U.S. Army Corps of Engineers

New England District
Concord, Massachusetts

Performing Remedial Investigation/Feasibility Study (RI/FS) Work For Six Operable Units (OUs) At The General Electric (GE)/Housatonic River Project Pittsfield, Massachusetts

REVISED DRAFT FEASIBILITY STUDY ALLENDALE SCHOOL

Contract No. DACW33-94-D-0009
Task Order No. 0032
DCN: GEP2-120998-AAEK

10 December 1998

98P-0892

WESTON
MANAGERS DESIGNERS/CONSULTANTS

REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) WORK FOR SIX OPERABLE UNITS (OUs) GENERAL ELECTRIC (GE)/HOUSATONIC RIVER PROJECT PITTSFIELD, MASSACHUSETTS

FEASIBILITY STUDY ALLENDALE SCHOOL

REVISED DRAFT

Contract No. DACW33-94-D-0009
Task Order No. 0032
DCN:GEP2-120998-AAEK

Prepared for:

U.S. ARMY CORPS OF ENGINEERS
NORTH ATLANTIC DIVISION
NEW ENGLAND DISTRICT
696 Virginia Road
Concord, Massachusetts 01742-2751

Prepared by:

ROY F. WESTON, INC.
One Wall Street
Manchester, New Hampshire 03101-1501

10 December 1998

W.O. No. 10971-032-003

REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) WORK FOR SIX OPERABLE UNITS (OUs) GENERAL ELECTRIC (GE)/HOUSATONIC RIVER PROJECT PITTSFIELD, MASSACHUSETTS

FEASIBILITY STUDY ALLENDALE SCHOOL

REVISED DRAFT

Prepared for:

U.S. ARMY CORPS OF ENGINEERS
NORTH ATLANTIC DIVISION
NEW ENGLAND DISTRICT
696 Virginia Road
Concord, Massachusetts 01742-2751

Prepared by:

ROY F. WESTON, INC.
One Wall Street
Manchester, New Hampshire 03101-1501

Lee dePersia Program Manager	Date	Bette L. Nowack, P.E OU Manager	Date
Catherine M. Schmidt Author	Date	Arthur J. Cunningham, P.E. QA Officer	Date

10 December 1998

W.O. No. 10971-032-003

TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS (Continued)

Section **Page**

TABLE OF CONTENTS
(Continued)

Section **Page**

LIST OF FIGURES

Title

Note: All figures are located at the end of the document.

LIST OF TABLES

Title **Page**

LIST OF ACRONYMS

AALs	Allowable Ambient Limits
amsl	above mean sea level
APEG	Alkaline Polyethylene Glycol
ARAR	Applicable or Relevant and Appropriate Requirement
AUL	Activities and Use Limitation
AWQC	Ambient Water Quality Criteria
BBL	Blasland, Bouck, & Lee, Inc.
BCD	Base-Catalyzed Decomposition
bgs	below ground surface
CENAE	U.S. Army Corps of Engineers, New England District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Chemical of Concern
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
GE	General Electric
gpm	gallons per minute
HDPE	High-Density Polyethylene
HQ	Hazard Quotient
KPEG	Potassium Polyethylene Glycol
MADEP	Massachusetts Department of Environmental Protection
MCP	Massachusetts Contingency Plan
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NCP	National Contingency Plan
NPL	National Priorities List
O&G	Oil & Grease
O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PAHs	Polynuclear Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PIDC	Pittsfield Industrial Development Company
POTW	Publicly Owned Treatment Works

LIST OF ACRONYMS
(Continued)

ppb	parts per billion
PPE	Personal Protective Equipment
ppm	parts per million
ppt	parts per trillion
PRG	Preliminary Remediation Goal
PVC	Polyvinyl Chloride
RA	Remedial Action
RAO	Remedial Action Objective
RBC	Risk-Based Concentration
RCRA	Resources Conservation and Recovery Act
RO	Remedial Objective
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SET	Solvated Electron Technology
SOW	Scope of Work
STM	Short-Term Measure
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TBC	To-Be-Considered
2,3,7,8-TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
TCL	Target Compound List
TMV	Toxicity, Mobility, and Volume
TPH	Total Petroleum Hydrocarbons
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage, and Disposal Facility
USGS	U.S. Geological Survey
VLDPE	Very-Low-Density Polyethylene
VOC	Volatile Organic Compound
WESTON®	Roy F. Weston, Inc.
yd^3	cubic yards

SECTION 1

INTRODUCTION

1. INTRODUCTION

1.1 PURPOSE AND ORGANIZATION OF THE REPORT

This Revised Draft Feasibility Study (FS) has been prepared for the Allendale School property in Pittsfield, MA. Allendale School is part of the proposed General Electric (GE)-Housatonic River National Priorities List (NPL) site. For administrative purposes, the GE site has been subdivided into operable units (OUs), as defined by the U.S. Environmental Protection Agency (EPA). OU 3 of the proposed GE NPL site consists of the Allendale School property.

This FS has been prepared for the U.S. Army Corps of Engineers, North Atlantic Division, New England District (CENAE) by Roy F. Weston, Inc. (WESTON®) under contract no. DACW33-94-D-0009 with CENAE.

The purpose of this FS is as follows:

- Summarize the site history and major findings from site investigation activities.
- Develop a conceptual model for the site.
- Present the results of the human health risk assessment.
- Summarize remedial action objectives (RAOs) and preliminary remediation goals (PRGs) developed for the site.
- Document the development and screening of remedial action alternatives for the site.
- Present a detailed evaluation of several alternatives relative to the evaluation criteria established in the National Contingency Plan (NCP).
- Provide information required in order for EPA to select an appropriate preferred remedial alternative for presentation to the public.

Section 1 of this document establishes the purpose and objectives of the report and presents a brief site description and history. Section 2 summarizes the development of RAOs, including the identification of applicable or relevant and appropriate requirements (ARARs) that may influence site remediation and potential site-specific PRGs. The development of PRGs is also discussed in this section. Section 3 contains a summary of the identification and preliminary screening of technologies potentially applicable for the Allendale School property. Section 4 describes the remedial alternatives assembled from the potentially applicable technologies screened in Section 3, and selects a limited number of alternatives for detailed evaluation in Section 5. Section 5 includes an evaluation of each alternative against the evaluation criteria established in the NCP, and a comparative analysis of alternatives. Section 6 contains a list of references used in Sections 1 through 5. All figures referenced in Sections 1 through 5 are contained at the end of the document.

1.2 SITE BACKGROUND INFORMATION

1.2.1 Site Description

Allendale School is located in Pittsfield, Massachusetts (Figure 1-1) and is part of the proposed GE-Housatonic River NPL site. The property is located approximately 1,500 feet north of the Housatonic River. Figure 1-2 shows the location of Allendale School (OU 3) in relation to the other OUs within the proposed NPL site. The Allendale School property is located immediately north of the Hill 78 Area of the GE facility (OU 1), across the Tyler Street Extension (Figure 1-3). The school building is situated on the northwest side of the property. The remainder of the 12-acre property generally consists of paved and grass-covered areas. A small wetland is located on the southern portion of the property. Residential properties are located to the north, east, and west of the Allendale School property. The school property and the surrounding area are currently zoned for residential use.

1.2.2 Site History

The Allendale School property was formerly part of the 1,250 acre Allen Farm, which was used to breed horses. In 1920, the Pittsfield Industrial Development Company (PIDC) purchased several hundred acres of the Allen Farm. The current Allendale School property was purchased from the PIDC in 1950 by local philanthropists and donated to the City of Pittsfield. According to the *MCP Interim Phase II Report for the Allendale School Property, Blasland & Bouck Engineers, P.C., January 1993* (03-0007) the Allendale School was constructed on the property in 1950 and 1951.

At the time of the school's construction in 1950, GE entered into an agreement under which GE allowed the City to remove soil material from GE property for use as fill material at the school property. A copy of this agreement is contained in Appendix E of the *MCP Interim Phase II Report for the Allendale School Property* (03-0007). The agreement indicates that fill material placed at the Allendale School property originated from the Hill 78 Area located south of the school property (03-0007). Concerns regarding the potential presence of polychlorinated biphenyls (PCBs) at the Allendale School property were initially raised during the construction of the Pittsfield Generating Company facility (formerly known as the Altresco Corporation Cogeneration Facility), located at the Hill 78 Area. Due to the presence of PCBs in soil at this area, the potential existed for PCBs to be present in the fill at the Allendale School property.

The Massachusetts Department of Environmental Protection (MADEP) conducted soil and surface-water sampling in January 1990 to investigate the potential for PCBs at the Allendale School property. The results from this sampling event and subsequent soil sampling conducted by GE in 1990 indicated PCB concentrations greater than the "level of concern" of 2 milligrams per kilogram (mg/kg) in soil established by MADEP. PCBs were not detected in surface-water samples collected by MADEP. A Short-Term Measure (STM), as defined by *The Massachusetts Contingency Plan (MCP), Massachusetts Department of Environmental Protection, 310 CMR 40.000, 31 October 1997* (00-0114), was conducted in 1991 to reduce the potential for human contact with soils containing levels of PCBs greater than 2 mg/kg. The STM consisted of the placement of a permeable geotextile layer overlain with a minimum of 2 feet of "clean" soil over areas where PCB soil concentrations exceeded 2 mg/kg within the top 3 feet of existing soil. The STM cap is constructed of permeable materials that allow for infiltration of rain water and snow melt. The area covered by the STM permeable cap is approximately 5 acres.

In March 1992, MADEP classified the Allendale School property as a priority site and required a Phase II Comprehensive Site Assessment in accordance with 310 CMR 40.545 of the MCP. Prior to 1992, the Allendale School property was considered to be part of the GE Hill 78 Landfill Area site.

In January 1993, GE submitted the Interim Phase II Report to MADEP. On 13 September 1996, after review of that document, MADEP directed GE to: (1) submit an Imminent Hazard

Evaluation Proposal for surface and near-surface soil sampling and analysis at the Allendale School property to evaluate whether a potential "imminent hazard" exists; (2) submit thereafter a supplemental Phase II scope of work proposing additional investigations; and (3) upon completion of the additional investigations, submit a supplemental Phase II report for the property. On 27 September 1996, GE submitted an Imminent Hazard Evaluation Proposal, which was conditionally approved by MADEP in a letter dated 10 October 1996. In support of the imminent hazard evaluation, GE collected soil samples from the surface (0 to 6 inches) and near-surface (6 to 12 inches) from 114 grid node locations based on a 50-foot grid. Concentrations of PCBs were greater than 2 mg/kg in 2 out of 114 locations, at both the surface and near-surface intervals (sampling locations AS-96-76 and AS-96-80). None of the 114 surface samples had PCB concentrations greater than the MCP potential imminent hazard threshold of 10 mg/kg, and only 1 out of 114 of the near-surface samples had a PCB concentration greater than 10 mg/kg (16 mg/kg, sampling location AS-96-80, 6- to 12-inch interval). On 6 December 1996, GE submitted an Imminent Hazard Evaluation Report. Based on the available information, GE concluded that a potential imminent hazard as defined in the MCP (310 CMR 40.0321(2)(b)) did not exist at the schoolyard.

Additional soil sampling activities were conducted in 1996 and 1997 in support of supplemental Phase II activities. As described in the *MCP Supplemental Phase II Report for the Allendale School Property, Blasland, Bouck, & Lee, Inc., August 1997* (03-0023), based on these soil sampling activities, the horizontal extent of surficial (0 to 3 feet below ground surface [bgs]) soil with PCB concentrations greater than 2 mg/kg appeared to be limited to soil beneath the permeable cap, with the exception of areas along the eastern and northwestern sides of the cap.

In February and March 1998, additional soil sampling activities were conducted by GE in order to delineate areas with soil concentrations greater than 2 mg/kg in surficial soil outside the cap, to further define the vertical extent of contamination, and to collect and analyze additional soil samples for Appendix IX of 40 Code of Federal Regulations (CFR) 264 constituents. Based on the additional soil-sampling activities, three areas were identified for soil removal due to PCB concentrations greater than 2 mg/kg in surficial soil outside the cap. The excavated areas are shown in Figure 1-4. These areas included a wetland area on the southeastern side of the cap and areas on the northeastern and northwestern sides of the cap. Approximately 1,600 cubic yards (yd^3) of soil were excavated from these areas and disposed of off-site in April 1998. Excavation depths ranged from 6 inches to 3 feet. A geotextile material was placed in the excavations prior to backfilling. Backfill and topsoil materials were then placed in the excavations to restore the areas to the original grades.

1.3 CONCEPTUAL MODEL

A conceptual model of the Allendale School property was developed to form the basis for the evaluation of potential remedial measures. The conceptual model was developed using data contained in several site investigation reports prepared by Blasland, Bouck & Lee, Inc. (BBL) on behalf of GE. These reports are referenced throughout this section where appropriate. No new data were collected as part of this FS. The existing data were also used to construct a three-dimensional model of the site to better illustrate the extent of PCB contamination and its distribution relative to the various geologic units. The model has been used to produce several of the figures presented in this section.

1.3.1 Hydrogeological Model

The regional geological and hydrogeological setting has been described in detail in previous documents and, therefore, will only be summarized here. For a complete discussion of the regional geology and hydrogeology, consult the *Source Area Characterization Report, Roy F. Weston, Inc., July 1998* (00-0274).

The Allendale School property is located within the Taconic region of the New England Physiographic Province of the eastern United States. This region is characterized by rough glaciated terrain with hilltops rising to elevations on the order of 2,000 feet and relatively narrow stream valleys. The site is located within the Housatonic River valley, one of the larger stream valleys in the region. The Housatonic River divides the region into the Berkshire Highlands to the east and the Taconic Hills to the west.

Bedrock geology in the Housatonic River valley in the vicinity of the site is dominated by various members of the Stockbridge Formation, which include a variety of calcitic and dolomitic marbles with minor quartzite stringers. Groundwater in the bedrock exists predominantly in fractures. Regional tectonic events have left the bedrock in the vicinity of the site somewhat fractured and faulted, providing an extensive network of pathways for groundwater movement and storage (fracture porosity). In addition, groundwater flow through the carbonate rocks of the Stockbridge Formation has enhanced the permeability and porosity of these rocks by dissolving the fracture faces (solution porosity).

The overburden geology of the region is typical of continental glaciated terrain and is characterized by till-covered uplands dissected by alluvial-filled stream valleys. The glacial deposits are Pleistocene in age and include till and various alluvial deposits. The till is typically gray to dark brown, depending on the locale, and moderately to very dense with varying amounts of sand, gravel, and cobbles in a fine-grained (silt and/or clay) matrix. The till is typically found directly overlying bedrock in most areas and is usually exposed in the upland areas. The thickness of the till can vary widely from nonexistent to over 50 feet, but is generally found to be on the order of 10 to 20 feet thick. In stream valleys, the till is typically overlain by alluvial (glacio-fluvial) deposits consisting of sand and gravel with lesser amounts of silt and clay. The composition and thickness of the alluvium, is highly variable across the region, with maximum thicknesses in the range of several hundred feet in some of the deeper valleys. The glacial alluvium can be locally overlain by recent alluvium, which represents the reworking of the glacially-deposited material by younger rivers and streams. Artificial fill is also present in widely varying textures and thicknesses in areas where cultural development is present.

Groundwater in the overburden is typically found within 5 to 10 feet of the ground surface under unconfined conditions. Groundwater in the overburden is not used for economic purposes in the vicinity of the site. In general, groundwater flow in the overburden is toward the Housatonic River, which acts as the predominant groundwater discharge point for the region.

The site geological model has been developed from boring logs and cross-sections presented in the MCP Interim Phase II Report (03-0007), the MCP Supplemental Phase II Report (03-0023), and the A*ddendum to the MCP Supplemental Phase II Report for the Allendale School Property, Blasland, Bouck, & Lee, Inc., June 1998* (03-0040).

Figures 1-5 through 1-7 illustrate the subsurface lithology at the Allendale School property. The locations of the cross-sections presented in these figures are shown in Figure 1-4. The overburden at the Allendale School property is composed of four distinct units: fill, glacial alluvial deposits, peat, and till. The till is assumed to directly overlie bedrock of the Stockbridge Formation in the vicinity of the site and is believed to be approximately 50 feet deep based on borings from adjacent areas (Hill 78). No borings have been drilled through the till at the Allendale School property to confirm its thickness or the bedrock type. The till is overlain by a discontinuous layer of peat that averages about 2 feet thick where present. The peat is present over much of the central portion of the site, pinching out along the eastern and western edges of the site and under the school to the north. The peat layer presumably extends off-site to the south, under the Tyler Street Extension, and is interpreted as the former ground surface. The glacial alluvial material laterally abuts the peat layer and directly overlies the till where the peat is absent. The fill material was used to fill in low-lying areas when the property was initially developed in 1950 (03-0040) and generally overlies the peat layer and glacial alluvial deposits. Prior to placement of the fill, much of the central and southern parts of the site were wetlands, thus explaining the presence of the peat layer. The fill material generally ranges in thickness from less than 1 foot near the school building to about 5 feet at the southern edge of the site, although isolated pockets in excess of 10 feet thick are also present.

The till layer is similar in composition to that found at other sites in the vicinity and is generally described as a gray to brown silty fine sand with varying amounts of fine to coarse gravel. The glacial alluvium is described as a red-brown fine to coarse sand with varying amounts of fine gravel and minor amounts of silt. The fill encountered was somewhat variable ranging from a brown clayey silt to a light brown to gray medium sand. The peat layer is composed of black decaying organic matter, wood fragments, and silt.

Groundwater at the Allendale School property is generally found within 10 feet of the ground surface under unconfined conditions. Regional groundwater flow in the vicinity of the school is generally from north to south toward the Housatonic River. Figure 1-8 shows a groundwater contour map for the site developed by BBL using water level data from 11 monitoring wells and piezometers. The groundwater contours indicate groundwater at the site converges in the south-central portion of the site, at the location of a former wetlands area, and then drains southward. These flow patterns likely parallel pre-fill surface-water drainage patterns and are strongly influenced by the distribution of the higher permeability fill and slope of the peat layer. No multilevel wells or piezometers have been installed at the site, thus, no information is available with regard to vertical flow directions, or interaction of groundwater between the various units.

No information is available with regard to the interaction of groundwater and surface water in wetlands along the southeastern corner of the site. It is presumed that groundwater discharges to those wetlands based on the topographic relationships.

1.3.2 Nature and Extent of Contamination

Historically, PCB concentrations detected at the Allendale School property have been compared to the MCP Method 1 Category S-1 soil standard of 2 mg/kg for PCBs. Category S-1 soil includes soil that is potentially accessible and a child’s frequency and intensity of use are both considered to be high; or soil that is accessible and is either currently used for growing fruits or vegetables for human consumption or if it is reasonably foreseeable that the soil may be put to such use; or a child’s frequency or intensity of use is considered to be high; or an adult’s frequency and intensity of use are both considered to be high (00-0114). At the Allendale School property, children’s frequency of use is characterized as high because children attend school on the property. Due to concerns regarding exposure to PCBs in surficial soil, a significantly greater number of surficial soil samples have been collected at the property (refer to Figure 1-9), in comparison to the number of subsurface soil samples collected (refer to Figure 1-10).

Excavation of soils containing greater than 2 mg/kg PCBs in surficial soils outside the capped area was performed in April 1998, as described in Subsection 1.2. PCB concentrations greater than 2 mg/kg are present in soil greater than 3 feet bgs, both within and outside the capped area. Figure 1-4 shows the locations where PCB concentrations in soil exceed 2 mg/kg. As illustrated by this figure, the horizontal extent of PCB-containing soil material is generally encompassed by the existing cap, with the exception of areas along its northwestern and eastern sides, the southwestern side of the main school building (in the vicinity of ASB-3), and along the Tyler Street Extension (in the vicinity of ASB-12). Figure 1-11 illustrates the horizontal extent of contamination at several elevations beneath the ground surface elevation (approximately 1,008 to 1,010 feet above mean sea level [amsl] in the vicinity of the cap).

The vertical extent of PCBs in soil appears generally to range from 1 to 8 feet bgs. However, PCB contamination is present at depths up to and greater than approximately 12 feet near the south corner of the main school building (borings B-20-96 and B-66), the eastern side of the permeable cap (boring ASB-34), and the eastern side of the baseball field (boring ASB-29). The thickness of the soil containing greater than 2 mg/kg PCBs is shown in Figure 1-12. It should be noted that the model used to produce this figure extrapolated the PCB data in areas where the depth of contamination is not defined, such as in several areas on the southern side of the cap. Areas where the vertical extent of PCBs has not been fully delineated include those locations where PCBs are present in the deepest sample collected from the soil boring at that location. These locations are identified in Figure 1-13. Figure 1-13 also identifies the maximum depth of PCB concentrations above 2 mg/kg at each location.

PCBs represent the primary chemical of concern (COC) at the Allendale School property. Other compounds detected in site soils and/or groundwater above regulatory and/or risk-based criteria include dioxins (converted into total 2,3,7,8-tetrachlorodibenzo-p-dioxin [2,3,7,8-TCDD] equivalents for comparison to criteria), pesticides (dieldrin), metals (arsenic and thallium), and polynuclear aromatic hydrocarbons (PAHs), including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene and phenanthrene. The levels of arsenic found in site soils are within the natural range for this metal, suggesting that the levels detected may not be site-related. The highest concentration of arsenic detected at the site was 17 mg/kg, within the range of naturally occurring arsenic concentrations (2 to 22 mg/kg) reported for Massachusetts soil in *Elements in North American Soil, Hazardous Materials Control Resources Institute, J. Dragon and A. Chiasson, 1991* (99-0103). Dioxins and several PAHs, including benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, and phenanthrene, were not detected above PRGs. The other COCs (dieldrin, thallium, and the remaining PAHs) exceed the PRGs in only a few samples from a limited area. As shown in Figure 1-14, based on existing analytical data, non-PCB chemicals of concern exceed PRGs at only two locations (sample locations AS-98-129 and ASB-3) outside the capped area. The locations inside the capped area exceeding PRGs for non-PCB chemicals of concern also contain PCBs above 2 mg/kg. The identification of chemicals of concern and locations of chemicals of concern exceeding regulatory or risk-based criteria are further discussed in Section 2.

1.3.3 Contaminant Fate and Transport

PCBs represent the principal chemical of concern at the Allendale School property. The PCBs found in site soils and unfiltered groundwater samples were predominantly Aroclor-1254 and Aroclor-1260. Aroclor-1254 was the only PCB found in filtered groundwater samples. However, Aroclor-1254 was detected at low concentrations and it is often difficult to distinguish between the Aroclors at low concentrations. This subsection focuses on the fate and transport of PCBs. Additional chemicals of concern for soil include dioxins, pesticides, PAHs, and metals. Dioxins, pesticides, and PAHs were not detected in samples collected from monitoring wells and piezometers on the Allendale School property during the latest round of groundwater monitoring (March 1998). Arsenic was detected in two samples collected during this sampling round, however, the concentrations were well below MCP standards.

The fate and transport of PCBs is dominated by their low water solubility and high affinity for organic matter. In general, the adsorption of PCBs to soils increases with increasing soil organic content, decreasing soil particle size, and increasing congener chlorination (03-0007). As a result, dissolved PCB concentrations in groundwater are typically in the parts-per-trillion (ppt) to very low parts-per-billion (ppb) range, although turbid samples could contain substantially higher levels. Although PCBs could theoretically volatilize, their strong adsorption to soils limits that pathway. Thus, migration of PCBs is generally limited to high-energy sediment transport mechanisms such as surface-water runoff and stream flow, although some limited migration could also occur as a result of fine particle movement in groundwater.

The potential migration pathways/exposure routes for the Allendale School property, taking into account the anticipated transport mechanisms described previously, include the following:

- Direct contact.
- Windblown dust.
- Sediment transport via surface water.
- Sediment transport via groundwater.
- Leaching and dissolution to groundwater.

The direct exposure and windblown dust pathways have been mitigated by the installation of an earthen and geotextile fabric cover over the areas of the site where PCBs exceeded 2 mg/kg at the ground surface and excavation of other selected areas. The sediment transport via surface-water pathway has been partially addressed by regrading during placement of the earthen cover and installation of a stormwater drainage system to promote drainage of surface runoff. The presence of wetlands in the southeastern corner of the site may represent a remaining sediment transport via surface-water pathway. Although sediment transport via groundwater flow is generally not considered to be a major migration pathway due to the low flow velocities typically associated with groundwater, it may be a concern at this site due to the placement of the fill. Surface-water infiltration and groundwater flow through the fill may be able to transport fines due to the relatively low density of the fill compared to natural soils. This "winnowing" of the fines from the fill may be the cause of the PCBs at depths below the fill/native material contact. Finally, the presence of Aroclor-1254 in groundwater at the site suggests that PCBs may be leaching and dissolving into the groundwater to a limited extent. Migration of PCBs in the downgradient direction as a result of groundwater flow is possible. However, the groundwater in the vicinity of the property is not used as a source of potable water. In addition, existing groundwater data have not indicated PCBs above analytical detection limits in filtered groundwater samples collected from monitoring wells and piezometers on the Allendale School property, with the exception of one sample collected in March 1998 from a monitoring well upgradient of the fill area.

Pesticides and dioxins have fate and transport properties similar to PCBs. They have a low aqueous solubility, they sorb strongly to organic matter in soils and sediments, and are generally quite stable in the environment. Pesticides do not biodegrade significantly in water but biodegradation can occur in sediments and soils. Dioxins generally do not biodegrade under natural conditions. Some limited evaporation and photodegradation can occur in both soil and water. Pesticides and dioxins also can be transported by biota uptake.

PAHs generally have very low mobilities, with mobility decreasing with increasing molecular weight. They have low aqueous solubility and sorb readily to organic matter in soils and sediment. The aqueous solubility decreases and the sorption increases as the molecular weight increases. Biodegradation of PAHs is an important fate mechanism, especially for lower molecular weight compounds. Volatilization is generally greater for lower molecular weight PAHs.

The mobility of metals is complex and depends, on the most basic level, on whether the metal is dissolved or is in an insoluble solid form of the metal. In water, the most important conditions influencing the availability and mobility of metals are pH, oxidation/reduction conditions, the presence of complexing agents, and salinity. In soils and sediment, the cation exchange capacity, surface area, and organic carbon content of the matrix are also important. The mobilities of many metals in soil are limited by their tendency to be adsorbed and/or coprecipitated by manganese and iron oxides, and/or insoluble organic material. The presence of available (acid volatile) sulfide can control bioavailability of metals in sediment.

Fate and transport mechanisms and potential migration pathways at the site for dioxins, PAHs, and pesticides then, are the same as those described previously for PCBs. The potential migration pathways for metals, however, must include dissolution in groundwater and movement off-site in the downgradient direction.

SECTION 2

REMEDIAL OBJECTIVES AND CLEANUP GOALS

2. REMEDIAL OBJECTIVES AND CLEANUP GOALS

Remedial action objectives (RAOs) must be established prior to the development and evaluation of remedial alternatives. RAOs are the general conceptual goals of remedial actions, such as complying with applicable or relevant and appropriate objectives (ARARs) or reducing risk. The RAOs are presented in Subsection 2.1. Existing laws, regulations, policies, and guidance, which may be ARARs or “to be considereds” (TBCs) for the site, are presented in Subsection 2.2.

2.1 REMEDIAL ACTION OBJECTIVES

Development of specific RAOs involves identification of affected media and contaminant characteristics; identification of future land and groundwater uses; evaluation of exposure pathways and contaminant migration; and determination of acceptable exposure limits to humans and aquatic and terrestrial receptors. The site-specific media addressed in this FS include surface and subsurface soils. There are no surface water bodies on the Allendale School property.

Groundwater will not be evaluated in this FS. The limited groundwater data currently available does not indicate PCBs above analytical detection limits (0.0003 to 0.001 milligrams per liter [mg/L]) in filtered groundwater samples collected from monitoring wells and piezometers on the Allendale School property, with the exception of one sample collected in March 1998 from a monitoring well upgradient of the fill area. Groundwater in the Pittsfield area is not currently used as a public water supply. There are no private wells within 50 feet of the Allendale School property. All of the drinking water for the City of Pittsfield currently is obtained from regional reservoirs. The Massachusetts Contingency Plan (MCP) classifies groundwater as GW-1, GW-2 or GW-3 (00-0114). GW-1 is defined by the Massachusetts Department of Environmental Protection (MADEP) as “either a current or future source of drinking water” if it has a high or medium yield according to U.S. Geological Survey (USGS) standards and fulfills a number of other criteria (00-0114). Groundwater in the Pittsfield area does not meet these criteria and, therefore, is not classified by MADEP as a GW-1 source. GW-2 is defined as a potentially useful drinking water aquifer if it is within 30 feet of a currently occupied structure and the depth to groundwater is less than 15 feet (00-0114). GW-3 is the classification given to all groundwater in Massachusetts based on the potential to discharge to a surface water body (00-

0114). The Allendale school property fulfills the criteria of the GW-2 and GW-3 categories. Based on the classification as GW-2 and GW-3 and the lack of potential for use, groundwater exposure via ingestion of drinking water has not been evaluated.

Sediment will not be evaluated in this FS, based on an evaluation of the wetland located in the southeastern corner of the property. MADEP has determined that an environmental risk assessment is not warranted at the Allendale School property and that the preliminary remediation goal selected for PCBs in soil is considered to be protective of both human health and the environment. In addition, Woodlot Alternatives, Inc. performed a functional value assessment of the wetland and concluded that the wetland provides very few functions and values relative to other types of wetlands. A copy of the determination by MADEP and the functional value assessment are contained in Appendix A.

The RAOs presented here are based on the presumed future use of the Allendale School property. It is assumed that the property will either continue to be used as an elementary school or will be redeveloped for residential use, and that additional construction/expansion activities may occur that may bring contaminated soil from as deep as 10 feet bgs up to the ground surface. The *Revised Draft Human Health Risk Assessment for Allendale School, Roy. F. Weston, Inc., December 1998* (03-0058) includes sampling results to a depth of 10 feet below the current ground surface. The maximum depth of 10 feet bgs is based on EPA guidance and assumes that 10 feet is the maximum depth that would be excavated for a residential foundation. Therefore, it is assumed in this FS that remedial actions would be required up to a maximum of 10 feet bgs.

PCBs represent the primary chemical of concern (COC) at the Allendale School property. Additional chemicals of concern are identified in Subsection 2.3. RAOs developed to address soil contamination at the Allendale School property include the following:

- **General—**Compliance with chemical-, location-, and action-specific ARARs, as described in Subsection 2.2.

- **Soil—**Protection of human receptors from direct contact with, and ingestion of, contaminated soil that may present a health risk (a cumulative carcinogenic risk greater than 10^{-4}, a carcinogenic risk greater than 10^{-6} for any one contaminant or a hazard quotient [HQ] greater than one).

2.2 SITE ARARS AND TBCS

The NCP requires that Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) actions comply with all ARARs, unless a waiver is applied. The definitions, categories, and identification of ARARs are found in this subsection.

ARARs are defined by CERCLA as follows:

- <u>Applicable requirements</u> are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. In order to be applicable, the standards have to be promulgated.

- <u>Relevant and appropriate requirements</u> are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site.

TBC material refers to other federal and state criteria, advisories, guidances, and proposed standards and local ordinances that are not legally binding and do not have the status of potential ARARs. However they may provide useful information or recommended procedures.

ARARs and TBCs may be divided into the following categories:

- <u>Chemical-specific requirements</u> are health- or risk-based concentration limits or ranges in various environmental media for specific hazardous substances, pollutants, or contaminants. In most cases, these are applicable requirements and are set as cleanup levels. An example would be chemical-specific state or federal soil standards.

- <u>Location-specific requirements</u> are restrictions on activities that are based on the characteristics of a site or its immediate environment. An example would be restrictions on work performed in wetlands or wetlands buffers. In this example, the location-specific requirements necessitate restoration of wetlands impacted by contamination and/or remedial activities.

- <u>Action-specific requirements</u> are controls or restrictions on particular types of activities, such as hazardous waste management or wastewater treatment. An example would be state and federal air emissions standards and/or state allowable ambient limits (AALs) as applied to an in situ soil vapor extraction treatment unit.

The chemical-, location-, and action-specific ARARs and TBCs for the Allendale School property are summarized in the tables contained in Appendix B. The tables also provide a citation, a synopsis, and a determination of the applicability of chemical- and location-specific ARARs and TBCs, and indicate how each remedial alternative will address each ARAR and TBC.

2.3 MEDIA-SPECIFIC CLEANUP GOALS

Candidate preliminary remediation goals (PRGs) were developed using the criteria listed in Table 2-1. The criteria used to develop the candidate PRGs include risk-based concentrations (RBCs), background, and ARAR and TBC concentrations for soil for each of the COCs at the Allendale School property. The carcinogenic RBCs listed in this table are based on an individual contaminant carcinogenic risk of less than 1-in-1,000,000 (10^{-6}) to meet the remedial objective stated in Subsection 2.1. The noncancer RBCs are based on a hazard quotient of one. The rationale and methodology for development of human health risk-based RBCs are presented in the Revised Draft Human Health Risk Assessment (03-0058). As noted in the risk assessment, potential risks to human receptors are currently within acceptable limits. The RBCs have been developed based on a future residential use scenario, which poses potential unacceptable risks to human receptors.

Candidate PRGs, the basis for candidate PRG selection, the maximum concentration detected, and the number of sampling locations exceeding the candidate PRG are presented in the right-hand columns of Table 2-1. A risk management decision was made with regard to selection of candidate PRGs to be implemented at the site. The risk management decision was based on an evaluation of the seven criteria discussed in Section 5: short-term effectiveness; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume; implementability; cost; compliance with ARARs; and overall protection of human health and the environment.

RBCs were calculated to achieve the RAO of 10^{-6} carcinogenic risk for each individual COC. However, these RBCs were adjusted to reflect a carcinogenic risk of 10^{-5} for selection of candidate PRGs. The rationale for basing the selected PRGs on a carcinogenic risk of 10^{-5} rather than 10^{-6} involves the conservative nature of the assumptions used in the risk assessment calculations, the comparison of the site soil contaminant concentrations with background levels,

Table 2-1

Candidate Preliminary Remediation Goals
Allendale School,
Pittsfield, MA

Chemical	RBCs[a] Carcinogenic Child/Adult (mg/kg)	RBCs[a] Non-carcinogenic (mg/kg)	MCP S-1 Standards[b] (mg/kg)	TSCA (mg/kg)	EPA (mg/kg)	Background Soil Levels Range (mg/kg)	Candidate PRGs (mg/kg)	Basis for Candidate PRG Selection[c]	Maximum Detected Concentration (mg/kg)	Number of Locations Exceeding Candidate PRG
Dioxins/Furans										
Total 2,3,7,8 TCDD (equivalent)	0.00000856	NTV	0.000004	NA	0.001 [d]	NA	0.001	EPA	0.00046071	0 [e]
Pesticides										
Dieldrin	0.0107	1.97 [f]	0.03	NA	NA	NA	0.107	RBC (10^{-5})	6.4	9 [g]
Polychlorinated Biphenyls										
Total PCBs	0.398	2.28 [f]	2	1 [h]	NA	NA	2	MCP	1100	75
Polynuclear Aromatic Hydrocarbons										
Benzo(a)anthracene	0.838	NTV	0.7	NA	NA	0.005 - 0.02 [i] 0.169 - 59 [j]	8.38	RBC (10^{-5})	15	1
Benzo(a)pyrene	0.104	NTV	0.7	NA	NA	0.002 - 1.3 [i] 15 - 62 [j]	1.04	RBC (10^{-5})	16	2
Benzo(b)fluoranthene	1.05	NTV	0.7	NA	NA	0.02 - 0.03 [i] 0.9 - 47 [j]	10.5	RBC (10^{-5})	14	1
Benzo(k)fluoranthene	12.5	NTV	7	NA	NA	0.01 - 0.11 [i] 0.058 - 0.25 [j]	125	RBC (10^{-5})	12	0 [e]
Dibenz(a,h)anthracene	0.117	NTV	0.7	NA	NA	NCA [i,j]	1.17	RBC (10^{-5})	2.5	1
Indeno(1,2,3-cd)pyrene	1.19	NTV	0.7	NA	NA	0.01 - 0.015 [i] 8 - 61 [j]	11.9	RBC (10^{-5})	3.8	0 [e]

Table 2-1

Candidate Preliminary Remediation Goals
Allendale School,
Pittsfield, MA
(Concluded)

Chemical	RBCs[a] Carcinogenic Child/Adult (mg/kg)	Non-carcinogenic (mg/kg)	MCP S-1 Standards[b] (mg/kg)	TSCA (mg/kg)	EPA (mg/kg)	Background Soil Levels Range (mg/kg)	Candidate PRGs (mg/kg)	Basis for Candidate PRG Selection[c]	Maximum Detected Concentration (mg/kg)	Number of Locations Exceeding Candidate PRG
Phenanthrene	NA	1160	100	NA	NA	0.01 - 0.015 [i] 8 - 61 [j]	1160	RBC (HQ=1)	12	0 [e]
Metals										
Arsenic	0.687	44.6 [f]	30	NA	NA	2 - 22 [k]	22	Background	17	0 [e]
Thallium	NA	13.8 [f]	8	NA	NA	0.25 - 10 [l]	13.8	RBC (HQ=1)	17	1

EPA = U.S. Environmental Protection Agency
HQ = Hazard Quotient
MCP = Massachusetts Contingency Plan Method 1 Standard
NA = Not applicable.
NCA = No criteria available
NTV = No toxicity value
PRG = Preliminary Remediation Goals
RBC = Risk-Based Concentration
TSCA = Toxic Substances Control Act

[a] RBC is based on target cancer risk of 10^{-6} or a target hazard quotient of 1. RBCs were calculated in the Revised Draft Human Health Risk Assessment for Allendale School (03-0058).

[b] The lowest of the MCP S-1/GW-2 and S-1/GW-3 standard is presented for comparison.

[c] The candidate PRGs for pesticides and PAHs are based on a cancer risk of 10^{-5} (refer to Section 2.3 for rationale). The candidate PRG for thallium is based on a hazard quotient of 1.

[d] Recommended PRG for residential areas (99-0102).

[e] Because there are no sampling locations which exceed the candidate PRG, a PRG will not be selected for this contaminant in Table 2-2.

[f] Based on exposure to child, age

[g] The number of locations exceeding the PRG for dieldrin includes samples with detection limits greater than two times the PRG. These locations are: ASB-30, ASB-31, K-16, K-17, K-18, K-19, and K-20.

[h] Based on the cleanup goal for total PCBs in high-occupancy areas without a cap. The cleanup goal for PCB remediation waste beneath a cap in high-occupancy areas is 10 mg/kg. Alternatively, a site-specific risk assessment may be performed.

[i] Based on rural soil concentrations from Toxic Profile for Polycyclic Aromatic Hydrocarbons, PB95-264370, The Agency for Toxic Substances and Disease Registry, U.S. Department of Human Services, 1995 (99-0017).

[j] Based on urban soil concentrations (99-0017).

[k] Massachusetts soils (99-0103).

[l] Central Michigan Soils (99-0101).

and the presence of scattered exceedances of the candidate PRGs in non-fill areas of the site. The risk-based concentrations were calculated based on a residential future use scenario and/or future construction activities at the school.

Concentrations of polynuclear aromatic hydrocarbons (PAHs) exceeding the 10^{-6} RBCs in the soil are present in scattered areas that were not identified as fill areas. It should be noted that the PAH concentrations observed fall within the background ranges for these chemicals in soil at urban sites (refer to Table 2-1). Remediating to 10^{-5} RBCs would limit excavation/remediation to the known areas of fill, making the cleanup both more implementable and less costly. Removal of large quantities of additional soil outside the fill areas would add greatly to the cost and remediation time while resulting in minimal incremental reduction of risk. After soil within the fill area has been remediated, the only soils exceeding the 10^{-6} risk level will be scattered outside the fill areas, since the PRG driving remediation in the fill areas is the PCB PRG. Remediation to the PCB PRG in the fill area will result in achievement of the 10^{-6} RBCs for PAHs in the fill area.

In general, candidate PRGs were chosen by selecting the RBC (based on a hazard quotient of one for noncarcinogens or adjusted to reflect a carcinogenic risk of 10^{-5}), because the RBCs were calculated for site-specific conditions. Three exceptions are the candidate PRGs for dioxins (based on the recommended PRG for residential areas in *Approach for Addressing Dioxin in Soil at CERCLA and RCRA Sites, OSWER Directive 9200.4-26, USEPA, Office of Solid Waste and Emergency Response, April 13, 1998* [99-0102]), PCBs (based on the MCP Method 1 S-1 Standard to maintain consistency with other MADEP-led PCB cleanups in Massachusetts), and arsenic (based on the typical background concentration of arsenic in Massachusetts soil).

Typical values for naturally occurring concentrations of metals in soil are presented in Table 2-1. Arsenic concentrations detected at the site are below concentrations typically found in Massachusetts soils (99-0103). In addition, arsenic was not detected above the MADEP background soil concentration of 17 mg/kg for arsenic listed in *Guidance for Disposal Site Risk Characterization, In Support of the Massachusetts Contingency Plan, Interim Final Policy #WSC/ORS-95-141, MADEP, 1995* (99-0121). The candidate PRG for arsenic was adjusted to be equivalent to background concentrations in found in Massachusetts soil, because it would be impracticable to remediate to below naturally occurring background levels for this metal. Typical concentrations of PAHs found in rural and urban soil are presented for comparison in Table 2-1, but were not used in the selection of candidate PRGs because these contaminants are not naturally occurring. The Toxic Substances Control Act (TSCA) cleanup goal for PCBs was not selected because this cleanup goal does not necessarily apply to spills prior to 1978. In addition, TSCA allows for the use of a risk-based cleanup goal, if accepted by the EPA Regional Administrator.

The selected soil PRGs, the basis for PRG selection, and number of locations exceeding the PRG for each chemical of concern are shown in Table 2-2. The locations of the samples exceeding PRGs are discussed in Section 3. PRGs were not selected for dioxins, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and arsenic because the candidate PRGs presented in Table 2-1 were not exceeded.

Analytical data sheets were not available for 48 sample locations. These locations include B-20-96 through B-32-96, SS-01 through SS-26, SD-01 through SD-03, B4, B5, and B9 through B12. The analytical results for these samples were obtained from figures presented in the Addendum to the MCP Supplemental Phase II Report for the Allendale School Property (03-0040). The number of locations exceeding the PRG for PCBs includes eight of these sample locations.

Table 2-2

Selected Preliminary Remediation Goals
Allendale School,
Pittsfield, Massachusetts

Chemical	Selected Preliminary Remediation Goal (PRG) (mg/kg)	Basis for PRG Selection	Number of Locations Locations Exceeding PRG
Pesticides			
Dieldrin	0.107	RBC (10^{-5})	9
Polychlorinated Biphenyls			
Total PCBs	2	MCP	75
Polynuclear Aromatic Hydrocarbons			
Benzo(a)anthracene	8.38	RBC (10^{-5})	1
Benzo(a)pyrene	1.04	RBC (10^{-5})	2
Benzo(b)fluoranthene	10.5	RBC (10^{-5})	1
Dibenz(a,h)anthracene	1.17	RBC (10^{-5})	1
Metals			
Thallium	13.8	RBC (HQ=1)	1

SECTION 3

IDENTIFICATION AND SCREENING OF TECHNOLOGIES

3. IDENTIFICATION AND SCREENING OF TECHNOLOGIES

The primary objective of this section is to identify and screen potential remedial technologies that will be combined into remedial alternatives that encompass a range of appropriate site cleanup options and are designed to protect human health and the environment. The technology identification and screening process presented in this section includes the following steps:

- Development of general response actions to address the remedial action objectives (RAOs).
- Identification of remedial technologies within each general response category and identification of process options related to each remedial technology.
- Identification of volumes or areas of each medium to which the general response actions might be applied, considering RAOs and the chemical and physical characteristics of the site.
- Screening and evaluation of each process option to eliminate those that cannot be implemented technically at the site, to assess the benefits and disadvantages of each option, and to select representative processes for each technology type that will be retained for further consideration in Section 4, Development and Screening of Alternatives.

3.1 DEVELOPMENT OF GENERAL RESPONSE ACTIONS

General response actions describe medium-specific remedies that satisfy the RAOs in general terms. Consequently, general response actions have been developed for the soil medium at the Allendale School property. Groundwater, surface water, and sediment will not be evaluated in this FS. The rationale for eliminating these media is discussed in Section 2.

The general response actions developed for soil were based on the physical characteristics of the soil, the type and concentration of contaminants present, the volume of contaminated soil, and the PRGs. For each general response action identified, one or more remedial technologies were identified, and for each remedial technology, one or more process options were identified.

An initial consideration in the screening process is the technical implementability of a process option, given the site-specific conditions and the contaminant types. Those processes judged to be inappropriate for the site-specific conditions are eliminated from further consideration. As the screening process continues, the process options are generally evaluated on their own merits, although consideration may be given to synergism between options. Also, because several similar process options may be appropriate, the screening may result in the selection of one process option to represent a group of related process options.

The general response actions for soil were developed to meet the RAOs presented in Section 2 and the PRG of 2 mg/kg PCBs. These response actions would address other organic chemicals of concern in a manner similar to the PCBs. These response actions do not necessarily address metals; however, metals concentrations above PRGs were only present at one location. The general response actions, remedial technologies, and associated process options for soil at the Allendale School property are presented in Table 3-1.

3.2 ESTIMATED VOLUMES TO BE REMEDIATED

To evaluate and compare potential remedial process options, estimates of quantities of materials requiring remediation are needed. These estimates facilitate evaluation of the implementability and costs of process options. Practically, it is not possible to accurately predict the area or volume of soil requiring remediation until remedial actions have been initiated and confirmational samples have been analyzed. In addition, the vertical extent of contamination has not been defined in some areas (refer to Figure 1-13). However, preliminary quantity estimates are necessary to properly evaluate remedial process options.

A preliminary estimate of the volume of soil requiring remediation at the Allendale School property has been determined through an evaluation of analytical data, geological units, and the horizontal and vertical extent of fill, as determined using Figure 2, Comparison of Pre-1950 to Post-1951 Topographic Elevations, presented in the *Supplemental Phase II Scope of Work for the Allendale School Property, Blasland, Bouck, & Lee, Inc., November 1996* (03-0015). As stated in Subsection 1.3, horizontally, the limits of soil with PCBs greater than 2 mg/kg generally correspond to the extent of fill. Vertically, however, PCBs greater than 2 mg/kg are generally found in the fill and extend approximately 2 feet below the fill layer. PCBs greater than 2 mg/kg were also present up to a maximum of 8 feet below the vertical extent of fill at sample location ASB-34.

Table 3-1

Remedial Technologies and Process Options, Allendale School, Pittsfield, MA

General Response Action	Remedial Technology	Process Options
No action	None	Not applicable
Institutional controls	Access restrictions	Deed restrictions
Removal	Removal	Excavator/backhoe
Containment	Capping	Synthetic membrane Low permeability cap (soils/compacted clays) Asphalt cap Geosynthetic clay liner Multilayered cover system Permeable soil cover
Treatment	Thermal treatment	Incineration (rotary kiln) Thermal desorption Thermal wells Vitrification
	Physical/chemical treatment	Soil washing Solvent extraction Soil flushing Stabilization/solidification Chemical dechlorination Oxidation/reduction
	Biological treatment	Biodegradation
Disposal	On-site disposal	Backfilling
	Off-site disposal	Non-TSCA PCB treatment/disposal facility TSCA treatment/disposal facility Permitted landfill

Due to the lack of analytical data for subsurface soil in several areas, including the northwestern portion of the permeable cap, as well as the uncertainty of the vertical extent of contamination in other areas (refer to Figure 1-13), the volume of soil requiring remediation was not estimated using analytical data only. The extent of PCB contamination appears to be horizontally limited to the extent of fill materials and, on average, to vertically extend 2 feet beyond the extent of fill. Thus, for the purposes of this report, the volume of soil requiring remediation was estimated by calculating the volume of fill plus the volume of native soil 2 feet below the fill. The volume of soil with PCB concentrations exceeding the TSCA level of 50 mg/kg was also calculated using this method in areas where analytical data indicated soil with PCB concentrations greater than 50 mg/kg. Historical soil sampling locations with PCB concentrations greater than 50 mg/kg are shown in Figure 1-4. The total volume of soil exceeding PRGs (both within and outside the capped area) is estimated as 38,000 yd^3, with approximately 6,000 yd^3 of this volume estimated to contain PCB concentrations greater than 50 mg/kg. This estimate does not include the cap materials, which are assumed to contain PCB concentrations less than 2 mg/kg (based on historical data from samples collected of the cap materials) and will be retained for use as backfill.

Based on EPA guidance, soils less than 10 feet below the ground surface present a potential risk to human health due to additional construction/expansion activities that may occur in the future. Such activities may bring contaminated soil from as deep as 10 feet bgs up to the ground surface. Since a groundwater exposure pathway has not been identified for the Allendale School property, soil greater than 10 feet deep is presumed to be within acceptable risk levels. Therefore, it is assumed in this FS that remedial actions would be required only up to a maximum of 10 feet bgs.

Additional soil sampling activities prior to remediation are recommended to further define the extent of soil exceeding PRGs. In areas where there is currently a lack of analytical data, such as the northwest portion of the existing cap, soil samples would be collected at various depths. In areas where the vertical extent of contamination is not defined (refer to Figure 1-13), soil samples would be collected from depths below the maximum sampling depth for historical sampling locations in that area. The soil sampling could be performed using a drill rig or Geoprobe® system during a school vacation week. It is anticipated that the number of samples required to further define the extent of contamination could be collected within one week.

As shown in Figure 1-14, based on existing analytical data, non-PCB chemicals of concern exceed PRGs at only two locations (sample locations AS-98-129 and ASB-3) outside the capped area. The locations inside the capped area exceeding PRGs for non-PCB chemicals of concern also contain PCBs in excess of PRGs. The soil inside the capped area exceeding PRGs for non-PCB chemicals of concern will be remediated by removing soil exceeding the PRG for PCBs. Confirmation samples following soil excavation will be analyzed for all chemicals of concern to confirm that cleanup goals have been achieved. The area of sample locations AS-98-129 and

ASB-3 (outside the capped area) have not been included in the estimate for soil volumes requiring remediation. Only one PAH was detected at sample location AS-98-129 at a concentration slightly exceeding the PRG. Sample location ASB-3 exceeds PRGs for several PAHs and dieldrin, as well as for PCBs. This sampling location, as well as locations B-22-96 and B-21-96 (located outside the capped area), appear to be isolated areas exceeding the PRG for PCBs. Additional soil sampling would be conducted in the vicinity of these sample locations prior to remediation to confirm the presence of PCBs exceeding PRGs and determine the extent of soil remediation required in these areas. This sampling would be conducted during the delineation sampling described above. In addition, a portion of the confirmation samples collected following excavation would be analyzed for non-PCB COCs (refer to Subsection 5.2.3).

3.3 SCREENING AND COMPARATIVE EVALUATION OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS

This subsection describes the results of a comparative analysis of each process option identified in Subsection 3.1. The process options were compared for effectiveness, implementability, and relative cost. The purpose of this screening and evaluation process is to eliminate technologies that are not feasible or have severe limitations that might prevent achievement of RAOs. Based on the results of the comparative analysis, a recommendation has been made for each process option to be retained or eliminated from further consideration. Those process options retained may be used in the development of alternatives in Section 4. The factors used in the evaluation are the following:

- Effectiveness – The effectiveness of the process option was assessed, taking into account the following:
  - Effectiveness of the process option in meeting RAOs.
  - Potential impacts to human health and the environment during the construction and implementation phases.
  - How proven and reliable the process is with respect to the contaminants and conditions at the site.
- Implementability – Process options were evaluated against the following implementability factors:

- Ability to obtain necessary permits and/or public acceptance.

- Availability of support services and equipment necessary to perform the process option.

- Ability to retain the current use of the property as a school, with little disruption to the normal school schedule and activities.

▪ Cost – Process option cost factors were evaluated with respect to the following:

  Relative capital and operation and maintenance (O&M) costs of process options that provide similar results.

Table 3-2 presents the comparative analysis of process options for soil at the Allendale School property. The results of the screening and evaluation process for the general response actions, remedial technologies, and process options are graphically represented in Figure 3-1. In this figure, the technologies and process options that were eliminated are shown with a dashed outline. Those process options with a solid outline have been retained and will be used in the development of remedial alternatives in Section 4.

Table 3-2

Comparative Analysis of Process Options for Soil at the Allendale School Property, Allendale School, Pittsfield, MA

Process Option	Effectiveness	Implementability	Relative Cost	Recommendation
No Action: Soil would be left in place with no remedial actions taken.	▪ This option is not expected to meet the RAOs (not protective). ▪ No significant reduction in toxicity, mobility, or volume is expected under this option. ▪ The effectiveness of the existing cap will decrease if not maintained.	▪ Because there would be no action taken and no commitment of resources, this option could be readily implemented. ▪ Administrative implementability would be very difficult based on expected public opposition to no action.	There would be no costs associated with this option.	The no-action alternative will be retained as required by the NCP.
Deed Restrictions: These are institutional controls that would restrict the future use of the building and/or the property. These controls impose limits on the future use of the land, and prohibit the installation of drinking water wells. The current permeable cap would remain in place, with continued periodic inspections and repair of the cap as necessary.	▪ Would maintain restrictions on use of the building to restrict the contact with people or animals, which, in turn, would reduce the potential for contact and exposure to the constituents of concern. ▪ The ultimate effectiveness of deed restrictions is contingent on continued future enforcement of the restrictions. ▪ Deed restrictions can reduce the potential for contact, but do not reduce toxicity, mobility, or volume.	▪ Deed restrictions are legal and administrative procedures that are implemented at some hazardous materials sites. ▪ Deed restrictions would be implemented with the cooperation of local authorities. ▪ Public opposition to this alternative is likely. ▪ Restrictions prohibiting future excavation activities may not be acceptable to the community if future construction or building expansion is planned.	The costs associated with this option would be very low.	This option is potentially applicable and will be retained for further consideration.
Excavation: Excavation involves the removal of site soils using standard construction equipment and techniques. The alternative may consist of excavation of soil containing contaminants exceeding cleanup goals throughout the property or outside the capped area only. Then the excavated soils would undergo temporary storage, analysis, disposal, or treatment by another process option. Excavated areas would be backfilled with clean fill or treated soil.	▪ Excavation would be an effective initial step of a remedial alternative because it would minimize the mobility of contamination and mitigate further contaminant migration. Removal of the contaminated materials would be a permanent solution.	▪ Excavation is a widely used, conventional construction technique. It is most practical for depths up to 25 feet. Based on the current understanding of the depth of contamination at Allendale School, excavation could be readily implemented. ▪ Dust control may be required during excavation activities.	The costs associated with this option would be moderate to high compared to other options.	This option is potentially applicable and will be retained for further consideration.

Table 3-2

Comparative Analysis of Process Options for Soil at the Allendale School Property, Allendale School, Pittsfield, MA (Continued)

Process Option	Effectiveness	Implementability	Relative Cost	Recommendation
Incineration (Rotary Kiln): This is a high-temperature incineration option that would be capable of treating both solid and liquid feed materials. The feed materials would be passed through a cylindrical, refractory-lined shell mounted on a slight incline that would be rotated to promote mixing and transfer of the material through the kiln. Temperatures in the kiln would reach 1,800° F. A secondary combustion chamber (called an afterburner) is designed to destroy organics in the flue gases and would operate at temperatures as high as 2,200° F. Treatment residuals requiring additional treatment or disposal include ash and possibly a liquid waste stream if a wet scrubber is used for treatment of emissions.	▪ Rotary kiln incinerators have been used successfully in remediation of soils contaminated with a wide range of organic compounds. It is expected that this technology could meet the cleanup objectives for all organic contaminants. ▪ High metals concentrations in the solid waste, debris, and soil may result in substantial accumulation of metals in the fly ash. Based on the metals concentrations in the fly ash, a secondary treatment, such as stabilization, may be required to immobilize metals before placing treated soil in the ground.	▪ Both mobile (transported intact) and transportable (delivered in pieces and assembled on-site) rotary kiln incinerators are available for on-site use. In addition, soils can be transported off-site for treatment at a stationary commercial incinerator. ▪ It is likely that a trial burn and performance test would need to be conducted to verify the effectiveness of the kiln, if conducted on-site. ▪ Under current policy, an EPA risk assessment of the alternative would be needed, if incineration conducted on-site. ▪ Obtaining community acceptance for incineration may be difficult. ▪ Treatment of air emissions would likely be required.	The costs for high-temperature incineration would be high when compared to other treatment technologies.	Concern about community acceptance makes incineration on-site or at another OU an unlikely choice for this site. Therefore, this option will not be retained for further consideration. Off-site incineration at a licensed TSCA facility is potentially applicable and will be retained for further consideration.
Ex Situ Thermal Desorption: Thermal desorption is a technology in which wastes are heated to temperatures between 300° F and 600° F (low temperature thermal desorption) or 600° F and 1,000° F (high temperature thermal desorption) to volatilize organic compounds.	▪ Thermal desorption systems have proven to be effective for most of the organic contaminants, including VOCs, PAHs, PCBs, and pesticides. ▪ Thermal desorption alone does not reduce the toxicity or volume of contamination, but the associated vapor treatment system would, either directly (through treatment) or indirectly (through collection and off-site destruction of contamination).	▪ There are several vendors actively promoting thermal desorption technology; however, advance scheduling may be required to reserve a thermal desorption unit at the site. ▪ Few, if any, off-site facilities would be able to accept soil with PCB concentrations greater than 50 mg/kg, however, thermal desorption using a portable unit at another area of the GE site may be an option. ▪ The potential exists for public opposition to the use of on-site thermal treatment systems with process emissions.	The costs for thermal desorption are moderate to high.	On-site thermal treatment will not be retained for further consideration due to the likelihood of public opposition. Off-site thermal desorption (possibly at another OU) is potentially applicable and will be retained for further consideration.

