | 2-4 | 2/3/1999 | 0.27U |
| GP-033 | 2-4 | 2/3/1999 | 0.27U |
| GP-034 | 2-4 | 2/3/1999 | 0.26U |
| GP-035 | 2-4 | 2/3/1999 | 0.29U |
| GP-036 | 2-4 | 2/3/1999 | 0.26U |
| GP-037 | 2-4 | 2/3/1999 | 0.27U |
| GP-038 | 2-4 | 2/3/1999 | 0.28U |
| GP-039 | 2-4 | 2/3/1999 | 0.29U |
| GP-040 | 2-4 | 2/3/1999 | 0.26U |
| GP-042 | 1-2 | 2/10/1999 | 0.26U |
| GP-043 | 2-4 | 2/10/1999 | 0.27 |
| GP-044 | 1-2 | 2/10/1999 | 0.26U |
| MW-010 | 0-2 | 1/17/1989 | 0.1 |
| MW-011 | 0-2 | 1/13/1989 | 0.1U |
| SB-001 | 1-4 | 11/14/2002 | 6.9 |
| SB-003 | 1-4 | 11/14/2002 | 9.7 |
| SB-010 | 1-4 | 11/13/2002 | 1.3 |
| SB-012 | 1-4 | 11/13/2002 | 0.68 |

DATA QUALIFIERS:

U = UNDETECTED AT THE SPECIFIED DETECTION LIMIT

0 75 150 225 300

SCALE IN FEET

FIGURE E-5

PCP IN SUBSURFACE SOIL (1'-4') (mg/kg)

HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

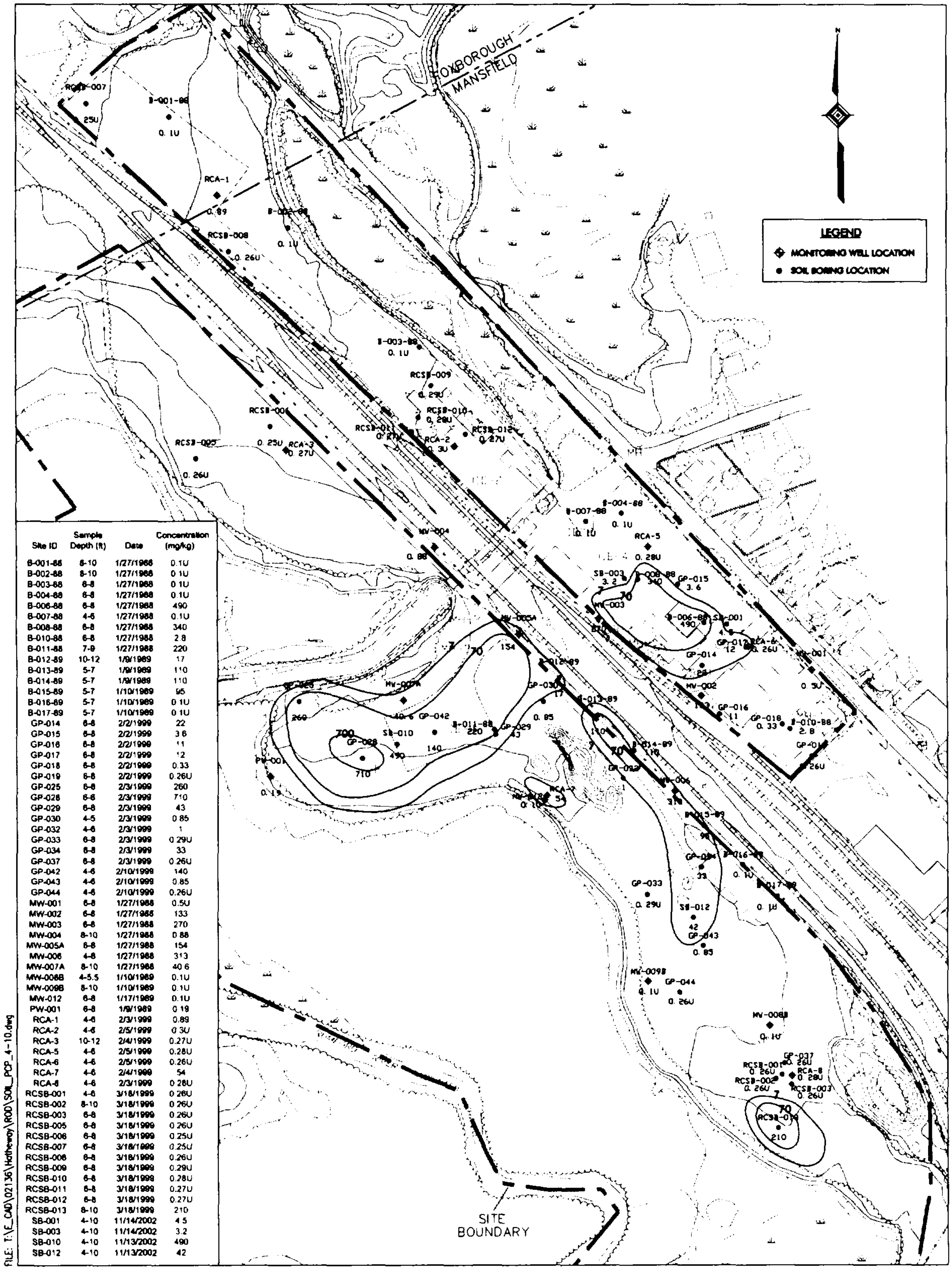
M&E Metcalf & Eddy

TRC Boott Mills South 116 John Street Lowell, MA 01852 978-970-5600

TRC PROJ. NO.: 02136-0490-01X39

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061




| Site ID | Sample Depth (ft) | Date | Concentration (mg/kg) |
|---|---|---|---|
| B-001-88 | 8-10 | 1/27/1988 | 0.1U |
| B-002-88 | 8-10 | 1/27/1988 | 0 1U |
| B-003-88 | 6-8 | 1/27/1988 | 0 1U |
| B-004-88 | 6-8 | 1/27/1988 | 0.1U |
| B-006-88 | 6-8 | 1/27/1988 | 490 |
| B-007-88 | 4-6 | 1/27/1988 | 0.1U |
| B-008-88 | 6-8 | 1/27/1988 | 340 |
| B-010-88 | 6-8 | 1/27/1988 | 2 8 |
| B-011-88 | 7-9 | 1/27/1988 | 220 |
| B-012-89 | 10-12 | 1/9/1989 | 17 |
| B-013-89 | 5-7 | 1/9/1989 | 110 |
| B-014-89 | 5-7 | 1/9/1989 | 110 |
| B-015-89 | 5-7 | 1/10/1989 | 95 |
| B-016-89 | 5-7 | 1/10/1989 | 0 1U |
| B-017-89 | 5-7 | 1/10/1989 | 0 1U |
| GP-014 | 6-8 | 2/2/1999 | 22 |
| GP-015 | 6-8 | 2/2/1999 | 3 6 |
| GP-016 | 6-8 | 2/2/1999 | 11 |
| GP-017 | 6-8 | 2/2/1999 | 12 |
| GP-018 | 6-8 | 2/2/1999 | 0.33 |
| GP-019 | 6-8 | 2/2/1999 | 0.26U |
| GP-025 | 6-8 | 2/3/1999 | 260 |
| GP-028 | 6-8 | 2/3/1999 | 710 |
| GP-029 | 6-8 | 2/3/1999 | 43 |
| GP-030 | 4-5 | 2/3/1999 | 0 85 |
| GP-032 | 4-6 | 2/3/1999 | 1 |
| GP-033 | 6-8 | 2/3/1999 | 0 29U |
| GP-034 | 6-8 | 2/3/1999 | 33 |
| GP-037 | 6-8 | 2/3/1999 | 0.26U |
| GP-042 | 4-6 | 2/10/1999 | 140 |
| GP-043 | 4-6 | 2/10/1999 | 0.85 |
| GP-044 | 4-6 | 2/10/1999 | 0.26U |
| MW-001 | 6-8 | 1/27/1988 | 0.5U |
| MW-002 | 6-8 | 1/27/1988 | 133 |
| MW-003 | 6-8 | 1/27/1988 | 270 |
| MW-004 | 8-10 | 1/27/1988 | 0 88 |
| MW-005A | 6-8 | 1/27/1988 | 154 |
| MW-006 | 4-8 | 1/27/1988 | 313 |
| MW-007A | 8-10 | 1/27/1988 | 40 6 |
| MW-008B | 4-5.5 | 1/10/1989 | 0.1U |
| MW-009B | 8-10 | 1/10/1989 | 0.1U |
| MW-012 | 6-8 | 1/17/1989 | 0.1U |
| PW-001 | 6-8 | 1/9/1989 | 0 19 |
| RCA-1 | 4-6 | 2/3/1999 | 0.89 |
| RCA-2 | 4-6 | 2/5/1999 | 0 3U |
| RCA-3 | 10-12 | 2/4/1999 | 0.27U |
| RCA-5 | 4-6 | 2/5/1999 | 0.28U |
| RCA-6 | 4-6 | 2/5/1999 | 0.26U |
| RCA-7 | 4-6 | 2/4/1999 | 54 |
| RCA-8 | 4-6 | 2/3/1999 | 0 28U |
| RCSB-001 | 4-6 | 3/18/1999 | 0 26U |
| RCSB-002 | 8-10 | 3/18/1999 | 0 26U |
| RCSB-003 | 6-8 | 3/18/1999 | 0.26U |
| RCSB-005 | 6-8 | 3/18/1999 | 0 26U |
| RCSB-006 | 6-8 | 3/18/1999 | 0.25U |
| RCSB-007 | 6-8 | 3/18/1999 | 0.25U |
| RCSB-008 | 6-8 | 3/18/1999 | 0.26U |
| RCSB-009 | 6-8 | 3/18/1999 | 0.29U |
| RCSB-010 | 6-8 | 3/18/1999 | 0.28U |
| RCSB-011 | 6-8 | 3/18/1999 | 0.27U |
| RCSB-012 | 6-8 | 3/18/1999 | 0.27U |
| RCSB-013 | 8-10 | 3/18/1999 | 210 |
| SB-001 | 4-10 | 11/14/2002 | 4 5 |
| SB-003 | 4-10 | 11/14/2002 | 3.2 |
| SB-010 | 4-10 | 11/13/2002 | 490 |
| SB-012 | 4-10 | 11/13/2002 | 42 |

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DATA QUALIFIERS:

U = UNDETECTED AT THE SPECIFIED DETECTION LIMIT

0 75 150 225 300

SCALE IN FEET

FIGURE E-6
PCP IN SUBSURFACE SOIL
(4' AND BELOW)
(mg/kg)

HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

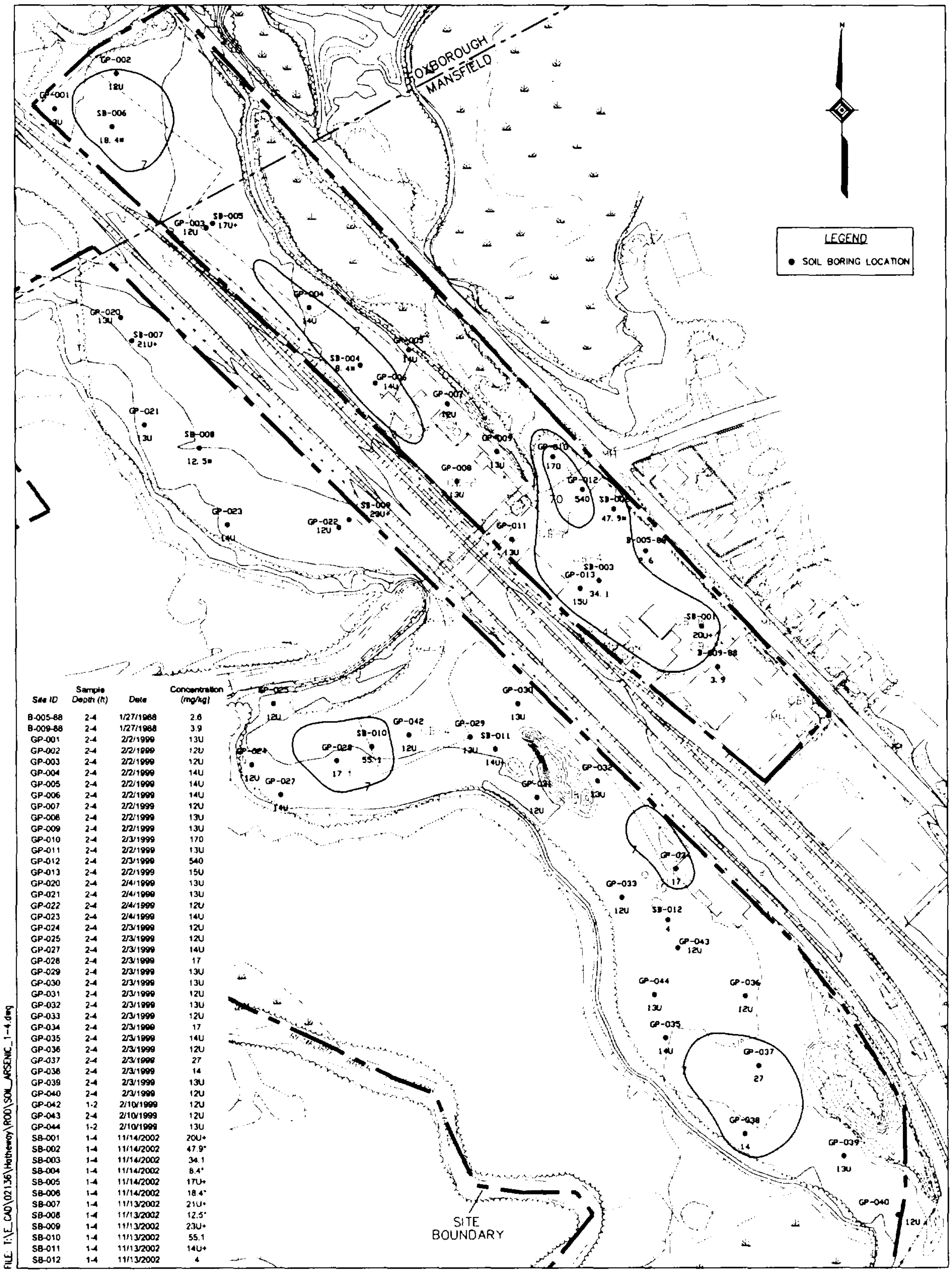
M&E Metcalf & Eddy

TRC
Boott Mills South
116 John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0490-01X39

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061




| Site ID | Sample Depth (ft) | Date | Concentration (mg/kg) |
|---|---|---|---|
| B-005-88 | 2-4 | 1/27/1988 | 2.6 |
| B-009-88 | 2-4 | 1/27/1988 | 3.9 |
| GP-001 | 2-4 | 2/2/1999 | 13U |
| GP-002 | 2-4 | 2/2/1999 | 12U |
| GP-003 | 2-4 | 2/2/1999 | 12U |
| GP-004 | 2-4 | 2/2/1999 | 14U |
| GP-005 | 2-4 | 2/2/1999 | 14U |
| GP-006 | 2-4 | 2/2/1999 | 14U |
| GP-007 | 2-4 | 2/2/1999 | 12U |
| GP-008 | 2-4 | 2/2/1999 | 13U |
| GP-009 | 2-4 | 2/2/1999 | 13U |
| GP-010 | 2-4 | 2/3/1999 | 170 |
| GP-011 | 2-4 | 2/2/1999 | 13U |
| GP-012 | 2-4 | 2/3/1999 | 540 |
| GP-013 | 2-4 | 2/2/1999 | 15U |
| GP-020 | 2-4 | 2/4/1999 | 13U |
| GP-021 | 2-4 | 2/4/1999 | 13U |
| GP-022 | 2-4 | 2/4/1999 | 12U |
| GP-023 | 2-4 | 2/4/1999 | 14U |
| GP-024 | 2-4 | 2/3/1999 | 12U |
| GP-025 | 2-4 | 2/3/1999 | 12U |
| GP-027 | 2-4 | 2/3/1999 | 14U |
| GP-028 | 2-4 | 2/3/1999 | 17 |
| GP-029 | 2-4 | 2/3/1999 | 13U |
| GP-030 | 2-4 | 2/3/1999 | 13U |
| GP-031 | 2-4 | 2/3/1999 | 12U |
| GP-032 | 2-4 | 2/3/1999 | 13U |
| GP-033 | 2-4 | 2/3/1999 | 12U |
| GP-034 | 2-4 | 2/3/1999 | 17 |
| GP-035 | 2-4 | 2/3/1999 | 14U |
| GP-036 | 2-4 | 2/3/1999 | 12U |
| GP-037 | 2-4 | 2/3/1999 | 27 |
| GP-038 | 2-4 | 2/3/1999 | 14 |
| GP-039 | 2-4 | 2/3/1999 | 13U |
| GP-040 | 2-4 | 2/3/1999 | 12U |
| GP-042 | 1-2 | 2/10/1999 | 12U |
| GP-043 | 2-4 | 2/10/1999 | 12U |
| GP-044 | 1-2 | 2/10/1999 | 13U |
| SB-001 | 1-4 | 11/14/2002 | 20U+ |
| SB-002 | 1-4 | 11/14/2002 | 47.9* |
| SB-003 | 1-4 | 11/14/2002 | 34.1 |
| SB-004 | 1-4 | 11/14/2002 | 8.4* |
| SB-005 | 1-4 | 11/14/2002 | 17U+ |
| SB-006 | 1-4 | 11/14/2002 | 18.4* |
| SB-007 | 1-4 | 11/13/2002 | 21U+ |
| SB-008 | 1-4 | 11/13/2002 | 12.5* |
| SB-009 | 1-4 | 11/13/2002 | 23U+ |
| SB-010 | 1-4 | 11/13/2002 | 55.1 |
| SB-011 | 1-4 | 11/13/2002 | 14U+ |
| SB-012 | 1-4 | 11/13/2002 | 4 |

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DATA QUALIFIERS.

U = UNDETECTED AT THE SPECIFIED DETECTION LIMIT

* = DUPLICATE ANALYSIS NOT WITHIN CONTROL LIMITS

+ = FIELD SCREENING RESULT

0 75 150 225 300

SCALE IN FEET

# FIGURE E-7

ARSENIC IN SUBSURFACE SOIL (1'-4') (mg/kg)

HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

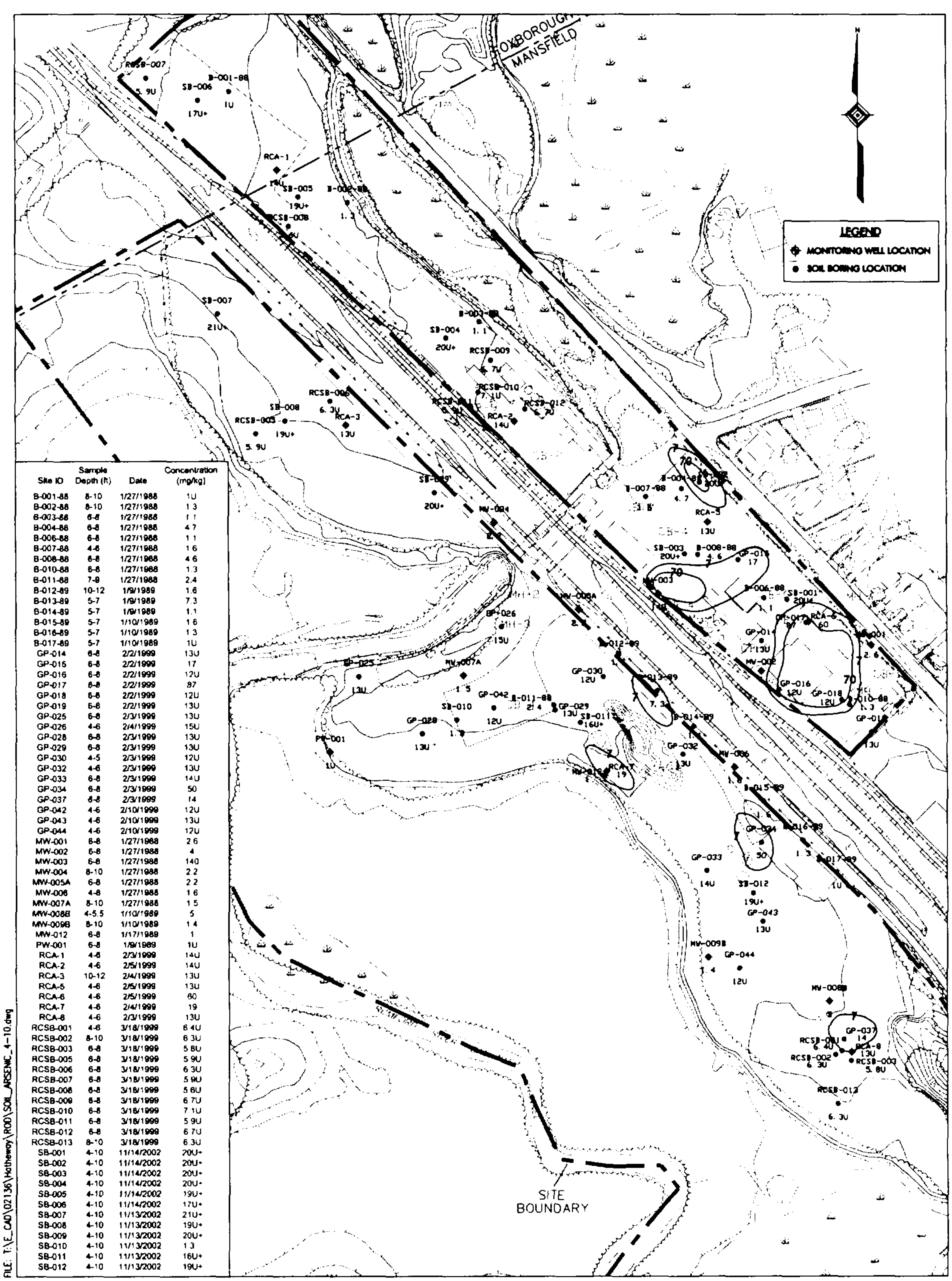
M&E Metcalf & Eddy

TRC
Boott Mills South
116 John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0490-01X39

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061




| Site ID | Sample Depth (ft) | Date | Concentration (mg/kg) |
|---|---|---|---|
| B-001-88 | 8-10 | 1/27/1988 | 1U |
| B-002-88 | 8-10 | 1/27/1988 | 1.3 |
| B-003-88 | 6-8 | 1/27/1988 | 1.1 |
| B-004-88 | 6-8 | 1/27/1988 | 4.7 |
| B-006-88 | 6-8 | 1/27/1988 | 1.1 |
| B-007-88 | 4-6 | 1/27/1988 | 1.6 |
| B-008-88 | 6-8 | 1/27/1988 | 4.6 |
| B-010-88 | 6-8 | 1/27/1988 | 1.3 |
| B-011-88 | 7-9 | 1/27/1988 | 2.4 |
| B-012-89 | 10-12 | 1/9/1989 | 1.6 |
| B-013-89 | 5-7 | 1/9/1989 | 7.3 |
| B-014-89 | 5-7 | 1/9/1989 | 1.1 |
| B-015-89 | 5-7 | 1/10/1989 | 1.6 |
| B-016-89 | 5-7 | 1/10/1989 | 1.3 |
| B-017-89 | 5-7 | 1/10/1989 | 1U |
| GP-014 | 6-8 | 2/2/1999 | 13U |
| GP-015 | 6-8 | 2/2/1999 | 17 |
| GP-016 | 6-8 | 2/2/1999 | 12U |
| GP-017 | 6-8 | 2/2/1999 | 87 |
| GP-018 | 6-8 | 2/2/1999 | 12U |
| GP-019 | 6-8 | 2/2/1999 | 13U |
| GP-025 | 6-8 | 2/3/1999 | 13U |
| GP-026 | 4-6 | 2/4/1999 | 15U |
| GP-028 | 6-8 | 2/3/1999 | 13U |
| GP-029 | 6-8 | 2/3/1999 | 13U |
| GP-030 | 4-5 | 2/3/1999 | 12U |
| GP-032 | 4-6 | 2/3/1999 | 13U |
| GP-033 | 6-8 | 2/3/1999 | 14U |
| GP-034 | 6-8 | 2/3/1999 | 50 |
| GP-037 | 6-8 | 2/3/1999 | 14 |
| GP-042 | 4-6 | 2/10/1999 | 12U |
| GP-043 | 4-6 | 2/10/1999 | 13U |
| GP-044 | 4-6 | 2/10/1999 | 12U |
| MW-001 | 6-8 | 1/27/1988 | 2.6 |
| MW-002 | 6-8 | 1/27/1988 | 4 |
| MW-003 | 6-8 | 1/27/1988 | 140 |
| MW-004 | 8-10 | 1/27/1988 | 2.2 |
| MW-005A | 6-8 | 1/27/1988 | 2.2 |
| MW-006 | 4-8 | 1/27/1988 | 1.6 |
| MW-007A | 8-10 | 1/27/1988 | 1.5 |
| MW-008B | 4-5.5 | 1/10/1989 | 5 |
| MW-009B | 8-10 | 1/10/1989 | 1.4 |
| MW-012 | 6-8 | 1/17/1989 | 1 |
| PW-001 | 6-8 | 1/9/1989 | 1U |
| RCA-1 | 4-6 | 2/3/1999 | 14U |
| RCA-2 | 4-6 | 2/5/1999 | 14U |
| RCA-3 | 10-12 | 2/4/1999 | 13U |
| RCA-5 | 4-6 | 2/5/1999 | 13U |
| RCA-6 | 4-6 | 2/5/1999 | 60 |
| RCA-7 | 4-6 | 2/4/1999 | 19 |
| RCA-8 | 4-6 | 2/3/1999 | 13U |
| RCSB-001 | 4-6 | 3/18/1999 | 6.4U |
| RCSB-002 | 8-10 | 3/18/1999 | 6.3U |
| RCSB-003 | 6-8 | 3/18/1999 | 5.8U |
| RCSB-005 | 6-8 | 3/18/1999 | 5.9U |
| RCSB-006 | 6-8 | 3/18/1999 | 6.3U |
| RCSB-007 | 6-8 | 3/18/1999 | 5.9U |
| RCSB-008 | 6-8 | 3/18/1999 | 5.6U |
| RCSB-009 | 6-8 | 3/18/1999 | 6.7U |
| RCSB-010 | 6-8 | 3/18/1999 | 7.1U |
| RCSB-011 | 6-8 | 3/18/1999 | 5.9U |
| RCSB-012 | 6-8 | 3/18/1999 | 6.7U |
| RCSB-013 | 8-10 | 3/18/1999 | 6.3U |
| SB-001 | 4-10 | 11/14/2002 | 20U+ |
| SB-002 | 4-10 | 11/14/2002 | 20U+ |
| SB-003 | 4-10 | 11/14/2002 | 20U+ |
| SB-004 | 4-10 | 11/14/2002 | 20U+ |
| SB-005 | 4-10 | 11/14/2002 | 19U+ |
| SB-006 | 4-10 | 11/14/2002 | 17U+ |
| SB-007 | 4-10 | 11/13/2002 | 21U+ |
| SB-008 | 4-10 | 11/13/2002 | 19U+ |
| SB-009 | 4-10 | 11/13/2002 | 20U+ |
| SB-010 | 4-10 | 11/13/2002 | 1.3 |
| SB-011 | 4-10 | 11/13/2002 | 16U+ |
| SB-012 | 4-10 | 11/13/2002 | 19U+ |

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DATA QUALIFIERS

*U = UNDETECTED AT THE SPECIFIED DETECTION LIMIT*

+ = FIELD SCREENING RESULT

0 75 150 225 300

**SCALE IN FEET**

FIGURE E-8

ARSENIC IN SUBSURFACE SOIL (4' AND BELOW) (mg/kg)

HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

M&E Metcalf & Eddy

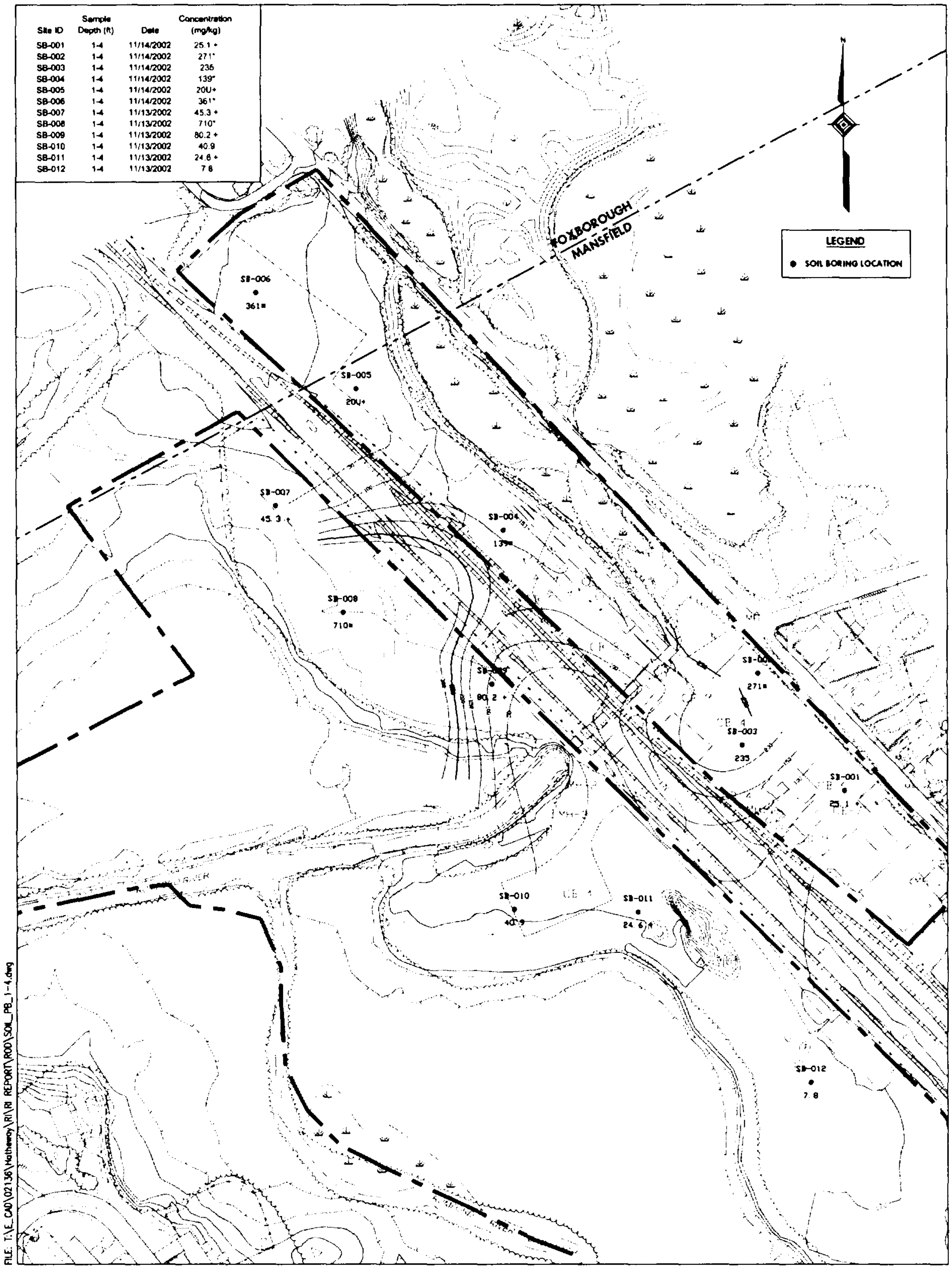
TRC Boott Mills South, 116 John Street, Lowell, MA 01852, 978-970-5600

TRC PROJ. NO.: 02136-0490-01X39

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061

| Site ID | Sample Depth (ft) | Date | Concentration (mg/kg) |
|---|---|---|---|
| SB-001 | 1-4 | 11/14/2002 | 25.1 + |
| SB-002 | 1-4 | 11/14/2002 | 271* |
| SB-003 | 1-4 | 11/14/2002 | 236 |
| SB-004 | 1-4 | 11/14/2002 | 139* |
| SB-005 | 1-4 | 11/14/2002 | 20U+ |
| SB-006 | 1-4 | 11/14/2002 | 361* |
| SB-007 | 1-4 | 11/13/2002 | 45.3 + |
| SB-008 | 1-4 | 11/13/2002 | 710* |
| SB-009 | 1-4 | 11/13/2002 | 80.2 + |
| SB-010 | 1-4 | 11/13/2002 | 40.9 |
| SB-011 | 1-4 | 11/13/2002 | 24.6 + |
| SB-012 | 1-4 | 11/13/2002 | 7.8 |

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DATA QUALIFIERS:

U = UNDETECTED AT THE SPECIFIED DETECTION LIMIT

* = DUPLICATE ANALYSIS NOT WITHIN CONTROL LIMITS

+ = FIELD SCREENING RESULT

0 75 150 225 300

SCALE IN FEET

FIGURE E-9

LEAD IN SUBSURFACE SOIL

(1'-4')

(mg/kg)

HATHEWAY AND PATTERSON SITE

15 COUNTY ROAD

MANSFIELD, MASSACHUSETTS

M&E Metcalf & Eddy

TRC

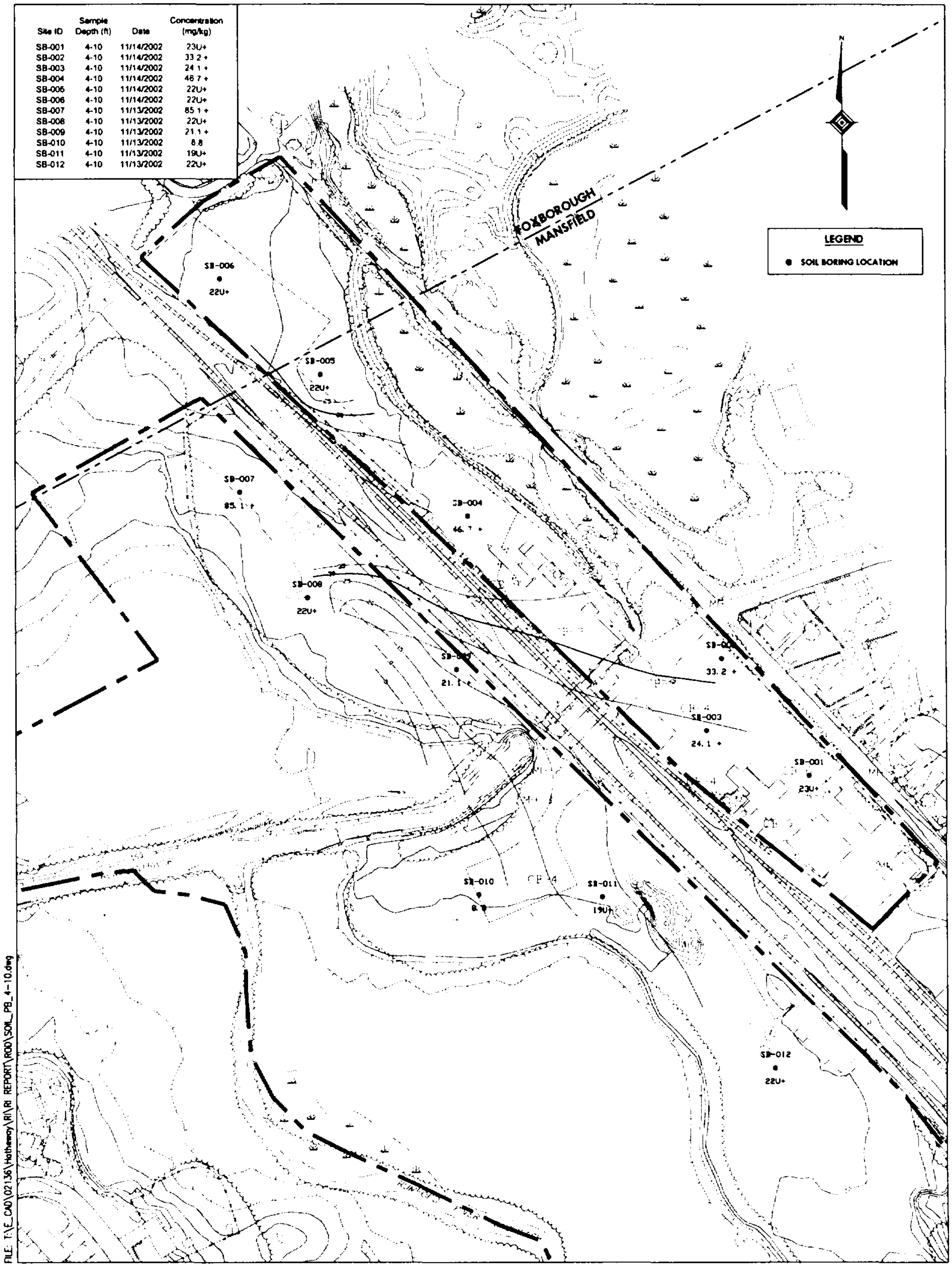
Boott Mills South
116 John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0490-01X39

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061

| Site ID | Sample Depth (ft) | Date | Concentration (mg/kg) |
|---|---|---|---|
| SB-001 | 4-10 | 11/14/2002 | 23U+ |
| SB-002 | 4-10 | 11/14/2002 | 33 2 + |
| SB-003 | 4-10 | 11/14/2002 | 24 1 + |
| SB-004 | 4-10 | 11/14/2002 | 46 7 + |
| SB-005 | 4-10 | 11/14/2002 | 22U+ |
| SB-006 | 4-10 | 11/14/2002 | 22U+ |
| SB-007 | 4-10 | 11/13/2002 | 85 1 + |
| SB-008 | 4-10 | 11/13/2002 | 22U+ |
| SB-009 | 4-10 | 11/13/2002 | 21.1 + |
| SB-010 | 4-10 | 11/13/2002 | 8.8 |
| SB-011 | 4-10 | 11/13/2002 | 19U+ |
| SB-012 | 4-10 | 11/13/2002 | 22U+ |

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DATA QUALIFIERS

U = UNDETECTED AT THE SPECIFIED DETECTION LIMIT
+ = FIELD SCREENING RESULT

0 75 150 225 300

SCALE IN FEET

FIGURE E-10
LEAD IN SUBSURFACE SOIL
(4' AND BELOW)
(mg/kg)
HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

M&E Metcalf & Eddy

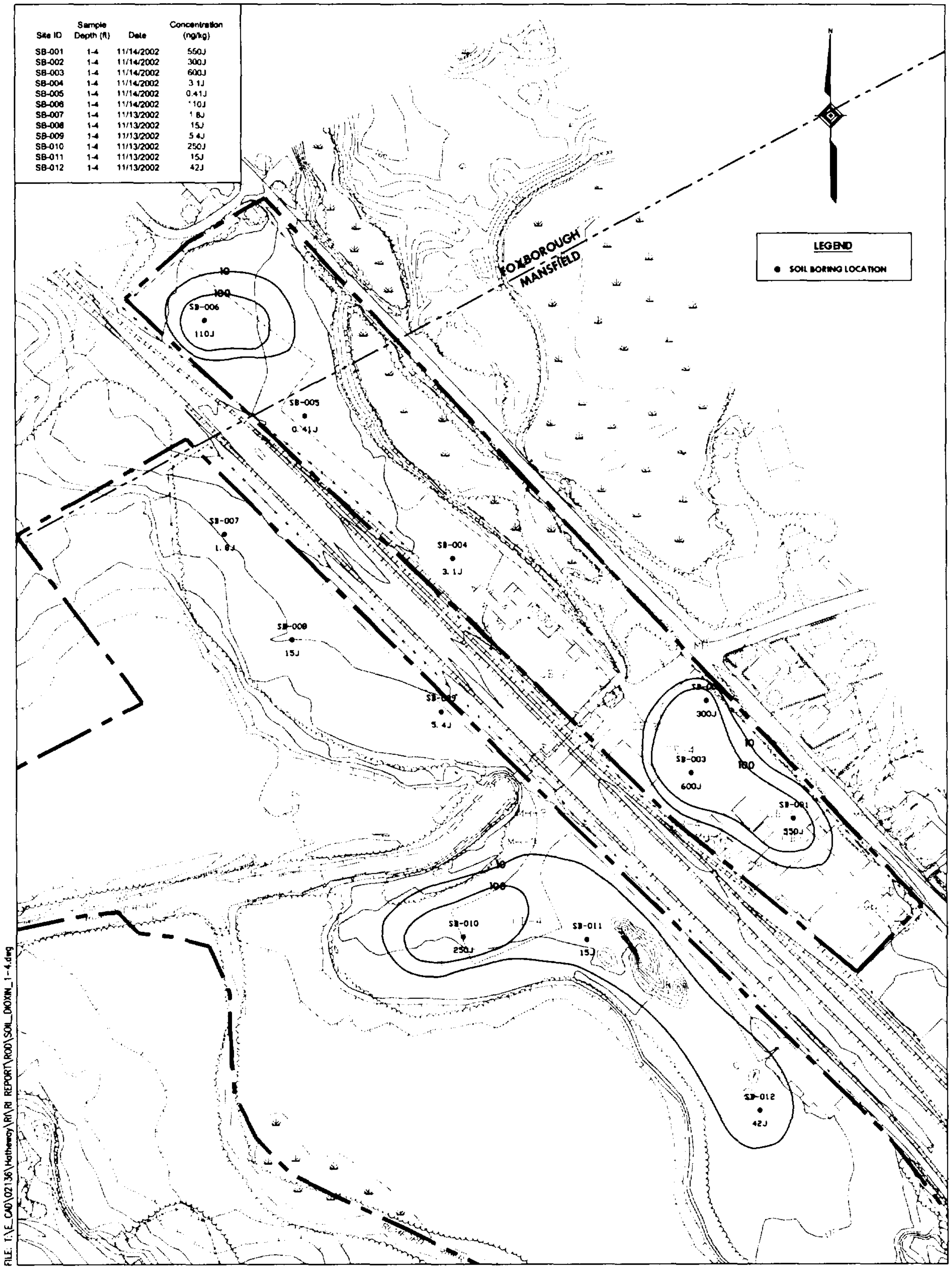
TRC
Boott Mills South
116 John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0490-01X39

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061

| Site ID | Sample Depth (ft) | Date | Concentration (ng/kg) |
|---|---|---|---|
| SB-001 | 1-4 | 11/14/2002 | 550J |
| SB-002 | 1-4 | 11/14/2002 | 300J |
| SB-003 | 1-4 | 11/14/2002 | 600J |
| SB-004 | 1-4 | 11/14/2002 | 3.1J |
| SB-005 | 1-4 | 11/14/2002 | 0.41J |
| SB-006 | 1-4 | 11/14/2002 | 110J |
| SB-007 | 1-4 | 11/13/2002 | 1.8J |
| SB-008 | 1-4 | 11/13/2002 | 15J |
| SB-009 | 1-4 | 11/13/2002 | 5.4J |
| SB-010 | 1-4 | 11/13/2002 | 250J |
| SB-011 | 1-4 | 11/13/2002 | 15J |
| SB-012 | 1-4 | 11/13/2002 | 42J |

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DATA QUALIFIERS:
J = ESTIMATED VALUE

0 75 150 225 300
SCALE IN FEET

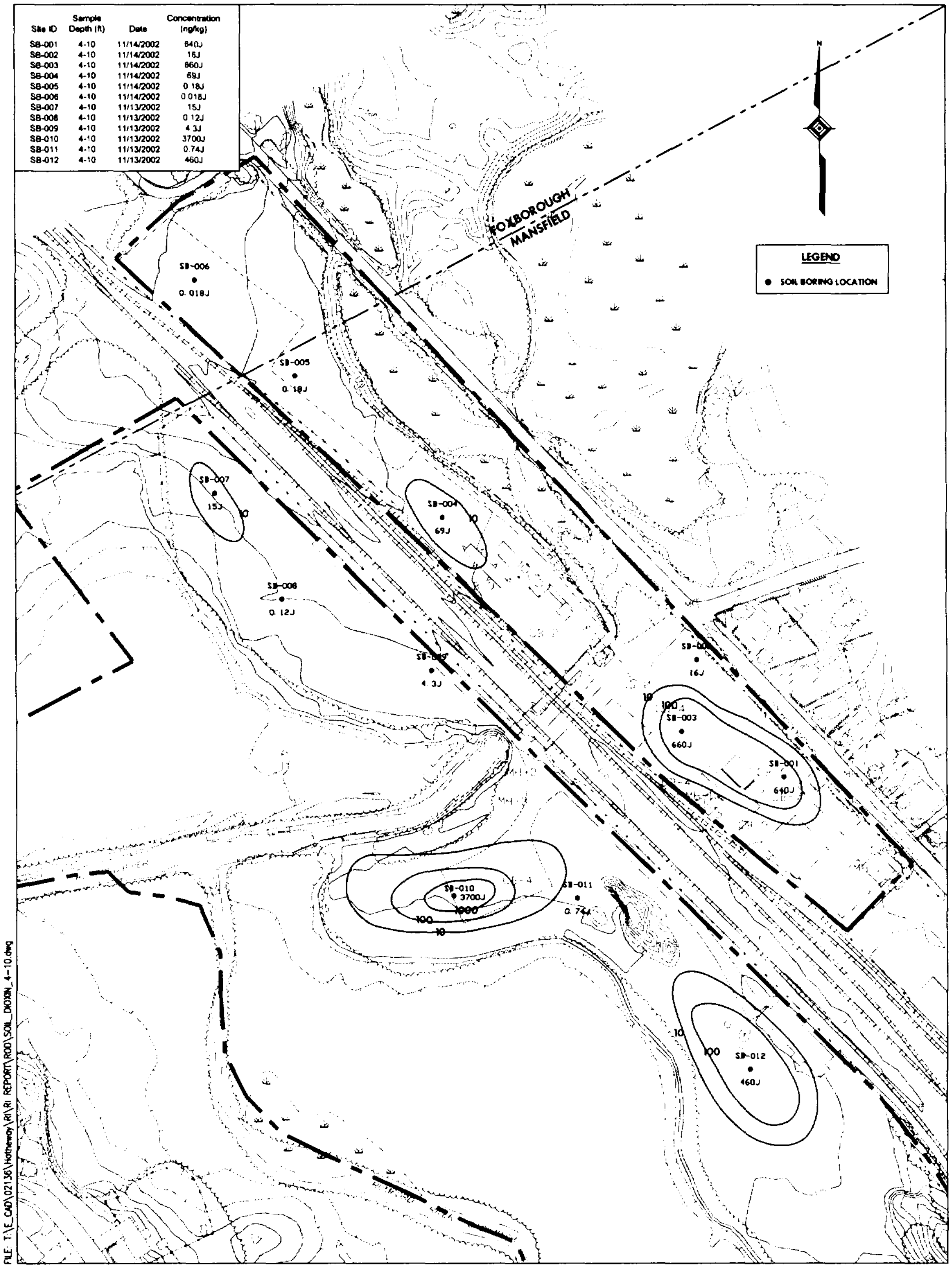
FIGURE E-11
DIOXIN IN SUBSURFACE SOIL
(1'-4')
(ng/kg)
HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

M&E Metcalf & Eddy

TRC
Boott Mills South
116 John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0490-01X39
EPA CONTRACT NO.: 68-W6-0042
RAC SUBCONTRACT NO.: 107061

| Site ID | Sample Depth (ft) | Date | Concentration (ng/kg) |
|---|---|---|---|
| SB-001 | 4-10 | 11/14/2002 | 640J |
| SB-002 | 4-10 | 11/14/2002 | 16J |
| SB-003 | 4-10 | 11/14/2002 | 660J |
| SB-004 | 4-10 | 11/14/2002 | 69J |
| SB-005 | 4-10 | 11/14/2002 | 0 18J |
| SB-006 | 4-10 | 11/14/2002 | 0.018J |
| SB-007 | 4-10 | 11/13/2002 | 15J |
| SB-008 | 4-10 | 11/13/2002 | 0 12J |
| SB-009 | 4-10 | 11/13/2002 | 4 3J |
| SB-010 | 4-10 | 11/13/2002 | 3700J |
| SB-011 | 4-10 | 11/13/2002 | 0.74J |
| SB-012 | 4-10 | 11/13/2002 | 460J |




DATA QUALIFIERS
J = ESTIMATED VALUE

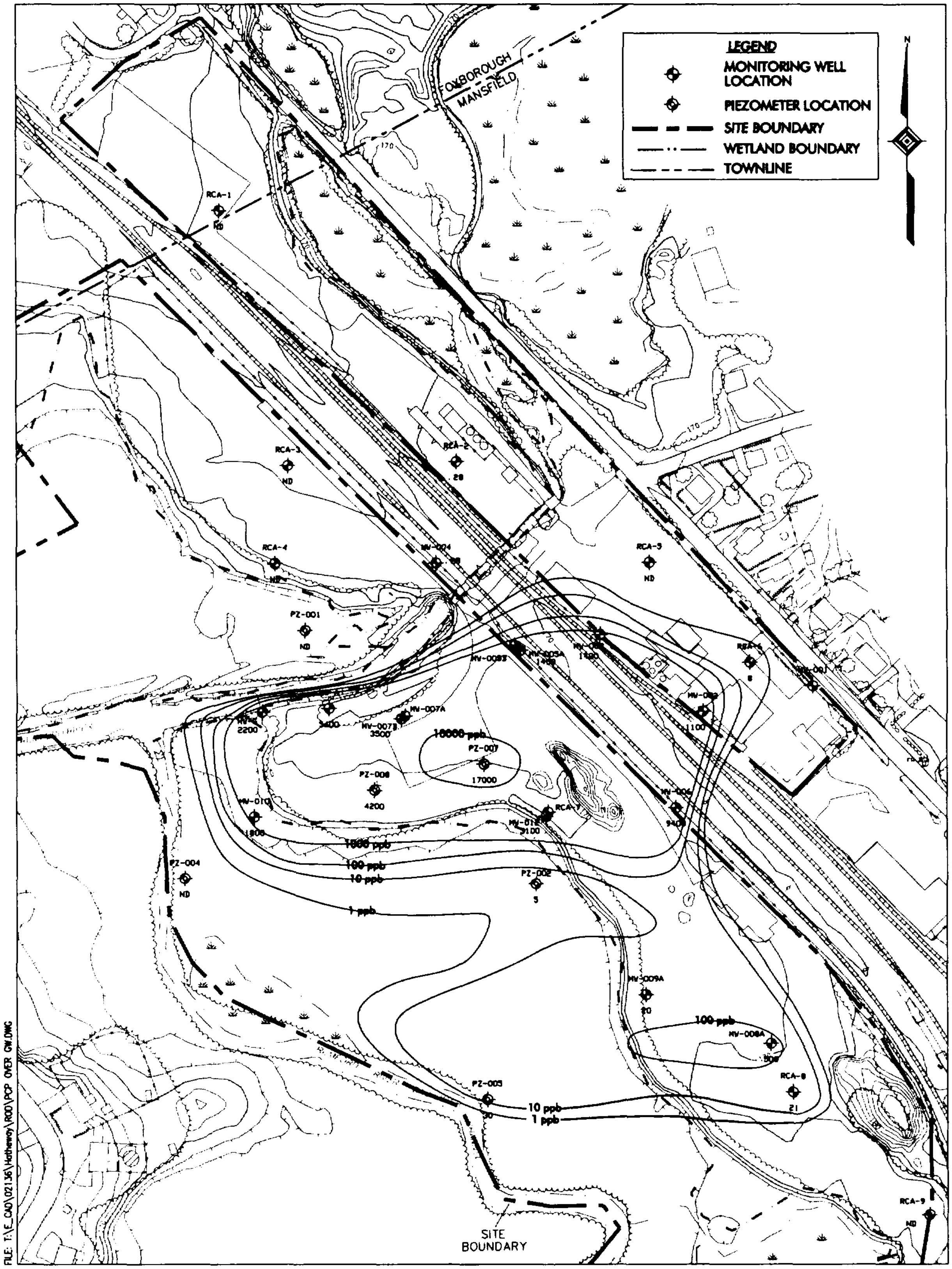
0 75 150 225 300
SCALE IN FEET

FIGURE E-12
DIOXIN IN SUBSURFACE SOIL (4' AND BELOW) (ng/kg)
HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

M&E Metcalf & Eddy

TRC
Boott Mills South
116 John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0490-01X39
EPA CONTRACT NO.: 68-W6-0042
RAC SUBCONTRACT NO.: 107061




FILE: T:\E_CAD\02136\Hatheway\ROD\PCP OVER GW.DWG

0 75 150 225 300

SCALE IN FEET

FIGURE E-13

PCP CONCENTRATIONS IN OVERBURDEN GROUND WATER (MAXIMUM CONCENTRATION)

HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

M&E Metcalf & Eddy

TRC

Boott Mills South
116 John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0490-01X38

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061

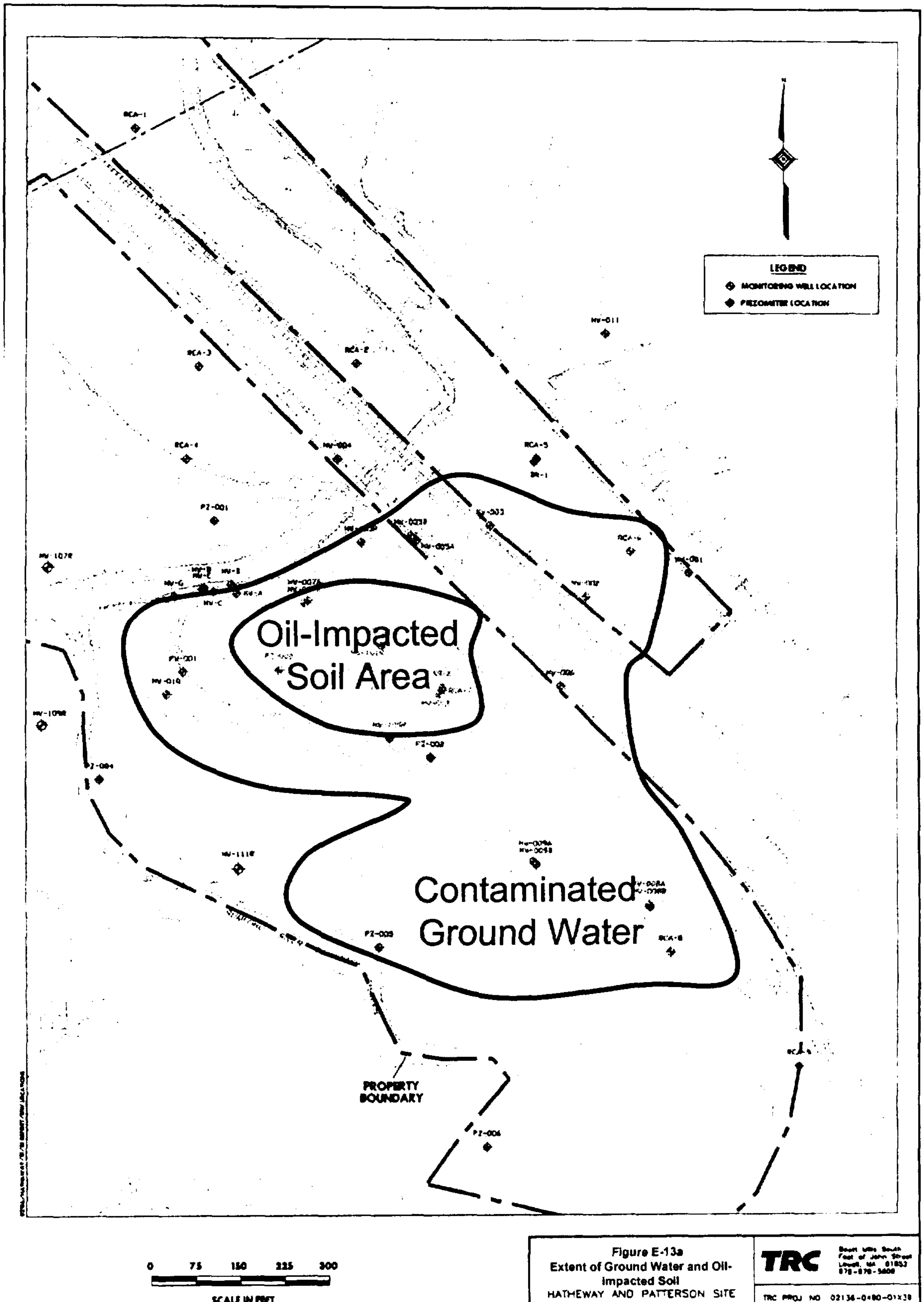
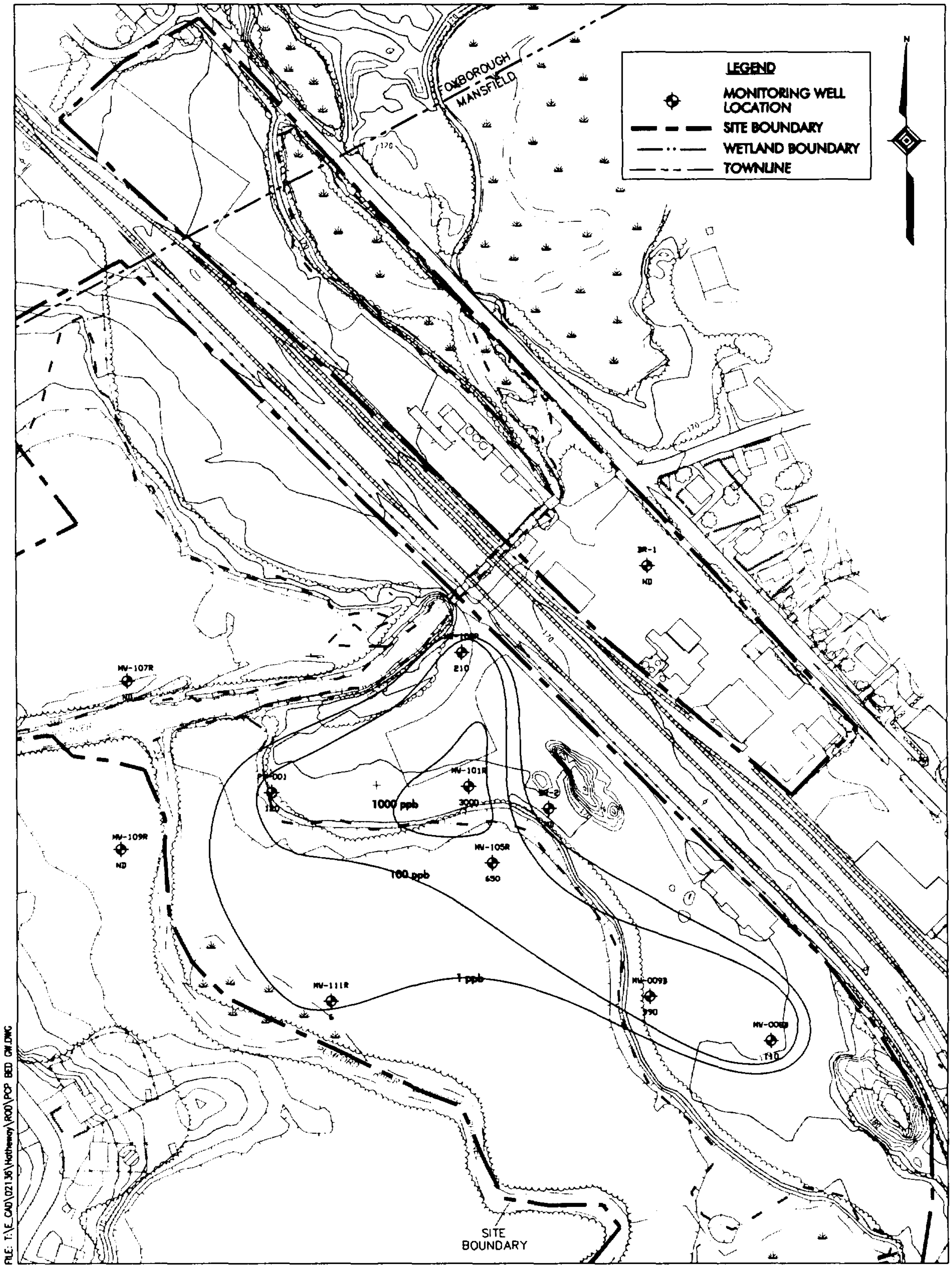



**Figure E-13a**
**Extent of Ground Water and Oil-Impacted Soil**
HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

M&E Metcalf & Eddy

TRC

TRC PROJ NO 02136-0480-01X38
EPA CONTRACT NO. 68-W6-0042
RAC SUBCONTRACT NO. 107061




FILE: T:\E_CAD\02136\Hatheway\R00\PCP_BED_GW.DWG

0 75 150 225 300

SCALE IN FEET

FIGURE E-14

PCP CONCENTRATIONS IN BEDROCK GROUND WATER µg/l (MAXIMUM OBSERVED)

HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

M&E Metcalf & Eddy

TRC

Boott Mills South
116 John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0490-01X38

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061

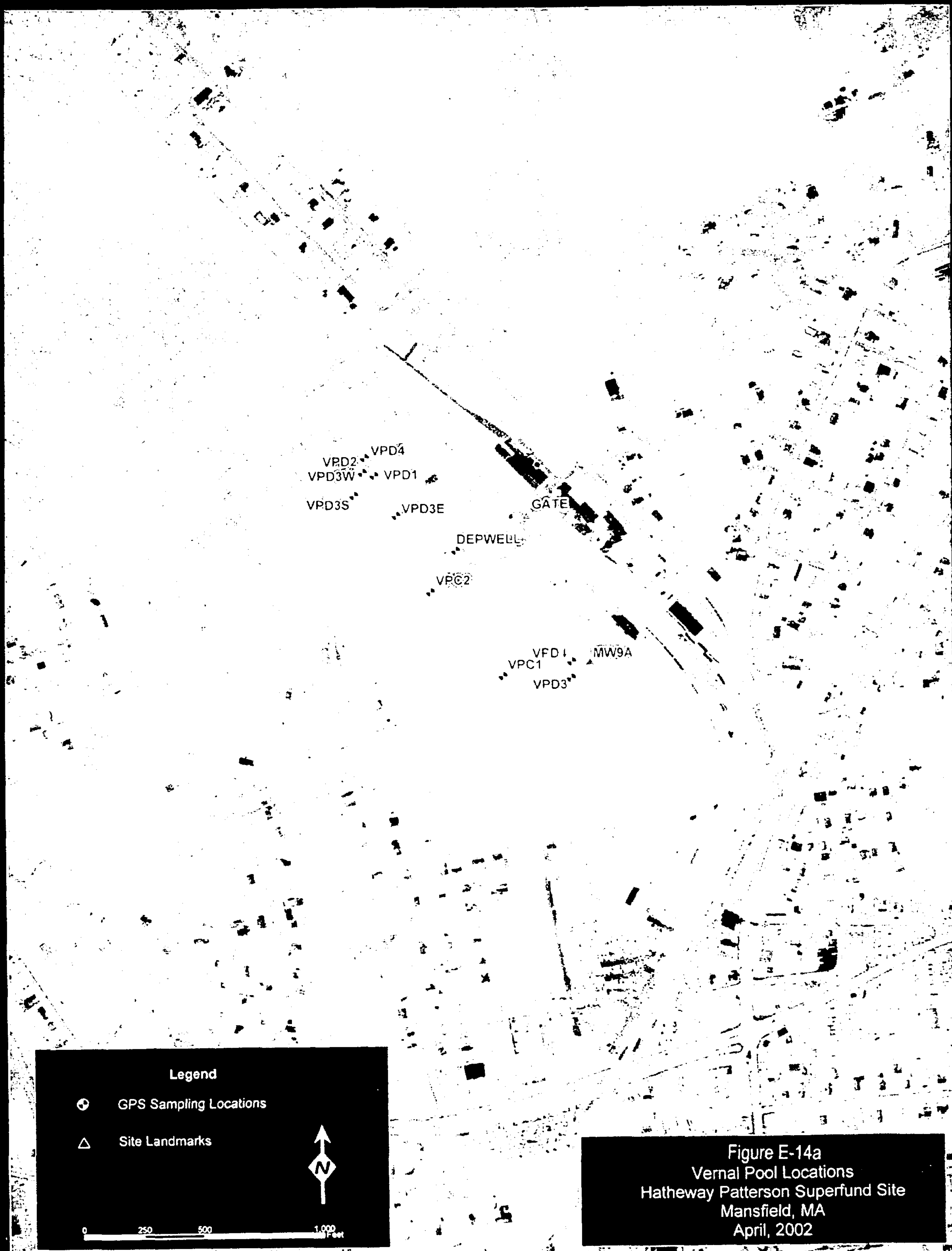



Figure E-14a
Vernal Pool Locations
Hatheway Patterson Superfund Site
Mansfield, MA
April, 2002

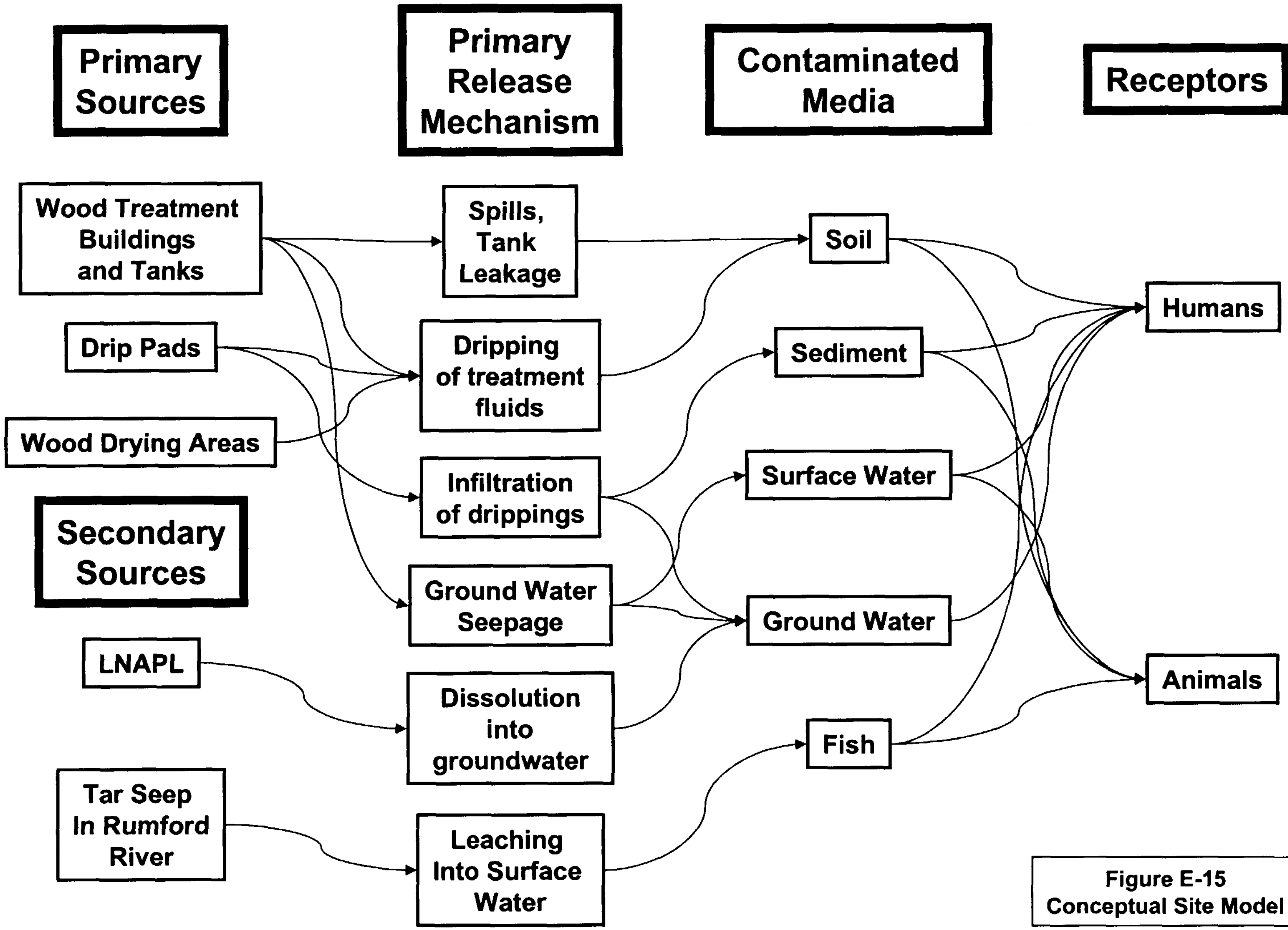


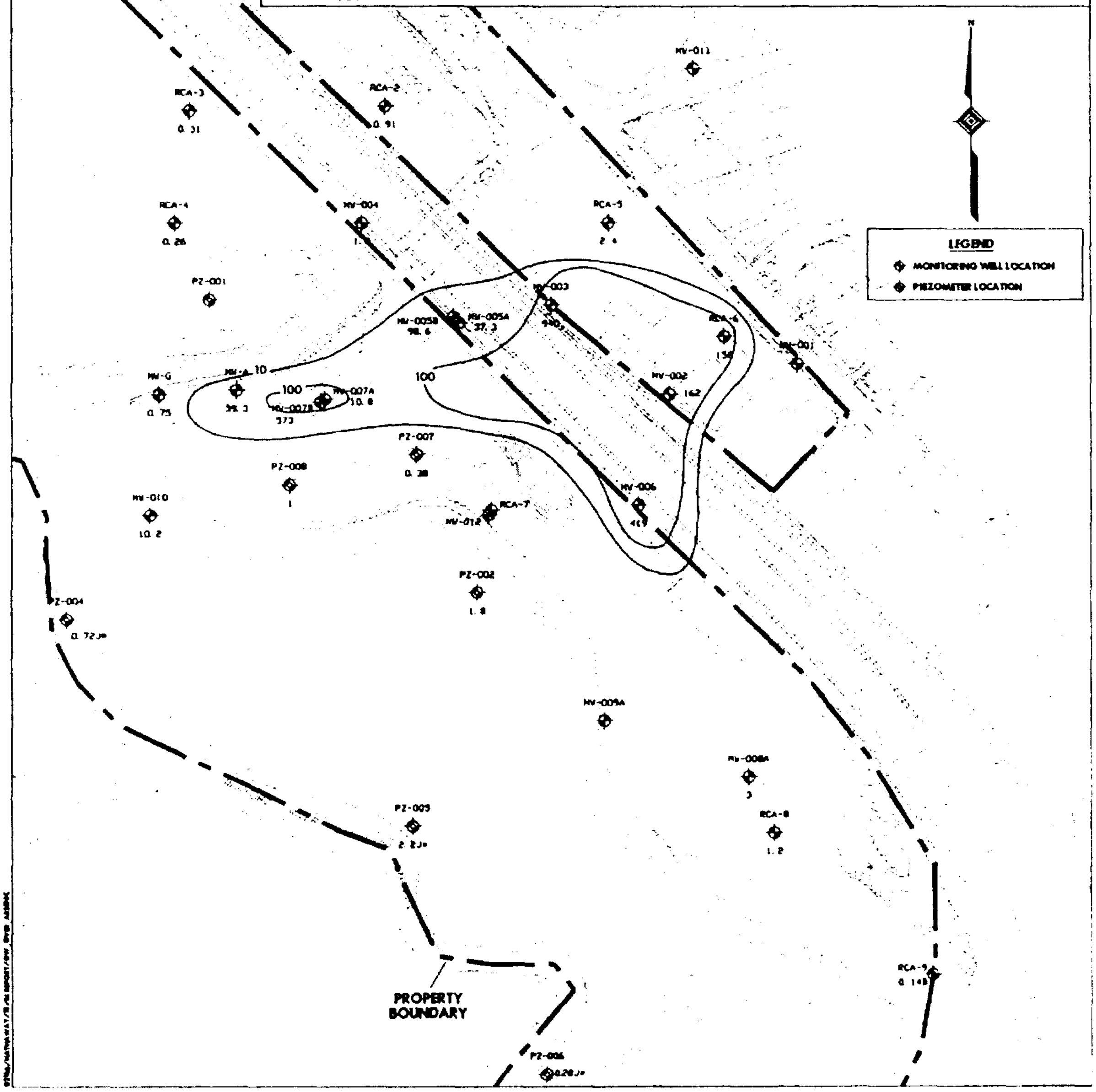

Figure E-15
Conceptual Site Model

| CONSTITUENT | UNITS | MW-002 D01856 11/19/2001 Primary | MW-002 D04390 12/10/2003 Primary | MW-002 D04419 12/10/2003 Duplicate 1 | MW-003 D01857 11/16/2001 Primary | MW-003 D04391 12/11/2003 Primary | MW-004 D01858 11/13/2001 Primary | MW-004 D04392 12/12/2003 Primary | MW-005A D01859 11/15/2001 Primary | MW-005A D01860 11/15/2001 Duplicate 1 | MW-005A D04393 12/15/2003 Primary | MW-005B D01861 11/14/2001 Primary | MW-005B D04394 12/11/2003 Primary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Turbidity | (ntu) | 0.5 | 1.94 | 1.94 | 0 | 0 | 1.04 | 0.71 | 0 | 0 | 0 | 4.82 | 0.41 |
| Arsenic | (ug/l) | 263 | 161 | 162 | 401 | 940 | 7.3 | 1.8 | 33 | 32.9 | 37.3 | 79.6 | 98.6 |

| CONSTITUENT | UNITS | MW-006 D01862 11/15/2001 Primary | MW-006 D04395 12/16/2003 Primary | MW-007A D01863 11/15/2001 Primary | MW-007A D04396 12/16/2003 Primary | MW-007B D02002 11/15/2001 Primary | MW-007B D04397 12/16/2003 Primary | MW-008A D01864 11/13/2001 Primary | MW-008A D04398 12/18/2003 Primary | MW-009A D01866 11/16/2001 Primary | MW-010 D01868 11/14/2001 Primary | MW-010 D04401 12/18/2003 Primary | MW-011 D01869 11/16/2001 Primary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Turbidity | (ntu) | 1.02 | 3.47 | 1.54 | 7.2 | 11.3 | 3.1 | 0.26 | 4.2 | 0 | 2.65 | 31.8 | 4.32 |
| Arsenic | (ug/l) | 519 | 416 | 14.3 | 10.8 | 547 | 573 | 3.8 | 3 | 0.12J | 6.4 | 10.2 | 0.55 |

| CONSTITUENT | UNITS | MW-012 D01870 11/19/2001 Primary | MW-A D04405 12/15/2003 Primary | MW-G D04408 12/12/2003 Primary | PZ-001 D03559 12/11/2002 Primary | PZ-002 D03560 12/11/2002 Primary | PZ-002 D04407 12/13/2003 Primary | PZ-004 D03563 12/12/2002 Primary | PZ-005 D03564 12/12/2002 Primary | PZ-006 D03565 12/12/2002 Primary | PZ-007 D03566 12/11/2002 Primary | PZ-007 D04406 12/15/2003 Primary | PZ-008 D03562 12/10/2002 Primary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Turbidity | (ntu) | 0.52 | 4.6 | 0 | 0 | 37 | 4.62 | 3.1 | 4.5 | 4.1 | 1.1 | 6.96 | 2.4 |
| Arsenic | (ug/l) | 1.1 | 39.3 | 0.75 | 0.65 | 3.3 | 1.6 | 0.72J | 2.2J | 0.28J | 28 | 0.38 | 1.1J |

| CONSTITUENT | UNITS | PZ-008 D03561 12/10/2002 Duplicate 1 | PZ-008 D04409 12/16/2003 Primary | RCA-1 D04410 12/11/2003 Primary | RCA-2 D04411 12/11/2003 Primary | RCA-3 D04412 12/12/2003 Primary | RCA-4 D04413 12/12/2003 Primary | RCA-5 D04414 12/10/2003 Primary | RCA-6 D04415 12/10/2003 Primary | RCA-8 D04417 12/18/2003 Primary | RCA-9 D04418 12/18/2003 Primary |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Turbidity | (ntu) | 2.4 | 3.1 | 1.1 | 0.3 | 4.4 | 2.71 | 1.9 | 1 | 3.9 | 3.9 |
| Arsenic | (ug/l) | 1J | 1 | 0.73 | 0.91 | 0.31 | 0.26 | 2.4 | 156 | 1.2 | 0.148 |




NOTE:
DECEMBER 2003 VALUES ARE CONTOURED

DATA QUALIFIERS:
J = ESTIMATED VALUE
* = RESULT FROM DECEMBER 2002 SAMPLING WELL NOT SAMPLED DURING DECEMBER 2003 SAMPLING ROUND

0 75 150 225 300
SCALE IN FEET

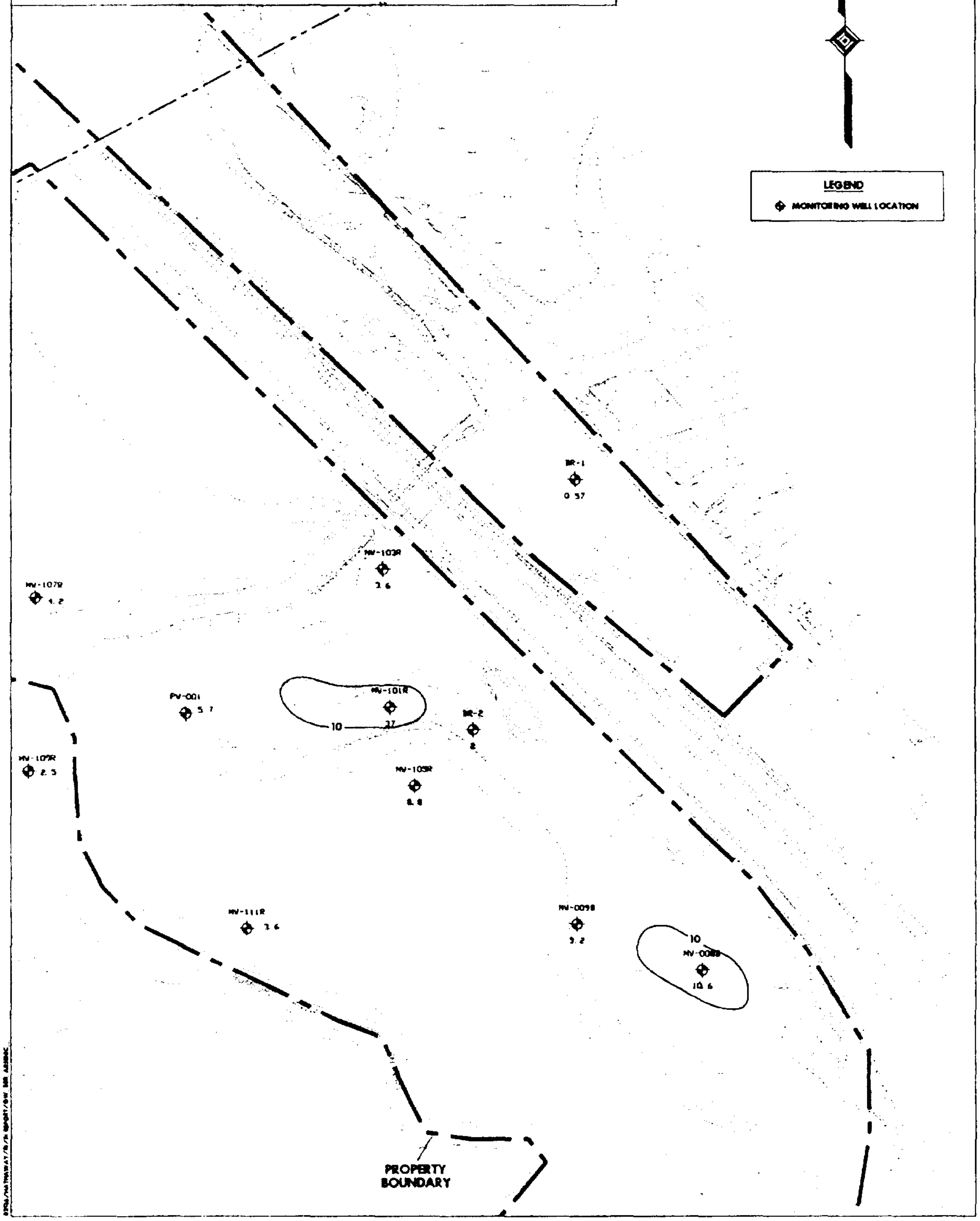
**Figure E-16**
ARSENIC IN OVERBURDEN GROUND WATER (ug/L)
HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

M&E Metcalf & Eddy

TRC
Boott Mills South
Foot of John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO. 02136-0490-01X39
EPA CONTRACT NO. 68-W6-0042
RAC SUBCONTRACT NO. 107061

| CONSTITUENT | UNITS | BR-1<br>D04387<br>12/11/2003<br>Primary | BR-2<br>D04368<br>12/17/2003<br>Primary | MW-008B<br>D01865<br>11/14/2001<br>Primary | MW-008B<br>D04399<br>12/18/2003<br>Primary | MW-009B<br>D01867<br>11/14/2001<br>Primary | MW-009B<br>D04400<br>12/17/2003<br>Primary | MW-009B<br>D04420<br>12/17/2003<br>Duplicate 1 | MW-101R<br>D04402<br>12/15/2003<br>Primary | MW-103R<br>D04403<br>12/18/2003<br>Primary | MW-105R<br>D04404<br>12/12/2003<br>Primary |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Turbidity | (ntu) | [illegible] | [illegible] | [illegible] | [illegible] | 4.27 | 0.75 | 0.75 | 52.5 | 20 | 4.6 |
| Arsenic | (ug/l) | 0.57 | 2 | [illegible] | 10.6 | 6.1 | 9.2 | 9.1 | 37 | 3.6 | 6.8 |




0 75 150 225 300

SCALE IN FEET

**Figure E-17**

ARSENIC IN BEDROCK GROUND WATER

HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

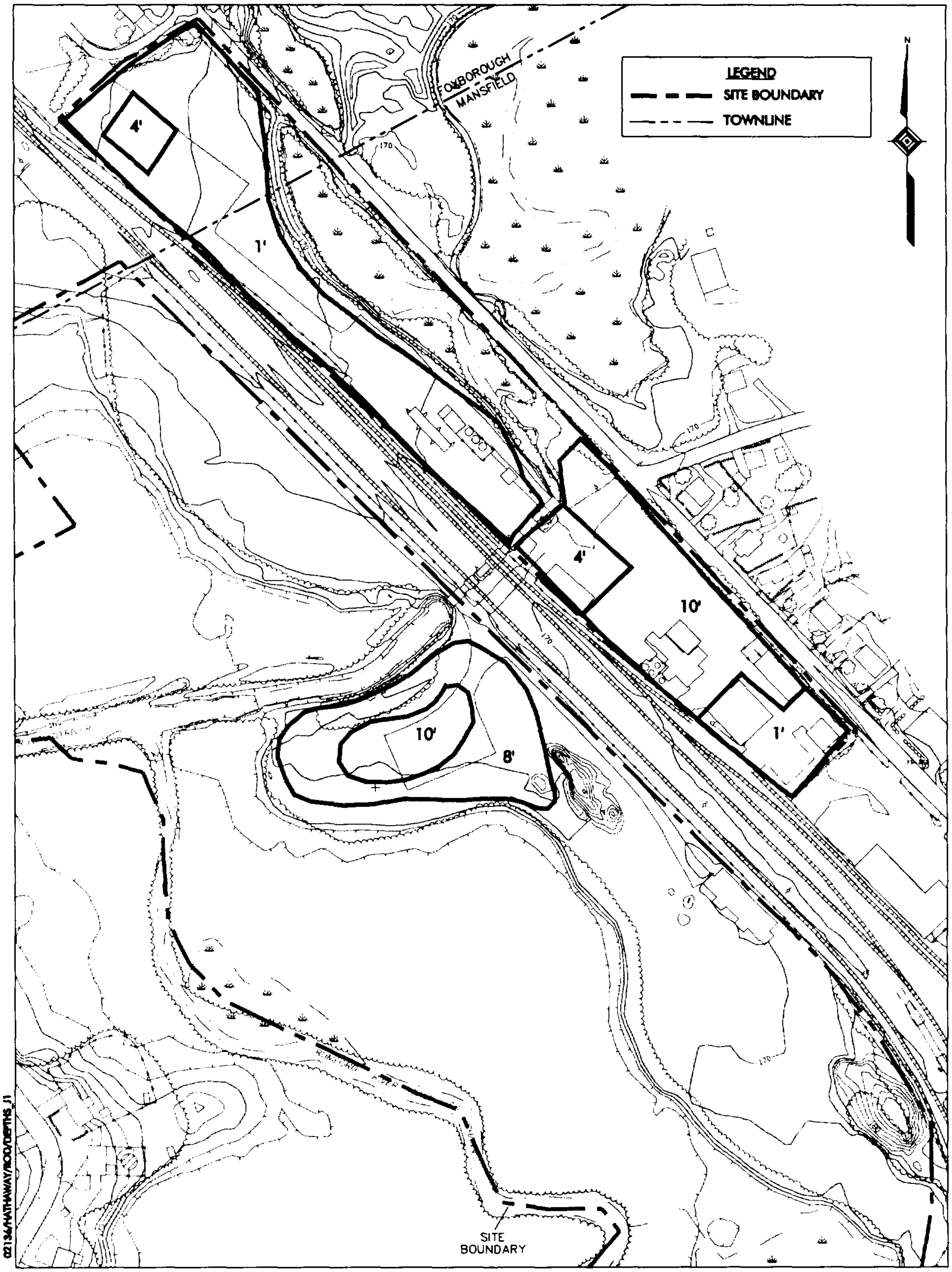
M&E Metcalf & Eddy

TRC
Boott Mills South
Foot of John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0490-01X38

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061




0 75 150 225 300

SCALE IN FEET

FIGURE J-1
SOIL EVCAVATION DEPTHS
RA-S3, RA-S4, RA-S5
HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

M&E Metcalf & Eddy

TRC
Boott Mills South
Foot of John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0490-01X38

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061

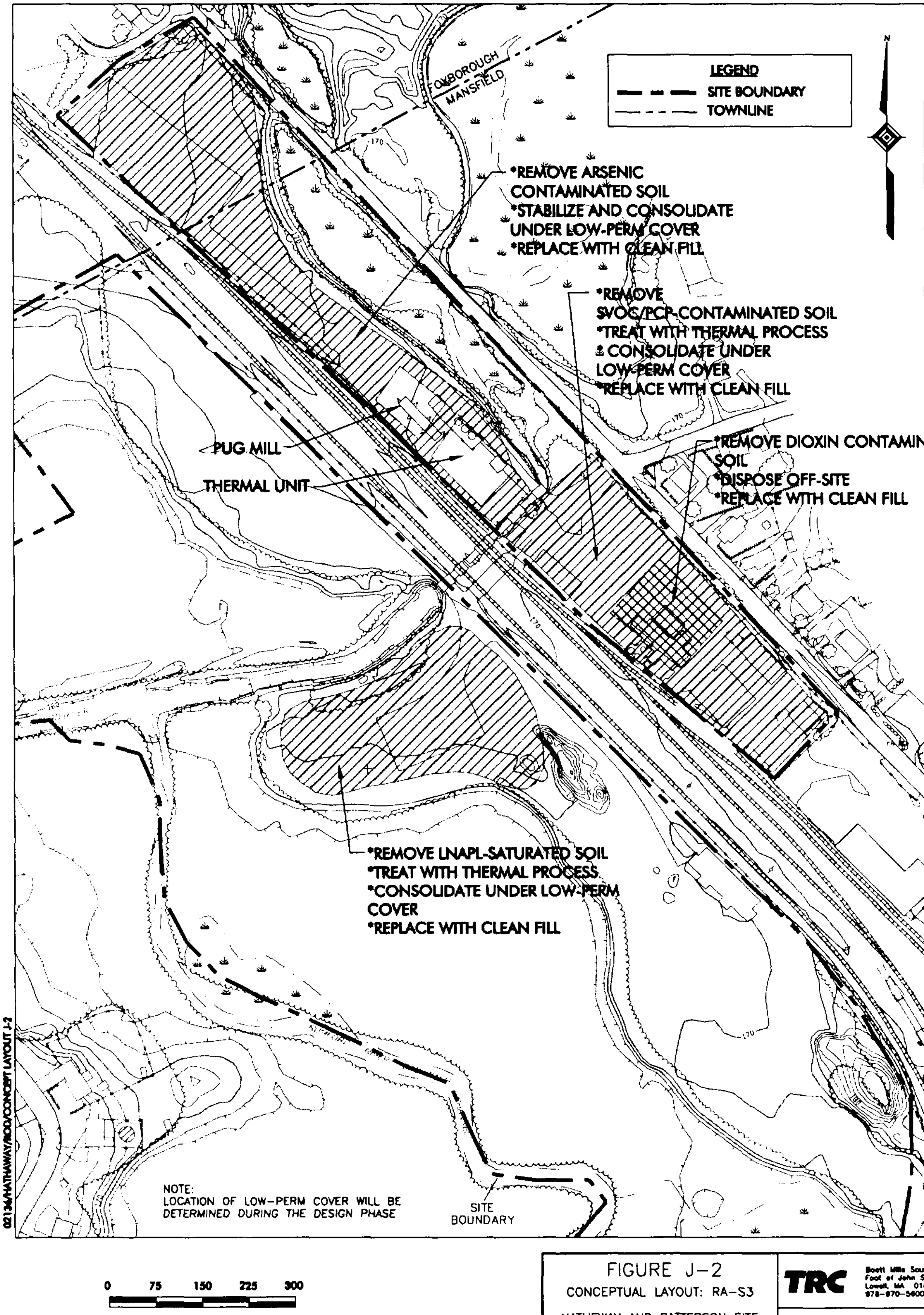



FIGURE J-2

CONCEPTUAL LAYOUT: RA-S3

HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

Metcalf & Eddy

TRC
Boott Mills South
Foot of John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0490-01X38