Table 3-2

Comparative Analysis of Process Options for Soil at the Allendale School Property, Allendale School, Pittsfield, MA (Continued)

Process Option	Effectiveness	Implementability	Relative Cost	Recommendation
Ex Situ Vitrification: In this process, excavated soil is passed through a high-temperature reactor where the materials are heated to their melting point and converted to a glass-like matrix, which can be used as fill material on-site or disposed of off-site. During the process, inorganic compounds become entrapped within the matrix and organic compounds are destroyed by oxidation.	▪ Almost all organic compounds are destroyed during the process due to extremely high temperatures. Metals are immobilized into a compatible glass-like product. ▪ The resulting vitrified mass effectively immobilizes the entrapped compounds, including any residual PCBs not destroyed by the vitrification process. However, PCBs are already relatively immobile in soil.	▪ Ex situ vitrification is a relatively complex, high-energy technology requiring a high degree of specialized skill and training. It has not been used extensively to date. ▪ Moisture content and soil classification can affect the applicability of the technology. Limestone or soda ash is sometimes added to the feed soils.	The costs of ex situ vitrification would be high because of the high capital costs, high energy requirements to melt the solids, and the specialized skill and training required to operate the system.	Because of the expected high cost of this option and the lack of proven experience in its implementation, it will not be retained for further consideration.
Soil Washing: Soil washing is a physical/chemical process that reduces the volume of soil material undergoing further treatment by removing organic contaminants that adhere to organic matter and fine particles within a soil matrix. The affected soils are subjected to a multistage washing system where surfactants are used to separate the contaminants and the finer particles from the coarser soil materials. The exiting wash stream then undergoes additional treatment.	▪ In soil washing the contaminated wash stream requiring treatment is only a small fraction of the original soil volume. ▪ Soil washing has been proven effective for VOCs, SVOCs, and a wide range of metals. Soil washing is less effective for PCBs. ▪ The effectiveness will depend on factors such as: particle size distribution, moisture content, pH, and cation exchange capacity, among others. ▪ The site soils in areas targeted for excavation may not contain a sufficient coarse fraction to make the application of soil washing effective. ▪ Soil washing alone does not reduce the toxicity or volume of contamination, but the associated treatment system would, either directly (through treatment) or indirectly (through collection and off-site destruction of contamination).	▪ Treatability studies would need to be conducted to identify the optimal washing reagents, estimate the amount of residual waste volumes to be created, and to quantify the effectiveness of the process for site contaminants. ▪ Treatment residuals require additional treatment or disposal. ▪ On-site treatment of soil may not be practical due the current use of the property and the length of time required for implementation (greater than 3 months).	The costs associated with soil washing would be moderate; however, these costs may increase significantly if multiple treatments are required.	Soil washing is potentially applicable and will be retained for further consideration, however, only as an off-site alternative, with treatment conducted at another area of the GE site.

Table 3-2

Comparative Analysis of Process Options for Soil at the Allendale School Property, Allendale School, Pittsfield, MA (Continued)

Process Option	Effectiveness	Implementability	Relative Cost	Recommendation
Solvent Extraction: Solvent extraction is a physical/chemical process that reduces the volume of soil material undergoing further treatment by removing organic contaminants that adhere to organic matter and fine particles within a soil matrix. The affected soils are subjected to a multistage washing system where surfactants and solvents are used to separate the contaminants and the finer particles from the coarser soil materials. The exiting wash stream then undergoes additional treatment.	▪ The contaminated wash stream requiring treatment is only a small fraction of the original soil volume. ▪ Solvent extraction has been successfully used for PCBs and pesticides, but may require several applications in order to achieve cleanup goals. ▪ The effectiveness will depend on factors such as: particle size distribution, moisture content, pH, and cation exchange capacity, among others. ▪ Solvent extraction alone does not reduce the toxicity or volume of contamination, but the associated treatment system would, either directly (through treatment) or indirectly (through collection and off-site destruction of contamination).	▪ Treatability studies would need to be conducted to identify the optimal washing reagents, estimate the amount of residual waste volumes to be created, and to quantify the effectiveness of the process for site contaminants. ▪ Treatment residuals require additional treatment or disposal. ▪ On-site treatment of soil may not be practical due the current use of the property and the length of time required for implementation (greater than 3 months).	The costs associated with solvent washing would be moderate; however, these costs may increase significantly if multiple treatments or expensive solvents are required.	Solvent washing is potentially applicable and will be retained for further consideration, however, only as an off-site alternative, with treatment conducted at another area of the GE site.
Stabilization/Solidification: Soil stabilization is a technology that would immobilize contaminants in a soil matrix using chemical treatment. Several types of stabilization processes are available including: cement-based, pozzolanic, thermoplastic, sulfide, and organic polymerization.	▪ Effectiveness with site-specific organic contaminants would need to be demonstrated. ▪ Soil with PCB concentrations greater than 50 mg/kg would require an alternate method of treatment/disposal. ▪ The mobility of the contaminants would be decreased, but not toxicity or volume. However, PCBs are already relatively immobile in soil, therefore, stabilization/solidification would accomplish very little reduction in mobility. ▪ Off-site use of stabilized soil would result in elimination of contaminated soil exceeding cleanup goals from the site, however, additional costs would be incurred due to backfill required.	▪ Ex situ stabilization is a commonly used technology that could be readily implemented at the site. ▪ Treatability testing would be required to determine the types and amounts of admixtures and the effectiveness of the technology with site-specific organic contaminants. ▪ On-site reuse of stabilized soil may not be practical due to the potential for future building expansion. ▪ There may also be public opposition to off-site reuse of stabilized soil containing PCBs or difficulty finding uses for treated material.	The costs for this option would be moderate compared to other treatment options.	Due to the uncertainty of the effectiveness of this alternative, this process option will not be retained for further consideration.

Table 3-2

Comparative Analysis of Process Options for Soil at the Allendale School Property, Allendale School, Pittsfield, MA (Continued)

Process Option	Effectiveness	Implementability	Relative Cost	Recommendation
Chemical Dechlorination: Chemical dechlorination is a technology in which a reagent is used to remove the chlorine atoms of chlorinated organic contaminants, transforming the contaminants into less toxic compounds.	▪ Dechlorination has been proven effective for detoxification of aromatic compounds, especially PCBs.	▪ Dechlorination is available commercially. ▪ Dechlorination could be implemented on-site or at an off-site facility. ▪ Pilot-scale and full-scale testing would be required to confirm the effectiveness of the process. ▪ May produce treatment residuals that would require additional treatment or disposal. ▪ On-site treatment of soil may not be practical due the current use of the property and the length of time required for implementation (greater than 3 months).	The unit cost for this technology is moderate to high.	This process option will be retained for further consideration, however, only as an off-site alternative, with treatment conducted at another area of the GE site.
Oxidation/Reduction: Oxidation/reduction is a chemical treatment process in which organic compounds are reduced to nonhazardous materials. The process involves the addition of a reagent and may involve the addition of a catalyst or heat.	▪ Oxidation/reduction has been proven effective for organic compounds, including PCBs. ▪ Contaminants are destroyed, thereby reducing the toxicity, mobility, and volume of contamination.	▪ Oxidation/reduction processes are available commercially. ▪ Air emissions may require treatment, however, the treatment systems are generally less complex than for incineration.	The costs associated with oxidation/reduction would be moderate compared to other treatment technologies.	Oxidation/reduction will be retained as a component of other process options, such as thermal desorption.
Soil Flushing: This technology involves extraction of contaminants from soil using water and other suitable aqueous solutions applied to the soil in situ. As these aqueous solutions pass through the soil matrix, they would desorb or solubilize the contaminants. The solutions would then be recovered and treated to destroy the collected contaminant compounds.	▪ The technology is most effective for water-soluble metal species. ▪ Less cost-effective for organic compounds. ▪ Effectiveness is also dependent on permeability of soil and ability to capture the contaminated solution.	▪ Recovery and treatment of the contaminated solutions from the subsurface would be a requirement for using this option.	The costs associated with soil flushing would be moderate compared to other treatment alternatives.	This process option will not be retained for further consideration due to the low water solubility of PCBs.

Table 3-2

Comparative Analysis of Process Options for Soil at the Allendale School Property, Allendale School, Pittsfield, MA (Continued)

Process Option	Effectiveness	Implementability	Relative Cost	Recommendation
In Situ Biodegradation: Biodegradation is a process in which indigenous or inoculated microorganisms (i.e., fungi, bacteria, and other microbes) degrade organic contaminants found in soil and/or groundwater.	▪ Biodegradation is effective for a range of simple organic compounds; however, it is less effective for chlorinated compounds and is still in the experimental stage for treating metals.	▪ Limited processes are currently available for treatment of PCB-contaminated soil. ▪ Treatability tests are necessary to select proper microorganisms and nutrients. ▪ Greater time for treatment required in order to achieve cleanup goals in comparison with other treatment options.	The costs associated with the application would be low to moderate, depending on the microorganisms and nutrients.	This process option will not be retained for further consideration due to lack of performance data and commercial availability.
In Situ Thermal Treatment: In situ thermal treatment involves the injection of heat into thermal wells to volatilize organic compounds. Soil vapor is extracted and treated.	▪ In situ thermal treatment systems have not been used widely. ▪ Effectiveness depends on the conductive properties of the soil. ▪ Effectiveness of soil vapor extraction system in collecting all contaminated soil vapor uncertain. ▪ Thermal desorption alone does not reduce the toxicity or volume of contamination, but the associated vapor treatment system would through treatment.	▪ There are a limited number of vendors actively promoting in situ thermal desorption technology. ▪ Requires a large number of wells per acre. Technology may be more easily implemented at smaller sites. ▪ The high water table at the site makes this technology difficult to implement. Pumping to lower the water table would be required. ▪ A pilot test or treatablility study would be required to determine the applicability in site soils. ▪ Potential exists for public opposition to the use of on-site thermal treatment systems with process emissions.	The costs for in situ thermal desorption are moderate to high.	In situ thermal treatment will not be retained for further consideration due to the high water table at the property and the large number of wells that would be required for treatment.
In Situ Soil Vitrification: In this process, electrodes would be placed in the ground and an electrical current would be passed through the soil. This current would heat the soil to temperatures in excess of 2,400°F. At these temperatures, the soils would begin to melt and would convert to a glass-like material upon cooling. During the process, inorganic target compounds would be effectively encapsulated and rendered immobile within this glass-like matrix, while some organic compounds would be destroyed by pyrolysis.	▪ Tests have shown that the vitrified soils are very durable and leach-resistant; however, PCBs are already relatively immobile in soil. ▪ Very effective for immobilizing metals in soil. ▪ Organics will be destroyed by pyrolysis at high temperatures.	▪ The technology requires an unsaturated subsurface to make heat transfer to the soil matrix most effective. ▪ The high water table at the site makes this technology difficult to implement. ▪ The residual hardened material left in-place may not be acceptable if future construction activities are planned at the site.	The costs of in situ vitrification would be high due to the significant electrical costs, especially in a high water table environment.	This process option will not be retained for further consideration because of the high water table at the site.

Table 3-2

Comparative Analysis of Process Options for Soil at the Allendale School Property, Allendale School, Pittsfield, MA (Continued)

Process Option	Effectiveness	Implementability	Relative Cost	Recommendation
Synthetic Membrane Cap: This is a capping technology in which an impermeable synthetic membrane is installed over the affected contaminated material. These membranes are typically composed of polyethylene (PE), polypropylene (PP), or polyvinyl chloride (PVC).	▪ This synthetic membrane cap would effectively isolate the affected soils, thereby eliminating the contact exposure pathway and reducing potential risks associated with these soils. ▪ Placement of the synthetic membrane over the affected soils would effectively reduce the mobility of the site-related constituents by preventing erosion due to wind and runoff, and minimizing infiltration of precipitation. ▪ The toxicity or volume would not be reduced.	▪ Synthetic membranes would require more effort to implement than simple low permeability soil caps because the component pieces of the membrane must be joined in the field; however, it is an established technology. ▪ Synthetic membranes require design features, such as additional cover layers, to enhance the durability of the capping system. ▪ Synthetic membranes would significantly limit infiltration of precipitation, necessitating engineering of site drainage by grading or collection systems for runoff. ▪ Deed restrictions would be required to prevent excavation and future residential use.	Relative to other types of caps, the costs associated with synthetic membranes would be moderate to high. Relative to treatment or removal alternatives, the costs associated with synthetic membranes are low.	This option will be retained for further consideration as a component of a multilayer cap.
Low Permeability Cap (Soils/Compacted Clays): This is a capping option that involves the application of a layer of low permeability soil or compacted clay. Sometimes such caps are multilayered and include a lateral drainage layer and a final soil cover on top of the low permeability soil or clay layer.	▪ This soil/clay cap would effectively isolate the affected soils, thereby eliminating the contact exposure pathway and reducing potential risks associated with these soils. ▪ A low permeability soil/clay cap would effectively eliminate erosion of the soils and would reduce, but not eliminate, infiltration into affected soils. Soil/clay caps are not as effective as impermeable caps for minimizing infiltration. ▪ Soil/clay caps are more susceptible to weathering and erosion than synthetic membrane, asphalt, and concrete caps. ▪ Toxicity and volume would not be reduced.	▪ These caps would be easily implemented using standard construction and compaction techniques. ▪ Availability of suitable materials can affect project cost and schedule. ▪ Project schedule can be affected by adverse (wet) weather during implementation. ▪ Engineering of site drainage would be required to handle the increased runoff. ▪ Deed restrictions would be required to prevent excavation and future residential use.	Relative to other impermeable caps, the costs of a soil/clay cap would be low to moderate.	This option will be retained for further consideration as a component of a multilayer cap.

Table 3-2

Comparative Analysis of Process Options for Soil at the Allendale School Property, Allendale School, Pittsfield, MA (Continued)

Process Option	Effectiveness	Implementability	Relative Cost	Recommendation
Asphalt Cap: This is a capping option that involves the application of a layer of asphalt over the affected soils to create an impermeable cover.	▪ An asphalt cap would effectively isolate the affected soils, thereby eliminating the contact exposure pathway and reducing potential risks associated with these soils. ▪ Like the previously mentioned caps, asphalt caps would reduce the mobility of the site-related constituents by preventing infiltration and erosion. ▪ Asphalt caps would be more resistant to weathering and erosion than soil caps. ▪ Asphalt caps would be subject to cracking and deterioration with time, which could affect their integrity and effectiveness. ▪ Toxicity and volume would not be reduced.	▪ Asphalt caps would be easily implemented using standard construction techniques. ▪ Implementation would be more difficult on sloped and wet areas. ▪ May not be compatible with future-use scenarios. ▪ Engineering of site drainage would be required to handle the increased runoff. ▪ Deed restrictions would be required to prevent excavation and future residential use.	Relative to other capping options, the costs associated with asphalt would be moderate to high, depending on the area covered and the thickness of the cap.	Because of potential incompatibility with current and future land-use scenarios and because this type of technology can be represented by other capping options more compatible with land-use scenarios, this option will not be retained for further consideration.
Geosynthetic Clay Liners: Dry clays contained in a geosynthetic liner expand when wet to form a low-permeability liner.	▪ Effective when placed immediately below a synthetic liner.	▪ Geosynthetic clay liners are readily available and deploy quickly compared to natural clays. ▪ Deed restrictions would be required to prevent excavation and future residential use.	Raw material cost exceeds cost of natural clays (if available), but installed cost is competitive.	This option will be retained for further consideration as a component of a multilayer cap.

Table 3-2

Comparative Analysis of Process Options for Soil at the Allendale School Property, Allendale School, Pittsfield, MA (Continued)

Process Option	Effectiveness	Implementability	Relative Cost	Recommendation
Multilayered Cover System: This is a capping option that combines a synthetic liner with a low permeability soil cap. It is typically covered with a drainage and vegetated layer.	▪ A multilayered cap would combine the effectiveness of both of the component layers and would provide a higher level of protectiveness. ▪ The mobility of contaminants would be reduced, however, the toxicity and volume of contaminants will not be reduced.	▪ A multilayered cap would require the most effort to implement of any of the capping options because it would require the installation of two separate caps. ▪ Engineering of site drainage would be required to handle the increased runoff. ▪ Deed restrictions would be required to prevent excavation and future residential use.	The costs associated with a multilayered cap would be relatively high compared to other capping options.	Because of the higher level of protectiveness offered by this technology and the applicability for a wider range of future-use scenarios, this option will be retained for further consideration.
Permeable Soil Cover: This option involves capping an area with a permeable clean soil cover.	▪ Placing a permeable soil cover is an effective method of preventing direct contact between the contaminants and human and ecological receptors. ▪ The toxicity, mobility, or volume of contaminants will not be reduced. ▪ The effectiveness of the alternative would be contingent on cover maintenance. ▪ A permeable soil cover would not stop potential downward mobility of contaminants by leaching, if leaching is a significant mode of contaminant transport.	▪ Construction of a permeable soil cover can be implemented easily. ▪ A permeable soil cap currently covers soil above a concentration of 2 mg/kg in the top 3 feet of soil at the school property. ▪ Deed restrictions would be required to ensure that subsurface soils beneath the cover are not disturbed.	The costs associated with a permeable soil cover would be low to moderate.	Continued inspections and maintenance of the existing permeable soil cap at the property will be retained as an option. Extension of the existing permeable cap will not be retained, as this would not significantly reduce site risks.

Table 3-2

Comparative Analysis of Process Options for Soil at the Allendale School Property, Allendale School, Pittsfield, MA (Concluded)

Process Option	Effectiveness	Implementability	Relative Cost	Recommendation
Disposal at a Non-TSCA PCB Treatment/Disposal Facility: This option involves transportation of PCB-contaminated material to a treatment/disposal facility approved to accept special wastes.	▪ This is an effective method for disposing of material contaminated with PCBs above the cleanup goals without using on-site treatment. ▪ Soil with PCB concentrations greater than 50 mg/kg would require treatment/disposal at an alternate facility licensed to accept TSCA wastes. ▪ Contaminated soil above cleanup goals would be permanently removed from the site.	▪ This option could be readily implemented once an approved facility is located. ▪ Transportation of contaminated waste must comply with DOT regulations.	The costs associated with this alternative are high.	This option is potentially applicable for non-TSCA soil and will be retained for further consideration.
Disposal at a TSCA Treatment/Disposal Facility: This option involves transportation of PCB-contaminated material to a treatment/disposal facility approved to accept TSCA wastes.	▪ This is an effective method for disposing of material contaminated with PCBs above the cleanup goals without using on-site treatment. ▪ Contaminated soil above cleanup goals would be permanently removed from the site.	▪ This option would be readily implemented once an approved facility is located. ▪ Transportation of contaminated waste must comply with DOT regulations.	The costs associated with this alternative are high.	This option is potentially applicable and will be retained for further consideration.
Disposal at a Permitted Landfill: This option involves disposal of treated soil or soil with relatively low PCB concentrations (less than 2 mg/kg) at an off-site permitted landfill.	▪ This is an effective method for disposal of treated material if soil reuse is not an option.	▪ This process option can be readily implemented.	The costs associated with off-site disposal of soil with PCB concentrations less than 2 mg/kg at a permitted landfill are expected to be low to moderate.	This option is potentially applicable and will be retained for further consideration.

SECTION 4

DEVELOPMENT AND SCREENING OF ALTERNATIVES

4. DEVELOPMENT AND SCREENING OF ALTERNATIVES

4.1 INTRODUCTION

In Section 4, the remedial technologies that were retained for further consideration in Section 3 have been selectively combined to form remedial alternatives. The remedial alternatives developed cover a range of remediation strategies, including no action, limited action/ institutional controls, containment, source removal, treatment, and disposal. These remedial alternatives have been screened in this section to provide a representative number of alternatives for detailed analysis in Section 5. The screening criteria used in this section are those presented in the NCP and the *U.S. EPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, October 1988* (99-0001) and consist of effectiveness, implementability, and cost.

Subsection 4.2 presents the rationale used to develop the remedial alternatives and outlines each of the alternatives. Subsection 4.3 describes in detail each of the alternatives. Subsection 4.4 presents the screening methodology and the results of the alternative screening process. In Subsection 4.5 the results are presented as a comparative summary of the alternatives based on the screening criteria.

4.2 DEVELOPMENT OF ALTERNATIVES

Consistent with guidance under CERCLA, remedial alternatives were developed to represent varying levels of protection of human health and the environment. The alternatives have been selected to meet the following objectives:

- Alternatives that eliminate, to the extent feasible, the need for long-term management at the site.
- Alternatives that use treatment as a primary component to reduce the toxicity, mobility, or volume (TMV) of contaminated materials.
- Alternatives that involve containment to reduce the mobility of contaminants.

- Alternatives that involve a limited amount of action by instituting site access and use restrictions to prevent potential exposure to physical hazards, or by relying on natural attenuation processes.
- A no-action alternative.

As described previously, remedial alternatives will only be evaluated for the soil medium at the Allendale School. The human health risk assessment indicates that current risks to human receptors are within acceptable limits, based on the current use of the property as an elementary school. However, potential risks based on a residential use scenario are above acceptable limits. Therefore, remedial alternatives have been developed to address potential risks to future human receptors.

Because on-site treatment is not practical due to the current use of the property, alternatives have been developed, which include treatment at another OU within the proposed GE NPL site. The remedial alternative chosen for the Allendale School property may be coordinated with remedial activities at another OU. It should be noted that the treatment alternatives were selected primarily for the treatment of PCBs. Concentrations of other organic COCs would also likely be reduced by these treatment processes. These processes would have little to no impact on concentrations of metals COCs; however, only one soil sample location (K18) exceeded preliminary remediation goals (PRGs) for metals (refer to Figure 1-14). The mixing of soil that would occur during treatment would be expected to reduce average concentrations of non-PCB COCs to below cleanup goals. The alternatives developed for Allendale School soils from the process options presented in Section 3 are the following:

- Alternative 1: No Action.
- Alternative 2: Limited Action/Institutional Controls—Deed restrictions and continued inspections and maintenance of the existing permeable cap.
- Alternative 3: Impermeable Cap, Institutional Controls—Deed restrictions, consolidation of soils exceeding cleanup goals, installation of a multimedia cap, periodic inspection, and maintenance of cap.
- Alternative 4: Excavation, Off-Site Treatment and/or Disposal—Removal, off-site treatment, and/or disposal.
- Alternative 5A: Excavation, Thermal Treatment at Another OU, Disposal—Removal, treatment via thermal desorption at another OU, disposal.

- Alternative 5B: Excavation, Physical/Chemical Treatment at Another OU, Disposal—Removal, physical/chemical treatment at another OU, disposal.

These remedial alternatives are discussed in more detail in the following subsections.

4.3 POTENTIAL REMEDIAL ALTERNATIVES

4.3.1 Alternative 1: No Action

The no-action alternative was included as required under the NCP as a baseline alternative for comparison with other active remedial alternatives. All contaminated materials, both within and outside the capped area, would be left in place. Inspections and maintenance of the existing cap would be discontinued.

4.3.2 Alternative 2: Limited Action/Institutional Controls

The limited action/institutional controls alternative involves implementation of institutional controls, such as deed restrictions, and continued inspections and maintenance of the existing cap. Deed restrictions include restricted future use of the property, including prohibitions on excavation, construction, installation of drinking water wells, or residential use. Biannual inspections and maintenance (as required) of the existing cap would continue under this alternative in order to maintain the protection against dermal contact provided by the cap.

4.3.3 Alternative 3: Impermeable Cap, Institutional Controls

This alternative involves excavation of contaminated soil exceeding cleanup goals located outside the limits of the existing permeable cap. The excavated soil would be consolidated within the limits of the existing cap and a new impermeable cap would be installed to cover the area of the existing permeable cap. The impermeable cap would be sloped to direct drainage to swales located around the perimeter of the new cap. All disturbed ground surfaces would be regraded and revegetated. The area would be graded to restore its current use to the extent possible. It is anticipated that the area would be restored to its current use (e.g., ballfields, play areas, etc.); however, the total area available for play may be smaller because of the slopes required for drainage.

The consolidated excavated soil would be placed and graded to create the necessary slopes for proper drainage (a minimum 3% slope is anticipated). If necessary, soil within the capped area would be relocated to create the proper slopes however, that is not expected to be required. The consolidated soil would be compacted in lifts and properly prepared for installation of the impermeable cap.

The impermeable cap would be constructed with the following features:

- 6 inches of topsoil.
- 30 inches of protective soil.
- Fabric geonet drainage composite.
- 60-mil high-density polyethylene (HDPE) membrane.
- 24 inches of compacted clay.
- Maximum side slopes of 1:4.

To allow for replacement of the existing tree line, the cap would be terminated approximately 40 feet north of the fenceline along the Tyler Street Extension. Soils south of this termination point to the fenceline also would be excavated and consolidated under the new impermeable cap. The drainage swales around the perimeter of the impermeable cap would discharge to a new swale north of the Tyler Street Extension. Drainage would discharge to an infiltration pond near the Tyler Street Extension and Virginia Avenue or be directed to another suitable location. Erosion control measures would be implemented during construction to protect off-property receptors from contamination.

During excavation of potentially contaminated soils from outside the area receiving the impermeable cap, confirmation sampling would be conducted to verify that cleanup goals have been met. As areas of the property are determined to require no further excavation, the former cap soils may be placed and compacted in the excavation. Additional clean soil would be brought to the property for use as backfill, as required. Once all the contaminated soils have been excavated, consolidated, compacted, and graded, the impermeable cap would be installed. Clean cover soil would then be placed and graded to restore the school property to the new finished grade elevations. Disturbed areas of the property would be revegetated to stabilize the soil and minimize erosion and runoff.

Implementation of deed restrictions is required for this alternative to be effective. Deed restrictions include restricted future use of the property, including prohibitions on excavation, construction, installation of drinking water wells, or residential use.

4.3.4 Alternative 4: Excavation, Off-Site Treatment and/or Disposal

This alternative involves excavation of the contaminated soils and transportation of the excavated material to an off-site facility, and off-site treatment and/or disposal. Soil excavation would be conducted using standard construction equipment (e.g., excavators) and techniques. Cap materials would be segregated for use as backfill. Due to schedule constraints (i.e., the need to complete the remedial action during school vacation), several excavators would likely operate at one time. The excavated soils would be treated by incineration, disposed of at a Toxic Substances Control Act (TSCA) chemical waste landfill (soils with PCB concentrations greater than 50 mg/kg), disposed of at a non-TSCA landfill as a special waste (soils with PCB concentrations between 2 and 50 mg/kg), or treated at a non-TSCA facility. Disposal of excavated soil at a disposal facility constructed at another OU may also be an option.

During excavation of potentially contaminated soils from the Allendale School property, confirmation sampling would be conducted to verify that cleanup goals have been met. As areas of the property are determined to require no further excavation, the former cap soils would be placed and compacted in the excavation. As excavation continues, additional backfill would be used to partially backfill those areas requiring no further excavation. Once all the contaminated soils have been excavated, clean cover soil would be placed and graded to restore the school property to its finished grade. Disturbed areas of the property would be revegetated to stabilize the soil and minimize erosion and runoff.

This alternative would effectively remove the risks associated with the contaminated soils at the Allendale School property. However, facilities capable of accepting the contaminated soils must be identified and applicable transportation and disposal regulations must be met.

In order to further delineate the extent of contamination, additional soil borings are recommended prior to excavation activities. These borings could be completed during a school vacation. Further delineation of the extent of contamination will expedite excavation activities, as less frequent screening/confirmation sampling would be required. The exact number and location of the borings would be determined during remedial design.

4.3.5 Alternative 5A: Excavation, Thermal Treatment at Another OU, Disposal

This alternative assumes that treatment of excavated soil will be conducted at another location (to be identified) within the proposed GE Housatonic River site. The treatment of soil excavated from the Allendale School property may be coordinated with treatment of soil from other OUs. This alternative involves excavation of contaminated material exceeding the cleanup goals (as described for Alternative 4), transportation of the excavated soil to another OU, backfilling of excavated areas with clean fill, treatment of the soil using a portable thermal desorption unit, treatment of vapors associated with the thermal treatment unit, reuse of the treated soil at another OU, or off-site disposal. Residuals from treatment of the gas and/or liquid wastes produced in thermal treatment would require off-site disposal.

Because completion of the remedial alternative over the school summer vacation is preferred, it is likely that the excavations at the Allendale School property would be backfilled using clean soil from an off-site source, rather than using treated soil, as treatment would likely take several months to complete. Depending on the reduction in PCB concentrations achieved, the treated soil may be used as backfill at another OU or disposed of off-site. Excavation, backfilling, and site restoration would be conducted as described for Alternative 4. This alternative would effectively reduce the TMV of contaminants present in the soil at the Allendale School property.

4.3.6 Alternative 5B: Excavation, Physical/Chemical Treatment at Another OU, Disposal

This alternative involves excavation of contaminated material exceeding the cleanup goals, transportation of the excavated material to another OU (to be identified), physical/chemical treatment of the material at that OU, disposal of the treated material at that OU or another OU or appropriate facility to be identified, and restoration of the school property with clean fill and vegetation. Excavation would be conducted as described for Alternative 4. Soil from the existing permeable cap would be excavated and stockpiled on the school property for use as backfill. Soil excavated from beneath the cap and potentially contaminated soil excavated from outside the limits of the cap would be transported to another OU, stockpiled, and sampled for PCBs.

If the treatability studies conducted prior to full-scale remedial activities determine that the treatment process may not be able to effectively treat soils with high PCB concentrations, soil with PCB concentrations exceeding a certain level (as determined by the treatability study) may require segregation for an alternative treatment/disposal method. Soil to be treated would be mechanically screened to separate non-soil material from the process stream. The material removed would be tested and disposed of off-site at an appropriate treatment or disposal facility. Soil requiring treatment would be treated by solvent extraction, dehalogenation, or soil washing. Pilot testing of the selected technologies would be required in a predesign study to determine the effectiveness of these technologies in achieving the cleanup goals. Treated material may be disposed of at the OU where it is treated or transported to another OU or an off-site facility to be identified. Treatment residuals would be transported to an appropriate off-site treatment and disposal facility or managed on-site at another OU, if appropriate.

4.4 EVALUATION OF ALTERNATIVES

Remedial alternatives developed in Subsection 4.2 have been evaluated to select a representative number of alternatives that will undergo a more thorough and extensive analysis in Section 5. Where practical, comparisons have been made between similar alternatives to select only the most promising ones for further evaluation. Alternatives selected for further evaluation preserve the range of practicable treatment and containment technologies developed initially.

The remedial alternatives have been evaluated based on the short-term and long-term aspects of three broad criteria: effectiveness, implementability, and cost. The factors against which the alternatives have been evaluated are defined as follows:

Effectiveness: The effectiveness of the alternatives has been assessed taking into account the following:

- Degree to which the alternative protects human health and the environment in the long term (period following completion of the remedial action).

- Degree to which the alternative protects human health and the environment in the short term (period of construction and implementation of the remedy).

- Degree to which the alternative reduces the TMV of contaminated material.

Implementability: Alternatives have been evaluated against the following implementability factors:

- Degree to which the alternative can be constructed.
- Degree to which the alternative technologies can be reliably operated and maintained.
- Ability of the alternative to meet technology-specific regulations.
- Ability to obtain concurrence from other agencies and offices.
- Availability of required treatment, storage, and disposal services and capacity.
- Availability of necessary equipment.
- Time required to achieve remediation.

The time required to complete the remedial alternative is critical at the Allendale School property due to the current use of the property as an elementary school. Ideally, the remedial alternative would not disturb the normal school schedule and activities.

Cost: The relative costs of remediation have been developed for screening purposes and include both capital and operations and maintenance (O&M) costs. In keeping with EPA FS guidance (99-0001), the focus of costs prepared for screening purposes is relative accuracy among alternatives so that cost comparisons among alternatives are sustained as the more detailed cost evaluation is performed in Section 5.

4.4.1 Alternative 1—No Action

4.4.1.1 Effectiveness

Alternative 1 does not provide any protection to human health, other than the protection provided by the existing permeable soil cover. However, the protection currently provided by the soil cover will decrease over time as the cover materials erode. Since no active treatment or containment is performed under this alternative, no significant reduction in the TMV of contaminants is expected. Any reduction in TMV can only be expected through natural attenuation and degradation processes. The time required to reduce the contaminant concentrations to acceptable levels via natural attenuation processes is unknown, and would likely greatly exceed 30 years.

4.4.1.2 Implementability

The no-action alternative can be implemented easily because there will be no action taken. However, it is likely that the public will oppose this option, making it difficult to implement administratively.

4.4.1.3 Cost

There will be no costs associated with this option because no action will be taken.

4.4.2 Alternative 2—Limited Action/Institutional Controls

4.4.2.1 Effectiveness

As with the no-action alternative, no active remediation is associated with this alternative. Therefore, this alternative does not initially provide any additional protection to human health other than the protection from dermal contact provided by the existing permeable cap. However, implementation of the deed restrictions will reduce the future potential exposures due to direct contact with the subsurface contaminants and their associated risks. Any reduction in contaminant concentrations will be a result of natural attenuation. No monitoring program is associated with this option; therefore, there is no method for determining if reductions in contaminant concentrations have occurred. Biannual inspections and maintenance (as required) of the existing cap will continue under this alternative in order to maintain the effectiveness of the cap in preventing contact with contaminated soil.

4.4.2.2 Implementability

Inspections and maintenance of the existing cap are implemented easily. Deed restrictions require the cooperation of the property owner and may not be acceptable to the owner or the public. Contaminated soil would remain in place under this alternative, which may also not be acceptable to the public.

4.4.2.3 Cost

The cost associated with this alternative would be low.

4.4.3 Alternative 3—Impermeable Cap, Institutional Controls

4.4.3.1 Effectiveness

Covering the soil contaminated with PCBs in excess of the cleanup goals with an impermeable cap would be protective of human health at the school property in the long term. The cap would prevent contact with contaminated soil by human receptors. The cap would also prevent the migration of contamination via infiltration of rainfall through contaminated soils.

In the short term, potential risks to the surrounding community and to remediation workers during implementation of this alternative are exposure to contaminated soils and particulate emissions. Particulate emissions from excavated soils would be minimized by instituting engineering controls, such as placing temporary covers over stockpiled soils and wetting soils to minimize dust production. Site-specific health and safety procedures and personal protective equipment (PPE) would protect workers, if required. Another short-term impact to the community from this alternative is an increase in truck traffic and the consequent noise pollution. Erosion control measures would be implemented during construction to protect off-property receptors from contamination.

No reduction in the TMV of contamination by treatment would be achieved under this alternative.

4.4.3.2 Implementability

This alternative can be implemented using conventional construction technologies for excavation, compaction, and installation of the impermeable cap. The equipment required for excavation and installation of the cap is readily available. The impermeable cap materials are less readily available but can be obtained when needed with proper scheduling.

To minimize impacts to the Allendale School academic schedule, the preferred time-frame to complete the soil excavation, consolidation, and cap installation is during the school summer vacation. This could likely be achieved with proper coordination and scheduling. Administratively, constructing the landfill as proposed may require waivers for some regulatory setback requirements. In addition, this alternative may not be acceptable to the public because contaminated soil will remain in-place.

4.4.3.3 Cost

The costs of this alternative would include excavation of contaminated soil, sampling and analysis to confirm achievement of the cleanup goals, backfilling with clean fill, and installation of the impermeable cap. Long-term O&M costs will be required to maintain and periodically inspect the cap and to potentially replace the HDPE membrane.

4.4.4 Alternative 4—Excavation and Off-Site Treatment and/or Disposal

4.4.4.1 Effectiveness

This alternative would be effective in permanently reducing the TMV of the contaminants at the Allendale School property. Off-site treatment and/or disposal is a proven and reliable technology; however, overall reduction in TMV would depend on the specific treatment and/or disposal facility used.

In the short term, potential risks to the surrounding community and to remediation workers during implementation of this alternative are exposure to contaminated soils and particulate emissions. Construction activities would proceed during summer recess to minimize short-term adverse impacts on human health. Particulate emissions from excavated soils would be minimized by engineering controls, such as placing temporary covers over stockpiled soils, covering trucks during transport of soils, and wetting soils to minimize dust production. Site-specific health and safety procedures and PPE would be used for the protection of workers, if required. Another short-term impact to the community from this alternative is a significant increase in truck traffic and the consequent noise pollution. In order for this alternative to be completed during the school summer vacation, based on the estimate of 38,000 yd^3 of soil that will require remediation, approximately 2,000 truckloads of contaminated soil would be removed from the school over approximately 50 working days. This would result in approximately 40 round trips per day to remove contaminated soil. A similar number of truckloads of clean fill would be delivered to the school over approximately the same 50-day period to restore the grade at the school. Erosion control measures would be implemented to protect off-property receptors from potential contamination.

4.4.4.2 Implementability

Excavation, transportation, and backfill of the contaminated areas of the site would involve common construction equipment and techniques. Facilities are available for off-site treatment and/or disposal. A TSCA-regulated disposal facility and several facilities capable of disposing of or treating special wastes are located within a reasonable transport distance. Alternatively, disposal of excavated soil at a disposal facility constructed at another OU may be considered. The time required to complete this alternative is approximately 3 to 4 months, assuming a 5-day work week and 3 excavators working simultaneously. The schedule may be expedited if the work week is expanded to 6 or 7 days. Alternatively, excavation activities may be conducted in stages, possibly over two consecutive summers.

4.4.4.3 Cost

The costs for this alternative include capital costs associated with excavation, in-situ dewatering, transportation of excavated materials to an off-site facility, treatment and/or disposal, and backfilling of the excavated area. No O&M costs would be incurred. The cost for this alternative, Alternative 5A, and Alternative 5B would be much higher than for the other alternatives because of the extensive excavation activities.

4.4.5 Alternative 5A—Excavation, Thermal Treatment at Another OU, Disposal

4.4.5.1 Effectiveness

Under this alternative, soil exceeding cleanup goals would be removed from the Allendale School property and treated at another OU. Therefore, this alternative provides a high degree of protection in the long term, relative to the no action and limited action/removal alternatives, because the contaminated soil is removed from the property. A significant reduction of TMV will also be achieved. As with Alternative 4, excavation of the contaminated soils would have a short-term adverse impact from the dust and noise associated with construction activities. However, engineering controls, such as dust suppression techniques, would be used to minimize the impacts.

4.4.5.2 Implementability

Thermal desorption is a commercially available technology that has been proven effective for remediation of PCBs. As with Alternative 4, excavation would be expected to be completed in approximately 3 to 4 months. The treatment rate for thermal desorption systems is typically 10 to 25 tons/hour. Larger units may be available to treat approximately 50 to 75 tons/hour. In order to treat 38,000 yd^3 of soil, 11 to 29 months would be required for treatment in a typical system, assuming treatment occurs 10 hours per day, 5 days per week. For a large-scale unit, 4 to 6 months would be required for treatment, assuming treatment occurs 10 hours per day, 5 days per week. The relatively high silt content in the site soils may reduce the process throughput. High moisture content in the soil may also impact the treatment rate.

4.4.5.3 Cost

As with Alternative 4, the costs of thermal treatment would include excavation of soils above cleanup goals, in-situ dewatering, and backfilling of the excavated area. In addition, the costs for this alternative would include transportation to the treatment area, thermal treatment of excavated soil, and transportation and disposal of treatment residuals. No long-term O&M costs would be incurred. A high moisture or silt/clay content would likely reduce the rate of treatment, thereby increasing the costs.

4.4.6 Alternative 5B—Excavation, Physical/Chemical Treatment at Another OU, Disposal

4.4.6.1 Effectiveness

Excavation and removal of soil contaminated with PCBs in excess of the cleanup goals would be protective of human health at the school property in the long term. Treatment and disposal of soils exceeding the cleanup goals at another location would reduce the TMV of contaminated materials. Therefore, treatment would enhance the overall long-term effectiveness of this alternative. As with Alternatives 4 and 5A, in the short-term, exposure to contaminated materials and particulate emissions are potential risks to the surrounding community and to remediation workers during implementation of this alternative.

4.4.6.2 Implementability

Technically, the project can be implemented using conventional construction techniques and a treatment technology that has been proven effective for removing PCBs from contaminated soil. The equipment to remove the contaminated soil from the property is readily available. The treatment equipment is less readily available but can be obtained when needed with proper scheduling.

As with Alternative 4, excavation would be expected to be completed in approximately 3 to 4 months. The time available to treat the contaminated soil removed from the school at another OU has not been defined. The time required to treat the estimated 38,000 yd^3 of soil depends on the technology selected. Both solvent extraction and dechlorination are batch processes with a processing capacity of 100 to 150 tons/day. On this basis, the time required for treatment would range from approximately 19 to 29 months, assuming treatment occurs 5 days per week. Soil washing is a semicontinuous process with a wide-ranging capacity. Based on an assumed processing rate of 500 tons/day, the time required for treatment would be approximately 6 months.

High moisture content in the soil may reduce the effectiveness or increase the cost of dechlorination. Soil moisture content would also have an impact on the cost of solvent extraction, and to a lesser extent, soil washing. The presence of fine soil particles, such as silt or clay, would have a detrimental impact on the performance of soil washing. It would impact solvent extraction and dechlorination to a lesser degree.

4.4.6.3 Cost

The costs of this alternative would include excavation of contaminated soil, backfilling with clean fill, in-situ dewatering, transportation of soil to a treatment or disposal location, disposal of treated soils, and sampling and analysis to confirm achievement of the cleanup goals. A high moisture or silt/clay content would likely reduce the rate of treatment, thereby increasing the treatment costs. No long-term O&M costs would be required.

4.5 COMPARISON OF POTENTIAL REMEDIAL ALTERNATIVES

Six potential remedial alternatives were developed for the Allendale School property. These alternatives include: (1) no action; (2) limited action/institutional controls; (3) impermeable cap, institutional controls; (4) excavation and off-site treatment and/or disposal; (5A) excavation, thermal treatment at another OU, disposal; and (5B) excavation, physical/chemical treatment at another OU, disposal.

Alternative 1, the no-action alternative, would not be effective in providing protection to human health because no action would be taken to change the current level of contamination. Only natural attenuation of contamination would be achieved in this alternative. This would not provide a significant reduction in the TMV of the contamination. Although this alternative is not protective, it will be retained for comparative purposes as required by the NCP.

Alternative 2, the limited action/institutional controls alternative, does not include any remediation for the protection of human receptors. However, continued inspections and maintenance of the existing cap and implementation of institutional controls, including deed restrictions, would provide protection by restricting the use of the property and by maintaining the level of protection provided by the existing permeable soil cap, thereby decreasing opportunities for direct human exposure to the contaminants. Due to the ease of implementation, relative low cost, and protectiveness of this alternative, it will be retained for detailed analysis.

Alternative 3 includes excavation and consolidation of contaminated soil, backfilling with clean fill, and installation of an impermeable cap. This alternative does not provide a significantly greater degree of long-term protection than the protection provided by the existing permeable cap. Leaching to groundwater has not been identified as a potential concern to human health at this site because the groundwater has not been classified as a source of potable water. The costs for implementation of this alternative would be significantly higher than for Alternative 2, which involves continued maintenance of the existing cap. In addition, deed restrictions would be required for this alternative to prevent future excavation and residential use. This alternative will not be retained for detailed analysis.

Alternative 4 includes excavation of contaminated soils, transportation and disposal/treatment at an off-site licensed facility or possibly at a disposal facility constructed at another OU, and backfilling of the excavation with clean fill. This alternative, as well as Alternatives 5A and 5B, would provide the highest degree of protection of human health and the environment in the long term by removing the contaminated soils from the site. This alternative utilizes proven and reliable technologies. The costs associated with this alternative are similar to the treatment alternatives. Because this alternative provides an option for off-site treatment and/or disposal if treatment at another OU is infeasible, it will be retained for detailed analysis.

Alternative 5A consists of excavation of soil exceeding cleanup goals and thermal treatment at another OU, and backfilling the excavation with clean fill. This alternative would also provide a high degree of protection in the long term by permanently removing contaminated soils from the Allendale School property. Temporarily, the contaminated soil would be transferred to another OU, where the TMV of contaminated soil would be reduced through thermal treatment. This alternative uses a reliable technology that has been proven effective for PCBs. This alternative will be retained for detailed analysis.

Alternative 5B includes excavation of contaminated soils, physical/chemical treatment at another OU, and backfilling the excavation with clean fill. This alternative would provide a significantly greater degree of long-term protection than Alternatives 1 and 2, which do not involve removal of contaminated soil. Alternative 5B also would provide more long-term protection than Alternative 3, the on-site landfill alternative, and is comparable to Alternatives 4 and 5A. This alternative will be retained for detailed analysis. Solvent extraction and chemical dechlorination will be retained as the representative treatment technologies for this alternative. Soil washing will be eliminated because it is not likely to be as effective as solvent extraction or chemical dechlorination due to the soil types present at the property.

Alternative 1 is not protective of future human health. Alternatives 2 and 3 provide a greater degree of long-term protection than Alternative 1. Alternatives 4, 5A, and 5B provide the greatest degree of long-term effectiveness because contaminated material is treated and/or disposed of off-site. Alternatives 3, 4, 5A, and 5B have the greatest potential to impact the on-site receptors and surrounding community in the short term because of the increase in noise, truck traffic, and dust generated by excavation activities. However, unlike Alternatives 4, 5A, and 5B, the majority of the trucks required for Alternative 3 would be carrying clean material to the property rather than contaminated material from the property. Alternatives 5A and 5B provide reduction of TMV via treatment. The degree of effectiveness of Alternatives 5A and 5B would be determined by treatability studies prior to remedial activities. Alternative 4 may provide reduction of TMV, if the soil is treated off-site. Alternatives 1 and 2 do not reduce TMV. Alternative 3 would reduce the mobility of the contaminants by reducing infiltration.

All alternatives are judged to be technically feasible, although the degree of effectiveness of Alternatives 5A and 5B would be determined during treatability studies. The deed restrictions required for Alternatives 1, 2, and 3 may not be acceptable to the community. In addition, contaminated soil would remain on the property under these alternatives, which also might not be acceptable to the community. However, alternatives using disposal off-site likely would create some community concerns associated with truck traffic, noise, and dust. The time required to complete the remedial alternative is critical at the Allendale School property due to the current use of the property as an elementary school. Alternatives 1 and 2 would require the least amount of time to implement and would not disturb, or only minimally disturb, normal school activities. In order to implement Alternatives 3, 4, 5A, or 5B during the school summer vacation, extensive coordination and aggressive scheduling would be required. Under Alternatives 5A and 5B, treatment at another OU would require several additional months following excavation activities. The soil could be stockpiled for a year or more prior to treatment if the location of a treatment facility could not be identified, or if the construction of the treatment facility was not completed prior to excavation activities.

A comparison of costs for the six alternatives is presented in Table 4-1. These costs are approximate and have been estimated based on available vendor costs and typical unit rates. The costs may vary by as much as 50%. The cost for Alternative 4 is approximately one-half of the cost for Alternatives 5A and 5B. A range of costs is presented for Alternative 5B due to the variation in costs presented by vendors for solvent extraction and chemical dechlorination. Therefore, the costs associated with Alternative 5B may be higher or lower than for Alternative 5A. Costs for Alternative 3 are significantly lower than for Alternatives 4, 5A, and 5B. The cost for Alternative 2 would be approximately $310,000.

Table 4-1

Cost Summary for Each Alternative

Alternative	Capital Costs	Operation and Maintenance Costs[a]	Total (Rounded)
Alternative 1	None	None	None[b]
Alternative 2	$190,000	$120,000	$310,000
Alternative 3	$1,500,000	$1,130,000	$2,600,000
Alternative 4[c]	$12,300,000	$14,000	$12,000,000
Alternative 5A	$24,400,000	$14,000	$24,000,000
Alternative 5B	$24,000,000 - $37,000,000	$14,000	$24,000,000 - $37,000,000

[a] Management, maintenance, and monitoring of the area have been assumed for 30 years based on CERCLA guidance.

[b] No costs would be incurred except the potential future costs of administrative fines for potential noncompliance with regulations and associated litigation fees.

[c] Assumes disposal of soil at off-site disposal facility.

It is important to note, however, that the costs of Alternatives 5A and 5B may be significantly reduced if the contaminated soils being treated are combined with similarly contaminated soils from other OUs and the cost of constructing the treatment facility is shared with the other OUs. Unit costs for treatment also would likely be lower due to economy of scale factors.

From the six potential remedial alternatives developed for the Allendale School property, the following five were selected for detailed analysis:

- **Alternative 1: No Action—**The "no action" alternative is retained as required by the NCP as a baseline alternative for comparison with other alternatives. It is unlikely that this alternative would ever be implemented.

- **Alternative 2: Limited Action/Institutional Controls—**This alternative reduces the potential for exposure through deed restrictions and inspections and maintenance of the existing cap. This alternative has a relatively low cost and can be implemented easily.

- **Alternative 4: Excavation, Off-Site Treatment and/or Disposal—**This alternative provides an even greater level of effectiveness because contaminated materials are removed from the Allendale School property. Aggressive scheduling would be required to complete this alternative during the school summer vacation. Another significant implementability issue would be related to the truck traffic, noise, and dust associated with transporting contaminated materials off-site. This alternative would require less time to implement than the treatment alternatives. The capital costs for this alternative are significantly less than the costs for Alternatives 5A and 5B.

- **Alternative 5A: Excavation, Thermal Treatment at Another OU, Disposal—**This alternative provides the potential for significant reduction in TMV. Thermal desorption has been proven effective for PCBs. As with Alternative 4, contaminated materials above cleanup goals would be removed from the property. However, under this alternative, the contaminated materials would be transferred to another OU. Aggressive scheduling would be required to complete the excavation required for this alternative during the school summer vacation. Another significant implementability issue would be related to the truck traffic, noise, and dust associated with transporting contaminated materials off-site. The capital costs for this alternative are similar to Alternative 5B.

- **Alternative 5B: Excavation, Physical/Chemical Treatment at Another OU, Disposal—**This alternative provides the potential for significant reduction in TMV. The effectiveness of the treatment would be determined through treatability studies prior to remediation. As with Alternatives 4 and 5A, contaminated materials above cleanup goals would be removed from the property. As with Alternative 5A, under this alternative, the contaminated materials would be transferred to another OU. Aggressive scheduling would be required to complete the excavation for this alternative during the school summer vacation. Another significant implementability issue would be related to the truck traffic, noise, and dust associated with transporting contaminated materials off-site. The potential capital costs for this alternative vary depending on the treatment technology and vendor selected, but are expected to be similar to Alternative 5A.

Alternative 3 will not be retained for detailed analysis because it does not provide a significantly greater degree of protection than that provided by the existing permeable cap. Continued inspections and maintenance of the existing cap are included in Alternative 2.

SECTION 5

DETAILED ANALYSIS OF ALTERNATIVES

5. DETAILED ANALYSIS OF ALTERNATIVES

5.1 INTRODUCTION AND EVALUATION CRITERIA

Based on the initial screening of the remedial alternatives for the Allendale School property, six alternatives have been retained for detailed evaluation. Alternative 4 has been divided into Alternative 4A (excavation, off-site treatment and/or disposal) and Alternative 4B (excavation, disposal at another OU). Alternative 5B (excavation, physical/chemical treatment at another OU, disposal) has been further defined to include solvent extraction (Alternative 5B-1) and chemical dechlorination (Alternative 5B-2) as the methods of physical/chemical treatment for the purposes of detailed analysis in this section. The alternatives are summarized in Table 5-1. Before a detailed evaluation was performed, each alternative was further defined with respect to the volume and areas to be addressed and the specific technologies to be used for costing. Some of the alternatives undergoing a detailed analysis in Section 5 were revised from the original conceptual designs presented in Section 4. These revisions were based on refined volume estimates and a more in-depth evaluation of the treatment technologies and their efficiencies and costs.

For the treatment alternatives, a treatment goal of 1 to 2 mg/kg has been assumed for the purposes of this FS. This goal would allow for reuse of treated soil as daily cover material at an off-site landfill and would likely be an acceptable level for soil reuse at another OU. Transportation of treated soil to another OU for disposal has been included in this FS. Soil reuse at the GE Housatonic River site would significantly reduce the costs of transportation and disposal. In addition, a treatment level greater than 2 mg/kg may be acceptable for on-site reuse of soil at an industrial property. If disposal of treated soil at another OU is not feasible, transportation and disposal of treated soil at an off-site landfill at a cost of approximately \$25/ton would be an option.

The detailed evaluation of alternatives involves the analysis and presentation of the relevant information needed to allow decision-makers to select a site remedy. For the detailed analysis, each alternative was evaluated against the evaluation criteria described in this section. The results of this assessment are arrayed such that comparisons can be made among alternatives, and the key tradeoffs among alternatives can be identified. This approach to analyzing alternatives is designed to provide decision-makers with sufficient information to compare the alternatives adequately, to select an appropriate remedy for the remedial unit, and to demonstrate satisfaction of the statutory requirements in the Record of Decision (ROD).

Table 5-1

Alternatives Retained for Detailed Analysis

Alternative	Description of Alternative
Alternative 1	No Action.
Alternative 2	Limited Action/Institutional Controls (deed restrictions and continued inspections and maintenance of the existing permeable cap).
Alternative 4A	Excavation, Off-Site Treatment and/or Disposal (excavation of soil exceeding cleanup goals, off-site treatment and/or disposal).
Alternative 4B	Excavation, Disposal at another OU (excavation of soil exceeding cleanup goals, disposal of soil at another OU).
Alternative 5A	Excavation, Thermal Treatment at Another OU, and Disposal (excavation of soil exceeding cleanup goals, treatment of excavated soil via thermal desorption at another OU, disposal off-site or at another OU).
Alternative 5B-1	Excavation, Solvent Extraction at Another OU, and Disposal (excavation of soil exceeding cleanup goals, treatment of excavated soil via solvent extraction at another OU, disposal off-site or at another OU).
Alternative 5B-2	Excavation, Chemical Dechlorination at Another OU, and Disposal (excavation of soil exceeding cleanup goals, treatment of excavated soil via chemical dechlorination at another OU, disposal off-site or at another OU).

A detailed analysis of alternatives consists of the following components:

- Further definition of each alternative, if appropriate, with respect to the volumes or areas of contaminated media to be addressed, the technologies to be used, and any performance requirements associated with those technologies.
- An assessment and a summary of each alternative against evaluation criteria (refer to Table 5-2).
- A comparative analysis among the alternatives to assess the relative performance of each alternative with respect to each evaluation criterion.

The aforementioned analysis process is based on the statutory requirements of CERCLA, the NCP, and EPA FS guidance (09-0001).

There are nine evaluation criteria identified in the NCP and the FS Guidance. These criteria are typically grouped into threshold criteria, primary balancing criteria, and modifying criteria. The threshold criteria describe requirements that are expected to be met (or a justifiable reason for a waiver) for any qualifying remedial alternative. The primary balancing criteria are generally used to differentiate between qualifying alternatives and often lead to the selection of the preferred remedy. The initial balancing evaluates the extent to which each alternative achieves a permanent solution and uses treatment in a cost-effective manner. As required by the NCP, the alternative that is protective of human health and the environment, is ARAR-compliant, and affords the best combination of attributes is selected as the preferred alternative in the Proposed Plan. The modifying criteria address state and community acceptance of the proposed alternative and are generally addressed in the ROD. While state and community concerns are addressed in the FS and the Proposed Plan to the extent possible, state and community acceptance may not be fully assessed until formal review of the FS and Proposed Plan and the public comment period.