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061

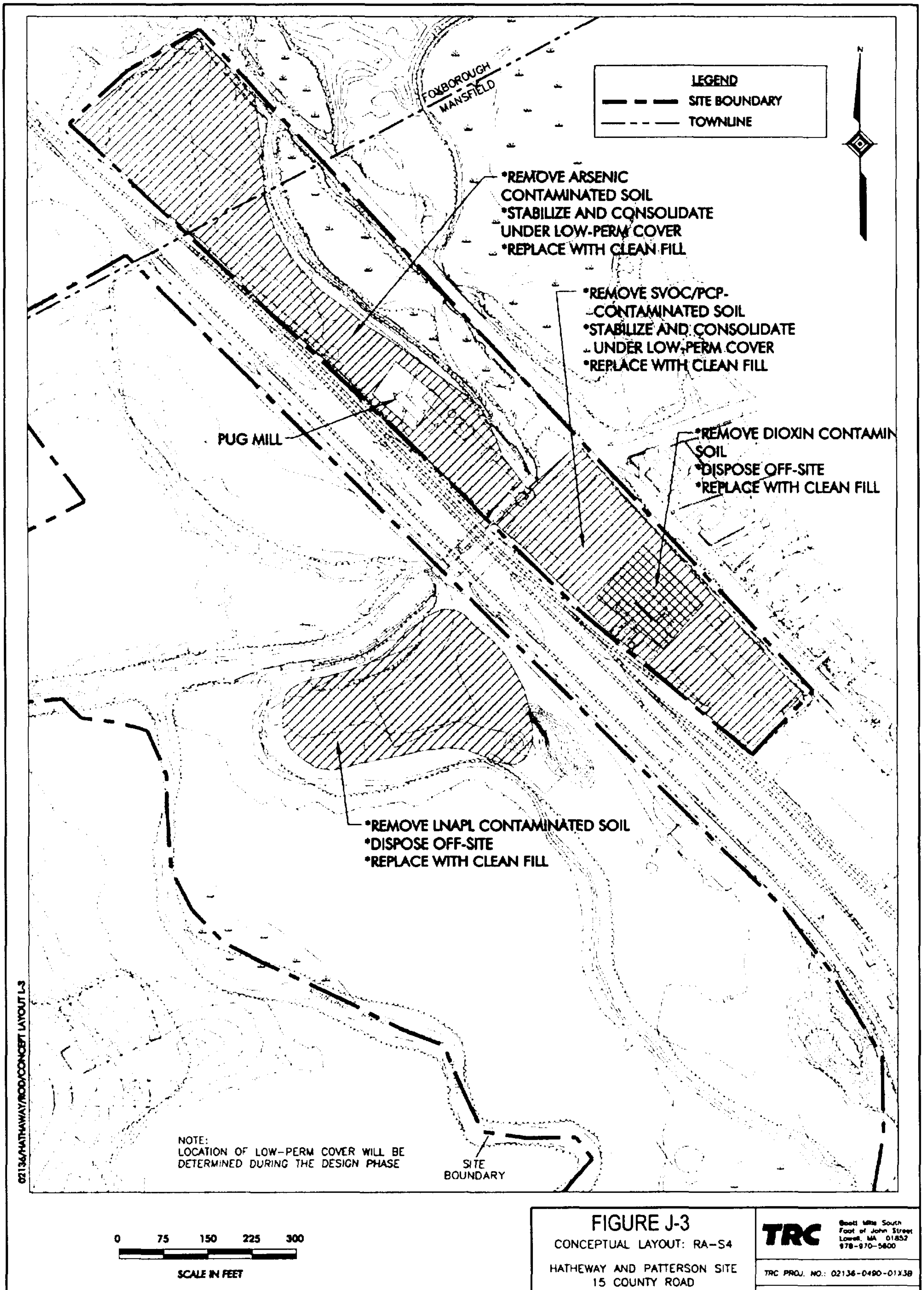


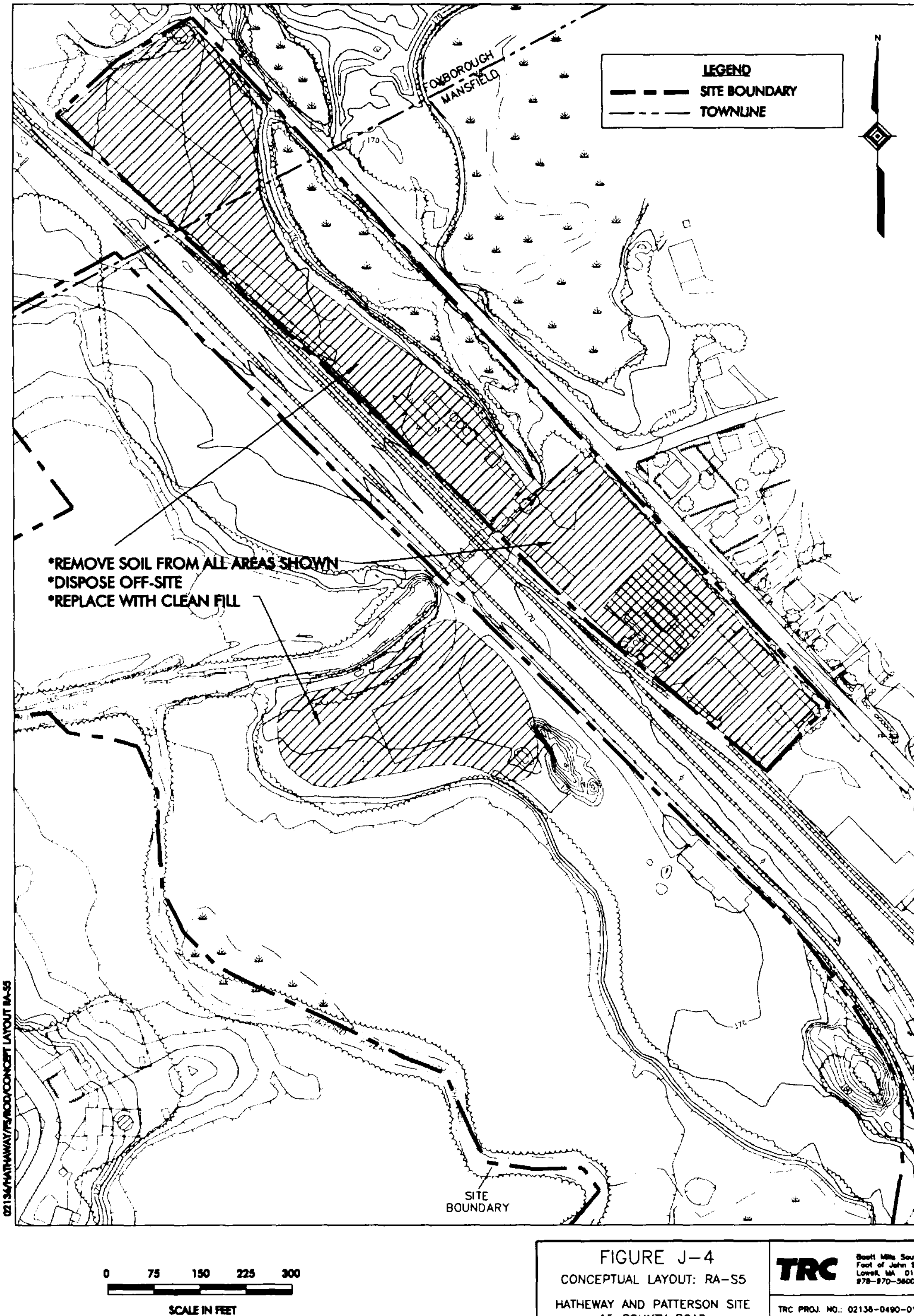

FIGURE J-3
CONCEPTUAL LAYOUT: RA-S4

HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

M&E Metcalf & Eddy

TRC Boott Mills South, Foot of John Street, Lowell, MA 01852, 978-970-5600

TRC PROJ. NO.: 02136-0490-01X38
EPA CONTRACT NO.: 68-W6-0042
RAC SUBCONTRACT NO.: 107061




# FIGURE J-4

CONCEPTUAL LAYOUT: RA-S5

HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

Metcalf & Eddy

TRC
Boott Mills South
Foot of John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0490-01X38

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061

02136/HATHAWAY/FS/ROD/CONCEPT LAYOUT RA-S5

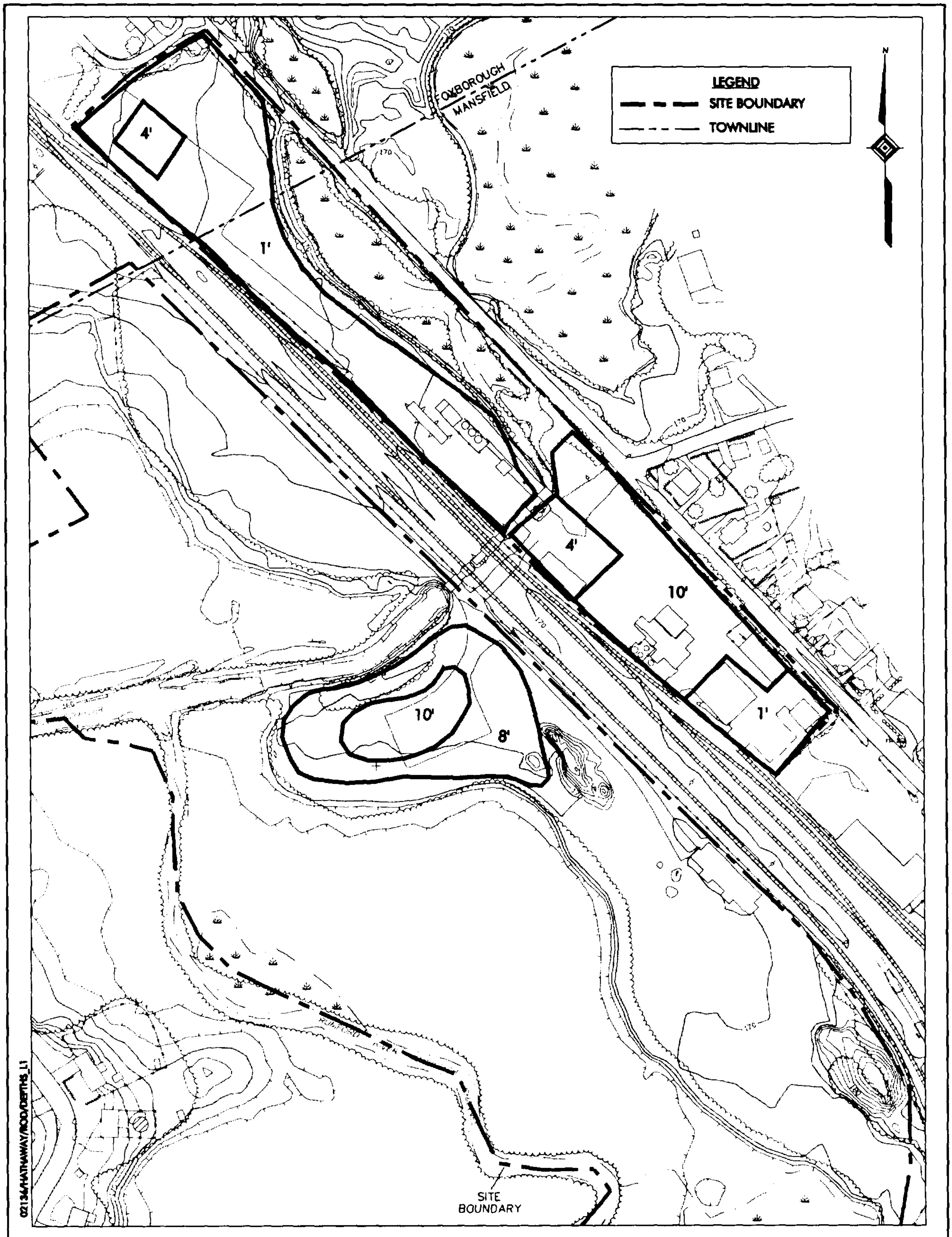



FIGURE L-1
SOIL EVCAVATION DEPTHS
RA-S3, RA-S4, RA-S5
HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

M&E Metcalf & Eddy

TRC Boott Mills South Foot of John Street Lowell, MA 01852 978-970-5600

TRC PROJ. NO.: 02136-0490-01X3B

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061

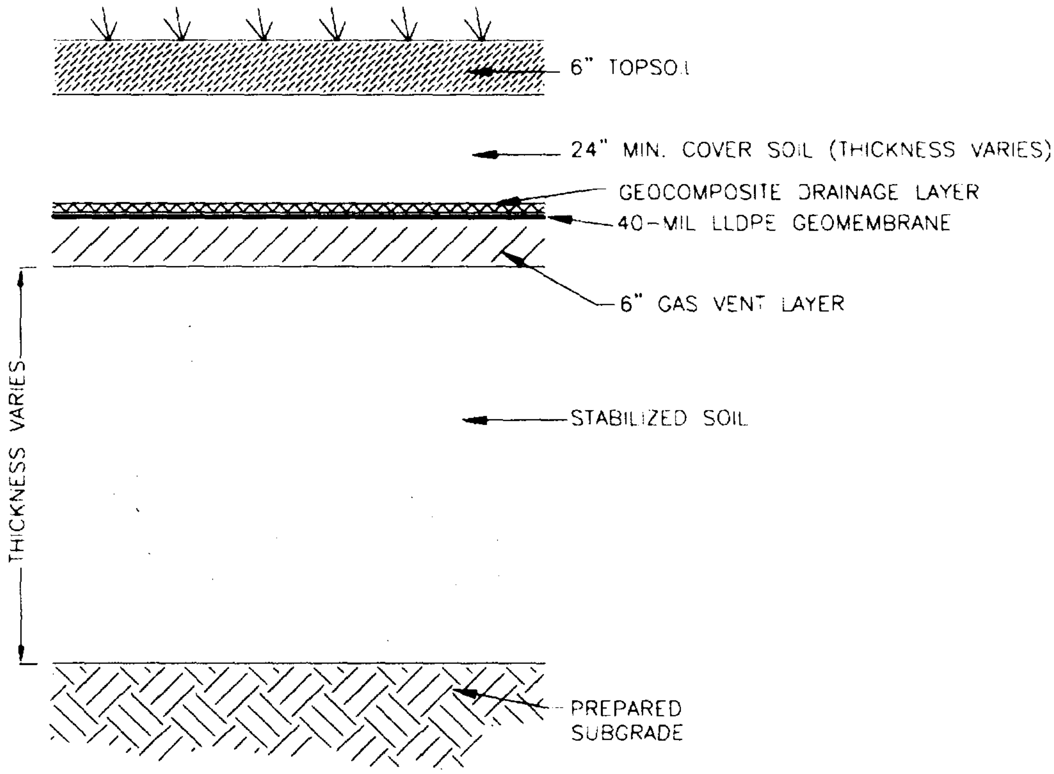



FIGURE L-2
LOW PERMEABILITY
REPRESENTATIVE COVER CROSS SECTION
HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

M&E Metcalf & Eddy

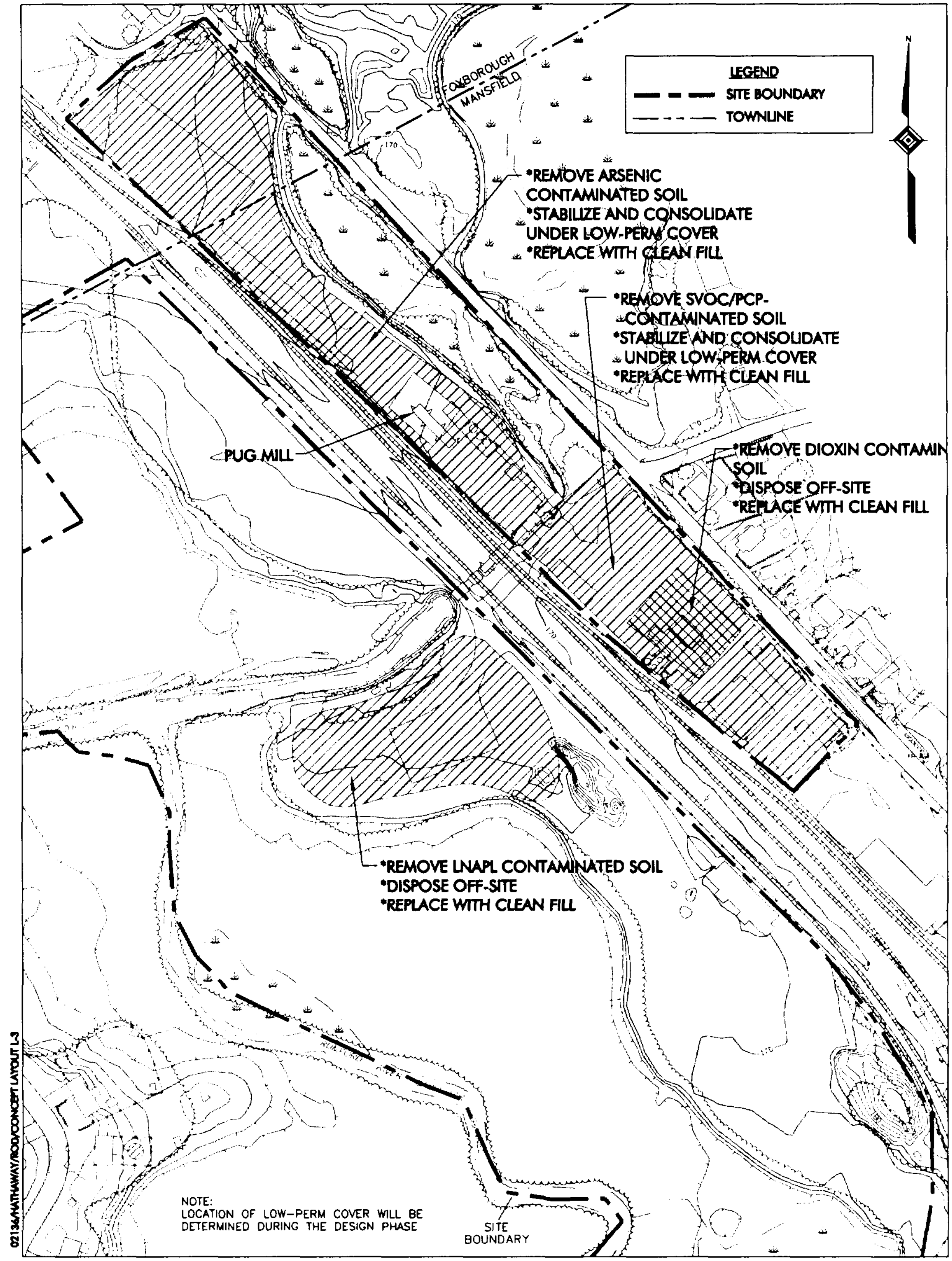
TRC

TRC PROJ. NO. 02136 0490 01X38

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO. 107061

02136/HATHAWAY/ROD/LOW_PERM/L-2




0 75 150 225 300

SCALE IN FEET

FIGURE L-3

CONCEPTUAL LAYOUT: RA-S4

HATHEWAY AND PATTERSON SITE
15 COUNTY ROAD
MANSFIELD, MASSACHUSETTS

M&E Metcalf & Eddy

TRC
Boott Mills South
Foot of John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 02136-0490-01X38

EPA CONTRACT NO.: 68-W6-0042

RAC SUBCONTRACT NO.: 107061

## ATTACHMENT A: PUBLIC HEARING TRANSCRIPT

1 - 22

UNITED STATES OF AMERICA

ENVIRONMENTAL PROTECTION AGENCY

BOSTON REGION

In the Matter of:

PUBLIC HEARING:

RE: HATHEWAY AND PATTERSON SUPERFUND SITE

Mansfield Town Hall
Six Park Row
Mansfield, Massachusetts

Tuesday
July 7, 2005

The above entitled matter came on for hearing, pursuant to Notice at 7:15 p.m.

BEFORE:
PAMELA HARTING-BARRAT, Comm. Involvement Coordinator
DAVE LEDERER, Project Manager

MARY JANE O'DONNELL, Section Chief
KAREN LUMINO, Remedial Project Manager
EPA, Region 1
1 Congress St., Suite 1100
Boston, MA 02114-2023

COPY

# I N D E X

P R O C E E D I N G S

(7:15 p.m.)

MS. HARTING-BARRAT: Good evening. My name is Pamela Harting-Barrat. I'm the Community Involvement Coordinator for the Environmental Protection Agency's Region 1 Boston Office.

I'll be the hearing officer for tonight's hearing on the proposed remedy for the Hatheway and Patterson Superfund Site in Mansfield and Foxboro, Mass.

The purpose of this hearing is to formally accept oral comments on the proposed plan that was released to the public on June 16, 2005.

We will not be responding to comments tonight, but will respond to them in writing after July 18th, which is the close of the comment period.

A public information meeting on the proposed plan was held on June 16, 2005. At that meeting, information concerning the plan was presented and EPA responded to questions about the site.

Now, let me describe the format for the hearing.

First, Dave Lederer, the EPA Project Manager, will give a brief overview of the proposed clean up plan for the site.

Following the presentation, I will accept oral comments for the record. Those of you wishing to comment should have indicated your desire to do so by signing the sign in sheet and acknowledging that you plan to make some comment.

Also available are copies of the plan.

If you have not filled out or signed the sign in sheet and you wish to make a comment, please see David or myself.

I will call on those wishing to make a comment in the order in which you signed up to speak. When called on, please come to the front of the room and use the microphones provided. State your name and address or your affiliation.

We're recording these proceedings verbatim, so we need to get this information for the record.

Please limit your oral comments to 15 minutes. If the extent of your comments will take longer than 15 minutes, I ask that you summarize your major points and provide EPA with a copy of the full text of your comments.

The text, in its entirety, will become a part of the hearing record.

After all the comments have been heard, I will close the formal hearing. If you wish to submit written comments, you can hand them to me tonight, or you can mail them to our Boston office at the address noted on the plan.

At the conclusion of the hearing, please see any of the EPA representatives if you have any questions on how to submit comments.

All oral comments that we receive tonight and the written comments that we receive during the comment period will be addressed in a responsive summary and become part of the administrative record for the site and will be included with the decision on the remedy for the site.

Are there any questions?

We're going to start with a brief overview of the plan and I will turn it over to Dave Lederer.

MR. LEDERER: I'm not going to trip.

Hello, everyone. I guess, before I start, this document here I've got many copies of. This is the proposed plan in written form. It's about 20 pages long. If anyone doesn't have a copy of that, if they want it, there are copies right up here.

I tried to give a quick overview with how we got here to this point tonight so that people have a basis to make their comments tonight.

This is just again, how to comment, a slide that describes the comment period starting on June 17th and ending on July 18th. You can comment tonight in person, or you can send a fax, an e-mail or a letter. But it has to be at least post marked by midnight on July 18th.

And we will respond to all comments. And this is the address of where you can comment. And all of that information again is in the proposed plan that's available up here in the front and everyone should have gotten by mail.

My name's Dave Lederer and the Project Manager for the US EPA. And here is a brief overview of how we got here.

This site has been in the Superfund program for -- in one form or another, for about ten years. We did do an emergency clean up in the 1990's.

And since that time, the site's been listed in our long term clean up program which is -- you see reference to on top of that -- that figure.

This is a map of the site. And the -- the dashed lines shows the boundary roughly of the site.

Again, a map of the site. And that shows the -- the rough extent of the fence line.

You'll hear some reference I might have to the process or operations area. This is the primary area where Hatheway and Patterson did its -- its wood treatment operation. And this back area which they did a bit of work on, but not quite as much.

The line between Foxboro and Mansfield is shown on this figure. And also the railroad tracks that run through the middle of the site. Also, the Rumford River which splits the site into two pieces.

A good deal of wetlands. About almost half of the site is -- consists of wetlands.

Some of the chemicals used on the site included pentachlorophenol, oil and creosote -- creosote dissolved in oil, I should say, and cooper chromium arsenic which was a primary wood treatment chemical towards the end of the operation.

Chemicals concerned, these are the compounds that we feel cause the risk at the site. In soil included pentachlorophenol, dioxin, which is a -- which is a byproduct of pentachlorophenol production, benzo(a)pyrene and arsenic.

And in ground water, similar list, pentachlorophenol, arsenic and chromium.

The extent of the contamination, again, this is very rough, in the soils, these are the soils that presented a risk that EPA found to be unacceptable under our regulations. And the compounds we found in that soil.

The so called oily soils, you'll hear me refer to them as LNAPL's, light non aqueous phase liquids. That just means oil.

And the contaminated ground water, this is the rough extent that we found so far.

You'll note that, in our -- in our -- in our studies, we have not found that the contaminated ground water has crossed the Rumford River to this side here or to this side here.

But, one of the things in our plan is to continue to monitor for that possibility.

These are the reasonably anticipated future uses that we determined in cooperation with the Town of Mansfield and also with this small lot in Foxboro which we primarily relied on the zoning that has been put in place by the Town of Foxboro.

Our human health risk assessment. This is a summary of it. Basically, we divided it into two categories for simplicity. Remedial action was needed for the processary soils, that's the soils that align that primary area next to County Street and also ground water. Remedial action was not needed, protection of human health base.

For soils, on the other side of the railroad tracks, it's the southeast, southwest quadrant. In surface water, the fish.

Similarly, we did an ecological risk assessment. Basically, to sum this all up, very -- very quickly, we did a lot of testing of fish sediment and other wildlife. And we did not find any significant risk attributable to the site.

A primary thing that went into our decision process was Mass DEP's use and value determination. The

State basically sent us a letter and said that they considered the use and value of the aquifer below the site to be low because of the factors that are listed here.

And as a result, the drinking water standards, according to the Commonwealth, do not apply, and that potable drinking water standards are not to be considered.

So, basically, the ground water clean up standards we used in coming up with the plan are based on protection of aquatic life in the Rumford River.

So, those two risk assessments led us to come up with the following clean up goals for soil, which you see listed here. Again, all this information is in the proposed plan. And for ground water.

That basically led to the following map which shows the extent of soil excavation that we feel is necessary in order to meet the clean up goals that are -- I've just shown you.

Basically, most of it is clustered on the production or operations area which is on the County Street side of the railroad tracks.

And this small area -- smaller area down in here is primarily due to the presence of pentachlorophenol and these oily soils, otherwise known as LNAPL soils, down this particular part of the site.

So that's where the soil we're going to excavate is going to come from.

The next part of the analysis was to figure out what to do with the soil after we had dug it up.

Basically, all of the alternatives we looked at that were active alternatives, although we were also required to look at a no action alternative which we did not select.

But, all the active alternatives all included these -- these items. We included demolition to buildings, excavation of the soils, about the clean up levels for the contaminants that were already listed, excavation. We needed a de-watering system with treatment in case we had to get rid of any construction water.

The vernal pool assessment plan and a further look at the vernal pools that are on the site.

Institutional controls needed to be put in place on site ground water use, future site reuse and intensive monitoring of the ground water potential migration. Want to make sure it does not cross the Rumford River in the future.

And furthermore, we need to put land use restrictions potentially on the railroad right of way.

So, we came up with this series of five alternatives.

As I said, we're required by statute to look at a no action alternative. We also looked at a limited action alternative, which included just passing the site off and putting deed restrictions on the property.

And we looked at these three alternatives. One being thermal desorption of the pentachlorophenol which is what PCP stands for.

The preferred remedy, which is S4, wherein we stabilize metals and PCP, probably with some kind of portable cement mixed with some other -- other stabilization agents.

And Number 5 was an alternative where we shipped all the soils that were listed before, about 31,000 cubic yards, in case I did not mention that, off of the site to an off site disposal area.

The ground water alternatives included these; no action and a limited action.

The limited action includes institutional controls to prevent the use of ground water on site and the monitoring in the future to make sure that plume does not impact off site properties.

So, again, we looked at these alternatives. And the alternatives that are marked in pink on this figure here are the ones that we are proposing selecting.

You can see on the bottom line here the projected costs of each of the alternatives.

The ground water alternatives are listed on the right and the five soil alternatives on the left.

It's not the projected cost slide.

This shows you some of the areas again that will be impacted by the construction. I've shown two potential areas where, in the arsenic laden soils, which would primarily come from this area of the site, and is part of the site over here, will be stabilized and put under a cover which will be placed.

We've got two areas that we've guessed that they -- that it might fit. One area being here, one area being there.

We're interested in working with the Town. We don't have a particular spot. We think it's probably -- makes the most sense to put it on that side of the tracks. But, again, the Town owns the land. And we're very willing to work with the Town as far as where that facility might be placed.

This gives you an idea of what the -- the cover will look like in side view. The stabilized soil will be placed on the subgrade.

There'll be a gas vent layer, a geomembrane made out of plastic, about 40 mils thick. That's -- That's fairly thick. Much thicker than -- than your garden variety garbage bag. That would be probably ten times as thick, something like that. No. Actually more than that.

A garbage bag's around 1 mil. This is about 40 times thicker than what we see in the store.

On top of that would go a geocomposite drainage layer, some cover soil and six inches of topsoil, then there'll be grass.

Again, how the exact configuration of this is open for interpretation in the design.

The recommended alternative is -- the projected cost is shown here which is approximately 12.1 million. And that includes 30 years of operation and maintenance costs.

So, the tentative schedule for moving forward is for public comment period, which we're in right now, ends on July 18th. During August or September, we anticipate signing a record of decision.

And during 2006, we'll be looking at getting the design going. And we are hoping to demolish the remaining Hatheway and Patterson buildings during 2006.

And as far as projecting a schedule beyond that, it's really going to depend on funding. Right now, we do not have any responsible parties on this site.

And at this point, we'll be looking to the -- the Superfund, the Federal Superfund to come up with the funds needed to clean up the site, the projected 12.1 million.

And I believe that's the end of my presentation.

MS. HARTING-BARRAT: Thanks for the summary, Dave.

We'll now begin the formal hearing. The first speaker John or -- or Lou? You may want to spell your name.

MR. AMORUSO: Thank you.

My name is Louis, L-O-U-I-S, Amoruso, A-M-O-R-U-S-O. I am a Selectman here in the town of Mansfield. But, I'm speaking as a resident here. John will be presenting the Board's point of view.

First of all, let me say that, I think, that the crew of people here from EPA that have worked on this project have been extremely cooperative, worked very hard on it and there is nothing I have to say that -- to even suggest slightly that there is anything that they have done that I -- that is wrong or hasn't been working with the Town to help us out.

I think, everything has been very positive in that matter.

There are a couple of items that I'm concerned about in the planned clean up. And I'm going to just summarize them. I've given a written explanation.

But, the issues I have are particularly with the side on the far side of the railroad tracks, not on the County Street side, but the opposite side of the tracks, where we hope one day we may be able to put some business commercial operations in there.

I'm concerned, number one, about the membrane, how low it is below the ground level. Obviously, we'd be expecting that buildings going in there would have a slab type of basement or cellar or support.

However, it seems to me that the distance down of that membrane is not sufficient to avoid breaking it if a business were to be built on top of it, a building were to be built on top of it. So, I'm concerned about that part.

I'm also concerned about the encapsulation of the treated soils. I presume, the concrete, if it gets wet to protect and keep the materials encapsulated would then harden and solidify which would consider -- considerably form a very large block underneath the ground.

Again, I'd be concerned about the ability to put commercial or industrial buildings on top of that.

Those are my concerns particularly.

And my last question or suggestion is, one of looking at the Rumford River. Rather than just simply monitoring, I don't know how expensive that is relative to this other proposal.

But, perhaps, enclosing that Rumford River going through the site so that we're certain that the waters in the ground do not meet the waters in the river might be an option I didn't hear about. So, I'm concerned about that.

And those are my primary issues.

And I again thank you for -- for your work, because I know that you put a lot of time and effort into it. And I -- I much appreciate it. You've been very, very helpful.

Thank you.

MS. HARTING-BARRAT: Thank you.

Mr. D'Agostino?

MR. D'AGOSTINO: Thank you very much. I appreciate the opportunity to comment.

We likewise would like to echo Selectman Amoruso's comments in relationship to the effort that has been placed on this particular project by Mr. Lederer, the EPA, the regional office, the--

MR. LEDERER: And you're supposed to give your name and--

MR. D'AGOSTINO: Oh, I'm sorry. John D'Agostino, D-apostrophe-A-G-O-S-T-I-N-O. I am the Town Manager here in the town of Mansfield. My address would be 6 Park Row, Mansfield, Mass, which is Town Hall.

I don't live here, but I appear from time to time as though, I spend so much time here, I might as well live here.

But, in any regard, I'll restate my comments.

I would like to first thank EPA regional office for their efforts in working with the Town in partnership and various staff members to reach a conclusion or a reasonably anticipated reuse option which we believe to be commercial and open space which -- which ever is of the higher standard of clean up.

Now, my concern is, and the Town's concern is that the storage of this material in -- whether it's encapsulated or kept on site, will limit our ability to reuse the entire site.

That being the case, we would then ask that EPA look at alternatives to storing that on site that would not limit our ability to reuse this site fully in its commercial state.

If we decide to put buildings on the site, we certainly want the ability to make sure that we place those buildings where we find that to be most conducive for maximizing our tax dollars in return.

The property has been dormant for many years. There has not been an opportunity to reuse the site.

We do require clean up, as you have indicated. And consequently, in your presentation, we are anxious to get these properties back on the tax rolls as soon as possible so that we could realize some sort of a revenue stream from the Town's perspective.

We want to make sure that that's done in the plan process. You alluded to the fact in your earlier presentation that you're going to allow that to happen by working with the Town and as to the actual placement of the storage area, for lack of better terminology.

I -- I hope that we have the opportunity to do that firsthand.

But, also more importantly that, whatever option we choose, and it seems as though, for the record, it's going to be RA-S4 which is the preferred alternative. Based on our reasonable reuse options, we want to make sure that where and when that storage occurs of material on site that it is done in a manner that is sensitive to the environment, but at the same time, does not limit our ability as a Town to be able to use that either as open space or commercial reuse, which ever is of the higher standard of clean up.

Thank you.

MS. HARTING-BARRAT: Thank you.

Is there someone else who would like to make a public comment?

Would you please state your name please for the record when you come up?

MR. BRITT: Hi. Good evening. My name is Joseph Britt, B-R-I-T-T. I live at 12 County Street.

First, I want to tell you, I appreciate the plan the guys you put together and taking it from beginning to end, it's kind of informative. It kind of addresses people from whether or not you're someone like me who has no idea or someone being an engineer or what have you.

With respect to the Town's position that they want to reuse the land, of course, the biggest thing for the residents down there is to get it cleaned up.

The strongest proposal that I see that you have there going is to excavate, tear buildings down. And try to get it so it doesn't become a problem again.

Things look good on paper, but putting it into action and seeing it in action, who's going to oversee it is -- is really concerns that we have.

We've got a pile of excavated soil there now that's been there probably well over a year.

But, it's not a total complaint. Because I'm happy that it's a continuous project that's going on to try to -- to try to get to the problem.

But, nonetheless, you put one thing on paper. And then, the next thing you see is that it doesn't always go that way.

So, we'd be really concerned about who's going to take on the project and who's going to see it through and making sure that -- that it goes the way that it's planned out to be.

I don't know what the -- the -- tearing down the buildings what -- what those -- what that may cause or -- or what kind of effect that may have. We don't -- I don't really know what's inside the buildings.

I know some of the buildings have been put to some type of use. But, I don't know what -- what's inside the buildings.

So, we'd be a little concerned about anything getting -- getting in through the air.

And, of course, every -- a lot of trucks and so forth coming in and trying to get out of there, we'd be concerned about the type of -- which way they're going to go in the yard and come out of the yard. Traffic impacts, children down in the area, those types of concerns.

But, I will take the opportunity to put some things in writing.

One of the things you get, when you get a pamphlet like this here, and the author or authors, they start to go and they start to refer to FBOC and PCP's. And you find yourself flipping back and forth through this trying to make sense of what it was.

But, overall, I -- I got the gist of it.

So, thanks.

MS. HARTING-BARRAT: Thank you very much.

Is there anyone else who would like to make a statement?

Seeing none, I want to thank you for your participating this evening. Remember that the public comment period for making written comments closes on July 18th.

And the hearing is now officially closed. Thank you so much.

(Whereupon, at 7:41 p.m., the hearing was concluded.)

CERTIFICATE OF REPORTER AND TRANSCRIBER

This is to certify that the attached proceedings in the Matter of:

RE: HATHEWAY AND PATTERSON SUPERFUND SITE

Place: Mansfield, Massachusetts

Date: July 7, 2005

were held as herein appears, and that this is the true, accurate and complete transcript prepared from the notes and/or recordings taken of the above entitled proceeding.

| | |
|---|---|
| Maryann Rossi<br>Reporter | 07/07/2005<br>Date |
| Maryann Rossi<br>Transcriber | 07/07/2005<br>Date |

## ATTACHMENT B: WRITTEN COMMENTS RECEIVED DURING COMMENT PERIOD

The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health
Center for Environmental Health
Environmental Toxicology Program
250 Washington Street, Boston, MA 02108-4619



July 18, 2005

David Lederer
Remedial Project Manager
U.S. Environmental Protection Agency
One Congress Street, Suite 1100 (HBO)
Boston, MA 02114-2023

Dear Mr. Lederer,

Thank you for the opportunity to comment on the U.S. Environmental Protection Agency's (EPA) proposed cleanup plan for the Hatheway and Patterson superfund site. Massachusetts Department of Public Health, Center for Environmental Health (MDPH/CEH) has some concerns about the proposed cleanup plan, specifically, concerns about the groundwater proposal, concerns about the proposed soil removal depths, and concerns about the implications these proposals have in terms of fish contamination. As you are likely aware, MDPH/CEH and the federal Agency for Toxic Substances and Disease Registry (ATSDR) have previously released a public comment draft Public Health Assessment (PHA) and will soon be finalizing this PHA. This document draws a number of conclusions, makes recommendations and identifies public health activities that are needed to address concerns at this site. Unfortunately, EPA's latest remedial plan does not fully address health and exposure concerns at this site.

EPA's groundwater proposal includes institutional controls (i.e., no clean-up action, just continued monitoring). EPA has characterized the groundwater flow and believes there is no evidence that the plume has left the site boundary, and EPA will continue to monitor the plume to make sure it doesn't leave the site, which will prevent uptake by off-site private wells. Once the potential for groundwater contamination reaching the residential neighborhood adjacent to the site has been adequately characterized through detailed monitoring, MDPH/CEH's concerns about private wells and possible basement seepage from flooding can be better addressed. However, the Rumford River is within the site boundaries and EPA's proposal does not adequately address our concerns with respect to groundwater discharge into the Rumford River. Also, EPA's soil excavation may not be deep enough, particularly in the areas near the site buildings where dioxin contamination was present (e.g., subsurface contamination from soil could still contaminate groundwater, and potentially leach into the River). Overall, MDPH/CEH is concerned that under this proposal, contaminated groundwater will still be able to periodically reach the Rumford River and contaminate sediment and fish. This poses health concerns with regards to human fish consumption. Therefore, MDPH intends to keep the public health fish consumption advisory in place for the Rumford River until these concerns are more fully addressed. The public health fish consumption advisory currently in place was developed in collaboration with EPA as well as other state agencies, and is the subject of two prior ATSDR Public Health Consultations with specific recommendations. MDPH recommends continued monitoring of sediment and fish from the Rumford River until it is confirmed that contamination from the site no longer reaches the River from groundwater.

If you have any questions, please feel free to contact us at (617) 624 – 5757.

Sincerely,

Elaine T. Krueger, Director
Environmental Toxicology Program
Center for Environmental Health
Massachusetts Department of Public Health

CC: Suzanne K. Condon, Associate Commissioner, Center for Environmental Health
Martha J. Steele, Deputy Director, Center for Environmental Health
William Sweet, Agency for Toxic Substances and Disease Registry, Region 1
Scott Leite, Agent, Mansfield Board of Health
Millie Garcia-Surette, DEP, Southeast Regional Office
Mark Tisa, MA Division of Fisheries and Wildlife

Hatheway Patterson plant

I want to first applaud the author of the informational packet on Proposed Plan for Hatheway Patterson Superfund site June 2005. I found it informative. I tink the best plan of action is to excavate,replenish treat and monitor as needed.

The default of the company placed residents, and government with an avalanche of burdens, the residents who thought the state would protect them learned that the water was being contaminated and the laws allowed for the company to bail without seizing cash for the damage done. Now the only thing to save the state and the town and the residents is the land. The fallout of contamination has affected our property values our quality of life our vegetation and plant life and wildlife and perhaps our children's health. I can not concern myself with the intention of the town to reap money from the cleaned-up property and they may well be entitled to it. My concern is, we as residents have done all we can. We have spent moeny on our lands to rid the soil of the contaminants to remove the unknown fungus from the rock surface, to establish substantial lawns and plant life.

At one of the public meeting on discussion of improvements in this area a resident commented that "How many people live there anyway just take it over by imminent domain and take their home's" I assure you if this was a tree line landscaped portion of the town you would not hear such mindless talk. No one should be able to put a price on hard labor, love for your town, and your stake in the neighborhood . When you find a place to root you should not be uprooted because it is convenient, I assert that this comment is fueled by the plight of the Hatheway Patterson plant.

We have done all we can we have knocked on all the doors we have trumpeted loud and clear and we now sit at your door step waiting for you to invite us in. To invite us in for a chance to redeem our "stake in the neighborhood" to allow us to shine as the rest of the town and to remove the stigma that we have less value than other areas. We work well with business and residents but residential housing rarely affects business but business always affects housing and quality of life.

I urge any member of the Superfund to think of this project as not only doable but most likely to have the greatest benefit and a successful cleanup. I do not see this as a long life commitment. Once the clean-up has been done this will result in a monitoring process and spot check. The Town of Mansfield and the state can seek further maintenance of the problem from the proposed business. There may be a more dire clean-up site somewhere else in the United States but is there a site where the remedy is so visible and possibly short term.

I urge you to open the door and let us in, help us stand up again to make this area a place where people and business want to come, indeed can not wait to come and do good things.

Thank you
Joseph C. Britt
12 County St.
Mansfield Mass. 02048

7-15-05

Joseph C. Britt

TOWN OF MANSFIELD, MASSACHUSETTS
Six Park Row, Mansfield, MA 02048


July 18, 2005

Mr. Dave Lederer
EPA – New England, Region 1
One Congress Street
Suite 1100
Boston, MA 02114-2023

RE: Proposed Cleanup Plan, Hatheway-Patterson Superfund Site, Mansfield MA

Dear Mr. Lederer:

On behalf of the Mansfield Planning Board, I would like to take this opportunity to comment on the Environmental Protection Agency's proposed cleanup plan for the Hatheway-Patterson Superfund site.

I would like to thank the EPA and its staff for being so actively involved with the Town of Mansfield in analyzing, evaluating and developing cleanup options for the Hatheway-Patterson site. The extensive contact among EPA staff, town staff and Mansfield residents has been exemplary. The information that has been generated has been presented in a format and manner that has been easily understood and beneficial to those involved in the process.

The remedial action objectives and preliminary remediation goals as articulated in the study as a method to prevent further contamination and to reduce unacceptable levels of risk from site contaminants should be fully supported by the town.

We appreciate your taking the town's concerns on future reuse of the site as the cornerstone throughout the process and including our future reuse expectations in your plan.

With regard to the cleanup alternatives proposed for the Hatheway-Patterson site, of the five, only RA-S4 and RA-S5 appear to meet most of the town's site cleanup and reuse goals.

However, I would prefer that the entire site be cleaned up in accordance with remedial alternative RA-S5, although the cost of cleanup is considerably more and the length of time is uncertain. Although storing some of the material on the site in accordance with RA-S4 would, as I understand it, prevent further onsite contamination and reduce or eliminate offsite impacts, thus achieving most of the study's cleanup goals, I remain concerned about the affect of permanent onsite storage of polluted materials from a site reuse perspective. I am concerned that landfilling materials onsite will result in a dimunition of value to the property overall and may be a disincentive for future reuse.

At this time, I would like the EPA to further evaluate the removal of all materials from the site, even if this requires a phased clean-up over an undetermined timeframe.

Thank you for allowing me the opportunity to comment on this reuse plan. I would like to repeat my appreciation for the efforts of EPA staff in working with the town and residents on the Hatheway-Patterson Superfund site cleanup.

Sincerely,

Shaun P. Burke jd

Shaun P. Burke, AICP
Director of Planning and Development

cc: Mansfield Board of Selectmen
Mansfield Planning Board
Hatheway-Patterson Redevelopment Committee
John O. D'Agostino, Town Manager

SPB/jd

amec

July 13, 2005

Mr. Dave Lederer
United States Environmental Protection Agency
1 Congress Street, Suite 1100 (HBO)
Boston, Massachusetts 02114

**RE: Comment Letter on Proposed Cleanup Plan**
**Hatheway & Patterson Superfund Site**
**Mansfield, MA**

Dear Mr. Lederer:

On behalf of CSX Transportation, Inc. (CSXT), AMEC Earth & Environmental, Inc. (AMEC) has prepared this comment letter regarding the proposed United States Environmental Protection Agency (USEPA) Cleanup Plan for the Hatheway & Patterson Superfund Site in Mansfield, Massachusetts (Site). CSXT retained AMEC to review the proposed USEPA cleanup plan and attend the public meetings. As a result of the review, AMEC generally agrees with proposed remedial alternatives chosen. However, it is respectfully requested that the following suggestions of alternative risk assessment measures be evaluated as part of the remedial alternative in support of the most cost efficient and effective remediation of the Site.

The two risk assessment tools outlined herein may help to limit the volume of physical remediation necessary, thereby reducing total costs while still achieving the same risk assessment goals utilizing area-averaging techniques.

**Iterative Approach to Identifying Soil Samples Requiring Remediation**

A Clean-Up Goal (CUG) represents an exposure point concentration (EPC) to which a receptor may be exposed in a particular area that will result in a target, or acceptable, health risk. The actual EPC in the area must be equal to or less than the CUG in order to achieve the target risk. If the actual EPC exceeds the CUG, then remediation techniques may be used to reduce the EPC to equal the CUG. The EPC is typically calculated as the mean (or upper bound estimate of the mean, such as the 95% confidence limit) of concentrations measured at sample locations in an area. Because the EPC is the mean concentration in a receptor's exposure area, some measured concentrations will be lower than the EPC and some measured concentrations will be higher than the EPC. The goal of remediation is to achieve a mean concentration (or 95% of the upper confidence limit) in the exposure area that equals the CUG. This means that some post-remediation concentrations will be lower than the CUG and some post-remediation concentrations will be higher than the CUG.

AMEC Earth & Environmental, Inc.
239 Littleton Road, Suite 1B
Westford, MA 01886 USA
Tel (978) 692-9090
Fax (978) 692-6633

An effective means of identifying sample locations that require remediation to achieve a CUG is to conduct a Pick-Up Level (PUL) evaluation. The PUL refers to the highest individual sample concentration that can remain in an exposure area in order to achieve an EPC in the exposure area that equals the CUG. All concentrations above the PUL would be "picked up," and concentrations less than the PUL would remain. Sample locations with concentrations that need to be "picked up" to achieve an EPC that is equal to or less than the CUG are identified using an iterative approach in which the highest concentration in the exposure area is assumed to be remediated, and the EPC is re-calculated using the remaining (lower) concentrations and then compared again to the CUG.

First, the measured concentrations of a constituent in the area are ranked in descending order. If the existing EPC exceeds the CUG, the highest concentration in the area is assumed to be remediated and is removed from the calculation of the EPC. The EPC is then recalculated using the remaining concentrations (all measured concentrations except the highest concentration). The recalculated EPC is compared to the CUG. If the recalculated EPC remains higher than the CUG, then the process of "picking up" the highest concentration and recalculating the EPC is repeated. If the recalculated EPC is equal to or less than the CUG, then the highest remaining concentration is referred to as the PUL, and concentrations exceeding the PUL are targeted for remediation. The process is repeated until the remaining EPC no longer exceeds the CUG.

Utilizing this risk assessment method, potentially reduces the quantity of soil remediation, while still maintaining the same risk assessment and cleanup goals. Spatial analysis, utilizing geostatistical methods, should also be considered when calculating soil volumes for remediation.

**Geostatistical Methods for Estimating Exposure Point Concentrations**

Traditional risk assessment approaches estimate Exposure Point Concentrations (EPCs) in exposure areas assuming that each sample point has equal "weight" in the calculation of the average concentration in the area. This assumption means that each sample point is assumed to "cover" or represent an area of equal size. Because of focused sampling that typically occurs at CERCLA sites, more samples are typically collected from areas suspected of having elevated concentrations. As a result, the mean of these sample results is typically biased or skewed high because more samples were collected from affected areas than unaffected areas, even though the unaffected areas may comprise a larger portion of the site.

Geostatistical techniques can be used to account for the fraction of the site represented by each sample point, providing a more accurate estimate of actual mean (or upper bound) concentrations. For example, the surface area "covered" by each sample location is computed by dividing the site into polygons. Each polygon contains one sample location. Polygon boundaries are determined such that all points within the polygon are closer to the polygon's sample location than another polygon's sample location. The concentrations in that polygon's sample are assumed to represent all soil within that polygon. An area-weighted average concentration (or upper bound concentration) can then be estimated, using the sample concentrations in each polygon and the surface area of each polygon.

This technique can more accurately represent average conditions over an area because each sample concentration is assigned a weight determined by the fraction of the site covered by that concentration. Samples that are close together represent only a small fraction of the site, and therefore have less "weight" in the calculation of the average. Samples that are distant from all surrounding samples represent a large surface area of the site, and therefore have more "weight" in calculating the average concentration. This is an important consideration at CERCLA sites, where areas suspected of having higher concentrations are sampled with higher density than other areas. As a result, the samples that "cover" the largest fractions of the site have the lowest concentrations. Accounting for the fraction of the site represented by each sample can, therefore, yield EPCs that are more representative of actual conditions at the site than those calculated using traditional techniques that assume equal weight for each sample.

If remediation is determined to be necessary in a particular area, previously established polygons, each representing a sample location, can be used to define the volume of soil requiring remediation. Once samples requiring remediation have been identified, the polygons associated with these samples can be used to define the limits of remediation.

Thank you for your consideration of these suggestions towards the remediation of the Hatheway & Patterson Superfund Site. Please contact either of the undersigned at 978-692-9090 if you have any questions regarding these comments.

Sincerely,
AMEC Earth & Environmental Inc.

Rebecca L. Woolley, LSP
Project Manager

Samuel P. Farnsworth, LSP
Senior Manager, NE/NY

cc: M. Adkins, CSX Transportation, Inc.
T. Anderson, CSX Transportation, Inc.

ellenmcgowan@comcast.net
07/18/2005 03:13 PM

To Dave Lederer/R1/USEPA/US@EPA
cc
bcc
Subject Mansfield's Hatheway and Patterson Site

Good Afternoon,
I hear you are accepting ideas for this site in Mansfield. A community center is needed in this community. We don't need more apartment buildings. As this town was just voted one of the top 100 communities in the USA don't you think a community center would prove successful? I do!
Thanks for your time!
Ellen McGowan

bryantrose@comcast.net
07/16/2005 07:12 AM

To Dave Lederer/R1/USEPA/US@EPA
cc
bcc
Subject Mansfield's Hatheway & Patterson

Good morning,

ANother thought....movie hall OR bowling alley.

Rose Bryant

bryantrose@comcast.net
07/14/2005 07:49 AM

To Dave Lederer/R1/USEPA/US@EPA
cc
bcc
Subject Mansfield's Hatheway & Patterson

Good morning,

Glad the site is being cleaned...It's been a sore spot for many years.

In terms of redeveloping the site, instead of apartments, businesses etc what about a community center. A hugh building that would host a gym, a theather for MMAS, classes for kids/moms, a place for teenagers to go and "hang". A pool for seniors to swim for theraphy. The town doesn't need another apartment complex...we NEED a place for the majority of our population...KIDS...to hang.

There was a survey done after 9/11 and the results were resounding...a safe place for kids to hang. That's what this time needs...please reconsider the apartment/building complex.

Sincerely,

Rose Bryant

Mmasmember@aol.com
07/18/2005 08:54 AM

To Dave Lederer/R1/USEPA/US@EPA
cc
bcc
Subject Mansfield's Hatheway & Patterson

Hello from Ken Butler General Manager & Founder of the Mansfield Music & Arts Society (MMAS Inc.)

Founded in 1993 we have been working hard to bring cultural events and education to our community. Our membership is getting stronger and we are triing to find a site for the society to build a regional arts center. I have been asking the town to give us property to build upon.

MMAS is a 501 c 3 tax-exempt org. the Hatheway & Patterson site could be a great location. HOw could MMAS find out more?

Ken

## APPENDIX A: DEP CONCURRENCE LETTER

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ONE WINTER STREET, BOSTON, MA 02108 617-292-5500

MITT ROMNEY
Governor

KERRY HEALEY
Lieutenant Governor

STEPHEN R. PRITCHARD
Secretary

ROBERT W. GOLLEDGE, Jr.
Commissioner

September 29, 2005

Ms. Susan Studlien
Office of Site Remediation and Restoration
U.S. Environmental Protection Agency, Region 1
One Congress Street, Suite 1100
Boston, MA 02114-2023

Re: State Concurrence Determination
Record of Decision - Hatheway and Patterson Superfund Site
Mansfield, Massachusetts

Dear Ms. Studlien:

The Department of Environmental Protection (the Department) has reviewed the Record of Decision (ROD) and the selected remedy recommended by the U.S. Environmental Protection Agency (EPA) for the Hatheway and Patterson Superfund Site. For the reasons described below, the Department concurs with the recommended remedy for the Site.

A Baseline Ecological Risk Assessment (BERA) was performed to evaluate risks posed by contaminants from the site to the Rumford River. The Rumford River upstream of the site does not represent a pristine environment. Other sources of contamination have resulted in the release of pollutants to this stretch of river, and the BERA separated risks derived from past activities at the site from those associated with upstream activities. The BERA concluded that the Rumford River was unlikely to be at a substantial risk from exposure to site-related contaminants.

A Baseline Human Health Risk Assessment (HHRA) was also conducted to evaluate human health risks posed by exposure to hazardous substances in soil and groundwater at the Hatheway and Patterson Superfund Site. The HHRA revealed that current conditions at the site present unacceptable risks to human health, thus requiring implementation of remedial actions to mitigate those risks.

The remedy set forth in the ROD addresses principal threats from soil exposure and potential releases of contaminants from soil to other media such as groundwater and surface water. Soil containing arsenic and pentachlorophenol (PCP) will be addressed through treatment by stabilization and on-site consolidation under an impermeable cap; soil above cleanup levels for light non-aqueous phase liquids (LNAPL) and dioxin will be disposed of off-site. Appropriate institutional controls will be determined and developed during Remedial Design to prevent long term exposures to contaminants that will remain in groundwater and soils. The remedial measures will prevent exposure to receptors from soils and groundwater at the site in accordance with the Remedial Action Objectives (RAOs) as described in the ROD, and will allow future redevelopment to proceed in a protective manner.

The selected remedy for this site is a comprehensive approach that addresses all current and potential future exposures and subsequent risks caused by soil and groundwater contamination. The plan is based on a future use scenario of commercial/open space for the Mansfield portion of the Site and a smaller area for residential use in Foxborough. The plan also assumes that groundwater at the Site is not available for drinking water by future users of the Site, therefore no active cleanup measures are planned for groundwater under the Site. Institutional controls should be identified, designed and/or implemented, as appropriate, in order to ensure the future use scenario upon which the remedy is based.

As noted in the Department's comments to EPA on the ROD and in discussions with EPA staff, details on the long-term operation and maintenance needs to protect the remedy and demonstrate its effectiveness will be developed during the Remedial Design phase, along with the identification and development of appropriate institutional controls.

Based on the foregoing, the Department concurs with the EPA's selection of the remedy.

If you have any questions regarding this letter, please contact Mr. Scott Sayers, Project Manager at (508) 946-2780 or Mr. Jay Naparstek, Deputy Division Director at (617) 292-5697.

Very truly yours,

Robert W. Golledge, Jr.
Commissioner
Department of Environmental Protection

Copies to:

File RTN 4-0571
Jay Naparstek, MADEP Boston
Scott Sayers, MADEP SERO
Dave Lederer, USEPA

## APPENDIX B: REFERENCES

**REFERENCES**


| |
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# APPENDIX C: GLOSSARY OF TERMS AND ACRONYMS

| GLOSSARY OF TERMS AND ACRONYMS | |
|---|---|
| ARAR | Applicable, Relevant or Appropriate Requirements |
| AST | Aboveground Storage Tanks |
| AVS | Acid Volatile Sulfides |
| AWQC | Ambient Water Quality Criteria |
| BERA | Baseline Ecological Risk Assessment |
| CBR | Critical Body Residue |
| CCA | Chromated Copper-Arsenate |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act |
| CERCLIS | Comprehensive Environmental Response, Compensation and Liability Information System |
| COC | Contaminant Of Concern |
| COPC | Chemical of Potential Concern |
| CSF | Cancer Slope Factor |
| CSM | Conceptual Site Model |
| CTE | Central Tendency Exposure |
| D&F | Dioxins and Furans |
| DL | Detection Limit |
| DNAPL | Dense Non Aqueous Phase Liquid |
| EDI | Estimated Daily Intake |
| EPA | United States Environmental Protection Agency |
| Eq-P | Equilibrium Partitioning |
| EPRB | Emergency Planning and Response Branch |
| ER-L | Effects Range - Low |
| ER-M | Effects Range - Median |
| ESI | Expanded Site Inspection |
| ET | Ecotox Threshold |
| EU | Exposure Unit |
| FCAP | Fluoro-chomre-arsenate-phenol |
| FS | Feasibility Study |
| FSP | Field Sampling Plan |
| HI | Hazard Index |
| HPC | Hatheway & Patterson Company |
| HQ | Hazard Quotient |
| HRS | Hazard Ranking System |
| kg | Kilogram |
| L | Liter |
| LCV | Lowest Chronic Value |
| LEL | Lowest Effect Level |
| LNAPL | Light Non Aqueous Phase Liquid |
| m | meter |
| MADEP | Massachusetts Department Of Environmental Protection |
| MADEQ | Massachusetts Department of Environmental Quality |

| | |
|---|---|
| MDPH | Massachusetts Department of Public Health |
| mg | Milligram |
| MM | Management of Migration |
| NAWQC | National Ambient Water Quality Criteria |
| NCP | National Contingency Plan |
| NOR | Notice of Responsibility |
| NPL | National Priorities List |
| O&M | Operation and Maintenance |
| OSRR | Office of Site Remediation and Restoration |
| OSWER | Office of Solid Waste and Emergency Response |
| PAH | Polycyclic Aromatic Hydrocarbon |
| PAC | Powdered Activated Carbon |
| PA/SI | Preliminary Assessment/Site Investigation |
| PCP | Pentachlorophenol |
| PE | Performance Evaluation |
| ppb | Parts Per Billion |
| ppm | Parts Per Million |
| ppt | Parts Per Trillion |
| PRG | Preliminary Remediation Goal |
| QAPP | Quality Assurance Project Plan |
| RAC | Remedial Action Contract |
| RAFU | Reasonably Anticipated Future Use |
| RAG | Remedial Action Guidelines |
| RAO | Response Action Objective |
| RfC | Reference Concentration |
| RfD | Reference Dose |
| RI | Remedial Investigation |
| RME | Reasonable Maximum Exposure |
| ROD | Record of Decision |
| SARA | Superfund Amendments and Reauthorization Act |
| SCV | Secondary Chronic Value |
| SEL | Severe Effect Level |
| SEM | Simultaneously Extracted Metal |
| SIP | Site Inspection Prioritization |
| SLERA | Screening-Level Ecological Risk Assessment |
| SPLP | Synthetic Precipitation Leaching Procedure |
| SVOC | Semivolatile Organic Compound |
| TAL | Target Analyte List |
| TCL | Target Compound List |
| TCLP | Toxic Characteristic Leaching Procedure |
| TEF | Toxic Equivalency Factors |
| TEL | Threshold Effects Level |
| TRC | TRC Environmental Corporation |

| | |
|---|---|
| TRV | Toxicity Reference Value |
| UCL | Upper Confidence Limit |
| ug (or $\mu$g) | Micrograms |
| UST | Underground Storage Tanks |
| VOC | Volatile Organic Compound |

# APPENDIX D: ARARS TABLES

| Chemical Specific ARARs | | | | | |
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| **Alternative** | **Media/ Authority** | **Requirements** | **Status** | **Requirement Synopsis** | **Action to Attain ARAR** |
| | **All Media** | | | | |
| Applies to all alternatives* | Federal Criteria, Advisories, and Guidance | American Conference of Governmental Industrial Hygienists Threshold Limit Values (TLVs) | To Be Considered | Health-based guidelines for exposure limit represented in terms of exposure over a workday (8 hours) or a work week (40 hours). These standards were issued as consensus standards for controlling air quality in work place environments. | TLVs will be used for assessing site inhalation risks for site remediation workers. |
| Applies to all alternatives* | | EPA Risk Reference Dose (RfDs) and EPA Carcinogen Assessment Group Potency Factors | To Be Considered | Reference dose is an estimate of a daily oral exposure to human populations that is likely to be without an appreciable risk of non-cancer effects. The Cancer Group Potency Factors are used as qualitative weight-of-evidence judgment as to the likelihood of a chemical being a carcinogen. | Risks due to carcinogens and noncarcinogens with EPA RfDs and carcinogens with Cancer Potency Factors were used to develop target cleanup levels and evaluate remedial alternatives. |
| Applies to all alternatives* | | EPA Carcinogenicity Slope Factors | To Be Considered | Slope factors are developed by EPA from health effects assessments. Carcinogenic effects present the most up-to-date information on cancer risk. | Risks due to carcinogens as assessed with slope factors were used to develop target cleanup levels and evaluate remedial alternatives. |
| Applies to all alternatives* | | OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils | To Be Considered | This draft guidance establishes a methodology for assessing indoor air risks to human health. | Risks associated with future residential exposure to indoor air were evaluated consistent with this guidance. |
| Applies to RA-S3, RA-S4 and RA-S5 | | US EPA Guidance: Approach for Addressing Dioxin in Soil at CERCLA and RCRA Sites | To Be Considered | Recommends PRG's or points of departure for cleanup levels for dioxin in soils and sediments at CERCLA sites. Recommended cleanup levels are based on direct exposure pathway. | This guidance was used in setting cleanup levels for dioxin-contaminated soils. |

| Chemical Specific ARARs | | | | | |
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| **Alternative** | **Media/ Authority** | **Requirements** | **Status** | **Requirement Synopsis** | **Action to Attain ARAR** |
| Applies to all alternatives* | Other guidance | Ontario Ministry of Environment and Energy (OMEE) Lowest and Severe Effect Levels (LELs and SELs) for Freshwater Sediments (Persaud et al. 1993) | To be considered | The LEL value is the concentration at which the majority of the sediment-dwelling organisms are not affected. | The LEL value was used for selecting Chemicals of Potential Concern and for characterizing ecological effects for all alternatives and to assist in setting soil/sediment cleanup levels. |