The following two evaluation criteria comprise the threshold criteria, which address compliance with specific statutory requirements:

- <u>Compliance with ARARs</u>—Assessment against this criterion describes how the alternative complies with ARARs, or whether a waiver may be required. The assessment includes non-ARAR advisories, criteria, and guidance referred to as “to be considereds” (TBCs).

- <u>Overall protection of human health and the environment</u>—Assessment against this criterion describes how the alternative as a whole protects and maintains protection of human health and the environment.

The following five criteria encompass technical, cost, and institutional considerations and make up the primary balancing criteria:

- <u>Short-term effectiveness</u>—Assessment against this criterion examines the effectiveness of alternatives in protecting human health and the environment during the construction and implementation phase, until response actions are complete and remedial objectives (ROs) have been met.

- Long-term effectiveness and permanence—Assessment of alternatives against this criterion evaluates the long-term effectiveness of alternatives in protecting human health and the environment after ROs have been met.

- Reduction of toxicity, mobility, and volume (TMV) of contaminants—Assessment against this criterion evaluates the expected performance of the specific treatment technologies that comprise the alternatives.

- Implementability—Assessment against this criterion evaluates the technical and administrative feasibility of alternatives and the availability of required resources.

- Cost—Assessment against this criterion evaluates the capital, O&M, and total project present-worth costs of each alternative.

Each of these seven evaluation criteria has been further divided into specific factors to allow a thorough analysis of the alternatives. These factors are shown in Table 5-2.

Two other evaluation criteria, state and community acceptance, are addressed in the FS and the Proposed Plan to the extent possible, but may not be fully assessed until formal review of the FS and Proposed Plan and public comment period are completed.

- State acceptance—This criterion reflects the state's preference among or concerns about alternatives.

- Community acceptance—This criterion reflects the community's preferences among or concerns about alternatives.

Subsection 5.2 provides a detailed description of each of the alternatives and presents the results of the evaluation of each alternative with the aforementioned threshold and primary balancing evaluation criteria. In Subsection 5.3, the alternatives are evaluated against each other, highlighting the advantages and disadvantages of each alternative relative to other alternatives.

Table 5-2

Evaluation Criteria to be Considered for Remedy Selection

Reduction of TMV of Contaminants Through Treatment	Short-Term Effectiveness	Implementability	Long-Term Effectiveness and Permanence	Overall Protection of Human Health and the Environment	Cost	Compliance with ARARs
Type and quantity of residuals resulting from treatment process.	Potential impacts on the community during remedial actions, effectiveness of protection measures.	Ability to construct/ implement technology.	Magnitude of residual risk from untreated waste and treatment residuals.	Existing and potential risks adequately eliminated, reduced, or controlled through treatment, engineering controls (e.g., containment), and/or institutional controls.	Capital costs.	Chemical-specific ARARs.
Fate of residuals remaining after treatment.	Potential impacts on workers during remedial actions, effectiveness of protection measures.	Difficulties and unknowns associated with the technology.	Adequacy and reliability of engineering and institutional controls used to manage untreated waste and treatment residuals.		O&M costs (30-year present worth).	Location-specific ARARs.
Degree to which treatment is irreversible.	Potential environmental impacts of remedial actions, effectiveness of protection measures.	Ability to monitor effectiveness of remedy.	Long-term management and monitoring requirements.		Costs of 5-year reviews, if required (included in O&M).	Action-specific ARARs.
Treatment process employed and type and amount of materials to be treated.	Time until protection is achieved.	Reliability of technology.	Potential for future exposure to human and environmental receptors.		Present worth analysis (30-year).	Other criteria and guidance.
Degree of expected reduction in TMV: Is it permanent or significant?	Time until remedial action is complete.	Ability to undertake additional remedial actions, if deemed necessary in the future.	Potential need for replacement.		Potential future remedial action costs.	

Table 5-2

Evaluation Criteria to be Considered for Remedy Selection (Concluded)

Reduction of TMV of Contaminants Through Treatment	Short-Term Effectiveness	Implementability	Long-Term Effectiveness and Permanence	Overall Protection of Human Health and the Environment	Cost	Compliance with ARARs
		Availability of necessary equipment; specialists; and treatment, storage, and disposal services.				
		Ability to perform O&M functions.				
		Ability to obtain approvals from, and need to coordinate with, other agencies.				
		Ability to complete the remedial action with minimal disturbance to the school schedule and activities.				

5.2 DETAILED ANALYSIS OF ALTERNATIVES

5.2.1. Alternative 1: No Action

5.2.1.1. Description of Alternative 1

The no-action alternative for the Allendale School property involves no engineered treatment or containment of soils that contain contaminants in excess of cleanup goals. This response action relies on natural attenuation to reduce levels of contamination in soil. The environmental mechanisms at work in natural attenuation include: biodegradation; sorption; desorption of contaminants from soils to surface water and groundwater; and dilution.

The no-action alternative has been evaluated to satisfy the requirements of 40 CFR 300.68(f), which requires consideration of this alternative as a baseline against which other alternatives may be compared.

5.2.1.2. Assessment of Alternative 1

This subsection and Table 5-3 present an assessment of the no-action alternative against the seven evaluation criteria, which were introduced in Subsection 5.1 and Table 5-2.

Short-Term Effectiveness

Based on the results of the Revised Draft Human Health Risk Assessment for Allendale School (03-0058), the current risks to human receptors are within acceptable levels. However, potential future risks to human receptors are unacceptable, based on a residential exposure scenario. In the short term, Alternative 1 would not reduce the potential for future human health risks posed by the soil at the Allendale School property.

This alternative would not reduce future potential carcinogenic risks to school or resident children and maintenance workers for all foreseeable future uses. In addition, the effectiveness of the existing permeable cap will decrease over time, as the cover material erodes and exposes the contaminated soil below.

Table 5-3

Evaluation Criteria to be Considered for Remedy Selection—Alternative 1: No Action

Criteria	Assessment
<u>Short-Term Effectiveness</u>	
Potential impacts on the community during RA; effectiveness of protection measures.	There would be no additional impacts to the community associated with implementation of this alternative.
Potential impacts on workers during RA; effectiveness of protection measures.	None expected because no activities are proposed.
Potential environmental impacts of RA; effectiveness of protection measures.	There would be no additional environmental impacts associated with implementation of this alternative because no activities are proposed.
Time until protection is achieved.	It is likely to be many decades, if ever, before residual soil contamination concentrations are reduced to acceptable levels by natural attenuation.
Time until RA is complete.	There is no RA in this alternative.
<u>Long-Term Effectiveness and Permanence</u>	
Magnitude of residual risk from untreated waste and treatment residuals.	Potential future human health risks posed by soil exceeding EPA's acceptable risk range (1E-04 to 1E-06) for carcinogenic contaminants. While the potential for exposure is currently minimized by the cap, the effectiveness of the cap will decrease over time if the cap is not maintained. The carcinogenic risks to the public may be gradually reduced through natural attenuation, but not necessarily to acceptable levels.
Adequacy and reliability of engineering and institutional controls used to manage untreated waste and treatment residuals.	Not applicable.
Long-term management and monitoring requirements.	Long-term monitoring would not be performed.

Table 5-3

Evaluation Criteria to be Considered for Remedy Selection—Alternative 1: No Action (Continued)

Criteria	Assessment
Potential for future exposure to human and environmental receptors.	Future residential use scenarios yield unacceptable risks to human receptors. Current exposures for human receptors may be reduced over time, but risks would not necessarily be reduced to acceptable levels.
Potential need for replacement.	The no-action alternative is likely to need to be “replaced” at this site because residual risks would continue to exceed acceptable levels in the future.
<u>Reduction of TMV of Contaminants through Treatment</u>	
Type and quantity of residuals resulting from treatment process.	Not applicable.
Fate of residuals remaining after treatment.	Not applicable.
Degree to which treatment is irreversible.	Not applicable.
Treatment process employed and type and amount of materials to be treated.	Not applicable.
Degree of expected reduction in TMV: Is it permanent or significant?	Only reduction in TMV due to natural attenuation processes would be possible.
<u>Implementability</u>	
Ability to construct technology.	Not applicable.
Difficulties and unknowns associated with the technology.	The degree to which natural attenuation would reduce contaminant concentrations is unknown.
Ability to monitor effectiveness of remedy.	Site conditions would not be monitored.
Reliability of technology.	Not applicable.
Ability to perform O&M functions.	Not applicable.
Ability to undertake additional RAs, if deemed necessary in the future.	No impact on the ability to implement further RA.
Availability of necessary equipment; specialists; and treatment, storage, and disposal services.	Not applicable.

Table 5-3

Evaluation Criteria to be Considered for Remedy Selection— Alternative 1: No Action (Concluded)

Criteria	Assessment
Ability to obtain approvals from, and need to coordinate with, other agencies.	Approval from federal, state, and local agencies unlikely in areas where chemical- and action-specific ARARs would not be achieved.
Cost	
Capital costs.	Not applicable.
O&M costs (30-year present-worth).	No maintenance is included in this alternative. Potential future costs may involve administrative fines for potential noncompliance with regulations and associated litigation fees.
Costs of 5-year reviews, if required (included in O&M).	Not costed.
Present-worth analysis (30-year).	Not applicable.
Potential future RA costs.	Costs of additional source characterization and/or RAs may be incurred.
Compliance with ARARs	
Chemical-specific ARARs.	Compliance not attained over the short term.
Location-specific ARARs.	Compliance attained.
Action-specific ARARs.	Compliance not attained.
Other criteria and guidance.	Compliance with chemical-specific TBCs (such as MCP Method 1 soil standards) would not be attained.
Overall Protection of Human Health and the Environment	Based on the results of the risk assessments, this alternative would not be protective of future human health. Some reduction in the risk to human health would likely be achieved with time, based on the assumption of some benefit from natural attenuation processes. However, this benefit cannot be quantified or even confirmed.

ARAR = Applicable or relevant and appropriate requirement.
MCP = Massachusetts Contingency Plan.
O&M = Operations and maintenance.
RA = Remedial action.
TMV = Toxicity, mobility, volume

There would be no potential or increased short-term risks associated with implementation of this alternative because there would be no activity involved.

Long-Term Effectiveness and Permanence

With this alternative, the future use of the property for residential purposes would pose unacceptable risks to human receptors. Risks to human receptors would also be unacceptable for future excavation in the fill area. The level of protection currently provided by the existing permeable cap would decrease over time as the cap materials erode.

The risks associated with the PCBs may be reduced over several decades, but not necessarily to acceptable levels. Because natural attenuation would be relied upon for reduction in the TMV of the contaminants present, it is likely to be many decades, if ever, before RAOs for these media are met. Since no monitoring would be conducted, it will not be possible to determine if or when cleanup goals are achieved.

Reduction of Toxicity, Mobility, or Volume (TMV)

Treatment of contaminated soils is not a component of this alternative; therefore, no reduction in TMV would occur, except through natural attenuation processes.

Implementability

There are no technical implementation issues involved in the no-action alternative because no activities would be performed. However, this alternative would not meet the RAOs that are established for any of the media at the Allendale School property and, therefore, may not be acceptable to federal and state agencies.

Cost

A present-worth cost of Alternative 1 was not estimated. However, the no-action alternative might involve costs that cannot be quantified at this time. Potential costs may involve administrative fines for potential noncompliance with regulations and associated litigation fees. The potential need for a future “replacement remedy” is high, and the associated costs would likely be higher than the cost of proceeding with a remedy at this time.

Compliance with ARARs

In general, this alternative would not comply with chemical-specific TBCs and ARARs in the short term. Soil would continue to contain contaminants at concentrations in excess of cleanup goals over the short term. Compliance may be obtained over the long term, based on natural attenuation processes; however, it could be decades, if ever, before concentrations are reduced to acceptable levels for all foreseeable future uses of the property.

Compliance with several action-specific ARARs would not be attained. Compliance with location-specific ARARs would be attained because no action would be taken.

Overall Protection of Human Health and the Environment

Current risks to human receptors are within acceptable limits. This alternative would not be protective of human receptors in the future. Unacceptable risks to human receptors are possible in the future, if the property is to be used for residential purposes or if excavation is required in the contaminated areas. Some reduction in the risks to human health would likely be achieved with time; however, it may be decades, if ever, before concentrations are reduced to acceptable levels for all foreseeable future uses.

5.2.2 Alternative 2: Limited Action/Institutional Controls

5.2.2.1 Description of Alternative 2

The limited action/institutional controls alternative involves natural attenuation, implementation of deed restrictions, and continued biannual inspections and maintenance (as required) of the existing permeable cap. Deed restrictions include restricted future use of the property, including prohibitions on excavation, construction, installation of drinking water wells, or residential use.

The existing permeable cap serves to protect human receptors from surficial soil containing contaminant concentrations above cleanup goals. Biannual inspections of the existing permeable cover would continue under this alternative, in order to maintain the protection provided by the cap. Maintenance of the cap would be conducted as necessary. Cap maintenance may include replacing eroded soil, reseeding, replacing stone, or repairing/replacing geotextile.

As with the no-action alternative, Alternative 2 allows the existing soil contamination to remain in place. Any reduction in contaminant levels would be due to natural attenuation.

The existing permeable cap was constructed to cover surficial soil (0 to 3 feet deep) with PCB concentrations greater than 2 mg/kg, based on analytical data collected during previous investigations conducted by GE. Additional sampling would be performed to ensure that surficial soil outside the capped area does not contain PCB concentrations above 2 mg/kg with high quality, validated data. Two soil samples would be collected from each of 50 locations in OU 3 that are outside the capped area. At each location, one sample would be collected from surficial soil (0-1 ft bgs) and one sample would be collected from subsurface soil (1-3 ft bgs). All of the samples would be analyzed for PCBs (Method 8280). In addition, 10% of the samples would be analyzed for PCB congeners (Method 1668), 10% for dioxin (Method 1613), and 25% for other COCs. This sampling would likely be performed during a school vacation.

5.2.2.2 Assessment of Alternative 2

The following subsections and Table 5-4 discuss the seven evaluation criteria as they apply to this alternative.

Short-Term Effectiveness

This alternative would be protective of human health in the short term, based on the Revised Draft Human Health Risk Assessment (03-0058). The existing permeable cap would protect human receptors from exposure to contaminated soil, while deed restrictions would provide additional protection from exposure to contaminated soil. No physical activities will be performed at the site in the short term.

Table 5-4

Evaluation Criteria to be Considered for Remedy Selection—Alternative 2: Limited Action/Institutional Controls

Criteria	Assessment
Short-Term Effectiveness	
Potential impacts on the community during RA; effectiveness of protection measures.	Engineering controls would be used to minimize the possibility of community impacts during removal and transportation of the soil.
Potential impacts on workers during RA; effectiveness of protection measures.	None anticipated. Workers would be adequately protected with appropriate PPE, if necessary.
Potential environmental impacts of RA; effectiveness of protection measures.	Engineering controls would be used to prevent releases of contaminants to the environment during implementation.
Time until protection is achieved.	Human receptors are currently protected from exposure to contaminated soils by the existing cap and would be protected from future exposure to contaminated soil following implementation of deed restrictions.
Time until RA is complete.	Institutional controls are dependent on issuing agencies.
Long-Term Effectiveness and Permanence	
Magnitude of residual risk from untreated waste and treatment residuals.	On-site residual risks would be minimal, provided that deed restrictions are enforced.
Adequacy and reliability of engineering and institutional controls used to manage untreated waste and treatment residuals.	The permeable cap and deed restrictions would be a reliable means of preventing human exposure to residual wastes.
Long-term management and monitoring requirements.	Long-term inspections and maintenance of the existing cap would be performed.
Potential for future exposure to human and environmental receptors.	The risk assessment indicates that the risk to humans is presently acceptable, and this alternative will limit the potential for future exposure and risk.
Potential need for replacement.	Additional remedial activities may be required if deed restrictions cannot be implemented or enforced.
Reduction of TMV of Contaminants Through Treatment	
Type and quantity of residuals resulting from treatment process.	Not applicable.
Fate of residuals remaining after treatment.	Not applicable.

Table 5-4
Evaluation Criteria to be Considered for Remedy Selection—
Alternative 2: Limited Action/Institutional Controls
(Continued)

Criteria	Assessment
Degree to which treatment is irreversible.	Not applicable.
Treatment process employed and type and amount of materials to be treated.	Not applicable. All contaminated materials will be subject to natural attenuation.
Degree of expected reduction in TMV: Is it permanent or significant?	The degree of long-term reduction in toxicity and mobility due to natural attenuation processes is uncertain.
Implementability Ability to construct technology.	Not applicable.
Difficulties and unknowns associated with the technology.	None known.
Ability to monitor effectiveness of remedy.	No long-term monitoring would be conducted, other than the cap inspections.
Reliability of technology.	The reliability of the alternative would be dependent on the ability to implement and enforce the deed restrictions.
Ability to perform O&M functions.	Maintenance of the existing permeable cap would be performed easily.
Ability to undertake additional RAs, if deemed necessary in the future.	No impact on the ability to implement further RA.
Availability of necessary equipment; specialists; and treatment, storage, and disposal services.	Readily available.
Ability to obtain approvals from, and need to coordinate with, other agencies.	Approval from federal agencies likely for implementation of institutional controls. Approval from state and local agencies may be difficult to obtain.
Cost Capital costs.	$ 188,000
O&M costs (30-year present-worth).	$ 117,000
Present-worth analysis (30-year).	$ 305,000
Potential future RA costs.	Costs of contaminant characterization and/or additional remedial actions such as excavation, treatment, and disposal of soils.

Table 5-4
Evaluation Criteria to be Considered for Remedy Selection—
Alternative 2: Limited Action/Institutional Controls
(Concluded)

Criteria	Assessment
<u>Compliance with ARARs</u>	
Chemical-specific ARARs.	Compliance not attained over the short term.
Location-specific ARARs.	Compliance attained.
Action-specific ARARs.	Compliance attained.
Other criteria and guidance.	Compliance with chemical-specific TBCs (such as MCP Method 1 soil standards) would not be attained.
<u>Overall Protection of Human Health and the Environment</u>	This alternative would be protective, provided that the deed restrictions are enforced.

ARAR = Applicable or relevant and appropriate requirement.
MCP = Massachusetts Contingency Plan.
O&M = Operation and maintenance.
PPE = Personal protective equipment.
RA = Remedial action.
TBC = To be considered.
TMV = Toxicity, mobility, volume.

Long-Term Effectiveness and Permanence

Human health risks are currently within acceptable limits under this alternative, and would be expected to be acceptable over the long term. This alternative would require continued enforcement of deed restrictions to restrict excavation activities and to prevent future residential use. Deed restrictions, along with continued inspections and maintenance of the permeable cap, would likely be a reliable means of preventing human exposure to contaminated soil. The effectiveness of the alternative would be dependent on the enforcement of the deed restrictions.

Reduction of Toxicity, Mobility, or Volume (TMV)

In this alternative, there is no active remedial treatment/removal of soil. As a result, contaminant concentrations in the soil would be reduced only by the natural attenuation processes. There is the potential for contamination to be transferred to other media. Toxicity may potentially be reduced by biodegradation and adsorption, which would make PCBs less bioavailable. The mobility of the PCBs would also be decreased by the same natural mechanisms. The volume of the contaminated materials would be reduced through biodegradation. Any reduction in TMV through natural processes would take years to achieve. It would take decades for natural attenuation to reduce soil concentrations to acceptable levels for all foreseeable future uses, if ever.

Implementability

In general, the limited action/institutional controls alternative is easily implemented. However, implementation of the deed restrictions may be difficult and will require the approval of local agencies. This alternative would not hinder any future remedial activities, such as excavation, containment, and/or treatment.

Cost

The estimated capital costs and O&M costs for this alternative are summarized in Appendix C, Table C-1. The capital costs take into account the cost of registering the required deed restrictions and sampling to confirm that PCB concentrations in soil outside of the capped area are less than 2 mg/kg. O&M includes enforcement of deed restrictions, and Superfund Amendments and Reauthorization Act (SARA) 5-year reviews.

Compliance with ARARs

In general, this alternative would not comply with chemical-specific ARARs and TBCs in the soil. Compliance may be obtained over the long term, based on natural attenuation processes; however, it may be decades before concentrations are reduced to acceptable levels for all foreseeable future uses. Compliance with location-specific and action-specific ARARs would be attained. Location-specific ARARs and TBCs are presented in Appendix B, Tables B-1 and B-2. Action-specific ARARs for this alternative are presented in Appendix B, Table B-3.

Overall Protection of Human Health and the Environment

Based on available soil data and an evaluation of the current use of the property, present conditions at the Allendale School property do not present an unacceptable risk to human health. Potential future risks to human health would be minimized by continued maintenance of the existing permeable cap and deed restrictions. Therefore, this alternative is protective of human health.

5.2.3 Alternative 4A: Excavation, Off-Site Treatment and/or Disposal

5.2.2.3 Description of Alternative 4A

This remedial alternative involves excavation and off-site treatment or disposal of soils from the Allendale School property. The excavated material would be loaded onto trucks for transportation to an approved off-site treatment and/or disposal facility. The excavated material would be replaced with clean fill trucked in from an off-site source. Following backfilling of the excavated area to the pre-excavation grade, a screened loam cover would be placed on top of the clean fill and the site would be re-vegetated. Site features such as the ballfield, playground equipment, and trees would be replaced as required.

The sampling described for Alternative 2 to obtain high-quality validated data to confirm historical sampling results outside the capped area will also be conducted for Alternative 4A.

Pre-Remedial Investigation

The areas selected for excavation were estimated based on analytical data collected during previous investigations conducted by GE. Additional sampling would be performed prior to the excavation effort to further define the area and volume of soils to be excavated in areas where there is a lack of sampling data or the vertical extent of contamination is not defined.

In areas where there is currently a lack of analytical data, such as the northwest portion of the existing cap, soil samples would be collected at various depths. In areas where the vertical extent of contamination is not defined (refer to Figure 1-13), soil samples would be collected from depths below the maximum sampling depth for historical sampling locations in that area. All soil samples would be analyzed for PCBs via Method 8280. The soil sampling could be performed using a drill rig or Geoprobe® system during a school vacation week. It is anticipated that the number of samples required to further define the extent of contamination could be collected within one week.

The results of the pre-remedial investigation would be used to delineate the soils to be excavated. The current estimate of the total volume of material at OU 3 that exceeds the 2 mg/kg preliminary remediation goal (PRG) for PCBs in soil is 38,000 yd^3. As described in Section 3.2, contaminated soil would be excavated to a maximum depth of 10 feet bgs.

Excavation

Prior to commencing excavation, a temporary fence would be installed on the perimeter of the contaminated area to provide security around the construction zone and to minimize the visual impact of the excavation. Temporary construction and support facilities (site trailer and equipment storage) would be mobilized to the site. The area with trees along the southeastern fence-line would be cleared and grubbed. A decontamination pad would be constructed at the site exit to decontaminate trucks and equipment leaving the site.

Most of the area that will be excavated is currently covered with a 2-foot thick soil cap underlain by a geotextile. It is assumed that the soil cap materials (estimated at approximately 16,100 yd^3) are suitable for reuse at the site. This soil would be removed to the degree possible while ensuring that contaminated material below the geotextile remains in place. The cap material would be set aside for use as fill and topsoil during restoration of excavated areas.

Excavation would commence starting at the school and working toward the Tyler Street Extension. This would allow early restoration of the portion of the site adjacent to the school. Contaminated material would be stockpiled, as required, prior to loading onto trucks for transportation to the disposal facility. Stockpiles and other exposed areas would be wetted, as necessary, to minimize fugitive dust emissions.

The number of loaded trucks per day that can practically access the site on local public roads will limit the rate at which soil can be removed from the site and the rate at which clean backfill can be brought to the site. It is estimated that 60 trucks per day (one truck every 10 minutes over a 10-hour workday) can access the site. Thus, approximately 65 days would be required for trucking the 38,000 yd^3 of contaminated material from the site and the 38,000 yd^3 of backfill and topsoil to the site. In addition to the excavation and backfilling, time would be required for mobilization, confirmatory sampling and analysis, site restoration, and demobilization. It is estimated that 18 to 20 weeks would be required to remove the contaminated materials from OU 3 and restore the site.

In order to minimize the impacts from noise, fugitive dust emissions, increased vehicular traffic, and general construction hazards, as well as maintain the established school schedule, construction activities only will be performed during the scheduled summer vacation for the Allendale School. This allows approximately 10 weeks during the months of June, July, and August in which construction activities can be conducted. Because construction activities likely will require approximately 18 to 20 weeks for completion, excavation and soil removal activities will likely span two consecutive summer vacation periods. This estimate is based on an 8 hour per day, 5-day workweek. The excavation may be expedited if the workday and/or week are extended; however, the costs of this alternative would likely increase.

Protection would be achieved following removal of the soil, which will occur during two 10-week school summer vacation periods. Removal of the contaminated materials from OU 3 can possibly be completed in a single 10-week school summer vacation if the staging/treatment area is located close to OU 3, and if the public roads between OU 3 and the storage area are closed. This will allow the use of off-road dump trucks or a conveyance system to more rapidly transport the excavated materials away from OU 3.

Since excavation likely would be performed below the groundwater table over a large area, significant quantities of water are anticipated. Dewatering operations would be performed during excavation prior to collecting post-remediation samples and during backfilling with clean material. Dewatering will be performed by pumping directly from the open excavation or from rows of advancing well points as the excavation proceeds. It is estimated that an average volume of 20,000 gallons of water will be generated each day for a period of 30 days. The water removed during dewatering would be stored on-site in mobile storage tanks prior to treatment and disposal. The on-site treatment system will consist of a sedimentation tank to remove suspended particles, a particulate filter and two carbon vessels in series. The system will be capable of treating 20 gallons per minute (gpm). Options for disposal of this water include off-site disposal, treatment at an existing groundwater treatment facility on the GE property, or on-site treatment and discharge to the sanitary or storm sewer system. Because of the large quantities of water, setup and operation of an on-site treatment system with discharge to the sanitary sewer would be preferable over off-site disposal, and is assumed for the purposes of this FS. In addition, complying with discharge criteria for the sanitary sewer system is more feasible than performing treatment to the ambient water quality criteria (AWQC), which would likely be required for discharge to the stormwater system.

Confirmatory Sampling and Analysis

Post-remediation samples would be collected from the excavated areas to determine whether the contaminated material was excavated to a lateral and vertical extent that falls below the applicable cleanup goals. Samples would be collected from the excavation floor at a frequency of one per 50-foot by 50-foot area (each sample consisting of a composite of five subsamples collected within the area). Two samples will be collected per 50 linear feet of sidewall (one discrete sample at each of two depths). This represents a total number of approximately 200 samples. Quality control samples, including duplicate samples and matrix spike/matrix spike duplicate (MS/MSD) samples are also included in the cost estimate in Appendix C. Additional excavation would be performed as necessary to remove remaining material that exceeds cleanup criteria.

Because the time frame for completing the excavation work is limited, analytical work for post-remedial samples to be analyzed for PCBs would be performed at an on-site laboratory, where possible. Approximately 10% of the analytical samples collected would be sent to an off-site laboratory for confirmation of the on-site laboratory results. Additional analytical work may be sent off-site, depending on whether results are time-critical. In addition, 10% of the post-remedial samples would be submitted to an off-site laboratory for dioxin analysis, and 25% of the samples would be submitted to an off-site laboratory for analysis of the other COCs.

Characterization of the material sent for off-site treatment and/or disposal would be performed according to the treatment/disposal facility requirements. It is anticipated that one representative sample would be required for approximately every 500 tons of material shipped from the site. Because of the broad range of analyses typically required for the characterization samples, it is anticipated that these samples would be analyzed off-site.

Prior to and during discharge to the municipal sanitary sewer system, samples of treated water will be collected to demonstrate compliance with discharge criteria. It is estimated that a full characterization for all applicable discharge criteria would be required at periodic intervals during discharge events. In addition, applicable permits/approvals would be obtained from the required authority prior to commencing discharge.

Treatment and/or Disposal

The destination for the contaminated material will depend on the waste classification (TSCA/non-TSCA) and contaminant concentrations. For purposes of disposal, it was assumed that PCBs are the primary contaminant in the site soil and that the soil will not be hazardous based on the Resource Conservation and Recovery Act (RCRA) definition of hazardous. Based in existing analytical data, the excavated soil is not anticipated to be RCRA hazardous. Additional characterization of the material being sent for disposal would be performed during execution of the project as described previously. Following characterization of the soil, a suitable disposal facility would be selected. All disposal would be subject to the facility’s acceptance of the waste.

Wastes regulated by TSCA (soils containing PCBs greater than 50 mg/kg, estimated at approximately 6,000 yd^3) would be transported to a TSCA-approved landfill or incinerator for management and disposal. The nearest facility to the Allendale School property is CWM Chemical Services, Inc.’s Model City facility, a TSCA-approved landfill, located in Model City, NY. This facility was chosen for costing purposes. Costs for transportation and disposal at a TSCA incinerator would likely be higher.

For soils containing less than 50 mg/kg PCBs, disposal options include thermal processing (desorption) and disposal in a landfill cell. The upper acceptable concentration for non-TSCA PCBs is determined by the facility's operating permit and may vary between facilities. It is presumed that multiple facilities will be required for disposal of all the site soils below 50 mg/kg PCBs. Currently, there are several facilities within approximately 150 miles of the site that have the ability to provide disposal for the non-TSCA site soils.

5.2.2.4 Assessment of Alternative 4A

The following text and Table 5-5 discuss the seven evaluation criteria as they apply to this alternative.

Short-Term Effectiveness

The primary short-term risks associated with this alternative are related to construction activities, excavation, and heavy equipment operation. In addition, there are risks associated with potential exposure to contaminated soils and particulate emissions associated with excavation and stockpiling of the soils.

Appropriate surface-water runoff controls will be implemented to prevent water from the excavated soils or rainfall runoff in the area of the excavation from impacting the environment.

Exposure to contaminated soils and particulate emissions are potential risks to the surrounding community and to site workers during excavation of the soils at OU 3. Engineering controls, such as watering for dust control, would be used to minimize these risks. On-site air quality monitoring would be employed during construction activities. Engineering construction standards, including Occupational Safety and Health Administration (OSHA) regulations, would be followed to maximize worker safety during the excavation activities.

Protection will be achieved following removal of the soil, which would occur during two 10-week school summer vacation periods.

Table 5-5

Evaluation Criteria to be Considered for Remedy Selection—Alternative 4A: Excavation, Off-Site Treatment, and/or Disposal

Criteria	Assessment
<u>Short-Term Effectiveness</u> Potential impacts on the community during RA; effectiveness of protection measures.	Engineering controls would be used to minimize the possibility of community impacts during removal and transportation of the soil.
Potential impacts on workers during RA; effectiveness of protection measures.	Engineering controls, PPE, and monitoring would be used to minimize the potential for worker exposure to contaminants.
Potential environmental impacts of RA; effectiveness of protection measures.	Engineering controls would be used to prevent releases of contaminants to the environment during implementation.
Time until protection is achieved.	Protection would be achieved following removal of the soil. Due to the schedule for the school, two consecutive summer vacation periods may be required for completion.
Time until RA is complete.	The remedial action would require approximately 5 months to complete. Due to the schedule for the school, two consecutive summer vacation periods will be required for completion.
<u>Long-Term Effectiveness and Permanence</u> Magnitude of residual risk from untreated waste and treatment residuals.	On-site residual risk would be minimal because soil causing potential risks to human receptors has been removed. There is minimal risk that off-site treatment and disposal facilities would not adequately contain (prevent release of) contaminants from excavated soils. These facilities are permitted and inspected periodically.
Adequacy and reliability of engineering and institutional controls used to manage untreated waste and treatment residuals.	Treatment and/or disposal at a permitted off-site facility is a common and reliable means of managing untreated waste.
Long-term management and monitoring requirements.	No long-term monitoring is required.
Potential for future exposure to human and environmental receptors.	The potential for exposure to human receptors would be eliminated.
Potential need for replacement.	No maintenance or repair required after RA is complete.
<u>Reduction of TMV of Contaminants Through Treatment</u> Type and quantity of residuals resulting from treatment process.	If the soils are transported to a treatment facility, the type and quantity of residuals would depend on the type of facility selected. TSCA soil would be landfilled at a permitted TSCA facility. Treatment residuals will be generated from possible thermal desorption of non-TSCA material.

Table 5-5

Evaluation Criteria to be Considered for Remedy Selection—Alternative 4A: Excavation, Off-Site Treatment, and/or Disposal (Continued)

Criteria	Assessment
Fate of residuals remaining after treatment.	If the soil is transported to a treatment facility, any residuals would be managed by the facility. Residuals transported off-site would be disposed of in an off-site landfill following treatment.
Degree to which treatment is irreversible.	Degree of irreversibility would depend on the treatment option selected.
Treatment process employed and type and amount of materials to be treated.	Approximately 38,000 yd^3 of soil would require off-site treatment and disposal.
Degree of expected reduction in TMV: Is it permanent or significant?	A significant reduction in TMV may be accomplished through off-site treatment of the soil. Any soil that is moved to a landfill for disposal would not be treated.
<u>Implementability</u> Ability to construct technology.	 No construction of technology would be required. Existing off-site treatment/disposal facilities would be used.
Difficulties and unknowns associated with the technology.	Schedule constraints posed due to the preference of completing the remedial alternative during the school summer vacation. Access constraints exist due to volume of trucks required.
Ability to monitor effectiveness of remedy.	To the extent possible, all soil exceeding cleanup goals would be removed to a maximum depth of 10 feet bgs. The effectiveness of the removal would be evaluated by confirmation sampling following excavation. No long-term monitoring would be conducted.
Reliability of technology.	Removal of the soil using conventional construction equipment and techniques and off-site treatment and/or disposal would be a reliable means of addressing the contaminated soil.
Ability to perform O&M functions.	Not applicable.
Ability to undertake additional RAs, if deemed necessary in the future.	Additional RAs could be undertaken if necessary.
Availability of necessary equipment; specialists; and treatment, storage, and disposal services.	Necessary equipment and services are readily available.
Ability to obtain approvals from, and need to coordinate with, other agencies.	Concurrence from federal, state, and local agencies will be required.

Table 5-5

Evaluation Criteria to be Considered for Remedy Selection—Alternative 4A: Excavation, Off-Site Treatment, and/or Disposal (Concluded)

Criteria	Assessment
<u>Cost</u> Capital costs.	$ 12,293,000
O&M costs (30-year present worth).	$ 14,000
Present-worth analysis (30-year).	$ 12,307,000
Potential future RA costs.	No future RA costs anticipated.
<u>Compliance with ARARs</u> Chemical-specific ARARs and TBCs.	Compliance with MCP Method 1 S-1 standards would be attained in the top 10 feet of soil. Soil exceeding MCP Method 1 S-1 standards would remain below 10 feet.
Location-specific ARARs.	Compliance attained.
Action-specific ARARs.	Compliance attained.
<u>Overall Protection of Human Health and the Environment</u>	Alternative is protective of human health and the environment.

ARAR = Applicable or relevant and appropriate requirement.
MCP = Massachusetts Contingency Plan.
O&M = Operations and maintenance.
PPE = Personal protective equipment.
RA = Remedial action.
TSCA = Toxic Substances Control Act.
yd^3 = Cubic yards.

Long-Term Effectiveness and Permanence

Current use of the site does not present an unacceptable risk to human health from exposure to site contaminants. Risks associated with potential future uses of OU 3 would be substantially reduced or eliminated as a result of removal of the contaminated materials.

Upon completion of the excavation activities to the predetermined boundaries, no further remediation will be required. In addition, no long-term O&M requirements will be instituted at the site.

Reduction of Toxicity, Mobility, or Volume (TMV)

No reduction of contaminant volume or contaminant destruction would be performed as a result of implementation of this alternative assuming off-site treatment and/or disposal. Off-site destruction of PCBs in the non-TSCA regulated material may be performed if the soil is transported to a thermal processing facility for treatment and disposal. Incineration of the soil regulated under TSCA at an off-site facility is also possible; however, this alternative would likely be more expensive than disposal at a TSCA landfill.

Implementability

The technology required for implementation of this remedial alternative exists and has been proven and demonstrated on similar projects of this magnitude. Restrictions, such as working during the school summer vacation and permissible truck traffic, will constrain the project schedule. Adequate engineering controls are available for protection of site workers and nearby residents to minimize exposure to contaminants during excavation and transportation activities.

Cost

The estimated capital costs and O&M costs for this alternative are summarized in Table C-2 in Appendix C.

The capital costs take into account the cost of preparatory site work, excavation, dewatering, backfilling, and restoration of the excavated area. Transport of the contaminated materials to the disposal facility, and disposal of the materials are also included. No operations and maintenance costs are associated with this alternative; however, a 5-year SARA review has been assumed.

Compliance with ARARs

Summaries of the chemical-specific, location-specific, and action-specific ARARs for this alternative are presented in Appendix B.

Implementation of this alternative is expected to comply with the majority of the ARARs and TBCs listed in Appendix B. However, the Revised Draft Human Health Risk Assessment (03-0058) evaluated risks posed by contaminated soil up to depths of 10 feet, while the MCP Method 1 S-1 standards apply to soil up to 15 feet deep. Excavation to a maximum depth of 10 feet is assumed in this FS. Therefore, soil exceeding MCP Method 1 S-1 standards may remain at depths of greater than 10 feet. Based on an evaluation of existing analytical data, MCP Method 1 S-1 standards for PCBs would be exceeded at depths greater than 10 feet bgs at three locations (soil sampling locations B66, ASB-29, and ASB-34) following remediation. The volume of soil exceeding MCP Method 1 standards at depths greater than 10 feet bgs cannot be quantified at this time because the horizontal and vertical extent of contamination in these areas is not well defined.

It should be noted that Method 1 numbers are conservative screening numbers. Under the MCP, a Method 3 Risk Assessment would need to be performed to determine whether PCB concentrations in site soils greater than 10 feet deep would pose a condition of significant risk. Part of the Method 3 evaluation would include adequate characterization of the vertical and horizontal extent of PCBs in site soil. If a Method 3 Risk Assessment indicates a condition of no significant risk under current conditions, MCP requirements would still not be met unless an Activities and Use Limitation (AUL) were placed on the property. The AUL would require precautions, such as health and safety measures, if excavation of soil at depths greater than 10 feet bgs were required in the future. The AUL would also require proper handling and disposal of any soil excavated below a depth of 10 feet, such that the soil would not be relocated to shallower depths which could result in exposures to human receptors.

Overall Protection of Human Health and the Environment

Currently, the contaminated soil is located in an unmanaged system with the potential for exposure to human receptors if future excavation occurs. This alternative will involve movement of the soil to a location where the contaminants are placed in a managed system where mobility is controlled and access is restricted.

In the short term, vegetated areas will be impacted, but this alternative will provide a permanent long-term solution to the contamination in the area. Restoration activities will be performed following excavation. Increased traffic and construction hazards will also be present during the excavation activities, but these will only occur over the short term.

5.2.4 Alternative 4B – Excavation, Disposal at Another OU

5.2.4.1 Description of Alternative 4B

This alternative would consist of the following remedial actions:

- Excavation of contaminated soil with PCB concentrations less than 50 mg/kg to a maximum depth of 10 feet bgs and placement of these soils on the existing landfill in OU 1 (Hill 78).
- Excavation of contaminated soil with PCB concentrations greater than 50 mg/kg to a maximum depth of 10 feet bgs and disposal at an EPA-approved disposal facility located within one mile of the Allendale School property.
- Regrading and placement of a RCRA cap on Hill 78.
- Conducting long-term environmental monitoring and placement of institutional controls at Hill 78.

As stated above, this remedial alternative involves excavation of soil exceeding cleanup goals at Allendale School to a maximum depth of 10 feet bgs and disposal of the excavated soil at Hill 78 (OU 1) for soil containing less than 50 mg/kg PCBs, and at another location within one mile of OU 3 for soils exceeding 50 mg/kg PCBs. The excavated material would be replaced with clean fill trucked in from an off-site source. Following backfilling of the excavated area to the pre-excavation grade, a screened loam cover would be placed on top of the clean fill and the site would be revegetated. Site features such as the ballfield, playground equipment, and trees would be replaced as required. Pre-remedial investigation, excavation, and confirmatory sampling and analysis would be conducted as described for Alternative 4A. Disposal characterization samples for PCB analysis would also be collected as described for Alternative 4A to determine the appropriate disposal location. Disposal of excavated soil is described below.

Disposal

Soil with PCB concentrations greater than 50 mg/kg (approximately 6,000 yd^3) would be disposed at another location (to be determined) on the GE facility. The soil from the Allendale School property would likely be combined with excavated soil from other remedial activities at the GE facility or associated sites. An EPA-approved cell would be constructed for disposal of the soil. Costs for construction and long-term O&M of the cell are not included in this FS, since the volume of soil to be disposed in the cell from Allendale School would likely be small in comparison to soil from remedial actions at other OUs.

The soil with PCB concentrations greater than 50 mg/kg may be transported directly to the disposal site or stockpiled until additional materials are generated from removal actions at other OUs or until construction of the facility for disposal of soil with PCB concentrations greater than 50 mg/kg is completed. For the purpose of this FS, it is assumed that excavated soil with PCB concentrations greater than 50 mg/kg would be transported to the disposal location and stockpiled for approximately 18 months. The stockpile location would be graded, then covered with sand, geotextile and a 20 or 30-mil geomembrane liner. Soils stockpiled in this area would be covered with a 10-mil liner to control runoff and mobilization of particulates from the pile. The construction of the temporary staging area would be similar to that described for Alternative 5A (refer to Subsection 5.2.5.1).

Soil with PCB concentrations below 50 mg/kg (approximately 32,000 yd^3) would be disposed at the Hill 78 Landfill, located adjacent to and south of the Allendale School property. Trucking of the soil is assumed for the purpose of this FS, however a conveyor-type system would allow for rapid transport of excavated soil to Hill 78. For the purpose of this FS, it is assumed that excavated soil with concentrations of PCBs less than 50 mg/kg will be stockpiled adjacent to the current Hill 78 landfill for a period of approximately 18 months. The soil would be stockpiled as described for soil with PCB concentrations greater than 50 mg/kg. Following design of the landfill cap, and preparation and grading of Hill 78, the soil would be added to the existing landfill. The landfill would then be re-graded and capped, using a composite-barrier type cap. Additional soil from other remedial actions at the GE facility or associated sites may be added to the Hill 78 Landfill prior to capping, however, this possibility has not been considered during evaluation of Alternative 4B in this FS.

It is estimated that the composite-barrier would cap the existing landfill in its entirety, as well as the soils excavated from the Allendale School property, and would cover an area of approximately 1.25 acres. The cap would require O&M activities consisting of periodic inspection and repair. A security fence would be constructed to prevent unauthorized site access and deed restrictions would be imposed to restrict future construction activities that would violate the integrity of the cap. The cap would comply with RCRA Subtitle C requirements (40 CFR 264) for a final cover, and as such, would consist of:

- A low hydraulic conductivity layer, composed of a composite-barrier layer (manufactured clay mat and a geomembrane);
- A drainage layer of granular material (typically sand) or a drainage composite;
- A protective cover layer, consisting of a top vegetative soil layer and a separator filter layer. The separator filter layer is composed of sand and located directly beneath the top vegetative cover layer. The top vegetative soil layer is comprised of topsoil and sand or fill.

Because of the nature of the contamination in the soils at Allendale School, it is not anticipated that the capped materials will produce significant quantities of landfill gases. Therefore, a passive gas venting system and associated air monitoring are not included in this FS for the purposes of alternative evaluation. However, a sub-base layer has been included to provide a base for the remaining layers. A typical cross-section of a RCRA cap, containing the layers listed above is provided in Figure 5-1. Descriptions of the layers are provided in the paragraphs that follow.

The sub-base layer would consist of a 12-inch lift of sandy soils placed on a graded and compacted layer of soil from Allendale School overlying the existing landfill. The sandy soils would provide a stable base for constructing the overlying final cover system components. A geotextile would be installed on top of the sand layer to serve as bedding material for the overlying composite-barrier layer.

The composite-barrier layer would consist of a clay mat overlain by a geomembrane. The clay mat would be manufactured from bentonite clay bonded to geosynthetic materials (i.e., geotextile or geomembrane). The overlying geomembrane, would be 40-mil, very-low-density polyethylene (VLDPE). The geomembrane would be installed using double-track, hot wedge welding techniques that would allow for thorough testing of the seams through air pressurization.

The drainage composite layer would consist of a single-layer, high-density polyethylene (HDPE) drainage net covered with a non-woven needle-punched geotextile. The geotextile would act as a filter to allow downward percolation of water while preventing intrusion of the cover soil into the drainage net.

The protective cover layer would consist of a minimum of 36 inches of specified granular soil (drainage sand) and 6 inches of topsoil that would be mulched and seeded. This layer would serve to stabilize the cover system against wind and water erosion, and would promote evapotranspiration and protect the composite-barrier layer from frost penetration.

The geosynthetic sandwich (i.e., geomembrane and drainage composite) would be terminated in a perimeter anchor trench. A subdrain would be installed within the anchor trench to collect water transmitted through the plane of the drainage net. The subdrain would consist of perforated plastic piping placed within a blanket of crushed stone, and would discharge to surrounding drainageways. In order to allow for appropriate construction of the cover system termination, proper cap drainage, access, and setbacks from other facilities at OU 1, regrading of the existing Hill 78 perimeter may be required. The volume of soil requiring excavation and regrading from the existing landfill perimeter has been estimated at approximately 7,200 yd^3. This material would be consolidated on the landfill.

The composite-barrier cover system would cover an estimated area of 1.25 acres. Final grading of the existing landfill prior to cap construction would produce a minimum slope of 5% on top and a maximum 33% sideslope. Because only compacted soil is expected to be disposed beneath the composite-barrier cap, surveying to monitor landfill subsidence is not anticipated to be required.

As previously stated, methane and other decomposition gases are not anticipated to be produced beneath the cap. Therefore, a passive gas venting system has not been included for this alternative.

Operation and Maintenance

A groundwater monitoring program would be implemented to track contaminant migration and to monitor conditions in the Hill 78 landfill. For costing purposes, it was assumed that groundwater monitoring would be conducted for 30 years. Two upgradient and three downgradient wells were assumed, with semiannual monitoring of PCBs, PCB congeners, dioxins, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals constituents in each well. Surface water monitoring have not been included in this FS, but could be added, once the remedial alternative for this and other OUs at or near the GE facility are implemented. A groundwater monitoring program will likely also be implemented for the disposal facility for those soils with PCB concentrations greater than 50 mg/kg; however this program has not been costed, as it is assumed that these costs would be included with the costs for remedial actions at other OUs.

Other operation and maintenance activities would include inspections and maintenance (as required) of the landfill caps. Costs for these activities, as well as for groundwater monitoring associated with disposal of soils at Hill 78 are included in Appendix C.

5.2.4.2 Assessment of Alternative 4B

The following text and Table 5-6 discuss the seven evaluation criteria as they apply to this alternative.

Short-Term Effectiveness

The primary short-term risks associated with this alternative are related to construction activities, excavation, and heavy equipment operation. In addition, there are risks associated with potential exposure to contaminated soils and particulate emissions associated with excavation, transportation, staging and final disposal of the soils.

Table 5-6

Evaluation Criteria to be Considered for Remedy Selection—Alternative 4B: Excavation, Disposal at Another OU

Criteria	Assessment
<u>Short-Term Effectiveness</u>	
Potential impacts on the community during RA; effectiveness of protection measures.	Engineering controls would be used to minimize the possibility of community impacts during removal, transportation and placement of the soil.
Potential impacts on workers during RA; effectiveness of protection measures.	Engineering and placement controls, PPE, and monitoring would be used to minimize the potential for worker exposure to contaminants.
Potential environmental impacts of RA; effectiveness of protection measures.	Engineering controls would be used to prevent releases of contaminants to the environment during implementation.
Time until protection is achieved.	Protection would be achieved following removal of the soil. Due to the schedule for the school, two consecutive summer vacation periods may be required for completion.
Time until RA is complete.	The remedial action would require approximately 5 months for excavation and transportation of soil. The time required for final capping of the disposal cells would depend on remedial actions at other OUs. Due to the schedule for the school, two consecutive summer vacation periods will be required for completion.
<u>Long-Term Effectiveness and Permanence</u>	
Magnitude of residual risk from untreated waste and treatment residuals.	On-site residual risk would be minimal because soil causing potential risk to human receptors has been removed. There is minimal risk that the disposal facilities would not adequately contain (prevent release of) contaminants from excavated soils. These facilities would be inspected periodically.
Adequacy and reliability of engineering and institutional controls used to manage untreated waste and treatment residuals.	Disposal at an off-site facility is a common and reliable means of managing untreated waste.
Long-term management and monitoring requirements.	No long-term monitoring is required other than monitoring at the disposal locations.
Potential for future exposure to human and environmental receptors.	The potential for exposure to human receptors would be eliminated.
Potential need for replacement.	No maintenance or repair required after RA is complete other than maintenance of the landfill caps at the disposal locations.
<u>Reduction of TMV of Contaminants Through Treatment</u> Type and quantity of residuals resulting from treatment process.	Not applicable.

Table 5-6

Evaluation Criteria to be Considered for Remedy Selection—
Alternative 4B: Excavation, Disposal at Another OU
(Continued)

Criteria	Assessment
Fate of residuals remaining after treatment.	Not applicable.
Degree to which treatment is irreversible.	Not applicable.
Treatment process employed and type and amount of materials to be treated.	Not applicable. Approximately 38,000 yd^3 of soil would require disposal.
Degree of expected reduction in TMV: Is it permanent or significant?	Any soil that is moved to a landfill for disposal would not be treated. The degree of long-term reduction in toxicity and mobility due to natural attenuation processes is uncertain.
Implementability Ability to construct technology.	Construction of a disposal cell for soil containing greater than 50 mg/kg PCBs and a landfill cap for Hill 78 would be constructed using conventional equipment and techniques.
Difficulties and unknowns associated with the technology.	Schedule constraints posed due to the preference of completing the remedial alternative during the school summer vacation. Access constraints exist due to volume of trucks required.
Ability to monitor effectiveness of remedy.	To the extent possible, all soil exceeding cleanup goals would be removed to a maximum depth of 10 feet bgs. The effectiveness of the removal would be evaluated by confirmation sampling following excavation. Groundwater monitoring would be conducted at the disposal facilities to monitor the effectiveness of the containment. The integrity of the landfill covers would also be monitored.
Reliability of technology.	Removal of the soil using conventional construction equipment and techniques and disposal at another OU would be a reliable means of addressing the contaminated soil.
Ability to perform O&M functions.	Not applicable.
Ability to undertake additional RAs, if deemed necessary in the future.	Additional RAs could be undertaken if necessary.
Availability of necessary equipment; specialists; and treatment, storage, and disposal services.	Necessary equipment and services are readily available.
Ability to obtain approvals from, and need to coordinate with, other agencies.	Concurrence from federal, state, and local agencies will be required.

Table 5-6

Evaluation Criteria to be Considered for Remedy Selection—Alternative 4B: Excavation, Disposal at Another OU (Concluded)

Criteria	Assessment
Cost	
Capital costs.	$ 6,679,000
O&M costs (30-year present worth).	$ 112,000
Present-worth analysis (30-year).	$ 6,791,000
Potential future RA costs.	No future RA costs anticipated.
Compliance with ARARs	
Chemical-specific ARARs and TBCs.	Compliance with MCP Method 1 S-1 standards would be attained in the top 10 feet of soil. Soil exceeding MCP Method 1 S-1 standards would remain below 10 feet.
Location-specific ARARs.	Compliance attained.
Action-specific ARARs.	Compliance attained.
Overall Protection of Human Health and the Environment	Alternative is protective of human health and the environment.

ARAR = Applicable or relevant and appropriate requirement.
MCP = Massachusetts Contingency Plan.
O&M = Operations and maintenance.
PPE = Personal protective equipment.
RA = Remedial action.
TSCA = Toxic Substances Control Act.
yd^3 = Cubic yards.

Appropriate surface-water runoff controls will be implemented to prevent water from the excavated soils or rainfall runoff in the area of the excavation from impacting the environment.

In addition, precautions will be taken during handling of soils during both staging and disposal activities to ensure that no adverse impacts result.

These impacts include exposure to contaminated soils and particulate emissions, resulting in potential risks to the surrounding community and to site workers during excavation of the soils at OU 3 and during transportation and disposal of contaminated soils at Hill 78. Engineering controls, such as watering for dust control, would be used to minimize these risks. On-site air quality monitoring would be employed during construction activities. Engineering construction standards, including OSHA regulations, would be followed to maximize worker safety during the excavation and construction activities.

Similar risks to those described above could be posed by exposure of workers and/or residents to particulate emissions and/or runoff from the staged soils during the 18-month period that they remain at the staging area. Such risks could be present if the protective cover on the soils was torn or blown off in a storm. Routine maintenance and repair on an as needed basis will mitigate potential impacts during the 18-month period when the soils remain at the staging area.

Protection will be achieved at the Allendale School property following removal of the soil which would occur during two 10-week school summer vacation periods.

Long-Term Effectiveness and Permanence

Current use of the site does not present an unacceptable risk to human health from exposure to site contaminants. Risks associated with potential future uses of OU 3 would be substantially reduced or eliminated as a result of removal of the contaminated materials. The RCRA cap described in Subsection 5.2.4.1 would prevent exposure to material disposed at another OU. In addition, exposure to soils with PCB concentrations greater than 50 mg/kg will be prevented via disposal in an EPA-approved cell.

Upon completion of the excavation activities to the predetermined boundaries, no further remediation will be required. In addition, no long-term O&M requirements will be instituted at the site. O&M for the disposal area and RCRA cap would be as described in Subsection 5.2.4.1.

Reduction of Toxicity, Mobility, or Volume (TMV)

No significant reduction of contaminant volume or contaminant destruction would be performed as a result of implementation of this alternative. The mobility of the contaminants would be decreased by the landfill caps at the disposal locations.

Implementability

The technology required for implementation of this remedial alternative exists and has been proven and demonstrated on similar projects of this magnitude. Restrictions, such as working during the school summer vacation and permissible truck traffic, will constrain the project schedule. Adequate engineering controls are available for protection of site workers and nearby residents to minimize exposure to contaminants during excavation and transportation activities.

Cost

The estimated capital costs and O&M costs for this alternative are summarized in Table C-3 in Appendix C.

The capital costs take into account the cost of preparatory site work, excavation, dewatering, backfilling, and restoration of the excavated area. Transport of the contaminated materials to the disposal locations and construction of a cap for the Hill 78 Landfill are also included. The estimate for capping of the Hill 78 Landfill is based on the volume of existing material in the landfill and the additional material expected to be disposed at the landfill from Allendale School. Additional material may be disposed in the landfill from remedial actions at other OUs, however costs for capping of the additional volume have not been included. In addition, costs for construction of the disposal cell for soil containing greater than 50 mg/kg PCBs have not been included, as it is anticipated that a significant amount of additional material from remedial actions at other OUs would be disposed in this cell. The portion of the disposal cell costs attributed to the relatively small volume of soil expected to exceed 50 mg/kg PCBs from Allendale School would be minimal.

Staging of the excavated material at another OU for 18 months prior to disposal is assumed for the purpose of this FS. Disposal of the material at the time of generation would result in a cost saving of approximately $450,000.

Operations and maintenance costs include inspections of the landfills and maintenance as required. A 5-year SARA review has also been assumed.

Compliance with ARARs

Summaries of the chemical-specific, location-specific, and action-specific ARARs for this alternative are presented in Appendix B.

Implementation of this alternative is expected to comply with the majority of the ARARs and TBCs listed in Appendix B. However, the Revised Draft Human Health Risk Assessment (03-0058) evaluated risks posed by contaminated soil up to depths of 10 feet, while the MCP Method 1 S-1 standards apply to soil up to 15 feet deep. Therefore, soil exceeding MCP Method 1 S-1 standards may remain at depths of greater than 10 feet. Based on an evaluation of existing analytical data, MCP Method 1 S-1 standards for PCBs would be exceeded at three locations (soil sampling locations B66, ASB-29, and ASB-34), at depths between 10 and 15 feet below grade after remediation is complete. MCP requirements would not be met unless a risk assessment was performed that indicated a condition of no significant risk and an AUL was placed on the property.

Overall Protection of Human Health and the Environment

Currently, the contaminated soil is located in an unmanaged system with the potential for exposure to human receptors if future excavation occurs. This alternative will involve movement of the soil to a location where the contaminants are placed in a managed system where mobility is controlled and access is restricted.

In the short term, vegetated areas will be impacted, but this alternative will provide a permanent long-term solution to the contamination in the area. Restoration activities will be performed following excavation. Increased traffic and construction hazards will also be present during the excavation activities, but these will only occur over the short term.

5.2.5 Alternative 5A: Excavation, Thermal Treatment at Another OU, Disposal

5.2.5.1 Description of Alternative 5A

This remedial alternative involves excavation, staging of soils at another OU, on-site treatment of the staged soils in a thermal desorption unit at another OU, collection and off-site disposal of the concentrated PCB waste generated during thermal desorption of the soils, and on-site reuse of the soils at another OU. On-site disposal of treated soil at another OU is assumed for the purpose of this FS; however, the treated soil could be reused as daily cover at an off-site landfill. The treated soil would likely be suitable backfill for reuse in filling excavations that may be required during remediation of other OUs at the GE Housatonic River site. An important distinction is that high-temperature thermal desorption, and not incineration, would be used to treat the soils. High-temperature thermal desorption removes contaminants such as PCBs from the contaminated matrix without modifying the molecules. Incineration chemically changes the contaminants by oxidation, and may result in more hazardous incineration by-products, such as dioxins.

The time-critical portion for implementing Alternative 5A would be the excavation phase of the alternative. Due to time constraints associated with the excavation and backfilling at the Allendale School, the soils would be excavated and stockpiled pending treatment rather than excavated and direct-fed into the thermal desorption unit. Clean fill from an off-site source would be used to backfill the excavation. Details of the excavation and backfilling process to be implemented at the school are presented in detail in Subsection 5.2.3

The excavated soils may have to remain in the stockpile area pending completion of construction of the treatment system. It is assumed that a suitable location for construction of the treatment system can be found at another OU within 1 mile of the Allendale School and the contaminated soil stockpile area. It is also assumed that the soils can be fed from the contaminated soil stockpile area directly to the treatment unit without the need for an additional stockpile area to reduce the amount of materials handling that may be required.

Construction of the high-temperature thermal desorption system would require standard construction techniques to prepare the site prior to construction. Various vendors have different site requirements; some systems are trailer-mounted while others are installed in pre-engineered buildings. At a minimum, a stable, flat surface is required for the treatment system.

Excavation and Handling

A detailed description of the excavation, initial staging, and site restoration is presented in Subsection 5.2.3 of this report. Backfill would not be placed until analysis of confirmatory samples indicates that all soils in excess of cleanup criteria have been removed to a maximum depth of 10 feet. Excavated soils would be staged on-site, at another OU, and treated using the thermal desorption treatment system. It is anticipated that permitting and construction for the treatment system may not be completed prior to the excavation of contaminated soils from OU 3; therefore, excavated soils would be staged within the initial staging area for a period of up to 2 years. In addition, treatment of the soil excavated from OU 3 may be delayed until remedial alternatives at other OUs are evaluated.

Temporary structures for storage of the excavated soil have been included in Alternatives 4B, 5A, 5B-1, and 5B-2. Due to the large volume of soil, the soil would likely be divided between two stockpiles. The soil would be stockpiled on 20-mil or 30-mil HDPE, underlain by a six inch layer of sand and geotextile. A drainage system consisting of perforated polyvinyl chloride (PVC) pipe surrounded by crushed stone would be placed on the HDPE to collect leachate from the stockpile. The leachate would be collected and disposed of appropriately. Soil berms would be constructed around the stockpile, with the HDPE liner wrapped around the berms and secured in trenches surrounding the berm. The stockpiles would be covered with 10-mil HDPE and the HDPE secured in the trenches surrounding the berm. This method for storage of the soil provides a relatively inexpensive means of securing the soil until treatment. The costs for construction of the stockpile areas have been included in Appendix C. If a more secure storage area is required, two temporary structures, consisting of a PVC-coated polyester fabric on an aluminum frame, could be used. The structures would be constructed on an asphalt pad. The cost for two of these structures would be approximately $1,870,000, including installation and paving of the staging area.

Following initial staging, the soils would be transferred to the location of the soil treatment system, assumed to be within 1 mile of the initial staging area. The soils would be screened to remove the oversize fraction (soil particles larger than 1 to 2 inches, depending on the specific vendor’s system used), and the acceptable soils would be fed into the treatment system.

Unacceptable oversize materials may be either tested to determine waste characteristics and disposed of off-site as a separate waste stream, or reduced in size (e.g., in a ball mill or crusher) and reintroduced to the soil feed stream. Based on soil characterization boring logs from previous investigations, the screening process may not be required. Following prescreening, the soils may be fed directly into the thermal desorption equipment, or may be temporarily staged in the immediate vicinity of the treatment equipment, in a “day pile.” This small volume staging area would allow for the system to be run at the optimal efficiency and would eliminate the need to prescreen the soils at the exact rate of the thermal processor.

Operation and Management of the Thermal Treatment System

The thermal treatment system consists of a soil heating chamber; a vapor collection system to collect the desorbed water and contaminants; a condenser/separation system to change the collected vapors to the liquid phase and separate the water from the concentrated contaminants; a treated soil cooling (or quench) system; an air treatment system to ensure that contaminants, including particulates, are not discharged from the exhaust stack; and a water treatment system to clean the condensed water prior to discharge. Residuals produced include treated soil, treated water, air and water contaminant removal media and fines (e.g., baghouse filters, spent activated carbon), and a highly concentrated contaminant stream. A process flow diagram for this alternative is presented in Figure 5-2. A treatability test would be required on representative site soils to determine the treatment efficiency and parameters, and to determine the quantity and quality of the treatment residuals produced in the process.

The thermal desorption units that were evaluated during the detailed analysis are sized to treat from 2 to 20 tons per hour, depending on feed soil characteristics such as contaminant concentration, percent moisture, and particle size (or percent fines). A high concentration of fine soil particles decreases the processing rate because the fines can result in binding of contaminants. High moisture content decreases the processing rate because water has a high specific heat, thereby requiring an increase in retention time to allow the water to be boiled off prior to desorbing the contaminants. Based on vendor discussions, a treatment rate of 8 tons per hour was assumed for the detailed analysis of this treatment alternative.

The soil treatment unit can consist of one of several configurations, depending on the vendor's system selected for use. In order to remove contaminants without the possibility of incinerating them, the heat is applied indirectly, either by heating the carrier gas stream that is passed over the contaminated soil and desorbs contaminants into it, or by heating the soil (e.g., through a rotary kiln or thermal screw) and desorbing contaminants from the heated soil into a carrier gas. Prior to "discharge" the soil is cooled, either through a quench step or some other heat recovery method. Ideally, the heat removed from the soil following treatment would be recovered to provide heat to soils that are entering the thermal desorption unit.

The carrier gas with its burden of desorbed contaminants and vaporized soil moisture is then collected and cooled, allowing the water vapor and contaminants to condense out. Particulates are removed using conventional treatment (e.g., cyclone, baghouse fabric filters), and can be fed back into the soil influent during system operation to minimize the volume of treatment residuals generated. Noncondensible organic vapors are removed by passing the carrier gas through vapor-phase activated carbon canisters. The condensed water and contaminants are separated following condensation. Conventional oil/water treatment techniques will be used. The water will be polished using activated carbon prior to discharge. For the purpose of this FS, it was assumed that the treated water would be discharged to the sanitary sewer. Prior to discharge, a portion of this water may be recycled in a quench step, or may be used to increase moisture in the treated soil to reduce dust pending reuse of the treated soil as backfill.

In order to confirm the effectiveness of the treatment operations, analysis of the various treatment streams would be required. A sample would be collected (and analyzed on-site using PCB field-test kits) from the clean soil effluent once per 12-hour shift to confirm the treatment system's removal efficiency. Test-kit results would be confirmed by collecting soil samples less frequently for laboratory analysis for PCBs. The treated soil would also require analysis less frequently for full parameters to ensure that it is suitable for off-site disposal or reuse on-site at another OU.

The polished water stream would require analysis for water quality parameters and contaminant concentrations prior to discharge in conformance with the discharge permit or permit equivalency. Likewise, the stack discharge would require air monitoring to ensure that unacceptable levels of airborne contaminants are not being discharged. Air emissions would likely be monitored through the use of a continuous emissions monitoring system. Finally, treatment residuals, such as the condensed contaminant stream and recovered particulates/spent carbon, would require waste classification prior to disposal.

Following treatment of the soils and proper management of the treatment residuals, the unacceptable risks associated with the contaminated soils generated at OU 3 would be eliminated. Therefore, no continuing operations and management would be required other than that proposed for the 5-year SARA review identified under Alternative 4.

Residuals Management

As discussed previously, several residual streams would be produced during high temperature thermal treatment of PCB-contaminated soils. These residuals include treated soil, treated water, air and water contaminant removal medium (e.g., baghouse filters/fines, spent activated carbon), and a highly concentrated contaminant stream.

The treated soil would be sampled and analyzed for PCBs to confirm treatment efficiencies. Treatment efficiencies would be evaluated by collecting one PCB screening sample to be analyzed on-site using a field test kit per 12-hour workshift. An off-site laboratory confirmation sampling frequency of one PCB sample per 500 yd^3 was assumed. The soils would be sampled and analyzed for a full suite of organic and inorganic compounds and the presence of leachable metals less frequently (assumed 1 sample per 2,500 yd^3) to confirm that the soils are of acceptable quality for off-site disposal or on-site reuse as backfill at another OU. It is assumed that all soils would meet the treatment criteria; soils not meeting the treatment criteria for PCBs would be reprocessed in the thermal desorption unit. Soils not meeting treatment criteria that would allow for unrestricted use at another OU at the site can be used for a more restrictive use, e.g., as landfill daily cover or as backfill at locations where long-term engineering and/or administrative controls will be in place. If leaching of metals is a concern, the treated soils may be amended with cement to stabilize the metals in the treated soil prior to reuse. If off-site disposal of the treated soil is selected, it is likely that the soil would be suitable for reuse as daily cover at an off-site landfill.

A significant volume of water would be generated during the thermal desorption process. The soils being treated contain approximately 25% moisture, most of which would be driven off in the thermal desorption unit. The bulk of this water would be collected in the condensate. Even assuming 50% of the treated water would be used for dust control of the treated soils, more than 1 million gallons of water would require disposal over the time required to treat the soils. This water would be polished with carbon and may be discharged to a sanitary sewer system and, subsequently, to the local publicly-owned treatment works (POTW), discharged to the Housatonic River via a direct discharge or storm drain system, or recharged to groundwater. The volume of water generated would make shipment of this residuals stream to a commercial treatment facility for treatment and disposal cost prohibitive.

Discharge of the water would be performed in accordance with a discharge permit or permit equivalency. The permit conditions would specify the analytical testing scheme required for the discharged stream. Depending on which discharge scenario was used, the analytical requirements may change. For the purpose of this FS, it was assumed that the water would be discharged to the sanitary sewer. It was further assumed that the discharge would require sampling for the full suite of organic parameters on a daily basis during treatment system startup, and on a weekly basis thereafter. Discharge to the river would likely require analysis for the full suite of Target Compound List (TCL) and Target Analyte List (TAL) compounds and water quality parameters, such as pH, total organic carbon, chemical oxygen demand, total suspended solids, total dissolved solids, and temperature.

Concentrated treatment residuals (e.g., spent carbon, collected particulates, collected concentrated PCBs) will require waste full characterization prior to disposal at an off-site treatment, storage, and disposal facility (TSDF). It is anticipated that collected particulates and spent carbon may be generated by both vapor-phase treatment to remove noncondensible organics and by water polishing prior to discharge and that both of these wastes may be combined into a single waste stream. Mass balance calculations indicate that approximately 1,000 gallons of oily, concentrated PCB waste will be generated during the thermal desorption process. This waste stream would be shipped off-site for incineration at a TSCA-licensed facility following waste characterization. Used personal protective equipment (PPE) generated by personnel performing excavation, materials handling, treatment system operation, and sampling activities would be collected, classified, and shipped off-site for disposal in accordance with its waste type.

5.2.5.2 Assessment of Alternative 5A

The following text and Table 5-7 discuss the seven evaluation criteria as they apply to this alternative.

Short-Term Effectiveness

There would be short-term impacts due to the excavation activities at OU 3. These impacts are described in detail in Subsection 5.2.3 of this report. They include potential exposure to contaminated soils and particulate emissions upon removal of the existing cover currently in place at the property and potential traffic impacts if the Tyler Street Extension is temporarily closed to allow the excavation and backfill activity to occur within the time-frame allotted by the school summer vacation. These impacts can be mitigated in the manner described for Alternative 4.

Short-term impacts associated with the thermal desorption treatment include those from soils handling during transfer of contaminated soils from the long-term stockpile to the soil-screening area, and during introduction into the thermal desorption unit. Emissions from the stockpiled untreated soils will be controlled by storing the materials in temporary containment enclosure until treatment. There also is the potential for short-term impacts from potential fugitive emissions of particulates and vapors and from handling concentrated wastes.

Soil handling has the potential for allowing direct exposure and inhalation of airborne dusts and vapors by site workers and the local community. Inhalation, ingestion, and dermal contact would be minimized by utilization of the appropriate protective clothing and equipment, and following proper health and safety procedures during soil treatment activities. Soil piles would be covered, where practical, to minimize the generation of airborne dusts. Dust from the treated soil will be minimized by adding moisture following treatment during a quench step.

Table 5-7

Evaluation Criteria to be Considered for Remedy Selection— Alternative 5A: Excavation, Thermal Treatment at Another OU, Disposal

Criteria	Assessment
Short-Term Effectiveness	
Potential impacts on the community during RA; effectiveness of protection measures.	Engineering controls would be used to minimize the possibility of community impacts during removal and treatment of the soil.
Potential impacts on workers during RA; effectiveness of protection measures.	Engineering controls, PPE, and monitoring would be used to minimize the potential for worker exposure to contaminants.
Potential environmental impacts of RA; effectiveness of protection measures.	Engineering controls would be used to prevent releases of contaminants to the environment during implementation of the RA.
Time until protection is achieved.	Protection would be achieved following removal of the soil.
Time until RA is complete.	Based on an average soil feed rate of 8 tons per hour, the RA would require approximately 11 months to complete following start of thermal treatment. Taking into consideration the time to excavate soils, obtain permits/permit equivalencies, perform treatability testing, and set up the treatment system, it is anticipated that the RA would be completed within 3 years of beginning excavation.
Long-Term Effectiveness and Permanence	
Magnitude of residual risks from untreated waste and treatment residuals.	Residual risks at OU 3 would be minimal due to excavation of soil exceeding cleanup goals. There would be a slight risk associated with reuse of soils if treatability testing indicated that stabilization was required to prevent soil leaching. There would be no residual risk associated with the recovered oily PCB waste since it will be incinerated off-site. There would be minimal risk posed by the treated soil disposed at another OU.
Adequacy and reliability of engineering and institutional controls used to manage untreated waste and treatment residuals.	Thermal desorption has been used at other sites to successfully remove PCB contamination from excavated soils. Incineration has been proven to destroy PCBs in high-concentration oil matrices.
Long-term management and monitoring requirements.	No long-term monitoring is required.
Potential for future exposure to human and environmental receptors.	The potential for exposure to human and environmental receptors would be eliminated at OU 3.
Potential need for replacement.	No maintenance or repair required following RA.

Table 5-7

Evaluation Criteria to be Considered for Remedy Selection—
Alternative 5A: Excavation, Thermal Treatment at Another OU, Disposal
(Continued)

Criteria	Assessment
<u>Reduction of TMV of Contaminants through Treatment</u> Type and quantity of residuals resulting from treatment process.	The soil volume will be reduced from the original volume to be treated due to the thermal destruction of organic carbon content (peat) in the soil. An estimated 32,000 yd^3 of clean soil will be generated by the treatment system. Recovered particulates (fine fraction of soil) and spent activated carbon would be generated during air and water treatment. The majority of this material would be recycled into the treatment system with the soil feed; the treatment would generate an estimated total of 60 yd^3 over the life of the treatment. An estimated 1,000 gallons of oily concentrated PCB waste would be generated. Approximately 15 gpm of treated, clean water would be generated for discharge.
Fate of residuals remaining after treatment.	The majority of the particulates and spent carbon generated during treatment (from air and water treatment) would be fed into the thermal desorber with the feed soil. Fines not fed back into the process would likely be disposed of at an industrial landfill, but may be disposed of in a hazardous or municipal landfill based on waste characteristics and facility acceptance. PCB oil would require incineration at a permitted TSCA incinerator. Treated water would be discharged to the local POTW in accordance with the conditions of a discharge permit or permit equivalent. Treated clean soils could potentially be used as backfill for excavations at other OUs at the site, but may require amendment with organic matter (e.g., peat, manure) to meet site-specific soil condition requirements.
Degree to which treatment is irreversible.	PCBs are permanently removed from soil. Off-site incineration of recovered PCB oil would permanently destroy contaminants.
Treatment process employed and type and amount of materials to be treated.	Approximately 38,000 yd^3 of soil would require thermal treatment prior to reuse.
Degree of expected reduction in TMV: Is it permanent or significant?	TMV of contaminants would be permanently reduced at the site. A significant reduction in TMV may be accomplished through thermal treatment of the soil at another OU on the site.

Table 5-7

Evaluation Criteria to be Considered for Remedy Selection— Alternative 5A: Excavation, Thermal Treatment at Another OU, Disposal (Continued)

Criteria	Assessment
<u>Implementability</u>	
Ability to construct technology.	Treatment equipment is transportable from the vendor's location to the site. Construction of concrete pad on which to stage equipment will use conventional construction techniques.
Difficulties and unknowns associated with the technology.	There are potential schedule constraints due to the preference of completing the remedial alternative during the school summer vacation. It is currently unknown whether thermal treatment will alter the valence state of the native metals in the soil, thereby increasing their potential to leach. The possible impact of treatment on native metals in soil would be evaluated during treatability testing.
Ability to monitor effectiveness of remedy.	To the extent possible, all soil exceeding cleanup goals would be removed to a maximum depth of 10 feet bgs. The effectiveness of the removal would be evaluated by confirmation sampling following excavation. Collection of samples outside the excavation area will ensure that all contaminated soils up to a depth of 10 feet bgs are removed from OU 3. No long-term monitoring would be conducted other than a 5-year review.
Reliability of technology.	Removal of the soil using conventional construction equipment and techniques, thermal treatment of soils at another OU, and disposal of treatment residuals would be a reliable means of addressing the contaminated soil.
Ability to perform O&M functions.	Not applicable.
Ability to undertake additional RAs, if deemed necessary in the future.	Additional RAs could be undertaken if necessary.
Availability of necessary equipment; specialists; and treatment, storage, and disposal services.	Necessary equipment and services are readily available from multiple vendors.
Ability to obtain approvals from, and need to coordinate with, other agencies.	Concurrence from federal, state, and local agencies will be required, and/or permits must be obtained.

Table 5-7

Evaluation Criteria to be Considered for Remedy Selection—
Alternative 5A: Excavation, Thermal Treatment at Another OU, Disposal (Concluded)

Criteria	Assessment
Cost	
Capital costs.	$ 24,400,000
O&M (30-year present-worth).	$ 14, 000
Present-worth analysis (30-year).	$ 24,414,000
Potential future RA costs.	No future RA costs anticipated.
Compliance with ARARs	
Chemical-specific ARARs and TBCs.	Compliance with MCP Method 1 S-1 standards would be attained in the top 10 feet of soil. Soil exceeding MCP Method 1 S-1 standards would remain below 10 feet.
Location-specific ARARs.	Compliance attained.
Action-specific ARARs.	Compliance attained.
Overall Protection of Human Health and the Environment	Alternative is protective of human health and the environment.

ARAR = Applicable or relevant and appropriate requirement.
gpm = Gallons per minute.
O&M = Operations and maintenance.
PCB = Polychlorinated biphenyl.
POTW = Publicly owned treatment works.
PPE = Personal protective equipment.
RA = Remedial action.
TSCA = Toxic Substances Control Act.
yd^3 = Cubic yards.

An air-monitoring program would be implemented to evaluate the potential for air emissions from the operation of the system. Continuous emissions monitoring is available, as required, to confirm that the gas discharged from the stack meets all applicable emissions limits. If possible, the treatment system would be installed within a treatment building to further reduce the amount of particulate and vapor emissions that can be generated to the outside environment.

The short-term impacts associated with handling the contaminated wastes would be minimized through the use of proper PPE and safety procedures. The system would be operated by technology vendor representatives who have been fully trained in proper operating procedures and all appropriate safety protocols. Wastes would not be stored longer than required prior to off-site disposal (e.g., concentrated oily PCB waste) or returned to the contaminated soil being fed into the thermal treatment unit (e.g., particulates generated from the air treatment and water treatment systems, and spent carbon).

Long-Term Effectiveness and Permanence

The excavation and treatment of contaminated soils would result in the minimization or elimination of unacceptable risk to human health from contact at OU 3 with unacceptable levels of PCB-contaminated soils. A reduction in long-term risk would be realized because the contaminants would be permanently removed from the soils, and the resultant high-concentration PCB waste would be transported to a licensed TSCA incinerator and permanently destroyed. A small volume of particulate waste would be generated. At the end of the treatment, the final amount of residual fines might not be returned to the feed stream because there would be no more contaminated soil to treat. An estimated 60 yd^3 of fine particulates would be generated for final disposal. This material most likely would be disposed of in an off-site industrial landfill, but could be disposed of in an off-site municipal or hazardous waste landfill in accordance with its waste characteristics and facility acceptance of the waste stream prior to disposal.

Treated soil could be reused as backfill for excavations at other OUs at the GE Housatonic River site. As the treatment would remove all carbon content in the soils, the soil could be amended with high-organic matter, such as peat or manure, prior to reuse as backfill. Alternatively, the soil could be disposed of or reused as daily cover at an off-site landfill.

Reduction of Toxicity, Mobility, or Volume (TMV)

Contaminated soils would be removed, treated, and potentially reused at another OU. This alternative would reduce the volume of contaminated material from 38,000 yd^3 of soil contaminated with relatively low concentrations of PCBs to approximately 1,000 gallons of highly concentrated PCB oil and 60 yd^3 of fines/activated carbon. Furthermore, following shipment of the concentrated PCB waste to an off-site TSCA incinerator for destruction, the toxicity of the waste would be reduced because the PCBs would be destroyed.

Implementability

Technically, the project can be implemented using conventional technologies. Soil excavation and replacement, site preparation, soil handling, thermal desorption, condensing/refrigerating technology, and water and air treatment technologies are proven, reliable, and commercially-available. There are a minimum of four technology vendors who have used thermal desorption technology to successfully treat soils contaminated with PCBs, indicating that the technology is both technologically viable and commercially available. However, there maybe some public opposition to on-site thermal treatment technologies by local residents.

Cost

The estimated capital costs and O&M costs for this alternative are presented in detail in Appendix C.

The capital costs take into account the cost of excavation and staging, site restoration of OU 3, preparatory site work, obtaining required permits, thermal treatment at another OU, transport and disposal of treatment residuals produced during on-site treatment, applicable sampling and analysis, stockpiling of treated soils, and transportation to another OU (assumed to be within one mile of the treatment area) for reuse. Specific assumptions on sampling and analytical frequencies are provided in Subsection 5.2.3.1 of this report.

Operation costs for the thermal treatment system include costs associated with water and air treatment. Treatment costs also were based on an assumed feed rate of 8 tons per hour into the soil treatment unit. This feed rate drove the time required to treat the entire volume of contaminated soils, which affected other costs such as sample collection and water discharge. The soil feed rate and other assumptions used in this evaluation can be further refined following a treatability test performed on representative site soils.

O&M costs are limited to those incurred by performing a 5-year SARA review. Since the costs associated with destruction of all contaminants in excess of acceptable concentrations are captured within the capital costs, there would be no costs incurred for continued monitoring or O&M of engineering and/or administrative controls.

Compliance with ARARs

A summary of the chemical-specific ARARs for this alternative is presented in Subsection 2.2 of this report. Summaries of the location-specific and action-specific ARARs for this alternative are presented in Appendix B.

Implementation of this alternative is expected to comply with the majority of the ARARs and TBCs listed in Appendix B. However, the Revised Draft Human Health Risk Assessment (03-0058) evaluated risks posed by contaminated soil up to depths of 10 feet, while the MCP Method 1 S-1 standards apply to soil up to 15 feet deep. Therefore, soil exceeding MCP Method 1 S-1 standards may remain at depths of greater than 10 feet. Based on an evaluation of existing analytical data, MCP Method 1 S-1 standards for PCBs would be exceeded at three locations (soil sampling locations B66, ASB-29, and ASB-34). MCP requirements would not be met unless a risk assessment was performed that indicated a condition of no significant risk and an AUL was placed on the property.

Overall Protection of Human Health and the Environment

Removal of soils with PCB concentrations greater than the PRG of 2 mg/kg would be protective of human health. While physical removal of these soils may potentially increase the short-term exposure to site contaminants during excavation activities, the permanent removal of the contaminated media and subsequent destruction of the highly concentrated oily residue would be more protective of human health in the long term.

5.2.6 Alternative 5B-1: Excavation, Solvent Extraction at Another OU, Disposal

5.2.6.1 Description of Alternative 5B-1

This remedial alternative involves the excavation of soil exceeding PRGs as described for Alternative 4A, treatment at another OU with solvent extraction to remove PCBs, and disposal of the treated soil. For the purposes of this FS, reuse of treated soil at another OU is assumed, however, the soil would likely be suitable for reuse as daily cover at an off-site landfill.

Solvent extraction is a physical/chemical process that removes the organic contaminants that adhere to the organic matter and fine particles within the soil matrix. This technology does not destroy the PCBs; rather, it removes the PCBs from the soil and concentrates them in a waste product that must be sent for off-site disposal.

Solvent extraction has been proven to effectively remove PCBs and other organic contaminants from soils in numerous full-scale remedial operations. The process occurs in a specially constructed and largely automated treatment plant. The plants are of a modular design and can be temporarily installed at the site.

Solvent extraction is a two-step process. In the first step, the solvent is contacted with the soil. This is done in a fully enclosed contact vessel in a batch process. Both actively mixed and passive flow-through contact vessels designs are employed. The contact vessels must be loaded with the contaminated soil and then the clean soil unloaded after the solvent extraction has occurred. The soil is typically moved in and out of the contact vessels with front-end loaders or similar earth-moving equipment.

When the solvent contacts the soil, the PCBs and other organic contaminants desorb from the soil and are solubilized into the solvent. This occurs because the PCBs and other organic contaminants in the soil have a high affinity for the solvents used. Typically, proprietary, low-toxicity organic solvents are used. After the solvent has contacted the soil for a sufficient period of time to desorb the contaminants from the soil, the solvent is separated from the soil. This separation is done with gravity settling, centrifuges, and other physical separation techniques.

Pore water in the soil also will separate from the soil during this operation. The contaminant-laden solvent stream and any water is then passed to the second process step.

The second step in this process is to separate the organic contaminants, water, and the solvent into three separate liquid streams. This separation is performed with distillation or other similar separation technologies. The PCBs and other organic contaminants are concentrated into a stream that is sent off-site for disposal. The water stream is typically added back to the soil or sent to a municipal or industrial wastewater treatment plant. The separated solvent is recycled back into the process. The process is a closed loop where the solvent used is recovered and recycled over and over again. Solvent recovery rates are approximately 90 to 99%, however a high percentage of fine soils would decrease recovery rates.

There is one additional step common to most solvent extraction systems. After the solvent and liquids have been removed from the soil with gravimetric techniques, the soil is heated and a vacuum applied to remove and recover as much of the solvent as possible from the soil. Additional pore water is also driven from the soil. The vapor from heating the soil is condensed and sent to the liquid stream separator discussed in the previous paragraph.

The soil is now a dry, clean, treated soil. Typically, the water generated during the process is added back to the soil to return the soil to its original moisture content. The soil can then be reused as backfill at another OU or shipped off-site and used as daily cover at a RCRA Subtitle D-regulated landfill. The soil can contain parts per million (ppm) concentrations of the solvent, although most solvents used are biodegradable. Solvent extraction has been used successfully to remove PCBs from soil and sediments in several full-scale remediation projects. Vendors have been able to consistently attain PCB target concentrations below 1 ppm at a competitive cost.

Figure 5-3 presents a process flow sheet for this process. The figure shows the two primary streams generated from this process, including the treated soil and the concentrated organic waste stream containing the PCBs.

Excavation and Soil Staging

Approximately 38,000 yd^3 (approximately 57,000 tons) of soil would be excavated and transported to the temporary contaminated-soil staging area as described for Alternative 5A. The exact location of the soil treatment facility is not known at this time. However, for costing purposes, it is assumed that the treatment facility would be located at another OU at the site. It is also assumed that the soil treatment area would be close (approximately 1 mile) to the excavation at OU 3 and that there would be direct access between the two locations to minimize soil transportation costs. It is possible that a soil conveyer system would be used to transport the soil to the contaminated-soil staging area, which could further reduce material-handling costs.

Soil Treatment with Solvent Extraction

Prior to constructing a treatment plant at the site, a bench-scale treatability test would need to be conducted on the soil. This test would help determine the detailed configuration of the plant as well as the flow rates and required extraction times. Most solvent extraction plant designs are modular in nature. Therefore, plant capacity can be as small or as large as desired, ranging up to 300 tons per day. The larger the plant, the quicker the plant can process the soil, but the higher the up-front mobilization and site preparation costs. To optimize plant economics, it would be necessary to balance the up-front costs with the desire to process the soil in as short a time as possible. An additional consideration in designing the plant capacity is whether soils or sediments from other OUs at the site would be treated at the treatment plant.

For this study, it is assumed that a facility with a daily capacity of 190 tons per day would be constructed. At 190 tons per day, the 38,000 yd^3 of contaminated soil could be treated in approximately 10 months (assuming a 7-day work week and a bulk density of 1.5 tons per yard). For this FS, a target treatment goal of 1 mg/kg is assumed for soil. If another target treatment goal is selected in the future, estimated costs may be altered to some degree.

The treatment plant would be installed on a concrete pad. The pad would be installed as part of the site preparation activities. The pad would be surrounded by a buffer area of curbed asphalt as well as an 8-foot high security fence. The plant area also would be supplied with potable process water, 440-volt electricity, and a fire hydrant for firewater. The area required for the treatment plant would be approximately 2 acres.

The soil would be transferred from the contaminated-soil staging area and loaded into the treatment system with a front-end loader. The process itself is a completely enclosed system. The soil is sealed in a contact vessel before the soil is treated with any solvent. The vessels are not opened again until the solvent has been removed from the soil with the soil-heating process. Air emissions would be small and limited to tank vents, boiler exhaust, and other minor sources. All air emissions would be passed through scrubbers and activated carbon to remove any volatilized solvent or organic exhaust vapors. The process will yield a clean soil as well as a liquid concentrated PCB stream. A waste solvent stream is not produced because of the closed-loop process.

Water generated during the process would be returned to the soil so that the soil for disposal would be at its original moisture content. The treated soil then would be placed in an adjacent treated soil storage area by a front-end loader and covered with plastic until it is disposed of. The concentrated PCBs would be pumped directly into 55-gallon drums. Further discussion on the storage and disposal of these streams is included in the next subsection.

The treated soil would need to be sampled to ensure that it is below treatment goals. Soil samples would be analyzed for PCBs and the residual solvent. Most vendors perform confirmation sampling as part of their normal treatment package. Some additional sampling would be required to corroborate the vendor's sampling program.

Storage and Disposal of Waste Streams Generated at the Treatment Plant

The concentrated PCB waste stream generated during this process would be in a liquid form and would be pumped directly into 55-gallon drums within the treatment system. Once full, drums would be stored for less than 90 days on a bermed and covered drum storage pad until they are transported for off-site disposal. It is expected that the concentration of PCBs in this waste stream would exceed 5,000 ppm. Therefore, according to Section 761.60 of 40 CFR Part 761, the concentrated PCB waste stream would have to be disposed of at an off-site TSCA-approved incinerator.

In order to estimate the volume of concentrated PCB solution that would be generated, a mass balance can be calculated using the concentration of extractable organics. According to the vendors, total oil and grease (O&G) is a reasonable surrogate measurement for the concentration of extractable organics. No O&G data are available for OU 3. For costing purposes, it is assumed that approximately 1,000 gallons (0.017 gallons per ton) of the concentrated PCB stream would be generated. This estimate is based on an assumed average O&G concentration of 100 ppm for the entire 38,000 yd^3 of contaminated soil.

Since the water would be added back to the soil, it is assumed that the mass of the treated soil would be identical to the mass of the soil to be treated. Therefore, based on soil volumes and bulk density, it is estimated that 57,000 tons of cleaned soil would be generated. Treated soil would be stored on the polyethylene sheeting at the treated soil storage area and covered with additional polyethylene sheeting. For costing purposes, it is assumed that the soil would be transported to another OU for reuse. Alternatively, the treated soil could be trucked off-site and disposed of at a RCRA Subtitle D landfill for use as daily cover.

A few additional wastes could be generated including contaminated PPE and contaminated carbon from air scrubbers. The volumes of these materials would be small.

5.2.6.2 Assessment of Alternative 5B-1

The following text and Table 5-8 discuss the seven evaluation criteria as they apply to this alternative.

Short-Term Effectiveness

There would be some potential risks associated with the excavation activities of this alternative. For a detailed discussion of the short-term effectiveness of the excavation activities for this alternative, see Subsection 5.2.3.

There would be some potential risks to residents and workers during the treatment of the soil with solvent extraction technology. The greatest risk to both groups is the presence of large volumes of flammable solvent at the site. Installing a fire control system with adequate access to firewater would control this risk. In addition, there would be a buffer zone around the soil treatment facility to further reduce risks to residents.

Table 5-8

Evaluation Criteria to be Considered for Remedy Selection — Alternative 5B-1: Excavation, Off-Site Solvent Extraction Treatment at Another OU, Disposal

Criteria	Assessment
<u>Short-Term Effectiveness</u>	
Potential impacts on the community during RA; effectiveness of protection measures.	Potential impacts include fugitive dust emissions, solvent vapors, and fire risk during excavation and treatment. Engineering controls would be used to minimize the possibility of community impacts during removal, transportation, and treatment of the soil.
Potential impacts on workers during RA; effectiveness of protection measures.	Potential impacts include fugitive dust emissions, solvent vapors, and fire risk during excavation and treatment. Engineering controls, PPE, and monitoring would be used to minimize the potential for worker exposure to contaminants. Safety systems would be implemented to prevent exposure as well as fires or explosion of the organic solvent used in the solvent extraction process.
Potential environmental impacts of RA; effectiveness of protection measures.	Engineering controls would be used to prevent releases of contaminants to the environment during implementation.
Time until protection is achieved.	Protection would be achieved following removal of the soil, which would occur during two 10-week summer periods. It also may be possible to excavate the soil during 10-ten-week period if a soil conveyor system or mining trucks can be used.
Time until RA is complete.	The remedial action would require approximately 2.5 years to complete. If the excavation can be completed in one 10-week session, the RA could possibly be completed in 1.5 years.
<u>Long-Term Effectiveness and Permanence</u>	
Magnitude of residual risk from untreated waste and treatment residuals.	On-site residual risks would be minimal because of excavation of soil exceeding cleanup goals. Soil contaminants would be removed from the soil and then destroyed during the treatment process, thereby minimizing risk associated with contaminated materials removed from the site.
Adequacy and reliability of engineering and institutional controls used to manage untreated waste and treatment residuals.	There would be minimal treatment residuals. Concentrated PCB wastes would be sent off-site for incineration at a permitted facility. Treated soil would be used as backfill at another OU. This is a common and reliable means of managing treated soil.

Table 5-8

Evaluation Criteria to be Considered for Remedy Selection — Alternative 5B-1: Excavation, Off-Site Solvent Extraction Treatment at Another OU, Disposal (Continued)

Criteria	Assessment
Long-term management and monitoring requirements.	No long-term monitoring is required.
Potential for future exposure to human and environmental receptors.	The potential for exposure to human and environmental receptors would be eliminated.
Potential need for replacement.	No maintenance or repair is required after RA is complete.
Reduction of TMV of Contaminants through Treatment Type and quantity of residuals resulting from treatment process.	The treatment process would effectively remove the PCBs from the soil and concentrate them. The concentrated PCBs would then be incinerated off-site at a permitted facility. Low levels of PCBs and solvents will remain in the treated soil. The solvents used are biodegradable.
Fate of residuals remaining after treatment.	There would be no residuals remaining at OU 3. The treated soils with low levels of TPH would be reused at another OU.
Degree to which treatment is irreversible.	The removal of PCBs from the soil with solvent extraction and subsequent off-site incineration of PCBs would be irreversible.
Treatment process employed and type and amount of materials to be treated.	Approximately 38,000 yd^3 of soil would be excavated and treated off-site.
Degree of expected reduction in TMV: Is it permanent or significant?	TMV of contaminants would be permanently reduced at the site. A significant and permanent reduction in TMV would be accomplished through treatment of the soil.
Implementability Ability to construct technology.	The solvent extraction process has been successfully implemented at several full-scale RAs, which are similar to the RA planned for the OU 3 soils. No significant problems are expected when constructing a treatment facility large enough to treat the soils over a 10-month period of time.

Table 5-8

Evaluation Criteria to be Considered for Remedy Selection — Alternative 5B-1: Excavation, Off-Site Solvent Extraction Treatment at Another OU, Disposal (Continued)

Criteria	Assessment
Difficulties and unknowns associated with the technology.	Schedule constraints exist due to the preference of completing the remedial alternative during the school summer vacation. There may be some problems implementing this technology if the soil contains too many fine and clay materials. The technology requires the use of large volumes of flammable solvents.
Ability to monitor effectiveness of remedy.	To the extent possible, all soil exceeding cleanup goals would be removed to a maximum depth of 10 feet bgs. The effectiveness of the removal would be evaluated by confirmation sampling following excavation. The effectiveness of the treatment would be evaluated by sampling following treatment. No long-term monitoring would be required.
Reliability of technology.	Removal and transport of the soil using conventional construction equipment and techniques would be a reliable means of removing the materials from OU 3. Solvent extraction has proven reliable in removing PCBs from soil to below target levels as low as 1 ppm during full-scale operation.
Ability to perform O&M functions.	Not applicable.
Ability to undertake additional RAs, if deemed necessary in the future.	Solvent extraction equipment is modular and easily expandable. The equipment is also quite durable. Thus, the equipment could be used to treat additional contaminated soils in the future, if necessary.
Availability of necessary equipment; specialists; and treatment, storage, and disposal services.	Necessary equipment and services are readily available for excavation, transport, and storage of the contaminated materials. Solvent extraction equipment may have to be specifically fabricated for this site.
Ability to obtain approvals from, and need to coordinate with, other agencies.	Concurrence from federal, state, and local agencies would be required. Solvent extraction facilities have been able to obtain approvals and permits in the past. Several vendors already have TSCA permits for treating PCBs at concentrations exceeding 50 ppm.

Table 5-8

Evaluation Criteria to be Considered for Remedy Selection — Alternative 5B-1: Excavation, Off-Site Solvent Extraction Treatment at Another OU, Disposal (Concluded)

Criteria	Assessment
<u>Cost</u> Capital costs.	$23,391,000
O&M costs (30-year present-worth).	$14,000
Present-worth analysis (30-year).	$23,405,000
Potential future RA costs.	No future RA costs anticipated.
<u>Compliance with ARARs</u> Chemical-specific ARARs and TBCs.	Once the PCBs are removed from the soils with solvent extraction, the PCBs would be destroyed at a TSCA-permitted incinerator. Incineration is an EPA-approved method for destroying PCBs. Compliance with MCP Method 1 S-1 standards would be attained in the top 10 feet of soil. Soil exceeding MCP Method 1 S-1 standards would remain below 10 feet.
Location-specific ARARs.	Compliance attained.
Action-specific ARARs.	Compliance attained.
<u>Overall Protection of Human Health and the Environment</u>	Alternative is protective of human health and the environment.

ARAR = Applicable or relevant and appropriate requirements.
MCP = Massachusetts Contingency Plan.
O&M = Operations and maintenance.
PCB = Polychlorinated biphenyls.
PPE = Personal protective equipment.
ppm = Parts per million.
RA = Remedial action.
TPH = Total petroleum hydrocarbons.
TSCA = Toxic Substances Control Act.
yd^3 = Cubic yards.

A second potential risk to residents and workers during the implementation of soil treatment activities is the risk of exposure to airborne dust containing PCBs. Emissions from the stockpiled soils in the contaminated-soil staging area would be controlled by covering the soil stockpiles. Also, the contaminated soil could be wetted during earth-moving activities to control dust emissions. Engineering construction activities, including OSHA rules, would be followed during earth movement and treatment activities to maximize worker safety.

There is also a potential risk to residents and workers during the implementation of soil treatment activities from the exposure to volatilized solvent. This risk is minimized through the use of a closed loop system where there are very few solvent and air emissions. In addition, all air emissions are run through scrubbers and/or activated carbon to control volatilized solvent emissions.

Finally, there is a potential risk to residents and workers from transporting the concentrated PCB waste stream to a TSCA-permitted incinerator and incineration of the wastes at this facility. To the extent possible, this risk would be minimized by careful planning of transportation activities; use of an experienced, licensed hauler of hazardous wastes; and incineration of the wastes at a state-of-the-art and TSCA-permitted incineration facility.

There are no expected direct environmental impacts from the soil treatment activities under this alternative.

Long-Term Effectiveness and Permanence

The excavation and treatment of contaminated soils at OU 3 would result in a substantial overall reduction of risk to human health. In this alternative, the PCBs posing potential risks to human health would be removed from OU 3, greatly reducing long-term risks to human receptors at the OU. In addition, the solvent extraction process would then remove the PCBs from the soil and the PCBs would be destroyed at a TSCA-approved incinerator. The destruction of these PCBs would further reduce the long-term risks.

There would be some minimal potential long-term risks due to residual PCBs remaining in the treated soil. The residual PCBs would be at a concentration of less than 1 mg/kg so this risk should be small. It is not believed that the residual solvent in the soil would pose a significant long-term risk because the solvents used are biodegradable.

Reduction of Toxicity, Mobility, or Volume (TMV)

If this alternative is selected, there would be a significant and permanent reduction in the TMV, of the waste because almost all of the PCBs in the top 10 feet of soil at OU 3 would be removed and then destroyed. The solvent extraction would remove the PCBs from the contaminated soil and concentrate them in a high-strength solution. This solution would subsequently be sent to a TSCA-permitted incinerator where the PCBs would be completely destroyed. These processes are irreversible.

There would be trace concentrations of PCBs in the treated soil after treatment. For this project, a target post-treatment concentration of 1 mg/kg is assumed. There would also be levels of residual solvents in the treated soil. The solvents utilized in this technology are not toxic, are not listed materials, and are biodegradable. Residual solvent concentrations are expected to be on the order of low ppm.

The levels of PCBs and residual solvent in the treated soil are expected to allow the use of the soil as clean fill at other OUs without presenting unreasonable risks to human health. In addition, the low levels of residual PCBs and solvents would not preclude the use of this waste as daily cover in a Subtitle D regulated landfill.

Implementability

This alternative is technically implementable. The excavation and transportation of the soil would use proven and reliable technologies. See Subsection 5.2.3 for a detailed discussion of the implementability of excavation activities.

The solvent extraction technology to treat the soil is also implementable. It is relatively easy to mobilize and install the solvent extraction equipment at the treatment site, and the equipment is not difficult to operate. The technology has been demonstrated at several similar full-scale remediation projects to reduce PCB concentrations to below 1 mg/kg. Maximum concentrations at these other sites have been as high as 40,000 mg/kg, much higher than the maximum concentration of 1,100 mg/kg found at OU 3. Reliable test methods have been developed to measure the concentration of residual PCBs and solvents in the soils to monitor the effectiveness of the treatment technology.

An additional benefit of the solvent extraction technology is that the treatment plants can be expanded easily. Therefore, it is possible to design a solvent extraction plant with a higher capacity if the plant would need to treat soil or sediments from other OUs at the site.

There are several limitations in implementing the solvent extraction technology. In particular, it is sometimes difficult to implement solvent extraction for soils containing a high percentage of fine and clay particles. The small particles can cause problems in physically separating the solvents from the soil. A bench-scale treatability test should determine if this will be problematic. In addition, the solvent used during treatment is flammable and explosive and must be handled with care.

Permitting of a solvent extraction facility is not expected to be difficult. The primary vendors selling solvent extraction services have already obtained nationwide TSCA permits to process PCBs with concentrations exceeding 50 mg/kg. Air permits also may be required, but the treatment plants have state-of-the-art air emission control devices. The vendors claim that they have not had any major problems obtaining air permits in the past.

Based on discussions with both vendors and regulators, the siting of these facilities is also manageable. There are some aspects of site safety that may be an issue of concern, such as the presence of large volumes of flammable solvents. However, it is possible to minimize these risks with careful planning. In addition, this technology would leave measurable concentrations of residual solvent in the treated soil. Based on past experience, concentrations in the ppm range can be expected.

Cost

The total present worth of this treatment technology is $23,405,000. A breakdown of line items contributing to the estimated capital costs and O&M costs, as well as the present-worth analysis for this alternative, is summarized in Appendix C, Table C-5. In addition, see Subsection 5.2.3 for a detailed discussion of the costs of excavation activities.

The estimated capital cost for this treatment technology is $23,391,000. The capital cost takes into account the cost of excavation and transportation of the contaminated soil; bench-scale treatability test; site preparation costs for the treatment facility; mobilization and demobilization of the solvent extraction treatment plant; soil treatment; confirmation sampling of the soil; disposal of the PCBs at a TSCA-regulated incinerator; and transportation of treated soil to another OU for reuse.

The cost estimates are greatly impacted by changes in the per ton treatment cost charged by the vendor. Based on conversations with several vendors, the per ton cost can range from $100 to $250 per ton. An estimate of $175 is assumed in the cost estimating tables in Appendix C. The per ton cost will vary, depending on the exact soil characteristics, such as soil moisture and particle size distribution, as well as the target treatment level selected. Great cost savings or potential cost increases may be realized depending on exact site conditions. One way to better define the per ton cost is to run a bench-scale treatability test. In addition, the excavation and soil handling costs also may be reduced if a soil conveyor system is installed to transport the soil from the excavation to the contaminated soil staging area.

The long-term operating costs for this alternative are limited to a SARA review conducted in year 5 to ensure that complete remediation has occurred. The cost for the one-time SARA review is estimated to be $15,000 in year 5.

No significant economies of scale are realized with this technology. There is some reduction in the per ton mobilization and site preparation costs if a smaller plant is selected or if the plant remains at the site for a longer period of time. However, the flat per ton treatment rate for soil does not change significantly with plant capacity.

Compliance with ARARs

Implementation of this alternative is expected to comply with ARARs. A summary of specific ARARs for the treatment and disposal of soils contaminated with PCBs is presented in

Subsection 2.2. For a complete list of the ARARs relevant to this alternative as well as the actions to be taken to attain the requirements, refer to Appendix B. This alternative would not comply with chemical-specific TBCs due to the potential for soil exceeding MCP Method 1 S-1 standards to remain below a depth of 10 feet. MCP requirements would not be met unless a risk assessment was performed that indicated a condition of no significant risk and an AUL was placed on the property.

Overall Protection of Human Health and the Environment

There would be a short-term risk of human exposure to PCBs during the excavation and treatment of the contaminated soil. The pathway would be through airborne dust, which could impact area residents as well as workers. This risk would be controlled by suppressing the dust during the excavation and by storing the contaminated soil in a contained structure.

There is also a short-term risk of human exposure to volatilized solvent during the soil treatment. This risk would be controlled through the use of state-of-the-art air emission control technologies.

Finally, there is some risk of fire and explosion at the site during the treatment activities due to the presence of flammable solvents at the treatment facility. This risk would be controlled by installing a system for fire control as well as paved buffer areas.

On the other hand, the implementation of this alternative would result in a substantial overall reduction of risk to human health. In this alternative, PCBs in soil up to a depth of 10 feet bgs would be removed from OU 3, greatly reducing long-term risks to human receptors at the OU. In addition, the treatment process would then remove the PCBs from the soil and the PCBs would be destroyed at a TSCA-approved incinerator. The destruction of these PCBs would further reduce the long-term risks.

5.2.7 Alternative 5B-2: Excavation, Chemical Dechlorination at Another OU, Disposal

5.2.7.1 Description of Alternative 5B-2

This remedial alternative is the same as Alternative 5B-1, with the exception of the method of soil treatment (chemical dechlorination instead of solvent extraction) at another OU within the overall site. Soils would be excavated and removed from OU 3 in the same manner as described for Alternative 4A. The soils would be stockpiled at another OU as described for Alternative 5A. Following treatment, the soils would be nonhazardous, and it is assumed that they would be disposed of in the same manner as the soils for Alternative 5B-1. Figure 5-4, the process flow diagram for this alternative, illustrates the processes associated with excavation, dechlorination treatment, and disposal.

Dechlorination Treatment Process

Several different dechlorination treatment processes have been developed for treatment of contaminated soils. The objective of all of these processes is to detoxify the contaminated materials by stripping the chlorine atoms from chlorinated contaminants. The processes differ by the method of dechlorination treatment and by the types of residuals remaining following treatment. None of the dechlorination treatment processes have been implemented at a scale that would, in a reasonable time frame (12 to 24 months), treat the 38,000 yd^3 of PCB-contaminated soils present at OU 3.

The following three types of dehalogenation processes can be used for treatment of PCB-contaminated soils:

- Solvated Electron Technology (SET).
- Base-Catalyzed Decomposition (BCD).
- Glycolate Dehalogenation.

A specific dechlorination process for treatment of the OU 3 soils would be selected during the remedial design phase of the project. Following selection of the specific treatment process, pilot testing would be conducted to verify the effectiveness of the process for treatment of the site soils, and to establish design and operating parameters for the full-scale treatment system. The three dechlorination technologies are described briefly in the following paragraphs.

Solvated Electron Technology (SET)

The SET process neutralizes halogenated compounds (those containing chlorine, fluorine, bromine, or iodine) by exposing them to free electrons in a solvated solution. Solvated electrons are a powerful reducing agent. Solvated electron solutions are produced when a base metal (usually sodium, but sometimes calcium or lithium) is dissolved in liquid anhydrous (water-free) ammonia. Halogenated compounds, which have a powerful affinity for free electrons, are mixed with the solvated solution and, in a very rapid reaction, are neutralized. For PCBs, ions of chlorine combine with ions of sodium, and sodium chloride is formed. The SET process strips chlorine from hydrocarbons, often without further degrading the hydrocarbons. Thus, the total petroleum hydrocarbons (TPH) in soil typically increases following SET treatment.

The final configuration of the SET system depends on several parameters including soil particle size, the presence of rocks, the degree to which PCBs and other chemical of concern are sorbed to rocks, moisture content, and the presence of natural organic (humic) materials. The solvated electron solution can be either added directly to the soil in a reactor or the contaminants can be solvent-extracted from the soils using ammonia. If the extraction method is used, then sodium is added to the liquid extract to generate the reaction in which the PCBs are destroyed. Following destruction of the PCBs, the reaction liquids are distilled and the ammonia is recycled to the extraction reactor. The still bottom materials are typically nonhazardous salts, although pH adjustment may be required prior to disposal.

SET has been demonstrated to achieve consistently high levels of contaminant destruction in soils contaminated with PCBs, dioxins, and pesticides. Soils containing up to 10,000 ppm of contaminants have been treated by SET to less than 1 ppm residual contamination. The SET process does not generate air emissions. All residual ammonia is recycled to the process.

Base-Catalyzed Decomposition (BCD)

In the BCD process, contaminated soil is screened, processed with a crusher and pugmill, and mixed with sodium bicarbonate. The mixture is heated to above 330°C (630°F) in a rotary reactor to decompose and partially volatilize the contaminants. The BCD process produces primarily biphenyl, low-boiling-point olefins, which are not water soluble and are much less toxic than PCBs, and sodium chloride. Thus, in the BCD process, contaminants are partially decomposed within the treated medium, and are not transferred to another medium.

Glycolate Dehalogenation

In glycolate dehalogenation, an alkaline polyethylene glycol (APEG) reagent is used to dehalogenate halogenated aromatic compounds in a batch reactor. The APEG reagent dehalogenates the pollutant to form a glycol ether and/or a hydroxylated compound, and an alkali metal salt, which are water-soluble by-products. Potassium polyethylene glycol (KPEG) is the most common APEG reagent. Contaminated soils and the reagent are mixed and heated in a treatment vessel. In the APEG process, the reaction causes the polyethylene glycol to replace halogen molecules and render the compound nonhazardous or less toxic. For example, the reaction between chlorinated organics and KPEG causes replacement of a chlorine molecule and results in a reduction in toxicity. The concentrations of PCBs that have been treated by the APEG process are reported to be as high as 45,000 ppm. Concentrations were reduced to less than 2 ppm per individual PCB congener.

Glycolate dehalogenation typically produces a wastewater stream that may require treatment by an advanced oxidation process, carbon adsorption, or precipitation. Glycolate dehalogenation residuals contain chlorine and hydroxyl groups, which make them water-soluble and slightly toxic.

Treatment Approach for OU 3

The SET process has been selected for detailed evaluation in this alternative because it appears to have good potential for scale-up to the size system necessary for treatment of the OU 3 soils in a 1- to 2-year time-frame. However, as noted, the actual dechlorination treatment process used would be selected during remedial design, and pilot testing would be conducted to verify the effectiveness of the technology and determine the final design criteria and operational parameters.

As described for Alternative 5A, excavated soil from OU 3 would be transported to the staging and treatment area for storage until treatment. Backfilling and restoration of the OU 3 site would proceed in the same manner as for Alternative 4A. The timing, logistics, and costs for OU 3 excavation, soil transport, confirmatory sampling, and site restoration would be the same as for Alternative 4A.

Following completion of pilot testing and final design of the remedial process, the dechlorination treatment system would be constructed adjacent to the containment structures. After the treatment system is completely constructed, startup testing would be conducted to verify attainment of the soil treatment objectives. Following successful completion of the startup testing, treatment of the soil would commence at a rate of approximately 5 to 8 tons per hour (120 to 192 tons per day, assuming 24-hour operation).

Treatment of the 57,000 tons of soil would require an estimated 10 to 16 months, depending on the treatment rate and the treatment system down-time for maintenance and repairs. Treated soil would be tested, at a rate of 1 sample per 500 tons, for compliance with treatment objectives, and transported from the site to a landfill for use as cover material. As noted in the description of the SET process, there may be residual petroleum hydrocarbons present in the soil following the dechlorination treatment process. However, given the low average PCB concentration (7 to 12 mg/kg) in the contaminated materials, the resulting TPH concentration would also be low, and suitable for soil reuse at another OU. Reuse of treated soil as daily cover at an off-site landfill could also be an option. For the purposes of this FS, it is assumed that treated soil would be reused on-site at another OU.

Following treatment of all of the stockpiled soils, the temporary storage structures and treatment system would be decontaminated and removed from the site. The concrete pad for the treatment area would be removed and the site graded and restored to pre-construction conditions.

5.2.7.2 Assessment of Alternative 5B-2

The following text and Table 5-9 discuss the seven evaluation criteria as they apply to this alternative.

Table 5-9

Evaluation Criteria to be Considered for Remedy Selection—Alternative 5B-2: Excavation, Off-Site Dechlorination Treatment at Another OU, Disposal

Criteria	Assessment
<u>Short-Term Effectiveness</u>	
Potential impacts on the community during RA; effectiveness of protection measures.	Engineering controls would be used to minimize the possibility of community impacts during removal and transportation of the soil.
Potential impacts on workers during RA; effectiveness of protection measures.	Engineering controls, PPE, and monitoring would be used to minimize the potential for worker exposure to contaminants. Safety systems would be implemented to prevent worker exposure to ammonia and ammonia/sodium solvated electron solution.
Potential environmental impacts of RA; effectiveness of protection measures.	Engineering controls would be used to prevent releases of contaminants to the environment during implementation.
Time until protection is achieved.	Protection would be achieved following removal of the soil, which would occur during two 10-week summer periods.
Time until RA is complete.	The remedial action would require approximately 3.5 years to complete.
<u>Long-Term Effectiveness and Permanence</u>	
Magnitude of residual risk from untreated waste and treatment residuals.	On-site residual risk would be minimal because of excavation of soil exceeding cleanup goals to a maximum depth of 10 feet bgs. Soil contaminants would be destroyed by treatment process thereby minimizing risk associated with contaminated materials removed from the site.
Adequacy and reliability of engineering and institutional controls used to manage untreated waste and treatment residuals.	There would be minimal treatment residuals. Treated soil would be reused at another OU. This is a common and reliable means of managing treated soil.
Long-term management and monitoring requirements.	No long-term monitoring is required.
Potential for future exposure to human and environmental receptors.	The potential for exposure to human and environmental receptors would be eliminated.
Potential need for replacement.	No maintenance or repair required after remedial action is complete.