*Because alternatives RA-S1 and RA G1 do not require any action to be taken, this requirement is used to assist in determining a baseline risk.

| Location-Specific ARARs | | | | | |
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| Alternative | Media/ Authority | Requirements | Status | Requirement Synopsis | Action to Attain ARAR |
| | **All Media** | | | | |
| Applies to RA-S2 (monitoring) RA-S3, RA-S4, RA-S5, RA-G2 | | Executive Order 11990; "Protection of Wetlands" (40 CFR Part 6, Appendix A) | Applicable | Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative with lesser effects is available. Action to avoid, whenever possible, the long- and short-term impacts on wetlands and to preserve and enhance wetlands. If activity takes place, impacts must be minimized to the maximum extent. | Wetlands have been identified on the site and excavation, consolidation and installation of monitoring wells occur in or around wetlands. Because high levels of contamination exist in or near wetlands areas, there is no practicable alternative to excavating or consolidating in these areas. All practicable means will be used to minimize harm to the wetlands. Wetlands disturbed by remedial activities will be mitigated, restored, or preserved. The Proposed Plan will solicit specific comments on this work. |
| Applies to RA-S3, RA-S4, and RA-S5 | | Fish and Wildlife Coordination Act (16 U.S.C. §661 et seq.); Fish and wildlife protection (40 CFR §6.302(g)) | Applicable | Any modification of a body of water requires consultation with the U.S. Fish and Wildlife Services and the appropriate state wildlife agency to develop measures to prevent,, mitigate or compensate for losses of fish and wildlife. | The Site includes streams and rivers. These alternatives may require discharge of treated water into Rumford River resulting from dewatering activities. Consultation will be undertaken with appropriate agencies in this case. |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5, RA-G2 | | Executive Order 11988; "Floodplain Management" (40 CFR Part 6, Appendix A) | Applicable | Actions will avoid, whenever possible, the long- and short-term impacts associated with the occupancy and modifications of floodplains development, wherever there is a practical alternative. Promotes the preservation and restoration of floodplains so that their natural and beneficial value can be realized. | The Site includes areas defined to be within the 100-year floodplain. These alternatives all involve installation of monitoring wells; some include excavation, and/or consolidation and cap construction possibly in the floodplain areas. All practicable means will be followed to minimize harm and avoid adverse effects as much as possible. Actions will be taken to restore and preserve the natural and beneficial values of the floodplain. |
| Applies to RA-S3, RA-S4, | Federal Regulatory Requirements (continued) | Standards For Owners And Operators Of RCRA Hazardous Waste Treatment, Storage, And Disposal Facilities, 40 C.F.R. Part 264.18(b)k General | Applicable | Requires that hazardous waste treatment, storage, or disposal facilities within a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout unless an alternative demonstration | The Site includes areas defined to be within the 100-year floodplain. Consolidation and capping will be designed, constructed and maintained to prevent washout by a 100-year flood. |

| Location-Specific ARARs | | | | | |
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| Alternative | Media/ Authority | Requirements | Status | Requirement Synopsis | Action to Attain ARAR |
| | | Facility Standards, Subpart B | | is made to the Regional Administrator. | |
| Applies to RA-S2 , RA-S3, RA-S4,. RA-S5, RA-G2 | | Endangered Species Act, 16 U.S.C. 1531 et seq.; 50 C.F.R. Parts 17.11-12 | Applicable | Requires site action to be conducted in a manner that avoids harming threatened or endangered species or their habitat. | Transient bald eagles have been sited. Work will be conducted to avoid harming the bald eagle or its habitat. |
| Applies to RA-S2 , RA-S3, RA-S4,. RA-S5, RA-G2 | State Regulatory Requirements | Wetlands Protection Act (Mass. Gen. Laws ch. 131, §40); Wetlands Protection Regulations (310 CMR §10.00) | Applicable | Sets performance standards for dredging, filling, altering of inland wetlands and within 100 feet of a wetland. The requirement also defines wetlands based on vegetation type and requires that effects on wetlands be mitigated. Resource areas at the site covered by the regulations include banks, bordering vegetated wetlands, land under bodies of water, land subject to flooding, riverfront, and estimated habitats of rare wildlife. Under this requirement available alternatives must be considered that minimize the extent of adverse impacts and mitigation including restoration and/or replication are required. | Wetlands have been identified on the site and excavation, consolidation and installation of monitoring wells occur in or around wetlands and the 100 foot buffer zone. Because high levels of contamination exist in or near wetlands areas, there is no practicable alternative to excavating or consolidating in these areas. All practicable means will be used to minimize harm to the wetlands including erosion and sedimentation controls and stormwater management. Wetlands disturbed by remedial activities will be mitigated, restored, or preserved. |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5, and RA-G2 | | Massachusetts Endangered Species Act (Mass. Gen. Laws ch. 131, §40); Massachusetts Endangered Species Act Regulations, Part III: Alteration of Significant Habitat (321 CMR §§10.30-10.43) | Applicable | The MESA establishes State's list of threatened and endangered species and species of special concern. Habitat of such species is protected by the regulations promulgated under the MA Wetlands Protection Act. | The Site is noted as being near the habitat of "species of special concern" (see letter in Appendix B); further review will be conducted to determine applicability of this requirement. Should endangered or threatened species or species of special concern be determined to be present at the site, the substantive requirements of this regulation will be met. |

| Location-Specific ARARs | | | | | |
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| **Alternative** | **Media/ Authority** | **Requirements** | **Status** | **Requirement Synopsis** | **Action to Attain ARAR** |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5, RA-G2 | Federal Criteria, Advisories and Guidance | Policy on Floodplains and Wetland Assessments for CERCLA Actions (EPA OSWER, 8/8/1985) | To Be Considered | Floodplain and wetlands assessments must be incorporated into analysis conducted during planning of remedial action; public participation requirements must also be met.<br><br>Restates requirement that remedial action may only be located in wetlands if no practicable alternative exists. Potential harm or adverse effects to wetlands or floodplains must be minimized and/or mitigated as required by law/regulation. | Floodplain and wetlands assessments and associated considerations were incorporated into RI/FS process.<br><br>Public participation requirements were met through Proposed Plan.<br><br>Substantive requirements for decision-making will be met when selecting and designing remedy. |

| Action-Specific ARARS | | | | | |
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| **Alternative** | **Media/Authority** | **Requirements** | **Status** | **Requirement Synopsis** | **Action to be Taken to Attain ARAR** |
| | **Surface Water, Wetlands** | | | | |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5, RA-G2 | Federal Regulatory Requirements | Clean Water Act (33 U.S.C. §1251 *et seq.*); Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 CFR Part 230, 231 and 33 CFR Parts 320-323) | Applicable | Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative with lesser effects is available. If activity takes place, impacts must be minimized to the maximum extent. Controls discharges of dredged or fill material to protect aquatic ecosystems. | Wetlands have been identified on the site coincident with contamination. Excavation, consolidation, and installation of monitoring wells will occur in and around site wetlands. These actions will be designed to minimize adverse effects and to preserve, mitigate, and restore disturbed areas. |
| Applies to RA-S3, RA-S4 | | Rivers and Harbors Act of 1899 (33 U.S.C. §401 *et seq.*); (33 CFR Part 320) | Applicable | Protects navigable rivers from unauthorized discharges or from unauthorized obstruction or alteration. | Discharges to the Rumford River resulting from dewatering activities, if any, will occur via a piping system that will not obstruction or alter the River. |
| Applies to RA-S-3, RA-S4, RA-S5 | | Clean Water Act, Section 402, National Pollutant Discharge Elimination System (NPDES), 33 USC 1342 (40 CFR 122-125, 131) | Applicable | These standards govern discharge of water into surface waters. | Groundwater resulting from dewatering activities, if any, will be treated to the required standards before discharge to the Rumford River. |
| Applies to RA-S3, RA-S4, RA-S5 | State Regulatory Requirements | Massachusetts Surface Water Quality Standards—Vernal Pools, 314 CMR §4.06(1)(d)(11) and 314 CMR 9.08 (variance) | Relevant and Appropriate | Prohibits discharge of dredged or fill material to a vernal pool certified by the Massachusetts of Division of Fisheries and Wildlife, unless a variance is granted under 314 CMR 9.08.)(11) – Vernal Pools | Wetland features exist, which, although not officially classified, may be characteristic of vernal pools. If further studies indicate an ecological risk exists, it will be considered an overriding public interest to address the risk. Dredging and/or filling activities will be conducted to avoid, minimize and mitigate adverse effects and restoration/replication will be conducted. |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5, RA-G2 | | Surface Water Quality Standards (314 CMR 4.00) | Applicable | Surface water in the vicinity of the Site are classified as Class B and designated as habitat for fish, other aquatic and wildlife, and for primary and secondary contact recreation. The state surface water minimum criteria | Surface water standards will be used as performance criteria to measure the effectiveness of the Site remedy at preventing degradation of surface water below these standards. |

| Action-Specific ARARS | | | | | |
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| **Alternative** | **Media/Authority** | **Requirements** | **Status** | **Requirement Synopsis** | **Action to be Taken to Attain ARAR** |
| | | | | for Class B waters are consistent with federal AWQC. | |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5, RA-G2 | | 401 Water Quality Certification for Discharge of Dredged or Fill Material, 314 CMR 9.00 | Applicable | Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative with lesser effects is available. If activity takes place, adverse impacts must be minimized. Controls discharges of dredged or fill material to protect aquatic ecosystems. | Wetlands have been identified on the site coincident with contamination. Excavation, consolidation, and installation of monitoring wells will occur in and around site wetlands. These actions will be designed to minimize adverse effects and to preserve, mitigate, and restore disturbed areas. |
| Applies to RA-S-3, RA-S4, RA-S5 | | Massachusetts DEP Surface Water Discharge Permit Program (314 CMR 3) | Applicable | These standards govern discharge of water into surface waters. | Groundwater resulting from dewatering activities, if any, will be treated to the required standards before discharge to the Rumford River. |
| | **<u>Groundwater</u>** | | | | |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5 and RA-G2 | Federal Regulatory Requirements | Federal Safe Drinking Water Act – Maximum Contaminant Levels (MCLs) and non-zero MCLs 40 CFR 141 | Relevant and Appropriate | These levels regulate the concentration of contaminants in public drinking water supplies but may also be considered appropriate for groundwater aquifers potentially used for drinking water. | These standards will be used during groundwater monitoring to measure the performance of the remedy to ensure that groundwater migrating off the Site does not exceed MCLs and non-zero MCLs. |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5 and RA-G2 | | Resource Conservation and Recovery Act (42 U.S.C. §6901 *et seq.*); (40 CFR 264.94 and 95) Subpart F | Relevant and Appropriate | Establishes maximum concentration limits for RCRA groundwater monitoring and response requirements for solid waste management units. Standards for 14 toxic compounds have been adopted as part of RCRA groundwater protection standards. | These standards will be used during groundwater monitoring to measure the performance of the remedy to ensure that groundwater migrating off the Site does not exceed RCRA groundwater concentration levels for Site contaminants. Compliance boundary is south of the Rumford River and will be established more specifically during remedial design. |

| Action-Specific ARARS | | | | | |
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| **Alternative** | **Media/Authority** | **Requirements** | **Status** | **Requirement Synopsis** | **Action to be Taken to Attain ARAR** |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5 and RA-G2 | | Resource Conservation and Recovery Act (42 U.S.C. §6901 et seq.); (40 CFR 264.100) Subpart F | Relevant and Appropriate | Requires that corrective action be taken in the event groundwater is migrating offsite in excess of RCRA groundwater concentration levels set out in 40 CFR 264.94. | Corrective action will be taken should offsite monitoring wells demonstrate that groundwater is migrating offsite in excess of RCRA groundwater concentration levels. |
| Applies to all alternatives+ | State Regulatory Requirements | Massachusetts Ground Water Quality Standards (314 CMR §6.00) | Applicable | Establishes groundwater quality criteria necessary to sustain the designated uses, and regulations necessary to achieve the designated uses or maintain the existing groundwater quality. Groundwater at the site is classified as Class II and III, non-potable uses. | The standards will be used to measure performance of the remedy to ensure that contaminants in groundwater do not cause indoor air inhalation risks, or cause surface water to be degraded above AWQC. |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5 and RA-G2 | | Massachusetts DEP Drinking Water Standards, 310 CMR 22.00 | Relevant and Appropriate | These levels regulate the concentration of contaminants in public drinking water supplies but may also be considered appropriate for groundwater aquifers potentially used for drinking water. | These standards will be used during groundwater monitoring to measure the performance of the remedy to ensure that groundwater migrating off the Site does not exceed MCLs and non-zero MCLs that are more stringent that federal standards for Site contaminants. |
| | **Air** | | | | |
| Applies to RA-S3, RA-S4 and RA-S5 | Federal Regulatory Requirements | National Emission Standards for Hazardous Air Pollutants (NESHAPs) 40 CFR Part 61 Subparts H&I | Relevant and Appropriate | Regulates air emissions of VOC's from regulated source categories. | VOC emission levels will be met during soil treatment processes through carbon filtering and/or other engineering controls |
| Applies to RA-S3, RA-S4, RA-S5 | | RCRA Air Emissions Standards for Process Vents (40 CFR Part 264, Subpart AA) | Relevant and Appropriate if threshold concentrations are met | Contains air pollutant emission standards applying to solvent extraction and air stripping facilities that treat RCRA wastes with total organics concentrations of 10 parts per million by weight or greater. | Treatment components treating wastes with regulated levels of organic constituents will be designed to meet the criteria set forth in this subpart if threshold levels are met. |

| Action-Specific ARARS | | | | | |
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| **Alternative** | **Media/Authority** | **Requirements** | **Status** | **Requirement Synopsis** | **Action to be Taken to Attain ARAR** |
| Applies to RA-S3, RA-S4, RA-S5 | | RCRA Air Emissions Standards for Equipment Leaks (40 CFR Part 264, Subpart BB) | Relevant and Appropriate if treatment involves groundwater with organics at concentrations of at least 10% by weight. | Sets emission standards for equipment that contains or contacts RCRA wastes with organic concentrations of at least 10 percent by weight. | Treatment components treating wastes with regulated levels of VOCs will be designed to meet the criteria set forth in this subpart if threshold levels are met. |
| Applies to RA-S3, RA-S4, RA-S5 | | RCRA Air Emissions Standards for Tanks and containers (40 CFR Part 264, Subpart CC) | Relevant and Appropriate if threshold levels are met | Requires specific organic emissions controls on tanks and containers having VOC concentrations equal to or greater than 500 parts per million by weight. | Treatment facility components treating wastes with regulated levels of VOCs will be designed to meet the criteria set forth in this subpart if threshold levels are met. |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5, RA-G2 | State Regulatory Requirements | Ambient Air Quality Standards (310 CMR 6.00) | Applicable | Sets primary and secondary standards for emissions of Sulfur Oxides, particulate matter, CO, ozone, Nitrogen Dioxide, and Lead. | Remedies will be designed, constructed, and operated in accordance with these rules. No air emissions from remedial treatment will cause ambient air quality standards to be exceeded. Dust standards will be complied with during any and all excavation of materials at the Site. |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5, RA-G2 | | Massachusetts DEP Air Pollution Control Regulations (310 CMR 7.00) | Applicable | Regulates dust, particulates and fugitive emissions. Establishes emissions limitations for various processes and regions within the state. | Excavation and treatment processes will be designed, constructed, and operated in accordance with these rules. Air monitoring will be conducted to ensure levels are met. |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5, and RA-G2 | Massachusetts Criteria, Advisories, and Guidance | Massachusetts Threshold Effects Exposure Levels (TELs) and Allowable Ambient Limits (AALs) for Air (December 1995) | To Be Considered | Establishes exposure concentrations for air contaminants developed and recommended by the Office of Research and Standards to protect public health. | Evaluation of air emissions will consider AALs and TEL's. |
| | **Soil** | | | | |

| Action-Specific ARARS | | | | | |
|---|---|---|---|---|---|
| **Alternative** | **Media/Authority** | **Requirements** | **Status** | **Requirement Synopsis** | **Action to be Taken to Attain ARAR** |
| | Federal Regulatory Requirements<br><br>Base RCRA program has been delegated to Massachusetts; therefore, only State references appear as ARARs unless particular provision not contained in State program. | | | | |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5, RA-G2 | State Regulatory Requirements | RCRA Hazardous Waste Management - Identification and Listing of Hazardous Waste (310 CMR 30.100) | Applicable | Establishes standards for identifying and listing hazardous waste. | Testing as appropriate will assess whether hazardous wastes are present in excavated soil, sediments (if any) and groundwater generated during remedial activities. |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5, RA-G2 | | Hazardous Waste Management - Requirements for Generators of Hazardous Waste (310 CMR 30.300) | Applicable to any action that generates hazardous waste | Generator requirements outline waste characterization, management of containers, packaging, labeling, and manifesting. Generator requirements apply to contaminated substances meeting the definition of hazardous under 310 CMR 100. | Waste generated during excavation, treatment processes and well drilling that are characteristic waste will be managed in accordance with the substantive requirements of this regulation |
| Applies to RA-S3, RA-S4 | | Hazardous Waste Management – Landfill Closure and Post Closure Care (310 CMR 30.633 (1)(a-d), 2(a), (d), (e)) | Relevant and Appropriate | Establishes performance standards for low permeability covers and for post closure care and for groundwater monitoring. | Consolidated wasted will be covered onsite with a low permeability cover that meets these standards. Post-closure care of cover will meet these standards. |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5, RA-G2 | | Hazardous Waste Management – Closure and Post Closure (310 CMR 30.582, 30.585, 30.592) | Relevant and Appropriate | Establishes performance standards for closure and pose closure care and groundwater monitoring | All equipment, structures and soil will be properly decontaminated and disposed of during the remedial action. Post closure care will meet substantive standards as determined by EPA. |

| Action-Specific ARARS | | | | | |
|---|---|---|---|---|---|
| **Alternative** | **Media/Authority** | **Requirements** | **Status** | **Requirement Synopsis** | **Action to be Taken to Attain ARAR** |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5, RA-G2 | | Hazardous Waste Management – General Requirements for ignitable, reactive, or incompatible waste (310 CMR 30.560) | Applicable | General requirement for handling hazardous waste. | Hazardous wastes will be handled in accordance with these requirements. |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5, RA-G2 | | Hazardous Waste Management – Tanks (310 CMR 30.343) | Applicable | Establishes management procedures tanks uses to store hazardous waste. | Any hazardous waste stored in containers will meet substantive requirements of this subpart, including condition and management of containers. |
| Applies to RA-S2, RA-S3, RA-S4, RA-S5, RA-G2 | | Hazardous Waste Management - Containers (310 CMR 30.342) | Applicable | Specifies conditions under which hazardous waste may be stored in containers. | Any hazardous waste stored in containers will meet substantive requirements of this subpart, including condition and management of containers. |
| Applies to RA-S3 and RA-S4 | Federal Criteria, Advisories and Guidance | Revised Alternative Cap Design Guidance Proposed for Unlined, Hazardous Waste Landfills in the EPA Region I (EPA OSRR, 2/5/01). | To Be Considered | Provides guidance for landfill cap design for unlined, hazardous waste landfills at Superfund landfill sites in EPA Region I. | Guidance will be considered when designing low permeability cover for consolidated material onsite. |
| Policy on Floodplains and Wetland Assessments for CERCLA Actions (EPA OSWER, 8/8/1985) | | USEPA Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments (EPA/530-SW-89-047) | To Be Considered | Presents technical specifications for the design of multi-barrier covers for landfills at which hazardous wastes were disposed. | Technical specifications in guidance will be considered when designing low permeability cover for consolidated material onsite. |

+Alternatives RA-S1 and RA-G1 rely on natural processes to address risk at the Site in conjunction with monitoring and institutional controls.

# APPENDIX E: ADMINISTRATIVE RECORD INDEX AND GUIDANCE DOCUMENTS

# Hathaway & Patterson
# NPL Site Administrative Record
# Record of Decision (ROD)
# Operable Unit 1

## Index

September 2005

Prepared by
EPA New England
Office of Site Remediation & Restoration

**Introduction to the Collection**

This is the Administrative Record for the Hathaway & Patterson Superfund site, Mansfield, MA, OU 1, Entire Site, Record of Decision (ROD), released September 2005. 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 file replaces the Proposed Plan for Record of Decision Administrative Record released in June 2005. This file includes, by reference, the administrative record files for the Hathaway & Patterson Removal Action, March 1994 and Removal Action II, September 2003.

The administrative record file is available for review at:

Mansfield Public Library
255 Hope Street
Mansfield, MA 02048
(508) 261-7380 (phone)
(508) 261-7422 (fax)
http://www.sailsinc.org/mansfield/

EPA New England Superfund Records & Information Center
1 Congress Street, Suite 1100 (HSC)
Boston, MA 02114 (by appointment)
617-918-1440 (phone)
617-918-1223 (fax)
http://www.epa.gov/region01/superfund/resource/records.htm

Questions about this administrative record file should be directed to the EPA New England site manager.

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).

# Instructions about PDF

Some of the documents in this collection are available as a Portable Document Format (PDF) file. The PDF process maintains the look and presentation of the original document. To view PDF files, you will need Adobe Acrobat Reader software loaded on your computer. This software is available, free of charge, from Adobe Software [this is a link to http://www.adobe.com]. To ensure you will be able to see a PDF file in its entirety, please obtain the most recent version of the free Adobe Reader from the Adobe Web site. (http://www.adobe.com/products/acrobat/readstep.html)

## 01: SITE ASSESSMENT

**222422** **TO-DO LIST, REMOVAL SITE INVESTIGATION**

**Author:** MARY ELLEN STANTON US EPA REGION 1
**Addressee:**
**Doc Type:** LIST
**Doc Date:** 06/03/0001 **# of Pages:** 1
**File Break:** 01.03

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**225299** **A SOILS AND HYDROGEOLOGIC INVESTIGATION**

**Author:** KEYSTONE ENVIRONMENTAL RESOURCES INC
**Addressee:** HATHEWAY & PATTERSON COMPANY INC
**Doc Type:** REPORT
**Doc Date:** 05/01/1988 **# of Pages:** 108
**File Break:** 01.03

---

**225300** **PHASE 2 SITE INVESTIGATION AND PRELIMINARY HEALTH AND ENVIRONMENTAL ASSESSMENT**

**Author:** KEYSTONE ENVIRONMENTAL RESOURCES INC
**Addressee:** HATHEWAY & PATTERSON COMPANY INC
**Doc Type:** REPORT
**Doc Date:** 12/01/1989 **# of Pages:** 189
**File Break:** 01.03

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**225301** **DESIGN REPORT FOR SHORT-TERM MEASURE**

**Author:** KEYSTONE ENVIRONMENTAL RESOURCES INC
**Addressee:** HATHEWAY & PATTERSON COMPANY INC
**Doc Type:** REPORT
**Doc Date:** 07/01/1991 **# of Pages:** 36
**File Break:** 01.03

---

## 01: SITE ASSESSMENT

**225302** **COMPLETE REPORT FOR SHORT-TERM MEASURE**

**Author:** KEYSTONE ENVIRONMENTAL RESOURCES INC
**Addressee:** HATHEWAY & PATTERSON COMPANY INC
**Doc Date:** 01/01/1992 **# of Pages:** 32
**File Break:** 01.03
**Doc Type:** REPORT

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**222423** **REMOVAL PROGRAM PRELIMINARY ASSESSMENT / SITE INVESTIGATION (PA/SI), 22 JUNE 1993 [WITH TRANSMITTAL DATED 08/09/1993]**

**Author:** ROY F WESTON INC
**Addressee:** US EPA REGION 1
**Doc Date:** 08/01/1993 **# of Pages:** 72
**File Break:** 01.03
**Doc Type:** REPORT

---

**222424** **SITE INVESTIGATION CLOSURE**

**Author:** MARY ELLEN STANTON US EPA REGION 1
**Addressee:** DAVID MCINTYRE US EPA REGION 1
**Doc Date:** 08/05/1993 **# of Pages:** 3
**File Break:** 01.03
**Doc Type:** MEMO

---

**223758** **PRELIMINARY ASSESSMENT (PA) REPORT**

**Author:** MA DEPT OF ENVIRONMENTAL PROTECTION
**Addressee:**
**Doc Date:** 12/01/1994 **# of Pages:** 26
**File Break:** 01.02
**Doc Type:** REPORT

---

## 01: SITE ASSESSMENT

**222426** **TRANSMITTAL OF RECENT TESTS ON SAMPLES COLLECTED AS PART OF RUMFORD RIVER SITE**

**Author:** RICHARD A HAWORTH US EPA REGION 1
**Addressee:** TIMM US AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR)
**Doc Type:** LETTER
**Doc Date:** 02/07/2000 **# of Pages:** 2
**File Break:** 01.05

---

**222425** **SITE INVESTIGATION CLOSURE, RUMFORD RIVER SITE**

**Author:** RICHARD A HAWORTH US EPA REGION 1
**Addressee:** STEVEN R NOVICK US EPA REGION 1
**Doc Type:** MEMO
**Doc Date:** 08/28/2001 **# of Pages:** 3
**File Break:** 01.03

---

## 02: REMOVAL RESPONSE

**222427** **SITE VISIT**

**Author:** MARK J BEGLEY MA DEPT OF ENVIRONMENTAL PROTECTION
**Addressee:** LISA A DANEK US EPA REGION 1
MARY DEVER US EPA REGION 1
GREGG HUNT MA DEPT OF ENVIRONMENTAL PROTECTION
TIMOTHY C JONES ROY F WESTON INC
SCOTT LEITE MANSFIELD (MA) TOWN OF
DICK LEWIS MANSFIELD (MA) TOWN OF
RICHARD PACKARD MA DEPT OF ENVIRONMENTAL PROTECTION
ANDREA PAPADOPOULOS MA DEPT OF ENVIRONMENTAL PROTECTION
LEN PINAUD MA DEPT OF ENVIRONMENTAL PROTECTION
JOSEPH J SAROTTA MANSFIELD (MA) FIRE DEPARTMENT
MARY ELLEN STANTON US EPA REGION 1

**Doc Date:** 11/23/1993 **# of Pages:** 13
**File Break:** 02.01

**Doc Type:** MEETING NOTES

---

**229335** **REQUEST FOR A REMOVAL ACTION AT THE HATHEWAY AND PATTERSON COMPANY, INC.**

**Author:** LISA A DANEK US EPA REGION 1
**Addressee:** PAUL G KEOUGH US EPA REGION 1

**Doc Date:** 12/03/1993 **# of Pages:** 13
**File Break:** 02.09

**Doc Type:** MEMO

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## 02: REMOVAL RESPONSE

**222447** **WORK PLAN FOR REMOVAL OF HAZARDOUS SUBSTANCES**

**Author:** WILLIAM C TALLMAN OHM REMEDIATION SERVICES CORP
**Doc Date:** 12/07/1993 **# of Pages:** 10
**Addressee:** US EPA REGION 1
**File Break:** 02.06
**Doc Type:** WORK PLAN

---

**222428** **NOTIFICATION THAT FORMER HATHEWAY AND PATTERSON COMAPNY, INC. OFFICE BUILDING IS BEING USED FOR OFFICE SPACE BY EPA AND CONTRACTORS**

**Author:** LISA A DANEK US EPA REGION 1
**Doc Date:** 12/14/1993 **# of Pages:** 1
**Addressee:** BERTRAM COOK MANSFIELD (MA) TOWN OF
**File Break:** 02.01
**Doc Type:** LETTER

---

**222433** **POLLUTION REPORT (POLREP) 1 - REMOVAL ACTION**

**Author:** LISA A DANEK US EPA REGION 1
**Doc Date:** 12/28/1993 **# of Pages:** 8
**Addressee:**
**File Break:** 02.04
**Doc Type:** MEMO

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**222448** **REQUEST FOR STATE OFFICIALS TO INDENTIFY POTENTIAL STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)**

**Author:** LISA A DANEK US EPA REGION 1
**Doc Date:** 12/28/1993 **# of Pages:** 5
**Addressee:** JULIE HUTCHESON MA DEPT OF ENVIRONMENTAL PROTECTION
**File Break:** 02.11
**Doc Type:** LETTER

---

## 02: REMOVAL RESPONSE

**222434** **POLLUTION REPORT (POLREP) 2 - REMOVAL ACTION**

**Author:** LISA A DANEK US EPA REGION 1
**Addressee:**
**Doc Type:** MEMO

**Doc Date:** 01/27/1994 **# of Pages:** 7
**File Break:** 02.04

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**229337** **MASSACHUSETTS APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)**

**Author:** RICHARD PACKARD MA DEPT OF ENVIRONMENTAL PROTECTION
**Addressee:** LISA A DANEK US EPA REGION 1
**Doc Type:** LETTER

**Doc Date:** 02/15/1994 **# of Pages:** 23
**File Break:** 02.11

---

**222429** **GENERAL OVERVIEW OF REGULATIONS THAT PROVIDE FOR ACTIONS BEING TAKEN**

**Author:** LISA A DANEK US EPA REGION 1
**Addressee:** MANSFIELD (MA) TOWN OF
**Doc Type:** MEMO

**Doc Date:** 02/17/1994 **# of Pages:** 2
**File Break:** 02.01

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**222435** **POLLUTION REPORT (POLREP) 3 - REMOVAL ACTION**