Table 5-9

Evaluation Criteria to be Considered for Remedy Selection— Alternative 5B-2: Excavation, Off-Site Dechlorination Treatment at Another OU, Disposal (Continued)

Criteria	Assessment
Reduction of TMV of Contaminants through Treatment Type and quantity of residuals resulting from treatment process.	The treatment process would effectively destroy the PCBs and other chlorinated contaminants. Low levels of TPH may remain in the treated soil. The soil would also contain sodium chloride and would be slightly nitrogen-enriched
Fate of residuals remaining after treatment.	There would be no residuals remaining at OU 3. The treated soils with low levels of TPH would be reused at another OU.
Degree to which treatment is irreversible.	The dechlorination treatment process would be irreversible.
Treatment process employed and type and amount of materials to be treated.	Approximately 38,000 yd^3 of soil would be excavated and treated off-site.
Degree of expected reduction in TMV: Is it permanent or significant?	TMV of contaminants would be permanently reduced at the site. A significant and permanent reduction in TMV would be accomplished through treatment of the soil.
Implementability Ability to construct technology.	The dechlorination treatment technology has not been implemented at a scale required for treatment of the OU 3 soils. Complications associated with scale-up to a 5 to 8 tons per hour system are expected.
Difficulties and unknowns associated with the technology.	Schedule constraints due to the preference of completing the remedial alternative during the school summer vacation. Dechlorination treatment is unproven in large-scale applications.
Ability to monitor effectiveness of remedy.	To the extent possible, all soil exceeding cleanup goals would be removed. The effectiveness of the removal would be evaluated by confirmation sampling following excavation. No long-term monitoring would be conducted.

Table 5-9

Evaluation Criteria to be Considered for Remedy Selection—
Alternative 5B-2: Excavation, Off-Site Dechlorination Treatment at Another OU, Disposal
(Continued)

Criteria	Assessment
Reliability of technology.	Removal and transport of the soil using conventional construction equipment and techniques would be a reliable means of removing the materials from OU 3. Dechlorination treatment has been demonstrated to be reliable at small scales but has not been demonstrated in large-scale applications.
Ability to perform O&M functions.	Not applicable.
Ability to undertake additional RAs, if deemed necessary in the future.	Additional RAs could be undertaken if necessary
Availability of necessary equipment; specialists; and treatment, storage, and disposal services	Necessary equipment and services are readily available for excavation, transport and storage of the contaminated materials. Dechlorination treatment equipment would likely need to be specifically designed for this application.
Ability to obtain approvals from, and need to coordinate with, other agencies.	Concurrence from federal, state, and local agencies would be required
Cost	
Capital costs.	$36,218,000
O&M costs (30-year present-worth).	$14,000
Present-worth analysis (30-year).	$36,232,000
Potential future RA costs.	No future RA costs anticipated.
Compliance with ARARs	
Chemical-specific ARARs and TBCs.	Compliance with TSCA requirements would be attained though the use of an EPA-approved method for destruction of PCBs. Compliance with MCP Method 1 S-1 standards would be attained in the top 10 feet of soil. Soil exceeding MCP Method 1 S-1 standards would remain below 10 feet.

Table 5-9

Evaluation Criteria to be Considered for Remedy Selection—Alternative 5B-2: Excavation, Off-Site Dechlorination Treatment at Another OU, Disposal (Concluded)

Criteria	Assessment
Location-specific ARARs.	Compliance attained.
Action-specific ARARs.	Compliance attained.
Overall Protection of Human Health and the Environment	Alternative is protective of human health and the environment.

ARAR = Applicable or relevant and appropriate requirements.
MCP = Massachusetts Contingency Plan.
O&M = Operations and maintenance.
PCB = Polychlorinated biphenyls.
PPE = Personal protective equipment.
ppm = Parts per million.
RA = Remedial action.
TPH = Total petroleum hydrocarbons.
TSCA = Toxic Substances Control Act.
yd^3 = Cubic yards.

Short-Term Effectiveness

The primary short-term risks associated with this alternative are related to construction activities, excavation, and heavy equipment operation. There are also some short-term risks associated with the use of liquid ammonia, solid/liquid sodium, and the ammonia/sodium solvated electron solution. These materials are used in industry and standard industrial practices will be implemented to protect workers, the community, and the environment.

Appropriate surface-water runoff controls would be implemented to prevent water from the excavated soils or rainfall runoff in the area of the excavation or treatment areas from impacting the environment.

Exposure to contaminated soils and particulate emissions are potential risks to the surrounding community and to site workers during excavation of the soils at OU 3. Emissions from the stockpiled untreated soils would be controlled by storing the materials in contained enclosures until treatment. On-site air quality monitoring would be employed during construction activities. Engineering construction standards, including OSHA rules, would be followed to maximize worker safety during the excavation, treatment, and construction activities.

The remedial action, including dechlorination treatment of all soils, and restoration of the storage and treatment area at another OU, would require approximately 3.5 to 4 years to complete.

Long-Term Effectiveness and Permanence

Current use of the site does not present an unacceptable risk to human health from exposure to site contaminants. Risks associated with potential future uses of OU 3 would be substantially reduced or eliminated as a result of removal of the contaminated materials.

No long-term monitoring and maintenance of OU 3 would be required for this alternative.

Reduction of Toxicity, Mobility, or Volume (TMV)

Contaminated soils would be excavated, transported off-site, and treated to destroy the contaminants. The dechlorination treatment process would effectively reduce and destroy the site contaminants, thereby eliminating the TMV of the contaminants. The treatment process residuals would be nontoxic and would be disposed off-site as landfill cover material. Low levels of TPH may remain in the treated soil, however, based on the estimated contaminant concentrations at OU 3, the soil would be suitable for reuse at another OU. The treated soil would also contain sodium chloride and would be slightly nitrogen-enriched.

Implementability

The dechlorination treatment process has not been implemented at a scale that will be required to treat the volume (38,000 yd^3) of contaminated soils in a reasonable time-frame (1 to 2 years). Technically, the project can be implemented using demonstrated technologies. However, it is likely that there will be some difficulties associated with scaling up of the dechlorination treatment process. Otherwise, the excavation, soil handling, confirmational sampling, backfilling, and site restoration technologies and methods are conventional and implementable at

OU 3. Careful planning would be required to complete the soil removal, backfilling, and OU 3 site restoration during the school summer vacation period(s), thereby eliminating the need to work at the site during times when school is in session.

To the extent possible, all soil exceeding cleanup goals would be removed from OU 3 to a maximum depth of 10 feet bgs. The effectiveness of the removal would be evaluated by confirmation sampling following excavation. No long-term monitoring would be conducted.

Implementation of this alternative would not impede the potential to implement additional remedial measures at OU 3 in the future if necessary. However, it is expected, under this alternative, that removal of contaminated materials from OU 3 would be substantially complete and thus, it is highly unlikely that additional remedial measures would be required.

Administratively, concurrence with state and local authorities would be required for transport of the substantial volume of contaminated materials and backfill over local roadways. Concurrence with local authorities would be required for procurement and establishment of the soil storage and treatment area at another OU.

Cost

The estimated capital costs and O&M costs for this alternative are presented in detail in Appendix C.

The capital costs take into account the cost of preparatory site work, excavation, dewatering, transport of the contaminated materials to another OU, backfilling, and restoration of the excavated area. The capital costs also include construction of the storage and treatment area, including the containment structures, and dechlorination treatment of the contaminated materials. Transportation of the treated soil to another OU for reuse is also included in the capital costs. Sampling and laboratory testing would be necessary for confirmation of treatment goals and disposal characterization of the treated soil. The costs are based on analysis at an off-site laboratory, with 2-day turnaround for most samples. It is possible that savings could be realized through the use of an on-site laboratory or through increased reliance on on-site screening methodologies. High clay and moisture content in the soils to be treated would increase the cost of the SET process.

The high ($350 per ton) cost for dechlorination treatment of the contaminated soils could possibly be reduced if PCB-contaminated soils from other OUs are also treated by the dechlorination process. This would provide an economy of scale that could lower the per ton cost of dechlorination treatment.

Compliance with ARARs

Implementation of this alternative is expected to comply with ARARs. A summary of specific ARARs for the treatment and disposal of soils contaminated with PCBs is presented in Subsection 2.2. For a complete list of the ARARs relevant to this alternative as well as the actions to be taken to attain the requirements, refer to Appendix B. This alternative would not comply with chemical-specific TBCs due to soil exceeding MCP Method 1 S-1 standards below a depth of 10 feet. MCP requirements would not be met unless a risk assessment was performed that indicated a condition of no significant risk and an AUL was placed on the property.

Overall Protection of Human Health and the Environment

There would be short-term impacts resulting from excavation, dewatering, transport of the excavated materials, transport of the backfill material, backfilling, and site restoration as described for Alternative 4A. Based on available site analytical data and an evaluation of the current use of the site, present conditions at OU 3 do not present an unacceptable risk to human health. Receptors associated with potential future uses of the site would be protected by removal of the contaminants.

5.3 COMPARISON OF POTENTIAL REMEDIAL ALTERNATIVES

In this subsection, the alternatives are evaluated in relation to one another for each of the evaluation criteria to identify the relative advantages and disadvantages of each alternative. The comparisons are made with respect to seven of the nine evaluation criteria discussed in Subsection 5.1. When there is no significant difference between alternatives for a criterion, the text points out this fact and the discussion focuses on differentiating among the alternatives for those criteria where the difference is apparent and noteworthy. The results of the evaluation of each alternative with respect to the seven evaluation criteria are expressed with a ranking system in Table 5-10. The ranking is based on a scale of 1 through 5, with 5 representing the rank that best satisfies the requirements of the criterion.

Seven potential remedial alternatives were analyzed in detail in Subsection 5.3. These alternatives include: 1 – No Action; 2 – Limited Action/Institutional Controls; 4A – Excavation, Off-Site Treatment and/or Disposal; 4B – Excavation, Disposal at Another OU, 5A – Excavation, Thermal Treatment at Another OU, Disposal; 5B-1 – Excavation, Solvent Extraction at Another OU, Disposal; and 5B-2 – Excavation, Chemical Dechlorination at Another OU, Disposal. The following subsections augment the information presented in Table 5-10 and highlight the advantages, disadvantages, and relative merits of each alternative.

5.3.1 Short-Term Effectiveness

The Revised Draft Human Health Risk Assessment (03-0058) has indicated that current risks are within acceptable limits. Implementation of Alternative 1 would pose no additional risks in the short term, because no remedial activities would be implemented. Alternative 2 would pose minimal impacts to human receptors in the short term as only cap maintenance activities would be performed. Alternatives 4A, 4B, 5A, 5B-1, and 5B-2 are very similar with respect to short-term effectiveness. Short-term risks are associated with the excavation component of these alternatives, including the potential for fugitive dusts, noise, and truck traffic. However, in Alternative 4A, the excavated material would be transported off-site, while in Alternatives 4B, 5A, 5B-1, and 5B-2, additional short-term risks would be present at the temporary stockpile and treatment locations at another OU on the GE Housatonic River site.

Table 5-10

Summary of Detailed Alternatives Evaluation

Alternative	Short-Term Effectiveness	Long-Term Effectiveness and Permanence	Reduction in TMV	Implement-ability	Compliance With ARARs	Protection of Human Health and the Environment	Cost (rounded)
Alternative 1 No Action	5	1	1	1	1	1	Minimal
Alternative 2 Limited Action/ Institutional Controls	5	3	1	3	3	3	$305,000
Alternative 4A Excavation, Off-Site Treatment and/or Disposal	4	5	1 to 5[a]	4	4	5	$12,300,000
Alternative 4B Excavation, Disposal at another OU	3	4	2	5	4	4	$6,790,000
Alternative 5A Excavation, Thermal Treatment at Another OU, Disposal	3	5	5	4	4	5	$24,400,000
Alternative 5B-1 Excavation, Solvent Extraction at Another OU, Disposal	3	5	5	4	4	5	$23,400,000
Alternative 5B-2 Excavation, Chemical Dechlorination at Another OU, Disposal	3	5	5	3[b]	4	5	$36,200,000

[a] Depending on the ultimate disposal method.

[b] This alternative has not been previously implemented for the large volume of soil estimated to require treatment for this project.

5.3.2 Long-Term Effectiveness and Permanence

Since no remedial activities would be implemented under Alternative 1, no additional risk would be posed by the no-action alternative. Alternatives 4A, 4B, 5A, 5B-1, and 5B-2 provide the highest degrees of long-term effectiveness and permanence because under these alternatives, soil exceeding cleanup goals up to a maximum depth of 10 feet bgs is removed from the Allendale School property. However, under Alternative 4B, the soil would be transported to another OU for disposal. Potential risks would be minimized by construction of an engineered barrier over the soil at the disposal locations. Alternatives 5A, 5B-1, and 5B-2 provide reduction or destruction of contaminants. Alternative 4A may also provide reduction or destruction of contaminants if off-site treatment is used. In Alternative 5B-2, the contaminants would be destroyed through on-site dechlorination. No hazardous or TSCA-regulated treatment residuals would be generated through treatment under this alternative. In Alternatives 5A and 5B-1, ultimate destruction of the contaminants would occur at an off-site facility. Alternative 2 would provide long-term effectiveness if the deed restrictions associated with this alternative are enforced. Because the effectiveness of this alternative is dependent on deed restrictions, this alternative would be less reliable than Alternatives 4A, 4B, 5A, 5B-1, and 5B-2.

5.3.3 Reduction of TMV

Alternatives 1 and 2 do not provide for reduction in TMV, other than that achieved through natural attenuation processes. Under Alternative 4A, the excavated material would be transported to an off-site facility. A significant reduction in TMV would be achieved only if the excavated material is treated at an off-site thermal desorption or incineration facility. The mobility of the contaminants would be decreased by the landfill caps at the disposal locations under Alternative 4B, however no additional significant reduction in TMV would occur.

Alternatives 5A, 5B-1, and 5B-2 provide the greatest potential for reduction in TMV. Under these alternatives, the volume of contaminants would be reduced through treatment. For Alternatives 5A and 5B-1, the TMV of contaminants would be further reduced following destruction of the concentrated wastes at an off-site TSCA incineration facility. In Alternative 5B-2, the contaminants would be destroyed during the chemical dechlorination process.

5.3.4 Implementability

Alternative 1 would be the most readily implementable alternative from a construction standpoint because no activities are involved, but would be the least implementable from an administrative standpoint because regulatory agencies are unlikely to approve of this alternative. The remedial component of Alternative 2 would also be easily implemented. However, the deed restrictions associated with this alternative may be difficult to enforce and may not be acceptable to the community.

The most difficult implementability factor associated with Alternatives 4A, 4B, 5A, 5B-1, and 5B-2 would be completing the excavation of soil exceeding cleanup goals without disrupting the normal school schedule and activities. Excavation of the soil during one school summer vacation would require long work hours and extensive coordination and scheduling. It may also require relocation of the school children for several weeks or delaying the start of school. The grassed areas would also not be suitable for play until the grass is restored. Additional implementability issues would be associated with implementation of the treatment systems under Alternatives 5A, 5B-1, and 5B-2. In general, the treatment systems selected are demonstrated processes that are anticipated to be effective for treatment of the Allendale School soil. However, chemical dechlorination (Alternative 5B-2) may be slightly more difficult to implement than the other treatment alternatives as it has not yet been implemented at this scale.

5.3.5 Compliance With ARARs

Each alternative was evaluated for compliance with chemical-, location-, and action-specific ARARs. The results of the evaluation are presented in Appendix B. Alternatives 1 and 2 would not comply with several chemical-specific ARARs and TBCs, including MCP Method 1 S-1 soil standards. Alternatives 4A, 4B, 5A, 5B-1, and 5B-2 would comply with ARARs; however, these alternatives also would not comply with the TBC MCP Method 1 standards below a depth of 10 feet. Based on EPA guidance, excavation of soil to a maximum depth of 10 feet is assumed. However, MCP Method 1 soil standards apply to a depth of 15 feet. Therefore, soil may remain in excess of MCP standards in the 10- to 15-foot depth range. Based on an evaluation of existing data, MCP Method 1 soil standards are exceeded in three locations at this depth interval. MCP requirements would not be met unless a risk assessment was performed that indicated a condition of no significant risk and an AUL was placed on the property.

5.3.6 Overall Protection of Human Health and the Environment

Because the Revised Draft Human Health Risk Assessment for Allendale School (03-0058) has indicated that current risks are within acceptable limits, all alternatives would be protective of human health in the short term. However, unacceptable future risks to human receptors are possible, based on a future residential use scenario. In addition, excavation of subsurface soils in the fill area (e.g., for expansion of the school building) would also present an unacceptable risk if excavated soils are not managed properly.

Alternative 1 would not provide adequate protection for future human receptors for all foreseeable future uses. In addition, the protection currently provided by the permeable cap would likely be reduced over time as the cap erodes. As mentioned previously, Alternative 2 is protective of future human health only if the deed restrictions are implemented and enforced. Even if the restrictions preventing future residential use are implemented, there would be no guarantee that school and residential children would not contact subsurface soil (i.e., during unsupervised play).

Alternatives 4A, 4B, 5A, 5B-1, and 5B-2 would provide the greatest protection to human health, as soil exceeding cleanup goals to a maximum depth of 10 feet bgs would be completely and permanently removed from the Allendale School property to the extent possible. In Alternative 4A, the soil would be transported off the GE Housatonic River site following excavation. In the treatment alternatives and Alternative 4B, the soil would remain on the GE Housatonic River site until treatment activities could be initiated or containment facilities constructed; however, the potential risks to human receptors would be effectively reduced in the long-term.

5.3.7 Cost

Costs were not developed for Alternative 1; however, potential costs for this alternative include fines for noncompliance with ARARs and the potential costs for future remedial actions, if deemed necessary. Costs for Alternative 2 are significantly lower than for the excavation and treatment alternatives, however, this alternative limits the future use of the property. Costs for the excavation and disposal alternatives (Alternative 4A and 4B) are significantly lower than the costs for the excavation and treatment alternatives. Costs for the treatment alternatives include on-site reuse of treated soil at another OU. The costs would likely be higher if on-site reuse or disposal of treated soil is not possible and the soil is reused as daily cover material at an off-site landfill. Costs for the treatment alternatives could be reduced if the soil from OU 3 were combined with soil/sediment from other OUs due to economy of scale factors. Costs for treatment Alternatives 5A and 5B-1 are similar, while costs for Alternative 5B-2 are higher.

SECTION 6

REFERENCES

6. REFERENCES

(03-0007) Blasland & Bouck Engineers, January 1993. P.C., *MCP Interim Phase II Report for the Allendale School* Property.

(03-0015) Blasland, Bouck, & Lee, Inc., November 1996. *MCP Supplemental Phase II Scope of Work for the Allendale School Property*.

(03-0023) Blasland, Bouck, & Lee, Inc., August 1997. *MCP Supplemental Phase II Report for the Allendale School Property*.

(03-0040) Blasland, Bouck, & Lee, Inc., June 1998. *Addendum to the MCP Supplemental Phase II Report for the Allendale School Property. Volumes I, II, III*.

(03-0058) WESTON (Roy F. Weston, Inc.) November 1998. *Revised Draft Human Health Risk Assessment for Allendale School*

(00-0114) MADEP (Massachusetts Department of Environmental Protection), 31 October 1997. *The Massachusetts Contingency Plan (MCP), 310 CMR 40.000*.

(00-0274) WESTON (Roy F. Weston, Inc.), July 21, 1998. *Source Area Characterization Report.*

(99-0001) USEPA, (U.S. Environmental Protection Agency), October 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA.*

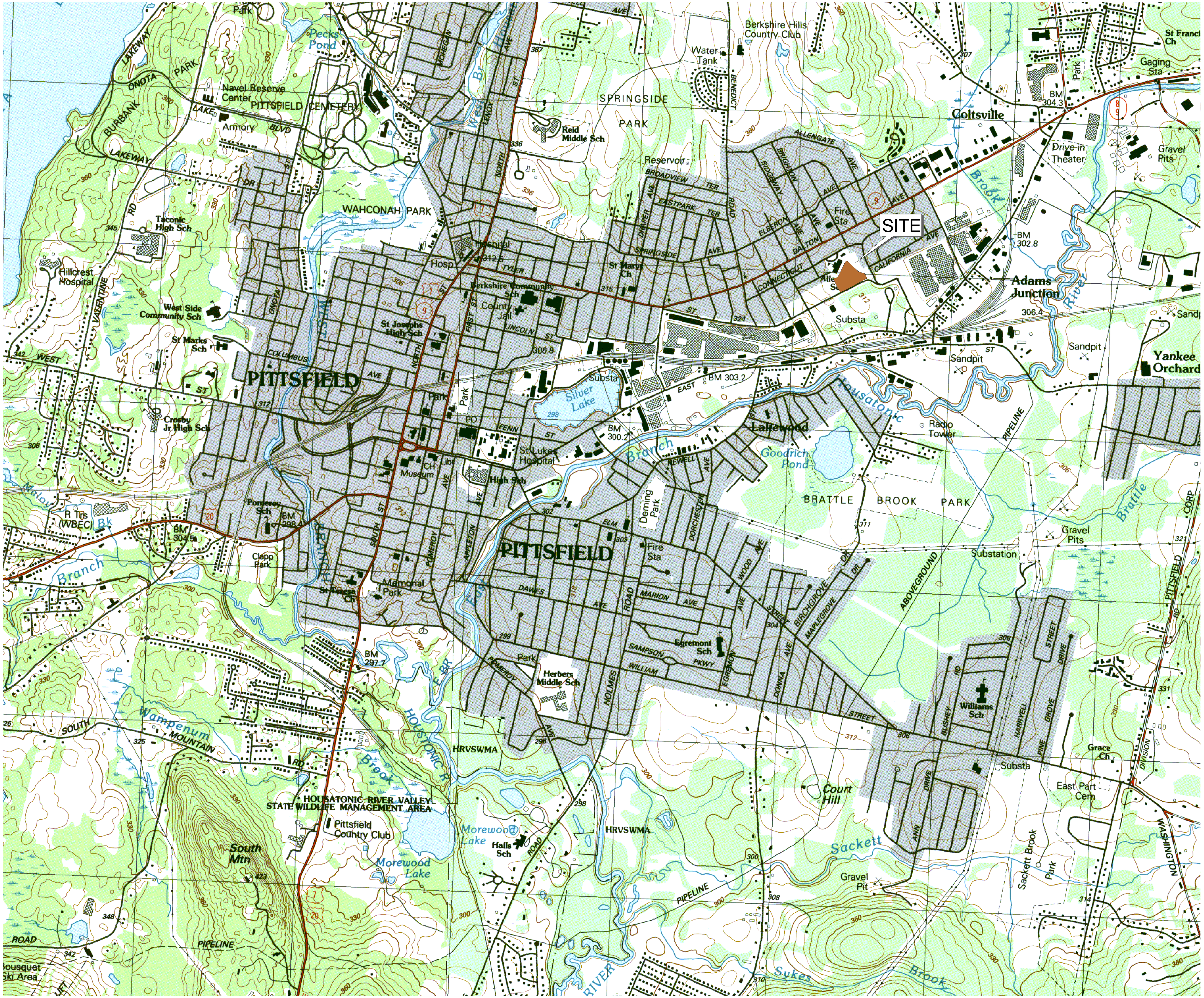
(99-0017) ATSDR (Agency for Toxic Substances and Disease Registry), 1995. *Toxicology Profile for Polychlorinated Biphenyl.* Draft Publication for Comment (Update). U.S. Department of Health and Human Services, Public Health Service. Prepared by Research Triangle Institute, Contract No. 205-93-0606.

(99-0102) USEPA, April 13, 1998. Office of Solid Waste *and Emergency Response. Approach for Addressing Dioxin in Soil at CERCLA and RCRA Sites, OSWER Directive 9200.4-26.*

(99-0103) Dragun, J. and A. Chiasson, 1991. *Elements in North American Soil. Hazardous Materials Control Resources Institute.* Greenbelt, MD.

(99-0121) MADEP, 1995. *Guidance for Disposal Site Risk Characterization, #WSC/ORS-95-141*

FIGURES



Map produced by WESTON, adapted from MassGIS Scanned USGS Quads

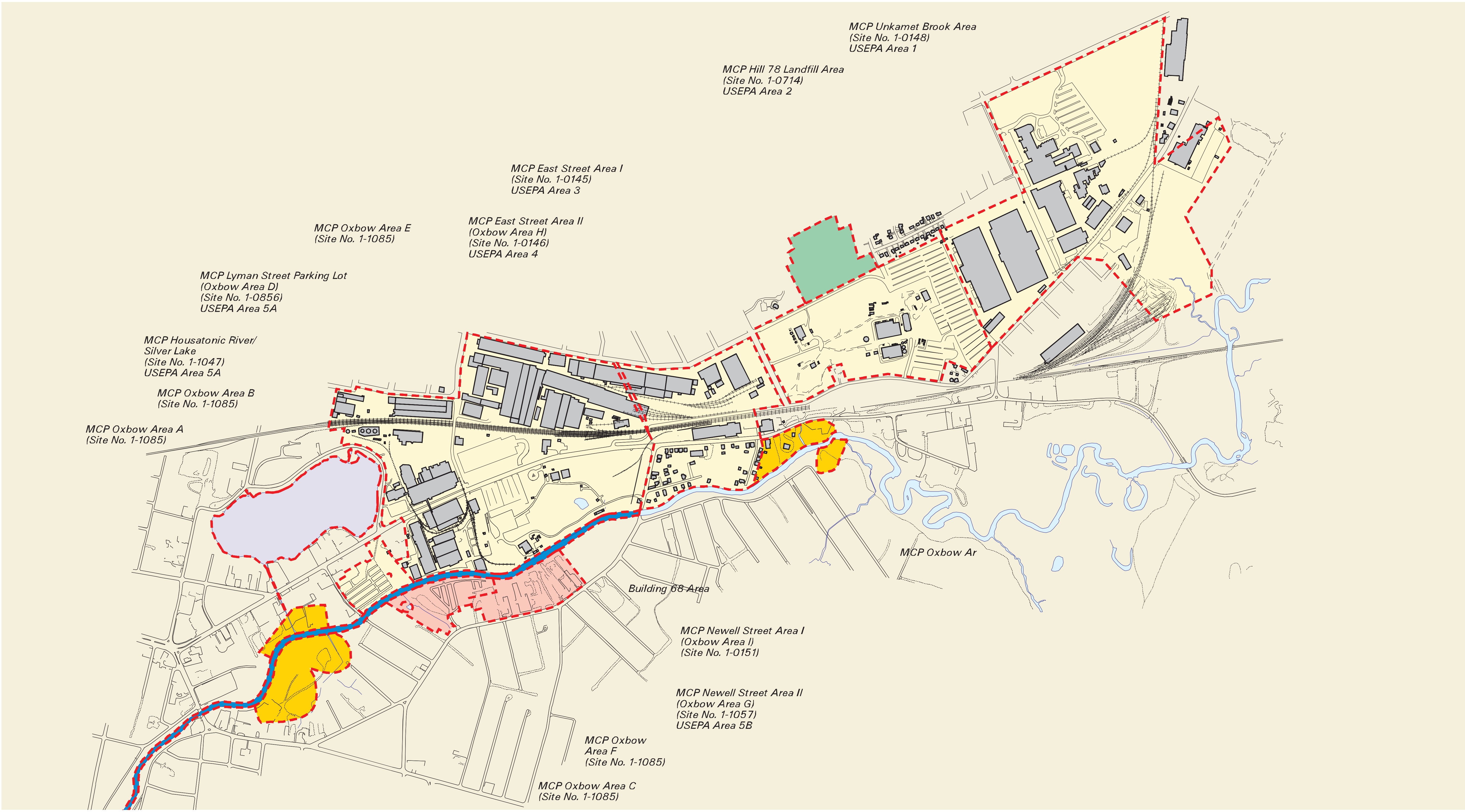
N
W E
S

Scale in Feet

1000 0 1000 2000 3000 4000 5000

Revised Draft Feasibility Study, Allendale School
General Electric (GE)/Housatonic River Site
Pittsfield, Massachusetts

FIGURE 1- 1
LOCATION MAP



LEGEND

O.U. #1 - GE Facility

O.U. #2 - Housatonic River

O.U. #3 - Allendale School

O.U. #4 - Silver Lake

O.U. #5 - Newell Street

O.U. #6 - Oxbows A, B, C, J, and K

N

Scale in Feet

500 0 500 1000 1500 2000

Map produced by WESTON, adapted from Geographic Information System (GIS) database provided by TechLaw Inc.

Revised Draft Feasibility Study, Allendale School
General Electric (GE)/Housatonic River Project
Pittsfield, Massachusetts

FIGURE 1-2
AREA MAP

/proj2/gepitt/amls/asarea.aml ..17 Mar 99 13:02:53 Wednesday

Map produced by WESTON, adapted from Geographic Information System (GIS) database provided by TechLaw Inc.

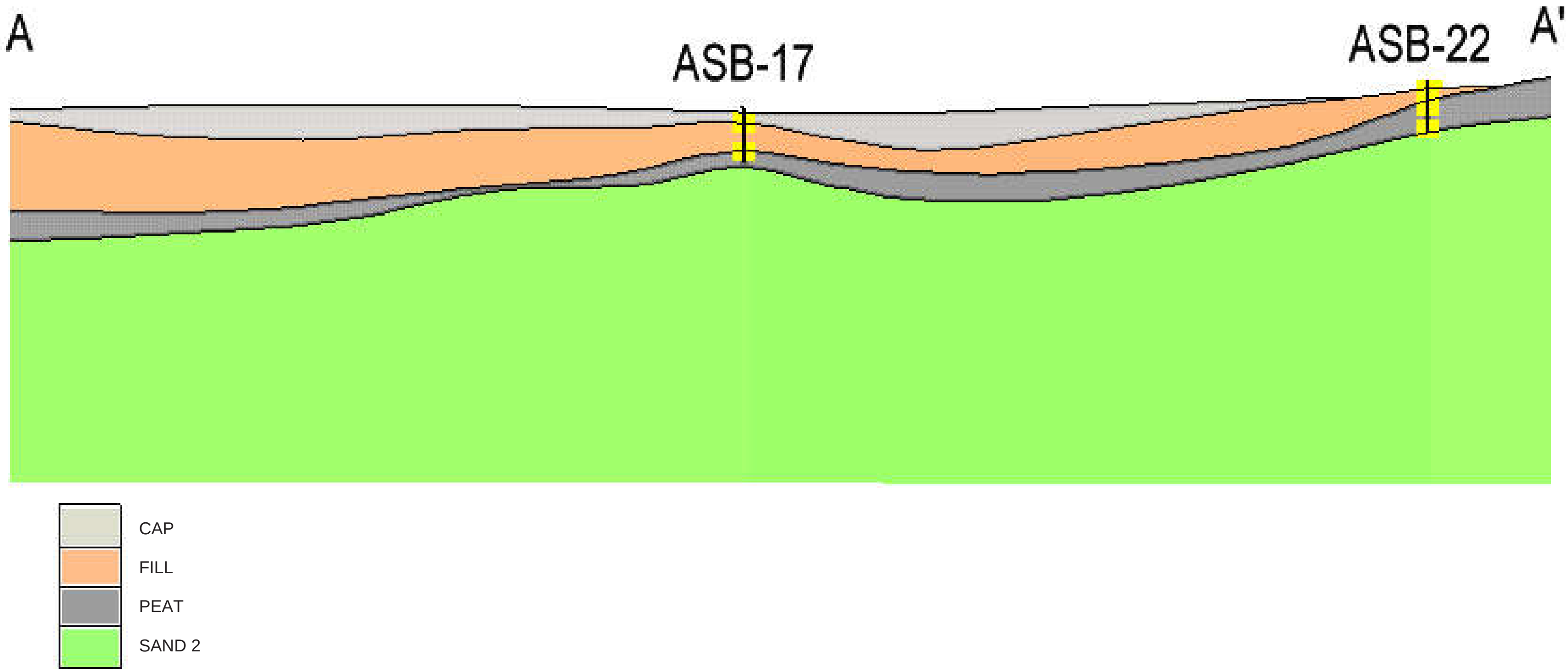
Revised Draft Feasibility Study, Allendale School
General Electric (GE)/Housatonic River Project
Pittsfield, Massachusetts

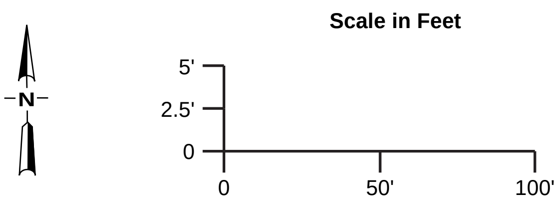
FIGURE 1-3
SITE PLAN

| I:/gepitt/aprs/allen103.apr | Fig 1-3 | I:/gepitt/plots/allen103.eps | 12/3/1998 |

Figure 1-4 Summary of PCB Concentrations in Soil

This figure is an oversized plate and is contained in a pocket at the end of the hardcopy of this document.

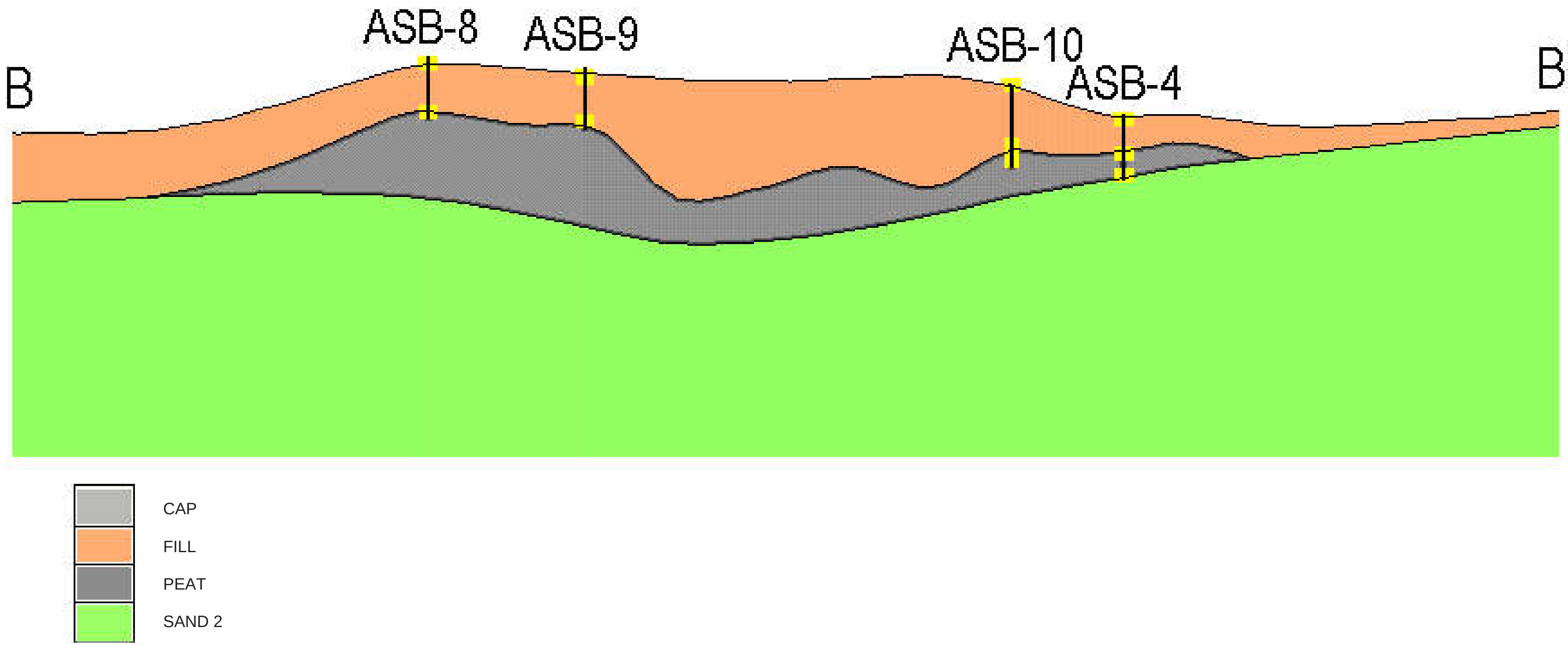


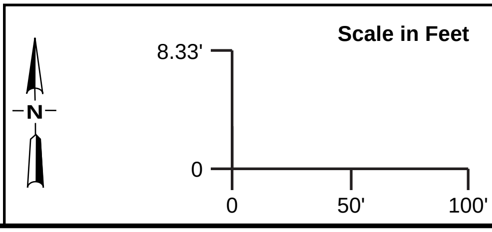


Revised Draft Feasibility Study, Allendale School
General Electric (GE)/Housatonic River Project
Pittsfield, Massachusetts

FIGURE 1-5
CROSS SECTION A-A'

98P-2469-3

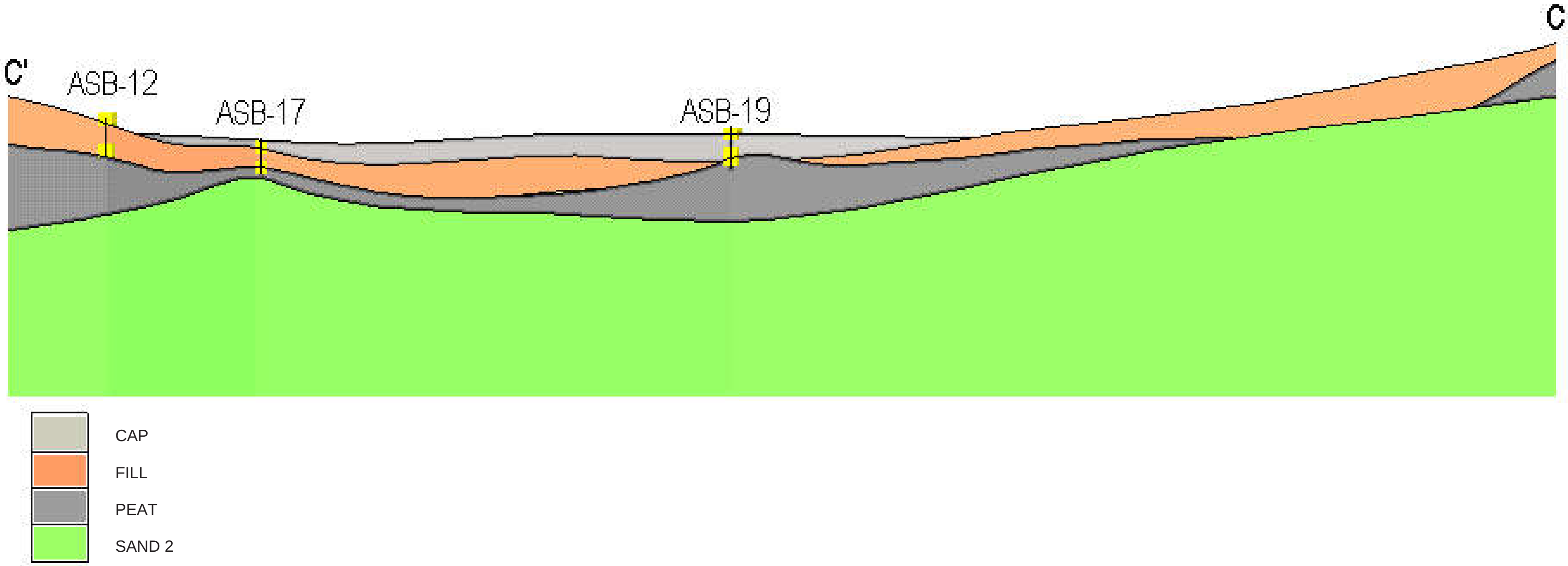


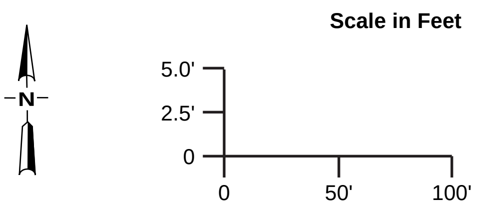


Revised Draft Feasibility Study, Allendale School
General Electric (GE)/Housatonic River Project
Pittsfield, Massachusetts

FIGURE 1-6
CROSS SECTION B-B'

98P-2469-4

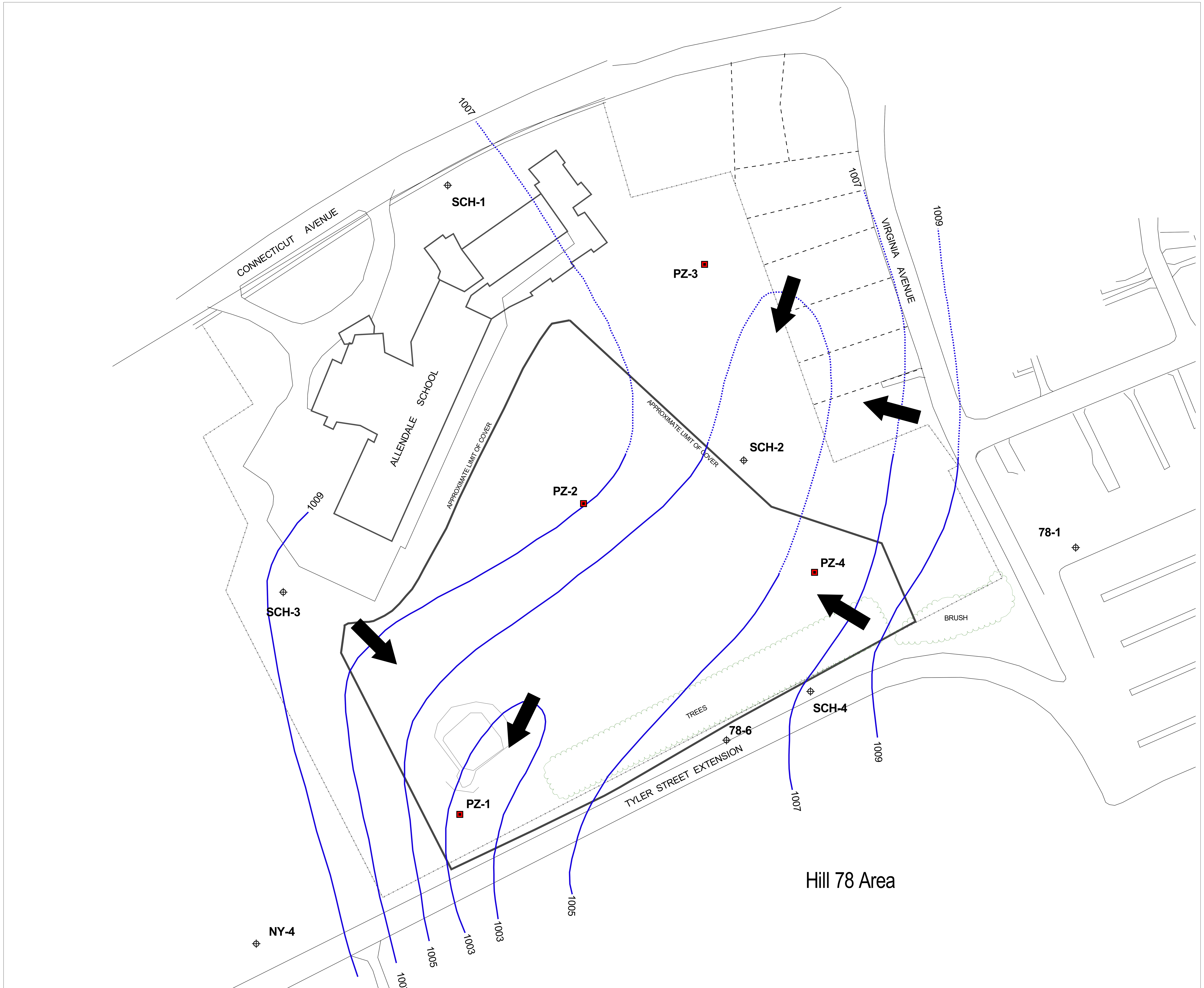




Revised Draft Feasibility Study, Allendale School
General Electric (GE)/Housatonic River Project
Pittsfield, Massachusetts

FIGURE 1-7
CROSS SECTION C-C'

98P-2469-5



WESTON
MANAGERS DESIGNERS/CONSULTANTS

Monitoring Well Locations

Piezometer Locations

Trees and Brush

Chain Link Fence

Water Table Elevation Contours (dashed where inferred)

Ground-water Flow Direction

Water Elevation Contour Map from *Addendum to the Supplemental Phase II Report for the Allendale School Property,* Blasland, Bouck & Lee, Inc., June 1998.

Map produced by WESTON, adapted from Geographic Information System (GIS) database provided by TechLaw Inc.

N
W E
S

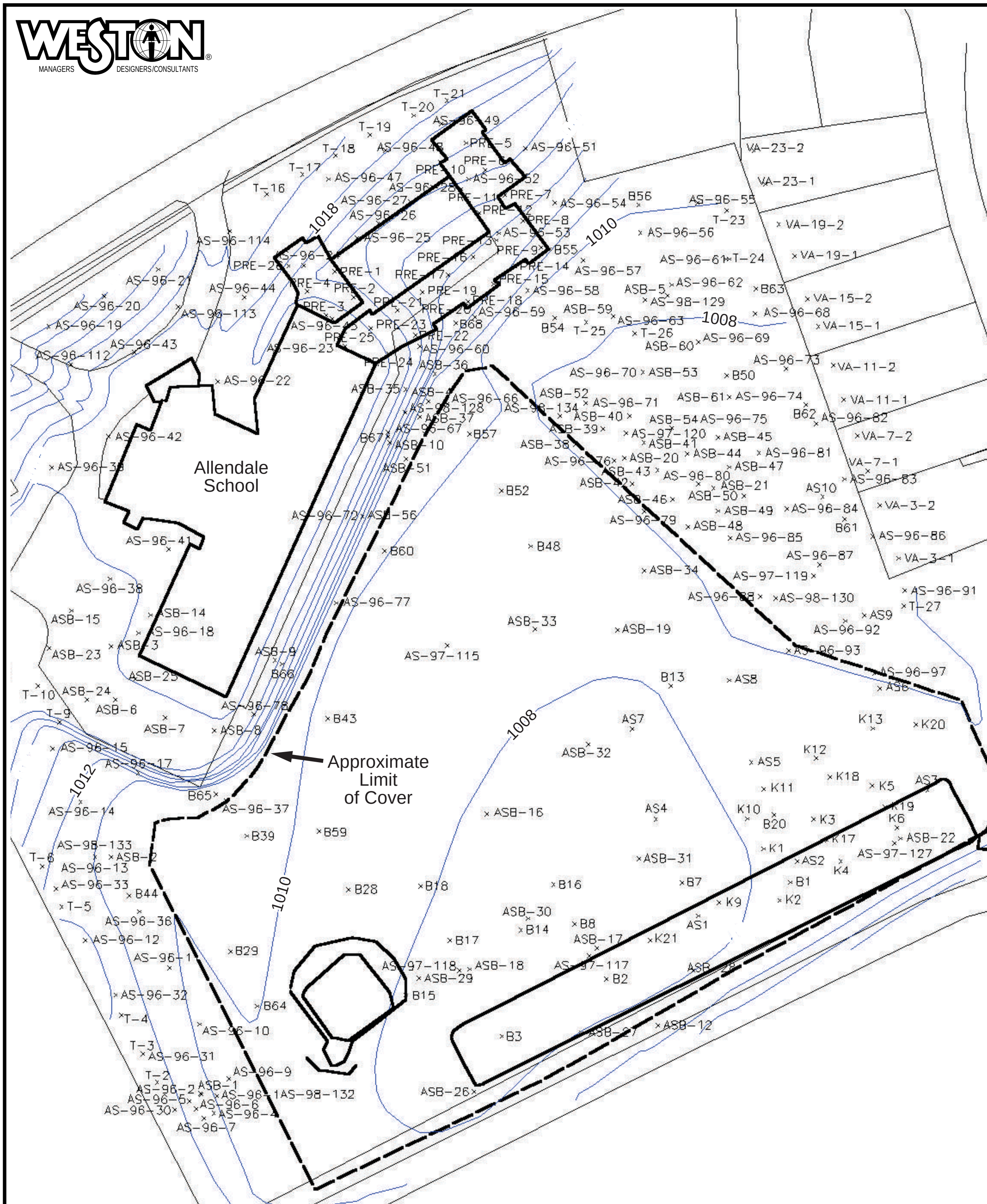
Scale in Feet

120 0 120 240

Revised Draft Feasibility Study, Allendale School
General Electric (GE)/Housatonic River Project
Pittsfield, Massachusetts

FIGURE 1-8
WATER TABLE ELEVATION CONTOUR MAP

WESTON
MANAGERS DESIGNERS/CONSULTANTS



Soil Sampling Points With Samples Collected Less Than 3 Feet from the Surface

N

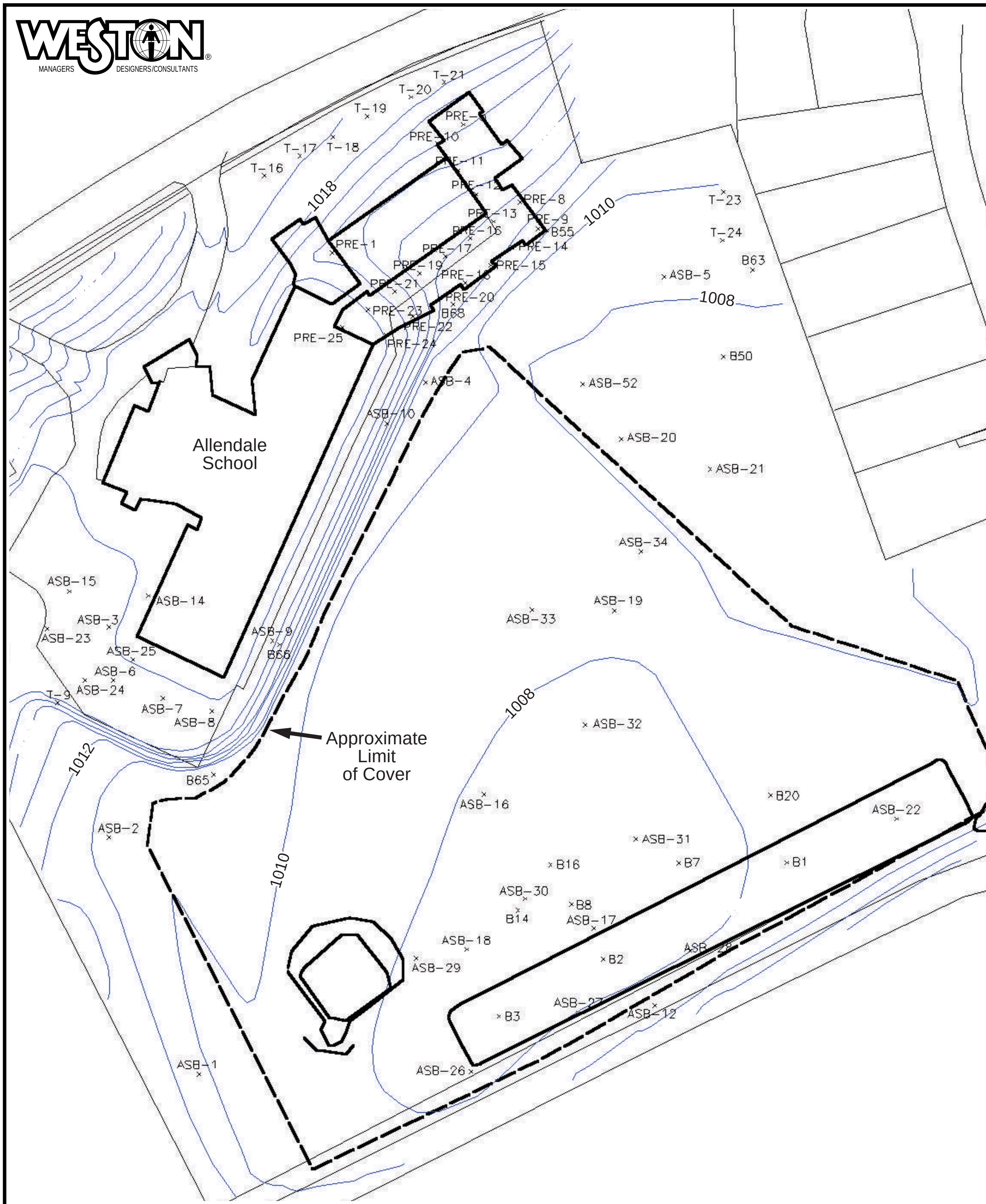
Scale in Feet

0 75 150

Revised Draft Feasibility Study, Allendale School
General Electric (GE)/Housatonic River Project
Pittsfield, Massachusetts

FIGURE 1-9
SURFICIAL SOIL SAMPLE LOCATIONS

98P-2469-1



Soil Sampling Points With Samples Collected Greater Than 3 Feet from the Surface

N

Scale in Feet

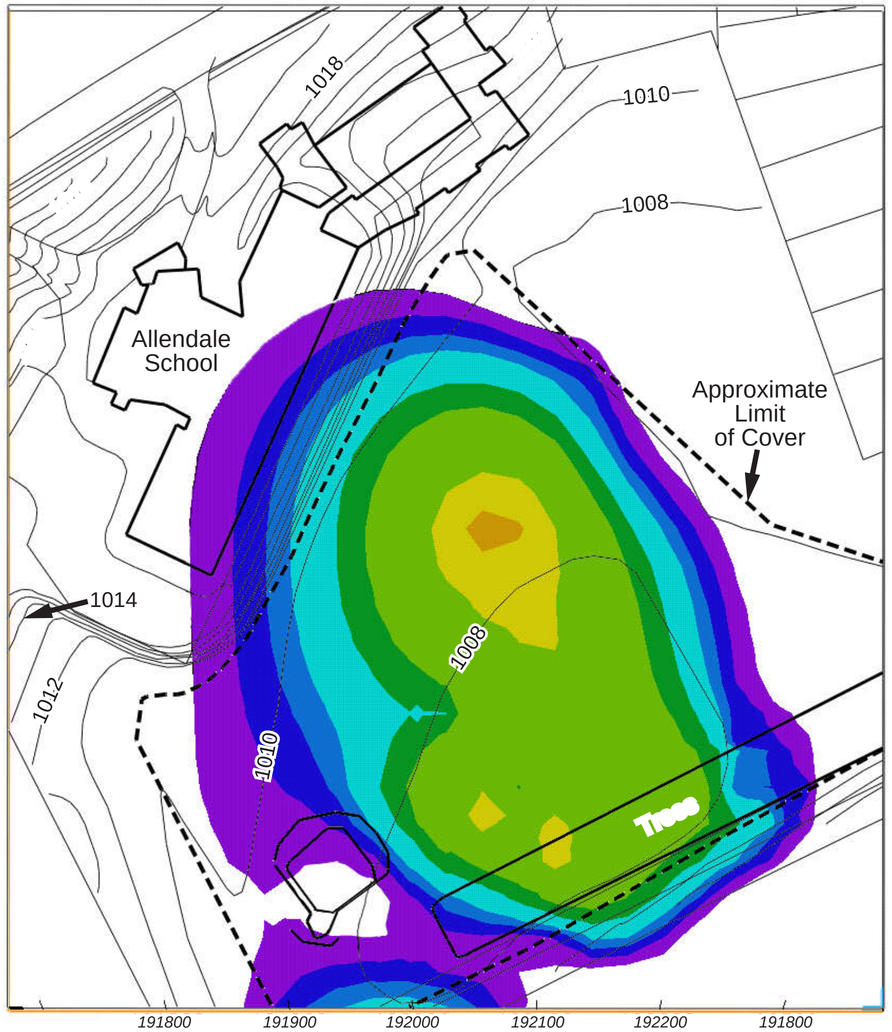
0 75 150

Revised Draft Feasibility Study, Allendale School
General Electric (GE)/Housatonic River Project
Pittsfield, Massachusetts