**Author:** LISA A DANEK US EPA REGION 1
**Addressee:**
**Doc Type:** MEMO

**Doc Date:** 03/09/1994 **# of Pages:** 7
**File Break:** 02.04

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## 02: REMOVAL RESPONSE

**222430** **DOCUMENT TRANSMITTAL ACKNOWLEDGEMENT, ADMINISTRATIVE RECORD FILE**

**Author:** MARY A TYNAN MANSFIELD PUBLIC LIBRARY
**Addressee:** LISA A DANEK US EPA REGION 1
**Doc Date:** 03/10/1994 **# of Pages:** 1
**File Break:** 02.01
**Doc Type:** FORM

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**222436** **POLLUTION REPORT (POLREP) 4 - REMOVAL ACTION**

**Author:** LISA A DANEK US EPA REGION 1
**Addressee:**
**Doc Date:** 04/29/1994 **# of Pages:** 7
**File Break:** 02.04
**Doc Type:** MEMO

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**222437** **POLLUTION REPORT (POLREP) 5 - REMOVAL ACTION**

**Author:** LISA A DANEK US EPA REGION 1
**Addressee:**
**Doc Date:** 07/12/1994 **# of Pages:** 5
**File Break:** 02.04
**Doc Type:** MEMO

---

**222432** **COMPUTATION SHEETS**

**Author:** LISA A DANEK US EPA REGION 1
**Addressee:** SUSAN BENOIT
**Doc Date:** 09/15/1994 **# of Pages:** 12
**File Break:** 02.02
**Doc Type:** MEMO

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## 02: REMOVAL RESPONSE

**222438** **POLLUTION REPORT (POLREP) 6 - REMOVAL ACTION**

**Author:** LISA A DANEK US EPA REGION 1
**Addressee:**
**Doc Type:** MEMO
**Doc Date:** 09/15/1994 **# of Pages:** 5
**File Break:** 02.04

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**229338** **DRAFT, APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)**

**Author:** LISA A DANEK US EPA REGION 1
**Addressee:**
**Doc Type:** MEMO
**Doc Date:** 10/21/1994 **# of Pages:** 28
**File Break:** 02.11

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**222439** **POLLUTION REPORT (POLREP) 7 - REMOVAL ACTION**

**Author:** LISA A DANEK US EPA REGION 1
**Addressee:**
**Doc Type:** MEMO
**Doc Date:** 11/28/1994 **# of Pages:** 6
**File Break:** 02.04

---

**222431** **TRANSMITTAL OF FINAL REPORT, SOIL SAMPLING AND FIELD SCREENING**

**Author:** ALAN M HUMPHREY US EPA
**Addressee:** LISA A DANEK US EPA REGION 1
**Doc Type:** MEMO
**Doc Date:** 12/20/1994 **# of Pages:** 1
**File Break:** 02.01

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## 02: REMOVAL RESPONSE

**229339** **310 CMR: 40.0940-42, METHODS FOR CHARACTERIZING RISK OF HARM, APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENT (ARAR)**

**Author:** MA DEPT OF ENVIRONMENTAL PROTECTION
**Addressee:**
**Doc Type:** REPORT
**Doc Date:** 01/13/1995 **# of Pages:** 2
**File Break:** 02.11

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**229340** **310 CMR: 40.0318-32, LIMITED REMOVAL ACTIONS, APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENT (ARAR)**

**Author:** MA DEPT OF ENVIRONMENTAL PROTECTION
**Addressee:**
**Doc Type:** REPORT
**Doc Date:** 01/13/1995 **# of Pages:** 4
**File Break:** 02.11

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**229341** **310 CMR: 40.0996, METHOD 3 UPPER CONCENTRATION LIMITS, APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENT (ARAR)**

**Author:** MA DEPT OF ENVIRONMENTAL PROTECTION
**Addressee:**
**Doc Type:** REPORT
**Doc Date:** 01/13/1995 **# of Pages:** 4
**File Break:** 02.11

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**222440** **POLLUTION REPORT (POLREP) 8 - REMOVAL ACTION**

**Author:** LISA A DANEK US EPA REGION 1
**Addressee:**
**Doc Type:** MEMO
**Doc Date:** 02/08/1995 **# of Pages:** 5
**File Break:** 02.04

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## 02: REMOVAL RESPONSE

**222441** **POLLUTION REPORT (POLREP) 9 - REMOVAL ACTION**

**Author:** LISA A DANEK US EPA REGION 1
**Addressee:**
**Doc Type:** MEMO

**Doc Date:** 04/17/1995 **# of Pages:** 5
**File Break:** 02.04

## 02: REMOVAL RESPONSE

**222442** **POLLUTION REPORT (POLREP) 10 - REMOVAL ACTION**

**Author:** FRANK GARDNER US EPA REGION 1

**Doc Date:** 06/26/1995 **# of Pages:** 6

**Addressee:**
DONALD F BERGER US EPA REGION 1
RUDY BROWN US EPA REGION 1
LINDA BYRNE US EPA REGION 1
JOHN M CARLSON US EPA
EDWARD J CONLEY US EPA REGION 1
JOHN P DEVILLARS US EPA REGION 1
FILOMENA DINARDO US EPA REGION 1
DENNIS P GAGNE US EPA REGION 1
NANCY GRANTHAM US EPA REGION 1
JOHANNA HUNTER US EPA REGION 1
LIZA JUDGE US EPA REGION 1
HILARY E KELLEY US EPA REGION 1
GREGORY M KENNAN US EPA REGION 1
JOHN LINDSEY US NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
PAUL D MCKECHNIE US EPA - OFFICE OF THE INSPECTOR GENERAL
PATRICIA L MEANEY US EPA REGION 1
LINDA M MURPHY US EPA REGION 1
CHERYL OHALLORAN US EPA REGION 1
THOMAS PAPINEAU US EPA REGION 1
STEPHEN S PERKINS US EPA REGION 1
DONALD PORTEOUS US EPA REGION 1
ANDREW RADDANT US DEPT OF THE INTERIOR
MADELINE SNOW MA DEPT OF ENVIRONMENTAL PROTECTION
ANNE SPENCER US EPA - EMERGENCY RESPONSE DIVISION

**File Break:** 02.04

**Doc Type:** MEMO

## 02: REMOVAL RESPONSE

**222443** **DRAFT, POLLUTION REPORT (POLREP) 10 - REMOVAL ACTION**

**Author:** FRANK GARDNER US EPA REGION 1

**Addressee:**

**Doc Type:** MEMO

**Doc Date:** 06/26/1995 **# of Pages:** 4

**File Break:** 02.04

## 02: REMOVAL RESPONSE

**222444** **POLLUTION REPORT (POLREP) 11**

**Author:** FRANK GARDNER US EPA REGION 1

**Doc Date:** 07/28/1995 **# of Pages:** 6

**File Break:** 02.04

**Addressee:**
DONALD F BERGER US EPA REGION 1
RUDY BROWN US EPA REGION 1
LINDA BYRNE US EPA REGION 1
JOHN M CARLSON US EPA
EDWARD J CONLEY US EPA REGION 1
JOHN P DEVILLARS US EPA REGION 1
FILOMENA DINARDO US EPA REGION 1
KENNETH FINKELSTEIN US NATIONAL OCEANIC ATMOSPHERIC ADMINISTRATION
AL FREZZA US EPA REGION 1
DENNIS P GAGNE US EPA REGION 1
NANCY GRANTHAM US EPA REGION 1
JOHANNA HUNTER US EPA REGION 1
ART JOHNSON US EPA REGION 1
LIZA JUDGE US EPA REGION 1
HILARY E KELLEY US EPA REGION 1
GREGORY M KENNAN US EPA REGION 1
PAUL D MCKECHNIE US EPA - OFFICE OF THE INSPECTOR GENERAL
PATRICIA L MEANEY US EPA REGION 1
LINDA M MURPHY US EPA REGION 1
STEVEN R NOVICK US EPA REGION 1
CHERYL OHALLORAN US EPA REGION 1
THOMAS PAPINEAU US EPA REGION 1
STEPHEN S PERKINS US EPA REGION 1
DONALD PORTEOUS US EPA REGION 1
ANDREW RADDANT US DEPT OF THE INTERIOR
MADELINE SNOW MA DEPT OF ENVIRONMENTAL PROTECTION

**Doc Type:** MEMO

**222445** **POLLUTION REPORT (POLREP) 12 AND FINAL**

**Author:** FRANK GARDNER US EPA REGION 1

**Doc Date:** 09/06/1995 **# of Pages:** 6

**File Break:** 02.04

**Addressee:**
DONALD F BERGER US EPA REGION 1
RUDY BROWN US EPA REGION 1
LINDA BYRNE US EPA REGION 1
JOHN M CARLSON US EPA
EDWARD J CONLEY US EPA REGION 1
JOHN P DEVILLARS US EPA REGION 1
FILOMENA DINARDO US EPA REGION 1
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DENNIS P GAGNE US EPA REGION 1
NANCY GRANTHAM US EPA REGION 1
JOHANNA HUNTER US EPA REGION 1
ART JOHNSON US EPA REGION 1
LIZA JUDGE US EPA REGION 1
HILARY E KELLEY US EPA REGION 1
GREGORY M KENNAN US EPA REGION 1
JOHN LINDSEY US NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
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PATRICIA L MEANEY US EPA REGION 1
LINDA M MURPHY US EPA REGION 1
STEVEN R NOVICK US EPA REGION 1
CHERYL OHALLORAN US EPA REGION 1
THOMAS PAPINEAU US EPA REGION 1
STEPHEN S PERKINS US EPA REGION 1
DONALD PORTEOUS US EPA REGION 1
ANDREW RADDANT US DEPT OF THE INTERIOR
KATHLEEN WOODWARD US EPA REGION 1

**Doc Type:** MEMO

## 02: REMOVAL RESPONSE

**225305** **AFTER ACTION REPORT, DECEMBER 1993 THROUGH SEPTEMBER 1995**

**Author:** ROY F WESTON INC
**Addressee:** US EPA REGION 1
**Doc Date:** 10/01/1995 **# of Pages:** 75
**File Break:** 02.05
**Doc Type:** REPORT

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**222446** **FEDERAL ON-SCENE COORDINATOR'S (OSC) REPORT (DECEMBER 1993 - SEPTEMBER 1995)**

**Author:** FRANK GARDNER US EPA REGION 1
**Addressee:**
**Doc Date:** 11/16/1995 **# of Pages:** 43
**File Break:** 02.05
**Doc Type:** REPORT

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**225303** **POLLUTION REPORT (POLREP) 1**

**Author:** FRANK GARDNER US EPA REGION 1
**Addressee:**
**Doc Date:** 08/22/2003 **# of Pages:** 4
**File Break:** 02.04
**Doc Type:** MEMO

---

**225304** **POLLUTION REPORT (POLREP) 2**

**Author:** FRANK GARDNER US EPA REGION 1
**Addressee:**
**Doc Date:** 09/26/2003 **# of Pages:** 5
**File Break:** 02.04
**Doc Type:** MEMO

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## 03: REMEDIAL INVESTIGATION (RI)

**214537** **WOBURN ENVIRONMENTAL STUDIES, PHASE 1 REPORT, REMEDIAL INVESTIGATION (RI), VOLUME 3 OF 3, SUBSURFACE DATA / MAPS / FIGURES**

**Author:** ROUX ASSOCIATES
**Addressee:** STAUFFER CHEMICAL CO
**Doc Type:** REPORT
**Doc Date:** 04/01/1983 **# of Pages:** 255
**File Break:** 03.06

---

**222038** **REQUEST FOR HEALTH CONSULTATION**

**Author:** MARY ELLEN STANTON US EPA REGION 1
**Addressee:** LOUISE A HOUSE US PUBLIC HEALTH SERVICE/ATSDR
**Doc Type:** MEMO
**Doc Date:** 08/05/1993 **# of Pages:** 17
**File Break:** 03.09

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**225308** **PROVISIONAL PUBLIC HEALTH FISH CONSUMPTION ADVISORY: RUMFORD RIVER; FULTON, KINGMAN, AND CABOT PONDS; NORTON RESERVOIR**

**Author:** ELAINE T KRUEGER MA DEPT OF PUBLIC HEALTH
**Addressee:** SCOTT LEITE MANSFIELD (MA) TOWN OF
**Doc Type:** LETTER
**Doc Date:** 10/19/1998 **# of Pages:** 10
**File Break:** 03.09

---

**225309** **HEALTH CONSULTATION, RUMFORD RIVER SITE**

**Author:** US DEPT OF HEALTH AND HUMAN SERVICES
**Addressee:**
**Doc Type:** REPORT
**Doc Date:** 06/16/1999 **# of Pages:** 21
**File Break:** 03.09

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## 03: REMEDIAL INVESTIGATION (RI)

**225310** **UPDATED PUBLIC HEALTH FISH CONSUMPTION ADVISORY FOR THE RUMFORD RIVER AND ASSOCIATED IMPOUNDMENTS**

**Author:** ELAINE T KRUEGER MA DEPT OF PUBLIC HEALTH
**Addressee:** SCOTT LEITE MANSFIELD (MA) TOWN OF
**Doc Type:** LETTER
**Doc Date:** 06/30/1999 **# of Pages:** 4
**File Break:** 03.09

---

**225311** **UPDATED PUBLIC HEALTH FISH CONSUMPTION ADVISORY FOR THE RUMFORD RIVER AND ASSOCIATED IMPOUNDMENTS**

**Author:** ELAINE T KRUEGER MA DEPT OF PUBLIC HEALTH
**Addressee:** GEORGE YOUNG FOXBOROUGH (MA) TOWN OF
**Doc Type:** LETTER
**Doc Date:** 06/30/1999 **# of Pages:** 4
**File Break:** 03.09

---

**225312** **TRANSMITTAL OF HEALTH CONSULTATION FOR THE RUMFORD RIVER SITE**

**Author:** ELAINE T KRUEGER MA DEPT OF PUBLIC HEALTH
**Addressee:** RICHARD A HAWORTH US EPA REGION 1
**Doc Type:** LETTER
**Doc Date:** 06/30/1999 **# of Pages:** 2
**File Break:** 03.09

---

**222039** **HEALTH CONSULTATION, GLUE FACTORY POND / RUMFORD RIVER**

**Author:** US PUBLIC HEALTH SERVICE/ATSDR
**Addressee:**
**Doc Type:** REPORT
**Doc Date:** 06/25/2001 **# of Pages:** 50
**File Break:** 03.09

---

## 03: REMEDIAL INVESTIGATION (RI)

**27793** **COMMENTS ON DRAFT HABITAT EVALUATION SURVEY TECHNICAL MEMORANDUM**

**Author:** CHESTER L JANOWSKI US EPA REGION 1
**Addressee:** CINTHIA MCLANE METCALF & EDDY
**Doc Type:** LETTER
**Doc Date:** 08/30/2001 **# of Pages:** 1
**File Break:** 03.10

---

**222037** **HEALTH AND SAFETY PLAN FOR TECHNICAL ASSISTANCE EFFORT [WITH TRANSMITTAL DATED 09/19/2001]**

**Author:** TRC ENVIRONMENTAL CORP
**Addressee:**
**Doc Type:** REPORT
**Doc Date:** 09/01/2001 **# of Pages:** 186
**File Break:** 03.07

---

**222398** **FIELD SAMPLING PLAN (FSP) AND QUALITY ASSURANCE PROJECT PLAN (QAPP), VOLUME 1 OF 2**

**Author:** TRC ENVIRONMENTAL CORP
**Addressee:**
**Doc Type:** WORK PLAN
**Doc Date:** 09/01/2001 **# of Pages:** 650
**File Break:** 03.02

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**222399** **FIELD SAMPLING PLAN (FSP) AND QUALITY ASSURANCE PROJECT PLAN (QAPP), VOLUME 2 OF 2**

**Author:** TRC ENVIRONMENTAL CORP
**Addressee:**
**Doc Type:** WORK PLAN
**Doc Date:** 09/01/2001 **# of Pages:** 1005
**File Break:** 03.02

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## 03: REMEDIAL INVESTIGATION (RI)

**222401** **REVISED QUALITY ASSURANCE PROJECT PLAN (QAPP) APPENDIX F (DAS ANALYTICAL SPECIFICATIONS)**

**Author:** DALE S WEISS TRC COMPANIES INC
**Addressee:** CHESTER L JANOWSKI US EPA REGION 1
**Doc Date:** 11/09/2001 **# of Pages:** 381
**File Break:** 03.04
**Doc Type:** WORK PLAN

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**27794** **DRAFT HABITAT EVALUATION SURVEY TECHNICAL MEMORANDUM [WITH TRANSMITTAL DATED 12/19/2001]**

**Author:** US EPA REGION 1
**Addressee:** METCALF & EDDY
**Doc Date:** 12/01/2001 **# of Pages:** 67
**File Break:** 03.10
**Doc Type:** REPORT

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**225306** **FINAL HABITAT EVALUATION SURVEY TECHNICAL MEMORANDUM**

**Author:** METCALF & EDDY
**Addressee:**
**Doc Date:** 01/01/2002 **# of Pages:** 66
**File Break:** 03.04
**Doc Type:** REPORT

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**27795** **RISK ASSESSOR REVIEW OF DRAFT HABITAT EVALUATION SURVEY TECHNICAL MEMORANDUM**

**Author:** RICHARD SUGATT US EPA REGION 1
**Addressee:** CHESTER L JANOWSKI US EPA REGION 1
**Doc Date:** 01/03/2002 **# of Pages:** 1
**File Break:** 03.10
**Doc Type:** MEMO

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## 03: REMEDIAL INVESTIGATION (RI)

**222397** **DATA REPORT**

**Author:** TRC ENVIRONMENTAL CORP
**Addressee:** METCALF & EDDY
**Doc Type:** REPORT
**Doc Date:** 06/04/2002 **# of Pages:** 142
**File Break:** 03.02

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**222449** **VERNAL POOL SURVEY, AMENDMENT TO FINAL HABITAT EVALUATION SURVEY TECHNICAL MEMORANDUM [WITH TRANSMITTAL]**

**Author:** METCALF & EDDY
**Addressee:**
**Doc Type:** REPORT
**Doc Date:** 08/20/2002 **# of Pages:** 61
**File Break:** 03.04

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**222450** **TRC REVIEW OF EPA QUALITY ASSURANCE PROJECT PLAN (QAPP) FOR RUMFORD RIVER REMEDIAL INVESTIGATION / FEASIBILITY STUDY (RI/FS)**

**Author:** DALE S WEISS TRC COMPANIES INC
**Addressee:** DAVID O LEDERER US EPA REGION 1
**Doc Type:** REPORT
**Doc Date:** 03/07/2003 **# of Pages:** 5
**File Break:** 03.04

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**220701** **QUALITY ASSURANCE PROJECT PLAN (QAPP) FOR REMEDIAL INVESTIGATION / FEASIBILITY STUDY (RI/FS), REVISION 1.0 [WITH TRANSMITTAL DATED 10/13/2000]**

**Author:** METCALF & EDDY
**Addressee:** TRC ENVIRONMENTAL CORP
**Doc Type:** REPORT
**Doc Date:** 10/01/2003 **# of Pages:** 713
**File Break:** 03.04

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## 03: REMEDIAL INVESTIGATION (RI)

**225313** **PUBLIC HEALTH ASSESSMENT FOR PUBLIC COMMENT [WITH TRANSMITTAL]**

**Author:** US DEPT OF HEALTH AND HUMAN SERVICES
**Addressee:**
**Doc Type:** REPORT
**Doc Date:** 05/07/2004
**# of Pages:** 222
**File Break:** 03.09

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**232730** **BASELINE ECOLOGICAL RISK ASSESSMENT (ERA), VOLUME 1 OF 2, TEXT, TABLES AND FIGURES**

**Author:** LOCKHEED MARTIN INFORMATION TECHNOLOGIES
**Addressee:** US EPA REGION 1
**Doc Type:** REPORT
**Doc Date:** 07/01/2004
**# of Pages:** 1
**File Break:** 03.10

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**232731** **BASELINE ECOLOGICAL RISK ASSESSMENT (ERA), VOLUME 2 OF 2, APPENDICES**

**Author:** LOCKHEED MARTIN INFORMATION TECHNOLOGIES
**Addressee:** US EPA REGION 1
**Doc Type:** REPORT
**Doc Date:** 07/01/2004
**# of Pages:** 1
**File Break:** 03.10

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**225307** **VISIT TO DELINEATE WETLANDS AT HATHEWAY AND PATTERSON SUPERFUND SITE, NOVEMBER 1-5, 2004**

**Author:** CHRISTINA HOFFMAN METCALF & EDDY
**Addressee:** CINTHIA MCLANE METCALF & EDDY
**Doc Type:** REPORT
**Doc Date:** 12/16/2004
**# of Pages:** 24
**File Break:** 03.04

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## 03: REMEDIAL INVESTIGATION (RI)

**229342** **BASELINE HUMAN HEALTH RISK ASSESSMENT (HHRA)**

**Author:** METCALF & EDDY
**Addressee:**
**Doc Type:** REPORT
**Doc Date:** 01/01/2005 **# of Pages:** 1
**File Break:** 03.10

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**232734** **SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT (ERA), VERNAL POOLS, ADDENDUM TO THE BASELINE ECOLOGICAL RISK ASSESSMENT (ERA)**

**Author:** LOCKHEED MARTIN INFORMATION TECHNOLOGIES
**Addressee:** US EPA REGION 1
**Doc Type:** REPORT
**Doc Date:** 03/01/2005 **# of Pages:** 1
**File Break:** 03.10

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**232728** **INTERIM FINAL REMEDIAL INVESTIGATION (RI) REPORT, VOLUME 1 OF 2**

**Author:** METCALF AND EDDY, INC
**Addressee:** TRC ENVIRONMENTAL CORP
**Doc Type:** REPORT
**Doc Date:** 04/01/2005 **# of Pages:** 1
**File Break:** 03.06

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**232729** **INTERIM FINAL REMEDIAL INVESTIGATION (RI) REPORT, VOLUME 2 OF 2**

**Author:** METCALF AND EDDY, INC
**Addressee:** TRC ENVIRONMENTAL CORP
**Doc Type:** REPORT
**Doc Date:** 04/01/2005 **# of Pages:** 1
**File Break:** 03.06

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## 03: REMEDIAL INVESTIGATION (RI)

**229343** **RISK CALCULATIONS FOR RECREATIONAL USE OF SE/SW QUADRANT**

**Author:** DIANE SILVERMAN METCALF AND EDDY, INC
**Addressee:** CINTHIA MCLANE METCALF & EDDY
**Doc Type:** MEMO
**Doc Date:** 04/05/2005
**# of Pages:** 5
**File Break:** 03.10

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## 04: FEASIBILITY STUDY (FS)

**229310** **UPDATE FROM TOWN OF MANSFIELD ON REUSE PLANNING**

**Author:** STEVEN W MACCAFFRIE MANSFIELD (MA) TOWN OF
**Addressee:** DAVID O LEDERER US EPA REGION 1
**Doc Type:** LETTER
**Doc Date:** 03/31/2005
**# of Pages:** 1
**File Break:** 04.01

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**232732** **PROPOSED PLAN**

**Author:** US EPA REGION 1
**Addressee:**
**Doc Type:** FACT SHEET
**Doc Date:** 06/01/2005
**# of Pages:** 22
**File Break:** 04.09

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## 04: FEASIBILITY STUDY (FS)

**232733** **INTERIM FINAL FEASIBILITY STUDY (FS)**

**Author:** METCALF AND EDDY, INC
**Addressee:** TRC ENVIRONMENTAL CORP
**Doc Type:** REPORT
**Doc Date:** 06/01/2005 **# of Pages:** 1
**File Break:** 04.06

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**237347** **SUMMARY OF OBSERVED BIOLOGICAL ACTIVITY IN TEMPORARY POOLS ON AND AROUND THE HATHEWAY AND PATTERSON SUPERFUND SITE**

**Author:** LOCKHEED MARTIN INFORMATION TECHNOLOGIES
**Addressee:** US EPA REGION 1
**Doc Type:** REPORT
**Doc Date:** 06/23/2005 **# of Pages:** 1
**File Break:** 04.04

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## 05: RECORD OF DECISION (ROD)

**238011** **RECORD OF DECISION (ROD)**

**Author:** US EPA REGION 1
**Addressee:**
**Doc Type:** RECORD OF DECISION
**Doc Type:** REPORT
**Doc Date:** 09/30/2005 **# of Pages:** 290
**File Break:** 05.04

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## 09: STATE COORDINATION

**229345** **GROUNDWATER USE AND VALUE DETERMINATION**

**Author:** JAY NAPARSTEK MA DEPT OF ENVIRONMENTAL PROTECTION
**Addressee:** ROBERT G CIANCIARULO US EPA REGION 1
**Doc Type:** LETTER
**Doc Date:** 01/21/2005 **# of Pages:** 5
**File Break:** 09.01

## 11: POTENTIALLY RESPONSIBLE PARTY

**222040** **NOTIFICATION OF VIOLATIONS OF FEDERAL AND STATE HAZARDOUS WASTE REGULATIONS**

**Author:** MERRILL S HOHMAN US EPA REGION 1
**Addressee:** GERALD A MONTE MA EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
**Doc Type:** LETTER
**Doc Date:** 10/24/1991 **# of Pages:** 2
**File Break:** 11.09

**222041** **CLOSURE OF HAZARDOUS WASTE MANAGEMENT UNITS**

**Author:** GARY GOSBEE US EPA REGION 1
**Addressee:** WILLIAM HAYNES HATHEWAY & PATTERSON COMPANY INC
**Doc Type:** LETTER
**Doc Date:** 05/13/1993 **# of Pages:** 3
**File Break:** 11.09

## 11: POTENTIALLY RESPONSIBLE PARTY

**222042** **NOTICE OF POTENTIAL LIABILITY AND INVITATION TO PERFORM OR FINANCE PROPOSED CLEANUP ACTIVITIES**

**Author:** EDWARD J CONLEY US EPA REGION 1
**Addressee:** WILLIAM HAYNES HATHEWAY & PATTERSON COMPANY INC
**Doc Type:** LETTER
**Doc Date:** 12/01/1993
**# of Pages:** 6
**File Break:** 11.09

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**222043** **PROPERTY ASSESSMENT RECORD**

**Author:** MANSFIELD (MA) TOWN OF
**Addressee:**
**Doc Type:** PRINTOUT
**Doc Date:** 08/26/1998
**# of Pages:** 14
**File Break:** 11.14

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**229344** **NOTIFICATION OF POTENTIALLY INTERESTED PARTY (PIP) OF EPA'S FORTHCOMING PROPOSED CLEANUP PLAN**

**Author:** SUSAN STUDLIEN US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION
**Addressee:** THOMAS ANDERSON CSX TRANSPORTATION
**Doc Type:** LETTER
**Doc Date:** 04/22/2005
**# of Pages:** 2
**File Break:** 11.09

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## 13: COMMUNITY RELATIONS

**222046** **MASSACHUSETTS WOOD SITE REMOVAL BEGINS [WITH TRANSMITTAL DATED 02/14/1994]**

**Author:** SUPERFUND WEEK
**Addressee:**
**Doc Type:** NEWS CLIPPING
**Doc Date:** 02/04/1994 **# of Pages:** 2
**File Break:** 13.03

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**222047** **PLANT CLEANUP TO BE DISCUSSED IN MANSFIELD**

**Author:** GAYLE GODDARD-TAYLOR SUN CHRONICLE, THE
**Addressee:**
**Doc Type:** NEWS CLIPPING
**Doc Date:** 02/15/1994 **# of Pages:** 1
**File Break:** 13.03

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**222048** **HATHEWAY CLEANUP IN FULL GEAR, EPA HANDLING SHORT-TERM WORK AT MANSFIELD SITE**

**Author:** GAYLE GODDARD-TAYLOR SUN CHRONICLE, THE
**Addressee:**
**Doc Type:** NEWS CLIPPING
**Doc Date:** 02/18/1994 **# of Pages:** 2
**File Break:** 13.03

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**222049** **ADMINISTRATIVE RECORD FILE AVAILABLE FOR THE REMOVAL ACTION [AS PRINTED IN THE MANSFIELD NEWS]**

**Author:** US EPA REGION 1
**Addressee:**
**Doc Type:** PRESS RELEASE
**Doc Date:** 03/18/1994 **# of Pages:** 1
**File Break:** 13.03

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## 13: COMMUNITY RELATIONS

**222051** **PRESS RELEASE DELAYED**

**Author:** AMY ROGERS US EPA REGION 1
**Addressee:** FRANK GARDNER US EPA REGION 1
SCOTT LEITE MANSFIELD (MA) TOWN OF
SAPPO MANSFIELD (MA) FIRE DEPARTMENT
**Doc Date:** 08/11/1995 **# of Pages:** 1
**File Break:** 13.03
**Doc Type:** MEMO

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**222044** **REPORT OF TELEPHONE CONVERSATION WITH PETE KNOLL, SUN CHRONICLE (ATTLEBORO, MA)**

**Author:** FRANK GARDNER US EPA REGION 1
**Addressee:**
**Doc Date:** 08/16/1995 **# of Pages:** 1
**File Break:** 13.01
**Doc Type:** MEMO

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**222052** **EPA AND DEP TACKLE HAZARDOUS WASTE THREAT AT DEFUNCT WOOD TREATMENT PLANT**

**Author:** US EPA REGION 1
**Addressee:**
**Doc Date:** 08/16/1995 **# of Pages:** 2
**File Break:** 13.03
**Doc Type:** PRESS RELEASE

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## 13: COMMUNITY RELATIONS

**222053** **EPA AND DEP TACKLE HAZARDOUS WASTE THREAT AT DEFUNCT WOOD TREATMENT PLANT [WITH MARGINALIA]**

**Author:** US EPA REGION 1
**Addressee:**
**Doc Type:** PRESS RELEASE
**Doc Date:** 08/16/1995 **# of Pages:** 2
**File Break:** 13.03

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**222054** **EPA FINISHES WASTE CLEANUP AT WOOD PLANT, FORMER MANSFIELD FACTORY CLEARED OF 120,000 GALLONS**

**Author:** SUN CHRONICLE, THE
**Addressee:**
**Doc Type:** NEWS CLIPPING
**Doc Date:** 08/17/1995 **# of Pages:** 1
**File Break:** 13.03

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**222045** **REPORT OF TELEPHONE CONVERSATION WITH ALMA THOMPSON, BROCKTON ENTERPRISE REGARDING PRESS RELEASE**