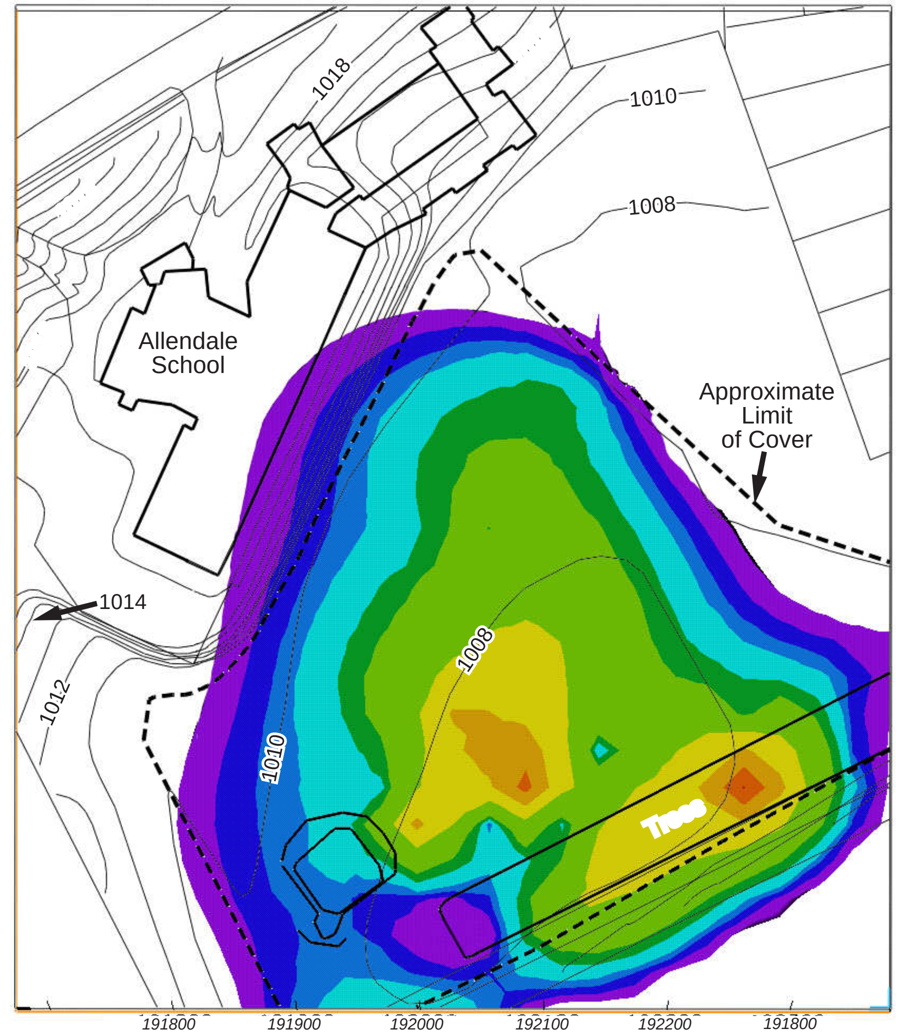
FIGURE 1-10
SUBSURFACE SOIL SAMPLE LOCATIONS

98P-2469-2

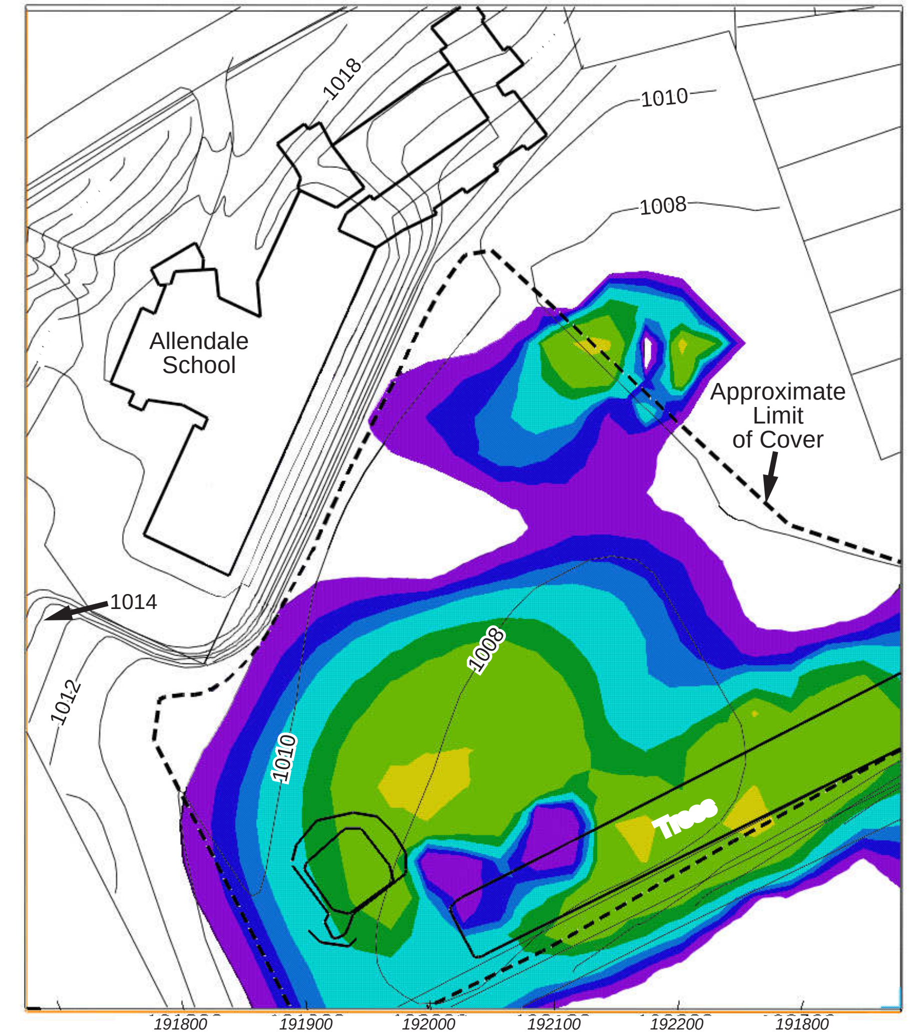
PCB Contaminated Soils above 2 mg/kg



at Elevation 1002 Feet



at Elevation 1004 Feet



at Elevation 1006 Feet

PCBs in mg/kg

- >50
- 40 - 50
- 30 - 40
- 20 - 30
- 10 - 20
- 7.5 - 10
- 5 - 7.5
- 4 - 5
- 3 - 4
- 2 - 3

Legend

Surface Contours

N

Scale in Feet

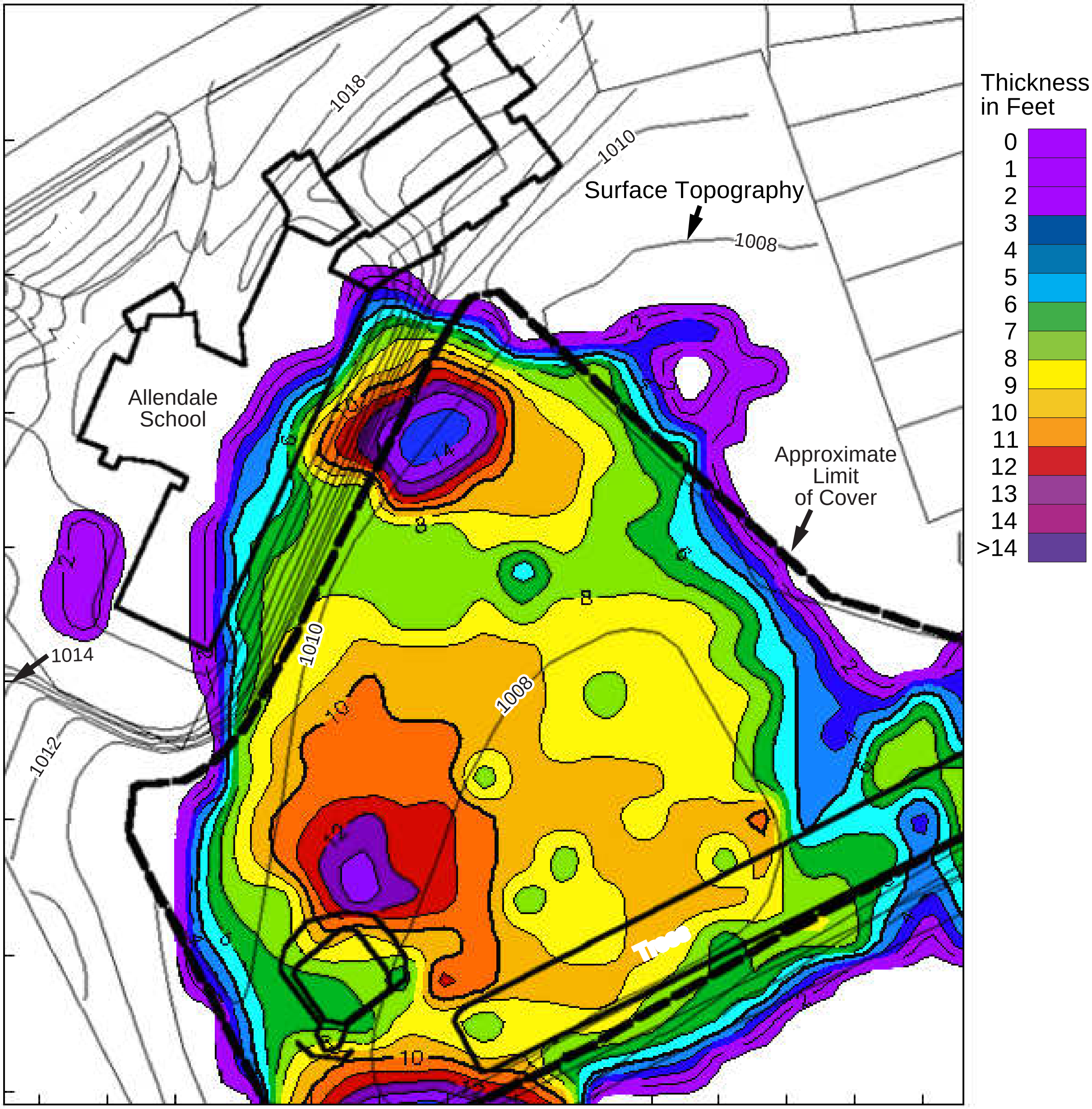
0 75' 150' 225'

Revised Draft Feasibility Study, Allendale School
General Electric (GE)/Housatonic River Project
Pittsfield, Massachusetts

FIGURE 1-11
HORIZONTAL DISTRIBUTION OF PCB CONCENTRATIONS IN SOIL

98P-2469-6

WESTON
MANAGERS DESIGNERS/CONSULTANTS



8 Isopach Showing Thickness (in feet) of Soil Containing >2 mg/kg PCB

N

Revised Draft Feasibility Study, Allendale School
General Electric (GE)/Housatonic River Project
Pittsfield, Massachusetts

FIGURE 1-12
ESTIMATED THICKNESS OF SOIL ZONE CONTAINING MORE THAN 2 mg/kg PCBs

Trees and Brush

Chain Link Fence

Depth of April 1998 Excavation:

0.5 '

1'

3'

3.5+ Maximum depth below existing ground surface of soil sample with a total PCB concentration greater than 2 mg/kg
Note: Only soil sample locations with PCB concentrations greater than 2 mg/kg are shown.

Surficial Soil Sample Location (Total Sampling Depth < 3.0')

Surficial Sample Locations Where the Deepest Soil Sample Exceeds 2 mg/kg

Subsurface Soil Sample Location (Total Sampling Depth >= 3.0')

Subsurface Sample Locations Where the Deepest Soil Sample Exceeds 2 mg/kg

Map produced by WESTON, adapted from Geographic Information System (GIS) database provided by TechLaw Inc.

N W E S

Scale in Feet

120 0 120 240

Revised Draft Feasibility Study, Allendale School
General Electric (GE)/Housatonic River Project
Pittsfield, Massachusetts

FIGURE 1-13
SAMPLE LOCATIONS WHERE DEPTH OF CONTAMINATION NOT DEFINED

| proj3/gepitt/aprs/allen113.apr | Fig 1-13 | proj3/gepitt/plots/allen113.eps | 11/24/1998 |

Trees and Brush

Chain Link Fence

Depth of April 1998 Excavation:

0.5 '

1'

3'

Highest PCB Concentration of All Samples Collected at Boring Location:

Surficial Soil Sample Location (Total Sampling Depth <= 3')
- Less than 2.0 ppm
- 2.0 to less than 50.0 ppm
- Greater than or equal to 50 ppm

Subsurface Soil Sample Location (Total Sampling Depth > 3')
- Less than 2.0 ppm
- 2.0 to less than 50.0 ppm
- Greater than or equal to 50 ppm

Note: only sample locations with samples analyzed for SVOC, pesticides, and metals are shown.

COCs

Th	Thallium
B(a)A	Benzo(a)anthracene
B(a)P	Benzo(a)pyrene
B(b)F	Benzo(b)fluoranthene
D(a,h)A	Dibenz(a,h)anthracene
Diel	Dieldrin

Map produced by WESTON, adapted from Geographic Information System (GIS) database provided by TechLaw Inc.

N
W E
S

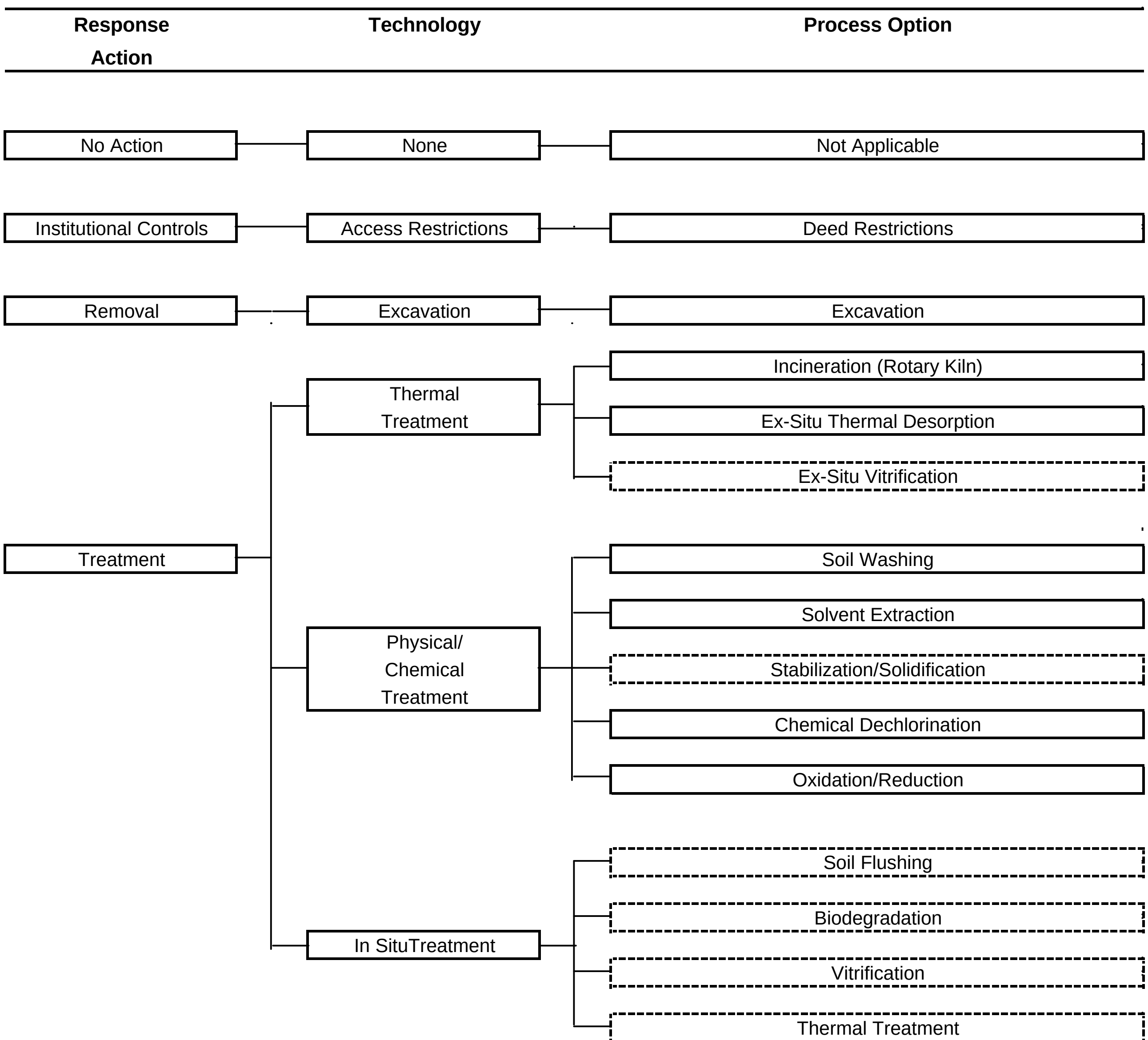
Scale in Feet

120 0 120 240

Revised Draft Feasibility Study, Allendale School
General Electric (GE)/Housatonic River Project
Pittsfield, Massachusetts

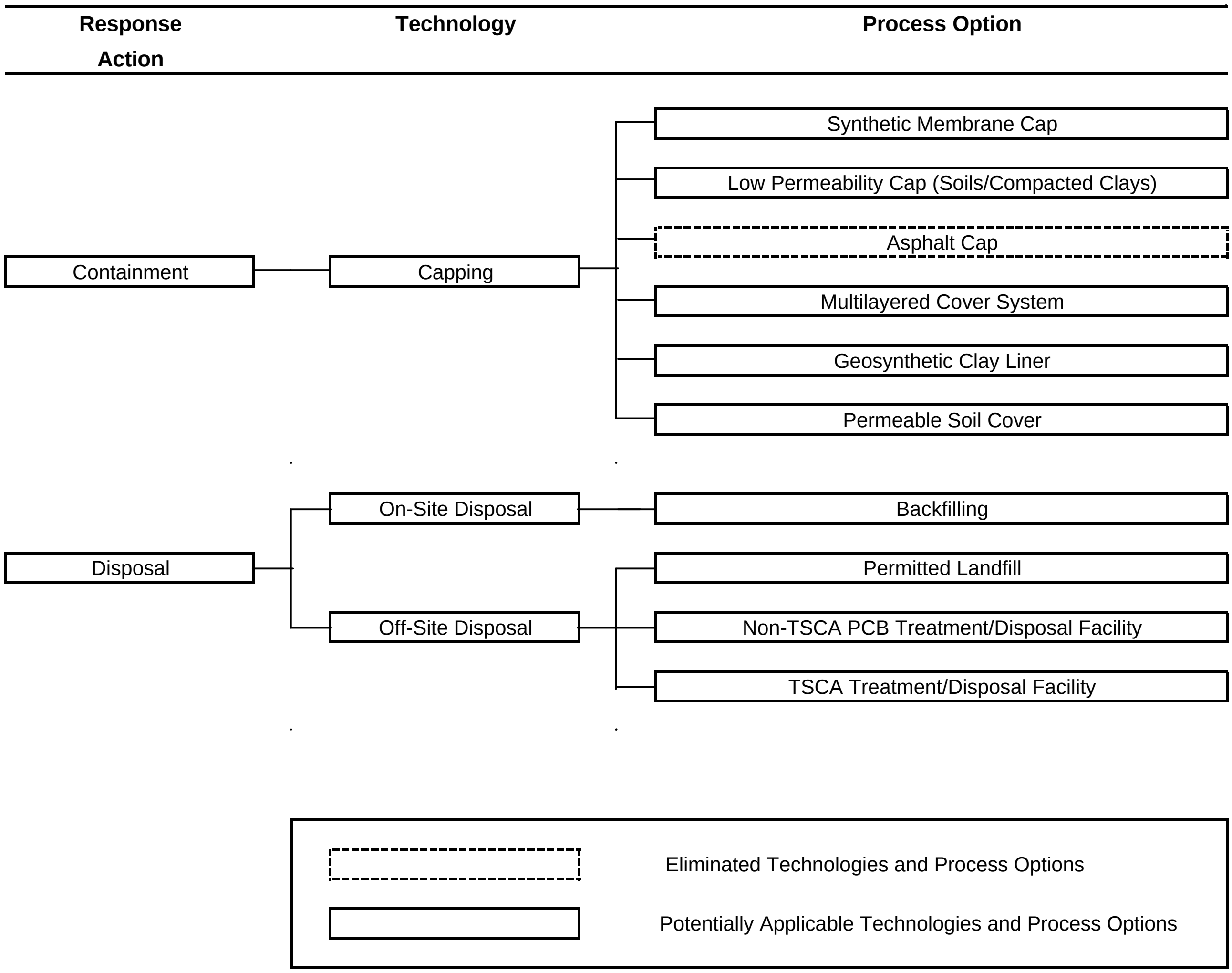
FIGURE 1-14
LOCATIONS OF NON-PCB COCs EXCEEDING SOIL PRELIMINARY REMEDIATION GOALS

Figure 3-1 Screening Matrix of Process Options

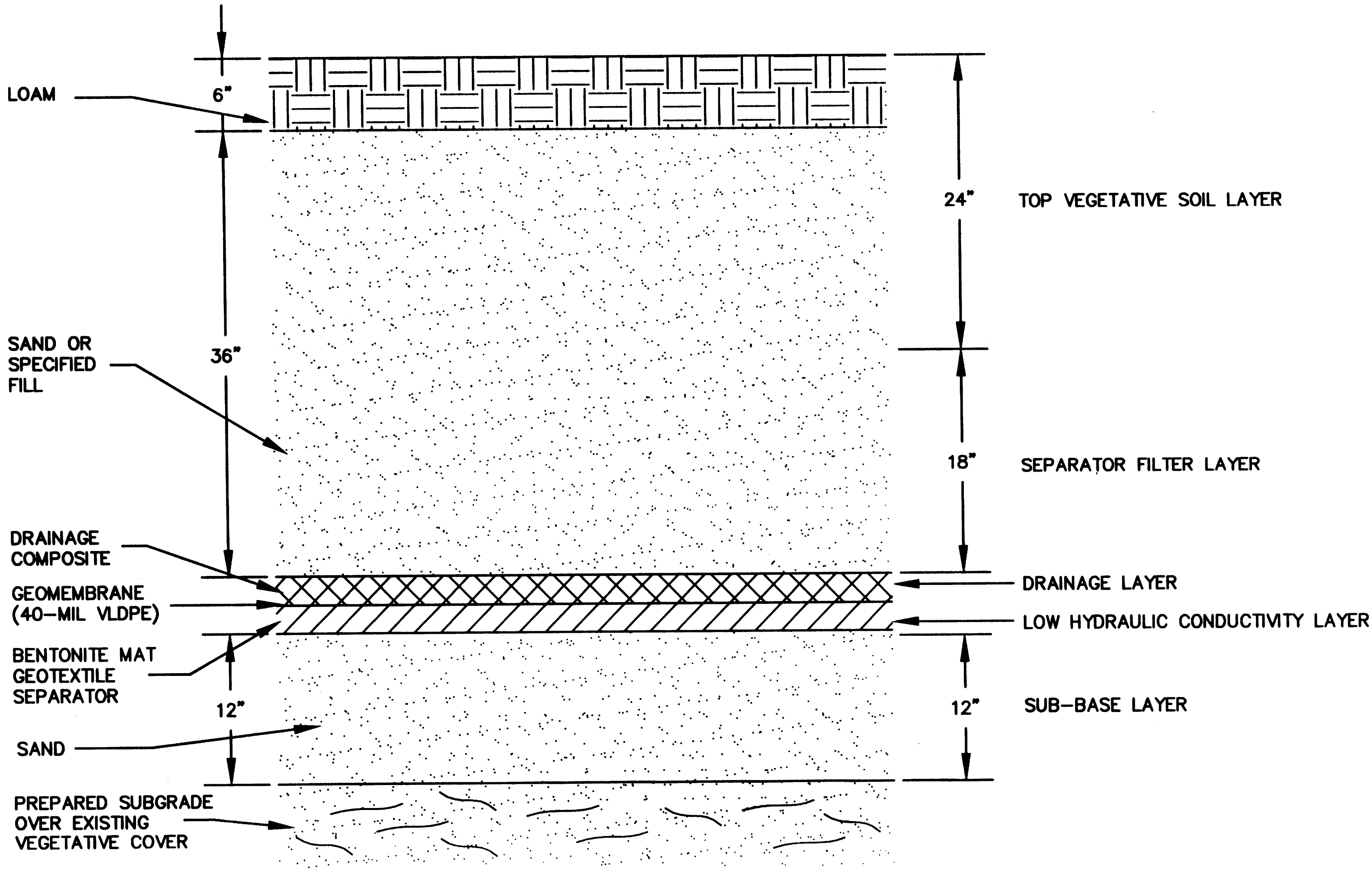


(Continued on next page)

Figure 3-1 Screening Matrix of Process Options



G;\PROJECTS\10971032\003\REV_FS\FIG5-1.DWG (PLOT 1=1)



ALTERNATIVE 4B EXCAVATION AND DISPOSAL AT ANOTHER OU

DETAIL OF TYPICAL RCRA FINAL COVER
Feasibility Study, Allendale School
General Electric/Housatonic River Site
Pittsfield, Massachusetts

ROY F. WESTON, INC.
WESTON
MANAGERS DESIGNERS/CONSULTANTS

DRAWN	DATE	DES. ENG.	DATE	W. O. NO
CDT	NOV.98			10971-
CHECKED		APPROVED		DWG. NO. 5

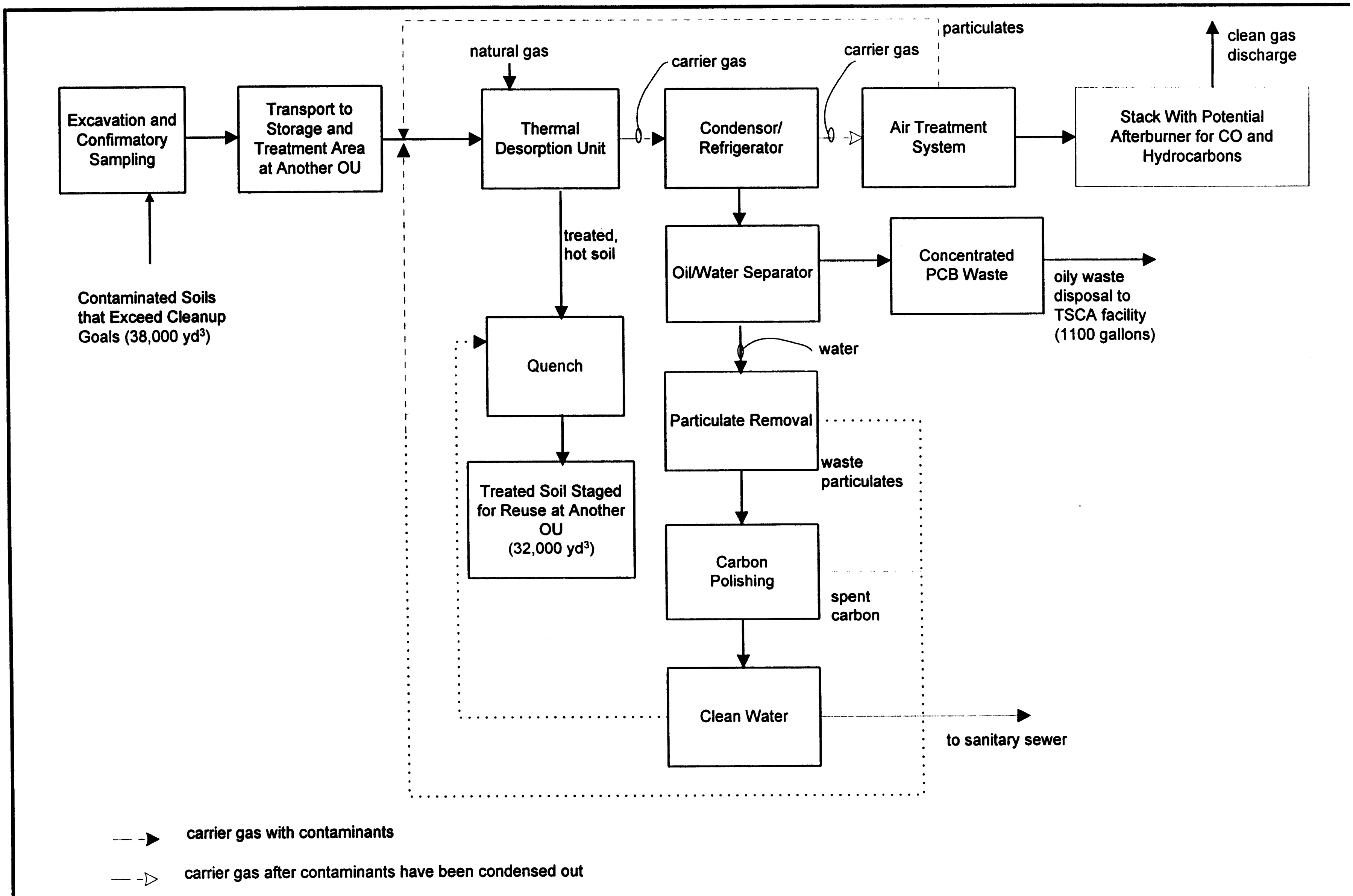


FIGURE 5-2
REMEDIAL PROCESS FLOW SHEET - ALTERNATIVE 5A-1 THERMAL DESORPTION
Final Feasibility Study, Allendale School
General Electric/Housatonic River Site
Pittsfield, Massachusetts

WESTON MANAGERS DESIGNERS/CONSULTANTS

DRAWN DPC	DATE 09 NOV 1998
DES. ENG. FRS	SCALE N/A
CHECKED	REVISION NO. 3
APPROVED	DWG. NO. 5-2

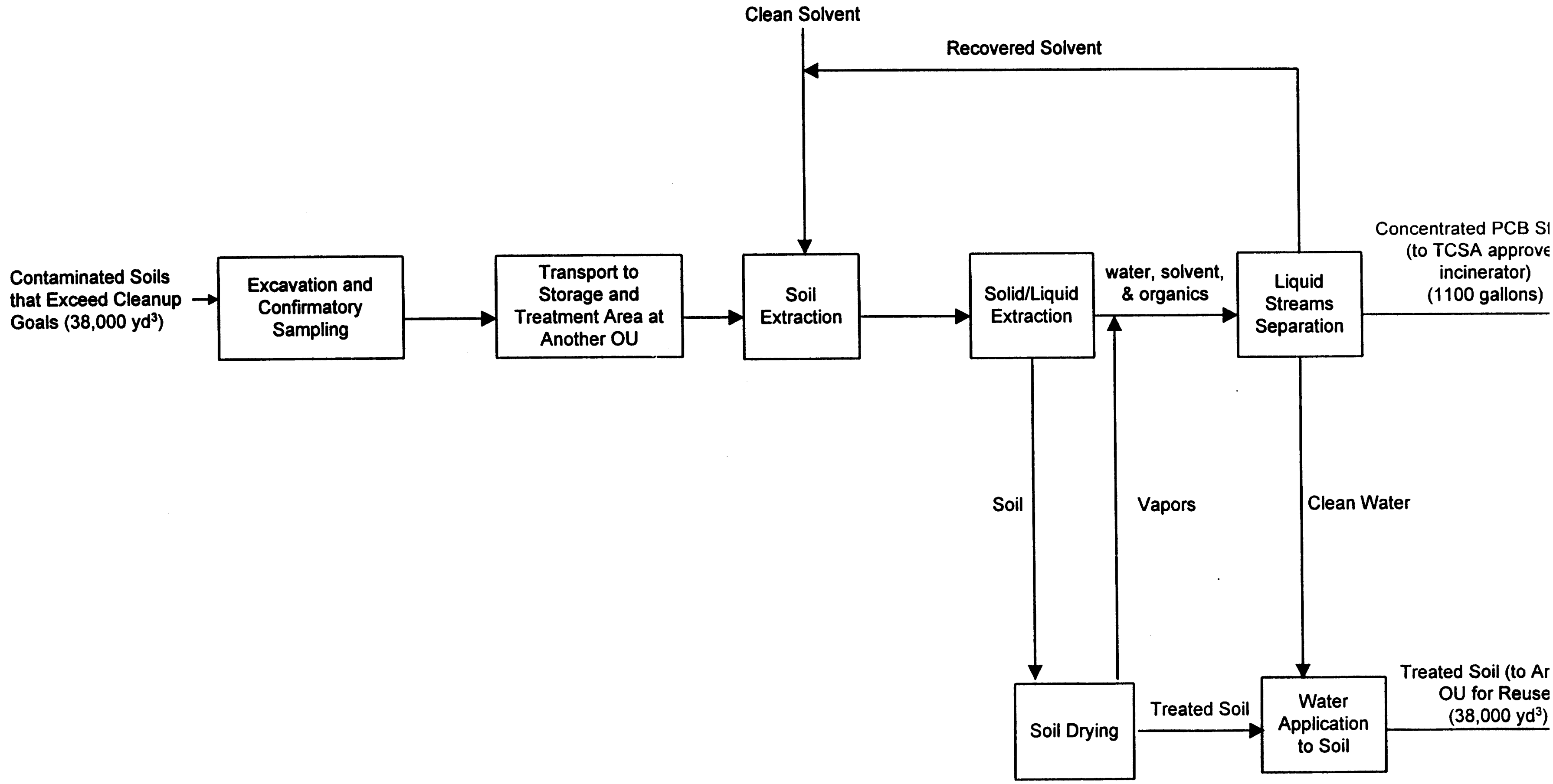


FIGURE 5-3
REMEDIAL PROCESS FLOW SHEET - ALTERNATIVE 5B-1 SOLVENT EXTRACTION
Final Feasibility Study, Allendale School
General Electric/Housatonic River Site
Pittsfield, Massachusetts

WESTON MANAGERS DESIGNERS/CONSULTANTS

DRAWN	DPC	DATE	09 NOV
DES. ENG.	CMS	SCALE	N/A
CHECKED	CMS	REVISION NO	3
APPROVED		DWG NO	5-3

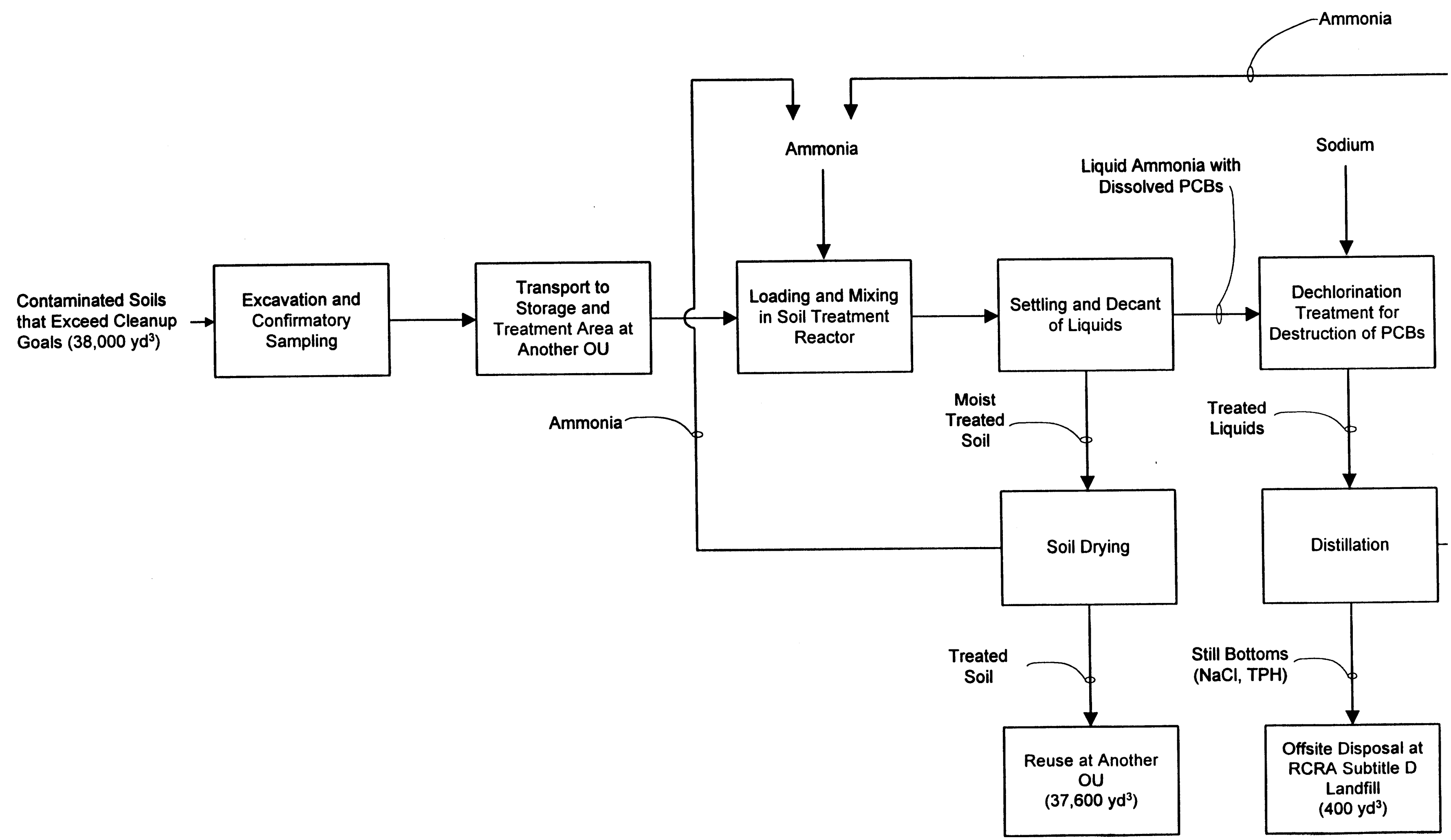


FIGURE 5-4
REMEDIAL PROCESS FLOW SHEET - ALTERNATIVE 5B-2 DECHLORINATION
Final Feasibility Study, Allendale School
General Electric/Housatonic River Site
Pittsfield, Massachusetts

WESTON® MANAGERS DESIGNERS/CONSULTANTS

DRAWN	DPC	DATE	09 NOV
DES. ENG.	FRS	SCALE	N/A
CHECKED	CMS	REVISION NO	2
APPROVED	BLN	DWG. NO.	5-4

APPENDIX A

WOODLOT ALTERNATIVES INC.
FUNCTIONAL VALUE ASSESSMENT AT ALLENDALE SCHOOL WETLAND AND MA DEP MEMORANDUM RE: ECOLOGICAL RISK ASSESSMENT FOR ALLENDALE SCHOOL

WOODLOT
ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS

November 3, 1998

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL | # of pages ▸

To [illegible]	From [illegible]
Dept./Agency [illegible]	Phone # 617- 918-133[illegible]
Fax # [illegible] 5401	Fax #

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Mr. Stephen Druschel
TechLaw Inc.
160 N. Washington Street
Suite 400
Boston, MA. 02114

Re: Work Assignment No. R01074
Subcontract No. G100-250
Function Value Assessment at Allendale School Wetland

Dear Mr. Druschel;

Enclosed please find one copy of the function value assessment for the wetland delineated by Woodlot at the Allendale School. This has been prepared following review by both USEPA and TechLaw Inc. As requested by USEPA the text is being provided at this time. A map locating the delineation will be prepared and provided to TechLaw Inc. within the next week.

Do not hesitate to contact me should you have any questions.

Sincerely,

WOODLOT ALTERNATIVES INC.

Michael Murphy

cc: C. Janowski (USEPA)
J Lortie

CONFIDENTIAL FOR
MEDIATION PURPOSES

WETLAND DELINEATION AND FUNCTION VALUE ASSESSMENT

ALLENDALE SCHOOL

Background

A wetland delineation and function-value assessment was conducted at a site identified by USEPA in proximity to the Allendale School on October 22, 1998. The wetland boundary was determined using the technical criteria of the U. S. Army Corps of Engineers (Corps). The wetland boundary was marked with numbered, pink flagging tied to vegetation, as were plot centers. Plot information was recorded in field data books and transcribed onto standard Corps data sheets (attached). Principal wetland functions and values at the site were determined using the Corp's *Highway Methodology for Wetland Function-Value Evaluations* manual (USACE 1995).

Site Description

The site consists of a small (approximately 125' x 125' square) emergent wetland dominated by common reed (*Phragmites australis*). Soils within the wetland are low chroma loamy sands with redoximurphic features (i.e., mottles) under a dark A horizon. Drainage is from the southeast corner, across the center of the wetland to the northwest corner. From there, drainage continues across a ballfield for approximately 50' to a city drainage grate. A few scattered shrubs and trees occur along the periphery of the wetland and include red-osier dogwood (*Cornus sericea*), weeping willow (*Salix babylonica*), silver maple (*Acer saccharinum*), and white pine (*Pinus strobus*). One small area within the wetland has been previously disturbed and contains bare soil, planted pussy willow (*Salix discolor*), and a variety of herbaceous wetland and upland plant species. Common reed has not yet invaded this portion of the wetland, which is approximately 40' by 40' square.

The entire wetland is surrounded by developed land. Roads abut the eastern and southern sides and mowed ballfields and a lawn abut the western and northern sides. Uphill of the wetland (at the southeast corner) is a large parking lot. In addition, areas to the north and east of the wetland consist of dense residential development and areas to the west and northwest consist of the school and associated playing fields.

Function Value Assessment

The results of the wetland function-value assessment are documented in the evaluation form (attached) and in the narrative found below. The following functions and values have been assessed:

- Groundwater Interchange (Recharge/Discharge)
- Floodflow Alteration (Storage and Desynchronization)
- Fish and Shellfish Habitat
- Sediment/Toxicant Retention
- Nutrient Removal/Retention/Transformation
- Production Export (Nutrient)
- Sediment /Shoreline Stabilization
- Wildlife Habitat
- Recreation
- Educational/Scientific Value
- Uniqueness/Heritage
- Visual Quality/Aesthetics
- Endangered Species Habitat

Groundwater Interchange (Recharge/Discharge)

This function considers the potential for the wetland to serve as a groundwater recharge and or discharge area. It refers to the fundamental interaction between wetlands and aquifers, regardless of the size or importance of either.

The wetland exhibits very little, if any, potential to store surface water and to contribute to any aquifer below it because it contains an outlet. Groundwater discharge at the wetland is possible because it occurs on a gradual slope and has steep banks along its uphill margins, where shallow groundwater may discharge.

Floodflow Alteration (Storage and Desynchronization)

This function considers the effectiveness of the wetland in reducing flood damage by attenuating floodwaters for prolonged periods following precipitation and snow melt events.

The wetland has little water storage capacity because of its small size, and is not associated with any watercourse. Therefore, it provides a very small amount of local floodflow alteration functions.

Fish and Shellfish Habitat

This function considers the effectiveness of seasonal or permanent water bodies associated with the wetlands in question for fish and shellfish habitat.

The wetland provides no fish or shellfish habitat.

- **Sediment/Toxicant Retention**

  This function reduces or prevents degradation of water quality. It relates the effectiveness of the wetland to trap sediments, toxicants, or pathogens carried in by river or runoff water.

  The wetland functions to trap water borne sediment and toxicants that are carried into the area during storm events. The wetland probably receives excess road sand and salt in winter and early spring, as well as sheet flow from the roads and parking lot during summer rainstorms. The dense emergent vegetation within the wetland helps to retain these sediments.

- **Nutrient Removal/Retention/Transformation**

  This wetland function considers the effectiveness of the wetland as a trap for nutrients in runoff water from surrounding uplands or contiguous wetlands, and the ability of the wetland to process these nutrients into other forms or trophic levels. One aspect of this function is to prevent adverse effects of nutrients entering aquifers or surface waters such as ponds, lakes, streams, rivers, or estuaries.

  Because of its small size, the wetland has limited ability to process many of the nutrients that may enter it. However, the nutrients that do wash in may get trapped within sediments in the wetland. Therefore, while this wetland performs some nutrient removal/retention transformation, its overall ability to perform this function is low.

- **Production Export (Nutrient)**

  This function evaluates the effectiveness of the wetland to produce food or usable products for humans or other living organisms.

  The small size of the wetland limits its ability to provide large amounts of biomass for export. In addition, effective export of biomass is limited by the low energy flows that move through this wetland system, i.e., no large stream abuts the wetland that could transport biomass downstream during a storm event.

- **Sediment /Shoreline Stabilization**

  This function considers the effectiveness of a wetland to stabilize stream banks and shorelines against erosion.

  The wetland may trap sediment from overland sheet flow from the adjacent roads and parking lot. However, since the wetland is not associated with a watercourse, it does not function to stabilize any shoreline sediments.

- **Wildlife Habitat**

This function considers the effectiveness of the wetland to provide habitat for various types and populations of animals typically associated with wetlands and the wetland edge. Both resident and/or migrating species must be considered.

The wetland is too small and too isolated from other natural communities to provide large amounts of wildlife habitat. However, a small number of typical urban wildlife species (i.e., song sparrows, meadow voles, raccoons) may live in, or pass through the wetland.

- **Recreation (Consumptive and Non-Consumptive)**

This value considers the suitability of the wetland and associated watercourses to provide recreational opportunities such as hiking, canoeing, boating, fishing, hunting, and other active or passive recreational activities.

The wetland does not provide for any recreational uses.

- **Educational/Scientific Value**

This function considers the suitability of the wetland as a site for an "outdoor classroom" or as a location for scientific study or research.

Because of its proximity to a school, the wetland is easily accessible for any educational purposes. However, since its other functions and values are so limited, the wetland is not a valuable education site.

- **Uniqueness/Heritage**

This value relates to the effectiveness of the wetland or its associated water bodies to provide certain special values such as archeological sites, unusual aesthetic qualities, historical events unique plants, animals, geologic features, etc.

The wetland is highly altered, degraded, and covers a limited area. Overall, its value for uniqueness/heritage is low.

- **Visual Quality/Aesthetics**

  This value relates to the visual and aesthetic qualities of the wetland.

  This wetland is dominated by tall common reed and is adjacent to roads and playing fields. Therefore, it provides very little visual quality or aesthetic value.

- **Endangered Species Habitat**

  This function considers the suitability of the wetland or associated water bodies to support rare, threatened, or endangered species.

  The wetland is not known to support rare, threatened, or endangered plants, animals, or natural communities.

Summary

As evident in the above discussion, this wetland provides very few functions and values relative to other types of wetlands. Its primary function is sediment and toxicant retention. The wetland probably receives road sand and salt in winter and during the spring thaw. In addition, summer storms may wash additional sediments into the wetland and overland sheet flow could contain gasoline, oil, and other toxicants from the surface of the parking lot. The dense reed that occurs in this wetland has the potential to trap these sediments and toxicants because of the dense standing and fallen stems that occur, and because of the thick root system. Other functions and values provided by this wetland, however, are limited.

Allendale School Wetland

Source: USGS Pittsfield East Quadrangle
Scale, 1:25000

Wetland Function-Value Evaluation Form

Total area of wetland ±16,000 SQ FT Human made? NO Is wetland part of a wildlife corridor? NO or a "habitat island"? NO

Adjacent land use ROADS, PLAYGROUND Distance to nearest roadway or other development 0'

Dominant wetland systems present PEM Contiguous undeveloped buffer zone present NO

Is the wetland a separate hydraulic system? NO If not, where does the wetland lie in the drainage basin? IN UPPER PART

How many tributaries contribute to the wetland? 0 Wildlife & vegetation diversity/abundance (see attached list)

Wetland I.D. ____
Latitude ____ Longitude ____
Prepared by: ____ Date 10-21-98
Wetland Impact:
Type ____ Area ____

Evaluation based on:
Office ✓ Field ✓

Corps manual wetland delineation completed? Y ✓ N ____

Function/Value	Occurence Y	Occurence N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
Groundwater Recharge/Discharge	X		1,2,4,16		DISCHARGE MAY OCCUR ALONG TOE OF ROAD SLOPES. SMALL WETLAND ON SIDE SLOPE.
Floodflow Alteration		X	3,4,5,9		
Fish and Shellfish Habitat		X			
Sediment/Toxicant Retention	X		1,2,4,6,9	✓	PROB. RECEIVES ROAD SAND
Nutrient Removal	X		3,7,8,9		
Production Export		X			
Sediment/Shoreline Stabilization		X	2,3		NOT ASSOC. WITH A WATERCOURSE, BUT MAY RECEIVE RO
Wildlife Habitat		X	13,17		
Recreation		X			
Educational Scientific Value		X	8,9,15		SMALL, DISTURBED WETLAND
Uniqueness/Heritage		X	17,8		
Visual Quality/Aesthetics			9		
ES Endangered Species Habitat		X			
Other					

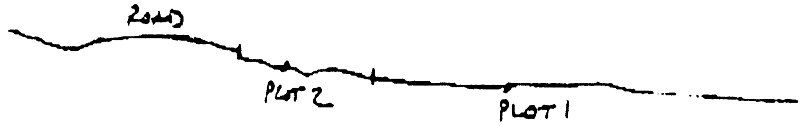
Notes:

* Refer to back up list of numbered considerations.

MEDIATION PURPOSES

SOIL

Sketch Landscape Position



Depth	Horizon	Matrix Color	Redoximorphic Features Color, Abundance, Size & Contrast	USDA Texture and nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.
1-0"	O		ROOT ZONE	
0"-7"	A	2.5Y 3/2	OX. RHIZO.	F. SANDY LOAM
7"-16"	B	10YR 4/3	CMF 10YR 5/2	LOAMY FINE SAND
			FMD 2.5Y 4/2	
			MMD 10YR 3/4	
			FMD 10YR 5/6	
16"-20"+	B2	5Y 5/3	FSP 10YR 5/6	LFS
			CMP 10YR 4/4	

HYDRIC SOIL INDICATOR(S) III.F.2.

REFERENCE: NEIWPCC 1995

OPTIONAL SOIL DATA:

TAXONOMIC SUBGROUP:
SOIL DRAINAGE CLASS:
DEPTH TO ACTIVE WATER TABLE:
NTCHS HYDRIC SOIL CRITERION:

CONCLUSIONS

	Yes	No
Greater than 50% Hydrophytes?	X	
Hydric Soils Criterion Met?	X	
Wetland Hydrology Met?	X	

IS THIS DATAPOINT WITHIN A WETLAND?

Yes	No
X	

REMARKS:

PROJECT TITLE: Allendale Street. TRANSECT: PLOT: 1

CONFIDENTIAL FOR MEDIATION PURPOSES

VEGETATION	Stratum and Species (dominants only)	Dominance Ratio	Percent Dominance	NWI Status
T - N/A				
P - N/A				
SH - N/A				
H - PHRAGMITES AUSTRALIS		90/90%	100%	

Note 1: Use asterisk * to indicate plants with adaptations to wetland hydrology.
Plants recorded with asterisks should be considered as "other hydrophytes" in the tally below.
Note 2: Species with NA or NI status are reported, but are not calculated in the tally below.

OBL	FACW	FAC	OTHER HYDROPHYTES	FAC-	FACU	UPL
	1					

Hydrophytes SUBTOTAL: 1   Non-hydrophytes SUBTOTAL: 0

100 X Subtotal Hydrophytes / (Subtotal Hydrophytes + Subtotal Non-hydrophytes) = 100% = Percent Hydrophytes

Describe Vegetation Disturbance:

HYDROLOGY

1. Hydrology is often the most difficult feature to observe.
2. Interpretation must consider the validity of the observation in light of the season, recent weather conditions, watershed alterations, etc.
3. Interpretation of hydrology may require repeated observations over more than one season.

☐ RECORDED DATA

Stream, lake or tidal gage Identification:

Aerial photograph Identification:

Other Identification:

☐ NO RECORDED DATA

☐ OBSERVATIONS:

Depth to Free Water: >20"

Depth to Saturation (including capillary fringe): >20"

Describe Altered Hydrology:

☐ Inundated ☐ Saturated in upper upper 12 inches ☒ Water Marks ☐ Drift Lines ☒ Sediment Deposits ☒ Drainage Patterns Within Wetland

☐ Other (explain):

WOODLOT ALTERNATIVES, INC.

SOIL Sketch Landscape Position

Depth	Horizon	Matrix Color	Redoximorphic Features Color, Abundance, Size & Contrast	USDA Texture and nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.
0"-6"	A	2.5Y 3/1		SANDY LM
6"-13"	B1	2.5Y 5/3	CMD 10YR 5/4	LOAMY FINE SAND w/ ROCK CHPS
13"-20"	B2	2.5Y 4/4	CMF 2.5Y 5/4	LFS w/ ROCK CHPS

HYDRIC SOIL INDICATOR(S)

REFERENCE:

OPTIONAL SOIL DATA:

TAXONOMIC SUBGROUP:
SOIL DRAINAGE CLASS:
DEPTH TO ACTIVE WATER TABLE.
NTCHS HYDRIC SOIL CRITERION:

CONCLUSIONS

	Yes	No
Greater than 50% Hydrophytes?		X
Hydric Soils Criterion Met?		X
Wetland Hydrology Met?		X

IS THIS DATAPOINT WITHIN A WETLAND?
Yes: No: X

REMARKS:

PROJECT TITLE: ALLENDALE · SCHOOL TRANSECT: PLOT 2

CONFIDENTIAL FOR MEDIATION PURPOSES

WOODLOT ALTERNATIVES, INC.

Delineator(s): [illegible] Date: 10·26·95

VEGETATION Stratum and Species (dominants only)	Dominance Ratio	Percent Dominance	NWI Status
T - Populus tremuloides	3/3	100%	FACU
P - Acer saccharinum	10/20%	50%	FACW
Pinus strobus	5/20%	25%	FACU
Populus tremuloides	5/20%	25%	FACU
SH - N/A	–	–	
H - Zizea aurea	90/100%	90%	FAC
Phragmites australis	2/100%		
Solidago canadensis	5/100%		

Note 1: Use asterisk * to indicate plants with adaptations to wetland hydrology.
Plants recorded with asterisks should be considered as "other hydrophytes" in the tally below.
Note 2: Species with NA or NI status are reported, but are not calculated in the tally below.

OBL	FACW	FAC	OTHER HYDROPHYTES	FAC-	FACU	UPL
	1	1			3	

Hydrophytes SUBTOTAL: 2 Non-hydrophytes SUBTOTAL: 3

$$\frac{100 \times \text{Subtotal Hydrophytes}}{\text{Subtotal Hydrophytes} + \text{Subtotal Non-hydrophytes}} = 40\% = \text{Percent Hydrophytes}$$

Describe Vegetation Disturbance:

HYDROLOGY

1. Hydrology is often the most difficult feature to observe.
2. Interpretation must consider the validity of the observation in light of the season, recent weather conditions, watershed alterations, etc.
3. Interpretation of hydrology may require repeated observations over more than one season.

☐ RECORDED DATA

Stream, lake or tidal gage Identification:

Aerial photograph Identification:

Other Identification:

☐ NO RECORDED DATA

☐ OBSERVATIONS:

Depth to Free Water >20"

Depth to Saturation (including capillary fringe): >20"

Describe Altered Hydrology:

☐ Inundated ☐ Saturated in upper upper 12 inches ☐ Water Marks ☐ Drift Lines ☐ Sediment Deposits ☐ Drainage Patterns Within Wetland

☐ Other (explain):

WOODLOT ALTERNATIVES, INC.

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
WESTERN REGIONAL OFFICE

ARGEO PAUL CELLUCCI
Governor

TRUDY COXE
Secretary

DAVID B. STRUHS
Commissioner

Memorandum – Confidential

Date: November 2, 1998

From: John Ziegler, Project Manager, Bureau of Waste Site Cleanup-Special Projects, Massachusetts DEP, and Margaret Harvey, Office of Research and Standards, Massachusetts DEP

To: Chet Janowksi, OU 3 Remedial Project Manager, USEPA New England Region

Cc: J. Lyn Cutler, Section Chief, Bureau of Waste Site Cleanup-Special Projects, Massachusetts DEP

File 1-0960

RE: Ecological Risk-Assessment for Allendale School

The Allendale School site contains an approximately 10,000 square foot undeveloped, naturally vegetated land area (the 'Area') located on the southeast side of the existing cap. The Massachusetts Department of Environmental Protection (MADEP) *Guidance for Disposal Site Risk Characterization* (MADEP, 1996) [Risk Guidance] was reviewed regarding the Allendale School site to determine if an environmental risk assessment is warranted. Please note that for this discussion, the use of the term "environmental risk assessment" is equivalent to the term " ecological risk assessment".