**Author:** FRANK GARDNER US EPA REGION 1
**Addressee:**
**Doc Type:** MEMO
**Doc Date:** 08/18/1995 **# of Pages:** 1
**File Break:** 13.01

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**222055** **HATHEWAY PATTERSON CLEANUP NEARS COMPLETION**

**Author:** MEREDITH HOLFORD MANSFIELD NEWS
**Addressee:**
**Doc Type:** NEWS CLIPPING
**Doc Date:** 08/25/1995 **# of Pages:** 2
**File Break:** 13.03

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## 13: COMMUNITY RELATIONS

**222050** **EPA AWARDS NEARLY $1 MILLION IN BROWNFIELDS FUNDS TO MASSACHUSETTS**

**Author:** US EPA REGION 1
**Addressee:**
**Doc Type:** PRESS RELEASE
**Doc Date:** 07/15/1998 **# of Pages:** 4
**File Break:** 13.03

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**222405** **PRELIMINARY SITE TESTING COMPLETED, EPA BEGINS REMEDIAL INVESTIGATION, COMMUNITY UPDATE #2**

**Author:** US EPA REGION 1
**Addressee:**
**Doc Type:** FACT SHEET
**Doc Date:** 07/01/2002 **# of Pages:** 4
**File Break:** 13.05

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**225314** **INVITATION TO INFORMATIONAL MEETING**

**Author:** US EPA REGION 1
**Addressee:**
**Doc Type:** FACT SHEET
**Doc Date:** 07/25/2002 **# of Pages:** 1
**File Break:** 13.04

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**225315** **INVITATION TO INFORMATIONAL MEETING**

**Author:** US EPA REGION 1
**Addressee:**
**Doc Type:** FACT SHEET
**Doc Date:** 06/19/2003 **# of Pages:** 1
**File Break:** 13.04

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## 13: COMMUNITY RELATIONS

**225317** **HATHEWAY AND PATTERSON UPDATE, JULY - AUGUST 2003**

**Author:** US EPA REGION 1
**Addressee:**
**Doc Type:** FACT SHEET

**Doc Date:** 07/01/2003 **# of Pages:** 2
**File Break:** 13.05

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**225316** **INVITATION TO INFORMATIONAL MEETING**

**Author:** US EPA REGION 1
**Addressee:**
**Doc Type:** FACT SHEET

**Doc Date:** 06/22/2004 **# of Pages:** 1
**File Break:** 13.04

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## 16: NATURAL RESOURCE TRUSTEE

**225318** **RESPONSE TO QUESTION REGARDING STATE-PROTECTED RARE SPECIES**

**Author:** CHRISTINE VACCARO MA DIVISION OF FISHERIES
**Addressee:** ANTHONY M RODOLAKIS METCALF & EDDY
**Doc Type:** LETTER

**Doc Date:** 09/07/2001 **# of Pages:** 1
**File Break:** 16.01

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## 16: NATURAL RESOURCE TRUSTEE

**225319** **RESPONSE TO QUESTION REGARDING FEDERALLY-LISTED AND PROPOSED, ENDANGERED OR THREATENED SPECIES**

**Author:** MICHAEL AMARAL US DOI/US FISH & WILDLIFE SERVICE
**Doc Date:** 09/28/2001 **# of Pages:** 1
**Addressee:** ANTHONY M RODOLAKIS METCALF & EDDY
**File Break:** 16.01
**Doc Type:** LETTER

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**225320** **NOTIFICATION OF START OF REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS)**

**Author:** CHESTER L JANOWSKI US EPA REGION 1
**Doc Date:** 03/20/2002 **# of Pages:** 1
**Addressee:** ANDREW RADDANT US DEPT OF THE INTERIOR
**File Break:** 16.01
**Doc Type:** LETTER

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**225321** **RESPONSE TO NOTIFICATION OF START OF REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS)**

**Author:** ANDREW RADDANT US DEPT OF THE INTERIOR
**Doc Date:** 04/10/2002 **# of Pages:** 2
**Addressee:** CHESTER L JANOWSKI US EPA REGION 1
**File Break:** 16.01
**Doc Type:** LETTER

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## 17: SITE MANAGEMENT RECORDS

**222056** **SITE CONTACT LIST [WITH BUSINESS CARDS]**

**Author:** US EPA REGION 1
**Addressee:**
**Doc Type:** LIST
**Doc Date:** 01/01/0001 **# of Pages:** 3
**File Break:** 17.07

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**222057** **PRESUMPTIVE REMEDIES FOR SOILS, SEDIMENTS, AND SLUDGES AT WOOD TREATER SITES**

**Author:** US EPA - OFFICE OF EMERGENCY & REMEDIAL RESPONSE
**Addressee:**
**Doc Type:** REPORT
**Doc Date:** 12/01/1995 **# of Pages:** 60
**File Break:** 17.07

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**222058** **BROWNFIELDS PILOT PROGRAM PRELIMINARY COMPREHENSIVE SITE ASSESSMENT, VOLUME 1 OF 2 - SUMMARY REPORT, ASSISTANCE AGREEMENT BP991019-01-0**

**Author:** RESOURCE CONTROL ASSOCIATES INC
**Addressee:** VANASSE HANGEN BRUSTLIN INC
MANSFIELD (MA) TOWN OF
**Doc Type:** REPORT
**Doc Date:** 06/22/2000 **# of Pages:** 252
**File Break:** 17.08

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## 17: SITE MANAGEMENT RECORDS

**25697** **AERIAL PHOTOGRAPHIC ANALYSIS OF HATHEWAY AND PATTERSON SITE, MANSFIELD, MASSACHUSETTS, EPIC BOOK**

**Author:** US EPA - ENVIRONMENTAL PHOTOGRAPHIC INTERPRETATION CTR (EPIC)
**Addressee:** US EPA REGION 1
**Doc Date:** 08/01/2001 **# of Pages:** 1
**File Break:** 17.04
**Doc Type:** PHOTOGRAPH

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**225322** **PROPERTY ACCESS REQUEST, CLEMMY TANK PROPERTY (PARCEL 18-229)**

**Author:** DALE S WEISS TRC COMPANIES INC
**Addressee:** JOSEPH DITCHMAN JPD MORTGAGE LLC
**Doc Date:** 08/30/2001 **# of Pages:** 2
**File Break:** 17.02
**Doc Type:** LETTER

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**225323** **FORECLOSURE ON WILLIAM E HAYNES, TRUSTEE OF HPC REALTY TRUST**

**Author:** JOHN O DAGOSTINO MANSFIELD (MA) TOWN OF
**Addressee:** CHESTER L JANOWSKI US EPA REGION 1
**Doc Date:** 09/26/2001 **# of Pages:** 4
**File Break:** 17.02
**Doc Type:** LETTER

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## 17: SITE MANAGEMENT RECORDS

**225324** **FORECLOSURE ON LAND OWNED BY HATHEWAY AND PATTERSON CO. INC., LOCATED ON 35 COUNTY STREET, KNOWN AS MAP 19, LOT 210 AND 220**

**Author:** RICHARD V BOUCHER MANSFIELD (MA) TOWN OF
**Doc Date:** 10/29/2001 **# of Pages:** 2
**Addressee:** JOHN O DAGOSTINO MANSFIELD (MA) TOWN OF
MANSFIELD (MA) TOWN OF
**File Break:** 17.02
**Doc Type:** MEMO

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**225325** **REQUEST FOR ACCESS TO PROPERTY LOCATED AT 128 HIGHLAND STREET**

**Author:** DAVID O LEDERER US EPA REGION 1
**Doc Date:** 08/09/2004 **# of Pages:** 3
**Addressee:** CECILIA TJAHJADI MANSFIELD (MA) RESIDENT
**File Break:** 17.02
**Doc Type:** LETTER

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**Number of Documents in Collection 110**

# EPA Region 1 AR Compendium GUIDANCE DOCUMENTS

EPA guidance documents may be reviewed at the EPA Region I Superfund Records Center in Boston, Massachusetts.

**TITLE**
INTERIM FINAL GUIDANCE FOR CONDUCTING REMEDIAL INVESTIGATIONS AND FEASIBILITY STUDIES UNDER CERCLA.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 10/1/1988 | OSWER #9355.3-01 | 2002 |

**TITLE**
POLICY ON FLOOD PLAINS AND WETLAND ASSESSMENTS FOR CERCLA ACTIONS

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 8/1/1985 | OSWER #9280.0-02 | 2005 |

**TITLE**
GETTING READY - SCOPING THE RI/FS [QUICK REFERENCE FACT SHEET]

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 11/1/1989 | OSWER #9355.3-01FS1 | 2013 |

**TITLE**
FEASIBILITY STUDY - DEVELOPMENT AND SCREENING OF REMEDIAL ACTION ALTERNATIVES [QUICK REFERENCE FACT SHEET]

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 11/1/1989 | OSWER #9355.3-01FS3 | 2018 |

**TITLE**
FEASIBILITY STUDY:  DETAILED ANALYSIS OF REMEDIAL ACTION ALTERNATIVES [QUICK REFERENCE FACT SHEET]

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 3/1/1990 | OSWER #9355.3-01FS4 | 2019 |

**TITLE**
SUPERFUND LDR GUIDE #5 DETERMINING WHEN LAND DISPOSAL RESTRICTIONS (LDRs) ARE APPLICABLE TO CERCLA RESPONSE ACTIONS

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 7/1/1989 | OSWER #9347.3-O5FS | 2218 |

**TITLE**
GROUND-WATER PROTECTION STRATEGY

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 8/1/1984 | EPA/440/6-84-002 | 2403 |

**TITLE**
GUIDELINES FOR GROUND-WATER CLASSIFICATION UNDER THE EPA GROUND-WATER PROTECTION STRATEGY (DRAFT)

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 12/1/1986 | | 2404 |

**TITLE**
CONSIDERATIONS IN GROUND WATER REMEDIATION AT SUPERFUND SITES

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 10/18/1989 | OSWER #9355.4-03 | 2410 |

**TITLE**
GUIDANCE ON REMEDIAL ACTIONS FOR CONTAMINATED GROUND WATER AT SUPERFUND SITES

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 12/1/1988 | OSWER #9283.1-2 | 2413 |

**TITLE**
CERCLA COMPLIANCE WITH OTHER LAWS MANUAL (DRAFT)

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 8/8/1988 | OSWER #9234.1-01 | 3002 |

# EPA Region 1 AR Compendium GUIDANCE DOCUMENTS

EPA guidance documents may be reviewed at the EPA Region I Superfund Records Center in Boston, Massachusetts.

**TITLE**
ARARs Q'S & A'S [QUICK REFERENCE FACT SHEET]

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 5/1/1989 | OSWER #9234.2-01FS | 3006 |

**TITLE**
CERCLA COMPLIANCE WITH OTHER LAWS MANUAL - CERCLA COMPLIANCE WITH STATE REQUIREMENTS [QUICK REFERENCE FACT SHEET]

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 12/1/1989 | OSWER #9234.2-05FS | 3009 |

**TITLE**
CERCLA COMPLIANCE WITH OTHER LAWS MANUAL - CERCLA COMPLIANCE WITH THE CWA AND SDWA [QUICK REFERENCE FACT SHEET]

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 2/1/1990 | OSWER #9234.2-06FS | 3010 |

**TITLE**
CERCLA COMPLIANCE WITH OTHER LAWS MANUAL - OVERVIEW OF ARARs - FOCUS ON ARAR WAIVERS [QUICK REFERENCE FACT SHEET]

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 12/1/1989 | OSWER #9234.2-03FS | 3011 |

**TITLE**
CERCLA COMPLIANCE WITH OTHER LAWS MANUAL - SUMMARY OF PART II - CAA, TSCA, AND OTHER STATUTES [QUICK REFERENCE FACT SHEET]

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 4/1/1990 | OSWER #9234.2-07FS | 3012 |

**TITLE**
CERCLA COMPLIANCE WITH OTHER LAWS MANUAL PART II: CLEAN AIR ACT AND OTHER ENVIRONMENTAL STATUTES AND STATE REQUIREMENTS

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 8/1/1989 | OSWER #9234.1-02 | 3013 |

**TITLE**
LAND DISPOSAL RESTRICTIONS AS RELEVANT AND APPROPRIATE REQUIREMENTS FOR CERCLA CONTAMINATED SOIL AND DEBRIS

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 6/5/1989 | OSWER #9347.2-01 | 3016 |

**TITLE**
CERCLA COMPLIANCE WITH OTHER LAWS MANUAL. RCRA ARARS: FOCUS ON CLOSURE REQUIREMENTS.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 10/1/1989 | OSWER #9234.2-04FS | 3017 |

**TITLE**
REMEDIAL INVESTIGATION - SITE CHARACTERIZATION AND TREATABILITY STUDIES [QUICK REFERENCE FACT SHEET]

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 11/1/1989 | OSWER #9355.3-01FS2 | 5025 |

**TITLE**
INTERIM GUIDANCE ON SUPERFUND SELECTION OF REMEDY

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 12/24/1986 | OSWER #9355.0-19 | 9000 |

**TITLE**
GUIDE TO SELECTING SUPERFUND REMEDIAL ACTIONS

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 4/1/1990 | OSWER #9355.0-27FS | 9002 |

# EPA Region 1 AR Compendium GUIDANCE DOCUMENTS

EPA guidance documents may be reviewed at the EPA Region I Superfund Records Center in Boston, Massachusetts.

**TITLE**
PROTECTION OF WETLANDS: EXECUTIVE ORDER 11990. 42 FED. REG. 26961 (1977).

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 5/24/1977 | | C003 |

**TITLE**
COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980. AMENDED BY PL 99-499, 10/17/86.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 10/17/1986 | | C018 |

**TITLE**
DRAFT GUIDANCE ON REMEDIAL ACTIONS FOR CONTAMINATED GROUND WATER AT SUPERFUND SITES.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 10/1/1986 | OSWER 9283.1-2 | C022 |

**TITLE**
POLICY FOR SUPERFUND COMPLIANCE WITH THE RCRA LAND DISPOSAL RESTRICTIONS.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 4/17/1989 | OSWER 9347.1-02 | C058 |

**TITLE**
NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 1/1/1992 | OSWER 9200.2-14 | C063 |

**TITLE**
CODE OF FEDERAL REGULATIONS. TITLE 40. PARTS 190 TO 299. PROTECTION OF ENVIRONMENT. REVISED AS OF JULY 1, 1989.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 7/1/1989 | OLD 40 CFRs | C129 |

**TITLE**
GROUND WATER ISSUE. PERFORMANCE EVALUATIONS OF PUMP-AND-TREAT REMEDIATIONS.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 10/1/1989 | EPA 540/4-89/005 | C134 |

**TITLE**
PRESUMPTIVE REMEDIES: POLICY AND PROCEDURES.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 9/1/1993 | OSWER 9355.0-47FS | C143 |

**TITLE**
GUIDANCE FOR EVALUATING THE TECHNICAL IMPRACTICABILITY OF GROUND WATER RESTORATION.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 10/4/1993 | OSWER 9234.2-25 | C158 |

**TITLE**
GUIDANCE ON PREPARING SUPERFUND DECISION DOCUMENTS: THE PROPOSED PLAN, THE RECORD OF DECISION, E.S.D.'S, R.O.D. AMENDMENT. INTERIM FINAL.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 7/1/1989 | OSWER 9355.3-02 | C179 |

**TITLE**
ARARs Q's & A's: STATE GROUND-WATER ANTIDEGRADATION ISSUES.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 7/1/1990 | OSWER 9234.2-11FS | C191 |

EPA guidance documents may be reviewed at the EPA Region I Superfund Records Center in Boston, Massachusetts.

**TITLE**
ARARs Q's & A's: COMPLIANCE WITH FEDERAL WATER QUALITY CRITERIA.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 6/1/1990 | OSWER 9234.2-09/FS | C192 |

**TITLE**
ARARs Q's & A's. COMPLIANCE WITH THE TOXICITY CHARACTERISTICS RULE: PART I.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 5/1/1990 | OSWER 9234.2-08/FS | C193 |

**TITLE**
BASICS OF PUMP-AND-TREAT GROUND-WATER REMEDIATION TECHNOLOGY.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 3/1/1990 | EPA 600/8-90/003 | C194 |

**TITLE**
IMMOBILIZATION AS TREATMENT. DRAFT.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 2/1/1991 | OSWER 9380.3-07FS | C202 |

**TITLE**
RISK ASSESSMENT IN SUPERFUND: A PRIMER. FIRST EDITION. SEPTEMBER 1990.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 4/1/1991 | EPA 540/X-91/002 | C235 |

**TITLE**
INTERIM FINAL GUIDANCE ON PREPARING SUPERFUND DECISION DOCUMENTS: PROPOSED PLAN, RECORD OF DECISION, ESD'S, RECORD OF DECISION AMENDMENT.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 6/1/1989 | OSWER 9355.3-02 | C249 |

**TITLE**
COMPLIANCE WITH THE CLEAN AIR ACT AND ASSOCIATED AIR QUALITY REQUIREMENTS. ARARS FACT SHEET.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 9/1/1992 | OSWER 9234.2-22FS | C256 |

**TITLE**
COMMUNITY RELATIONS IN SUPERFUND: A HANDBOOK.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 3/1/1986 | OSWER 9230.0-3A | C260 |

**TITLE**
GROUNDWATER USE AND VALUE DETERMINATION GUIDANCE. A RESOURCE-BASED APPROACH TO DECISION MAKING. FINAL DRAFT.

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 4/3/1996 | | C273 |

**TITLE**
ROLE OF THE BASELINE RISK ASSESSMENT IN SUPERFUND REMEDY SELECTION DECISIONS

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 4/22/1991 | OSWER 9355.0-30 | C276 |

**TITLE**
FINAL GROUND WATER USE AND VALUE DETERMINATION GUIDANCE

| DOCDATE | OSWER/EPA ID | DOCNUMBER |
|---|---|---|
| 4/4/1996 | | C278 |

## APPENDIX F: LETTER FROM TOWN OF MANSFIELD TO EPA, 3/31/2005

TOWN OF MANSFIELD, MASSACHUSETTS
Six Park Row, Mansfield, MA 02048
BOARD OF SELECTMEN

Steven W. MacCaffrie, Chairman
Roger S. Achille, Vice Chairman
Bernard J. Dolan, Clerk
Louis P. Amoruso
Michael W. McCue

Telephone: 508-261-7372
Fax: 508-261-7498

March 31, 2005

David Lederer
United States Environmental Protection Agency
Region One
One Congress Street, Suite 1100
Boston, MA 02114-2023

Dear Mr. Lederer:

Pursuant to an EPA reuse planning grant which was awarded to the Town of Mansfield to study the reuse options associated with the Hatheway and Patterson Site located on County Street, please be advised that on Tuesday, March 29th, Ken Buckland of the Cecil Group discussed various options regarding the reuse of the property. According to the interested parties present at that meeting, it was determined that the reasonably anticipated future use of the site will be commercial use to the front parcel located on County Street and on the back parcel either Open Space or Commercial, whichever is considered by EPA to be the higher standard for clean-up. Furthermore, the Town of Mansfield understands that necessary and appropriate deed restrictions will be place on the property in accordance with the RAFU, which establishes the basis of the allowable uses given the standard of clean up for the site.

The Town of Mansfield is anxious to move forward on clean-up initiatives based on the town's desired reuse option for the site as outlined in the preceding paragraph. We are also discussing various development options for Transit Oriented Development initiatives, which will link the Train Station to this parcel and abutting parcels (located to the south of the Hatheway and Patterson site). We will begin the planning phase within the next few weeks and will conclude that phase in early October of 2005.

If you have any questions or desire additional information, please fee free to contact John D'Agostino, Town Manager at 508-261-7370.

Sincerely yours,

Steven W. MacCaffrie
Chairman, Board of Selectmen

Cc: Planning Board
Zoning Board
Conservation Commission

# APPENDIX G: DEP GROUNDWATER USE AND VALUE DETERMINATION

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOUTHEAST REGIONAL OFFICE
20 RIVERSIDE DRIVE, LAKEVILLE, MA 02347 508-946-2700

MITT ROMNEY
Governor

KERRY HEALEY
Lieutenant Governor

ELLEN ROY HERZFELDER
Secretary

ROBERT W. GOLLEDGE, Jr.
Commissioner

January 21, 2005

Mr. Robert Cianciarulo, Chief
Massachusetts Superfund Section
Office of Site Remediation and Restoration
U.S. EPA Region I
1 Congress Street
Suite 1100 (HBO)
Boston, MA 02114

RE: Groundwater Use and Value Determination
Hatheway and Patterson Superfund Site

Dear Mr. Cianciarulo:

Enclosed please find the Groundwater Use and Value Determination prepared by the Department (DEP) for the Hatheway and Patterson Superfund Site. This Use and Value Determination was conducted by the DEP, pursuant to the finalized Guidance developed by the EPA.

In determining the use and value of the groundwater in the vicinity of the Hatheway and Patterson Site, we referred to the aquifer classification contained in the Massachusetts Contingency Plan (MCP). The classification in the MCP gives consideration to all of the factors in the Use and Value Guidance. Enclosed with the Use and Value Determination are copies of the GIS maps (1 mile and 4 mile radii) used to determine the aquifer classification. These maps provides a variety of information, including the USGS yield classification, the presence of public water supplies and zones of protection, surface water bodies, wetlands, protected open space areas, and drainage basin boundaries.

If you have any questions regarding this letter, please contact me at 292-5697.

Very truly yours,

Jay Naparstek,
Deputy Division Director

GROUNDWATER USE AND VALUE DETERMINATION

Hatheway and Patterson Superfund Site
Mansfield, Massachusetts

January 2005

Consistent with the Environmental Protection Agency's (EPA) 1996 Final Ground Water Use and Value Determination Guidance, the Department has developed a "Use and Value Determination" of the groundwater at and in the vicinity of the Hatheway and Patterson Site (the "Site"). The purpose of the Use and Value Determination is to identify whether the aquifer at the site should be considered of "High, Medium," or "Low" use and value. In the development of its Determination, the Department has applied the criteria for groundwater classification as promulgated in the Massachusetts Contingency Plan (MCP). The classification contained in the MCP considers criteria similar to those recommended in the Use and Value Guidance. The Department's recommendation supports a *low use and value* for the groundwater. Outlined below is an explanation for the determination.

The Hatheway and Patterson Superfund Site covers approximately 38 acres of land in Mansfield, Massachusetts. Groundwater at the site flows in a southwesterly direction and discharges to the Rumford River, which flows from north to south. The Rumford River appears to capture most or all of the flow from the site. Contamination at the Site includes soils containing semi-volatile organics, pentachlorophenol, arsenic, chromium, lead, dioxins, and petroleum hydrocarbons; and groundwater containing semi-volatile organics, metals, dioxins, and petroleum hydrocarbons.

The groundwater beneath and in the vicinity of the Site is not classified as a current or potential drinking water supply. The closest municipal water supply wells are located approximately one mile to the east. An approved Zone II extends to approximately one-quarter mile to the east of the site. There is an EPA designated Sole Source Aquifer also located approximately one-quarter mile to the east. Wetland areas are located to the east, northeast and southwest of the site. The aquifer underlying the Site is classified as low yield by the United States Geological Survey (USGS). The Site Area aquifer is classified as both GW-2 and GW-3 (see description below).

**GW-2** This designation addresses areas where there is a potential for migration of vapors from groundwater to occupied structures. The classification applies to locations where groundwater has an average annual depth of 15 feet or less and where there is an occupied building or structure within a 30-foot surface radius of that groundwater.

**GW-3** This designation considers the impacts and risks associated with the discharge of groundwater to surface water, and therefore applies to all groundwater.

Considering this determination and the site conditions, the groundwater risk evaluation and cleanup decisions should consider, but not be limited to the following:

Human Health:
- a) vapor seepage into buildings,
- b) site excavation activities that may expose workers to contaminated groundwater and vapors,

c) discharge to surface water and potential exposure routes (e.g. wading, other recreational activities) potential for migration of contaminated groundwater to areas of higher groundwater use and value.

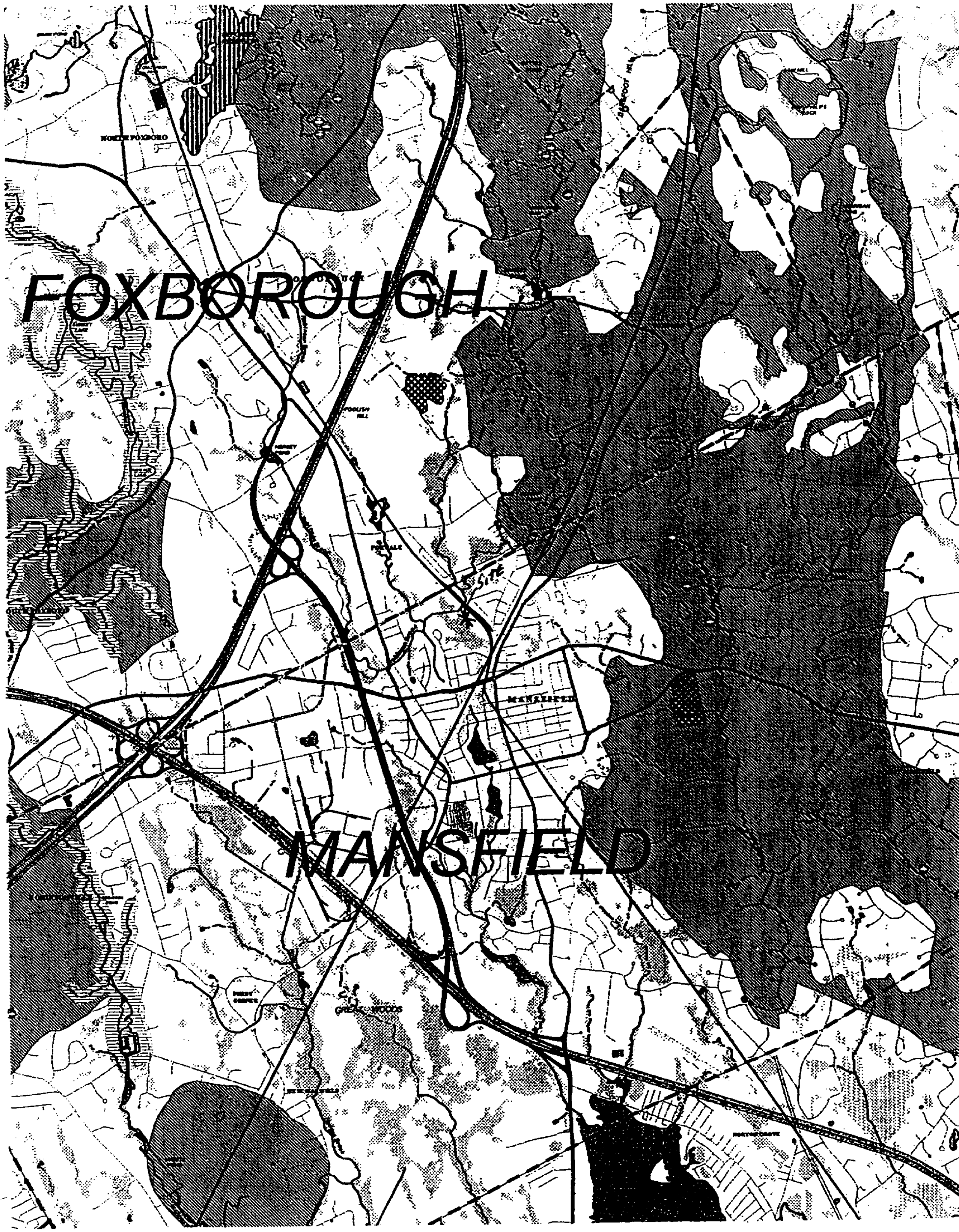
Ecological — a) effects to wetlands and river biota.

In light of the use and value factors and similar criteria established in the MCP that were examined in this determination, the Department recommends a *__low use and value__* for the Site groundwater.

**TABLE 1**

**HATHEWAY AND PATTERSON SITE GROUNDWATER USE AND VALUE DETERMINATION**
**January, 2005**

| USE AND VALUE FACTORS | RATING | HATHEWAY AND PATTERSON SITE (4-0571) SITE-SPECIFIC DETERMINATION |
|---|---|---|
| 1. Quantity | Low | - Aquifer would be considered low to medium yield based on hydraulic conductivity values determined at the site. |
| 2. Quality | High | - Water quality, other than that impacted by site contaminants, is believed to be good. |
| 3. Current Public Water Supply Systems | Medium | - The nearest pubic water supplies are approximately one mile from the site. An approved Zone II area exists approximately ¼ mile east of the site. |
| 4. Current Private Drinking Water Supply Wells | Low | -private drinking water supplies are located in the surrounding area, but they are cross gradient of the site and are outside of the extent of contamination. |
| 5. Likelihood and Identification of Future Drinking Water Use | Low | -Site is zoned for industrial use, residential properties exist within one half mile of the Site<br>-Not designated by the Town as an area for future drinking.<br>-No current Activity and Use Limitations on the Study Area properties (it is expected that there will be groundwater use restrictions). |
| 6. Other Current or Reasonable Expected Ground Water Use(s) in Review Area | Low | - On-site businesses use public water. Not expected to use site water for non-potable uses. |
| 7. Ecological Value | Low | -Groundwater discharges to the Rumford River<br>- No Ecological risk identified through RI Risk Assessment.<br>- No Endangered species habitat exists on-site. |
| 8. Public Opinion | Low | -Public appears to place minimal value for on-site groundwater. |




SCALE 1: 63,360
1 INCH = 1 MILE

This remedy also partially 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 (groundwater and/or land use restrictions are necessary), a review will be conducted within five years after initiation of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

G. AUTHORIZING SIGNATURES

This ROD documents the selected remedy for soil and groundwater at the Hatheway & Patterson Site. This remedy was selected by EPA's Region I-New England office; with concurrence of the Massachusetts Department of Environmental Protection.

Concur and recommended for immediate implementation:

U.S. Environmental Protection Agency

By: ______________________ Date: 9-30-05

**Richard Cavagnero,**
**Deputy Director**
**Office of Site Remediation and Restoration**
**Region 1**

**CONCURRENCES**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SYMBOL | Record of Decision: Hatheway & Patterson Superfund Site | | | | HBO | HIO | | |
| SURNAME | Mansfield-Foxborough, MA | Carr | Keller | Cianciarulo | Bell | Kaiser | Page 11 of 87 | |
| DATE | 9/28/05 | 9/28/05 | 9/28/05 | 9/29/05 | 9/29/05 | 9-30-05 | | |

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