The Risk Guidance ".. is structured so that, very early in the process, the ecological risk assessor will identify exposure pathways unlikely to pose significant risk of harm, and rule out the need for further detailed quantitative assessment of those pathways." The Massachusetts Contingency Plan (MCP) divides the environmental risk characterization into two stages: Stage I Environmental Screening and Stage II Environmental Risk Characterization. The overall purpose of a Stage I Environmental Screening is to evaluate the need for a quantitative Stage II Environmental Risk Characterization. Stage I is used to eliminate from further evaluation those situations in which either (1) the exposures are clearly unlikely to result in environmental harm or (2) harm is readily apparent. Exposure pathways that are not eliminated in Stage I are carried through the quantitative Stage II Environmental Risk Characterization process. The Stage I screening process is dependent on the type of site and habitat. Specifically, the Risk Guidance provides separate Stage I screening criteria for aquatic, terrestrial, and wetland habitats.

The Stage I screening criteria for aquatic habitats were not fully evaluated for this Area because site data do not indicate the presence of an aquatic habitat, and, therefore, exposure to aquatic and benthic organisms is unlikely. The Risk Guidance states that exposure of aquatic and benthic organisms is likely only when contaminants are present in sediment or surface water, or could potentially be transported to surface water or sediment. Based on an evaluation of site data, DEP concludes that "sediment" and "surface water" are not present in the Area. The Risk Guidance defines "sediment" as "...all detrital and inorganic or organic matter situated on the bottom of lakes, ponds, streams, rivers, the ocean or other surface water bodies." There is no surface water body within the Area. Although it is possible that the Area does contain some standing water at various times within the year, DEP believes it is highly improbable that this periodic standing water supports any aquatic or terrestrial organisms.

Both the Stage I screening criteria for wetland and terrestrial habitats were also evaluated for this Area. The Area contains natural vegetation and may be indicative of a wetland as defined by Massachusetts Wetland regulations (310 CMR 10). Additionally, risks to terrestrial habitats were considered, assuming the Area does not meet the definition of a wetland. The Stage I evaluations for wetland and terrestrial habitats are discussed below.

In accordance with the Risk Guidance, the Stage I screening process for a wetland habitat is as follows:

- Identify potential receptor groups and exposure pathways and evaluate the likelihood of each potential exposure pathway; and

- Perform an effects-based screening on the identified complete exposure pathways.

As previously discussed, it is highly improbable that there exists a complete exposure pathway for aquatic organisms within the "wetland" area because of the absence of sediment or surface water. Therefore, exposure to aquatic organisms in the "wetland" are not relevant to characterization of ecological risk for the Allendale School site. The Risk Guidance, however, also recommends that exposure pathways for terrestrial habitat be considered for upland areas in or adjacent to wetlands. As part of settlement negotiations between the government and General Electric, polychlorinated biphenyl (PCB) cleanup concentrations of 10 and 14 parts per million (ppm) were cited as being protective of terrestrial receptors (memorandum from Susan Svirsky, USEPA, to Bryan Olson, USEPA, dated June 2, 1998). These cleanup concentrations are higher than the human health-based cleanup concentration of 2 ppm for PCBs at Allendale School, which was agreed upon by GE and the Governments. Therefore, cleanup of the "wetland" area to the human health-based concentration of 2 ppm will also be protective of the environment.

The Area was also evaluated assuming the Area is not a wetland, but rather a terrestrial habitat. For terrestrial habitats, the Risk Guidance recommends that terrestrial habitat quality be evaluated during the Stage I screening process prior to conducting a Stage II ecological risk characterization. Based on this evaluation, the Area would screen out of the MCP ecological risk assessment process using the screening criteria for terrestrial habitat quality, as per Section 9.5.2.1 of the Risk Guidance, for the following reasons:

1) There are no significant habitats mapped for the Allendale School site (MADEP, 1997). Significant habitats include state-listed threatened or endangered species and Areas of Critical Environmental Concern (ACEC); and,

2) The undeveloped portion of the affected area is less than two acres.

In conclusion, MADEP has evaluated the Allendale School site data in accordance with the Risk Guidance to determine if an environmental risk assessment is warranted. Aquatic, terrestrial, and wetland habitats were considered in this evaluation. On the basis of this evaluation, a Stage II environmental risk characterization is not warranted for the Allendale School site. Furthermore, the human health-based cleanup standard of 2 ppm for PCBs is considered to be protective of both the environment and human health.

References

Massachusetts Department of Environmental Protection, April, 1996. Guidance for Disposal Site Risk Characterization, Chapter 9, Method 3 Environmental Risk Characterization, Interim Final Policy WSC/ORS-95-141.

Massachusetts Department of Environmental Protection, October 7, 1997. Bureau of Waste Site Cleanup Priority Resource Maps, Pittsfield East.

Roy F. Weston, Inc., September 10, 1998. Remedial Investigation/Feasibility Study (RI/FS) Work for Six Operable Units (OUs) General Electric (GE)/Housatonic River Project, Pittsfield, Massachusetts, Draft Feasibility Study, Allendale School. Prepared for U.S. Army Corps of Engineers, North Atlantic Division, New England District. Contract No. DACW33-94-D-0009, Task Order No. 0032.

U.S. Environmental Protection Agency, June 2, 1998. Memorandum from Susan Svirsky to Bryan Olson.

APPENDIX B

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Table B-1

Summary of Chemical-Specific Arrears and TBCs

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
CHEMICAL-SPECIFIC				
Soil	FEDERAL – EPA Risk Reference Doses (RfDs)	RfDs are dose levels developed based on the noncarcinogenic effects and are used to develop hazard indices. A hazard index of less than or equal to 1 is considered acceptable. Requirements will be attained by removal of contaminated soil and confirmational monitoring.	EPA reference doses have been used to characterize risks due to exposure to contaminants in soil. Requirements will be attained by removal of contaminated soil, except in the case of no action and limited action.	TBC
Soil	FEDERAL – EPA Cancer Slope Factors	Cancer slope factors are developed by EPA from Health Effects Assessments or evaluation by the Carcinogenic Assessment Group, and are used to develop excess cancer risks. A range of 10^{-4} to 10^{-6} is considered acceptable.	EPA cancer slope factors have been used to compute the individual increment cancer risk resulting from exposure to soil contamination. Requirements will be attained by removal of contaminated soil, except in the case of no action and limited action.	TBC
Sediment	FEDERAL-NOAA Environmental Effects Range-Low (ER-L) and Maximum (ER-M) Standards, Technical Memorandum NOS OMA 52	Reference doses for various contaminants in sediments and their potential effects on biota exposed to the contaminants.	NOAA values have been used to evaluate potential impacts of PCB contamination on the benthic community and were considered in developing cleanup goals for the site.	TBC
Sediment	FEDERAL – EPA's Equilibrium Partitioning (EqP)-Based Sediment Benchmark Methodology	The EPA Science Advisory Board has selected the equilibrium partitioning approach (EqP) for developing sediment criteria for establishing numerical chemical specific criteria for nonionic hydrophobic chemicals. The assessment employed the EqP methodology using the freshwater chronic AWQC for PCBs to assess potential impact.	EqP-based criteria were used to evaluate potential impacts of PCB contamination in sediments and were considered in developing clean-up goals for the site.	TBC

Table B-1

Summary of Chemical-Specific ARARs and TBCs (Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Soil	FEDERAL- Toxic Substances Control Act (TSCA) PCBs Manufacture, Processing, Distribution, and Use Prohibitions (40 CFR Part 761, 761.60, 761.61, 761.65, 761.70, 761.79, 761.125 and 761.202, 761.265)	Regulates the use, storage, and disposal of PCBs. Establishes requirements for incineration, decontamination, and PCB spill cleanup. Lists strict compliance criteria for disposal of different concentration levels of PCBs. Contains notification provision prior to initiating site cleanup. Requires a cleanup plan for the site, including schedule, disposal technology, and approach. Identifies cleanup goals for bulk PCB remediation waste (i.e. soil, sediment) in high-occupancy (Allendale School) and low-occupancy areas. Contains deed restriction provisions for caps, fences, and low-occupancy areas.	A cleanup plan for the site will be developed and appropriate notifications made. If required, deed restrictions will be placed in the land records.	Applicable
Soil/Sediment	FEDERAL - Guidance on Remedial Actions for Superfund Sites with PCB Contamination (August 1990)	Describes various scenarios and considerations pertinent to determining the appropriate level of PCBs that can be left in each contaminated media to achieve protection of human health and the environment.	This guidance will be considered in determining the appropriate level of PCBs that will be left in the sediment/soil. Management of PCB-contaminated residuals will be designed in accordance with the guidance.	TBC
Soil	FEDERAL – RCRA – Examples of concentrations meeting criteria for action levels (40 CFR 264.521(a)(2)(i – iv) Appendix A	Non-enforceable health-based standards for air, water, and soil are established for 146 toxic compounds.	These standards will be considered when developing cleanup goals for the site.	TBC
Surface Water, Sediment	STATE - COMMONWEALTH of MA Surface Water Quality Standards, 314 CMR 4.00	Surface water classification B standards are applicable to the site. Massachusetts Surface Water Quality standards for toxic pollutants in Class B waters are essentially the same as Federal Ambient Water Quality Criteria.	Site activities are not expected to impact surface water.	Applicable

Table B-1

Summary of Chemical-Specific ARARs and TBCs (Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Soil	STATE - Massachusetts Contingency Plan (MCP) Method 1 Soil Standards, 310 CMR 40.0975(6)(a)	State risk-based soil standards for soil cleanup at MCP sites, where a site-specific risk assessment is not conducted. Not applicable (except for screening purposes) where sediment and/or surface water contamination exists, or where ecological risks are to be evaluated.	State risk-based soil standards will be considered when developing cleanup goals for the site.	TBC
Soil	STATE - Massachusetts Contingency Plan (MCP) Upper Concentration Limits (UCLs), 310 CMR 40.0996(2)	State risk-based soil and groundwater standards, which if exceeded, indicate the potential for significant risk of harm to public health and the environment under future conditions.	State risk-based soil standards will be considered when developing cleanup goals for the site.	TBC
Sediment	CANADIAN - Ontario Ministry of Environment (OMEE) Sediment Quality Guidelines (1996)	Identifies PCB concentrations associated with deleterious effects on fish and invertebrates. OMEE Sediment Quality Guidelines were derived specifically for freshwater sediments. The lowest effect level (LEL) indicates a level of sediment contamination that can be tolerated by most benthic organisms. The severe-effect level (SEL) indicates a level of contamination at which pronounced disturbance of sediment-dwelling organisms will occur and the contaminant concentration will be detrimental to the majority of benthic species.	Both LELs and SELs were used to establish protection from potential effects on the benthic community and were considered in developing cleanup goals for the site.	TBC

Table B-2

Summary of Location-Specific ARARs and TBCs

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
LOCATION-SPECIFIC				
Wetlands	FEDERAL - Wetlands Executive Order (EO 11990) 40 CFR Part 6, Appendix A	Under this order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands or beneficial values of wetlands.	All practicable means will be used to minimize harm to wetland areas. Wetland areas disturbed during remediation will be restored.	TBC
Wetlands	FEDERAL-16 USC 661 et. seq., Fish and Wildlife Coordination Act (50 CFR Part 81, 225, 402, 226, and 227)	Requires federal agencies to take into consideration the effect that water-related projects will have on fish and wildlife. Requires consultation with U.S. FWS and the state to develop measures to prevent, mitigate, or compensate for project-related losses to fish and wildlife.	Identify species of concern and potential impacts based on the selected remedial alternative.	Applicable
Endangered Species Habitat	FEDERAL - 16 USC 1531, et. Seq., Endangered Species Act	Requires that action be performed to conserve endangered or threatened species. Activities must not destroy or adversely modify the critical habitat upon which endangered or threatened species depend.	Confirm that no endangered or threatened plant or animal species are present at the site.	TBC
Wetlands	FEDERAL - Clean Water Act (CWA) Guidelines for Disposal of Dredged or Fill Material (33 U.S.C 1344) (40 CFR 6, App. A)	No discharge of dredged or fill material will be permitted if there is a practicable alternative to the discharge that would have a less adverse impact on the aquatic ecosystem, as long as the alternative does not have other significant adverse environmental consequences. Appropriate and practicable steps must be taken that will minimize the potential adverse impacts of the discharge of the dredged material on the aquatic ecosystems.	Any activities that involve the discharge of dredge or fill materials in wetlands will be conducted in a manner using the alternative that would have the least adverse impact on the aquatic ecosystem and the environment, pursuant to 40 CFR §230.10(a).	Applicable
Areas of Critical Environmental Concern	STATE – Massachusetts Areas of Critical Environmental Concern (310 CMR 12)	Designates areas within Massachusetts that are of regional, state, or national importance and/or that contain significant ecological systems with critical interrelationships among a number of components. Provides for preservation and/or restoration of these areas.	Each remedial alternative will be evaluated for its ability to preserve and/or restore designated ACECs, if they exist.	TBC

Table B-2

Summary of Location-Specific ARARs and TBCs (Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Rare Species	STATE - Massachusetts Wetlands Protection Program Policy 90-2; Standards and Procedures for Determining Adverse Impacts to Rare Species	Clarifies the rules regarding rare species habitat contained in 310 CMR 10.37 and 10.59.	Habitats of rare species, as determined by the Massachusetts Natural Heritage Program, will be considered in the mitigation plans.	TBC
Wetlands	STATE - Massachusetts Wetlands Protection Act (H.O.L. 131.840)(310 CMR 10.00)	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling, alteration, and pollution of wetlands. Work within 100 feet of a wetland is regulated under this requirement. The requirement also defines wetlands based on vegetation type and requires that efforts on wetlands be mitigated. Each remedial alternative will be evaluated for its ability to attain regulatory performance standards, including mitigation of impacted wetland. These regulations also contain wildlife habitat evaluation provisions.	Each remedial alternative will be evaluated for its ability to attain regulatory performance standards. If alternatives involve removing, filling, dredging, or altering a DEP-defined wetland, or conducting work within 100 feet of a wetland, it must be demonstrated that the modifications are not significant to the wetland or that the proposed work will contribute to the protection of the wetland. Whenever possible, remedial actions will be conducted so that impacts to wetlands and habitats will be minimized or mitigated.	Applicable
Hazardous Waste	STATE - Hazardous Waste Facility Siting Regulations (990 CMR 1.00)	These regulations outline the criteria for the construction, operation, and maintenance of a new facility or increase in an existing facility for the storage, treatment, or disposal of hazardous waste.	No portion of the facility may be located within a wetland, border a vegetated wetland, or be located within a 100-year floodplain, unless approved by the state.	May be applicable, depending on remedy selected

Table B-3

Summary of Action-Specific ARARs and TBCs—Alternative 2
Limited Action/Institutional Controls

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
ACTION-SPECIFIC				
Surface Water	FEDERAL - National Pollution Discharge Elimination System (NPDES) (40 CFR 122)	Regulates the discharge of water into public surface water. Major requirements include: ▪ Use of best available technology (BAT) economically achievable is required to control toxic and non-conventional pollutants. Use of best conventional pollutant control technology (BCT) is required to control conventional pollutants. Technology-based limitations may be determined on a case-by-case basis. ▪ Must comply with applicable federally approved state water quality standards. These standards may be in addition to or more stringent than other federal standards under the CWA.	If wastewater will be discharged off-site via surface water, an NPDES permit will be obtained.	Applicable depending on discharge destination
Wetlands	FEDERAL - Clean Water Act §404 (40 CFR 230)	No discharge of dredged or fill material will be permitted if there is a practicable alternative to the discharge that would have a less adverse impact on the aquatic ecosystem, on long as the alternative does not have other significant adverse environmental consequences. Appropriate and practicable steps must be taken that will minimize potential adverse impacts of the discharge of the dredged material on the aquatic ecosystem.	Excavated materials will be dewatered or solidified/stabilized. Excavated or dredged materials will not be discharged to the aquatic system. Excavated areas will be filled with clean off-site materials, in accordance with 40 CFR 230.	Applicable

Table B-3

Summary of Action-Specific ARARs and TBCs—Alternative 2
Limited Action/Institutional Controls
(Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Wetlands Floodplains	FEDERAL - Procedures on Floodplain Management and Wetlands Protection (40 CFR 6, App. A)	Federal agencies will avoid, whenever possible, the long- and short-term impacts associated with the destruction of wetlands and the occupancy and modifications of floodplains and wetlands development wherever there is a practicable alternative in accordance with Executive Orders 11990 and 11988. The agency will promote the preservation and restoration of floodplains so that their natural and beneficial values can be realized. Any plans for actions in wetlands or floodplains must be submitted for public review.	All practicable means will be used to minimize harm to wetlands. The site is not located within a 100-year floodplain. Wetlands disturbed by excavation will be restored to their original conditions. Temporary fill placed in wetlands for access roads and staging area will not have a significant impact on the extent of flooding.	Applicable
Surface Water Wetlands	FEDERAL - Fish and Wildlife Coordination Act (16 U.S.C 166 et seq.)	Any modification of a body of water requires prior consultation with the U.S. FWS to develop measures to prevent, mitigate, or compensate for losses to fish and wildlife.	If any losses to fish and wildlife are expected, U.S. FWS officials will be consulted and a plan to mitigate the damage will be prepared.	Applicable

Table B-3

Summary of Action-Specific ARARs and TBCs—Alternative 2
Limited Action/Institutional Controls
(Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Excavated/ Dredged Materials, Treatment Residuals	FEDERAL, STATE - TSCA, Subpart D, Storage and Disposal (40 CFR 761.60, 761.61, 761.65, 761.70, 761.79, 761.125, 761.202, 761.265), Massachusetts Hazardous Waste Regulations (310 CMR 30.131)	All excavated/dredged materials and treatment residuals that contain PCBs at concentrations of 50 ppm or greater will be disposed of in an incinerator or in a chemical waste landfill or, upon application, using a disposal method to be approved by the EPA Region in which the PCBs are located. Massachusetts classifies wastes containing PCBs in concentrations equal to or greater than 50 ppm as hazardous waste MA02. On-site storage facilities for PCBs will meet, at a minimum, the following criteria: ▪ Adequate roof and walls to prevent rain from entering the structure. ▪ Adequate floor with continuous curbing. ▪ No openings that would permit liquids to flow from curbed area. In addition, storage facilities may not be located at a site that is below the 100-year flood water elevation. There are less stringent requirements for less than 30-day storage. For nonliquid PCBs, mass air emissions from an incinerator will be no greater than 0.001 g PCB/kg of the PCB introduced.	Excavated material will be stockpiled on a synthetic liner and covered daily. TSCA PCB management approval pursuant to 40 CFR 761.61(c) and 40 CFR 761.65(b)(2)(vi) for alternative storage provisions will be obtained. Excavated soils regulated by TSCA will be disposed of at a TSCA-permitted facility.	Applicable if PCB concentrations are >50 ppm; Relevant and appropriate if PCB concentrations are <50 ppm

Table B-3

Summary of Action-Specific ARARs and TBCs—Alternative 2 Limited Action/Institutional Controls (Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Hazardous Waste	FEDERAL - RCRA, Land Disposal Regulations (40 CFR 268, Subpart C)	Prohibits the disposal of RCRA hazardous waste in the land unless treatment standards are met or a treatability variance is obtained.	Excavated soils are not expected to be classified as listed or characteristically hazardous waste. Excavated soils will be analyzed to confirm they should not be classified as hazardous waste. Excavated soils may be stabilized or solidified to render them nonhazardous or, alternatively, to meet the treatability variance requirements in the land disposal requirements. Materials not meeting established treatment standards and debris will be designated for off-site disposal and be treated off-site if LDRs apply.	Applicable if the soils are listed waste or characteristic of hazardous waste under federal law
Hazardous Waste	FEDERAL - RCRA, 40 CFR 264 Subpart L - Waste Pile Requirements (Subtitle C).	Requires two or more liners and a leachate collection and removal system above and between such liners. In addition, the waste pile must be designed and constructed to control runon and runoff.	Excavated materials are not expected to be classified as listed or hazardous waste under federal law.	TBC
Ambient Air	FEDERAL - Clean Air Act (CAA) 40 CFR 50.6	Air quality regions must maintain maximum primary and secondary 24-hr (NAAQS) concentrations for particulate emissions below 150 $\mu g/m^3$, with 24-hour average for particulates having a mean diameter of 10 micrometers or less. The annual standard is 50 $\mu g/m^3$, (annual arithmetic mean).	If remedial actions may cause the air quality region to exceed standards, air dispersion monitoring will be performed to evaluate potential impacts of remedial actions to ambient air.	Applicable
Noise	FEDERAL - Noise Control Act (40 CFR 204, 205, 211)	Regulates construction and transportation equipment noise, process equipment and noise levels, and noise levels at the property boundaries of the project.	Site noise levels will be in accordance with federal requirements.	Relevant and Appropriate
Dewatering water	STATE - Massachusetts Ground Water Discharge Permit Program 314 CMR 5.00	These standards require any facility that discharges a liquid effluent onto or below the land surface to obtain a permit. The discharge will not result in a violation of Massachusetts Surface Water Quality Standards 314 CMR 4.00 or Massachusetts Ground Water Quality Standards 314 CMR 6.00.	A permit will be required if there will be an off-site discharge.	Applicable depending on discharge destination

Table B-3

Summary of Action-Specific ARARs and TBCs—Alternative 2 Limited Action/Institutional Controls (Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Wastewater	STATE - Sewer System Extension and Permit Program (314 CMR 7.00), Operation and Maintenance and Pre-Treatment Standards for Wastewater Treatment Works and Indirect Discharges (314 CMR 12.00)	Regulates the discharge of industrial wastewater into the sanitary sewer system.	If wastewater cannot be discharged on-site or to surface water, it may be discharged off-site via the sanitary sewer. A permit will be obtained for this activity, and wastewater will be pretreated if necessary.	Applicable depending on discharge destination
Surface Water	STATE - Massachusetts Surface Water Quality Standards 314 CMR 4.00	These standards designate the most sensitive uses for which the various waters of the Commonwealth will be enhanced, maintained, and protected. Minimum water quality criteria required to sustain the designated uses are established. Federal AWQC are to be considered in determining effluent discharge limits. Where recommended limits are not available, site-specific limits will be developed. Any on-site water treatment and discharge is subject to these requirements.	Any surface water discharge will comply with these standards. If required, pretreatment will be performed.	Applicable depending on discharge destination
Wetlands	STATE - Massachusetts Wetlands Protection Act (310 CMR 10.000)	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling, alteration, or pollution of wetlands. Work within 100 feet of a wetland is regulated under this requirement. The requirement also defines wetlands based on vegetation type and requires that efforts on wetlands be mitigated. Each remedial alternative will be evaluated for its ability to attain regulatory performance standards, including mitigation of impacted wetland. These regulations also contain wildlife habitat evaluation provisions.	If alternatives involve removing, filling, dredging, or altering a DEP-defined wetland, or conducting work within 100 feet of a wetland, it will be demonstrated that either the modifications are not significant to the wetland or that the proposed work will contribute to the protection of the wetland. Whenever possible, remedial actions will be conducted so that impacts to wetlands and habitats will be minimized or mitigated.	Applicable

Table B-3

Summary of Action-Specific ARARs and TBCs—Alternative 2
Limited Action/Institutional Controls
(Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Dredged Materials	STATE - Water Quality Certification for Discharge of Dredged or Fill Material, Dredging and Dredged Material Disposal in Waters of the United States within the Commonwealth (314 CMR 9.00)	The substantive portions of these regulations establish criteria and standards for the dredging, handling, and disposal of fill material and dredged material.	Excavation, filling, and disposal operations will meet substantive criteria and standards in these regulations. The remedial alternative will be designed to ensure the maintenance or attainment of the MA Water Quality Standards in the affected water and to minimize the impact on the environment.	Applicable
Hazardous Waste	STATE - Massachusetts Hazardous Waste Regulations 310 CMR 30.640 – 310 CMR 30.649 – Waste Pile Requirements	Requires a liner that is a minimum of 4 feet above the probable high groundwater level and a leachate collection and removal system above the liner. In addition, the waste pile must be designed and constructed to control runon and runoff. Each owner using a single-lined waste pile will comply with 310 CMR 660: Groundwater Protection.	Excavated soils will be placed in a waste pile on a synthetic liner and covered daily. The waste pile will be constructed to control runon and runoff. Due to the temporary nature of the soil storage pile, all aspects of this regulation may not be complied with in full.	Applicable to excavated materials with PCB concentrations greater than 50 ppm (MA02)
Wastewater	STATE - Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities (314 CMR 8.00)	Water treatment units that are exempt from M.G.L.a.21C and that treat, store, or dispose of hazardous wastes generated at the same site are regulated to ensure that such activities are conducted in a manner that protects public health and safety and the environment.	If on-site treatment of wastewater is performed, all processes will comply with Massachusetts requirements regarding location, technical standards, closure and post-closure, and management standards.	Relevant and appropriate

Table B-4

Summary of Action-Specific ARARs and TBCs—Alternative 4A/4B Excavation and Off-Site Disposal

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Surface Water	FEDERAL - National Pollution Discharge Elimination System (NPDES) (40 CFR 122)	Regulates the discharge of water into public surface waters. Major requirements include: ▪ Use of best available technology (BAT) economically achievable is required to control toxic and nonconventional pollutants. Use of best conventional pollutant control technology (BCT) is required to control conventional pollutants. Technology-based limitations may be determined on a case-by-case basis. ▪ Applicable federally approved state water quality standards must be complied with. These standards may be in addition to or more stringent than other federal standards under the CWA.	If wastewater will be discharged off-site via surface water, an NPDES permit will be obtained.	Applicable depending on discharge destination
Wetlands	FEDERAL - Clean Water Act §404 (40 CFR 230)	No discharge of dredged or fill material will be permitted if there is a practicable alternative to the discharge that would have a less adverse impact to the aquatic ecosystem, as long as the alternative does not have other significant adverse environmental consequences. Appropriate and practicable steps must be taken that will minimize the potential adverse impacts of the discharge of the dredged material on the aquatic ecosystem.	Excavated materials will be dewatered or solidified/stabilized. Excavated or dredged materials will not be discharged to the aquatic system. Excavated areas will be filled with clean off-site materials, in accordance with 40 CFR 230.	Applicable

Table B-4

Summary of Action-Specific ARARs and TBCs—Alternative 4A/4B
Excavation and Off-Site Disposal
(Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Wetlands Floodplains	FEDERAL - Procedures on Floodplain Management and Wetlands Protection (40 CFR 6, App. A)	Federal agencies will avoid, whenever possible, the long- and short-term impacts associated with the destruction of wetlands and the occupancy and modifications of floodplains and wetlands development wherever there is a practicable alternative in accordance with Executive Orders 11990 and 11988. The agency will promote the preservation and restoration of floodplains so that their natural and beneficial values can be realized. Any plans for actions in wetlands or floodplains must be submitted for public review.	All practicable means will be used to minimize harm to wetlands. The site is not located within a 100-year floodplain. Wetlands disturbed by excavation will be restored to their original conditions. Temporary fill placed in wetlands for access roads and staging area will not have a significant impact on the extent of flooding.	Applicable
Surface Water Wetlands	FEDERAL - Fish and Wildlife Coordination Act (16 U.S.C 166 et seq.)	Any modification of a body of water requires prior consultation with the U.S. FWS to develop measures to prevent, mitigate, or compensate for losses to fish and wildlife.	If any losses to fish and wildlife are expected, U.S. FWS officials will be consulted and a plan to mitigate the damage will be prepared.	Applicable

Table B-4

Summary of Action-Specific ARARs and TBCs—Alternative 4A/4B
Excavation and Off-Site Disposal
(Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Excavated/ Dredged Materials, Treatment Residuals	FEDERAL, STATE - TSCA, Subpart D, Storage and Disposal (40 CFR 761.60, 761.61, 761.65, 761.70, 761.79, 761.125, 761.202, 761.265), Massachusetts Hazardous Waste Regulations (310 CMR 30.131).	All excavated/dredged materials and treatment residuals that contain PCBs at concentrations of 50 ppm or greater will be disposed of in an incinerator or in a chemical waste landfill or, upon application, using a disposal method to be approved by the EPA Region in which the PCBs are located. Massachusetts classifies wastes containing PCBs in concentrations equal to or greater than 50 ppm as hazardous waste MA02. On-site storage facilities for PCBs will meet, at a minimum, the following criteria: ▪ Adequate roof and walls to prevent rain from entering the structure. ▪ Adequate floor with continuous curbing. ▪ No openings that would permit liquids to flow from curbed area. In addition, storage facilities may not be located at a site that is below the 100 year flood water elevation. There are less stringent requirements for less than 30-day storage. For nonliquid PCBs, mass air emissions from an incinerator will be no greater than 0.001 g PCB/kg of the PCB introduced.	Excavated material will be stockpiled on a synthetic liner and covered daily. TSCA PCB management approval pursuant to 40 CFR 761.61(c) and 40 CFR 761.65(b)(2)(vi) for alternative storage provisions will be obtained. Excavated soils regulated by TSCA will be disposed of at a TSCA-permitted facility.	Applicable if PCB concentrations are >50 ppm; Relevant and appropriate if PCB concentrations are <50 ppm

Table B-4

Summary of Action-Specific ARARs and TBCs—Alternative 4A/4B Excavation and Off-Site Disposal (Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Hazardous Waste	FEDERAL - RCRA, Land Disposal Regulations (40 CFR 268, Subpart C)	Prohibits the disposal of RCRA hazardous waste in the land unless treatment standards are met or a treatability variance is obtained.	Soils on-site are not expected to be classified as listed or characteristically hazardous waste. Excavated soils will be analyzed to confirm they should not be classified as hazardous waste. Excavated soils may be stabilized or solidified to render them nonhazardous or, alternatively, to meet the treatability variance requirements in the LDRs. Materials not meeting established treatment standards and debris will be designated for off-site disposal and will be treated off-site if LDRs apply.	Applicable if the soils are listed waste or characteristic of hazardous waste under federal law
Hazardous Waste	FEDERAL - RCRA, 40 CFR 264 Subpart L - Waste Pile Requirements (Subtitle C)	Requires two or more liners and a leachate collection and removal system above and between such liners. In addition, the waste pile must be designed and constructed to control runon and runoff.	Excavated materials are not expected to be classified as listed or hazardous waste under federal law.	TBC
Ambient Air	FEDERAL - Clean Air Act (CAA) 40 CFR 50.6	Air quality regions must maintain maximum primary and secondary 24-hr (NAAQS) concentration for particulate emissions below 150 $\mu g/m^3$, 24-hour average for particulates having a mean diameter of 10 micrometers or less. The annual standard is 50 $\mu g/m^3$, annual arithmetic mean.	If remedial actions may cause the air quality region to exceed standards, air dispersion monitoring will be performed to evaluate potential impacts of remedial actions to ambient air.	Applicable
Noise	FEDERAL - Noise Control Act (40 CFR 204, 205, 211)	Regulates construction and transportation equipment noise, process equipment and noise levels, and noise levels at the property boundaries of the project.	Site noise levels will be in accordance with federal requirements.	Relevant and appropriate
Dewatering water	STATE - Massachusetts Ground Water Discharge Permit Program 314 CMR 5.00	These standards require any facility that discharges a liquid effluent onto or below the land surface to obtain a permit. The discharge will not result in a violation of Massachusetts Surface Water Quality Standards 314 CMR 4.00 or Massachusetts Ground Water Quality Standards 314 CMR 6.00.	A permit will be required if there will be an off-site discharge.	Applicable depending on discharge destination

Table B-4

Summary of Action-Specific ARARs and TBCs—Alternative 4A/4B
Excavation and Off-Site Disposal
(Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Wastewater	STATE - Sewer System Extension and Permit Program (314 CMR 7.00), Operation and Maintenance and Pre-Treatment Standards for Wastewater Treatment Works and Indirect Discharges (314 CMR 12.00)	Regulates the discharge of industrial wastewater into the sanitary sewer system.	If wastewater cannot be discharged on-site or to surface water, it may be discharged off-site via the sanitary sewer. A permit will be obtained for this activity, and wastewater will be pretreated if necessary.	Applicable depending on discharge destination
Surface Water	STATE - Massachusetts Surface Water Quality Standards 314 CMR 4.00	These standards designate the most sensitive uses for which the various waters of the Commonwealth will be enhanced, maintained, and protected. Minimum water quality criteria required to sustain the designated uses are established. Federal AWQC are to be considered in determining effluent discharge limits. Where recommended limits are not available, site-specific limits will be developed. Any on-site water treatment and discharge is subject to these requirements.	Any surface water discharge will comply with these standards. If required, pretreatment will be performed.	Applicable depending on discharge destination
Wetlands	STATE - Massachusetts Wetlands Protection Act (310 CMR 10.000)	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling, alteration, or pollution of wetlands. Work within 100 feet of a wetland is regulated under this requirement. The requirement also defines wetlands based on vegetation type and requires that efforts on wetlands be mitigated. Each remedial alternative will be evaluated for its ability to attain regulatory performance standards, including mitigation of impacted wetland. These regulations also contain wildlife habitat evaluation provisions.	If alternatives involve removing, filling, dredging, or altering a DEP-defined wetland, or conducting work within 100 feet of a wetland, it will be demonstrated that either the modifications are not significant to the wetland or that the proposed work will contribute to the protection of the wetland. Whenever possible, remedial actions will be conducted so that impacts to wetlands and habitats will be minimized or mitigated.	Applicable

Table B-4

Summary of Action-Specific ARARs and TBCs—Alternative 4A/4B Excavation and Off-Site Disposal (Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Dredged Materials	STATE - Water Quality Certification for Discharge of Dredged or Fill Material, Dredging and Dredged Material Disposal in Waters of the United States within the Commonwealth (314 CMR 9.00)	The substantive portions of these regulations establish criteria and standards for the dredging, handling, and disposal of fill material and dredged material.	Excavation, filling, and disposal operations will meet substantive criteria and standards in these regulations. The remedial alternative will be designed to ensure the maintenance or attainment of the MA Water Quality Standards in the affected water and to minimize the impact on the environment.	Applicable
Hazardous Waste	STATE - Massachusetts Hazardous Waste Regulations 310 CMR 30.640 – 310 CMR 30.649 – Waste Pile Requirements	Requires a liner that is a minimum of 4 feet above the probable high groundwater level and a leachate collection and removal system above the liner. In addition, the waste pile must be designed and constructed to control runon and runoff. Each owner using a single-lined waste pile will comply with 310 CMR 660: Groundwater Protection.	Excavated soils will be placed in a waste pile on a synthetic liner and covered daily. The waste pile will be constructed to control runon and runoff. Due to the temporary nature of the soil storage pile, compliance with all aspects of this regulation may not occur.	Applicable to excavated materials with PCB concentrations greater than 50 ppm (MA02)
Wastewater	STATE - Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities (314 CMR 8.00)	Water treatment units that are exempt from M.G.L.a.21C and which treat, store, or dispose of hazardous wastes generated at the same site are regulated to ensure that such activities are conducted in a manner that protects public health and safety and the environment.	If on-site treatment of wastewater is performed, all processes will comply with Massachusetts requirements regarding location, technical standards, closure and post-closure, and management standards.	Relevant and appropriate

Table B-5

Summary of Action-Specific ARARs and TBCs—Alternative 5A
High-Temperature Thermal Desorption

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Surface Water	FEDERAL - National Pollution Discharge Elimination System (NPDES) (40 CFR 122)	Regulates the discharge of water into public surface waters. Major requirements include: ▪ Use of best available technology (BAT) economically achievable is required to control toxic and nonconventional pollutants. Use of best conventional pollutant control technology (BCT) is required to control conventional pollutants. Technology-based limitations may be determined on a case-by-case basis. ▪ Compliance with applicable federally approved state water quality standards must be complied with. These standards may be in addition to or more stringent than other federal standards under the CWA.	If wastewater will be discharged off-site via surface water, an NPDES permit will be obtained. If wastewater will be discharged to surface water and the site is listed on the NPL, a NPDES permit equivalency will be required. Treatment areas, if not located within a building, are expected to require a stormwater permit and a stormwater pollution prevention plan (SWPPP).	Applicable depending on method of discharge selected.
Wetlands	FEDERAL - Clean Water Act §404 (40 CFR 230)	No discharge of dredged or fill material will be permitted if there is a practicable alternative to the discharge that would have a less adverse impact to the aquatic ecosystem, as long as the alternative does not have other significant adverse environmental consequences. Appropriate and practicable steps must be taken that will minimize the potential adverse impacts of the discharge of the dredged material on the aquatic ecosystem.	Excavated materials will be treated at another OU at the site using thermal desorption. Dredged materials will not be discharged to the aquatic system. Excavated areas will be filled with clean off-site materials, in accordance with 40 CFR 230.	Applicable

Table B-5

Summary of Action-Specific ARARs and TBCs—Alternative 5A
High-Temperature Thermal Desorption
(Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Wetlands Floodplains	FEDERAL - Procedures on Floodplain Management and Wetlands Protection (40 CFR 6, App. A)	Federal agencies will avoid, whenever possible, the long- and short-term impacts associated with the destruction of wetlands and the occupancy and modifications of floodplains and wetlands development wherever there is a practicable alternative in accordance with Executive Orders 11990 and 11988. The agency will promote the preservation and restoration of floodplains so that their natural and beneficial values can be realized. Any plans for actions in wetlands or floodplains must be submitted for public review.	All practicable means will be used to minimize harm to wetlands. The site is not located within a 100-year floodplain. The treatment system and soil staging area(s) will not be constructed within a 100-year floodplain or a wetland. Wetlands disturbed by excavation will be restored to their original conditions. Temporary fill placed in wetlands for access roads and staging area will not have a significant impact on the extent of flooding.	Applicable
Surface Water Wetlands	FEDERAL - Fish and Wildlife Coordination Act (16 U.S.C 166 et seq.)	Any modification of a body of water requires prior consultation with the U.S. FWS to develop measures to prevent, mitigate, or compensate for losses to fish and wildlife.	U.S. FWS will be consulted prior to implementing the remedial action to develop measures to prevent, mitigate, or compensate for losses to fish and wildlife if the remedial action modifies any body of water.	Applicable if the implementation of the remedial action modifies a body of water.

Table B-5

Summary of Action-Specific ARARs and TBCs—Alternative 5A
High-Temperature Thermal Desorption
(Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Excavated/ Dredged Materials, Treatment Residuals	FEDERAL - TSCA, Subpart D, Storage and Disposal (40 CFR 761.60, 761.61, 761.65, 761.70, 761.79, 761.125, 761.202, 761.265), Massachusetts Hazardous Waste Regulations (310 CMR 30.131).	All excavated/dredged materials and treatment residuals that contain PCBs at concentrations of 50 ppm or greater will be disposed of in an incinerator or in a chemical waste landfill or, upon application, using a disposal method to be approved by the EPA Region in which the PCBs are located. Massachusetts classifies wastes containing PCBs in concentrations equal to or greater than 50 ppm as hazardous waste MA02. On-site storage facilities for PCBs will meet, at a minimum, the following criteria: ▪ Adequate roof and walls to prevent rain from entering the structure. ▪ Adequate floor with continuous curbing. ▪ No openings that would permit liquids to flow from curbed area. In addition, storage facilities may not be located at a site that is below the 100-year flood water elevation. There are less stringent requirements for less than 30-day storage. For nonliquid PCBs, mass air emissions from an incinerator will be no greater than 0.001 g PCB/kg of the PCB introduced.	Thermal treatment system will be used only with the approval of Region I, U.S. EPA, and MADEP to treat soils containing 50 ppm PCB or greater. Contaminated soils staging area(s) will be constructed to meet criteria as specified, and will not be located at an elevation beneath the 100-year flood water elevation. Soils with 50 ppm or greater PCBs are hazardous waste under Massachusetts law, but will be treated to reduce PCB concentration to a maximum of 2 ppm prior to reuse. The treatment process will generate a concentrated liquid PCB stream with concentrations exceeding 50 ppm. This material will be stored in drums in a locked shed with a curbed concrete floor in accordance with TSCA. This water will be disposed of at a TSCA-approved incinerator. The air treatment unit included in the thermal desorption system will treat air emissions to the limits required, and use of a Continuous Emissions Monitoring System (CEMS) will confirm emissions limits are met.	Applicable if PCB concentrations are >50 ppm; Relevant and appropriate if PCB concentrations are <50 ppm

Table B-5

Summary of Action-Specific ARARs and TBCs—Alternative 5A
High-Temperature Thermal Desorption
(Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Hazardous Waste	FEDERAL - RCRA, Land Disposal Regulations (40 CFR 268, Subpart C)	Prohibits the disposal of RCRA hazardous waste in the land unless treatment standards are met or a treatability variance is obtained.	Soils on-site are not expected to be classified as listed or characteristically hazardous waste under the federal definition. If thermal treatment causes soils to leach metals, thereby making them characteristic hazardous waste, the soils would be stabilized with cement prior to reuse or disposal. The oily, high-concentration PCB waste that will be generated during treatment of soils will be incinerated, not disposed of in the land. Materials not meeting established treatment standards and debris would be designated for off-site disposal and will be treated off-site if LDRs apply.	Applicable if the soils are listed waste or characteristic of hazardous waste under federal law
Hazardous Waste	FEDERAL - RCRA, 40 CFR 264 Subpart L - Waste Pile Requirements (Subtitle C)	Requires two or more liners and a leachate collection and removal system above and between such liners. In addition, the waste pile must be designed and constructed to control runon and runoff.	Excavated materials are not expected to be classified as listed or hazardous waste under federal law.	TBC
Ambient Air	FEDERAL - Clean Air Act (CAA) 40 CFR 50.6	Air quality regions must maintain maximum primary and secondary 24-hr (NAAQS) concentration for particulate emissions below 150 $\mu g/m^3$, with 24-hour average for particulates having a mean diameter of 10 micrometers or less. The annual standard is 50 $\mu g/m^3$, annual arithmetic mean.	If remedial actions may cause the air quality region to exceed standards, air dispersion monitoring will be performed to evaluate potential impacts of remedial actions to ambient air.	Applicable
Air	FEDERAL - New Source Performance Standards (40 CFR 60)	Selected remedies should be evaluated to determine if they meet any of the air emission devices regulated under the NSPS requirements. Regulated devices include steam generating units. These requirements typically include emission standards for specific pollutants and monitoring and recordkeeping.	The treatment system will be evaluated during treatability testing/design phase.	Applicable if boiler is subject to these regulations

Table B-5

Summary of Action-Specific ARARs and TBCs—Alternative 5A High-Temperature Thermal Desorption (Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Noise	FEDERAL - Noise Control Act (40 CFR 204, 205, 211)	Regulates construction and transportation equipment noise, process equipment and noise levels, and noise levels at the property boundaries of the project.	Engineering controls will be used on equipment to ensure site noise levels will be in accordance with federal requirements.	Relevant and appropriate
Dewatering water	STATE - Massachusetts Ground Water Discharge Permit Program 314 CMR 5.00	These standards require any facility that discharges a liquid effluent onto or below the land surface to obtain a permit. The discharge will not result in a violation of Massachusetts Surface Water Quality Standards 314 CMR 4.00 or Massachusetts Ground Water Quality Standards 314 CMR 6.00.	A permit will be required if there will be an off-site discharge.	Applicable if excavation activities will require dewatering (see Alternative 4)
Wastewater	STATE - Sewer System Extension and Permit Program (314 CMR 7.00), Operation and Maintenance and Pre-Treatment Standards for Wastewater Treatment Works and Indirect Discharges (314 CMR 12.00)	Regulates the discharge of industrial wastewater into the sanitary sewer system.	If wastewater cannot be discharged on-site or to surface water, it may be discharged off-site via the sanitary sewer. A permit will be obtained for this activity, and wastewater will be pretreated.	Applicable if discharge to POTW is selected as treated water disposal method
Surface Water	STATE - Massachusetts Surface Water Quality Standards 314 CMR 4.00	These standards designate the most sensitive uses for which the various waters of the Commonwealth will be enhanced, maintained, and protected. Minimum water quality criteria required to sustain the designated uses are established. Federal AWQC are to be considered in determining effluent discharge limits. Where recommended limits are not available, site-specific limits will be developed. Any on-site water treatment and discharge is subject to these requirements.	Wastewater discharge to surface water will only be performed under a NPDES permit or permit equivalency. Wastewater treatment will be performed prior to discharge. Effluent analysis will ensure that discharge limits that are protective of water quality are being met.	Applicable if discharge to surface water is selected as treated water disposal method

Table B-5

Summary of Action-Specific ARARs and TBCs—Alternative 5A
High-Temperature Thermal Desorption
(Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Wetlands	STATE - Massachusetts Wetlands Protection Act (310 CMR 10.000)	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling, alteration, or pollution of wetlands. Work within 100 feet of a wetland is regulated under this requirement. The requirement also defines wetlands based on vegetation type and requires that efforts on wetlands be mitigated. Each remedial alternative will be evaluated for its ability to attain regulatory performance standards, including mitigation of impacted wetland. These regulations also contain wildlife habitat evaluation provisions.	If alternatives involve removing, filling, dredging, or altering a DEP-defined wetland, or conducting work within 100 feet of a wetland, it will be demonstrated that either the modifications are not significant to the wetland or that the proposed work will contribute to the protection of the wetland. Whenever possible, remedial actions will be conducted so that impacts to wetlands and habitats will be minimized or mitigated.	Applicable
Dredged Materials	STATE - Water Quality Certification for Discharge of Dredged or Fill Material, Dredging and Dredged Material Disposal in Waters of the United States within the Commonwealth (314 CMR 9.00)	The substantive portions of these regulations establish criteria and standards for the dredging, handling, and disposal of fill material and dredged material.	Excavation, filling, and disposal operations will meet substantive criteria and standards in these regulations. The remedial alternative will be designed to ensure the maintenance or attainment of the MA Water Quality Standards in the affected water and to minimize the impact on the environment.	Applicable
Hazardous Waste	STATE - Massachusetts Hazardous Waste Regulations 310 CMR 30.640 – 310 CMR 30.649 – Waste Pile Requirements	Requires a liner that is a minimum of 4 feet above the probable high groundwater level and a leachate collection and removal system above the liner. In addition, the waste pile must be designed and constructed to control runon and runoff. Each owner using a single-lined waste pile will comply with 310 CCMR 660: Groundwater Protection.	Excavated soils will be stored under a temporary roofed structure and on a plastic liner equipped with runon and runoff controls in accordance with this regulation. However, due to the temporary nature of the storage pile in this project, compliance with all aspects of this regulation may not occur.	Applicable to excavated materials with 50 ppm or more PCB (MA02)

Table B-5

Summary of Action-Specific ARARs and TBCs—Alternative 5A High-Temperature Thermal Desorption (Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Air	STATE - Massachusetts Air Pollution Control Regulations (310 CMR 7.00, 310 CMR 7.00 Appendix C: Operating Permit Program)	310 CMR 7.02 requires a Limited Plan Application (LPA) prior to construction if potential emissions exceed 1 ton per year (tpy) (including fuel combustion products) or if fuel input to the process exceeds 10 MBtu/hr natural gas, propane, or distillate oil. A Comprehensive Plan Application (CPA) is required if potential emissions exceed 5 tpy or if the fuel input to the process exceeds 40 MBtu/hr natural gas or propane or 30 MBtu/hr distillate fuel. 310 CMR 7.02 generally requires the source to achieve best available control technology (BACT). Massachusetts regulates PCBs as a Hazardous Air Pollutant (HAP). If the source has the potential to emit greater than 10 tpy of a single HAP, 50 tpy of VOC or NO_x, or 100 tpy of any other regulated air pollutant, an operating permit is required. Furthermore, the selected remedial actions may fall under the definition of an incinerator per 310 CMR 7.08.	An LPA or CPA will be applied for, as required, based on site status. If site is included on the NPL, permit equivalencies will be obtained. Emissions controls will be used to prevent unacceptable levels of HAPs. A continuous emissions monitoring system (CEMS) will be used to monitor compliance with emissions limits.	Applicable - fuel input has been estimated at 25 MBtu/hr.
Wastewater	STATE - Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities (314 CMR 8.00)	Water treatment units that are exempt from M.G.L.a.21C and that treat, store, or dispose of hazardous wastes generated at the same site are regulated to ensure that such activities are conducted in a manner that protects public health and safety and the environment.	If on-site treatment of wastewater is performed, all processes will comply with Massachusetts requirements regarding location, technical standards, closure and post-closure, and management standards.	Relevant and appropriate

Table B-6

Summary of Action-Specific ARARs and TBCs—Alternative 5B-1
Soil Washing with Solvent Extraction

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Surface Water	FEDERAL - National Pollution Discharge Elimination System (NPDES) (40 CFR 122)	Regulates the discharge of water into public surface waters. Among other things, major requirements are: ▪ Use of best available technology (BAT) economically achievable is required to control toxic and nonconventional pollutants. Use of best conventional pollutant control technology (BCT) is required to control conventional pollutants. Technology-based limitations may be determined on a case-by-case basis. ▪ Must comply with applicable federally approved state water quality standards. These standards may be in addition to or more stringent than other federal standards under the CWA.	An NPDES permit will be obtained for any wastewater generated from dewatering during soil excavation or storage that is discharged off-site via surface water. It is not expected that any wastewater will be generated during soil treatment with solvent extraction because all wastewater generated is returned to the treated soil at the end of the process.	Applicable depending on discharge destination.
Wetlands	FEDERAL - Clean Water Act §404 (40 CFR 230)	No discharge of dredged or fill material will be permitted if there is a practicable alternative to the discharge that would have a less adverse impact to the aquatic ecosystem, as long as the alternative does not have other significant adverse environmental consequences. Appropriate and practicable steps must be taken that will minimize the potential adverse impacts of the discharge of the dredged material on the aquatic ecosystem.	Excavated materials will be dewatered or solidified/stabilized. Excavated or dredged materials will not be discharged to the aquatic system. Excavated areas will be filled with clean off-site materials, in accordance with 40 CFR 230.	Applicable

Table B-6

Summary of Action-Specific ARARs and TBCs—Alternative 5B-1
Soil Washing with Solvent Extraction
(Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Wetlands Floodplains	FEDERAL - Procedures on Floodplain Management and Wetlands Protection (40 CFR 6, App. A)	Federal agencies will avoid, whenever possible, the long- and short-term impacts associated with the destruction of wetlands and the occupancy and modifications of floodplains and wetlands development wherever there is a practicable alternative in accordance with Executive Orders 11990 and 11988. The agency will promote the preservation and restoration of floodplains so that their natural and beneficial values can be realized. Any plans for actions in wetlands or floodplains must be submitted for public review.	All practicable means will be used to minimize harm to wetlands. The site is not located within a 100-year floodplain. Wetlands disturbed by excavation will be restored to their original conditions. Temporary fill placed in wetlands for access roads and staging area will not have a significant impact on the extent of flooding.	Applicable
Surface Water Wetlands	FEDERAL - Fish and Wildlife Coordination Act (16 U.S.C 166 et seq.)	Any modification of a body of water requires prior consultation with the U.S. FWS to develop measures to prevent, mitigate, or compensate for losses to fish and wildlife.	If any losses to fish and wildlife are expected, U.S. FWS officials will be consulted and a plan to mitigate the damage will be put in place in accordance with this regulation.	Applicable

Table B-6

Summary of Action-Specific ARARs and TBCs—Alternative 5B-1
Soil Washing with Solvent Extraction
(Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Excavated/Dredged Materials, Treatment Residuals	FEDERAL, STATE - TSCA, Subpart D, Storage and Disposal (40 CFR 761.60, 761.61, 761.65, 761.70, 761.79, 761.125, 761.202, 761.265), Massachusetts Hazardous Waste Regulations (310 CMR 30.131).	All excavated/dredged materials and treatment residuals that contain PCBs at concentrations of 50 ppm or greater will be disposed of in an incinerator or in a chemical waste landfill or, upon application, using a disposal method to be approved by the EPA Region in which the PCBs are located. Massachusetts classifies wastes containing PCBs in concentrations equal to or greater than 50 ppm as hazardous waste MA02. On-site storage facilities for PCBs will meet, at a minimum, the following criteria: ▪ Adequate roof and walls to prevent rain from entering the structure. ▪ Adequate floor with continuous curbing. ▪ No openings that would permit liquids to flow from curbed area. In addition, storage facilities may not be located at a site that is below the 100-year flood water elevation. There are less stringent requirements for less than 30-day storage. For nonliquid PCBs, mass air emissions from an incinerator will be no greater than 0.001 g PCB/kg of the PCB introduced.	Two separate materials containing PCBs in concentrations exceeding 50 ppm will be handled in this alternative. The first material handled is the 40,000 yd^3 of excavated soil. The soil will be stored on a curbed pad and covered with a temporary roofed structure in accordance with this regulation. This soil will then be treated with solvent extraction. The treated soil will have residual PCB concentrations of less than 1 ppm and would no longer be subject to this regulation. The treatment process will generate a concentrated liquid PCB stream with concentrations far exceeding 50 ppm. This material will be stored in drums in a locked shed with a curbed concrete floor in accordance with this regulation. This waste will be disposed of in a TSCA-approved incinerator in accordance with this regulation. Incineration is an EPA-approved method for disposing of PCBs.	Applicable if PCB concentrations are > 50 ppm; relevant and appropriate if PCB concentrations are < 50 ppm.

Table B-6

Summary of Action-Specific ARARs and TBCs—Alternative 5B-1 Soil Washing with Solvent Extraction (Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Hazardous Waste	FEDERAL - RCRA, Land Disposal Regulations (40 CFR 268, Subpart C)	Prohibits the disposal of RCRA hazardous waste in the land unless treatment standards are met or a treatability variance is obtained.	Soils on-site are not expected to be classified as listed or characteristically hazardous waste. Excavated soils will be analyzed to confirm they should not be classified as hazardous waste. Excavated soils may be treated/stabilized/solidified to render them non-hazardous or, alternatively, to meet the treatability variance requirements in the LDRs. Materials not meeting established treatment standards and debris will be designated for off-site disposal and will be treated off-site if LDRs apply.	Applicable if the soils are listed waste or characteristic of hazardous waste under federal law.
Hazardous Waste	FEDERAL - RCRA, 40 CFR 264 Subpart L - Waste Pile Requirements (Subtitle C).	Requires two or more liners and a leachate collection and removal system above and between such liners. In addition, the waste pile must be designed and constructed to control runon and runoff.	Excavated materials are not expected to be classified as listed or hazardous waste under federal law.	Applicable if the soils are listed waste or characteristic of hazardous waste under federal law.
Ambient Air	FEDERAL - Clean Air Act (CAA) 40 CFR 50.6	Air quality regions must maintain maximum primary and secondary 24-hr (NAAQS) concentration for particulate emissions below 150 $\mu g/m^3$, 24-hour average for particulates having a mean diameter of 10 micrometers or less. The annual standard is 50 $\mu g/m^3$, annual arithmetic mean.	If remedial actions cause the air quality region to exceed standards, air dispersion monitoring will be performed to evaluate potential impacts of remedial actions to ambient air.	Applicable
Air	FEDERAL - New Source Performance Standards (40 CFR 60)	Selected remedies should be evaluated to determine if they meet any of the air emission devices regulated under the NSPS requirements. Regulated devices include steam generating units. These requirements typically include emission standards for specific pollutants and monitoring and recordkeeping.	It is not expected that the excavation and solvent extraction process used during this alternative will be regulated by these standards. However, regulators will be consulted to ensure compliance with this regulation.	Applicable if boiler is subject to these regulations.

Table B-6

Summary of Action-Specific ARARs and TBCs—Alternative 5B-1 Soil Washing with Solvent Extraction (Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Noise	FEDERAL - Noise Control Act (40 CFR 204, 205, 211)	Regulates construction and transportation equipment noise, process equipment and noise levels, and noise levels at the property boundaries of the project.	Site noise levels will be in accordance with federal requirements.	Relevant and appropriate
Dewatering water	STATE - Massachusetts Ground Water Discharge Permit Program 314 CMR 5.00	These standards require any facility that discharges a liquid effluent onto or below the land surface to obtain a permit. The discharge will not result in a violation of Massachusetts Surface Water Quality Standards 314 CMR 4.00 or Massachusetts Ground Water Quality Standards 314 CMR 6.00.	A permit will be obtained for any off-site discharge of wastewater generated from dewatering during soil excavation or storage that is applied onto the ground or returned to the groundwater at the site. It is not expected that any wastewater will be generated during soil treatment with solvent extraction because all wastewater generated is returned to the treated soil at the end of the process.	Applicable depending on discharge destination
Wastewater	STATE - Sewer System Extension and Permit Program (314 CMR 7.00), Operation and Maintenance and Pre-Treatment Standards for Wastewater Treatment Works and Indirect Discharges (314 CMR 12.00)	Regulates the discharge of industrial wastewater into the sanitary sewer system.	If wastewater generated from dewatering during soil excavation or storage cannot be discharged on-site or to surface water, it may be discharged off-site to the sanitary sewer. A permit will be obtained for this activity, and wastewater will be pretreated if necessary. It is not expected that any wastewater will be generated during soil treatment with solvent extraction because all wastewater generated is returned to the treated soil at the end of the process.	Applicable depending of discharge destination

Table B-6

Summary of Action-Specific ARARs and TBCs—Alternative 5B-1
Soil Washing with Solvent Extraction
(Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Surface Water	STATE - Massachusetts Surface Water Quality Standards 314 CMR 4.00	These standards designate the most sensitive uses for which the various waters of the Commonwealth will be enhanced, maintained, and protected. Minimum water quality criteria required to sustain the designated uses are established. Federal AWQC are to be considered in determining effluent discharge limits. Where recommended limits are not available, site-specific limits will be developed. Any on-site water treatment and discharge is subject to these requirements.	Any surface water discharge will comply with these standards. It is not expected that any wastewater will be generated during soil treatment with solvent extraction because all wastewater generated is returned to the treated soil at the end of the process.	Applicable depending of discharge destination
Wetlands	STATE - Massachusetts Wetlands Protection Act (310 CMR 10.000)	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling, alteration, or pollution of wetlands. Work within 100 feet of a wetland is regulated under this requirement. The requirement also defines wetlands based on vegetation type and requires that efforts on wetlands be mitigated. Each remedial alternative will be evaluated for its ability to attain regulatory performance standards, including mitigation of impacted wetland. These regulations also contain wildlife habitat evaluation provisions.	If alternatives involve removing, filling, dredging, or altering a DEP-defined wetland, or conducting work within 100 feet of a wetland, it will be demonstrated that either the modifications are not significant to the wetland or that the proposed work will contribute to the protection of the wetland. Whenever possible, remedial actions will be conducted so that impacts to wetlands and habitats will be minimized or mitigated.	Applicable
Dredged Materials	STATE - Water Quality Certification for Discharge of Dredged or Fill Material, Dredging and Dredged Material Disposal in Waters of the United States within the Commonwealth (314 CMR 9.00)	The substantive portions of these regulations establish criteria and standards for the dredging, handling, and disposal of fill material and dredged material.	Excavation, filling, and disposal operations will meet substantive criteria and standards in these regulations. The remedial alternative will be designed to ensure the maintenance or attainment of the MA Water Quality Standards in the affected water and to minimize the impact on the environment.	Applicable

Table B-6

Summary of Action-Specific ARARs and TBCs—Alternative 5B-1
Soil Washing with Solvent Extraction
(Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Hazardous Waste	STATE - Massachusetts Hazardous Waste Regulations 310 CMR 30.640 – 310 CMR 30.649 – Waste Pile Requirements	Requires a liner that is a minimum of 4 feet above the probable high groundwater level and a leachate collection and removal system above the liner. In addition, the waste pile must be designed and constructed to control runon and runoff. Each owner using a single-lined waste pile will comply with 310 CCMR 660: Groundwater Protection.	Excavated soils will be stored under a temporary roofed structure and on a plastic liner equipped with runon and runoff controls in accordance with this regulation. However, due to the temporary nature of the soil storage pile in this project, compliance with all aspects of this regulation may not occur.	Applicable to excavated materials with PCB concentrations greater than 50 ppm (MA02)
Air	STATE - Massachusetts Air Pollution Control Regulations (310 CMR 7.00, 310 CMR 7.00 Appendix C: Operating Permit Program)	310 CMR 7.02 requires a Limited Plan Application (LPA) prior to construction if potential emissions exceed 1 tpy (including fuel combustion products) or if fuel input to the process exceeds 10 MBtu/hr natural gas, propane, or distillate oil. A Comprehensive Plan Application (CPA) is required if potential emissions exceed 5 tpy or if the fuel input to the process exceeds 40 MBtu/hr natural gas or propane or 30 MBtu/hr distillate fuel. 310 CMR 7.02 generally requires the source to achieve best available control technology (BACT). Massachusetts regulates PCBs as a Hazardous Air Pollutant (HAP). If the source has the potential to emit greater than 10 tpy of a single HAP, 50 tpy of VOC or NO_x, or 100 tpy of any other regulated air pollutant, an operating permit is required. Furthermore, the selected remedial actions may fall under the definition of an incinerator per 310 CMR 7.08.	Excavation and soil treatment activities during this alternative are not expected to generate air emissions requiring an air permit. Solvent extraction is a closed loop system so that the only air emissions are associated with the boiler and several other low-volume streams. All air emissions are passed through scrubbers and activated carbon. If potential emissions exceed 1 tpy, an LPA or CPA will be submitted to the state.	Applicable
Wastewater	STATE - Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities (314 CMR 8.00)	Water treatment units that are exempt from M.G.L.a.21C and that treat, store, or dispose of hazardous wastes generated at the same site are regulated to ensure that such activities are conducted in a manner that protects public health and safety and the environment.	If on-site treatment of wastewater is performed, all processes will comply with Massachusetts requirements regarding location, technical standards, closure and post-closure, and management standards.	Relevant and Appropriate

Table B-7

Summary of Action-Specific ARARs and TBCs—Alternative 5B-2
Chemical Dechlorination

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Surface Water	FEDERAL - National Pollution Discharge Elimination System (NPDES) (40 CFR 122)	Regulates the discharge of water into public surface waters. Major requirements include: ▪ Use of best available technology (BAT) economically achievable is required to control toxic and nonconventional pollutants. Use of best conventional pollutant control technology (BCT) is required to control conventional pollutants. Technology-based limitations may be determined on a case-by-case basis. ▪ Compliance with applicable federally approved state water quality standards. These standards may be in addition to or more stringent than other federal standards under the CWA.	An NPDES permit will be obtained for any wastewater generated from dewatering during soil excavation or storage that is discharged off-site via surface water. It is not expected that any wastewater will be generated during soil treatment with the chemical dechlorination process.	Applicable depending on discharge destination.
Wetlands	FEDERAL - Clean Water Act §404 (40 CFR 230)	No discharge of dredged or fill material will be permitted if there is a practicable alternative to the discharge that would have a less adverse impact to the aquatic ecosystem, as long as the alternative does not have other significant adverse environmental consequences. Appropriate and practicable steps must be taken that will minimize the potential adverse impacts of the discharge of the dredged material on the aquatic ecosystem.	Excavated materials will be dewatered or solidified/stabilized. Excavated or dredged materials will not be discharged to the aquatic system. Excavated areas will be filled with clean off-site materials, in accordance with 40 CFR 230.	Applicable

Table B-7

Summary of Action-Specific ARARs and TBCs—Alternative 5B-2 Chemical Dechlorination (Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Wetlands Floodplains	FEDERAL - Procedures on Floodplain Management and Wetlands Protection (40 CFR 6, App. A)	Federal agencies will avoid, whenever possible, the long- and short-term impacts associated with the destruction of wetlands and the occupancy and modifications of floodplains and wetlands development wherever there is a practicable alternative in accordance with Executive Orders 11990 and 11988. The agency will promote the preservation and restoration of floodplains so that their natural and beneficial values can be realized. Any plans for actions in wetlands or floodplains must be submitted for public review.	All practicable means will be used to minimize harm to wetlands. The site is not located within a 100-year floodplain. Wetlands disturbed by excavation will be restored to their original conditions. Temporary fill placed in wetlands for access roads and staging area will not have a significant impact on the extent of flooding.	Applicable
Surface Water Wetlands	FEDERAL - Fish and Wildlife Coordination Act (16 U.S.C 166 et seq.)	Any modification of a body of water requires prior consultation with the U.S. FWS to develop measures to prevent, mitigate, or compensate for losses to fish and wildlife.	If any losses to fish and wildlife are expected in this project, U.S. FWS officials will be consulted and a plan to mitigate the damage will be put in place in accordance with this regulation.	Applicable

Table B-7

Summary of Action-Specific ARARs and TBCs—Alternative 5B-2 Chemical Dechlorination (Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Excavated/ Dredged Materials, Treatment Residuals	FEDERAL, STATE - TSCA, Subpart D, Storage and Disposal (40 CFR 761.60, 761.61, 761.65, 761.70, 761.79, 761.125, 761.202, 761.265), Massachusetts Hazardous Waste Regulations (310 CMR 30.131).	All excavated/dredged materials and treatment residuals that contain PCBs at concentrations of 50 ppm or greater will be disposed of in an incinerator or in a chemical waste landfill, or, upon application, using a disposal method to be approved by the EPA Region in which the PCBs are located. Massachusetts classifies wastes containing PCBs in concentrations equal to or greater than 50 ppm as hazardous waste MA02. On-site storage facilities for PCBs will meet, at a minimum, the following criteria: ▪ Adequate roof and walls to prevent rain from entering the structure. ▪ Adequate floor with continuous curbing. ▪ No openings that would permit liquids to flow from curbed area. In addition, storage facilities may not be located at a site that is below the 100-year flood water elevation. There are less stringent requirements for less than 30-day storage. For nonliquid PCBs, mass air emissions from an incinerator will be no greater than 0.001 g PCB/kg of the PCB introduced.	Excavated soil will be stored on a curbed pad and covered with a temporary roofed structure in accordance with this regulation. This soil will then be treated with the solvated electron technology (SET) dechlorination treatment process. The treated soil will have residual PCB concentrations of less than 1 ppm and would no longer be subject to this regulation. The treatment process will generate a concentrated still bottom stream containing NaCl and TPH. It is not expected to contain PCBs (i.e., is not subject to TSCA) because they are destroyed in the process.	Applicable if PCB concentrations are > 50 ppm; relevant and appropriate if PCB concentrations are < 50 ppm.

Table B-7

Summary of Action-Specific ARARs and TBCs—Alternative 5B-2 Chemical Dechlorination (Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Hazardous Waste	FEDERAL - RCRA, Land Disposal Regulations (40 CFR 268, Subpart C)	Prohibits the disposal of RCRA hazardous waste in the land unless treatment standards are met or a treatability variance is obtained.	Soils on-site are not expected to be classified as listed or characteristically hazardous waste. Excavated soils will be analyzed to confirm they should not be classified as hazardous waste. Excavated soils may be further treated, stabilized, or solidified to render them nonhazardous or, alternatively, to meet the treatability variance requirements in the LDRs. Materials not meeting established treatment standards and debris will be designated for off-site disposal and treated off-site if LDRs apply.	Applicable if the soils are listed waste or characteristic of hazardous waste under federal law.
Hazardous Waste	FEDERAL - RCRA, 40 CFR 264 Subpart L - Waste Pile Requirements (Subtitle C)	Requires two or more liners and a leachate collection and removal system above and between such liners. In addition, the waste pile must be designed and constructed to control runon and runoff.	Excavated materials are not expected to be classified as listed or hazardous waste under federal law.	Applicable if the soils are listed waste or characteristic of hazardous waste under federal law.
Ambient Air	FEDERAL - Clean Air Act (CAA) 40 CFR 50.6	Air quality regions must maintain maximum primary and secondary 24-hr (NAAQS) concentration for particulate emissions below 150 $\mu g/m^3$, 24-hour average for particulates having a mean diameter of 10 micrometers or less. The annual standard is 50 $\mu g/m^3$, annual arithmetic mean.	If remedial actions cause the air quality region to exceed standards, air dispersion monitoring will be performed to evaluate potential impacts of remedial actions to ambient air.	Applicable
Air	FEDERAL - New Source Performance Standards (40 CFR 60)	Selected remedies should be evaluated to determine if they meet any of the air emission devices regulated under the NSPS requirements. Regulated devices include steam generating units. These requirements typically include emission standards for specific pollutants and monitoring and recordkeeping.	It is not expected that the excavation and chemical dechlorination process used during this alternative will be regulated by these standards. However, regulators will be consulted to ensure compliance with this regulation.	TBC

Table B-7

Summary of Action-Specific ARARs and TBCs—Alternative 5B-2 Chemical Dechlorination (Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Noise	FEDERAL - Noise Control Act (40 CFR 204, 205, 211)	Regulates construction and transportation equipment noise, process equipment and noise levels, and noise levels at the property boundaries of the project.	Site noise levels will be in accordance with federal requirements.	Relevant and appropriate
Dewatering water	STATE - Massachusetts Ground Water Discharge Permit Program 314 CMR 5.00	These standards require any facility that discharges a liquid effluent onto or below the land surface to obtain a permit. The discharge will not result in a violation of Massachusetts Surface Water Quality Standards 314 CMR 4.00 or Massachusetts Ground Water Quality Standards 314 CMR 6.00.	A permit will be obtained for any off-site discharge of wastewater generated from dewatering during soil excavation or storage that is applied onto the ground or returned to the groundwater at the site. It is not expected that any wastewater will be generated during soil treatment with the chemical dechlorination process.	Applicable depending on discharge destination
Wastewater	STATE - Sewer System Extension and Permit Program (314 CMR 7.00), Operation and Maintenance and Pre-Treatment Standards for Wastewater Treatment Works and Indirect Discharges (314 CMR 12.00)	Regulates the discharge of industrial wastewater into the sanitary sewer system.	If wastewater generated from dewatering during soil excavation or storage cannot be discharged on-site or to surface water, it may be discharged off-site to the sanitary sewer. A permit will be obtained for this activity, and wastewater will be pretreated if necessary. It is not expected that any wastewater will be generated during soil treatment with the chemical dechlorination process.	Applicable depending on discharge destination
Surface Water	STATE - Massachusetts Surface Water Quality Standards 314 CMR 4.00	These standards designate the most sensitive uses for which the various waters of the Commonwealth will be enhanced, maintained, and protected. Minimum water quality criteria required to sustain the designated uses are established. Federal AWQC are to be considered in determining effluent discharge limits. Where recommended limits are not available, site-specific limits will be developed. Any on-site water treatment and discharge is subject to these requirements.	Any surface water discharge will comply with these standards. It is not expected that any wastewater will be generated during soil treatment with the chemical dechlorination process.	Applicable depending on discharge destination

Table B-7

Summary of Action-Specific ARARs and TBCs—Alternative 5B-2
Chemical Dechlorination
(Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Wetlands	STATE - Massachusetts Wetlands Protection Act (310 CMR 10.000)	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling, alteration, or pollution of wetlands. Work within 100 feet of a wetland is regulated under this requirement. The requirement also defines wetlands based on vegetation type and requires that efforts on wetlands be mitigated. Each remedial alternative will be evaluated for its ability to attain regulatory performance standards, including mitigation of impacted wetland. These regulations also contain wildlife habitat evaluation provisions.	If alternatives involve removing, filling, dredging, or altering a DEP-defined wetland, or conducting work within 100 feet of a wetland, it will be demonstrated that either the modifications are not significant to the wetland or that the proposed work will contribute to the protection of the wetland. Whenever possible, remedial actions will be conducted so that impacts to wetlands and habitats will be minimized or mitigated.	Applicable
Dredged Materials	STATE - Water Quality Certification for Discharge of Dredged or Fill Material, Dredging and Dredged Material Disposal in Waters of the United States within the Commonwealth (314 CMR 9.00)	The substantive portions of these regulations establish criteria and standards for the dredging, handling, and disposal of fill material and dredged material.	Excavation, filling, and disposal operations will meet substantive criteria and standards in these regulations. The remedial alternative will be designed to ensure the maintenance or attainment of the MA Water Quality Standards in the affected water and to minimize the impact on the environment.	Applicable
Hazardous Waste	STATE - Massachusetts Hazardous Waste Regulations 310 CMR 30.640 – 310 CMR 30.649 – Waste Pile Requirements	Requires a liner that is a minimum of 4 feet above the probable high groundwater level and a leachate collection and removal system above the liner. In addition, the waste pile must be designed and constructed to control runon and runoff. Each owner using a single-lined waste pile will comply with 310 CCMR 660: Groundwater Protection.	Excavated soils will be stored under a temporary roofed structure and on a plastic liner equipped with runon and runoff controls in accordance with this regulation. However, due to the temporary nature of the soil storage pile in this project, full compliance with all aspects of this regulation may not occur.	Applicable to excavated materials with PCB concentrations greater than 50 ppm (MA02)

Table B-7

Summary of Action-Specific ARARs and TBCs—Alternative 5B-2
Chemical Dechlorination
(Continued)

Media	Requirement	Requirement Synopsis	Action to be Taken to Attain Requirements	Status
Air	STATE - Massachusetts Air Pollution Control Regulations (310 CMR 7.00, 310 CMR 7.00 Appendix C: Operating Permit Program)	310 CMR 7.02 requires a Limited Plan Application (LPA) prior to construction if potential emissions exceed 1 tpy (including fuel combustion products) or if fuel input to the process exceeds 10 MBtu/hr natural gas, propane, or distillate oil. A Comprehensive Plan Application (CPA) is required if potential emissions exceed 5 tpy or if the fuel input to the process exceeds 40 MBtu/hr natural gas or propane or 30 MBtu/hr distillate fuel. 310 CMR 7.02 generally requires the source to achieve best available control technology (BACT). Massachusetts regulates PCBs as a Hazardous Air Pollutant (HAP). If the source has the potential to emit greater than 10 tpy of a single HAP, 50 tpy of VOC or NO_x, or 100 tpy of any other regulated air pollutant, an operating permit is required. Furthermore, the selected remedial actions may fall under the definition of an incinerator per 310 CMR 7.08.	Excavation and soil treatment activities during this alternative are not expected to generate air emissions requiring an air permit. Chemical dechlorination is a closed loop system and there are no anticipated air emissions. If potential emissions exceed 1 tpy, an LPA or CPA will be submitted to the state.	Applicable depending on potential emissions.
Wastewater	STATE - Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities (314 CMR 8.00)	Water treatment units that are exempt from M.G.L.a.21C and which treat, store, or dispose of hazardous wastes generated at the same site are regulated to ensure that such activities are conducted in a manner that protects public health and safety and the environment.	If on-site treatment of wastewater is performed, all processes will comply with Massachusetts requirements regarding location, technical standards, closure and post-closure, and management standards.	Relevant and appropriate

APPENDIX C

COST TABLES

Table C-1
Present Worth Costs for Alternative 2
Limited Action/Institutional Controls

(A) Capital Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**DEED RESTRICTIONS**	1	LS	#######	20,000	**20,000**
II	**ANALYTICAL COSTS**					
1	PRE-REMEDIAL INVESTIGATION SAMPLES (50 locations)					
a	PCB analysis @ offsite lab	120	SMPL	150.00	18,000	
b	Analysis for other COCs @ offsite lab (PCB congeners & dioxins every 10 smpls; metals, SVOCs, & Pesticides every 4 smpls)	1	LS	#######	50,500	
c	Validation	234	SMPL	45.00	10,530	
d	Equipment/supplies	234	SMPL	25.00	5,850	
e	Labor (2 geologists)	1	LS	#######	11,700	
f	Geoprobe/ Drill rig	10	DAY	2000.00	20,000	
	Subtotal					116,580
	TOTAL COST ANALYTICAL COSTS					**116,580**
	CAPITAL COST SUBTOTAL					**136,580**
	ENGINEERING, PROCUREMENT, LEGAL AND ADMINISTRATIVE COSTS: @ 20%				27,316	
	CAPITAL COST SUBTOTAL					**163,896**
	CONTINGENCY @ 15%				24,584	
	TOTAL CAPITAL COST (ROUNDED)					**188,000**

Table C-1 (Continued)
Present Worth Costs for Alternative 2
Limited Action/Institutional Controls

(B) Operation and Maintenance Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**INSPECTIONS AND MAINTENANCE OF EXISTING CAP**					
1	BIANNUAL INSPECTIONS	2	EA	800.00	1,600	1,600
2	MAINTENANCE	1	LS	1000.00	1,000	1,000
	SUBTOTAL					**2,600**
II	**SARA REVIEW (AT YEARS 5, 10, 15, 20, 25, 30)**	6	EA	15000.00		
	ANNUAL SUBTOTAL FOR 30 YEAR PROJECT LIFE					**2,600**
	CONTINGENCY (10%)					260
	TOTAL ANNUAL O&M 30 YEAR PROJECT LIFE					**2,860**
	NON-ANNUAL SUBTOTAL FOR YEARS 5, 10, 15, 20, 25, 30					**15,000**
	CONTINGENCY (10%)					1,500
	TOTAL NON-ANNUAL O&M, YEARS 5, 10, 15, 20, 25, 30					**16,500**

Table C-1 (Continued)
Present Worth Costs for Alternative 2
Limited Action/Institutional Controls

(C) Summary of Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**CAPITAL TOTAL**				188,000	
II	**TOTAL PRESENT WORTH OF O&M COST :**					
	INFLATION RATE = 4%					
	DISCOUNT RATE = 7%					
	PRESENT WORTH OF ANNUAL O&M AT 30 YEAR PROJECT LIFE				56,000	
	PRESENT WORTH OF NON-ANNUAL O&M AT 30 YEAR PROJECT LIFE				61,000	
III	**PRESENT WORTH COST ALTERNATIVE 1-30 YEARS**					**305,000**

Table C-2
Present Worth Costs for Alternative 4A
Excavation, Off-Site Treatment and/or Disposal

(A) Capital Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**PLANS / SUBMITTALS**					
1	PLANS (Work Plan / Health & Safety Plan / Sampling & Analysis Plan / Construction Quality Control)	1	LS	40000.00	40,000	40,000
2	FINAL REPORT	1	LS	40000.00	40,000	40,000
	TOTAL COST FOR PLANS / SUBMITTALS					**80,000**
II	**EXCAVATION**					
1	MOBILIZATION / DEMOBILIZATION	1	LS	20000.00	20,000	20,000
2	CONSTRUCTION SUPPORT (trailers, utilities, health and safety equipment, etc.)	5	MO	3960.00	19,800	19,800
3	SITE PREPARATION (2 weeks)					
a	Construction Equipment (excavator, dozer, loader, truck, water truck, roller, and maintenance)	2	WK	17050.00	34,100	
b	Labor (site manager, SHSC, QC, technicians, equip. operators, labo	10	DAY	7110.00	71,100	
c	Travel (6 people @ $ 86/day)	10	DAY	516.00	5,160	
d	Construct access roads, decon. pad; clear & grub trees, fencing, signage, & barricades	1	LS	28000.00	28,000	
	Site Preparation Subtotal					138,360
4	SOIL EROSION & SEDIMENTATION CONTROL MEASURES	1	LS	10000.00	10,000	10,000
5	EXCAVATION OF SOIL (38 days or 8 wk)					
a	Construction Equipment (excavators, dozers, loaders, trucks, water truck, roller, and maintenance)	2	MO	########	227,600	
b	Labor (site manager, SHSC, QC, technicians, equip. operators, laborers, detail officers)	38	DAY	13680.00	519,840	
c	Travel (6 people @ $ 86/day)	38	DAY	516.00	19,608	
d	PPE/Monitoring (crew of 16 @ $100/day)	38	DAY	1600.00	60,800	
e	Water for dust suppression	171000	GAL	0.05	8,550	
f	Dewatering equipment and piping to sewer	1	LS	########	110,000	
g	Contaminated water (decon. water & dewatering)	782800	GAL	0.30	234,840	
	Excavation of Soil/Sediment Subtotal					1,181,238
	TOTAL COST FOR EXCAVATION					**1,369,398**
III	**BACKFILLING / RESTORATION (6 wk)**					
1	CONSTRUCTION EQUIPMENT (excavators, dozers, loaders, trucks, water truck, roller, and maintenance)	2	MO	########	227,600	227,600
2	LABOR (site manager, SHSC, QC, technicians, equip. operators, laborers, detail officers)	30	DAY	13680.00	410,400	410,400
3	TRAVEL (6 people @ $ 86/day)	30	DAY	516.00	15,480	15,480
4	CONTAMINATED WATER (decon. water & dewatering)	1	LS	########	180,000	180,000
5	COMMON BORROW (backfill materials)	50850	TON	6.35	322,898	322,898
6	SITE RESTORATION					
a	Loam	6150	TON	14.60	89,790	
b	Hydroseed	217800	SF	0.05	10,890	
c	Ballfield / wetlands / trees restoration	1	LS	60000.00	60,000	
	Site Restoration Subtotal					160,680
	TOTAL COST FOR BACKFILLING / RESTORATION					**1,317,058**

Table C-2
Present Worth Costs for Alternative 4A
Excavation, Off-Site Treatment and/or Disposal

(A) Capital Costs (cont.)

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
IV	**TRANSPORTATION AND DISPOSAL**					
1	TRANSPORT and TREAT / DISPOSE of SOIL at TSCA FACILITY (> 50 ppm)	9000	TON	250.00	########	2,250,000
2	TRANSPORT and TREAT / DISPOSE of SOIL at SPECIAL WASTE FACILITY (25 < ppm < 50)	9600	TON	85.00	816,000	816,000
3	TRANSPORT and TREAT / DISPOSE of SOIL at SPECIAL WASTE FACILITY (0 < ppm < 25)	38410	TON	65.00	########	2,496,650
	TOTAL COST FOR TRANSPORTATION AND DISPOSAL					**5,562,650**
V	**ANALYTICAL COSTS**					
1	ONSITE LAB					
a	Mobilization / Demobilization	2	EA	5000.00	10,000	
b	Rental of lab / PCB analyses (max 30 PCB smpl's per day)	12	WK	1500.00	18,000	
	Confirmation Samples Subtotal					28,000
2	POST REMEDIATION SAMPLES (floor & wall)					
a	PCB analysis @ onsite lab	246	SMPL	150.00	36,900	
b	Offsite verification (10%)	21	SMPL	150.00	3,150	
c	Validation	267	SMPL	45.00	12,015	
d	Equipment/supplies	267	SMPL	25.00	6,675	
e	Shipping (3/wk for 12 wk)	36	EA	75.00	2,700	
f	Labor (2 sample technicians)	1	LS	6015.00	6,015	
	Post Remediation Samples Subtotal					67,455
3	PRE-REMEDIAL INVESTIGATION SAMPLES (50 locations)					
a	PCB analysis @ offsite lab	120	SMPL	150.00	18,000	
b	Analysis for other COCs @ offsite lab (PCB congeners & dioxins every 10 smpls; metals, SVOCs, & Pesticides every 4 smpls)	1	LS	50500.00	50,500	
c	Validation	130	SMPL	45.00	5,850	
d	Equipment/supplies	130	SMPL	25.00	3,250	
e	Labor (2 geologists)	1	LS	11700.00	11,700	
f	Geoprobe/ Drill rig	10	DAY	2000.00	20,000	
	Pre-remedial Investigation Samples Subtotal					109,300
4	CONTAMINATION DELINEATION SAMPLES					
a	PCB analysis @ offsite lab	246	SMPL	150.00	36,900	
b	Offsite verification for PCBs and analysis for other COCs	1	LS	########	105,840	
c	Validation	473	SMPL	45.00	21,285	
d	Equipment/supplies	473	SMPL	25.00	11,825	
e	Labor (2 geologists)	1	LS	5850.00	5,850	
f	Geoprobe/ Drill rig	5	DAY	2000.00	10,000	
	Subtotal					191,700

Table C-2
Present Worth Costs for Alternative 4A
Excavation, Off-Site Treatment and/or Disposal

(A) Capital Costs (cont.)

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
5	WATER SAMPLES FOR SEWER DISCHARGE COMPLIANCE (2 per week)					
a	Equipment/supplies	36	SMPL	25.00	900	
b	Labor (2 sample technicians)	1	LS	810.00	810	
c	Analysis - sewer discharge compliance	36	SMPL	500.00	18,000	
	Water Samples for Sewer Compliance Discharge Subtotal					19,710
6	DISPOSAL CHARACTERIZATION					
a	PCB sampling	228	SMPL	150.00	34,200	
b	Full characterization	29	SMPL	1250.00	36,250	
c	Equipment/supplies	257	SMPL	25.00	6,425	
d	Labor (2 sample technicians)	1	LS	5790.00	5,790	
	Disposal Characterization Subtotal					82,665
	TOTAL COST FOR ANALYTICAL COSTS					**498,830**
	CAPITAL COST SUBTOTAL					**8,907,936**
	ENGINEERING, PROCUREMENT, LEGAL AND					
	ADMINISTRATIVE COSTS: @ 20%				1,781,587	
	CAPITAL COST SUBTOTAL					**10,689,523**
	CONTINGENCY @ 15%				1,603,428	
	TOTAL CAPITAL COST (ROUNDED)					**12,293,000**

Table C-2 (Continued)
Present Worth Costs for Alternative 4A
Excavation, Off-Site Treatment and/or Disposal

(B) Operation and Maintenance Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**SARA REVIEW (AT YEARS 5)**	1	EA	15000.00	15,000	15,000
	SUBTOTAL					**15,000**
	CONTINGENCY (10%)					1,500
	TOTAL O&M					**16,500**

Table C-2 (Continued)
Present Worth Costs for Alternative 4A
Excavation, Off-Site Treatment and/or Disposal

(C) Summary of Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**CAPITAL TOTAL**				12,293,000	
II	**TOTAL PRESENT WORTH OF O&M COST :**					
	INFLATION RATE = 4%					
	DISCOUNT RATE = 7%					
	PRESENT WORTH OF O&M				14,000	
III	**PRESENT WORTH COST ALTERNATIVE 1 - 5 YEARS**					**12,307,000**

Table C-3
Present Worth Costs for Alternative 4B
Excavation, Disposal at Another OU

(A) Capital Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**PLANS / SUBMITTALS** (See Table C-2 for Details)	1	LS	80000.00	80,000	**80,000**
II	**SOIL CAP DESIGN REPORT** (30%, 60%, 75%, 100%)	1	LS	80000.00	80,000	**80,000**
III	**EXCAVATION** (See Table C-2 for Details)	1	LS	########	1,369,398	**1,369,398**
IV	**BACKFILLING / RESTORATION** (See Table C-2 for Details)	1	LS	########	1,317,058	**1,317,058**
V	**TRANSPORTATION AND STAGING OF SOILS > 50 PPM AT ANOTHER OU** (within one mile)					
1	CONSTRUCTION OF CONTAMINATED SOIL STAGING AREA (1 week)					
a	Equipment (dozer, roller, loader, & maintenance)	1	WK	7525.00	7,525	
b	HDPE liner, sand, geotextile, drainage pipe, crushed stone, etc.	1	LS	13400.00	13,400	
c	10-mil HDPE	1	LS	2376.00	2,400	
d	Labor	5	DAY	7920.00	39,600	
	Construction of Contaminated Soil Staging Area Subtotal					62,925
2	TRANSPORT CONTAMINATED SOIL TO STAGING AREA (within one mile)					
a	Mobilization / demobilization	2	EA	1000.00	2,000	
b	Equipment (dump trailers, dozer)	0.25	MO	29475.00	7,369	
c	Road repair	1	LS	800.00	800	
d	Barricades / signage	0.5	WK	16700.00	8,350	
e	Labor (operator, detail officers)	5	DAY	1970.00	9,850	
	Transport Contaminated Soil to Staging Area Subtotal					28,369
3	PLACE SOIL IN STAGING AREA					
a	Equipment (loaders, excavators)	0.25	MO	46000.00	11,500	
b	Labor	0.25	MO	14400.00	3,600	
	Place Soil in Staging Area Subtotal					15,100
	TOTAL COST FOR CONTAMINATED SOIL TRANSPORTATION AND STAGING AT ANOTHER OU					**106,394**
VI	**TRANSPORTATION AND STAGING OF SOILS < 50 PPM AT HILL 78**					
1	(3.5 weeks)					
a	Equipment (dozer, roller, loader, & maintenance)	3	WK	7525.00	22,575	
b	HDPE liner, sand, geotextile, drainage pipe, crushed stone, etc.	1	LS	56500.00	56,500	
c	10-mil HDPE	1	LS	52900.00	10,600	
d	Labor	15	DAY	7920.00	118,800	
	Construction of Contaminated Soil Staging Area Subtotal					208,475
2	TRANSPORT CONTAMINATED SOIL TO STAGING AREA AT					
a	Mobilization / demobilization	2	EA	1000.00	2,000	
b	Equipment (dump trailers, dozer)	1.75	MO	117900.00	206,325	
c	Road repair	1	LS	5000.00	5,000	
d	Barricades / signage	2	WK	16700.00	33,400	
e	Labor (operator, detail officers)	35	DAY	1970.00	68,950	
	Transport Contaminated Soil to Staging Area Subtotal					315,675
3	PLACE SOIL IN STAGING AREA AT HILL 78					
a	Equipment (loaders, excavators)	1.75	MO	46000.00	80,500	
b	Labor	1.75	MO	14400.00	25,200	
	Place Soil in Staging Area Subtotal					105,700
	TOTAL COST FOR CONTAMINATED SOIL TRANSPORTATION AND STAGING AT HILL 78					**629,850**

Table C-3
Present Worth Costs for Alternative 4B
Excavation, Disposal at Another OU

(A) Capital Costs (cont.)

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
VII	**PLACEMENT AND CAPPING OF SOILS ON HILL 78**					
1	PERIMETER REGRADING (includes 30% expansion ex-situ)	9300	CY	4.80	44,640	44,640
2	MINOR CUTS, FILLS, GRADING, AND CONTOURING (10% of Hill	4200	CY	4.80	20,160	20,160
3	PLACEMENT OFSOILS ON HILL 78 (includes 30% expansion ex-si	49300	CY	4.80	236,640	236,640
4	SAND SUBBASE (12" LIFT)	2300	CY	13.20	30,360	30,360
5	GEOTEXTILE FABRIC	54500	SF	0.24	13,080	13,080
6	BENTONITE MAT	54500	SF	0.90	49,050	49,050
7	40-MIL VLDPE GEOMEMBRANE	54500	SF	1.14	62,130	62,130
8	DRAINAGE NET	54500	SF	0.42	22,890	22,890
9	GEOTEXTILE FABRIC	54500	SF	0.24	13,080	13,080
10	SAND/FILL (36" LIFT)	6060	CY	13.20	79,992	79,992
11	LOAM (6" LIFT)	1010	CY	19.20	19,392	19,392
12	FERTILIZE AND SEED	60000	SF	0.06	3,600	3,600
13	DRAINAGE, EROSION, AND SEDIMENTATION CONTROL	1	LS	5,356.14	5,356	5,356
14	MISCELLANEOUS SITEWORK ALLOWANCE	1	LS	2,400.00	2,400	2,400
15	TESTING ALLOWANCE	1	LS	1,339.29	1,339	1,339
16	ACCESS RESTRICTIONS (INCLUDES 1510 FEET FENCING, GATE AND SIGNAGE)	1	LS	30,500.00	30,500	30,500
	TOTAL COST FOR PLACEMENT AND CAPPING OF SOILS ON HILL 78					**634,609**
VIII	**INSTALLATION OF WELLS TO MONITOR EFFECTIVENESS OF CAP**	5	WELL	12,000.00	60,000	**60,000**
IX	**ANALYTICAL COSTS ASSOCIATED WITH EXCAVATION** (Table C-2: Items V.1 - 6)	1	LS	498830.00	498,830	**498,830**
X	**MAINTENANCE OF STAGING AREA FOR 18 MONTHS**					
1	LABOR (ASSUME 2 TECHNICIANS TO INSPECT/REPAIR STAGING AREA ON A SEMI-MONTHLY BASIS)	36	DAY	1200.00	43,200	43,200
2	TRAVEL (2 PEOPLE @$34/DAY)	36	DAY	68.00	2,448	2,448
3	TOOLS/EQUIPMENT	36	DAY	500.00	18,000	18,000
	TOTAL COST FOR MAINTENANCE OF STAGING AREA					**63,648**
	CAPITAL COST SUBTOTAL					**4,839,787**
	ENGINEERING, PROCUREMENT, LEGAL AND					
	ADMINISTRATIVE COSTS: @ 20%				967,957	
	CAPITAL COST SUBTOTAL					**5,807,744**
	CONTINGENCY @ 15%				871,162	
	TOTAL CAPITAL COST (ROUNDED)					**6,679,000**

Table C-3 (Continued)
Present Worth Costs for Alternative 4B
Excavation, Disposal at Another OU

(B) Operation and Maintenance Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**ANNUAL MAINTENANCE AND MONITORING**					
1	COVER SYSTEM MAINTENANCE (@ 2% OF CAPITAL)	1	LS	6053.39	6,053	6,053
2	SEMIANNUAL GROUNDWATER MONITORING (5 WELLS)					
a	Labor (two technicians, one day per event)	2	DAY	1200.00	2,400	
b	Laboratory Analysis (PCBs, congeners, metals, dioxins, pesticides, VOC, SVOCs)	14	SMPL	1500.00	21,000	
c	Validation	14	SMPL	45.00	630	
d	Equipment/supplies	2	DAY	500.00	1,000	
e	Travel (2 people @ $34/day)	2	DAY	68.00	136	
	Subtotal Semiannual Groundwater Monitoring					31,219
	TOTAL COST FOR ANNUAL MAINTENANCE AND MONITORING					**37,273**
II	**NON-ANNUAL MAINTENANCE AND MONITORING**					
1	REPLACE FENCE AT YEAR 15	1	LS	30500.00	30,500	30500
2	REPLACE MONITORING WELLS AT YEAR 20	1	LS	60000.00	60,000	60000
3	SARA REVIEW (AT YEAR 5)	1	EA	15000.00	15,000	15000
	CONTINGENCY (10%)					
	NON-ANNUAL SUBTOTAL FOR YEAR 5					16500
	NON-ANNUAL SUBTOTAL FOR YEAR 15					33550
	NON-ANNUAL SUBTOTAL FOR YEAR 20					66000
	ANNUAL SUBTOTAL FOR 30 YEAR PROJECT LIFE					**37,273**
	CONTINGENCY (10%)					3,727
	TOTAL ANNUAL O&M 30 YEAR PROJECT LIFE					**41,000**

Table C-3 (Continued)
Present Worth Costs for Alternative 4B
Excavation, Disposal at Another OU

(C) Summary of Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**CAPITAL TOTAL**				6,679,000	
II	**TOTAL PRESENT WORTH OF O&M COST :**					
	INFLATION RATE = 4%					
	DISCOUNT RATE = 7%					
	PRESENT WORTH OF ANNUAL O&M AT 30 YEAR PROJECT LIFE				39,000	
	PRESENT WORTH OF NON-ANNUAL O&M AT 30 YEAR PROJECT LIFE				73,000	
III	**PRESENT WORTH COST ALTERNATIVE 1 - 5 YEARS**					**6,791,000**

Table C-4
Present Worth Costs for Alternative 5A
Excavation, Thermal Treatment at Another OU, Disposal

(A) Capital Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**PLANS / SUBMITTALS** (See Table C-2 for Details)	1	LS	80000.00	80,000	**80,000**
II	**EXCAVATION** (See Table C-2 for Details)	1	LS	########	1,369,398	**1,369,398**
III	**BACKFILLING / RESTORATION** (See Table C-2 for Details)	1	LS	########	1,317,058	**1,317,058**
IV	**CONTAMINATED SOIL TRANSPORTATION AND STAGING**					
1	CONSTRUCTION OF CONTAMINATED SOIL STAGING AREA (4 weeks)					
a	Equipment (dozer, roller, loader, & maintenance)	4	WK	7525.00	30,100	
b	HDPE liner, sand, geotextile, drainage pipe, crushed stone, etc.	1	LS	67000.00	67,000	
c	10-mil HDPE	1	LS	13000.00	13,000	
d	Access road	1	LS	20000.00	20,000	
e	Labor	20	DAY	7920.00	158,400	
	Construction of Contaminated Soil Staging Area Subtotal					288,500
2	TRANSPORT CONTAMINATED SOIL TO STAGING AREA (within mile radius)					
a	Mobilization / demobilization	2	EA	1000.00	2,000	
b	Equipment (dump trailers, dozer)	2	MO	117900.00	235,800	
c	Road repair	1	LS	7347.00	7,347	
d	Barricades / signage	2	WK	16700.00	33,400	
e	Labor (operator, detail officers)	38	DAY	1970.00	74,860	
	Transport Contaminated Soil to Staging Area Subtotal					353,407
3	PLACE SOIL IN STAGING AREA					
a	Equipment (loaders, excavators)	2	MO	46000.00	92,000	
b	Labor	2	MO	14400.00	28,800	
	Place Soil in Staging Area Subtotal					120,800
	TOTAL COST FOR CONTAMINATED SOIL TRANSPORTATION AND STAGING					**762,707**
V	**PRECONSTRUCTION**					
1	TREATABILITY TESTING	1	LS	50000.00	50,000	50,000
2	SITE PREPARATION AND MOBILIZATION	1	LS	800000.00	800,000	800,000
3	PERMITTING	1	LS	50000.00	50,000	50,000
4	WORK PLANS , HEALTH & SAFETY PLANS, COMMUNITY OUTRI	1	LS	100000.00	100,000	100,000
	TOTAL COST FOR PRECONSTRUCTION					**1,000,000**
VI	**SOIL TREATMENT**					
1	MATERIALS HANDLING (transport to treatment unit, screening)	38,000	CY	6.00	228,000	228,000
2	TREATMENT BY THERMAL DESORPTION	57,000	TON	175.00	9,975,000	9,975,000
	TOTAL COST FOR SOIL TREATMENT					**10,203,000**

Table C-4
Present Worth Costs for Alternative 5A
Excavation, Thermal Treatment at Another OU, Disposal

(A) Capital Costs (cont.)

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
VII	**TRANSPORTATION & DISPOSAL - TREATMENT RESIDUALS**					
1	TRANSPORT & DISPOSAL of CONCENTRATED PCB OIL	20	DRUM	700.00	14,000	14,000
2	TRANSPORT & DISPOSAL of RESIDUAL FINE PARTICLES	90	TON	185.00	16,650	16,650
3	WATER DISPOAL COSTS FOR DISCHARGE to SANITARY SEWE	6,566,400	GAL	0.30	1,969,920	1,969,920
4	TRANSPORTATION TO ANOTHER OU FOR DISPOSAL (within mile radius) (from IV (2))				353,407	353,407
	TOTAL COST FOR TRANSPORTATION & DISPOSAL - TREATMENT RESIDUALS					**2,353,977**
VIII	**ANALYTICAL COSTS**					
1	ANALYTICAL COSTS ASSOCIATED WITH EXCAVATION (Table C-2: Items V.1 - 6)	1	LS	498830.00	498,830	498,830
2	PCB FIELD TEST KITS (1 sample of treated soil per 12-hour shift)	630	SMPL	50.00	31,500	31,500
3	PCB SAMPLES of TREATED SOIL(1 per 500 cubic yards)	78	SMPL	90.00	7,020	7,020
4	FULL TCL/TAL of TREATED SOIL (1 per 2,500 cubic yards)	16	SMPL	990.00	15,444	15,444
5	TCLP METALS ANALYSIS for TREATED SOILS (1 per 2,500 cubic y	16	SMPL	100.00	1,560	1,560
6	WATER QUALITY SAMPLING for DISPOSAL to POTW	56	SMPL	700.00	39,200	39,200
7	WASTE CHARACTERIZATION SAMPLES for TREATMENT RESIDU	2	SMPL	890.00	1,780	1,780
	TOTAL COST FOR ANALYTICAL COSTS					**595,334**
	CAPITAL COST SUBTOTAL					**17,681,474**
	ENGINEERING, PROCUREMENT, LEGAL AND					
	ADMINISTRATIVE COSTS: @ 20%				3,536,295	
	CAPITAL COST SUBTOTAL					**21,217,768**
	CONTINGENCY @ 15%				3,182,665	
	TOTAL CAPITAL COST (ROUNDED)					**24,400,000**

Table C-4 (Continued)
Present Worth Costs for Alternative 5A
Excavation, Thermal Treatment at Another OU, Disposal

(B) Operation and Maintenance Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**SARA REVIEW (AT YEAR 5)**	1	EA	15000.00	15,000	15,000
	SUBTOTAL					**15,000**
	CONTINGENCY (10%)					1,500
	TOTAL O&M					**16,500**

Table C-4 (Continued)
Present Worth Costs for Alternative 5A
Excavation, Thermal Treatment at Another OU, Disposal

(C) Summary of Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**CAPITAL TOTAL**				#########	
II	**TOTAL PRESENT WORTH OF O&M COST :**					
	INFLATION RATE = 4%					
	DISCOUNT RATE = 7%					
	PRESENT WORTH OF O&M				14,000	
III	**PRESENT WORTH COST ALTERNATIVE 1-5 YEARS**					#########

Table C-5
Present Worth Costs for Alternative 5B-1
Excavation, Solvent Extraction at Another OU, Disposal

(A) Capital Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**PLANS / SUBMITTALS** (See Table C-2 for Details)	1	LS	80000.00	80,000	**80,000**
II	**EXCAVATION** (See Table C-2 for Details)	1	LS	1369398.00	1,369,398	**1,369,398**
III	**BACKFILLING / RESTORATION** (See Table C-2 for Details)	1	LS	1317057.50	1,317,058	**1,317,058**
IV	**CONTAMINATED SOIL TRANSPORTATION AND STAGING**					
1	CONSTRUCTION OF CONTAMINATED SOIL STAGING AREA (4 weeks)					
a	Equipment (dozer, roller, loader, & maintenance)	4	WK	7525.00	30,100	
b	HDPE liner, sand, geotextile, drainage pipe, crushed stone, etc.	1	LS	67000.00	67,000	
c	10-mil HDPE	1	LS	13000.00	13,000	
d	Access road	1	LS	20000.00	20,000	
e	Labor	20	DAY	7920.00	158,400	
	Construction of Contaminated Soil Staging Area Subtotal					288,500
2	TRANSPORT CONTAMINATED SOIL TO STAGING AREA (within 1 mile radius)					
a	Mobilization / demobilization	2	EA	1000.00	2,000	
b	Equipment (dump trailers, dozer)	2	LS	471600.00	943,200	
c	Road repair	1	LS	7347.00	7,347	
d	Barricades / signage	2	WK	16700.00	33,400	
e	Labor (operator, detail officers)	38	DAY	1970.00	74,860	
	Transport Contaminated Soil to Staging Area Subtotal					1,060,807
3	PLACE SOIL IN STAGING AREA					
a	Equipment (loaders, excavators)	2	MO	46000.00	92,000	
b	Labor	2	MO	14400.00	28,800	
	Place Soil in Staging Area Subtotal					120,800
	TOTAL COST FOR CONTAMINATED SOIL TRANSPORTATION AND STAGING					**1,470,107**
V	**SITE PREPARATION**					
1	EARTH WORKS & SITE GRADING	2.5	ACRE	12000.00	30,000	30,000
2	CONCRETE PAD (8 inch, Light industrial, reinforced)	20000	SF	5.00	100,000	100,000
3	ASPHALT FOR BUFFER AREA (with curbs)	66000	SF	3.00	198,000	198,000
4	FENCE	1200	LF	25.00	30,000	30,000
5	FENCE GATE	2	EA	2500.00	5,000	5,000
6	ELECTRIC SERVICE	1	LS	5000.00	5,000	5,000
7	POTABLE WATER SERVICE	1	LS	5000.00	5,000	5,000
8	HYDRANT	1	LS	10000.00	10,000	10,000
9	CONSTRUCTION OF CLEAN SOIL AREA	1	LS	30000.00	30,000	30,000
	TOTAL COST FOR SITE PREPARATION					**413,000**

Table C-5
Present Worth Costs for Alternative 5B-1
Excavation, Solvent Extraction at Another OU, Disposal

(A) Capital Costs (cont.)

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
VI	**SOIL TREATMENT**					
1	BENCH TREATABILITY TEST	1	LS	20000.00	20,000	20,000
2	MOBILIZATION / DEMOBILIZATION	1	LS	150000.00	150,000	150,000
3	LOAD / UNLOAD SYSTEM WITH 2 LOADERS	57000	ton	10.00	570,000	570,000
4	SOLVENT EXTRACTION TREATMENT COSTS	57000	ton	175.00	9,975,000	9,975,000
	TOTAL COST FOR SOIL TREATMENT					**10,715,000**
VII	**RESIDUALS TRANSPORTATION AND DISPOSAL**					
1	TRANSPORT AND INCINERATE CONCENTRATED PCB SOLUTION at TSCA FACILITY	20	drum	700.00	14,000	14,000
2	TRANSPORTATION TO ANOTHER OU FOR DISPOSAL (within mile radius) (from IV (3))	1	LS	1060807.00	1,060,807	1,060,807
3	DISPOSAL OF PPE (2 drums per month)	22	drum	250.00	5,500	5,500
4	DISPOSAL OF SPENT CARBON FROM AIR EMISSION CONTROL (1 drum per month)	11	drum	500.00	5,500	5,500
	TOTAL COST FOR RESIDUALS TRANSPORTATION & DISPOSAL					**1,085,807**
VIII	**ANALYTICAL COSTS**					
1	ANALYTICAL COSTS ASSOCIATED WITH EXCAVATION (Table C-2; Items V 1 - 6)	1	LS	421685.00	421,685	421,685
2	PCB FIELD TEST ANALYSES FOR CONFIRMATION SAMPLING OF TREATED SOIL	630	sample	50.00	31,500	31,500
3	PCB LABORATORY ANALYSES FOR CONFIRMATION SAMPLING OF TREATED SOIL	78	sample	90.00	7,020	7,020
4	SOLVENT LABORATORY ANALYSES FOR CONFIRMATION SAMPLING OF TREATED SOIL	78	sample	300.00	23,400	23,400
5	TCL/TAL LABORATORY ANALYSES FOR CONFIRMATION SAMPLING OF TREATED SOIL	16	sample	990.00	15,840	15,840
	TOTAL COST FOR ANALYTICAL COSTS					**499,445**
	CAPITAL COST SUBTOTAL					**16,949,815**
	ENGINEERING, PROCUREMENT, LEGAL AND ADMINISTRATIVE COSTS: @ 20%				3,389,963	
	CAPITAL COST SUBTOTAL					**20,339,777**
	CONTINGENCY @ 15%				3,050,967	
	TOTAL CAPITAL COST (ROUNDED)					**23,391,000**

Table C-5 (Continued)
Present Worth Costs for Alternative 5B-1
Excavation, Solvent Extraction at Another OU, Disposal

(B) Operation and Maintenance Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**SARA REVIEW (AT YEARS 5)**	1	EA	15000.00	15,000	15,000
	SUBTOTAL					**15,000**
	CONTINGENCY (10%)					1,500
	TOTAL O&M					**16,500**

Table C-5 (Continued)
Present Worth Costs for Alternative 5B-1
Excavation, Solvent Extraction at Another OU, Disposal

(C) Summary of Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**CAPITAL TOTAL**				23,391,000	
II	**TOTAL PRESENT WORTH OF O&M COST :** INFLATION RATE = 4% DISCOUNT RATE = 7% **PRESENT WORTH OF O&M**				14,000	
III	**PRESENT WORTH COST ALTERNATIVE 1 - 5 YEARS**					**23,405,000**

Table C-6
Present Worth Costs for Alternative 5B-2
Excavation, Dechlorination Treatment at Another OU, Disposal

(A) Capital Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**PLANS / SUBMITTALS** (See Table C-2 for Details)	1	LS	80000.00	80,000	**80,000**
II	**EXCAVATION** (See Table C-2 for Details)	1	LS	1369398.00	1,369,398	**1,369,398**
III	**BACKFILLING / RESTORATION** (See Table C-2 for Details)	1	LS	1317057.50	1,317,058	**1,317,058**
IV	**CONTAMINATED SOIL TRANSPORTATION AND STAGING**					
1	CONSTRUCTION OF CONTAMINATED SOIL STAGING AREA (4 weeks)					
a	Equipment (dozer, roller, loader, & maintenance)	4	WK	7525.00	30,100	
b	HDPE liner, sand, geotextile, drainage pipe, crushed stone, etc.	1	LS	67000.00	67,000	
c	10-mil HDPE	1	LS	13000.00	13,000	
d	Access road	1	LS	20000.00	20,000	
e	Labor	20	DAY	7920.00	158,400	
	Construction of Contaminated Soil Staging Area Subtotal					288,500
2	TRANSPORT CONTAMINATED SOIL TO STAGING AREA (within mile radius)					
a	Mobilization / demobilization	2	EA	1000.00	2,000	
b	Equipment (dump trailers, dozer)	2	LS	471600.00	943,200	
c	Road repair	1	LS	7347.00	7,347	
d	Barricades / signage	2	WK	16700.00	33,400	
e	Labor (operator, detail officers)	38	DAY	1970.00	74,860	
	Transport Contaminated Soil to Staging Area Subtotal					1,060,807
3	PLACE SOIL IN STAGING AREA					
a	Equipment (loaders, excavators)	2	MO	46000.00	92,000	
b	Labor	2	MO	14400.00	28,800	
	Place Soil in Staging Area Subtotal					120,800
	TOTAL COST FOR CONTAMINATED SOIL TRANSPORTATION AND STAGING					**1,470,107**
V	**SITE PREPARATION**					
1	EARTH WORKS & SITE GRADING	2.5	ACRE	12000.00	30,000	30,000
2	CONCRETE PAD (8 inch, Light industrial, reinforced)	20000	SF	5.00	100,000	100,000
3	ASPHALT FOR BUFFER AREA (with curbs)	66000	SF	3.00	198,000	198,000
4	FENCE	1200	LF	25.00	30,000	30,000
5	FENCE GATE	2	EA	2500.00	5,000	5,000
6	ELECTRIC SERVICE	1	LS	5000.00	5,000	5,000
7	POTABLE WATER SERVICE	1	LS	5000.00	5,000	5,000
8	HYDRANT	1	LS	10000.00	10,000	10,000
9	CONSTRUCTION OF CLEAN SOIL AREA	1	LS	30000.00	30,000	30,000
	TOTAL COST FOR SITE PREPARATION					**413,000**

Table C-6
Present Worth Costs for Alternative 5B-2
Excavation, Dechlorination Treatment at Another OU, Disposal

(A) Capital Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
VI	**SOIL TREATMENT**					
1	TREATABILITY TEST	1	LS	30000.00	30,000	30,000
2	SOIL DECHOLRINATION TREATMENT COSTS INCLUDING MOB/DEMOB, LOADING & UNLOADING	57000	TON	350.00	19,950,000	19,950,000
	TOTAL COST FOR SOIL TREATMENT					**19,980,000**
VII	**RESIDUALS TRANSPORTATION AND DISPOSAL**					
1	TRANSPORTATION TO ANOTHER OU FOR DISPOSAL (within mile radius) (from IV (3))	1	LS	1,060,807	1,060,807	1,060,807
2	DISPOSAL OF STILL BOTTOMS (NON-HAZ., 1% OF SOIL)	585	TON	125.00	73,125	73,125
3	DISPOSAL OF PPE (2 drums per month)	22	DRUM	250.00	5,500	5,500
	TOTAL COST FOR RESIDUALS TRANSPORTATION AND DISPOSAL					**1,139,432**
VIII	**ANALYTICAL COSTS**					
1	ANALYTICAL COSTS ASSOCIATED WITH EXCAVATION (Table C-2; Items V 1 - 6)	1	LS	421685.00	421,685	421,685
2	PCB FIELD TEST ANALYSES FOR CONFIRMATION SAMPLING OF TREATED SOIL	630	SMPL	50.00	31,500	31,500
3	PCB LABORATORY ANALYSES FOR CONFIRMATION SAMPLING OF TREATED SOIL	78	SMPL	90.00	7,020	7,020
4	TCL/TAL LABORATORY ANALYSES FOR CONFIRMATION SAMPLING OF TREATED SOIL	16	SMPL	990.00	15,840	15,840
	TOTAL ANALYTICAL COSTS					**476,045**
	CAPITAL COST SUBTOTAL					**26,245,040**
	ENGINEERING, PROCUREMENT, LEGAL AND ADMINISTRATIVE COSTS: @ 20%				5,249,008	
	CAPITAL COST SUBTOTAL					**31,494,047**
	CONTINGENCY @ 15%				4,724,107	
	TOTAL CAPITAL COST (ROUNDED)					**36,218,000**

Table C-6 (Continued)
Present Worth Costs for Alternative 5B-2
Excavation, Dechlorination Treatment at Another OU, Disposal

(B) Operation and Maintenance Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**SARA REVIEW (AT YEARS 5)**	1	EA	15,000	15,000	15,000
	SUBTOTAL					**15,000**
	CONTINGENCY (10%)					1,500
	TOTAL O&M					**16,500**

Table C-6 (Continued)
Present Worth Costs for Alternative 5B-2
Excavation, Dechlorination Treatment at Another OU, Disposal

(C) Summary of Costs

ITEM	DESCRIPTION	UNIT QUANTITY	UNIT	UNIT COST	TOTAL COST	SUBTOTAL
I	**CAPITAL TOTAL**				36,218,000	
II	**TOTAL PRESENT WORTH OF O&M COST :**					
	INFLATION RATE = 4%					
	DISCOUNT RATE = 7%					
	PRESENT WORTH OF O&M				14,000	
III	**PRESENT WORTH COST ALTERNATIVE 1 - 5 YEARS**					**36,232,000**